EXCHANGE RATE APPRECIATION, CAPITAL FLOWS AND EXCESS LIQUIDITY

Adjustment and Effectiveness of Policy Responses

Edited by
Victor Pontines
Reza Y. Siregar

The SEACEN Centre

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Foreword

The 2008-2009 Global Financial Crisis (GFC) brought the global economy to the brink of a global depression not seen since the Great Depression of the 1930's. While several of the European peripheral countries remain deeply-mired in dealing with banking and sovereign debt problems, the Asian region is fast relegating the GFC as a thing of the past with its swift and immediate recovery from the recent crisis. Most recent indicators of economic performance by individual economies in the region show that indeed, it is the fastest growing region in the world at the moment. Such dynamism in the region, however, also comes with its own set of pressing and immediate challenges. Buoyant growth in the region, spurred to a great extent by the ultra-low policy rates in the region as well as by the series of quantitative easing in the advanced economies to revive their anemic growth prospects, has led foreign capital returning to the Asian region.

With memories of the 1997-1998 Asian financial crisis still firmly etched in the memories of policymakers in the region, they know fully-well that capital inflows can both be a blessing and a curse. On the one hand, foreign capital can be tapped to augment the scarce availability of domestic savings and as such, can be crucially drawn upon to improve existing levels of physical and human infrastructures. Large capital inflows and the attendant rise in domestic currencies, however, can create macroeconomic problems and issues in an economy especially when these flows come in droves and are volatile. In particular, substantial capital inflows cause domestic credit to expand and speculative activities to swell, which can lead to inflated values in asset prices and create lingering risks in the balance sheets of households, banks and corporations. Once the tides turn, sudden stops or drastic reversals in these flows can lead to the bursting of asset bubbles, investment and output collapse and, ultimately, to a very costly recession, if not, a widespread depression.

Cognizant of these concerns, The SEACEN Centre conducted two signature research projects which aimed to identify and debate issues surrounding capital inflows and exchange rate appreciations as well as to explore possible alternative measures in managing capital inflows and exchange rate appreciations. These two collaborative signature research projects were led by Dr. Reza Y. Siregar, former Director of Research and Learning Contents of The SEACEN Centre and Dr. Victor Pontines, Senior Economist who was on secondment from Bank Negara Malaysia to SEACEN. The SEACEN Centre wishes to express its sincere gratitude to the project researchers as well as to the participating SEACEN member central banks/monetary authorities for their active participation

in both signature projects and in the preparation of the chapters for this edited volume. They are namely, Prof. Levy-Yeyati, Professor of Economics at Universidad Di Tella in Buenos Aires, Senior Fellow at Brookings Institution, and Director of Economics in CIPPEC, Argentina's top think tank; Masahiro Kawai, Dean and CEO, Asian Development Bank Institute (ADBI); Prof. Hiro Ito from the Department of Economics, Portland State University; Stefan Avdjiev, Robert McCauley and Patrick McGuire from the Monetary and Economic Department, Bank for International Settlements, Basel, Switzerland; Junhan Kim, Senior Economist at The Bank of Korea; and, Lynne Cockerell, Chamath De Silva and Chris Potter from the International Department of the Reserve Bank of Australia. All of the above named researchers contributed papers to the first signature research project of *Policy Responses and Adjustments in the Course of Exchange Rate Appreciation*. Meanwhile Prof. Stefan Gerlach from the Institute for Monetary and Financial Stability, Goethe-University Frankfurt and CEPR; Peter Tillmann from Justus-Liebig-University Giessen and Institute for Monetary and Financial Stability, Goethe-University; Mark Spiegel from the Department of Economic Research, Federal Reserve Bank of San Francisco; Darsono and Juda Agung from the Directorate of Economic Research and Monetary Policy, Bank Indonesia; Ahmad Razi, Ahmad Mohd. Ripin and Mohd. Nozlan from the Economics Department and Monetary Assessment and Strategy Department of Bank Negara Malaysia and Veronica Batallones Bayangos, Acting Deputy Director at the Center for Monetary and Financial Policy (CMFP) of the Bangko Sentral ng Pilipinas (BSP), authored the papers for the second signature research project of *Living with Capital Flows and Excess Liquidity: Assessing Effectiveness of Monetary Policy in SEACEN Economies.* The assistance received from the staff members of the Research and Learning Contents Department of The SEACEN Centre is also gratefully acknowledged. Finally, the views expressed in this study, however, are those of the authors and do not necessarily reflect those of The SEACEN Centre or its member central banks/ monetary authorities.

Dr. A.G. Karunasena June 2012
Executive Director
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Introduction

When the process of domestic and international financial liberalisation became intense in East Asia in the 1990s, economies in this part of the world were enjoying rapid and sustained growth fueled by high-saving and investment rates as well as by pronounced human capital accumulation. Dubbed as the so-called "Asian Miracle", this was the result of disciplined macroeconomic management as well as a policy strategy predicated on active public sector involvement in production and resource allocation and implicit guarantees on private sector investment projects. The drawback of this strategy was that it induced domestic firms to undertake high-risk projects by relying heavily on short-term borrowing, mostly in foreign currency. These short-term private capital inflows were mainly intermediated by domestic financial institutions which created currency and maturity mismatches since these foreign-currency borrowings by the domestic firms were mainly unhedged.

The large and short-term capital inflows which poured in at the beginning of the 1990s into the East Asian economies that saw the currencies of these economies strengthen against the US dollar both in nominal and real terms, suddenly and massively reversed on an unprecedented scale when the Asian financial crises erupted in the summer of July 1997. The sharp fall in their currencies exposed a crucial weaknesses in their domestic banking systems where the double mismatches mentioned earlier had a debilitating consequence on the real sector of these economies resulting in the increased incidences of bankruptcies, unemployment and collapses in output. Thus, what initially started as a currency crisis was quickly transformed into a full-blown economic and financial crisis.

The subsequent recovery of these economies from the crisis was remarkable and immediate and was believed to be facilitated by the implementation of comprehensive economic and structural reforms as well as by generally favourable external conditions. In the aftermath of the Asian crisis, most of the SEACEN economies have enjoyed healthy current account surpluses and as foreign capital returned to the region, these economies have responded to the tendencies of their currencies to appreciate and the consequent potential impact on their trade competitiveness by intervening and accumulating international reserves to varying degrees. While the recent 2008-2009 Global Financial Crisis (GFC) briefly interrupted the flows of foreign capital into the region, the resilience of the region in withstanding the economic blows wrought by the GFC in view of a better and sturdier financial system compared to before the Asian financial crisis

coupled with the monetary easing and continued sluggish performance of the advanced economies has meant that the region is again faced with another surge of capital inflows. This brings the policymakers in the region into somewhat familiar territory as they are again beset with well-known yet challenging questions such as how policy should best respond to the influx of massive capital flows as well as how to carefully manage the potential repercussions of the upward pressure on the exchange rate brought on by these flows.

Against this background, The SEACEN Centre organised two Research Workshops that provided the forum for the participants of the ***SEACEN Signature Research Project on Policy Responses and Adjustments in the Course of Exchange Rate Appreciation*** as well as the ***SEACEN Signature Research Project on Living with Capital Flows and Excess Liquidity: Assessing the Effectiveness of Monetary Policy in SEACEN Economies*** to discuss their preliminary findings and other technical matters pertaining to both projects. More importantly, these research workshops were conducted to provide the opportunity for participants of both projects to identify and debate issues surrounding capital inflows and exchange rate appreciations as well as to explore possible alternative measures in managing capital inflows and exchange rate appreciations.

The twelve chapters in this Volume are the fruit of the collaborative efforts of the participants of the two research projects.The chapters are divided into three parts: (i) Background and Survey of Issues (Chapters 1 and 2); (ii) Perspectives and Evidence (Chapters 3 to 7); and (iii) Country Studies (Chapters 8 to 12).

The first chapter, by Stefan Gerlach and Peter Tillmann comprehensively reviews the current state of the debate on capital flows. More specifically, they document the recent patterns and trends in capital inflows as well as the latest evidence on the potential drivers of these flows to emerging markets in general and to Asian economies in particular. They also critically discuss the ever changing views on the efficacy of capital controls, explore the possible role that macro-prudential tools can play in mitigating asset-bubble consequences from large capital inflows, and, finally, consider the issue of whether inflation targeting (IT) can remain an appropriate monetary policy framework in emerging economies. They cite evidence from recent data that the current wave of inflows is different from previous waves in that the current surge is tilted more towards portfolio flows. Alluding to the successful experiences of Hong Kong and other Asian economies in the implementation of macro-prudential measures, they argue

that these measures, if properly executed, can be effective in mitigating the consequences of capital inflows on asset prices and financial stability. On the other hand, in the absence of properly designed macro-prudential measures or in the circumstance that such measures are difficult to implement, resorting instead to capital controls in managing capital flows can be an option. They, however, emphasised that finding the right dosage of these macro-prudential measures in general and capital controls in particular can be difficult. In the final section of the chapter, the authors cite recent evidence on the performance of IT and make the case that it is well-equipped for dealing with surges in capital flows.

Chapter 2 by Eduardo Levy-Yeyati surveys in detail the issues surrounding the consequences of exchange rate policy (ERP), both from the short-run perspective of countercyclical management and the long-run development perspective. Viewed in terms of the former, Levy-Yeyati generically uses the term exchange rate smoothing policies to refer to macroeconomic tools such as exchange rate intervention and capital controls that address the macroeconomic risks that arise from pro-cyclical capital inflows, excessive exchange rate volatility and asset inflation. He then shows through careful analysis that while intervention marginally leads to weaker currency relative to the non-intervention case, the oft-cited conventional view that intervention is too costly due to wide sovereign spreads or heavy quasi-fiscal losses appears to be overstated. On the other hand, he argues that capital controls can be effective especially in cases when they are administered in large doses. More importantly, capital controls can deter the occurrence of a form of Dutch Disease, coined by Levy-Yeyati as "financial Dutch Disease", one that is induced by sustained capital inflows and increases non-tradable prices at the expense of all tradables (both exports and import-substitution sectors). With regard to the latter perspective, intervention appears to be consistently significant and economically important for long-term growth performance, but not for the *volume* of exports and imports, as the conventional mercantilist view would expect. Nevertheless, intervention seems to offer a significant boost to savings and investment, possibly associated with lower labour costs.

Chapter 3 by Hiro Ito and Masahiro Kawai measure the extent of different income and regional groups of economies including those of the SEACEN economies in achieving any two, but not all, of the three policy goals of monetary policy independence, exchange rate stability and financial market openness as dictated by the classic hypothesis of the "impossible trinity" or "trilemma". They measure the extent of the policy choices via the construction of a set of trilemma

indexes which were derived from separate estimated models that explain these three policy goals. They then go on to plot the combinations of the indexes in the famous trilemma triangles and make contrasting observations between middle or low-income groups, on the one hand, and high income economies, on the other. Specifically, the former have, on average, pursued high levels of monetary policy independence and exchange rate stability for the last twenty years, whereas, the latter have shifted from favouring, on average, the combination of exchange rate stability and monetary policy independence during the 1970s to that of greater financial market openness and exchange rate stability. With regard to SEACEN economies, it appears that these economies have taken, on average, a similar path as other middle or low-income economies, but interestingly had pursued exchange rate stability persistently until the Asian financial crisis. The authors then conclude by emphasising that SEACEN economies have ample room to open financial markets and for the trilemma indexes to be useful warning indicators of crisis.

Chapter 4 by Mark Spiegel empirically examines the relationship between the adoption of formal monetary regimes and capital account volatility before the global financial crisis, during and after the crisis. Spiegel pays special attention to formal inflation targeting regimes as well as examines the impact of adopting fixed exchange rate pegs. He finds robust evidence that inflation targeting countries have lower capital and current account volatility, and also exhibit lower and less volatile inflation on average. However, they are not robust to the inclusion of country fixed effects, leaving open the possibility that the inflation targeting decision is driven by other country characteristics that are associated with superior economic performances. He also finds that countries that pursued inflation targeting and those that pursued exchange rate pegs during and after the crisis had superior inflation performances, both in terms of lower average inflation levels and reduced inflation volatility. He argues that one reason why there was a failure to identify any role for inflation targeting once country fixed effects were included is the failure to distinguish between those countries that had fundamentals-based reasons for large capital inflows or outflows, such as shocks to a country’s terms of trade. In view of this, he concludes that for future research, the inclusion of more conditioning variables may help to identify the role of the monetary regime in the determination of the eventual magnitudes of realised capital inflows and outflows.

Chapter 5 by Victor Pontines and Reza Siregar studies the macroeconomic effects of large exchange rate appreciations and reserves accumulations in selected Asian economies. They generally found weak evidences of adverse

consequences of large exchange rate appreciations on one hand, and varying macroeconomic impact of large reserves accumulation on the other. The authors conclude that the benefit of fear of appreciation cannot be completely dismissed but the gain has to be balanced with the well-known quasi-fiscal costs and other distortions created by such interventions. This then implies that apart from macroeconomic indicators such as exports, growth and inflation considered in the analysis, a broader set of key indicators have to be included in order to arrive at a more comprehensive assessment of either to allow strong currencies, or to otherwise intervene in foreign exchange markets.

Chapter 6 by Stefan Avdjiev, Robert McCauley and Patrick McGuire examines the role that international credit play in generating credit market booms in emerging economies. Utilising recent cases in Europe and older cases before the 1997-98 Asian financial crisis as well as regression analysis for a sample of 31 emerging market economies in the years 2002-08, they find that international credit is an enabler of credit market booms. In addition, they present evidence that, after the onset of the crisis, overall credit and real output tended to contract more when the dependence on international credit have reached a higher level. The authors also raise the observation that based on recent data, the growth of international credit in Asia has not contributed much to the recent period of rapid credit growth in the region. The authors argue, however, that if countries in the region become more financially open, residents will be able to capitalise on carry trade opportunities, and thus shift their liabilities out of domestic currency. They then cite the experience of Europe where greater dependence on international credit, in particular foreign currency credit, limits the ability of domestic policymakers to constrain credit growth. The authors conclude that international credit must merit attention and one way is for the authorities to use BIS statistics to cross-check estimates of the international indebtedness of their residents.

Chapter 7 by Victor Pontines and Reza Siregar carefully examines not only the crucial determinants of aggregated and cross-border international bank lending but also the stability of this type of capital flows - on whether they tend to pull-out from recipient economies during difficult times in source economies. They find that while such retrenchments are not evident on an aggregated basis, cross-border international bank lending actually pull-out from host economies. The authors conclude based on this evidence that encouraging the entry of brick-and-mortar affiliates of international banks maybe the judicious choice for host economies. They then verify whether this outcome is distinct between a foreign bank branch structure as opposed to a foreign bank subsidiary. In their analysis,

they find that foreign bank subsidiaries are more capable of shielding themselves from the financial difficulties of their global parent banks.

Chapter 8 by Darsono and JudaAgung documents the recent trend of capital inflows in Indonesia, and assesses how the surge in capital inflows has increased the complexities of macroeconomic management. They provide suggestions on what are required for the Indonesian rupiah to be managed flexibly and avoid the occurrence of currency overvaluation. In view that Indonesian monetary policy strategy uses the interest rate as an operating instrument, they argue that there is a need for such a strategy to be buttressed by the accumulation of foreign exchange reserves via sterilised intervention as well as by macro-prudential policies. The authors conclude that employing such multiple instruments is only necessary and logical in view of Indonesia's ever-increasing integration with the global economy.

Chapter 9 by Junhan Kim sets out to explain the likely drivers of international capital movements under the condition that covered interest rate parity does not hold and in the presence of financial frictions in both domestic and foreign financial markets. He finds in his simulations that reacting more aggressively to output in situations of a foreign interest rate shock would make foreign loans less susceptible to external shock. However, reacting more aggressively to inflation would instead give rise to high volatility. This result, according to the author, can be used as basis for the argument that inflation targeting when interpreted as reacting more aggressively to inflation than output, may be at odds with financial stability in the presence of adverse external shocks.

Chapter 10 by Ahmad Razi, Ahmad Mohd. Ripin and Mohd. Nozlan draw from the Malaysian experience with regard to capital flows during the 1990s and 2000s to assess the conventional endorsement of treating capital controls as a legitimate but last-resort policy option for capital flows management. The authors point out that in principle, Malaysia has exercised a comprehensive framework of capital flow management that is built upon strong macroeconomic foundations, supported by comprehensive prudential regulation for the banking system. They also emphasised that under exceptional circumstances when all conventional policies have been exhausted, administrative measures are deployed in a targeted and transitory manner. Nevertheless, they argue that the conventional macroeconomic framework in dealing with capital inflows appears to be disconnected from the realities of policymaking. According to them, the idea of exhausting all potential macroeconomic and prudential measures prior to resorting to capital controls may impede the timeliness and effectiveness of policymakers'

responses to negative spillovers from volatile capital flows.Thus, in essence, it may inevitably render capital flow management measures ineffective for managing excessive inflows.

Chapter 11 by Veronica Bayangos provides a succinct analysis of the nature and drivers of overseas remittances by Filipino migrant and overseas workers to the Philippines. She also presents a comprehensive analysis of the channels and impact of overseas remittances on growth and inflation. Bayangos' preliminary simulation of an increase in remittances from a complete macro-econometric model indicates that it will increase consumption, investment, labour productivity and economic growth in the Philippines. There are indications that an increase in remittances also leads to a change in the economic structure, in particular a decline in traded goods production and exports as well as effects on the labour market. These imply that there is an increased dependence on remittances. Another interesting finding of the simulation is that monetary policy transmission continues to be relevant as it feeds through the market interest rates. However, the simulation results also suggest that monetary policy pass-through tends to moderate once we take into account the impact of a surge in remittance flows.

Chapter 12 by Lynne Cockerell, Chamath De Silva and Chris Potter provides a comprehensive historical account of Australia's decision to float its exchange rate as well as an incisive discussion of the eventual consequences and issues surrounding that decision. They argue that while, on the one hand, Australia has faced increased volatility in its exchange rate and capital flows, these factors, however, have often operated to Australia's advantage. In particular, the exchange rate has operated as a shock absorber through a number of significant episodes, including the Asian financial crisis, the tech bubble, and the ongoing financial crisis, as well as through large swings in the terms of trade. They re-confirm in their analysis that the terms of trade serve as the fundamental driver of the Australian dollar. They also provide evidence in their empirical analysis that floating rates have generally worked toward mitigating the effects of external shocks.

PART 1

BACKGROUND AND SURVEY OF ISSUES

Chapter 1

CAPITAL FLOWS: WHERE DO WE STAND?[1]

By
Stefan Gerlach[2] and Peter Tillmann[3]

1. Introduction

Capital flows to emerging market economies are back on the agenda of international financial diplomacy. While these countries received sharp increases in inflows after the onset of tensions in the capital markets in the advanced economies in 2007, the net flows turned negative after the failure of Lehman Brothers in September 2008 that marked the height of the global financial crisis. Recently, however, many emerging market economies again experience very large inflows, partially due to concerns about financial stability in the advanced economies.

Several aspects of these flows are notable.[4] First, while their overall level may be broadly comparable to those observed in the run-up to the Asian financial crisis and before 2008, the pace at which the inflows have risen has been striking. Second, many Asian economies have seen particularly large inflows. Third, portfolio flows have played a more important role than in the past, largely because banking flows have been slow to recover in light of deleveraging in the financial sector.

Large capital inflows raise important policy issues, particularly in the emerging market economies where the economic conditions may be particularly sensitive to the impact of real exchange rate changes on export competitiveness, and where the institutional arrangements for banking supervision, financial

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1. This paper was prepared for the *Research Workshop on Living with Capital Flows and Excess Liquidity: Assessing Effectiveness of Monetary Policy in SEACEN Economies*, Kuala Lumpur, 14-16 August 2011. We thank the participants for the useful discussions.

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4. See the discussion in Pradhan et al (2011).

regulation and macroprudential oversight may not be fully developed. Thus, inflows can put upward pressure on the real exchange rate and in this way harm the traded-goods sector. They may lead to macroeconomic overheating and raise inflationary pressures, and risk fuelling asset price bubbles and a deterioration of lending standards, raising the risk of financial instability. Furthermore, they may cause large fiscal deficits (or losses by central banks) if attempts are made to sterilise them. And, if a sudden stop occurs, it can force abrupt changes in economic conditions.

To cope with these challenges, many emerging economies have over time made use of a range of tools to inhibit the inflows. However, the use of such capital controls has historically been seen as highly controversial by policymakers in the advanced economies and by the international financial institutions. However, there is now much greater recognition across the world that capital controls can play a crucial role in dealing with inflows.

The main reason for this change in sentiment is no doubt the recent financial crisis, which demonstrated all too clearly that large-scale inflows, coupled with weaknesses in financial regulation and supervision, can have exceptionally serious consequences. One particular concern is that they fuel asset price booms whose unwinding can cause massive losses in the financial sector and require direct public intervention. Furthermore, a financial crisis can, by slowing growth and reducing tax revenues, lead to a fiscal crisis (Reinhart and Rogoff, 2009).

Of course, central banks in the emerging market economies have plenty of experience with the risks associated with large inflows; what is new is that policymakers in the advanced countries have also come to recognise the dangers. The fact that large inflows appear to have played a role in the housing boom and the subsequent crash in the United States has no doubt influenced international views about the desirability of capital controls.

But while the view that capital controls can have a role to play has become increasingly accepted, it nevertheless remains the case that the circumstances under which this is so are restrictive, including, in particular, the condition that other macroeconomic policy tools must have been exhausted. Furthermore, capital controls are now motivated largely as tools to help ensure financial stability rather than to facilitate the conduct of monetary policy.

In this paper we provide a brief overview of the current state of the debate about capital flows. We review the rebound of capital flows since 2009 when the financial crisis started to subside, discuss how views about capital controls

have changed over time and examine their implications for monetary policy and macroprudential policy. In particular, we review the latest contributions to the literature on the determinants of capital flows and assess whether inflation targeting remains an appropriate monetary policy framework in the emerging economies. Throughout the analysis special attention is paid to the Asian experience with capital inflows and macroprudential as well as monetary policy.

2. The Ebb and Flow of Capital Flows

2.1 Some Stylised Facts

We begin by reviewing the recent behaviour of capital flows to the emerging market economies in general and to the Asian economies in particular. Three key observations stand out: First, the massive retrenchment of investors from the emerging economies during the financial crisis was followed by an unprecedented return of capital flows only two years later. Second, the rebound of capital inflows is highly heterogeneous across the emerging countries. Third, compared to the previous waves of capital flows, the composition of capital inflows changed remarkably. We discuss each observation in turn.

First, the overall volume of capital inflows almost reaches the pre-crisis levels. Figure 1shows the net capital flows to the emerging market economies as a percentage share of their GDP. Prior to the financial crisis, the emerging economies experienced a massive and sustained wave of inflows accounting for more than 4 percent of the GDP in net terms. In the figure, the dramatic retrenchment of foreign investors in 2008, during the scramble for liquidity in the financial markets in the advanced economies, and the exceptionally strong rebound since the second half of 2009, as concerns about sovereign debt in many of the same countries grew, are readily apparent. The pattern of flows that goes hand in hand with the unfolding financial crisis originating in the industrial countries, which serves to illustrate that capital flows to the emerging market countries are frequently determined by developments in the advanced economies.

Second, the rebound is uneven across regions and countries. Figure 2 shows the net capital flows to Asia. The figure reveals that while flows to the entire group of emerging countries have not yet reached the immediate per-crisis level, flows to the Asian emerging economies have already exceed those observed in 2007-08. Although differences between Asia in Figure 2 and the overall group of emerging market economies depicted in Figure 1 are striking, they still understate the degree of cross-country and cross-regional heterogeneity. Since these figures contrast flows to Asia to flows going to the overall family of emerging

economies, they are unable to show that the flows to Asia are much stronger than those to Latin America and other emerging economies.

This notion of a multi-speed recovery of international flows is further strengthened by a country-level comparison of current capital inflows with those observed in the pre-crisis boom. Figure 3 reports the difference of capital inflows as a fraction of GDP between these episodes. The results are striking: while in some Eastern European countries the GDP-share of net inflows dropped by a quarter, inflows to Asia are broad based with almost all countries showing a gain in the share of inflows to GDP. Although financial centers such as Hong Kong and Singapore experience exceptionally strong inflows, countries such as Thailand and Indonesia also received massive inflows well above their pre-crisis level. In contrast to emerging Asia, flows to Latin America exhibit a much larger degree of cross-country heterogeneity.

A third salient observation concerns the composition of the flows, see again Figures 1 and 2: while the surge in inflows prior to the crisis was predominantly due to foreign direct investment (FDI), the current rebound is due to bank lending and portfolio flows, suggesting that they thus are at least partially are driven by concerns about financial stability and perceptions of sovereign risk in the advanced countries. Note also that bank flows were a sizable part of inflows prior to 2008 in all the emerging market economies. In Asia, in contrast, bank flows were significantly less important due to the ongoing deleveraging of financial institutions in the advanced economies. As argued below, this fact might contribute to the relative resilience of Asia compared to other regions. The role of flows channeled through the banking system also explains the severe drying up of flows to the emerging market economies in Eastern Europe. Prior to the financial crisis, more than two thirds of inflows to this region were bank flows. With banks and, in particular, those in Europe being heavily hit by the debt crisis in the European periphery, lending to the Eastern European countries was dramatically reduced.

Figure 4 distinguishes between the capital inflows to Asian economies prior to the Asian crisis in 1997, during the 2004-07 episode, and in the post-crisis period. While – again - the overall volume of capital inflows exceeds that of the previous boom periods, the composition of flows changed in important ways. The share of bank flows declined. At the same time, portfolio flows became more sizeable and account for roughly one half of the current volume of net inflows. As mentioned before, the drop in bank lending is explained by the sharp deleveraging of financial institutions in industrial countries. The strength of portfolio flows reflects, as will be discussed in the next section, the return differential between the booming emerging markets and accommodative monetary conditions

in the industrial economies. The most notable feature in Figure 4 as well as in Figures1 and 2, however, is the decline in the role of FDI. Inflows in the form of FDI have long been seen as "good" capital inflows as opposed to "bad" types such as portfolio inflows. The reason for this was that portfolio flows were considered volatile while FDI was seen as a stable source of funding. This is not necessarily true, as Figure 5 reveals. The standard deviation based on a 10-year moving window of annual observations of alternative types of inflows changes over time. Most importantly, FDI became more volatile and over the past decade has been *more* volatile than portfolio inflows. Given that most measures to control capital inflows are directed towards portfolio inflows, this is a striking finding. Before we discuss these measures, we briefly review the determinants of cross-border capital flows and survey the latest empirical research.

2.2 What Drives Capital Flows?

In thinking about the causes of capital flows, it is useful to distinguish between push and pull factors, and between cyclical and structural factors. Push factors, defined as financial and macroeconomic conditions in the advanced economies, lead investors to refrain from investments in the mature economies and instead send funds to the emerging economies. These factors tend to be global and lead to inflows into the emerging market economies as a group. In contrast, pull factors are given by the financial, macroeconomic and political conditions in the recipient countries. While these may be correlated across economies, reflecting regional developments, they are best seen as idiosyncratic or country specific. Naturally, domestic economic policies may influence the pull factors, but they have by definition no impact on the nature and the strength of the push factors.

Among the push factors, interest rates in the advanced economies are particularly powerful drivers of capital flows.[5] Lower interest rates reduce expected returns on holding bonds issued by the advanced economies, thus providing investors with incentives to search for higher returns elsewhere. One reason lower interest rates can have such a large effect is that, by reducing borrowing costs, they help fuel "carry trades" in which investors take leveraged positions in, in particular, emerging market assets.

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5. Of course, interest rates in the advanced economies are, appropriately, set in light of domestic economic conditions and not in light of their implications for global capital flows.

The sensitivity of capital flows to interest rates in the advanced economies implies that a tightening of monetary policy in, say, the United States risks triggering a sharp reversal of capital flows which can have large effects on the emerging economies. The Volker disinflation in the U.S. between 1979 and 1982, when short-term U.S. interest rates rose dramatically, triggered capital flows from the developing economies, which played an important role for setting the stage for the subsequent debt crisis in Latin America.

The second, closely related factor is financial conditions in the mature markets. An increase in investors' willingness to hold risky assets or, equivalently, in their perception of the riskiness of assets, can have large effects on capital flows. Paradoxically, while periods of heightened riskiness in the past have been associated with reduced flows to the emerging markets, in the most recent period increased risk perceptions have tended to boost flows. What is different this time is, of course, that perceptions of riskiness have risen more in the advanced than in the emerging market economies.

The series of financial crises since 1997 highlight the role of another push factor of steadily growing relevance: the risk of contagion. Thus, the financial crises in the 1980s in many cases remained limited to a particular country or, as in Latin America, were confined to a specific region. A decisive characteristic of crises today, however, is that an event in one country can trigger investor responses that impact on other countries. Through trade and financial linkages, the interconnectedness of global financial institutions and the channels of risk aversion and market expectations, a sudden stop of capital inflows or even a dramatic outflow can be the fallout of a crisis happening elsewhere, even on another continent. The series of collapsing currencies during the Asian crisis and spillovers from the Russian default to the Brazilian crisis thereafter showed the powerful role of contagious capital movements, not to mention the repercussions of sovereign debt problems we see today.

Pull factors such as investment opportunities and growth prospects in the emerging economies, domestic monetary and financial condition, steps towards financial liberalisation and political stability, tend to make it more attractive for investors to direct flows towards the emerging world.

An alternative categorisation of the driving forces distinguishes between cyclical and structural factors (IMF 2011a). Among the cyclical factors are global and local interest rates, domestic inflation and global risk aversion, which all tend to fluctuate, sometimes sharply, around some "normal" levels. Structural factors such as potential growth in the mature and the emerging economies,

portfolio diversification, trade and financial openness are typically slow-moving variables. The challenges for macroeconomic management clearly come from cyclical, and hence volatile, determinants of capital flows.

A large literature quantify the role of push and pull factors in the determination of capital flows. Here we briefly survey some recent studies, which were all written against the backdrop of the retrenchment and the subsequent rebound of flows.

Milesi-Ferretti and Tille (2011) document this unprecedented collapse in international capital flows during the financial crisis. They show that the main driving force had been a risk shock that made investors more cautious about future investment prospects. The size of the capital flow reversal that preceded the current wave of inflows was tightly linked to the extent of international financial integration as well as domestic macroeconomic conditions. A second observation is that the retrenchment was highly heterogeneous across time, across types of flows and across geographic regions.

Forbes and Warnock (2011) study the determinants of extreme movements of capital across borders. They identify "waves" of capital flows, i.e., prolonged periods of capital flows referred to as surge, stop, flight and retrenchment periods. Interestingly, they also focus on gross flows rather than net flows as capital flows initiated by foreigners are likely to be driven by other considerations than flows initiated by domestic investors. Both type of investors could also be affected differently by policy measures and economic shocks, and potentially respond by adjusting different types of capital flows. Their findings attribute a crucial role to global factors, a somewhat less important role to contagion and less prominent role to domestic pull factors. Among these global factors, global risk has the largest explanatory power. Global growth predicts surges of capital flows and sudden stops while contagion through financial linkages is a significant predictor of stops and retrenchments. In contrast to other studies, Forbes and Warnock (2011) find that liquidity conditions and global interest rates are insignificant explanatory variables. Among the pull factors, domestic growth has the strongest impact on surges and stops.

While most of the existing studies focus on capital flows at a quarterly or even annual frequency, the recent study by Fratzscher (2011) is based on portfolio flow data at daily, weekly and monthly frequency. This is particularly interesting in the current crisis and the subsequent recovery as quarterly data wash out many of the high frequency movements of volatile portfolio inflows. He finds that common factor driving flows across countries have highly heterogeneous

impacts on the 50 countries included in the study. This impact is associated with a country's strength of domestic institutions, its country risk assessment and domestic macroeconomic fundamentals. A second finding is related to the current surge in capital inflows. The author shows that idiosyncratic pull factors originating in the emerging market economies dominated the driving forces during the recovery from the global crisis.

Although global in nature, the recent financial crisis affected countries differently. Tille (2011) shows that the Asian economies fared better in terms of capital flow volatility than other merging regions. He shows that the contraction of capital flows, though severe, has been limited to the acute phase of the crisis immediately following the Lehman collapse and goes on to argue that the limited reliance on flows channeled through banks and financially engineered products could explain Asia's limited exposure to the storm.

Although the evidence reviewed above differ in the weights attached to push versus pull factors in explaining cross-border capital flows, global push factors are the key drivers of capital flows. This, in turn, implies that to the extent these global forces are taken as given for a small, open, emerging market economy, domestic macroeconomic policy has little room to affect capital inflows. It should also be noted that the relative importance of push versus pull factors and, hence, the explanatory power of foreign and domestic variables, changes over time. This also implies that the challenges for domestic macroeconomic policy, either monetary, fiscal and macroprudential, also vary together with global financial conditions. Before we discuss the consequences of capital flows for macroeconomic policy, we briefly sketch the current environment in which capital flows take place, that is, the current realisations of push versus pull factors.

2.3 Push Factors in the Current Situation

The current situation is characterised by exceptionally powerful push factors.[6] In the aftermath of the global financial crisis, monetary policy in the advanced economies remains unusually expansionary and interest rates along the yield curve are at historically low levels. Furthermore, the central banks have flooded markets with liquidity, leading investors to search for profitable investment opportunities at home and abroad.

6. For an analysis, see also IMF (2011a).

While many emerging economies also sharply cut interest rates at the peak of the crisis, which reduced interest rate spreads against the advanced economies, they now face mounting inflationary pressures and strong recoveries. As a consequence, they have been compelled to start tightening monetary policy well in advance of the central banks in most mature economies. The result is a sizable yield differential, which attracts funds to the emerging economies. As the Economist (2011) notes, these flows "may have less to do with their long-term prospects than with temporary factors such as unusually loose rich-world monetary policy, over which they have no control." Furthermore, the accommodative monetary stance in the industrial economies will persistent for some time. With the crisis still unresolved in Europe, fiscal strains in the U.S. and a weak recovery in many industrialised economies, the yield differential of emerging over advanced economies will push capital flows into the emerging economies for the time being.

2.4 The Effects of Capital Flows

Capital inflows are, of course, highly welcome in the emerging economies. They lower the costs of funding, help raise the standard of living and thus facilitate convergence with the advanced economies. Likewise, cross-border flows, by offering profitable investment opportunities and extending the set of available assets, contribute to economic efficiency and risk sharing also in the source countries.

Nevertheless, it is possible to have too much of a good thing and massive capital inflows often have many unwarranted effects:

1. They can lead to a real exchange rate appreciation that undermines competitiveness and employment in the traded goods sector.

2. By preventing the central bank from tightening monetary policy, they can lead the economy to overheat, generating inflationary pressures.

3. They can trigger and prolong asset price bubbles, which have adverse allocative consequences, amplify financial fragility and whose eventual collapse might lead to severe macroeconomic and financial instability.

4. The danger of a sudden stop of capital inflows and a retrenchment of investors threatens not only growth prospects, but could lead to banking sector distress and business cycle downturns.

The current surge in capital inflows put these fears back on the table of international financial diplomacy. Around the emerging world, strong currencies, high and increasing inflation rates as well as soaring asset prices fuel these concerns. According to the European Central Bank (ECB) (2011), "one of the key risks is a boom/bust cycle in one or more systemically important emerging economies."

3. The Changing View on Capital Controls

As a natural consequence of the surge in capital inflows since 2009, the issue of controls as a measure in containing the side effects of massive capital inflows has reappeared on the international agenda. Measures to control capital inflows or, in the IMF's terminology, "Capital Flow Management Measures" (CFMs), have long been seen as an inappropriate tool to address the concerns raised above. Kenneth Rogoff (2002), at that time director of the IMF's research department, summarises the prevailing view: "In my brief tenure, I have seen a lot more destructive capital and exchange controls than I have seen healthy ones. Even where some limited form of capital control is warranted on economic grounds, actual implementation is all too often dominated by political considerations, and the results are not pretty." He further argues that "capital controls often breed corruption and always engender distortions. … And to sustain effective capital controls indefinitely, a government has to be prepared not only to intervene heavily throughout the trade and financial system—a policy that has highly undesirable side effects—but it must also be disciplined enough (which few are) to limit excessive capital inflows during boom times."

This assessment was largely based on three views: First, CFMs were primarily seen to have adverse effects on the development of resilient domestic financial systems, the enhancement of allocative efficiency, and the economy's long-run growth potential. They were also seen as delaying inevitable structural reforms and financial soundness. Second, despite a vast amount of empirical studies on the consequences of capital controls, there is a lack of evidence on the effectiveness of CFMs in affecting the volume, the composition and the volatility of capital inflows. Third, the introduction of CFMs was feared to trigger sudden capital outflows and lead to unwarranted activities to circumvent those measures.

The global financial crisis has changed that assessment. Before we outline (our understanding of) the IMF's current views, let us briefly summarise what we know about the efficiency of capital controls. According to the IMF (2011b), CFMs encompass a broad spectrum of instruments, including taxes and

macroprudential measures. The IMF further distinguishes between CFMs that discriminate on the basis of residency and other CFMs that do not, e.g., prudential measures differentiating transactions based on the currency denomination of assets. Traditionally, capital controls limit the rights of residents or non-residents to enter into capital transactions. Typical measures include taxes on flows from non-residents, unremunerated reserve requirements on such flows, special licensing requirements, or even outright bans or limits. Measures could apply to all kinds of flows or to selected categories only. A survey of capital flow management measures taken in Asia is provided in Pradhan et al. (2011) and Ostry et al. (2010) ranging from limits to direct and indirect FX exposure over reserve requirements on foreign currency accounts (Korea) to withholding taxes (Indonesia, Chinese Taipei) and foreign holdings of government bonds (Thailand, Korea).

3.1 Are Capital Controls Effective?

In an extensive study on the determinants of capital flows mentioned above, Forbes and Warnock (2011) also assess the impact of controls on gross capital flows. The main finding, which reflects the dominant view in the empirical literature, is that capital controls do not appear to be effective in reducing the likelihood and severity of boom-bust cycles of capital flows. These findings are robust with respect to a large battery of modifications including alternative measures of capital controls, i.e., de facto versus de jure measures and the analysis of controls on inflows versus outflows.

A more nuanced assessment is provided by Magud, Reinhart and Rogoff (2011). They start their analysis by identifying four factors that make it difficult to assess the effectiveness of capital controls. First, there is no universally accepted theoretical framework in which effectiveness can be studied. Second and relatedly, there is little agreement about exactly what "effectiveness of capital controls" refers to and how it can be measured. Third, there are large differences between countries and across time in the capital control measures implemented that makes it difficult to do comparative studies. Fourth, the evidence is dominated by the two "poster children", i.e., case of Chile's unremunerated reserve requirements in the early 1990s and the case of Malaysia in the aftermath of the Asian currency crisis in 1997 where controls on capital outflows were imposed. The authors provide a meta-analysis of 37 empirical studies and develop indicators of effectiveness. In contrast to Forbes and Warnock (2011), they find that controls tend to increase the independence of monetary policy, affect the composition of capital inflows and reduce pressure on the real exchange rate. However, capital controls on inflows are not found to affect the overall volume of capital inflows.

Malaysia, which introduced controls on outflows, was the only case in which capital controls had an effect on the volume of flows. They conclude that the success of capital controls depend on, among other things, the set of initial conditions and the accompanying policy package such as the Chilean macroeconomic reforms in the 1990s.

Taken together, the empirical literature of the past twenty or so years suggests that traditional capital controls are too blunt an instrument to affect the size of capital inflows. The reason behind this inconclusive evidence and the difficulty to find significant effects of controls in the first place is most likely an endogeneity problem that plagues many of the above mentioned studies. To see this, suppose that an economy attracts a surge of capital flows and policymakers respond by introducing capital controls that are effective in reducing the inflows to the level before the surge. If so, it may falsely appear that the controls had no effect at all: the inflows were just as high as they were before the controls were introduced.

As this example suggests, in studying econometrically the effectiveness of controls, it is important to model also the factors which led the authorities to adopt them. This is not always easy to do. Overall, it therefore seems plausible that capital controls are more effective than has been found in the empirical literature to date.

The decisive question for policymakers is whether these studies provide information for the effectiveness of CFMs designed primarily for macroprudential purposes. There are several considerations that might lead to a more nuanced assessment in the current setting:

1. The focus is now on controls as mere complements rather than substitutes for traditional macro tools.

2. The focus is on avoiding macroeconomic imbalances and the build-up of asset price bubbles rather than on shielding the exchange rate.

3. Controls are supposed to be "Pigouvian" in the sense that they are meant to internalise externalities associated with financial crises that arise from the fact that individual market participants do not internalise their contribution to aggregate financial instability (see Korinek 2011 and Jeanne and Korinek 2011). This would be an unambiguously welfare-improving and stability-enhancing role for capital controls.

Since the objective of capital controls has changed, it is not surprising that an assessment of their strengths and weaknesses has also have changed. In fact, the IMF recently explicitly endorsed capital controls as a useful tool of macroeconomic policy in the emerging market economies.

3.2 The IMF's Evolving Views

As emphasised above, the financial crisis has led to a reassessment of the use of capital controls as a part of policymakers' toolkit. While for a long time it considered direct controls as an anathema to policymakers, the IMF recently adopted a more pragmatic approach (see Ostry et al, 2010; Ostry et al, 2011; and Pradhan et al, 2011). However, this shift in tone does not imply that the IMF has provided a blanket endorsement of capital controls as a panacea to offset the risks arising from large-scale capital inflows. Rather, the IMF has outlined the specific circumstances under which it feels capital controls may be used.

Four principles guiding the design and implementation of capital controls are readily apparent (see IMF, 2011b):

First, before resorting to restrictions on capital inflows, policymakers' "standard" toolkit must be exhausted. This includes monetary and fiscal policy, and regulatory and supervisory tools aiming at safeguarding the financial sector. Capital controls should not be a substitute for other macro policies. Only if the economy is operating near potential, if the level of reserves is adequate, if the exchange rate is not undervalued and if the flows are believed to be transitory, then the use of capital controls in addition to both prudential and macroeconomic policy is justified as part of the policy toolkit to manage inflows.

Similarly, regulatory and supervisory policies should first be used to mitigate risks to financial stability. However, when inflows bypass regulated institutions and markets or when the prudential and supervisory framework is underdeveloped, capital controls can play a useful role.

Second, country-specific circumstances and needs should be taken appropriate account of. There is no blue-print for capital controls in a one-size-fits-all fashion. Each measure should be individually tailored to the specific needs and institutional framework of the county in question.

Third, non-discriminatory measures should be given priority. Capital controls that do not distinguish on the basis of residency should be employed first. Only as a second line of defence can discriminatory measures be used.

Third, price-based measures (prudential taxes on inflows, reserve requirements) should be given priority over quantity-based measures (e.g., ceilings, limits and outright bans). The former is more transparent, by raising only the costs of transactions, leaving the ultimate investment decision with the investor.

Pradhan et al (2011) study whether countries comply with these guidelines. A key conclusion is that "almost all countries still have more room to pursue conventional macroeconomic responses." It seems that a further appreciation of the exchange rate, possibly accompanied by the accumulation of foreign exchange reserves and sterilisation efforts, is desirable before the imposition of capital controls should be taken into account. Resisting an appreciation might give rise to additional inflows as investors maintain expectations of an appreciation in the future. Moreover, allowing for foreign exchange rate volatility could discourage speculative flows even if the exchange rate is close to its equilibrium value.

Figure 6 plots the appreciation of the real effective exchange rate in March 2011 relative to the previous peak in during 2007-08. Only very few countries now reach the level of the real exchange rate they faced three years earlier. In fact, most countries' real exchange rate is still below the peak of the previous cycle. Interestingly, the figure also reveals that countries that have not adopted a formal inflation target, probably because they have an exchange rate objective, allowed a larger appreciation than many economies with inflation targeting. The notion that many countries still have room for tightening monetary conditions is confirmed by a comparison of actual policy rates set by central banks in the region and the level of the policy rate that would be the recommendation from a Taylor-type interest rate rule (see Taylor, 1993). Figure 7 plots both interest rate levels. Apparently, in all the economies monetary policy is still more accommodative than suggested by a Taylor-rule estimated separately for each country.[7]

Although the IMF's conditional endorsement of CFMs is remarkable, many reasons behind its previous skepticism remain valid. In particular, capital controls inevitably create distortions. Even a carefully designed measure to change the composition of capital inflows towards more stable FDI away from volatile

7. It is well known (since Svensson, 1997) that the parameters in the Taylor rule depend on the structure of the economy. Consequently, it is important to use Taylor rules with parameters calibrated to the economy in question.

portfolio flows will inevitably reduce some “good” flows alongside the intended “bad ones” (Ostry et al, 2011). Furthermore, investors will, with some delay, find ways to circumvent capital controls. Interestingly, Ostry et al (2011) argue that this not necessarily an argument against controls as long doing so raises the cost of transactions. In this sense, capital controls throw “sand in the wheels” of international finance. Moreover, the political economy of capital controls, as earlier illustrated in the quote from Rogoff (2002), has to be taken seriously.

3.3 Asia’s Experience with Macroprudential Tools

To prevent asset price bubbles and financial sector weaknesses, macroprudential policy tools are of crucial importance. The set of tools comprise variable provisioning requirement, cyclically varying loan-to-value (LTV) ratios, countercyclical capital buffers, taxes on volatile funding, reserve requirement and outright caps on credit growth.

While these macroprudential tools are fairly new in the toolbox of policymakers in the advanced countries, the emerging Asian markets have a long experience with many of these measures. Regulators in South Korea and Hong Kong, for example, have made extensive use of limits to loan-to-value (LTV) ratios in order to contain property price bubbles. The experience of Hong Kong SAR, whose currency board regime leaves no room for using monetary policy to combat financial instability, is particularly interesting in this respect.

In a recent analysis, Lechmanova (2011) argues that in the Asian economies, macroprudential tools haven been quite successful in limiting the build-up of financial leverage and procyclical credit provision. The use of LTV ratios in Hong Kong since 1991 is subject to empirical analysis conducted by Wong et al (2011). The authors show that LTV limits reduced the risk of boom-bust cycles in property prices in Hong Kong.

The experience of Korea over the recent cycle may also provide policymakers and regulators from the mature economies with a useful illustration as to how this particular policy instrument can be used to reduce the risk of a property bubble emerging. To accompany the monetary policy tightening in Korea that was started in 2001, the authorities imposed macroprudential tools on 12 occasions to fend off speculation in the property market (see Park, 2011). As a result, house price growth in Korea fell from 11.6 percent in 2006 to 3.1 percent in Q4:2007 (Khan, 2011). In the most recent cycle, the Korean authorities relaxed the LTV ratios in 2008 and they tightened them again in 2009.

Despite the encouraging experiences Asian economies have had with selective macroprudential measures, the use of these tools is no panacea. In particular, moral hazard considerations can arise, as discussed by Lechmanova (2011). Thus, if investors believe policy will prevent the build-up of bubbles and reduce the likelihood of future crashes, the use of macroprudential policy could lead them to conclude that the economic environment has become more stable and, therefore, make them willing to assume more risk.

Overall, the Asian experience suggests that a combination of monetary policy and macroprudential measures may reduce the risk of large capital inflows triggering an episode of financial instability. But if macroprudential tools are not easily available or deemed ineffectual, some form of capital controls can be used instead. However, such controls may be too blunt as tools to avoid specific financial imbalances and it is therefore essential that they are used only in specific situations.

One important advantage of capital controls is that they may be more easily implemented than the more sophisticated macroprudential measures. Capital controls may therefore be particularly attractive in economies where the regulatory and supervisory apparatus is relative less well developed and where this hampers the use of elaborate macroprudential tools. Indeed, this is almost surely one reason why, historically, capital controls have been more commonly used in the emerging market economies. However, many policymakers in the advanced economies have concluded from the global financial crisis that the regulation of banks and other financial institutions, which was deemed well designed before the crisis, nevertheless turned out to be incapable of preventing financial instability. In the emerging economies where financial regulation is even weaker, the need of policymakers to have one instrument at hand that can be used quickly to combat instabilities is even more apparent.

4. Challenges for Monetary Policy: Is Inflation Targeting Still Appropriate?

In the last fifteen years, a number of emerging market countries have adopted monetary policy frameworks involving explicit inflation targeting (IT). This policy choice reflects the same consideration that led to the introduction of IT in many advanced economies, including Sweden and the United Kingdom: the need to introduce a new anchor for monetary policy following the abandonment of a fixed exchange rate regime. In Asia, the financial crisis in 1997-98 was a

watershed: Korea introduced IT in 1998, Indonesia and Thailand in 2000, and the Philippines in 2002 (Filardo and Genberg, 2010; Ito and Hayashi, 2004).[8]

However, other central banks – including the Federal Reserve, the European Central Bank, the Swiss National Bank (SNB), among the advanced economies; and Bank Negara Malaysia and the Monetary Authority of Singapore in Asia – also gear monetary policy to achieving low and stable inflation, but have not adopted explicit IT. In many cases this reflects the fact that they already have long histories of successful monetary policy management and therefore little need to demonstrate a break with an inflationary past. Furthermore, they presumably do not wish to restrict their flexibility in conducting policy by adopting IT.[9]

4.1 Success of Inflation Targeting

In a recent paper, Gerlach and Tillmann (2011) explore how successful these policy choices have been, looking at data from economies with and without IT in the Asia-Pacific. This is an interesting issue since the literature to date has not drawn any clear-cut conclusions about the effectiveness of IT in the emerging economies. While Goncalves and Salles (2008) and Lin and Ye (2009) find a significant decline in the level of inflation after the adoption of IT, Brito and Bystedt (2010) do not. These authors judge success essentially by computing the average inflation rate and its variance since the adoption of the target. However, while it seems natural to do so, it is possible for the average inflation rate to be close to the target, but deviations of inflation from target nevertheless to be large and protracted.

We therefore use an alternative metric of success and study how persistent shocks to inflation are. The intuition is straightforward: deviations of inflation from target will be temporary if the central bank is effective in stablising inflation. In fact, a number of authors have argued that the persistence of inflation has fallen in many industrial countries in recent years, and have suggested that this is due to the greater focus on inflation stabilisation by central banks.

Our results point to a significant reduction in inflation persistence for all countries with the exception of Indonesia. Turning to the Asian comparison group,

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8. See Hammond (2011) for the latest survey on inflation targeting.
9. Gerlach and Jordan (2011) argue that while the SNB's framework shares important aspects of IT, there are several differences, the most important of which is the fact that the SNB views itself as being more flexible with respect to the behaviour of inflation.

we note that persistence in the 2000-2010 sub-sample increases for China, Hong Kong and Japan. Malaysia and Chinese Taipei experience a fall in persistence, which is, however, small compared to the group of IT economies. Overall, our results suggest that inflation became significantly less persistent after the Asian financial crisis. This drop in persistence is particularly large in those economies that formally adopted IT as a monetary policy strategy.

4.2 Inflation Targeting in Turbulent Times

But while the evidence is broadly compatible with the idea that the adoption of explicit (and implicit) IT is one reason for better inflation control across the world in recent years, the concern has been expressed that gearing monetary policy too closely to inflation may lead policymakers to attach too little attention to other aspects of the economy. In particular, as many believe the current financial crisis is evidence of, there is a risk that too little weight is attached to the developments in credit and asset markets. Furthermore, among the emerging markets economies, there is a concern that IT can constitute a source of instability in the presence of strong capital inflows.

The reason why IT can fail in these important aspects arises from the fact that under it interest rates are set largely on the basis of forecasts of future inflation. Since, as the evidence suggests, the development of a financial bubble may have little if any impact on inflation forecasts, suggesting that under IT policymakers are unlikely to respond to it. Furthermore, large capital inflows are likely to increase inflationary pressures, thus requiring tighter monetary policy that in turn is likely to further increase inflows. Thus, gearing monetary policy to inflation in the presence of large inflows can risk leading to instability.

Thus far the evidence on IT in turbulent times is limited. Rose (2007) finds some weak evidence that countries with IT have a lower propensity to be affected by sudden stops of capital inflows. This suggests that a clear and credible focus on inflation stabilisation by the provision of a commitment by policymakers to achieve low and stable inflation is honoured by foreign investors.

One of the key defining characteristics of IT is central bank independence, which is a *conditio sine qua non* of the successful use of this framework. In this vein, the findings of Klomp and de Haan (2009) are important. They find a significant and robust negative relationship between central bank independence and financial instability, suggesting that IT reduces the likelihood of financial instability in contrast to what many observers have suggested. However, direct evidence on the effect of IT on the evolution of property price bubbles is provided

by Mésonnier and Frappa (2010). Based on 17 industrial economies over the period 1980 to 2007, the authors provide evidence of a significant positive effect of IT on real house price growth and the house price–to–rent ratio.[10] Overall, the evidence on the effect of IT on the likelihood of financial instability is arguably best described as conflicting.

While it is not clear whether IT promotes or helps avoid financial imbalances, there is some evidence that it raised economies' resilience to the global financial crisis. A recent study by de Carvalho Filho (2011) shows that IT countries outperform non-IT economies during the financial crisis and its aftermath in terms of GDP growth. This holds after controlling for the initial conditions and structural characteristics, such as the foreign exchange rate regime, the degree of capital account restrictions, and openness to trade.

Before proceeding, we note that it is difficult to be sure about the effects of IT on inflation and on the maintenance of financial instability because, as was the case with capital controls, countries' decision to adopt this framework depends on economic conditions. As argued before, economies that have established strong track records of maintaining low inflation (and potentially also of financial stability) have had little reason to change their policy frameworks, thus spuriously suggesting that IT does not have much of an effect.

4.3 Current Challenges in the Emerging Economies

Mishkin (2004) discusses the challenges that arise when implementing IT in the emerging economies.[11] He identifies, among other things, two weaknesses that should be addressed in order to strengthen the case for IT. First, weak domestic financial institutions endanger monetary stability as the central bank cannot raise interest rates in order to sustain the inflation target since doing so might pose risks to financial stability. Second, he points to the danger of government bail-outs of distressed banks leading to a drastic increase in public liabilities. In this case, monetising the debt burden will undermine the inflation

10. The way these authors identify IT economies, however, raises some concerns. While Spain is counted as an IT economy, the rest of the EMU members are not. In addition, all EMU members are treated as separate observations although they share a common monetary policy.

11. In their review of the first decade of inflation targeting in the emerging market economies, Amato and Gerlach (2002) argue that suitably defined inflation targeting is the proper strategy for fast-growing open economies.

target regime. Both of these concerns illustrate the necessity of establishing and maintaining central bank independence. If the central bank is shielded from governmental interference, both risks can be contained.

Massive capital inflows are often seen as a threat to the overall success of IT. In the current situation, capital inflows affect effective IT in at least two ways.

First, capital inflows increase liquidity, which is already abundant, and depresses long-term interest rates. In the present setting, this constitutes an unwarranted monetary easing as many economies operate close to, or even above, potential and face strong inflationary pressure. A recent IMF study (see Pradhan et al, 2011) finds that an increase in nonresident participation in local bond markets by one percentage point reduces long-term bond yields by about 5bps on average.

Second, although a monetary tightening is now appropriate in many emerging market economies, policymakers may refrain from raising short-term interest rates since, given the loose monetary policy in the U.S., doing so may widen the return differential and attract even more capital inflows. Take the Bank of Korea as an example. Headline inflation is persistently exceeding the target range of 2 percent to 4 percent. Nevertheless, at its latest meeting the Bank of Korea's policymaking committee left policy rates unchanged as fear of the adverse side effects mounted. Although a substantial part of the inflation dynamics is explained by rising food prices and costs for fuel and energy products, and therefore due to temporary factors, the broader political consequences of prolonged inflationary pressure remain a concern. As mentioned before (see also Figure 6), a historical comparison guided by the Taylor-rule suggests that the Bank of Korea has room for tightening.

5. Conclusions

Capital flows have recovered with dramatic speed after the global financial crisis and so has the debate about their role in economic policy. Particular focus in now placed on their role in preventing inflows from generating risks to financial stability, particularly in economies where macroprudential tools are limited and where financial regulation and supervision are not yet fully developed.

In this paper we have sketched some key patterns behind the current wave of capital inflows to the emerging market economies, briefly assessed the driving forces behind this development and discussed the recent regulatory responses.

We emphasised four key points:

First, in terms of the speed of capital flows, their composition and heterogeneity of flows across the emerging countries, this current wave of flows is different from the previous waves. Not only did capital inflows resume as quickly as hardly ever before, they were also tilted towards portfolio inflows. Among the recipient economies, Asia clearly stands out in the recent wave of inflows. Almost all countries in Asia received even larger flows than before the crisis, while other regions exhibit a much larger degree of heterogeneity.

Second, the Asian experience suggests that macroprudential measures, if properly used, could be effective in mitigating the consequences of capital inflows on asset prices and financial stability. Authorities in Korea, Hong Kong as well as many other Asian emerging economies successfully used, among other instruments, limits to loan-to-value ratios to contain exuberant property price dynamics. When accompanied by consistent monetary policy path, these tools are particularly promising in dealing with inflows of "hot money."

Third, if appropriately designed macroprudential tools are not available, or too difficult to implement, resorting instead to capital controls to manage inflows, as recently endorsed by the IMF, is an option. Given that sophisticated macroprudential tools such as banking capital regulation or caps to loan-to-value ratios require equally capable supervisory institutions, a control on capital inflows can be an alternative that is relatively easier and quicker to implement. It should be noted, however, that finding the right dose for macroprudential measures is difficult given the lack of practical experience with these tools.

Fourth, IT, either explicit or implicit through a clear commitment to achieve low and stable inflation, remains the preferred monetary policy framework for emerging countries. The preliminary evidence indeed suggests that economies with IT exhibited a significantly higher degree of resilience towards global turmoil than economies pursuing alterative monetary strategies. Thus, IT, in combination with selective macroprudential measures is well equipped to cope with soaring capital inflows.

A common theme in these conclusions is the lack of empirical research on several key issues. Establishing reliable evidence on the efficacy of macroprudential measures used throughout Asia as well as on the effects of capital controls should be a research priority.

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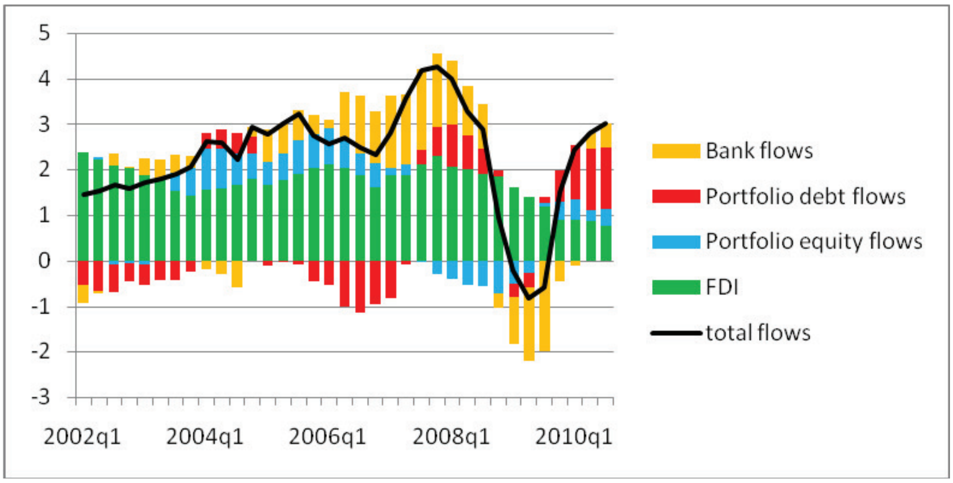
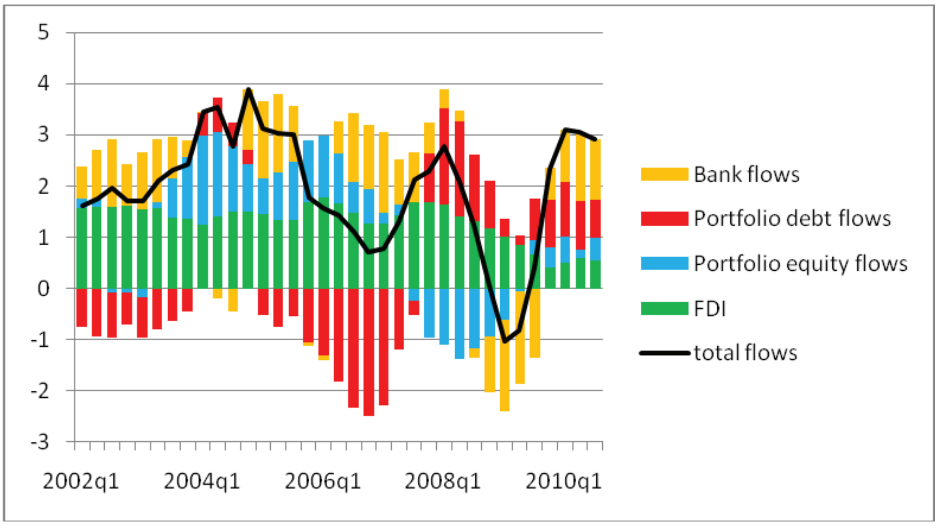
Figure 1
The Composition of Net Capital Inflows to All Emerging Markets
(in percent of GDP, four quarter moving average)



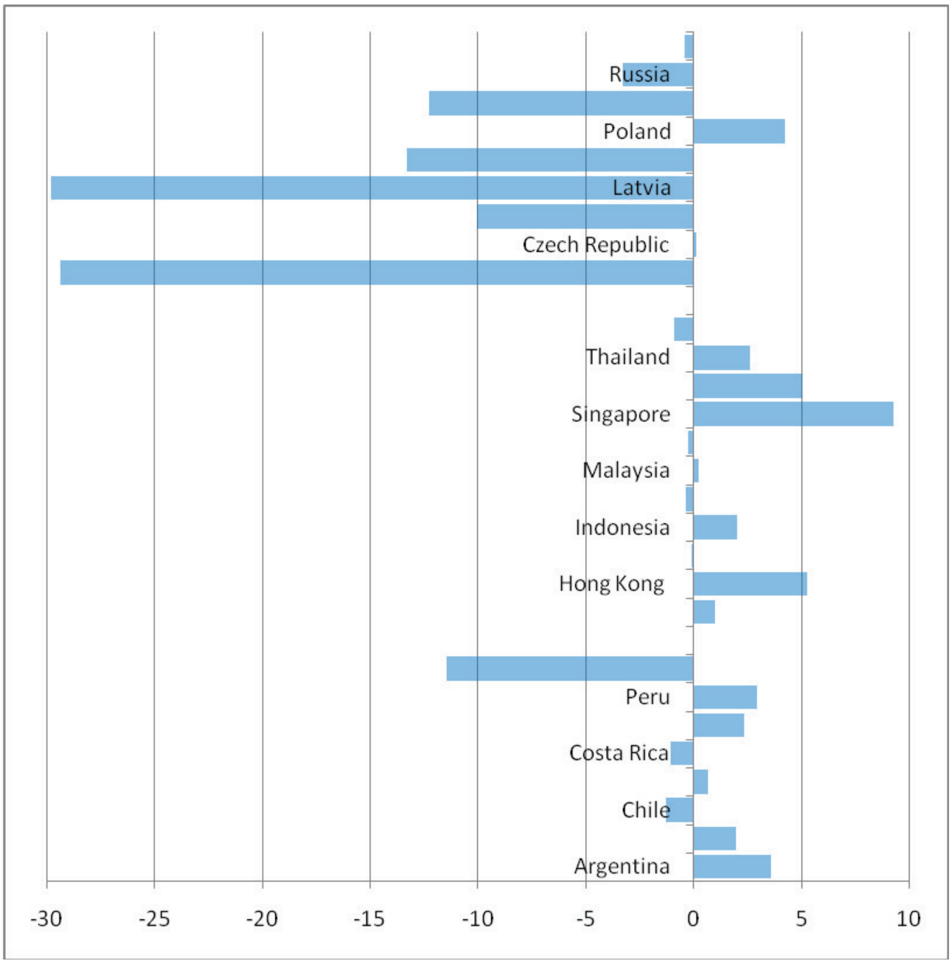
Source: IMF World Economic Outlook April 2011.

Figure 2
The Composition of Net Capital Inflows to Asian Emerging Markets
(in percent of GDP, four quarter moving average)



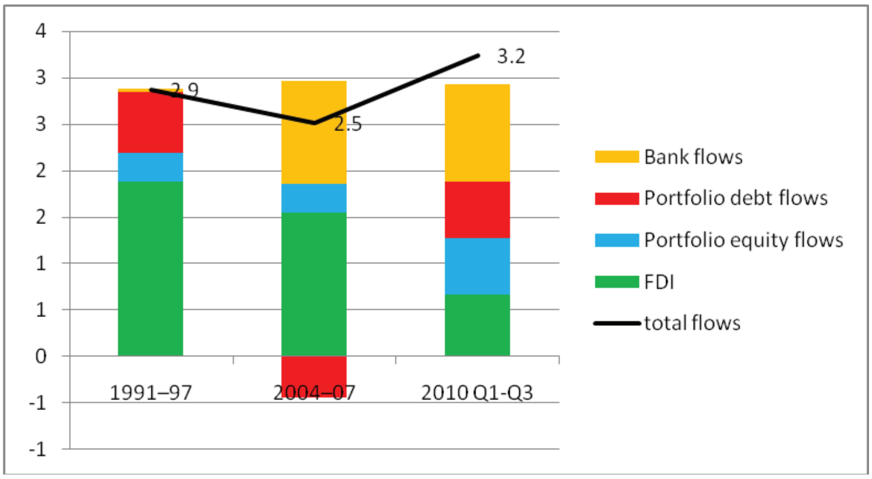
Source: IMF World Economic Outlook April 2011.

Figure 3
Change in Net Private Capital Flows
(in percent of GDP between Q1-Q3:2010 and 2004-07)



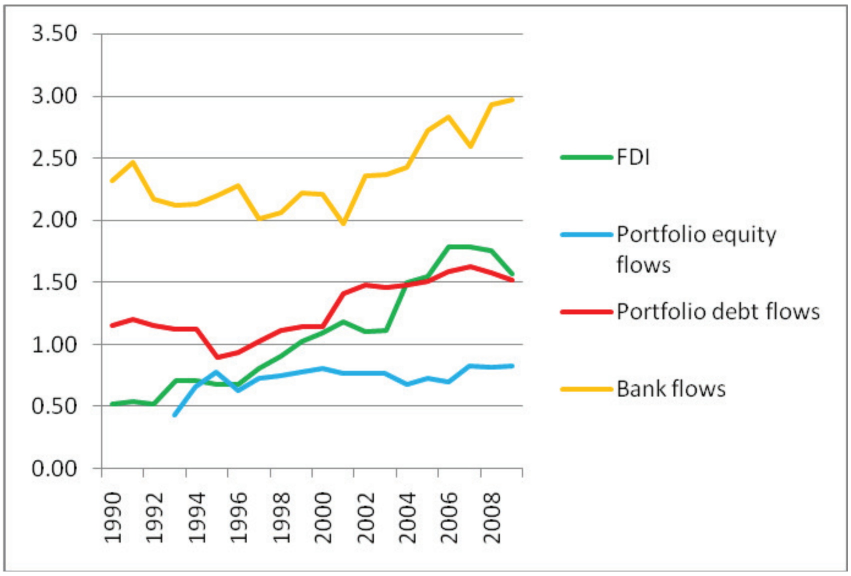
Source: IMF World Economic Outlook April 2011.

Figure 4
Size and Composition of Net Capital Inflows to Asian Emerging Markets During Recent Waves of Capital Inflows
(in percent of GDP)



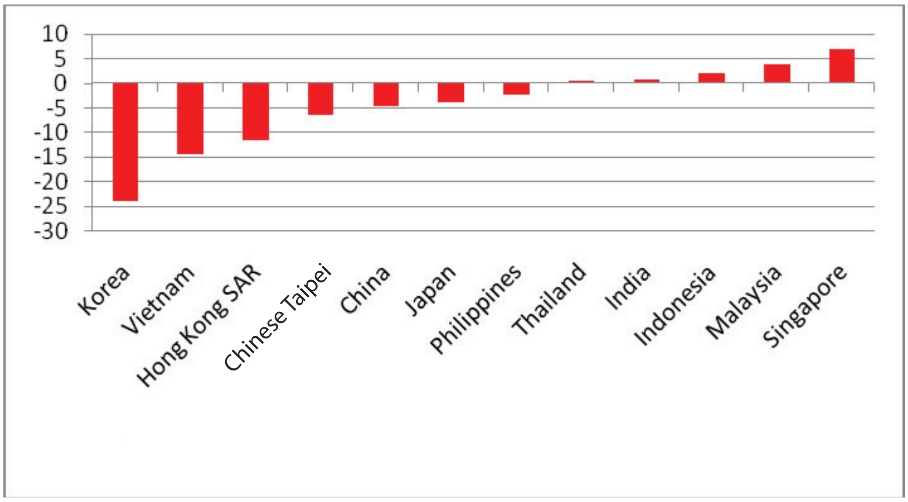
Source: IMF World Economic Outlook April 2011.

Figure 5
Standard Deviation of Net Capital Inflows into Emerging Economies
(in percent of GDP, based on a 10-year moving window)



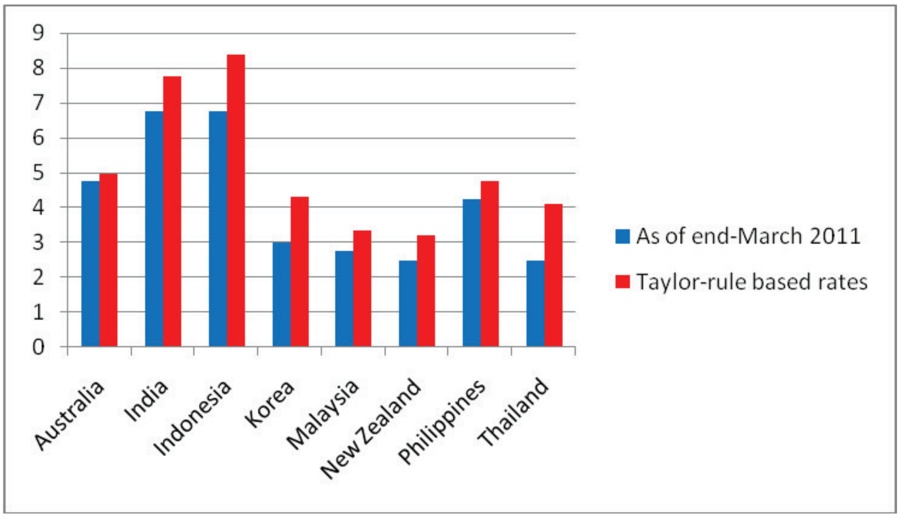
Source: IMF World Economic Outlook April 2011.

Figure 6
Appreciation of Real Effective Exchange Rates between Peak in 2007-08 & March 2011
(in percent)



Source: IMF Real Economic Outlook Asia-Pacific April 2011.

Figure 7
Selected Policy Rates and Taylor-rule Based Rates
(in percent)



Source: IMF Regional Economic Outlook Asia-Pacific April 2011.

Chapter 2

EXCHANGE RATE-SMOOTHING POLICIES: A REASSESSMENT

By
Eduardo Levy Yeyati[1]

Introduction

While the analytical economic literature often sees nominal variables as being irrelevant for the real economy, there is a multiplicity of empirical channels through which exchange rate policy exerts a critical influence on the macroeconomic environment, with non-trivial development implications. This paper examines the empirical literature on the consequences of exchange rate policy (ERP), both from the short-run perspective of countercyclical management and the long-run development perspective. In the current context of capital inflows driven by benign terms of trade and low interest rates, the paper focuses on exchange rate interventions associated with the "fear of appreciation" or, more generally, leaning-against-the-wind policies aimed at smoothing out cyclical exchange rate swings. To that end, the paper documents the main patterns of current exchange rate intervention in the emerging world, and explores empirically its consequences on real appreciation, external balance and growth. Based on this evidence, the last section elaborates, from a positive standpoint, on the available policy options.

1. Why Do We Talk About Exchange Rate Policy?

The analytical economic literature often sees nominal variables as being irrelevant for the real economy. However, there are a number of empirical channels through which exchange rate policy exerts a critical influence on the macroeconomic environment, with non-trivial development implications. To organise the discussion, it is useful to distinguish the several direct and indirect effects identified in the economic literature, and their various interactions,

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summarised in Figure1 from LYS (2010).[2] Thus, for instance, while exchange rate anchors may influence inflation rates directly, exchange rate flexibility may affect output volatility through its impact on the output response to real shocks.

In this section, we survey the main empirical results on what in our view has been the decisive motive behind exchange rate policies in recent years: its incidence on growth and growth volatility (including through episodes of financial stress).

1.1 Exchange Rate Policies and Growth

The literature has identified several channels though which exchange rate policy may be related to growth. From a global perspective, fixed exchange rates have been viewed as important drivers behind the development of international financial markets at the end of the nineteenth century (Johnson, 1956, is an early reference). Later on, the Mundellian paradigm shifted the attention to domestic factors by focusing on the role of exchange rate as shock absorber, emphasising that fixed regimes tend to magnify real shocks. If so, and to the extent that volatility deters long-term growth (see. e.g., Ramey and Ramey, 1995, and Aizenman and Marion, 1999), fixed regimes are likely to deliver a weaker economic performance. Others have suggested that rigid exchange rates tend to create exchange rate misalignments that lead to speculative attacks, resulting in growth under-performance due to a higher propensity to suffer economically costly currency crisis (Aizenman and Glick, 2005, and Kuttner and Posen, 2001) have both found that the harder and longer the peg, the larger are the depreciations associated with the crisis).

As the casual meta-analysis of related empirically studies in Table 1 shows, while exchange rate policies are often found not to be significant for industrial countries, there is no basic agreement in the case of developing economies. Levy Yeyati and Sturzenegger (2001, 2003) found that floating leads to higher growth, while Rogoff et al (2005) found that this result applies only to financially advanced economies. Why the contradiction? One could think of several reasons

2. On the left-hand side, the figure identifies relevant exogenous shocks (such as changes in terms of trade or in global liquidity and global risk aversion). On the right-hand side, it shows four key policy objectives: output growth, output volatility, inflation and equity. In the middle, the choice of exchange rate policy affects policy objectives both directly (modifying the impact of exogenous shocks on policy objectives) and indirectly (affecting intermediate variables that may, in turn, have significant consequences for some of the policy objectives)

linked with the regime classification procedure. First, regimes are endogenous: for example, peg failures are often recorded as intermediates or floats; more generally, most classifications do not control for crisis episodes in which the behaviour of exchange rates and reserves cease to reflect a regime choice. Second, as noted, regime flexibility is usually measured as exchange rate volatility, which leads to an association with bad economic outcomes (rigid regimes under attack are often coded as floats; stable floats are often dropped or coded as intermediate or pegged regimes).[3] Third, information on intervention variables is seldom complete: even in classifications that control for policy intervention, the focus on reserves fails to capture other intervention mechanisms, such as interest rates, currency derivatives, or capital controls.

Interestingly, the analytical literature has emphasised as much the link between exchange rate flexibility and growth as the one between the latter and the *level* of the exchange rate. In fact, a recent body of work has recovered an old theme: the use of undervalued exchange rates to stimulate economic growth. Reviewing this argument, Eichengreen (2006) has argued that the undervalued exchange rates implemented by the Bretton Woods agreement were a key driver of Europe's recovery in the post-war period. Ohkawa and Rosovksy (1973) and Eichengreen (2006a, 2006b) made the same point for Japan's post-WWII recovery.

Empirical evidence on this mercantilist view has been reported in a number of recent studies. Hausmann et al (2005) found that depreciated real exchange rates (as well as trade growth) are important components of growth accelerations; conversely, Johnson, Ostry, and Subramanian (2006) showed that persistent overvaluations tend to be associated with poorer growth.[4] Moreover, under- and over-valuation have been invoked to explain the "Dutch disease" effect of foreign aid (Rajan and Subramanian, 2005), the disappointing growth dividends of financial integration (Prasad, Rajan, and Subramanian, 2006), or the positive correlation between intervention (reserve accumulation) and investment and growth (Levy Yeyati and Sturzenegger, 2007). However, these neo-mercantilist views supporting

3. These two arguments suggest a potential bias of classifications based on exchange rate variability to find flexibility associated with bad outcomes—and an opposite bias for codings where flexibility is associated with no policy intervention.

4. Assuming that growth opportunities are concentrated in the tradable sector, Hausmann and Rodrik (2003) argue in favour of a depreciated exchange rate to foster innovation. A similar reasoning leads Rodrik (2006a) to argue that a competitive exchange rate may be an efficient development tool.

the growth effects of undervalued currencies have been saluted, at best, with skepticism, probably due to the disbelief in the relationship between nominal variables and growth mentioned in the introduction.[5]

1.2 Exchange Rate Regime and Output Volatility

The relation between the exchange rate regime (ERR) and output volatility has a long tradition in international finance, starting from their basic principle that, in the context of price rigidities, under floating exchange rates the economy has a greater ability to adjust to “real” external shocks, whereas fixed exchange rates have a larger ability to absorb “nominal” shocks.[6] Empirically, the standard test examines whether a more flexible regime attenuates the output response to shocks: if nominal prices are (downward) inflexible, the output response to (negative) real shocks should be more muted under floating regimes, as documented in Broda (2001) and Edwards and Levy Yeyati (2005). More importantly, the latter confirmed that the response to terms of trade shocks is indeed asymmetric: for rigid regimes, the output response is larger for negative (but less so for positive) shocks.

A related channel is the link between exchange rates and income distribution. The early reference is Kalecki’s (1939) analysis of the effects of a devaluation in an open economy, according to which a depreciation would not necessarily increase aggregate demand because it would reduce the share of wages in output (and thus, the income of those with a larger propensity to consume). This point was later taken up by Díaz Alejandro (1965) who studied the link of a depreciated real exchange rate with poverty and inequality: in the context of a country exporting food commodities, a depreciation redistributed income from workers to landowners who invested the windfall abroad, reducing aggregate demand and inducing a contractionary devaluation.[7] However, if, by contrast,

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5. Neo-mercantilism as a deliberate policy decision has also been under dispute. For example, Aizenman and Lee (2005) argue that the evidence on reserve accumulation favours prudential over mercantilist motives, a point to which we return later in the paper.
6. A view that goes back to Meade (1951) and Friedman (1953). See also Dornbusch (2001) and Kenen (2002).
7. Several caveats could be mentioned regarding Diaz Alejandro’s story. First, it included a very restrictive class of beneficiaries—in modern societies the benefits of a real depreciation may be more widespread. Second, in an economy with nominal wage rigidities, a devaluation may allow to soften this constraint leading to an expansion in employment with beneficial income distribution effects.

the resources transferred to the landowners/capitalists made their way to the domestic financial sector and, through it, to investment at home—or if, as argued by Aghion, Bacchetta, Ranciere and Rogoff (2006), windfall profits increase the liquidity of financially constraint local firms – depreciations may be expansionary. At any rate, there has been relatively little empirical work testing this hypothesis. On the negative side, Edwards (1989) found that devaluations reduce the real wage with little impact on the labour share. On the positive side, Levy Yeyati and Sturzenegger (2007) showed that interventions aimed at depreciating the currency reduce the labour share of GDP, as well as unemployment, a channel related to the expansionary version of Díaz Alejandro story that, the authors argued, may explain the benign growth impact.

2. Exchange Rate Policy from a Historical Perspective

The channels previously described have been reflected in the policy debate (and in the actual implementation of exchange rate policy) over the years. As conditions in international financial markets and developing economies changed, the focus of the debate shifted accordingly. Tracing the policy debate in the post-Bretton Woods clearly illustrates how the different intervening factors identified in the literature provide justification for different MERP. More importantly, it provides the broader perspective needed to go from the analytical arguments and the empirical results based on historical data, to policy decisions that need to factor in the current context and prognosis.

2.1 A Brief History of the Exchange Rate Debate Post-Bretton Woods

A casual review of the exchange rate debate in the late 1980s and early 1990s shows how the discussion in developing countries hinged on the role of exchange rates and income policies as nominal anchors in a high inflation environment (Bruno, Di Tella, Dornbusch, and Fischer, 1988). The academic literature mirrored these concerns, assessing the merits of exchange rate-based stabilisations (ERBS) coupled with income policies, relative to the more traditional money-based stabilisations (Kiguel and Liviatan, 1991; Vegh, 1992; Calvo and Vegh, 1993).

As inflation concerns subsided and financial integration increased in the second half of the 1990s, the exchange rate policy debate in developing economies shifted the focus to the limits that financial globalisation imposed on monetary policy under pegs. As in the early years of the twentieth century, growing financial

integration and sophistication strengthened the restrictions imposed by the *trilemma* (Obstfeld and Taylor, 2004; Rose, 2006), making floating regimes more attractive.[8] In addition, the role of (domestic and external) financial dollarisation (FD) introduced currency imbalances that introduced negative balance sheet effects from sudden exchange rate corrections: to the extent that FD made depreciation contractionary, it detracted from the countercyclical benefits of flexible regimes, making pegs (particularly, hard ones presumably less prone to speculative attacks) more attractive.[9] The combination of these two apparently inconsistent views led to one of the dominant proposals in the exchange rate debate of the late 1990s, the "bipolar" view (Fischer, 2000) that noted that pure flexible exchange rates or superfixed regimes (the so-called "hard" pegs, such as currency boards or unilateral dollarisation) were the only viable alternative for financially integrated developing economies, at the expense of inherently vulnerable conventional pegs.

By the turn of the century, the failure of Argentina's currency board to ensure fiscal and monetary discipline casted doubt on the benefits of hard pegs.[10] Also, by the end of the decade the success in building central bank autonomy and monetary credibility, together with the resulting decline in inflation and exchange rate pass-through, led to the growing popularity of flexible regimes and light versions of inflation targeting arrangements that prioritised the inflation rate, rather than the exchange rate, as the key nominal anchor, This has led some observers to salute the float cum inflation targeting regime (FIT) as a new, possibly more resilient paradigm (Rose, 2006).

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8. The impossible trinity refers to the inability to sustain simultaneously three policy objectives: an independent monetary policy, open capital markets, and fixed exchange rates: If monetary policy and open capital markets are priorities, exchange rates need to float. If exchange rate and capital markets are priorities countries cannot have an independent monetary policy. If monetary policy and exchange rates are priorities capital markets need to be shut down.

9. Indeed, it was the risk of balance sheet losses to financially dollarised governments and firms in the event of a devaluation—stressed in third generation models of currency crises popularised in the context of the Asian crisis—that led to the definition of *fear of floating* (Calvo and Reinhart, 2002), and to the popularity of currency boards and de jure dollarisation (see, for example, Barro, (1999); Hausmann, Gavin, Pages, and Stein (1999); Haussmann, Pianzza, and Stein, (2001); Ghosh et al (1997); and Dornbusch (2001).

10. The market discipline that would impose a hard budget constraint on the government in the absence of monetary financing did not materialise. Moreover, at the time of the currency run, the contraction of the monetary base caused by the unsterilised sale of reserves was neutralised by the issuance of fiat money by the national and sub-national governments showed that not even monetary discipline was guaranteed by the currency board agreement.

The empirical literature on the consequences of FIT on the real economy in the developing world suffers from two important shortcomings. The first one, as noted, is semantic: FIT adopts a number of varieties that are not always strictly comparable. The second one owes to the fact that IT in developing countries has been adopted: (i) very recently (Chile and Israel lead the way in the mid-1990s, although they implemented a fully-fledged IT framework only recently); and (ii) in times of moderate (two-digit) inflation. Whereas there is some evidence about the ability of IT to bring down inflation from moderate to one digit levels at a reasonable sacrifice ratio (in terms of slower and possibly more volatile growth),[11] much less can be said about its relative advantages for developing economies once inflation has declined or in a context of persistent supply shocks as the one that characterised the past few years.

FIT has had its most severe test to date during the 2007-2011 inflation rollercoaster. Supply shocks unrelated to domestic demand are usually transitory and, for this reason, partially dismissed under the IT framework by targeting an adjusted (core) price index less sensitive to supply swings. Furthermore, in developing economies, the lack of institutional credibility led central banks to favour the familiar but more commodity-sensitive headline CPIs over rather opaque core measures. As a result, the food and energy inflation through mid-2008, and again in the post-2008 crisis recovery, represented an unexpectedly large and protracted supply shock. This ultimately reflected in above-target inflation and, more importantly, inflation expectations de-anchored from the inflation target, forcing central banks out of their benign neglect and into tightening mode—in some cases, even in a context of a cooling economy.

What will become of FIT in the aftermath of the current crisis? This is, in essence, the motivating question of a recent Brookings report (Brookings, 2011) written by a Committee of_former central bankers, economics ministers and monetary experts. The succinct answer would be: we still do not know. While the report does not disguise their bias towards IT, they recognise the need to complement monetary policy by addressing the undesirable consequences of undue exchange rate volatility and massive capital flows. Capital controls such as Tobin taxes, or exchange rate intervention in the event of deep fluctuations, once ruled out by IT‘s benign neglect view of exchange rates, are now to be tolerated, while keeping the eye on the inflation ball as the unique long-term

11. The standard measure of the sacrifice ratio computes the output loss associated with a unit percentage change in inflation.

policy target. While the report is oriented to the reality of emerging economies, the recent intervention and, ultimately, cap on the appreciation of the Swiss franc shows that these concerns are common to core economies as well.

From a broader perspective, the ambiguities of the report, which balances orthodox IMF positions of intervention and control with more heterodox central bank practices in emerging economies, only reflect the fact that the debate of IT (and monetary policy in general) in the post crisis is still in the preliminaries. It is uncertain to what degree IT will evolve to a more flexible scheme Fed style (that is, one in which inflation, growth and potentially other objectives could be factored in monetary decisions) but the combination of interest rate management with exchange rate and portfolio flow management have become the rule rather than the exception in current IT practice, and will almost certainly be the mold – perhaps with milder intervention once financial shocks appease, for the 2.0 versions of IT. At any rate, the comeback of exchange rate policies is unlikely to revert in the medium term.

2.2 The Comeback of Exchange Rate Policies

In recent years while about 25 middle-income developing countries officially subscribed to FIT, many countries (China, Malaysia, Thailand, Colombia and Argentina, to name a few) were still pursuing active exchange rate policies, and three of them (Argentina in 2005, Thailand and Colombia in 2006) introduced controls on capital inflows to countervail the appreciation of their currencies. During the post crisis, in line with the deepening of monetary expansion in the US (the so-called quantitative easing, version 2), exchange rate intervention and capital controls came back to the foreground and have played an important role both in central bank policy and in the global macroeconomic debate, including a star appearance in the G20 agenda.

This comeback of exchange rate policies has been attributed to two main motives: a prudential motive linked with mean-reverting exchange rate swings and the propensity to suffer dollar liquidity runs in a cyclical downturn, and a revival of mercantilist policies aimed at maintaining an undervalued currency as a means to protect the domestic industry from international competitors. We examine both motives in turn.

2.3 The Prudential Motive

The first interpretation of the current surge in international reserves in developing economies had to do with prudential considerations, specifically, the

fear of a shortage of liquid foreign assets of the type that caused the many emerging market financial crises in the second half of the 1990s. In this view, the less than perfectly flexible exchange rates that characterised many developing economies in the early 2000s were simply the result of the rapid accumulation of precautionary reserves in the aftermath of a crisis at home or in the neighbourhood—a hypothesis partially supported by the data (Aizenmann and Lee, 2005; Aizenmann and Marion, 2004).[12]

Indeed, a similar motive could be conceived for a more explicit exchange rate objective. For example, a leaning-against-the-wind (LAW) policy during expansions may be seen as the countercyclical prudential response to pro-cyclical (and largely exogenous) swings in capital flows and real exchange rates. Limiting the transitory (and possibly excessive) appreciation of the local currency through the accumulation of foreign reserves in this context would be a natural defensive strategy to limit the country's external vulnerability and minimise the real exchange rate adjustment and the associated balance sheet effects during the recessive phase.[13]

But there are clear indications that this, if at all relevant, is only part of the story. Many of these economies are not financially dollarised or have seen their external debt to GDP ratio fall dramatically in recent years, at the time reserve accumulation was at its peak. If prudential concerns were at the root of the initial surge in intervention, it is difficult to attribute the still on-going process to liquidity risk (let alone the imposition of controls on inflows that could only add to the cost of stock-building).

2.4 The Mercantilist Motive

Prudential issues and currency mismatches certainly played an indirect role in the "mercantilist" view of intervention: a declining degree of FD relaxed the balance sheet concerns behind the fear of floating, recovering the expansionary benefits of depreciations. Indeed, the main hypothesis of the mercantilist view (namely, the pro-growth consequences of an undervalued currency) depends critically on the absence of the currency mismatches usually found in financially

12. Caballero and Cowan (2006) argue that while there are arguments for the government to purchase insurance, the latter should be done not through reserve accumulation but rather through the use of derivative markets. Summers (2006) considers that reserves are larger than justifiable from a prudential motive—and should, therefore, be managed as long-term savings. Rodrik (2006b) also argues reserves are too large for a prudential motive.
13. See Levy Yeyati (2005) and Caballero and Lorenzoni (2006).

dollarised economies. Thus, the revival of the mercantilist view in the later years is not independent of the decline in FD in the developing world.

But does a temporarily high real exchange rate have a persistent positive effect on economic activity? If so, does this effect come from an increase in external demand, a decline in the demand for imports (with a concomitant increase in the demand for domestic products), or is it related to income distribution and the dilution of producer costs? The empirical literature tends to agree with the fact that interventions and undervalued currencies are associated with faster growth, but they are far less clear about the specific channel at play. Some point to traditional export-led dynamics (Prasad et al, 2006; Rajan and Subramanian, 2005).

However, one can conceive an alternative argument for the same stylised facts: in a reversion of Diaz Alejandro's (1965) contractionary devaluation story, Levy Yeyati and Sturzenegger (2007) argue that because devaluations reduce labour costs in terms of producer prices, rather than fuelling capital flight, they increase firm profitability and real investment.[14]

Table 2 summarises their main findings in a nutshell. The test use a "conservative" intervention measure that filters out changes in money demand from the annual change of the ratio of reserves to broad money (*M2*), and is defined, for country *s* and year *t*, as:[15]

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14. Levy Yeyati and Sturzenegger (2007) show that depreciations work not so much through the trade channel but through an increase in savings and investment associated with the regressive income distribution effects of devaluations. See also Aghion et al (2006) for a model along these lines.

15. Though unlikely, an appreciation can cause reserves to grow if the latter are held for precautionary motives (Obstfeld, Shambaugh and Taylor, 2010), and a stronger currency "deteriorates" the reserve-to-money coverage ratio thanks to valuation changes, inducing dollar purchases. The measure used here controls for that potential bias. In turn, additional controls (terms of trade, external demand shocks, and capital inflows) help alleviate the simultaneity problem associated with the possibility that both interventions and growth respond to favourable conditions and that intervention reflects growth-induced capital inflows that add to the appreciation bias. The regressions also control for initial wealth (proxied by the initial per capita GDP) and population growth, and include country and year dummies to capture the effect of common global factors such as international liquidity or risk appetite.

$$Intervention_{s,t} = R2_{s,t} - R2_{s,t-1*}$$

where,

$$R2_j = \frac{Foreign.Assets_j - Foreign.Liabilities_j - Gov.Deposits_j}{M2_j},$$

As can be seen, intervention appears to be consistently significant and economically important both for cyclical and, crucially, long-term growth performance (as identified by a Hodrick-Prescott filter), but not for the *volume* of exports and imports (Columns 3 and 4), as the conventional mercantilist view would expect (Rodrik, 2009).[16] On the other hand, intervention seems to offer a significant boost to savings (Column 5) and investment (Column 6), possibly associated to the lower labour costs (as captured in the declining labour-to-capital ratio (Column 7).

2.5 Prudential vs. Mercantilist Motives in the Data

There are as many imperfect ways to test the mercantilist motive, as there are theoretical interpretations of the channels, in principle consistent with a positive correlation of reserve changes with appreciating capital inflows, transitory terms of trade shocks and export booms. Precautionary motives, in turn, have been proxied by the time proximity to financial crises (Aizenman and Lee, 2003), the presence of financial dollarisation and currency mismatches (Levy Yeyati, 2007) and, more recently, by financial depth (as captured, e.g., by M2 over GDP), under the hypothesis that foreign currency liquidity works as a buffer in the event of capital flight much in the same way as deposit insurance does for domestic deposits (Obstfeld et al, 2008).

Lane (2009) uses a parsimonious version of these specifications for the case of Japan and finds evidence in support for both views. While the Japanese case certainly differs from the average emerging economy, the approach remains valid. Table 3 reports the results of alternative versions of such a test. As dependent variable we use two versions of the change in the reserve to GDP ratio, where reserves are measured, alternatively, as central bank international reserves minus gold, and as net foreign assets minus government deposits (the variable *R* as defined above). Controls include contemporaneous changes in the

16. We abstract here from increases in nominal export and import ratios, which could simply reflect the relative tradable to non-tradable price change as a result of a real appreciation.

M2 to GDP ratio, the financial account balance, and the trade balance. Additionally, we include the change in the real effective exchange rate, and terms of trade shocks. We add year dummies to control for common global factors (e.g., dollar weakness, or global risk appetite) that may temporarily influence the balance of payments in the emerging world. We look at two sample periods: 1974-2008 and, in our view, more representative of the LAW pattern, 1993-2008.[17]

The findings suggest that, for the case of emerging countries, the link between M2 and reserves often found in the literature is largely explained by the early post-Bretton Woods period, while the more recent experience tends to support the mercantilist LAW view, as indicated by the significantly positive correlation with capital inflows, and positive terms of trade shocks. Interestingly, although not necessarily surprisingly, the reserve accumulation is negatively correlated with the exchange rate, possibly reflecting the reverse causality as, ceteris paribus, reserve purchases should depreciate the local currency.

The results make intuitive sense, as intervention has typically been associated with (and advocated by policymakers on) the need to prevent "excessive" appreciation (and has been often followed by the threat or imposition of restrictions or taxes on capital inflows). Moreover, while the liquidity buffer may have been important at earlier stages of reserve accumulation (most notably, in the late 90s right after the Asian crises), years of leaning against the trade bonanza may have brought the stock of reserves beyond what was required for precautionary reasons: prudential factors may remain relevant, albeit currently not binding. That said, to the extent that "excessive" appreciation entails the risk of a disorderly exchange rate correction and a current account deterioration that may impair the country´s capacity to cope with a sudden reversal of capital flows, the prudential nature of the leaning against appreciation becomes clearer.

2.6 The Countercyclical Motive

Advocates of reserve accumulation had their belated recognition in the midst of the financial crisis of 2007-2008, when the stock of reserves enabled financially integrated emerging economies to control the pace of the exchange rate adjustment needed to offset the rapid unwinding of foreign investment positions

17. Additional, we tested changes in the nominal and nominal effective exchange rates, GDP growth, and exchange rate volatility in the past 12 and 24 months, which proved not to be significant. Results are available upon request.

and the terms of trade shock—triggered by the global recession that in the 1990s may have caused a stream of balance of payment crises. As a result, the prudential motive—or, more precisely, the policy of smoothing out the cyclical pattern of exchange rates—looks, a fortiori, a plausible justification for reserve accumulation.

Indeed, as we argue more specifically in the next section, the two motives are not at odds with each other. An eventual reversal of fortunes may have also been in the minds (and often in the words) of many policymakers in non-industrial countries that targeted an undervalued currency as a development tool in the good years. Moreover, in a financially integrated world dominated by volatile global shocks, the prospect of letting exchange rates be aligned to its equilibrium level may not look very reassuring, particularly if one fears that the equilibrium exchange rate may change dramatically once the financial cycle of excess liquidity is over. More generally, active exchange rate policy could in principle be geared towards preventing deviations from a long-run equilibrium level –as opposed to a market-determined equilibrium that may prove to be too ephemeral for policy´s sake. To this exchange rate smoothing policies we turn next.

2.7 The Role of a Global Safety Net

It has been argued, most notably by the US and the IMF (and most, notably, in reference to emerging Asia, particularly China) that international reserves stocks, to the extent that they are hoarded for precautionary motives at a non-trivial carrying cost, could be usefully reduced by the introduction of a credible international lender of last resort in the form of a global financial safety net (GFSN). Indeed, the debate GFSNs was at the forefront of the G20 agenda during the Korean Presidency, where an ad hoc working group was formed. Ultimately, no workable initiative came out from this group, and the G20 had to endorse an IMF proposal (currently still to be approved by the IMF board) that improves only marginally upon existing facilities and does not address one of their key drawbacks: the absence of the automatic access that is characteristic of the central bank facilities on which the canonical definition of an international lender of last resort is usually modeled (Fernández Arias and Levy Yeyati, forthcoming).

At any rate, in light of our previous discussion, the question remains: could the introduction of a true GFSN reduce the incentives to accumulate international reserves, if reserves are a spinoff of exchange rate policy driven by other motivations? The question deserves a qualified yes. For starters, as noted, reserve

accumulation or, more generally, exchange rate smoothing policy, is in part driven by the belief the buildup of excessive appreciation leaves the country subject to cyclical reversals that can, through foreign exchange shortages, cause financial disruptions or outright panics. Hence, the usefulness of reserves in bad times, as witnessed during the recent crisis. It follows that the presence of a multilateral (or regional) source of liquidity may tilt the cost-benefit balance of intervention (which may include, besides the often overstated cost of carry, the undesired amplification of real shocks through lower interest rates and higher inflation in good years) in favour of more exchange rate flexibility.

Countries confident in this liquidity safety net may not only reduce their future foreign exchange purchases but also relocate the current ones towards more profitable (but less liquid) instruments. If reserves were to be used only in extreme cases in which the GFSN is not large enough, they could be treated as savings for all practical purposes and invested as such.

This confidence, however, cannot be built overnight. First, we currently do not count with a useful GFSN: IMF facilities face a number of problems that detract from their appeal, as shown by the lack of demand from all but a few non-Asian economies in the recent past despite ostensible needs of dollar liquidity. And, because political and moral hazard considerations will likely preclude the launch of a standing (that is, non-contingent) IMF facility in the near future, this missing piece in the international financial architecture will need to come from the region.

In this regard, on the upside, Asia, unlike Latin America, can count on its own issuer of last resort (a country that can print reserve assets in high demand during episodes of financial distress; see Cordella and Levy Yeyati, 2010). Japan can issue (and China, because of its reserve hoarding, can lend) foreign currency in bad times, as it is reflected in the leverage limits (less than one for Japan and China) in the regional reserve pool, the Chiang Mai Initiative.

On the downside, like the international community within the IMF, Asia still needs to sort out economic and political considerations and, in particular, figure out eligibility conditions for borrowing countries that balance transparency and accessibility, on the one hand, and credit risk (the risk of recipient countries exploit the facility at the expense of prudential policies), on the other. Only when an IMF-style application process currently in place is replaced by transparent ex ante qualification conditions, so that the government –and the market– knows for sure the size of the liquidity protection offered by the regional

GFSN, will individual countries rely on the regional pool and relax its tight grip on exchange rate swings.

3. Exchange Rate Smoothing Policies

As noted in a recent survey by the Bank for International Settlements, "'macro prudential' has become a true buzzword in the wake of the recent financial crisis" (Clemens, 2010). However, as often with topical buzzwords, the term has been given several and often unrelated meanings.

The term "macro prudential measures" was coined circa 1979 to refer to initiatives that were taken to deal with such issues as credit booms, mounting sovereign risk and sudden capital flow reversals that escaped the typical approach to bank regulation through individual banks' prudential indicators. At the time, these initiatives included restrictions on banks' foreign exchange positions, country exposures and maturity mismatches. The next big appearance of the term was also triggered by the Asian crises in the late 1990s, leading to the development of "macro prudential indicators". As defined at the time by Andrew Crocket (2000), "the macro prudential *objective* can be defined as limiting the likelihood of the failure . . . of significant portions of the financial system . . . limiting 'systemic risk,' as opposed to the traditional micro prudential objective to limit the likelihood of failure of individual institutions, or 'idiosyncratic risk.'"[18]

Recently, however, the term has been used more broadly to denote policies designed to address macroeconomic sources of risks: pro-cyclical capital flows, excessive currency volatility and asset inflation—as well as macroeconomic tools aimed at deterring those flows, such as exchange rate intervention and capital controls—are often bunched together under the macro prudential umbrella. The contents of this new compound are broad, going from the domestic effect of global business and interest rate cycles (e.g., the incidence of Chinese growth or the U.S. quantitative easing) to large swings in risk appetite (e.g., debt crises in Europe or political upheaval in North Africa). In between, they delve into exchange rate misalignments, asset and consumer price inflation, and the undesired macroeconomic consequences of credit booms.

18. "To bring out the contrast, think of the financial system as a portfolio of securities, i.e., the individual institutions. The macro prudential perspective would focus on the *overall* performance of the portfolio; the micro prudential vision would give equal and separate weight to the performance of *each* of its constituent securities" (Crocket, 2000).

Thus, if anything, the broad macro prudential agenda revisits old debates from a "fresh-from-the global-crisis" perspective. Indeed, *prudential macroeconomic policies* (a more accurate but still imperfect label for monetary, exchange rate and fiscal policies aimed at mitigating the effects of temporary financial shocks) could be seen as a global component of the standard countercyclical macroeconomic toolkit. Within this context, exchange rate intervention could be seen as a policy aimed at smoothing out the mean-reverting, cyclical volatility of exchange rates.

3.1 Why Bother? Chasing a Moving Target

The overvaluation of exchange rates—for example, due to current account inflows from a boom in commodity prices, or capital inflows fueled by excessive global liquidity, as in the periods before and after the global crisis—has been for long one of the most immediate macroeconomic concerns of financially integrated developing economies. The perils of overvaluation can be argued in at least two alternative ways: (1) as increasing the risks of a sudden exchange rate correction, with the concomitant deleterious effect on inflation and financial stability; and (2) as taxing unnecessarily—and, to some extent, irreversibly—economic activity and employment in the tradable sector, due to the associated loss of competitiveness. In both cases, the underlying concern comes from the risk of a reversal of these inflows and a related exchange rate correction down the line. Thus, it is not a particular exchange rate level (as in the case of the mercantilist view), but rather the excess volatility due to these transient underlying factors that is at the aim of exchange rate–smoothing policies.[19]

Naturally, the final verdict cannot ignore a reference to an equilibrium real exchange rate (ERER). Has the currency exceed the equilibrium level (or is it in the process of doing so)? A static approach to defining and measuring an ERER based on the country's fundamental variables is an exercise so elusive that it often favours an agnostic position: an equilibrium exchange rate is whatever the exchange rate is in the absence of intervention.[20]

19. This crucial distinction separates the discussion below from the debate on exchange rate undervaluation as a development tool (see Levy-Yeyati and Sturzenegger, 2007, and the references therein).

20. Note that equally misleading would be the claim that any deviation from long-run averages constitutes a misalignment, because many changes in fundamental are highly persistent if not permanent. Perhaps the key challenge in exchange rate policy is telling structural from cyclical elements behind real exchange rate pressures.

More interesting, from a policy standpoint, is a dynamic approach that focuses on the probability of unexpected swings in the currency, regardless of whether it is in equilibrium at current levels. For example, if the ERER is assumed to be partially determined by external factors such as global demand, terms of trade, or global liquidity and risk aversion governing capital flows, the concern may lie not in the probability that the ER be away from its equilibrium *today*, but rather that any of those drivers, most of them cyclical, moves in a way that changes the ERER *tomorrow*, leaving the current exchange rate misaligned.

An IMF survey on exchange rate modeling highlights six fundamentals as the key influences over the EER: (1) productivity differentials (positive—more appreciated—effect, in line with the Balassa-Samuelson effect); (2) trade restrictions that may lead to higher domestic prices (positive); (3) price controls (negative, to the extent that they artificially depress non-tradables, such as services and transportation); (4) government consumption (positive, to the extent that it favours the demand for non-tradables); (5) commodity terms of trade (positive); and (6) net foreign assets (NFA; positive).[21]

The first four factors are largely local and can be expected to remain stable or move slowly over time. By contrast, the last two are globally determined and highly volatile. They are also at the center of the prudential macroeconomic debate. How can we be sure that the current exchange rate reflects current and expected values of these fundamentals, when the NFA and commodities have displayed such an unpredictable behaviour in the past? And just how unpredictable are these global influences after all?

The first thing to note in this regard is that capital flows in emerging economies move in sync across countries and, to the extent that they play a role in the determination of exchange rates, generate common exchange rate trends (Figure 2).[22] In turn, these common trends can be related to a few well-known, globally determined speculative drivers such as risk appetite, or the value of U.S. dollar (Figure 3).Moreover, in addition to these globally determined portfolio flows, the NFA position, typically defined as a ratio to GDP, may reflect valuation changes due to moves in relative prices that are, unsurprisingly, also influenced by the

21. See IMF (2006). Note that the NFA is an appropriate measure of the "transfer problem" only to the extent that rates of return on external assets and liabilities are comparable (Lane and Milesi-Ferretti, 2002).

22. The sample of emerging economies is the one used in the Brookings Graduation Scorecard included in this report; see Chapter 4.

same global variables. For example, it is easy to show that big swings in risk appetite, to the extent that they result in asset market rallies and selloff, can inflate the NFA positions of emerging economies (Levy-Yeyati and Williams, 2011).[23]

Indeed, precisely because of these valuation changes, the connection between real exchange rates and NFA changes can cut both ways (Figure 4); thus, a net dollar debtor like Peru would benefit from an appreciating currency (as its debt-to-GDP ratio falls), whereas the opposite would be the case for a net dollar creditor like Chile (as the value of its dollarised sovereign assets declines in GDP terms). Interestingly, in the first case, the positive association between NFA and the real effective exchange rate (REER) would simply reflect the valuation effect of a stronger currency on dollarised debt liabilities. Inverting the causality to interpret this as evidence that better fundamentals are validating the stronger currency would be a circular (and misleading) argument for complacency.

The same short-run global influences can be identified in the behaviour of the other global driver of ERER: commodity terms of trade. Once we take into account that commodities respond to global drivers differently—and therefore cannot be summarised by a broad commodity index—it is easy to illustrate the presence of common patterns in items relevant for the region such as grains, copper and oil. Changes in the price of grains (e.g., soybeans, corn and wheat) tend to correlate very closely, and common factors can be identified even in less obviously related commodities such as oil and copper (Figure 5).

In turn, as before, these common threads can be related to a few global drivers: liquidity and risk appetite (possibly a reflection of the growing role of speculative investors and positioning in commodities markets); the U.S. dollar (a numeraire effect due to the fact that commodity prices are quoted in dollars); and the world economic cycle (including a growing demand from emerging economies and, in the case of grains, from the bio-diesel industry). Table 4 reports quantitative estimates of these influences during the 2000s.[24]

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23. Changes in NFA can be decomposed into net flows and capital gains, namely, the change in the value of net holdings due to valuation changes. In this context, for example, an equity rally that increases the value of both equity assets and liabilities relative to GDP, would inflate the absolute value of NFA, whatever its sign.

24. Just to mention a few recent samples of a long and vast literature, let us note that commodities have been shown to be affected by lower U.S. real interest rates (Frenkel, 2008), global demand both from advance and, increasingly, the emerging world (Frenkel and Rose, 2010); Cevik and Sedik (2010), and global equity returns (Carrera et al, 2010). Specific results are far from systematic, as they vary with the commodity and the sample period of choice.

Naturally, this does not deny the validity of the traditional bottoms-up approach based on microeconomic data on supply and inventories, which in some cases remains essential (Frenkel and Rose, 2010). But in times of global financial distress like the ones we have been living since 2008, microeconomic considerations are often dwarfed by the common impact of global shocks that can reverse trends—and render the current ERER obsolete—almost overnight.

3.2 Varieties of Dutch Disease

A key concern associated with a temporarily overvalued currency is the loss of international competitiveness. In particular, the commodity surge that benefited most emerging economies in the 2000s (and appears to continue, albeit at a slower pace, in the near future) have started to sound the alarm about the possibility of catching a mild case of Dutch Disease (DD).[25]

The term "Dutch Disease," originally coined by *The Economist* in 1973 to refer to the decline of the manufacturing sector in the Netherlands after the discovery of a large natural gas field in 1959, is used to denote the effects of large inflows of foreign currency on the international competitiveness of the manufacturing sector. The story is well known: An increase in revenues from the booming primary sector appreciates the currency, resulting in a loss of competitiveness (and, ultimately, a decline in production) in the lagging manufacturing sector. Although DD has also been used to refer to capital inflows such as foreign aid, foreign direct investment (FDI), and even portfolio flows, it is useful to distinguish between a "financial" DD driven by capital inflows (at the expense of a generalised loss of competitiveness and a current account deficit) from the traditional DD, in which a growing trade surplus in the primary sector offsets a growing trade deficit in the manufacturing sector, as the real exchange rate adjusts.

Although available labour market and manufacturing production data may not yet capture the DD symptoms, a casual look at net primary and manufacturing exports in four likely candidates—the commodity exporters Argentina, Brazil, Chile and Colombia—offers some incipient reasons for concern. The fact that

25. With the exception of Mexico, where oil exports have steadily declined in importance, the other LAC-7 members are all important commodity producers. By contrast, Central America and the Caribbean, as net commodity importers, stand on the opposite side of the prudential macroeconomic dilemma. Needless to say, competitiveness is one angle of the overall concern with excessive appreciation. The other one is inflation, either of assets (with the risk of creating a credit boom or a real estate bubble) or, if the appreciation is resisted, of goods and services.

their total net exports to GDP have declined in constant terms may be attributed to the real appreciation, which in turn owes as much to improving terms of trade as it does to financial inflows. But whereas the volumes of net primary exports have remained stagnant (with the notable exception of Colombia, blessed by growing mining and oil export), the volumes of non-primary net exports have been falling rapidly into deep negative territory (with a transitory pause during the 2009 GDP contraction).

However, this pattern is not only the result of a dramatic improvement of commodity terms of trade: as the Brazilian case illustrates, we could think of sustained capital inflows as inducing a financial Dutch Disease that increases non tradable prices at the expense of all tradables (both export, and import substitution sectors) – a variety that explains narrowing trade balances or widening current account deficits.

What is behind exchange rate pressure in the emerging world? Alternatively, where do the dollars are being purchased by the central banks come from? Figure 6 offers a first glance at the two main "emerging regions": Latin America and Asia. The differences are predictable but nonetheless striking: Latin America are less opened economies, and the current account surpluses (mostly the reflection of commodity terms of trade) that fuelled appreciation and offsetting dollar purchases in the mid-2000s have been gradually replaced by capital inflows. By contrast, emerging Asia still preserves a strong current account surplus (mostly from manufacturing exports).

However, the dynamic pattern does not differ so much between the two regions: in both cases, portfolio flows have become relatively more important, at the expense of the current account surplus in Asia, and both the current account and FDI flows in Latin America.

This schematic bunching of countries masks additional complexities. Two Asian examples illustrate this diversity. On the one hand, the current account pattern of primary exporter Indonesia is almost the negative of that of manufactures exporter South Korea. On the other hand, capital flows into labour-exporting countries like India and Philippines (and outflows in labour-importing Indonesia or Malaysia) are strongly related to remittances, a variety of financial DD that in principle should be more closely correlated with the regional cycle than to local rates and exchange rate expectations.

Therefore, it is hard to argue that the emerging world's industrial competitiveness is at stake due to a traditional case of DD triggered by booming commodity prices. On the contrary, even in commodity exporters there is evidence that a large part of the excess supply of hard currency comes from FDI, remittances and, more recently, portfolio flows.

This distinction goes beyond definitions, as different sources of DD call for different responses. For example, while commodity booms require sector-specific interventions, such as the Social and Economic Stabilisation (Copper) Fund in Chile, or a mix of taxes and subsidies designed to mitigate its impact on the relative competitiveness of the industrial sector, a case of financial DD that detracts from the competitiveness of the country as a whole may require a macroeconomic barrier to keep away the flow –a line of reasoning behind the focus on prudential macroeconomic responses such as sterilised exchange rate intervention or capital controls.

3.3 A Taxonomy of Prudential Macro Policies

Ultimately, regardless of whether the exchange rate is thought to be misaligned vis-à-vis current fundamentals (e.g., due to the amplifying effects of speculative capital flows) or aligned with volatile fundamentals that are likely to change in the near future, the key prudential macroeconomic question remains: *How can macroeconomic policy smooth out excessive exchange rate volatility?*

The past six months have witnessed a few experiments on this front. In Turkey, a cut in the policy interest rate that reduced the carry on the lira was combined with successive hikes of reserve requirements that kept lending rates high, thereby neutralising the monetary effect of the rate cut. In Israel, a policy rate hike was coupled with the imposition of a Tobin tax on forward positions, thus detracting from the appeal of the increase in the carry.

However, despite what seems to be an increasingly populated menu of alternative measures, for the purposes of the prudential macroeconomic debate, exchange rate–smoothing policies can be usefully grouped into two categories: intervention in the foreign exchange market ("buying inflows"), and sand in the wheel of portfolio inflows ("taxing inflows"). In the first case, the public sector (the Central Bank or the Treasury) takes the buy side of the dollar market to stabilise the clearing price. In the second one, it discourages the sell side, fending off inflows instead of absorbing them.

Intervention, in the hands of the Central Bank, can take the form of sterilised dollar purchases in the spot market, whereby the Central Bank "issues" peso paper in exchange for dollars, changing the supply and demand in the foreign exchange market (i.e., it meets the speculative demand for peso assets without altering the money supply),[26] and intervention in the forward market, which has no immediate monetary effect and therefore needs no sterilising open market operations. But the Central Bank does not need to be alone in this effort, because a similar effect could be achieved through balance sheet operations by the Treasury, by issuing peso debt to cancel or buy back dollar debt, or by investing public external surpluses (as in the Chilean Copper Fund) or fiscal surpluses (as in sovereign wealth funds) in foreign assets.

On the other corner, sand-in-the-wheel measures include capital controls—the already-discussed Chilean-type Tobin tax or the equivalent unremunerated reserve requirements on selected foreign inflows,[27] as well as Asian-type quantitative caps on cross-border flows and foreign ownership. In addition, within this category we can count micro prudential measures, such as limits to banks´ foreign exchange positions and restrictions on dollar lending to non-dollar earners, red tape options like reporting requirements of foreign exchange transactions, and the lifting of capital restrictions on outflows (as in the relaxation of foreign asset limits to local institutional investors).

Perhaps more controversially, we can also group under the "tax" umbrella the use of traditional reserve requirements to widen the wedge between the passive interest rate that determines the currency carry, and the lending rate that governs the transmission of monetary policy, as recently in Turkey (or in Peru up until the September 2008 crisis). Though in principle, this combination of lower rates and higher reserve requirements could be seen as business-as-usual monetary policy, from the perspective of the foreign exchange market, the lower carry is the flipside of a tax, in this case on financial intermediaries (banks), that detracts from the speculative returns of the carry trade much in the same way as a Tobin tax.

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26. In practice, the Central Bank seldom issues its own paper; rather, it mops up the pesos injected through dollar purchases by reducing its stock of Treasury securities.

27. Naturally, this is a particular case of the differential reserve requirements widely used in LAC in the past to discourage dollar intermediation.

Table 5 summarises this taxonomy, the logistics and costs involved, and the recent policy track record in the emerging world.

3.4 The Effectiveness of Exchange Rate Policies

A normative assessment of the optimal degree of intervention exceeds the scope of this report. But a positive question about its effectiveness is a good starting point: can intervention artificially depress the value of the currency? There is surprisingly little consensus about the capacity of intervention to fend off appreciation pressures; policymakers seem to prefer intervention to benign neglect, despite the skepticism often voiced in academic and policy circles.

Quantifying this effect is not simple, because it entails not only a good account of other factors that may be pressing on both the exchange rate and the level of reserves but also accurate measures of intervention and currency strength. Given that there seems to be no single measure that can at the same time summarise the competitiveness effect and the fact that in most cases the policy target is a bilateral nominal exchange rate rather than a real effective one, we prefer to look at a number of alternative options. As for intervention, we use the conservative measure from Levy Yeyati and Sturzenegger (2010), defined above.

So does intervention lead to a weaker currency, relative to the non-intervention case? Yes, it does—marginally. From the results reported in Table 6, intervention in Peru in 2007 (9 percent, according to the measure defined above) has an estimated effect of 2.7 percent on the GDP-adjusted RER and 1.1 percent on the REER.

What about the cost? As documented in Cárdenas and Levy Yeyati (2010), the conventional view that intervention is too costly due to wide sovereign spreads or heavy quasi-fiscal losses appears to be overstated—even more so if one considers the benign effect of reserves on credit ratings and sovereign spreads.

The cost of reserves is often estimated as the gap between the yield of hard-currency public debt and the return on reserves. Because reserves are held in short risk-free assets, this gap is, in turn, a function of the sovereign risk spread and the hard-currency interest rate premium.[28]

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28. See Jeanne and Ranciere (2006) and Rodrik (2006).

However, the cost of reserves tends to differ from this simple formula. First, to the extent that liquid reserves reduce credit risk (and the interest rate) paid on the total (public and private) debt stock, the marginal cost of carrying reserves for indebted economies may be significantly lower than the sovereign spread.[29] Second, because the fact that reserves are held in short-dated instruments is related less to liquidity than to central banks' reserve management practices (including, possibly, fear of mark-to-market losses), the term premium is in most cases an unnecessary cost.

Third, and more importantly, reserves are typically purchased by central banks through interventions sterilised with the sale of local currency-denominated debt. As an illustration, in Figure 7.a, we picked fast-growing emerging economies that have been accumulating reserves in the period 2003-July 2008 (prior to the reversal of the appreciation phase), and compared the local currency equivalent of dollar purchases (adjusting for valuation changes using the monthly average exchange rate and assuming an average return on reserves equal to the 1-year Libor), with the contemporaneous expansion of the monetary base. As can be seen, the landscape is not homogenous: the share of money creation (in turn, seignorage and inflation tax) to reserves purchases (which could be seen as the inverse of the sterilisation ratio) ranges from over 70 percent in Argentina, Chile, Indonesia and Turkey to less than 20 percent in Brazil, Korea, Malaysia, Singapore and Thailand. But it has remained very low for non-inflationary emerging economies (and most emerging Asia). The sterilisation ratio actually increased over time, as Figure 7.b shows for the post global crisis period

Sterilised intervention may result in central bank quasi fiscal losses associated to steep interest rate differentials or, alternatively, if intervention delays appreciation (and appreciation expectations depress local currency rates), valuation changes in the local-currency value of international reserves as the exchange rate moves towards its new, more appreciated equilibrium.[30] Conversely, it may be relatively cheap in a scenario that combines low local interest rates and cyclical (hence, mean reverting) swings in the nominal exchange rate.

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29. If, for a given net debt stock, a larger stock of liquid foreign currency assets tightens the sovereign spread, the resulting gain in rollover costs should be net out from the spread (Levy Yeyati, 2008a).

30. Under the uncovered interest rate parity (UIP) condition, the interest rate differential should equal expected appreciation so that the cost of sterilised purchases should ultimately be, on average, similar to purchases directly funded by dollar debt (the only difference being that, in the first case, it is the central bank that bears the currency risk). However, as is well known, UIP seldom holds.

A quick look at the *realised* costs of reserves during the 2005-2010 rollercoaster confirms this premise. Figures 8.a show back-of-the-envelope estimates of the cumulative valuation and carry losses for six central banks known to intervene actively in foreign exchange markets.[31] Predictably, valuation losses accumulate during the appreciation phase, and decline during a sell- off, as the central bank sells expensive what it had bought cheap, and reserves stocks benefit from the revaluation of the dollar. Indeed, economies blessed with low interest rates such as South Korea profited during the period, as the early appreciation reverted, and reserves were sold at higher parities to contain the currency run. On the other corner, not surprisingly, carrying costs were larger for "carry currencies" such as Brazil or Turkey, with wide interest rate differentials often unrelated with exchange rate expectations.

In sum, while realised intervention costs tend to vary considerably, the conventional view that reserves are costly due to wide sovereign spreads or heavy quasi fiscal losses appears to be somewhat overstated. Leaning-against-the-wind reserve accumulation would sustain important valuation losses only if appreciation pressures are permanent. By contrast, if they are due, for example, to cyclical inflows or short-lived terms of trade shocks, the reversion of the exchange rate to its earlier, more depreciated level would eliminate much of the valuation losses.

Moreover, the carrying cost can be further reduced by investing in higher-yielding long-run saving instruments as in the case of sovereign wealth funds, because prudential macro policies do not require reserves to be held in short, low-yielding liquid assets. At any rate, as a careful analysis of the realised cost of intervention reveals, they appear to be quite smaller than originally thought.[32]

3.5 Controls

Of all the *sand-in-the-wheel* options, the one that best fits the macro prudential mandate—and the only one endorsed by mainstream economists and the IMF—is the tax-based control on capital inflows of the type introduced in several Latin America countries in the mid-1990s. This modality usually takes

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31. For Korea, reserve purchases and sales are estimated as valuation-adjusted changes in reserve stocks. Carry is proxied by the yield differential between the country´s JP Morgan GBI portfolio and the 2-year YS Treasury yield, except for Argentina, where I use the yield of the central bank paper used to sterilise dollar purchases.

32. See Cárdenas and Levy-Yeyati (2010) and references therein.

the form of an unremunerated reserves requirement (URR) on capital inflows, and is virtually identical to a Tobin tax—so much so that back in the 1990s, the Chilean and Colombian authorities offered the option of an upfront payment tax in lieu of the URR to those investors with a stronger preference for liquidity.

Perhaps because of their connotations for mainstream economics in the post Bretton Woods era, or the looming risk of a wave of beggar-thy-neighbor reactions to global liquidity, capital controls are receiving a disproportionate attention in the exchange rate policy debate, relative to their subsidiary role in the policy toolkit. Indeed, most of the material recently developed by the IMF in connection with the G20 discussion on this issue falls under the capital control umbrella. The preliminary conclusions of this work are rather sobering: controls are barely effective and, if they are, they are highly distortionary; as a result, they should be viewed as a last resort tool in case everything else fails (Ostry et al, 2011).

How effective and how costly are they in reality? The Latin American experience with tax-based controls generated more than a few empirical attempts to quantify its effects.[33] Perhaps the simpler approach is the one proposed by De Gregorio, Edwards and Valdés (2000): the difference between the (90-day) UF-U.S. dollar forward discount and interest rate differential (i.e., the deviation from covered interest rate parity), which during the period of controls oscillated between 2 percent and 3 percent, in line with the value of the equivalent Tobin tax during the period, calculated by the authors in the paper (Figure 8).[34] In other words, the rate differential widened proportionally to the strength of the URR, as intended.[35]

Another way to gauge the same effect is by comparing prices of identical assets trading domestically and abroad, for example, stocks and American Depository Receipts (ADRs).[36] Assuming expected return arbitrage across markets, the percentage price discount between the (underlying) shares in Santiago

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33. See, among others, Cardenas and Barrera (1997); De Gregorio, Edwards and Valdes (2000); Edwards (1999) and Gallego and Hernández (2003).

34. The Unidad de Fomento (UF) is indexed to the Chilean CPI.

35. Indeed, the higher domestic interest rates sometimes highlighted by control skeptics (Forbes 2003) could be seen as a prima facie proof of their effectiveness.

36. ADRs are shares of non-U.S. corporations traded in the U.S. (and denominated in dollars), while the underlying shares trade in the domestic market of the issuer. ADRs are issued by a so-called depositary bank in the U.S. and represent a specific number of underlying shares remaining on deposit in a custodian bank in the issuer’s home market.

and the corresponding ADR in New York (the *cross-market premium*), can be attributed to transaction costs including, most notably, the 3 percent Tobin tax, as the international investor demands a compensating 3 percent yield premium (a 3 percent price discount) from the stock in Santiago. This is precisely what is found in the data during the period of controls (the shaded area in the graph on the right in Figure 8), where it can be seen how the ADR premium rises and declines reflecting the intensity of capital inflows.[37]

Are controls effective? Yes, because they impose a toll on traffic in and out of domestic markets. How effective are they? As with exchange rate intervention, the impact of controls will be small if they are administered in small doses. For example, a 2 percent tax will not obtain much more than a 3 percent cut in the value of local assets (including the local currency); a 10 percent tax will obtain a proportionally (but probably not linearly) stronger effect. A 2 percent tax opened to adjustments (as the IOF recently introduced in Brazil) should have an effect in between, as it affects the expectations and should keep the position of short-term speculative investors relatively light.[38]

4. Summing Up

From the discussion above, it follows that, from the perspective of an emerging economy, the question at the origin of countercyclical (prudential) macro policy is not so much whether the exchange rate is currently misaligned as whether it is likely to be misaligned in the future, and by how much. If ERERs change over time, in line with country fundamentals such as the NFA or terms of trade that reflect short-term influences that are both financial (risk appetite, the world interest rate cycle, the U.S. dollar), and real (the world business cycle, China), what is a small open economy to do to reduce the exposure to those factors?

In theory, one could address this question by decomposing fundamentals into a permanent and transitory component and use the permanent component to calculate the ERER and detect potential deviations. However, this is easier said than done. While it is intuitive to see that the interest rate cycle in the U.S.

37. The same measure can be readily applied to assess the effect of quantitative limits on capital flows, like those that characterised emerging Asia in the 1990s, or, more recently, the ones imposed in the midst of the Argentine crisis in 2002 (Levy-Yeyati, Schmukler and Van Horen, 2004).

38. An additional finding of the empirical literature on tax-based controls points to their benign composition effect (the lengthening of cross-border transactions), which, to the extent that it lowers flow volatility, should have positive prudential implications.

or the euro zone is bound to come to an end in the near future, it is much harder to forecast a Chinese deceleration or the evolution of the demand from bio-diesels, two critical inputs to time the end of the grains up cycle. Moreover, the ERER is a multilateral concept; by definition, any short-term deviation will depend on other countries' performance, including their own prudential macro response to exchange rate pressures—an aspect that insinuates the benefits of the always-elusive macroeconomic coordination. Perhaps for this reason, prudential macro policies have been—and will likely continue to be—an erratic and exploratory affair.

Ultimately, an unbiased look at the available evidence on exchange rate–smoothing policies appears to indicate that they are not as powerful as fervent proponents would argue, nor as damaging as opponents would claim. But are they efficient? They probably are, if the objective is to mitigate the impact of transient global factors on domestic cycles, and to prevent asset inflation and overvaluation that are costly to revert in the down cycle. Rather than as a temporary last-resort option, as they are often characterised by mainstream analysts (Ostry et al., 2010), we see these policies, together with micro prudential and macro prudential regulation on financial intermediaries, as an essential part of the macroeconomic toolkit to ensure that globalised emerging economies are the beneficiaries of financial integration and not its victims.

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Appendix

Table 1

Study	*Estimation method*	*Sample period*	*Key results*
Ghosh et al. (1997)	OLS panel data, two-stage instrumental variables	1960-1990	GDP growth was not affected by (*de jure* or *de facto*) regimes
Levy Yeyati and Sturzenegger (2001)	two-stage instrumental variables	1974-1999	No significant links for developed economies. For developing economies, pegs associated with slower growth.
Bailliu et al. (2003)	GMM panel data	1973-1998	Pegged regimes grow by about one-half percentage point faster than floats and about one percentage point faster than intermediate regimes. Regimes with anchors and pegged regimes grew faster than regimes (floats and intermediates) without anchors
Levy Yeyati and Sturzenegger (2003)	two-stage instrumental variables	1974-2000	For aggregate of all economies, growth for intermediate regimes and pegged regimes was about 1 percentage point and 0.8 percentage point, respectively, lower than under floating. Controlling for endogeneity, growth under pegs was about 2 ½ percentage points below floating, while for intermediate regimes there was little difference from floating. Application of separate regressions to industrial and developing countries showed little impact of regime for former group, while for developing countries less-flexible regimes were associated with slower growth
Ghosh et al. (2003)	OLS panel data, fixed effects, two-stage instrumental variables	1970-1990	Compared with floats, growth was about 3.3 percentage points higher under intermediate regimes and 2.5 percentage points higher under pegs. Attributed this result to the fact that their coding tends to drop floats with stable exchange rates
Rogoff et al. (2005)	OLS panel data, fixed effects	1970-1999	For developing economies, real growth appears to decline with increased flexibility; for emerging markets, no evidence of a link between regimes and growth is found. For advanced economies, growth rose with increased flexibility
Dubas et al. (2005)	Random effects	1971-2002	For all countries, pegged regimes grew a bit more than one percentage point relative to floats. The difference between floats and intermediate regimes was not statistically significant. For industrial countries, regime dummies were not significant. For nonindustrialized economies, pegs grew 1.3 percentage points more that floats, but there was no statistically significant difference between floats and intermediates
De Grauwe and Schnabl (2005)	For inflation: GMM panel data for growth: GLS	1994-2004	For *de jure* regimes, no clear association with growth. Using *de facto* coding, pegged rates were associated with higher growth
Aghion et al. (2006)	GMM panel data	1970-1999	Pegs are associated with slower growth for not financially developed countries

Table 2

Note: All regressions included country fixed effects and Time dummies. Control variables for column 7 are dated in t, instead of t+1. Robust standard errors in parentheses / * significant at 10%; ** significant at 5%; *** significant at 1%.

	Dependent Variable						
Control Variables	*Percentage of Change of the Real Gross Domestic Product (Trend HP, t+1)*	*Percentage of Change of the Real Gross Domestic Product (Cycle HP, t+1)*	*Export and Import as a share of GDP (Δ% Volume Import, t+1)*	*Export and Import as a share of GDP (Δ% Volume Export, t+1)*	*Nominal Gross domestic savings as % GDP (t+1)*	*Real Gross capital formation as % GDP (t+1)*	*Retribution to Labor as % Capital Compensation (t)*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
int2. Index (t)	0.786***	2.041***	5.918**	-0.775	2.926***	1.631***	-23.867***
	(0.193)	(0.462)	-2.669	-2.293	-0.89	-0.545	-7.519
int2. Index (t-1)	0.938***						-19.578**
	(0.204)						-9.429
int2. Index (t-2)	0.791***						
	(0.185)						
int2. Index (t-3)	0.661***						
	(0.184)						
Dep. var. (t)	-3.561***	-27.353***	-0.092***	-0.087***		0.540***	
	(0.285)	(1.787)	-0.022	-0.027		-0.028	
LGDP (t)					11.443***	-0.826	
					-0.983	-0.592	
LGDP_HP_cycle (t)					10.062***	10.605***	
					-3.506	-2.004	
Δ%GDPpw (t)							-0.028
							-0.19
Δ%GDP (t+1)			1.226***	0.453***			
			-0.121	-0.099			
ΔLog(ToT) (t+1)	0.013***	0.015**	0.070***	0.157***	0.061***	-0.009	-0.044
	(0.003)	-0.007	-0.016	-0.033	-0.008	-0.005	-0.063
Population growth (t+1)	0.324***	0.006	-0.879	0.546	0.398*	0.124	2.847
	(0.078)	-0.125	-0.689	-0.479	-0.207	-0.11	-3.456
Financial account to GDP (t+1)	0.036***	0.029**	0.126**	0.094	-0.163***	0.131***	0.304**
	(0.006)	-0.013	-0.063	-0.064	-0.028	-0.017	-0.144
Trading partners growth (t+1)	0.022	0.019	0.716*	0.235	0.112**	0.008	-1.306
	(0.023)	-0.055	-0.376	-0.334	-0.053	-0.034	-0.92
Observations	2127	2384	1434	1561	2359	2348	596
R-squared	0.672	0.259	0.279	0.21	0.801	0.776	0.886
Mean Dep. var.	3.537	0.298	5.698	5.397	16.097	21.979	94.715
St Dev Dep. var.	2.048	3.226	13.201	12.905	11.555	6.711	46.939

Table 3

Note: y(t, t+s) corresponds to the average over the period t to t+s of the variable y. Except otherwise indicated, all controls are averages for the period over which the dependent variable is measured. All regressions included country fixed effects and time dummies.

Table 1

Dependent Variable: Percentage of Change of Ratio Reserves / GDP

	Sample: 1974 - 2008		*Sample: 1993 - 2008*	
	Δ% NFA / GDP	**Δ% Foreign Assets / GDP**	**Δ% NFA / GDP**	**Δ% Foreign Assets / GDP**
	(t)	**(t)**	**(t)**	**(t)**
Variables	**[1]**	**[2]**	**[3]**	**[4]**
Δ% M2 / GDP	0.056	0.071*	-0.07	-0.001
	(0.038)	(0.039)	(0.134)	(0.11)
Δ% Financial Account / GDP	0.002***	0.001***	0.002***	0.001***
	(0.001)	(0.0003)	(0.0005)	(0.0004)
Δ% (X-M) / GDP	0.167***	0.241***	0.086	0.212**
	(0.047)	(0.048)	(0.063)	(0.087)
Δ% Log(ER)	-0.004	0.007**		
	(0.004)	(0.003)		
Δ% Log(RER)			-0.004	-0.034**
			(0.011)	(0.013)
ΔLog(ToT)			0.017	0.02*
			(0.012)	(0.011)
Observations / Countries	565 / 22	565 / 22	221 / 18	221 / 18
R-squared	0.192	0.271	0.208	0.247
Mean Dep. var.	0.002	0.002	0.003	0.003
St. Dev. Dep. var.	0.03	0.03	0.018	0.018

Note: y(t, t+s) corresponds to the average over the period t to t+s of the variable y

Except otherwise indicated, all controls are averages for the period over which the dependent variable is measured

All regressions included country fixed effects and Time dummies

Robust standard errors in parentheses / * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4

Demand, Supply and Speculative Factors Behind the Common Commodity Trends, 2000–2010

Note: Industrial production (IP) indexes are weighted by GDP. EM = emerging market; AM = advanced markets; HY = BofAM Merrill Lynch High Yield Corporate Effective Yield. Robust standard errors in parentheses. ***, ** and * denotes significance at the 1, 5 and 10 percent level. Source: IMF and World Bank data.

	Dep. Variable	
Control Variables	PC1 Grains	PC1 Copper and Oil
IP (EM)	11.82 *	18.34 ***
IP (AM)	8.916 ***	-0.655
US real interest rate	-0.008 ***	0.005 ***
S&P500	-2.406 **	
Broad USD index	-9.766 ***	-4.11 **
log (US HY spread)		1.19 **
Constant	-1.262 ***	-9.481 ***
Obs.	129	129
R-squared	0.50	0.68

Table 5

	Action	Costs from using these tools to weaken the local currency	Limitations	Strengths	Logistics	Economies that have used this approached in recent years
FX market strategy	Central bank FX buying-selling / unsterilized	Inflation: Local currency liquidity from intervention could push up goods and asset prices	May be perceived by market as unsustainable	Powerful disincentive	Auction vs discretionary with costs and benefits to both	**LatAm:** None **EM Asia:** Infrequently and on an ad-hoc basis **EMEA:** Turkey, Russia, Romania (and pegged regimes in Baltic States, Bulgaria)
	Central bank FX buying-selling / sterilized	Fiscal: Sterilization costs	Impact can be diluted by high local yields	Fewer side effects on money supply and inflation	Auction vs discretionary. Bill sales vs repo sterilization	**LatAm:** Brazil, Colombia, Argentina, Mexico (through options; clearly aimed at building FX reserves as opposed to limit excessive appreciation), Chile, Peru. **EM Asia:** Singapore, Korea, Chinese Taipei, China, Philippines and Thailand **EMEA:** SA, Israel, Egypt, Poland, Hungary
	Government FX intervention	Credibility: May be undermined if the Central Bank opts not to intervene	Opaqueness would undermine 'signalling effect'	Powerful disincentive	Through state or private sector banks	**LatAm:** Chile, Argentina in the past, Brazil with SWF to intervene in FX forwards market. Peru: Banco de la Nacion has done it in the past **EM Asia:** Not seen in Asia, since the Asian financial crisis (HK) **EMEA:** Poland (MOF), Israel (MOF, hedging FX debt)
	Interest rate shifts	Inflation	Less effective against FX appreciation during climate of low global rates	Reinforces impact of intervention	At MPC meetings or on an ad-hoc basis (for extra signalling effect)	**LatAm:** Have done it in the past **EM Asia:** Rarely except "in extremis" or when consistent with inflation target. In many cases, gradual rate normalisation reflects reluctance to attract inflows. **EMEA:** Turkey, Hungary, Romania, Ukraine
Quant. measures	Taxation: Withholding taxes on non-resident incomes or capital gains and/or Tobin tax on transactions	Admin costs, affect FX market liquidity, may weaken long-term direct investment	Blunt tool. Legislative inertia when reversing	Adds to fiscal revenue. May equalize tax burden of locals vs foreigners	Legislative approval may be needed to implement or remove	**LatAm:** Brazil (6% IOF), Chile (4% withholding), Colombia (33% withholding), Peru (5% WHT on up to 60d NDFs; may extend it further out the curve) **EM Asia:** Philippines (20% withholding), Thailand (15% withholding), Korea (14% withholding), India (30% withholding are the maximum rates, before accounting for bilateral tax agreements) **EMEA:** Egypt (20% withholding)
	Unremunerated reserve requirements (to slow foreign borrowing)	Admin costs, could hurt local bank balance sheets	Blunt tool. Legislative inertia when reversing			**LatAm:** Brazil: 60% RR on banks' short USD positions in spot. Peru: 60% RR on s/t foreign lines of credits to banks & on bank loans from their foreign subsidiaries **EM Asia:** Indonesia (increase RR on IDR and FX deposits), China hiked RRR 6 times by 300bp since Dec 2009 **EMEA:** Turkey (increase on both TRY and FX deposits, may impose on CCS)
	Restricting foreign access to local bonds and equities	Distorts markets	May be circumvented	Tackles short-term flows	Self policed or by local authorities	**LatAm:** Argentina, Colombia, Brazil, Peru all have different extents of restrictions **EM Asia:** Some forms in most of Asia (except Singapore and HK), notably Chinese Taipei (restricting FINI from buying bonds), India (outright FII level limits), Indonesia (SBI min holding period) and Sri Lanka (proportional limit for offshore holding) **EMEA:** None in the mainstream economies
Prudential regulations	Constrain/limit FX exposure of residents	Higher resident borrowing costs	Could be slow to impact FX	Contribute to l/t health of private sector balance sheets	Joint effort by central bank, government and financial regulator	**LatAm:** Almost all **EM Asia:** Korea (levy on short-term bank FX funding; limits on FX forward exposures), Indonesia (limits on short term FX borrowing). Chinese Taipei, HK and Singapore are trying to limit property speculation **EMEA:** SA, Hungary, Poland

Table 6
Does Intervention Matter for Exchange Rates?

Note: Sample period: 1974–2007. PPP = purchasing power parity-adjusted RER are from the Penn Tables. GDP: RER adjusted by the GDP deflators. REER: real effective exchange rate from IMF. Panel regressions, including the following additional controls: terms of trade, trade-weighted GDP of trading partners, the financial account over GDP ratio, and year dummies. All variables in logs. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Source: These regressions update work first reported by Levy-Yeyati and Sturzenegger (2007).

	Bilateral RER		***REER***	***3-Year Averages***		
				Bilateral RER		***REER***
	PPP	*GDP*	*IMF*	*PPP*	*GDP*	*IMF*
Intervention	0.122***	0.304***	–0.141**	0.277***	0.504*	-0.412**
	-0.035	-0.108	-0.071	-0.076	-0.275	-0.168
Observations	2,271	2,039	1,155	791	746	428
R^2	0.803	0.975	0.639	0.827	0.978	0.673

Figure 1

Note: In the figure, i* represents international risk-free interest rates, p stands for the sovereign risk premium, e denotes the exchange rate, g_y and σ_y are output growth and volatility, and π is the inflation rate.

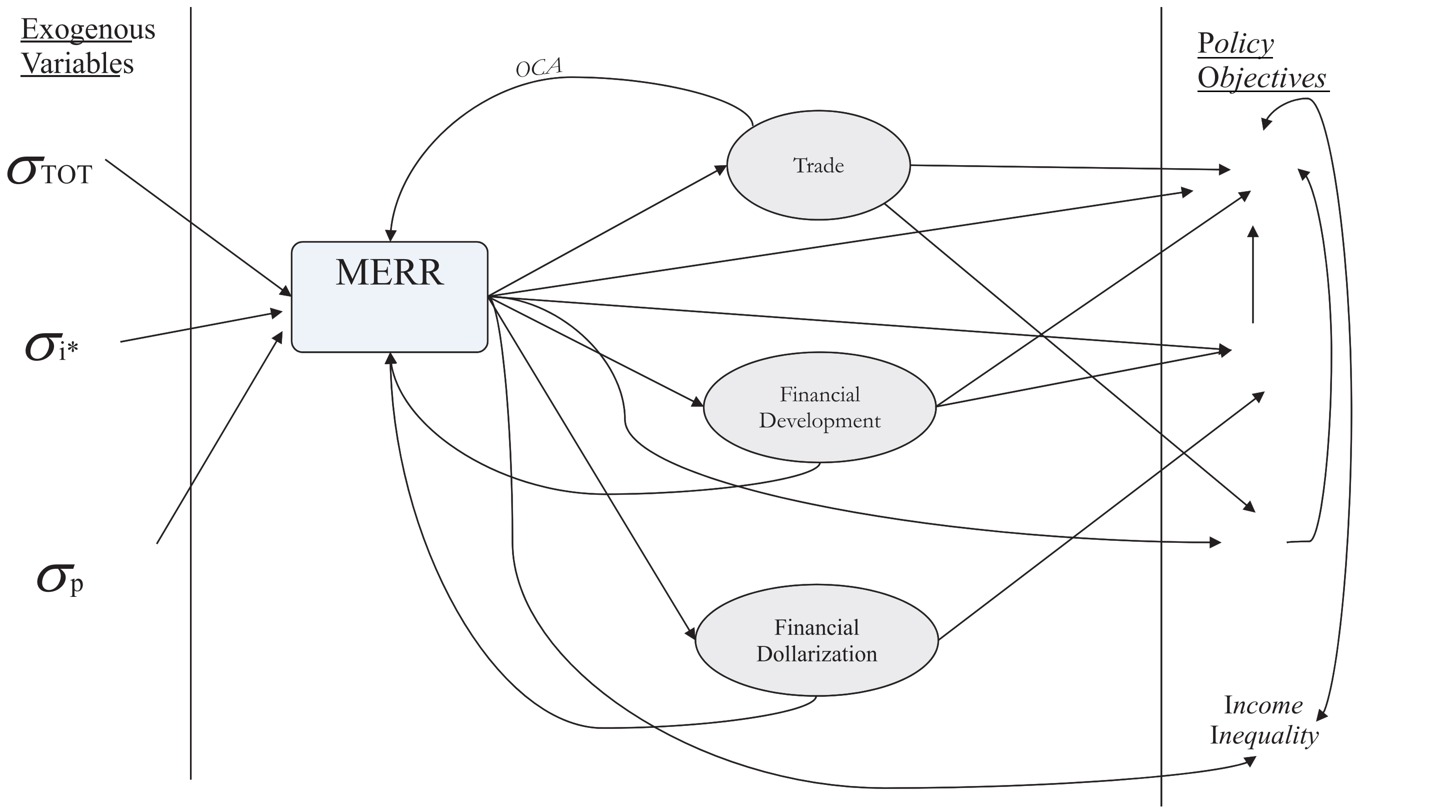


Figure 2

The Growing Synchronicity of Portfolio Inflows and Exchange Rates

Note: The top graph shows the first principal components (PC1) of quarterly portfolio inflows and exchange rate changes, over the emerging market sample. The bottom graph shows the period average R2 from country-by-country regressions of portfolio inflows (on the left) and foreign exchange rate changes (on the right) against the corresponding principal component (PC1). Source: Levy Yeyati and Williams (2011).

Figure 2a

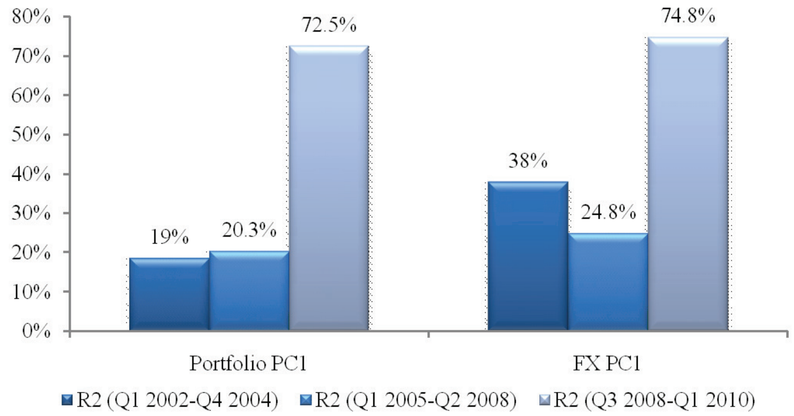


Figure 2b

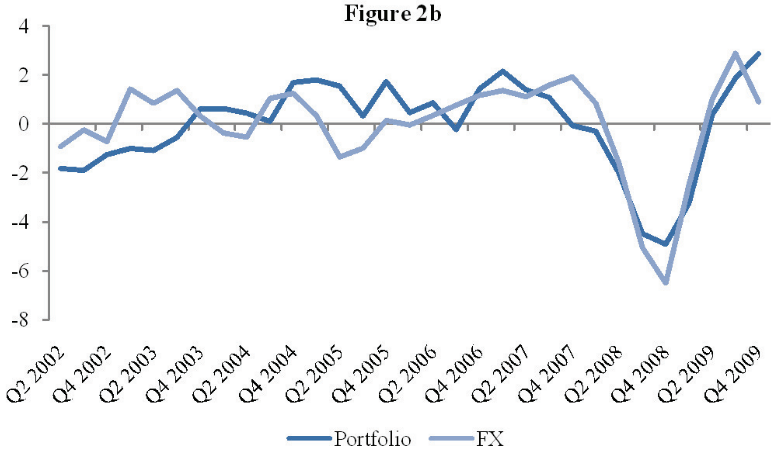


Figure 3

Global Drivers: Inflows to Emerging Markets Respond to Risk Appetite; Exchange Rates React to Risk and the U.S. Dollar

Note: The top graph shows the link between the first principal components (PC1) of quarterly portfolio inflows with S&P 500 returns. The bottom graph shows the link between the PC1 for exchange rates changes, on the one hand, and S&P 500 returns and the US broad dollar index, on the other. Source: Levy Yeyati and Williams (2011).

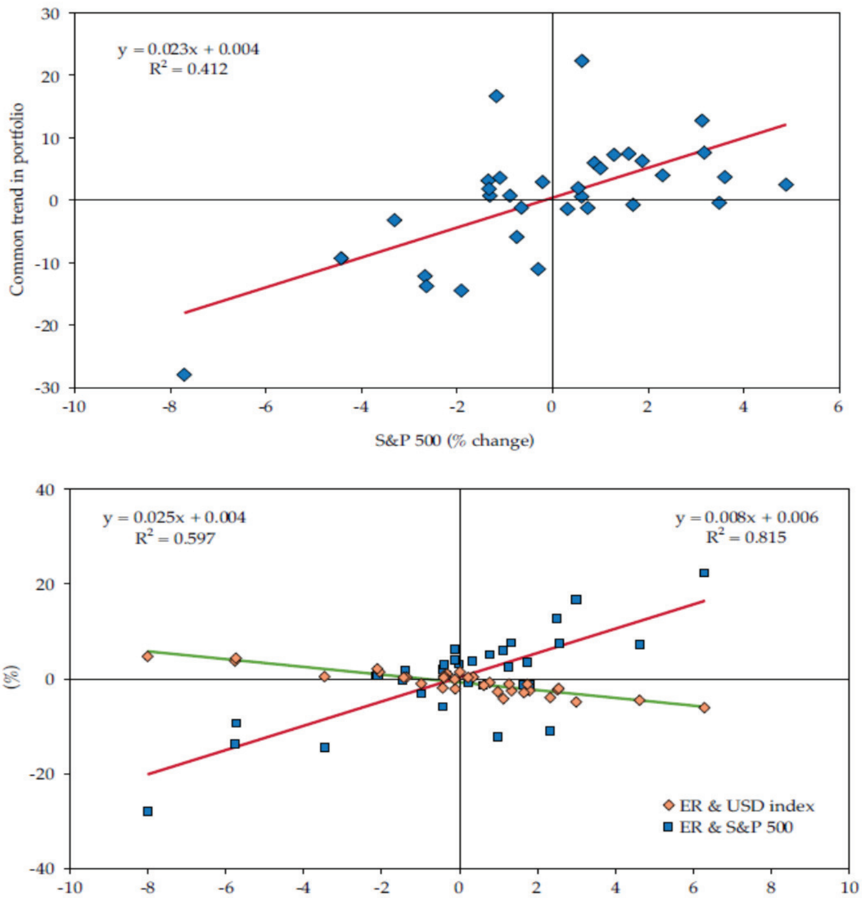


Figure 4
Valuation Changes: Appreciation and Net Foreign Assets in Peru and Chile

Note: To isolate the valuation component of the NFA change, the latter is taken net of the current account (CA) balance. A positive change in REER denotes appreciation. NFA data are from Lane and Milesi-Ferretti (2007).

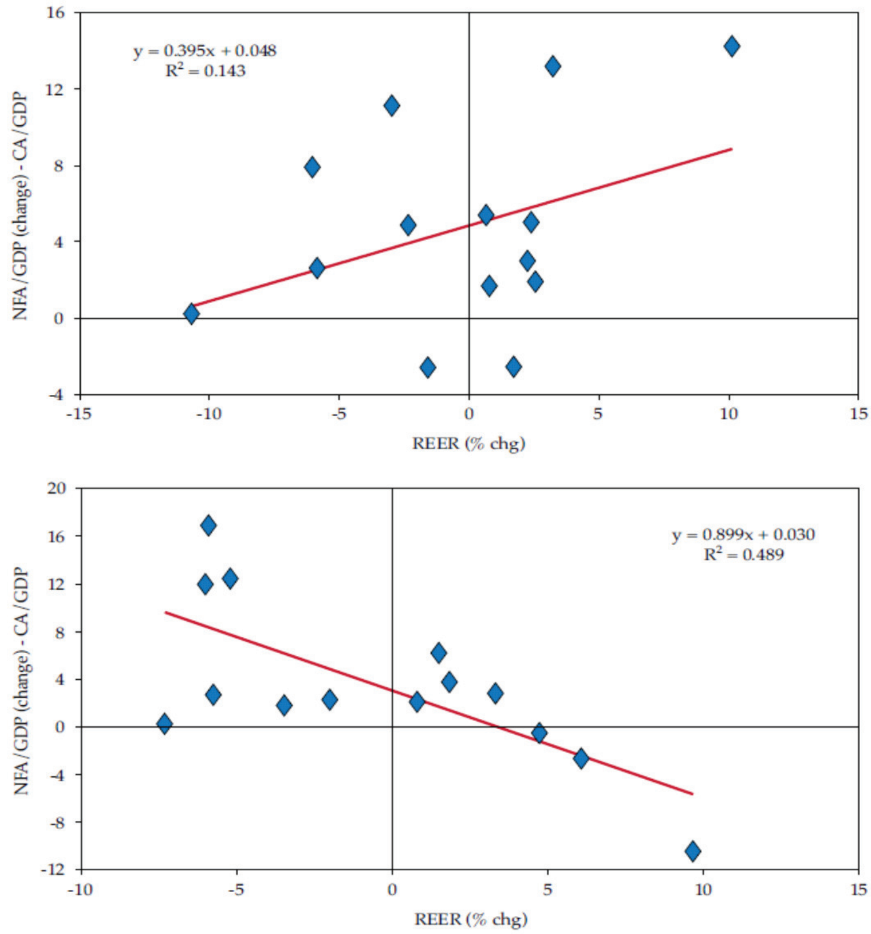
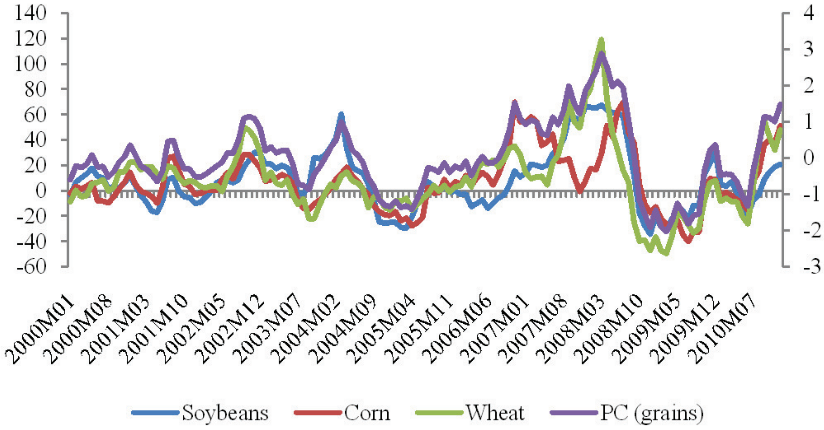


Figure 5

Commodities: Common Trends in Grains as Well as in Oil and Copper

Note: PC1 computed based on price index changes. The graph on the right shows the group average R2 of a regression of each commodity against its group PC1.

Source: World Bank data.



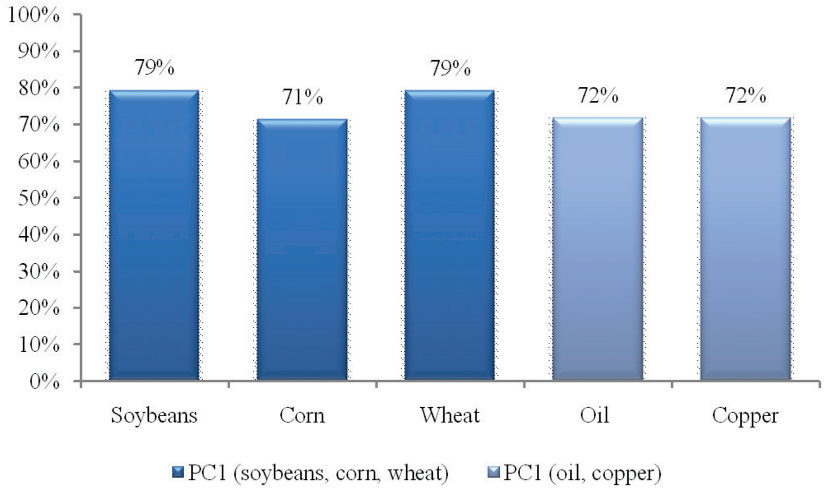
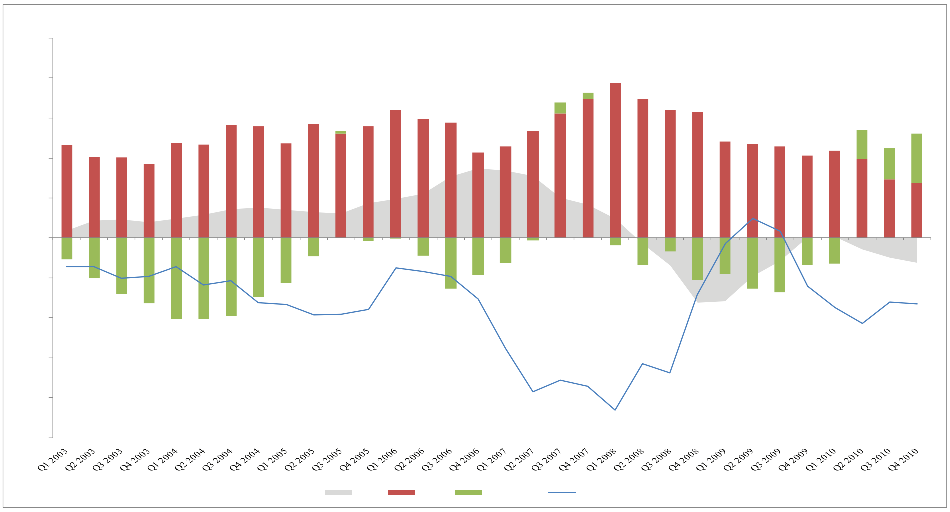


Figure 6

Latin American Countries and Asia: CA, FDI, Portfolio and Reserves



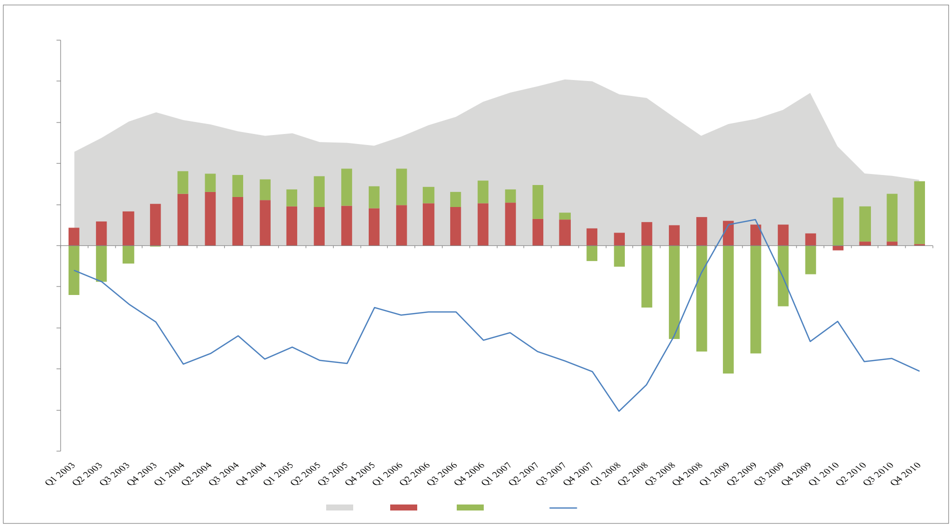
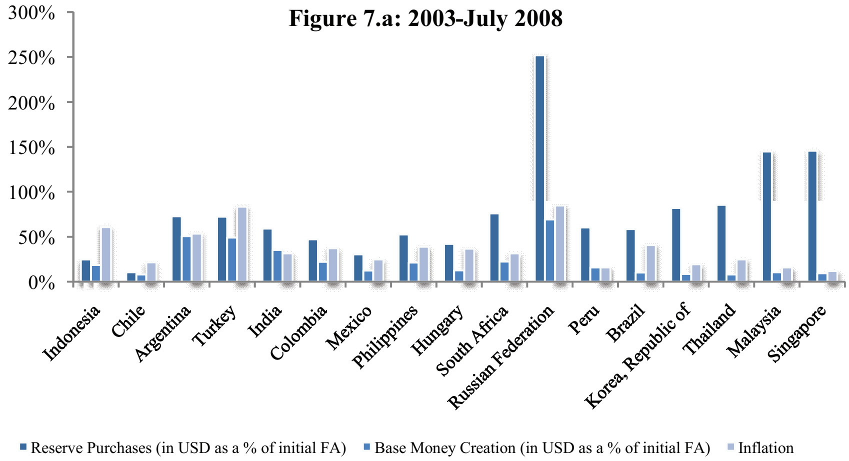


Figure 7
Reserve Accumulation and Money Creation

Note: This figure shows reserve purchases, base money creation (as a percentage of initial foreign assets) and inflation in different countries. Reserve purchases were calculated as the difference between foreign assets (in USD). Source: IMF IFS Statistics.



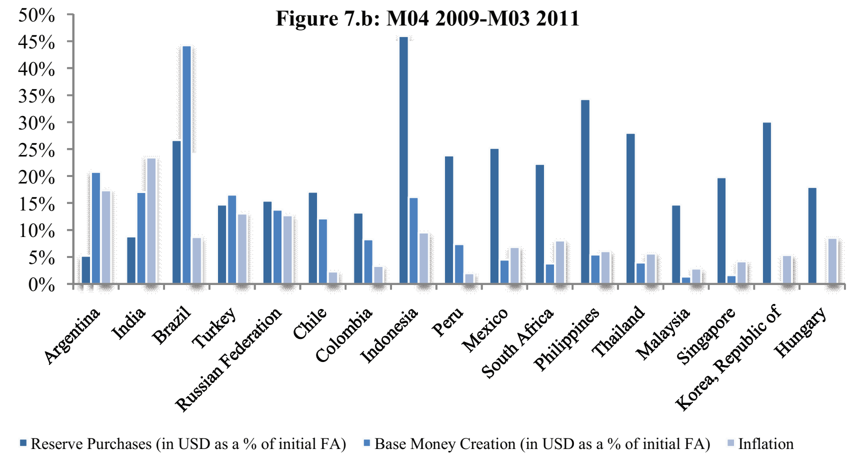


Figure 8.a
Profits and Losses from Reserve Purchases

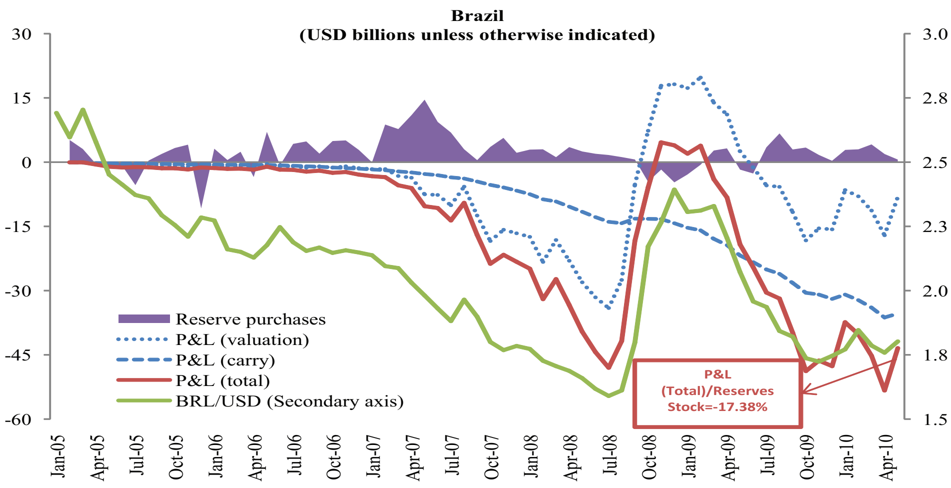


Figure 8.b
Profits and Losses from Reserve Purchases

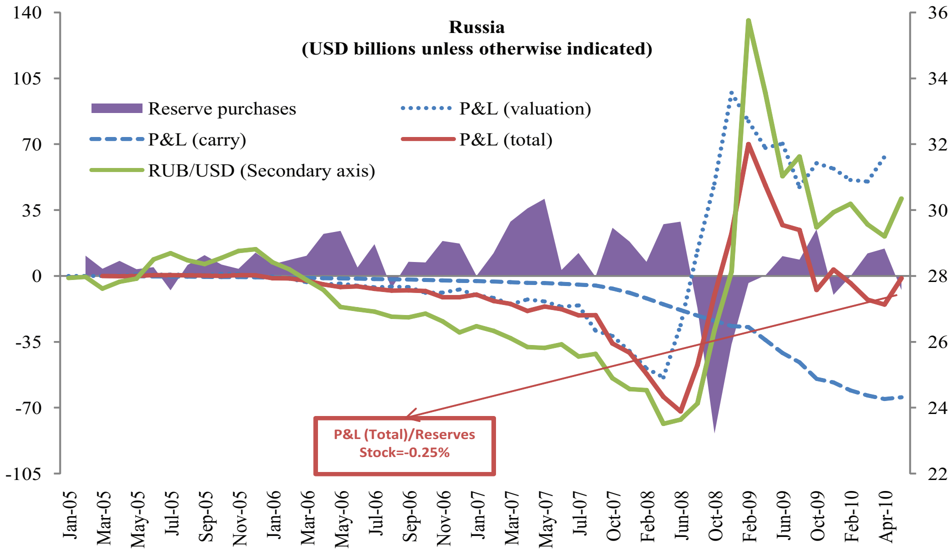


Figure 8.c
Profits and Losses from Reserve Purchases

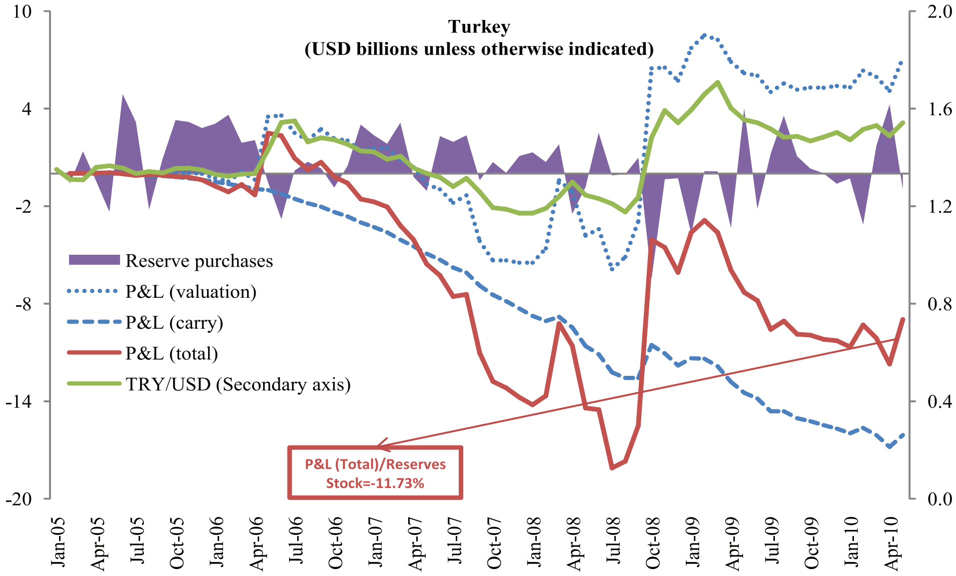


Figure 8.d
Profits and Losses from Reserve Purchases

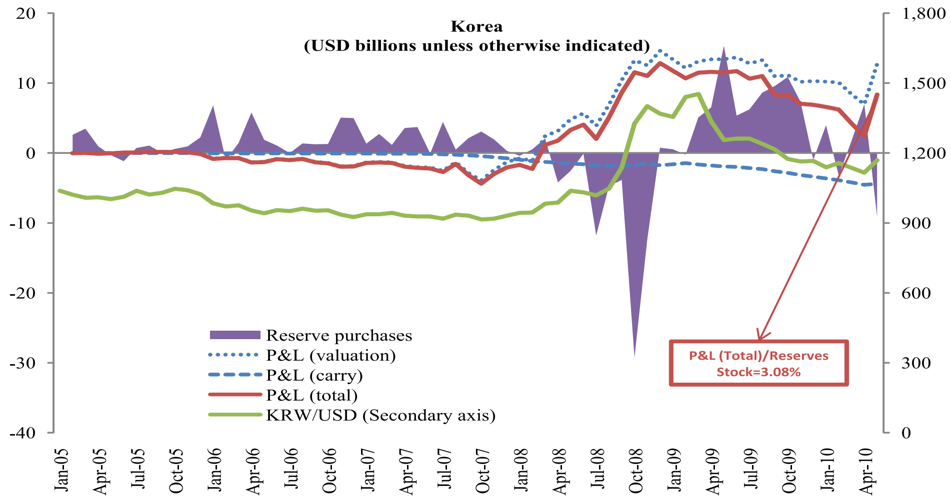


Figure 8.e
Profits and Losses from Reserve Purchases

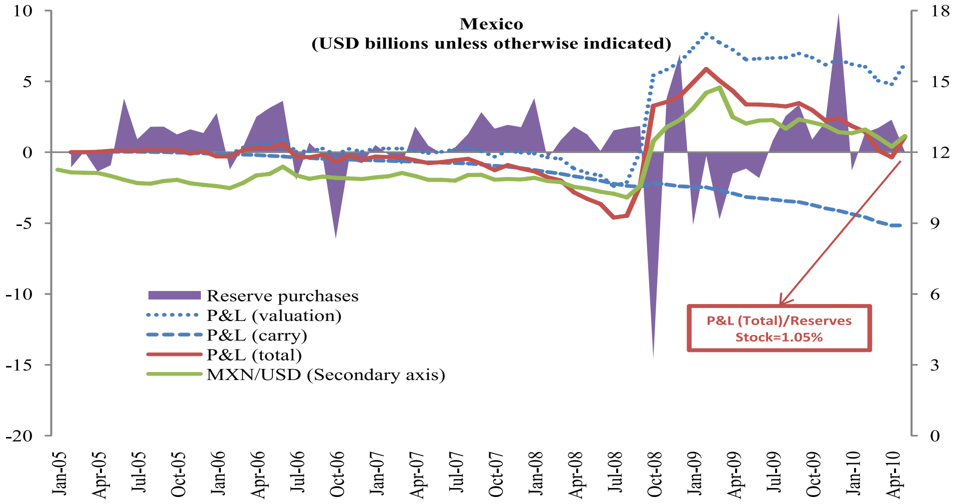


Figure 8.f
Profits and Losses from Reserve Purchases

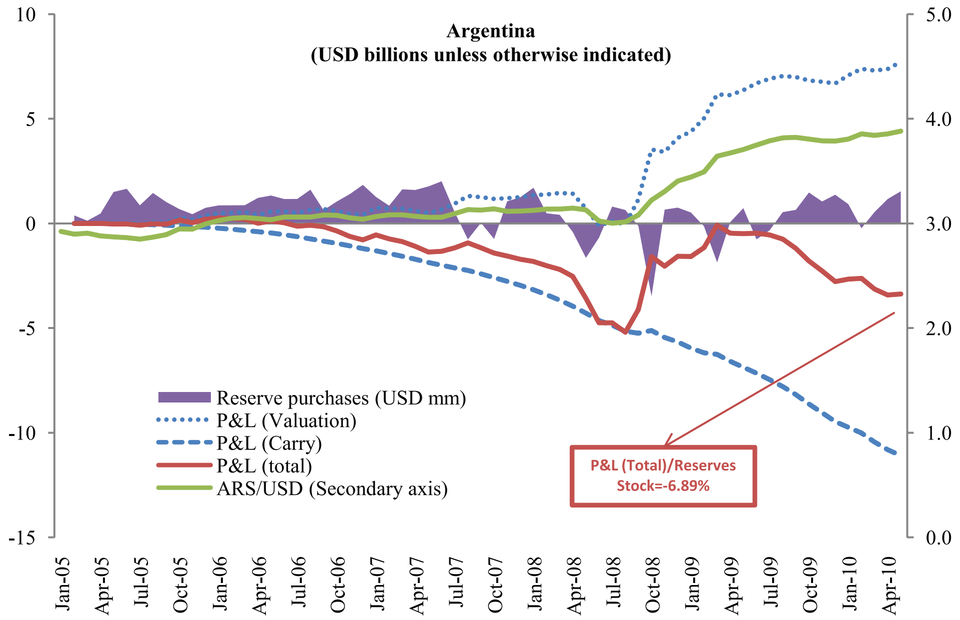
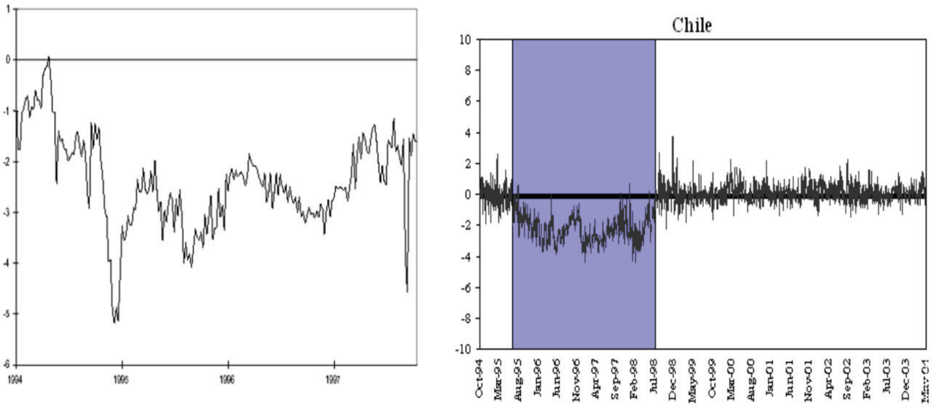


Figure 9

Chile: Forward Discount versus Interest Rate Differentials in Times of Controls

Note: The graph on the left shows the difference between the 90-day UF-U.S. dollar forward discount and the interest rate differential (De Gregorio, Edwards and Valdés 2000). The graph on the right shows the percentage difference of the price of the stock in the domestic market and the corresponding American Depository Receipts (ADR) on the New York Stock Exchange (Levy-Yeyati, Schmukler and Van Horen 2009).



PART 2

PERSPECTIVES AND EVIDENCE

Chapter 3

THE TRILEMMA CHALLENGE FOR SEACEN MEMBER ECONOMIES: TESTING THE TRILEMMA HYPOTHESIS [1]

By
Hiro Ito[2] and Masahiro Kawai[3]

1. Introduction

Facing a fragile recovery of the world economy from the global financial crisis of 2008-09, policymakers around the globe are contemplating what would be an optimal mix of open macroeconomic policies that are effective enough to guide their economies to stable and sustainable economic growth.

As of this writing, four years since the breakout of the crisis, the world economy is still full of unstable factors. Generally, the advanced economies only show feeble, if any, recovery while the developing and emerging market economies are doing well. The Greek debt crisis is affecting other southern european economies such as Italy, Spain, and Portugal and posing threats to the eurozone as a whole. The U.S. economy is experiencing its own debt problem and "jobless recovery," unable to wipe out the possibility of a double-dip recession. The Japanese economy has been hit by the triple disaster of the 11 March 2011 earthquake, tsunami, and nuclear plant failure.

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1. This is a revised version of the paper presented to the SEACEN Research Workshop on "Policy Responses and Adjustments in the Course of Exchange Rate Appreciation" organized by The SEACEN Centre on 18-22 July 2011. The authors are thankful to Eduardo Levy-Yeyati, Naoto Osawa, Reza Siregar and other participants of the workshop as well as Giovanni Capannelli, Mario B. Lamberte, Peter Morgan, Gloria O. Pasadilla and Willem Thorbecke for their useful comments. Michael Cui, Jacinta Bernadette Rico, Erica Clower, and Shigeru Akiyama provided excellent research assistance. Ito thanks Portland State University for its financial support and ADBI for its hospitality while he was visiting the institute. The authors accept responsibility for any errors in the paper. The views expressed in these paper are those of the authors and do not necessarily reflect those of The SEACEN Centre, the SEACEN member central banks/monetary authorities, the Asian Development Bank, its Institute, its executive directors, or the countries they represent.

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Unlike the Asian financial crisis of 1997-98 and the Latin American debt crisis in the 1980s, developing and emerging economies are not facing a crisis of their own. Although they experienced the tsunami of crisis in 2008-09 mainly through the international trade channel, in retrospect, the global financial crisis only dented the growth of developing and emerging economies including those in Asia.

However, the better performance of emerging economies can slip out of the hand, if the conditions in the eurozone and the US deteriorate significantly. Many emerging economies have been experiencing volatile capital flows: large capital outflows due to US and European banking sector difficulties, causing shortages of international liquidity and sharp currency depreciation; and large capital inflows due to unusually lax monetary policy taken by advanced economies' central banks, causing upward pressure on both their currency values and on the levels of asset price inflation. Whether they deteriorate or recover, advanced economies can rapidly change the direction of capital flows, possibly causing disruptions in the capital markets of emerging economies. In short, regardless of what happens to the world, policymakers in developing and emerging economies must consider how to keep their economies immune from the unstable parts of the world and sustain stable economic growth. Their task is, however, complex in such a globalised environment.

Despite the complexity of policy management, monetary authorities face a simple, old theoretical constraint, called the "impossible trinity," or "trilemma". This is a hypothesis that was first made popular by Mundell (1963). The hypothesis states that an economy simultaneously may choose any two, but not all, of the three goals of monetary policy independence, exchange rate stability, and financial market openness to the full extent. This hypothesis has been widely taught and recognised because it is quite intuitive and helpful to understand the constraints policymakers must face in an open economy setting.

Despite its pervasive recognition, the hypothesis has not been subject to rigorous empirical scrutiny until recently. The main reason for this is because it is quite difficult to create systematic metrics that measure the extent of achievement in the three policy goals of the trilemma. If one does not know to what extent each of the policy choices has been achieved, it is difficult to estimate what kind of other policy choices are still available and to what extent.

Aizenman, Chinn and Ito (2008) developed a set of "trilemma indexes" that measure the degree of achievement of the three policy choices for a wide coverage of economies and periods. Using the indexes, they empirically proved

that the hypothesis is valid by showing that the three measures of the trilemma are linearly related to each other.

Although the indexes by Aizenman, et al (2008), cover many countries and years, the systematic approach they employ to get a wider coverage may have sacrificed some nuances, potentially exposing the metrics to debate. While there cannot be "perfect metrics" that depict the state of policy implementations with decent precisions and subtlety, the bottom line is that this sort of exercise must be an endless exploration for economists.

We join this exploration and develop a set of indexes that measures the extent of exchange rate stability, monetary policy independence, and financial market openness. In our exploration, we take different, more nuanced and detailed methodologies than Aizenman, et al (2008). While building on the past literature, we attempt to overcome the weaknesses of the indexes developed previously. However, our aim for a higher level of subtlety for the indexes comes with a cost since the coverage of countries is smaller. The indexes are available for about 90 economies for the period of 1970-2009 when those for developing economies tend to be missing in early years.

Once the new indexes are introduced, we analyse if the indexes are consistent with the concept of the trilemma, that is, if the indexes are linearly dependent. Given that the indexes are normalised to take values between zero and one, the linearity of the indexes can be tested by examining whether the sum is statistically different from the value of two. These results show that policymakers do face a linear constraint of the three policy choices as theory suggests.

Extending this exercise, we also illustrate the policy mixes of our sample economies using the famous trilemma triangle, which is often illustrated in textbooks on international macroeconomics and is an intuitive way of showing how monetary authorities face the trade-off of choosing a mix of the three policies while having to stay inside the triangle. Our attempt to show the policy mix in the trilemma triangle, using actual metrics of the three policies instead of drawing the triangle abstractly, must be the first attempt in the literature of international macroeconomics. The triangle based on our indexes turns out to be useful in illustrating the development of policy mixes for economies over years.

Although we show that the sum of the three indexes adds up to two *on average,* we do not exclude the possibility of the sum deviating from the value of two for an individual economy for a certain period. Conceptually, we could

assume that if the sum of the three indexes surpasses the value of two for an extended period, such a policy combination is unsustainable. Furthermore, such an unsustainable combination of policies—if not addressed by policy actions—could be corrected by market forces, leading to an occurrence of economic disruptions such as a currency crisis. We show how the sum of the three indexes behaves for a group of Asian economies at the time of the Asian financial crisis.

We review the concept of the trilemma in Section 2. In Section 3, we define our indexes of the trilemma by carefully discussing the methodologies for constructing the indexes. We also look into the linearity of the indexes by examining whether the sum of the three indexes statistically equals to the value two. In Section 4, we make observations of the indexes for selected economies and economy groups by plotting combinations of the three indexes in the famous trilemma triangles. In Section 5, we examine how the sum of the three indexes evolved for Asian economies in the period before and after the Asian financial crisis. We conclude the main findings of the paper and discuss future research agendas in Section 6.

2. The Hypothesis of "Impossible Trinity" or the "Trilemma"

The trilemma is often illustrated using an equilateral triangle like the one shown in Figure 1. Each of the three sides represents monetary policy independence, exchange rate stability, and financial market openness. Starting from one corner, as one goes vertically toward one of the three sides, this represents a higher degree of the outcome in the policy represented by that side. In other words, one can stand on one of the three sides only when the full extent of a policy is achieved (represented by the side). Hence, although it is possible to achieve the full extent of two policy goals, i.e., standing on one corner in the triangle, it is impossible to be on all the three sides simultaneously. The fact that one may simultaneously choose any two, but not all, of the three goals of monetary policy independence, exchange rate stability, and financial market openness to the full extent signifies the trilemma. The top vertex in the triangle illustrated in Figure 1, labeled "flexible exchange rate regime", is, for example, associated with the full extent of monetary policy independence and financial market openness, but not exchange rate stability.

Since the time of the Gold Standard, different international monetary systems have attempted to achieve different combinations of two out of the three policy goals. In other words, history is full of "corner solutions". The Bretton Woods system sacrificed international capital mobility for monetary policy independence and exchange rate stability. The euro system is built upon the fixed exchange

rate arrangement and free capital mobility, but essentially abandoned monetary policy autonomy of the small member countries.

Countries do not always have to adopt "corner solutions," however. For example, one can implement a policy to achieve one particular side without achieving any of the remaining two, in which case one of the goals is fully achieved and the other two goals are achieved only partially. Or one can also implement a policy combination represented by a "dot" inside the triangle, for which the extent of achievement of the three goals can be measured by the vertical distance from a vertex to the dot.[4] Hence, once two of the three distances from the corners are determined, the last one can be determined, that is, knowing two policies would be sufficient to determine the policy combination.

China is a good example of a country represented by a "corner solution" initially, a "achieving a side" later, and a "dot inside the triangle" most recently. In the triangle in Figure 1, China before 1980 can be represented as the country with the policy combination represented by the bottom left corner (i.e., financially closed system). When it started to open up its capital account in a cautious and step-by-step manner, the policy combination began to gradually move from the corner horizontally toward the right. Since the government exited from the dollar peg and gradually introduced some exchange rate flexibility in July 2005, the country's position in the triangle has been drifting toward inside the triangle, showing greater monetary policy independence.

Thus, the trilemma is "binding" as long as the measures of the three policy choices prove to be linearly related to each other, i.e., as long as the "dot" is either on one of the three sides or inside the triangle. However, the fact that countries have adopted different policy combinations over the years must mean that each of the three policy choices is a mixed bag of both merits and demerits for managing macroeconomic conditions.

A high degree of monetary policy independence could help stabilise the economy against shocks while it could also help monetary authorities to smooth inflation and output movements (at least in the short run in a world with price and wage rigidities), play a lender of last resort function in the event of a systemic banking sector crisis, or monetise fiscal debt independently of other economies' macroeconomic management. Exchange rate stability could provide a nominal anchor and help increase the credibility of policymakers, thereby contributing to

4. In this case, any dot inside the triangle lies on the plane represented by the triangle. For more details on the geometrics of the trilemma triangle, see Ito and Kawai (2012).

more stable output movement (Aizenman, et al, 2012). However, greater levels of exchange rate fixity could also impede policymakers from a policy choice of using the exchange rate as a tool to absorb external shocks.[5] Financial market opening is also argued to be a double-edged sword. Theoretically, a more open financial market should lead to more efficient resource allocation as well as to more efficient risk sharing. However, it could also become a destabilising factor by making economies more exposed to volatile cross-border capital flows, and thereby to boom-bust cycles.

Despite the double-edged nature of these three policies, policymakers tend to have bias toward their positive aspects and therefore pursue higher levels in all three policies. However, to reiterate, a country can in principle only achieve the full extent of two policies, not all three. An ambitious pursuit of wrong combinations of policies—of trying to achieve all three at the same time—can lead to some economic disruptions. Hence, it would be useful for policymakers to understand where they are located in the trilemma triangle, though this is not an easy task.

3. New Measures for the Trilemma Hypothesis

Aizenman, et al (2008) developed a set of the "trilemma indexes" that measure the degree of the three policy choices countries can make with respect to the trilemma for more than 170 countries for the period 1970 through 2009. The monetary policy independence index is based on the correlation of a country's interest rates with the base country's interest rate.[6] The index for exchange rate stability is an invert of the exchange rate volatility, i.e., standard deviations of the monthly rate of depreciation, for the exchange rate between the home and base countries. The degree of financial openness is measured by the financial openness index developed by Chinn and Ito (2006).

While their systematic approach makes it possible for the indexes to cover a large number of countries, their simple approach may fail to depict the subtlety of the policy arrangements. First, one can argue that simple correlations for the monetary policy independence index may be spurious if they are not properly controlled for. Second, if a country pegs its currency value to a basket of

5. Exchange rate rigidities could render monetary authorities blind in terms of reading appropriate market signals and therefore make their economies prone to asset boom and bust cycles.

6. The base country is defined as the country that a home country's monetary policy is most closely linked with as in Shambaugh (2004). The base country is either one of Australia, Belgium, France, Germany, India, Malaysia, South Africa, the U.K., and the U.S. More details on the construction of the indexes can be found in Aizenman, et al. (2008).

currencies, rather than a particular currency, standard deviations of a simple pair-wise exchange rate may not reflect the reality of the exchange rate arrangements. Third, regulatory policies pertaining to cross-border capital flows (*de jure* approach) may not reflect the actual degree of financial market openness, which can be captured by observed volumes of cross-border capital flows or by the price co-movements in financial assets, including the interest rate parity (*de facto* approach).[7]

Responding to these limitations of the indexes used by Aizenman, et al (2008, 2012), we introduce our new indexes of the trilemma. While there are no such things as perfect measures of the three policy goals, we try to overcome the drawbacks of the previous indexes. Here, while we base our approaches on the methodologies introduced in previous papers and implement theoretically reasonable methods, we attempt to create a set of indexes that may capture more subtleties of the aspects of the three policies in the trilemma hypothesis. The pursuit of more nuanced approaches comes at the expense of a smaller coverage of economies; we cover only about 90 economies for the period from 1970 to 2009.[8] We now explain each one of the three indexes below.

3.1 Exchange Rate Stability

To create an index that measures the extent of exchange rate stability of a particular sample currency i, we employ the methodology first introduced by Frankel and Wei (1994). They investigate the extent of influence of major currencies in the Asian region using the following estimation model:

$$\Delta e_{it} = \alpha_i + \beta_{iUS}\Delta e_{US\,t} + \beta_{iJP}\Delta e_{JP\,t} + \ldots + \beta_{iK}\Delta e_{K\,t} + \varepsilon_{it} \quad (1)$$

where e_{kt} is the (log of) exchange rate of currency k against some numeraire currency (such as the Swiss franc and the SDR) and $k = i, US, JP, DM, \ldots, K,$ that is, the sample currency i, the U.S. dollar, the Japanese yen, the German deutsche mark or the euro, the British pound, and so forth. The currencies included in the right-hand side of the estimation equation can be thought of comprising an implicit basket in the mind of monetary authorities. Therefore, $\hat{\beta}_k$, the estimated coefficient on the rate of change in the exchange rate of currency k (where

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7. The work by Quinn, Schindler and Toyoda (2010) reviews a variety of indexes that measure the extent of financial openness or capital controls.

8. The list of countries for which the indexes are constructed and the details of the data coverage are reported in Appendix 1 of Ito and Kawai (2012).

$k = US, JP, DM, \ldots, K$) against the numeraire, represents the weight of currency k in the implicit basket. If the sample currency i is pegged to a currency or a basket of major currencies, we must observe either $\hat{\beta}_k = 1$ for the major currency (k) to which currency i is pegged, or $\sum_k^K \hat{\beta}_k = 1$ for the K currencies included in the implicit basket. Also, in such a case, the goodness of fit of the above estimation model must be high.[9]

To suit our purposes, we make several modifications to the Frankel and Wei estimation model. First, we apply the estimation model to each of our sample currencies, but estimate it over rolling windows of 36 months. In other words, $\hat{\beta}_k$'s, the weights of the major currencies in the basket, become time-varying because we believe it is more realistic to assume that policymakers keep updating their information sets. Furthermore, to get more precise estimates, we conduct the estimation in two-stages, i.e., after running the estimation for one time, the estimates whose *p*-values are greater than 20 percent are dropped from the estimation, which leaves only currencies with significant estimates in the estimation.[10] The estimates are now time-varying, so is the goodness of fit, or the adjusted R^2. We use the annual average of the time-varying adjusted R^2 as the measure of exchange rate stability (ES^*) as we ultimately employ annual data in our analysis.

The basic assumption of this exercise is that monetary authorities use an implicit basket of currencies as the portfolio of official foreign exchange reserves, but that the exchange rate response to the change in the value of the entire basket should vary over time and across monetary authorities. If a country wants to maintain a certain level of exchange rate stability, whether against a single currency or a basket of several currencies, the central banker should allow her currency to change its value only in accordance with the change in the *entire* value of the basket of major currencies.[11]

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9. One may also consider imposing the constraint of $\sum_k^K \hat{\beta}_k = 1$ in the estimation. However, we decided not to do so as we would rather have the estimation model as a general form because some of the currencies in our sample may have adopted flexible exchange rates which can be precluded by having the above constraint.

10. When all of the right-hand side variables turn out to be insignificant (with all the p-values greater than 20 percent), the currency that has the lowest *p*-value is retained in the estimation.

11. Even when a country adopts a floating exchange rate system, it is often the case that the central banker has a target currency in mind whose movement affects the currency policy (which is the same as the "base country" in the context of Shambaugh, (2004) and Aizenman, et al (2008)). This is detected as the currency that has the lowest p-value even if all the currencies on the right-hand side of the estimation are found insignificant.

As for the explanatory variables in the estimation, we will include the major currencies which are often held by monetary authorities as foreign exchange reserves, such as the U.S. dollar, the British pound, the Japanese yen, and the euro. In the years before the introduction of the euro in 1999, the German deutsche mark is included in place of the euro. For the former French or Belgian colony countries, the French or Belgian franc is included, respectively, instead of the deutsche mark[12,13]. We use the Swiss franc as the numeraire.

3.2 Monetary Policy Independence

For the index on monetary policy independence, we consider the following simple estimation model:

$$i_{it} = \phi_i + \gamma_i i^*_{it} + u_{it} \tag{2}$$

where i^*_{it} is the "synthetic foreign interest rate", which is the weighted average of the foreign interest rates, with the weights being the estimated $\hat{\beta}'s$ from the Frankel-Wei estimation given by equation (1), i.e.,

$$i^*_{it} = \hat{\beta}_{iUSt} i_{i1t} + \hat{\beta}_{iJPt} i_{i2t} + \ldots + \hat{\beta}_{iKt} i_{iKt} \tag{3}$$

where we assume that monetary authorities choose a basket of K currencies.[14]

Similarly to the exchange rate stability estimation, we could use the adjusted R^2 of equation (2) for the measure of monetary policy independence.[15] However, merely basing the estimation on equation (2) can be problematic because of the

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12. Since Bhutan and Sri Lanka peg their currencies to the Indian rupee, the Indian rupee is also included in the estimation for these countries. For the same reason, the estimations for Botswana, Lesotho, Namibia, and Swaziland include the South African rand as one of the right-hand side currencies. For several countries in the Pacific, the Australian dollar is included.

13. The estimation also includes a dummy variable that takes the value of one if the monthly rate of change in the exchange rate of the domestic currency is greater than 10 percent in absolute terms so as to minimise noise from exchange rate disruptions such as abortion of an exchange rate regime and sudden re/devaluation of the currency. Similarly, we include a dummy that takes the value of one in the first month after the introduction of the euro.

14. As explained in the estimation of equation (1), only significant estimates of $\hat{\beta}'s$ (or the one that has the lowest p-value) are included.

15. That is, if home country i closely follows the monetary policy of the countries included in the basket, the goodness of fit of equation (2) must be high (while γ_{it} should be close to the value of one), which means the home country's monetary policy is *dependent* on the (weighted average) behaviour of the basket countries.

following two reasons. First, either of the variable i_{it} and i^*_{it} can be non-stationary, which makes γ_{it} spurious and therefore, adjusted R^2 unreliable (see Obstfeld, Shambaugh and Taylor, 2005). Second, a model like equation (2) can involve missing variable bias; it does not control for other factors that can affect the authorities' decisions on the policy interest rate, namely, domestic and global factors (other than those of the economies for which conditions are embedded in the basket). For example, in the case of both the domestic and foreign countries facing common shocks, the estimated coefficient on the foreign interest rate could be spuriously significant and possibly close to one, even though the domestic authorities do not follow the foreign country's monetary policy.

Assuming that it is safe to assume non-stationarity in the interest rate level series,[16] and incorporating other factors, we modify equation (2) and consider the following 12-month differenced estimation model:

$$\Delta i_{it|t-12} = \gamma_{it}\Delta i^*_{it|t-12} + \phi_{iyt}\tilde{y}_{it} + \phi_{i\pi t}\tilde{\pi}_{it} + \phi_{iy_G t}y_{Gt} + \phi_{ioil\pi t}oil\pi_{it} + D_i'\Phi_D + \varepsilon_{it}. \tag{4}$$

where $\Delta i_{it|t-12}$ and $\Delta i^*_{it|t-12}$ refer to the change in the home and (synthetic) foreign policy interest rates, respectively, over a 12 month period[17]. Hence, we examine the correlation between the change in the home and foreign policy rates over a 12 months period. $\tilde{y}_{it}$ is a proxy for the output gap, measured by the year-to-year growth rates of industrial production; $\tilde{\pi}_{it}$ is a proxy for the inflation gap, measured by the year-to-year CPI inflation rates; y_{Gt} is the year-to-year growth rate of the world economy, measured by the average rate of change in industrial production of the G7 and BRIC countries; and $oil\pi_{it}$ is the year-to-year rate of change in the price of crude oil. Inclusion of $\tilde{y}_{it}$ and $\tilde{\pi}_{it}$ is supposed to control for the domestic conditions the monetary authorities in country *i* would consider

16. Given the Fisher equation, the stationarity of the nominal interest rate series is conditional upon the stationarity of the expected rate of inflation series or that of the real interest rate series. Theoretically, it is difficult to argue the non-stationarity of the real interest rate, although the real interest rate series can involve structural breaks, causing non-stationarity in a statistical test (See Huizinga and Mishkin (1984) and Garcia and Perron (1996)). Given the past episodes of hyperinflation in many countries, it is possible that the rate of inflation series is non-stationary, which has been shown in many studies.

17. We use the change in the policy rate over 12 months instead of month-to-month changes, i.e., first-differences, because of the following reasons. First, estimation with the first-differenced policy rates would involve too much noise that affects both the estimated coefficients and adjusted R^2. Second and more importantly, estimating equation (2) in first-difference form is essentially the same as assuming that the home country must react to a change in the foreign interest rate i^* within one month, which is too restrictive an assumption.

in setting the policy interest rate and, hence mimics the Taylor rule.[18] D is a vector of dummies to control for high- or hyper-inflation as well as for currency crises that are identified based on the often-used exchange market pressure (EMP) indexes first developed by Eichengreen, Rose and Wyplosz (1994).[19,20]

Along with equation (4), we also consider the following two other estimation equations.

$$\Delta i_{it|t-12} = \phi_{iyt}\widetilde{y}_{it} + \phi_{i\pi t}\widetilde{\pi}_{it} + \phi_{iy_G t} y_{Gt} + \phi_{ioil\pi t} oil\pi_{it} + D_i'\Phi_D + \varepsilon_{it} \tag{5}$$

$$\Delta i_{it|t-12} = \gamma_{it}\Delta i^*_{it|t-12} + D_i'\Phi_D + \varepsilon_{it} \tag{6}$$

Equation (5) is obtained by excluding the foreign interest rate from equation (4) while equation (6) is obtained by excluding the control variables that represent the domestic and global conditions from equation (4) although it still includes the

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18. We do not necessarily assume all the economies in our sample follow the Taylor rule. The domestic variables can be insignificant contributors to the decision making of the policy rates.

19. More specifically, we include the interest rate dummy that takes the value of one if the policy interest rate is greater than 100 percent; the inflation dummy that takes the value of one if the change in the rate of inflation from the same month in the previous year is greater than 50 percent; and the interest rate change dummy that takes the value of one if the change in the policy rate is greater than 5 percent points from the previous month or 50 percent points from the same month in the previous year. The currency crisis dummy takes the value of one when the EMP index exceeds the threshold of mean plus or minus 2 standard deviations of the index.

20. The EMP index is constructed as the weighted average of monthly changes in the nominal exchange rate, the nominal interest rate, and the foreign exchange reserve loss in percentage. The exchange rate is between the domestic currency and the currency of the base country (as defined in Shambaugh, 2004). The nominal interest rate and the foreign exchange reserve loss are included as the differentials from those of the "base country." The base country follows the definition by Shambaugh (2004), and for the countries whose base countries are not defined by Shambough (2004), we follow the base countries defined by Aizenman et al (2008). The weights are inversely related to the variance of changes in each component for each of the sample countries. When we calculate the standard deviations of the EMP index for the threshold, we exclude the EMP values that are lower than the bottom one percentile or greater than the top one percentile because outliers of the EMP index can make the standard deviations unnecessarily large and thereby make the thresholds too lenient for some countries, especially those which have experienced significant swings in their EMP indexes.

vector of dummies. Using these estimation models and focusing on their adjusted R^2's, we come up with the following two types of measures for the level of monetary policy independence: [21]

$$MI\_1 = \frac{Adj.R^2 \text{ of Eq. } 5}{Adj.R^2 \text{ of Eq. } 4} \tag{7}$$

$$MI\_2 = 1 - \frac{Adj.R^2 \text{ of Eq. } 6}{Adj.R^2 \text{ of Eq. } 4} \tag{8}$$

Here, *MI_1* indicates that the lower this ratio is, the more explanatory power the foreign interest rate has as given by $Adj.R^2$ in equation (4), thus implying that a higher ratio indicates higher levels of monetary policy independence.

MI_2, on the other hand, is based on the idea that the better the foreign interest rate explains the variation of the domestic interest rate, the closer the adjusted R^2 of equation (6) will be to that of equation 4. This would make the level of *MI_2* lower.

Whatever the measure for monetary policy independence, it should show how much contribution the foreign interest rate makes in explaining the variation of the domestic interest rate. However, we need to be careful about which measure of MI to use. We can compare the explanatory power of equation (4) with that of equation (5) or (6) only if the foreign interest rate and the vector of domestic and global factors are completely independent from each other. We may not do so in the case of a country that is highly integrated with other economies or a regional economic community, for which case both the domestic and foreign economies can face similar shocks. For example, when the domestic country is geographically close to the foreign country, thereby subject to similar shocks, the domestic authority with full monetary policy independence could behave similarly to the foreign monetary authority. This means that even though equation (5) is the true specification, equation (6) could deliver a good fit because the domestic interest rate and the vector of domestic and global conditions could be highly correlated. On the other hand, even if equation (6) is the true specification, the goodness of fit of equation (5) could be high if the domestic

21. A more straightforward way of measuring the extent of monetary policy dependence would be to use $\hat{\gamma}$ in equation(4). However, $\hat{\gamma}$ is found to be quite unstable (despite inclusion of the dummies). For some developing economies that had experienced episodes of high inflation, it can easily surpass the value of one.

and global factors on the right hand side of (5) are highly correlated with the foreign interest rate.

Hence, we take the following approach for each of our sample economies. We estimate both equations (5) and (6). First, if the adjusted R^2 of equation (5) is greater than that of equation (6), then we choose *MI_1* as the monetary policy independence index, as in this case it is reasonable to conclude that the vector of domestic and global macroeconomic variables is not highly correlated with the foreign interest rate *i**. This procedure allows us to see how much additional explanatory power the foreign interest rate would have in equation (4) compared to equation (5), so *MI_1* can be a good measure of monetary policy independence. Second, if the adjusted R^2 of equation (6) is greater than that of equation (5), then we choose *MI_2*. In this case, we can see how much additional explanatory power the vector of domestic and global variables would have in equation (4) compared to equation (6). Finally, if the adjusted R^2's of equations (5) and (6) are sufficiently close to each other, we use the average of *MI_1* and *MI_2*.[22]

3.3 Financial Market Openness

Here, we base our index of financial market openness on the *de facto* measure of financial openness developed by Lane and Milesi-Ferretti (2000, 2007; *L-MF* hereafter). *L-MF* compile the data for the international investment positions for about 180 economies during the period of 1970-2007. For each economy, total assets are composed of FDI assets, portfolio equity assets, debt assets (= 'debt equity' + 'other' investment (i.e., bank loans and trade credit)), financial derivatives assets, and foreign exchange reserves, while total liabilities include FDI liabilities, portfolio equity liabilities, debt liabilities, and financial derivatives liabilities.

22. Specifically, we use the following rule: If the adjusted R^2 of equation (5) is greater than the sum of the adjusted R^2 of equation (6) and the standard errors of the difference between the two adjusted R^2's, then we take MI_1 as the MI index. If the adjusted R^2 of equation (6) is greater than the sum of the adjusted R^2 of equation (5) and the standard errors of the difference between the two adjusted R^2's, then we take MI_2 as the MI index. If the difference between the two adjusted R^2's is within its standard errors, then we use the average of the two MI indexes.

L-MF normalise the sum of "total assets" and "total liabilities" as ratios to GDP and total trade volume (i.e., exports + imports) and use these as the measures of financial market openness. For our purpose, we raise the following points and consequently make several modifications. First, normalising the sum of total assets and liabilities as a ratio to GDP would make the financial market openness index susceptible to business cycles. Also, it would make the index appear unnecessarily low for large economies such the U.S. and make the one with international financial centres—such as Ireland, Luxemburg, Singapore, and Hong Kong—appear extremely high, much higher than that of the U.S. which has presumably one of the most open, if not the most open, financial markets in the world. Normalising the sum of total assets and liabilities as a ratio to total trade volume, on the other hand, would make the index of financial openness less susceptible to business cycles and help correct distortions arising from the country being a financial centre. It, however, tends to penalise too harshly economies that are highly open to international trade such as Singapore. Hence, normalising assets and liabilities as ratios to GDP and trade volume has both merits and demerits.

Second, including foreign exchange reserves as part of "total assets" for the purpose of creating an index of financial market openness can be problematic because investment by monetary authorities should not be treated the same as private investment. One can think about China and other East Asian economies, which can appear as "financially open" if their massive foreign exchange reserves are included as part of total assets.

Last, the index of financial market openness based on the *L-MF* data may not be appropriate in the context of the trilemma hypothesis because the data seem to have an explosive trend. In fact, the work by Quinn, Schindler and Toyoda (2010) shows that the index series is non-stationary. Hence, there is a need to normalise and standardise the sum of total external assets and liabilities in both an economically and econometrically reasonable way.

Given these considerations, we create our index of financial market openness in the following way. We first calculate two indexes of financial market openness in a way similar to *L-MF* by normalising the sum of external assets and liabilities, less official foreign exchange reserve assets, as ratios to GDP and trade volume. We then take the average of the two, i.e.,

$$FO_{it}* = \frac{1}{2}\left\{ \frac{\text{Total Assets}_{it} + \text{Total Liabilities}_{it} - \text{Official Reserve Assets}_{it}}{GDP_{it}} + \frac{\text{Total Assets}_{it} + \text{Total Liabilities}_{it} - \text{Official Reserve Assets}_{it}}{(EX+IM)_{it}} \right\} \tag{9}$$

We finally assume that the advanced economies as a group achieved full financial openness as of the late 1990s. Using this assumption, we calculate financial market openness as above for advanced economies during the period from 1995 to 1999; and regard this measure, defined $FO_{ADV}*$, as the highest level of financial market openness.[23] We normalise the above $FO*$ as a ratio to $FO_{ADV}*$, and define the index to be bound between zero and one.[24]

$$FO_{it}** = \frac{FO_{it}*}{FO_{ADV}*} \quad \text{where } 0 < FO_{it}** < 1 \tag{10}$$

In this way, we define the financial market openness index by normalising the volume of total assets and liabilities (excluding official reserve assets) as a ratio to both GDP and trade volume and ensuring it ranges between zero and one.[25]

3.4 Adjustments

3.4.1 Adjustments for ES and FO

In this exercise, our general approach is to "let the data speak for themselves". However, while there is no theoretical basis for each of the three indexes to be normally distributed, we must also avoid any distorted or lopsided distribution, given the need for each index to range between zero and one. Based on this, we carefully examine the distribution and make the following two observations. First, the index for exchange rate stability hardly takes a value which is below 0.3. This can be driven by a statistical artifact of the estimation model that includes several dummy variables. We know that some advanced economies do not intervene much in the foreign exchange markets, particularly in recent years, and this must mean that the exchange rate stability indexes for these economies are close to zero. Second, the index for financial market openness hardly falls below 0.1. Considering that we normalise actual volumes of gross external assets and liabilities by GDP and total trade, it is understandable

23. We exclude Luxemburg from the calculation since it is an extreme outlier due to its role as an international financial centre. Chinn and Ito's (2006, 2008) *de jure* index of financial market openness also shows that the level of financial regulatory openness reached the highest level in the mid-1990s and has since plateaued.

24. Any FO_i taking a value above one is assumed to be one.

25. We also update the data on external assets and liabilities using the international investment positions data of the IMF's *International Financial Statistics*.

for such a *de facto* index not to fall close to zero. Even if the authorities banned capital flows with regulatory controls, some amount of cross-border capital flows do occur. We know that some economies have essentially closed financial markets, for which the financial market openness indexes must be zero.

To incorporate the above two concerns, we adjust the indexes for exchange rate stability and financial openness as follows:

$$ES_{it} = (ES_{it}* - 0.30)/0.70$$

$$FO_{it} = (FO_{it}** - 0.10)/0.90$$

where $ES*$ and $FO**$ are indexes constructed according to the procedures describe previously.

3.4.2 Adjustments for All Three Indexes

The above adjustments for *ES* and *FO* create some downward bias in the new set of three trilemma indexes. As we will discuss in the next subsection, in order for the indexes to have theoretical validity, the sum of the indexes must equal two, for which the newly created downward bias can be a little problematic. In fact, when we define $\overline{MI} + \overline{ES} + \overline{FO} = 2 \cdot A$ where $\overline{X} = \sum_{1}^{T}\sum_{1}^{I} X_{it}$, i.e., the cross-country, cross-time average of variable X (= MI, ES, or FO), A is found to be smaller than 1.

Hence, we make a further adjustment to the set of the three indexes so that the sum of the indexes will not become far from theoretical predictions. More specifically, we define the sum of the adjusted measures of exchange rate stability, monetary policy independence and financial market openness to be unity by defining a new set of indexes as: $X* = X/A$ where $X = MI$, ES, or FO.

3.5 Theoretical Validity of the Indexes – Are They Linearly Related to Each Other?

Before making observations of the newly defined indexes, we need to ensure that these indexes hold theoretical validity. Theory predicts that monetary authorities would have to face a trade off in choosing two out of the three policy choices if they are implemented each to the full extent. If they do not implement any combination of two policies fully, they could achieve three policies partially. However, once they make policy choices in any two of the three areas,

they cannot make an independent choice in the third area, as it is automatically determined. That means that the extent of achievement in the three choices must be linearly related to each other. Furthermore, as long as we assume that the triangle to depict the trilemma hypothesis is an equilateral triangle with the height of one, the three indexes must add up to two.[26]

One may wonder if our exercise is tautological because we already make an adjustment to ensure that the cross-time-country average of the three indexes equals to two. However, even if we make this adjustment, it does not guarantee that the sum of the three indexes will be equal to two over the entire sample period for a given economy or a group of economies, or across all economies in a given year. If the indexes are not in line with theoretical predictions, the sum of the three indexes could still deviate from the value of two in subsamples even though the across-the-board average is two.

Figure 2 shows the development of the average sum of the three indexes for different groups of economies. The shaded areas refer to the 90 percent confidence intervals of the mean of the sum. For the full sample, the sum is statistically equal to the value of 2 for most of the 1980s and the 1990s as well as the mid-2000s. While the sum of the three indexes is not statistically different from the value of 2 for most of the sample period for the subgroups of both developing and emerging economies, for the group of advanced economies, it deviates upward from the value of 2 for most of the period in the late 1990s and the mid-2000s.

Overall, it is safe to conclude that the sum of the three indexes is not statistically different from the value of two, confirming the theoretical validity of the indexes.

4. The Three Indexes

4.1 Some Observations of the Indexes

Figure 3 illustrates the average values of the three indexes for different income and regional groups of economies.[27] We can observe that “middle- or

26. See Appendix 2 of Ito and Kawai (2012).

27. “High-,” “Middle-,” and “Low-income” economy groups are based on the World Bank’s Classifications. “Emerging Market Economies” refer to the economies included in the MSCI Emerging Markets Index. They are: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Russia, South Africa, Chinese Taipei, Thailand, Turkey and Venezuela.

low-income" economies have, on average, pursued high levels of monetary policy independence and exchange rate stability over the sample period, but that this is not the case for "high-income" or "emerging" economies for the last twenty years. Since the late 1970s, the level of monetary policy independence for "middle- or low-income" economies, excluding emerging ones, has been taking cycles between high and medium levels while their exchange rate stability indexes have been in a moderately downward trend though they are rising rapidly in the last few years.

Among "high-income" economies, on the other hand, policy priorities seem to have drastically changed from the combination of exchange rate stability and monetary policy independence during the 1970s to that of greater financial market openness and exchange rate stability. Lastly, although there has been much talk about financial globalization among developing and emerging economies, the rise in the level of financial market openness is not as steep as what they experienced in the early 1980s. While "middle-income" or "emerging market" economies have maintained intermediate levels of financial market openness since the late 1980s, those economies which are not perceived to be "emerging" have experienced a *fall* in the level of financial market openness in the last decade.

SEACEN economies appear to have taken somewhat similar paths to other middle- or low-income economies, but these economies distinctively had pursued exchange rate stability persistently until the Asian financial crisis. During the crisis, the level of exchange rate stability plummeted, reflecting the policy decisions of aborting fixed exchange rates taken by the crisis economies. In the few years before the global financial crisis of 2008, the level of exchange rate stability made a large comeback, which seems to be enabled by sacrificing monetary poicy independence. Understandably, these economies increased the level of monetary policy independence during both the Asian financial crisis and the global financial crisis, reflecting the stabilization efforts during the turmoil. The level of financial market openness has risen in two steps, one in the mid-1980s and another in the late 1990s. SEACEN economies appear different from other middle- or low-income economies in that they have been on a steady path for higher levels of financial market openness, even increasing their levels in the aftermath of financial crises.

Emerging market economies in Latin America have maintained relatively high levels of monetary policy independence since the 1980s, though cyclically reducing their levels. The level of exchange rate stability, however, does not appear as high as that of SEACEN economies for most of the sample period

except for the immediate post-Asian financial crisis period. This group of economies rapidly increased the level of financial market openness in the beginning of the 1980s, but since then, there has not been much progress toward more open financial markets. Compared to this group of economies, the progress on financial market opening for SEACEN economies appears more persistent.

4.2 The Trilemma Triangle

The most intuitive way of showing combinations of the three policies, monetary policy independence, exchange rate stability, and financial market openness, for a particular economy is to locate the economy in the trilemma triangle shown in Figure 1.

However, to do that, the sum of the three policy indexes must equal to two *exactly* for every year and every economy. Although we have shown that the sum of the three indexes is statistically equal to the value of two, it is often the case that the sum of the three indexes deviates from the value of two for a certain economy and year. Hence, an adjustment was made to ensure that the sum of the three indexes to amount to two for every economy and year.[28]

With this adjustment, we are now able to show combinations of the three policies in the trilemma triangle using the metrics that represent the extent of actual achievement in the three policy goals. To our knowledge, plotting a combination of the three policies in a trilemma triangle is the first attempt in the literature of international macroeconomics.

Figure 4 shows the trilemma triangles with the re-adjusted three indexes for three five-year periods, 1986-90, 1996-2000, and 2006-09, and for different economy groups: advanced economies,[29] SEACEN economies, and emerging Latin American economies. We can make several interesting observations. Generally speaking, while advanced economies used to have a wide variety in the combinations of the three policies, these economies moved toward higher degrees of financial market openness over years. By the end of the 2000s, there are two types of advanced economies: one group composed of economies

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28. This is spelt out in Appendix 2-2 in Ito and Kawai (2012). Essentially, we divide each index by scalar B_{it} when $MI_{it} + ES_{it} + FO_{it} = 2B_{it}$.

29. The group of advanced economies is a subset of high-income economies and includes: Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, and the U.K.

that have pursued higher levels of financial market openness and exchange rate stability, most notably the eurozone economies, and the other composed of economies that have achieved greater degrees of monetary policy independence and financial market openness (i.e., flexible exchange rate systems) such as Germany, Iceland, Scandinavian countries, Japan, and Australia.

While advanced economies have steadily increased the level of financial market openness, this is not the case for SEACEN or Latin American economies. Among the SEACEN economies, starting from the combination of relatively stable exchange rates and relatively high monetary policy independence (i.e., left-bottom corner of the triangle), many economies tried to maintain monetary policy independence, but gave up some degree of exchange rate stability in the late 1990s, mostly reflecting the abortion of fixed exchange rate regimes during and in the immediate aftermath of the Asian financial crisis. As of the last half of the 2000s, there seems to be a wider variety of policy combinations among the SEACEN economies—some have retained full monetary policy independence while others have gradually moved toward financial market openness, though many are still clustering inside the triangle distant from full financial market openness.

Emerging Latin American economies, after pursuing relatively high levels of monetary policy independence and exchange rate stability by limiting financial market openness till the end of the 1990s (except for Argentina and Peru, which had open financial markets), there seem to be two groups of economies in the second half of the 2000s: one group has achieved high levels of financial market openness and monetary policy independence while the other group has continued to pursue relatively high levels of monetary policy independence and exchange rate stability. Argentina and Peru made a big swing from a combination of highly open financial markets with relatively flexible exchange rates to the second group above, particularly toward greater exchange rate stability.

Figure 5 illustrates the trilemma triangles for select individual economies in Asia. The values of the trilemma indexes are five-year averages, and the year in the triangle refers to the last year of the five-year periods. As has been discussed widely, China has maintained high levels of exchange rate stability and monetary policy independence. Despite the government's announcement to increase the level of exchange rate flexibility in 2005, the triangle plot suggests that the country has retained *de facto* rigid fixed exchange rates while it does seem to have started opening financial markets. Other Asian economies, on the other hand, seem to have reduced the level of exchange rate stability after the 1997-98 Asian financial crisis though they also seem to have continued to retain

monetary policy independence. Asian emerging markets do not appear to have been as financially open as has been discussed. Interestingly, many Southeast Asian economies appear to have increased the level of exchange rate stability in the last period though financial market openness has not increased very much.

5. The Asian Financial Crisis: The Trilemma View

Although the three indexes of the trilemma hypothesis must be linearly dependent, in reality, actual policy arrangements of exchange rate stability, monetary policy independence, and financial market openness may deviate from the theoretical linear relationship. Anecdotally, we sometimes observe monetary authorities trying to implement an "inconsistent" policy in the face of the trilemma policy constraint. For example, the authorities of an economy experiencing capital flight and speculative attacks on their currency may try to maintain the (overvalued) fixed parity of the currency and retain monetary policy independence without limiting financial market openness. The authorities in such a situation will eventually have to lose control of monetary policy, abort the fixed exchange rate, or implement capital controls. In other words, authorities can deviate from the constraint of the trilemma only in the short run, but not in the long run. After all, a policy that deviates from the trilemma will eventually have to end. Otherwise, markets will punish authorities and force them to change policies in a way consistent with the trilemma.

Given this observation and using the indexes we have developed, we should be able to identify policy combinations that yield $MI + ES + FO > 2$ and are "unsustainable". Once we do this, we can hypothesise that such "unsustainable" policy combinations that deviate from the trilemma constraint must be correlated with macroeconomic disruptions, such as a currency crisis, debt crisis, and banking crisis.

Figure 6 depicts the sum of the three indexes for several Asian economies (upper panel) in the 1990s and Latin American economies (lower panel) in the 1980s. The upper panel of the figure shows that the sum of Thailand's trilemma indexes surpasses the value of two in the period leading to the baht crisis, while those of other crisis-affected countries do not seem to exceed the value of two. This suggests that Thailand likely implemented "unsustainable" policies in the period leading to the baht crisis while other countries maintained "sustainable" policy combinations and may have encountered the currency crisis

mainly due to contagion from Thailand. Also, once the currency crises broke out, all countries appear to have lowered the sum of the three indexes as a reaction to the crises. Thus, the Thai baht crisis was likely driven by the mismanagement of the country's policies, which likely affected the neighboring economies through contagion.

The lower panel of the figure suggests that many Latin American economies implemented "unsustainable" policy combinations throughout most of the 1980s, although the sum of the three policy indexes was in a declining trend toward the end of the decade in most of the countries. The lingering debt and currency crisis situation of these economies may be attributed to the mismanagement of policies.

Although we must conduct a more formal analysis to reach more definitive conclusions, the evidence indicates that Thailand implemented "unsustainable" open macroeconomic policies prior to the baht crisis in a way similar to the Latin American economies during the debt crisis period of the 1980s.

6. Concluding Remarks

We have introduced a new set of indexes of exchange rate stability, monetary policy independence, and financial market openness, all of which are theoretically constrained as a trilateral trade-off as predicted by the famous "impossible trinity" or "trilemma" hypothesis. In our exploration, we have taken a different and more nuanced approach than the previous indexes such as those developed by Aizenman et al (2008).

Using the new indexes, we have presented our sample economies' policy mixes by plotting them in the famous trilemma triangle. The triangle is very useful in illustrating how policy mixes of economies have evolved over time. We have shown that much room remains for the SEACEN economies to open financial markets, moving away from the current policy preferences of maintaining relatively high levels of monetary policy independence and exchange rate stability with limited financial market openness.

While the sum of the newly defined indexes must add up to two theoretically, it in reality can deviate from the value of two. The trilemma hypothesis suggests a policy combination that creates a large, persistent deviation is unsustainable, and, hence, will be corrected by economic disruptions such as currency and banking crises.

We showed how the sum of the three indexes evolved for Asian economies at the time of the 1997-98 Asian financial crisis and for Latin American economies during debt crises in the 1980s. Before the baht crisis, Thailand seems to have implemented "unsustainable" policies while other crisis–affected Asian economies do not seem to have had such unsustainable policies, implying that they were affected by crisis contagion from Thailand. Also, most of the Asian economies experienced a decline in the sum of the three indexes in the post-crisis period. Latin American economies seem to have had policies that were unsustainable throughout the 1980s, suggesting that mismanagement of macroeconomic policies had a long-lasting impact on their economic performance.

These findings suggest that the indexes of the trilemma we have introduced can be collectively used as a warning indicator, to show the extent of an unsustainable policy mix for each economy. However, we still need to conduct a more formal analysis to unravel the nature of the correlation between the indexes and the occurrences (and maybe magnitudes) of economic and financial crises. In addition, it would be useful to identify factors that affect the choice of policy combinations. We leave these as a future research agenda.

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Figure 1
The Trilemma

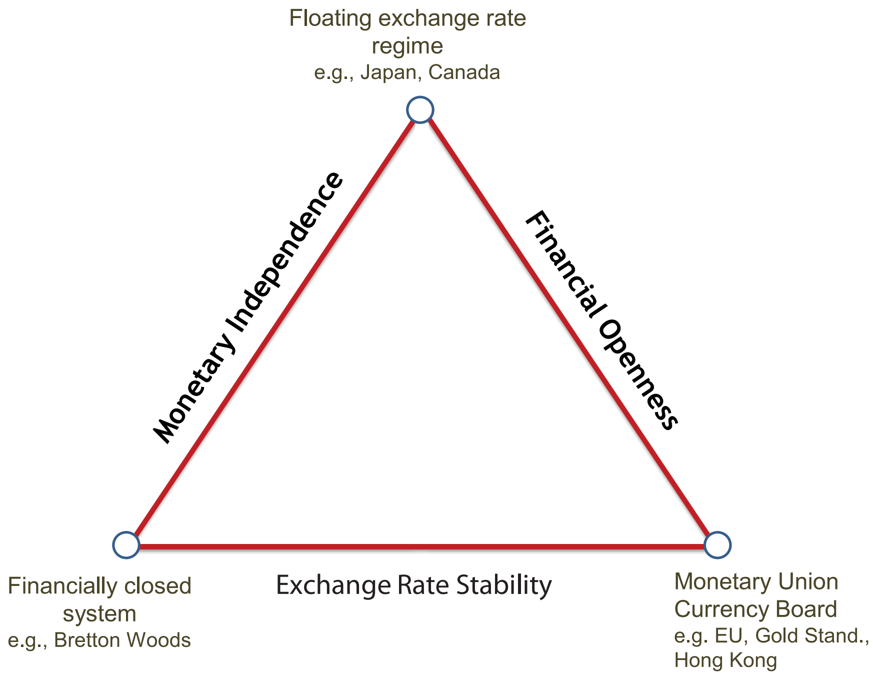


Figure 2
The Sum of the Three Indexes

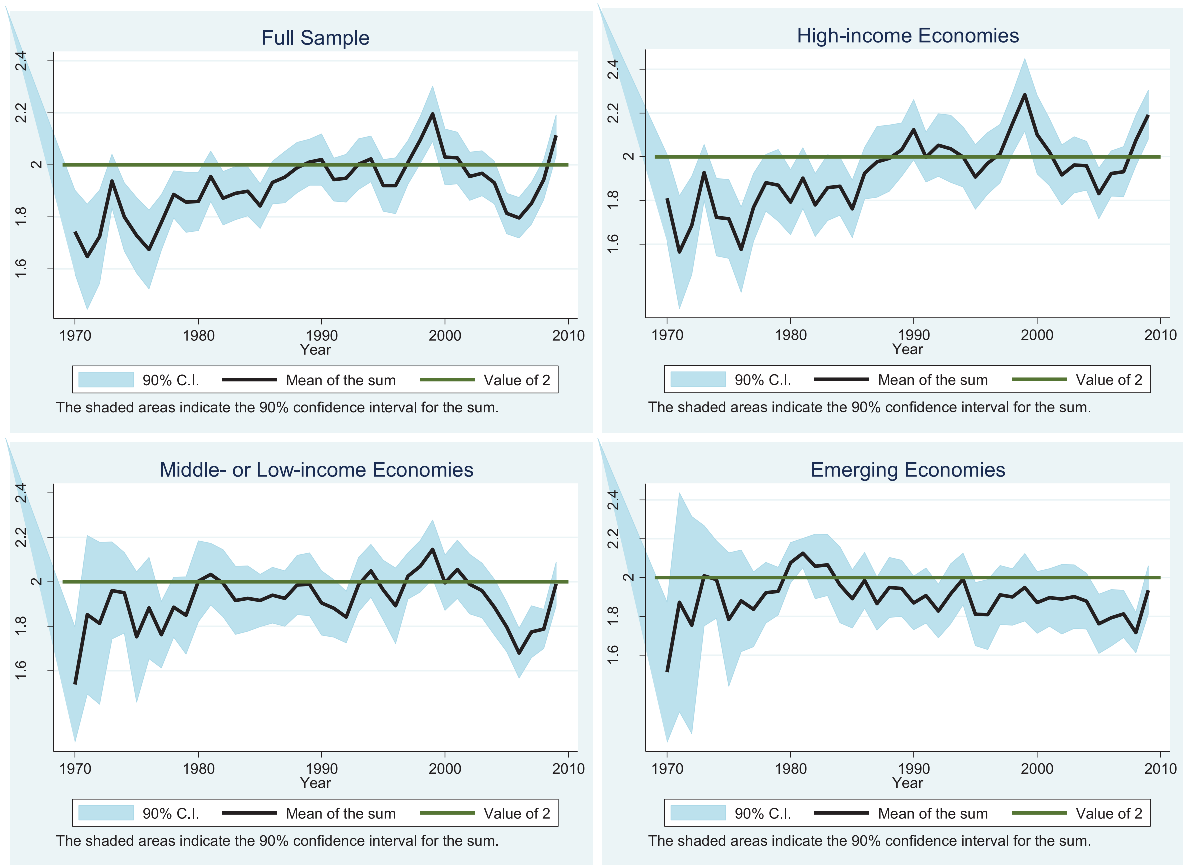


Figure 3
Trilemma Indexes for Groups of Economies

Figure 4
Trilemma Triangles – Groups of Economies

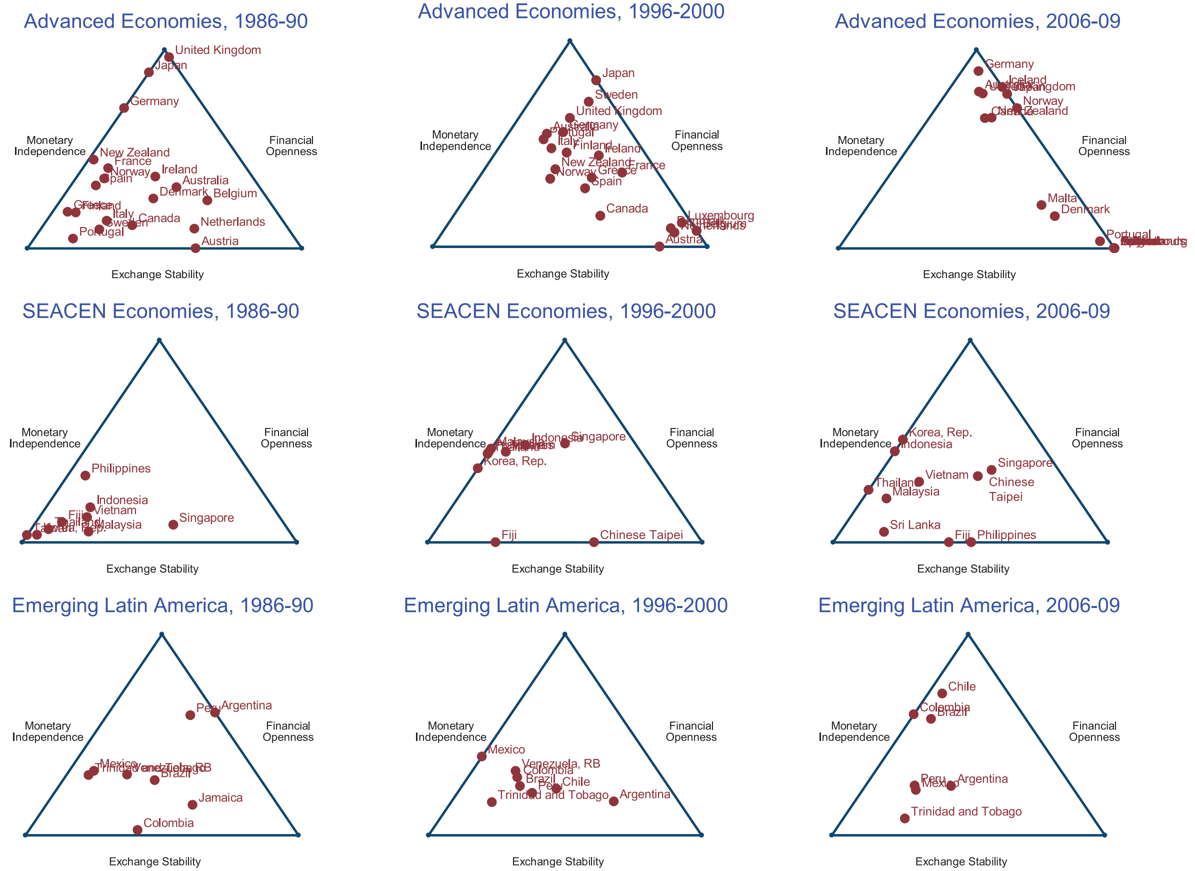


Figure 5
Trilemma Triangles – Individual Economies

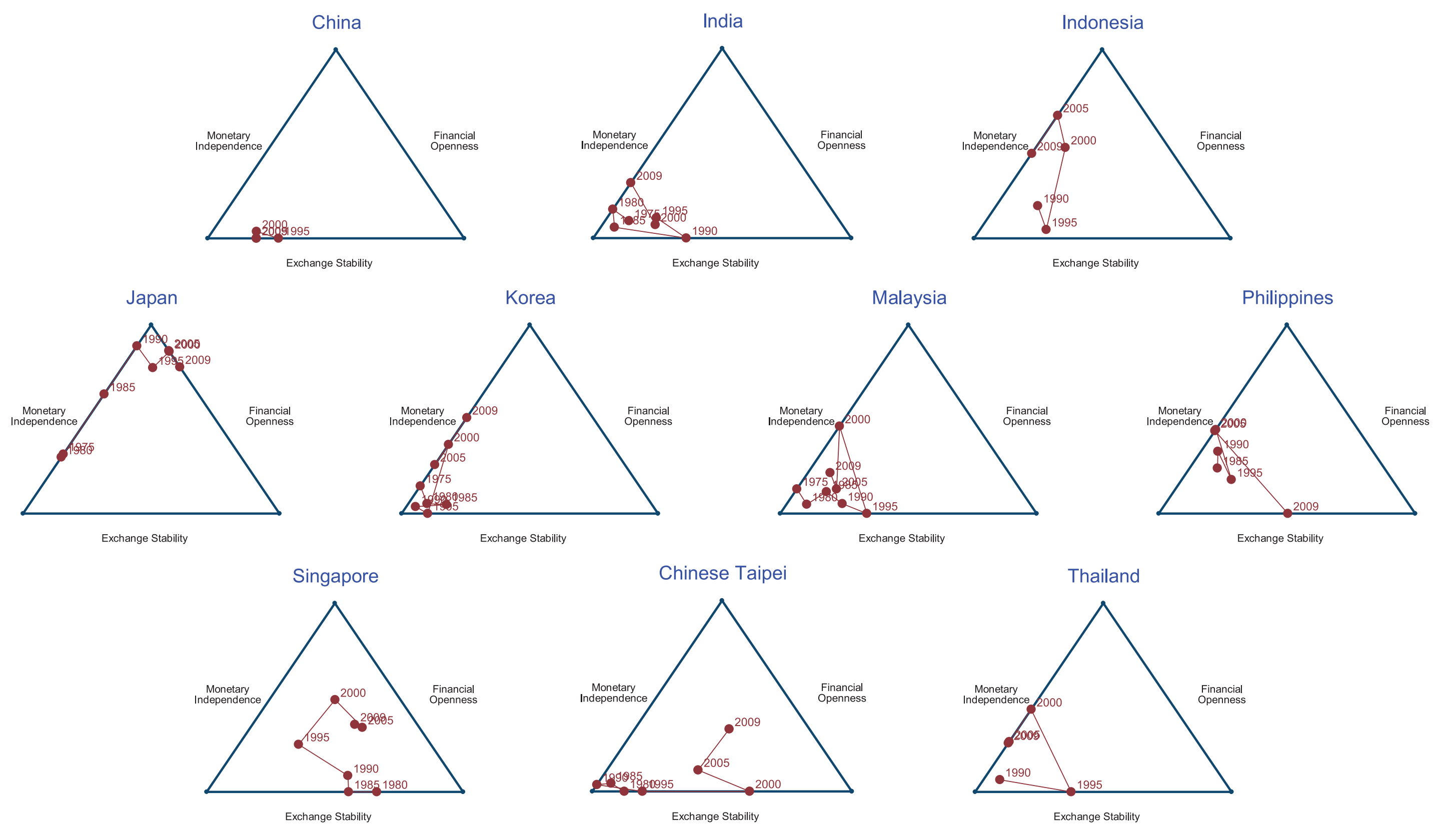
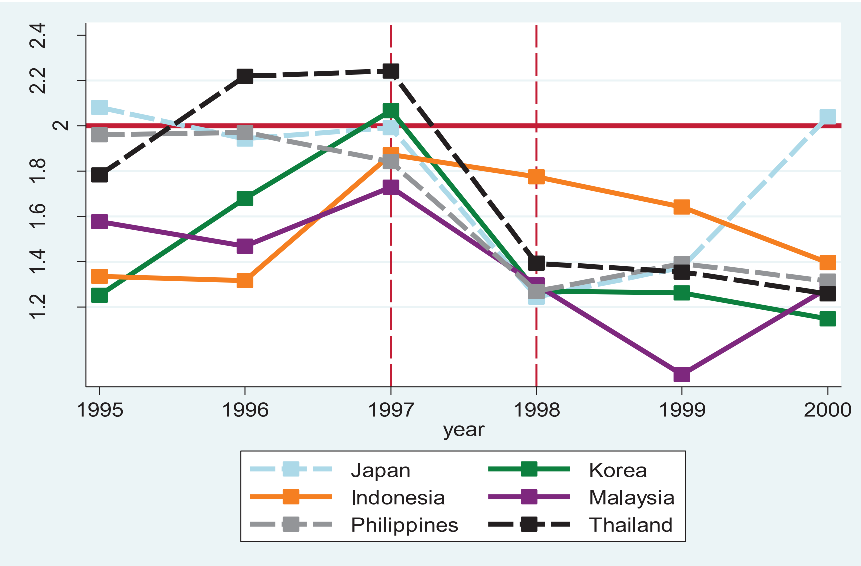
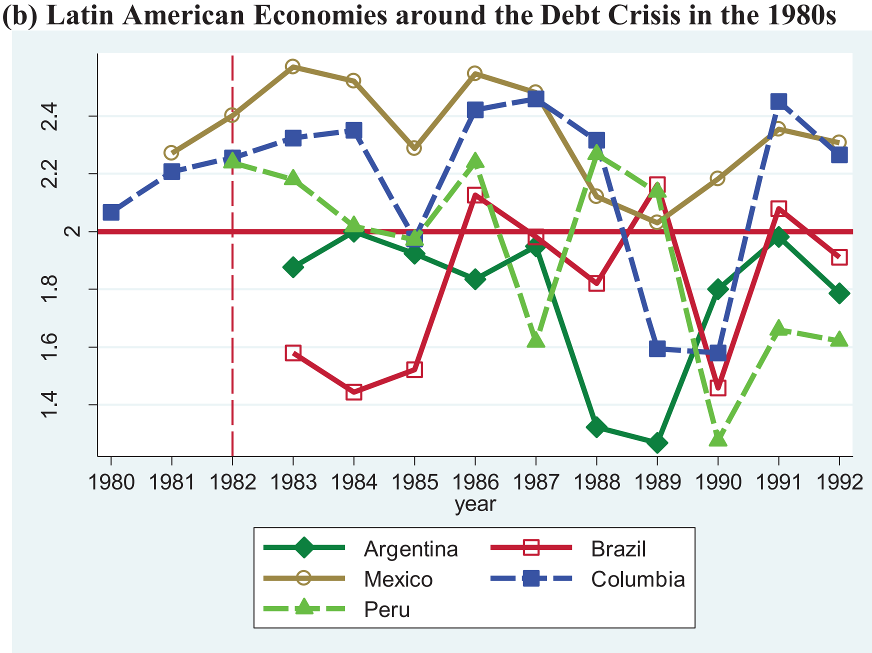


Figure 6
The Sum of the Three Indexes over the Crisis Period
(a) Asian Economies around the Asian Financial Crisis in 1997-98



(b) Latin American Economies around the Debt Crisis in the 1980s



Chapter 4

MONETARY REGIMES AND CAPITAL ACCOUNT VOLATILITY BEFORE AND AFTER THE GLOBAL FINANCIAL CRISIS

By
Mark M. Spiegel[1]

1. Introduction

The emerging market economies were hard hit during the global financial crisis. With the recovery from the crisis, however, the emerging market economies appeared to gain strength much faster than their developed-country counterparts, who had experienced particularly sharp disruptions during the crisis (e.g., Rose and Spiegel (2012)). Unfortunately, the recovery of these emerging market economies brought with them marked surges in capital inflows, as the relatively strong performances of these countries, combined with concerns about the growth prospects of the developed world and its pursuit of easy money policies sent capital towards these countries in search of yield.

While capital inflows bring much needed investment, they may also lead to difficulties. Capital flows may be subject to disruptive reversals subsequent to changes in fundamentals, such as relative interest rates. They may also exacerbate price volatility, and lead to the formation of asset price bubbles (e.g., Ostry, Ghosh, Habermeier, Chamon, Qureshi and Reinhart (2010)). Capital inflows of the type experienced by these emerging market economies are especially likely to be inflationary, as they lead to increased demand in the target countries, increasing the price of assets and non-tradables.

This paper investigates the impact of inflation targeting o capital account volatility. Surges in capital inflows can be problematic for policymakers in inflation targeting regimes (e.g., Frankel and Cavallo (2004)). Under inflation targeting, incipient increases in prices associated with surges in capital inflows raise inflation

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concerns and may trigger a tightening in domestic monetary or financial conditions. These policy responses usually raise domestic real interest rates, leaving the countries pursuing them even more attractive as destinations for the aforementioned capital inflows. This can require further rounds of tightening, which only exacerbate the situation. Inflation targeting regimes were seen to exhibit higher rates of interest during the boom years prior to the global financial crisis, consistent with this scenario (De Carvalho Filho (2010)).

We also examine pegged exchange rate regimes. Surges in capital inflows put upward pressure on nominal rates, calling for the opposite monetary policy response under pegged regimes, namely that of easing monetary policy to push down the value of the local currency. This case appears to not be as perverse, as a successful defence of an exchange rate peg through easier monetary policy is likely to be associated with reduced local interest rates, stemming a country's attractiveness as a destination for foreign investment.

Because of the potential perversity of the monetary response in an inflation targeting regime to a surge in capital inflows, we concentrate on the implications of inflation targeting for capital account and inflation volatility in this paper. However, we also consider the implications for pegged exchange rate regimes. While the dynamics associated with the natural monetary policy response of a central bank pursuing an exchange rate target is not necessarily perverse, the well-documented fragility of pegged exchange rate regimes and the volatility of their collapses (e.g., Rose (2011)) raises the possibility that these types of regimes may also have unique capital account volatility patterns.

The relatively recent adoption of inflation targeting monetary regimes has led to a number of papers investigating their relative performances (e.g., Svennson (2010)). This literature, which is reviewed briefly below, largely has concentrated on the implications of inflation targeting for inflation and output and their respective volatilities. However, the recent global financial crisis has reiterated the importance of exposure to capital account volatility, both outflows as the result of "sudden stops," and inflows as low global interest rates encouraged investors searching for yield to place large positions in countries that emerged from the crisis in relatively attractive positions.

Our empirical investigation examines a large cross-country panel, controlling for time and country fixed effects. We estimate using ordinary least squares, controlling for heteroskedasticity and allowing for error clustering by country. We use this panel to examine the implications of inflation targeting for the volatility of national capital and current accounts. We also examine the impact of inflation

targeting on monetary policy outcomes, including average inflation rates and the volatility of inflation. We allow for the potential endogeneity of the inflation targeting regime using instrumental variable (IV) estimation, with inflation targeting adoption of neighbouring countries introduced as an instrument.

We then examine the robustness of our results to separating our sample into developed and emerging market sub-samples, and to considering central banks that pursue pegged exchange rate regimes as an alternative mechanism for monetary discipline. This also provides evidence on the observed impact of the pursuit of exchange rate pegs on capital account volatility in the data. Finally, we examine a post-2007 sample to consider whether or not the impact of inflation targeting has changed subsequent to the global financial crisis.

Our results suggest that despite the perverse dynamics discussed above, inflation targeting is associated with reduced capital account variability, both measured in terms of the standard deviations of the capital account and the standard deviations of the current account. This sensitivity is robust to controlling for time fixed effects, but not country fixed effects. Our IV estimation also suggests that inflation targeting does not have a measurable impact on either the volatility of national capital or current accounts, although our instrument appears to be rather weak in practice, leaving inference from our IV estimation difficult.

We then examine the implications of inflation targeting for the level and volatility of inflation and obtain qualitatively similar results: Countries adopting inflation targeting have lower mean inflation and lower inflation volatility, but statistically significant impacts at standard confidence levels are not robust to the inclusion of country fixed effects.

We subject these results to a number of robustness tests, including separating our sample into developed and emerging market sub-samples, and adding a variable to control for countries pursuing formal pegged exchange rate regimes.[2]Qualitatively, our results for inflation targeting are stronger for the sub-sample of emerging market economies — they are robust to the inclusion of country fixed effects —but not for the sub-sample of developed countries. This mirrors some of the weak results for developed economies found in the literature (e.g., Ball and Sheridan (2005)).Our results for the full sample are largely robust to conditioning for countries that pursue exchange rate pegs.

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2. See Pontines (2011) for a discussion of the potential impact of inflation targeting on exchange rate volatility.

Our results for pegged exchange rate regimes are surprisingly similar to those for inflation targeting regimes in terms of inflation performances. Pegged exchange rate regimes exhibit statistically significantly lower average levels of inflation, as well as inflation volatility. However, as in the case of inflation targeting regimes, these differences are not robust to the inclusion of country fixed effects. This raises the possibility that the adoption of pegged exchange rates may also reflect country characteristics that lead monetary authorities to pursue superior policies. Another issue is that our panel only considers a country as pursuing a pegged regime when that regime is in place. While we limit our analysis to 5-year observations for this reason, it remains possible that a country might abandon its exchange rate peg and devalue near the end of a five-year interval. In this case, we might be observing the lack of volatility when the peg is in place and missing its impact on overall national volatility when the peg is abandoned.

Finally, we repeat our exercises for the global financial crisis era. We examine the same specifications for a cross-section of countries from the first quarter of 2007 through the fourth quarter of 2009. Because we use a cross section, we cannot subject the sample to country fixed effects, but we do include a battery of conditioning variables. We find that our results for inflation targeting and capital account volatility during the crisis period are qualitatively the same: Inflation targeting regimes exhibit lower levels of capital account and current account volatility, but these results are not robust to the introduction of our conditioning variables. Concerning inflation performances, we do not find any measurable differences between inflation targeters and non-targeters in terms of inflation levels, but we do find that inflation targeters exhibited lower levels of inflation volatility during the crisis. Moreover, this latter result is robust to the inclusion of our country conditioning variables.

Our results are therefore best characterised as mixed. The data demonstrate robust differences among inflation targeting countries relative to their non-targeting counterparts. This goes against concerns that countries committed to the pursuit of inflation targeting may find themselves exposed to greater swings in capital flows, exacerbating capital account volatility. However, the weakness of our results in the presence of country fixed effects raises the possibility that countries that adopt inflation targeting may be different in a number of dimensions, and the apparently superior performances of inflation targeting regimes in terms of inflation and capital account volatility may be driven by something else.

The weakness of our results in the presence of county fixed effects does not constitute evidence of the lack of such effects. While the countries that

adopt inflation may have exceptional characteristics that are captured by our fixed effects, we cannot reject the possibility that those countries still had exceptional capital and current account experiences.[3]

The remainder of this paper is divided into eight sections. The following section provides a brief literature review concerning the relationship between inflation targeting and inflation and capital account performances. Section 3 introduces our empirical specification for capital account volatility and discusses our data set. Section 4 reviews our base specification results. Section 5 examines the relative inflation performances of inflation targeting regimes. Section 6 conducts our robustness checks. Section 7 provides our cross-sectional results for the crisis period. Section 8 concludes.

2. Literature Review

2.1 Inflation Targeting and Inflation Performance

Inflation targeting was introduced in New Zealand in 1993, and by 2010 had been adopted by about 25 countries worldwide (Svennson (2010)). The primary characteristics of inflation targeting include an explicit and transparent announced target, and a system guaranteeing accountability of the monetary authority in achieving the agreed-upon target. Typically, but not universally, monetary authorities under inflation targeting regimes enjoy "instrument independence," meaning that they are left to their own authority in deciding the proper policies to achieve the announced inflation target, while the policy goals, namely the values of the target itself, are often negotiated with the national government. Inflation targeting regimes often also include explicit procedures to ensure accountability by requiring the monetary authority to explain instances where the announced target has not been achieved and plans to move back towards compliance with the agreed-upon targets.

The widespread adoption of inflation targeting during the period commonly referred to as the "Great Moderation," was largely the result of several coincidental factors. As discussed by Blanchard, Dell'Ariccia, and Mauro (2010), inflation targeting was widely advocated in academic circles because it delivered optimal policy under the standard new Keynesian macroeconomic models that were gaining popularity during this period. Among central banks, there was a

3. Gertler (2005) makes a similar comment in response to the apparently negative results for inflation targeting reported by Ball and Sheridan (2005).

need to reduce inflation below the high levels that were experienced during the 1970s. However, the popularity of inflation targeting also stemmed from the high levels of transparency and accountability in an inflation targeting regime.

Many studies (e.g., Svennson (2010)) have found that inflation targeting has achieved its primary goals of stabilising both inflation and the real side of the economy. Part of the reason for this apparent success is that inflation targeting regimes in practice usually practice "flexibility," i.e., place some weight in stabilising output as well as inflation.

Once one acknowledges that inflation targeting central banks pursue output stabilisation to some extent, the potential arises for causality in the opposite direction, i.e., from capital mobility to monetary policy outcomes. However, the direction of this reverse causality is unclear, as increased capital mobility may enhance monetary policy discipline, but may also reduce monetary policy "effectiveness" by encouraging global convergence of interest rate yields and reducing the sensitivity of long rates in a country to movements in the monetary authority's short-term policy rate. Spiegel (2009) finds that countries with open capital accounts tend to have lower inflation volatility[4].

Although inflation targeting as formal monetary regime is a relatively recent phenomenon, inflation targeting regimes have proven themselves to be quite durable, with exit from such regimes only occurring when countries joined the European Monetary Union. Rose (2007) points out that even given the relatively short time that has passed since the launch of inflation targeting regimes, the failure of countries to exit from those regimes already leaves them longer lasting than most pegged exchange rate regimes.

Early studies have generally suggested benign implications of inflation targeting [e.g., Rose (2007)]. In addition, many have argued that inflation targeting held advantages over other potential monetary targeting regimes, such as the exchange rate pegs considered below [Mishkin (1999)]. While many countries adopt pegged regimes in initial stabilisations, the challenges associated with exchange-rate-based stabilisations, particularly the real exchange rate appreciation often experienced when prices do not fall sufficiently quickly in the wake of exchange rate pegs, have led many in the 1990s adopting such reforms to move quickly

4. See Spiegel (2012) for a survey of the literature on the implications of increased capital mobility for monetary policy outcomes.

from exchange-rate based stabilisations to formal inflation targeting regimes, as in the case of the Eastern European transition economies of the Czech Republic, Hungary, and Poland studied by Jonas and Mishkin (2005).

However, empirical tests have identified a discrepancy in the relative performances of inflation targeting regimes in developed and emerging market economies. In a recent paper, Ball and Sheridan (2005) examine 20 OECD countries, seven of which adopted inflation targeting. They find no evidence that inflation targeting improved performance, whether measured by inflation, output, or interest rates. They do find that on average inflation falls and becomes more stable among inflation targeters after the adoption of inflation targeting. However, the countries in the sample that did not adopt inflation targeting experienced similar improvements in their performances over those periods. They conclude that the benefits experienced worldwide during the period where countries were adopting inflation targeting must be attributable to something other than the monetary regime itself.

Stronger indications of inflation targeting benefits are found for a set of emerging market economies by Gonçalves and Salles (2008). They find that among the 36 emerging market economies in their sample, the 13 countries that adopted inflation targeting experienced larger reductions in average inflation as well as volatility in economic growth. Their results therefore suggest that not only does inflation targeting yield superior inflation performances for emerging market economies, but the flexibility allowed under inflation targeting also allows for superior real-side economic performances. However, Brito and Bystedt (2010) find that after controlling for time and country fixed effects, the impact of inflation targeting on their sample of emerging market economies is lessened. Moreover, they find that the adoption of inflation targeting is associated with reduced output growth performances.

2.2 Inflation Targeting and the Capital Account

Less evidence exists on the implications of inflation targeting for volatility in national capital accounts. However, the potential for surges in capital inflows, or "sudden stops" in these flows leading to reversals that manifest themselves as rapid capital outflows, raises independent concerns about the merits of inflation targeting. Abrupt changes in the pattern of capital flows can raise challenges for countries pursuing inflation targeting or other monetary goals, such as exchange rate targeting. It has long been noted that emerging market economies with underdeveloped capital markets can be quite vulnerable to swings in

exchange rates, leading to potential problems for exporters in the wake of large appreciations or difficulties for financial institutions with hard currency liabilities subsequent to large depreciations [e.g., Jonas and Mishkin (2005)]. Still, both Rose (2007) and Pontines (2011) find that inflation targeting regimes experience lower nominal exchange rate variability than other countries. The evidence for real exchange movements is mixed, as De Carvalho Filho (2010) finds that inflation targeting countries experienced wider swings in real exchange rates, while Pontines (2011) obtains exactly opposite results through a treatment exercise that accounts for the potential endogeneity of the adoption of formal inflation targeting.

Under a floating exchange rate regime, maintaining nominal exchange rate targets in the face of large capital inflows may still be achieved through sterilisation, selling domestic assets, such as government treasury obligations, to leave the monetary base unchanged. However, it has been argued (e.g., Calvo (1991)) that sterilisation efforts may be costly for countries to conduct, as they can have negative implications for government balance sheets, commonly referred to as the "quasi-fiscal costs" of sterilisation. To maintain a monetary target in the face of capital inflows, the central bank must purchase the foreign assets entering its country. These assets typically yield lower returns than the domestic assets that must be sold to accommodate their purchases, reducing the stream of revenues of the consolidated government.

Historical estimates of these costs have been large. Calvo, Leiderman, and Reinhart (1996) estimate quasi-fiscal costs of 0.5 percent of GDP for Columbia in 1991, while Khan and Reinhart report estimates between 0.25 and 0.5 percent for Latin American countries during the same period. Kletzer and Spiegel (2004) do find that countries respond to quasi-fiscal costs in monetary policy decisions. However, under uncovered interest rate parity, nominal interest rate spreads should reflect expected changes in currency values, so realised quasi-fiscal costs should be minimal. Kletzer and Spiegel (1998) find that realised quasi-fiscal costs are typically very low. It is therefore puzzling that they drive policy decisions, although it is well documented that in practice there are substantial deviations from uncovered interest parity.

Still, the potential for sterilised intervention has been shown to be limited in the face of persistent capital inflows [e.g., Cardarelli, Elekdag, and Kose (2009)]. Moreover, emerging market economies in transition are typically unwilling to completely abandon their exchange rate goals when transitioning towards an

inflation targeting regime, leading some to miss their announced inflation targets during transition (e.g., Jonas and Mishkin (2005)).[5] Finally, a number of emerging market economies have tried to use increases in reserve requirements and other non-monetary actions to stem capital inflows, but these appear to be of limited effectiveness in open capital account situations if there viable alternative alternatives to intermediation through the banking sector (e.g., Spiegel (1995)).

The impact of inflation targeting regimes on countries concerned about capital flow volatility may not be unambiguously negative. Caballero and Krishnamurthy (2005) argue that formal inflation targeting regimes may grant some credibility advantages over central banks that pursue a "fear of floating" (e.g., Calvo and Reinhart (2002)) response to a sudden stop. A central bank in the latter situation would defend the nominal exchange rate, reducing losses suffered by agents from a sudden stop. While such credibility might be deemed desirable, the anticipation of this response may encourage acquisition of dollar liabilities and actually trigger a sudden stop. As such, a credible inflation targeting regime may exhibit reduced capital account volatility.

Official attitudes have shifted recently in favour of using capital controls as a vehicle to mitigate capital flow volatility. A notable turning point was the change in sentiment of the International Monetary Fund. In response to the volatile capital flows experienced subsequent to the global financial crisis, the International Monetary Fund published a staff report (Ostry, Ghosh, Habermeier, Chamon, Qureshi, and Reinhart (2010)) that advocated the use of capital controls, in conjunction with macro-prudential policies, as part of the "... policy toolkit to manage inflows."[6] The document noted that during the global crisis, capital controls were useful in reducing financial fragility when concentrated on addressing liability risk.

One concern with the use of capital controls is their potential for global spillovers. Subsequent to a global increase in liquidity, investors allocate more capital to emerging market economies in efforts to increase yields. Under such circumstances, there are likely to be spillovers as capital controls in one country are likely to divert capital flows elsewhere, necessitating the implementation of capital controls in that country. Of course, these negative spillovers can result

5. Countries adopting exchange rate targeting may have other motives for resisting wide movements in nominal exchange rates. Jonas and Mishkin note that Hungary was determined to maintain some range for their nominal exchange rate, as they believed that doing so would facilitate admission to the European Monetary Union.

6. Ostry, Ghosh, Habermeier, Chamon, Qureshi and Reinhart (2010), pg. 5

in increased barriers to capital inflows through a wide set of countries that merely serve to offset the adverse impacts of other countries' capital control policies. There are also limits to the efficacy of capital controls, and regimes frequently allow capital control circumvention. Spiegel (1990) finds that Mexican capital controls imposed subsequent to the 1982 debt crisis initially were successful in inhibiting capital inflows, as evidenced by deviations from interest rate parity, but soon broke down.

There are other responses that countries could take to respond to capital inflows. One is lowering the high domestic nominal interest rates that are attracting foreign capital. This can be achieved through fiscal consolidation. Cardarelli, Elekdag, and Kose (2007) find that surges in capital inflows can be mitigated by fiscal consolidation, while Cardarelli, Elekdag, and Kose (2009) document that countries that pursued such fiscal consolidations experienced superior growth performances when the surges stopped.

Small open economies are particularly vulnerable to global shocks through capital flows. Countries often respond to waves of capital inflows and outflows by pursuing procyclical fiscal policies, raising government spending when access to foreign capital is abundant during economic boom periods, and pursuing austerity during lean times (e.g., Kaminsky, Reinhart, and Vegh (2004)), precisely the opposite direction that would be advocated by most standard macroeconomic models.

Cross-sectional evidence on monetary policy and the capital account is limited, particularly for emerging market economies and small open economies that are likely to be buffeted by waves of capital inflows and outflows, although Kaminsky, Reinhart, and Vegh (2004) is an exception as it investigates monetary policy reaction functions for a broad cross-section of countries. Their study indicates that monetary policy among OECD countries has historically been countercyclical, while monetary policy in emerging market economies tends to be primarily procyclical, or acyclical. Moreover, Kaminsky, Reinhart, and Vegh (2004) identify a "when it rains it pours" phenomenon in the emerging market economies: Monetary policy in the emerging market economies tends to be expansionary precisely when they are experiencing surges in capital inflows, and contractionary when capital is flowing out. As a result, monetary policy exacerbates the volatility associated with waves of capital inflows and outflows. Clearly, such policy is inconsistent with inflation targeting, which implies dampening the inflationary impact likely to follow a surge in capital inflows by tightening policy.

However, this effort may be frustrated by the increased interest rates associated with the monetary tightening, which increases the attractiveness of an economy as a destination for foreign capital. This perverse outcome has been noted by Blanchard (2004), who argues that the proper response to such a surge in capital inflows is therefore a tightening of fiscal policy, rather than a monetary policy response. Blanchard concludes that the inflation-targeting Brazilian Central Bank was correct in its decision to refrain from raising interest rates in response to the capital inflow surges that Brazil experienced in 2002-2003. However, numerous studies (e.g., Kaminsky, Reinhart, and Vegh (2004)) have found that fiscal policies tend to be even more pro-cyclical than monetary policies. Governments are often capital constrained in normal times, and only find the opportunity to pursue desired projects when they enjoy ample access to foreign capital. Moreover, the size of government spending is likely to increase due to the so-called "voracity effect" (Lane and Tornell (1999)) encouraging political groups to compete more fiercely in good times.

3. Empirics

In this section we move towards examining the implications of inflation targeting for capital account volatility and inflation performance. The following sub-section introduces our base specification. The remaining sub-sections introduce our data set and discuss summary statistics concerning differences across groups within our sample.

3.1 Base Specification

Our base specification examines the impact of inflation targeting on capital account volatility, measured as the standard deviation of the capital account for a panel of countries. We first examine a univariate specification with time fixed effects included. We then add country fixed effects to control for time invariant determinants of our dependent variables. As demonstrated above, these time effects are crucial to condition for the global effects of the great moderation, which were generally enjoyed by both inflation targeting and non-targeting countries. We then instrument for the likely endogenous inflation targeting regime decision, as discussed below. Finally, we control for a number of time-varying country characteristics, including capital account openness, $KOPEN_{it}$, growth in gross domestic product, $GGDP_{it}$, and population growth, $GDOP_{it}$.

Capital account openness in particular is likely to have an impact on capital account volatility, as capital controls are often implemented in the interest of

mitigating surges in capital inflows and outflows. However, for that same reason capital controls are most likely to be implemented during episodes of capital account volatility. As such, our expected sign of the implications of capital controls is unclear.

After including all of the conditioning variables, our initial specification is

$$SD(CAP)_{it} = \alpha_i + \theta_t + B_1 IT_{it} + B_2 KOPEN_{it} + B_3 GGDP_{it} + B_4 GPOP_{it} + \varepsilon_{it} \tag{1}$$

where $SD(CAP)$ represents the standard deviation of country i's capital account at time t; α_i is a country dummy; θ_t captures time fixed effects, IT_{it} is our variable of interest, equal to 1 if country i is an inflation targeter at time t, and 0 otherwise, and ε_{it} is a disturbance term, assumed to be well behaved up to heteroskedastic errors and clustering by country. We are concerned that the choice of inflation targeting is likely to be a function of both a country's long-run characteristics, such as its institutional qualities, as well as its current situation. In particular, many countries pursued inflation targeting as part of a stabilisation program. As such, we would expect those countries that adopted inflation targeting to be those countries that expected to benefit from adopting such a regime the most.

It seems likely that this type of endogeneity problem would be most prevalent in assessments of the impact of inflation targeting on levels and standard deviations of inflation itself. Countries with high initial inflation may expect greater benefits from the adoption of an inflation targeting regime, and therefore one might attribute the observation of a decline in inflation subsequent to the launch of an inflation targeting regime to "reversion to the mean," as initially-high inflation countries would be expected to have greater reductions in inflation on average than other countries, holding all else equal. However, if initial inflation is correlated with initial capital account volatility, this may pose a problem for our base specification as well. We therefore also consider an IV specification.

As our instrument, we make use of the fact that adoption of inflation targeting appeared to occur in waves, as countries followed the leads of New Zealand and other early adopters. However, the prevalence of inflation targeters alone would not serve as an instrument as this variable would be common across countries at any point in time. To have a truly independent instrument, we posit that a country will be more likely to adopt inflation targeting at any point in time the more common it is among proximate countries at the time.

We define an index of "inflation targeting pressure", ITP_{it}, as comprised of the share of inflation targeters at any point in time weighted by proximity[7]. Formally, our index of inflation targeting pressure satisfies:

$$ITP_{it} := \frac{1}{n}\sum_{j=1}^{n}\left(\frac{1}{d_{i,j}}\right)IT_{j,t} \tag{2}$$

where j represents the set of n countries in the sample other than country i, $d_{i,j}$ represents the grand circle distance between country i and j using data from Rose (2007) and $IT_{j,t}$ takes value 1 if country j is an inflation targeter during period t, and 0 otherwise. We then use this index of inflation targeting pressure as an instrument for inflation targeting, IT_{it} , in a two-stage least squares procedure.

3.2 Data

Our data set is quarterly and covers 68 countries over the period using quarterly data from 1974 through 2010.[8] Our country set is determined by the availability of inflation targeting regime designation, which is obtained from Rose (2007). As discussed in Rose (2007), there are disagreements about the launch of inflation targeting regimes. We therefore use Rose (2007) as our primary source of inflation targeting launch dates, since that is the source with the largest country coverage. Identification of a country as pursuing a pegged exchange rate regime is based on the *de facto* designation of Reinhart and Rogoff (2004). We follow Kaminsky, Reinhart, and Vegh (2004) in only distinguishing between pegged and a non-pegged exchange rate regimes. Many studies, for example, Rose (2011), have found little empirical difference between all forms of de jure exchange rate regimes, much less between different classes of managed and free floats. Our list of the inflation targeting and pegged exchange rate regimes in our sample is shown in Appendix Table A1.

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7. Our specification for the inflation targeting pressure instrument closely follows that of the Persson and Tabellini (2009) index of "closeness to democracy," which measures the degree of democracy among a country's neighbours as a plausibly exogenous proxy for "democratic capital," which they demonstrate encourages democratisation.

8. Our regression panels are slightly smaller. We use the full data set for our first stage in our IV estimation. We have 66 countries in our inflation performance regressions, while our current and capital account data sets are smaller in the cross-section, with 63 and 57 countries, respectively.

In order to calculate volatility, we aggregate the data into 5- and 2-year intervals. After aggregation, our five-year panels range from 1978 through 2007. Our basic results are reported for the 5-year interval panels, while we report our results for the 2-year panels in the appendix tables as a robustness check. We also construct a cross-sectional sample of average values of the same variables from the first quarter of 2007 through the fourth quarter of 2009 to examine country performances during and after the recent global financial crisis.

Most data comes from standard sources. Current and capital account data, as well as inflation figures come from the International Financial Statistics of the International Monetary Fund. GDP and population data comes from the World Bank indicators.[9] Identification of the openness of national capital accounts is based on the Chinn and Ito (2007) data set of *de facto* capital account openness. Designation of the inflation targeting regime is based on Rose (2007). Summary statistics for the five-year panels are shown in Table 1. It can be seen that there are substantial differences between inflation targeters and non-targeters, as shown in columns 1 and 2. Countries that are inflation targeters have higher GDP per capita, higher average income growth, less volatile income growth, lower average inflation, and less volatile average inflation. However, the large discrepancies among the non-inflation targeting sub-sample leave the standard errors of these populations too imprecisely measured to make any inferences at standard statistical significance levels, except for the conclusion about average growth volatility.

This discrepancy in growth volatility is particularly interesting, as one commonly thinks of inflation targeting as a monetary regime in which one gives up the right to stabilise output in order to achieve superior monetary outcomes. These summary statistics would seem to indicate that the adoption of inflation targeting leads to both superior monetary outcomes and superior outcomes in the real economy, at least in terms of GDP per capita, income growth, and their respective volatilities.

However, Table 1 also suggests some caution. Columns 3 and 4 demonstrate that similar discrepancies can be seen between the sub-samples that adopted

9. There are some extreme outlying values of inflation in our panel, reaching levels of over a million percent a year in some cases. To ensure that these outliers are not driving our results, we truncate the inflation figures at a maximum value of 250 percent per year. However, we include the base specifications with inflation values unconstrained in appendix Table A2 to demonstrate that the qualitative results we report below are robust to the inclusion of the extreme inflation values in the sample.

formal exchange rate pegs and those that did not, although the point estimates for the discrepancies are lower than those observed for formal inflation targeters. Countries that adopted formal exchange rate pegs have lower and less volatile inflation, higher per capita GDP, and higher GDP growth with less income growth volatility. These discrepancies are universally statistically insignificant, but it is telling that they go in the predicted direction for formal exchange rate pegs as well. It appears that the adoption of such monetary policy regimes is not done at random.[10]

The time series properties of the discrepancies in inflation performances between countries that did and did not adopt inflation targeting can be seen in Figures 1 and 2. Figure 1 plots average inflation levels for the inflation targeters at any point in time against the non-targeters. In our unbalanced panel, this implies that the population of targeters is increasing over time.[11] It can be seen that inflation targeters have much lower inflation on average than non-targeters, although this discrepancy has largely diminished over time, as average inflation levels have fallen worldwide and a wider variety of countries have adopted inflation targeting regimes. Figure 2 exhibits similar patterns for the volatility of inflation, as measured by the standard deviation of inflation. Inflation volatility was initially much lower in inflation targeting countries, and while inflation targeting countries still exhibit lower volatility, this discrepancy has been markedly reduced.

Similar apparently benign implications of inflation targeting in our sample can be seen in the summary statistics concerning the capital account outcomes that are the focus of this paper (Table 2). Capital account volatility, as measured by the standard deviation of the capital account relative to GDP, in our sample for inflation targeters is substantially lower than that for targeters. This goes against the argument that inflation targeting as a monetary policy can exacerbate the volatility of capital flows. Still, one must take care in making any inference from this stylised fact, as it is also true that non-targeters have more open capital accounts in a *de facto* sense, in that the average levels of absolute values of capital flows and current accounts are substantially larger for inflation non-

10. As discussed above, our sample of pegged experiences only includes the periods during which the peg was maintained. Episodes following the collapse of exchange rate pegs are usually quite volatile, so it would be more appropriate to say that the figures suggest that countries under formal exchange rate pegs have lower and less volatile inflation, higher per capita GDP, and higher GDP growth with less income growth volatility *while their pegs are in place*.

11. For example, the number plotted in the second quarter of 1990 only refers to the average inflation level in New Zealand, the only targeter in our sample at that time.

targeters than targeters. As such, the relative volatility of these flows may be less clear.

The time series data associated with these patterns can be seen in Figures 3 and 4. Figure 3 concentrates on capital account volatility. After a discrete increase in the 1980s, our sample mean is relatively flat, but volatile over the rest of our sample period. The same is true for our sub-sample of non-inflation targeters. However, our sample of inflation targeters shows an upward trend over the course of the sample period where inflation targeting existed, with the two series being largely identical by the 2008-2010 period. We do not see evidence of convergence in current account volatility, however (Figure 4). Both current account series show an upward trend in volatility over the course of our sample, and while current account volatility observed among inflation targeters is consistently lower than that observed for the non-targeters, both volatilities appear to have increased at roughly the same pace over the last two decades.

However, we obtain markedly different results comparing those countries that pursue exchange rate pegs to those that do not. Columns 3 and 4 of Table 2 suggest that on average, peggers in our sample have higher average levels of capital flows in absolute values, as measured by capital and current account levels, as well as substantially higher standard deviations of these flows. Again, these are point estimates and the variability across the populations preclude making inferences at statistically significant levels about the pure differences in these populations, but the discrepancies relative to cutting the data between inflation targeters and non-targeters is suggestive.

Recall from the literature review above that the impacts of inflation targeting appear to differ between the developed and emerging market economies. While the emerging market economies appear to have superior inflation performances, the literature has found mixed evidence of improvements in inflation experiences between the developed economies that adopted inflation targeting and those that did not. However, the discrepancies in our sample do not appear to be an artifact of our pooling across these two country groups. Table 3 divides our sample into developed economies, identified by OECD membership, and the rest of the sample, which is classified as non-OECD economies.[12]

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12. We define countries as "OECD" based on membership in the OECD at the start of our sample in 1974. Using this definition, our group of OECD countries include Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, UK, and the USA

We find that for both groups inflation targeters have higher GDP per capita and lower average inflation than non-targeters, as well as smaller average capital flows as a percentage of GDP. These mirror the results obtained for the pooled sample. Inflation targeters from the OECD countries have modestly larger capital account volatility, measured either in terms of the capital account or the current account. However, we find substantial differences on average in capital account volatility between inflation targeters and non-targeters among the non-OECD countries, with inflation targeting yielding substantial decreases in either measure of capital account volatility. This suggests that it is the non-OECD sub-sample that explains the discrepancies between targeters and non-targeters we find in our full sample.

Several caveats are in order, first, while we find that the standard deviations of current and capital accounts are substantially smaller among the non-OECD inflation targeters than among the targeters, the magnitudes of capital flows are smaller as well. It is therefore unclear whether it would be more appropriate to condition by the magnitude of capital flows or by GDP (as is done here). Second, the large variability among the non-targeters in the data set typically leaves the discrepancies between different populations statistically indistinguishable. Moreover, one would like to condition on country characteristics, and to the extent possible, attempt to allow for the endogeneity of regime choice.

Finally, our data appears to mirror the result in the literature (e.g., Ball and Sheridan (2005)) that the benign inflation experiences enjoyed during the great moderation by inflation targeting countries were also enjoyed by the other countries. See Figure 5. It is apparent that during the period when countries began to adopt inflation targeting (beginning in 1990 with New Zealand), average inflation levels among countries that adopted inflation targeting during our sample period also fell dramatically. However, it is also clear that average inflation over the set of countries that did not adopt inflation targeting fell at least as dramatically.

There are also some interesting discrepancies between the developed and emerging market groups across distinctions by those that are either identified as in exchange rate pegs or not (Table 4).[13] Among both the OECD and non-OECD countries, those identified as pursuing pegged regimes have higher standard deviations of capital flows, either measured in terms of the capital or the current accounts. We also find that non-OECD countries pursuing exchange rate pegs have the most volatile capital flow experiences.

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13. The sample is reduced for the latter group because they are not included in the sample Reinhart and Rogoff (2004) sample.

4. Results

Our base specification results are shown in Table 5. We first run a simple univariate specification with time fixed effects (Model 1). The inflation targeting variable enters significantly at a 5 percent confidence level with a negative sign, implying that countries that are inflation targeters have less capital account volatility, rather than the greater capital account volatility that is often feared in the literature. Still, our point estimate of -0.018 indicates that inflation targeting adoption also has economic significance. The point estimate indicates a 34.6 percent decline in capital volatility among average inflation non-targeters that adopt inflation targeting. However, the other specifications demonstrate that this result is quite fragile, and in particular it is not robust to the inclusion of country fixed effects (Model 2). The inclusion of country fixed effects leaves the *IT* variable insignificant, and it remains so with the inclusion of the conditioning variables or for the IV specifications (Models 3, 4, and 5).

The results therefore indicate that inflation targeters experience reduced capital account variability on average, but it is unclear whether the reduced volatility is attributable to the fact that they are inflation targeters, or whether countries that adopt inflation targeting are also more likely to pursue other policies that results in reduced capital account variability.

We next examine the results for current account volatility (Table 6). Our specification is identical to our base specification, except that our dependent variable is now SD(CUR) , the standard deviation of a country's current account over the five-year interval. Our results are similar: Inflation targeting also has a statistically significant impact on current account volatility in our univariate specification (Model 1). Again, the coefficient value indicates economic significance as well. Our point estimate indicates that after controlling for time fixed effects inflation targeters in our sample have 53 percent lower current account volatility. However, inclusion of country fixed effects also again leaves the *IT* variable insignificant, and it also remains insignificant with the inclusion of the conditioning variables or for the IV specifications (Models 2, 3, 4, and 5).

Overall, our results are therefore mixed. On one hand, our univariate specifications indicate strong differences in capital and current account volatility between those countries that adopt inflation targeting and those that do not; indeed, the point estimates that we obtain seem implausibly large. However, these results are not robust to the inclusion of fixed effects. Moreover, our

weak IV results suggest that this weakness is not attributable to the likely endogeneity of the adoption of inflation targeting.

Instead, the difficulties appear to lie in the country fixed effects. For both specifications we obtain a substantial jump in measured R-squared when we add the country fixed effects, to 70 percent in the case of capital account volatility and to 80 percent in the case of current account volatility. It therefore appears that there are differences between inflation targeters and the rest of our sample, with the inflation targeters experiencing far lower average capital and current account volatility as a group, but there appear to be other systematic differences between these groups as well, captured in the country fixed effects, that may be attributable to other time-invariant differences than the presence or absence of inflation targeting.

5. Inflation Regimes and Inflation Experiences

We next turn to examine the evidence in our data set concerning the relationship between inflation targeting and inflation outcomes. Our specifications are quite similar to those that we used for capital account volatility. With all of our conditioning variables included, our full specifications satisfy:

$$mean(Inf)_{it} = \alpha_i + \theta_t + B_1 IT_{it} + B_2 KOPEN_{it} + B_3 GGDP_{it} + B_4 GPOP_{it} + \varepsilon_{it} \qquad (3)$$

where $mean(Inf)_{it}$ represents average inflation over our five-year interval, and

$$SD(Inf)_{it} = \alpha_i + \theta_t + B_1 IT_{it} + B_2 KOPEN_{it} + B_3 GGDP_{it} + B_4 GPOP_{it} + \varepsilon_{it} \qquad (4)$$

where $SD(Inf)_{it}$ represents the standard deviation of inflation over our five-year interval, which we use as an indicator of inflation volatility.

Our results for average inflation are shown in Table 7. Qualitatively, our results are quite similar to those that we obtained for capital account volatility. Our univariate specification (Model 1) enters significantly negative, suggesting that inflation targeters on average enjoy substantially lower inflation levels on average than those that do not adopt inflation targeting after accounting for time fixed effects. Again, the point estimates on these estimates appear to be implausibly large.

However, once we also include country fixed effects, the significance of inflation targeting breaks down and it universally enters insignificantly with the incorrect sign. Again, this result is robust to either instrumenting for the adoption

of inflation targeting (Models 3 and 5), or for OLS with our conditioning variables added (Model 4). Also as above, the inclusion of country fixed effects results in a substantial increase in our measured R-squared, suggesting that the bulk of determination of average inflation levels is attributable to time-invariant country characteristics, rather than inflation targeting per se.

Unlike our capital account results, we now find that capital account openness, *KOPEN*, has a statistically significant negative impact on inflation. Moreover, these results are robust to the inclusion of country fixed effects. However, one must consider the likely endogeneity of capital control policies. Countries experiencing high and volatile inflation may be more willing to introduce capital account restrictions.

Similar results are obtained for the impact of inflation targeting on inflation volatility, measured as the standard deviation of inflation (Table 8). The univariate specification enters again with an implausibly large and highly significant coefficient estimate. However, the remaining specifications all have inflation targeting entering insignificantly, whether we use OLS or instrument for the inflation targeting variable. We again observe a substantial increase in measured R-squared when country fixed effects are added.

Overall, our results appear similar to those we found for capital and current account volatility. There appears to be evidence that countries adopting inflation targeting have lower average inflation as well as lower inflation volatility. However, these results are lost when country fixed effect are included, suggesting that discrepancies between inflation targeting and non-targeting countries are likely attributable to country-specific characteristics that are correlated with inflation targeting, rather than inflation targeting itself.

6. Robustness Tests

In this section, we investigate the robustness of our inflation targeting results. First, we divide the sample into “OECD” and “non-OECD” sub-samples, again based on membership at the start of our sample in 1974. Second, we allow for countries to also differ in their capital account and inflation experiences because of the adoption of a formal exchange rate peg.

6.1 OECD and Non-OECD Sub-samples

We separate our sample into OECD and non-OECD sub-samples according to membership in the OECD in 1974. We then run our base specifications for

these two sub-samples, looking at both capital account volatility and inflation performances. Since our IV results proved very weak, we do not repeat these for our sub-samples.

The results for the OECD country sub-sample are shown in Table 9. The results for capital and current account volatility are reported in Models 1 through 4. It can be seen that inflation targeting has no significant impact on either measure of capital account volatility, either in our univariate plus time fixed effect specifications (Models 1 and 3), or with country fixed effects and our conditioning variables included (Models 2 and 4). We obtain similar results for inflation experiences. Inflation targeting appears to have no measurable impact on inflation experiences, either in our univariate specifications (Models 6 and 8), or after the inclusion of country fixed effects and our conditioning variables.

These weak results for the OECD sub-sample are in keeping with the literature, such as Ball and Sheridan (2005) who find that while inflation declined over time for developed economies that had adopted inflation targeting, it declined for the developed economies that failed to adopt inflation targeting as well. Our results here confirm their results for inflation experiences and suggest that the capital account volatility experiences among the developed economies were similar. However, our overall results above suggested that our full sample demonstrated measurable differences among inflation targeting countries. Since we failed to find such differences among our OECD sub-sample, one might expect that we would observe such differences in our non-OECD sub-sample.

Indeed, that appears to be the case. Our results for the non-OECD sub-sample appear stronger than those we obtained for our full sample (Table 10). We observe measurable differences in both capital account and inflation experiences between inflation targeting and non-targeting countries. Inflation targeting countries exhibit measurably lower capital and current account volatilities (Models 1 and 3), as well as measurably lower average inflation levels and inflation volatility in our univariate specifications with time fixed effects (Models 2 and 4). Moreover, the significance of inflation targeting is robust to the inclusion of country fixed effects. As was the case for our full sample, however, the inflation results disappear when we include country fixed effects and our conditioning variables.

Our full sample results appear to be driven by the emerging market economies in our sample. Our non-OECD sub-sample results mirror those in our full sample, and are even stronger, while we fail to find any measurable role for inflation targeting in our OECD sub-sample. Still, as in the full sample, many of our

results for inflation targeting in the non-OECD sub-sample disappear when country fixed effects are added, raising the question of whether these observed differences are attributable to inflation targeting itself, or to other characteristics of non-OECD countries that also happen to inflation targeting adopters. One notable exception is that of current account volatility, non-OECD inflation targeters appear to exhibit lower current account volatility even after conditioning for time and country fixed effects.

6.2 Conditioning for Pegged Exchange Rate Regimes

Inflation targeting regimes usually allow their exchange rates to float (Rose (2007)).[14] However, pegged exchange rate regimes may also impose monetary discipline and affect capital inflows as well as inflation volatility. We therefore condition for the adoption of such regimes in our empirics. It is unclear whether we would expect exchange rate pegs to have substantive impacts on inflation or capital account variability. The literature (e.g., Rose (2011)) suggests that formal adoption of pegged exchange rate regimes has little observable impact on output growth or inflation. However, if exchange rate pegs have such effects then one would want to condition for these in our empirics. As countries enter and exit pegged regimes over the course of our sample, the country fixed effects do not condition for the influence of pegged exchange rate regimes.

Our results with a variable conditioning for exchange rate pegs included are shown in Table 11. We introduce a variable $PEG_{i,t}$ that takes value 1 if country i is in a formal exchange rate peg in period t, and 0 otherwise. It can be seen that our basic results for inflation targeting are robust to the inclusion of the $PEG_{i,t}$ variable. The inflation targeting variable enters significantly negative with only time fixed effects included in the determination of both capital and current account volatility, as well as the mean and standard deviation of inflation. The coefficient point estimates are similar to those we obtained with the peg variable omitted. However, when country fixed effects are included, the inflation targeting variable again loses its statistical significance in all of our specifications.

The $PEG_{i,t}$ variable, is insignificant as a determinant of the volatility of the capital account, either with fixed effects included or excluded. However, it enters significantly negative in the determination of current account volatility at a 10 percent confidence level with country fixed effects included. Moreover, with

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14. There have been exceptions. For example, the Reserve Bank of Australia intervened in its foreign exchange market in the 1990s [Rose (2007)].

country fixed effects excluded, we also find that adoption of an exchange rate peg is associated with measurably lower average levels and volatility of inflation. However, the significance of this variable also disappears when country fixed effects and our other conditioning variables are included.

Overall, the qualitative results we obtained for our inflation targeting variable are robust to conditioning for the presence of a pegged exchange rate regime. Our results also suggest that the adoption of a pegged exchange rate regime has similar implications for inflation levels and inflation volatility as inflation targeting.

7. Inflation Targeting and the Global Financial Crisis

Lastly, we turn to the observable differences between inflation targeting countries and those that did not adopt inflation targeting during and after the global financial crisis. We date these crisis years as stemming from the first quarter of 2007 through the fourth quarter of 2009. Since our data is of insufficient length to construct a panel, we estimate the impact over a pure cross-section, with some conditioning variables included to account for observable differences across countries. Our sample is a cross-section of as much as 67countries, but it declines to as low as 57 for the sample associated with the standard deviation of the capital account. As our sample is of modest size, we can only include so many conditioning variables without reducing our ability to make inferences due to diminishing degrees of freedom.

Our results for capital account volatility during and after the crisis are shown in Table 12. Qualitatively, these results are quite similar to those that we find for our panel above: Inflation targeting has a statistically significant negative impact on capital and current account volatility with coefficient point estimates indicating economic significance as well in our univariate specifications (Models 1 and 4). However, with the introduction of our conditioning variables, inflation targeting becomes insignificant for both measures of capital account volatility (Models 2 and 5). As above, instrumenting with our inflation targeting pressure variable fails to yield significance, although our coefficient estimates are substantially higher in both cases.

Our results for the relative inflation experiences of inflation targeting countries are shown in Table 13. We obtain no significant difference for levels of inflation among inflation targeting countries during our crisis period, either with or without the inclusion of country fixed effects. However, we obtain significantly negative

coefficient estimates for the impact of inflation targeting on the volatility of inflation during the crisis episode. Moreover, this result is robust to the inclusion of our conditioning variables (Model 5). Inflation targeting maintains its statistically significant coefficient estimate with only a modest decline in the point estimate for our OLS specification, although the variable is insignificant again in our IV estimation due to the weakness of our instrument. Overall, while our inability to introduce country fixed effects in our cross-section gives us pause about pushing this volatility result too hard, it is in keeping with some of the recent literature that suggests that inflation targeting countries were more successful than other countries at maintaining well-anchored inflation expectation and avoiding a "deflation scare" (e.g., De Carvalho Filho (2010)).

As above, however, the likely endogeneity of the adoption of an inflation targeting regime leaves it difficult to make too strong conclusions about relative performances during the crisis, particularly since our relatively short investigation period necessitates the use of a cross section which precludes the introduction of country fixed effects. Still, our results for inflation volatility appear to be interesting as they suggest that inflation targeting regimes exhibited less inflation volatility than their non-targeting counterparts, in keeping with the early results elsewhere in the literature.

Finally, we control for countries that pursued pegged regimes in Table 14. We find little impact of inflation targeting or exchange rate pegging on capital account volatility, but we do find evidence that either monetary regime had an impact on inflation performances during the crisis, as both inflation targeters and exchange rate peggers had lower and less volatile inflation. Moreover, our inflation targeting results are robust to the inclusion of our conditioning variables as is the impact of pursuing an exchange rate peg on inflation levels, but not volatility.

Our results therefore indicate that countries that maintained some form of nominal anchor, either in the form of inflation targeting or in the form of maintaining an exchange rate peg, exhibited superior inflation performances during the crisis. However, as above, our inability to introduce country fixed effects leaves it difficult to compare the strength of these results with those of the overall sample.

8. Conclusion

A number of studies have shown that the adoption of formal monetary regimes, such as inflation targeting, is associated with lower inflation and improved economic performances. However, it is commonly perceived that these regimes may encounter difficulties during periods of surges in capital inflows, as efforts to combat incipient increases in inflation by tightening monetary policy might only serve to raise domestic interest rates, and thereby the attractiveness of the inflation targeter as a destination for foreign investment. This paper examines the impact of inflation targeting on the volatilities of national capital and current accounts. We also examine the implications of the pursuit of nominal exchange rate pegs as an alternative formal regime-based nominal anchor.

In contrast to the prediction that inflation targeting will be associated with capital account difficulties, we find that inflation targeting is actually associated with reduced capital account volatility. Importantly, this result is robust to the inclusion of time fixed effects. A number of studies have also found that the apparent improved performances that studies found after the adoption of inflation targeting were also experienced during those periods by countries that did not adopt inflation targeting, but were more appropriately attributed to the general effects of the "great moderation" period.

However, our full sample results for superior capital account performances were not robust to the inclusion of country fixed effects. This leaves open the possibility that the decision to adopt inflation targeting reflected other characteristics that drove the superior inflation performances observed for inflation targeters in the data, rather than the inflation targeting regime itself. We did attempt to correct for this possible endogeneity problem, but our instrument proved too weak to rescue inflation targeting as a driver of superior economic outcomes. Nevertheless, our capital and current account volatility results were robust to the inclusion of country fixed effects for our non-OECD sub-sample.

One reason why we failed to identify any role for inflation targeting once country fixed effects were included in our full sample may be that we failed to distinguish between those countries that had fundamentals-based reasons for large capital inflows or outflows, such as shocks to a country's terms of trade. More conditioning variables may help to identify the role of the monetary regime in the determination of the eventual magnitudes of realised capital inflows and outflows. We leave this for future research.

Lastly, the results for inflation performances during the crisis period proved interesting. We find that both countries that pursued inflation targeting and those that pursued exchange rate pegs during and after the crisis had superior inflation performances, both in terms of lower average inflation levels and reduced inflation volatility. However, as above, our inability to introduce country fixed effects leaves it difficult to compare the strength of these results with those of the overall sample.

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Appendix

Table 1
Summary Statistics, 5-Year Panel Data

	Targeter	Non-Targeter	Pegger	Non-Pegger
GDP/Capita	15974.91	10108.36	14196.38	9901.42
	(10996.65)	(10211.99)	(11069.27)	(10119.39)
Average income growth	0.0399	0.0330	0.0390	0.0359
	(0.0132)	(0.0332)	(0.0242)	(0.0266)
Std Dev of income growth	0.0133	0.0261	0.0202	0.0255
	(0.0061)	(0.0249)	(0.0142)	(0.0248)
Average inflation rate	3.1234	14.9023	5.3702	16.2752
	(1.9963)	(26.2491)	(7.4279)	(28.0748)
Std Dev of Inflation rate	1.3941	8.0863	3.3374	8.6952
	(0.8663)	(18.7035)	(7.5002)	(19.8955)
Number of obs	37	371	83	292

Observations are 5-yr intervals from 1974 through 2009. See Appendix A1 for designation of inflation targeting and pegged exchange rate countries. Standard deviations of variables in parentheses.

Table 2
Monetary Regime and Capital Account Outcomes

	Targeter	Non-Targeter	Pegger	Non-Pegger
Average $\lvert CAP/GDP \rvert$	3.420E-06	7.170E-06	9.040E-06	5.910E-06
	(1.310E-05)	(1.460E-05)	(1.820E-05)	(1.300E-05)
Std Dev of CAP/GDP	5.129E-02	5.201E-02	6.245E-02	4.871E-02
	(4.497E-02)	(4.012E-02)	(5.365E-02)	(3.549E-02)
Average $\lvert CA/GDP \rvert$	1.490E-06	5.200E-06	5.800E-06	4.340E-06
	(4.720E-06)	(1.190E-05)	(1.170E-05)	(1.100E-05)
Std Dev of CA/GDP	2.616E-02	3.333E-02	3.617E-02	3.115E-02
	(1.808E-02)	(2.627E-02)	(2.998E-02)	(2.376E-02)
Number of obs	37	371	83	292

Observations are 5-yr intervals from 1974 through 2009. See appendix A1 for designation of inflation targeting and pegged exchange rate countries. Standard deviations of variables in parentheses.

Table 3
Separated Developed and Emerging Market Economy Samples

	Targeter(OECD)	Non-Targeter(OECD)	Targeter(Non-OECD)	Non-Targeter(Non-OECD)
GDP/Capita	24218.89	20285.25	7272.93	4653.18
	(7780.77)	(9272.99)	(5986.67)	(5372.55)
Average inflation rate	2.19890	8.03737	4.29446	18.97175
	(0.79378)	(12.58097)	(2.44019)	(31.00559)
Std Dev Inflation Rate	1.00237	2.66089	1.89030	11.30243
	(0.40721)	(5.02051)	(1.04096)	(22.70328)
Average |CAP/GDP|	5.0300E-06	3.4700E-06	1.7100E-06	1.0500E-05
	(1.8400E-05)	(9.8500E-06)	(1.2300E-06)	(1.7200E-05)
Std Dev of CAP/GDP	5.4745E-02	3.9817E-02	4.7646E-02	6.3072E-02
	(6.2078E-02)	(2.1509E-02)	(1.3217E-02)	(4.9029E-02)
Average |CA/GDP|	2.0300E-06	2.4300E-06	9.2500E-07	7.7000E-06
	(6.5900E-06)	(7.6600E-06)	(6.3500E-07)	(1.4200E-05)
Std Dev of CA/GDP	2.6358E-02	2.3160E-02	2.5959E-02	4.2475E-02
	(2.2888E-02)	(1.4034E-02)	(1.1732E-02)	(3.1008E-02)
Number of obs	19	119	18	252

Observations are 5-yr intervals from 1974 through 2009. See appendix A1 for designation of inflation targeting and pegged exchange rate countries. Standard deviations of variables in parentheses.

Table 4
Separated Developed and Emerging Market Economy Samples

	Pegger(OECD)	Non-Pegger(OECD)	Pegger(Non-OECD)	Non-Pegger(Non-OECD)
GDP/Capita	22305.00	20305.13	7985.53	4134.15
	(9116.97)	(9159.90)	(8019.26)	(4404.45)
Average inflation rate	3.09331	8.72161	7.23311	20.81661
	(2.58540)	(13.44834)	(9.38263)	(33.18798)
Std Dev Inflation Rate	1.08274	2.91906	5.18214	12.16805
	(1.00581)	(5.36991)	(9.73589)	(24.20121)
Average |CAP/GDP|	1.0300E-06	4.5400E-06	1.6800E-05	7.1700E-06
	(1.6100E-06)	(1.3000E-05)	(2.3100E-05)	(1.3000E-05)
Std Dev of CAP/GDP	4.2818E-02	4.1834E-02	8.1439E-02	5.5005E-02
	(1.7289E-02)	(3.4536E-02)	(6.8627E-02)	(3.5345E-02)
Average |CA/GDP|	9.7700E-07	2.8100E-06	1.0600E-05	5.7100E-06
	(2.3700E-06)	(8.4700E-06)	(1.5000E-05)	(1.2800E-05)
Std Dev of CA/GDP	2.4775E-02	2.3272E-02	4.7563E-02	3.8223E-02
	(1.4962E-02)	(1.5862E-02)	(3.6543E-02)	(2.7277E-02)
Number of obs	36	102	47	190

Observations are 5-yr intervals from 1974 through 2009. See appendix A1 for designation of inflation targeting and pegged exchange rate countries. Standard deviations of variables in parentheses.

Table 5
Capital Account (CAP) Regression Results, 5- Year Intervals

	(1)	(2)	(3)	(4)	(5)
	SD(CAP)	SD(CAP)[1]	IV:SD(CAP)[1]	SD(CAP)[1]	IV:SD(CAP)[1]
IT	-0.018*	-0.005	0.031	-0.004	0.036
	(-1.99)	(-0.46)	(0.80)	(-0.35)	(1.02)
KOPEN				-0.001	-0.000
				(-0.28)	(-0.01)
GPOP				0.636	0.848
				(0.57)	(1.12)
GGDP				0.108	0.041
				(1.14)	(0.39)
R^2	0.137	0.704	0.659	0.703	0.649
N_clust	63	63		63	
N	262	262	262	252	252

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table 6
Current Account (CA) Regression Results, 5-Year Results

	(1)	(2)	(3)	(4)	(5)
	SD(CA)	SD(CA)[1]	IV:SD(CA)[1]	SD(CA)[1]	IV:SD(CA)[1]
IT	-0.017***	-0.007	0.020	-0.006	0.016
	(-3.24)	(-1.34)	(1.02)	(-1.16)	(0.98)
KOPEN				0.000	0.001
				(0.16)	(0.48)
GPOP				0.425	0.542
				(0.64)	(1.25)
GGDP				0.058	0.021
				(0.83)	(0.42)
R^2	0.136	0.779	0.718	0.779	0.737
N_clust	63	63		63	
N	265	265	265	255	255

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table 7
Inflation Targeting and Average Inflation, 5-Year Intervals

	(1) mean(Inf)	(2) mean(Inf)[1]	(3) IV:mean(Inf)[1]	(4) mean(Inf)[1]	(5) IV:mean(Inf)[1]
IT	-6.968***	-3.692	29.099	-6.695	25.019
	(-3.34)	(-0.56)	(0.64)	(-0.99)	(0.55)
KOPEN				-4.172*	-4.258**
				(-1.84)	(-2.57)
GPOP				95.926	36.051
				(0.18)	(0.11)
GGDP				-106.989	-132.294*
				(-1.59)	(-1.89)
R^2	0.072	0.507	0.424	0.506	0.398
N_clust	66	66		66	
N	343	343	343	325	325

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table 8
Inflation Targeting and SD of Inflation, 5-Year Intervals

	(1)	(2)	(3)	(4)	(5)
	SD(Inf)	SD(Inf)[1]	IV:SD(Inf)[1]	SD(Inf)[1]	IV:SD(Inf)[1]
IT	-4.347***	-0.727	10.367	-3.522	10.327
	(-3.17)	(-0.16)	(0.41)	(-0.79)	(0.41)
KOPEN				-2.048	-2.085**
				(-1.46)	(-2.15)
GPOP				48.920	22.772
				(0.14)	(0.11)
GGDP				-85.399	-96.450**
				(-1.60)	(-2.24)
R^2	0.064	0.458	0.439	0.444	0.396
N_clust	66	66		66	
N	343	343	343	325	325

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table 9
OECD Countries, 5-Year Intervals

	(1) SD(CAP)	(2) SD(CAP)[1]	(3) SD(CA)	(4) SD(CA)[1]	(5) Mean(Inf)	(6) Mean(Inf)[1]	(7) SD(Inf)	(8) SD(Inf)[1]
IT	0.008	0.006	0.000	0.004	-2.831	0.462	-0.567	0.903
	(0.54)	(0.30)	(0.08)	(0.62)	(-1.02)	(0.26)	(-0.71)	(0.99)
KOPEN		0.000		0.001		-1.542		-0.106
		(0.03)		(0.25)		(-1.55)		(-0.22)
GPOP		0.011		0.007		379.167***		235.423
		(0.01)		(0.01)		(2.91)		(1.40)
GGDP		0.354		0.120		-91.439		-19.313
		(1.61)		(1.10)		(-0.84)		(-1.49)
R^2	0.089	0.522	0.064	0.683	0.083	0.748	0.072	0.736
N_clust	23	23	23	23	23	23	23	23
N	126	125	127	126	134	129	134	129

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table 10
Non-OECD Countries, 5-Year Intervals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SD(CAP)	SD(CAP)^1	SD(CA)	SD(CA)^1	Mean(Inf)	Mean(Inf)^1	SD(Inf)	SD(Inf)^1
IT	-0.037***	-0.022**	-0.031***	-0.024***	-5.025**	-19.722	-3.249*	-12.287
	(-3.34)	(-2.10)	(-3.68)	(-3.02)	(-2.11)	(-1.44)	(-1.79)	(-1.38)
KOPEN		-0.001		-0.000		-5.901*		-3.498*
		(-0.31)		(-0.08)		(-1.83)		(-1.84)
GPOP		0.472		0.026		-754.092		-589.451
		(0.40)		(0.02)		(-0.80)		(-0.93)
GGDP		-0.028		-0.041		-168.935*		-137.981*
		(-0.22)		(-0.37)		(-1.80)		(-1.81)
R^2	0.187	0.784	0.189	0.809	0.103	0.514	0.098	0.472
N_clust	40	40	40	40	43	43	43	43
N	136	127	138	129	209	196	209	196

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table 11
Results for Exchange Rate Peggers, 5-Year Intervals

	(1) SD(CAP)	(2) SD(CAP)	(3) SD(CA)	(4) SD(CA)	(5) Mean(Inf)	(6) Mean(Inf)	(7) SD(Inf)	(8) SD(Inf)
IT	-0.016*	-0.006	-0.018***	-0.008	-10.360***	-6.954	-6.073***	-3.289
	(-1.97)	(-0.49)	(-3.18)	(-1.41)	(-3.86)	(-1.04)	(-3.44)	(-0.75)
PEG	0.005	-0.007	-0.002	-0.006	-10.866***	-2.386	-5.353***	1.080
	(0.66)	(-0.74)	(-0.31)	(-1.55)	(-4.13)	(-0.64)	(-2.93)	(0.49)
KOPEN		0.000		0.001		-4.016*		-2.150
		(0.06)		(0.56)		(-1.88)		(-1.57)
GPOP		0.799		0.575		148.316		37.747
		(0.67)		(0.83)		(0.27)		(0.10)
GGDP		0.114		0.064		-112.581		-85.784
		(1.18)		(0.89)		(-1.63)		(-1.59)
R^2	0.139	0.704	0.137	0.783	0.103	0.507	0.079	0.444
N_clust	63	63	63	63	66	66	66	66
N	262	252	265	255	341	324	341	324

T statistics in parentheses
OLS estimation with robust start errors clustered by country
p <0.10, ** p<0.05, *** p<0.01

Table 12
Capital and Current Account Regression Results, Cross-Section

	(1) SD(CAP)	(2) SD(CAP)	(3) IV:SD(CAP)	(4) SD(CUR)	(5) SD(CUR)	(6) IV:SD(CUR)
IT	-0.008	0.009	-0.161	-0.020**	-0.010*	-0.013
	(-0.32)	(0.38)	(-0.85)	(-2.40)	(-1.71)	(-0.28)
KOPEN		-0.016	-0.021		-0.004	-0.004
		(-1.17)	(-1.00)		(-1.15)	(-1.10)
GPOP		0.080	1.013		-0.556	-0.540
		(0.08)	(0.51)		(-1.43)	(-1.19)
GGDP		-0.150	-0.177		-0.176	-0.176
		(-0.37)	(-0.33)		(-1.01)	(-1.10)
LPOP		-0.033	-0.031		-0.005	-0.005
		(-1.64)	(-1.08)		(-1.18)	(-1.23)
LGDP		0.002	0.009		-0.011***	-0.011**
		(0.20)	(0.46)		(-2.81)	(-2.48)
R^2	0.002	0.332	.	0.077	0.563	0.562
N	62	62	62	62	62	62

T statistics in parentheses
OLS estimation with robust start errors clustered by country
p <0.10, ** p<0.05, *** p<0.01

Table 13
Mean and SD of Inflation Regression Results, Cross-Section

	(1) Mean(Inf)	(2) Mean(Inf)	(3) IV:Mean(Inf)	(4) SD(Inf)	(5) SD(Inf)	(6) IV:SD(Inf)
IT	-1.257	-1.203	-18.365	-0.849***	-0.720**	-4.097
	(-1.32)	(-1.29)	(-0.57)	(-2.67)	(-2.51)	(-0.56)
KOPEN		-1.223	-1.880		0.024	-0.105
		(-1.54)	(-1.03)		(0.12)	(-0.25)
GPOP		34.242	114.466		35.740**	51.524
		(0.69)	(0.56)		(2.14)	(1.20)
GGDP		-43.077**	-60.580		-21.792***	-25.236**
		(-2.51)	(-1.07)		(-2.84)	(-2.47)
LPOP		1.456**	1.145		0.812***	0.751*
		(2.17)	(0.65)		(3.47)	(1.81)
LGDP		-1.964***	-0.880		-1.028***	-0.814
		(-3.40)	(-0.35)		(-4.83)	(-1.45)
R^2	0.018	0.370	.	0.076	0.423	.
N	67	67	67	67	67	67

T statistics in parentheses
OLS estimation with robust start errors clustered by country
p <0.10, ** p<0.05, *** p<0.01

Table 14
Results for Exchange Rate Peggers, Cross-Section

	(1) SD(CAP)	(2) SD(CAP)	(3) SD(CA)	(4) SD(CA)	(5) Mean(Inf)	(6) Mean(Inf)	(7) SD(Inf)	(8) SD(Inf)
IT	0.001	0.006	-0.022*	-0.017*	-3.884**	-2.462*	-1.349***	-0.822**
	(0.02)	(0.25)	(-1.83)	(-1.90)	(-2.65)	(-1.80)	(-2.96)	(-2.35)
PEG	0.015	-0.005	-0.004	-0.014	-5.374***	-3.023***	-1.061**	-0.354
	(0.77)	(-0.25)	(-0.34)	(-1.16)	(-3.78)	(-2.67)	(-2.20)	(-0.90)
KOPEN		-0.015		-0.002		-0.876		0.071
		(-1.16)		(-0.72)		(-1.20)		(0.38)
GPOP		0.058		-0.613		1.866		30.210*
		(0.05)		(-1.60)		(0.04)		(1.75)
GGDP		-0.140		-0.150		-28.991**		-19.865**
		(-0.35)		(-0.85)		(-2.16)		(-2.60)
LPOP		-0.034		-0.006		0.926		0.728***
		(-1.63)		(-1.45)		(1.35)		(3.08)
LGDP		0.003		-0.010***		-1.468**		-0.956***
		(0.23)		(-2.68)		(-2.42)		(-4.47)
R^2	0.007	0.333	0.079	0.580	0.270	0.430	0.157	0.434
N	62	62	62	62	66	66	66	66

T statistics in parentheses
OLS estimation with robust start errors clustered by country
p <0.10, ** p<0.05, *** p<0.01

Table A1
Inflation Targeting and Exchange Rate Pegging Regimes

Country	Targeter Dates	Pegger Dates
Argentina	None	1985q1-1986q1,1991q1-2002q1
Australia	1993q2-2010q4	1974q1-1975q1
Austria	None	1981q1-2007q4
Belgium	None	1974q1-2007q4
Brazil	1999q3-2010q4	None
Bulgaria	None	1997q1-2007q4
Canada	1991q2-2010q4	None
Chile	1991q1-2010q4	1980q1-1982q1
China	None	1994q1-2007q4
Colombia	1999q3-2010q4	None
Costa Rica	None	1974q1-1981q1
Cyprus	None	1992q1-2007q4
Czech Republic	1998q1-2010q4	None
Denmark	None	1999q1-2007q4
Ecuador	None	1974q1-1982q1,2000q1-2007q4
Estonia	None	1993q1-2007q4
Finland	1993q2-1998q4	1995q1-2007q4
France	None	1987q1-2007q4
Germany	None	1999q1-2007q4
Greece	None	1990q1-2007q4
Hong Kong	None	1984q1-2007q4
Hungary	2001q3-2010q4	None
Iceland	2001q2-2010q4	None
India	None	1974q1-1976q1,1992q1-1996q1
Indonesia	2005q3-2010q4	None
Ireland	None	1974q1-1979q1,1997q1-2007q4
Israel	1992q1-2010q4	None
Italy	None	1997q1-2007q4
Korea	1998q3-2010q4	1974q1-1980q1
Lebanon	None	1993q1-2007q4
Lithuania	None	1995q1-2003q1
Luxembourg	None	1974q1-2007q4
Malaysia	None	1974q1-1976q1,1999q1-2006q1
Malta	None	2001q1-2007q4
Mexico	1999q1-2010q4	1974q1-1981q1,1992q1-1994q1
Netherlands	None	1983q1-2007q4
New Zealand	1990q2-2010q4	None
Norway	2001q2-2010q4	None
Pakistan	None	1974q1-1982q1
Panama	None	1974q1-2007q4
Peru	2002q1-2010q4	None
Philippines	2002q1-2010q4	1996q1-1998q1
Poland	1998q3-2010q4	1990q1-1991q1
Portugal	None	1994q1-2007q4
Romania	2005q4-2010q4	None
Slovakia	2005q1-2010q4	None
Slovenia	None	2004q1-2007q4
South Africa	2000q2-2010q4	None
Spain	1995q1-1998q4	1994q1-2007q4
Sweden	1993q1-2010q4	None
Switzerland	2000q1-2010q4	None
Thailand	2000q3-2010q4	1974q1-1998q1
Turkey	2006q1-2010q4	None
United Kingdom	1992q4-2010q4	1991q1-1993q1
Venezuela	None	1974q1-1983q1

Table A2
Not Truncated Average Inflation Regression Results, 5-Year Intervals

	(1) mean(Inf)	(2) mean(Inf)[1]	(3) IV:mean(Inf)[1]	(4) mean(Inf)[1]	(5) IV:mean(Inf)[1]
IT	-17.730**	18.588	701.559	-0.115	762.625
	(-2.23)	(0.60)	(1.19)	(-0.00)	(1.27)
KOPEN				-21.416	-23.475
				(-1.17)	(-1.20)
GPOP				1787.380	347.324
				(0.85)	(0.11)
GGDP				-226.191	-834.808
				(-0.95)	(-0.97)
R^2	0.030	0.320	.	0.293	.
N_clust	66	66		66	
N	343	343	343	325	325

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table A3
Not Truncated SD of Inflation Regression Results, 5-Year Intervals

	(1) SD(CA)	(2) SD(CA)[1]	(3) IV:SD(CA)[1]	(4) SD(CA)[1]	(5) IV:SD(Current)[1]
IT	-0.017***	-0.006	0.018	-0.006	0.013
	(-2.98)	(-1.18)	(0.92)	(-1.07)	(0.83)
KOPEN				0.000	0.001
				(0.19)	(0.40)
GPOP				0.435	0.522
				(0.65)	(1.23)
GGDP				0.051	0.018
				(0.73)	(0.36)
R^2	0.130	0.799	0.755	0.800	0.772
N_clust	63	63		63	
N	265	265	265	255	255

T statistics in parentheses

OLS estimation with robust start errors clustered by country

All regressions include time fixed effects; [1]include country fixed effects

p <0.10, ** p<0.05, *** p<0.01

Table A4
Capital Account (CAP) Regression Results, 2-Year Intervals

	(1) SD(CAP)	(2) SD(CAP)[1]	(3) IV:SD(CAP)[1]	(4) SD(CAP)[1]	(5) IV:SD(CAP)[1]
IT	-0.016**	-0.005	-0.036	-0.003	-0.037
	(-2.37)	(-0.76)	(-1.17)	(-0.38)	(-1.43)
KOPEN				-0.001	-0.001
				(-0.83)	(-1.03)
GPOP				0.277	0.023
				(0.40)	(0.04)
GGDP				-0.063	-0.025
				(-1.46)	(-0.46)
R^2	0.106	0.588	0.551	0.594	0.552
N_clust	64	64		64	
N	697	697	697	681	681

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table A5
Current Account (CA) Regression Results, 2-Year Intervals

	(1) SD(CA)	(2) SD(CA)[1]	(3) IV:SD(CA)[1]	(4) SD(CA)[1]	(5) IV:SD(CA)[1]
IT	-0.014***	-0.004	-0.018	-0.004	-0.017
	(-2.95)	(-1.03)	(-1.14)	(-0.98)	(-1.23)
KOPEN				-0.001	-0.001
				(-0.69)	(-0.98)
GPOP				-0.005	-0.102
				(-0.02)	(-0.46)
GGDP				-0.027	-0.012
				(-1.12)	(-0.44)
R^2	0.088	0.731	0.708	0.735	0.717
N_clust	64	64		64	
N	706	706	706	690	690

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table A6
Inflation Targeting and Average Inflation, 2-Year Intervals

	(1) mean(Inf)	(2) mean(Inf)[1]	(3) IV:mean(Inf)[1]	(4) mean(Inf)[1]	(5) IV:mean(Inf)[1]
IT	-6.946***	-8.192	35.591	-9.209	34.631
	(-3.41)	(-1.45)	(0.86)	(-1.63)	(0.86)
KOPEN				-5.118***	-5.649***
				(-3.49)	(-4.14)
GPOP				80.170	99.084
				(0.29)	(0.52)
GGDP				-155.938***	-182.499***
				(-2.92)	(-3.29)
R^2	0.064	0.370	0.249	0.419	0.264
N_clust	66	66		66	
N	949	949	949	909	909

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table A7
Inflation Targeting and SD Inflation, 2-Year Intervals

	(1)	(2)	(3)	(4)	(5)
	SD(Inf)	SD(Inf)^1	IV:SD(Inf)^1	SD(Inf)^1	IV:SD(Inf)^1
IT	-2.359***	-1.877	4.405	-1.815	2.658
	(-3.22)	(-1.07)	(0.46)	(-1.04)	(0.26)
KOPEN				-1.317***	-1.371***
				(-2.74)	(-3.50)
GPOP				96.895	98.825**
				(1.21)	(2.04)
GGDP				-52.360**	-55.070***
				(-2.18)	(-3.05)
R^2	0.037	0.295	0.278	0.354	0.343
N_clust	66	66		66	
N	949	949	949	909	909

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table A8
OECD Countries, 2-Year Intervals

	(1) SD(CAP)	(2) SD(CAP)[1]	(3) SD(CA)	(4) SD(CA)[1]	(5) Mean(Inf)	(6) Mean(Inf)[1]	(7) SD(Inf)	(8) SD(Inf)[1]
IT	0.006	0.007	0.001	0.005	-3.092	-2.195	-0.335	0.022
	(0.62)	(0.51)	(0.22)	(1.22)	(-1.09)	(-1.57)	(-0.58)	(0.07)
KOPEN		-0.001		-0.000		-1.831***		-0.188
		(-0.24)		(-0.45)		(-3.02)		(-0.85)
GPOP		0.494		-0.053		290.098**		86.824*
		(0.41)		(-0.14)		(2.76)		(2.05)
GGDP		0.018		-0.003		-63.142		-13.815***
		(0.17)		(-0.07)		(-1.27)		(-3.64)
R^2	0.100	0.468	0.044	0.660	0.110	0.726	0.052	0.509
N_clust	23	23	23	23	23	23	23	23
N	339	336	342	339	376	362	376	362

T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table A9
Non-OECD Countries, 2-Year Intervals

	(1) SD(CAP)	(2) SD(CAP)[1]	(3) SD(CA)	(4) SD(CA)[1]	(5) Mean(Inf)	(6) Mean(Inf)[1]	(7) SD(Inf)	(8) SD(Inf)[1]
IT	-0.034***	-0.014***	-0.024***	-0.014**	-4.807**	-17.785*	-1.682**	-3.525
	(-3.43)	(-2.82)	(-3.41)	(-2.62)	(-2.05)	(-1.81)	(-2.08)	(-1.08)
KOPEN		-0.002		-0.001		-6.785***		-2.068***
		(-0.92)		(-0.56)		(-2.83)		(-2.78)
GPOP		-0.257		-0.356		-380.760		-46.086
		(-0.78)		(-0.65)		(-0.84)		(-0.38)
GGDP		-0.101*		-0.031		-198.117***		-64.355**
		(-1.92)		(-0.94)		(-2.86)		(-2.11)
R^2	0.136	0.635	0.123	0.744	0.096	0.424	0.054	0.352
N_clust	41	41	41	41	43	43	43	43
N	358	345	364	351	573	547	573	547

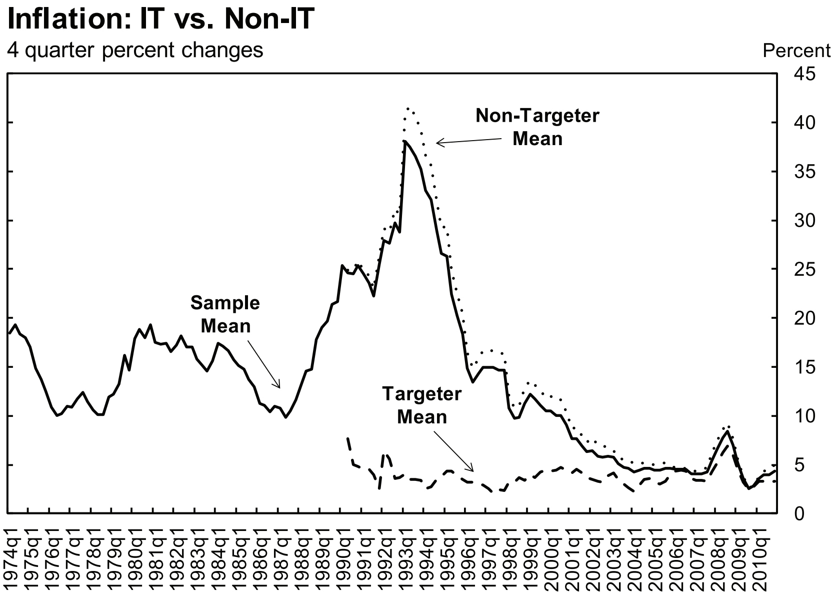
T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Table A10
Results for Exchange Rate Peggers, 2-Year Intervals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SD(CAP)	SD(CAP)	SD(CA)	SD(CA)	Mean(Inf)	Mean(Inf)	SD(Inf)	SD(Inf)
IT	-0.014**	-0.003	-0.014***	-0.004	-10.726***	-9.518*	-3.357***	-1.602
	(-2.33)	(-0.36)	(-2.73)	(-1.09)	(-4.04)	(-1.73)	(-3.47)	(-0.94)
PEG	0.006	0.001	-0.001	-0.000	-10.346***	-2.214	-2.597***	0.722
	(0.98)	(0.19)	(-0.31)	(-0.21)	(-3.98)	(-0.59)	(-2.68)	(0.45)
KOPEN		-0.001		-0.001		-4.935***		-1.390***
		(-0.75)		(-0.64)		(-3.29)		(-2.69)
GPOP		0.263		0.001		123.514		92.836
		(0.37)		(0.00)		(0.43)		(1.13)
GGDP		-0.064		-0.026		-157.530***		-52.738**
		(-1.44)		(-1.11)		(-2.95)		(-2.19)
R^2	0.110	0.594	0.088	0.735	0.085	0.421	0.046	0.355
N_clust	64	64	64	64	66	66	66	66
N	696	681	705	690	942	906	942	906

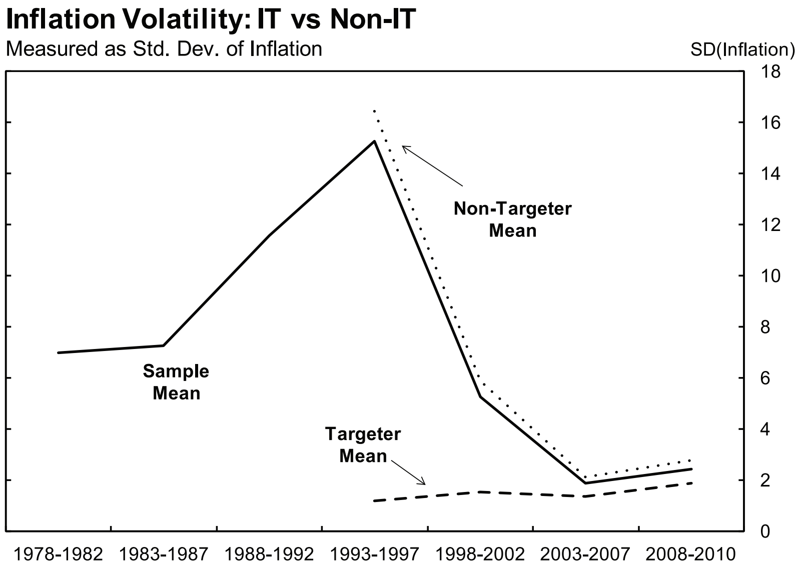
T statistics in parentheses
OLS estimation with robust start errors clustered by country
All regressions include time fixed effects; [1]include country fixed effects
p <0.10, ** p<0.05, *** p<0.01

Figure 1



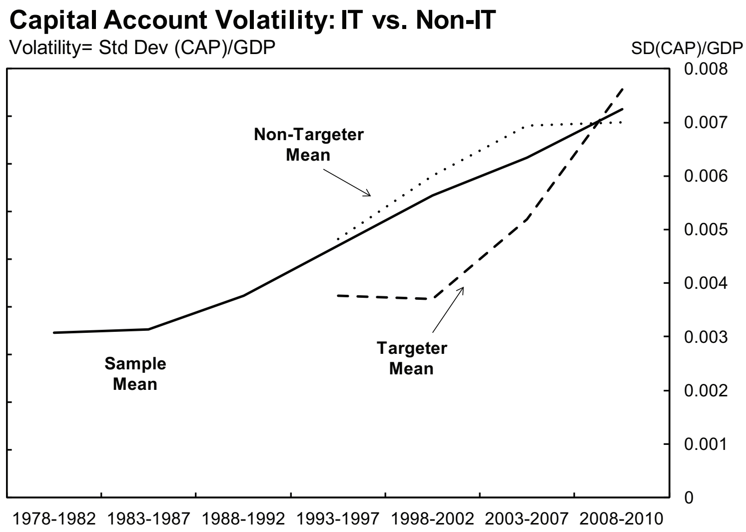
Sources: IFS, WDI, Rose (2007)

Figure 2



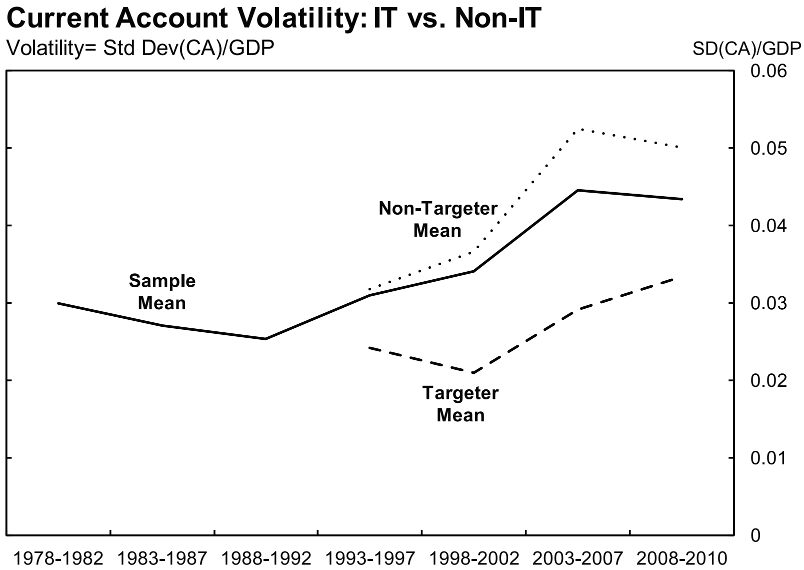
Sources: IFS, WDI, Rose (2007)

Figure 3



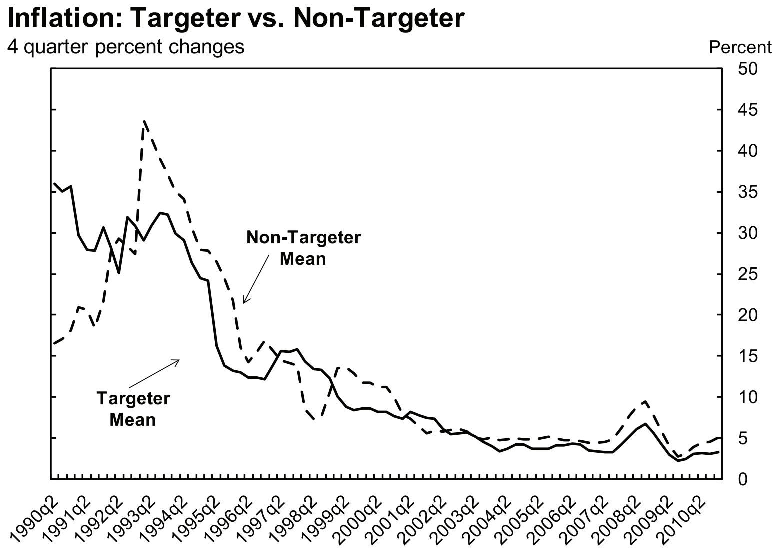
Sources: IFS, WDI, Rose (2007)

Figure 4



Sources: IFS, WDI, Rose (2007)

Figure 5



Sources: IFS, WDI, Rose (2007)

*Time series of inflation targeting among group of countries that ever adopted inflation targeting in our sample vs those that did not.

Chapter 5

EPISODES OF LARGE EXCHANGE RATE APPRECIATIONS AND RESERVES ACCUMULATIONS IN SELECTED ASIAN ECONOMIES: IS *FEAR OF APPRECIATION* JUSTIFIED?

By
Victor Pontines and Reza Siregar[1]

1. Introduction

The real potential consequences of exchange rate appreciations remain one of the perennial macroeconomic policy debates. The recent sub-prime financial crisis has, in fact, done very little to put the debate to rest. If anything, the recent crisis has intensified the deliberations further. Moreover, the return of massive capital flows to emerging markets, including East and Southeast Asia, especially since middle 2010, has created mayhem and is posing policy dilemmas for the management of monetary and exchange rate policies, in particular, and macroeconomic policies, in general. While the effects of a strong currency are lamentable for exporters, many view potential benefits to the macroeconomic outlook from currency appreciations.

In this regard, one of the two key objectives of our paper is to provide an empirical platform to the debate on macroeconomic consequences of large currency appreciations. Observing the experiences of six major Asian economies (the ASEAN-5 (Indonesia, Malaysia, Philippines, Thailand and Singapore) and Korea) during the past two decades, the primary aim of our study is to ascertain the consequences of strong currencies on a set of vital macroeconomic indicators, namely, exports, growth and price. While the former assesses the consequences of actually allowing the domestic currency to appreciate, we also at the same time ascertain the macroeconomic outcomes on the same set of macroeconomic variables of those instances wherein the monetary authorities of these same

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economies repel supposed appreciation pressures. We believe that in order to render a complete diagnosis of what can be considered as the costs and benefits of currency appreciations, gauging the macroeconomic outcomes not only of actual appreciations, but as well as of appreciation pressures that did not transpire due to heavy reserves purchases by the monetary authorities is the natural and logical strategy to undertake as far as this contentious issue is concerned. This is of great relevance to the economies examined in this paper as all of them in recent times have engaged in heavy reserves accumulation. Once we have evaluated the results emanating from these two separate objectives, we would like to deal with the question of whether we can justify the supposed fear of appreciation phenomenon among the policy makers of these Asian economies.

In an attempt to contribute further to what has been done in the past, we employ a more structured set of sequential steps to address the aforementioned policy issues. The structure of the paper is as follows: a brief literature survey on the debates will be presented in Section 2. In Section 3, we employ a regime-switching model to take account of possible asymmetry in exchange rate behaviour and policy stance. Monetary authorities can asymmetrically manage their exchange rates wherein they can allow for some currency depreciation while substantially limiting the extent of currency appreciation. For lack of better alternatives, this exchange rate intervention behaviour has been coined by Levy Yeyati and Sturzenegger (2007) as 'fear of floating in reverse' or 'fear of appreciation'.

In Section 4, we will identify the periods or episodes of significant exchange rate appreciation pressures experienced by these six economies. Note here that we do not focus on just any periods in which appreciation did take place. Rather, we will focus on the periods of significantly large appreciations and extreme appreciation pressures. As emphasised above, since monetary authorities of these economies have been known to actively intervene and manage the movements of their currencies, we will also carefully observe the rates of reserve accumulation as a proxy for foreign exchange market intervention. The proper dating of these events or episodes is critical and must be carried out systematically to prevent misclassification of episodes of significantly large exchange rate appreciation and to ensure consistency of the subsequent analyses of those events. In this Section, a firm definition and measurement of extreme appreciation pressures on exchange rate will be introduced and estimated.

Having identified and isolated dates of extreme currency appreciation and pressure, the next sequential step is to assign dummy variables to them and estimate their impacts on the macroeconomic indicators of exports, growth and price. Based on the estimation results of a simple autoregressive distributed lag

model and the subsequent impulse response functions, concrete analyses on the impacts of strong currencies as well as of large reserves purchases on these key domestic macroeconomic indicators will be drawn in Section 5 of the paper. A brief concluding section ends the paper.

2. Literature Review

This paper touches on a broad range of relevant and topical issues that have pre-occupied the interests of policymakers and academics alike. For one, by examining the effect of large currency appreciations on exports, we deal, in an alternative fashion, with the heated and ongoing debate on whether large exchange rate movements affect trade and current account balances. For instance, a number of studies have verified this issue according to the validity of the so-called "elasticity pessimism" and studies such as Hooper et al (2000), Chinn (2004) and Chinn and Lee (2009) have found export and import elasticities that are relatively low.[2] Likewise, evidence emanating from new open economy models found limited short-run responsiveness of the current account to exchange rate changes (Goldberg and Knetter, 1997; Devereux and Engel, 2003).

This contentious topic of the supposed impact of exchange rate changes on the current account is all the more relevant as it is directly linked with the global rebalancing issue, in particular, the question of the materialisation of a possible Chinese renminbi appreciation in reducing the large Chinese current account surplus. The evidence in this emerging strand of literature has so far been mixed. For example, Kwack et al (2007), Marquez and Schindler (2007), Cheung et al (2010) and Thorbecke and Smith (2010) have found Chinese trade elasticities that are quite small, whereas Ahmed (2009) and Cline (2010) have found opposite results.

The paper also ascertains the impact of large currency appreciations on economic growth and as such, follows the considerable literature that investigates the growth effects of exchange rate changes. However, a distinctive feature of our line of inquiry is that previous literature on this area has only mainly focused on two fronts. One large body of literature dealt with the reverse question to ours on the growth effects of depreciation episodes[3] while a second related

2. In other words, the so-called Marshall-Lerner condition is not fulfilled, and should be interpreted as changes in real exchange rates does not immediately affect the current account. A contrasting view, however, is put forward by Obstfeld (2002).

3. On this strand of literature, see for instance, Hong and Tornell (2005), Gupta et al (2007), Cerra and Saxena (2008), Bussiere et al (2010) and IMF (2010).

literature has focused on the growth ramifications of any departures of the real exchange rate from a certain equilibrium rate. This so-called "misalignment view" of the nexus between the real exchange rate and economic growth hinges on the idea that the promotion of an undervalued currency brings forth several manifestations of positive externalities to the domestic economy in terms of technology transfers and learning-by-doing (Eichengreen, 2008; Aizenman and Lee, 2008) as well as improvement in welfare that comes from investments in the tradable sector (Korinek and Serven, 2010). The latter implication of an undervalued currency is closely intertwined with the export-promotion cum growth strategy that is alleged to underpin the development strategies in most parts of Asia in recent times.

Finally, the paper also investigates the inflation consequences of large exchange rate appreciations and this is in line with the already theoretically established existence of a relationship between the real exchange rate and the inflation rate.[4] Widely referred to in the empirical literature as the "the pass-through" of exchange rate changes to inflation, the bulk of the literature has determined the extent of the responsiveness of inflation to the real exchange rate and the evidence suggest the clear role of the real exchange rate along with some other macroeconomic variables in the inflation process.[5] On the other hand, a separate strand of literature has also lately taken notice of the decline in exchange rate pass-through in the last two decades, both for developed and developing countries.[6]

3. Fear of Appreciation

A current understated nuanced of the seeming move to allowing some greater flexibility in exchange rates is that under various reasons it is possible that the degree of flexibility is significantly higher on one side of the market.[7] In other words, the monetary authorities in the six Asian economies examined in this paper can asymmetrically manage their exchange rates wherein they can allow for some currency depreciation while substantially limiting the extent of currency appreciation. This exchange rate intervention behaviour has been coined by Levy Yeyati and Sturzenegger (2007) as 'fear of floating in reverse' or 'fear of

4. See, for instance, Montiel and Ostry (1991) and Calvo et al (1995) as examples of these theoretical studies.
5. See, for instance, Kamin and Klau (2003).
6. See, for instance, Ihrig et al (2006) and Frankel et al (2004).
7. See, for instance, Stigler et al (2009) for this various set of plausible reasons.

appreciation. In accordance, the first important task of the paper is to verify evidences of asymmetrical exchange rate behaviour, that is, the presence, if any, of fear of appreciation on the part of the six monetary authorities.

We conduct our estimation using weekly data and divide the estimation into three distinct periods: pre-GFC period (January 2000-December 2006), GFC crisis period (January 2007-July 2009) and post-GFC period (August 2009-March 2011). All nominal exchange rate (domestic currency per US$) data for these countries are obtained from the Pacific Exchange Rate Service (http://fx.sauder.ubc.ca). The rationale for the choice of the three distinct periods are based on the view that the bulk of reserves accumulation occurred during the pre-GFC period as evidenced from official reserves data and numerous academic studies; the period of the GFC crisis captures the massive volatilities experienced by the countries examined that consequently led to the drawdown or de-cumulation of reserves by these countries. The post-GFC period corresponds to the several months after the collapse of Lehman Brothers and is in agreement with official announcements and publications by international multilateral institutions of a global economic recovery that is underway.

In order for this paper to capture asymmetry in exchange rate behaviour, we employ a class of a regime-switching model known as the smooth transition autoregressive model (STAR) and in particular a certain type of regime switching model known as the LSTR2 model. This model allows one to explicitly measure the thresholds on both sides of the market, i.e., appreciation and depreciation thresholds. This is nothing but a logical method to capture this form of exchange rate behaviour. A brief discussion on the underlying mechanics of the LSTR2 model is provided in Appendix A.[8] Appendix B presents the estimation results for the three respective periods as well as the diagnostic results for these estimated models.

We now examine our main focus of interest, the lower or appreciation threshold (c_L) and upper or depreciation thresholds (c_H) from the fitted LSTR2 models which are presented in Table 1.[9] This table is divided into three panels

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8. In general, the construction of STAR models follows the same steps as in the ARIMA-Box-Jenkins modeling approach, wherein the modeling cycle consists of model specification, parameter estimation, and diagnostic evaluation.

9. It should be noted at this point that since the nominal exchange rate is defined in this paper as the local currency with respect to the USD, the lower (c_L) threshold parameter corresponds to the central bank's tolerance for allowing appreciation (appreciation threshold), whereas the upper (c_H) threshold parameter corresponds to the central bank's tolerance for allowing a depreciation (depreciation threshold) of its local currency with respect to the USD.

— the upper panel contains the estimated lower and upper thresholds for the pre-GFC period, the middle panel reports the lower and upper thresholds for the GFC period, while the lower panel contains the lower and upper thresholds for the post-GFC period. Turning first to the estimated lower and upper thresholds for the pre-GFC period, these are at 1.34 percent and 3.83 percent, respectively, for the Indonesian rupiah; 1.49 percent and 2.12 percent for the Korean won; -1.80 percent and 3.88 percent for the Philippine peso; -0.39 and 0.71 for the Singapore dollar, and -0.07 percent and 1.90 percent for the Thailand baht. This shows that in all of the five East Asian currencies, the upper threshold, c_H is larger than the (absolute value of the) lower threshold, c_L, indicating a lower threshold tolerance or aversion of the monetary authorities in these countries to currency appreciations against the US$.

However, according to our findings, this phenomenon of fear of appreciation all but disappeared during the height of our chosen period for the GFC. Understandably, the preference of the monetary authorities of the said countries is to avoid a freefall in the value of their currencies and as such, would adopt the typical strategy during a financial turmoil of resisting or leaning against the significant selling pressures that are brought on to bear on these currencies by the international financial markets. In light of the proposed testing strategy laid out in this paper, this is either interpreted as significantly negative lower and upper thresholds or a significantly negative lower threshold but with an insignificant upper threshold.[10] As reported in the middle panel of Table 1, the former applies to the cases of the Philippine peso, Singapore dollar and the Thailand baht vis-à-vis the US dollar. Whereas, the latter applies to the cases of the Indonesian rupiah and Korean won vis-à-vis the US dollar.

More interestingly, once this tumultuous period of the GFC subsided, can we find a re-appearance of the behaviour akin to the pre-GFC period of fear or aversion to currency appreciations? There are indications that the global financial crisis had only briefly and temporarily interrupted this behaviour and as such, this phenomenon may have again reasserted itself on the part of the monetary authorities in these countries. To varying degrees, all five countries

10. Both cases are the expected results and this is reasonably logical since in any crisis situation, the preference of a monetary authority is to mitigate or alleviate the pressure of its currency depreciating or sliding in a freefall such that both threshold parameters (c_L and c_H) must either be significantly negative (indicating its preference for its currency to strengthen) or, to a lesser extent, significantly negative lower threshold but with an insignificant upper threshold (again to indicate that it is willing to accept a much stronger currency in a crisis situation, while averting the possibility of a free-fall in the value of its own currency).

show a revealed preference for limiting the extent of strengthening of their currencies against the US dollar (0.44 percent and 1.31 percent, respectively, for the Indonesian rupiah; -1.60 percent and 3.09 percent for the Korean won; 0.22 percent and 2.12 percent for the Philippine peso; 0.10 percent and 0.24 percent for the Singapore dollar, and -0.70 percent and 0.87 percent for the Thailand baht).

In other words, it is only understandable that after experiencing a tumultuous period that was punctuated by sharp and volatile movements in their exchange rates, it is of necessity that these countries slow the pace of the depreciations of their currencies vis-à-vis the US dollar, while at the same time, retain their preference to restrain the strengthening of their currencies against the US dollar. For instance, when compared to their respective pre-GFC behaviour, we observed that this analysis applies in the cases of the Indonesian rupiah, Singapore dollar and the Thailand baht. In the case of the Korean won, however, which can be depicted as being the most affected amongst the five Asian currencies in the group during the outbreak of the global financial crisis, we can observe some loosening in their restraint to the appreciation of their currency against the US dollar after the GFC, which is in marked contrast to the outcome found during the pre-GFC period.

4. Identifying Large Appreciation and Intervention Episodes

4.1 Large Appreciation Episodes

In identifying large appreciation episodes, we work with monthly real effective exchange rates data obtained from the Bank for International Statistics (BIS) website (http://www.bis.org/statistics/eer/index.htm) for the period of January 1994 to January 2011 for the six Asian countries. The question that arises at the onset is how to establish a threshold that will define the "largeness" of the appreciation episode. In typical studies of currency crises episodes, a large value of a certain index of exchange market pressure (EMP) is indicative of a currency crisis episode. A large value is then usually defined once values of this index exceed its mean by 1.5 or 3 standard deviations. For instance, Eichengreen et al (1996) set a threshold of 1.5 standard deviations above the mean of the entire panel index, and thus a crisis is deemed to occur once the value of this full panel index exceeds this cutoff point. Kaminsky and Reinhart (2000), on the other hand, set a threshold of 3 standard deviations above the mean of the respective country's index. In terms of our foregoing objective of defining instead the "largeness" of an appreciation episode, we can adopt a recent definition of a large appreciation event by Kappler et al (2011) as comprising a 10 percent (or

larger) appreciation of the nominal effective exchange rate over a two a two-year window (or less) which leads to sustained real effective appreciation.

The main problem, however, with the above designations of "largeness" is that they are arbitrary and lack the theoretical justification of setting a cutoff point or threshold either for a large EMP index or a large appreciation event. This paper dispenses with this problem by deviating from the conventional yet arbitrary approach of defining a large appreciation episode by employing an alternative and objective approach. This paper uses instead the extreme value theory (EVT) to identify large appreciation episodes.[11] The main rationale for its use here is that the tail of the distribution of changes in the exchange rate, in particular, the right-tail observations of the changes in exchange rate represent the outliers or, simply, the extreme or large exchange rate appreciations. To be more specific, the EVT works by exploiting the information in the tails of the distribution by locating the threshold that separates the normal values of the changes in exchange rates (corresponding to the normal periods) from that of the extreme or large values (corresponding to the large or extreme appreciation episodes) but without the need to set an arbitrary cutoff or threshold value for the changes in exchange rates. A brief discussion on the underlying mechanics of the EVT is provided in Appendix C.

Figure 1 shows the logarithmic changes in the real effective exchange rate data of the six Asian countries. We have drawn vertical lines for those dates wherein large appreciation episodes were identified using the EVT. From these graphs, once we omit those large appreciation episodes that coincide with the Asian financial crisis years of 1997-98 as well as the recent global financial crisis years of 2008-2009 in order to avoid large appreciations that are preceded by large devaluations, it appears that while these episodes were felt at various times, a consistent pattern emerges as can be observed from Figure 1. One can arguably claim that there are three "great" and "major" events of large exchange rate appreciations in the past two decades for these countries, viz., the period between the early 1990s and prior to the abrupt interruption by the 1997-98 Asian financial crisis; the period between the early 2000s and prior to the 2008-2009 global financial crisis; and, intermittently, for some of these countries, the most recent months at the time of writing of this paper.

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11. The EVT has also found its application and use in the identification of currency crisis episodes via the papers of Pozo and Dorantes (2003), Pontines and Siregar (2007, 2008), Lestano and Jacobs (2007).

4.2 Large Intervention Episodes

Given the lack of official intervention data on these six Asian countries, we work with movements in central bank reserves to capture as closely as possible interventions in the exchange markets. In essence, the identification of large intervention episodes undertaken in this section is the mirror-image of the large appreciation episodes conducted in the previous section. That is, in order to moderate or repel supposedly large appreciation movements in the exchange rate, the central bank's action in the foreign exchange market should dictate it to purchase foreign currency as it would be the norm under a "leaning against the wind" strategy. Thus, we work with positive movements in reserves to identify large intervention purchases or reserves accumulation episodes. In employing the extreme value theory (EVT) to identify the large reserves purchases, we also work with the right-tail observations of the changes in reserves as this would constitute the outliers that represent the extreme or large reserves purchases to ward off actual appreciation movements in the exchange rate.

Figure 2 shows the logarithmic changes in international reserves data of the six Asian countries. Just as we did for the previous figure, we have also drawn vertical lines for those episodes where large reserves purchases were identified using the EVT. By also omitting those large reserves purchase episodes that coincide with the Asian financial crisis years of 1997-98 as well as the recent global financial crisis years of 2008-2009 to avoid large reserve purchases that are preceded by large reserves draw-downs, these graphs depict a particularly striking consistency that contrast with Figure 1. On the one hand, on a mirror-image perspective with respect to the one readily observed in Figure 1, three "great" waves of large reserves purchases in the past two decades are accounted for these countries that correspond to the ones emphasised in Figure 1, viz., the early 1990s; the early 2000s; and, the most recent months post-GFC. In contrast however to episodes in which large appreciation episodes are allowed, large reserves purchases are more frequent and persistent for this group of countries except perhaps with the lesser exception of Thailand.

5. Empirics

5.1 Methodology

To formally test the impact of large appreciation episodes that we have identified in the previous section on certain macroeconomic indicators, namely, exports, growth and price, we employ a simple test that was originally introduced by Romer and Romer (1989) to determine the statistical relationship in a time-

series context between monetary shocks that they have identified for the case of the United States and movements in real output. A more recent application of their simple time-series based test, also undertaken by Romer and Romer (2010), examines the macroeconomic effects of tax changes in the United States. This simple test was extended and applied in a panel context recently by Cerra and Saxena (2008) and Bussiere et al (2010) to study the macroeconomic effects of large devaluations. A more recent paper closer to ours in terms of the research questions posed but follows the testing undertaken by the two latter papers in a panel context is by Kappler et al (2011).

For this paper we determine how large appreciation episodes as well as large intervention episodes in the form of reserves purchases affect exports, growth and prices of six Asian countries by following the methodology pioneered by Romer and Romer (1989, 2010) in a time-series context. Having identified separately the large appreciation and intervention episodes, we create dummy variables that are equal to one in each of the months for which we identified such large episodes for both appreciations and intervention and zero in all other months. We then include current and lagged values of either the dummy variable for large appreciations or the dummy variable for large reserves purchases episodes in the following actual equation that is estimated as:

$$y_t = \beta_0 + \sum_{j=1}^{24} \beta_j y_{t-j} + \sum_{k=0}^{24} \beta_k D_{t-k} \tag{1}$$

where y is either the monthly change in log of exports, monthly change in log of output (output is measured by industrial production) or the monthly change in log price. D is either the dummy variable for large appreciation episodes or for large reserves purchases episodes. The regressions are run over the period of January 1994 to January 2011.

5.2 Empirical Results

A simple but natural way to summarise the response of our chosen macroeconomic indicators to either large appreciations or large reserves purchases episodes is to examine the impulse response function implied by our estimating equation as this should provide some horizon to an estimate of the total effect of such large episodes. The graphs that then follow depict the respective effects of a unit shock to the dummy variable (D) on large exchange

rate appreciations (left-panel diagrams) as well as the effect of a unit shock to the dummy variable on large reserves purchases (right-panel diagrams) to each of our chosen macroeconomic indicators.

5.2.1 Exports

The 24-months impulse response functions for the change in log of exports are given in Figure 3. As earlier noted, the effect on exports of a unit shock to the dummy variable (*D*) on large exchange rate appreciations are presented in the left-hand panel of each diagram while the effect on exports of a unit shock to the dummy variable on large reserves purchases are presented in the right-hand panel. Each figure also shows the two standard error bands for the impulse response functions.

After a unit-shock to the dummy variable on large exchange rate appreciations, the subsequent movements in exports are often small and irregular in the cases of Indonesia, Korea, and Thailand. The impulse response functions for Malaysia and Singapore show little effect on exports of a unit shock to the dummy variable on large exchange rate appreciations for the first several months. However, exports show an increasing (decreasing) response in Malaysia (Singapore) at the end of the first year and reach a plateau (trough) sometime after 19 months. The impulse response function for the Philippines show a negative effect on exports of a unit shock to this same dummy variable, however, and the wide confidence bands suggest that these effects are insignificant in statistical terms.

The responses of exports after a unit-shock to the dummy variable on large reserves purchases are consistently positive in the cases of Indonesia, Korea, and Singapore. Furthermore, the maximum effect of a rise in exports of around 10 percent, 6 percent and 15 percent are estimated for Indonesia, Korea and Singapore, in that respective order, and these maximum effects are felt after 20 months ($t = 2.02$), 18 months ($t = 1.90$) and 12 months ($t = 3.22$) also in that same respective order for these three countries. Meanwhile, the subsequent movements in response of exports after a unit shock to the dummy variable on large reserves purchases are irregular in the cases of Malaysia and the Philippines. However, for almost the entirety of the 24-months the impulse responses are positively signed. The maximum effect are estimated to be at around 5 percent and occurs after 19 months ($t = 2.78$) in the case of Malaysia, whereas it is estimated at around 10 percent in the case of the Philippines and this is felt after 8 months ($t = 1.80$). The maximum response of exports to a unit-shock in the dummy variable on large reserves purchases in the case of Thailand is

felt quite immediately (only after 2 months) and this peak response (at round 7 percent) is also significant (t = 1.89).

5.2.2 Growth

Does the response of exports to a one-unit shock in our respective dummies for large appreciations and large reserves purchases episodes bear some resemblance to the subsequent responses of output growth to similar unit-shocks in these dummies? The results paint an interesting picture. The impulse responses of growth to a unit-shock in the dummy variable for large appreciations in the case of Indonesia are quite irregular but for the most part the impulse responses are significantly negative. A more telling picture of the depressing effect of large appreciations on growth is provided by the results for Singapore as well as for the Philippines wherein for the latter large appreciations tend to have a sizeable, sustained and negative impact. These results are in contrast, however, to those obtained for Korea, Malaysia and more so with Thailand wherein the results reveal either few dynamics in the impulse responses or are statistically insignificant.

With regards to the response of growth to large reserves purchases, the results are quite uneven. On the one hand, the impulse responses obtained for Indonesia, Korea, Singapore and Philippines are small and insignificant, whereas the impulse responses obtained in the cases of Malaysia and Thailand reveal a positive and significant impact of reserves accumulation on growth.

5.2.3 Price

The reaction of the logarithmic changes in price to a unit-shock in the dummy for large appreciations is either a case of a negative reaction as in the cases of Indonesia, Korea, and Malaysia or impulse responses that reveal few dynamics or small changes (Philippines and Thailand). However, the wide confidence intervals imply that these noted reactions are insignificant in statistical terms. The only exception is the case of Singapore where there is a clear sustained rise in inflation. This effect is significant and the total impact of large appreciations after 24 months is that inflation in Singapore is about 2.1 percentage points higher than it otherwise would have been.

The response of the logarithmic changes in price to a unit-shock in the dummy for large reserves purchases is a study in contrast for the six Asian countries. While the impulse responses for Malaysia, Philippines and Thailand are statistically insignificant in view of the wide confidence intervals, there is

a noted significant decline in inflation in the case of Korea throughout the 24 months while Indonesia also experienced a significant drop in inflation for the first sixteen months but rose thereafter. On the other hand, in the case of Singapore dollar, the total impact of large reserves accumulation after 24 months on inflation is also positive, albeit about 1 percentage lower than that of allowing the Singapore dollar to actually rise.

6. Brief Concluding Analyses and Remarks

From the evidences that large appreciation of domestic currencies had only limited undesirable consequences on exports of all six economies, on growth rates of only three (Indonesia, Philippines and Singapore) out of six economies, and limited pass-through benefits on the domestic price, one may be tempted to immediately presume that the "fear of appreciation" policy stance pursued by selected Asian economies during the past decades cannot be warranted. However our study demonstrates that the justification for fear of appreciation phenomena cannot and should not be assessed only from the perspectives of episodes of large appreciations. Rather, one should arguably consider the benefit (or the cost) of pursuing extensive foreign exchange interventions to smooth the appreciation of domestic currency. In fact, hardly any study that we are aware of, has systematically ascertained the consequences of strong currencies from both positions of realised large appreciation against those of smoothed appreciation via foreign exchange rate intervention.

With intervention via reserves accumulation to smooth the strengthening of domestic currencies, export performances have improved across the economies under consideration, particularly for Indonesia, Korea and Singapore. The benefits of intervention measures on growth, however, were less significant and limited only to two economies (Malaysia and Thailand). Furthermore, reserves intervention has also significantly contained domestic inflation only in two (Korea and Indonesia) out of the six economies.

In summary, we find generally weak evidences of adverse consequences of large exchange rate appreciation on exports, growth and price variables on this group of major Asian economies. Moreover, the test results demonstrate that the benefits of foreign exchange intervention via reserves accumulation vary for the six economies. In the cases of Indonesia and Korea, intervention strategy had desirable consequences on exports and price indicators. As for the other economies, only exports benefited from the intervention measure. Hence, we conclude that the benefit of fear of appreciation policy cannot be completely dismissed. Yet, the gain may arguably be too limited, via the trade channel only,

to warrant or justify the cost of asymmetrical exchange rate policy stance, such as quasi-fiscal cost and other possible distortions. Certainly, more testing on other key indicators should be conducted to ensure the robustness of our empirical results. Future researches may also want to consider different empirical approaches and imposing some control variables in the estimating equation, such as economic openness and the stage of economic development.

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Table 1
Threshold Values (in percent)

	Lower threshold (c_L)	Upper Threshold (c_H)
	Pre-GFC period, January 2000 – December 2006	
Indonesia rupiah	1.34 (0.01)***	3.83 (0.28)***
Korea won	1.49 (0.04)***	2.12 (0.08)***
Philippine peso	-1.80 (0.18)***	3.88 (0.03)***
Singapore dollar	-0.39 (0.11)***	0.71 (0.13)***
Thailand baht	-0.07 (0.01)***	1.90 (0.08)***
	GFC period, January 2007 – July 2009	
Indonesia rupiah	-0.78 (0.02)***	0.88 (6.9)
Korea won	-0.37 (0.02)***	1.61 (1.20)
Philippine peso	-2.57 (0.06)***	-1.58 (0.05)***
Singapore dollar	-2.07 (0.17)***	-1.11 (4.15)
Thailand baht	-3.02 (0.23)***	-1.25 (0.16)***
	Post-GFC period, August 2009-March 2011	
Indonesia rupiah	0.44 (0.06)***	1.31 (0.23)***
Korea won	-1.60 (0.09)***	3.09 (0.07)***
Philippine peso	0.22 (0.05)**	2.12 (0.13)***
Singapore dollar	0.10 (0.01)***	0.24 (0.01)***
Thailand baht	-0.69 (0.10)***	0.87 (0.02)***

Numbers in parentheses are standard errors.
Significance levels: *10%, **5%, ***1%.

Figure 1
Logarithmic Changes in Real Effective Exchange Rate (REER) in six Asian Countries, January 1994 – January 2011

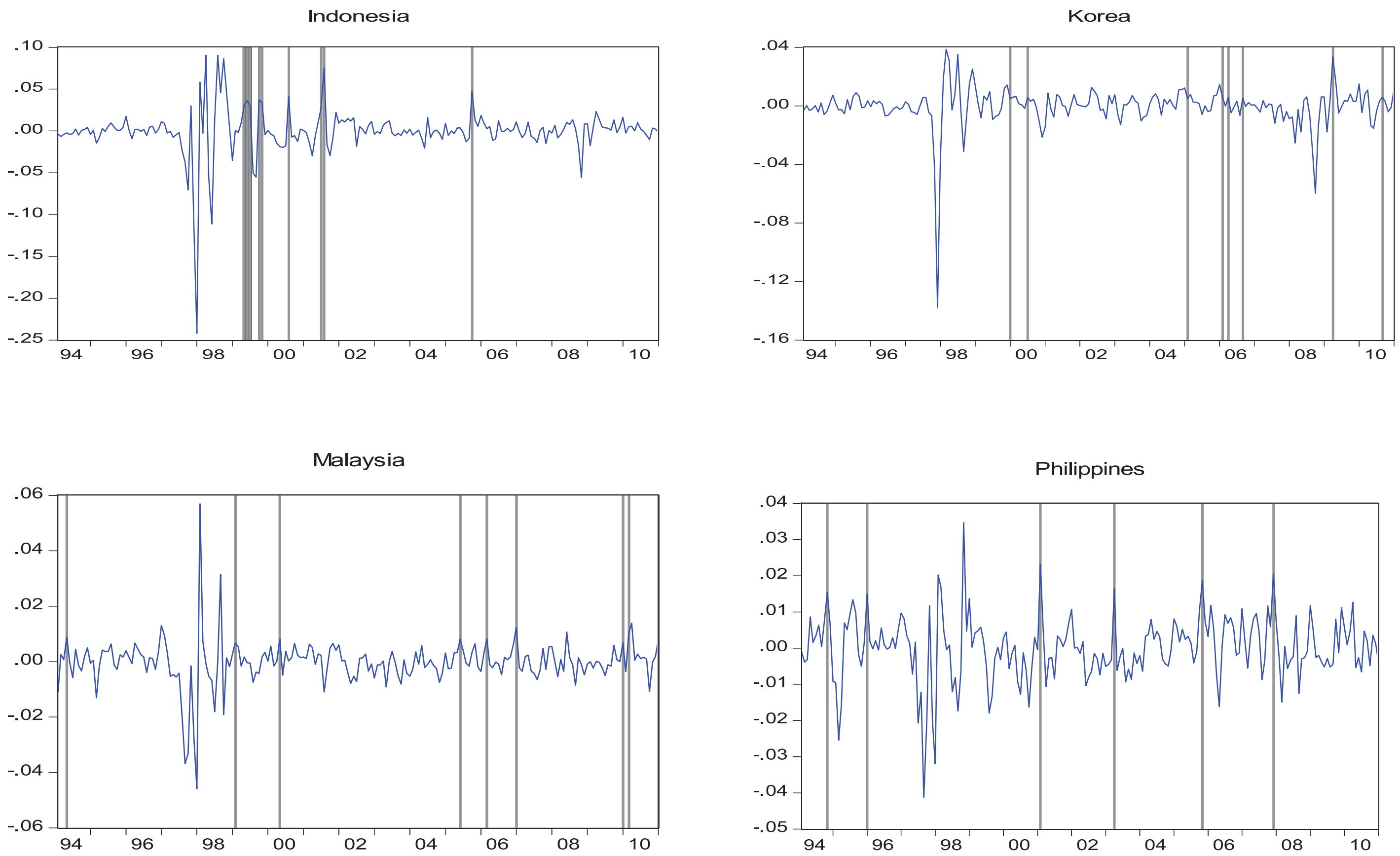
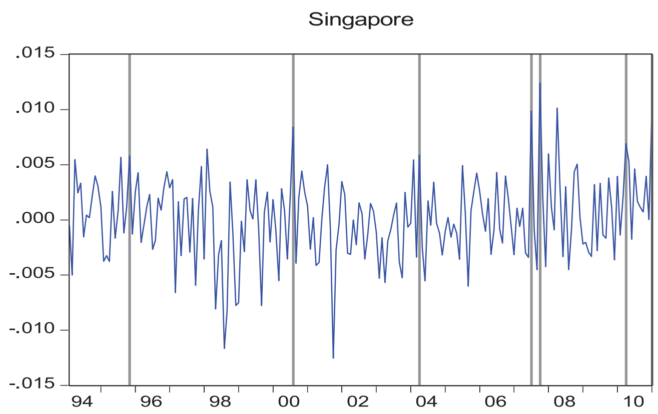


Figure 1

Logarithmic Changes in Real Effective Exchange Rate (REER) in six Asian Countries, January 1994 – January 2011



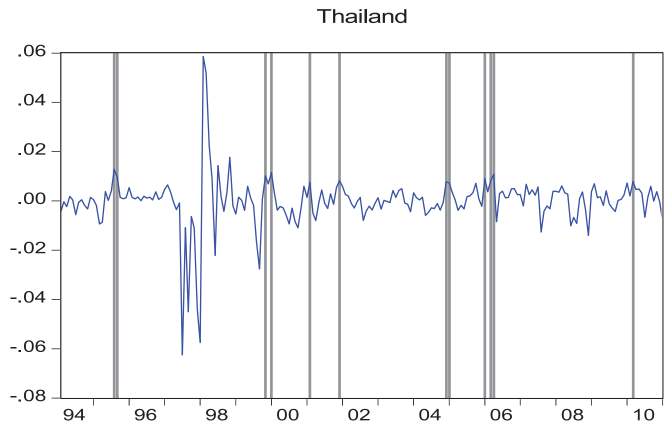


Figure 2
Logarithmic Changes in Reserves in six Asian Countries, January 1994 – January 2011

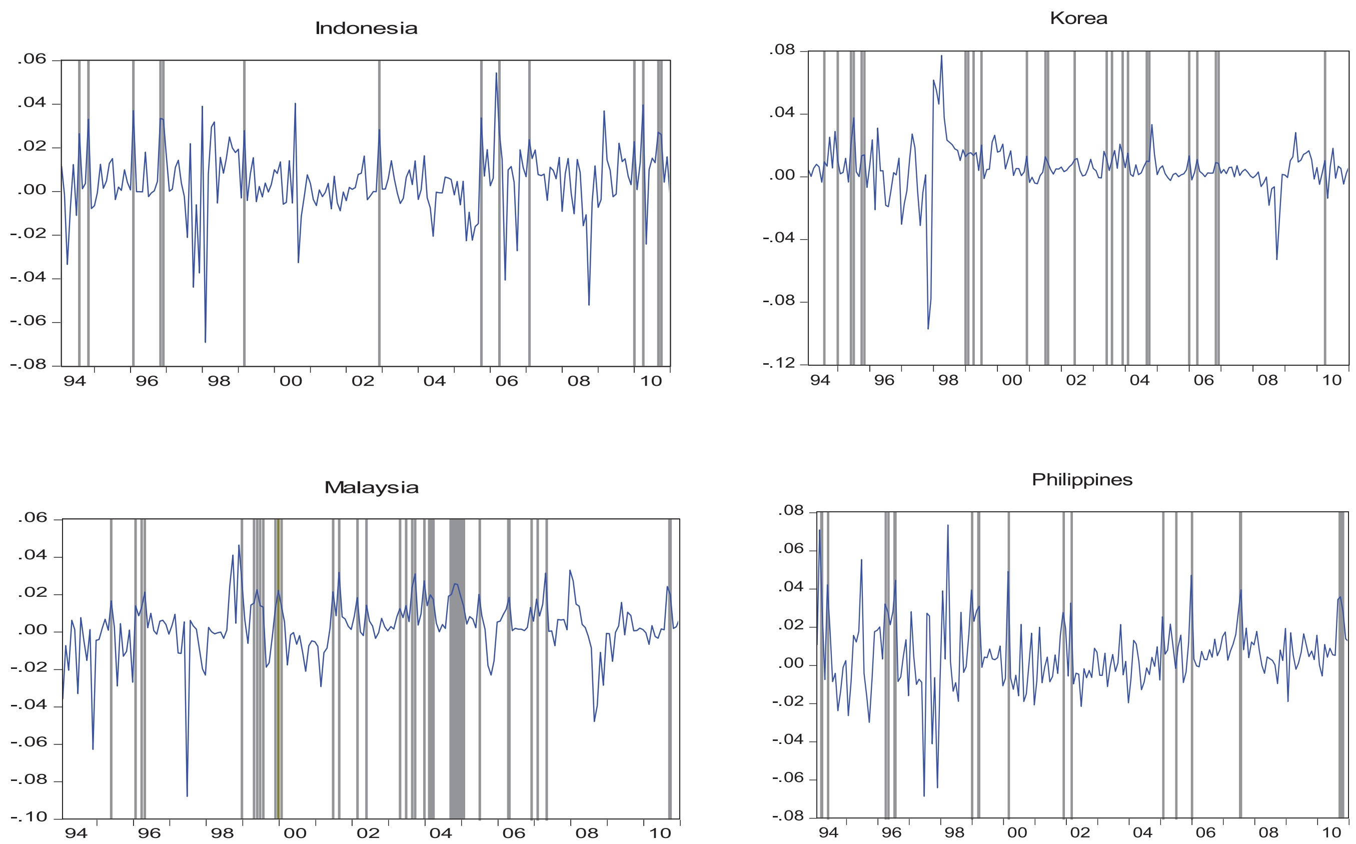


Figure 2
Logarithmic Changes in Reserves in six Asian Countries, January 1994 – January 2011

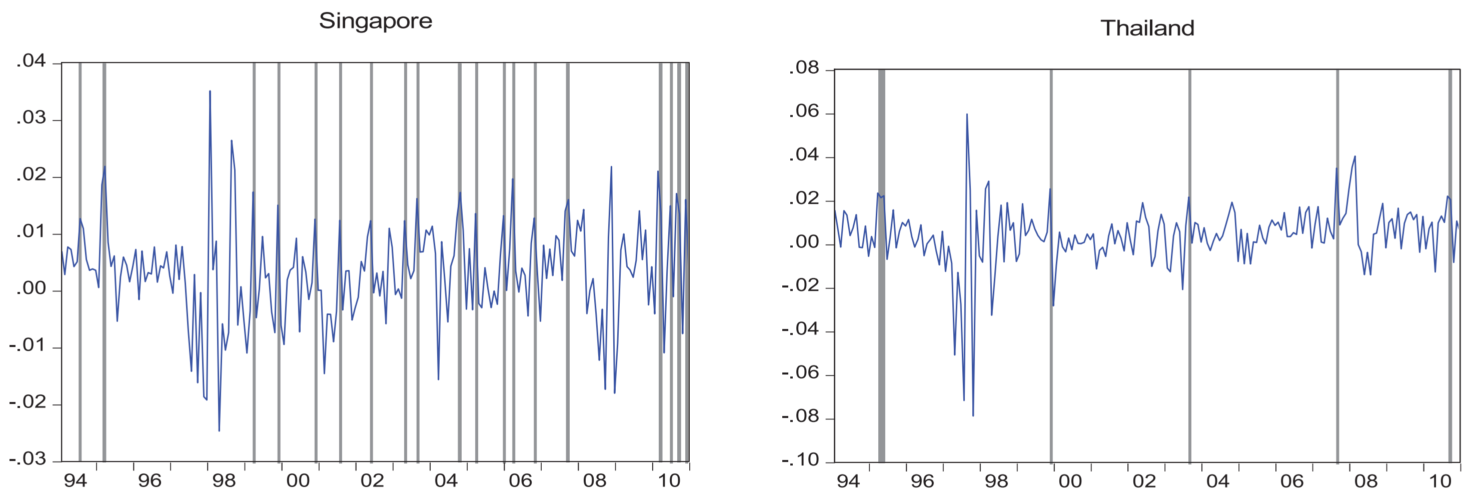
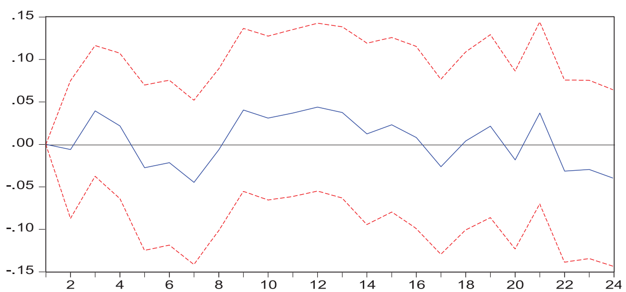
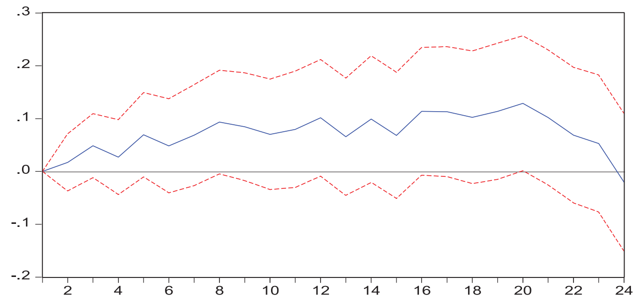


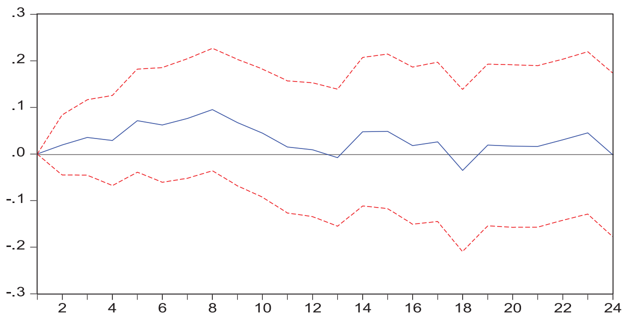
Figure 3
Impulse Response Function for Exports

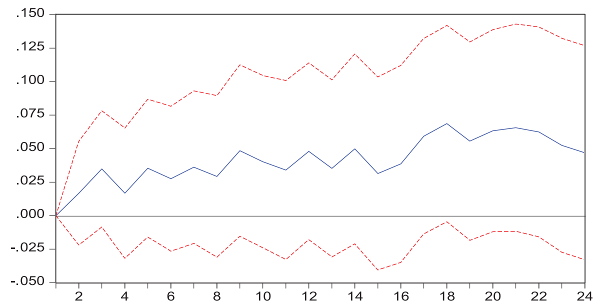
Indonesia





Korea

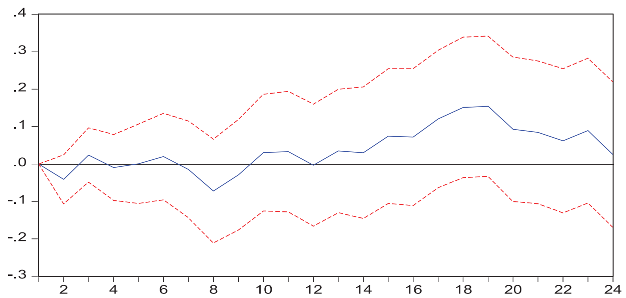


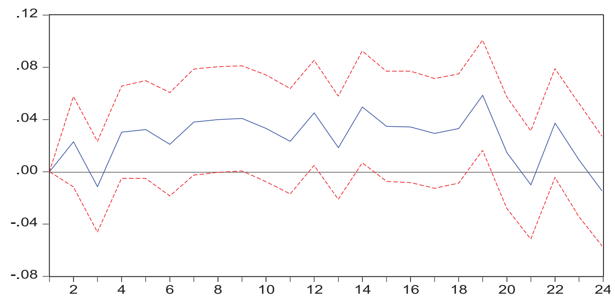


Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

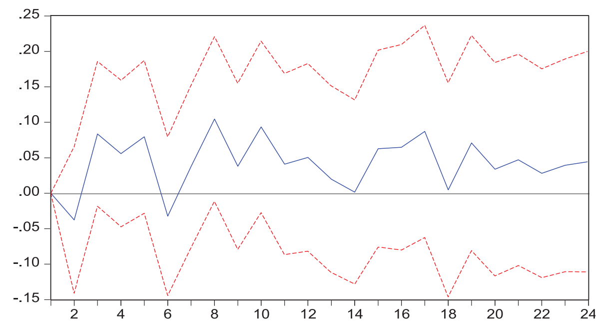
Figure 3
Impulse Response Function for Exports

Malaysia





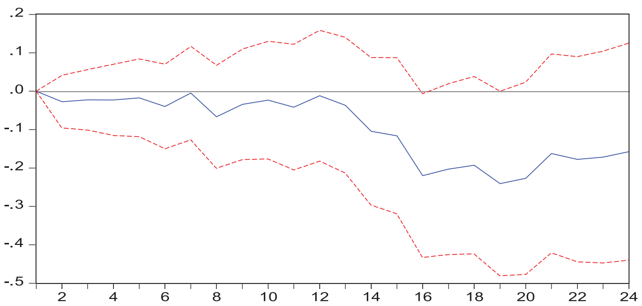
Philippines

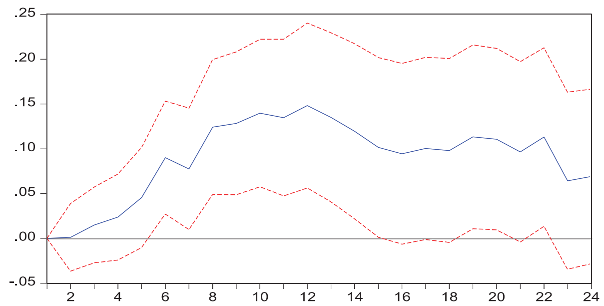


Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

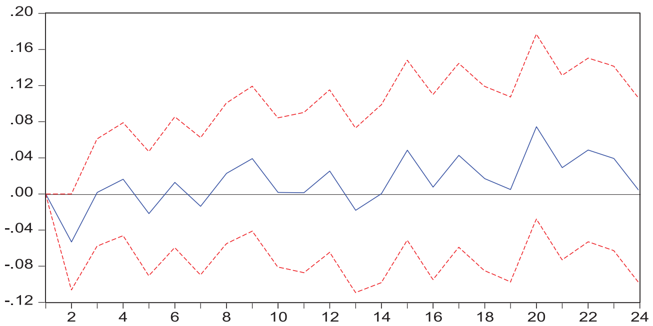
Figure 3
Impulse Response Function for Exports

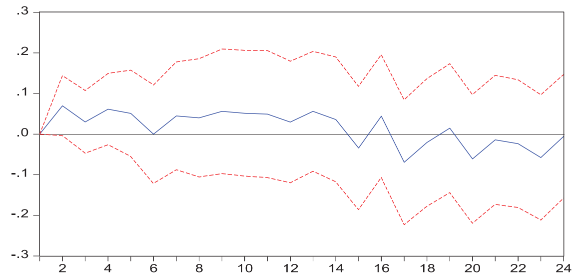
Singapore





Thailand

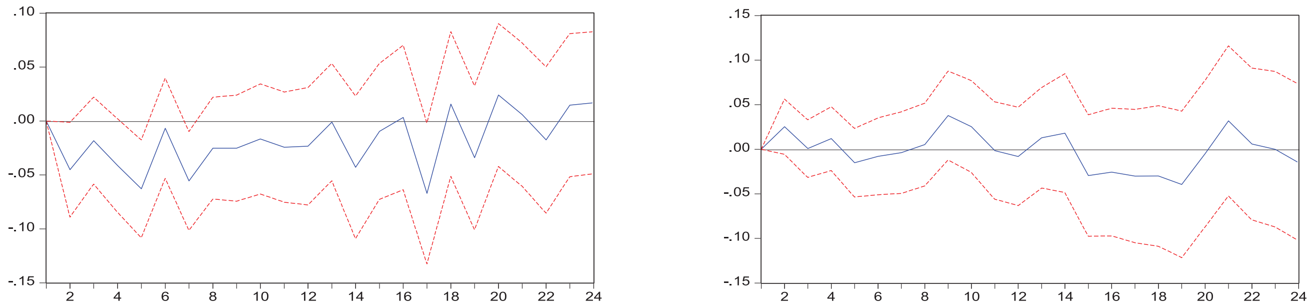




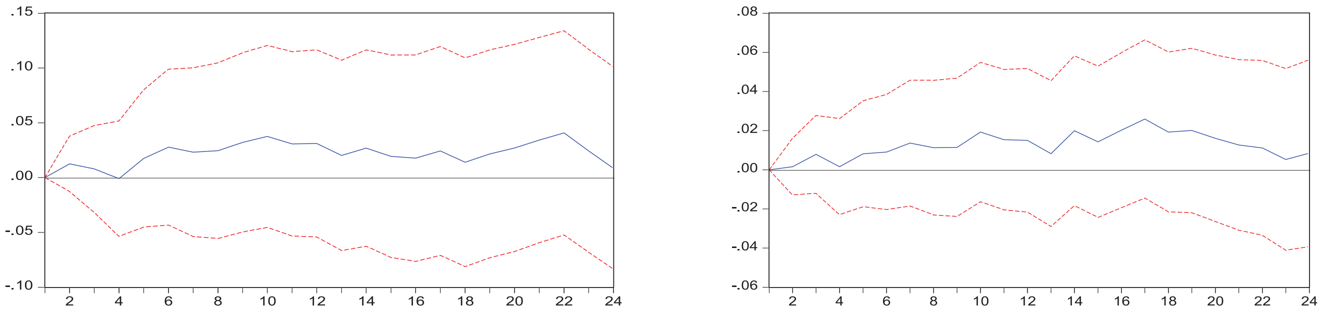
Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

Figure 3
Impulse Response Function for Growth

Indonesia



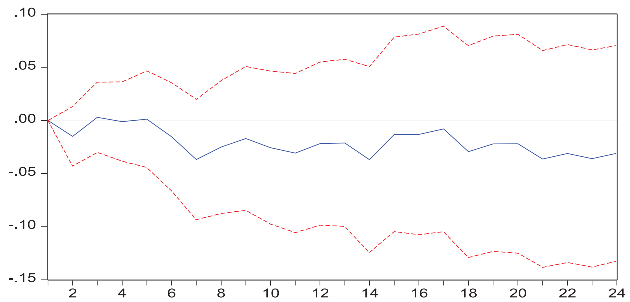
Korea

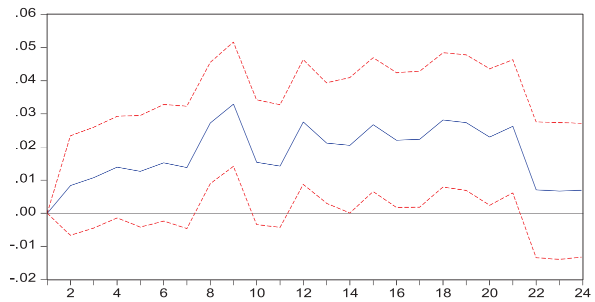


Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

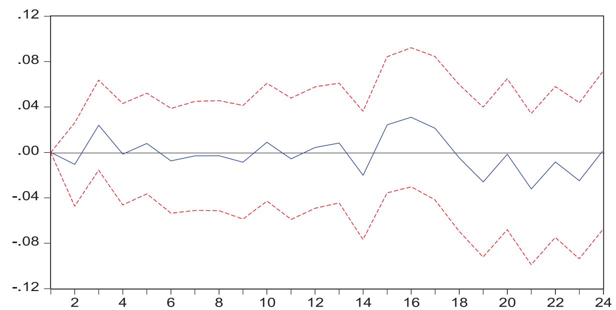
Figure 3
Impulse Response Function for Growth

Malaysia





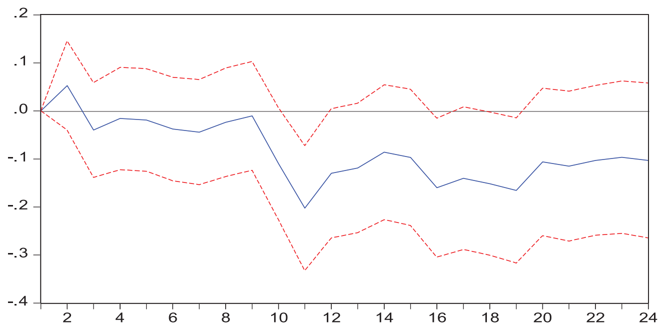
Philippines

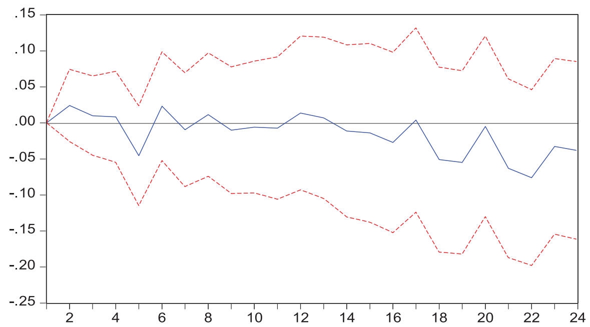


Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

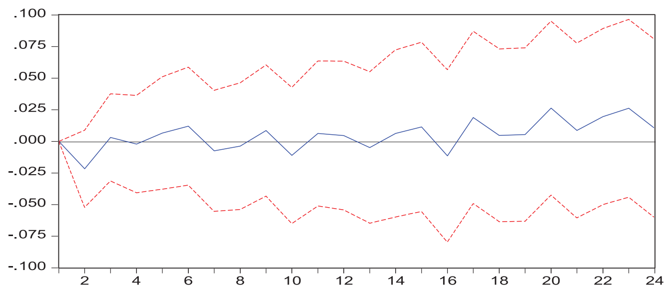
Figure 3
Impulse Response Function for Growth

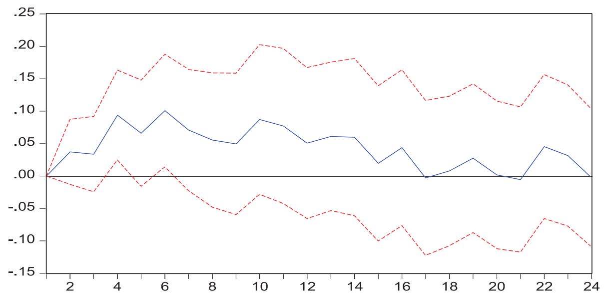
Singapore





Thailand

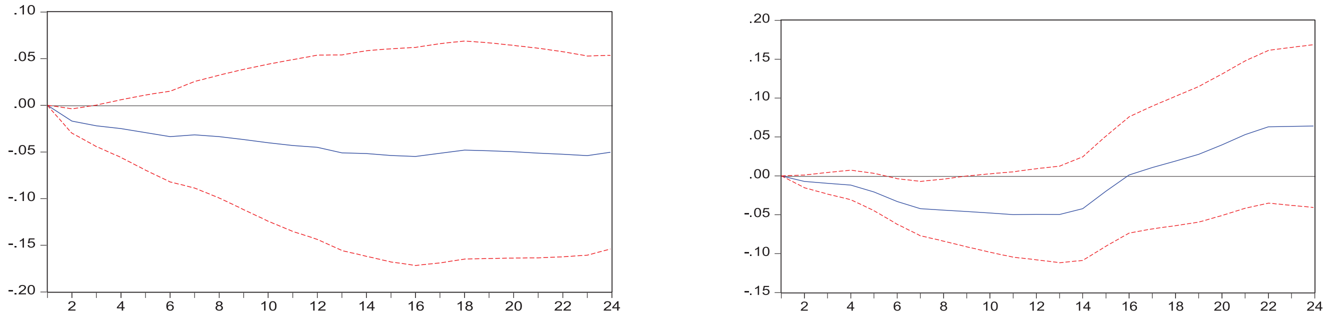




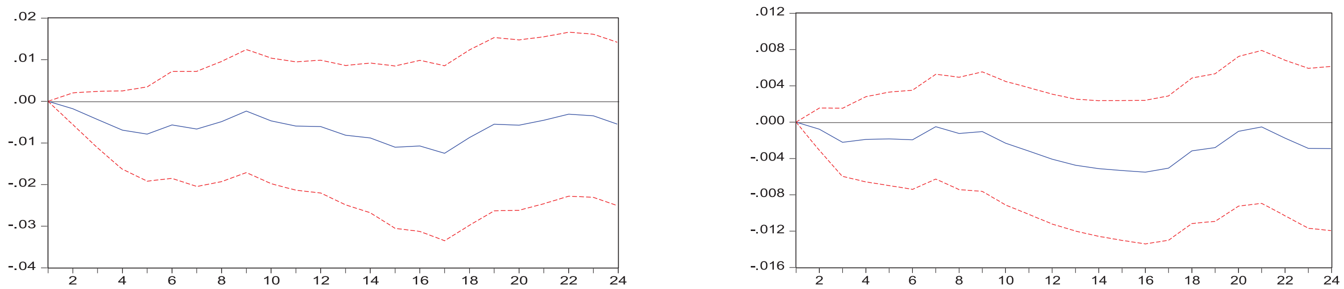
Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

Figure 4
Impulse Response Function for Price

Indonesia



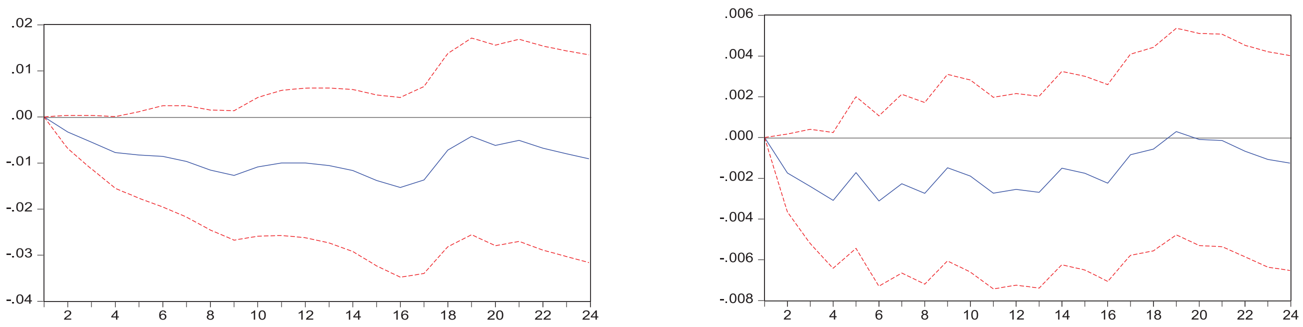
Korea



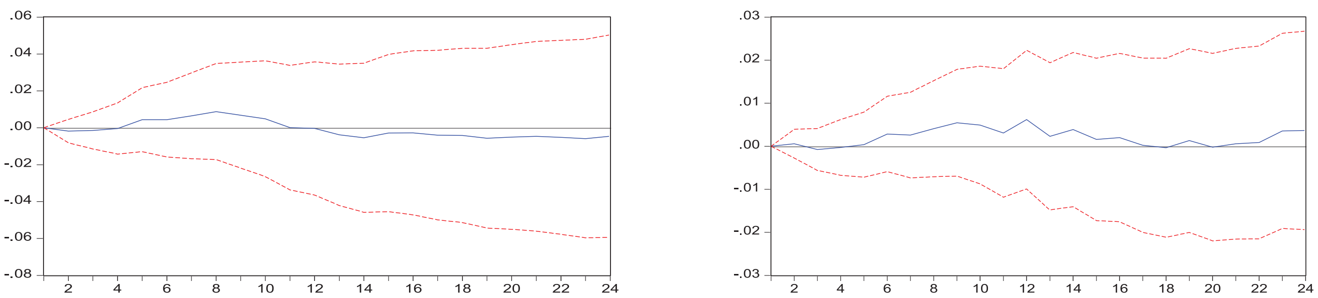
Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

Figure 4
Impulse Response Function for Price

Malaysia



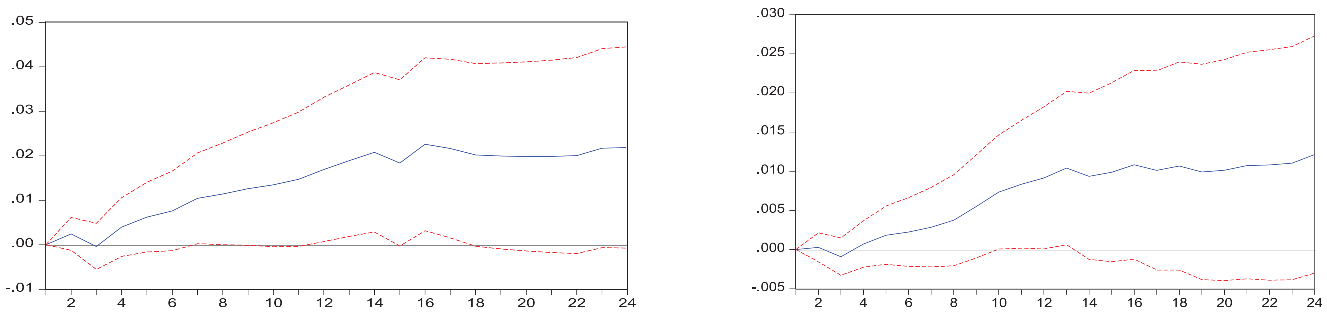
Philippines



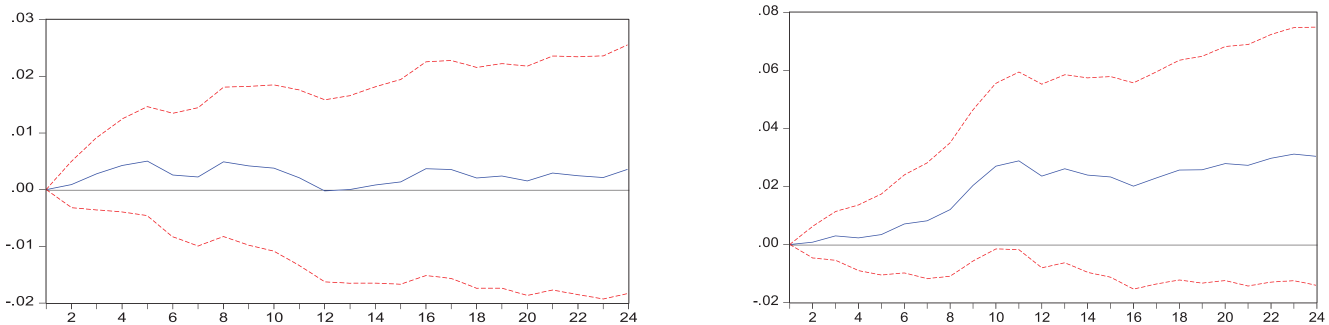
Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

Figure 4
Impulse Response Function for Price

Singapore



Thailand



Notes: The impulse responses shown at the left-hand panel is for a one-unit shock on the dummy variable for large appreciations while the one shown at the right-hand panel is for a one-unit shock on the dummy variable for large intervention episodes.

Appendix A

Applying a Regime Switching Method to Test for the Presence of Fear of Appreciation

The STAR model is a non-linear time series model that allows the variable under investigation, which in the present case denoted as Δln*exr,* the first difference of the log of the nominal exchange rate (local currency per US dollar) to adjust smoothly every moment within different regimes. This model may be written as:

$$\Delta \ln exr = \alpha_0 + \sum_{i=1}^{p} \alpha_i (\Delta \ln exr_{t-i}) + \left[\beta_0^* + \sum_{i=1}^{p} \beta_i^* (\Delta \ln exr_{t-i}) \right] F(\Delta \ln exr_{t-d}) + \varepsilon_t \qquad \text{(A1)}$$

where α_0 is the linear intercept term; α_i (i = 1, …, p) stand for the linear autoregressive parameters; β_0^* is the nonlinear intercept term, β_1^* (i = 1, …, p) stand for the nonlinear autoregressive parameters, $F(\Delta \ln exr_{t-d})$ is the transition function which characterized the smooth transition in between 2 regimes that depend on the lagged term of the first difference of the log of the nominal exchange rate, $\Delta \ln exr_{t-d}$ where d is the delay lag length, and ε_t is a white noise with zero mean and constant variance.

The theoretical and empirical aspects of this model are rather involved and extensively discussed in a number of studies. Interested readers should refer to Terasvirta and Anderson (1992) and Dijk et al (2002) for a thorough discussion of STAR models. Nonetheless, depending on the specification of the transition function, the natural starting point in describing the STAR model is the two-regime LSTR1 model with the following general logistic transition function, which takes values in the interval between zero and one:

$$F(\gamma, c; y_{t-d}) = \frac{1}{1 + \exp(-\gamma(y_{t-d} - c))}, \quad \gamma > 0 \qquad \text{(A2)}$$

where γ is the slope parameter (the magnitude of which measures the speed of transition between the two regimes), c is the threshold parameter (the value of which indicates the location of the transition) and y_{t-d} is the transition variable with the associated delay parameter d.

It turns out that a variant of the LSTR1 model is well-suited to testing whether East Asian currencies exhibit aversion to appreciations. In particular, one can resort to the LSTR2 model suggested in Terasvirta (1998).[12] The transition function of the LSTR2 model is the second-order logistic function:

$$F(\gamma, c_L, c_H; y_{t-d}) = \frac{1}{1 + \exp(-\gamma(y_{t-d} - c_L)(y_{t-d} - c_H))}, \quad \gamma > 0 \tag{A3}$$

Notice that the LSTR2 transition function resembles the transition function of the LSTR1 model but the LSTR2 transition function involves two threshold parameters c_L (the lower or appreciation threshold) and c_H (the upper or depreciation threshold). These lower (c_L) and upper (c_H) threshold parameters can be utilized to test for asymmetrical exchange rate behavior as these thresholds reflect to measure the relative tolerance of monetary authorities to exchange rate variations. To be more specific, if the upper threshold, c_H is larger than the (absolute value of the) lower threshold, c_L, this suggests an aversion of monetary authorities to currency appreciations.

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12. The other possible choice of the transition function is given by the exponential transition function: $F(\gamma, c; y_{t-d}) = 1 - \exp(-\gamma(y_{t-d} - c)^2)$. One limiting behaviour though of the ESTAR model is that for large values of γ, this model becomes practically indistinguishable from a linear model.

Appendix B

Table B1-A
Estimation Results of LSTR2 Models for East Asian Currencies vis-à-vis US Dollar
Pre-Global Financial Crisis (GFC) Sample Period,
Weekly Data, January 2000-December 2006

	Indonesian Rupiah	Korean Won	Philippine Peso	Singapore Dollar	Thailand Baht
p	5	1	3	8	1
d	2	3	1	5	9
linear part					
intercept	0.037 (0.01)***	0.004 (0.00)	0.001 (0.00)	-0.000 (0.00)	-0.000 (0.00)
$\Delta\ln exr_{t-1}$	-0.478 (0.15)***	-0.708 (0.26)**	0.369 (0.06)***	0.365 (0.08)***	0.471 (0.07)***
$\Delta\ln exr_{t-2}$	-0.889 (0.38)**		0.170 (0.04)***	-0.005 (0.10)	
$\Delta\ln exr_{t-3}$	-0.579 (0.16)***		0.062 (0.05)	0.038 (0.09)	
$\Delta\ln exr_{t-4}$	0.123 (0.12)			-0.182 (0.10)*	
$\Delta\ln exr_{t-5}$	-0.271 (0.10)***			0.248 (0.15)*	
$\Delta\ln exr_{t-6}$				-0.027 (0.10)	
$\Delta\ln exr_{t-7}$				-0.091 (0.14)	
$\Delta\ln exr_{t-8}$				-0.222 (0.13)*	
non-linear part					
intercept	-0.037 (0.01)***	-0.005 (0.00)	-0.096 (0.01)***	-0.000 (0.00)	0.001 (0.00)
$\Delta\ln exr_{t-1}$	0.893 (0.15)***	1.023 (0.27)***	-2.311 (0.23)***	-0.056 (0.18)	-0.319 (0.10)***
$\Delta\ln exr_{t-2}$	0.823 (0.39)**		-1.791 (0.29)***	-0.181 (0.17)	

$\Delta\ln exr_{t-3}$	0.827 (0.17)***		3.870 (0.76)***	-0.101 (0.16)	
$\Delta\ln exr_{t-4}$	-0.189 (0.13)			0.229 (0.19)	
$\Delta\ln exr_{t-5}$	0.187 (0.12)			-0.197 (0.19)	
$\Delta\ln exr_{t-6}$				-0.229 (0.17)	
$\Delta\ln exr_{t-7}$				0.425 (0.19)**	
$\Delta\ln exr_{t-8}$				0.412 (0.22)*	
LB-*Q* test	0.20	0.72	0.67	0.74	0.33

p is the number of lags of the linear autoregressive model; *d* is the optimal delay parameter; Numbers in parentheses are standard errors, whereas numbers in the LB-Q test are *p*-values. Significance levels: *10%, **5%, ***1%.

Table B1-B
Estimation Results of LSTR2 Models for East Asian Currencies vis-à-vis US Dollar
Global Financial Crisis (GFC) Sample Period, Weekly Data, January 2007-July 2009

	Indonesian Rupiah	Korean Won	Philippine Peso	Singapore Dollar	Thailand Baht
p	2	1	2	1	1
d	4	12	1	2	5
linear part					
intercept	0.000 (0.01)	0.002 (0.00)	-0.142 (0.08)*	-0.010 (0.00)**	0.007 (0.00)
$\Delta \ln exr_{t-1}$	0.206 (0.13)	-0.216 (0.12)*	-6.567 (3.74)*	-0.974 (0.50)**	1.704 (0.91)*
$\Delta \ln exr_{t-2}$	0.242 (0.13)**		-1.971 (0.86)**		
non-linear part					
intercept	0.001 (0.00)	-0.002 (0.00)	0.143 (0.075)*	0.010 (0.00)**	-0.007 (0.00)
$\Delta \ln exr_{t-1}$	-0.358 (0.29)	0.911 (0.18)***	6.735 (3.73)*	1.310 (0.50)***	-1.679 (0.92)*
$\Delta \ln exr_{t-2}$	-0.839 (0.36)**		2.047 (0.87)**		
LB-Q test	0.57	0.58	0.62	0.13	0.16

p is the number of lags of the linear autoregressive model; d is the optimal delay parameter;
Numbers in parentheses are standard errors, whereas numbers in the LB-Q test are p-values.
Significance levels: *10%, **5%, ***1%.

Table B1-C
Estimation Results of LSTR2 Models for East Asian Currencies vis-à-vis US Dollar
Post-Global Financial Crisis (GFC) Sample Period,
Weekly Data, August 2009-March 2011

	Indonesian Rupiah	Korean Won	Philippine Peso	Singapore Dollar	Thailand Baht
p	1	1	1	1	1
d	2	2	1	7	11
linear part					
intercept	-0.002 (0.00)	-0.001 (0.00)	-0.010 (0.00)***	-0.014 (0.01)**	-0.001 (0.00)
$\Delta\ln exr_{t-1}$	-0.840 (0.35)**	0.607 (0.13)***	1.237 (0.37)***	-1.259 (0.86)	0.577 (0.12)***
non-linear part					
intercept	0.001 (0.00)	0.006 (0.00)	0.009 (0.004)**	0.013 (0.00)***	0.003 (0.00)*
$\Delta\ln exr_{t-1}$	1.077 (0.37)***	-1.364 (0.26)***	-1.242 (0.42)***	1.398 (0.88)	-0.837 (0.28)***
LB-Q test	0.75	0.97	0.16	0.98	0.40

p is the number of lags of the linear autoregressive model; d is the optimal delay parameter;
Numbers in parentheses are standard errors, whereas numbers in the LB-Q test are p-values.
Significance levels: *10%, **5%, ***1%.

Appendix C

Applying Extreme Value Theory to Identify Large Appreciations and Intervention Episodes

In order to locate the threshold that separates the normal values of the changes in exchange rates (corresponding to the normal periods) from that of the extreme or large values (corresponding to the large or extreme appreciation episodes), for instance, but without the need to set an arbitrary cutoff or threshold value for the changes in exchange rates, the estimation of the parameter (α), the tail index of the distribution of the changes in exchange rates, is crucial as it determines the degree of tail fatness the distribution exhibits. The tail index measures the speed at which the distribution's tail approaches zero—the higher (α), the faster the speed and the less fat-tailed the distribution. In addition, the tail index (α) has the attractive feature that it is equal to the maximum number of existing finite moments in the distribution. Unfortunately, the estimation of the tail index is not a simple task, although there are a few available estimators in the literature. The most common of these is the Hill (1975) estimator, which is given as:

$$\gamma(k) = \frac{1}{k}\sum_{j=1}^{k} \ln(x(n-j+1) - \ln(x(n-k) \tag{C1}$$

We assume that there is a sample of *n* positive independent observations drawn from some unknown fat-tailed distribution. Letting the parameter (γ) be the inverse of the tail index (α), and $x(i)$ be the i th-order statistic such that $x(i-1) \leq x(i)$ for $i = 2,\ldots, n$. k is the pre-specified number of tail observations. The choice of k is crucial to obtain an unbiased estimate of the tail index. The intuition behind this critical choice of k is that there is an uncomfortable variance and bias trade-off. If we employ a k that is too low, we are not using all of the tail observations, and would thus obtain an estimate of the tail index with a large variance. In contrast, if we employ a k that is large, we bias the estimate of the tail index by including observations in the sample from the centre of the distribution.

In an important paper, Huisman et al. (2001) introduces an estimator that overcomes the need to select a 'single' optimal k in small samples, by accounting

for the bias in the Hill estimator. They showed that for values of k smaller than some threshold κ, the bias of the Hill estimate of γ increases almost linearly in k and can be approximated by:

$$\gamma(\mathrm{k}) = \beta_0 + \beta_1\mathrm{k} + \varepsilon(\mathrm{k}), \qquad k = 1,2, \ldots, \kappa \tag{C2}$$

The above equation has to be estimated by weighted least squares (WLS) to deal with the heteroscedasticity in the error term $\varepsilon(k)$. The weight has $(\sqrt{1}, \sqrt{2}, \ldots, \sqrt{k})$ as diagonal elements and zeros elsewhere. The bias corrected estimate of γ is the intercept β_0 and the estimate of the optimal tail index α would be given by $\hat{\alpha} = 1/\beta_0$.

The essence is to identify separately the 'extreme right-tail' observations from the ordered distribution of the changes in the exchange rate and the ordered distribution of the changes in reserves since the incidence of large appreciations and large reserves purchases are determined and located in the right-tail of the distribution. Accordingly, Diebold, Schuermann and Stroughhair (2000) suggested, (also similarly employed by Pozo and Dorantes (2003), Pontines and Siregar (2007, 2008) and Lestano and Jacobs (2007)), that recursive residuals be derived from the above discussed weighted least squares regression to diagnose structural changes, which will then guide us ultimately in the selection of the optimal k.

Chapter 6

RAPID CREDIT GROWTH AND INTERNATIONAL CREDIT: CHALLENGES TO ASIA[1,2]

By
Stefan Avdjiev, Robert McCauley and Patrick McGuire

1. Introduction

Monetary policy in advanced economies, implemented through very low interest rates and large-scale asset purchases, has led to concerns in emerging markets about a surge in global liquidity. The main worry is that monetary ease in the major currencies could exacerbate the alternation of strong capital inflows when risk is "on" and capital outflows when risk is "off" that emerging market economies tend to experience. Concerns arise about capital inflows' potential to ease monetary conditions, on the one hand, and capital outflows' potential to destabilise the financial system, on the other hand. International credit thus raises both monetary and financial stability issues.

International credit, defined here as foreign currency and cross-border credit, can pose particular risks to an economy that is experiencing rapid domestic credit growth. Financial crises in the past two decades have often followed periods of rapid credit expansion accompanied by buoyant asset prices in equity and real estate. In Asia, these risks became evident in the Asian financial crisis of 1997-98. More recently, the countries most affected by the global financial crisis have demonstrated these risks anew. The conditions that give rise to rapid

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1. Paper presented to the SEACEN Workshop on "Policy Responses and Adjustments in the Course of Exchange Rate Appreciation", Bali, Indonesia, 18-19 July 2011, and to the Hong Kong Institute for Monetary Research/Asia-Pacific Department of the International Monetary Fund conference, "Monetary and Financial Stability in the Asia-Pacific amid an Uneven Global Recovery", at the Hong Kong Monetary Authority, Hong Kong SAR, 10-11 October 2011. The authors thank Claudio Borio, Stephen Cecchetti, Lynne Cockerell, Roberto Cardarelli, Kostas Tsatsaronis and conference participants for useful comments and discussion and Bilyana Bogdanova, Pablo Garcia, Jimmy Shek and Jhuvesh Sobrun for research assistance.

2. Authors are members of the Monetary and Economic Department, Bank for International Settlements, Basel, Switzerland. Views expressed are those of the authors and not necessarily those of the BIS.

domestic credit growth also lead to international credit's playing a larger role in overall credit expansion (Borio et al (2011)). This regularity spans fixed and floating exchange-rate regimes, and even economies within currency areas (eg Ireland and Spain, as well as the United States, where international credit is almost entirely dollar-denominated).[3]

The international dimensions of credit growth pose specific policy challenges. First, in economies experiencing booms, international credit often complicates the job of domestic authorities who seek to monitor and to constrain credit. For example, domestic authorities have several tools to slow the growth of credit extended by banks *within* their jurisdiction. But short of capital controls, the tools to measure, much less to control, credit extended by institutions outside the country are limited.

Second, local firms and households may shift out of domestic currency liabilities ("liability dollarisation") in an attempt to avoid tightening in monetary conditions imposed by the home authorities.[4] This not only reduces the efficacy of domestic monetary policy, it also ties the economy to interest rate conditions set elsewhere. Moreover, heavy reliance on foreign currency borrowing potentially exposes domestic firms and households to currency risk.

Finally, international (foreign currency) credit can also put upward pressure on the real exchange rate, as borrowers exchange foreign for domestic currency for the purchase of domestic goods or assets. With a fixed exchange rate (or within a currency area), real exchange rate appreciation can take the form of relatively rapid inflation. For a country with an independent currency, real exchange rate appreciation can result from either nominal appreciation or relatively rapid inflation.

In this paper, the next section shows how international credit grew in selected European countries that were hard hit in the recent crisis, and then draws a parallel to the lead-up to the Asian financial crisis in the 1990s. The third section steps back from these cases and demonstrates that, for a broad sample of emerging market economies, a growing share of international credit in 2002-

3. In a related study, Magud et al (2011) show that the degree of flexibility of the exchange rate regime in emerging market economies is negatively correlated with both the pace of credit growth and the share of credit that is denominated in foreign currencies.

4 . One well-titled study of Central Europe found that monetary tightening systematically increased private sector borrowing in the euro and the Swiss franc. See Brzoza-Brzezina, et al (2010), "Substitution between domestic and foreign currency loans in Central Europe: do central banks matter?".

2008 was associated with booming overall credit. The fourth section examines the recent data for Asia and finds that, in contrast to the mid-1990s, international credit is generally small in relation to overall credit, and thus its rapid growth has made a limited contribution to overall credit growth outside of the more dollarised economies in the region. The fifth section examines the extent to which carry trades could be a driver of international credit and the sixth section concludes.

2. Rising International Credit in Domestic Credit Booms: Cases

Rapid expansion in international credit bears watching because, in many boom-bust credit cycles in the past, such credit tended to grow faster than overall credit during the boom.[5] We illustrate this broad finding with data from several European countries that suffered credit booms and busts since 2000. Then, we draw a parallel with countries that were caught up in the Asian financial crisis of the late 1990s.

By international credit, we refer to three components of total bank credit, the first two of which are types cross-border credit. First, non-banks in a country can borrow directly from non-resident banks (or issue bonds targeted at non-resident investors, not measured here). Such (1) *direct cross-border credit* is a large share of total credit to non-banks in some countries, and it tended to fall sharply during the recent crisis (Cetorelli and Goldberg, 2010), McCauley et.al (2010). Second, banks located in a particular country may finance a large share of their locally extended credit to non-banks (ie domestic credit) with net borrowing from non-residents (either from other banks or non-banks). This (2) *indirect cross-border credit* allows credit growth to outrun domestic deposit growth. This component of international credit is often ignored in empirical analysis of credit booms but, as discussed below, it tends to be large during such periods. Finally, we also examine (3) *foreign currency-denominated credit* to non-banks, regardless of whether this credit is extended by banks inside or outside

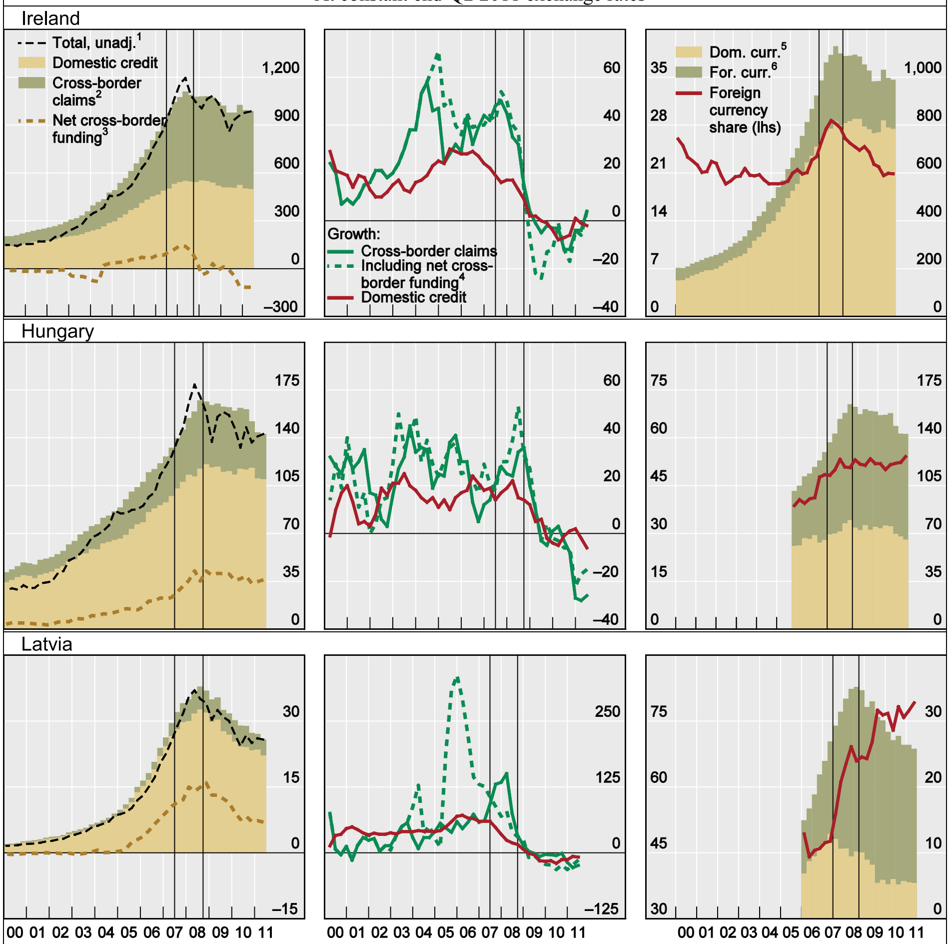
5. Borio et al (2011). Note that a comparison of cross-border with overall credit growth differs from a comparison of external claims with GDP, as in Lane and Milesi-Ferretti (2007). In particular, our comparison recognises that domestic credit stocks tend to be large in relation to GDP in Asia, but smaller in Latin America. Thus, our cross-border bank credit as a share of overall bank credit provides a measure of openness that takes into account differences in financial depth across regions and countries. Our approach also differs from that of Magud, et al (2011), who identify capital flow booms by reference to their own trend (with no reference to domestic credit developments) and rely on domestic credit without integrating cross-border bank credit.

the country. As mentioned above, when non-bank borrowers shift their liabilities out of the domestic currency, they create challenges for the domestic authorities.

Several European cases highlight to varying degrees the roles of direct and indirect cross-border credit in the course of the global credit boom of the 2000s (Figure 1). *Direct cross-border credit* to non-banks in Ireland (dark shaded area), for example, grew at roughly 40 percent year-on-year in the three years prior to the crisis (centre panel), ten percentage points above the rate for domestic bank credit. Moreover, banks *in* Ireland drew on *indirect cross-border credit* (left-hand panel, dashed brown line) to support their domestic lending. Combined, these two cross-border components accounted for more than half of the stock of total bank credit to non-banks in the country by 2008.

In other European countries like Hungary and Latvia, this *indirect cross-border credit* was even more important in the run-up to the crisis. Much of this reflected foreign banks outside these countries channelling funds (interoffice) to their *subsidiaries* in these countries (left panels, dashed brown line), which in turn extended *foreign currency* loans to residents (right-hand panels). In the Baltic states combined, for example, credit extended by subsidiaries of foreign banks located in these countries accounted for 80 percent of total bank credit to non-banks, mostly euro-denominated.

Figure 1
Bank Credit to Non-Banks in Selected European Countries
At constant end-Q2 2011 exchange rates[1]



[1] The stacked bars indicate total bank credit expressed in US dollars at constant end-2011 Q2 exchange rates, and thus exclude valuation effects. The dotted black line shows unadjusted total bank credit converted into US dollars at contemporaneous exchange rates. [2] BIS reporting banks' cross-border claims on non-banks. Claims include loans and securities, most of which is debt [3] Net cross-border borrowing (liabilities minus claims) from all sectors by banks located in the country. For non-BIS reporting countries (Hungary and Latvia), BIS reporting banks' net cross-border claims on banks in the country. [4] Growth after first including net cross-border borrowing (if positive) by banks in the country (dashed brown line), under the assumption that this cross-border credit is ultimately passed on to non-banks in the country. [5] Estimated cross-border and locally extended claims on non-banks in domestic currency. [6] Estimated cross-border and locally extended claims on non-banks in foreign currencies.
Sources: IMF International Financial Statistics; BIS Locational Banking Statistics; BIS Consolidated Banking Statistics.

In sum, these admittedly extreme European cases show an increased share of cross-border funding in economies experiencing a boom of credit in the run-

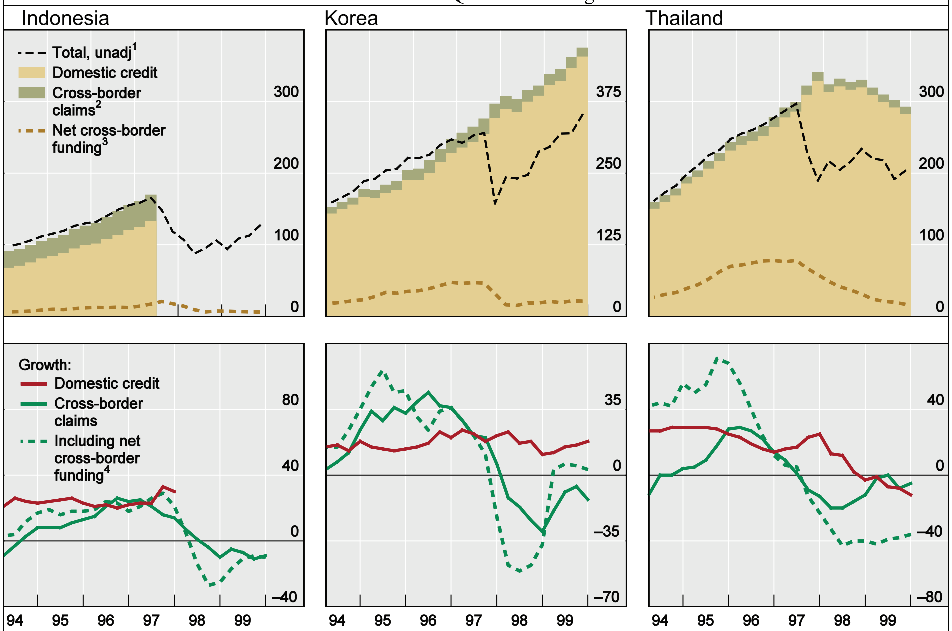
up to the recent global financial crisis. These cases must strike those who lived through the Asian financial crisis in 1997-98 as oddly familiar.

Indeed, turning back the clock to that period, the credit booms in Asian economies displayed much the same regularity.[6] In the run-up to the Asian crisis, direct and indirect cross-border credit grew to account for a combined share of roughly one-third of the total credit to non-banks in Indonesia and Thailand, and more than a quarter in Korea (Figure 2). Indonesian firms relied heavily on direct cross-border credit, especially in 1996-97 (albeit not to the same extent as borrowers in Ireland more recently). Regulation in Indonesia had limited resident banks' ability to lend foreign currency to local firms, so foreign banks lent directly to them from outside the country (dark shaded area, top left-hand panel).[7] By contrast, Korea and Thailand (like the Baltic countries ten years later) saw dollar credit funnelled through banks in the country (including Bangkok

6. Our presentation in Figure 2 for the 1990s differs from that of the more recent cases in Figure 1 because the detail in BIS international banking data improved in response to the Asian financial crisis, yielding better estimates of the foreign currency share of bank credit.

7. On Thailand, see Kawai and Takayasu (1999). On Indonesia, Radelet and Woo (2000, p 172) citing BIS data, note that Indonesian firms owed $40 billion of the $57 billion in debt to international banks owed by Indonesians in mid-2007; Grenville (2004, p 14) notes how small a proportion was Indonesian bank debt.

Figure 2
Bank Credit to Non-Banks in Selected Emerging Asian Countries in the Mid-1990s
At constant end-Q4 1996 exchange rates[1]



[1] The stacked bars indicate total bank credit to non-banks expressed in US dollars at constant end-1996 Q4 exchange rates, and thus exclude valuation effects. The dotted black line shows total bank credit converted into US dollars at contemporaneous exchange rates. [2] BIS reporting banks' cross-border claims on non-banks. Claims include loans and securities, most of which is debt [3] Net cross-border borrowing (liabilities minus claims) by banks located in the country estimated as BIS reporting banks' net cross-border claims on banks in the country. [4] Growth after first including net cross-border borrowing (if positive) by banks in the country (dashed brown line), under the assumption that this cross-border credit is ultimately passed on to non-banks in the country.
Sources: IMF International Financial Statistics; BIS Locational banking statistics by Residence.

International Banking Facilities included in the dashed brown line in Figure 2, top right-hand panel). While differences in the composition of cross-border credit thus reflected regulatory differences, rises in the share of international credit accompanied the domestic credit booms in each of these cases.

The six cases point to an association of rapid overall credit growth and a rise in the share of direct or indirect cross-border credit. Is such an association evident in a broader cross-section of experience? The next section suggests an affirmative answer.

3. Rising International Credit in Credit Booms: Regression Analysis

In this section, we focus on the relationship between total bank credit to non-bank borrowers and the international components of bank credit in emerging economies (see Annex 1 for sample of 31). We find that, in the years before the recent global financial crisis, a rising share of international credit was positively related to a rising ratio of bank credit to GDP.[8] In other words, the evidence systematically implicates international credit in credit booms. We also show that the economies most dependent on international credit suffered the largest reductions in bank credit in the period mid-2008 to mid-2011.

Our analysis required us to construct bank credit aggregates for a large sample of countries. Domestic credit as usually measured captures only loans or securities booked at banks in a given jurisdiction vis-à-vis residents of that jurisdiction. To this we added the cross-border credit reported in the BIS international banking statistics, yielding a measure of the total credit provided by banks to non-banks in a particular country.[9] To use this total to distinguish the underlying change in credit outstanding from valuation changes arising from currency movements requires an estimate of the breakdown between domestic and foreign currency credit. By exploiting detail in both the BIS locational and consolidated statistics, we generated estimates of the currency composition of our total bank credit measure for each country. Making allowances for the effect of exchange-rate movements shows that very few countries experienced outright declines in bank credit in the wake of the financial crisis (Box).

As discussed above in the context of the Asian financial crisis, capital controls and bank regulation in a particular country can dampen international credit flows or, depending on the type of regulation, favour one form of international credit over another. That is, international credit can flow both directly and indirectly, with the particular mix affected by policy and the organisation of globally active

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8. Borio and Lowe (2002) and Borio and Drehman (2009) examine credit-to-GDP ratios for a large sample of countries and show that the credit-to-GDP "gap" can anticipate financial stress.

9. We generally include bank credit to governments in each country, although the results for the pre-crisis 2002-2008 period discussed below are robust to exclusion of this credit. In the wake of the crisis (2008-2011), banks have shifted their portfolios towards holdings of government securities. Thus, for some analyses (eg Figure 4 below), it is necessary to exclude credit to governments to ascertain whether credit to the non-bank *private* sector is growing. The figure in Annex 3 decomposes bank credit into credit to non-bank private sector borrowers and credit to governments.

banks. Thus, focusing on only one type of international credit (eg direct cross-border) runs the risk of missing important developments in other forms (eg indirect cross-border).

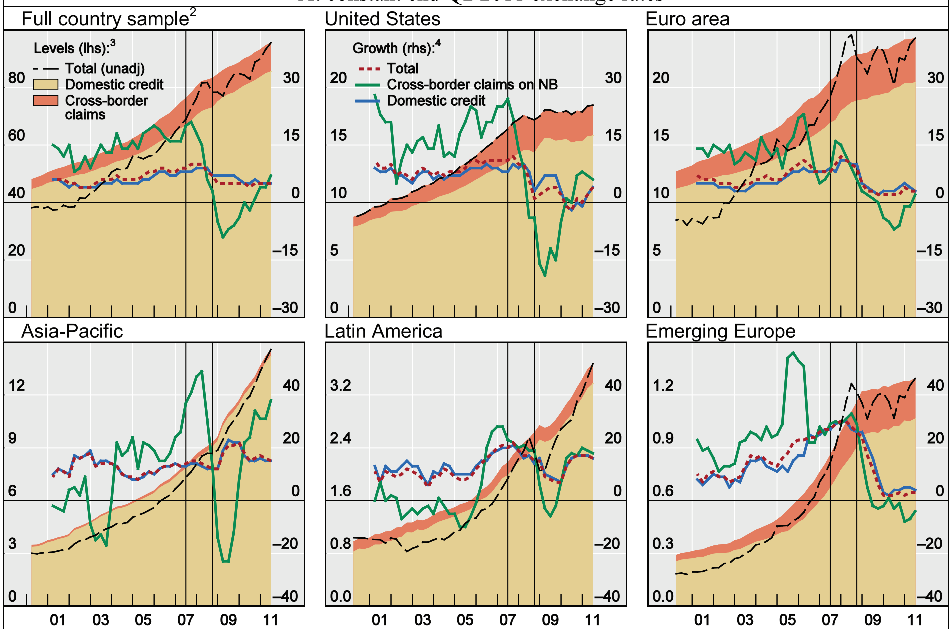
Box: Did Bank Credit Drop in the Recent Crisis?

The US dollar appreciated by roughly 25 percent with respect to the euro and Swiss franc in the five months following the collapse of Lehman Brothers, and by even more against many other currencies during this period.[1] Unless accounted for, exchange rate movements of this size severely distort credit growth rates for those economies where credit stocks have large foreign currency components. Moreover, they complicate the construction of regional and global credit aggregates (and growth rates), which requires expressing credit to borrowers in different countries in a common currency.

Both cross-border and domestic bank credit are (generally) denominated in multiple currencies. The BIS international banking statistics in combination with domestic bank credit data from the IMF's *International Financial Statistics*, along with some assumptions, yield an estimate of the currency breakdown of total credit to non-banks (either including or excluding bank credit to governments) in a particular country.[2] This breakdown allows us to express credit stocks at constant exchange rates (in this particular case, end-Q2 2011 rates). This, in turn, yields credit growth rates that are (largely) undistorted by exchange rate movements and thus provides a better measure of credit growth.

Global Bank Credit Aggregates, By Borrower Region

At constant end-Q2 2011 exchange rates[1]



The vertical lines represent end-Q2 2007 and end-Q3 2008.

[1] The shaded areas indicate total bank credit to non-bank borrowers (including governments), expressed in US dollars at constant end-Q2 2011 exchange rates. The dashed black line shows unadjusted total credit converted into US dollars at contemporaneous exchange rates. The shaded areas are adjusted using various components of the BIS banking statistics to produce a breakdown by currency for both cross-border credit and domestic credit. [2] Aggregate for a sample of 56 countries (see the statistical appendix for full list). [3] In trillions of US dollars. [4] In per cent.

Sources: IMF, International Financial Statistics; BIS international banking statistics; BIS calculations.

The estimates for a sample of 56 large and emerging economies are summarised in Figure A.[2] The stacked shaded areas show the stock of bank credit to non-banks (including governments and adjusted for exchange rate movements), broken down into domestic credit (tan area) and cross-border credit (salmon area). By contrast, the dashed black lines show the same credit total expressed in US dollars on an unadjusted basis.

What first strikes the eye is the difference in the importance of cross-border credit across regions. It represented a substantial share of bank credit even in the US and euro area economies. Among emerging markets, it accounted for a high share – roughly a quarter – of total bank credit in Emerging Europe, but much less in Asia and the Pacific and Latin America. Comparing these measures, the data that have been adjusted for exchange rate fluctuations tell very different stories from the ones implied by the unadjusted data. While the latter show large contractions outside the United States, the former indicate that, worldwide, total bank credit *did not actually contract* during the crisis. What did contract was direct cross-border credit. While growth in domestic credit remained positive in all six regions (blue lines), growth in direct cross-border credit (green lines) turned negative in each, at least for a time.

Data by country reveal that, despite the severity of the recent global financial crisis, bank credit contracted in only a handful of individual economies. When bank credit includes credit to governments in each country, as in Figure A, our estimates indicate that Estonia, Hungary, Ireland, Iceland, Latvia, Lithuania and Luxembourg experienced outright contractions in bank credit to non-bank borrowers between 2008Q2 and 2011Q2. In the wake of the crisis, government deficits in many countries have ballooned just as banks sought refuge from a volatile investing environment, a combination that tilted banks' portfolios towards government securities. If we focus on the growth in credit to non-bank *private* sector borrowers and strip out banks' domestic and cross-border claims on governments (see Figure A.3 in Annex 3), Croatia, the Netherlands, Romania, Spain, Ukraine and the United States experienced contractions of credit as well.

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[1] See Fratzscher (2009) and McCauley and McGuire (2009) for a discussion of the global factors driving exchange rate movements during this period. [2] The quality of the estimates is higher for those countries that report in the BIS statistics. See footnotes in figures for more details.

In support of this assertion, and as a prelude to our analysis below, note that for the 2002-2008 period, it is the *combined* share of direct and indirect cross-border credit that is most strongly correlated with readily available measures of financial openness.[10] As shown in Annex 2, cross-sectional regressions of the share of direct *plus* indirect cross-border credit (in total bank credit) on a country's financial openness, as captured by the Chinn-Ito index[11] (Chinn and Ito, 2008), reveal a strong positive relationship which is robust to the inclusion of various controls. Corresponding regressions taking as the dependent variable *only* the share of direct cross-border credit show no such relationship. This is not to say that direct cross-border credit cannot play an important role, as in the case of Ireland (Figure 1). Rather, the set of results suggests that, in practice, both forms of international credit are potentially important contributors to domestic credit booms.

To investigate this, we examine the relationship between international credit and credit growth in the lead-up (2002-2008) to the financial crisis. Overall, credit tended to boom in those emerging markets where international sources of credit rose in importance. Figure 3 plots overall credit developments as measured by the *change* in the ratio of total bank credit to GDP on the y axis against the *change* in borrower-countries' reliance on the international components of bank credit (as a share of total credit) on the x axis. Broadly speaking, the scatter plots show a positive relationship: bank credit rose in relation to GDP most (y axis) in those emerging economies that experienced the largest increase in the international dimensions of credit between 2002 and 2008 (x-axis).

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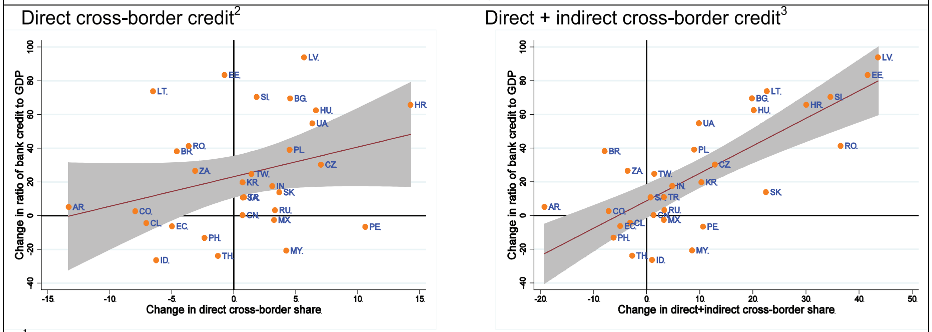
10. The international credit share considered here, and in the centre panel of Figure 4, is a combination of both the direct cross-border share and the indirect cross-border financing components. It is the ratio of direct cross-border credit to non-banks plus net cross-border borrowing by banks in the country (if positive), all divided by total bank credit to non-banks (ie domestic credit plus direct cross-border credit).

11. The Chinn-Ito index measures a country's degree of capital account openness. It is based on the binary dummy variables that codify the tabulation of restriction on cross-border financial transactions reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions.*

Figure 3
International Credit and Credit Expansion in Emerging Markets (2002 Q1 – 2008 Q2)[1]
In Per Cent



[1] The y-axis shows the change in the ratio of total bank credit (including credit to governments) to GDP over the 2002 Q1 – 2008 Q2 period. Total bank credit is the sum of domestic credit and cross-border bank credit to nonbanks in the country. The red lines indicate OLS predicted values and the gray areas indicate the 95 percent confidence bands for these regression lines. [2] The x-axis shows the change in the ratio of direct cross-border credit over total bank credit to non-banks (including governments). [3] The x-axis shows the change in the ratio of direct cross-border credit plus net cross-border borrowing by banks in the country (if positive) to total bank credit to non-banks.

Sources: IMF IFS, BIS international banking statistics, authors calculations

The relationship is most pronounced when the more comprehensive measure of international credit is used. That is, the change in the bank-credit-to-GDP ratio is only loosely related to the change in the share of *direct cross-border credit* in the left-hand panel. It is much more tightly related to the change in combined share of *direct cross-border credit* and *indirect cross-border credit* (centre panel). This is evidenced by the much narrower grey shaded area (confidence band for the estimated regression line) in the right-hand panel. In short, *indirect cross-border credit*, often denominated in foreign currency, appears to be a frequent enabler of domestic credit expansion.

Such indirect cross-border credit can be either plain or fancy. In Poland (and in other eastern European countries), it was plain: foreign banks advanced euros or Swiss francs to their affiliates in the country, which in turn extended mortgages to households at lower yields than those available on domestic-currency mortgages. Indeed, central and eastern European countries stand out, having experienced big credit booms and also showing a high share of credit denominated in foreign currency in mid-2008 (Figure 1, right-hand panels). In Korea, much of the *indirect cross-border credit* was fancy. Foreign banks advanced dollars to banks in the country, who bought won investments hedged into dollars with forward purchase of dollars against won. The forward counterparties, mostly

Korean exporters like shipbuilders, in effect borrowed dollars by contracting to sell future dollar revenues.

Further regression analysis confirms the impression conveyed by Figure 3 that direct cross-border credit is weakly related to overall credit growth. Models 1 through 4 in Table 1 relate the rise in bank credit as a share of GDP from mid-2002 to mid-2008 to the change in *direct cross-border credit* and various controls, including size (GDP or total credit), financial openness (Chinn-Ito index), the short-term interest rate differential and the volatility of the domestic currency. All the controls are potential incentives for domestic borrowers to draw on international credit. Again, direct cross-border credit is only weakly related to overall credit developments. While its coefficient is positive in all four model specifications, it is not statistically significant in any of them. Furthermore, the R-squared suggests that no more than a fifth of the variance in overall credit growth is associated with international credit.

Table 1
Bank Credit Booms and International Credit (2002 Q1 – 2008 Q2)
Cross-Sectional Change in Credit-To-GDP Ratio Regressed on Change in International Credit and Controls[1]

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Δ (direct cross-border share)[2]	1.757 (1.73)	1.644 (1.65)	1.717 (1.69)	1.128 (1.03)				
Δ (direct + indirect cross-border share)[3]					**1.631** **(6.24)**	**1.615** **(5.66)**	**1.615** **(5.92)**	**1.576** **(5.26)**
Size (nominal GDP 2002)		–0.0331 (–1.57)				–0.0026 (–0.16)		
Size (total credit 2002)			–0.0146 (–1.10)	–0.004 (–0.32)			–0.026 (–0.27)	0.002 (0.21)
Financial openness[4]				8.74 (1.74)				-1.231 (–0.30)
Short-term interest rate differential[5]				-1.034 (-0.76)				-0.671 (-0.69)
FX volatility[6]				69.79 (3.03)				49.19 (2.84)
Constant	23.086 (3.92)	29.981 (4.16)	25.981 (4.04)	-13.93 (-1.09)	8.694 (1.84)	9.36 (1.47)	9.37 (1.73)	-12.436 (-1.34)
Adjusted R^2	0.093	0.167	0.131	0..45	0.573	0.574	0.575	0.71
No. observations	31	31	31	30	31	31	31	30

Note: Values in parentheses are *t statistics*.
[1] The change in the ratio of total bank credit (including credit to governments) to GDP over the 2002 Q1 – 2008 Q2 period. Total bank credit is the sum of domestic credit and cross-border bank credit to non-banks in the country. [2] The change in the ratio of direct cross-border credit over total bank credit to non-banks. [3] The change in the ratio of direct cross-border credit plus net cross-border borrowing by banks in the country (if positive) to total bank credit to non-banks. [4] Capital account openness as measured by the Chinn and Ito (2008). It is based on binary dummy variables that codify restrictions on cross-border financial transactions reported in IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*. [5] The difference between short-term interest rates in each country and euro (for emerging European countries) and US dollar (for all other countries) short-term interest rates, average over the sample period. [6] Quarterly measure of exchange rate volatility generated from daily price data, average over the sample period. Eastern European yields are measured against euro; other against US dollar.

However, the relationship between the combined share of direct and indirect cross-border credit and overall credit developments, as indicated in Models 5-8 (Table 1), is strong,. The change in this combined share accounted for well over half of the cross-country variation in the change in credit-to-GDP ratios over this period. The inclusion of various controls does not change this relationship. The estimated coefficients suggest that an increase in (either direct or indirect) international credit as a share of total credit by one percentage point raises total credit by more than 1.6 percent of GDP.

To sum up, the evidence for emerging markets for 2002-2008 suggests that international credit is an enabler of domestic credit booms, as captured by a rise in the ratio of overall credit to GDP. Now we plot the data to see whether a parallel proposition holds concerning credit developments *after* the outbreak of the financial crisis in mid-2008. In particular, whether overall bank credit fell fastest where international credit had come to play the largest role.

Note that the proposition is a parallel one, not a converse one, in that we examine not the change in the ratio of bank credit to GDP but rather the percent change in outstanding bank credit. This is because recessions can drive down nominal GDP, leaving the ratio of credit to GDP to rise during a recession. So it is more telling to examine how the change in bank credit accorded with the overall dependence of emerging market economies on international credit, as in Figure 4. The x-axis in this figure measures the share of international credit in total credit at end-Q2 2008, and the y-axis measures the percent change in the stock of outstanding bank credit to non-banks in each country from its peak level going into the crisis (taken as the maximum value in 2007Q2 -2008Q4) to 2011Q2. As shown in the Box, only a handful of economies experienced outright contractions in total bank credit, and thus lie below the zero horizontal line. The results indicate that after the onset of the crisis, overall credit tended to contract more where the dependence on international credit had reached a higher level.[12]

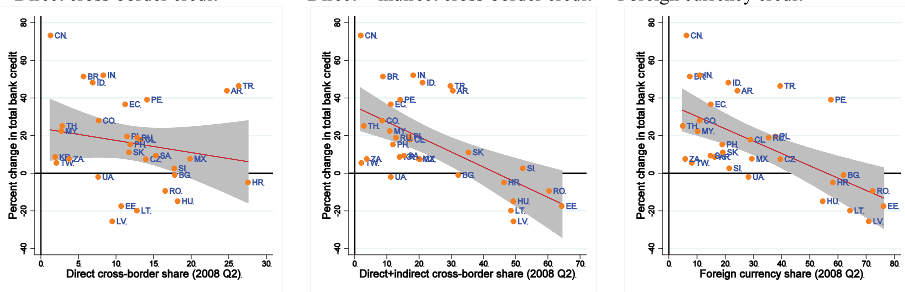
12. Cetorelli and Goldberg (2011) and McCauley et al (2010) analyse how the shock to internationally active banks' global portfolio was transmitted to emerging economies. Bruno and Shin (2011) provide a more theoretical treatment.

Figure 4

International Credit and Credit Growth in Emerging Markets (2008 Q2 – 2011 Q2)[1]

In per cent

Direct cross-border credit[2] | Direct + indirect cross-border credit[3] | Foreign currency credit[4]



[1] The y-axes show the percent change in total bank credit (excluding credit to governments) from the start of the 2008 financial crisis to end-Q2 2011. Since bank credit peaked in different quarters in different countries, the start of the crisis is taken to be the maximum value of total bank credit observed between 2007 Q2 – 2008 Q4. Total bank credit is the sum of domestic credit and cross-border bank credit to non-banks in the country. The red lines indicate OLS predicted values and the gray areas indicate the 95 percent confidence bands for these regression lines. [2] The x-axis shows the ratio of direct cross-border credit to total bank credit to non-banks (excluding governments) at end-Q2 2008. [3] The x-axis shows the ratio of direct cross-border credit plus net cross-border borrowing by banks in the country (if positive) to total bank credit to non-banks, at end-Q2 2008. [4] The x-axis shows the estimated share of total bank credit denominated in foreign currencies at end-Q2 2008.

Sources: IMF IFS, BIS international banking statistics, authors calculations

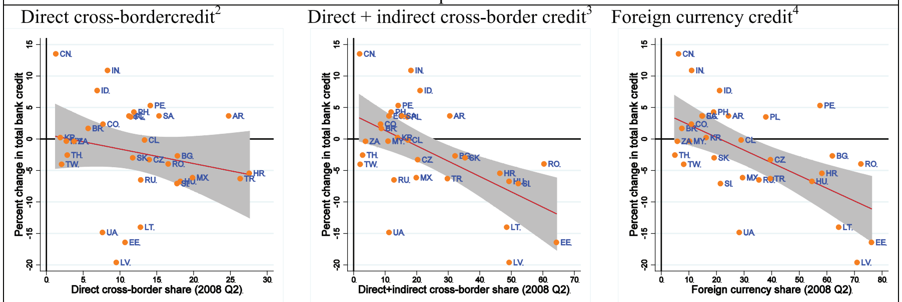
Again the relationship is most pronounced for the more comprehensive measure of international credit. When only direct-cross-border credit is considered (left panel) the data do not reveal a strong relationship across the sample; the slope coefficient on the regression line is negative, but not statistically significant. As in the earlier discussion, however, when the indirect cross-border credit is also taken into account (centre panel), a tighter (and statistically significant) pattern emerges. By these estimates, a two percentage point higher share of (direct and indirect) cross-border credit on the eve of the crisis is associated with a one percentage point lower growth rate in total bank credit in the following two years. Similarly, the right-hand panel shows that those economies where more credit was denominated in foreign currency at the onset of the crisis also suffered larger reductions in credit in the following two years.

Consistent with the evidence in Figure 4, those emerging economies heavily dependent on international credit also tended to suffer larger contractions in output during the crisis. Of course, as global trade contracted, few economies escaped recession. But those that had depended most on international credit before the Lehman collapse tended to suffer sharper downturns. Figure 5, plots cumulative GDP growth between 2008Q2 and 2009Q4 on the y-axis against the same three international credit shares at 2008Q2 on the x-axis. As above, the share of direct cross-border credit is only loosely related to GDP growth (left-

hand panel). But once again, the combined (direct plus indirect) share of cross-border credit (centre panel), and foreign currency credit (right-hand panel), are more tightly associated with the severity of the downturn.

Figure 5
International Credit and GDP Growth in Emerging Markets (2008 Q2 – 2009 Q4)[1]
In per cent

Direct cross-bordercredit[2] | Direct + indirect cross-border credit[3] | Foreign currency credit[4]



[1] The y-axes show the cumulative growth in GDP in the six quarters between end-Q2 2008 and end-Q4 2009. The red lines indicate OLS predicted values and the gray areas indicate the 95 percent confidence bands for these regression lines. [2] The x-axis shows the ratio of direct cross-border credit to total bank credit to non-banks (excluding governments) at end-Q2 2008. [3] The x-axis shows the ratio of direct cross-border credit plus net cross-border borrowing by banks in the country (if positive) to total bank credit to non-banks, at end-Q2 2008. [4] The x-axis shows the estimated share of total bank credit denominated in foreign currencies at end-Q2 2008.
Sources: IMF IFS, BIS international banking statistics, national sources, authors calculations

4. Dollar Credit in Asia in 2009-2011

With the perspective afforded by these results for the broad cross-section of emerging markets, this section reviews recent credit developments in major Asian economies. We first show that Asia's bank credit generally involves international credit only to a limited extent. Then we narrow the focus to a measure of credit to the non-financial *private* sector which comprises both bank and securities credit, in order to measure as precisely as possible the contribution of dollar-denominated credit to overall private credit growth in Asia. We find that, even though dollar credit grew very rapidly in 2010-11, its low share in overall credit kept its contribution to overall credit growth modest. Thus, as central banks in Asia tightened monetary policy in 2010-11, they may have overstated the challenge of borrowers obtaining credit from abroad in lower-yielding US dollars.[13] That said, we consider how Korea's experience in 2008 and Chinese borrowers' offshore borrowing in 2010-11 caution against complacency.

13. Indeed, since the global financial crisis, US dollar credit to non-US residents resumed robust growth through the first quarter of 2011. Borio et al (2011) report that from the first quarter of 2009 to the first quarter of 2011, dollar credit to non-financial private borrowers outside the United States actually grew by $1.1 trillion. Indeed, the resumption of double-digit growth of US dollar credit to borrowers outside the United States stands in sharp contrast to stagnant private credit growth in the United States.

The most salient finding is that, in contrast to the mid-1990s, international sources of credit generally represent a small share of total bank credit in Asia in this century (Figure 6). In particular, local lending to non-banks dwarfs direct cross-border lending to non-banks in the major Asian economies (also see Figure A in the Box). For its part, indirect cross-border funding also tends to be small relative to the total. Even in Korea, where it is largest in relation to overall credit, it has not reached proportions seen in that country before the Asian financial crisis of 1997-98 (Figure 2)—much less that reached in Thailand at that time. As a result, even though cross-border credit grew faster than overall credit before and since the recent financial crisis (Figure 6, middle column, green lines above red lines), international credit generally contributed modestly to overall increases in credit.

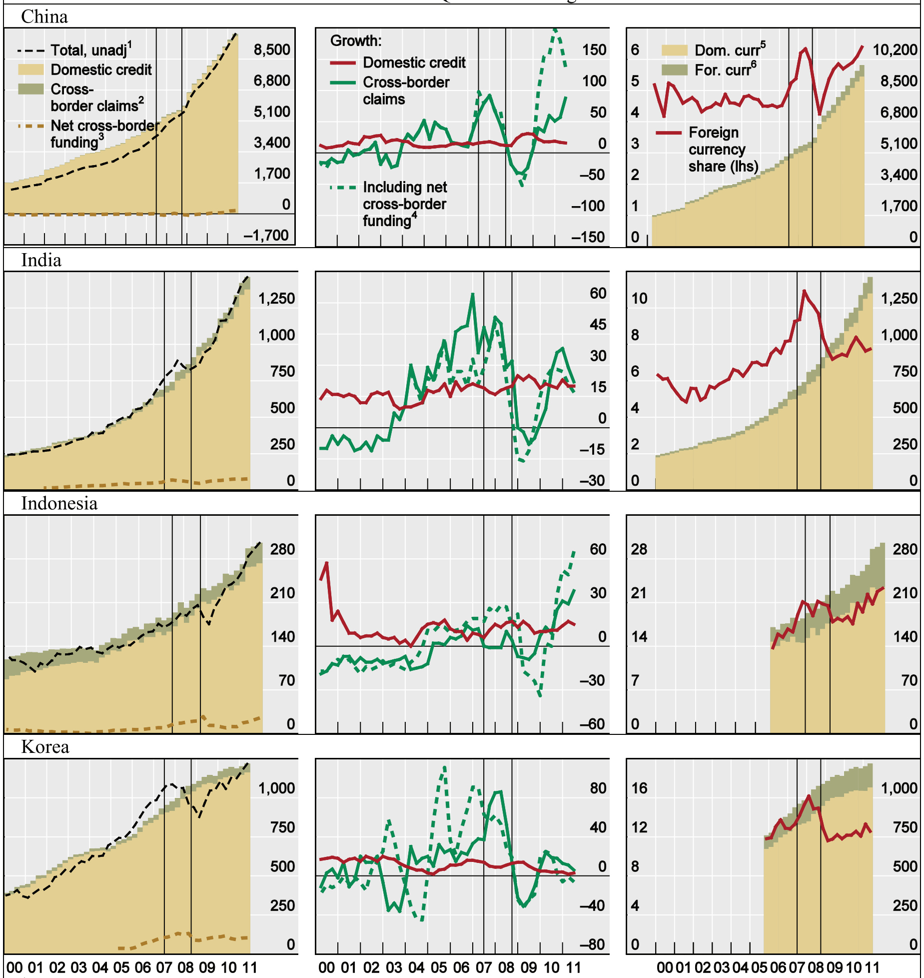
The contrast is stark not only between Asia in the mid-1990s and Asia in the 2000s, but also between Eastern Europe and Latin America, on the one hand, and Asia now. Compared to emerging Europe and Latin America, in Asia the foreign currency component of total bank credit (including that booked by domestic banks) forms a small portion of the total. As a result, the rapid growth of such credit before the global financial crisis did not make a substantial contribution to overall bank credit growth (Figure 6). The small share of cross-border credit also led to a different experience of the crisis in Asia. Even though direct cross-border credit to the region contracted sharply during 2009, falling by more than 20 percent over four quarters before in both the second and third quarters of that year, growth in bank credit to Asian borrowers hardly slowed after mid-2008 (see Box).

In view of the concerns over dollar credit in particular, Table 2 goes beyond the bank credit that we have analysed thus far and brings together data from the BIS international banking statistics, BIS international debt securities statistics and national sources to construct estimates of credit to non-financial private sector borrowers with a currency breakdown. Where available (UK, euro area), we start with a broad measure of total credit based on the total liabilities (bank borrowing and debt securities) of non-financial private sector borrowers as reported in flow-of-funds statistics. In combination with BIS data, these permit us to estimate the US dollar share of these liabilities. For all other countries, we construct total credit aggregates as in Borio et al (2011), by summing domestic credit (excluding credit to governments and non-bank financials), cross-border bank *loans* and issues of international debt securities by non-financial private sector residents.

Again, owing to its small share of overall credit in Asia, dollar credit growth's contribution in relation to overall credit growth was generally modest (penultimate

row of Table 2). Only in the more dollarised economies in the region, that is, in Hong Kong, the Philippines, Thailand and Indonesia, did the contribution rise to double-digit percentage points.

Figure 6
Bank Credit to Non-Banks, Selected Emerging Asian Countries
At constant end-Q2 2011 exchange rates[1]



[1] The stacked bars indicate total bank credit to non-banks expressed in US dollars at constant end-2012 Q2 exchange rates, and thus exclude valuation effects. The dotted black line shows unadjusted total bank credit converted into US dollars at contemporaneous exchange rates. [2] BIS reporting banks' cross-border claims on non-banks. Claims include loans and securities, most of which is debt [3] Net cross-border borrowing (liabilities minus claims) from all sectors by banks located in the country. For non-BIS reporting countries (China and Indonesia), BIS reporting banks' net cross-border claims on banks in the country. [4] Growth after first including net cross-border borrowing (if positive) by banks in the country (dashed brown line), under the assumption that this cross-border credit is ultimately passed on to non-banks in the country. [5] Estimated cross-border and locally extended claims on non-banks in domestic currency. [6] Estimated cross-border and locally extended claims on non-banks in foreign currencies.
Sources: IMF International Financial Statistics; BIS Locational Banking Statistics; BIS Consolidated Banking Statistics.

Table 2
Total Credit to the Non-Financial Private Sector in Selected Countries, Mid-2011

	UK	XM	HK	CN	IN	ID	KR	TH	MY	PH	BR	MX
Total credit[1]	4,883	22,534	590	8,800	1,006	228	1,143	354	317	77	1,447	281
US dollar credit[2]	881	887	146	468	89	31	109	16	23	14	120	101
As % of GDP[3]	37.3	7.0	61.8	7.3	5.1	4.0	10.0	4.9	9.4	6.7	5.2	9.1
As % of total credit[4]	18.0	3.9	24.7	5.3	8.9	13.7	9.5	4.5	7.2	18.1	8.3	36.0
Total credit growth 2009[5]	*12.4*	*13.7*	*69.8*	*60.9*	*64.2*	*85.9*	*36.5*	*44.9*	*46.9*	*32.5*	*102.2*	*25.6*
Dollar credit growth 2009[5]	*26.9*	*12.1*	*76.8*	*121.4*	*45.0*	*117*	*33.3*	*1,389*	*32.3*	*171*	*48.6*	*17.2*
Contribution[6]	*4.3*	*0.5*	*18.2*	*4.7*	*4.5*	*13.7*	*3.3*	*6.1*	*2.6*	*15.2*	*5.5*	*6.6*
Contribution/total growth[7]	*34.7*	*3.6*	*26.1*	*7.7*	*7.0*	*15.9*	*9.0*	*13.6*	*5.5*	*46.8*	*5.4*	*25.8*

BR = Brazil; CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; KR = Korea; MX = Mexico; MY = Malaysia;
PH = Philippines; TH = Thailand; UK = United Kingdom; XM = euro area.
[1] Total credit to non-financial private sector borrowers. For the euro area (XM) and the United Kingdom (UK), total liabilities of non-financial private sector borrowers from the flow of funds. For other countries, estimates constructed as the sum of domestic credit, cross-border loans to non-bank borrowers and issues of international debt securities by resident non-bank corporates. [2] For those countries which are reporters in the BIS banking statistics, estimates are constructed as the sum of (i) BIS reporting banks' cross-border loans to non-bank residents, (ii) resident banks' loans to resident non-banks and (iii) outstanding international debt securities issued by non-bank private sector residents. For non-BIS reporting countries (China, Indonesia, the Philippines and Thailand), the third component is not available in the BIS banking statistics. For China, locally extended US dollar credit is estimated from national data; for other non-reporters, it is proxied by BIS reporting banks' net cross-border claims on resident banks on the assumption that credit is onlent to non-financial private sector residents. In billions of US dollars. [3] Stock over nominal GDP of the country, in per cent. [4] Contribution of US dollar credit growth to total growth since end-Q1 2009 in credit to non-bank private sector borrowers, in per cent. [5] Percentage change in outstanding stocks between end-Q1 2009 and end-Q2 2011. [6] Contribution in percentage points of US dollar credit growth to growth of total credit to non-financial private sector borrowers. [7] Row 7 divided by row 5, multiplied by 100.
Sources: People's Bank of China; Hong Kong Monetary Authority; IMF, International Financial Statistics; national flow of funds statistics; BIS locational banking statistics by nationality; BIS international debt securities statistics.

Still, dollar credit did grow rapidly. It outpaced total credit growth (in the row above) across much of Asia between March 2009 and June 2011. In China, for example, dollar credit grew by 121 percent while overall credit grew at just half that pace. Hong Kong SAR, Indonesia, Thailand and the Philippines also saw faster growth of dollar credit. But Thailand's 1000 percent-plus growth was from a tiny base, underscoring how these data need to be interpreted with care.[14]

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14. Elsewhere, the rate of expansion of foreign currency credit relative to overall credit has not been as high. In Korea, dollar credit grew in tandem with overall credit, and in India and Malaysia, dollar credit grew more slowly than overall credit.

While the contribution of dollar credit growth to overall credit growth needs to be kept in perspective, general considerations and particular developments in Korea and China suggest, in different ways, that there are no grounds for complacency. As a general matter, policy to varying extents seems to hold down the growth of dollar credit in the region. In the cross-section of countries, international credit as a share of total credit in 2002-08 was to some extent related to capital account restrictions as captured by Chinn and Ito (2008) (see Annex 2). So while it seems at face value that international credit has played a limited role in credit developments in Brazil – Table 2 shows substantially more rapid growth of real credit than dollar credit in the recent past – this outcome may reflect to some extent policies like the tax on private short-term foreign borrowing (IMF, 2011, pp .66-67).

In Korea, Figure 6 above suggests that the reliance on indirect international credit before the global financial crisis was modest in relation to that in contemporary Hungary (Figure 1) or in Thailand or Korea before the Asian financial crisis (Figure 2). That did not prevent financial trauma, extending from the relatively thin foreign exchange market to even the domestic government bond market, when international banks' withdrew $56 billion in the fourth quarter of 2008. Policies to prevent the build-up of short-term cross-border interbank debt have been tightened since the global financial crisis (Baba and Shim, 2010) and have been associated with more moderate overall and international credit growth.

In the case of China, the extension of dollar credit to Chinese firms outside the mainland implies that China's overall dependence on dollar credit is understated. In particular, Chinese firms' affiliates in Hong Kong are using renminbi deposits in mainland banks or guarantees from mainland banks to secure US dollar credits extended in Hong Kong. If such dollar credit is funnelled back to the mainland, or otherwise replaces debt that might have been raised on the mainland, the measure in Table 2 of dollar credit to residents of China understates the effective flow of dollar credit. After the head of the Hong Kong Monetary Authority (2011) warned banks about the "unsustainable" rise in lending to Chinese-related nonbanks, Yuen (2012) reports that the 60 percent growth in Hong Kong loans to Chinese nonbanks in 2010 had slowed to 35 percent in 2011. As Chinese firms become more multinational it becomes more challenging to assess their dependence on foreign currency credit.

To sum up, the previous section has established an association between a rise in the share of international credit in overall credit and the rise in the ratio of overall bank credit to GDP across emerging markets in the 2000s. In this

section, we have shown that Asian emerging market economies generally show low shares of international credit and small contributions from US dollar credit. But the record in Asia and elsewhere suggests that policy-makers should keep an eye on international credit, including that part of it which is not readily captured in national reporting systems.

5. Carry Trades and International Credit

As we have seen, rapid credit growth in the 2000s in many emerging markets involved a greater reliance on international credit, much of it denominated in foreign currencies. No doubt open capital accounts and a large presence of foreign banks in some countries enabled the build-up of the stock of international credit. In addition, carry trade opportunities, where borrowers take advantage of interest rate differentials across currencies amidst low exchange rate volatility, also contributed to foreign currency credit growth. Such opportunities can be gauged by a carry-to-risk ratio, which is essentially a Sharpe ratio for a currency. In the numerator is the interest rate differential and in the denominator is a measure of the volatility of the currency. The higher the interest rate differential is for a given volatility level, the more attractive a long position becomes.

When exchange rate volatility is low, even small interest rate differentials can generate strong carry-trade incentives. For example, Figure 7 plots carry-to-risk ratios for selected currency pairs based on one month interest rate differentials and implied volatilities extracted from currency options.[15] In mid-2011, the CNY-US$ currency pair had the highest carry to risk ratio in our sample of currency pairs (2.21). While the CNY-US$ interest rate differential (4.4 percent) is far from the highest in the sample, the implied volatility of the CNY-US$ exchange rate (1.9 percent) is by far the lowest. It is, of course, capital controls that prevent domestic borrowers in China and international investors outside from taking advantage of this opportunity (McCauley, 2011). Nevertheless, the CNY-US$ case illustrates how an exchange rate regime that censors volatility can create strong carry trade incentives even without huge yield differentials.[16]

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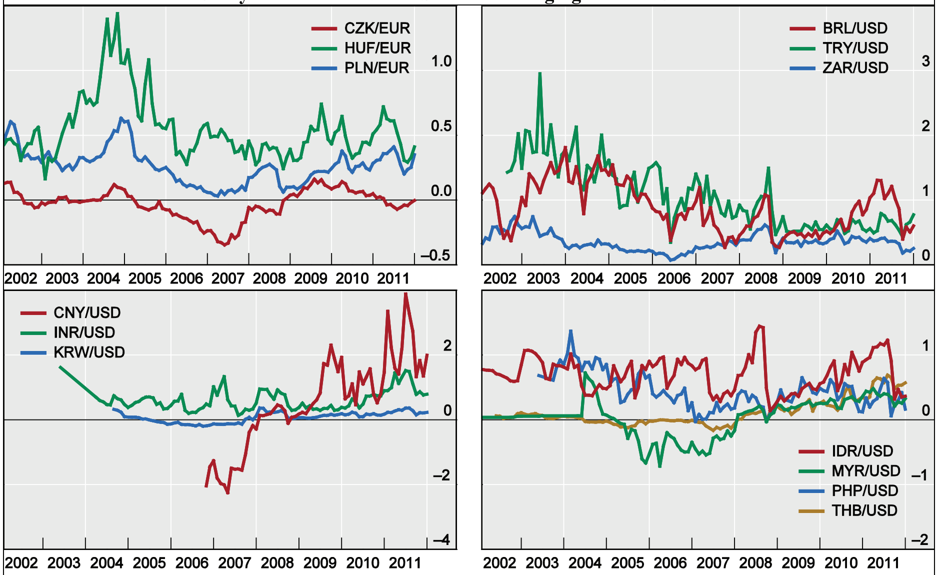
15. Using implied rather than realised exchange rate volatility in the denominator yields a forward-looking Sharpe ratio.

16. By contrast, the carry to risk ratio for the free-floating BRL-US$ pair is roughly half as large (1.10) despite the fact that the interest rate differential here (11.9 percent) is nearly triple in size. In other words, the volatility of the BRL/US$ rate (the denominator of the carry-to-risk ratio) reduces the incentives to engage in this carry trade.

Figure 7
Carry-To-Risk Ratios for Selected Emerging Market Currencies[1]



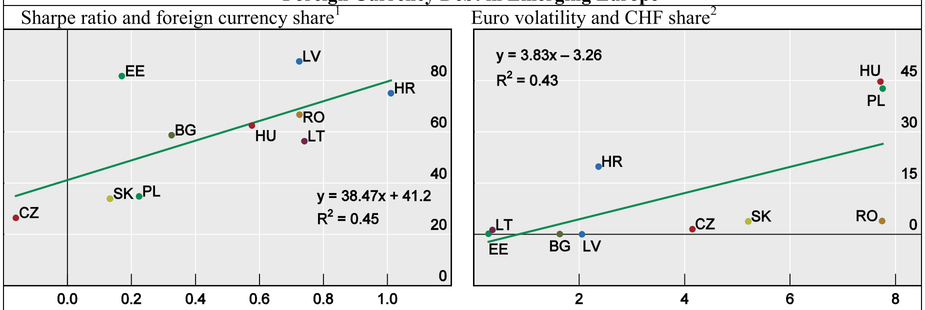
[1] Defined as the one-month LIBOR interest rate differential divided by the implied volatility derived from one-month at-the-money exchange rate options for the relevant currency pair. The funding currency is the second currency in the legend.
Sources: Bloomberg; JPMorgan Chase; BIS calculations.

In emerging Europe, where countries are, on average, more financially open than in emerging Asia, sustained carry trade opportunities seemed to contribute to the massive shift to foreign currency borrowing by the real side of the economy over the past decade (Figure 1, right-hand panels). For example, McCauley (2010) documents a positive relationship between the carry-to-risk ratio and the share of foreign currency credit during 2004-2007 (Figure 8, left-hand panel). This finding suggests that, in deciding in which currency to denominate their mortgages, households acted like so-called carry traders. Heavy reliance on foreign currency credit in the boom period saddled these economies with much larger debt loads in real terms once the crisis hit and local currencies depreciated.

Furthermore, carry-to-risk ratios help explain why, in some central and eastern European countries, households and firms borrowed in euro, while in other economies in the same region, most of the borrowing was in Swiss francs (McCauley, 2010) and Brown et al, 2009). In countries where the domestic currency was quite stable against the euro, as in the Baltic states, the borrowing

was largely in the euro (Figure 8, right-hand panel). Where there was considerable volatility in the domestic currency against the euro, borrowers reached for the larger interest rate differential, by borrowing in Swiss francs. For example, the volatility of the Hungarian forint or Polish zloty against the Swiss franc was only a bit higher than that against the euro, while the Swiss franc offered yields about a percent lower than the euro. As a result, the shares of foreign currency loans denominated in Swiss francs were substantial in both of those countries.

Figure 8
Foreign Currency Debt in Emerging Europe



BG = Bulgaria; CZ = Czech Republic; EE = Estonia; HR = Croatia; HU = Hungary; LT = Lithuania; LV = Latvia; PL = Poland; RO = Romania; SK = Slovakia.
[1] The x-axis shows the Sharpe ratio of the domestic currencies, where the numerator is the 36-month average of the three-month interest rate differential for the period October 2004–September 2007 and the denominator is the annualised volatility of the exchange rates of the respective local currency versus the euro over the same period; the y-axis shows all foreign currency loans as a percentage of all loans in September 2007. [2] The x-axis shows the annualised volatility of the exchange rate of local currency versus the euro over period October 2004–September 2007; the y-axis shows the CHF loans as a percentage of all foreign currency loans in September 2007.
Source: McCauley (2010).

In sum, interest differentials combine with currency volatility to shape the incentives to borrow in foreign currency. And borrowing in foreign currency ("liability dollarisation") in turn puts upward pressure on the domestic currency. To the extent that an appreciation leads to expectations of further appreciation, then the incentive to borrow in foreign currency increases at any given level of the interest differential. Given the current and prospective low yields on the dollar and other major currencies, policies that squelch currency volatility should be expected to invite carry trades, at least during "risk-on" periods in global financial markets (Ogus (2011)). Moreover, limiting the depreciation of the domestic currency during "risk off" periods will encourage positions in domestic currency assets funded with foreign currency liabilities.[17]

17. Grenville (2011, p 28) advocates "buying cheap and selling dear over the exchange rate cycle, where the width of the band gives some measure of the profit margin"—to the authorities, and the risk to private investors and borrowers.

6. Conclusions

Recent cases in Europe and older cases from before the Asian financial crisis of 1997-98 suggest that an increased role for international bank credit in overall credit is associated with larger credit booms. Regression analysis shows that this regularity holds in a sample of 31 emerging market economies in the years 2002-2008. In addition, we present evidence that, after the onset of the crisis, overall credit and real output tended to contract more where the dependence on international credit had reached a higher level. Most importantly, our empirical analysis highlights how both *direct cross-border* credit and *indirect cross-border* financing (of domestic credit) enable domestic credit booms.

In Asia, the growth of international credit has not contributed much to the recent period of rapid credit growth. However, if moving forward countries in the region become more financially open, residents will be able to capitalise on carry trade opportunities, and thus shift their liabilities out of the domestic currency. As the experience of emerging Europe suggests, greater dependence on international credit, particularly foreign currency credit, limits local policy makers' ability to constrain credit growth. The implication of this for Asia is that international credit growth merits attention. Authorities can use BIS statistics as a cross-check for estimates of international indebtedness of their residents, especially taking into account the direct cross-border lending to nonbanks.

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Annex 1

Sample of Economies

The analysis in this paper is based on a sample of 56 economies.

Advanced Economies (25):

AT=Austria, AU=Australia, BE=Belgium, CA=Canada, CH=Switzerland, DE=Germany, DK=Denmark, ES=Spain, FI=Finland, FR=France, GB=United Kingdom, GR=Greece, HK=Hong Kong, IE=Ireland IS=Iceland, IT=Italy, JP=Japan, LU=Luxembourg, NL=Netherlands, NO=Norway, NZ=New Zealand, PT=Portugal, SE=Sweden, SG=Singapore, US=United States

Emerging Economies (31):

Asia-Pacific: CN=China, ID=Indonesia, IN=India, KR=Korea, MY=Malaysia, PH=Philippines, TH=Thailand, TW=Chinese Taipei

Latin America: AR=Argentina, BR=Brazil, CL=Chile, CO=Colombia, EC=Ecuador, MX=Mexico, PE=Peru

Emerging Europe: BG=Bulgaria, CZ=Czech Republic, EE=Estonia, HU=Hungary, HR=Croatia, LT=Lithuania, LV=Latvia, PL=Poland, RO=Romania, SI=Slovenia, SK=Slovakia, UA=Ukraine

Other: RU=Russia, SA=Saudi Arabia, TR=Turkey, ZA=South Africa

Annex 2

International Credit and Financial Openness

Table A reports a regression of the change in the share of international credit (in total bank credit) on financial openness, yield differentials and currency volatility. The narrower measure of international credit, the share of direct cross-border claims on nonbanks, is not significantly correlated with any of the regressors. By contrast, the broader measure, which takes into account both direct and indirect cross-border credit, is strongly correlated with the Chinn-Ito measure of capital account openness. About a third of the cross-sectional variation in the penetration of direct and indirect international credit in this period is associated with capital account openness.

Table A
International Share of Bank Credit and Financial Openness
Change in the international share of total bank credit over the period mid-2002 to mid-2008

	Δ (direct cross-border share)[1]				Δ (direct + indirect cross-border share)[2]			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Financial openness[3]	0.639 (0.72)	0.608 (0.60)	0.66 (0.68)	-0.122 (-0.11)	**7.06** **(3.60)**	**6.35** **(2.84)**	**7.026** **(3.27)**	**6.19** **(2.52)**
Size (nom GDP 2002)		–0.0002 (–0.07)				–0.007 (–0,68)		
Size (total credit 2002)			0.0002 (0.06)	–0.001 (–0.35)			–0.006 (–0.05)	0.0003 (0.04)
ST interest rate diff[4]				–0.378 (–1.33)				-.65 (-1.02)
FX volatility[5]				–0.414 (–0.08)				13.53 (1.20)
Constant	0.248 (0.20)	0.327 (0.19)	0.205 (0.14)	2.31 (0.84)	**5.12** **(1.85)**	**6.93** **(1.80)**	5.19 (1.59)	1.62 (0.26)
Adjusted R^2	0.018	0.018	0.018	0.10	0.317	0.328	0.316	0.36
No. observations	30	30	30	30	30	30	30	30

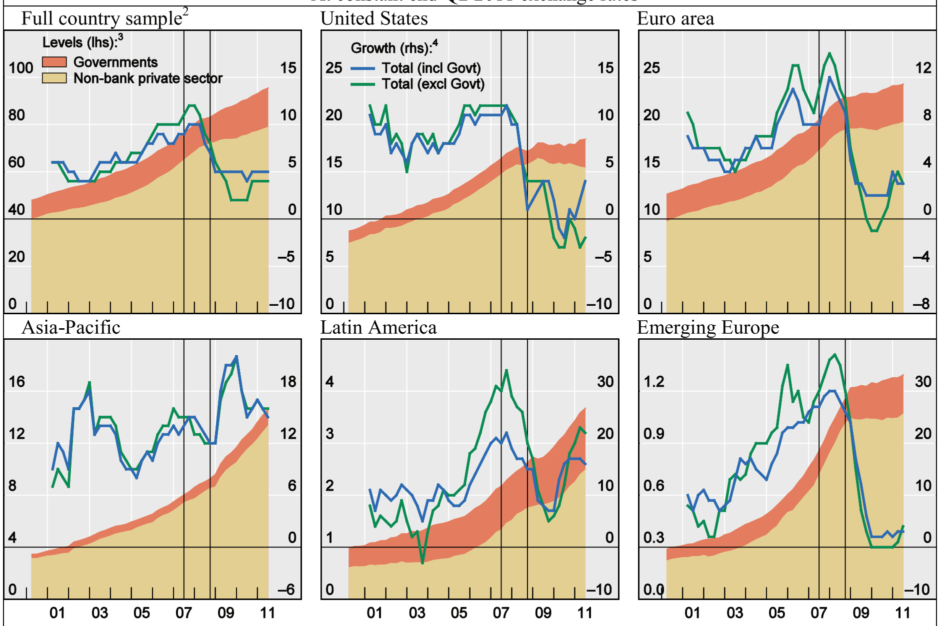
Note: Table shows a cross-sectional regression of the change in the international share of total bank credit (2002Q2-2008Q2) on various right-hand side controls. Values in parentheses are *t statistics*.
[1] The change (2002Q2 – 2008Q2) in the ratio of direct cross-border credit over total bank credit to non-banks. [2] The change (2002Q2 – 2008Q2) in the ratio of direct cross-border credit plus net cross-border borrowing by banks in the country (if positive) to total bank credit to non-banks. [3] Financial openness as measured by the Chinn and Ito (2008). It is based on binary dummy variables that codify restrictions on cross-border financial transactions reported in IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*. [4] The difference between short-term interest rates in each country and euro (for emerging European countries) and US dollar (for all other countries) short-term interest rates, average over the sample period. [5] Quarterly measure of exchange rate volatility generated from daily price data; average over 2002Q2 – 2008Q2.

Bank Credit to Non-Banks: Private vs Public Sector Borrowers

This Annex Graph is an alternative version of the graph discussed in the Box in the main text. Here, the stacked shaded areas depict total bank credit to non-bank borrowers, broken down into bank credit to governments and non-bank private sector borrowers.

Global Bank Credit to Non-Banks: Private Sector vs Government Borrowers

At constant end-Q2 2011 exchange rates[1]



The vertical lines represent end-Q2 2007 and end-Q3 2008.

[1] The shaded areas indicate total bank credit to non-bank borrowers expressed in US dollars at constant end-Q2 2012 exchange rates. The shaded areas are adjusted using various components of the BIS banking statistics to produce a breakdown by currency for both credit the non-bank private sector and to governments. [2] Aggregate for a sample of 56 countries (see the statistical appendix for full list). [3] In trillions of US dollars. [4] In per cent.

Sources: IMF, *International Financial Statistics*; BIS international banking statistics; BIS calculations.

Chapter 7

HOW SHOULD WE BANK WITH FOREIGNERS? AN EMPIRICAL ASSESSMENT OF LENDING BEHAVIOUR OF INTERNATIONAL BANKS TO SIX EAST ASIAN ECONOMIES

By
Victor Pontines and Reza Y. Siregar[1]

1. Introduction

One notable trademark of financial globalisation has been the remarkable rise in cross-border banking linkages between countries in recent years. The pros and cons of these linkages in turn are currently being intensely re-assessed in the wake of the 2007-2009 global financial crises. The alleged advantages are well-known—emerging market countries are deemed to have benefitted in the form of mitigating anti-competitive behaviour on the part of domestic banks in view of competition or the threat of competition from foreign banks which arguably leads to efficiency gains manifested in the form of greater variety in financial services and lower prices; the transfer and spill-over of knowledge and technical know-how as well as the greater availability of finance most especially to credit-constrained firms and households. Yet the recent interruption of the recent global financial crisis to this spectacular rise in international bank lending serves as a stark reminder, most especially to policymakers, that international bank lending can rapidly transmit adverse shocks emanating from developed financial markets to emerging markets. It is no surprise that under this circumstance, the role of the global banking system, in general, and international bank lending, in particular, has once again been placed into close scrutiny. As

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a testament to this greater focus on the consequential role of large and volatile cross-border capital flows, most especially that of greater cross-border banking interconnectedness, this concern has in fact been placed high in the policy reform agenda of the global financial system by the International Monetary Fund and the G-20 (IMF, 2010).

In the case of the East Asian economies, the intensified volatility in global bank lending and the accompanying sharp drops in lending by the international banks in late 2008 have brought back fears of a repeat episode of credit squeeze suffered by these group of economies during the height of the 1997-98 East Asian financial crisis (Figure 1). Indonesia, Korea and Thailand, arguably among the most severely affected economies by the Asian financial crisis, experienced sudden and sharp reversals of international bank lending flows. Specifically, total international bank claims on Indonesia, Korea and Thailand contracted by average annual rates of 6.3 percent, 7.5 percent and 13.3 percent, respectively, from 1997 to 2000. Thereafter, a steadfast surge in international bank lending resumed and flooded these same East Asian markets for five consecutive years until the collapse of Lehman Brothers in 2008. Korea, for instance, experienced a remarkable growth in international bank lending at an average annual rate of around 35 percent from 2003 to 2007. In 2008, the country, however, suffered a sudden retrenchment in international bank lending of around 20 percent. Neighbouring Asian countries such as the Philippines and Malaysia also experienced similar rates of sharp contractions in international bank lending that same year.

The importance of international bank lending can also be understood from the size of the loans coming especially from the banks of three advanced economies, namely Japan, US and UK. In early 2010, the total lending of banks from these three industrialised economies to the ASEAN-5[2] economies and Korea varied from less than 10 percent to as high as 75 percent of the annual GDP of these East Asian economies. In the case of Indonesia and the Philippines, for instance, the total loans of the banks from these three advanced economies hovered at around 6 to 9 percent of Indonesia and Philippines's GDP, respectively. In the same year, Thailand received around 15 percent of its GDP in terms of lending from these three advanced economies, whereas Korea and Malaysia

2. Comprise of Indonesia, Malaysia, Philippines, Singapore and Thailand.

reported a higher amount of lending of around 25 percent of their respective GDP from these advanced economies. Finally, in view of its status as a regional financial centre, Singapore received flows of international bank lending from these same advanced economies in the tune of around 75 percent of its GDP in 2010.

In light of the interconnectedness of the domestic banking systems in the above mentioned East Asian economies to lending by international banks, and its consequent role as a crucial source of finance for these economies, the key objectives of this paper are as follows. Our study assesses the fundamental determinants of lending by banks from the three advanced economies of Japan, UK and US to five Southeast Asian economies (Indonesia, Malaysia, Philippines, Singapore and Thailand) and Korea. These six Asian economies are selected for their relatively increased reliance on international bank lending, both prior to the 1997-98 East Asian crises as well as in the years preceding the recent global financial crisis. With regard to the former, for instance, there is now sizeable literature that ascribes the cause and severity of the Asian financial crisis to the large short-term bank loans that these economies obtained mainly from the three aforementioned advanced economies. It should not come as a surprise then that once we examine the stylised data on international bank lending, banks from Japan, UK and the US have lent strongly in these economies not just in recent years as noted above, but also since the early 1990s when this surge in international lending coincided with the process of liberalisation and structural reforms in the banking sector of these Asian economies.

The fundamental determining factors that we examine here include home and host country indicators. Economic performance as measured by the GDP growth rates of both the host and home economies are included as potential pull and push factors, respectively, and as such tries to account for the effect of cyclical conditions in home and host economies to international lending. Interest rate differentials between the host and home economies are another macroeconomic factor that we examine and try to account for the role of relative rates of return. One should note that these factors have come to be considered as standard in the emerging literature on the determinants of international bank lending.[3] This study, however, goes beyond the examination of the standard fundamental determinants of international bank lending by squarely ascertaining the role of three other critical factors.

3. See, for instance, Buch, et al (2010).

First, we take into account the role of expectations regarding short-term volatility in the global financial market in driving shifts in global supply conditions with regards to international bank lending. Second, a topical concern which resurfaced during the recent global financial crisis is the issue of potential spill-over or contagion effect. A crucial question in this regard is whether decisions by international banks to ramp-up or contract their lending to one country necessarily extend to neighbouring economies in the East Asian region. This has come to be known in the seminal literature as the potential existence of a common lender effect.[4] Finally, we deal with the issue of stability in international bank lending to our six Asian host economies by examining it via the sensitivity or reaction of lending by international banks to shocks coming from their own economies while, at the same time, taking into account the extent of the exposure by international banks into these same Asian economies. In other words, we investigate whether an escalation in international bank exposure to the six Asian host economies translates into steady financing on the part of these international banks in the face of economic disturbance occurring in their own economies. In view of what transpired during the recent global financial crisis as well as contentions of previous literature on the issue of stability in international bank lending against the background of shocks coming instead from *host* economies,[5] this is certainly a timely and interesting research objective to pursue.

That said, rather than simply focusing solely on the overall international bank lending,[6] we also assess the impact of the above mentioned determinants on cross-border lending by international banks. By comparing the extent of influence of the above same determinants on overall international bank lending as opposed to cross-border lending by international banks, we are able to investigate on an aggregate level the distinctive influence of each factor on the two channels by which international banks lend – cross-border vis-à-vis that of local lending. More importantly, in doing so, we can also explore the relative stability of the two channels of international bank lending. This is again a well-timed and worthwhile task to pursue in light of recent evidence that brick-and-mortar presence of international banks in recipient economies is the more prudent and judicious policy to undertake within the context of host economies.[7]

4. See, for instance, van Rijckeghem and Weder (2003).
5. See, for instance, Peria et al (2005).
6. See, for instance, Siregar and Choy (2010).
7. See, for instance, Kamil and Rai (2010) and de Haas and Lelyveld (2010).

The strength and soundness of the international bank's balance sheet should also influence its capacity to extend loans. Deterioration in its asset quality, for instance, would affect the capital adequacy position of the bank and in turn would influence its lending decision (Bayoumi and Melander, 2008). In order to test the likely impact of balance sheet strength and quality on the lending of the bank, our micro-panel empirical estimation will include a number of commonly observed balance sheet indicators that deal with aspects of size, solvency, net interest margin, profitability and liquidity.

Finally, once we have some understanding on the relative stability of the two channels of international bank lending as emphasised above, our study will then dig-deeper by dealing squarely with another relevant and contentious policy issue of the mode or organisational form of entry of international banks. Do subsidiaries and branches of international banks in the six Asian economies have a crisis-mitigating impact in terms of an unfettered capacity to lend in these economies during the recent crisis? In relation to this research question, we would like to know whether there is a significant difference between these two organisational forms of entry as far as their ability to withstand financial difficulties in their global parent banks and thereby are able to continue lending in the six economies.

These are again crucial research questions which have recently been brought into the limelight of policy discussions and arguments on the issue. One of this argument, for instance, is that the attraction of being able to easily ring-fence the assets of subsidiaries of foreign banks as opposed to foreign bank branches arguably leads banking regulators to favour an organisational bank structure comprising mainly of subsidiaries rather than branches (Mihaljek, 2010; Fiechter et al, 2011). In addition, as a perceived advantage for the international bank, the ability to screen and monitor its lending activities may be improved by the establishment of a local subsidiary (de Haas and van Horen, 2011). On the other hand, though, while the local subsidiary reduces geographical distance, Aghion and Tirole (1997) argue that it could potentially create "functional distance" within the bank as information may not be efficiently passed on from the subsidiary to the headquarters of the bank. It is quite a surprise that in spite of the policy importance of the issues raised above, to the best of our knowledge, hardly any formal empirical work has been conducted to investigate the lending behaviour of subsidiaries and branches during a crisis, particularly so in the recent global financial crisis. We consider this aspect as one key contribution of our study.

The paper proceeds as follows. Section 2 briefly presents key trends and stylised facts. Section 3 introduces the empirical approach as well as the data

employed, after which we proceed to Section 4 to elaborate in greater detail the exhaustive empirical findings. The paper ends with a brief concluding section.

2. Stylised Trends

Private international capital flows are a defining feature of the global financial landscape and the experience of the six Asian economies that we examine here are no exception. Lending on an aggregated level by international banks or global banks that occur through two distinct channels — directly, via cross-border lending by parent banks headquartered abroad, or indirectly, via credit extended by the local affiliates of these globally active banks – have expanded rapidly for these six economies from modest levels in the beginning of 2000s (Figure 1). However, this expansion has been quite volatile and uneven across the six economies and as such is intermittently punctuated by bouts of surges and reversals throughout the decade. Perhaps with the lesser exception of Thailand, the latter characterisation is much more drastic and consistently felt across the six economies during the recent GFC of 2008-2009, and at which time put a dramatic end to an international bank lending inflow boom that were experienced by these economies during the middle and latter part of the decade.

Nonetheless, a more careful examination of what transpired during the recent GFC suggests a more nuanced story to the sudden reversal in international bank flows in these six Asian economies. The component of international bank lending extended directly by the overseas headquartered parent banks of these internationally active banks is very volatile and experienced a much sharper decline during the recent crises as opposed to credit extended by the local affiliates of these same internationally active banks, which either slowed to a lesser extent than the former or quickly recovered in the immediate aftermath of the recent crises (Figure 2). In other words, the sudden retrenchment in international bank flows during the recent financial turmoil was predominantly driven by the sudden curtailment in cross-border lending by internationally active banks.

It is interesting to note also that between the early-1990s and prior to the Asian financial crisis, Japanese banks were the largest sources of funding for the banks and corporations in these six economies (Figure 3).[8] For instance, at

8. An exception is the Philippines which is heavily dominated by lending from US-owned banks.

one point between the period of 1990 to 1994, Japanese lending amounted close to 60 percent of total international bank lending in Thailand, Singapore and Indonesia. Not far from these three economies are Korea and Malaysia which recorded lending by Japanese banks of around 30 and 40 percent, respectively for the same period. As evident in Figure 3, close to the onset of the Asian financial crisis and in its aftermath, a consistent waning in the share of lending by Japanese banks was experienced by all six economies. The diminishing dominance in lending by Japanese banks has been replaced recently to some extent by UK banks and ever consistently by US banks. As a result of the critical influence of Japanese, UK and US owned-banks, the combined lending of these three big economies accounted for at least to around half of the combined lending by developed countries to the six Asian economies in the last two decades (Figure 3).

Finally, it is noteworthy to mention that while international banks that are headquartered overseas have expanded their lending activities for the greater part of this decade via their cross-border lending to all of the six economies, the extent of penetration by the local affiliates of these international banks reveals that these so-called foreign banks have made inroads into these six Asian economies but the extent of participation vary depending on the measure one uses. For instance, as presented in Table 1, in terms of the share of foreign banks to the total number of banks in the respective Asian economies' banking system, it shows that, with the lesser exception of Korea, the number of local affiliates of these international banks account for at least half of the domestic banking systems of these economies. Whereas, an examination of the share of foreign banks in terms of total domestic banking assets indicate that foreign banks account for less than a third of domestic banking assets in these economies. This latter point may be a reflection that in these Asian economies, takeovers by foreign banks have been in the form of purchases of small financial institutions (Gopalan and Rajan, 2010).

3. Estimation Approach and Data

3.1 Dynamic Macro-Panel Model

The basic working empirical model employed to assess the possible determinants of international bank lending is represented by the following dynamic panel equation:

$$\Delta \log Claims_{ij,t} = \alpha_0 + \alpha_1 \Delta \log Claims_{ij,t-1} + \beta_1 indiff_{ij,t} + \beta_2 VIX_t + \beta_3 Clender_{ij,t} + \\ \beta_4 growthrate_{j,t} + \beta_5 growthrate_{i,t} + \beta_7 growth_{i,t} \times \exp osure_{ij,t} + \upsilon_{ij,t} \quad (1)$$

Where i and j represent country pairs i and j, and i denotes the home or source economies of international bank lending (Japan, UK and US), while j denotes the six Asian host or recipient countries of Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand. The dependent variable in this section of the paper, $\Delta\log Claims_{ij,t}$ is the logarithmic differences of international bank lending from banks in home country i to our six host countries j; $\Delta\log Claims_{ij,t-1}$ is the lagged of the dependent variable. In Equation (1) we assume that $\upsilon_{ij,t}$ contains the following two effects: (a) the unobserved time-invariant country-pair specific effect, $\varepsilon_{ij,t}$ and (b) a stochastic error term η_{ij} varying across time and cross-section.

We pursue the first group of objectives set out in the beginning of this paper by conducting our estimation of equation (1) in two separate stages. In the first stage we obtain and use for our left-hand side variable, available raw data on total international bank lending (cross-border lending plus total credit extended by affiliates of these international banks), whereas in the second stage we only employ available data on international cross-border lending. In doing so, we can assess the relative stability of local lending by affiliates of international banks in the six Asian host economies vis-à-vis the cross-border lending by these international banks that are headquartered overseas to our same six Asian destination economies.

In terms of our right-hand side variables in equation (1), the fundamental determinants of international capital flows are accounted for by home or push and host or pull factors that figure prominently in the extant literature. The roles of standard macroeconomic factors such as the respective real GDP growth of host country j ($growthrate_{j,t}$) and home country i ($growthrate_{i,t}$) to capture economic cycles and nominal interest differential between host country j and

home country *i* ($indiff_{ij,t}$) to reflect rates of return in both home and host economies are included.[9] We expect a positive coefficient on the *i* ($indiff_{ij,t}$) variable as higher interest rate in the host country or, conversely, lower interest rates in the home countries, ceteris paribus, should lead to an increase in international bank flows in the host economies. We also expect a positive coefficient on the real GDP growth of host countries as higher returns in these countries should then lead to a rise in international bank flows in these countries. Whereas, there is ambiguity as to the expected sign of the real GDP growth in home countries as, on one hand, recessionary economic conditions in home countries entail lower profit opportunities at home, which should then encourage foreign banks to seek better or higher returns abroad in which case we expect a negative coefficient on the ($growthrate_{i,t}$) variable. On the other hand, weak economic conditions in the home countries may signal a worsening of the capital position of foreign banks which should then discourage, or worse, retrench their lending overseas.

Apart from considering the role of traditional push and pull factors on international bank lending, we also take into account a measure of the state of the global financial market, such as the S&P 100 Volatility Index (VIX_t) of the Chicago Board Options Exchange which is widely used as an indicator of expected short-term volatility of the global financial market. A high value for the (*VIX*) indicates more volatile market expectations and as such we expect a negative coefficient on the (*VIX*) variable as greater global volatility should lead to a reduction in international bank flows to host economies (Hermann and Mihaljek, 2010).[10] Furthermore, in line with the well-cited study of van Rijckeghem and Weder (2003), we also include in our empirical model a measure of the potential contagion or spill-over of changes in international bank flows from one country to another, and is denoted by the ($Clender_{ij,t}$) variable. More popularly known as the common lender effect, this argues that movements in international bank lending on one country may be transmitted to other countries that owe from the same international banks. We follow Peria, et al (2005) in accounting for this effect and thus operationalise ($Clender_{ij,t}$) as the changes in lending from home country banks to all the major Asian host countries except that of

9. These macroeconomic factors have also been considered by earlier studies such as by Jeanneau and Micu (2002) and Buch, Carstensen and Schertler (2010).

10. It is also based on this expected relation that (*VIX*) is construed as a factor that measures the global supply of international bank lending. Higher volatility corresponding to a high value (*VIX*) of makes it more difficult for banks to raise additional capital (Takats, 2010).

the individual Asian host country.[11,12] We should then expect that if the common lender effect works, the coefficient on the variable ($Clender_{ij,t}$) would be positive and significant.

In order to test the impact of home economy shocks on the stability of international bank lending to our six Asian host economies, our main variable of interest, an interaction term between our home countries' real GDP growth rate variable, ($growthrate_{i,t}$) and a measure of international banks' exposure to our individual Asian host countries, ($exposure_{ij,t}$) was created. We measure ($exposure_{ij,t}$) as the ratio of home country i's international bank lending on one particular Asian host country j to the total worldwide lending of home country i's banks. The rationale underlying this interaction variable follows on from a similar idea by Peria et al (2005) that the variable ($growthrate_{i,t}$) can be considered an alternative measure of home economy shocks as it is essentially indistinguishable from a crisis on the grounds that crisis coincide with deterioration in macroeconomic fundamentals such as real GDP growth rates as what happened in developed markets, for instance, during the recent global financial crisis. Consequently, the interaction between the variable ($growthrate_{i,t}$), and with the latter variable on international bank exposure, ($exposure_{ij,t}$) captures the reaction of international banks to shocks or crisis that emanate from home or source economies which then indicate the commitment, or lack thereof, of international banks to continue lending to host economies. Based on this interpretation, a rise in international bank exposure to host economies has an effect that can work in equal but opposite directions – as exposure increases, the response of international banks to shocks coming from their own economy is either to retrench or remain steady in their lending to the six Asian host

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11. As pointed out by Peria, et al (2005), in an ideal sense, the common lender effect can be equated to a portfolio allocation choice wherein changes in values of lending trigger an adjustment in other assets or claims. The limitation of working then with aggregated country level data on international bank lending is that it obscures this portfolio allocation decision at the individual bank level.

12. These major Asian host countries are the same six Asian economies that we examine in this paper, that is, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand plus China. Herein lies the distinction of the present study with regards to the Peria et al (2005) in which the latter defines the common-lender effect as the changes in lending from home country banks to all non-BIS-reporting countries other than that of the host economy. Our rationale for so doing is that we would like to capture more of the regional spillover dimension as far as the movements in this type of flows is concerned.

economies.[13] Thus, depending on the sign and significance of the interaction term, we can ascertain the impact of international bank exposure on how these international banks respond to a shock that originates from their own economies. A priori, if higher exposure translates into stable international bank lending, we should expect the interaction between home country foreign banks' real GDP growth rate and international bank exposure to be negative.

3.2 Dynamic Micro-Panel Model

In order to dig-deeper into the overarching issue of the credit stability of international bank lending amidst the financial turbulence that occurred in source economies in the recent global financial crisis as well as the concomitant implications of the balance sheet strength of these same banks, we estimate the following dynamic panel equation on a micro-panel dataset of foreign banks operating in the six Asian host economies:

$$\begin{aligned} loangrowth_{i,t} = {} & \alpha_0 + \alpha_1 loangrowth_{i,t-1} + \beta_1 growthhome_{i,t} + \beta_2 intratehome_{i,t} + \\ & \beta_3 growthhost_{i,t} + \beta_4 intratehost_{i,t} + \beta_5 solvency_{i,t} + \beta_6 weakness_{i,t} + \\ & \beta_7 interestmargin_{i,t} + \beta_8 liquidity_{i,t} + \beta_9 profitability_{i,t} + \beta_{10} size_{i,t} + \\ & \beta_{11} crisisdummy_{i,t} + \upsilon_{ij,t} \end{aligned} \tag{2a}$$

Where *i* denotes the individual foreign bank operating in the six Asian host countries of Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand. The dependent variable in this part of the analysis, ($loangrowth_{i,t}$) is the growth rate of lending by affiliates (branches and subsidiaries) of these international banks located in the host economies. Just as in the previous analysis, we also include macroeconomic home or push and host or pull factors of host country lending by foreign banks in equation (2a). To be more specific, we employ two

13. We should point out at this juncture, however, that the major difference between the interaction term used in our study as opposed to the interaction term used in the above cited Peria et al (2005) study is that the latter examines the response of international banks to shocks in *host* economies and as such the interaction term used is the product between the *host* countries' real GDP growth rate (as opposed to the home countries' real GDP growth rate used in our present study) and the measure of international bank exposure. Nonetheless, the interpretation of the expected a-priori signs with regards to both the interaction term and the shock variable work out to be similar in both studies.

home country variables of the foreign banks, i.e., home country GDP growth ($growth\text{home}_{i,t}$) and home country lending rate (int $rate$ $\text{home}_{i,t}$) as well as two analogous host country variables: host country GDP growth ($growthrate_{i,t}$) and host country lending rate (int $ratehost_{i,t}$). Along similar lines of arguments presented in the previous section, we expect that the sign of home country GDP growth is ambiguous with respect to host country lending by foreign banks, whereas host country GDP growth is expected to be strongly positively related to host country lending by foreign banks. Furthermore, higher home (host) country lending rates will be negatively (positively) related to host country lending by foreign banks as higher lending rates in a country makes it attractive for banks to expand their credit in that economy.

As a point of departure with the earlier presented dynamic macro-panel model, we now include in equation (2a) a set of bank specific balance sheet variables in order to control for other bank characteristics that may influence the decision of a bank to extend credit. Strengthening the balance sheet position of international banks has taken more prominence and traction in recent years in light of the package of proposed changes in the regulatory structures and supervisory standards in advanced economies' financial systems. Perhaps one underlying motivation in these discussions comes from the belief that the deterioration in the balance sheets of international banks from advanced economies has been blamed as one of the root-causes for the sharp and sudden drops in lending of international banks to East Asian economies in late 2008 and early 2009. For instance, doubts about the quality of international banks' balance sheets started to surface intensely starting in 2008 especially in the wake of the collapse of Bear and Stearns and Lehman Brothers (Hoggarth, et al, 2010). Thus, as earlier mentioned, another timely contribution of this study is on the inclusion and assessment of the effects of various balance sheet indicators with regards to the lending of these international banks to the six Asian economies.

A number of balance sheet indicators are thus considered in equation (2b). Quality and adequacy of assets are represented by total assets ($size_{i,t}$), liquid assets to total assets ($liquidity_{i,t}$) and equity to total assets ($solvency_{i,t}$). Theoretically, a strengthening of asset size and quality should have a positive effect on international bank lending. In addition, we also consider a cost factor measured as the ratio of the loan loss provisions to net interest revenue ($weakness_{i,t}$). It is expected that a rise in this measure of cost factor should reduce the capacity to lend of the bank. Lastly, but equally important is the overall past performance of the bank. In this case, we consider the commonly used indicator of profit, i.e. return-on-asset ($profitability_{i,t}$). The lending activity

of a bank should be positively related to its level of profitability. Furthermore, banks that enjoy higher net interest margins ($\text{int}\,erestm\,\text{arg}\,in_{i,t}$) tend to expand its lending.

We also include a crisis dummy ($crisisdummy_{i,t}$) which takes on the value of 1 for the years 2008-2009 to capture the amplified volatility emanating from the global financial crisis, whereas it is zero otherwise. There is actually ambiguity as to the expected sign of this crisis dummy variable with respect to its effect on host country lending by the affiliated branches and subsidiaries of the international banks. On one hand, the coefficient of this variable has been found to be either insignificant or even positive by earlier empirical studies such as by Peria et al (2005), De Haas and van Lelyveld (2006) and De Haas and van Lelyveld (2010). The underlying argument in support of this evidence is that the affiliated offices of these international banks in host economies can rely on their parent banks for support in case they encounter financial difficulties which make these group of banks either insensitive or robust to crisis episodes. This is unlike that for domestic banks which lack support from parental banks which have 'deep pockets' and will have to rely on their own resources in times of financial strain. On the other hand, the nature and scale of acuteness of the recent global financial crisis in which the robustness and resilience of this so called internal capital support from parent banks to their network of affiliates in overseas locations was severely tested in the wake of the economic slowdowns in the home countries of these global banks, and as such we expect a negative coefficient for the crisis dummy variable.

Finally, in order to advance with our final main objective as highlighted in the beginning of the paper, which is, to test the credit stability implications of foreign bank branches as opposed to foreign bank subsidiaries as distinct organisational forms of entry of foreign banks, we create another dummy variable to capture the organisational form of foreign banks in our sample. To be more specific, the dummy variable takes a value of one if the particular foreign bank in our sample is a subsidiary operating in the individual six Asian economies, whereas it is zero if the particular foreign bank is a branch. We then use this dummy variable to create an interaction term with our earlier crisis dummy variable to explicitly test the differences between subsidiaries and branches in their credit stability consequences to our six Asian host economies. We therefore expect to find support to the argument that subsidiaries rather than branches can shield themselves from the financial difficulties of its global parent bank if the sign of the coefficient of this interaction term comes out to be positive upon its inclusion in the same dynamic micro-panel regression that we encountered

previously in equation (2a). For completeness, the dynamic micro-panel regression presented earlier as equation (2a) can now be expressed as:

$$loangrowth_{i,t} = \alpha_0 + \alpha_1 loangrowth_{i,t-1} + \beta_1 growthhome_{i,t} + \beta_2 intratehome_{i,t} + \\ \beta_3 growthhost_{i,t} + \beta_4 intratehost_{i,t} + \beta_5 solvency_{i,t} + \beta_6 weakness_{i,t} + \\ \beta_7 interestmargin_{i,t} + \beta_8 liquidity_{i,t} + \beta_9 profitability_{i,t} + \beta_{10} size_{i,t} + \\ \beta_{11} crisisdummy_{i,t} + \upsilon_{ij,t} \quad (2b)$$

3.3 International Banking Statistics of the BIS

As discussed, the estimation of equation (1) in two separate stages requires us to obtain two country-level dependent variables on international bank lending — foreign bank claims and cross-border claims, respectively. We extract these two variables and facilitate the construction of our panel using the *International Banking Statistics* made available by the Bank for International Settlements (BIS). Specifically, in the first stage of our estimation of equation (1), we use data on foreign bank claims, the *foreign financial claims* of international banks to the financial and non-financial sectors in the six Asian economies as reported in the BIS's *Consolidated Banking Statistics*. This bilateral data comprises of the *international financial claims* – defined as the sum of the credit extended by the foreign banks headquartered overseas (cross-border claims) and the credit extended in foreign currencies by the affiliates of foreign banks in host economies (local claims of foreign affiliates in foreign currency) – plus the credit extended in local currency by the affiliates of foreign banks in host economies (*local claims of foreign affiliates in local currency*). As emphasised in the previous section, driven by the relative importance of international bank lending from Japan, UK and US banks in the six Asian economies, the focus of our first-stage estimation of equation (1) will be on the behaviour of foreign bank claims from banks coming from these three advanced economies.

On the other hand, obtaining convenient and suitable data on the cross-border claims variable with regards to the second stage of our estimation of equation (1) is not straightforward. One limitation of the BIS Consolidated Banking Statistics is that the data on international financial claims does not disaggregate 'pure' cross-border claims from that of the credit extended in foreign currencies

by the affiliates of foreign banks, i.e., local claims of foreign affiliates in foreign currency. Alternatively, one can resort to using the external positions of BIS reporting banks to the financial and non-financial sectors of our six Asian economies as reported in the BIS's Locational Banking Statistics. This is also the data that we use for our variable on cross-border claims at this stage of estimation of equation (1).[14] However, an issue with the Locational Banking Statistics on cross-border loans is that unlike the Consolidated Banking Statistics on foreign financial claims of international banks, it only makes available to the public the aggregate cross-border claims of all the BIS-reporting home country banks to non-BIS reporting countries including that of the six Asian economies examined here. In other words, in contrast to the estimation of equation (1) in the first stage in which we specifically focus on the behaviour of bilateral foreign bank claims from banks coming from the three advanced economies of Japan, UK and the US, a constraint faced by this study is that similarly investigating the respective bilateral cross-border claims of the three major home country banks in the second stage of estimation of equation (1) is not possible due to limitation on the available data. Thus, we settle at this stage of our estimation of equation (1) with the data on aggregate cross-border claims of all the BIS-reporting home country banks, which mostly comprise of industrialised countries, to our individual six Asian host economies.[15,16]

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14. Hermann and Mihaljek (2010) also use this data for their own variable on cross-border flows.
15. One should then note this caveat upon our presentation of the empirical results in the subsequent section of the paper.
16. One should also be made aware of the distinction between the BIS Consolidated Banking Statistics and Locational Banking Statistics. In the former, creditor data is reported according to the nationality principle while the latter is based on the residency principle. An illustrative example will be helpful here. Take for instance US bank loans which are consolidated on a worldwide basis regardless of their location (including for example US bank branches in Paris). In the locational statistics, all cross-border loans made by international banks in the US (including for instance Japanese banks) are reported as 'US', while the loans from US bank branches in Paris are reported as French loans. For further discussion on the limitation of BIS data, please refer to Box 1 of Hoggarth, et.al (2010).

Finally, we construct the common lender variable, ($Clender_{ij,t}$), and the variable on exposure, ($exposure_{ij,t}$) in the first stage of estimation of equation (1) using the above mentioned BIS Consolidated Banking Statistics data on international financial claims, whereas these same two variables were constructed using the BIS Locational Banking Statistics data on external positions of BIS reporting banks in the second stage estimation of equation (1).[17]

3.4 Bankscope Dataset

The raw data used in the calculation of the bank-specific variables of foreign banks as well as the raw data on total loans of affiliated branches and subsidiaries of foreign banks in equations (2a) and (2b) above were obtained from the Bureau van Dijk's BankScope database for all active foreign commercial banks in the six Asian host economies. This widely used subscription-based database makes available yearly balance sheet and income statement data for individual banks in a large number of countries including that of our six Asian economies. To be sure that the individual foreign commercial banks covered by the database were representative of the foreign commercial banking system in each of the six countries, they were verified by information obtained from the respective national monetary authorities.[18] The advantage of working with Bankscope on the lending of affiliated branches and subsidiaries of foreign banks in host economies is that not only does it provide data on the BIS-reporting foreign banks (the aggregated lending of these group of banks are included in the above mentioned Consolidated-BIS data), but also on the lending of foreign banks from non-BIS reporting countries. Finally, from our constructed panel data of foreign banks and the organisational form of all these individual banks for the six Asian host economies from Bankscope[19], the earlier mentioned organisational form dummy

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17. In view of the limitation we face in terms of available data on cross-border lending as highlighted above, one should note that in the latter construction of these two variables, the aggregate cross-border lending of all the BIS-reporting home country banks were used.

18. In this study, we use a standard definition of a foreign bank, that is, if foreign shareholders own a majority of outstanding shares that exceeds 50% of the subscribed capital of a bank.

19. This is denoted in Bankscope as entity type.

variable in equation (2b) for each bank in each year can then be constructed. As mentioned, the organisational form dummy (subsidiary) is one for foreign banks that operate as a subsidiary and zero for all other foreign banks that operate as branches.

4. Empirical Results

4.1 Macro-Panel Results on International Bank Lending Stability

4.1.1 The Evidence from Country-Level Data on Total Lending by International Banks

The results of our estimation of equation (1) in two separate stages are reproduced in Tables 2 and 3 in that respective order. In both tables, we first report pooled OLS and simple fixed-effects panel estimates in columns (1) and (2), respectively. We then report in the last two columns of both tables the results from the two dynamic GMM panel estimators, i.e., the results from the GMM difference estimator (column 3) and the GMM system estimator (column 4). It is well-known that both pooled OLS and fixed-effects estimation of a dynamic panel model will be subject to serious biases in the estimation of all model parameters. Specifically, the OLS estimate of the autoregressive coefficient will be biased upwards, while the corresponding fixed-effects estimate will be biased downwards. On the other hand, GMM estimates are supposedly free of such bias in large samples and given some weak assumptions, the estimate of the autoregressive coefficient should lie between the OLS and fixed-effects estimates. This is known as the "bounds-test" of small sample bias. For instance, the estimate of the autoregressive coefficient, $\Delta\log Claims_{ij,t-1}$ coming from the two GMM estimators reported in columns (3) and (4) of Table 2 lie between -0.11 (fixed-effects) and -0.08 (OLS), and thus passes the small sample bias test referred to above.

Moreover, the absence and the almost lack of significance, in the OLS and fixed-effects point estimates respectively, are largely due to endogeneity problems in these estimates, and, suitably for this purpose, for which the GMM point estimates are intended to control. When this problem is managed using the GMM, most of the point estimates improved markedly in significance. The system GMM results in column (4) is considered superior, a priori, to the differenced GMM results in column (3). The results from using both the differenced and the

system GMM estimators show almost similar results, with the lone exception of the statistical significance of the host country growth rate variable. Finally, the standard diagnostic tests suggest no misspecification problems.[20]

We are also interested in highlighting the effect of home and host country conditions. First, it is interesting to note that we do not find evidence for a relationship between the nominal interest rate differentials between the host and home economies and the changes in lending by international banks. This is the result even after we control for the possible presence of nonlinearities in the rates with the inclusion in the regression of a quadratic term of the nominal interest rate differential as nonlinearities can arise due to the distinct divergence in interest rates during periods of financial turmoil such as what happened during the recent global financial crisis in which advanced economy interest rates fell dramatically to almost zero levels when compared to normal or tranquil times.[21] A plausible explanation for this result is that international banks when deciding to lend or not, to host economies do not only take into account relative prices but also the relative risk levels (de Haas and Lelyveld, 2006). Furthermore, the insignificant role of the interest rate differential on changes to total lending of international banks also suggests that changes in the monetary policy stances in the home and host countries do not affect international lending by these banks. This result is in line with recent evidence obtained by Cetorelli and Goldberg (forthcoming) where international lending in the case of large and global US banks are insulated from changes in monetary policy in the US.[22]

A second result worth mentioning is that changes in lending by international banks is positively affected to some extent by host country GDP growth (this result is found not to be significant, however, in the differenced GMM estimator). That is, the presence of a 'pull factor' in lending by international banks suggests that these banks increase (decrease) their lending in host markets once these same economies experience stronger (adverse) macroeconomic conditions. Meanwhile, we also find that changes in lending by international banks are

20. The Hansen test for identifying restrictions and the differenced Hansen test for the validity of the instruments used in system GMM estimator in addition to those used in the differenced GMM estimator, fails to reject the null hypothesis that the instruments are valid. The AR2 test fails to reject the null hypothesis of no second-order residual autocorrelation.

21. We also ran the dynamic panel GMM regressions without this quadratic term and the insignificant effect of the nominal interest rate differential remained.

22. A contrasting result is found by Buch, et al (2010) in the case of international lending by banks headquartered in 17 OECD countries.

significantly positively influenced by the international banks' home country GDP growth as well. This implies that international banks' behaviour is veered towards focusing their activities at home when domestic economic conditions are low and weak, that is, international banks tend to increase and decrease their international lending to our six Asian economies in the course of cyclical conditions in their own home economies.

Next, we find evidence in support of the common lender effect in view of the positive and significant coefficient on the $Clender_{ij,t}$ variable, that is, changes in lending by international banks in one country tend to spillover to other countries that owe from the same international banks. Furthermore, in conformity with the theoretical expectation, a rise in the expected short-term volatility of the global financial market, which is proxied in this study by the widely used S&P 100 Volatility Index (VIX_t) of the Chicago Board Options Exchange, is found to significantly contribute to a decline in the changes in lending by international banks.

Finally, with regards to our ultimate variable of interest which is the interaction term between our home country international banks' real GDP growth rate and a measure of its exposure to the six Asian host economies, we obtain a negative and significant coefficient for this interaction variable as compared to the separate positive and significant coefficient of the international banks' home country real GDP growth rate. This suggests that the reaction or sensitivity of lending by international banks to shocks coming from their own economies tend to decrease as international bank exposure in the six Asian host economies increases. In short, a rise in international bank exposure translates into a steady financing on the part of the international banks in response to shocks in their own economies.[23] It is interesting to mention at this point that Peria et al (2005) using similar data on *foreign financial claims* of international banks found that the lending of international banks also become less responsive to shocks in *host* economies as exposure increases.

4.1.2 The Evidence from Cross-border Lending

In certain respects, the above main result suggesting that even in the face of economic downturn in source economies, lending by international banks in host economies tend to remain stable as their exposure rises, appears not to be

23. de Haas and van Horen (2010) find that in the wake of the Lehman Brothers collapse, agency problems increased less for bank lending to countries that they had been lending to before.

in sync with our earlier depicted stylised trend on the behaviour of these aggregated international bank lending flows. However, one should recall that the results presented in this part of the study uses total international bank lending (what is known as the total foreign bank claims in BIS), based on BIS' own definition which combines data on cross-border lending and total credit extended by affiliates of these international banks. On this basis, it is only logical at this juncture that we formally examine the hypothesis that cross-border operations of these international banks are more prone to 'a sudden-stop' and sharp reversal during periods of economic downturn in source economies.

The dynamic-panel estimation results of directly testing this hypothesis and as such exclusively concentrating only on publicly available data on cross-border lending by international banks, are presented in Table 3. For one, the standard diagnostic tests suggest no misspecification problems and we see that the two GMM-estimates of the autoregressive coefficient reported in columns (3) and (4) lie between the OLS and simple fixed-effects estimates in columns (1) and (2), respectively, and thus pass the small sample bias test referred to above. However, the differenced-GMM estimates in column (3) indicate marginal improvement in significance compared to the simple-fixed effects results in column (2). On this basis, the results are slightly weaker compared to the previous GMM results presented in Table 2 — the host country's real GDP growth rate is completely insignificant while there is no evidence of the common lender effect.

However, unlike the case of total lending by international banks, the test result for the quadratic term of the interest rate differential variable in the case of cross-border lending is found to be significant at the 10 percent level. This suggests that the transmission of monetary policy changes via bank lending is non-linear in both home and host economies and this non-linearity is revealed in the case of cross-border lending by international banks (Table 3) as opposed to total lending by international banks (Table 2). In addition, the VIX variable retains its strong negative significance in column (4), reconfirming the role of global market uncertainty in explaining the fluctuations of cross-border lending.

Furthermore, we still obtain a positive and significant coefficient on the international banks' home country real GDP growth rate as well as a significantly positive coefficient for the interaction variable between the international banks' home country real GDP growth rate and the measure of international bank exposure (Table 3). It is crucial to note that this positive sign of the interaction term reported in Table 3 is in contrast to the negative coefficient earlier obtained for this same variable in Table 2 for the case of total international bank lending.

This result suggests that the response or sensitivity of international banks to shocks coming from their own economies would be to cut back on their international cross-border lending to the six Asian host economies even when international bank exposure to these economies increases.

The story implied by these results is that cross-border lending by international banks is pulled out from host or recipient economies during difficult and tough economic times in home economies, whereas, under similar circumstances such curtailment in lending are not evident on an aggregate or collective basis. These findings reinforce the stylised evidence of the important role played by the lending of the brick-and-mortar affiliates of these international banks in mitigating or resisting the vulnerability of the six Asian economies from shocks originating in home countries. This analysis carries with it an important implication that when a country has concerns for foreign bank financing stability and is confronted with the need to make tough choices on whether to further open their domestic banking systems, it appears that encouraging internationally active banks to lend by establishing brick-and-mortar presence in recipient economies is the prudent and sensible policy. Recent studies that arrive at similar conclusions are Peria et al (2005), Kamil and Rai (2010), and de Haas and Lelyveld (2010).

That said, more recently Takats (2010) and the IMF (2011) have further thrown into the mix that not only the brick-and-mortar presence of international banks *per se* matters in terms of the financial stability concerns of emerging markets but also the organisational form of the entry of international banks. Specifically, encouraging the entry of subsidiaries and less so on branches can shield the said banks from the financial difficulties of their parent banks (Fiechter, 2011; IMF, 2011). This is a very interesting and noteworthy objective at this juncture of the paper, to which we turn to in the next sub-section.

4.2 Micro-Panel Test Results on Local Lending: Effects of Balance Sheet and Subsidiary Mode of Entry

We will now analyse the results of the estimation of our two equations 2a and 2b using the pooled OLS, simple fixed-effects and the two GMM estimators of differenced and system GMM estimators. In all, there are eight columns of results as shown in Table 4. The results based on these estimators will each have two respective columns, one containing the estimation results for equation (2a) and the other for equation (2b). Between the two GMM estimators, only the system GMM-estimates in columns (7) and (8) pass the small sample bias

test referred to above which also show no misspecification problems.[24] Accordingly, we would concentrate and emphasise the results coming from our system-GMM estimates reported in Table 4.

We first highlight the results emanating from the effect of home and host country conditions on local lending by international banks. First, we find that 'pull' factors in terms of the host country GDP growth rate and the host country interest rate both exert a strongly positive and significant effect on host credit growth by international banks. Likewise, the home country GDP growth rate 'push' factor is significant and positively related to host country credit growth by international banks, which is in line with what we found in the previous section when using country-level data on international lending by international banks and again indicates that international banks tend to refocus their lending activities at home when economic conditions weaken. Furthermore, we now find evidence of a significant and negative relation between home country interest rate and host country credit growth by international banks after controlling for the possible presence of a nonlinear relationship between these two variables by the inclusion of a quadratic term of the home country interest rate in the system-GMM estimations.[25] These results interestingly suggest that the changes in the transmission of monetary policy in home and host economies are impactful in terms of local lending by international banks.

Other interesting results are worth highlighting from the inclusion of balance sheet variables. To start with, we find that profitable foreign banks expand their credit faster while relatively solvent and liquid foreign banks tend to significantly decrease their host country credit growth. The latter results are contrary to our earlier expectations although a plausible explanation for this puzzling result is that relatively solvent and liquid foreign banks are typically more risk-averse and expand credit only moderately (de Haas and van Lelyveld, 2010). Our test results also demonstrate that foreign banks that enjoy relatively higher interest rate margins tend to expand their host country lending.

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24. That is, the differenced-GMM estimates of the autoregressive coefficient of equations (2a) and (2b) in columns (5) and (6) are smaller compared to the fixed-effects estimates (columns (4) and (5)). In addition, the result of the AR2 test shown in column (6) weakly rejects at the 10 percent level the null hypothesis of no second-order residual autocorrelation.

25. Though the quadratic term is found to be insignificant in columns (7) and (8), without the inclusion of this quadratic term in the system-GMM regressions, the linear home country interest rate variables also becomes insignificant.

Finally, we now move to our main variables of interest beginning with the crisis dummy. This dummy variable registers significantly negative in both columns (7) and (8), which indicate that during the recent global financial crisis, foreign banks contracted their local lending in the six Asian host economies. However, when testing for the differential in credit stability of foreign bank branches as opposed to foreign bank subsidiaries via the interaction term of the same crisis dummy variable with the organisational form dummy variable, the coefficient estimates are found to be significantly positive, as reported in column (6) as well as in column (8) (although it is only significant at the 10 percent level in this case). This suggests that subsidiaries have a crisis-mitigating impact on host economies, especially when the source of the shock emanates from strains in the financial conditions of global parent banks. What can serve as a plausible explanation for the notable difference between foreign bank subsidiaries and foreign bank branches in their ability to shield themselves from the financial difficulties of their parent banks? A reasonable explanation is that the payment of higher and irreversible fixed costs that comes with the direct investment decision of a foreign bank to establish operational presence in a host economy is no more evident than that of a foreign subsidiary, which makes it harder for international banks to 'cut' and 'run' during times of financial troubles either in host or source economies.[26]

The story that comes out from this part of the our study is that not only are home macroeconomic conditions relevant to local lending by international banks, but also that local lending by international banks react procyclically to changing local economic conditions. The financial characteristics of an individual foreign bank also matters. More importantly, encouraging foreign banks to operate as subsidiaries in order to maintain an 'arm's length' relation with its global parent bank may be the most compelling and viable solution to limiting the susceptibility of these flows to changing international economic conditions as well as a device to commit these banks to the host economies. That said, it is important to note at this stage, that from our system-GMM estimated results, the coefficient estimate for the interaction term that captures the differential in credit stability of foreign bank branches as opposed to foreign bank subsidiaries, is not the most significant variable.[27] This result should be viewed in the

26. See also, for instance, Peria et al (2005) and Kamil and Rai (2010).

27. Refer to the last column of Table 4.

perspective that pursuing a favoured subsidiary policy is not a guarantee that such a policy will provide the full-proof insulation, e.g., ring-fencing policy, from problems coming from the global parent banks.

5. Conclusion

Just as any other type of short-term capital flows, international bank lending is subject to episodes of ebb and flow. In the case of financially integrated economies of East Asia, for instance, international bank lending has provided the much needed financial capital to sustain the aspirations of economic expansion at various times in the region's recent economic history, i.e., years prior to the Asian financial crisis and the period preceding the recent global financial crisis. On the other hand, the Asian financial crisis provided us with one valuable lesson that flows of international bank lending could easily and rapidly exit in sizeable amounts in economies that play host to these types of flows. Not only that, some recent studies have also demonstrated that international bank lending play a vital role in the transmission of economic shocks from one economy or region to another. It is a widely-held observation that such a mechanism was at work in the recent crisis and that such financial linkages added to 'fuel the fire' of the recent crisis. In this study we indeed find in the affirmative the existence of the so-called common-lender or spill-over effect, that is, movements in international banks' lending in one country in the region has the potential to be transmitted to neighbouring countries that borrow from the same international banks.

In order to be able to device effective measures that can assist policymakers in East Asia in addressing the vices of international banking flows, while at the same time, reap the virtues that emanate from such flows, it is therefore clearly important at the onset to understand the lending behaviour of international banks. 'Rounding up the possible suspects' or unearthing the likely determinants of these international banking flows is the natural and logical way to proceed. This is the first main objective of our paper.

We find some indications of procyclicality in international bank flows, that is, internationally active banks increase (decrease) their lending on host or recipient markets once these same economies experience stronger (adverse) macroeconomic growth performance. Robust evidence suggests that weak (strong) economic conditions in the home or source countries leads internationally active banks to decrease (increase) their lending to host or recipient economies. We also find strong evidence that a 'global supply factor' is also at work with

international bank flows, that is, higher volatility in international financial markets leads to a reduction in international bank flows to host markets.

In addition to domestic and global macroeconomic factors, we also find supporting evidence to the significant role of balance sheet factors in explaining the movements of bank lending. The size and quality of asset, profitability and cost factors have influenced the lending of these banks of advanced economies to the ASEAN-5 and Korea. More importantly, our empirical assessment also confirms that cross-border lending by internationally-active banks tend to pull out from host or recipient economies during difficult and tough economic times in home economies, whereas, under similar circumstances such curtailment in lending are not evident on an aggregate or collective basis, thus reinforcing the critical role played by the brick-and-mortar affiliates of these internationally active banks in mitigating the vulnerability of the six East Asian economies from shocks originating in home countries. This then leads us to the other major aim of this paper. We tested whether there is a significant difference between foreign bank subsidiaries and branches as far as their ability to withstand financial difficulties in their global parent banks and thereby continue their ability to lend in the six Asian economies are concerned. Our results seems to suggest that foreign bank subsidiaries rather than foreign bank branches in the six major East Asian economies for the period of 2000 to 2010 provided the credit stability to these economies, especially amidst the turbulent economic environment in the advanced economies.

Nonetheless, encouraging the entry of brick-and mortar subsidiaries of internationally-active banks in the domestic banking systems of emerging markets should not be viewed as the magic cure-all solution to the financial stability concerns of these countries. It is clearly important that national banking regulators and supervisors should focus on first-best initiatives and efforts - that besides superior risk-management techniques and stronger capital-related prudential requirements for systemically important and inter-connected banks that often have large cross-border banking presence - they should strengthen supervisory capacity, including through active participation in cross-border banking supervision cooperation.

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Table 1
Measures of Foreign Bank Penetration in Selected East Asian Economies

	Number of foreign banks[a] (in percent)	**Share of banking assets (in percent)[b]**
Indonesia[c]	52	23
Korea[d]	35	13
Malaysia[c]	52	17
Philippines[e]	46	12
Singapore[f]	90	NA
Thailand[d]	63	21

Sources: Bankscope, EIU Financial Services Country Reports.

[a]Measured as percentage share of the total number of banks in the country; [b] Measured as percentage share of total bank assets;[c] As at end-2009; [d] As at end-2010; [e] As at September 2010; [f] As at June 2010; NA – not available.

Table 2
Dynamic Panel Estimation Results of Determinants of Changes in International Total Bank Claims, 2000Q1-2010Q3

	(1) OLS	(2) FE	(3) First-diff. GMM	(4) System GMM
log difference international total bank claims (lagged)	-0.08 [0.34]	-0.11 [0.21]	-0.10 [0.18]	-0.09 [0.24]
interest differential	0.02 [0.95]	0.42 [0.30]	0.53 [0.56]	0.06 [0.82]
square of interest differential	-0.03 [0.17]	-0.06 [0.07]*	-0.06 [0.31]	-0.03 [0.14]
Growth rate (host)	0.05 [0.63]	0.19 [0.04]**	0.51 [0.20]	0.51 [0.01]***
Growth rate (home)	0.45 [0.26]	0.50 [0.16]	1.80 [0.00]***	0.72 [0.04]**
Growth rate (home) × Exposure	0.01 [0.97]	-0.11 [0.55]	-1.41 [0.00]***	-0.39 [0.00]***
VIX	0.01 [0.93]	-0.05 [0.65]	-3.86 [0.00]***	-3.79 [0.00]***
Common lender	0.05 [0.44]	0.05 [0.46]	0.29 [0.00]***	0.32 [0.00]***
R-squared	0.16	0.16		
AB test AR1			0.01	0.01
AB test AR2			0.69	0.65
Hansen *J* test			0.99	0.99
difference Hansen *J* test				0.99

Notes: p-values in brackets. 'AB test AR1(2)': *p*-value of the Arellano-Bond test that average autocovariance in residuals of order 1 (order 2) is 0. 'Hansen *J*' and 'difference Hansen *J*': *p*-value of the Hansen *J* test for overidentifying restrictions and for the validity of the instruments used in SYS-GMM in addition to those used for first-diff. GMM, respectively, which are both asymptotically distributed as c^2 under the null of instrument validity.
* Significance at 10%; ** Significance at 5%; *** Significance at 1%.

Table 3
Dynamic Panel Estimation Results of Determinants of Changes in International Cross-border Bank Claims, 2000Q1-2010Q3

	(1) OLS	(2) FE	(3) First-diff. GMM	(4) System GMM
log difference international total bank claims (lagged)	-0.08 [0.51]	-0.14 [0.26]	-0.12 [0.15]	-0.10 [0.37]
interest differential	0.31 [0.27]	0.89 [0.09]*	1.29 [0.34]	0.36 [0.11]
square of interest differential	-0.05 [0.05]**	-0.07 [0.03]**	-0.09 [0.14]	-0.05 [0.06]*
Growth rate (host)	-0.09 [0.48]	0.02 [0.93]	-0.28 [0.31]	-0.15 [0.19]
Growth rate (home)	-1.33 [0.09]*	-0.61 [0.29]	1.57 [0.06]*	1.85 [0.06]*
Growth rate (home) × Exposure	0.64 [0.02]**	0.11 [0.84]	0.49 [0.48]	0.52 [0.05]**
VIX	-0.33 [0.25]	-0.32 [0.28]	-0.97 [0.10]	-1.43 [0.03]**
Common lender	0.01 [0.98]	-0.19 [0.67]	-0.13 [0.72]	0.10 [0.81]
R-squared	0.43	0.44		
AB test AR1			0.02	0.02
AB test AR2			0.17	0.21
Hansen *J* test			0.99	0.99
difference Hansen *J* test				0.99

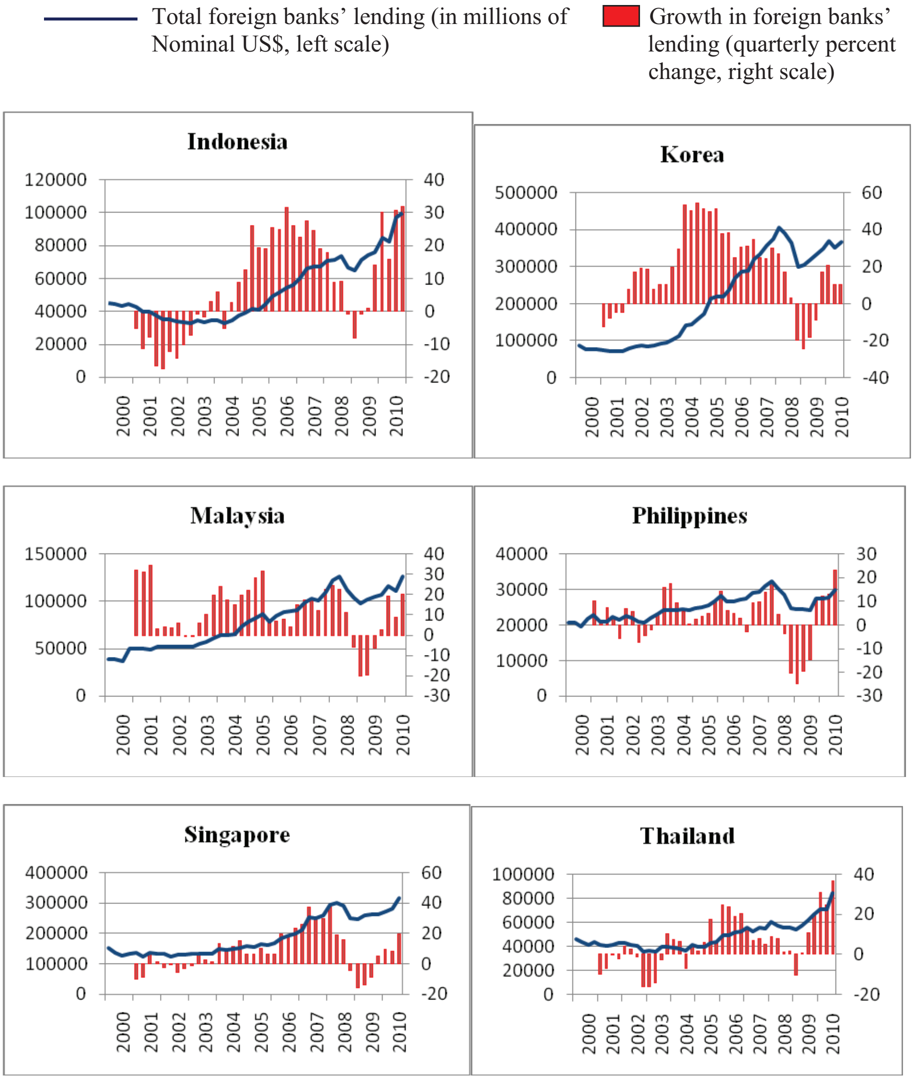
Notes: *p*-values in brackets. 'AB test AR1(2)': *p*-value of the Arellano-Bond test that average autocovariance in residuals of order 1 (order 2) is 0. 'Hansen *J*' and 'difference Hansen *J*': *p*-value of the Hansen *J* test for overidentifying restrictions and for the validity of the instruments used in SYS-GMM in addition to those used for first-diff. GMM, respectively, which are both asymptotically distributed as c^2 under the null of instrument validity.
* Significance at 10%; ** Significance at 5%; *** Significance at 1%.

Table 4
Dynamic Panel Estimation Results of Determinants of Loan Growth, 2000-2010

	(1) OLS	(2) OLS	(3) FE	(4) FE	(5) First-diff. GMM	(6) First-diff. GMM	(7) System GMM	(8) System GMM
Loan growth (lagged)	0.20 [0.00]***	0.21 [0.00]***	0.10 [0.16]	0.10 [0.16]	0.05 [0.00]***	0.02 [0.28]	0.15 [0.00]***	0.12 [0.00]***
Interest rate (home)	0.29 [0.89]	0.29 [0.89]	-10.55 [0.00]***	-10.54 [0.00]***	-24.45 [0.00]***	-27.08 [0.00]***	-8.70 [0.01]***	-5.54 [0.03]**
Square of interest rate (home)	-0.06 [0.72]	-0.06 [0.72]	1.00 [0.00]***	1.00 [0.00]***	2.44 [0.00]***	2.67 [0.00]***	0.51 [0.11]	0.34 [0.30]
Growth rate (home)	1.04 [0.02]**	1.04 [0.02]**	0.91 [0.12]	0.91 [0.12]	0.90 [0.00]***	1.10 [0.00]***	0.67 [0.02]**	1.27 [0.00]***
Interest rate (host)	1.71 [0.00]***	1.71 [0.00]***	2.94 [0.09]*	2.95 [0.09]*	3.41 [0.00]***	3.04 [0.00]***	1.16 [0.00]***	1.75 [0.00]***
Growth rate (host)	0.17 [0.73]	0.16 [0.75]	0.21 [0.68]	0.21 [0.67]	1.10 [0.00]***	1.23 [0.00]***	1.50 [0.00]***	1.31 [0.00]***
Crisis dummy	-0.70 [0.80]	4.25 [0.17]	0.59 [0.88]	3.24 [0.31]	-3.05 [0.09]*	-89.66 [0.02]**	-3.12 [0.03]**	-57.91 [0.07]*
Crisis dummy × subsidiary dummy		-5.02 [0.18]		-2.71 [0.56]		89.71 [0.02]**		56.71 [0.08]*
Solvency	-0.10 [0.58]	-0.10 [0.62]	1.53 [0.02]	1.53 [0.02]	1.56 [0.00]***	1.13 [0.01]**	-0.94 [0.00]***	-0.89 [0.00]***
Profitability	0.09 [0.96]	0.08 [0.96]	-1.18 [0.55]	-1.17 [0.55]	0.26 [0.89]	0.45 [0.86]	3.20 [0.02]**	2.44 [0.09]*
Size	0.00 [0.67]	0.00 [0.66]	-0.00 [0.00]***	-0.00 [0.00]***	-0.00 [0.00]***	-0.00 [0.00]***	-0.00 [0.33]	-0.00 [0.96]
Weakness	-0.01 [0.42]	-0.01 [0.42]	-0.02 [0.02]**	-0.02 [0.02]**	-0.00 [0.88]	-0.01 [0.75]	-0.05 [0.09]*	-0.02 [0.51]
Interest rate margin	-0.67 [0.29]	-0.68 [0.28]	0.35 [0.70]	0.35 [0.70]	4.62 [0.03]**	5.14 [0.00]***	2.01 [0.00]***	2.08 [0.01]***
Liquidity	0.02 [0.83]	0.02 [0.83]	0.58 [0.00]***	0.58 [0.00]***	1.12 [0.00]***	1.28 [0.00]***	-0.25 [0.00]***	-0.27 [0.00]***
R-squared	0.24	0.24	0.20	0.20				
AB test AR1					0.00	0.00	0.00	0.00
AB test AR2					0.20	0.09	0.86	0.78
Hansen *J* test					0.89	0.93	0.89	0.99
difference Hansen *J*							0.99	0.99

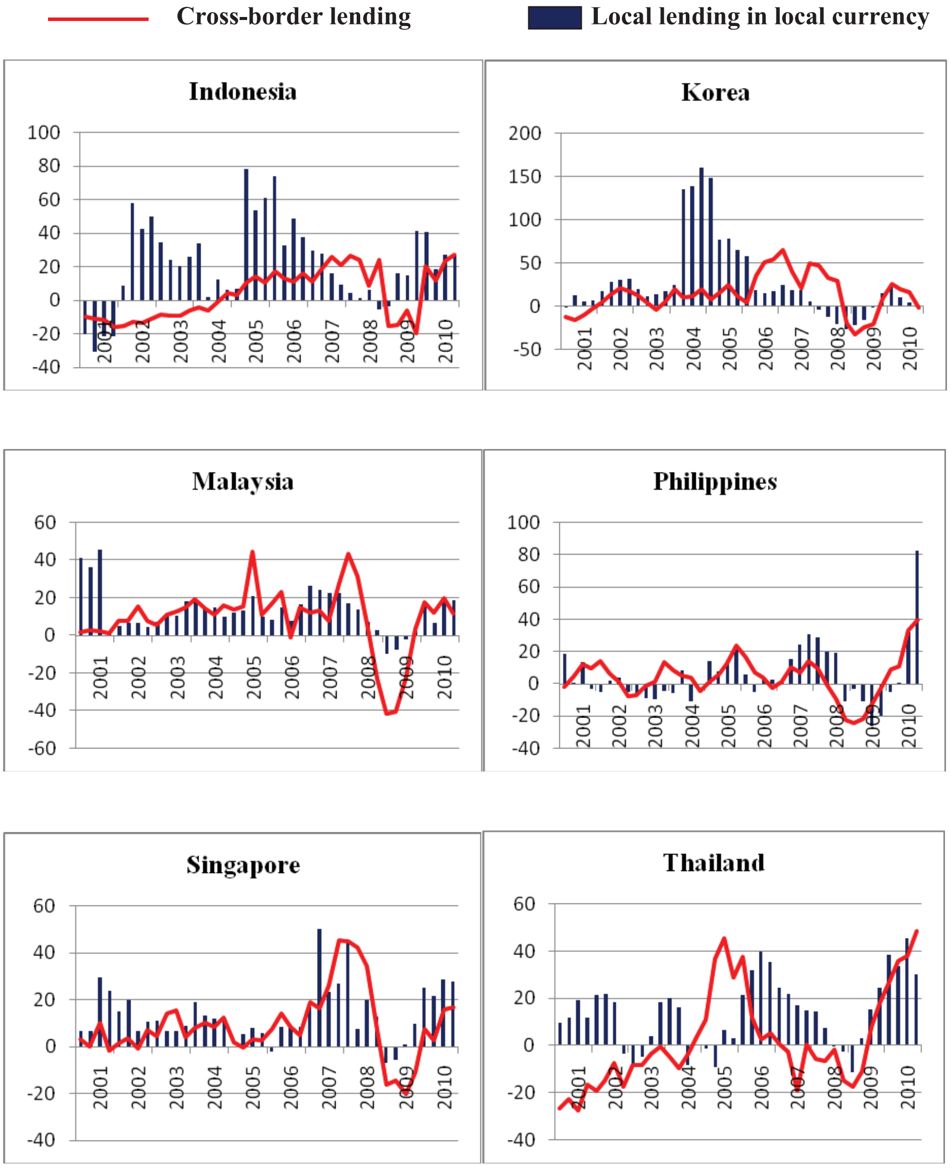
Notes: p-values in brackets. 'AB test AR1(2)': *p*-value ofthe Arellano-Bond test that average autocovariance in residuals of order 1 (order 2) is 0. 'Hansen *J*' and 'difference Hansen *J*': *p*-value of the Hansen *J* test for overidentfying restrictions and for the validity of the instruments used in SYS-GMM in addition to those used for first-diff. GMM, respectively , which are both asymptotically distributed as c^2 under the null of instrument validity. * Significance at 10%, ** Significance at 5%, *** Significance at 1%.

Figure 1
Total Foreign Banks' Lending to Selected Asian Countries[1/]



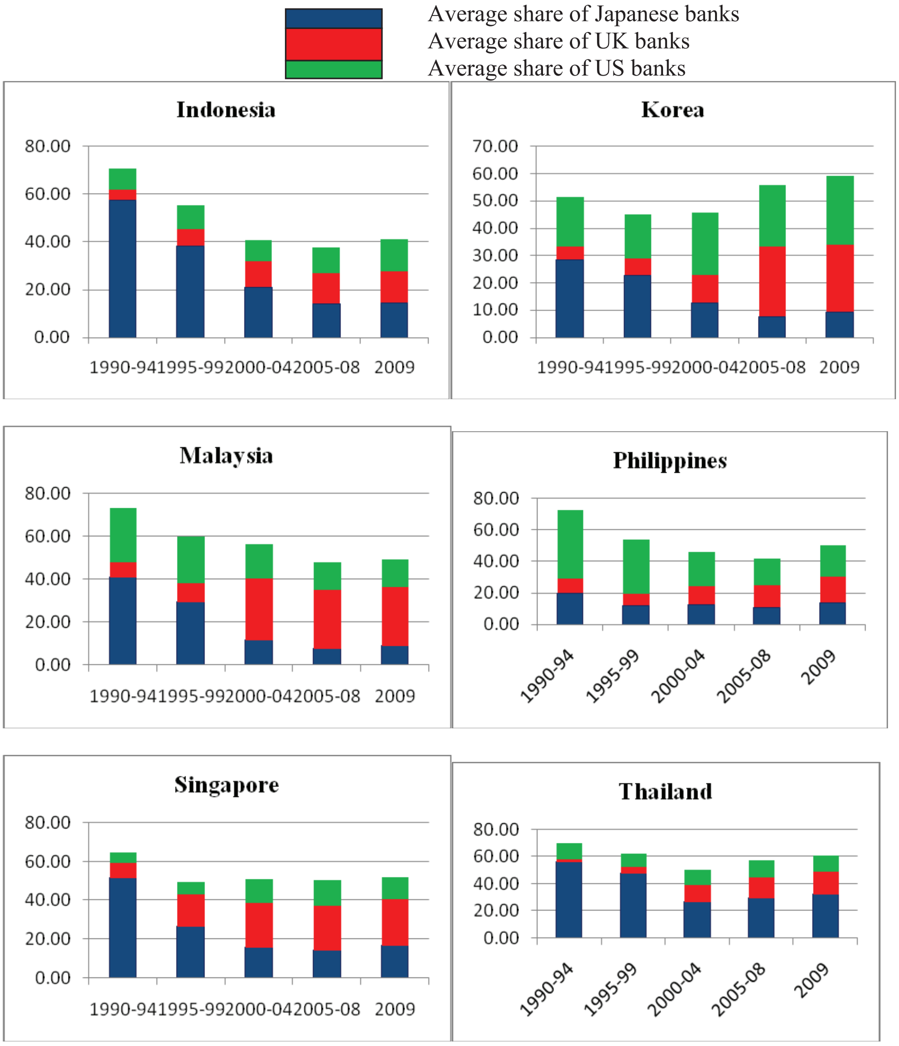
Sources: Raw data from Bank for International Settlements and authors' own calculations.
1/Includes cross-border lending and lending in foreign and local currencies by foreign-owned affiliates in each country.

Figure 2
Differences in Behaviour of Channels of Foreign Banks' Lending to Selected Asian Countries (quarterly percentage change)



Sources: Raw data from Bank for International Settlements and authors' own calculations.

Figure 3
Period Averages of Shares of Japanese, UK and US Banks' Lending to Total Foreign Bank Lending in Selected Asian Countries(in percentage)[1/]



Sources: Raw data from Bank for International Settlements and authors' own calculations.
1/ Includes cross-border lending and lending in foreign and local currencies by foreign-owned affiliates in each country.

PART 3

COUNTRY STUDIES

Chapter 8

POST-GLOBAL CRISIS CAPITAL INFLOWS TO INDONESIA: CHALLENGES AND POLICY RESPONSES

By
Darsono and Juda Agung[1]

1. Introduction

Indonesia has attracted large capital flows since the recovery of the global financial crisis. The push factors, such as the slow recovery in the advanced countries and abundant global excess liquidity, have led investors to search for better investment opportunities in the emerging countries with higher growth prospects and interest differentials. While the push factors have been apparently dominant, the pull factors, such as the prospective rating upgrades for Indonesia towards "investment grade" have also played an important role in making Indonesia an attractive investment destination.

Like water, the foreign capital inflow is something that should be welcomed, but an excessive inflow can be destabilising, if it is not managed properly. Traditionally, the main concern over large capital inflows is that the foreign funds may be utilised to finance an unsustainable current account deficit that could pose the risk of abrupt reversals in capital inflows (de Gregorio, 2010). This scenario could lead to painful consequences as a large exchange rate correction would potentially create a mismatch and balance sheet problems, as we saw in the 1997/1998 Asian financial crisis. Fortunately today the scenario is somewhat different. Driven mostly by global excess liquidity, the emerging countries such as Indonesia are currently receiving large inflows during the episodes of current account surplus. Second, the characteristics of the inflows are different from those on the eve of the Asian crisis. Before the Asian crisis, they were dominated by the external debt of domestic firms in the form of direct lending, corporate bonds and commercial papers to finance domestic investments. The recent inflows are mostly invested in short-term portfolio instruments such as central bank bill

1. From the Directorate of Economic Research and Monetary Policy, Bank Indonesia, respectively.

and government bonds. Thus far, there is no indication that the inflows have been intermediated by banks to finance the real economic activities, so that the potential balance sheet problem in the event of a sudden stop would be very limited.

The rapid capital inflows, nonetheless, pose some policy challenges. Capital inflows have created pressures on domestic currency appreciation, triggered asset price bubbles and intensified the risk of financial system instability. Speculative capital inflows could create economic vulnerabilities to changes in investor sentiment, primarily through changes in asset prices, the exchange rate, and maturity mismatches.

The procyclical nature of capital flows has also created complexity in monetary and exchange rate policies in Indonesia. The capital flow cycle is naturally tied to the business cycle. Foreign capital tends to flow during an expansionary period; therefore, the subsequent liquidity created further accelerates the economy and on many occasions leads to asset bubbles. In contrast, portfolio capital typically flows out when the economic outlook deteriorates, which undermines the domestic economy. Consequently, the highly procyclical nature of capital flows can be problematic. Monetary policy to address inflationary pressures through higher interest rates could further attract capital inflows. The surge in inflows amidst inflationary pressures in 2010 clearly illustrates this dilemma. Conversely, monetary policy to boost economic slowdown is often constrained by exchange rate depreciation pressure as demonstrated in the second half of 2005 during the currency crisis after the oil price shocks.

This paper aims to discuss the challenges posed by the large capital flows to Indonesia and their implications for monetary and exchange rate policies in managing the inflows. The following section presents the characteristics of inflows and challenges facing the central bank in managing the capital inflows in the aftermath of the global crisis. The third section elaborates the policy responses to date in Indonesia. The last section offers the conclusions.

2. The Recent Capital Inflows and Policy Challenges

Like the other emerging countries in Asia, Indonesia has been a recipient of large capital inflows since the recovery of the global crisis. The recent pick-up in private inflows to Indonesia is primarily in portfolio investments, reaching US$10.4 billion in the first half of 2011 (5.06 percent of GDP) from US$3.34 billion in the similar period of 2009 (Figure 1). FDI inflows increased dramatically as well, from US$3.35 billion in the first half of 2009 to US$11.05 billion in the

similar period of 2011, with accelerated domestic demand for investments (Figure 1).

The composition of portfolio investments has been skewed towards portfolio debt assets. In the post-crisis period, the inflows towards local currency debt market, particularly government bonds have been very dominant (Figure 2). Portfolio debt flows to corporate sector have been very limited due to underdeveloped corporate debt markets in Indonesia. Foreign holding on government bonds stood at US$23.9 billion (as of Sept. 2011), or around 32.5 percent of outstanding bonds. Meanwhile, foreign ownership of central bank bills decelerated to US$4.7 billion following the measures taken by BI to discourage inflow to the short-term central bank bills.

Figure 1
Capital Inflows to Indonesia

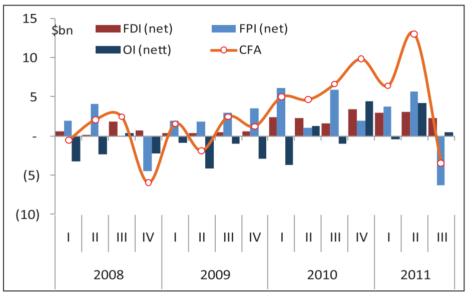
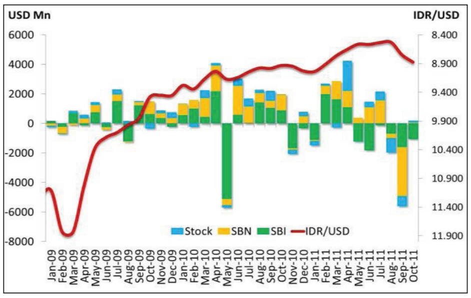


Figure 2
Portfolio Investment



The large capital inflows into Indonesia are driven by both pull and push factors. The pull factors, i.e., strong economic fundamentals and attractive yield, have led foreign investors to look for more prospective investment in the emerging market. Indonesia has stronger growth prospects in 2011 (6.5 percent) and 2012 (6.37 percent), while inflation is predicted to be maintained at a relatively low level in 2011 (4 percent) and 2012 (4.5 percent). Its fiscal deficit is projected at a more sustainable level, around 1.5 percent of GDP. In terms of yield, the return on Indonesian asset is still much higher than that of the advanced countries and quite competitive as compared to other neighbouring countries (Figure 4). Another pull factor that renders Indonesia attractive as an investment destination is the prospective rating upgrades to “investment grade” (Figure 3). From the external side (push factors), capital inflows are boosted by global excess liquidity, low interest rate, slow recovery, and unsustainable debt in the advanced countries.

Figure 3
Indonesia Rating by S&P

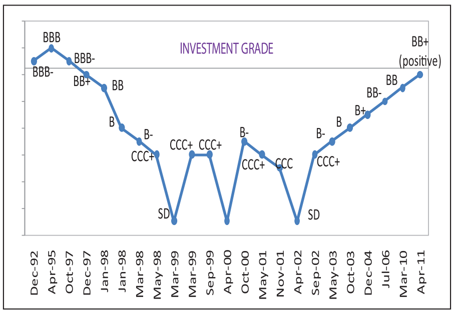
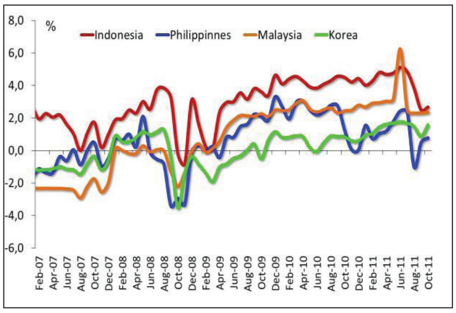


Figure 4
Covered Interest Rate



The large inflows confer benefits to the economy. The inflows have helped to reduce the cost of capital. Given limited market liquidity, the strong inflows have reduced the yield of government bonds substantially to 7.16 percent at the end of 2010 from around 20 percent during the Lehman crisis, implying cheaper budget financing (Figure 5). Rupiah appreciation, following the capital inflows, has a positive impact in curbing imported inflation. It is one of significant factors behind the relatively low CPI inflation in 2011 (Figure 6). In addition, the appreciation of the rupiah also facilitates the effort in enlarging economic capacity through a cheaper raw material and capital goods import that are required to enhance investment.

Figure 5
Government Bond Yield

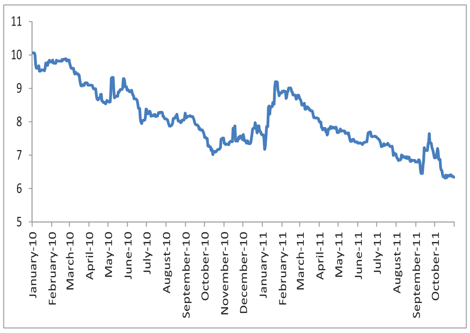
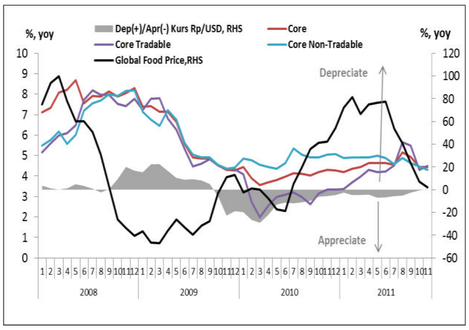


Figure 6
Exchange Rate & Core Inflation



However, the large capital inflows have posed a number of policy challenges. Firstly, the inflows have created upward pressures on the rupiah, which have led to concerns about the declining export competitiveness. The capital inflows, in general, have driven nominal rupiah appreciation since 2009 (Figure 8). The risk of the exchange rate overshooting has been mitigated by Bank Indonesia through foreign exchange market intervention. In real terms, the value of the rupiah has also appreciated since 2009, despite remaining relatively competitive as compared to a number of other countries in Asia (Figure 9).

Figure 7
Capital Flows to EM and Major Challenges

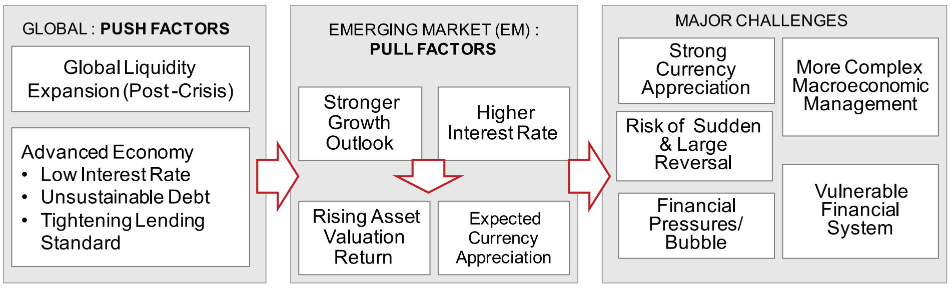


Figure 8
Monthly Portfolio Flows

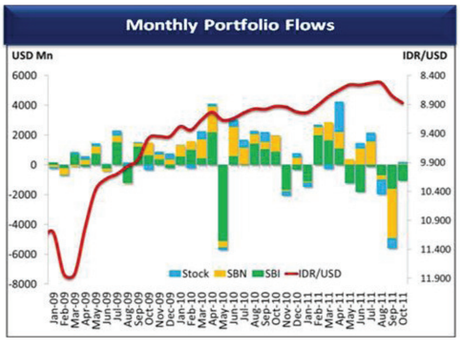
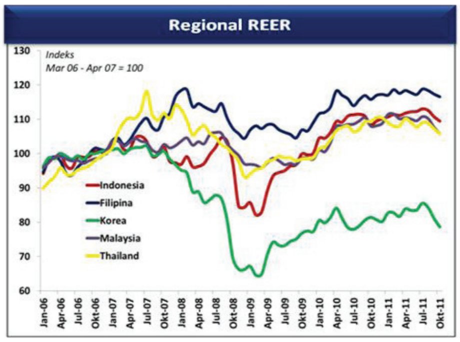


Figure 9
Regional REER



Secondly, the capital flows potentially create vulnerabilities in the macro-financial system. The dominant inflows to the portfolio investments especially to government bonds and central bank bills are more vulnerable to a change in market sentiment and, thus, risk of a sudden reversal. By the end of June 2011, the shares of foreign holding in Central Bank Bills (SBI) and Indonesia's government bonds still reached 33 percent of total SBI and around 33 percent of total government bonds (Figures 10 and 11). These figures are the highest among the countries in the region. Thus, there is potential risk of sudden capital reversal, which in turn could trigger destabilisation of the financial market.

Figure 10
Foreign Holding on Government Bond

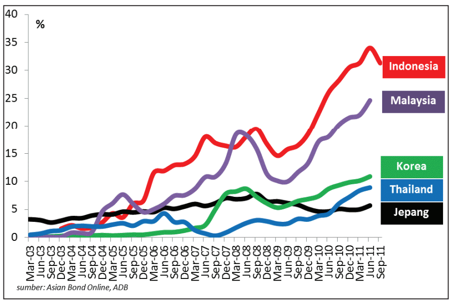
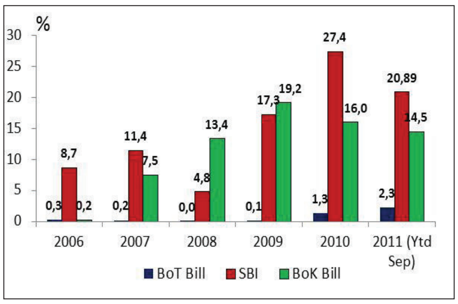
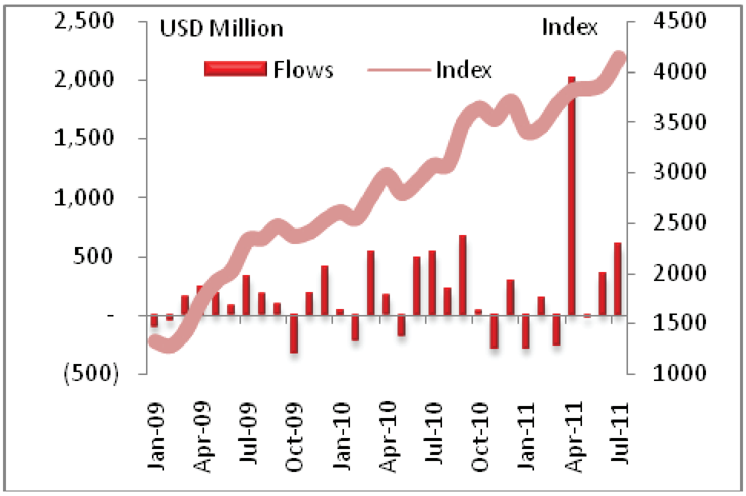


Figure 11
Foreign Holding on SBI



The large inflows also potentially create asset bubbles. The recent inflows have boosted stock and bond prices in Indonesia. The stock market index in Indonesia has now reached its highest levels, having risen in 2010 by about 46 percent, although the clear signs of stock price bubble are not evident at this stage (Figure 12).

Figure 12
Inflows to Stock and Stock Market Index



In addition to the Greek crisis in mid-2010, the sudden capital reversal in the Indonesian financial market also occurred in September 2011 due to the spill-over effect of the Euro crisis and US debt problem. The yield of the Indonesian government bond increased mostly due to non-resident investors' net sales. Yield of Indonesian government bond (10 year) increased on month-to-date basis (mtd) (Figure 14) in line with the movement of yields of other regional countries' government bonds. However, on year-to-date (ytd) basis, the yield of Indonesian government bonds still recorded a decline (Figure 13). Non-resident investors' net sale resulted in a decrease in the share of non-residents' holding of Indonesian government bonds from 32.6 percent (26/8/2011) to 29.4 percent (29/9/2011). However, further increase in Indonesian government bond's yield is, partly, restrained by government buy-back, Bank Indonesia purchase, and solid macroeconomic fundamentals. In addition to Bank Indonesia and government, banks are other main buyers of Indonesian government bonds in the secondary market (Figure 15).

Figure 13
Yield of Government Bond (10Y) -YtD

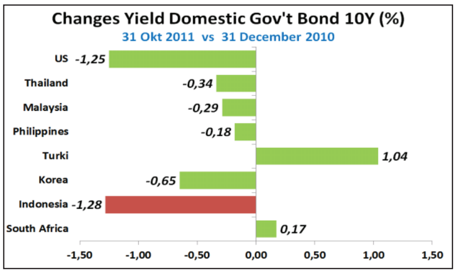


Figure 14
Yield of Government Bond (10Y)-MtD

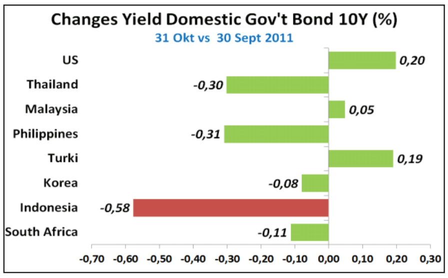


Figure 15
SUN Holding by Ownership

Group	ON			SPN			SPSN			Total		
	26-Aug-11	29-Sep-11	Δ	26-Aug-11	29-Sep-11	Δ	26-Aug-11	29-Sep-11	Δ	26-Aug-11	29-Sep-11	Δ
Non-Resident	229,392	205,812	(23,580)	14,131	9,634	(4,497)	3,858	3,453	(405)	247,381	218,899	(28,482)
Bank	215,953	222,022	6,069	1,301	5,471	4,170	8,995	9,523	528	226,249	237,016	10,767
Insurance	84,818	84,447	(371)	5	19	14	8,485	8,495	10	93,308	92,961	(347)
Pensiun Funds	33,650	33,450	(200)	413	526	113	1,787	1,737	(50)	35,850	35,713	(137)
Mutual Funds	44,388	42,452	(1,936)	-	-	0	4,177	4,327	150	48,565	46,779	(1,786)
Bank Indonesia*	35,605	45,142	9,537	-	300	300	199	199	0	35,804	45,641	9,837
Other	31,884	28,606	(3,278)	6,050	7,550	1,500	31,480	31,247	(233)	69,414	67,403	(2,011)
Total	675,690	661,931	(13,759)	21,900	23,500	1,600	58,981	58,981	0	756,571	744,412	(12,159)

*RR SUN is assumed to be equal to ON

In the Central Bank Bill market, foreign holdings of SBI decreased from US$6,441.3 million (26 Aug. 2011) to US$4,645.19 million (28 Sept. 2011). In 2011, a sudden sell-off of SBI by non-residents was constrained by Bank Indonesia's policy of 6 month-holding period. In the stock market, in line with the movement of global stock exchanges, Indonesia's stock exchange index (JCI) suffered a significant decline. The drop in JCI was driven by foreign investors' net sales (Figure 17). However, solid macro fundamentals and the relatively sound balance sheets meant that the system was able to withstand the further drop in stock market.

Figure 16
Global Stock Exchange - YtD

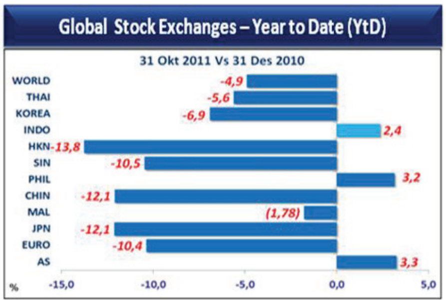
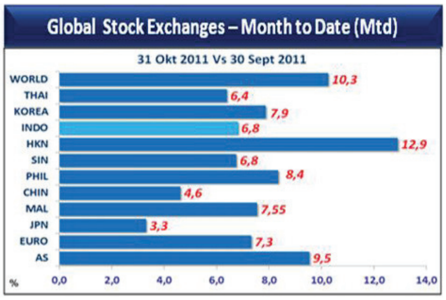


Figure 17
Global Stock Exchange - MtD



Non-resident investors' net sales in the domestic financial market put pressures on rupiah exchange rate. The rupiah and most of the other Asian currencies fell against US dollar (Figure 19). The rupiah experienced 0.71 percent depreciation (ptp) (Figure 18). Bank Indonesia intervened in the domestic foreign exchange market to keep the stability of the rupiah in tact (Figure 20).

Figure 18
Rupiah Exchange Rate

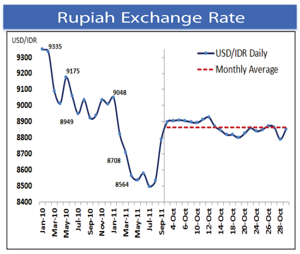


Figure 19
Rupiah Exchange Movement

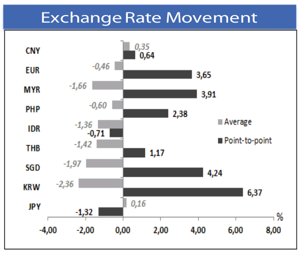
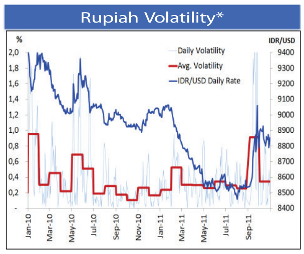


Figure 20
Rupiah Volatility



Fortunately, with ample liquidity in the domestic money market, the 2011 shock in the global financial market has not impacted the domestic money market. In fact, the interbank O/N rate is on a declining trend (Figure 21). Rates on deposits and lending are also trending downward, although the spread between these two rates is still wide (Figure 22). Bank credits keep increasing supported by with the growth of working capital and investment credits.

Figure 21
Interbank O/N and BI Rate

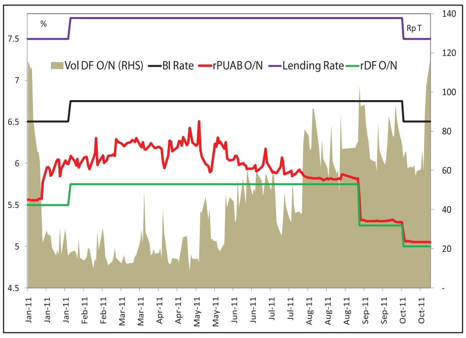
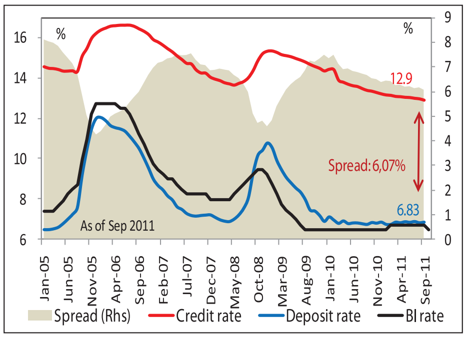


Figure 22
Financial Market Interest Rate



Thirdly, a surge in foreign capital inflows compounds the complexity of the challenges faced in terms of domestic monetary management. Persistent foreign capital inflows can undermine the efficacy of monetary management considering the measures taken in managing liquidity in the economy by Bank Indonesia are ultimately offset by the sheer magnitude of the capital inflows. This reduces the degree of monetary policy independence to external forces (Juhro, 2010) and is reflected by the orientation of monetary policy, which not only strives to control inflation, but also mitigates (eventually) rupiah appreciation through intensive intervention. In other words, interest rate dynamics are not fully influenced by market forces, domestic monetary policy is the primary determinant.

The challenges outlined represent a trilemma continuously faced by all open countries like Indonesia. Essentially, countries with open economies are constantly faced with a trilemma between free capital flows, exchange rate stability and independent monetary policy in the interest of the domestic economy. This trilemma triggers additional complications in the implementation of the ITF-based monetary policy in the context of an open economy because, on one hand, the role of the exchange rate as a shock absorber is not fulfilled and, on the other hand, there is a tendency to steer monetary policy, directly or indirectly, towards managing the exchange rate. Amid a deluge of foreign capital inflows, policy orientation towards managing external balances can become counterproductive to the management of internal balances.

3. Managing Capital Flows

Greater domestic economic integration with the global economy, coupled with a deluge of foreign capital flows, have increased macroeconomic management complexity, in particular monetary and exchange rate policy. Accordingly, monetary policy is recurrently faced with a trilemma, e.g., the impossible trinity, between free capital flows, exchange rate stability and independent monetary policy in the pursuit of price stability.

To confront this issue, the choice becomes how to transform the impossible trinity into a possible trinity. The concept of the possible trinity can be expressed as an intermediate solution that avoids volatile swings in the exchange rate, controls excessive short-term capital inflows and reinforces independent monetary policy (Palley, 2009). Therefore, a policy mix is required in order to strike an optimal balance between these three goals (Figure 23).

In terms of the exchange rate, the rupiah should be managed and provided space for it to remain flexible and appreciate, but avoid being overvalued as this will endanger macroeconomic stability. Consequently, Bank Indonesia's presence is required in the foreign exchange market to ensure that the rupiah does not deviate with excessive volatility. Of course, this option is no longer available if the rupiah becomes overvalued. Simultaneously, efforts to accumulate foreign exchange reserves are vital as a form of self-insurance considering that short-term capital flows are particularly vulnerable to the risk of sudden reversal.

It is noteworthy that monetary policy strategy using the interest rate as a primary instrument must be buttressed by other policy strategies, for example through measured intervention in the foreign exchange market coupled with sterilised intervention. This can be accomplished by considering the relationships between the weak and inconclusive UIP (Uncovered Interest Parity) variables. A weak relationship would imply that a monetary policy strategy that relies solely on the interest rate as an operational target might not be optimal.

Disyatat and Galati (2005) suggest that central bank intervention in the foreign exchange market can psychologically affect exchange rate fluctuations and is quite effective in directing the exchange rate in the short term, especially when compared to a response taken through the interest rate. The effects are more evident in a developing country along with the smaller market structure, armed with relatively comprehensive information available to the central bank compared to market players, and the coordinated intervention among central

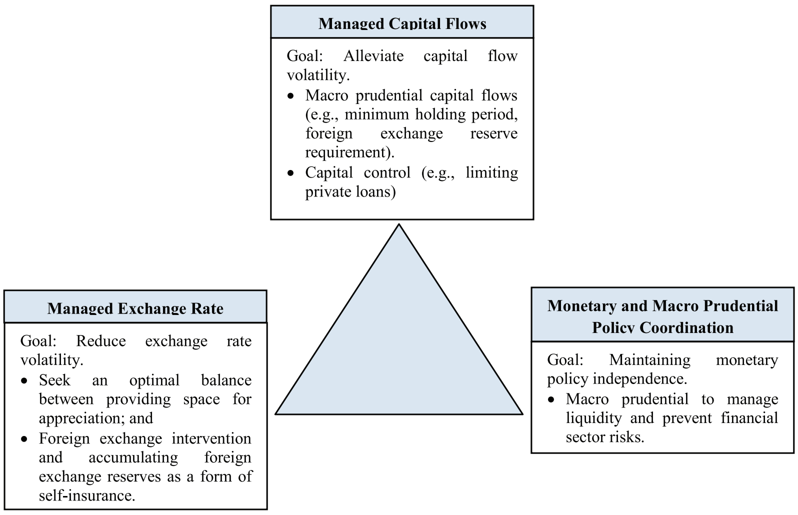
banks in the region. Other advantages can also be acquired from intervention strategy in the foreign exchange market, where intervention coupled with sterilisation policy can partially control the quantity of liquidity permanently. The use of intervention to affect money quantity can also support sub-optimal and asymmetric interest rate elasticity against liquidity control in the economy.

The role of intervention in the foreign exchange market was seen to increase during the financial crisis period, particularly in countries with fundamentally sound domestic economy. This policy was taken in order to respond to capital flight that occurred in a number of developing countries as a result of flight-to-quality to instruments deemed more financially sound, such as US T-Bonds, which has intensified depreciation pressure. Hence, to withstand excessive, spiralling depreciation-inflation expectations and to direct the exchange rate according to fundamental growth, many central banks intervened in the foreign exchange market.

Regarding capital flows, adhering to a free foreign exchange regime, macro prudential measures consist of policy options designed to reduce excessive short-term capital flows. Such measures have been introduced by Bank Indonesia through regulations that oblige investors to hold SBIs for a minimum period of one month. This policy has helped diversify foreign portfolio capital flows and extend the duration of SBIs.

Monetary policy complexity stemming from the interest rate can partially be resolved by quantitatively applying tighter monetary policy by raising the reserve requirement. In addition, macro prudential policy is aimed to avoid asset bubbles and excessive credit growth, which can trigger potential financial system instability. This type of macro prudential policy is effective if banks can intermediate the capital flows. Nevertheless, if the capital flows emanate directly from unregulated sectors, like direct loans from the private sector, measures to control capital inflows are another option, for example by limiting private loans.

Figure 23
Managing Trilemma



The coordinated implementation of a policy instrument mix is ultimately part of an important strategy of employing an optimal possible trinity in the current climate blighted by widespread uncertainty. Coordination is critical, not only to address the two sources of imbalances (external and internal imbalances), but also to optimally manage the impact of monetary policy, while avoiding overkill and mutual exclusivity. To this end, policy coordination should be based upon a wider implementation framework as formulated in the crisis management protocol (CMP) scheme, which incorporates prevention, management and resolution.

In this context, measured management of the dynamics of foreign capital flows is required. As a first line of defence, Bank Indonesia and the government will apply prudent and consistent macro prudential policy in order to maintain positive perceptions of the domestic economy in general. More specifically, these measures include the possibility of permitting exchange rate appreciation, the accumulation of foreign exchange reserves and other monetary and fiscal policies. In this regard, Bank Indonesia continuously assesses prudential and structural policies to manage capital inflows, for instance by applying a minimum holding period for domestic portfolio, and limits on the Net Open Position (NOP) of foreign exchange and the account balance in rupiah for foreign banks, as well as applying a foreign exchange reserve requirement as outlined in Figure 24.

Figure 24
Bank Indonesia's Policy Mix

Instruments	Policy	Rationale
1. Interest rate policy	Increasing BI rate by 25 bps to 6,75% in February 2011, holding it until Sept. 2011, and decreasing by 25 bps and 50 bps in Oct. and Nov. 2011.	• To keep inflation on track with inflation targets, 5% ±1% (2011) & 4,5% ± 1% (2012), while remaining conducive to safe guard financial stability & promote economic growth
2. Exchange rate policy	Implementing a consistent flexible Exchange Rate (with stable volatility), in line with macroeconomic dev. & movement of other Asian currencies.	• To stabilize exchange rate, help reduce inflationary pressures, particularly from imported inflation, and not put negative impacts on export performance.
3. Macroprudential on capital infows	a. Imposing 1 Month Minimum Holding Period (OMHP) on BI bills (June, 2010) and extend to 6 Months Holding Period (May 2011)	• To "put sand in the wheels" on short-term and speculative capital inflows, and mitigate risks of sudden reversals.
	b. Introducing 1 month Term Deposit (June 2010).	• To lock up domestic liquidity into longer term, and limit the supply BI bills in the market.
	c. Increasing FX Reserve Requirement from 1% to 5% March 1st, 2011, to 8% June 1st, 2011.	• To enhance bank's FX management liquidity in response to increasing FX exposure due to capital inflows, while supporting monetary operations in managing liquidity and stabilizing exchange rate.
	d. Reinstating limit offshore short term borrowing of banks to 30% capital (end Jan 2011),with 3 months transition period.	• To limit capital inflows to financial assets and encourage a shift to longer term offshore borrowing.
	e. Revocating BI direct FX supply to domestic corporate	• To bring domestic FX liquidity back to normal and further deepen FX market liquidity.
4.Strengthen monetary operation and macroprudential on financial system stability	a. Lengthening interval of auction (from weekly to monthly) and offer longer BI Bills maturity from 1 and 3 month to 9 month since August 2010.	• To enhance the effectiveness of domestic liquidity management, including from capital inflows, by locking up to longer term and in the same time help develop domestic financial markets.
	b. Increasing Rupiah reserve requirement from 5% to 8%, effective Nov 2010.	• To absorb domestic liquidity and enhance liquidity management of the banks, without exerting negative impact on lendings that are needed to stimulate growth.
	c. Linking Reserve requirement to Loan to Deposit Ratio (78 -100), effective March 1st, 2011.	• A prudential measure to enhance role of banking intermediation to support economic growth, while maintaining prudent banking operation.

Meanwhile, in line with such measures to manage foreign capital inflows, exchange rate management in harmony with fundamental conditions is conducted through symmetrical foreign exchange market intervention, which provides space for rupiah appreciation in the event of an influx of foreign capital flows. Accordingly, the amount of rupiah appreciation permitted must remain congruous with the degree of exchange rate appreciation in neighbouring countries. Therefore, in addition to helping ease inflationary pressures, exchange rate management is not expected to undermine the competitiveness of the domestic economy.

When the economy is beset by more arduous challenges consisting of a further deluge of foreign capital inflows, and amid domestic inflationary pressures, Bank Indonesia will consider the application of follow-up policies, including Capital Flow Management (CFM).[2] It should be emphasised that the sequence of policy measures to manage foreign capital inflows is critical, particularly for an economy like Indonesia that departed from open conditions in line with the application of a free foreign exchange regime at the beginning of the 1980s. In this context and with due regard to the policies practiced in several other countries, the various stages of policy commence with measures adhering to a free foreign exchange system and then subsequently become more managed.

4. Concluding Remarks

Indonesia has attracted large capital inflows since the recovery of the global financial crisis. The push and pull factors have led investors to search for better opportunities for investments in the emerging countries with strong economic fundamentals and interest rate differentials. The large inflows have benefited the economy, reducing the cost of capital, curbing imported inflation due to rupiah appreciation following capital inflows, and facilitating the effort in enlarging economic capacity through cheaper raw material and capital goods import that are required to enhance investment.

Despite the benefits, large capital inflows have posed a number of policy challenges. Firstly, the inflows have created upward pressures on the rupiah, which have led to concerns about the declining export competitiveness. Secondly,

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2. According to IMF guidelines (2011), CFM is best applied when an economy meets the following three conditions: (i) The exchange rate is not undervalued multilaterally; (ii) Foreign exchange reserves are excessive and, thus, incur additional costs; (iii) The economy is overheating, the inflation outlook is rising and there is risk of a credit boom or asset price boom.

capital flows potentially create vulnerabilities in the macro-financial system. The dominant inflows to the portfolio investments are more vulnerable to a change in market sentiment and thus risk of a sudden reversal. Thirdly, a surge in foreign capital inflows compounds the complexity of the challenges faced in terms of domestic monetary management.

The post-crisis challenges have revealed some valuable lessons for monetary policy and exchange rates. First, in a small open economy, like Indonesia, the multiple challenges facing monetary policy as a result of capital inflows imply that the monetary authorities should employ multiple instruments. In the face of capital flows, while the exchange rate should remain flexible, it should be maintained in such a way that the exchange rate is not misaligned from its fundamentals. Concomitantly, measures are required to accumulate foreign exchange reserves as self-insurance given that short-term capital flows are particularly vulnerable to a sudden stop. In terms of capital flow management, a variety of policy options are available to deal with the excessive procyclicality of capital flows, especially short-term and volatile capital. On monetary management, the dilemma facing monetary authorities have been partially resolved by applying quantitative-based monetary policy to support the standard interest rate policy instrument. In addition, macro prudential policies aimed at maintaining financial system stability should also be adopted to mitigate the risk of asset bubbles in the economy.

Second, exchange rate policy should play an important role in inflation targeting in a small open economy. According to standard ITF, central banks should be not attempt to manage the exchange rate. This conventional view argues that the exchange rate system should be allowed to float freely, thus acting as a shock absorber for the economy. However, in a small open economy with open capital movement, exchange rate dynamics are largely influenced by investor risk perception, which trigger capital movements. In this environment, there is a case for managing the exchange rate in order to avoid excess volatility that could push the exchange rate beyond its inflation target band

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Chapter 9

CIP AND INTERNATIONAL CAPITAL MOVEMENTS IN A DSGE MODEL WITH FINANCIAL FRICTIONS

By
Junhan Kim[1]

1. Introduction

There has been much interest among academics and practitioners in the causes of international capital flows and how to manage them. It is especially true for the emerging market economies, since their domestic financial markets are small and vulnerable to large and sudden capital movements. Over the course of the recent history of globalisation, the integration of financial markets around the world is more evident than ever. By opening up their domestic financial markets, the emerging market economies jump on the band wagon the international financial markets have to offer. It, however, opens up possibilities of severe reversals of capital flows, and consequently unstable domestic economies and financial markets.

Devising policies for coping with these problems has been a priority to local policymakers, so various policy measures have been suggested. However, it is an unfortunate inevitability that domestic markets, once protected by borders, institutions and policies, now have to face the harsh economic environments with little or no prior experiences, for the sake of improved efficiency and promises of new possibilities. Policymakers, despite having recognised the risks of opening up the borders, could not stand alone against the tides of globalisation. Opening up, by definition, leaves little room for policymakers to resist the waves which are buffeting the global economic landscape.

If the opening up of borders is one side of the coin, adoption of inflation targeting is the flipside. The emerging market economies, which have long suffered from the lack of central bank independence and consequently from the lack of anchored inflation expectation, finally earned trust after adopting inflation targeting as their monetary policy framework. It comes, however, at a cost of

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losing their grip on exchange rates. As has been well known, independent monetary policy and fixed exchange rate regime do not coexist, unless capital movement is controlled. Of course, there is no such thing as clear-cut distinctions between independence versus dependence, fixed versus floating, or controlled versus free. Nevertheless, policy trade-offs are not to be ignored or avoided.

Although inflation targeting has been shown to be a major contributor to price stability, which is a key to economic stability, the increased volume of international capital flows posed a threat. The increased volume in financial transactions, of course, coincides with the increase in the volume of trade these economies enjoyed from stabilisation. At times, nevertheless, the international capital flows overshadow trade in terms of volume and speed of changes. There is no doubt that policymakers keenly recognise these risks. The global imbalances, however, added complexity to the problem. Low interest rates in the global financial markets prevent individual countries from raising interest rates to guard against the risks. The raising of interest rates by individually by countries could have potentially made the problems worse, not better. Among the many causes of international capital flows, interest rate differentials could be one of the most important. When interest rate differentials widen, international capital flows in for the margin. Flexible exchange rates create self-fulfilling prophecy for an appreciation of the currency, and may lead to speculative behaviours.

Under the circumstances, understanding the relationship between interest rate differential and international capital movements seems crucial. One of the well known equilibrium conditions related to this issue is interest rate parity. Although uncovered interest rate parity, equality between interest rate differentials and expected changes in spot rates, is known not to hold empirically, covered interest rate parity, equality between interest rate differentials and forward-spot spreads, is known to hold in general. There are, however, some evidences that CIP does not necessarily hold all the time. Taylor (1989), Bhar et al. (2004) and others show that CIP may not hold at times. Baba and Packer (2009), by analysing Swap markets, also confirm that dollar and euro CIP did not hold during the global financial crisis. According to Baba et al. (2008) and others, deviation from CIP is largely due to risk premia. In the developing economies, the deviation tends to be more frequent and persistent. According to the survey by Alper et al. (2007), in addition to risk premia, the lack of financial development and capital control contributed to the causes of such deviation in developing economies. Deviations from CIP which gave rise to seemingly risk-free arbitrage opportunities for international investors, led to international capital inflows into some countries, including Korea.

In this paper, the relationship is viewed from different perspectives. I introduce a DSGE model with two financial sectors, domestic and foreign, and attempt to establish links between the interest rates, external finance premia and international lending. Of course, this paper is not the first to study the links between financial frictions and international capital flows. Gertler et al. (2007) studied the financial accelerator and the economy from the experiences of the Korean financial crisis during 1997-1998. According to their analysis, clinging to a fixed exchange rate regime exacerbated the crisis. Elekdag et al. (2006) provide empirical evidence that financial frictions and accordingly risk premium do matter in the emerging market economies. They use Korean data for their analysis.

A novel feature of this paper is two-fold. First, it introduces dual financial frictions, domestic and foreign. This is to analyse the interaction between a financial sector denominated in local currency and the other denominated in dollar. From this setup, external shocks, such as foreign interest rate shocks, create acceleration effects on both financial sectors. During the course of propagation of the shocks, external finance premia can be compared, and lending, domestic and foreign, can be measured. The effects on external finance premia can be understood as a theoretical underpinning of CIP, and the lendings as international capital flows.

Another novel feature of this paper is, following Kim and Yie (2008), the coexistence of banks and bond market. In this setup, firms get funded both by bank lending and by issuance of bonds. This is to measure the strength of the lending channel by estimating a substitution parameter between these two funding sources. This approach is extended to include two financial sectors, so there are four funding sources for firms and three substitution parameters.

As for how to model banks, there are many approaches, the most famous one being Bernanke and Gertler (1989), which models a friction from information asymmetry by costly state verification. This paper, however, as in Kim and Yie (2008), follows Holmstrom and Tirole (1997), and Chen (2001), which models a friction from moral hazard. The differences between these approaches are rather subtle and produce similar results, but the moral hazard approach seems attractive since the global financial crisis has been characterised by some as a consequence of moral hazard. Also, more importantly, this approach supports the empirical strategy of measuring the size (or strength) of the lending channel.[2]

2. See Kim and Yie (2008) for details.

This paper is organised as follows. First, the Korean episode regarding the deviation from CIP since 2007 is reviewed. Then, a DSGE model with financial frictions is introduced. This model is then estimated using Korean data. Finally, the results of some policy analyses are reported.

2. Episodes in Korea

Since 2006, the foreign debts of banks have been accumulating rapidly. This is mostly due to a large increase in exports, especially in the shipbuilding sector. When shipbuilders 'export', which means they start building ships, their future payments are subject to exchange rate fluctuations, therefore they try to hedge the risks by having forward contracts. Similar risks are present investing in foreign assets. Domestic investors who invest in foreign assets also face the same risks. That is, the exchange rates at the time the assets are bought are likely to be different as when the assets mature or are sold. They hedge the risks by having forward contracts with banks. Domestic banks, faced with the surge in demand for forward contracts from exporters and investors, would be left with huge foreign exposures if they do not hedge the foreign exchange position themselves. One of the ways of hedging the risk is to borrow from abroad, thereby squaring their book. That is, forward contracts, assets, can be squared with and borrowings from abroad, liabilities.

Domestic banks, however, may have limited access to international financial markets, so they may have to turn to the foreign banks. With Swap contracts with foreign banks, domestic banks can get dollars in exchange for a promise to pay it back in the future. Foreign banks, on the other hand, receive won in exchange for dollars so that they can hold local bonds until the Swap contracts are due. Foreign banks obtain dollars from the international markets or from their headquarters. Swap rates, the interest rate in won for funding dollars, have almost been equal to the domestic interest rates until mid-2007. This is covered interest parity. CIP is the relationship between interest differential and FX forward and spot rates as follows.

$$i_t = i_t^* + f_t - s_t,$$

where i_t is domestic interest rate, i_t^* is foreign interest rate, f_t is FX forward rate, s_t is FX spot rate. This is to say that the investment returns on bonds, regardless of denomination, should be the same. If, for example, the yields on bonds in local currency is i_t, then the yields on bonds of similar characteristics except the denomination, i_t^*, should be the same after the currency conversions back and forth, which is $f_t - s_t$.

Swap markets facilitate these transactions by ‘swapping’ assets and liabilities. So currency swap (CRS) rate is the foreign interest rate ‘converted’ into domestic interest rate by a Swap contract. As Figure 1 shows, until the mid-2007, 1-year Interest Rate Swap (IRS), which is the domestic funding cost, and CRS, which is the dollar funding cost, are basically the same. CDS (credit default swap), the insurance premium against the default of the debt, has been stable as well. Things have started to become volatile since mid-2007. IRS and CRS diverge from each other, even after taking into account CDS.

While the cost of dollar funding soared (Swap rates plummeted), capital flows do not necessarily coincide with these movements. Figure 2 shows that ‘others’, consists mostly of borrowings by domestic banks, are still positive overall until the second half of 2008, when Lehman Brothers fell. Also late 2009 and early 2010, when the deviation from CIP was still apparent, saw large surge in borrowings, not to mention portfolio inflows.

Figure 1
IRS, CRS, and CDS

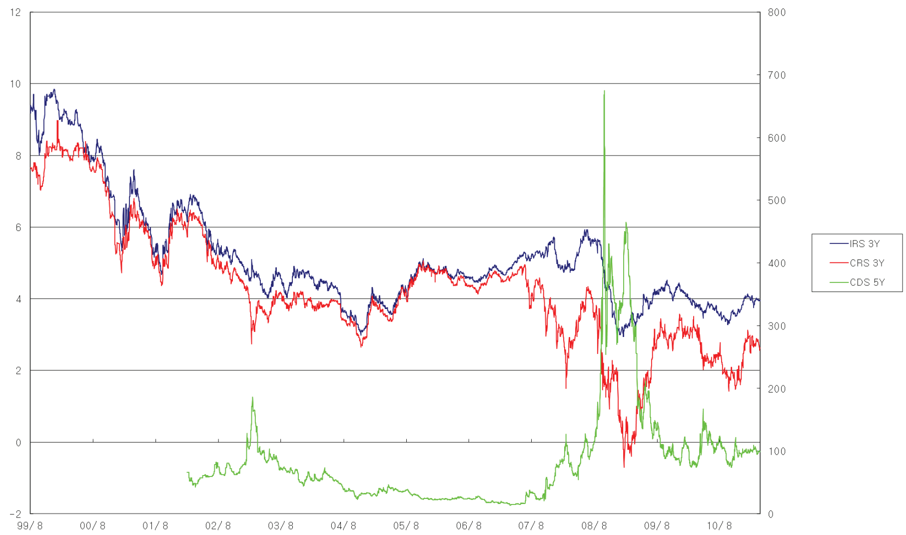


Table 1

Correlations

	Output Gap	Inflation	D Int.	F Int.	D EFP	F EFP
Output Gap	1.00					
Inflation	0.35	1.00				
Domestic Interest Rate	0.32	0.23	1.00			
Foreign Interest Rate	0.32	-0.04	0.33	1.00		
Domestic EFP	-0.59	-0.18	-0.79	-0.50	1.00	
Foreign EFP	-0.38	-0.11	0.10	-0.23	0.05	1.00

* 1996 Q1 - 2011 Q1. See Data Appendix for details.
** All variables are H-P filtered.

Table 1 summarises the correlations between the data used in the estimations later on. The correlation between the output gap and inflation is positive, as theorised by the Philips curve. The correlations between external finance premia (EFP) and other variables are mostly in line with the theories. Output and EFP are likely to be negatively related. The relation between interest rates and EFP are also likely to be negative. The domestic interest rate and Foreign EFP are positively related, albeit very loosely.

Table 2 shows that domestic loans are more related to foreign interest rate than domestic interest rate. Also, domestic interest rate is positively related to foreign loans. This can be seen as one of the characteristics of a small open economy. Also, it can be interpreted as a close link between domestic loans and foreign loans. One thing to note here is that domestic EFP seems to be closely related to foreign loans.

Figure 2
IRS, CRS, and CDS

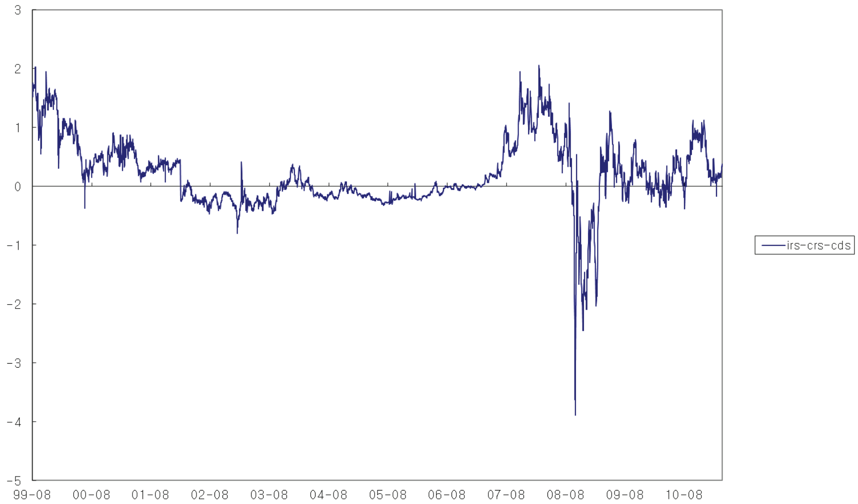


Figure 3
Capital Accounts

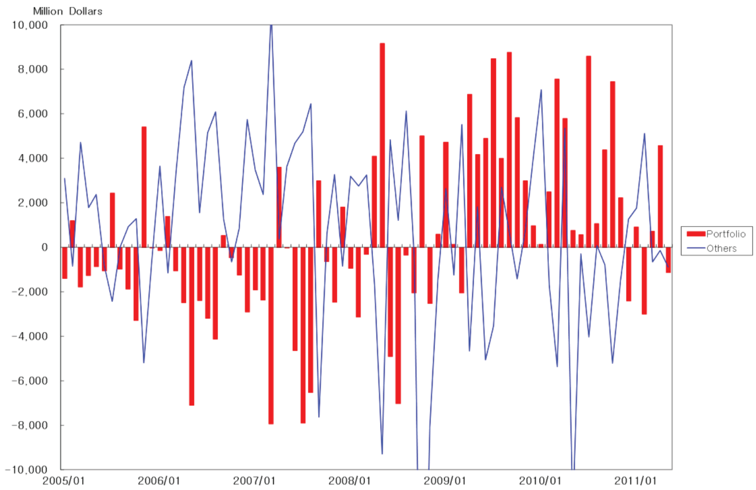


Table 2
Correlations

	D Int.	F Int.	D EFP	F EFP	D Loans	F Loans
Domestic Interest Rate	1.00					
Foreign Interest Rate	0.33	1.00				
Domestic EFP	-0.79	-0.50	1.00			
Foreign EFP	0.10	-0.23	0.05	1.00		
Domestic Loans	0.26	-0.56	-0.19	0.44	1.00	
Foreign Loans	0.63	0.35	-0.58	0.36	0.28	1.00

* 1996 Q1 - 2011 Q1. See Data Appendix for details.
** All variables are H-P filtered.

3. Modeling International Capital Movements

3.1 Model

The model is an otherwise standard DSGE model with sticky prices and financial frictions. Household utility optimisation and retailers' profit optimisation under sticky prices are almost standard features in a DSGE model. A noteworthy feature of the model is that there are two financial sectors, domestic and foreign. Financial frictions are modeled as in Holmstrom and Tirole (1997) and Chen (2001). Also, loans and bonds co-exist, which is adopted from Kim and Yie (2008).

The model consists of a representative household, entrepreneurs who owns intermediate goods, producing firms, retailers, final goods firms, bankers who own banks, and finally the central bank. The household consumes final goods and provides labour. Final goods are composed of retailers' individual goods. Retailers are in a monopolistically competitive market, where they convert intermediate goods into their own products with no costs. This is a mere theoretical device to avoid any complications in combining moral hazard and sticky prices under monopoly.

Intermediate good producers use capital, which must be financed both by banks and by bonds, together with their own funds due to moral hazard. Capital good producers are perfectly competitive and subject to decreasing return to scale technology. Banks also have to face moral hazard, so they finance loans with deposits and their own net worth, bank capital.

This model, although I would like to call it a small 'open' economy model, does not include international trades or exchange rates. Households do not have access to international markets. 'Openness' is only in the context that firms finance from 'foreign banks' and issue bonds abroad.

The focus of this paper is placed on external finance premia, not on exchange rate per se. The unusual complications, especially for emerging market economies, are less efficient FX markets, large and persistent interventions, heavy regulations, etc. I do not intend to depict all these complications in this model, so I abstract exchange rates. It is not, however, so inconceivable to include exchange rates in the model, as far as modeling goes. A simple extension by combining domestic consumption goods and imported goods would yield trades and the terms of trade. Empirical plausibility to capture the reality is another matter, of course.

Another abstraction is the assumption that external shocks are all independent of each other. This, of course, is not necessarily true and may be misleading. For example, interest rate shocks in the US not only have direct effects, but also indirect effects disguised as export demand shocks, bank capital shocks and many other different shocks. Identifying these shocks would require modeling of the US economy, which by itself is a challenging task.

3.1.1 Households

The representative household maximises the following utility function subject to the budget constraint.

$$\max \quad \sum_{t=0}^{\infty} \beta^t \left[\frac{\exp(v_t)}{1-\sigma} c_t^{1-\sigma} - \chi \frac{n_t^{1+\psi}}{1+\psi} \right],$$

$$\begin{aligned} s.t. \quad & c_t + b_t^D + b_t^F + d_t^D + d_t^F \\ & \leq \omega_t n_t + (1+r_{t-1}) b_{t-1}^D + (1+r_{t-1}^*) b_{t-1}^F + (1+r_{t-1}) d_{t-1}^D + (1+r_{t-1}^*) d_{t-1}^F + \Pi_t, \end{aligned}$$

where c is consumption, n is labour supply, ω is wage, v_t is exogenous AR(1) process, b^D is domestic bonds, b^F foreign bonds, bonds issued by domestic firms in international markets in dollars (converted in won for simplicity), d^D is deposits at domestic banks, d^F is deposits at foreign banks, r is domestic interest rate, r^* is foreign (or international) interest rate, Π is lump-sum transfer of profit, and β, σ, ψ, are parameters.

The first-order conditions are:

(1) $$\exp(v_t)\, c_t^{-\sigma} = \lambda_t,$$

(2) $$\chi n_t^{\psi} = \omega_t \lambda_t,$$

(3) $$\lambda_t = \beta(1 + r_t)\lambda_{t+1}\pi_{t+1},$$

(4) $$s_t \lambda_t = \beta(1 + r_t^*)\lambda_{t+1}\pi_{t+1}.$$

3.1.2 Intermediate Goods, Retailers and Final Goods Producers

Final goods are produced with the following technology:

$$y_t = [\int_0^1 y_t(i)^{\frac{\epsilon-1}{\epsilon}} di]^{\frac{\epsilon}{\epsilon-1}}.$$

Retail goods $y_t(i)$ are produced by the following technology:

$$y_t(i) = \exp(z_t)\, m_t^{\gamma}(i) n_t^{1-\gamma}(i),$$

$$z_t = \rho_t z_{t-1} + e_t^{z},$$

where m is intermediate goods and z is a technology shock.

I assume that the aggregations can be done in such a way that I can drop subscript from all individual producers. Factor prices can be derived from cost minimisation.

$$\omega_t = (1 - \gamma) x_t \exp(z_t)\, m_t^{\gamma} n_t^{-\gamma},$$

$$v_t = \gamma x_t \exp(z_t)\, m_t^{\gamma-1} n_t^{1-\gamma},$$

where x_t is the Lagrange multiplier for production function, and can be interpreted as real marginal cost.

Retailers are subject to price stickiness a la Calvo (1983), so the first-order condition of profit maximisation is as follows:

$$E_t \sum_{j=0}^{\infty} (\theta\beta)^j \lambda_{t+j} y_{t+j} \left(\frac{1}{P_t^*}\right)\left(\frac{P_t^*}{P_{t+j}}\right)^{-\epsilon} \left(\frac{P_t^*}{P_{t+j}^*} - \frac{\epsilon}{\epsilon-1} x_{t+j}\right) = 0,$$

where θ is the degree of stickiness.

Intermediate goods are produced by combining domestic intermediate goods and foreign intermediate goods following the CES technology.

$$m_t \equiv \left[\zeta^{\frac{1}{\rho}} m_t^{D\frac{\rho-1}{\rho}} + (1-\zeta)^{\frac{1}{\rho}} m_t^{F\frac{\rho-1}{\rho}}\right]^{\frac{\rho}{\rho-1}},$$

$$m_t^X = \zeta\left(\frac{v_t^X}{v_t}\right)^{-\rho} m_t,$$

where vs are the prices of intermediate goods, ζ, ρ are parameters, and $x = \{D, F\}$.

Domestic intermediate goods are produced using capital financed by domestic funding, and foreign intermediate goods are produced using capital financed by foreign funding.

$$m_t^X = u^X p_H k_{t-1}^{XT},$$

where p_H is the probability of success to produce goods when intermediate goods producers 'work', us are parameters, and k is capital goods.

Loan financing: Financial contracts are as follows:

$$f_t^X = u^X v_{t+1}^X + (1-\delta) q_{t+1} - \frac{g}{\Delta p},$$

where f is the amount committed to pay back if successful, where q is resale value of capital, δ is depreciation rate, g is private gain of entrepreneurs when they 'shirk', Δp is the difference in probability of success between the cases when entrepreneurs 'work' and 'shirk'. This condition is from incentive compatibility condition of entrepreneurs.

$$p_H[q_t u^X v_{t+1}^X + (1-\delta)q_{t+1} - f_t^X] \geq p_L[q_t u^X v_{t+1}^X + (1-\delta)q_{t+1} - f_t^X] + g,$$

The net worth of entrepreneurs, who own intermediate firms, evolves as follows:

$$\omega_t^X = \sigma^{EX} p_H[u^X v_t^X + (1-\delta)q_t - f_{t-1}^X]k_{t-1}^{XL} + e_t^{EX},$$

where ω is net worth, σs are survival rate, es are exogenous endowments. Entrepreneurs are assumed to invest all their net worth unless they are signaled to 'exit', at which time they consume all their remaining net worth and exit. In order to ensure they are not forced to exit except when they get a signal, exogenous endowment is assumed to be given as long as they survive. The exit is a theoretical device to ensure that entrepreneurs do not get wealthy enough to finance themselves.

Entrepreneurs' consumption:

$$c_t^{XE} = (1-\sigma^{EX})p_H[u^X v_t^X + (1-\delta)q_t - f_{t-1}^X]k_{t-1}^{XL}.$$

Capitals are funded by net wealth and loans:

$$q_t k_t^{XL} = w_t^X + l_t^X.$$

External finance premia are calculated as follows:

$$efp_t^D = [u^D v_{t+1}^D + (1-\delta)q_{t+1}]/q_t - r_t,$$

$$efp_t^F = [u^F v_{t+1}^F + (1-\delta)q_{t+1}]/q_t - r_t^*.$$

Bond financing equilibrium conditions for bond markets and loans are:

$$efp_t^X = efp_{SS}^X \left(\frac{b_t^X}{b_{SS}^X}\right)^{\eta X},$$

which states that external finance premium should be the same as marginal convex cost of issuing bonds.

Some of capitals are financed by issuing bonds:

$$q_t k_t^{XB} = b_t^X.$$

3.1.3 Capital Goods Producers

New capital goods are produced with the following technology:

$$k_t^{new} = \mu i_t^{\emptyset}[(1-\delta)k_{t-1}^T]^{1-\emptyset},$$

$$k_t^T = k_t^{new} + (1-\delta)k_{t-1}^T,$$

where i is investment, amount of consumption goods put into capital goods production, μ, ϕ are parameters.

From profit maximisation of capital good producing firms, the price of capital goods is as follows:

$$q_t = \frac{1}{\mu\emptyset} i_t^{1-\emptyset}[(1-\delta)k_{t-1}^T]^{\emptyset-1},$$

3.1.4 Banks

I assume that banks are competitive and that deposits are pooled. The first implies that banks do not make profits. So the banks' revenue and the monitoring costs should be the same.

$$R_t^X = \frac{h^X}{\Delta p f_t^X}$$

where *Rs* are the share of *f* that goes to banks, *hs* are monitoring costs.

The second assumption implies that the interest rate on deposit should be the same as the payment by entrepreneurs to banks less banks' monitoring costs.

$$r_t = \frac{p_H(1-R_t^D)f_t^D k_t^{DL}}{d_t^D},$$

$$r_t^* = \frac{p_H(1-R_t^F)f_t^F k_t^{FL}}{d_t^F}.$$

Bank capital and consumption by bankers evolve as follows:

$$a_t^D = \sigma^B[p_H f_{t-1}^D k_{t-1}^{DL} - r_{t-1} d_{t-1}^D] + e_t^{BD},$$

$$a_t^F = \sigma^F[p_H f_{t-1}^F k_{t-1}^{FL} - r_{t-1}^* d_{t-1}^F] + e_t^{BF}.$$

$$c_t^{BD} = (1-\sigma^B)[p_H f_{t-1}^D k_{t-1}^{DL} - r_{t-1} d_{t-1}^D],$$

$$c_t^{BF} = (1-\sigma^F)[p_H f_{t-1}^F k_{t-1}^{FL} - r_{t-1}^* d_{t-1}^F].$$

Loans are funded by banks' capital, deposits less monitoring costs:

$$l_t^X = a_t^X + d_t^X - h^X k_t^{XL}.$$

3.1.5 Market Clearing, Monetary Policy and Equilibrium

The right-hand side, outputs and endowments, should be the same as the expenditures, consumptions by households, entrepreneurs, and bankers, and investment.

$$c_t + c_t^{DE} + c_t^{FE} + c_t^{DB} + c_t^{FB} + i_t = y_t + e_t^{DE} + e_t^{DE} + e_t^{DB} + e_t^{FB} - h^D k_t^{DL} - h^F k_t^{FL}.$$

The total capital goods are the sum of capital goods funded by different sources:

$$k_t^T = k_t^{DL} + k_t^{DB} + k_t^{FL} + k_t^{FB}.$$

Monetary policy is a so-called Taylor-type rule. Nominal interest rate responds to inflation, output and other variables (x). It is well known that monetary policy is conducted in a gradual manner, so the past interest rate level is also on the right-hand side.

$$r_t = \alpha^r r_{t-1} + \alpha^\pi \pi_t + \alpha^y y_t + \alpha^x x_t. \tag{5}$$

Equilibrium is defined as the set of prices, quantities that satisfy optimisation and market clearing conditions.

3.2 Estimation

3.2.1 Bayesian Estimation

Parameters are estimated by the Bayesian method. Applying the Bayesian principle, the posterior distributions of parameters are multiples of prior distributions and likelihood functions, posterior distributions can be estimated by drawing samples from them.

Table 4 reports the prior distributions and posterior distributions of the estimated parameters. The rest of the parameters are not estimated directly due mostly to known difficulties of precise estimation[3]. Instead, the values of those parameters are either drawn from other studies, calibrated from data, or simply assumed, since they do not significantly affect the main results. See Table 3.

Table 3

Calibrated Parameters

	Description	Value	Source
σ	Risk Aversion	1	
ψ	Inter-temporal Rate of Substitution of Labor	1	
γ	Capital Share	0.3	
β	Discount Factor	0.99	
ϵ	Elasticity of Demand of Individual Goods	6	Markup Rate
δ	Rate of Depreciation	0.025	
ϕ	Production Function of Capital Good	0.98	
ζ	Elasticity of Substitution between m^D and m^F	0.1	
α^{π}	Interest Rate Reaction to Inflation	1.1	
α^{y}	Interest Rate Reaction to Output	0.25	
p_H	Probability of Success if 'Work'	0.99	
p_L	Probability of Success if 'Shirk'	0.69	
μ	Production Function of Capital Good	0.8	

3. For example, inter-temporal rate of substitution, or the inverse of risk aversion parameter in utility function, sigma, is relatively difficult to estimate. Accordingly, the estimates vary widely among empirical studies. Commonly known value ranges between 1 and 4 to 5.

3.2.2 Estimation Results

Figures 4, 5, and 6 show the prior and posterior distributions. Among these, ηs, substitutability between loan financing and bond financing, are not so informative. This is due to the fact that the data used in the estimation do not include the outstanding amount of bonds issued by firms. AR(1) parameters of some exogenous shock, ρ^{υ} and ρ^{π} are also not so informative.

Figure 7 shows the identified shocks. In mid-2007, the shocks numbered around 35 in the figures. The foreign interest rate shock, technology shock, entrepreneurs net worth shock, and external finance premium shocks are dominant, whereas the domestic interest rate shock, preference shock, or inflation shock are rather insignificant.

Table 4

Estimation Results

	Prior Mean	Posterior Mean	Conf. Interval	Prior Dist
θ	0.367	0.5381	0.4654 0.6224	beta
ρ	0.919	0.9412	0.9193 0.9630	beta
ηD	3.5	3.0866	2.3272 3.8266	gamm
ηF	3.5	3.032	2.2279 3.8060	gamm
ρ^{z}	0.654	0.7384	0.6648 0.8115	beta
ρ^{r*}	0.78	0.8314	0.7750 0.8843	beta
ρ^{π}	0.939	0.9331	0.9112 0.9542	beta
ρ^{υ}	0.477	0.4765	0.3376 0.6264	beta
ρ^{ED}	0.25	0.5715	0.4431 0.6792	beta
ρ^{EF}	0.25	0.4961	0.3637 0.6363	beta
ρ^{efpD}	0.275	0.6868	0.6013 0.7743	beta
ρ^{efpF}	0.275	0.6443	0.5442 0.7448	beta
σ_{r}	1.3	0.9386	0.7735 1.0877	invg
σ_{r*}	0.543	0.5064	0.4155 0.5889	invg
σ_{z}	1.562	2.2513	1.8486 2.6940	invg
σ_{π}	4.59	1.58	0.7770 2.2741	invg
σ_{υ}	2.089	1.6873	1.3537 1.9999	invg
σ_{ED}	3.4	961.24	867.21 1055.50	invg
σ_{EF}	4.4	455.444	392.17 513.95	invg
σ_{efpD}	2.2	13.6297	11.3136 15.8643	invg
σ_{efpF}	2.2	6.1763	4.8856 7.3954	invg

Figure 4
Estimation Results (Prior Dist. and Posterior Dist.)

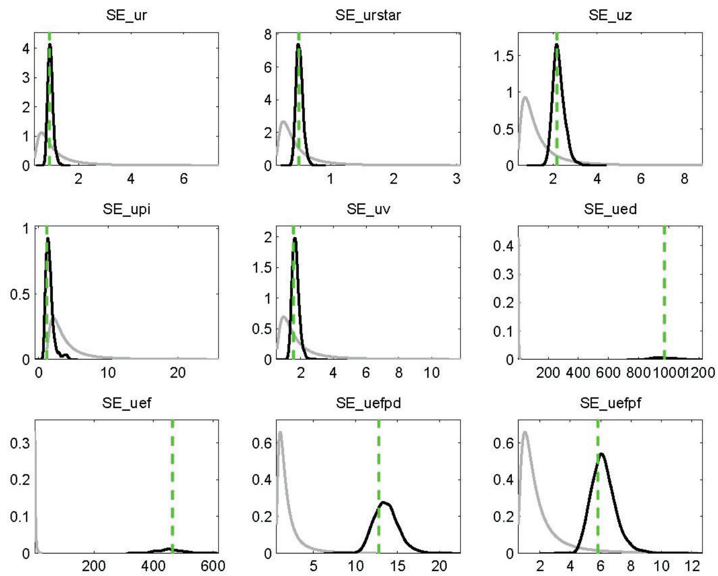


Figure 5
Estimation Results (Prior Dist. and Posterior Dist.)

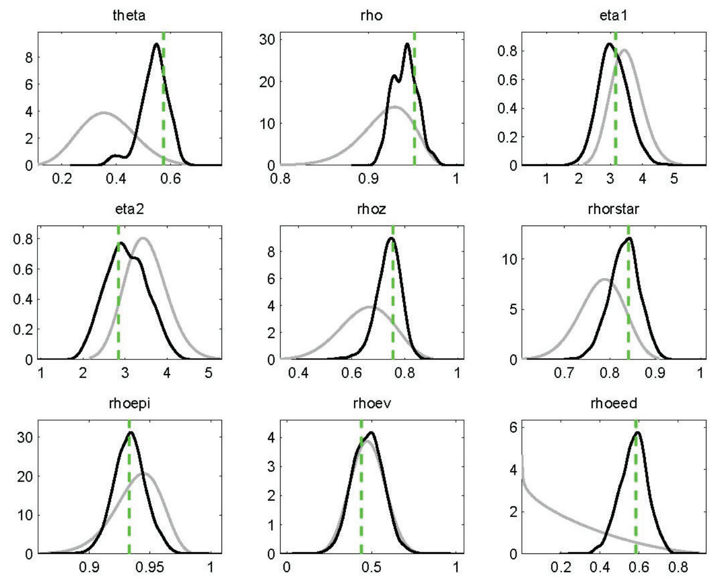


Figure 6
Estimation Results (Prior Dist. and Posterior Dist.)

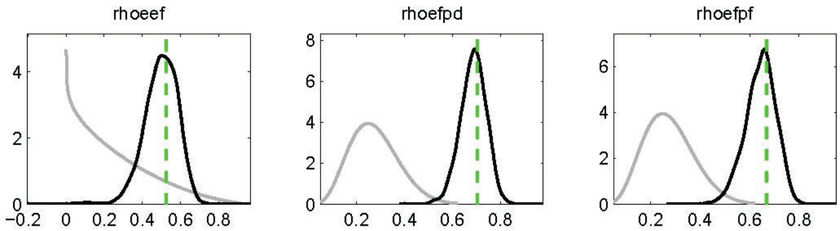
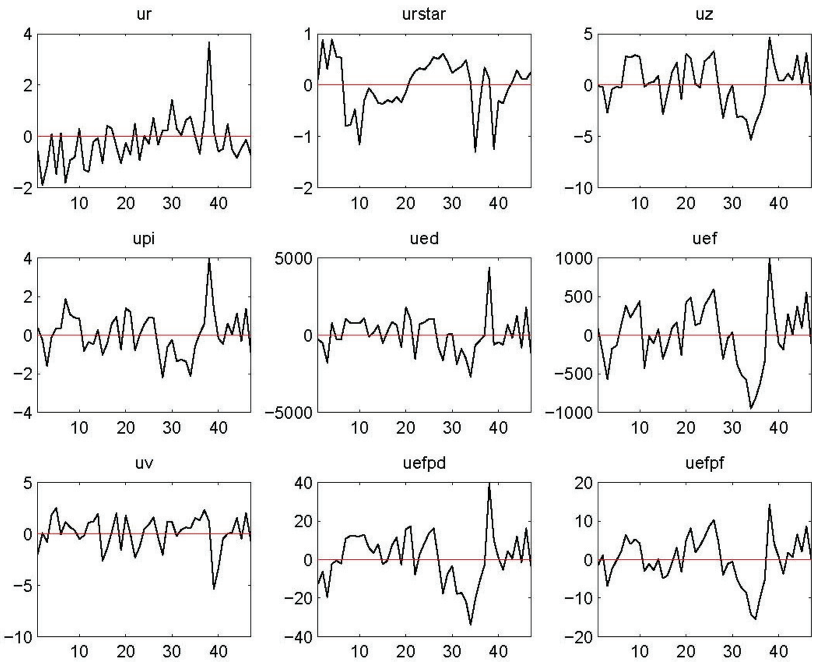


Figure 7
Smoothed Shocks



3.3 Impulse Response Functions

3.3.1 Domestic Interest Rate Shock

When the domestic interest rate unexpectedly rises, the economy shrinks and external finance premia rise. Lower output means low demand for capital, and correspondingly low price of capital, which further means that loan supply

may have to be lowered since net worth of entrepreneurs are now lower, therefore external finance premium becomes high.

Foreign external finance premium also rises, even though the shock is originated from the domestic financial sector. This is due to the substitution effects between these sectors. One thing to note, however, is that the foreign external finance premium rises more than the increase in domestic external finance premium. This can be interpreted as, whenever the economy shows signs of slowdown, or policy mistakes occur, foreign investors are first to respond through changes in external finance premium.

Increases in foreign external finance premium in response to domestic interest rate shock may imply a deviation from CIP. If 'interest rate differential' is interpreted as including external finance premia, the rise is attributed in part to the domestic interest rate shock. Nonetheless, the size of the estimated domestic interest rate shocks.

3.3.2 Foreign Interest Rate Shock

Foreign interest rate shock is similar to cost push shock, which lowers output while raising inflation. Due to the shrinking economy, the financial variables all shrink, so too the external finance premia. This means that loan 'demand' shrinks and therefore external finance premia also fall.

These results imply that unexpected fall in foreign interest rate may have contributed to the deviation of CIP, causing external finance premia to rise. If some critics' claim that after unusually large and prolonged monetary accommodations, rate hikes are too slow and too little, is correct, then the monetary policy 'mistake' may have been a major factor for the deviation.

3.3.3 Foreign External Finance Premium Shock

Although foreign external finance premium is important in determining the financial variables as well as the real variables, the magnitudes of the impulse responses are rather small. This can be interpreted as follows. Financial turmoil usually starts with sudden changes in premia in asset prices. The changes, however, may not necessarily be caused by shocks from the premia. That is, the changes in the premia are the results, not causes. This can also imply that sudden changes in the mood of investors, as some called 'animal spirits,' may not have been as important as they seem.

Figure 8
Impulse Responses of Domestic Interest Rate Shock

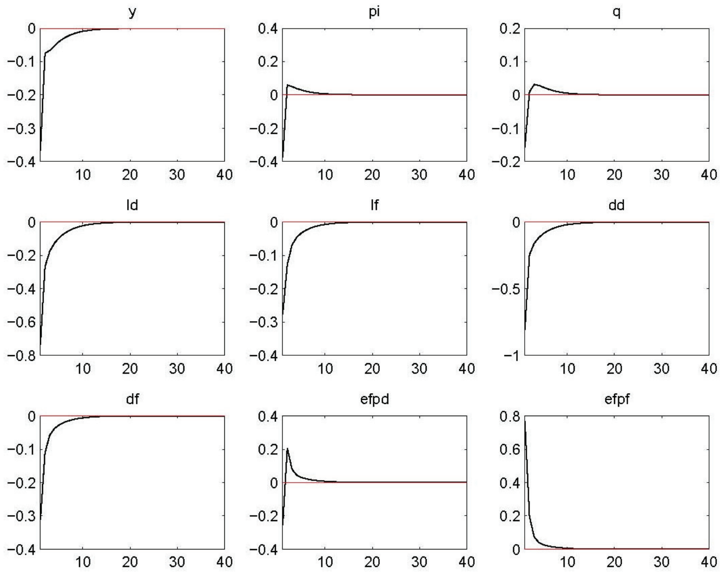


Figure 9
Impulse Responses of Foreign Interest Rate Shock

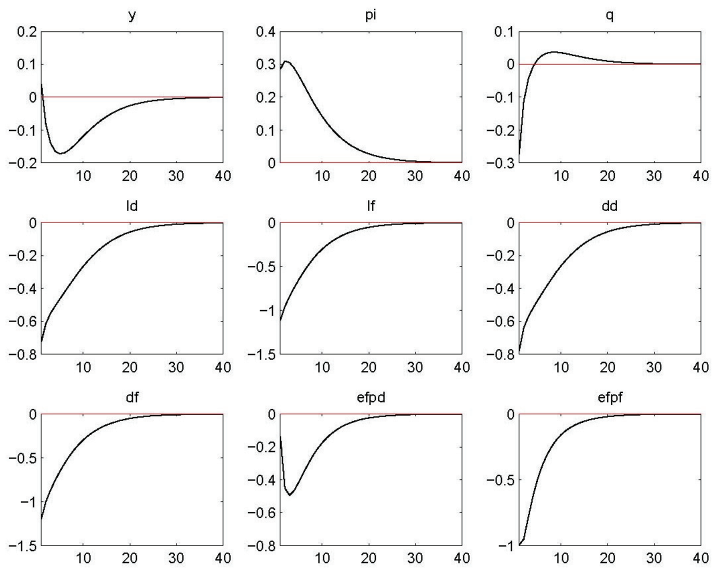
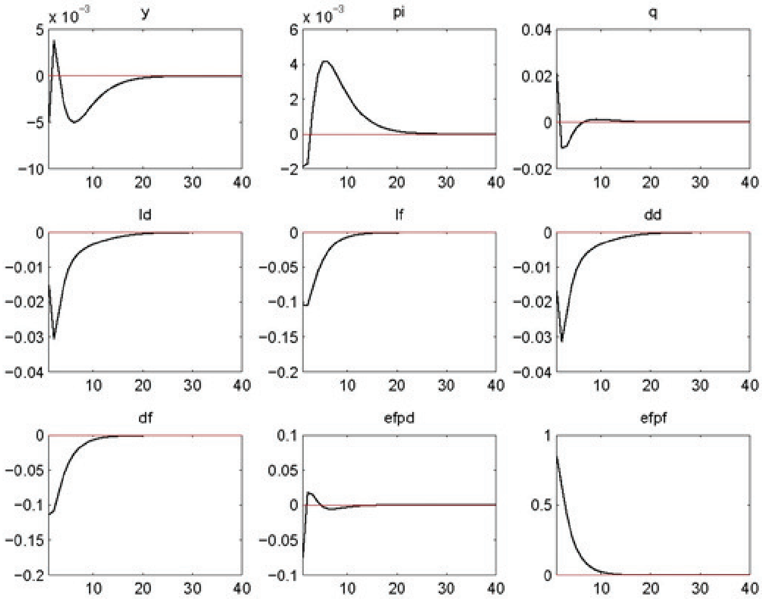


Figure 10
Impulse Responses of Foreign External Finance Premium Shock



4. Policy Implications

4.1 Monetary Policy

Figure 11 shows the impulse responses of foreign loans to foreign interest rate shock with different policy reaction parameters. From the figure, reacting more aggressively to output would make the loan less susceptible to external shocks, especially to foreign interest rate shock. Reacting more aggressively to inflation, however, would give rise to high volatility with respect to foreign interest rate shock.

This result may be used as a basis of the claim that inflation targeting, if it is interpreted as reacting more aggressively to inflation compared to output, may be at odds with financial stability, especially financial stability against international contagious shocks. It is, however, not necessarily the size of the response parameters that produces this result. This result is from output stabilisation, therefore implicitly loan demand stabilisation, not necessarily loan supply stabilisation. This distinction may become important when it comes to financial stability and financial frictions. A more careful approach may be needed.

Figure 11
Foreign Loans and Monetary Policy

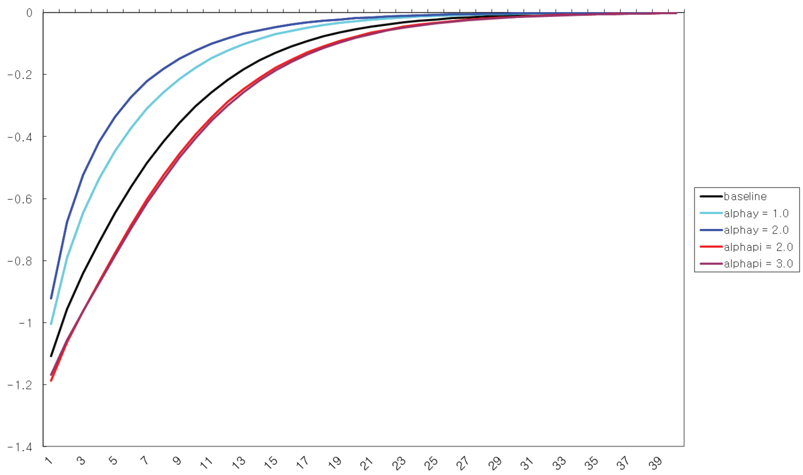


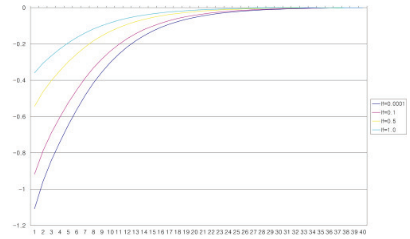
Figure 12 shows a case in which monetary policy responds to foreign loans. That is, Equation 5 becomes as follows:

(6) $$r_t = \alpha^r r_{t-1} + \alpha^\pi \pi_t + \alpha^y y_t + \alpha^x x_t.$$

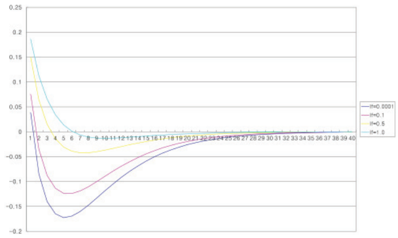
It seems quite straightforward that if monetary policy reacts to foreign loans more aggressively, foreign loans become more stable. The response of output, however, changes the sign as monetary policy becomes more aggressive in response to foreign loans. It changes from hump-shaped negative response to 'jump and die down' positive response. Foreign interest rate shock lowers the loan demand, and thereby lowers output as well. However, when interest rate reacts aggressively to foreign loans, the central bank may lower the policy rate, which makes output higher, not lower. Furthermore, domestic external finance premium may fall due to a favourable economic situation such as increasing output. If this is the case, then the interest rate differential (and loan rate differentials) widens.

Figure 12

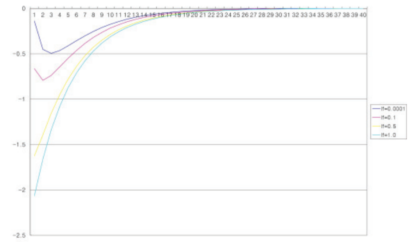
Monetary Policy Responding to Foreign Loans



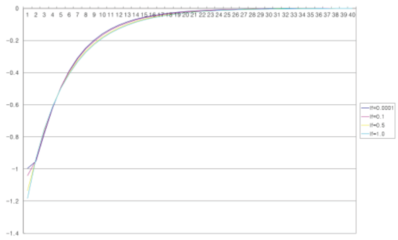
(a) Response of Foreign Loans to Foreign Interest Rate Shock



(b) Response of Output to Foreign Interest Rate Shock



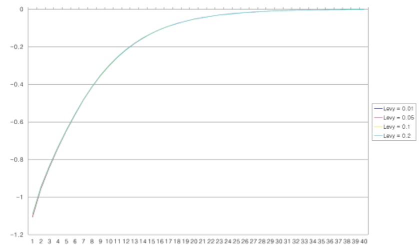
(c) Response of Domestic External Finance Premium to Foreign Interest Rate Shock



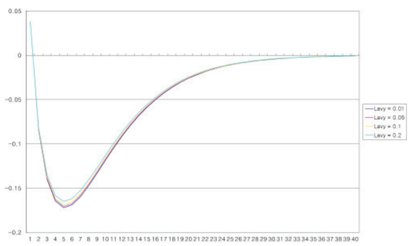
(d) Response of Foreign External Finance Premium to Foreign Interest Rate Shock

Figure 13

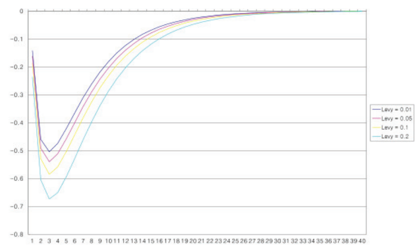
Effects of Imposing Bank Levy



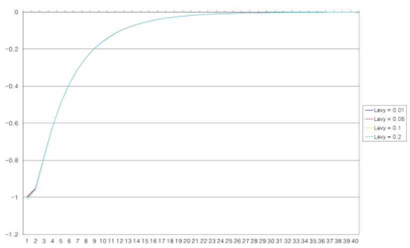
(a) Response of Foreign Loans to Foreign Interest Rate Shock



(b) Response of Output to Foreign Interest Rate Shock



(c) Response of Domestic External Finance Premium to Foreign Interest Rate Shock



(d) Response of Foreign External Finance Premium to Foreign Interest Rate Shock

4.2 Bank Levy

Now, let us analyse the effects of imposing bank levy. Domestic bank levy is modeled as follows:

$$\alpha_t^D = \sigma^B[p_H f_{t-1}^D k_{t-1}^{DL} - r_{t-1} d_{t-1}^D] + e_t^{BD} - levy * l_t^F.$$

Bank levy only affects bank capital accumulation. Incentive compatibility conditions and other optimality conditions are not affected. That is, banks cannot, and probably would not, change the amount of loans they are willing to provide after the levy. This is because the loan 'supply' is determined by the incentive compatibility conditions, not by 'marginal costs' as in the usual supply curves. Banks provide loans as long as borrowers are willing to work, not shirk.

The results are shown in Figure 13. If domestic banks are levied for foreign exposures, foreign loans and output do not change much in response to foreign interest rate shocks. Only domestic external finance premium seems to respond significantly.

5. Concluding Remarks

Analysing international capital flows is one of the main topics in international macroeconomics. One of the difficulties, however, is that modern macroeconomic models more or less focus on price dynamics rather than quantity dynamics. At an equilibrium, adjustments have already been done, or prices are set at a level which quantity adjustments do not need to occur in the first place. In an open economy model, this is interpreted as interest rates and exchange rates staying in parity. Consumers do not have an incentive to engage in international trade, investors are indifferent to assets with different denominations.

However, in reality, international trades do occur and international capital do flow from one country to another. This paper sets out to explain what drives the international capital movements, especially when covered interest parity condition does not seem to hold. The wedges between financial instruments are modeled explicitly from the assumptions based on the existence of financial frictions. Here not only domestic but also foreign financial frictions are included. The way in which these frictions are incorporated, together with the more traditional bond markets, is one of the contributions of this paper. This allows

us to look at international capital flows from different perspectives. Substitutions between domestic funding and foreign funding, substitutions between bank financing and bond financing are apparent in an aggregated economy, although they may be less visible when taken individually.

Explaining international capital flows in this way, of course, may have drawbacks. The behaviours of agents are not as smooth as this model assumes. Financial markets are not as integrated. Nevertheless, this model sheds light on the issue, while maintaining analytical coherence, allowing ‘structural’ interpretations and policy exercises.

For future research, exchange rates should be included explicitly in the model and certain features, such as habits and indexation to enhance empirical fitness, should also be considered. Also, policy simulations can be extended to include exchange rate policy, fiscal policy, and/or macro prudential policy.

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Appendix

Data Description

	Description	Data	Source
r	Domestic Interest Rate	CD (90 days) yield	BOK
r^*	Foreign Interest Rate	LIBOR (3 month)	BOK
y	Output	real GDP	BOK
π	Inflation	dlog(CPI)	NSO
i	Investment	Gross Capital Formation	BOK
l^D	Domestic Loans	Total Loans	BOK
l^F	Foreign Loans	National Foreign Debt	BOK
efp^D	Domestic Ext. Finance Premium	Loan Rate -CD yield	BOK
efp^F	Foreign Ext. Finance Premium	CRS (1 year) -IRS (1 year)	Bloomberg

1999 Q3 ~ 2011 Q1, H-P filtered

Chapter 10

MANAGING SHORT-TERM CAPITAL FLOWS – DO WE HAVE THE RIGHT FRAMEWORK? DRAWING LESSONS FROM MALAYSIA'S EXPERIENCE

By
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1. Introduction

The issue of managing capital flows and their potential impact has once again emerged in the minds of policymakers across the world – both in the developed and developing economies – in the recent period. These issues are certainly not new. Drawing from the emerging economies' experience in the 1990s, there are glaring similarities in the drivers of capital inflows into the emerging economies, including the multi-speed of global growth, widening interest rate differentials, easy global liquidity conditions, low risk aversion that has re-emerged as the global business cycle runs its course. Augmented by over-exuberance and mispricing of risks, these inflows could feed into domestic vulnerabilities that would eventually lead to sudden reversals and leave behind a trail of destruction. Nevertheless, despite the similarities in pattern and drivers, a practical solution for managing the challenge of capital flows has been rather elusive. Since the global economic recovery in 2009, the speed and volume of capital inflows into the emerging economies have grown at unprecedented levels and have raised a cause for concern. Reinhart and Reinhart (2008) identified periods associated with surges of capital flows (capital bonanzas) that were followed by series of sudden-stops. They found that for most countries, capital flow bonanzas lasted somewhere between two and four years. The tendency is for the authorities and investors to fall into the all-too-common trap of treating bonanzas as permanent rather than transitory shocks. This begs the question whether history will repeat itself again this time around. There have been proposals on the framework to effectively manage capital flows, most notably by the IMF (Ostry et al, 2011). It remains to be seen whether the framework would be adequate to ensure that capital flows can be intermediated effectively for the benefit of both investors and recipients.

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1. The authors are from the Economics Department and the Monetary Assessment and Strategy Department of Bank Negara Malaysia. All the views expressed and errors made in this paper are solely those of the authors and do not necessarily reflect the positions of their Departments, Bank Negara Malaysia or The SEACEN Centre. Comments are most welcome.

In this paper, we attempt to demonstrate that Malaysia was among the first countries that pioneered the comprehensive framework on capital flow management which, in principle, is similar to the guiding principles proposed by Ostry et al. Indeed, Malaysia has been fairly successful in averting the threat of inflows in 1993-1994, but this later proved to be inadequate to prevent the worst crisis that Malaysia have experienced in her history. Most importantly, while debates have largely focused on the framework in managing inflows, much less has been discussed about the framework and strategies in minimising the impact of sudden reversals.

The broad objective of this paper is to provide a critical review of the framework in managing capital flows – both in terms of inflows as well as sudden reversal of these flows – and to draw lessons and policy options for managing both short-term inflows and outflows. This critical assessment is an attempt to contribute to the current debate on the appropriate policy framework, especially from the perspective of developing countries on capital flow management. It is hoped that this paper will add towards a richer and more balanced view in the literature and further enhance the framework of capital flow management. Towards that end, this paper is organised as follows. The paper will first review the theoretical postulation and current thinking on the policy options for managing capital flows.

The subsequent section will then provide a catalogue of assessment on the experience of Malaysia in managing capital flows since the early 1990s. In reviewing the experience, the distinction between inflows and outflows period will be made in order to draw insights and policy lessons between managing inflows and outflows. Equally important, the section also aims to draw what are policy limitations and weaknesses, and things that could have been done better by the policymakers back then. In particular, what are the vulnerabilities that should have been identified earlier and corrected accordingly if Malaysia were to be able to withstand or avoid the Asian financial crisis in the late 1990s? Similarly, the recent experience before and during the global financial crisis will also be reviewed to provide insights on the apparent ability of the Malaysian economy in withstanding the shocks. Assessment will be made to gauge as to what extent have the stronger economic fundamentals as well as the role of macroeconomic and prudential policies played in enhancing the capacity to minimise the impact of the global financial crisis.

The final section will focus on the challenges going forward in light of the current scenario as well as the potential risk of sudden reversals in the future. Among others, the issue of reserve adequacy and regional cooperation and surveillance will also be discussed. A final concluding remark will end the paper.

2. Risks of Excessive Capital Flows to Emerging Economies

In general, capital flows can contribute to long-run economic growth by increasing the rate of capital accumulation beyond the amount of domestic savings and by spurring technological innovation (Kim and Yang, 2008). In addition, the free movement of capital enables a country in a temporary recession to borrow from the rest of the world to smoothen its consumption stream and subsequently maximise its inter-temporal optimisation. In other words, capital inflows can help dampen the adverse effects of domestic demand generated by business cycles, thereby increasing the countries' welfare. Furthermore, it has been argued that capital inflows can lead to efficient allocation of resources through financial deepening which promotes the development of financial intermediates, direct and indirect financing, and spur more activities in the banking sector and capital markets. Exposure to higher standards in accounting, auditing, regulations on disclosure and operating procedures introduced by the foreign players can also improve the efficiency of domestic financial institutions and firms.

Nevertheless, excessive capital inflows may also produce undesirable macroeconomic effects, particularly those concerning short-term capital such as portfolio funds which are easily reversed and tend to follow boom-bust cycles. Large volatility and substantial exchange rate movements constitute an important channel through which capital flows can potentially have an adverse impact on the domestic economy. During a boom cycle, surging inflows often lead to significant upward pressure on the exchange rate beyond the level warranted by fundamentals. Correspondingly, during a bust cycle, such inflows will often reverse abruptly and lead to significant depreciation of the domestic currency.

Sudden and upward movements in domestic currencies may reduce the competitiveness of the tradable goods through the erosion of firms' profit margins and export revenues (Ostry et al., 2010). Given that exports from the emerging markets are mostly labour intensive and low- and intermediate –technology products with thin profit margins, the degree of exchange rate pass-through tends to be relatively higher compared to the advanced economies, which specialise in technology-intensive products (Mohan and Kapur, 2010). This broadly implies that exporters and importers in emerging markets may not be able to ignore temporary shocks and set stable product prices in the event of large

currency fluctuations arising from volatility in capital flows. The less developed financial markets in the emerging economies may also exacerbate the problem as the relatively thin volume would expose its prices to extreme volatility, which could obscure the underlying price signals. This could lead to substantial effects on the real economic activity and may create significant employment, output and distributional consequences.

Given its fickle nature, capital flows can lead to boom-bust cycles in domestic asset markets. Surging capital inflows often create excessive demand for certain asset classes and subsequently affect the price of those assets beyond the level warranted by fundamentals. These inflows may also indirectly affect price of assets in other markets in the economy which can lead to speculative booms in various asset classes in the domestic economy (Kim and Yang, 2008). However, in the event of a reversal of capital, such speculative booms often turn into significant busts which can have significant wealth-decreasing effects by depressing the prices of real estate, equity shares and other domestic assets. This, in turn, can feed into the real economic activities through substantial deterioration of corporate and household balance sheets.

Volatile capital flows can also affect the liquidity in the domestic financial system. Given that capital inflows normally lead to appreciation in both nominal and real exchange rates, attempts by monetary authorities to intervene and resist appreciation entails accumulation of foreign reserves. Domestic liquidity may also increase if the intervention is not fully sterilised. This then causes an increase in liquidity flows into asset markets and, hence, asset prices may surge and exert inflationary pressure in the domestic economy (Hoggarth and Sterne, 1997). Equally important is the adverse impact on liquidity when these inflows reverse abruptly. Of importance, reversals of capital inflows can lead to lending constraints and tight credit conditions through the loss of bank deposits. This can negatively affect social welfare in a country through the rise of unemployment and poverty. In certain cases, political tension can also occur as a result of such social dislocations (i.e., riots in Indonesia in 1997).

3. Policy Framework to Manage Volatile Capital Flows

The current thinking and policy framework in managing large capital inflows appears to be well established. In view of the potentially destabilising effect of capital flows, especially in the case of surging inflows, policymakers possess a repertoire of policy toolkits to manage the implications arising from such flows. The conventional policy options, as broadly laid out by the IMF, mainly encompass macroeconomic and prudential measures. In the current framework, capital control

measures are legitimate options for policymakers to curb the adverse effects of such flows if all other policy measures have failed.

In essence, policymakers can design and undertake measures based on the primary concerns arising from such inflows. If there are significant macroeconomic concerns such as rapid appreciation of exchange rate, overheating in the economy or rising inflationary pressures, macro policy responses are appropriate to mitigate such risks. So what are the types of instruments policymakers can rely on in such instances?

The first line of defense for most countries facing large capital inflows is by using the exchange rate as an automatic stabiliser. Of significance, allowing the exchange rate to adjust toward the equilibrium level can help mitigate the transmission of global liquidity and capital inflows attracted by appreciation expectations. Countries could also choose to intervene in the foreign exchange market to keep the exchange rate at the current level or to slow the pace of appreciation if such an appreciation goes beyond the level warranted by fundamentals. This subsequently leads to the build-up of foreign reserves as buffer for potential external shocks emanating from volatile capital flows.

In addition to exchange rate policy responses, policymakers could consider monetary easing as a measure to contain the surge in capital inflows. This would narrow the interest rate differential between foreign and domestic interest rates and thereby, reduce the incentives for carry trade, in which investors borrow in low-yielding currencies and invest in high-yielding ones (IMF, 2010). However, this option may not be viable for countries facing high inflationary pressures. Accordingly, monetary authorities can also fine-tune policy tightening measures by increasing the reserves requirement which can limit the pace of credit expansion arising from surge in capital inflows.

To complement monetary policy measures, fiscal tightening could also be considered, for example by reducing the government's financing needs and thus allowing for lower interest rates. This is especially important for countries facing high inflationary pressures as accommodative monetary policy might further induce the risk of inflation. In addition, fiscal consolidation could mitigate asset price bubbles directly by lowering aggregate demand growth and supporting capital account adjustments, thereby cushioning the negative impact of a sudden reversal in capital inflows (IMF, 2010).

In some cases, relaxation of restrictions on residents' outward investment may help alleviate exchange rate pressure from large capital inflows without adversely affecting the financial integration of the economy (ADB, 2008). However, liberalisation of outflows depends critically on other preconditions of capital account liberalisation such as having adequate prudential regulations and robust risk management in place.

Notwithstanding the primacy of macro policies in tackling macroeconomic imbalances, there may be a pressing need for prudential measures to be adopted especially if macroeconomic imbalances lead to financial imbalances. Financial stability concerns may arise in the face of generalised credit booms and price increases across a variety of asset classes, sectoral balance sheet vulnerabilities and increases in the prices of individual, but systemically important assets. Of importance, financial-stability risks may be in the financial sector, the non-financial sector, or both. Moreover, macro and financial-stability concerns interact, with the former impacting the financial sector, and vice versa (Ostry et al, 2011). In this instance, strengthened prudential measures such as liquidity ratios which are differentiated according to currencies or reserves requirement that vary according to maturity can provide a useful tool for dealing with capital inflows and their inherent financial risks. A countercyclical use of such prudential measures can also help financial institutions to build up the necessary buffer to withstand the effects of a liquidity or currency crisis (IMF, 2010). In addition to the conventional macro-prudential measures, other prudential measures with capital account implications, such as measures that limit external borrowing by banks, can help reduce the risk of balance sheet imbalances in the financial sector arising from excessive capital inflows.

So when does one consider the use of capital control measures in abating surges in capital inflows? The conventional thinking seems to suggest that if other measures fail to abate capital inflows and its associated risks, then capital control may be an effective tool in managing the residual risks such as overshooting of exchange rate and excessive build-up in bubbles in domestic asset markets. Capital controls may also ensure monetary independence and ease excessive upward pressure on the exchange rate. However, the current thinking places an emphasis that macroeconomic and prudential policies need to have primacy over capital controls because of their importance in helping to abate the inflow surge and correct instability pertaining to specific imbalances in the economy. Moreover, both macroeconomic and prudential policy responses ensure that countries act in a multilaterally-consistent manner and do not impose controls merely to avoid necessary external and macro-policy adjustment (Ostry et al, 2011).

In general, there are two main types of capital controls, namely, the market-based controls and the administrative controls. Market-based controls, such as unremunerated reserve requirements (URR) and taxes on capital inflows, aim to increase the cost of the targeted capital transactions. On the other hand, administrative controls, such as prohibition of sale of monetary instruments to non-residents as well as quantitative limits on trading and hedging activities of the financial institutions, involve measures which restrict cross-border capital transactions through outright prohibitions or explicit quantitative limits.

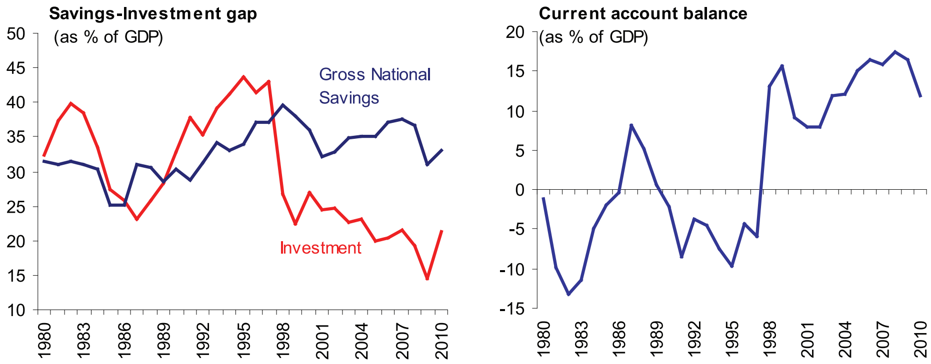
The use of capital controls as a last resort bodes well with the IMF-proposed framework in managing capital inflows as per Ostry et al, (2011). In essence, the paper postulates the idea that capital controls should be used only when all other measures appear to be insufficient or cannot provide timely response to abrupt or large increase in capital inflows. This is partly due to the controls' discriminatory nature and their potential distortions. Furthermore, capital control measures when taken unilaterally can pose negative externalities to other neighbouring economies. The framework also suggests that countries need to fulfill the necessary pre-conditions before resorting to the imposition of capital control measures. The pre-conditions include ensuring exchange rate must not be undervalued, having adequate level of reserves and ensuring that all possible macroeconomic and prudential measures have been exhausted.

4. The Malaysian Experience

On the whole, the regional countries, including Malaysia, experienced two distinct periods of short-term capital inflows and outflows since 1990, namely the periods of 1990-1999 (first sub-period) and 2000-2009 (second sub-period). In a broad sense, the nature of short-term capital flows also changed between the first and second sub- periods. Firstly, in terms of size and trend, the recent cycle of capital flows was much larger with two-way flows following greater participation by residents. In contrast, the first sub-period was characterised more by one-sided persistent inflows and mainly reflected the on-resident flows. Secondly, in terms of volatility, the recent episode was certainly more volatile with at least 3 episodes of inflows and reversals – namely, the Dotcom bubble bust, ringgit de-pegging and the global financial crisis. In contrast, the flows in the earlier period were less volatile with only one cycle of inflows and the reversal during the Asian financial crisis. Thirdly, in terms of composition, the recent flows involved both debt and equity flows as opposed to mainly equity and banking flows in the first sub-period. In addition to these three key differences in the

nature of short-term flows, the underlying current account balance also differs, with current account surplus in the second sub-period and persistent deficit in the first sub-period.

Figure 1
Malaysia Savings-investment Gap and Current Account Balance



For Malaysia in particular, the most glaring fundamental difference between these two sub-periods is that, during the 1990s, Malaysia was running a negative saving-investment gap. The economy was rapidly growing driven by strong expansion in consumption and investment. Following trade and financial liberalisation, the region was seen as the investment destination of choice for global investors. The strong value of the ringgit had also encouraged imports and foreign borrowings by residents. Consequently, Malaysia's current account was in deficit in the 1990s. This trend subsequently reversed as the vulnerabilities of the economy began to unravel. In the aftermath of the crisis, households, businesses and banks began to repair and consolidate their balance sheet positions and scaled back their consumption. This contributed to oversupply and long periods of excess capacity in the economy, causing sharp moderation in investment. National savings, on the other hand, remained relatively stable reflecting structural rigidities in the country's saving behaviour[2]. As a result, the national savings began to exceed investment for a prolonged period until the following decade.

2. There are intense debates suggesting that this gap was due to the deliberate attempt by the authority to promote exports by way of maintaining an undervalued currency.

4.1 The First Sub-period: 1990-1999

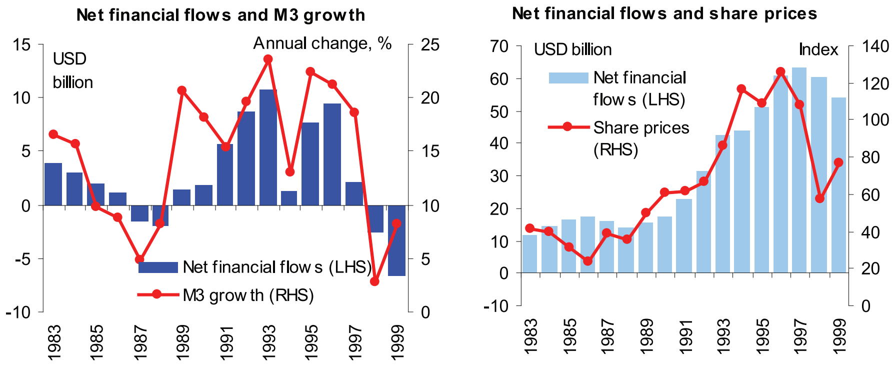
Like many other emerging economies, the 1990s were turbulent years for Malaysia. The surges and sudden reversal of capital flows played an integral part that contributed to these turbulent periods. The first half of the decade marked the period of strong surges of inflows, amid a confluence of *external-push* and *domestic / regional-pull factors*. The pull factors were driven by a combination of structural as well as cyclical drivers. Structurally, Malaysia and other emerging economies have embarked on financial liberalisation and other reforms, such as trade liberalisation, macroeconomic stabilisation and privatisation. These efforts began to translate into higher growth potential and attracted persistent inflows of capital in the form of foreign direct investment. Capital inflows were also driven by cyclical factors, as reflected by the widening return differentials in favour of the regional against advanced economies. In the advanced economies, economic growth was relatively weak and interest rates were eased to revive domestic economic activity. In the United States, the monetary conditions were eased substantially between 1990 and end-1992 in response to the recession. Monetary conditions were also eased in Japan as evidence of financial strain, and slowing activity persisted[3] in the country. In an environment of low global risk aversion, the low returns in the industrialised nations had encouraged global investors to search for opportunities to generate higher returns from asset classes in emerging markets.

The emerging economies were experiencing robust growth and in Malaysia, in particular, growth was averaging above 8 percent between 1988 and 1994. The rapid expansion of the domestic economic activity began to exert substantial pressures on the existing resources and led to a steady increase in domestic inflation, from 2.5 percent in 1988 to 4.7 percent in 1992. In response to the rising price pressures, the central bank tightened its monetary policy which resulted in the further widening of the interest rate differentials in favour of Malaysia (and other emerging economies). The consequent widening return differentials in favour of Malaysia attracted substantial inflows of foreign funds. Private short-term capital flows to Malaysia increased substantially from RM5 billion in 1991 to RM13.9 billion in 1993. As a result of these strong inflows, the liquidity conditions remained expansionary despite the interest rate hike. In the face of the surge of capital inflows, raising interest rates could only have a transient effect on the amount of excess liquidity in the market. Inflows through non-resident investments in stocks were especially significant in 1992-1993, as the

3. IMF World Economic Outlook (May 1993).

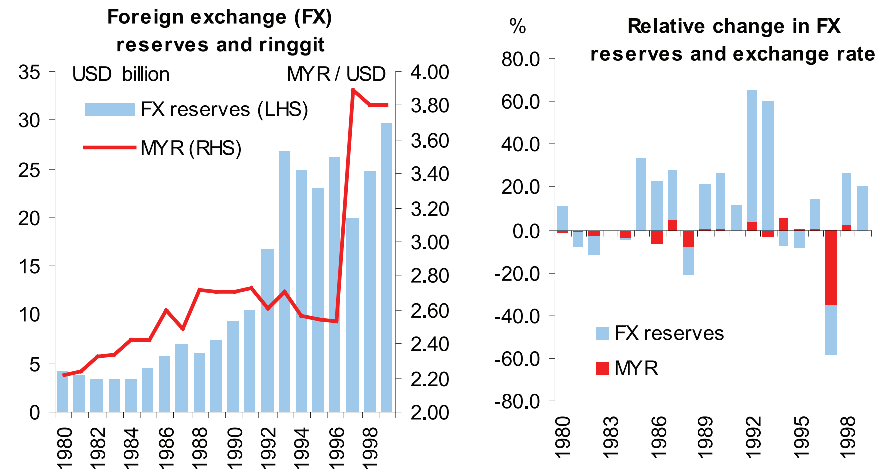
index of the stock market (KLSE) reached new levels in terms of both volume and prices. By 1994, the stock prices increased by almost double and the market turnover rose from RM51.3 billion (for 19.3 billion units) to RM387.2 billion (107.7 billion units) in 1993.

Figure 2
Net Financial Flows, M3 Growth and Share Prices



4.1.1 Policy Responses: Macroeconomic Policy

Figure 3
Foreign Exchange Reserves and Exchange Rate



The main challenge for the central bank during this period therefore was to manage rising domestic inflationary pressure amid strong capital inflows. The tightening of monetary policy through interest rate hike was initially effective in reducing inflation by inducing higher savings and curbing excessive growth in consumer spending. Fixed deposits increased by an annual rate of 9.9 percent in 1990 to 31.1 percent and 20.7 percent in 1991 and 1992, respectively. Meanwhile, the growth in overall consumption credit moderated sharply from an annual rate of 76.1 percent in 1990 to only 8.5 percent in 1992. Credit extended to motor vehicles fell to 7.6 percent (74 percent in 1990), outstanding credit card balances moderated to an annual rate of 13.6 percent in 1992 (101 percent in 1990) and import of consumption goods moderated to 2.9 percent in 1992 from 19.5 percent in 1990.

However, the interest rate hikes also added to more policy complications, as it triggered expectations for the currency to appreciate and encouraged further inflows of capital, particularly portfolio funds. This, in turn, resulted in the expansion of domestic liquidity as the annual growth of M3 expanded from 15 percent in 1991 to over 24 percent in 1993. Given the strengthening fundamentals of the economy, the immediate policy response was to allow the exchange rate to appreciate to a level that was consistent with the market's equilibrium values. This would mitigate the impact from imported inflation as well as alleviate the speculative pressure on the ringgit to appreciate further. However, the international monetary system at that time was heavily distorted by the easy liquidity conditions which might have resulted in the under-pricing of risks and encouraged search-for-yield activities towards the emerging markets. This led to increased vulnerability of the foreign exchange market to destabilising speculation. The ringgit appreciated by approximately 12 percent from August 1991 to September 1992. Subsequently, the ringgit depreciated by -5 percent in February 1993 as the crisis in the Exchange Rate Mechanism (ERM) of the European Monetary System (EMS) unfolded, causing major turbulence in the major and regional currencies. The global investors switched to the US dollar due to its status as a safe haven currency and caused massive depreciation pressures on other major and regional currencies. Such rapid and volatile adjustments in the currency would result in a severe dislocation in the real economy, which usually take a much longer time to adjust. Hence, the central bank decided to play a more active role in the foreign exchange and money markets to mitigate the impact of large-scale speculative flows.

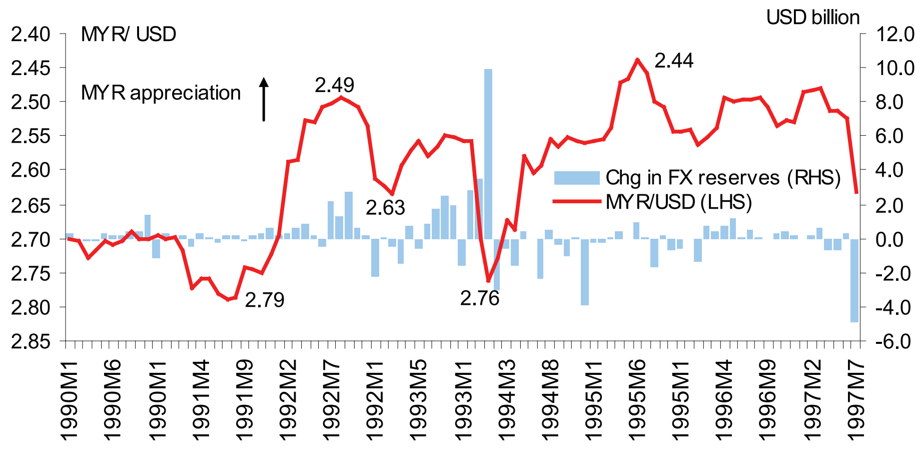
In an environment of heightened volatility in the international monetary system, the central bank also used the foreign exchange reserve intervention to

prevent extreme volatility in the exchange rate movements. Given the strong growth and interest rate differentials favouring the Malaysian economy and coupled with easy global liquidity conditions, foreign exchange interventions were mostly undertaken to prevent extreme and rapid appreciation of the ringgit. However, there was also some evidence that the intervention was conducted to prevent the ringgit from depreciating sharply. For example, the foreign exchange reserve unwounded by US$4 billion from December 1992 to March 1993, limiting the impact of ringgit depreciation. The interventions were far more pronounced between late 1993 and 1994. The foreign exchange reserve had accumulated by an unprecedented amount of US$16 billion from November 1993 to January 1994. However, the imposition of some macro-prudential measures to limit the exposure to inflows had resulted in the unwinding of short-term funds by about US$12 billion by the end of 1994. As a result, the ringgit remained relatively stable despite strong upward pressure in the first half of 1994.

The surge of capital inflows had exposed the limitations of monetary policy in containing the risk of inflation. At this juncture, the central bank was facing a dilemma of conflicting objectives between managing the risk of price stability and financial stability. Rising inflationary pressure requires tighter stance of monetary policy. However, contractionary domestic monetary policy was occurring at the time when the global interest rates were declining. The consequent interest rate differentials in favour of Malaysia would further induce inflows and create new liquidity, which would result in money supply expansion. At the same time, a sharp increase in the interest rate would exert sudden pressure on investment activity and would adversely affect the medium-term growth.

Figure 4

MYR monthly and monthly change in FX reserves



Being a small open economy, the strong growth that Malaysia was enjoying at that time also brought about unintended consequences that complicated policy formulations for macroeconomic stability. In this regard, there appeared to be an urgent need for other unconventional policies to complement the macroeconomic policies to manage both inflation and capital flows challenges.

Fiscal and other non-tax measures were also introduced to alleviate supply constraints and improve the efficiency of the private sector. On the fiscal front, the government undertook the budgetary restraint to reduce demand pressures emanating from the public sector. The government managed to achieve a balanced budget in 1993, underscoring its strong commitment to reduce inflation risk. With the benefit of hindsight, this prudent approach proved to be critical when the economy was severely hit by the Asian financial crisis later on. The government also reduced and abolished import duties for more than 600 consumer items and introduced the Fund for Food (RM300 million) by providing financing at discounted rates to facilitate supply and efficiency of food distribution throughout the country.

4.1.2 Policy Responses: More Unconventional Macro-policies and Capital Controls on Inflows

To stem the flood of speculative inflows, the central bank introduced several complementary measures to target specifically on the speculative short-term capital inflows (refer to the detailed measures and objectives in the Appendix). The measures included adjustments on the Statutory Reserves Requirement (SRR), limit on swap transactions with foreign customers, centralisation of the government deposits and EPF's excess funds with the central bank as well as issuance of Bank Negara Bills.

These measures, however, were not successful to avert the trend of speculative inflows, as the wide differentials in growth and interest rate, coupled with the relative stability of the ringgit, were too attractive for speculators. In fact, there were even views that the ringgit was undervalued given the strong economic growth at that time, although there were signs that the economy was at the risk of overheating and the current account was in deficit for a prolonged period. This has indeed reinforced our view that the foreign exchange markets for emerging economies are susceptible to extreme volatility and may not necessarily reflect the underlying fundamentals of the economy. More explicitly, the movement in exchange rate often responds to short-term events, news and cyclical factors that are not necessarily consistent with the medium-term fundamentals. Hence, over-relying on the exchange rate to do the rebalancing adjustment could risk real sector dislocations.

Driven by short-term speculation on the ringgit and interest rate differentials, the pace of inflows accelerated significantly towards the end of 1993. It was reported that during the month of December 1993 alone, a total of RM9.5 billion was placed with commercial banks through deposits and interbank placements. This was twice the total increase for the first eleven months of 1993. The inflows resulted in a sharp decline in the domestic interbank market from around 7 percent in early December to around 3 percent in mid-January 1994. The severity of the challenges called forth more stringent measures to minimise the risk of financial instability (refer to the detailed measures and objectives in Appendix). Of importance, there were further adjustments on the SRR as well as introduction of several administrative restrictions to further rein in the excessive inflows and build-up of external liabilities of the banking institutions. Among the capital control measures introduced were direct restriction on the amount of non-resident inflows which a banking institution may receive and prohibition of sales of short-term monetary instruments to non-residents.

In principle, Malaysia has exercised a comprehensive framework of capital flow management that is built upon strong macroeconomic foundations, supported by comprehensive prudential regulation for the banking system. Under exceptional circumstances, when all the conventional policies have been exhausted, administrative measures are deployed in a targeted and transitory manner. These comprehensive measures have to some extent been successful in reducing the volume of short-term inflows with minimum disruptions on the financial markets. There was a net outflow of RM8.4 billion in 1995 largely due to the unwinding of foreign exchange interbank borrowings, although non-bank continued to register net portfolio inflows. With the benefit of hindsight, these measures appeared to have reduced the vulnerability of contagion arising from the Mexican peso crisis which occurred in January 1995. Subsequently, these measures were progressively dismantled within six months after their introduction after their intended objectives were achieved. This, however, proved to be a mistake.

In the periods that followed, however, the relatively stable market conditions had precipitated the resumption of foreign portfolio inflows by the end of 1996, as growth and interest rate differentials and perception of currency undervaluation continued to persist. These inflows had once again led to a build-up in vulnerability and caused heightened volatility in the foreign exchange market. The inflows of foreign portfolio funds continued to intensify into the early 1997. As a result, the volume of foreign exchange market transaction reached its highest level of RM1.3 trillion. The unprecedented spike in volume was due to the intensified speculation for the ringgit to further appreciate. The magnitude of the speculative activity was also reflected in the rising volume of transaction in the swap market, whereby

the average monthly volume in the swap market increased significantly from RM33.4 billion in 1996 to RM55.6 billion in the first half of 1997. At this juncture, based on various reports by the central bank itself, the assessment was that these speculative pressures are likely to be transitory and can be managed adequately by conventional measures such as exchange rate flexibility and foreign exchange reserve interventions.

Correspondingly, the large inflows contributed to easy domestic liquidity condition. Therefore, the main focus of monetary policy was to slow down the overall domestic credit growth and to reduce over-concentration of financing towards property and shares, which had increased annually by more than 29 percent and 30 percent, respectively. Bank lending to the broad property sector, for consumption purposes, and for purchase of stocks accounted for nearly half of the increase in total loans in the first quarter of 1997. House prices increased by almost 13 percent in 1996, while share prices on the Main and Second Boards of the KLSE rose by 24.4 percent and 93 percent, respectively. Given the persistent exuberance that asset prices will continue to register strong increases, the interest rate hikes were not effective in moderating lending growth towards these unproductive sectors. The higher interest rates, however, had a more detrimental effect on the productive sectors in which excesses were not evident in the first place.

To reinforce the impact of interest rate, prudential measures were deployed to limit the banking system exposure to risky sectors that could be vulnerable to adverse developments in asset prices. From 1 April 1997, banking institutions were not allowed to exceed 20 percent of their outstanding loans to the broad property sector and not more than 15 percent for the purchase of shares. This measure had helped to moderate banking sector exposure to these risky sectors and slowed down asset price pressures. Of significance, loans to the broad property sector and for the purchase of shares declined to 22 percent of total loans as at end-1997 from 39 percent of total loans as at end-1996. Property prices fell substantially and the annual growth in the Malaysian House Price Index moderated significantly to 1.9 percent by end-1997 (1996: 12.9 percent).

4.1.3 Asian Financial Crisis: Comprehensive Capital Controls on Outflows

As widely documented, the Asian financial crisis eventually unraveled following the event of an external debt default by a property company in Thailand in early 1997. The subsequent decision by the Bank of Thailand to allow the Thai baht to depreciate in July 1997 triggered a change in market perception

that some, if not all, of the regional economies were having similar structural problems. Consequently, the contagion effect drove a sudden and massive reversal of short-term capital from the regional economies, including Malaysia. Within the span of a two-year period of 1997-1998, a total of RM62 billion of short-term funds flowed out of the domestic economy. The bulk of the outflows were in the form of short-term interbank placements by foreign banks. The initial policy response was to accommodate the outflow through running down some of the reserves as the initial view was that the “market panics” would be temporary. The short-term interest rate was also raised to nearly 20 percent during the initial period of the reversal as part of the policy response to discourage capital outflows and hence to provide support for the ringgit. At one point, the overnight rate was as high as 40 percent. However, despite the higher interest rate, speculative attacks persisted, and thus the ringgit weakened further.

Subsequently, in early August 1998, the central bank introduced a measure to limit the foreign exchange swap transaction that domestic banks could undertake with non-resident banks. The aim was to limit the supply of ringgit to the offshore market to limit the ability of speculators to cover their positions. Nonetheless, speculative bets on the ringgit to depreciate did not recede as the ringgit deposit rate offered by the offshore banks surged to as high as 30 pecent per annum. By the end of August, amidst the continued foreign exchange intervention by the central bank, the reserves declined to US$20 billion and the ringgit depreciated to RM4.88 per dollar. The massive withdrawal of liquidity also resulted in a sharp decline in share prices, which declined by more than 70 percent from its peak in early 1997, as well as a sharp pullback in bank credit, from a high annual growth of almost 30 percent in 1996-97 to -5 percent by the early 1999. This precipitated a downturn in economic activity, rising inflation and unemployment, which, in turn, led to corporate failures and rising bad debts that fed back into a vicious cycle of further downturn in economic activity.

A major policy dilemma at that juncture was between the need to ease the burden of borrowers – through lowering of interest rates and injection of liquidity into domestic economy – and the need to discourage further foreign capital outflows – through maintaining high interest rate and tight liquidity situation. The key consideration was also the need to have breathing space for structural and macroeconomic adjustments to revitalise both the corporate and banking sectors. Meanwhile, the foreign exchange reserves remained relatively “low” at only US$20 billion, which was only equivalent to 4 months of imports and about 1.5 times of short-term debt. There was an apparent risk that reserves could decline further should speculators continue to put pressure on the ringgit to depreciate further. The first option was to defend the ringgit exchange rate at the risk of

eroding the reserves to a level below the conventionally accepted sufficiency level of 3 month of imports and at least 1 time of short-term debt. Another option was to allow ringgit to depreciate further, which could compound the negative balance sheet effects on banks and corporations with adverse consequences on domestic financial and economic activities. This particular experience has indeed shaped the policymakers' current thinking that the adequacy of reserves is a necessary safeguard for a country to reinforce its credibility in managing the exchange rate policy.

In the end, the Malaysian government implemented a comprehensive exchange control regime on 1 September 1998. These set of measures, which were complementary to each other, included disallowing domestic banks from extending credit to non-residents, requiring foreign exchange interbank borrowings by domestic banks from foreign counterparty to be placed in non-interest bearing account at the central banks, restricting the uses of ringgit account held by foreigners, requiring residents to repatriate all ringgit deposits from abroad, and requiring all ringgit borrowings by non-residents from domestic banks for domestic use only. All payments of exports and imports were required to be settled in foreign currencies. The ringgit exchange rate against the dollar was then set at RM3.80. The central objective of these measures was to de-internationalise the ringgit from offshore markets and hence remove the ability of non-residents to cover their speculative position. At the same time, measures were also introduced to prevent foreign investors from repatriating their funds by imposing a 12-month minimum holding period, which was later changed into an exit levy system. The key objective of these measures was merely to slow down the pace of fund withdrawals by foreign investors from the domestic economy.

The de-internationalisation of the ringgit allowed the central bank to pursue a loose monetary policy in order to support domestic economic activity. Interest rate was quickly lowered to low levels. The base lending rate of banks declined from 11.7 percent to 6.75 percent by end of September. At the same time, the SRR was also lowered from 11 percent to 4 percent of eligible liabilities to inject liquidity into domestic banking system. The volume of interbank transactions declined reflecting the improvement in banking system liquidity and less reliance of interbank for sources of funds by banks. The trading activity of the money market instruments also improved in the secondary market following the downward trend of interest rates. Meanwhile, the share prices quickly rebounded and continued on their upward path thereafter. Nonetheless, credit conditions remained tight for quite a prolonged period. On balance, the measures managed to restore greater financial market stability, rebuild consumer and investor confidence and facilitated the recovery plan smoothly. The earlier corrective

measures led to a significant improvement in the current account of the balance of payments, turning from a deficit of 6.3 percent of GNP in 1997 into a surplus of 14 percent of GNP in 1998. The reserves position also strengthened, increasing to US$26.3 billion by end-1998.

4.1.4 Malaysia's Lessons in Managing the Surge of Capital Inflows in the 1990s

a. The trade-offs can be very difficult to ascertain and could complicate policy choices

Although the authority recognised that structural macroeconomic and financial imbalances were building up in the Malaysian economy well before the outbreak of the Asian financial crisis, they faced a very difficult policy dilemma at that time. The strong GDP growth of 10 percent annually, driven by strong growth of private investment and consumption amid the presence of a persistent current account deficit of well above 5 percent of GNP over an extended period, strongly indicated the un-sustainability of the external position in financing the private sector expansion in an overheating economy. While the public sector was having a surplus saving over investment, the private sector was experiencing a negative financing gap of more than 10 percent of GNP. Of significance, the financing gap was funded by short-term foreign exchange interbank borrowings as well as short-term foreign borrowings. The strong expansion of credit and money supply growth due to the presence of excess liquidity, in turn helped to fuel household consumption and investment in residential and commercial property, leading to sharp rising property prices. Meanwhile, the creditworthiness of borrowers was also exaggerated by the high market value owing to the over-valuation of share prices and property market. In this instance, there was clearly an evidence of prevalence of asset price bubbles especially in the period running to the outbreak of the Asian financial crisis. In the end, the failure of the policymakers to prevent as well as to correct these macroeconomic disequilibria could well be the real causes of the crisis.

b. The importance of a resilient and fundamentally sound banking sector both in terms of governance and practices

The Asian financial crisis has also exposed the apparent weakness and fragility of the banking system. While the domestic banks were not directly exposed to the risk of changes in exchange rate, as banks back then were subjected to net open position limits and excessive external borrowings, their

over-exposure to asset market – the excessive financing to property and for the purchase of shares – meant that the banking system was subjected to a high risk of asset price correction as well as to the inability of borrowers to repay their debt should the market and economic conditions deteriorated. In addition, the tendency of the domestic banks to increase their short-term external borrowings, which was then intermediated to domestic corporate borrowers to finance their long-term investment, also exposed them to the balance sheet risk in the form of currency and maturity mismatch. The degree of soundness of the banking system, which was initially seen as "very" strong, suddenly deteriorated in a dramatic fashion. The non-performing loans ratio increased sharply to almost 15 percent by end of 1998 from 5 percent at the beginning of the year. This, in turn, led to an erosion of capital for several banks and necessitated recapitalisation.

The introduction of capital control measures and the de-internationalisation of the ringgit provided the necessary 'breathing space' for the implementation of the financial restructuring. There was apparent failure by the policymakers to fully recognise the actual magnitude of the risks that the banking system was exposed to, which led to inaccurate assessment of the strength and soundness of the banking system. Of importance, there was a policy mistake in allowing banks to extend credit excessively which fueled the credit boom and asset price bubble, amplifying the boom and bust cycle.

c. Balancing between flexibility and stability of the exchange rate

A few other lessons could be learned by policymakers with respect to the managing of capital flows. Firstly, the policy of a de-facto pegging of the ringgit against the dollar prior to the crisis gave rise to the problem of moral hazard. In particular, pegging the ringgit appeared to have given the perception amongst businesses that the ringgit would remain relatively stable for an indefinite period. This might have encouraged domestic corporations and banks to engage in higher external borrowing and reluctance on their part to hedge their currency exposure. If banks and corporations had hedged more of their foreign exposures, they might be in a better position to cope with the impact of currency depreciation during the Asian financial crisis. Another related issue is the desirability of allowing a currency to fully internationalise as it allowed the possibility of a speculative attack when the domestic financial market was not sufficiently developed to a level that would enable it to withstand financial shocks.

d. The importance of a deeper financial market with wider range of instruments

Secondly, the domestic bond and equity markets were relatively shallow. Over-reliance on the banking system in providing financing to corporations for their investment and business expansion meant that the credit risk was mainly concentrated within the banking system. Hence, when the Asian financial crisis unfolded and caused severe dislocation of financial intermediation in the banking channel, the real sector was also equally affected given the lack of alternatives in domestic financing.

e. The importance of real time surveillance and cross-border co-ordination

Finally, the lack of a surveillance system to closely monitor the short-term capital flows had also resulted in policymakers to be one-step behind the market players in understanding the fast development in the financial market. Perhaps, one of the real factors behind the failure of the policymakers to recognise and understand the emerging risks then was the absence of adequate and timely information on the nature of capital flows prevailing during the period.

4.2 The Second Sub-period of 2000-2009

The period immediately following the Asian financial crisis was marked by relative stability in the magnitude of foreign portfolio flows. While there were continued outflows of short-term funds, the magnitude of the outflows was markedly smaller at RM18.6 billion over the period 1999-2003. The outflows of short-term funds were also reflected in the decline of net external liabilities of domestic banks, which turned to become net external asset position in 2001. The financial market conditions had also stabilised with sustained recovery in share prices and normalisation of credit market conditions.

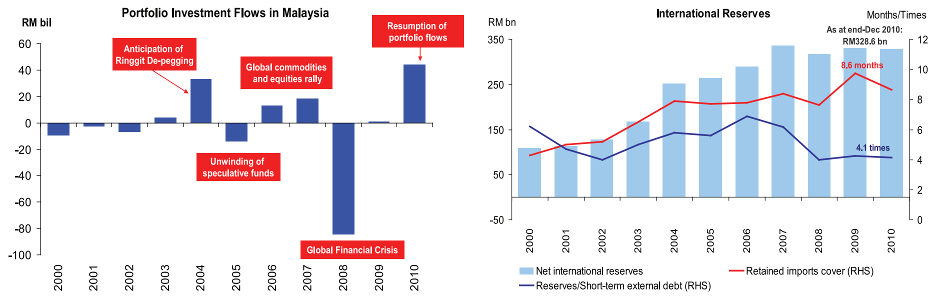
Meanwhile, as economic activity recovered to register a positive growth rate of 6.1 percent in 1999 and financial market condition stabilised, the selective exchange control measures introduced in September 1998 were gradually lifted. In particular, the 12- month holding period rule was replaced with an exit levy system in early 1999, which was eventually abolished in early 2001. The remaining controls that were retained were to ensure the non-internationalisation of the ringgit, which included rules on disallowing free uses of the external account and lending by domestic banks to non-residents except for certain trade and

investment purposes. At the same time, a series of liberalisation measures of the foreign exchange administrative rules were undertaken to promote investor confidence and to support the efficient functioning of the financial market. These included allowing the domestic banks to provide overdraft facilities to foreign stock broking companies and undertake foreign exchange spot and swap transactions with non-resident for the purpose of the purchase of shares in the domestic equity markets. Subsequently, subject to certain requirements, the domestic banks and residents were also allowed to invest abroad to enable residents to seek opportunity and diversify their portfolio abroad.

Meanwhile, the effort to restructure the financial sector was also intensified. By the end of 2005, Danaharta acquired non-performing loans amounting to RM52.4 billion and was able to recover RM30.4 billion (60 percent of non-performing loans). In addition, the Corporate Debt Restructuring Committee (CDRC) was also able to resolve corporate debts of RM52.6 billion. Meanwhile, Danamodal had injected a total of RM7.6 billion into ten banking institutions. During this stabilisation period, realising the need to diversify sources of financing for the corporate sector as well as to diversify risks from the banking system, steps were also undertaken to develop the domestic bond market. The National Bond Committee was established, with an objective to streamline and chart the direction of the Malaysian capital markets. By the end of 2000, total bonds outstanding amounted to RM245 billion, while Islamic debt totalled RM39 billion. By 2003, total bonds outstanding in the conventional and Islamic debt markets had increased to RM328 billion and RM89 billion, respectively.

While the period immediately after Asian financial crisis was characterised by relatively stable movement of short-term capital flows, the period since 2004 was characterised by greater flows of short-term capital both in terms of magnitude and volatility. At its peak in 2008, the total gross portfolio inflows and outflows in absolute terms were 23 times higher than in 2000. Moreover, since 2004, there have been several episodes of large inflows and outflows of capital in response to the developments in the global financial markets as well as changes in the domestic economic conditions.

Figure 5
Portfolio Investment Flows and International Reserves



Source: Department of Statistics, Malaysia

Source: Bank Negara Malaysia and DOSM

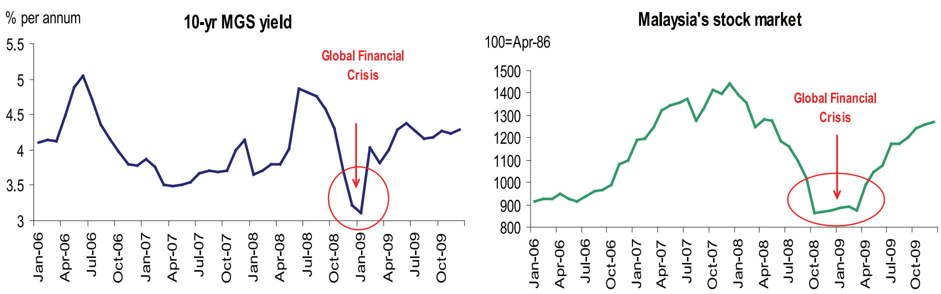
The year 2004 marked the return of large scale inflows into Malaysia, mainly in the form of portfolio funds and banking flows. The surge in inflows into Malaysia reflected the enhanced attractiveness of Malaysian assets, amid a positive economic and corporate outlook. Nevertheless, a significant portion of the inflows were also motivated by the expectations of a realignment of Asian exchange rates, including the ringgit. This development was particularly evident in the fourth quarter of 2004 during which there were significant inflows of speculative portfolio funds which continued into the first half of 2005. While there was a surge in portfolio inflows immediately following the de-pegging of the ringgit from the US dollar on 21 July 2005 (in anticipation of further ringgit appreciation), the flows normalised quickly amid an orderly price adjustment in the foreign exchange market. The large unwinding of the speculative short-term positions in the fourth quarter of 2005 (as expectations of ringgit appreciation subsided) resulted in a decline in the central bank's reserves from its peak of US$80 billion as at end-September 2005 to US$70.2 billion as at end-December 2005.

Notwithstanding such developments, Malaysia continued to experience large inflows of capital, predominantly portfolio funds between the period 2006-2008 on the back of strong economic fundamentals and the relative attractiveness of Malaysian papers following the rapid development of the domestic bond market. Of significance, between the period 2006 and 2008, the cumulative net inflow of portfolio funds amounted to RM35.1 billion and were mainly channeled into the bond markets as global investors remained risk averse with regards to the equity markets. The surge in inflows was however not unique to Malaysia as other regional economies also experienced similar developments. The inflows into the emerging economies were broadly supported by ample global liquidity and the relatively low-yield environment in the advanced markets which led investors to turn to the emerging markets for more attractive returns.

The impact of inflows was felt in the domestic financial markets, reflected by higher foreign participation in both equity and bond markets. Of importance, higher foreign participation in the Malaysian stock exchange had greatly enhanced liquidity in the equity market. Meanwhile, in the bond market, the negative correlation between the inflows of foreign portfolio investment and short-term yields suggests that high capital inflows have contributed to lower yields in the bond market. Despite the surge in inflows, the exchange rate appreciated gradually as a result of continuous and strategic intervention by the central bank in order to moderate large fluctuations of the exchange rate. The external reserves also increased significantly and peaked at US$125.8 billion in June 2008.

The surge in inflows into Malaysia since the de-pegging of the ringgit was interrupted by several external market developments which led to episodes of reversals in flows by foreign investors. Among others, the deteriorating global inflation outlook in 2006, the Shanghai stock market correction in February 2007, and the heightened global market uncertainty following the US sub-prime mortgage problem in July-August 2007 had subsequently led to outflows of foreign funds. Of significance were the massive deleveraging activities by foreign financial institutions following the Lehman collapse which subsequently led to the global financial crisis in the second half of 2008. The deleveraging activities and turmoil in the global financial markets triggered large-scale liquidation of capital by international investors, which affected the emerging markets across the board, including Malaysia. In the case of Malaysia, the sharp reversals culminated in a net portfolio outflow of RM111.6 billion between the second half of 2008 and the first half of 2009.

Figure 6
MGS Yield and Malaysian Stock Market



As a highly open economy with increasing level of integration with the world economy, Malaysia is not insulated from the effects of global conditions. The reversals of equity funds led to a sharp decline of the equity market from a peak of 1445 in December 2007 to just 864 in October 2008 in less than a year. Foreign holdings in the stock market were also showing a declining trend during the height of the global financial crisis, albeit not as sharply as the index itself. The bond markets were equally affected as well, as characterised by a steep decline in foreign holdings of short-term debt securities (mainly comprising BNM Bills) from a peak of 53 percent share of the total short-term debt securities in April 2008 to 7.5 percent share in October 2008. The sharp liquidation of short-term debt securities holdings by non-residents in the space of 4 months reflected the fickle and speculative nature of fixed-income securities which typically have more leverage embedded in them compared to equities.

4.2.1 How Malaysia Survived Global Financial Crisis Relatively Unscathed?

a. The importance of stronger economic fundamentals and deeper financial markets

Despite greater volatility of the flows since the aftermath of the global financial crisis, the domestic economy, especially the real sector, was relatively insulated from the negative spillovers emanating from the volatile global conditions. Of importance, while the magnitude of the recent reversals was much larger than the net outflows recorded during the height of the Asian financial crisis, the impact on the domestic economy was rather limited. Unlike in the 1990s, the financial system continued to remain robust and hence, financial intermediation activities were relatively intact even during the height of the crisis and in the face of massive capital flight. Such a development may be attributable to the country's well-developed financial system. In particular, the development of the domestic debt market allowed for the diversification of the composition of portfolio flows into Malaysia. As such, the reversals of the flows did not cause a significant disruption in any particular asset market. In addition, the depth of the domestic financial market also provided greater liquidity and price sensitivity to changes in financial conditions, facilitating more effective monetary operations in sterilising the impact of the large capital flows. Of equal importance, was the availability of strong international reserves position to accommodate the outflows without

affecting the overall domestic liquidity or interrupting the normal functioning of the foreign exchange and domestic money markets. To a certain extent, the high level of reserves was also beneficial in anchoring market confidence in the domestic economy and thus, prevented "market panics" which could further exacerbate the magnitude and impact of the reversals.

b. Regulatory and supervisory reforms in enhancing resilience of financial institutions to external shocks

In addition to financial deepening, concerted efforts on the regulatory front have, over the years, been accorded towards further strengthening and streamlining the existing prudential and regulatory framework with international best practices. The key focus has been on enhancing institutional risk management infrastructure and capabilities as well as promoting stronger governance and accountability amid greater transparency within and among the financial institutions. As a result, the Malaysian financial institutions are well-positioned to effectively mitigate the inherent vulnerabilities and withstand liquidity shocks through strong risk management capability.

Notwithstanding the regulatory reform since the Asian financial crisis, the central bank has also continuously enhanced its supervisory oversight and regulatory measures to ensure resilience and soundness of the financial institutions and system, in tandem with the changing financial and operating environment. In view of the magnitude and speed of mobility of international capital and the increasing risks of contagion of financial crises between markets, greater emphasis has also been placed on enhancing the effectiveness of macro-prudential surveillance. Such an approach provides a more holistic view of structural imbalances, interactions and vulnerabilities within the financial system as well as facilitates the monitoring of the financial system at the national and global level.

Equally important would be the identification and measurement of contagion risk between the various economic sectors with the financial sector. This facilitates impact assessment of stresses on one sector in the economy to the financial sector and vice versa. Coupled with more integrated micro- and macro-surveillance activities, improved financial safety nets, prudential standards and risk management principles that are aligned with international practices, the enhanced supervisory and regulatory measures adopted by the central bank have enabled more efficient identification of emerging vulnerabilities and effective remedial response to both macroeconomic and financial stability challenges.

4.2.2 Current Development and Policy Challenges Going Forward

Capital inflows into the emerging markets have rebounded strongly since the aftermath of the global financial crisis. Of significance, the portfolio inflows into the local debt market have dominated the recovery, particularly in the Asian emerging market economies. In the case of Malaysia, the economy has experienced surges in capital inflows since the second half of 2009, with a significant share in the form of central bank and government securities. Despite the surging inflows, there remain no signs of internal imbalances in the domestic economy.

Nevertheless, it is important to note that the current surge in foreign capital inflows continue to raise macroeconomic and financial stability concerns, similar to what policymakers in Malaysia and many other economies had faced during the previous episodes of large inflows. The difference this time is that the recent inflows are driven by unusually low policy rates and substantially weaker growth outlook in the advanced countries. Such drivers could augur a structural shift in global asset allocation and a sustained period of large capital inflows into the emerging markets that have stronger economic growth prospects and better asset performance compared to their more advanced counterparts.

In light of the recent trends, four broad policy challenges which are relevant to the emerging economies can be drawn up. First, as capital inflows, or more specifically portfolio inflows, continue to be predominantly in the form of debt securities, long-term yields in the emerging markets will be subsequently affected by foreign inflows and thus, may interfere with the transmission mechanism of monetary policy. This, in turn, may affect the effectiveness of central banks' policy rates in influencing the long-term rates and reduce monetary policy independence.

Second, as capital inflows into the emerging markets are expected to continue, given the structural shift in global asset allocation, conventional macroeconomic and prudential policy responses will be increasingly insufficient in mitigating the risks emanating from the large inflows of foreign capital. Hence, this necessitates the use of capital controls to effectively curb temporary surges in capital inflows. The IMF's recent articulation towards the legitimacy and importance of capital controls as part of the policy toolkit is indeed critical in the face of surging capital inflows into the emerging markets as well as the absence of internationally

accepted guidelines on what is deemed to be "appropriate" with regards to the management of capital flows. Nevertheless, there are shortcomings in the framework, which are seemingly disconnected from the realities of policymaking. While the IMF's recent guidelines stress that capital control measures should only be used as a last resort, the need to exhaust all potential macroeconomic and prudential measures may impede the timeliness and effectiveness of policymakers' responses to negative spillovers from the volatile capital flows. In essence, such restrictive pre-conditions prescribed by the IMF may inevitably render capital flow management measures ineffective for managing excessive inflows. An equally important issue is that, while the onus in managing volatile capital flows continues to fall on the emerging economies, the advanced economies should be mindful of the consequences of their policy actions which pose high risk to the global economic and financial conditions. Hence, there is a pressing need for a fundamental macroeconomic adjustment on a global scale rather than on the part of selective countries. Of importance, there is a need for coordination at a global level to address this global issue.

Third, the potential spillover effects to other neighbouring countries when an individual country implements capital control measures should also be considered. These effects can be potentially destabilising to the domestic economy if investors respond by flooding inflows of funds into countries which have not imposed any capital control-related measures. Hence, while the economy which imposes capital controls may able to discourage the inflows by its own virtue, the unilateral decision could create risks to other neighbouring economies which do not impose controls. It is therefore, inherent that appropriate coordination and communication among the regional economies can help ensure that measures imposed by one country do not adversely affect other countries in the region.

Finally, in view of the inflows into fixed income securities which are short-term in nature, the emerging economies are increasingly subjected to risks of abrupt reversals. This volatile nature of the inflows can significantly affect the domestic economic agents if adequate measures are not being undertaken by the authorities to protect their balance sheet exposure. Against this backdrop, the emerging countries in the region should be prepared to cope with the possibility of a reversal of capital flows as well as consider to further strengthen their economic fundamentals in order to withstand the potential effects of such reversals. In particular, these countries should consider building up sufficient external reserves to ensure that volatile movements in capital flows do not adversely impact the domestic economy. While there is no consensus on the appropriate level of reserves for emerging economies, reserves accumulation should reflect country-specific fundamentals and degree of integration with global

economy and financial markets. More importantly, as holding reserves entails cost, the authorities need to strike a balance between the cost of reserves in non-crisis periods and the benefits during times of crisis. Notwithstanding the cost of holding reserves, however, given the environment of continued uncertainties where global economic recovery is still fragile coupled with large and highly volatile capital flows, holding a higher level of reserves, and biasing slightly towards holding higher level of reserves than postulated by consensus, is perhaps warranted.

5. Concluding Remark

How best to manage capital flows has always been the key policy issue for authorities in the emerging economies since the advent of greater economic and financial globalisation. In this paper, we have demonstrated that the quest for the best solution regarding this matter remains elusive despite the IMF's best effort to formalise a proper framework that could serve as a guide to policymakers in managing large capital inflows, assessing the risks and selecting the appropriate policy tools. Furthermore, based on the Malaysian experience, despite the country's strategic adoption of a comprehensive framework on capital flows management, successful aversion of excessive inflows and their associated risks proved to be rather transient in nature as Malaysia was not spared from the damaging effects of the Asian financial crisis. This broadly shows that the adoption of a comprehensive framework is no panacea for the ill-effects of excessive capital flows in this age of financial globalisation. Importantly, structural reforms and financial development should remain in the loop for medium-to-longer term solution and this was evident during the recent crisis, in which Malaysia was relatively unscathed from the destabilising effects of the massive deleveraging of funds from the emerging economies.

Notwithstanding the on-going debate on how best to manage capital flows, it is important to note that these discussions primarily revolve around the need to mitigate implications relating to surges in inflows rather than the adverse effects arising from abrupt reversals of capital inflows. In this regard, the IMF and other international financial organisations remain silent with regards to the use of the appropriate measures to manage sharp capital reversals. As such, the current policy approach in managing capital flows appears to be less holistic than what would be desirable especially when taking into account the inherent volatility in capital flows.

Previous episodes of surges in capital inflows often ended abruptly, with sharp reversals followed by several financial crises and significant output losses in the emerging markets. Although policy responses on inflows such as strengthened prudential measures and macroeconomic adjustments (including building enough foreign reserves as buffer) may help to minimise the adverse effects of reversals, capital flows may well reverse sharply even if the fundamentals are strong, given the volatile nature of these flows and the inter-connectedness of global economic and financial conditions. Given such developments, perhaps, a more holistic approach which addresses the salient issues with regards to both inflows and outflows of capital would be more appropriate. More specifically, emphasis should be given to designing a concrete policy framework to mitigate the potential impact on the economy in case of an abrupt reversal. Together with the existing framework in managing capital inflows, this could ensure that countries can respond efficiently and effectively to any inherent risks associated with volatile capital flows while minimising disruptions to the domestic economy.

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Appendix

Initial Measures Undertaken to Rein in Surge in Capital Inflows (1991-1993)

1. *Adjustment to the Statutory Reserve Requirement (SRR)*

   - The SRR was increased on five occasions from May 1989 to May 1992 from 3.5 percent to 8.5 percent to absorb the excess liquidity from the banking system.

2. *Limit on Swap Transactions with Foreign Customers*

   - In June 1992, commercial banks were not allowed to engage in the non-trade-related swap and forward transactions (on the bid and offer side) with foreign customers in excess of a daily limit of US$2 million per name per day, and an overall limit of US$4 million in aggregate per day. This was intended to discourage speculative inflows from abroad.

3. *Centralisation of the Government Deposit (1991-1992) and Employees Provident Fund's Excess Funds with the Central Bank (1992)*

   - This was intended to reinforce the central bank's capacity to manage banking system liquidity and allow greater flexibility in its monetary management.

4. *Issuance of Bank Negara Bills (BNB)*

   - The BNB was introduced in February 1993 and served as an additional money market instrument for the central bank to manage the liquidity situation. This instrument was introduced amid the shortages of government papers. The surplus of fiscal balance at that time limited the availability of instruments for open market operations. The BNB was used as a tool to absorb excess liquidity from the banking system.

Further Measures which Include Capital Controls Undertaken to Rein in Surge in Capital Inflows (1993-1994)

1. *Further Adjustments to the SRR*

   - The SRR was further increased on five more occasions from January 1994, reaching its peak of 13.5 percent in June 1996. In addition, changes have also been made to the eligible liabilities (EL) in 1994 to widen the base of the coverage, including ringgit inflow funds from abroad. Previously the ringgit funds from abroad were not subject to the SRR and liquidity requirements and were, therefore, cheaper than the domestic funds. These measures essentially added the regulatory cost on the ringgit fund sourced from abroad.

2. *Direct Restriction on the Amount of Non-residents Inflows which a Banking Institution May Receive*

   - From 17 January 1994, the outstanding net external liabilities position (for non-trade related) of each banking institution was not allowed to exceed the specified limit by the central bank. Therefore, a banking institution that sourced funds from overseas for domestic uses would be subject to a certain limit. This limit was subsequently lifted in January 1995 as the pace of inflows receded.

3. To complement the second measure as above, the central bank also *prohibited sales of short-term monetary instruments to non-residents,* effective from January 1994. This policy was aimed at preventing non-residents from using highly liquid instruments[4] as a conduit for speculative activity. This restriction was also lifted in August 1994 when the large part of the inflows had been unwound.

4. Currency speculators could also circumvent the second measure above by placing their funds in non-interest bearing vostro accounts. To address this circumvention, *commercial banks were required to place with the central bank, an amount equivalent to the outstanding credit balances in the vostro accounts of foreign banking institutions.* The vostro account was subject to the SRR and liquidity requirements. As a result, this requirement

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4. These include Bank Negara Bills, Treasury Bills and Malaysian Government Securities and Cagamas bonds with maturity less than one year, Banker's acceptance and NIDs

imposes a cost on the commercial banks in Malaysia that offer such services for foreign banking institutions, which will then be passed on to the overseas banking institutions.

5. In February 1994, *commercial banks were prohibited to undertake non-trade- related swap and forward transactions on the bid side with non-residents.* This measure was intended to prevent non-residents from undertaking a speculative long-ringgit forward position at a time when ringgit is expected to strengthen further. This measure was subsequently lifted in August 1994.

Chapter 11

GOING WITH REMITTANCES: THE CASE OF THE PHILIPPINES

By
Veronica B. Bayangos [1]

1. The Context

Globalisation exposes developing countries to the volatility of international markets. In the literature on financial globalisation, there is considerable discussion on the implications of large surge and volatility of capital flows, especially when they are routed through the financial institutions (e.g., Prasad et al, 2003). The surge of inflows and flight of capital have severe effects on the economy. In many developing countries, remittances are a financial flow that is as important and, in some cases, more important as capital flows. It is often noted that remittances are more stable than capital flows to emerging and developing countries, but even so, remittances are also subject to shocks. The movements of capital flows and remittances have direct effects on aggregate demand, liquidity of financial markets and foreign exchange markets. In such a scenario, the magnitude and volatility of financial flows create significant challenges for monetary policy.

The rapid resumption of capital flows and remittance transfers from the advanced economies to some emerging economies in Asia since the middle of 2009 has posed two areas of challenges to policymakers in the region.[2] First,

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2. This is notable in selected emerging Asian economies such as Indonesia, Malaysia and Singapore.

some regional economies are experiencing inflationary pressures from volatile global commodity prices and policymakers have been reluctant to increase policy rates for fear of attracting more capital inflows. However, the IMF-REO (2011) argues that exchange rate appreciation and tighter fiscal policy can play a role in combating overheating pressures, but so must monetary policy. A second challenge for policymakers in several Asian emerging economies is managing the financial stability implications of large inflows.[3] Despite the slowdown since the second half of 2010, foreign exchange inflows to emerging Asia are expected to continue in the next two years (2012 to 2013).

The Philippines is not spared from the global authorities' concerns on large and volatile sources of foreign exchange flows. While the average foreign direct and portfolio investment captured about 1.6 percent of nominal GDP from 2002 to 2010, exports of goods and services and overseas Filipino (OF) remittances have outweighed capital flows as both amounted to more than 50 percent of nominal GDP during the same period.[4] In particular, the average OF remittances from 2002 to March 2011 amounted to about 10 percent of nominal GDP, certainly a magnitude that will concern policymakers.

Still, when remittances are a significant share of nominal GDP, even modest volatility can result in fluctuations in the inflows that are of macroeconomic significance. For this reason, the monetary authorities are interested in the determinants of remittance flows and how remittances affect the monetary policy transmission mechanism.

Understanding the nature and economic drivers of remittances to the Philippines is crucial to critical thinking about the impact on the economy. However, one needs to consider a more complete picture. The contribution of

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3. In its Global Financial Stability Report (GFSR), Update (2011), the IMF said that the financial risks have increased since April 2011 for three reasons: first, mounting concern about the strength of the global economic recovery; second, worries about political support for adjustment in Europe's periphery as well as political risks in addressing fiscal adjustment in some advanced economies; and third, spurred by a sustained period of low interest rates in the advanced economies, a growing investor search for yield that risks building up future financial imbalances, especially in the emerging market countries.

4. In a related paper, Bayangos (2011) examines the drivers of international claims and cross-border lending to the Philippines and the role of foreign banks during financial crises by modifying the Siregar and Choi (2008) gravity model from 1995 to 2009. This study finds that supply factors drive the decline in international claims to the Philippines in the run-up to the global financial crisis. The demand for cross-border bank lending also drops, albeit marginally. These findings are consistent with the general understanding that the global financial crisis originated outside the emerging markets, including the Philippines.

this paper is a comprehensive analysis of the channels and impact of remittances on growth and inflation. This paper focuses on the short-run macroeconomic effects of remittances. It first lays out the nature and characteristics of remittances to the Philippines over the past decade or so. Then it traces the impact of large changes in remittances and the challenges they create for the Philippine monetary policy transmission mechanism.

In this paper, the preliminary simulation of an increase in remittance from a complete macro econometric model estimated for the Philippines shows that it will increase consumption, investment, labour productivity and economic growth. There are indications that increase in remittances also leads to a change in the economic structure, in particular a decline in traded goods production and exports as well as labour market effects, and this implies that the dependence on remittances increases.

Another interesting finding of the simulation is that the monetary policy transmission continues to be relevant as it feeds through the market interest rates. However, the simulation results also suggest that monetary policy pass-through tends to moderate once we take into account the impact of a surge in remittance flows.

In this paper, remittances refer to transfers sent by both Filipino migrants and overseas workers. The rest of the paper is organised as follows: the following section traces the relevant issues in examination of the impact of remittances on growth. Section 3 describes the recent trends in OF remittances to the Philippines. Section 4 traces the impact of remittances on the monetary policy transmission mechanism using a quarterly macro econometric model estimated for the Philippines, including the nature of the model and methodology. Section 5 discusses the main findings and implications for monetary policy. Finally, Section 6 concludes with the way forward.

2. Survey of Empirical Literature: Tracing Relevant Issues in Examining Impact and Challenges of Changes in Remittances on Growth[5]

As mentioned in Section 1, remittances in the Philippines are large relative to the economy and shifts in remittances flows will have short-term macroeconomic effects to which monetary policy has to respond. The first is

5. This section draws largely from Bayangos and Jansen (2011a) and Bayangos and Jansen (2011b).

the impact the inflows have on domestic credit growth and on aggregate demand. This is likely to result in pressures on prices of goods and assets. The inflows may also lead to an appreciation of the real exchange rate, undermining export competitiveness.

A second concern relates to the volatility of the international financial markets. One claimed advantage of remittances is that they are not so volatile. Buch et al (2002) analysed the volatility of remittances and found that in 107 out of 135 countries, the volatility of remittances is smaller than that of private capital flows; in 70 countries it is lower than that of official capital flows; and in 62 countries remittances are less volatile than both private and official flows. Lueth et al. (2007) observes that remittance receipts in Sri Lanka are less volatile than official development assistance (ODA), foreign direct investment (FDI) and portfolio flows.

The impact on economic growth is the result of a complex set of reactions. First of all, an increase in remittances will have direct effects on aggregate demand as the purchasing power of the remittance-receiving households rises. Most studies (see e.g., Chami et al, 2003) find that the majority of remittances are consumed. Part of this will be spent on traded goods and imports will rise. The increased demand for non-traded goods will push up their prices.

The increase in the price of non-traded goods will increase the domestic cost of production. The inflow of remittances in the foreign exchange market may also lead to an appreciation of the nominal exchange rate. Both these effects will hurt the competitiveness of exporters. Many studies have confirmed this effect (see e.g., Amuedo-Dorantes and Pozo, 2004; Loser et al, 2006). Tuano-Amador et al (2007) find preliminary evidence for the Dutch disease effect in the Philippines.

The higher remittances flows will increase liquidity in the financial markets which may push down the interest rate and lead to an expansion of credit. The lower interest rate may invite an increase in expenditure. Increased investment of remittances in real estate or the stock market can push up asset prices which may exert a wealth effect. The total demand impact of an increase in remittances is the sum of these various effects: the direct expenditure effect, the multiplier effect and the interest rate effect will have a positive impact, while the exchange rate appreciation could have a negative impact.

An increase in remittances may affect competitiveness also through other channels. An increase in remittances is associated with an outmigration of workers so that the domestic labour force declines. Moreover, the households receiving remittances may use the higher income to reduce work effort and increase leisure or education, which will further reduce the labour supply. The reduction of the labour supply may lead to an increase in the wage level, which will increase production cost and reduce competitiveness (see Acosta et al, 2009; Amuedo-Dorantes and Pozo, 2004; Bourdet and Falck, 2006; Lartey et al, 2008; Loser et al, 2006; Chami et al, 2003; and Wahba, 1998). On the other hand, Yang (2008) finds that the increase in remittances to the Philippines during the Asian crisis in 1997 had no significant effect on the total number of hours worked.

Analysis of remittance flows suggests that they are dependent on external macroeconomic fundamentals. Though stable compared to other flows, workers' remittances can suffer when the exchange rate of the destination country appreciates against the source country. Remittance recipients can see their real purchasing power eroded, or may worry about possible future fluctuations. This creates a potential role for central banks in providing instruments that at least smooth proceeds from remittances. These could involve transfer of currency risk from migrants or workers to the central bank or through commercial hedging. Given the impact of currency fluctuations on remittances, there may be a case for promoting such instruments to mitigate the risk.

The net effect of all these effects on the output gap is an empirical matter. If the positive demand effect and labour supply effects dominate the negative export competitiveness effect, the output gap will tighten.

The increase in remittances will also have an effect on inflation. The demand pressures generated by the higher expenditure will push up prices and the adverse labour supply effect may push up wages while the exchange rate appreciation will reduce the domestic prices of imported goods. If the demand pressures dominate, inflation will increase.

A monetary authority that follows a Taylor rule will respond to these changes. If indeed the output gap tightens and inflation rises in response to an increase in remittances, the policy rate should be increased. And if the whole process of adjustment would indeed lead to a deterioration of the current account balance, the need for a tighter monetary policy would further increase. It is possible that

the central bank is also concerned about the exchange rate and would be worried that the appreciation of the exchange rate would undermine the competitiveness of the export sector. Such a concern could reduce the willingness to increase interest rates.

In the impact assessment it is also relevant to take into account any second round effects. Studies of the determinants of remittances have established that changes in the exchange rate, the interest rate, inflation, and home income may influence the decision to remit funds. The empirical evidence on these relationships is often mixed. For instance, Alleyne et al (2008) find a positive impact of the interest differential (defined as the difference between domestic and foreign interest rate), but Bougha-Hagbe (2004) finds a negative relationship. But it is clear that shocks to remittances will lead to shifts in economic variables that, in turn, will lead to new changes in remittances. Moreover, the monetary policy response to the original shock in remittances changes economic variables which will invite adjustments to remittances.

In deciding on the appropriate monetary policy response, the cyclicality of remittances is crucial. In looking for possible cyclical patterns of remittances, it is crucial to look deeper into the motives for sending remittances. The literature on remittances claims that remittances are driven by either altruistic or investment motives (see e.g., Alleyne et al, 2008; Bouhga-Hagbe, 2004; Buch et al, 2002). The first sees remittances as a form of altruism on the part of relatives overseas; they care for their family back home. The investment motive states that the overseas worker will have a tendency to invest her savings in the home country.

However, the literature on the cyclicality of remittances is inconclusive. Loser et al (2006) see a counter-cyclical pattern in remittance flows to seven Latin American countries that they study and they cite a number of other studies that come to the same conclusion.[6] Yang has done a number of interesting studies on remittances in the Philippines based on household data (Yang, 2008). In general, Yang's studies are consistent with the altruistic or insurance approach

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6. Sayan (2006) studies 12 developing countries in which remittances are significant and finds that only four show a statistically significant cyclical pattern; in two countries remittances are countercyclical; and in two they are pro-cyclical In addition, Lueth et al (2007) show that remittances in Sri Lanka are strongly pro-cyclical. For the case of Mexico, Vargas-Silva (2008) finds that remittances are counter-cyclical with respect to Mexico's business cycle, but this result is not robust to the use of different measures of remittances. Giuliano et al (2005) correlate the cyclical components of remittances and GDP for a sample of about 100 developing countries over the period 1975-2002 and find in about two thirds of the cases a positive correlation (i.e., remittances are pro-cyclical).

to remittances. These microeconomic studies would thus suggest a counter-cyclical pattern of remittances. This is in sharp contrast with the conclusions of studies that use a macroeconomic approach to analyse the cyclicality of remittance flows to the Philippines.

For the period 1970-1999, Chami et al (2006, 2003) show that, in the case of the Philippines, remittances are not profit-driven but are compensatory in nature, and hence, have a negative correlation with growth. The BSP re-estimated the same equation using ordinary least squares (OLS) and revealed that such relationship fades away when the appropriate correction is made for serial correlation (Dakila and Claveria, 2007). Tuaòo-Amador et al (2007) did a simple correlation test between (de-trended) GDP and remittances and concluded to pro-cyclicality. Dakila and Claveria (2007) come to the same conclusion using VAR analysis. Using an economy-wide macro econometric model of the Philippines, Bayangos and Jansen (2010) find that OF remittances are pro-cyclical, not only with the Philippine output, but with those of major host countries, including the United States.

If remittances are pro-cyclical, the policy conclusions are straight forward. The booming economy itself would already require cautious monetary policy and the increase in the remittances would have impact on the output gap and inflation that would strengthen that need. It should be noted at the same time that the increase in remittances will make monetary policy less effective. As noted above, the increase in remittance inflows leads to an increase in liquidity in the financial markets and to a downward pressure on the interest rate, leading to the possibility that and monetary policy action will have to be strong to counter these impacts. At the same time, monetary policy can easily become perverse: when the central bank tries to cool down the booming economy and the spurt in remittances through an increase in the interest rate, the rise in the interest rate differential may invite even more remittances or private capital flows.

If remittances are countercyclical the policy response will be different. When a domestic recession is compensated by an increase in remittances, the increase in expenditure is welcome as they compensate the decline in domestic demand and therefore monetary policy can be less active than would have been desirable in the absence of the remittances. In an economy with slack capacity utilisation, the inflationary effects of the increase in remittances are also likely to be less strong.

In recent years, the resumption of inflows to the emerging and developing economies and the persistent current account surplus in emerging Asia led to a re-evaluation of policy options in addressing the significant impact of these flows on the domestic economies.[7] For countries with significant current account surpluses (including large remittance transfers), the IMF (2011) noted that, structural reforms, apart from exchange rate flexibility, are key to sustain growth over the medium term. Greater exchange rate flexibility offers an important buffer against the risks posed by large surpluses, as it can reduce the contribution to domestic demand overheating from large surpluses, curb expectations of a large step appreciation; and lessen the need for foreign exchange intervention and the resulting risk of excess liquidity and credit booms.

In a related paper, Mandelman (2011) distinguishes between two groups of consumers, namely, "Ricardian" and "rule-of-thumb" households to trace the appropriate monetary policy in the Philippines.[8] The paper finds that exchange rate policy has a relevant stabilisation role with important welfare implications. Recipient households are better off with the exchange rate peg when facing an uptrend in remittances. However, the flexible policy arrangement is shown to have important stabilisation effects in the face of nominal and real shocks. When these shocks driving the cyclical swings around the stable trend are incorporated in the analysis, Mandelman (2011) finds that remittance recipient households are better off with a flexible exchange rate arrangement. Overall, the analysis suggests that countercyclical remittances and a flexible policy regime pursuing stabilisation goals are useful tools to smooth the consumption path of credit constrained households and, in doing so, achieve macroeconomic stability.

All in all, this section highlights that the impact of remittances on the macro economy is complex.

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7. The IMF REO (2011) argues that the first line of defence by central banks, when confronted with large and potentially destabilising capital flows, is to use macroeconomic policies, including both monetary and exchange rate policy and fiscal policy. Monetary policy should be tightened if the economy is overheating with high or rising inflation or a developing credit or asset price boom.

8. The Ricardian group of consumers is integrated to the financial markets where they can inter-temporally self-insure. The remaining households (rule-of-thumb group of consumers) consume all of their income every period, which is made up of wages and remittances. For the last group, the data confirm that migrants appear to be altruistic as they send countercyclical remittances that are useful for households consumption smoothing.

3. Going with Philippine Remittances: Recent Stylised Trends

The magnitude of remittances to the Philippines has been significant, both in absolute terms and as a ratio of nominal GDP and other economic indicators (Table 1). In 2010, remittances reached US$18.8 billion and the latest available data for 2011 (January to May) showed remittances at US$7.9 billion.[9] Recorded remittances were around 5.2 percent of GDP in 1996 and increased significantly to a level of around 9.4 percent of GDP in 2010. In real terms, the level of remittances has increased by 221.1 percent from 1980 to 2010.

Meanwhile, overseas Filipino remittances appear to be relatively more stable than other financial flows since 1996. The annual volatility of remittances in Figure 1, based on the coefficient of variation, is higher than exports of goods and services, but lower than foreign direct investments and portfolio investments. A closer look at the covariance from 1996 to March 2011 among remittances and other financial flows, such as exports of goods and services, foreign direct investments, portfolio and foreign borrowings, using Kendall tau's test, shows that remittances appear to show significant (at 5 percent probability) divergence with exports of goods and services and foreign borrowings, albeit negatively.[10] Moreover, remittances fluctuate with portfolio and foreign direct investments positively, albeit insignificant at 5 percent to 10 percent levels of significance. These findings may indicate that though remittances provide exposure to foreign shocks, remittance are relatively more stable than portfolio and foreign direct investments. And when a Granger causality test is used, the findings reveal that there is bi-directional causality between remittances and exports of goods and services at 5 percent level of significance. The results also show that remittances granger cause foreign borrowings at 5 percent level of significance.

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9. The BSP records the remittances that flow through the banking system, but there are many other channels along which the transfers are made. Based on the latest available data from the BSP, about 97 percent of these remittances are channelled through the formal banking system.

10. The Kendall tau's test results are as follows with the probability in parenthesis: XGS -0.32 (0.09), FDI 0.17 (0.39), PORT 0.08 (0.72) and BOR -0.39 (0.04).

The financial crisis that started in 2007 originated in the advanced countries but the developing countries are feeling the impact strongly. Merchandise exports are falling and foreign investments are projected to drop sharply. Many emerging and developing countries are now placing their hope on workers' remittances which are presumed to be a more stable financial flow. Studies have shown that the volatility of remittances is less than that of most other financial flows to the developing countries. Even so, remittances cannot escape the impact of the global financial crisis: the World Bank's Global Economic Prospects 2009 observes that while remittances accounted for 2 percent of recipient country GDP in 2007, this fell to 1.8 percent in 2008 and is projected to decline further to 1.6 percent in 2009 (World Bank GEP 2009, 16 and 38). Even in more normal times remittances do fluctuate from year to year and, for countries where remittances are a large share in GDP, such fluctuations may well be of macroeconomic significance and a matter of concern to policymakers.

Data from the Philippine Overseas Employment Administration (POEA) show that Filipino workers continued to be deployed abroad, offsetting the job losses resulting from social unrest in the Middle East and North African (MENA) region and the disasters that occurred in Japan. Such development, combined with the growing presence of bank and non-bank money transfer channels, both locally and internationally, as well as the expanding variety of products and services offered by the remittance networks, have enabled overseas Filipinos to send a higher value of remittances using more innovative financial services in the market.

In particular, POEA data indicate that the total number of deployed overseas workers for the period January-December 2010 grew by 3.4 percent to 1,470,826 from 1,422,586 in the same period a year ago. Of the total deployed overseas workers (new hires and rehires), 76.4 percent were land-based workers. The annual growth of deployed workers averaged about 5 percent for both land-based and sea-based workers (1999 to 2010, 4.99 percent for land-based workers and 5.12 percent for sea-based workers) (Figure 2).

The sources of remittance flows are geographically diverse, broadly reflecting the pattern of migration flows. In 1985 to 1989, the Middle East and the USA accounted for around three quarters of total remittances. Later the share of the Middle East declined but in the period 2000-2007 these two regions still accounted for about two thirds of total flows. Other significant source countries include Canada, the United Kingdom, Italy, Singapore, Japan, and Hong Kong.

Tuano-Amador et al (2007) present three major factors behind the uptrend in OF remittances since 1996. One, there is a trend rise in the number of deployed

workers and emigrants. For another, there has been a change in the skill composition of Filipinos workers and migrants. From 1995 to 2007, there was a significant rise in the number of deployed Filipino workers in the services and professional categories. And thirdly the measures adopted by the BSP and the banks to encourage OFs to channel their remittances through the financial system are essential, including the technical advances and technological advances in communications that facilitate international money transfers. The BSP's initiatives are geared towards enhancing transparency and promoting competition in the remittance market; improving access to financial services, especially the transfer of funds to beneficiaries in remote areas of the country; encouraging OF and their families to increase savings and investment; and increasing financial literacy among OF and beneficiaries. The OF surveys of the National Statistics Office (NSO) suggest that the share of remittances channelled through the banking system has increased from 46 percent in 1995 to 56 percent in 2009, probably as a result of these reforms.

We apply a Granger causality test on data from March 2001 to March 2011 to determine whether changes in remittances (REMIT) are useful in explaining the behaviour of other macroeconomic indicators: US GDP (USGDP), inflation (2000 base), real personal consumption expenditure (PCE), real disposable personal income (DISY), real money supply (MS), real bank deposit liabilities (DEPLIAB), nominal peso-dollar rate exchange rate (FXR), current account balance (CA), overnight RRP (RRP), 91-day Treasury bill (TBILL), labour force (LF) and compensation index for non-agriculture workers (1985 base). Except for RRP and TBILL, all variables are in logarithm. These variables are taken from the BSP database.

The Granger causality results show that there is bi-directional causality between remittances and real personal consumption, real disposable personal income, real deposit liabilities, overnight BSP borrowing rate, inflation, Philippine real GDP, labour force, and non-agriculture compensation. This analysis shows that remittances are an important force in the Philippines with impact on many aspects of the economy. Of course the Granger tests conducted here deal only with bi-variable relationships, and that, in fact, a full-fledged macroeconomic model in which the main facts around remittances are integrated.

To have an initial insight into the relevance of the overnight policy rate (interest rate) channel of monetary policy in the face of significant remittances, this study uses an ordinary least squares (OLS) and generalised method of moments (GMM) single equation regression.

In particular, the short-term interest rate (91-day Treasury bill rate in the secondary market), long-term government bond yield (25-year Treasury bond rate in the secondary market), and average bank lending rate are regressed on: (1) BSP overnight borrowing rate; (2) average nominal exchange rates; (3) budget deficit scaled to nominal GDP; (4) year-on-year expected inflation; (5) risk premium on the long-term bond (difference between 10-year note and 10-year US note); (6) remittances scaled to nominal GDP; and (7) an interaction term between the BSP policy rate and ratio of remittances to nominal GDP.

Indicators	**Ordinary Least Squares** [11]	**Generalised Method of Moments** [12]
91-day Treasury bill rate	0.805	0.542
25-year Treasury bond	0.515	0.480
Bank lending rate (average)	0.643	0.514

A summary of the preliminary regression results supports a significant impact of the policy rate even if we take into account the impact of remittances. The study shows that the overnight borrowing rate, exchange rate and expected inflation rates have significant impact on the 91-day Treasury bill rates. While for the long-term Treasury bond rates, the coefficients on exchange rates, risk premiums, share of remittances to nominal GDP, and the interaction term between the policy rate and share of remittances to nominal GDP are highly significant. In the case of the average bank lending rate, the result suggests that the overnight policy and the 91-Treasury bill rates have significant impact on the bank lending rate.[13] The estimation suggests that once the impact of remittances is taken into account, the policy rate pass-through coefficients tend to moderate, but not enough to completely eliminate the effectiveness of monetary policy through the interest rate transmission mechanism.

11. The signs and magnitudes of the individual coefficients in the equation, t statistics, the adjusted R^2, Durbin Watson and F statistics are all examined. In general, the single behavioural equation passed these tests.

12. The signs and magnitudes of the individual coefficients in each equation, t statistics, the adjusted R^2, Durbin Watson, F statistics and J test are all examined. In general, the single behavioural equation passed these tests.

13. In the regression result, the interaction term between the BSP overnight borrowing rate and remittances scaled to GDP was not significant. This means that the overnight and Treasury bill rates have direct impact on the bank lending rate.

The existing studies often apply a single-equation regression to test the impacts but that may offer only limited insight into the complex adjustment processes. The approach of this paper is to use a more complete macroeconomic model that includes the relevant institutions, markets, and agents and the various interactions between them. It can be argued that this gives a better insight into the impact of remittances on economic growth.

When studying the impact of migration and remittances, we have to deal with the issue of endogeneity. Remittances are part of GDP as they immediately are reflected in expenditure and this leads to a positive correlation that does not mean very much. Most studies use the two-stage least squares (instrument variable) and the GMM approach. In our model, we used the same methods to address the issue of endogeneity. In the next section, we introduce a full-fledged macroeconomic model in which the main facts around remittances are integrated.

4. Tracing the Impact of Remittances on Growth and Inflation

In this section, we identify the various channels along which remittances could affect the growth of the Philippine economy. To test the relevance of these channels and to examine whether the monetary policy transmission mechanism in the Philippines has been effective in the face of massive overseas remittances, this study extends the Bayangos and Jansen (2011) quarterly macro econometric model for the Philippines to the examine the monetary policy pass-through effects. Figure 3 traces the impact of changes in remittances on growth and inflation.

4.1 The Nature of the Model

The underlying analytical structure of our model shares features with the new Keynesian model of Ball (1999). The Ball (1999) model is designed to analyse monetary policy under inflation targeting and abstains from any optimising foundation. Central to this model are important nominal rigidities in describing the macroeconomy. In addition, there are lag effects in the transmission mechanism. We assume that aggregate output is demand-determined in the short to medium run. Goods markets are monopolistically competitive (Blanchard and Kiyotaki, 1987), leading to profits for firms that charge non-competitive sticky prices (Calvo, 1983), which clear all of domestic production to satisfy demand (net of imports) for consumption, investment, government spending, and exports.

Firms use a mark-up when setting prices which are responsive to demand and monetary conditions. Meanwhile, households and firms negotiate a non-competitive real wage, engaging in sticky nominal contracts (Calvo, 1983).

Asset markets are imperfect. The nominal exchange rate is allowed to transitorily deviate from purchasing power parity (PPP) so that movements occur in the real exchange rate. In addition, the nominal short-term interest rates play the leading role as the instrument of monetary policy, with the money supply having a limited role in describing the monetary stance. The model is designed to trace how the Philippine economy reacts to shocks and to policy interventions. Fiscal policy is introduced in the model through discretionary changes in government spending. The main attention in the model is on monetary policy as this is crucial for the changes in interest rates and the exchange rate.

The main features of the monetary block of the model are the following: (1) the policy interest rate of the BSP follows a policy rule that responds to inflation, output gap, and exchange rate pressures; (2) changes in the BSP policy rate affect the nominal exchange rate based on the uncovered interest parity (UIP) condition; and (3) the nominal peso-dollar rate is an effective transmission mechanism, as both direct and indirect pass-through effects to inflation are above average.

The model is largely demand driven. In the expenditure block, private consumption expenditures are mainly determined by disposable income. Private investment is driven by output growth, interest cost and the exchange rate, and export demand is determined by foreign income and the real exchange rate. All the changes in spending behaviour, when added up across the whole economy, generate changes in aggregate spending. Total domestic expenditure plus the balance of trade in goods and services reflect the aggregate demand in the economy, and is equal to gross domestic product (GDP).

Potential output and the resulting output gap as measure of future inflationary pressures have regained importance under the inflation targeting framework. Output gap is estimated based on Dakila (2001) in which it is expressed as the difference between the log of a one quarter moving average of supply-side GDP (de-seasonalised series) and potential output.

Aggregate demand translates into demand for labour. On the labour market this demand is confronted with supply to determine unemployment and wage pressures. The output gap then feeds into the wholesale price index. The wholesale price index is affected by the average prices of merchandise imports

in pesos, the excess liquidity as indicated by the money supply relative to gross domestic product, the average compensation (wages) for industry and services sectors, and the output gap. This specification makes the pricing decision based on a flexible mark-up.

The main link between monetary policy and wholesale price index, and consequently inflation is the output gap. Hence, there is an impact of monetary policy on expenditure. In addition, the real money supply strengthens the link to price level and consequently between monetary policy and the production sector.

Meanwhile, changes in the wholesale price drive prices of the industry and services sectors, and finally the final demand prices. Final demand prices are contained in the implicit GDP deflator. This, then, is the basis of headline inflation.

Because of the forward-looking nature of inflation targeting, the role of inflation expectations in this transmission mechanism becomes crucial. Indicators of inflation expectations include the two-year ahead inflation forecast.

The estimation of long-run inflation expectations follows a hybrid structure that contains both forward-looking and backward-looking expectations. The structure includes rational component of inflation, indicated by the medium-term (three to five years) inflation target announced by the government and contemporaneous and inertial components indicated by current and past inflation rate. The rational component is based on Demertzis' and Viegi's (2005) work on inflation targets as focal points for long-run inflation expectations. The idea is that in the absence of concrete information on inflation expectations, the only information that agents have is the quantitative inflation target announced by the government.

4.2 Remittances and the Economy

All the interactions described so far are rather standard for this type of model. However, for a country like the Philippines, where remittances are significant, we need to go further to capture the full macroeconomic dynamics.

$$R_t = \alpha + \delta C_t + \beta(r_t - r_t^f) + \theta Y_t^f + \varepsilon_t. \qquad (1)$$

Remittances are positively related with consumption C, indicating that remittances do not stabilise consumption as found in some other studies.[14] This relationship indicates that remittances increase when demand for consumption accelerates and they decrease when demand for consumption deteriorates. We look at the interest rate differential between local and international rates $(r - r^f)$ to determine whether investment considerations are at play.[15] In addition, we look at the income of host countries Y^f to capture the cyclicality of remittances with the income of host countries: remittances vary with the business cycle of the host countries. In good times, employment opportunities and wages are better allowing migrant workers to transfer more.

$$Y_t^d = (1-t)Y_t + R_t. \tag{2}$$

Following Chami, Fullenkamp and Jahjah (2003), Equation 2 shows that remittances add to disposable income Y^d and, through this, to real private consumption expenditure C_t in Equation 3. Disposable income is computed as income less tax.

$$C_t = \alpha + \delta Y_t^d + \lambda M_t - \theta(r_t^d - \pi_t^e) + \varepsilon_t. \tag{3}$$

Consumption demand is also determined by the money supply (M) and the real interest rate $(r_t^d - \pi_t^e)$. Part of the increased consumption demand is for imported goods, and affects the trade balance, while the rest is on domestic goods and may push up their prices.

The impact of an increase in remittances on investment demand is complex. The increased demand for domestic goods would lead to an increase in investment demand but remittances also affect variables, like wages, interest rates and exchange rate, that also play a role in the investment decision. The increase in wages induced by remittances will reduce profitability and thus reduce investment

14. The literature on the cyclicality of remittance flows is inconclusive with some studies finding evidence for countercyclical patterns and others for procyclicality (see Bayangos and Jansen 2011a).

15. Following the discussion in Section 3, and for simplicity, the insurance motive of remittances is assumed away. The insurance motive of remittances requires a different data set, that is, from survey results. In the absence of complete survey results, the paper assumes away the insurance motive of remittances.

demand. Remittances also affect market interest rates and thus the cost of investment. The appreciation of the exchange rate will make imported capital goods cheaper which would push investment demand. The net outcome of all these factors is difficult to predict, but in our model runs the net effect of an increase in remittances is a rise of investment. It is sometimes suggested that remittances may be used to finance residential construction but, as of this date, we have not found econometric evidence for this effect for the Philippines.

Since overseas remittances are channeled through the banking system, the impact of remittances is seen as directly affecting monetary conditions: an increase in remittances is reflected in an increase in deposit liabilities D_t in Equation 4.

$$D_t = \alpha + R_t + \varepsilon_t. \tag{4}$$

Deposit liabilities are then added to currency in circulation to arrive at total domestic liquidity. Equation 4 shows that bank deposits are driven by remittances so that any change in remittances will have an impact on total domestic liquidity. However, this specification is an empirical issue. The magnitude of the impact of movements in remittances on deposit liabilities will depend on the consumption response. It will also depend on whether the central bank will respond by tightening monetary policy with the rise in remittances.

The model also traces the impact of remittances on the labour market. Remittances are generated by OFs and an increase in remittances receipts is thus associated with an increase in emigration and a reduction of the domestic labour supply. The labour force in the model is determined by demographic trends (population of working age) and the level of wages. Every year a significant nu mber of people leave the country cutting into the remaining population of working age and so reducing labour supply. Furthermore, as suggested by the studies, remittance- receiving households may use the higher income to opt for more leisure or more schooling which will further reduce the labour supply. Our regression results show that variations in remittances have a significant effect on the labour force.

$$L_t = \alpha + \varpi A - \delta R_t + \lambda W_t + \varepsilon_t. \tag{5}$$

Equation 5 shows that an increase in remittances R will have a negative effect on labour force supply L. In addition, working age population (ages 15 years old and above) A and wages W will have positive impact on the labour force.[16]

The increase in remittances is thus associated with an increase in aggregate demand and also of demand for labour, but with a decline in the labour supply, a fall in unemployment and, since the level of unemployment is an important determinant of wages, an increase in wages. Wages feed into production cost and sectoral production prices and through these to wholesale and retail price inflation.

The Dutch disease effect is also captured by the model. The effect could be seen through the exchange rate effects.

$$e_t^n = \alpha - \beta T + \delta(r_t^f - r_t) + \varepsilon_t. \tag{6}$$

The estimation of Equation 6 follows the convention in which an increase in the nominal peso-dollar rate e^n corresponds to a depreciation rather an appreciation of the peso. The BSP maintains a freely floating peso, whose value is determined, to a great extent, by supply and demand factors. The nominal exchange rate is sensitive to the level of the current account balance T and to the interest rate differential $(r_t^f - r_t)$. The direct effect of an increase in remittances on the current account is positive leading to an appreciation, but there are also indirect effects on exports (through the impact of remittances on competitiveness) and on imports (through the increase in domestic demand that remittances generate) and the overall impact of an increase in remittances could be a deterioration of the current account balance which would lead to a depreciation of the nominal exchange rate.

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16. In developing countries like the Philippines, there may be an excess supply of labour and it could be argued that people migrate because there is not much to do at home. If that is so, the reduction of the labour force need not increase wages. However, there are three arguments against this. First, as there is no social security, unemployment is not an option: every person has to do something to make a living, even if only a low productivity informal sector job. They migrate not because there is nothing to do, but because they can earn more abroad. Moreover, as indicated earlier, emigration from the Philippines is quite substantial relative to the labour force. And, thirdly, emigration increasingly concentrates on skilled workers and does create shortages in these segments of the labour market. There is thus good reason to expect an impact of migration on wages, and that is what is implied in the econometric analysis. As argued in some studies, the rise in wages may be compensated by increased productivity due to better use of labour, investment in labour-saving technology, and improved skill levels.

There is also an indirect effect through the financial markets. The remittance inflows increase liquidity in financial markets which exerts downwards pressure on market interest rates. But the remittances also lead to an increase in spending, and thus a fall in the output gap, and in an increase in inflation. These changes induce the central bank to increase the policy rate and this pushes up the market interest rate. The net effect is an empirical matter. If, on balance, the market rate rises, the gap between local and global interest rates gap falls and the nominal exchange rate appreciates.

The change in the real exchange rate is determined by the change in the nominal exchange rate and the change in relative prices. As the increase in remittances leads to higher demand pressures, local prices increase, bringing an appreciation of the real exchange rate. Exports suffer from an increase in remittances as the real exchange rate appreciates.

We can now see how remittances complicate policymaking, in particular monetary policy. The transmission mechanism starts with the BSP's domestic interest rate policy. The BSP uses the overnight reverse repurchase rate (RRP)r^p as its policy instrument and follows a policy rule to anchor inflation in the long run (Clarida et al, 2000). The overnight *RRP* adjusts to inflationary pressure measured by the difference between the inflation forecast and the inflation target announced by the government and the output gap.[17]). This is seen as,

$$r_t^p = \alpha + \beta(\pi_t^f - \pi_t^*) + \rho(q_t - q_t^*) + \varepsilon_t, \tag{7}$$

where r^p is the *RRP*, α connotes the neutral monetary policy stance, π^f is the one-quarter ahead inflation forecast, π^* is the medium-term inflation target announced by the government, q is real output, q^* is potential real output and the error term is ε_t. In the empirical strategy, parameters in Equation 7 are estimated using GMM.[18]

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17. In Bayangos and Jansen (2011, forthcoming), the expected exchange rate gap (the difference between the expected exchange rate and realised exchange rate) is included.

18. The paper uses the old GDP series with 1985 as base year. The new GDP series, with 2000 as base year, is yet to be released. It may be argued that the value of labour services provided abroad is not counted in this old GDP series. This may indicate that somehow the output gap measure in Equation 7 above may be incomplete. The output gap may have to be adjusted for the share of overseas labour force (overseas workers) and for shocks to earnings outside the domestic labour force. This is an area of improvement of this paper. The new GDP series incorporates the expenditure of overseas workers and uses the 2005 benchmark weighted salary of sea-based workers (disaggregated by type of skill) and updated weighted average salary of land-based overseas workers (disaggregated by type of skill).

The RRP rate is transmitted to the benchmark interest rate r, through the natural arbitrage condition. In this model, the benchmark interest rate is the 91-day Treasury bill rate. As seen in Equation (8), r is also affected by other variables, such as the inflation rate π, foreign interest rate r^f, nominal deposit liabilities M, and an error term ε.

$$r_t = \alpha + \beta r_t^p + \rho \pi_t + \gamma r_t^f - \vartheta M_t + \varepsilon_t, \tag{8}$$

Equation 8 states that the benchmark interest rate is higher, the higher the RRP rate, the higher the inflation rate, the higher the foreign interest rate, and the lower the level of money supply. In this equation, there is a direct channel from the BSP's policy rate to the benchmark interest rate. Remittances affect the benchmark rate as they affect liquidity in financial markets and thus the money supply.

Changes in the benchmark interest rate are then carried over to the changes in the other market interest rates, such as bank lending rate [19] through the natural arbitrage condition. It is also assumed that the short-run domestic inflation is relatively sticky, indicating that inflation expectations for the short term are similarly sticky. This further implies that by controlling the nominal overnight RRP rate, the BSP can also affect the short-term real RRP rate or the difference between the short RRP rate and short-term inflation expectations. Through market expectations of future real rates, longer real rates (that is, longer than overnight rates) also are affected. Thus, the lowering of the overnight RRP is expected to lower short and longer real interest rates, and consequently affect economic activity.

Changes in the *RRP* rate and their impact on domestic market interest rates affect changes in the nominal exchange rate (see Equation 6 above). Remittances affect the nominal exchange rate through their impact on the domestic interest rate and thus on the interest rate differential. Moreover, remittances can affect the real exchange rate when demand pressures push up prices of non-traded goods.

We can conclude that the endogenous remittances lead to a complex adjustment process and set considerable policy challenges. An increase in

19. In the empirical estimation, the overnight RRP rate takes an indirect instrument in affecting bank lending rate.

remittances pushes up private consumption, has an ambiguous effect on investment and a negative effect on exports. On balance, aggregate demand increases and the output gap narrows.

The narrowing output gap generates inflationary pressures which are aggravated by the impact of remittances on wages and the impact on the money supply but are mitigated by the impact on the interest rates, which reduces interest cost, and on the exchange rate, which reduces the cost of imports. But, again, on balance, the inflationary pressures increase.

The narrowing of the output gap and the increase in inflationary pressures force the central bank to increase the policy rate and the increase in the rate needs to be more than it would have been in the absence of remittances because of the downward impact of increasing remittances have on the market interest rates. On the other hand, the fact that remittances lead to an appreciation of the real exchange rate and may make the central bank reluctant to raise the policy rate.

The higher interest rates attract more remittances (Equation 1) and a further appreciation of the exchange rate (Equation 6). A central bank trying to stabilise the output gap, inflation and the exchange rate will find it difficult to achieve all the objectives when remittances are substantial.

4.3 Structure of the Model, Diagnostics and Model Solution[20]

The analytical framework developed in Section 4.2 yields a system of simultaneous equations. The model consists of 67 equations, with 29 simultaneous equations. There are 32 recursive equations largely estimated using ordinary least squares, and the remaining 6 are identities. The 29 simultaneous equations are estimated using single-equation methods: five are estimated using generalised method of moments, 13 are estimated using two-stage least squares and the remaining 11 equations are estimated using ordinary least squares. The choice of instruments for the two-stage least squares are assumed to be all the lagged endogenous variables and all current and lagged exogenous variables in the whole system.

20. The complete specification of the basic version of the model is found in Bayangos (2007), Chapter 5; Bayangos (2011a); and Bayangos (2011b). For this paper, the model has been extended to include the various channels along which remittances (particularly the monetary policy pass-through) affect growth and inflation.

Each of the 29 simultaneous equations is assessed for basic and higher-order diagnostic tests. The signs and magnitudes of the individual coefficients in each equation, such as t statistics, the adjusted R^2, Durbin Watson and F statistics are all examined. In general, all of the behavioural equations pass these tests. In particular, the adjusted R^2 values for all the equations are greater than 60 percent and the values in all equations suggest there is no penalty for the number of explanatory variables used. All the calculated F values are higher than the critical values, at the 5 percent to 10 percent level of significance, thereby indicating a significant degree of reliability of coefficients of determination.[21]

The results of higher-order test statistics of residuals are similarly examined. Higher-order diagnostic tests start with the Jarque-Bera test. This test is designed to ascertain whether the series is normally distributed. The results show that all of the series are normally distributed. With a lag order of up two and at 5 percent to 10 percent level of significance, the Breusch-Godfrey results show that not all equations exhibit serial correlation. There are equations which initially exhibit serial correlation but for which additional lags are incorporated to make the residuals stationary.

White's heteroskedasticity test in the residuals is also used. White's test is a test of the null hypothesis of no heteroskedasticity. Using the 5 percent to 10 percent level of significance and in general up to two fitted items, the RESET results reveal that there are no specification errors in the equations. The J-test is also checked for four equations estimated using GMM at 5 to 10 percent level of significance. The results show that the four equations are over-identified and are therefore valid equations.

Solving a system simultaneously is indeed difficult. Both deterministic and static simulations are performed using the Fair-Taylor method.[22] This is an iterative algorithm, where each equation in the model is solved for the value of its associated endogenous variable, treating all other endogenous variables as fixed. Meanwhile, terminal conditions are assumed to hold in a specified time period. Put simply, this means that the values contained in the actual series after the end of the forecast sample are used as fixed terminal values. Forward solution is similarly used for equations that contain future (forward) values of the endogenous variables.

21. Exact collinearity is similarly checked. Highly collinear regressors lead to spurious estimates. There are a few cases though where exact collinearity is encountered, especially when dummy variables are used. However, a re-specification of some of these equations is done.

22. In technical terms, this is called the Gauss-Seidel algorithm method.

To gauge the simulation and forecasting performance of the model, the mean absolute percent error (MAPE) of selected endogenous variables is computed. As a general rule, the smaller the MAPE, the better the fit of the model to the actual data. The model's forecasting performance over parts of the sample period and the simulated response to some exogenous changes in policy variables are assessed. The simulation period extends from the first quarter of 2004 to the fourth quarter of 2008.[23]

5. Finding and Implications for Monetary Policy

5.1 Findings

The regression results are shown in Table 2. The strategy this paper follows to assess the impact of large remittance transfers on the Philippine transmission mechanism is straightforward. To capture the impact of significant remittance flows, a sustained US$1 billion increase in remittances is simulated on the estimated macro model over a five-year period (first quarter 2004 to fourth quarter 2008). Table 1 shows that this is a substantial increase; the outstanding amount of remittances more than doubled while the annual growth averaged to about 10 percent from 2004 to 2008. Of course, remittances are endogenous in our model; the increase in remittances is generated by increasing the (exogenous) income of host countries (see Equation 1 above). The annualised quarterly growth from the baseline scenario as well as volatility using the coefficient of variation (CV) is computed.[24]

Table 3 presents the results of the simulation. The simulation shows that the increase in remittances leads to a decline in export growth. The simulation results show the various channels through which the impact of large remittances takes place. First, the labour force growth declines as workers emigrate and reduce work effort. This has a positive effect on unemployment but leads to a growth in wages (the non-agricultural compensation index).

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23. In our model, the major macroeconomic variables can be predicted within reasonable error margins. Using generalised method of moments, two-stage least squares and ordinary least squares, about 89 percent of the MAPEs of our dynamic models fall below 10 percent. These include key variables in the monetary and real sectors, like the consumer price index (*CPI2000*), remittances (*REMIT)*, labour force (*LF*), 91-day Treasury bill *(TBR91*), and the nominal peso-dollar rate (*FXR*). For instance, *CPI2000*, *LF, TBR91, REMIT, and FXR* have a MAPE of 0.91 percent, 1.43 percent, 5.12 percent, 5.15 percent and 8.11 percent, respectively, These results indicate that the simulation properties of the model are reasonable.

24. Volatility is a measure of how wild or quiet an indicator is relative to its history. The CV is a comparative measure defined as the ratio of the standard deviation to the mean.

There is a significant appreciation of the nominal exchange rate. This is caused by the inflow of foreign exchange but also by the interest rate effect. The inflow of foreign exchange does, in the first instance, increase liquidity in the money market and this places a downward pressure on the interest rate. But there is a monetary policy effect as well: the increase in remittances stimulates aggregate demand. As a result, the output gap falls and inflation accelerates. The central bank is following a Taylor policy rule and thus responds by increasing the policy rate and this pushes up the market interest rates, such as the Treasury bill rate and bank lending rate. As Table 3 shows, this policy effect is strong leading to the rise in the market rate. This, in turn, widens the interest rate gap with the international interest rate, leading to a further appreciation of the nominal exchange rate.

The increase in remittances translates into a significantly faster growth of private consumption expenditure, which is also fuelled by the increasing wages. In Section 2, it was noted that rising wages imply a lower return on capital and thus a reduced investment demand. The increase in the market interest rates will further discourage investment. Still, in the simulation investment grows. This is due to the aggregate demand effect. The inflow of remittances and the resulting higher domestic spending invite capital formation to create the necessary production capacity. The appreciation of the exchange rate makes (imported) capital goods cheaper which also helps to increase investment.

The faster growth of consumption and investment demand exerts pressure on prices; there is a slight acceleration of inflation. The acceleration of inflation means that the real exchange rate appreciates more than the nominal one.

The volatility measure in Table 3 indicates that the BSP's reaction towards inflationary pressure, output gap and exchange rate fluctuations generated from the baseline lower volatility of inflation, the two-year-ahead inflation forecast, long-run inflation expectations and output gap, but higher in the nominal peso-dollar exchange rate. As real GDP growth slowed and the output gap widened, lower volatility compared to the baseline was seen.

5.2 Implications for Monetary Policy

The findings in Section 5.1 suggest implications for monetary policy.

First, remittances have a positive impact on the major Philippine economic indicators. The simulation of an increase in overseas remittances to the Philippines

shows that it will increase consumption, investment, money supply, labour productivity and economic growth. The results also indicate that a large increase in remittances may lead to a change in the economic structure, in particular, a decline in traded goods production and exports. These findings underscore the continuous need for the BSP to take endogeneity into account when formulating monetary policy.

Latest indicators using the flow of funds show that remittances continue to drive household consumption. In the 2009 Flow of Funds (FOF) Report, the household sector remained the prime saver in the economy for two consecutive years (2008 and 2009).[25] The household sector's accumulated savings was boosted by the steady inflow of remittances from overseas Filipinos despite the economic difficulties faced by their host economies. The sustained increase in income, combined with the slowdown in the growth of personal consumption expenditures contributed to the 36.8 percent growth in the accumulated households' savings. These findings indicate that beneficiaries of OFs may boost personal consumption over the ensuing years.

Second, this paper's preliminary finding that remittances respond to investment opportunities in the Philippines as much as to altruistic and insurance considerations, suggests a crucial role for the BSP to improve the remittance environment and to encourage OF beneficiaries to channel remittances to productive undertakings.[26] The BSP undertakes various bank-related initiatives to improve the remittance environment and to guide remittances to productive endeavours. Through these initiatives, the BSP intends to maximise the benefits of remittances aimed at ensuring the smooth inflow of remittances and promoting their use for development by channeling them to the financial sector so that these funds can be mobilised for lending and other productive activities.[27] These

25. The FOF presents a summary of financial transactions among the different institutions of the economy, and between these institutions and the rest of the world. It identifies which institutions are net borrowers and net lenders in the series of financial transactions. Institutions are categorised into four, namely, financial corporations, non-financial corporations, the general government, and the household sector.

26. Based on the second quarter 2011 Consumer Expectations Survey (CES), the bulk of OF households who used remittances for investments have increased to 6.8 percent from 5.7 percent in the first quarter of 2011.

27. In particular, the BSP initiatives to improve the remittance environment are geared towards the following: (1) enhancing transparency and competition to lower remittance charges; (2) improving payments and settlements system to facilitate remittances and help further reduce remittance charges; (3) channeling remittances to financial investments; (4) relaxing access of bank clientele to financial services; and (5) increasing financial education of OFWs and beneficiaries.

initiatives helped in the promotion of a culture of savings among the beneficiaries of OFs and encouraged them to channel these savings into investments in financial instruments and business ventures.

Third, the simulation result implies that the labour market effects of emigration and remittances are equally significant. This result may suggest that the labour market effects can be used to explain competitiveness that goes beyond the traditional exchange rate effect.[28] Emigration cuts into the labour force and the receipt of remittances further reduces labour supply. This could occur as households receiving remittances may use the higher income to reduce work effort and increase leisure or education, which will further reduce the labour supply. There is a strong effect on wages which will increase production cost and reduce competitiveness. The impact of the higher wages on competitiveness is mitigated by the sharp increase in labour productivity. As the labour force declines, output rises implying a more intensive use of labour through a decline in unemployment and underemployment. Moreover, the movement of labour abroad might reduce the domestic human capital stock (brain drain). Alternatively, the movement of labour abroad may facilitate technology transfer if the returning workers replicate the use of technologies learned abroad. The tentative conclusion here is that standard macroeconomic policy may not be enough to enhance competitiveness. There is a need for more structural policies to improve productivity, including investment in infrastructure and education, and reforms to increase competition on domestic markets and export promotion.

Fourth, another interesting finding of the simulation is the impact of significant remittance transfers on the exchange rate. Table 4 shows the growth rates of exports, measured in dollars. Many Asian countries follow an export-driven development strategy as reflected in high growth rates for exports and high ratios of exports to GDP. The Philippine year-on-year growth of exports of goods had slowly increased over time to reach a peak of 15.6 percent in 2006. Since then the growth has declined to 22.1 percent following the global financial crisis. There was a resurgence of export receipts though in the second quarter of 2011. Meanwhile, exports of goods and services scaled to nominal GDP stand at 37 percent in 2008, against much higher ratios, for example, Malaysia (110 percent), Thailand (77 percent) and Vietnam (78 percent). The Philippine export ratio had slowly increased over time to reach a peak of 55 percent in

28. In a related paper, Bayangos and Jansen (2011b) argue that in analysing the impact of changes in remittances on a country's competitiveness, the labour market effects should also be considered on top of the exchange rate effects.

2000. Since then the ratio has declined to 37 percent.[29] These two facts: the doubling of the remittances to GDP ratio since the mid-1990s and the decline in the export growth and exports to GDP ratio since 2000 may well be related. The preliminary simulation shows that a significant rise in remittances leads to appreciation of the peso-dollar rate. It should be noted that the recent rapid appreciation of the peso-dollar rate has been driven more by global conditions than by domestic conditions.

At present, the BSP monitors the exchange rate movements when setting the policy rate, but it only moves to dampen the impact of significant exchange rate shocks and not to target the exchange rate. The BSP monitors possible misalignments in the peso by looking at the movement of the real effective exchange rate (REER) to determine if there is a high and persistent deviation from its long-term average trend and whether such movements are supported by economic fundamentals.

On balance, the findings so far indicate that the overall impact on growth of massive remittance transfers to the Philippines appears to be positive.

Fifth, an equally interesting finding is the apparent moderation of the monetary policy pass-through with a significant rise in remittances. This finding brings us to a broader issue of whether inflation targeting framework has been undermined by large foreign exchange inflows. Table 3 shows that the pass-through of the policy rate to the benchmark rate (91-day Treasury bill rate) and to average bank lending rate appears to have been muted by a surge in remittances. The rise in policy rate (0.50 percentage point) appears to translate to the 91-day Treasury bill rate (at 0.20 percentage point) and to the bank lending rate (at 0.25 percentage point). This also suggests that monetary policy actions feed to average bank lending rate directly than the 91-day Treasury bill rate. Although at different magnitude, this finding is consistent with the initial findings in Section 3. A review of the pricing policy for BSP's standing facilities from 1992 to 2009

29. The data on the export ratios are drawn from the online version of the World Bank's World Development Indicators.

also reveals a similar finding. Because of the rejections of bids in the primary auction of Treasury bills, the pass-through from the overnight RRP rate to the 91-day Treasury bill rate appears to be incomplete. [30]

These results indicate that monetary policy actions continue to be a potent tool in transmitting influence to market interest rates, albeit moderate, in the face of large remittances.

6. Way Forward

Remittances to the Philippines have shown considerable resilience to the changing global conditions during the past several years. In addition to bolstering the balance of payments, large inflows are supporting the domestic economy. Many of the factors that have attracted them remain in place, suggesting that they will stay on an upward trajectory.

This paper lays out the nature and characteristics of overseas remittances to the Philippines over the past decade or so. It then traces the impact of significant changes in remittances and the challenges they create on the transmission of Philippine monetary policy particularly in the short run.

In the assessment of the impact of significant remittance transfers, we should also consider the remittances as a transmission channel of monetary policy. Using simulation results from an estimated macro econometric model built for the Philippines from March 2001 to March 2011, the paper reveals interesting insights. Significant remittance transfers will increase consumption, investment, labour productivity and economic growth.

There are also indications that significant increase in remittances may lead to exchange rate and labour market effects. This finding may imply that standard macroeconomic policy may not enough to address the competitiveness issue. There is a need for more structural policies to enhance productivity, including

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30. To determine the appropriateness of using the overnight RRP rate in pricing the volume of overnight reverse repurchase agreement (RRP) and special deposit account (SDA) placements with the BSP, a monthly vector autoregression (VAR) from January 1992 to December 2009 is employed.31 The VAR model is comprised of the following variables: *ERRP* (overnight reverse repurchase rate, in percent), *RRPSDAV* (the natural logarithm of the volume of *RRP* and *SDA* placements with the BSP, in million pesos), *ER* (average nominal US dollar/peso exchange rate), *TBILL* (weighted average of 91-day Treasury bill rate, in percent), and *M3_MS* (the natural logarithm of the total domestic liquidity, based on Monetary Survey, in million pesos).

investment in infrastructure and education, reforms to increase competition in the domestic markets, and export promotion. For the monetary authorities, continuous adherence to exchange rate flexibility is a reasonable option in addressing significant remittance flows.

An equally interesting finding is that the policy rate continues to be effective in affecting the market interest rates. However, the simulation results also suggest that the monetary policy pass-through tends to moderate once we take into account the impact of large remittance flows. This may also imply that the calibration of the policy rate when remittance flows are large may not be sufficient as an instrument of monetary policy.

The study also implies that remittance flows to the Philippines are not only important but equally challenging. In the long run, remittances should serve as an opportunity to facilitate medium-term economic growth. The main challenge remains for the Philippine monetary authorities to tackle the achievement of a balanced, sustainable, and more inclusive pattern of growth.

The issue is how best to channel the remittance flows towards financing broader-based growth, and in particular towards boosting investment. The BSP recognises that a challenge to policymakers is as to how to provide financial infrastructure and mechanisms for the overseas workers to remit their income to beneficiaries, including strong savings and investment climate, easier access to credit and other financial instruments, and active entrepreneurial activities.

A reasonable policy option in the face of significant surges in remittance flows is achieving sound macroeconomic fundamentals which translate into stable prices, a healthy financial sector and fiscal discipline. Such a condition is requisite to developing deeper financial products and stimulating private investment.

The findings of this paper also bring us to a bigger and recent debate on the nature and magnitude of capital and financial flows to the emerging and developing countries. There is a need to distinguish between the more permanent flows, such as exports and remittances, and those driven by cyclical trends (e.g., higher cross-border flows) as a result, for instance, of diversification by central banks and sovereign wealth funds (SWFs) in Asia and the Middle East, and structural portfolio adjustments in the private sector, as home bias declines worldwide. If cyclical factors are driving the trends in the inflows, intervention may be necessary to moderate the macroeconomic imbalances that could result from such large inflows. If structural, allowing the exchange rate to adjust would

be a first line of defence for the monetary authorities. Such an adjustment would enable countries to absorb the benefits of inflows, for instance, pushing for structural reforms to increase the capacity of domestic capital markets to enhance the resilience of the financial system. Beyond this, when confronted with surging inflows, the first line of defence is macroeconomic policies—namely, among others, allowing the currency to strengthen and accumulating reserves.[31]

For its part, the Philippine authorities continue to have a wide range of options to cope with financial flows, including remittance flows. These options can be grouped into macroeconomic and prudential policies, administrative capital controls (i.e. restrictions of capital transactions through quantitative limits or outright prohibitions) and market-based capital controls (i.e. unremunerated reserve requirements and taxes on capital inflows). However, the use of capital controls at this time may not be warranted as remittances are driven by fundamentals.

A challenging point is that financial flows are probably attracted to the emerging markets especially to East Asia not by apparent yield differentials or changes per se, but because of the real growth prospects behind the yields. It is the soundness of the macro environment implied by the potential for domestic savings to be put to work at home that is encouraging international investors.

Moving forward, although remittance transfers are fundamentally-driven, possible financial imbalances caused by massive remittance transfers may not be remote. In such a scenario, the first line of defence is prudential regulation and close supervision of the banking system. Compliance with Basel II and the development of Basel III proposal are encouraging steps in this direction, particularly the inclusion of higher capital and liquidity requirements. However, care must be taken to strike a right balance between the stability of financial systems and their efficiency. Well designed regulatory reforms should make financial systems more resilient and stable without stifling growth.

31. See IMF (2011), Ostry et al (2011), Ostry et al (2010) for the details.

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Table 1
Relative Size of OF Remittances: Level, Annual Growth Rate and as Ratio of Selected Economic Indicators [1/]

Period	Level (US$B)[1]	Growth Rate (%)	As % of GDP[2]	OF Remittances as % of - XGS	FDI	GIR	DSB
1996	4.3	11.3	5.2 [a/]	10.9	118.9	36.6	85.7
1997	5.7	33.3	7.0 [a/]	11.9	681.1	65.3	102.6
1998	7.4	28.3	10.2	17.0	365.5	68.0	144.6
1999	6.0	-18.3	7.3	16.0	482.8	40.0	91.5
2000	6.1	0.5	7.5	14.9	270.1	40.2	96.5
2001	6.0	-0.3	7.9	17.5	3,092.8	38.4	92.3
2002	6.9	14.2	8.5	18.2	446.6	42.1	88.7
2003	7.6	10.0	9.0	19.6	1,543.4	44.4	95.3
2004	8.6	12.8	9.4	20.0	1,242.7	52.7	118.4
2005	10.7	25.0	10.4	23.9	576.5	57.8	140.1
2006	12.8	19.4	10.4	24.1	436.9	55.6	157.6
2007	14.5	13.2	9.7	24.4	495.5	42.8	188.0
2008	16.4	13.7	9.5	28.3	1,063.9	43.7	222.9
2009	17.4	5.6	10.3	35.7	883.7	39.2	249.6
2010	18.8	8.2	9.4	29.4	1,095.3	30.1	256.1
2011	7.9	6.2	9.0	28.9	1,125.0	11.5	191.7
	(Jan-May)	(Jan-May)	(Jan-Mar)	(Jan-Mar)	(Jan-Apr)	(Jan-May)	(Jan-Mar)

[1] Refers to cash remittances coursed through the banking system

[2] Data were based on the revised GDP data published by the NSCB (nominal terms).

[a/] Data were based on the old GDP series

GDP = Gross Domestic Product

XGS = Exports of Goods and Services

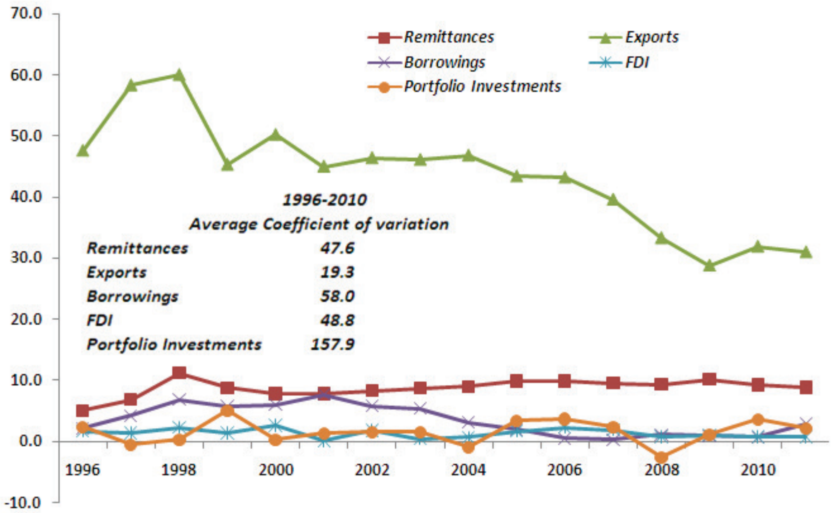
FDI = Foreign Direct Investment

GIR = Gross International Reserves

DSB = Debt Service Burden

Source of data: BSP-Department of Economic Statistics.

Figure 1
Relative Magnitude and Volatility of Selected Foreign Exchange Inflows, 1996-December 2010



Source of basic data: Department of Economic Statistics, BSP.

Figure 2
OFW Deployment (1999-2010)
Year-on-Year Cumulative Growth (Percent)

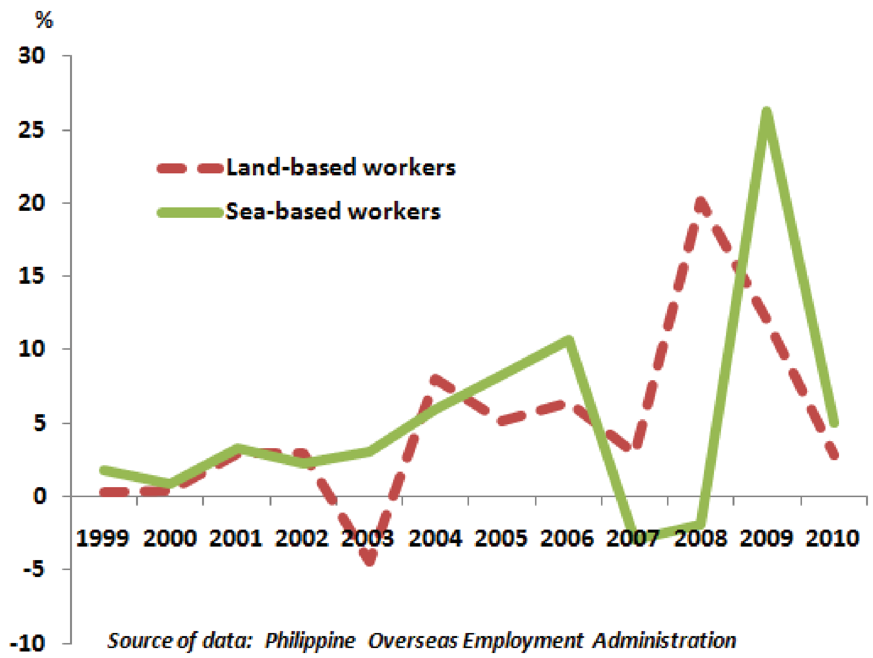


Figure 3
Tracing the Impact of Changes in Remittances on Economic Growth and Prices

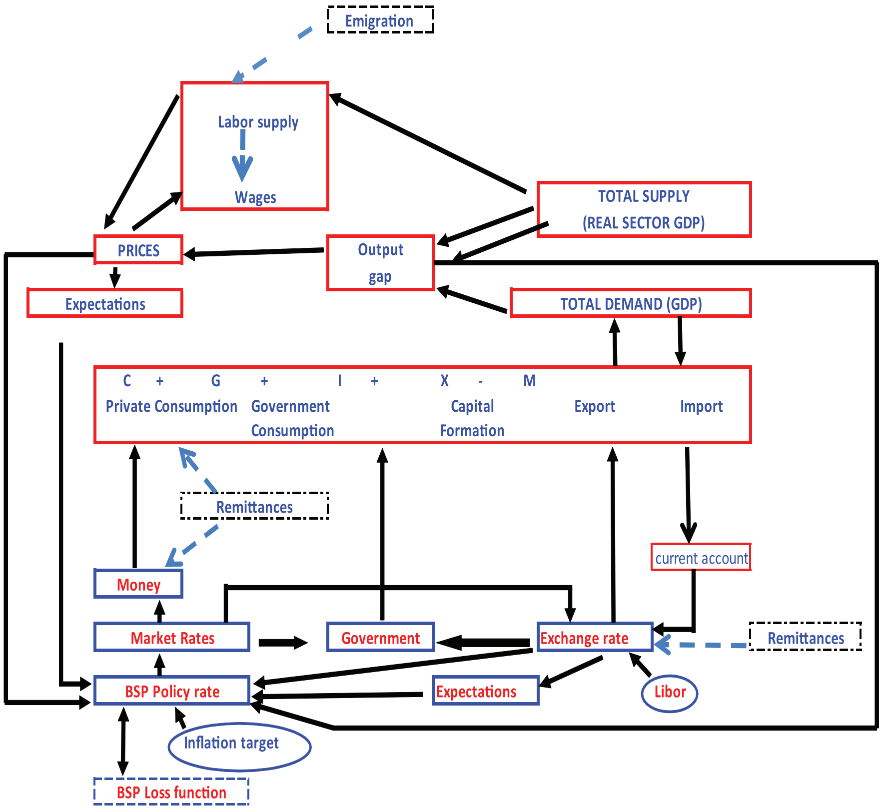


Table 2
Regression Estimates: Selected Behavioural Equations Relevant to Remittances

		Monetary Sector						Real Sector			
		RRP	TBR91	LR	FXR	REMIT	DEPLIAB	DISY	PCE	GDCF	LF
		BSP policy rate	91-day	Bank lending	Nomina peso-		Bank	Disposable	Personal		Labor
	Lag		Tbill rate	rate	dollar rate	Remittances	Deposits	Income	Consumption	Investments	Force
VARIABLES	(Quarter)	(EQ 1)	(EQ 2)	(EQ 3)	(EQ 4)	(EQ 5)	(EQ 6)	(EQ 7)	(EQ 8)	(EQ 9)	(EQ 10)
Constant		5.68	-1.01	4.07	1.20	10.66	5.13	2.08	3.04	1.73	-1.31
Log(GDP)	1					0.20 */	0.22 */			0.79*/	
INDTAX								-0.69 */			
CA/GDP	2				-0.12 */						
Potgap	1	0.16 */									
Log(DISY)									0.78 */		
Log(DISY)	1							0.49 */			
Log(PCE)/FXR	1					0.64 */					
RRP			0.81 */								
RRP	2	0.21 */									
TBR91	1		0.41 */	0.40 */	0.71 */				*/		
TBR91-XINFL	1					**/			-0.75		
TBR91-Libor90	1					0.13					
Log(DEPLIAB)	1						0.29 */		0.06 */	*/	
LR-XINFL										-0.22	
Libor90			0.78 */								
Libor90-TBR91					-0.20 */						
Log(LF)	2										0.38 */
FXR	1		0.20 */							0.15 */	
LR	1			0.34 */							
Log(REMIT)								0.12 */			-0.29 */
Log(REMIT)	1					0.22 */	0.11 */		0.13 */	0.22 */	
XINFL			0.74 */								
FINFL-INFTAR		0.30 */									
Log(USGDPHP)						0.17 */					
Workage											0.84 */
Log(DEPLOY)											-0.12 */
Log(QSE1P/PGDP)	1										0.14 */
AR(1)		0.87 */		0.43 */	0.25 **/	-0.02	-0.05	0.34 **/	-0.34 **/	-0.58 */	
Diagnostic Tests:											
Adjusted R^2		0.84	0.97	0.92	0.91	0.85	0.79	0.92	0.88	0.89	0.62
Durbin Watson		2.01	2.05	1.98	2.01	1.96	1.89	2.05	1.99	2.00	2.01
Prob (Jarque-Bera)		0.21	0.22	0.18	0.51	0.12	0.11	0.41	0.18	0.22	0.12
White Heteroscedasticity					0.16		0.22	0.12		0.45	0.75
Breusch-Godfrey					0.98		0.38	0.24		0.31	0.03
Prob (Ramsey RESET Test)					0.30		0.12	0.34		0.22	0.12
J-statistic (Adjusted)		0.08	0.05	0.03		0.01			0.04		

/ Significant at 5% level of significance* */ Significant at 10% level of significance*

Source: Author's estimates.

Table 3
Impact Scenario: A Sustained US$1 Billion Increase in OF Remittances

Economic indicators	Change from Baseline 2002-2008 [a/] Average	CV
<u>**GDP components (%)**</u>		
Personal consumption (growth)	4.12	2.50
of which: Disposable income (growth)	0.84	1.90
Gross capital formation (growth)	0.55	0.76
Total exports (growth)		
Merchandize exports of goods (growth)	-1.45	-0.83
Non-merchandize exports of goods (growth)	-1.01	-0.62
<u>**Labor sector indicators (%)**</u>		
Labor force (growth)	-0.35	-0.24
Non-agriculture compensation index (growth)	1.71	0.63
Unemployment (growth)	-0.78	-0.12
<u>**Financial indicators (%)**</u>		
Money supply (year-on-year growth)	2.12	1.01
RRP (%)	0.50	0.21
91-day treasury bill rate (%)	0.20	0.13
Bank lending rate (average, %)	0.25	0.12
Nominal peso-dollar rate (growth)	-1.52	-1.10
<u>**Macroeconomic indicators (%)**</u>		
Real GDP (growth)	1.09	0.98
Output gap (growth)	-0.45	-3.09
CPI-inflation	0.30	0.39
CPI-inflation forecast (two years ahead)	0.12	0.16
CPI-inflation expectations (long run)	0.07	0.09

Source: Author's results.

[a/] Preliminary.

Run as of 22 July 2011.

Table 4
Selected Asian Countries: Year-on-Year Growth Rate of Merchandise Exports, 1999-2010

Year	Philippines	Malaysia	Indonesia	Thailand	Singapore	India	South Korea	Vietnam
1999	-	17.0	1.7	7.6	4.4	8.2	9.9	23.3
2000	9.1	17.0	27.6	19.6	20.4	17.3	21.2	25.2
2001	-16.2	-10.6	-12.3	-7.1	-10.7	3.6	-14.0	4.0
2002	9.9	6.1	3.1	4.7	3.0	14.2	7.9	11.2
2003	2.7	12.4	8.4	18.2	14.8	19.1	20.7	20.6
2004	9.8	20.8	10.4	21.6	23.4	28.0	30.6	31.5
2005	3.8	11.8	22.9	15.2	16.8	31.1	12.1	22.5
2006	15.6	13.5	19.0	17.0	18.2	21.1	14.8	22.7
2007	6.4	9.5	14.0	18.2	10.2	24.3	14.2	21.9
2008	-2.5	13.3	18.3	15.9	13.2	29.1	14.2	29.1
2009	-22.1	-21.1	-14.4	-14.0	-20.2	-15.3	-13.7	-8.9
2010 Q2	34.3	33.1	34.4	42.0	34.9	28.7	34.2	32.9
Average 1999-2009	**1.6**	**8.2**	**9.0**	**10.6**	**8.5**	**16.4**	**10.7**	**18.5**

Chapter 12

AUSTRALIA'S EXPERIENCE WITH A FLOATING EXCHANGE RATE

By
Lynne Cockerell, Chamath De Silva and Chris Potter[1]

1. Introduction

There has been a recent resurgence of debate regarding the relative merits of floating versus fixed exchange rate regimes. Notably, it is occurring at a time when the economic strength of the emerging markets – that usually have adopted fixed and managed exchange rate regimes – has come to the fore and which has seen the balance tipped from a global system that had been dominated (in an economic sense) since the early 1970s by the floating currencies of the major economies to one that now represents a broad mix of regimes. It is also occurring in the context of the ongoing North Atlantic financial crisis, raising questions about the very structure of the international monetary system itself (see, for example, Bush, Farrant and Wright, 2011 and Zhou, 2009).

In particular, this recent debate questions the choice of exchange rate regime from the perspective of what would be in the global interest, asking whether the robustness of the current international monetary system ultimately depends on the predominance of one or other type of regime. It also asks whether fixed (and managed floating) exchange rate regimes have helped create the current 'global imbalances' that, some would argue, have been a contributing factor to the current financial crisis. This paper, however, is more concerned with the narrower, more traditional, question of which exchange rate regime is in the individual country's interest; whether this is also in line with global interest may well differ between the short and long run.

1. International Department, Reserve Bank of Australia. This paper was prepared for the SEACEN Research Workshop on 'Policy Responses and Adjustments in the Course of Exchange Rate Appreciation' in Bali, Indonesia, 18-19 July 2011. We thank George Gardner, James Holloway, Chris Ryan, James Whitelaw and participants at the SEACEN Research Workshop for their comments. The views expressed here are our own and do not necessarily reflect those of the Reserve Bank of Australia or The SEACEN Centre.

The key benefits of a floating exchange rate for the country concerned are well established: firstly, it allows exchange rate movements to reduce the effect of an external shock; and secondly, it frees domestic monetary policy to respond to the effect this shock has on the domestic economy (and domestic conditions more broadly). This is in stark contrast to a fixed exchange rate regime, whereby the exchange rate offers no such buffer to international shocks, which are transmitted directly to the domestic economy. In addition, interest rates, which are guided by the need to achieve external balance, will tend to reinforce rather than offset the effect of an idiosyncratic shock.

Given these benefits, it has been often argued that a floating exchange rate regime is a more compelling choice for countries that face large idiosyncratic external shocks and/or have a high degree of import pass-through to domestic inflation. Where this is not the case, it is argued that there is less need for timely exchange rate adjustment, particularly if the misalignments are relatively small and there is some catch-up of exchange rate levels to fundamentals over time. These arguments assume that the consequences of such misalignments at any point in time are not that significant and may also underestimate the extent to which imbalances may accumulate over time. The consequences of exchange rate misalignments can include an over-reliance on foreign-currency debt that has been encouraged by a fixed exchange rate regime (the 'original sin' as named by Eichengreen and Hausmann, 1999), the over-reliance on export-led growth that has been encouraged by an undervalued exchange rate (resulting in a 'fear of appreciation' as named by Levy-Yeyati and Sturznegger, 2007), speculation on the domestic currency that often has some implications for domestic asset prices and/or financial stability, and inappropriate domestic monetary policy settings reflecting the lack of monetary independence.

Countries contemplating a shift from fixed to flexible exchange rate regimes, however, typically face a number of significant concerns. If the exchange rate depreciates after a float, it can call into question the sustainability of a country's foreign-currency liabilities. If the exchange rate becomes more volatile (another reason for the 'fear of floating' as named by Calvo and Reinhart, 2002), it may introduce a new source of disruption to the domestic economy, imposing costs on domestic firms that are not well placed to handle this volatility and possibly resulting in the 'unnecessary dislocation' of industry. In each case, part of the problem – foreign-currency liabilities or a lack of diversification of domestic industry – may have arisen as a result of the existing fixed or managed exchange rate regime, while part of the solution – such as deep and liquid hedging markets – may only be expected to emerge under a floating regime.

A third key concern for countries contemplating a shift to a floating exchange rate regime is managing that transition in a manner that limits the risks to the domestic economy. This often leads to a delay in making the shift until further reforms occur (which might lack the political will to be implemented) or until, at least, some further development of domestic financial markets takes place (in particular the deepening of foreign exchange derivative markets). This gradual approach, that is often adopted in making the transition, raises questions about new potential risks being created in the process, including the emergence of domestic imbalances because of a misaligned exchange rate or an increase in financial fragilities as market participants attempt to take advantage of partially, but not fully, liberalised markets. It also delays the complete development of deep and liquid markets that could assist in managing the risks involved.

This paper discusses the Australian debate that occurred about the choice of its exchange rate regime during the 1970s and early 1980s that ultimately led to the decision to float the Australian dollar in December 1983. This decision is often now cited as one of Australia's most important economic reforms, such that the choice of a floating exchange rate regime is now rarely disputed by the public or academia. In these respects, Australia provides an interesting historical study of the adoption of a floating exchange rate regime.

The paper covers a number of questions: Why did Australia float its exchange rate? What effect did this have on the behaviour of the Australian dollar? What have been the implications for the domestic economy? And what did policymakers learn in the process? These questions are taken up in turn.

2. The Float of the Australian Dollar[2]

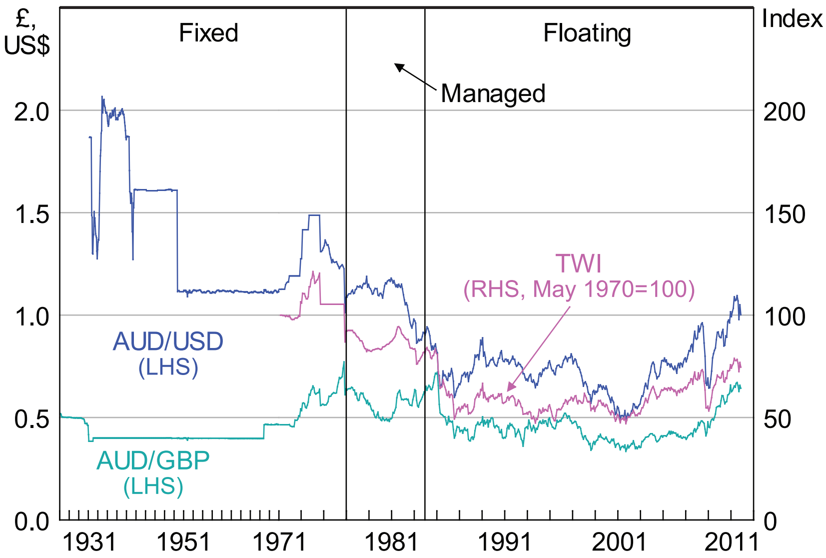
The international context for change was important. After the relative stability provided by the Bretton Woods system over more than two decades, it was on its last legs by the beginning of the 1970s. This was evidenced in a fair amount of turmoil in international financial markets. By early 1973, Bretton Woods finally broke down and all the major currencies floated. These events were closely followed by the first oil price shock in October 1973, which had the fairly immediate effect of driving a sizeable wedge between the current account positions of oil-producing and oil-importing countries, with corresponding

2. This section draws in particular on discussions of this evolution provided in Debelle and Plumb (2006), Manuell (1986) and RBA (1979). Phillips (1984) and Edwards (2006) are useful references for developments in 1983.

implications for exchange rate relativities. As both an importer and exporter of oil, this oil price shock did not have a large effect on Australia's trade balance, but was more important as a contributor to domestic inflation pressures, and the high nominal interest rates and slower global economic growth that accompanied it. A second oil price shock in 1979 and a short boom-bust cycle in commodity prices in 1981 added to the general volatility of this period.

It was against this backdrop that the domestic debate evolved regarding the choice of exchange rate regime for Australia. It formed part of the broader debate about economic reform, which ultimately favoured a shift to a more market-oriented economy. This section outlines the transition from a fixed exchange rate in the early 1970s, through a number of increasing flexible (but still quasi-fixed) regimes, until the floating of the Australian dollar in December 1983.

Figure 1
Australian Dollar*
Monthly



* US$ per A$ series spliced with US$ per A£ series at February 1966 at a conversion rate of approximately A$=0.5 x A£. Where A£ is the Australian pound (before decimalisation).
Sources: Global Financial Data; RBA

2.1 Fixed and Managed Exchange Rate Regimes in Australia

2.1.1 Peg to UK Pound

At the beginning of the 1970s, the Australian dollar was pegged to the UK pound. This had been the case since December 1931, with only one adjustment to the rate during the entire period.[3] There was no foreign exchange market in 1970: the banks merely acted as agents for the Reserve Bank of Australia for foreign exchange. Capital flows were largely subject to exchange control measures, with the significant exemption of capital flows to and from the Sterling Area. In practice, some transactions, such as those related to trade and current transactions were routinely approved. The general principle was to permit a fairly free passage for capital inflows, but limit capital outflows. In line with this, foreign direct investment in Australia was restricted only for particular industries, mainly banking and civil aviation,[4] and residents could borrow fairly freely in offshore markets. While approval would 'normally' be granted for direct investment by Australians offshore, portfolio investment abroad and foreign lending in Australia were largely banned (Sieper and Fane, 1980). Forward cover, which was underwritten by the Reserve Bank, was available for trade transactions, but no exchange rate protection was available for capital transactions.

As international currency markets showed signs of stress in the early 1970s, some important changes were made to domestic foreign exchange markets. In August 1971, as the US balance of payments position deteriorated, the United States suspended the convertibility of gold (the linchpin of the Bretton Woods system) and the major currencies floated as a result. Against this backdrop, following announcements made in August and September 1971, Australian banks were permitted to deal as principals in all foreign currencies, both spot and forward, for the first time in 32 years. This was subject to the requirement that banks cleared imbalances in their spot or forward books at the end of each day with the Reserve Bank (RBA, 1979; Phillips, 1983).

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3. In 1931, the exchange rate was fixed at 1.25 Australian pounds equal to 1 UK pound. Following decimalisation on 14 February 1966, this converted into 2.50 Australian dollars per UK pound. On 18 November 1967, the United Kingdom devalued the pound sterling by 14.3% against gold. To make that devaluation effective, a number of countries, including Australia, maintained their previous parities to gold, which led to a revaluation in the Australian dollar against the UK pound. The new rate was 2.1429 Australian dollars per UK pound (RBA 1979).
4. Restrictions on foreign direct investment were generally strengthened in the mid-1970s, although they were starting to be reversed by the end of the decade.

2.1.2 Peg to US Dollar

In December 1971, the Smithsonian Agreement re-established parities between the major exchange rates and included a 7.9 percent devaluation in the US dollar against gold. At this time, the Australian authorities decided that the Australian dollar would retain its previous parity to gold, thereby revaluing against the US dollar. The Australian dollar peg was also shifted to be against the US dollar, reflecting the increased use of the US currency in international transactions. This shift was carried through to forward markets in July 1972 and the Reserve Bank began offering cover in the US dollar, UK pound and the Canadian dollar.

In the early 1970s, and even after the revaluation in late 1971, the Australian dollar was generally considered to be 'undervalued'. Strong capital inflows supported this assessment. The policy framework under the fixed exchange rate regime during this period imposed significant challenges for policymakers. Fiscal and monetary policy were seen as being able to be used in combination to achieve the broad objectives of internal and external balance (that is, strong economic growth, a level of inflation that was not too high and equality in the balance of payments). For the Reserve Bank, this meant it could be put to work in achieving equality in the balance of payments through the purchase or sale of foreign exchange and could assist in the management of domestic liquidity through its ability to manage growth in banks' balance sheets and also through the sales or purchases of government securities, particularly with the non-bank public. The management of growth in banks' balance sheets involved the Reserve Bank varying either the LGS Convention – the prescribed ratio of cash reserves and Commonwealth Government Securities (LGS) to deposits held by banks – or the Statutory Reserve Deposit (SRD) ratio, which prescribed a share of deposits to be held in a Reserve Bank account (essentially, a reserves requirement ratio).

A decomposition of M3 growth highlights some of the challenges facing domestic monetary policy in seeking to manage growth in domestic liquidity. The money formation equation decomposes the change in M3 into a number of components based on a couple of identities that define M3 money and equate the assets and liabilities of the banking sector (including the Reserve Bank) (see, for example, Guttman, 2005, pp. 35-37):

$$\Delta M_t = \Delta FX_t + \Delta BC_t + BD_t - \Delta CGS_t^{NB} \tag{1}$$

This equation states that the change in M3 money in dollar terms (ΔM_t) can be decomposed into foreign exchange purchases (ΔFX_t), the change in bank

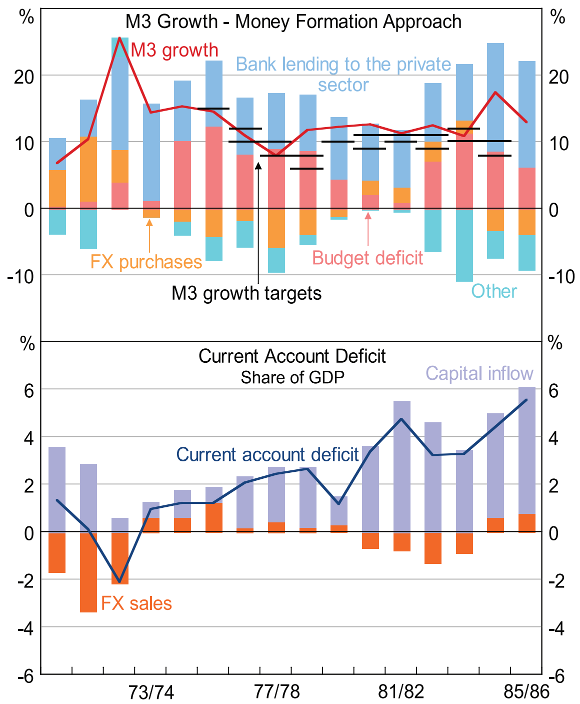
credit (ΔBC_t) and the government's budget deficit (BD_t) less sales of Commonwealth Government Securities (CGS) to the non-bank public sector (ΔCGS_t^{NB}). The sale of CGS to the non-bank public reduces bank liquidity as bank deposits are drawn down by the non-bank public to finance their purchase. However, bank purchases of CGS, if financed with their excess cash holdings, have no effect on the money supply.

A decomposition of M3 money into the first three components and the remainder[5] is shown in the graph below. During the fixed exchange rate period, sales (or purchases) of foreign exchange were needed to bridge the gap between the demand and supply of domestic currency. However, sales of foreign exchange, unless (successfully) sterilised through sales of CGS, would add to other sources of domestic liquidity. The various arms of policy – which included the size of the budget deficit, SRD and LGS ratios, interest rates, and eventually also capital controls – could then be adjusted in an effort to acquire the desired set of outcomes. One of the problems was that the objectives were not always compatible with each other under the policy framework as it operated. Periods when there was a desire for less domestic liquidity would typically also be periods of better domestic economic fundamentals that would induce capital inflows, compounding the problem. If the authorities sought to dampen domestic liquidity by raising interest rates, the immediate effect was often to make the problem worse as it served to encourage further capital to flow in (this is the 'impossible trinity' hypothesis in operation[6]). Not surprisingly, under this system, domestic liquidity was very hard to manage, potentially in the face of sometimes quite volatile capital flows (see Figure 2 below), and efforts to manage it were met with varying degrees of success.

5. The remainder includes the change in bank credit to the public sector plus miscellaneous factors (such as timing discrepancies) less the sale of Commonwealth Government securities to the non-bank public.

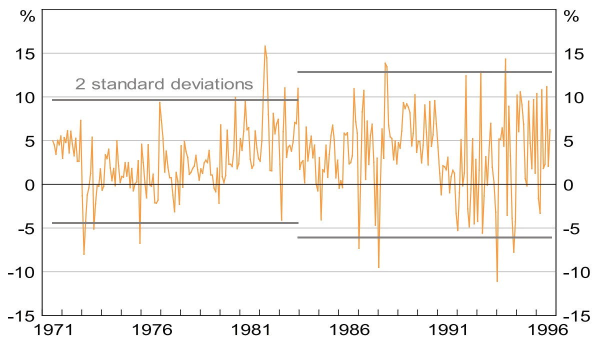
6. The impossible trinity is that a country can have any two of the following, but it cannot have all three: a fixed exchange rate, an open capital account and independent monetary policy.

Figure 2
Sources of Domestic Liquidity



Sources: ABS; RBA

Figure 3
Net Private Capital Inflow
Per cent GDP, monthly*



* The availability of monthly data ended in September 1996
Source: ABS

In the early 1970s, strong capital inflows led to a significant accumulation of foreign exchange reserves. By the second half of 1972, the accumulation of foreign exchange, a widening in the government's fiscal deficit (primarily financed by the banking sector) and strong growth in bank credit all contributed to M3 growth reaching almost 20 percent in year-ended terms in December and, as a result, inflation pressures started to build in Australia even ahead of the oil price shock in late 1973.

In September 1972, the authorities attempted to stem the capital inflow with the introduction of an embargo on offshore borrowings for repayment within two years.[7] Since much of the capital inflow originated in the United Kingdom, the Reserve Bank removed a previous exemption available to the Sterling Area, thereby making all currencies subject to capital control measures (Manuell, 1986, p.89). Even so, capital inflow increased further in the lead up to an election in December 1972, on expectation that the new incoming Whitlam government would revalue the exchange rate.

These pressures culminated in a 7 percent revaluation of the Australian dollar against the US dollar from the previous market rate (a revaluation of 4.9 percent on the mid-point) on 23 December 1972. The Variable Deposit Requirement (VDR) was also introduced, which required that 25 percent of offshore borrowings be placed in an interest-free account with the Reserve Bank, effectively acting as a tax on this particular type of capital inflow. For both the borrowing embargo and VDR, there were exemptions, mainly related to trade credit and small loans (Cohen, 1982, p.136). These measures were referred to as 'supplementary controls' and were the main discretionary arms of capital control policy over the following years.

Following the election and, as the new controls took effect, capital flows dramatically reversed in the first quarter of 1973. Net foreign exchange transactions that had contributed around 3 percent to money supply growth over the three months to December 1972, now subtracted around 4 percent over the following three months.

This capital outflow also occurred around the time the Smithsonian agreement broke down, which soon after resulted in all the major currencies floating. Australia did not follow suit for a number of reasons. In particular, the lack of sophistication and development of the domestic financial system, as well as the time zone difference between Australia and the major markets, posed practical

7. The embargo was based on a similar measure, the "Bardepot", introduced in Germany in the early 1970s.

difficulties and risks (Phillips, 1983). Furthermore, an undervalued Australian dollar (at least at the time) was expected to facilitate Australian borrowing in offshore markets. It was suggested that this might help promote international integration, although it also reflected concerns about the effect that a stronger exchange rate could have on Australian exports. The Australian dollar was subsequently revalued in February and September 1973. In October 1973, the VDR was increased to $33^1/_3$ percent.

In the forward market, from July 1972, rates were quoted in terms of a margin over the spot rate – the margin varying depending on the period being covered – bringing it into line with international practice. In June 1974, the authorities introduced the 'seven-day rule', which required importers and exporters to enter into a forward contract within seven days of assuming the exchange rate risk or forgo the opportunity for cover altogether. This was introduced after a number of episodes where heavy demand for foreign exchange cover would emerge 'particularly just prior to those weekends when rumours of a change in the value of the Australian dollar were rife' (Phillips, 1984).

By 1974, conditions in the domestic economy, following the first OPEC shock and a significant increase in wages, had changed considerably. Inflation had risen, peaking in early 1975 above 18 percent, with wages growth peaking at more than 30 percent. In 1974, the Australian economy entered a recession. Capital inflows were now much more muted and therefore much less of a problem. In response, the VDR was reduced in two steps, to 5 percent in August 1974, and the embargo on offshore borrowing was subsequently reduced to loans with terms of less than six months from November 1974.

2.1.3 Peg to Trade-weighted Index

In September 1974, the Australian dollar was devalued by 12 percent against the US dollar, reflecting the economic slowdown. The authorities took the opportunity to shift the peg to a trade-weighted basket, recognising that a broader basket was more 'appropriate', and would make the Australian dollar less subject to the 'vagaries of the US dollar' (Manuell, 1986, p.95). The Reserve Bank continued to publish the exchange rate for the Australian dollar against the US dollar on a daily basis, but varied the rate in line with keeping the trade-weighted basket constant. The Reserve Bank set the outer limits for which the banks could set their spot US dollar rate for transactions with the public. Banks were authorised to set their own rates for other US dollar transactions and for other currencies, both spot and forward (RBA, 1979, p.5.8).[8] The Reserve Bank stood ready to buy and sell US dollars, both spot and forward, at the determined rates.

Banks were not permitted to hold large open positions in foreign currency, requiring net foreign currency holdings to represent ‘reasonable working balances’.

Table 1
Major Foreign Exchange Developments in Australia up until Float

3 December 1931	***Peg to UK pound*** 1.25 Australian pounds = 1 UK pound
Early 1930s	Forward contract underwritten by Reserve Bank introduced
28 August 1939	Exchange controls introduced
14 February 1966	Decimalisation of currency 2.5 Australian dollars = 1 UK pound
18 November 1967	UK pound devalued 14.3% against gold Australian dollar retains gold parity
20/21 November 1967	Banks’ authority to deal in foreign exchange withdrawn
Aug/Sep 1971	Banks to act as principals in all foreign currencies
13 September 1971	Surveillance of capital inflows by Reserve Bank.
18 December 1971	***Peg to US dollar*** Smithsonian Agreement: A$ retains gold parity, revalued by 9% against US$
21 July 1972	Australian residents permitted to make and receive payments in any currency
26 September 1972	Borrowing embargo introduced on offshore loans to be repaid within 2 years New controls on foreign investment and takeovers
26 November 1972	An exemption for sterling area revoked and all transactions subject to exchange control approval. Other controls strengthened.
23 December 1972	A$ revalued 5% against US$ Variable Deposit Requirement (VDR) of 25 per cent on offshore borrowings introduced.
February 1973	Tightening of timing of payments under exchange control regulations Foreign exchange dealings of banks suspended owing to pressures on US$
13 February 1973	US dollar devalued 10% against SDR A$ revalues 11% against US$
March 1973	Banks permitted to exchange US spot and forward.
9 September 1973	A$ revalued 5% against US$
26 October 1973	VDR increased to 33.33%.
25 June 1974	VDR decreased to 25% Forward cover to be obtained within 7-days of assuming the exchange rate risk.
8 August 1974	VDR reduced to 5%
25 September 1974	***Peg to trade-weighted index (TWI)*** A$ devalued 12% against US$
10/11 November 1974	VDR suspended Borrowing embargo reduced to 6 mths
29 November 1976	***Flexible peg to TWI*** *– occasional adjustments to peg* Formation of ‘troika’ to keep peg under daily review A$ devalued 17.5% against TWI & US$
December 1976/ February 1977	Small revaluations of A$ peg
14 January 1977	VDR reimposed at 25% Borrowing embargo extended to 2 yrs
6 July 1977	VDR suspended Borrowing embargo reduced to 6 mths
3 August 1977	***Flexible peg to TWI*** *– regular adjustments to peg*
9 June 1978	Borrowing embargo suspended
December 1978	Export licensing abolished
January 1979	Exchange control restrictions eased to allow some offshore income to be held offshore
January 1979	Campbell Committee established to undertake Inquiry into the Financial System
June 1979	Trading banks establish currency hedge market (as complement to existing market run by merchant banks)
March 1980	Currency futures traded on Sydney Futures Exchange
Apr/Jul 1980	Some relaxation of rules on offshore investments by residents
May 1980	Interim report of Campbell Committee inquiry
September 1981	Final report of Campbell Committee inquiry
8 March 1983	A$ devalued 10% against TWI
29 May 1983	Treasurer announces review of Campbell Committee recommendations
31 October 1983	Package of measures intended to stabilise capital flows, including. allowing banks to set forward rates shifting announcement of the daily US$ fix to the end of the day
9 December 1983	***Float of Australian dollar*** Exchange controls largely abolished Treasurer announces 41 non-bank foreign exchange dealers will be authorised
June 1984	Reserve Bank no longer offers forward contracts

Sources: Cohen (1982) for supplementary exchange controls, otherwise, Manuell (1986)

8. At least this arrangement was in place in 1979.

By early 1976, with inflation around 13% and likely to persist, the Australian government formally adopted a monetary targeting framework. It appears to have been adopted with some misgiving about the ongoing stability of the relationship between money and inflation and the ability to achieve a monetary target under a fixed exchange rate regime; however, it also provided a certain degree of discipline on the government's fiscal position and it was expected to add credibility to the government's efforts to combat inflation, and so it was adopted (Guttman, 2005, pp.70-98). In March 1976, the Treasurer announced an initial target of 11 to 13 percent for annualised growth in M3 over the six months to June (Guttman, 2005, p.88). Monetary targeting became the guiding framework for monetary policy until April 1985, with the targets over the duration of this period set by the government (not the Reserve Bank). The ongoing tension between the objectives of the authorities and ultimately the difficulty they faced achieving control over the domestic money supply can be seen by the fairly persistent misses (on the high side) between M3 growth from its target (see Figure 2 above).

In the second half of 1976, the Australian dollar faced significant depreciation pressure. Over the three months to November, foreign exchange reserves were sold in response as capital flowed out, subtracting around 1 percentage point from money growth, which was then increasing at a year-ended rate of around 13 percent. As interest rates were increased over the period, and the economy had shown signs of improvement, these outflows were viewed as speculators attempting to force a devaluation. Foreign exchange reserves had become depleted such that back in July the authorities had been required to take measures to supplement reserves. It is also likely that the prospects for an earlier depreciation had been resisted owing to concerns about the effect this might have on inflation (RBA, 1979, p.5.14). The pressures on the exchange rate led to a devaluation of 17.5 percent against the trade-weighted basket on 29 November 1976.

2.1.4 Flexible Peg

In the announcement regarding the 1976 devaluation, the authorities outlined that the exchange rate would be made more flexible, with occasional adjustments made to reduce the build up of expectations of the need for a more discrete change. In part, the change to more flexible exchange rate arrangements in 1976 was intended to allow for some greater independence for monetary policy (Knight, 1976). A management 'troika' was established – consisting of the Governor of the Reserve Bank and the heads of Treasury and Prime Minister and Cabinet (later the Department of Finance) – to keep the exchange rate

under daily review. The Treasurer assumed ultimate responsibility for the exchange rate arrangements. Consistent with the view that the devaluation was somewhat overdone, the exchange rate was subsequently revalued by around 2½ percent in five small steps in December 1976.

Capital flows, however, were dramatically reversed in early 1977, with the exchange rate now coming under strong appreciation pressure. In January alone, purchases of foreign exchange contributed 1 percentage point to money growth. The authorities responded by increasing the VDR to 25 percent and once again extending the offshore borrowing embargo to loans with terms of at least two years to restrict inflows. When these concerns abated, the VDR was suspended in July 1977 and the borrowing embargo reduced to 6 months, before its eventual suspension in June 1978.

In August 1977, the exchange rate arrangements were further refined with the announcement that small, frequent adjustments would be made to the exchange rate. These arrangements remained in place until the floating of the Australian dollar in 1983. As before, these changes reflected increasing concerns by the authorities regarding the difficulties of managing domestic monetary conditions with a fixed exchange rate, as well as the gradual acceptance of more market-oriented policies.

There were also important changes through this period in domestic financial markets. The first of these was the development of the 'currency hedge market' in the mid-1970s, essentially an onshore non-deliverable forward market settled in Australian dollars, only available to Australian residents. The official forward market, which had been in operation since the 1930s, provided some cover for the exchange rate risk of trade-related transactions (in US and Canadian dollars and UK pounds), but capital transactions were not covered at all. The demand for hedging instruments was, however, increasing given that the Australian dollar had become somewhat more flexible, but moreover it had been subject to some large discrete adjustments on various occasions. It started as a contract for the mutual indemnification of risks between parties that had offsetting exchange rate obligations. The market developed, first with brokers helping to facilitate these agreements, and later with merchant banks establishing themselves as principals in the market. In 1979, banks also became principals (Phillips, 1983). In 1980, the currency hedge market was supplemented by currency futures traded on the Sydney Futures Exchange.[9] One consequence of these developments

9. In 1972, the Sydney Futures Exchange had sought government authorisation to introduce currency futures, but that approval was not forthcoming.

was that it opened up the prospect of speculating on the currency without the need for large upfront payments.

A second important change was the deregulation of the Australian financial system. The initial step in this process was a government Inquiry into the Australian Financial System, established in January 1979, which was expected to deliver a programme of reforms. It was chaired by Keith Campbell and therefore became known as the Campbell Committee. However, by the time the final report was published in 1981, the process of deregulation was well under way. In 1980 interest rate ceilings on all bank deposits were removed, and, by the mid-1980s, interest rate restrictions on new housing loans had been abolished (Battellino and McMillan, 1989). The most immediate effect of deregulation was to increase competition within the banking sector and between the banks and non-bank financial institutions. It was also an important step in changing the commercial banks' business model from that of the asset manager – which was largely their role in the highly regulated environment – to a more market-based model more focussed on the management of risk for return. This was important preparation for the large capital inflows that would result from the liberalisation of the capital account. These developments were ultimately evidenced in a significant expansion of credit to households and businesses, particularly in the second half of the 1980s after the float of the exchange rate.

This led to a third important change: a weakening in the effectiveness of monetary policy as it operated at the time (based more around the variation of SRD and LGS ratios than changes to the interest rate). The operation of monetary policy largely depended on the ability to manage domestic liquidity conditions via the influence the Reserve Bank could exercise over the size of bank balance sheets. However, ongoing growth in the relative size of non-bank financial institutions meant that a larger share of domestic liquidity conditions were no longer under the influence of the Reserve Bank. In part, the expansion of non-bank financial institutions was a product of the controls themselves, which had encouraged a growing share of banking business to move into the more lightly regulated sphere of the non-bank financial sector. Furthermore, the effect of monetary policy was also weakened as bank access to offshore sources of funding had increased over the 1970s.

Finally, a tender system for issuing commonwealth government debt was introduced for Treasury notes in 1979 and Treasury bonds in 1982. Prior to this change, the government had issued CGS via a tap system. The tap system had involved the government setting the offer yield and allowing the market to determine the demand at that price. This yield was often set below market-

clearing levels as the authorities were often reluctant to increase the yields enough as they were concerned about imposing capital losses on the banks' existing holdings of CGS. These concerns partly reflected the fact that under the LGS Convention (which had no official legal status), banks were essentially captive holders of government debt. But as a result, CGS issuance was often below target and the government instead met the funding shortfall by borrowing from the Reserve Bank. It also had implications for the Reserve Bank's open market operations, as a limited amount of CGS in the market at times meant that the Bank's own portfolio was often too small to be used as an effective tool. Furthermore, the Bank's operations often occurred at non-market-clearing levels as mispricing in the primary market for CGS got transmitted to the secondary market.

Under the new arrangements, the markets set the yield for the quantity of bonds put out by the government for private tender. Initially, the government was required to pay much higher yields on its debt, but within a year, these yields had fallen noticeably. However, as yields were now set by markets, they could be affected by the sterilisation activities of the Reserve Bank.

2.2 Float of the Australian Dollar

While some segments of the financial sector were becoming more market-oriented, other segments – most notably the exchange rate – remained constrained, and markets were increasingly able to take advantage of the opportunities that this presented. The more liberalised sectors often provided the means by which regulations could be circumvented and provided opportunities for arbitrage, often at the expense of the authorities.

In the early 1980s, as the changes mentioned above were just being introduced, inflation remained persistently high and the authorities continued to struggle to achieve their target for M3 growth. Even despite a significant reduction in the government budget deficit over a number of years that should have reduced pressures on M3 growth, this appears to have been largely offset by a step up in capital inflow around this time that contributed fairly directly to M3 growth.

However, in March 1983, there were large capital outflows in the one week just prior to the election of a new Labor government, a reflection of market concern surrounding the anticipated change in government. During this week, the Reserve Bank purchased foreign exchange equivalent to around 1½ percent of annual GDP (3½ percent of money supply). Given the circumstances, the

government was forced to devalue the Australian dollar – by 10 percent against the US dollar – within days of being elected. This devaluation represented the largest one day move in the exchange rate since more flexible exchange rate arrangements had been adopted in 1977. (Up until this point, daily changes to the exchange rate were usually no more than 0.4 percent.) This gave markets the confidence that they could force the hand of the authorities on the exchange rate. In the week following the devaluation, the Reserve Bank then sold as much foreign exchange as had been bought in the previous week (RBA, 1983).

The markets tested the authorities with large capital inflows throughout the remainder of 1983, reflecting the belief that a higher exchange rate would be favoured to combat the relatively high rate of inflation. Developments in currency derivatives markets enabled speculation on the currency with little up-front payment, and the emergence of offshore foreign exchange trading elsewhere in the Asian time zone enabled market participants to observe movements in the major currencies during the day after the 9.30 am fix and better speculate on the setting of the Australian dollar exchange rate for the next day.[10] Capital controls were proving to be increasingly ineffective and readily spilled over into domestic financial conditions, thwarting the efforts of the authorities to set domestic monetary policy effectively.[11] The authorities could sterilise inflows to a certain extent, but if pushed too far, this would push up domestic yields, which had also contributed to inflows in the first place.

On 31 October 1983, the government introduced a package of changes that were hoped to restore more control of the direction of the exchange rate and, moreover, domestic monetary conditions. It was in effect an interim measure intended to forestall at least for a time the floating of the exchange rate. Included in the package was a shift in the time set for fixing of the US dollar, from the beginning to the end of the day, while the TWI would continue to be set at 9.30am. This was hoped to limit profiteering from within day movements in the exchange rate, given that the Reserve Bank stood ready to exchange at the announced rate. The Reserve Bank also largely withdrew from the official forward market, allowing banks to freely set the margin for these contracts,

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10. In May, the Treasurer set up the Martin Review of the Campbell Committee recommendations. The report was submitted to Cabinet on 23 December 1983, after the float of the exchange rate. It was, however, indicative of the willingness of the new government to make changes in line with the market-oriented approach of the recommendations of the Campbell report.

11. The authorities assessed that these flows were virtually all legitimate under existing arrangements (Edwards, 2006, pp. 214-5).

which effectively floated the forward rate even while the spot rate remained fixed. If anything, pressures on the spot rate increased during the day after these changes, as authorities were often compelled to move the spot rate to follow developments in the forward market. In an effort to frustrate the market, the authorities would sometimes unexpectedly devalue the exchange rate or lower interest rates, but these efforts were not regarded as credible as they appeared to be contrary to the authorities' concerns regarding inflation.

By early December, the markets had assumed the belief that a revaluation was imminent. In just eight days, the Reserve Bank purchased net A$1.4 billion foreign exchange spot from banks. This alone was estimated to have contributed 2 percent to the money supply (Edwards, 2006, p.225). The crisis culminated on 8 December when the Reserve Bank was told by its New York office to expect another large inflow of capital to arrive the following day. The decision was made to close the foreign exchange market on Friday, 9 December 1983 to allow the authorities – which included the Prime Minister, Treasurer, Reserve Bank Governor, the Secretary to the Treasury, the Treasurer and others – to deliberate the appropriate course of action.

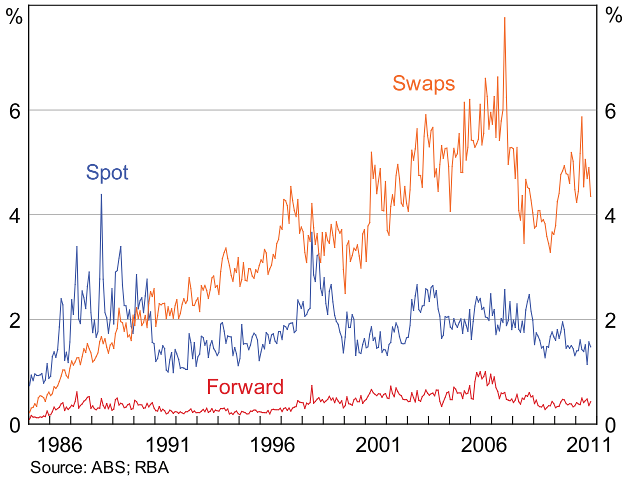
Some of the politicians involved on the day have provided their recollections of what took place (for example, Edwards, 2006, pp.205 232, 543 548; Hawke, 1994, pp.236 250), but there is otherwise no official record of the reasons for the float. The public debate on the topic (that in reality had been ongoing for decades) undoubtedly reflected many of the issues for debate in official circles as well. On the one hand, some considered that floating the exchange rate would be a 'leap into the dark'. The resulting volatility in the exchange rate could be disruptive to the domestic economy and it did not conform well to the view that most of Australia's problems at that time were of its own making. On the other hand, the fixed exchange rate regime presented considerable difficulties in attempting to manage growth in the money supply, as was the remit of the Reserve Bank at the time. It was not news to the authorities that the 'impossible trinity' was a confounding factor (see, for example, Knight, 1976). However, the trade-offs had been shifting since the deregulation of the banking sector and as Australia's international integration increased. The view was taken by some that as a small country on a big stage, international shocks simply could not be avoided. But there was a choice as to the prime location of that shock: on the exchange rate (under a floating regime) or on domestic conditions (under the flexible peg regime of the time). The key advantage to allowing the exchange rate to adjust is that it would moderate the effect of the shock on the domestic economy, whereas the fixed exchange rate regime would tend to exacerbate it.

At 6 pm on the evening of Friday, 9 December, the Treasurer announced that the markets would be re-opened on Monday, 12 December, with a floating exchange rate and with the removal of virtually all exchange control measures. It was expected that it would be a relatively free float, although intervention was not ruled out.[12] The decision to remove capital controls was done on a number of grounds. In the first instance, exchange controls were no longer needed to protect foreign exchange reserves and, even so, their effectiveness with deregulation had become more doubtful. Moreover, it was thought that the development and deepening of the foreign exchange market would be better fostered by the removal of controls, as there would be no limit on market participants.

Within a year, foreign exchange turnover almost quadrupled. 41 licences for non-bank dealers were initially authorised in the foreign exchange market, and by 1987, there were in total 90 authorised dealers. A 20 percent depreciation of the trade-weighted index over the first three months of 1985 would test the resolve of the authorities but was permitted. The current account deficit, which had averaged around 2½ percent since the beginning of the 1900s, widened to an average of 4¼ percent, as Australia drew on international capital markets to fund domestic investment. This also raised concerns about the potential sustainability of these deficits, but ultimately came to be understood under the 'consenting adults' view – that is, as long as the flows were put to good use and that the foreign-currency risk was limited, then the deficits would be sustainable (Debelle, 2011). However, this was a topic of considerable debate in the late 1980s (Belkar, Cockerell and Kent, 2007). The development of the cross-currency swap market in the second half of the decade was also significant, firstly because it facilitated the hedging of the foreign currency risk in offshore debt raisings, but also by encouraging the development of the Australian-dollar-denominated debt market offshore. The benefits of these developments are discussed further in Section 5.

12. Sanders (1984, p.543) indicated that 'the Bank may be in the market from time to time to test market trends or, if appropriate, smooth large transactions ... but we will not be aiming to produce any particular exchange rate outcome.'

Figure 4
Australian Dollar Turnover in Australia
Per cent of annual GDP, daily average turnover



Capital flows were still at times very volatile (see Figure 3 in Section 2.1), but now presented much less of a problem for policymakers as explained above. Nevertheless, the monetary targeting framework was becoming less useful for policymakers as the stability of the relationship between money and nominal income growth was breaking down. After the 1982 recession, there was a strong pick-up in economic growth over 1983 and 1984 and inflation came down sharply, from around 10 percent to 5½ percent over the two years. However, by February 1985, it became evident that money growth would substantially exceed its annual target for fiscal year 1984/85. This did not appear to suggest a clear need for tighter monetary policy given the combination of higher growth and lower inflation that had been recently achieved. Accordingly the target was 'suspended'. In retrospect, the strong growth in money at the time was not a reflection of loose monetary policy, but rather, households and firms that had been credit constrained under the regulated environment were now taking the opportunity to expand their balance sheets through increased borrowing (Grenville, 1997).

Many countries that abandoned monetary targeting during the 1980s were hard pressed to locate a clear alternative framework. In 1985, for want of an alternative, the Reserve Bank decided on a 'check-list' approach, which combined an array of intermediate and final objectives: monetary aggregates, interest rates, the exchange rate, the external accounts, the current performance and outlook

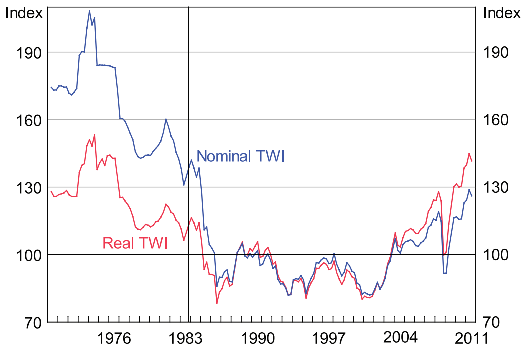
for the economy, asset inflation, actual and expected consumer inflation. Throughout much of 1985 and 1986, exchange rate weakness was the focus of monetary policy, primarily because of concerns regarding pass-through to inflation (Grenville, 1997). In 1987, inflation and activity were dual concerns. In the remaining years of the 1980s, there was increasing discomfort regarding the broad discretion permitted under the check-list approach. Moreover, Australia stood against the experience of most other OECD countries, which had largely been successful in reducing inflation. As output grew strongly in 1988 and 1989 and high inflation in Australia persisted, the Reserve Bank increasingly saw an urgency in reducing inflation. Following a significant tightening in policy, inflation fell in the early 1990s to around 2-3 percent. It was in this context, having already achieved a fall in inflation, that an inflation targeting framework evolved over a number of years, and was formally adopted in 1993. The inflation target was intentionally flexible in its design: 2-3 percent on average over the cycle; and it has remained in place since.

3. Behaviour of the Australian Dollar since the Float

The float of the Australian dollar fundamentally changed the characteristics of the exchange rate. No longer constrained by a peg, it became much more volatile, and the value was now set by the markets rather than the authorities. This section considers how the characteristics of the exchange rate changed after the float and the extent to which its value has reflected fundamental factors.

After an initial depreciation that occurred around one year after the float, the Australian dollar cycled around a fairly stable mean over the following two decades. Swings in the nominal trade-weighted exchange rate were typically between 20 and 40 percent over cycles of 2-5 years up until the early 2000s. Since 2002, however, the Australian dollar has appreciated by around 50 percent overall. This uptrend in the exchange rate was interrupted by the events of the current ongoing financial crisis, which led to some sharp adjustments during 2008-2009: the Australian dollar depreciated by almost 30 percent over a period of seven months from mid-2008, before recovering almost completely over the following year. Against the US dollar, the swings were more pronounced: a 35 percent depreciation followed by a 40 percent appreciation over the same periods.

Figure 5
Australian Dollar
Post-float average = 100



Sources: ABS; RBA

Such swings in the exchange rate have seen the Australian dollar often characterised as a volatile currency. Interestingly, at a daily frequency, movements in the main bilateral cross-rates for the Australian dollar are generally no more volatile than the cross-rates between the major currencies. The generally higher excess kurtosis for the Australian dollar – which indicates the existence of fat tails in the distribution – suggests a higher prevalence of 'extreme' daily movements (for the cross rates and in trade-weighted terms). This was particularly evident during the period that includes the current financial crisis where exchange rate volatility has increased notably for the Australian dollar, but not for the major currencies.

Although a lot of attention is typically paid to volatility of the exchange rate at a daily frequency, economic decisions are likely to be based on volatility over a longer horizon, such as weeks or months or quarters. At these longer horizons, more of the movement in the exchange rate should reflect developments in fundamental factors rather than noise or technical indicators.[13] Similar to daily movements, the volatility in the quarterly movements of the main bilateral rates for the Australian dollar appears comparable to quarterly movements in other major bilateral rates.

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13. It could be argued that the exchange rate volatility should be measured after abstracting from those movements in the exchange rate justified by fundamentals – that is, the volatility of the residuals in an estimated model. However, this presupposes that the various models applied to international exchange rate movements would be equally robust to place them on an equal footing for the purpose of this exercise.

Table 2
Exchange Rate Volatility

	Cross rates			Trade-weighted indices			
	AUD/ US$	EUR/ US$	US$/ JPY	AUD	US$	EUR	JPY
1984-2006				Daily data			
Standard deviation	0.6	0.7	0.7	0.6	0.4	0.3	0.6
Absolute percentage changes	0.5	0.5	0.5	0.4	0.3	0.2	0.4
Largest daily movement	4.8	4.2	7.3	–4.2	–2.8	2.2	8.1
Excess kurtosis†	3.9	1.7	5.9	3.9	1.8	2.9	10.2
2007-2011							
Standard deviation	1.1	0.7	0.7	0.9	0.5	0.4	0.8
Absolute percentage changes	0.8	0.5	0.5	0.6	0.4	0.3	0.6
Largest daily movement	8.6	3.5	-5.3	–6.6	–4.0	2.0	7.0
Excess kurtosis	7.7	1.5	4.3	8.3	4.3	1.8	6.0
1984-2011				Quarterly data			
Standard deviation	6.2	6.1	6.5	5.2	3.9	3.0	5.7
Absolute percentage changes	4.7	5.0	5.0	3.9	3.2	2.4	4.3
Largest quarterly movement	25.7	17.6	21.2	18.1	–11.7	8.8	19.3
Excess kurtosis	2.6	–0.3	0.7	1.3	–0.3	–0.2	1.0

†The excess kurtosis of a normal distribution is zero. Excess kurtosis greater than zero, for example, indicates a higher prevalence of extreme movements than for a normal distribution.

The volatility of the trade-weighted indices is somewhat different, with the Australian dollar and Japanese yen indices tending to be more volatile than the comparable indices for the US dollar and euro. This suggests that movements in the US dollar against the euro are typically moderated for each of these currencies by offsetting or otherwise generally smaller movements in other currencies that make up the trade-weighted basket. The trade-weighted indices for the Australian dollar and yen tend to be just as volatile as their bilateral exchange rates with the US dollar, possibly indicating that domestic factors tend to dominate movements in these exchange rates.

Compared to the fixed (and quasi-fixed) exchange rate period, it is not a surprise that the Australian dollar has been more volatile since it was floated, particularly when comparing average absolute percentage changes. However, the fixed exchange rate regimes did not always offer stability. Imbalances would build up, requiring the occasional discrete adjustment to the exchange rate. Arguably, these large discrete moves could potentially be more costly than the usually smaller, regular adjustments of a flexible regime. They are difficult to predict and therefore hedge against (Battellino and Plumb, 2009, p.7).

Table 3
Australian Dollar Volatility

Daily data

	AUD/US$			AUD TWI		
	Standard deviation	Absolute average % change	Largest daily move	Standard deviation	Absolute average % change	Largest daily move
Sep 74 – Jul 77	0.8	0.2	–17.5	0.8	0.0	–17.5
Aug 77 – Dec 83	0.4	0.2	–10.0	0.4	0.1	–10.1
Jan 84 – Dec 06	0.6	0.5	4.8	0.6	0.4	–4.2
Jan 07 – Dec 11	1.1	0.8	8.6	0.9	0.6	–6.6

3.1 Real Exchange Rate Model

An alternative benchmark for assessing exchange rate movements is against fundamentals. Theoretically, this should allow an assessment of whether the exchange rate is under or overvalued and indicate the extent to which the exchange rate adjusts to take account of international shocks. Such assessments are more difficult in practice. One reason is that models can only partly reflect the complexity of exchange rate determination, particularly since the market responds in a forward-looking manner to potentially a large number of factors that are not included in the model but are otherwise important for forming expectations about the variables that are. This perhaps helps explain the well established result that exchange rate models tend to perform poorly. In their seminal work, Meese and Rogoff (1983a, b) demonstrate that even when an exchange rate model performs well within sample, it typically performs poorly out of sample. This result appears to have continued to hold (Cheung, Chinn and Pascual, 2005).

The modelling approach adopted in this paper is based on a composite model that combines trade-related and portfolio reasons for demanding the currency. In line with previous research, the terms of trade and the real interest rate differential are used to capture these two effects (see, for example, Tarditi, 1996; Beechey et al, 2000; and Stone et al, 2005). In Australia's case, terms of trade movements can be considered to be largely exogenous, primarily driven by changes in international demand and supply conditions for domestically produced commodities and agricultural products. The effect of terms of trade movements on the real exchange rate is theoretically ambiguous, as it needs to not only take account of a change in relative prices but also of shifts in the distribution of

economic resources and activity both in the domestic economy and abroad. However, for large commodity exporters, like Australia, the effect has tended to be positive. This is in line with a generally expansionary effect of a terms of trade increase on the domestic economy, an increase in the return to capital and domestic labour resources, as well as an increase in transactions demand for the domestic economy, which are all expected to be reflected in a stronger exchange rate.

The long-run fundamental relationship between the real exchange rate, the terms of trade and the interest rate differential is modelled in an error-correction framework, estimated from 1985:Q1 to 2011:Q3.

$$\Delta rer_t = \mu + \alpha_1 rer_{t-1} + \alpha_2 tot_{t-1} + \alpha_3 ird_{t-1} + \beta' X_t + \varepsilon_t \qquad (2)$$

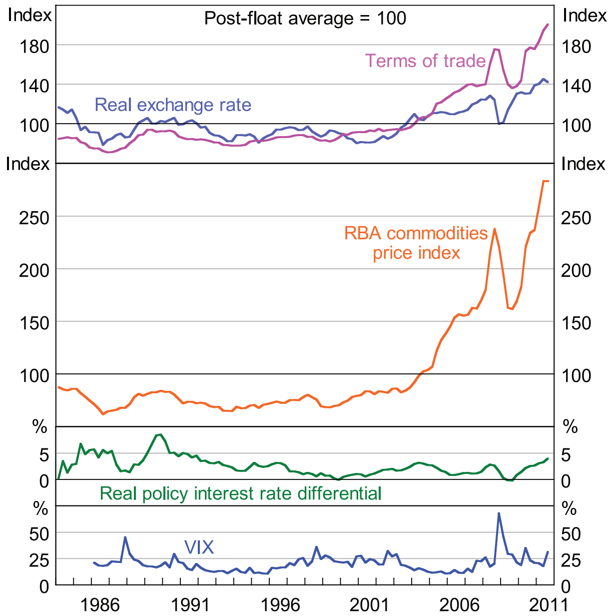
where rer_t is the real trade-weighted index for the Australian dollar (logs), tot_t is the Australian terms of trade for goods (logs),[14] ird_t is the real policy interest rate differential, measured as the difference between the real cash rate for Australia and a GDP-weighted average of real policy rates for the US, euro and Japan (percentage points). All three variables are treated as non-stationary over the full sample, although the real interest differential exhibits stationary characteristics since the mid-1990s.

X_t is a vector of short-run variables. Changes in commodity prices rather than the terms of trade are included in the short run, as commodity prices are more readily observable by the market, often at a daily frequency. This paper uses the RBA commodity price index, which is an index of mainly spot and contract prices that are weighted to reflect Australia's export composition, with relatively high weights on iron ore and coal.

Two other variables are included in the short run that capture broader changes in financial markets. Changes in real US share prices (S&P 500 deflated using US consumer prices) are expected to largely reflect general reassessments about global growth, which has implications for both the Australian economy and global commodity prices (and therefore Australia's terms of trade). Changes in the VIX are also included (the data start in 1986). It is typically referred to as the 'fear index', and measures the implied volatility on S&P 500 options. The VIX tends to spike during periods of market turbulence and therefore may capture some of the dynamics in market sentiment, particularly during the financial crisis period.

14. This follows Stone, et al (2005).

Figure 6
Real Exchange Rate Drivers
Quarterlt



Sources: ABS; Bloomberg; RBA; Thomson Reuters

3.2 Results

The results of OLS estimation of the error-correction models are shown in Table 4. Model 4.1 provides a baseline model for the period from shortly after the float of the exchange rate until the end of the 1990s (1985:Q1 to 1999:Q4). In the long run, both the terms of trade and interest rate differentials are significant at the 1 and 5 percent levels respectively: a 10 percent increase in the terms of trade results in a 6 percent appreciation in the real exchange rate and a 1 percentage point increase in the real interest rate differential leads to almost a 2 percent appreciation. The change in commodity prices in the short-run dynamics is significant. The contemporaneous change in US share prices is insignificant, however. The speed of the adjustment coefficient on the lagged real exchange rate is significant, suggesting cointegration, and implies that around half of the correction occurs in just under two quarters.[15]

15. Where disequilibrium half-life is defined as $-\ln(2)/[\ln(1+\alpha_{l})]$

Table 4
Exchange Rate Model Regression Output

	Model		
	[4.1]	[4.2]	[4.3]
	1985:1 1999:4	1985:1 2011:3	1986:2 2011:3
Variables			
Constant	0.48*	0.74***	0.55***
(s.e.)	(0.38)	(0.15)	(0.17)
Real exchange rate (t-1)	–0.30***	–0.33***	–0.24***
	(0.08)	(0.06)	(0.06)
Terms of trade (t-1)	0.19**	0.16***	0.12***
	(0.09)	(0.03)	(0.03)
Real interest rate differential (t-1)	0.58**	0.32	0.16
	(0.22)	(0.22)	(0.22)
Change in RBA commodity price index (t)	0.72***	0.40***	0.35***
	(0.12)	(0.08)	(0.08)
Change in real share prices (t)	0.04	0.29***	0.19***
	(0.08)	(0.06)	(0.06)
Change in VIX (t)			–0.15***
			(0.05)
Tech dummy		–0.03*	–0.02*
		(0.01)	(0.01)
June 2009 dummy		0.10**	0.09**
		(0.04)	(0.04)
Equilibrium relationships			
Terms of trade	0.64***	0.49***	0.49***
	(0.19)	(0.05)	(0.06)
Real interest rate differential	1.91**	0.98	0.68
	(0.77)	(0.64)	(0.89)
Observations	60	107	102
Durbin Watson	1.76	1.60	1.63
Standard deviation of dependent variable	0.04	0.05	0.04
Standard error of regression	0.03	0.03	0.03
Adjusted R^2	0.51	0.44	0.45

† Standard errors of equilibrium coefficients estimated through Bewley transformation. ***, **, * denotes significance at the 1, 5, and 10% levels respectively. All indices and changes are expressed as logs. Interest rate differential and VIX are expressed as percentage points

Models 4.2 and 4.3 extend the baseline model to the full sample and consider a number of different specifications. A dummy is included to cover the period between 1999:Q1 and 2003:Q4 during the tech bubble episode.[16] During this period, commodity-based currencies were sold as investors sought out technology-based assets. A second (spike) dummy is created equal to 1 in 2009:Q2, which corresponds with an unusually large one quarter appreciation in the exchange rate during the financial crisis.

Model 4.2 replicates the baseline model over the full sample and Model 4.3 adds the change in the VIX to the short run, which is found to be significant and with the expected negative sign. Compared to the baseline model, Model 4.2 suggests a slightly smaller long-run coefficient on the terms of trade, of around 0.5 rather than 0.6. The real interest rate differential is now insignificant, but is retained owing to its theoretical attractiveness.

The smaller coefficient on the terms of trade appears consistent with some weakening between the real exchange rate and terms of trade relationship over time, particularly over the past decade. While there is any number of possibilities for this result, it is interesting to note that the divergence has occurred at a time when the increase in the terms of trade has been particularly rapid, which might point to a potential non-linearity in the relationship. It could be that as the terms of trade continue to rise, it may be perceived as less likely to be permanent, and the real exchange rate may therefore not fully adjust. Another possibility is that as higher terms of trade contribute to a rise in domestic incomes, beyond some point the proportion of this income that is saved rather than consumed increases. To the extent this reduces the reliance on offshore capital and increases Australian investment abroad, all else equal, it can be expected to have a dampening effect on the exchange rate. This type of effect would also be consistent with the increase in income from the rise in terms of trade being treated as temporary by domestic agents within a permanent income framework. A trend increase in foreign ownership of the mining sector might have a similar effect, as more income related to higher terms of trade flows offshore over time.[17]

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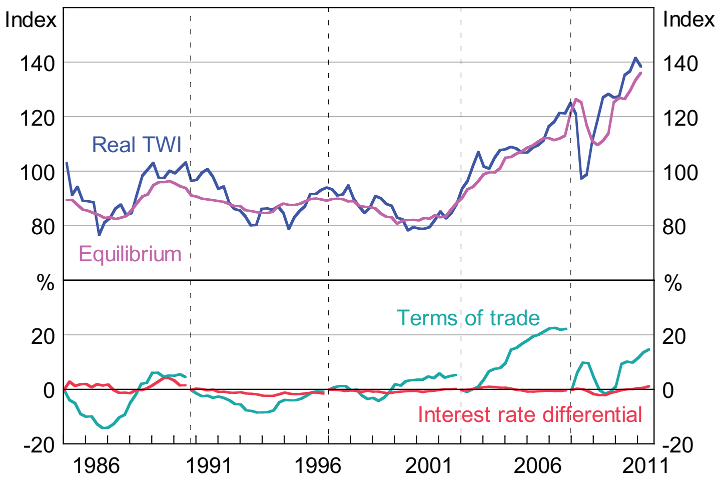
16. Consistent with Stone, et al (2005), the value of this dummy increases linearly from 0 to 1 over 1999 2000, remains at 1 over 2000 2002, and then decreases linearly to 0 over 2002 2003.
17. In an attempt to capture this supposed effect a squared terms of trade term was tested in the model. It was significant over some periods, but not others, suggesting this idea warrants further investigation

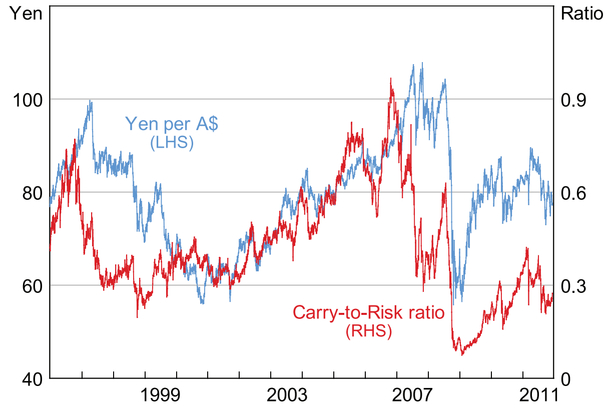
Figure 7 below shows a decomposition of the equilibrium for Model 4.3, illustrating the predominant role for the terms of trade. It is surprising, however, that real interest rate differentials are not significant in the models estimated over the full sample. In the earlier part of the sample, Australia's relatively high interest rates in the period immediately after the float are understood to have attracted substantial capital inflows, and this appears to have been reflected in the significance of the interest rate differential in Model 4.1. Whereas, in the 2000s, up until the current financial crisis, carry trade flows were considered to be a factor that contributed to appreciation pressures on the Australian dollar. One proxy for carry trade activity is the carry-to-risk ratio – the ratio of the (three-month) interest rate differential to (three-month) implied volatility – for the Australian dollar, when using Japanese yen as the funding currency. An increasing ratio from the early 2000s to the global financial crisis indicated the Australian dollar investments were becoming more and more attractive for Japanese investors, which in turn coincided with the Australian dollar appreciating against the yen over that period. This may suggest that further research is warranted on the measure of the real interest rate differential that is used in the models.

Figure 7
Decomposition of Equilibrium Real TWI
ECM model 4.3*, contribution to equilibrium



* Equilibrium includes tech dummy variable (for period between 1999 and 2003).
Sources: ABS; RBA; Thomson Reuters

Figure 8
Carry-to-Risk Ratio*
Australian dollar using yen funding



* Ratio of Australia-Japan 3-month interest rate differential to 3-month implied volatility (annualised) of AUD/JPY exchange rate.
Source: Bloomberg

Across all the models, the adjusted R-squared values, which range between 0.44 and 0.51, are relatively high for quarterly exchange rate models in general, but consistent with previous models of the Australian dollar.

The out-of-sample forecasting performance of Model 4.3 is tested using both the Theil's U statistic (TU) and the Clark West (CW) test (Clark and West, 2006). The TU test compares the root mean squared forecast error (MSFEs) from the estimated model to the MSFE from a random walk model for the exchange rate (by taking the ratio of the two). A TU equal to 1 indicates equivalence to a random walk, which is the null hypothesis; a TU less than 1 (greater than 1) indicates superior (inferior) forecasting to a random walk. Critical values for the test are obtained using bootstrap methods.

On the other hand, Clark and West (2006) note that the MSFE dominance of the random walk over an estimated model can be expected under the null hypothesis when the models are nested. The intuition is that, under the null hypothesis of a random walk, the estimated model is over-fitted reducing its forecast performance. The CW statistic therefore compares the MSFE of a random walk model with the estimated model, but includes an adjustment for the negative bias in the raw MSFE difference. The null hypothesis, like the TU, is equivalent to a random walk, which is indicated by a CW statistic of zero. The

CW statistic is asymptotically normally distributed, but owing to concerns about small sample properties, significance here is tested based on bootstrapping methods. The p-values for both test statistics are produced using a semi-parametric bootstrapping technique, which closely follows Mark and Sul (2001). The p-value for the TU is defined as the proportion of the distribution below the observed TU statistic; the p-value for the CW is defined as the proportion of the distribution above the observed CW statistic.

Both tests are included for robustness following Rogoff and Stavrakeva's (2008) critique of the use of such tests for assessing the forecasting performance of exchange rate models. Their paper emphasises that the CW and TU statistic may yield different results given that the hypotheses they are testing are subtly (but importantly) different. Specifically, it is possible for the CW test to conclude an improvement in forecasting performance from the estimated model relative to a random walk even if the MSFE of the estimated model is not smaller. It also highlights the limitations with the asymptotic version of the CW test and for this reason recommends using a bootstrapped test, as is done in this paper.

Table 5 presents the TU and CW statistics for Model 4.3 for a 1-quarter, 1-year and 4-year forecast horizons. The TU indicates an improvement over a random walk at the 1 percent level of significance for 1 quarter ahead forecasts and improvement at the 5 percent level for 1-year and 4-year ahead forecasts. Under the CW criterion, superior forecasting is present at the 10 percent levels of significance for the 1-quarter and 1-year ahead horizons. Overall, these results suggest that forecasts from the model represent an improvement over the naïve random walk forecast of no change. Naturally, this result is dependent upon the predictability of the terms of trade and other exogenous short-run factors.

Table 5
Forecast Evaluation

Model 4.3

	Theil's U (TU) statistic				Clark West (CW) statistic			
Forecast Horizon	TU	p-value	Distribution skewness	Distribution kurtosis	CW	p-value	Distribution skewness	Distribution kurtosis
1 qtr	0.75***	0.00	1.30	4.44	1.66*	0.07	0.05	–0.54
1 year	0.84**	0.01	1.13	2.93	1.94*	0.05	–0.01	–0.29
4 years	0.66**	0.03	2.62	16.22	0.43	0.39	–0.06	0.22

Bootstrapped distribution constructed from 2000 trials.

These results support a finding that the Australian dollar is determined by fundamentals (as demonstrated by its greater econometric predictability when compared to a random walk), and this appears to be a stronger result than that found for most other floating currencies in the literature (particularly the currencies of non-commodity economies). Two factors are likely to have supported this result: the relatively clean nature of the Australian dollar float, as well as the importance of the terms of trade which to a large extent reflects the importance of commodities to the Australian economy.

4. The Floating Exchange Rate, Output and Inflation

Since its float, the Australian dollar has been much more volatile than it was previously. This was an expected consequence of floating the Australian dollar, however, and the more pertinent issue is what has been the implication for the domestic real economy. More specifically, the question addressed in this section is: has the real Australian economy benefitted from the float of the Australian economy in spite of its greater volatility? This question is approached from a couple of angles, beginning with a broad discussion of Australia's economic performance during a number of external shocks in the past decades. A cross-country analysis seeking to evaluate the influence of exchange rate regimes on domestic output and inflation volatility follows.

The Australian economy has been subject to some significant external shocks since the exchange rate was floated. Four stand out: the Asian financial crisis (1997–98); the 'tech bubble' (1999–2001); the ongoing financial crisis (2007–); and the current commodities boom which represents a positive terms of trade shock for Australia (2005–). Australia performed relatively well throughout each of these episodes, arguably because the exchange rate was permitted to move sufficiently to moderate the effects of these shocks, but also because the independence of monetary policy allowed it to be managed in accordance with the needs of the domestic economy. In the first three episodes, the exchange rate depreciated, at times precipitously. This was particularly the case during the Asian crisis and the main period of the current financial crisis when the domestic interest rate was also cut. In the fourth (concurrent) episode, the positive shock of a strong terms of trade has seen the Australian dollar appreciate to its highest level since the float.

In conventional open-economy macroeconomics, a depreciation in the exchange rate in response to a negative international shock will have an offsetting effect on the trade balance. The depreciation boosts the international competitiveness of exports and the domestic competitiveness of import-competing

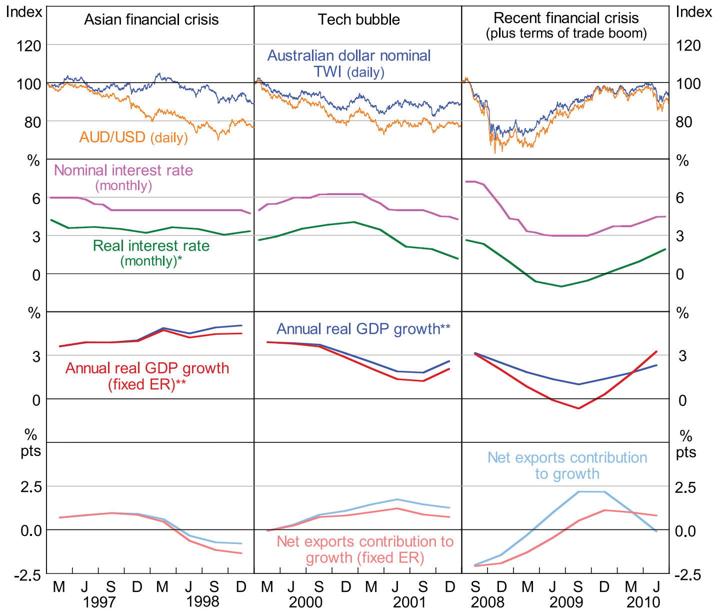
products. While more expensive imports may contribute to higher inflation, the effect would usually be temporary if inflation expectations are well anchored. In the case of a prolonged shock, a weaker exchange rate may assist an economy's restructuring through the resulting reallocation of resources to more profitable sectors. From a capital account perspective, the depreciation also improves the attractiveness of domestic investments for foreigners, as it makes domestic assets cheaper. These effects operate in the reverse direction for a positive shock, moderating its expansionary impact on the domestic economy. In the event of the present terms of trade shock, this is likely to be important for containing inflation pressures, which has not been achieved during any significant previous mining boom in Australia's history, which all have pre-dated the floating era (Battellino, 2010).

As an illustrative exercise, the effect of the flexible exchange rate on the trade balance is estimated using simple estimated models of import volumes, manufactured export volumes and service export volumes for the Australian economy (see Appendix A).[18] The estimates compare the forecasts from the model for observed movements in the exchange rate against the alternative scenario that the exchange rate was fixed at its initial level when the shock hit. This approach focuses narrowly on the effect of the trade balance. By ignoring the influence of exchange rate regime on domestic interest rates and adjustments in the broader economy, it probably underestimates the effect on GDP. The results are presented in Figure 9 below.

Although somewhat stylised, the exercise demonstrates the ameliorating effect of an exchange rate depreciation in response to a negative external shock. As expected, the depreciation of the Australian dollar in response to each shock resulted in higher net exports (that is, positively contributing to GDP growth) than would have been the case under a fixed exchange rate.

18. One attraction of this approach is that it makes use of models for which a role for the exchange rate is fairly robustly estimated. Note that while manufactured and service exports represent less than 30 percent of total exports, they are considered most responsive to movements in the exchange rate. Commodity exports, which represent around 60 percent, on the other hand, tend to be primarily driven by production and shipping capacity and are relatively less responsive to exchange rate movements.

Figure 9
Australian's Response to International Shocks



* Linear interpolation of the quarterly data
** Quarterly, seasonally adjusted
Sources: ABS; RBA

During the Asian crisis, the Australian dollar depreciated significantly against the US dollar and the other major currencies, reflecting concerns about the potential effect that a crisis in the region would have on the Australian economy. However, the Australian dollar was largely unchanged on a trade-weighted basis until early 1998, due to a large offsetting appreciation against the crisis-affected currencies. Australian exports to Asia fell significantly, but having now become cheaper elsewhere, many of these exports could be redirected, most particularly to Europe. On the other side of the equation, Asian imports had fallen in price in Australian-dollar terms and strong growth in imports ultimately outweighed relatively modest growth in exports over 1998. Although offsetting, the exchange rate movements had important compositional effects. Regardless, the more important factor would appear to have been the ability of the Reserve Bank

under a flexible exchange rate regime to loosen monetary policy (by 100 basis points over 1997) and keep interest rates at relatively low levels during the crisis period (although this difference is not captured in Figure 9 above). This episode also provides a salient lesson about the problems of using monetary conditions indices to guide monetary policy, as they often fail to distinguish between causes of changes in monetary conditions (Stevens, 1998). Perhaps most telling overall was that Australian GDP grew above trend over the entire period.

At the end of the 1990s / early 2000s, the Australian dollar was relatively weak as international capital favoured the 'new economy' technology-related assets over commodity-based assets – the 'tech bubble', or in Australia's case, sometimes called the 'tech wreck'. In return, the weaker currency supported an improvement in the trade balance over 2000 and 2001. GDP growth, on the hand, was slowing, largely in response to domestic rather than international factors. In this exercise, the counterfactual shown in the figure relates to the exchange rate being held at its initial level in 2000. However, this episode serves as a reminder of the difficulties the authorities often face in determining the 'right' level for the exchange rate under a fixed regime: at the time, the weak exchange rate appeared to be unjustified by the fundamentals of the Australian economy, but arguably correctly priced in the 'fundamental' decline in interest in investing in Australian assets.

The dynamics in the most recent episode – shown from late 2008 to June 2010 – reflect two opposing overlapping shocks: the period of financial market turbulence in 2008–2009, and the resumption of the global commodity boom, which had been interrupted by the crisis. As detailed in Section 3, this led to very sharp swings in the Australian dollar – down then up – within an 18 month period. Given the confluence of shocks, interpretation of this episode is difficult, particularly since a rebound in Chinese growth was an important driver of Australia's large trade surplus in 2009. The sharp swings and large one-day movements that were observed in the exchange rate during this period embody the very circumstances that the 'fear of floating' entails. Even so, while there was some disruption to growth, the financial crisis beginning in 2007 had no significant dislocating effect on the Australian economy (although the benefit from a rebound in Chinese growth was certainly fortuitous).

4.1 Cross-country Panel Model of Output and Inflation Volatility

To consider this question more rigorously, one approach would be to consider the role of the real exchange rate in models of domestic output and inflation.

However, models of Australian output have often failed to separately identify roles for the terms of trade and the exchange rate (see, for example, Beechey et al, 2000). Instead, this paper uses an international panel dataset to investigate whether a floating exchange rate regime is associated with a reduction in output or inflation volatility in the presence of terms of trade shocks. The estimated model is atheoretical and relatively unambitious. It uses panel regressions to estimate the effect of terms of trade volatility on output and inflation volatility. A dummy variable is included in these models for the exchange rate regime and it is interacted with terms of trade volatility to examine whether a country's choice of exchange rate regime matters. Control variables relating to other macroeconomic settings – including institutional and policy variables – are also included.

This approach closely follows a model used by Andrews and Rees (2009)[19]; however, with a few differences. Firstly, the dataset is limited to 47 countries, rather than the 71 countries in the original paper, largely removing African and Middle Eastern countries given the long history of political unrest in these regions (see Appendix A for a full list). Secondly, the sample period, which begins in 1971, is extended to 2009, rather than ending in 2005. Thirdly, a small but significant change is made to the specification, as explained in more detail below.

Following Andrews and Rees (2009) (and much of the literature), the data are first transformed into five-year blocks to allow for calculations of time-block volatility: in this paper, 7 five-year blocks starting with 1971–1975 and ending with 1 four-year block from 2006 2009 are used. To transform the data, a series of simple equations are estimated separately for output, CPI and terms of trade for each country using annual data:

$$\Delta X_{i,s} = c_i + \varphi_i \Delta X_{i,s-1} + \upsilon_{i,s}^{X} \tag{5}$$

where $\Delta X_{i,s}$ is the log change in output, CPI or the terms of trade for country i at time s (measured at an annual frequency), c_i is a constant for country i and $\upsilon_{i,s}^{X}$ is the residual term for country i in each period s. Within each five-year block, the volatility of shocks is calculated as the log of the standard deviation $\upsilon_{i,s}^{X}$ of and is denoted as: σ_{it}^{Y} for output growth volatility, σ_{it}^{π} for inflation volatility and σ_{it}^{TOT} for terms of trade growth volatility (where t identifies the

19. We wish to thank the authors for supplying us with their data and regression model code. This paper uses updated data from the same sources as those described in Andrews and Rees (2009).

date of the five-year block). These are interpreted as measures of unanticipated volatility. While an alternative would be to simply use log change in the variable, it would not allow for the possibility that households and firms act in anticipation to predictable terms of trade shocks.

A fixed-effects panel regression of the following form is estimated each for output volatility (σ_{it}^{Y}) and inflation volatility (σ_{it}^{π}):

$$\sigma_{it}^{X} = \delta\sigma_{it}^{TOT} + \theta\sigma_{it}^{TOT} ER_{it-1} + \psi Z_{it} + \varsigma FC_{t} + \mu_{i} + \lambda t + \eta_{it} \tag{6}$$

For X = Y or π and where ER_{it-1} is a dummy for a floating exchange rate regime, Z_{it} is a vector of control variables and FC_{t} is a dummy variable for the period affected by the current financial crisis (equal to 1 for t=8). In a deviation from the method of Andrews and Rees (2009), a time trend variable, t, is included in both regressions. In the output model, it is expected to pick up the well-documented international decline in output volatility since the 1970s. In the inflation model, it captures the general decline in inflation volatility over time, some of which can be explained by the shift in monetary policy regimes towards inflation targeting.[20] The FC_{t} dummy variable allows for a break in this trend during the recent crisis. Country-specific fixed effects (μ_{i}) are included to control for time-invariant factors, such as country size, that affect σ_{it}^{X}.

The exchange rate regime variable regime is defined according to the *de facto* exchange rate regime classification system outlined in Reinhart and Rogoff (2004) rather than the *de jure* regime. The variable takes a value of 1 when the exchange rate regime is freely floating, a managed float or dual market.[21,22] Results of a sensitivity analysis to the definition of the floating exchange rate regime is presented in Appendix A. Following Kent et al (2005) the structural variables in the regressions are lagged for two reasons: to capture the lagged effect of changes in these policy and institutional settings and to ensure exogeneity.

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20. Rather than use a time trend to capture the decline in output volatility, Andrews and Rees (2009) instead impose time-fixed effects.

21. Dual market refers to the case where at least one market-determined exchange rate exists for a country. Reinhart and Rogoff (2004) find that these types of arrangements have been used as a form of "back-door" floating, usually with accompanying exchange controls.

22. Andrews and Rees also include a dummy variable that takes a value of 1 when a country has a strict monetary policy. This variable is not included as adherence to the objective of strict monetary policy is influenced by the choice of exchange rate regime, and in many instances they would likely to be closely related.

Consistent with the related literature, all regressions contain a control variable representing the measure of openness to international trade (proxied by the ratio of exports plus imports to GDP). A measure of financial development is included, which, following the literature, is proxied by the ratio of domestic credit to GDP. The inflation volatility regressions also include the log of the average annual rate of inflation in the five years prior to the start of each window as well as a dummy variable that takes a value of one when an economy experiences a currency crisis during a five-year window.[23] Robust standard errors allowing for heteroskedasticity of unknown form are calculated.

The results for the output volatility regressions are shown in Table 6. Model 6.1 provides a baseline regression where the structural variables are included on their own but with no interaction with the terms of trade. The results show a positive relationship between (unanticipated) output volatility and (unanticipated) terms of trade volatility. The point estimate implies that if the volatility of annual terms of trade growth increased by one standard deviation, the volatility of annual GDP shocks increases by 10 percent; at the average level of volatility of GDP growth shocks (which is 2.16 percentage points), output growth volatility increases by 0.22 percentage points to 2.38 percentage points.[24] The coefficient on the floating exchange rate variable is consistent with our priors that a floating exchange rate should be associated with lower output volatility; on average, output growth volatility was 18 percent lower in economies with a floating exchange rate compared with fixed exchange rate economies, *ceteris paribus*.[25] The insignificant relationship between openness of trade and output volatility is consistent with some of the empirical literature that has failed

23. The currency crisis dummy takes a value of 1 when a country experienced a freely falling exchange rate regime, as defined by Reinhart and Rogoff (2004), at any time during a five-year block. These events usually coincide with the abandonment of less flexible exchange rate regimes.

24. A one standard deviation increase in the volatility of annual terms of trade shocks is equivalent to 0.83 log points (based on the log distribution of the output from equation (5) taken at five-year observations). The coefficient for terms of trade volatility in equation 6.1 is 0.12. Therefore a one standard deviation increase in the volatility of terms of trade shocks increases output volatility by $(e^{(0.83*0.12)}-1)*100=10$ percent. The average volatility of annual GDP shocks increases from 2.16 percentage points (the exponent of 0.77 log points, the mean of the GDP growth shock log distribution) to 2.38 percentage points (the exponent of 0.87 log points).

25. Note that output volatility is 18 percent lower and not 18 percentage points lower.

to find a strong correlation between the degree of goods mobility across borders and output (and its components) (Razin and Rose, 1994). The weak relationship between financial market development and output volatility is consistent with the literature that the relationship can be ambiguous (Beck et al, 2006). The trend term is negative (and significant) consistent with a general trend decline in output volatility over time, albeit with an increase during the financial crisis, as indicated by the dummy for that period.

The remaining models include an interaction term between the terms of trade and a floating exchange rate regime. They find that the output growth response of an economy with a floating exchange rate will be less volatile to a terms of trade shock than an economy with a fixed exchange rate. Model 6.2 (excluding the standalone dummy for the floating exchange rate) suggests that given a one standard deviation increase in the volatility of terms of trade shocks, *ceteris paribus*, annual output volatility will increase by significantly less in economies with a floating exchange rate: at the average level of GDP growth shocks, the increase in output volatility resulting from a terms of trade shock is 0.19 percentage points less under a floating exchange rate.[26] A similar result is found in Model 6.3, where the coefficients on both the floating exchange rate dummy and its interaction with the terms of trade are both negative. Although the coefficients are individually insignificant, they are jointly significant using a Wald test.

The evidence for the shock-absorbing influence of a floating exchange rate is less robust in the inflation volatility equations. In none of the specifications is the floating exchange rate control or the interaction term statistically significant; however, they are both negative. Model 7.1 suggests that inflation volatility for

26. In model 6.2, a one standard deviation increase in terms of trade volatility increases output volatility by $(e^{(0.83*0.14)}-1)*100=12$ percent for an economy with a non-floating exchange rate regime and by $(e^{(0.83*0.14) + (0.83*-0.10)}-1)*100=3$ percent in an economy with a floating exchange rate. At the average level of GDP growth shocks (0.77 log points), the increase in the average volatility of annual GDP shocks is 0.19 percentage points lower (calculated as the difference between the exponents of 0.80 log points and the exponent of 0.89 log points) for an economy with a floating exchange rate.

Table 6
Panel Regression Results – Output Volatility
Fixed-effects estimation, five-year blocks, the first ending in 1975, the last in 2009^
Fixed-effects estimation, five-year blocks, the first ending in 1975, the last in 2009^

	Model		
	[6.1]	[6.2]	[6.3]
Terms of trade variables			
σ Terms of trade $_t$	0.12**	0.14**	0.13**
σ Terms of trade $_t$ * Floating exchange rate $_{t-1}$		–0.10**	–0.04
Control variables			
Floating exchange rate $_{t-1}$	–0.20**		–0.14
Openness $_{t-1}$	0.21	0.22	0.22
Credit per cent of GDP $_{t-1}$	0.03	0.03	0.03
FC $_t$	0.54***	0.53***	0.54***
Trend	–0.09***	–0.09***	–0.09***
Wald tests (p-values)			
H0: terms of trade shocks (including interactions) (jointly) = 0		0.06	0.08
H0: floating exchange rate (and interaction) (jointly) = 0			0.04
Number of countries/observations	47/354	47/354	47/354
R^2 within	0.16	0.16	0.16

Notes: ^ the time block ending in 2009 is four years in length
***, **, * indicate that the coefficients are significant at the 1, 5, 10% levels using robust standard errors, respectively.

economies with a floating exchange rate is 14 percent lower than for economies with a fixed exchange rate. Model 7.2 suggests that given a one standard deviation increase in the volatility of terms of trade shocks, *ceteris paribus*, annual inflation volatility will increase by less in economies with a floating exchange rate: at the average level of inflation shocks, the increase in inflation volatility resulting from a terms of trade shock is 0.18 percentage points lower under a floating exchange rate.[27]

27. In model 7.2, a one standard deviation increase in terms of trade volatility increases inflation volatility by $(e^{(0.83*0.12)}-1)*100=10$ percent for an economy with a non-floating exchange rate regime and by $(e^{(0.83*0.12)+(0.83*-0.08)}-1)*100=3$ percent in an economy with a floating exchange rate. At the average level of inflation shocks (0.91 log points), the increase in the average volatility of annual inflation shocks is 0.18 percentage points lower (calculated as the difference between the exponents of 0.95 log points and the exponent of 1.01 log points) for an economy with a floating exchange rate.

Table 7
Panel Regression Results – Inflation Volatility

Fixed-effects estimation, five-year blocks, the first ending in 1975, the last in 2009^

Fixed-effects estimation, five-year blocks, the first ending in 1975, the last in 2009^

	Model		
	[7.1]	[7.2]	[7.3]
Terms of trade variables			
σ Terms of trade $_t$	0.10*	0.12*	0.11*
σ Terms of trade $_t$ * Floating exchange rate $_{t-1}$		–0.08	–0.03
Control variables			
Floating exchange rate $_{t-1}$	–0.15		–0.10
Openness $_{t-1}$	–0.55***	–0.54***	–0.56***
Credit $_{t-1}$	0.17	0.17	0.17
Inflation $_{t-1}$	0.25***	0.25***	0.25***
Currency crisis $_t$	1.09***	1.09***	1.09***
FC $_t$	1.00***	1.00***	1.00***
Trend	–0.15***	–0.15***	–0.15***
Wald tests (p-values)			
H0: terms of trade shocks (including interactions) (jointly) = 0		0.14	0.20
H0: floating exchange rate (and interaction) (jointly) = 0			0.51
Number of countries/observations	47/350	47/350	47/350
R^2 within	0.51	0.51	0.51

Notes: ^ the time block ending in 2009 is four years in length
***, **, * indicate that the coefficients are significant at the 1, 5, 10% levels using robust standard errors, respectively.

Adjusting the definition of a floating exchange rate regime dummy variable so that it includes freely floating exchange rate regimes only – corresponding with the countries that are able to pursue monetary policy truly independent of the exchange rate – the coefficient on the interaction term of terms of trade shocks and the floating exchange rate dummy is negative and statistically significant (see Appendix B, Model B3.1).[28]

28. The large currency crisis in Bolivia in the late 1970s appears to be influencing the results; removing Bolivia from the sample yields a statistically significant negative coefficient for the floating exchange rate interaction term in model 7.2 (negative and insignificant in 7.3).

The treatment of euro area economies included in the panel may be understating the shock-absorbing effects of floating exchange rate regimes for the inflation volatility regressions, given the inflation targeting success of the European Central Bank (ECB). According to Reinhart and Rogoff (2004), the exchange rate regime of euro area countries (since the adoption of the euro) is defined as 'fixed'.[29] Although this is accurate for the smaller member countries, it is unlikely to be the correct treatment for some of the larger ones including Germany, France and Italy, although any attempt to identify these countries is likely to be complicated.

The signs of the other variables in the inflation equations are as expected, as was the case in the output volatility equations. Of particular interest is the highly significant negative coefficient for the trade share of GDP (the 'openness 'variable). Countries more open to trade are estimated to have less inflation volatility perhaps owing to their willingness to substitute between domestic and international goods and services.

Australia's performance in response to a number of external shocks over the past couple of decades and evidence from the cross-country model supports the notion that floating exchange rates act as macroeconomic shock-absorbers. The output growth response of an economy with a floating exchange rate is less volatile to a terms of trade shock than an economy with a fixed exchange rate. This is a considerably stronger result than found in Andrews and Rees (2009). In contrast, the results of the inflation volatility regressions presented here are less convincing than those found in Andrews and Rees (2009). One possible explanation for these differences is the smaller sample of countries used in this paper. By excluding most of Africa and the Middle East, the inflation volatility of fixed exchange rate regimes has been reduced, making the stabilisation benefits of floating exchange rate less evident in this paper.

The results found in this paper are similar to those of the other cross-country studies that have used a panel VAR framework. Broda (2004) models the response of real GDP, the real exchange rate and consumer prices to terms of trade changes across different exchange rate regimes for a sample of developing countries. Hoffman (2007) models the response of real GDP, the trade balance and the real exchange rate to world output and world real interest rate shocks. Both of these papers find that floating exchange rates moderate the response of domestic output to foreign shocks. The results are most

29. The euro area countries fall under this definition because they each have no separate legal tender.

conclusive in the event of a negative shock and resulting real depreciation. Interestingly (and somewhat consistent with our less certain results), Broda finds that domestic price responses to a terms of trade shock are not significantly different between a floating and fixed exchange rate regime.

5. Lessons from the Australian Experience

This section turns to the question of what policy lessons might be learnt from Australia's experience in adopting a floating exchange rate. While it has been argued that the floating exchange rate regime has overall been beneficial for the Australian economy, it seems that a number of features of the Australian system contributed to its success, as well as a certain degree of good luck.

5.1 Financial Market Deregulation and Development

Financial market deregulation had largely (although only recently) taken place prior to the floating of the Australian dollar in late 1983. As outlined in Section 2 of the paper, this significantly changed the commercial banks' business model from mainly that of an asset manager to one where they had to more actively manage both sides of the bank's balance sheet, in an environment of increased competition. This encouraged more market-based pricing for loans and deposits and was expected to improve the allocation of capital as a result. It also reduced the Reserve Bank's ability to influence growth in bank balance sheets by varying the SRD and LGS ratios, although it paved the way for interest rates to become a more effective tool for monetary policy. Nevertheless, while the exchange rate was still fixed, its capacity to influence domestic monetary conditions was limited.

Capital controls also became less effective as new market developments (such as the introduction of currency futures) better enabled market participants to circumvent these controls (within the rules). In these respects, financial market developments were an important contributor – and probably brought forward – the ultimate decision to float the currency. They also provided good preparation for the eventual float. In particular, the development of domestically based hedging markets (although small) gave market participants some practice in trading and enabled more sophisticated approaches to be taken to managing exchange rate risk even prior to the float.[30]

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30. Interestingly, the non-deliverable currency hedge market in Australia developed onshore, which is in contrast to most current non-deliverable forward markets in Asia (Debelle, Gyntelberg and Plumb, 2006).

The approach taken in Australia to largely deregulate the financial system before capital account liberalisation largely accords with what is now advocated by much of the literature on the sequencing of reforms (see, for example, Arteta, Eichengreen and Wyplosz, 2001 and Johnston, 1998). The rationale is that a well-functioning financial sector is needed to help allocate the large inflow of foreign capital that might follow capital account liberalisation, and conversely to help avoid the outflow of domestic capital that might otherwise result. The challenge is often to manage large capital inflow in a way that results in a well-directed increase in investment rather than merely the inflation of asset prices, and to avoid creating financial fragility in the banking sector.

In Australia's case, there was a very rapid expansion of credit to households and businesses in the second half of the 1980s, partly a result of financial deregulation, as banks were now free to expand their balance sheets, but also as the banking sector obtained greater access to foreign capital. This fed into a domestic asset price bubble and, with the collapse of this bubble in the early 1990s, it resulted in two smaller state-owned banks and some non-bank financial institutions becoming bankrupt while two of Australia's largest four banks recorded large losses (although these were able to absorbed by bank capital) (Gizycki and Lowe, 2000). Also, in the immediate post-float period, some corporates took advantage of the new opportunity that presented itself to borrow (unhedged) in foreign currency, most notably in Swiss francs. When the exchange rate subsequently depreciated – by approximately 50 percent against the Swiss franc between the beginning of 1985 and the beginning of 1987 – some large losses were realised. Overall, however, this episode did not prove to be particularly costly and provided some salutary lessons regarding the management of exchange rate risk.

As discussed in Section 2 of the paper, the floating of the Australian dollar was critical for the development of the Australian dollar spot and forwards markets. It also involved the decision to fully liberalise the capital account at the same time as floating the exchange rate, which was largely motivated by a desire not to restrict market participation in order to promote the development and the deepening of these markets. Development of the forwards market was particularly important in terms of expanding Australia's capacity to hedge its foreign-currency risk (discussed below).

5.2 Strong Institutions and Policy Frameworks

In the literature, there is a strong recognition that the performance of a floating exchange rate regime can depend on the strength or weakness of

domestic institutions (see, for example, Calvo and Mishkin, 2003; and Caballero, Cowan and Kearns, 2004). For example, an increased risk of a sudden stop in capital or an inability to raise funds offshore in domestic currency or hedge foreign-currency exposures can be consequences of weak domestic institutions. Such factors add to domestic financial fragility and ultimately the risk of currency crises. This has led some to advocate a fixed exchange rate for countries where institutions are weak. Instead, others have argued that the desire to shift to a floating exchange rate can provide the impetus for reforms to take place. This discussion is often couched in terms of the experience of emerging market economies where institutions have often been perceived to be weak and financial crises have been recurrent.

There are a reasonably broad range of factors canvassed in the literature that are expected to contribute to institutional strength (see Mishkin, 2001; and many others). These include well-articulated and credible policy frameworks, at least a recent history of no default on sovereign debt, strong prudential supervision of the banking sector and a strong legal and judicial system, including sound bankruptcy procedures.

Australia has been fortunate to have received a strong institutional endowment from the United Kingdom, with the legal system and many institutional structures at least originally based on their UK counterpart. Australia has a solid reputation in terms of providing sound supervision to its banking sector, with the four major Australian banks attracting strong credit ratings, currently AA- or higher according to the major credit rating agencies. Australia has an AAA sovereign credit rating, with the Australian government having established its low-risk credentials particularly during the late 1920s/early 1930s. During this episode, the Australian government effectively faced a sudden stop in capital as New York stopped lending to Australia and funds from London were restricted. The Australian government chose at this time to implement austerity measures rather than default on its debt. Between April and June 1931, the Commonwealth government even covered the interest payments on the external debt of the New South Wales government (which is one of Australia's states) to ensure that the government's credit rating was protected. On the back of such credentials, foreigners have been willing to purchase Australian government debt issued offshore in Australian dollars since the 1980s.

When the Australian dollar was floated, it was recognised that by opening up the economy more broadly to market scrutiny, it should provide further impetus for the reform process to continue. The argument that the strength of institutions themselves can depend on the exchange rate regime, is sometimes suggested

as a rationale for adopting a floating exchange rate even if institutions are weak; however, this would certainly not be the ideal approach for bringing about institutional reform. One other consequence of floating the exchange rate, in Australia's case at least, is that it supported greater independence of the Reserve Bank. It removed the daily involvement of other government authorities in the daily setting of the exchange rate. When monetary targeting was abandoned as the monetary policy framework a little over a year after the float, the influence of the government – which had set the annual monetary target – was further reduced. These were important steps towards the effective independence of the Reserve Bank from the early to mid-1990s.

In the second half of the 1980s, as monetary targeting was being abandoned – not only in Australia but also elsewhere – and as the idea of inflation targeting had not yet emerged, thinking on monetary policy was largely in a state of flux. However, in the 1990s, the government established credible and transparent policy frameworks. In the early 1990s, the Reserve Bank had adopted a formal inflation target of 2-3 percent on average over the cycle. The Australian government subsequently adopted a medium-term fiscal policy framework, aimed at maintaining a budget balance on average over the course of the cycle and, in the late 1990s, the government established its Charter of Budget Honesty. These approaches have offered transparency about the authorities' policy objectives and demonstrate a commitment to sound policies. However, it was also understood in Australia that the credibility of these policies is only ultimately established through a strong record of low inflation and fiscal responsibility.

5.3 Other Factors Affecting Resilience

One common concern is that floating the exchange rate will introduce new risks to the economy, which will tend to more acute in the short term when markets may not be well positioned to manage these risks. This may be because markets are not yet deep or well developed (lacking depth in hedging markets in particular), and domestic agents are not yet experienced with managing these new risks. However, in the longer term, the benefits should be offsetting, including an increase in the resilience of the economy to external shocks (as discussed in Section 4) and more market-oriented pricing in the economy (particularly with regards domestic interest rates). That is, in shifting to a floating exchange rate regime, there is a certain need to trade-off the longer term benefits against some degree of increased risk in the short term.

To a certain extent, the ability of the economy to reallocate resources in the event of external shock will depend on frictions in the economy. In this regard,

other economic reforms are certainly complementary to the potential benefits to an economy of floating exchange rate regime. In Australia, there were a number of reforms undertaken, most particularly in the decade or so after the float, aimed at increasing the flexibility of the labour market and reducing rigidities in the wage-setting process, in particular making wage increases more closely tied to productivity gains.

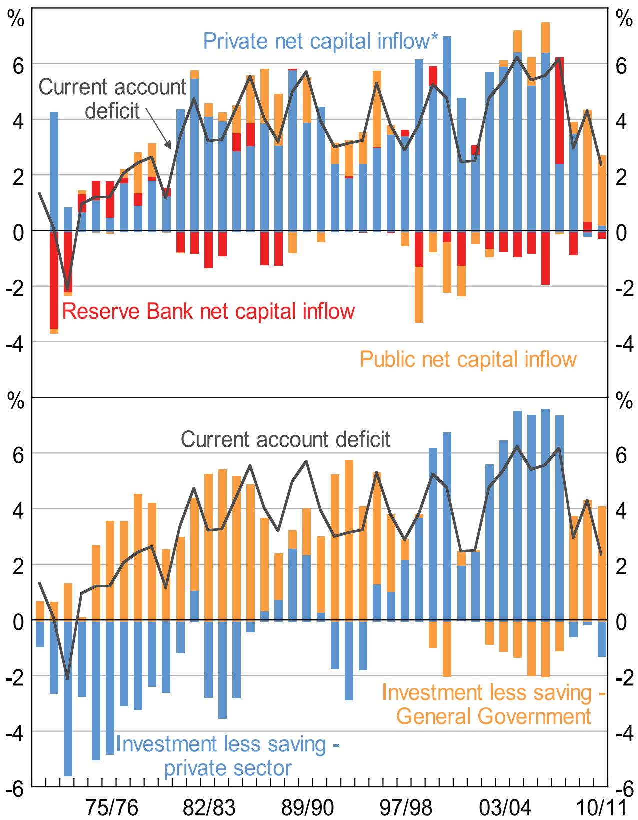
Among some emerging market countries that have had a heavy reliance on export-led growth, there is the concern that their domestic economies lack sufficient diversification to see the desired reallocation of resources between the tradables and non-tradables sectors when there is a change in international competitiveness. This tends to create a particular asymmetric concern about an exchange rate appreciation (the ‘fear of appreciation’ discussed by Levy-Yeyati and Sturzenegger, 2007) if it is thought that there may be limitations in the ability of non-tradables to grow sufficiently quickly to offset declines in output growth in the tradables sector. However, of course, resisting this appreciation tends to reinforce the reliance of the economy on the tradables sector.

One of the key new risks to be managed when adopting a floating exchange rate is the management of exchange rate risk. However, one of the difficulties of a fixed exchange rate regime is that it is not entirely without exchange rate risk altogether, as exchange rate pegs are rarely maintained indefinitely. When they are broken in order to devalue the currency, there are two particular problems that can arise: firstly, domestic agents may have underestimated the exchange rate risk under the fixed exchange rate regime and have taken on excessive foreign-currency exposures (i.e., ‘original sin’); and secondly, even if they had hoped to hedge this risk, there may not have been sufficient depth in derivative markets to provide a reliable and cost-effective means to do so. Moreover, if domestic agents had instead been expecting an exchange rate appreciation owing to some perception that the exchange rate was undervalued at the current level, they may have been willing to accept the exchange rate risk. In recent decades, such factors have on a number of occasions culminated in currency crises in emerging market countries.

One concern that has been raised for Australia is the potential external vulnerability that might result from sharp movements in the exchange rate or a sudden stop in capital given Australia’s relatively high level of external debt, most of which is held by the banking sector. There are two related aspects here: the sustainability of external debt (that is, will the debt be repaid under any scenario) and the exchange rate risk of external debt (that is, will an otherwise

sustainable amount of debt become unsustainable if the exchange rate depreciates sharply). These questions ask whether a potentially sharp adjustment in external debt could be required in the future, with a corresponding costly adjustment to the domestic economy, or even potentially the prospect of default. As discussed in Section 2, this was a topic of considerable debate in Australia in the late 1980s, couched in particular in terms of the sustainability of Australia's current account deficits, which are relatively wide by industrial country standards (Belkar, Cockerell and Kent, 2007). While Australia has recorded a current account deficit almost continuously since at least the 1860s, it widened from an average of around 2½ percent over the decade prior to the float to an average of around 4¼ percent since.

Figure 10
Current Account Deficit
Per cent of GDP

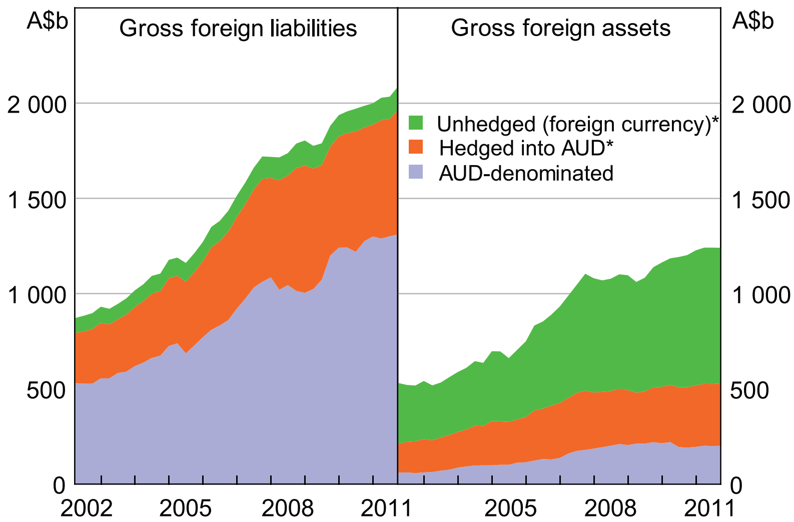


* Adjusted for the US dollar swap facility in 2008–09
Sources: ABS; RBA

The conclusion from the Australian debate favoured the 'consenting adults' view, which contends that the sustainability of the current account deficit will depend on whether capital inflows are largely the result of private decisions and that the capital is being put to good productive use. If funds are extended based on a reasonable assessment of the risks and are received by domestic agents with every reasonable expectation that they will have the capacity to repay, then the external debt position represents decisions made between 'consenting adults'. This view is now widely accepted in Australia, particularly given there should be good investment opportunities in Australia (particularly, since when the Australian dollar was floated, Australia had some catching up' to do and, more recently, the sizeable opportunities for mining production) and since most of these deficits have represented borrowing for private investment. (Note the recent decline in the gap between investment and saving for the private sector primarily represents an increase in private saving whereas private investment as a share of GDP has had only a modest decline.)

The exchange rate risk of Australian foreign-currency borrowing has been largely managed through a combination of issuing some portion of debt in offshore markets in Australian dollar terms and hedging most of the remaining risk. The ability to do both these things relies on the willingness of foreigners to accept Australian dollar exposures. In terms of Australia's foreign debt liabilities, more than one-half are in Australian dollars. The banking sector – which holds the majority of Australia's foreign debt liabilities – hedges virtually all of its foreign-currency exposures. Hedging is less complete by Australian corporates, although many have natural hedges with offshore income and expenses often being denominated in a common currency (typically US dollars). Overall, this results in Australia holding a net asset (rather than a net liability) position in foreign currency.

Figure 11
Currency Composition of Australia's External Position
Quarterly



* Hedge ratios inferred from 2001, 2005 and 2009 Hedging Surveys
Sources: ABS; RBA

This then raises the question as to the refinancing risk on Australia's external debt, and in particularly the vulnerability of this debt to a sudden stop to capital markets. Even though it would seem most of Australia's debt could be repaid in Australian dollars, loss of access to international capital markets would nevertheless impose some process of adjustment on the domestic economy. In the first instance, the adverse effect of a sudden stop should be a significant depreciation of the exchange rate that at some low enough level should entice the resumption of foreign investment in Australian assets (Debelle, 2011).

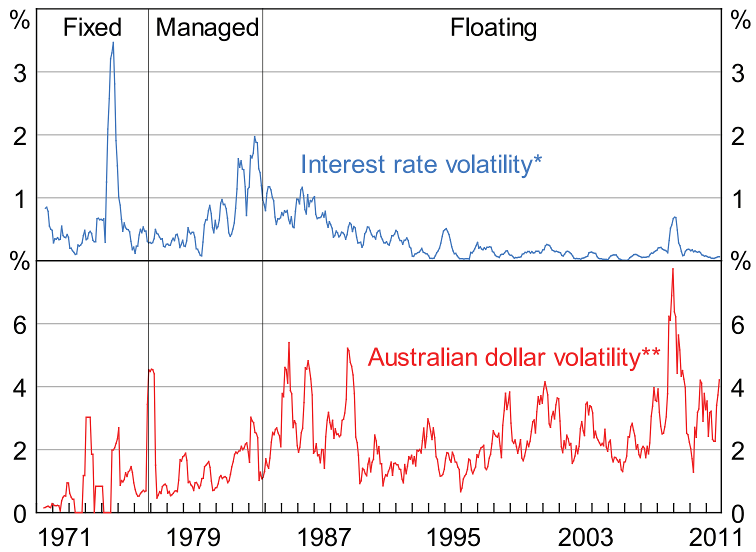
5.4 Independence of Monetary Policy

Finally, one of the policy lessons for Australia has been the significant benefits of having independent monetary policy. As already mentioned, in the event of an external shock, both the exchange rate and monetary policy can potentially be used to counter its effect on the domestic economy. This stands in contrast to a fixed exchange rate regime where these measures offer no such buffer and, if anything, tend to reinforce the adverse effects of an external shock.

Moreover, by accepting an increase in the volatility in the exchange rate, the volatility of interest rates is reduced. It is not clear then why a volatile exchange rate – which affects the tradables sectors most directly – should necessarily be that much more problematic than a volatile interest rate – which impacts the whole economy. One important difference is that the mismanagement of an exchange rate risk may result in an external vulnerability whereas any adverse consequences of interest rate volatility will be an internal cost. However, as mentioned, it is not the case that exchange rate risk is avoided under a fixed exchange rate regime; indeed, currency crises have been more prevalent among countries with fixed exchange rates. Instead, some of the volatility in the exchange rate under a floating exchange rate regime can be the result of its doing its job in mitigating the effect of external shocks.

Figure 12
Australian Interest Rate and Exchange Rate Volatility

Absolute monthly percentage point change, 6-month rolling average



* 90-day bank bill
** Against US dollar
Sources: RBA; Thomson Reuters

6. Conclusion

Given Australia's economic performance since the float in the face of some sizeable economic shocks, it is our sense that the shock-absorbing role of a flexible exchange rate has been substantial. However, it is important to recognise that the shock-absorbing mechanism has had two parts: one part because the exchange rate adjustment to shocks has a counterbalancing effect on the domestic economy; and the second part from the ability to operate monetary policy in defence of domestic inflation and growth rather than in defence of a particular level of the exchange rate. If anything, the second part has probably been the more important.

The float of the Australian dollar, however, was not a stand-alone event. In the context of the sequencing literature, this would seem to be important. It was underpinned by a broader package of financial and economic reforms, designed to reduce distortions and allow the financial system and economy to become more flexible and to develop based on market-oriented incentives. It was further supported by a well-capitalised and strongly supervised banking sector, which has taken a significant role in intermediating capital inflow into Australia since the Australian dollar was floated. A credible record of good economic management and financial stability has probably been equally important in this regard. These reforms appear to have been critical in fostering the deepening and development of markets, and developing the 'country trust'[31] that offers some protection against financial crises. Moreover, it casts some doubt on the notion that countries should wait for financial market development to take place before floating their exchange rates, as there would appear to be a certain degree of dependence of the one on the other.

Not surprisingly, the Australian dollar has been more volatile after the float than before. However, the stability of a fixed exchange rate regime is perhaps at times overstated. In Australia's case, large misalignments would build up that would ultimately require large discrete adjustments. Moreover, the stability of the exchange rate meted out its cost through instability in domestic financial conditions. This trade-off was an important reason behind why the Australian dollar was floated in the first place. Even though the Australian dollar has been more volatile since the float, it would seem that fundamental factors (the terms of trade in particular) have been important drivers of the exchange rate over the medium term.

31. A term used by Caballero, et al (2004).

Market participants and other domestic economic agents had a range of new risks to manage after the exchange rate was floated. This not only included increased volatility in the exchange rate but also an increase in capital inflows and a rapid expansion of credit to the private sector (following the deregulation of the banking sector) throughout the latter part of the 1980s. This exposed some weaknesses in the banking sectors' management of risk and created an asset price bubble that ended with a recession in the early 1990s. Some domestic corporates also learnt about the potential dangers of borrowing unhedged in foreign currency. In the end, this resulted in banks and corporates being more mindful to manage these types of risks, and it was probably a less costly lesson by having been learnt early.

A particular focus of attention has been on Australia's persistent current account deficit positions and relatively large holdings of external debt by the Australian banking sector. Over time, however, it has become widely accepted that Australia's current account deficits have been largely 'good' as they finance profitable investment opportunities in Australia. Nevertheless, this raises the question of the vulnerability of this debt to exchange rate movements or sudden stops in capital flows. The critical element here is Australia's significant hedging of the exchange rate risk of its foreign-currency debt. In fact, after accounting for the hedging, Australia has a net asset position in foreign currency. In turn, this provides some protection against sudden stops since outstanding debt can be largely repaid in domestic currency. The matching of both maturity and currency in the management of exchange rate risk, however, is necessary if hedging is to be considered almost complete.

This ability of Australia to hedge foreign-currency risks requires the willingness of foreigners to take on Australian dollar exposures, which reinforces the need for credible and well implemented domestic policies. Australia's ability to retain market confidence has been well tested through significant negative shocks since the Australian dollar was floated. The Australian dollar recorded significant depreciations against the major currencies in each case, but access to international capital markets was largely retained. Instead of following other countries into crisis, in each of these episodes it appears that the floating exchange rate regime has generally worked as theory would suggest, that is to mitigate the effects of external shocks.

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Appendix A

Simple Models of Australian Import, Service Export, and Manufactured Export Volumes

The trade balance (and GDP) estimates for the Australian economy under a hypothetical fixed exchange rate regime are derived from simple error-correction models of import, manufactured export and service export volumes. The exercise is conducted for three 2-year periods beginning in the 1997:Q1, 2000:Q1 and 2008:Q3 respectively.

To estimate these aggregates under a fixed exchange rate regime, the nominal exchange rate variable is held constant at its level observed in the quarter preceding each 2-year period. Using the coefficients produced from historical estimates of each model up to and including 2011:Q1, dynamic export and import volumes are forecast under both a fixed and floating exchange rate regime. The difference in these forecasts is then applied to the observed national accounts data to calculate the fixed exchange rate estimates that appear in the graph. The specifications and estimated coefficients for each model are detailed below.

Export Models

Service export volumes model:

$$\Delta SXVOL_t = \delta_0 + \delta_1 SXVOL_{t-1} + \delta_2 TP_{t-1} + \delta_3 REXR_{t-1} + \delta_4 \Delta TP_t + \delta_5 OLYMPICS_t + \delta_6 TERRORSR_t + \delta_7 TERRORLR_t + \delta_8 SARS_t + \sum_{i=1}^{4} \beta_i \Delta SXVOL_{t-i} + \sum_{j=0}^{2} \phi_j \Delta REXR_{t-j} + \varepsilon_t$$

Table A1
Service Export Volumes

Coefficients estimated using quarterly data for 1991:1–2011:1					
δ_0	0.68**	δ_6	–0.10***	β_4	–0.05
(s.e)	(0.27)		(0.03)		(0.08)
δ_1	–0.10*	δ_7	–0.00	ϕ_0	–0.12*
	(0.06)		(0.01)		(0.07)
δ_2	0.18	δ_8	–0.08***	ϕ_1	–0.07
	(0.12)		(0.02)		(0.06)
δ_3	–0.13**	β_1	–0.13*	ϕ_2	0.14**
	(0.06)		(0.08)		0.06
δ_4	0.73*	β_2	0.03		
	(0.37)		(0.08)		
δ_5	0.15***	β_3	0.09		
	(0.02)		(0.08)		

Observations = 81; Adjusted R^2 = 0.72; Durbin Watson = 2.28

***, **, * denotes significance at the 1, 5 and 10% levels respectively. All series (except dummy variables) are expressed as logs.

Manufactured export volumes model:

$$\Delta MANEX_t = \delta_0 + \delta_1 MANEX_{t-1} + \delta_2 TP_{t-1} + \delta_3 REXR_{t-1} + \delta_4 Time2002_t + \delta_5 Dum983_t + \sum_{i=1}^{4}\beta_i \Delta MANEX_{t-i} + \sum_{k=0}^{1}\psi_k \Delta TP_{t-k} + \sum_{j=0}^{2}\phi_j \Delta REXR_{t-j} + \sum_{l=0}^{1}\gamma_l \Delta DFD_{t-l} + \quad_t$$

Table A2
Manufactured Export Volumes

Coefficients estimated using quarterly data for 1991:1–2011:1

δ_0	0.18	β_1	–0.24*	ϕ_0	–0.01
(s.e)	(0.27)		(0.12)		(0.11)
δ_1	–0.10	β_2	–0.02	ϕ_1	0.06
	(0.09)		(0.12)		(0.12)
δ_2	0.20	β_3	–0.01	ϕ_2	0.19
	(0.23)		(0.11)		(0.12)
δ_3	–0.05	β_4	–0.17*	γ_0	0.00
	(0.09)		(0.10)		(0.58)
δ_4	–0.02	ψ_0	1.79*	γ_1	–1.01*
	(0.02)		(0.91)		(0.54)
δ_5	–0.09**	ψ_1	0.56		
	(0.04)		(1.01)		

Observations = 81; Adjusted R^2 = 0.31; Durbin Watson = 1.76

***, **, * denotes significance at the 1, 5 and 10% levels respectively. All series (except dummy variables) are expressed as logs.

Where:

SXVOL = chain volume of service exports

MANEX = chain volume of service exports

TP = index of export-weighted trading partner activity

REXR = export-weighted real exchange rate

OLYMPICS = 2000 Olympics dummy variable, which equals 1 in 2000:3 and –1 in 2000:4

TERRORSR = dummy, which equals 1 in 2001:4; 0 otherwise

TERRORLR = dummy, which equals 1 after 2002:2; 0 otherwise

SARS = dummy, which equals 1 in 2003:3; 0 otherwise.

DFD = domestic final demand

*Time*2002 = dummy, which equals 1 from 2002:1 onwards; 0 otherwise

*Dum*983 = dummy, which equals 1 in 1998:3; 0 otherwise

Import Model

The nominal exchange rate variable (G7-GDP-weighted exchange rate) enters the import volumes model through its effect on the relative price of imports (the *RELP* variable), where an appreciation of the Australian dollar is associated with a decrease in *RELP, ceteris paribus*. The estimates of export volumes (incorporating estimates from the service and manufactured export models above) are also used in calculating the *RELP* and *NIG* variables.

Import volumes model:

$$\Delta M_t = \delta_0 + \delta_1 M_{t-1} + \delta_2 NIG_{t-1} + \delta_3 RELP_{t-1} + \delta_4 \Delta NIG_t + \delta_5 \Delta RELP_t + \delta_6 \Delta M_{t-2} + \delta_7 \Delta STOCKS_t + \delta_8 \Delta INT_t + \varepsilon_t$$

Where:

M = chain volume of imported goods and services

NIG = chain volume of domestic final demand + exports

RELP = price of imports relative to the price index of domestic manufactures.

STOCKS = non-farm inventory investment.

INT = Australian cash rate.

Table A3
Import Volumes

Coefficients estimated using quarterly data for 1987:2–2011:1

δ_0	–3.10***	δ_5	–0.36***
(s.e)	(0.68)		(0.07)
δ_1	–0.35***	δ_6	0.17**
	(0.06)		(0.07)
δ_2	0.54***	δ_7	0.00*
	(0.11)		(0.00)
δ_3	–0.17***	δ_8	0.07***
	(0.04)		(0.03)
δ_4	1.67***		
	(0.23)		

Observations = 96; Adjusted R^2 = 0.66; Durbin Watson = 2.01
***, **, * denotes significance at the 1, 5 and 10% levels respectively. All series (except dummy variables) are expressed as logs.

Appendix B

List of Countries and Sensitivity Analysis Related to Cross-country Panel Model

The countries used for the cross-country panel model presented in Section 4.1 are listed in Table B1.

Table B1

List of Countries Included in Cross-country Panel Model

Australia	France	Korea, Republic of	Spain
Belgium	Germany	Malaysia	Sweden
Brazil	Greece	Mauritius	Switzerland
Bolivia	Honduras	Mexico	Thailand
Canada	Hong Kong	Morocco	Tunisia
Colombia	Hungary	New Zealand	Turkey
Costa Rica	Iceland	Norway	Great Britain
Denmark	India	Panama	Uruguay
Dominican Republic	Indonesia	Paraguay	
Ecuador	Ireland	Peru	
Egypt	Italy	Philippines	
El Salvador	Japan	Portugal	
Finland	Jordan	South Africa	

Reinhart and Rogoff (2004) develop a system for reclassifying historical exchange rate regimes into 15 independent brackets. Using different combinations of these *de* facto exchange rate regimes, the regression tables below model the sensitivity of the panel model results presented in Section 4.1.

Four exchange rate regime combinations are modelled. The categories progressively include less flexible regimes. Using the terminology of Reinhart and Rogoff (2004), the categories are: (1) freely floating or dual market; (2) freely floating, dual market or managed floating (the baseline combination); (3) freely floating, dual market, managed floating, moving band or wide *de facto* crawling band; and (4) freely floating, dual market, managed floating, moving band, wide *de facto* crawling band, pre-announced crawling band or narrow *de facto* crawling band. The results for output and inflation are shown using the definitions (1)-(4) in the following tables.

Table B2

Panel Regression Results – Output Volatility – Exchange Rate Regime Definition Sensitivity

Fixed-effects estimation, five-year blocks, the first ending in 1975, the last in 2009^				
	Regression			
	[B2.1]	[B2.2]#	[B2.3]	[B2.4]
Terms of trade variables				
σ Terms of trade $_t$	0.11**	0.13**	0.11*	0.17**
σ Terms of trade $_t$ * Floating exchange rate (1) $_{t-1}$	–0.03			
σ Terms of trade $_t$ * Floating exchange rate (2) $_{t-1}$		–0.04		
σ Terms of trade $_t$ * Floating exchange rate (3) $_{t-1}$			0.00	
σ Terms of trade $_t$ * Floating exchange rate (4) $_{t-1}$				-0.09
Control variables				
Floating exchange rate (1) $_{t-1}$	–0.13			
Floating exchange rate (2) $_{t-1}$		–0.14		
Floating exchange rate (3) $_{t-1}$			0.05	
Floating exchange rate (4) $_{t-1}$				0.14
Openness $_{t-1}$	0.19	0.22	0.21	0.21
Credit $_{t-1}$	0.04	0.03	0.03	0.03
FC $_t$	0.53***	0.54***	0.54***	0.54***
Trend	–0.09***	–0.09***	–0.09***	–0.09***
Wald tests (p-values)				
H0: terms of trade shocks (including interactions) (jointly) = 0	0.08	0.08	0.07	0.07
H0: floating exchange rate (and interaction) (jointly) = 0	0.43	0.04	0.79	0.60
Number of countries/observations	47/354	47/354	47/354	47/354
R^2 within	0.15	0.16	0.15	0.15

Notes: ^ the time block ending in 2009 is four years in length
Regression included in the body of the paper
***, **, * indicate that the coefficients are significant at the 1, 5, 10% levels using robust standard errors, respectively.

Table B3

Panel Regression Results – Inflation Volatility – Exchange Rate Regime Definition Sensitivity

Fixed-effects estimation, five-year blocks, the first ending in 1975, the last in 2009^

	Regression			
	[B3.1]	[B3.2]#	[B3.3]	[B3.4]
Terms of trade variables				
σ Terms of trade $_t$	0.13**	0.11*	0.17***	0.22***
σ Terms of trade $_t$ * Floating exchange rate (1) $_{t-1}$	–0.42**			
σ Terms of trade $_t$ * Floating exchange rate (2) $_{t-1}$		–0.03		
σ Terms of trade $_t$ * Floating exchange rate (3) $_{t-1}$			–0.21**	
σ Terms of trade $_t$ * Floating exchange rate (4) $_{t-1}$				–0.19**
Control variables				
Floating exchange rate (1) $_{t-1}$	0.63*			
Floating exchange rate (2) $_{t-1}$		–0.10		
Floating exchange rate (3) $_{t-1}$			0.27	
Floating exchange rate (4) $_{t-1}$				0.18
Openness $_{t-1}$	–0.53***	–0.56***	–0.56***	–0.53***
Credit $_{t-1}$	0.17	0.17	0.16	0.17
Inflation $_{t-1}$	0.25***	0.25***	0.25***	0.24***
Currency crisis $_t$	1.09***	1.09***	1.12***	1.06***
FC $_t$	1.03***	1.00***	1.00***	0.98***
Trend	–0.16***	–0.15***	–0.15***	–0.16***
Wald tests (p-values)				
H0: terms of trade shocks (including interactions) (jointly) = 0	0.01	0.20	0.02	0.02
H0: floating exchange rate (and interaction) (jointly) = 0	0.03	0.51	0.16	0.06
Number of countries/observations	47/350	47/350	47/350	47/350
R^2 within	0.51	0.52	0.52	0.52

Notes: ^ the time block ending in 2009 is four years in length
Regression included in the body of the paper
***, **, * indicate that the coefficients are significant at the 1, 5, 10% levels using robust standard errors, respectively.