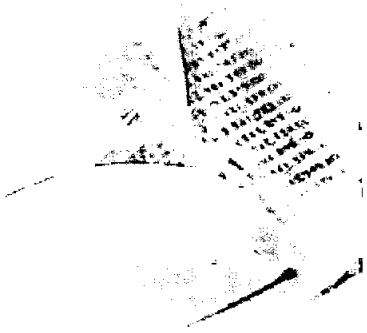
Adjustments of the Financial and Corporate Sector to the Changes in Exchange Rate Volatility and their Policy Implications in the SEACEN Countries



Dagva Boldbaatar
Yothin Jinjarak

The South East Asian Central Banks (SEACEN)
Research and Training Centre
Kuala Lumpur, Malaysia

ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE CHANGES IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS IN THE SEACEN COUNTRIES

By

D. Boldbaatar
and
Yothin Jinjarak

The South East Asian Central Banks (SEACEN)
Research and Training Centre
Kuala Lumpur, Malaysia
2007

Published by The South East Asian Central Banks (SEACEN)
Research and Training Centre
Lorong Universiti A
59100 Kuala Lumpur
Malaysia

Tel. No.: (603) 7958-5600
Fax No.: (603) 7957-4616
Telex: MA 30201
Cable: SEACEN Kuala Lumpur
Website: http://www.seacen.org

ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE CHANGES IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS IN THE SEACEN COUNTRIES

D. Boldbaatar and Yothin Jinjarak

ISBN: 983-9478-61-3

Printed in Malaysia by Graphic Stationers Sdn. Bhd.

FOREWORD

For small and open economies like those of the SEACEN countries, the choice of an appropriate exchange rate regime is central to long-run growth and economic stability. Over the past decade, SEACEN countries have moved towards more flexible exchange rate regimes in the aftermath of the 1997 financial crisis. Flexible exchange rate regimes supported with prudent macroeconomic management not only helped the economies in the region to recover faster after the crisis but also strengthen their resilience against external shocks. Meanwhile, flexible exchange rate regimes increased the short-run volatility in the regional currencies resulting in new challenges to policy authorities as well as to the private sector. The swings in the exchange rate have been further exacerbated by the changing international economic environment in particular, increasing financial globalisation with capital account liberalisation, sharp fluctuations in cross-rates among major international currencies, changing market risk appetite and the impending unwinding of global current account imbalances. Against this development, the key issues would be adjustments by policy makers and the private sector to lessen these swings in the exchange rate and also whether there are implications of such adjustments on economic growth and stability.

This research project attempts to answer the aforementioned questions and aims to analyse the recent adjustments of both financial institutions and corporate firms in response to exchange rate volatility. It also endeavours to obtain insights into how the behaviour of financial and corporate firms could play a critical role in economic growth and stability.

This collaborative study is divided into two Parts: Part I consists of the integrative report and regional analysis authored by Mr. Dagva Boldbaatar who was Senior Economist of The SEACEN Centre seconded from The Bank of Mongolia, where he has returned to serve as Director of the Monetary Policy and Research Department. The literature and methodology review Section of

the integrative report was authored by Dr. Yothin Jinjarak, Assistant Professor at the Nanyang Technological University, Singapore.

Part II consists of country chapters authored by the country researchers from eight participating SEACEN member central banks, namely, National Bank of Cambodia, Bank Indonesia, The Bank of Korea, Bank Negara Malaysia, Bangko Sentral Ng Pilipinas, Central Bank of Sri Lanka, The Central Bank of the Republic of China (Taiwan) and Bank of Thailand. The Project Leader would like express to his deep gratitude to the country researchers for preparing their respective country chapters and to the Directors of Research of the SEACEN member central banks and monetary authorities for their useful comments and suggestions on the final country chapters. He gratefully acknowledges the support of The SEACEN Centre staff in completing this study successfully. The views expressed in this paper, however, are those of the authors and do not necessarily reflect those of The SEACEN Centre, or SEACEN member central banks/monetary authorities.

Dr. A. G. Karunasena
Executive Director
The SEACEN Centre
Kuala Lumpur

August 2007

TABLE OF CONTENTS

Page

CHAPTER 8: ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR IMPLICATIONS IN THE SEACEN COUNTRIES: THE CASE OF TAIWAN
By Kuang Huei Lee

CHAPTER 9: ADJUSTMENT OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS: THE CASE OF THAILAND
by Jirapol Mahuttikarn

LIST OF TABLES

Page

CHAPTER 1: ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE CHANGES IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS IN THE SEACEN COUNTRIES

CHAPTER 2: EXCHANGE RATE POLICY SETTING IN CAMBODIA

CHAPTER 3: ADJUSTMENTS OF THE NON-FINANCIAL SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS IN INDONESIA

Page

CHAPTER 7: ADJUSTMENT OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS: THE CASE OF SRI LANKA

CHAPTER 8: ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR IMPLICATIONS IN THE SEACEN COUNTRIES: THE CASE OF TAIWAN

CHAPTER 9: ADJUSTMENT OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS: THE CASE OF THAILAND

LIST OF CHARTS/FIGURES

Page

CHAPTER 1: ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE CHANGES IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS IN THE SEACEN COUNTRIES

CHAPTER 2: EXCHANGE RATE POLICY SETTING IN CAMBODIA

CHAPTER 7: ADJUSTMENT OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS: THE CASE OF SRI LANKA

CHAPTER 8: ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR IMPLICATIONS IN THE SEACEN COUNTRIES: THE CASE OF TAIWAN

CHAPTER 9: ADJUSTMENT OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS: THE CASE OF THAILAND

LIST OF APPENDICES

Page

Page

CHAPTER 9: ADJUSTMENT OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS: THE CASE OF THAILAND

Adjustment of the Financial and Corporate Sector to the Changes in Exchange Rate Volatility and their Policy Implications in the SEACEN Countries

EXECUTIVE SUMMARY

This collaborative project, which is participated by 8 SEACEN member banks, aimed to examine exchange rate volatility faced by the member countries and to study its impact on the domestic economy with emphasis on adjustments of the corporate and financial sector. The project also investigated how the adjustments could contribute to the overall financial stability.

The last decade was the end of explicit commitment to the fixed exchange rate regime. Although, it is still debatable whether exchange rate should move or not, the lesson learnt from the 1997 Asian crisis was that a fixed exchange rate regime could have serious implications when the economy is not protected from severe exchange rate movements. The regime could undermine the resilience of the financial and corporate sector due to the commitment to stability of the exchange rate. Nevertheless, in the decade since the crisis, SEACEN economies have adjusted to an environment of more volatile exchange rates. The gradual decline in volatility could have contributed to economic performance and exchange rates adjusting to new levels. The managed float seems to be the main adopted regime and in some countries, the exchange rate has almost returned to the pre-crisis level.

The financial sector has increased capitalisation in response to the volatile exchange rate environment, boosting profitability and the capacity to absorb shocks including exchange rate volatility. Financial stability has increased as a result of accumulated foreign reserves by the monetary authorities, helping to raise foreign investors' confidence in bringing back capital to the region and allowing the economy to leverage the international financial market.

The corporate sector is always aware of exchange rate risk and is investing in instruments that allow it to mitigate exchange rate volatility. Financial derivatives are some of the instruments used widely. Empirical evidence reveals that exchange rate volatility does not influence corporate value significantly, due

perhaps to the successful risk mitigating strategies by the corporations and also partially because of more prudent exchange rate policy.

This study used the industry specific exchange rates for the analysis of exchange rate exposure and its impact on non-financial corporate sector in the participating SEACEN countries. The calculation of real effective exchange rate indices for each industry using trade weights specifically for that industry is more useful for the analysis of exchange rate pressure on the real economy. The economy wide aggregate real effective exchange rate would not be able to capture the pressure of exchange rate when half of the economy is importing and the other half is exporting. With more precise data on trade of each industry, the real pressure generated through exchange rate change can be captured more accurately. From the empirical analysis of some industries, it is noted that industry specific real effective exchange rate could be used for further analysis. On the whole, the conclusion reached is that corporate value is not affected by exchange rate exposure and this is in line with the conclusion reached in other studies.

The corporate sector adopts strategies which mitigate exchange rate risk. The strategies vary depending on the availability of instruments. Larger companies are utilising financial instruments such as forwards, swaps and netting off cash flows that match balance sheet exposures. Smaller companies, however, have to face risks if there is no option to hedge. The cost and access to hedge instruments is an issue of infrastructure which allow companies to leverage on them. Authorities' efforts to establish an efficient infrastructure was discussed in the case of Philippines. Similarly, the Indonesian non-deliverable forwards market is being developed.

Finally, it was found that there have been few adjustments made in recent times to mitigate the volatility of exchange rate. The major adjustments were made mostly right after the crisis period and presently, markets have become increasingly efficient in dealing with the impact of exchange rate volatilities. The most important contributions by the authorities are measures to ensure resilience of financial institutions, improvement of the efficiency of market, development of legal and technical framework for financial instruments that help both financial and corporate sectors to diversify risks and ensuring that exchange rate policy is prudent which would not lead to misalignments that create excessive exchange rate exposure.

CHAPTER 1

INTEGRATIVE REPORT ON ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE CHANGES IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS IN THE SEACEN COUNTRIES

by D. Boldbaatar and Dr. Yothin Jinjarak[1]

1. Introduction

The exchange rate is one of the key determinants of economic growth and stability in an economy, especially for a small and open economy like the majority of the SEACEN countries. Prior to the 1997 financial crisis, exchange rate policy has been centred on the stability objective as reflected in the adoption of the fixed exchange rate regime in several countries. Post-crisis, however, a majority of countries have moved to a more flexible regime, which resulted in increased exchange rate volatility. The wide fluctuations of exchange rate have been aggravated by the changing economic environment, notably the shift in exchange rate regime in key global players like China, and the impending unwinding of global current account imbalances. Against this development, the key questions will be how policy makers and private sector alike should adjust to the rise in exchange rate volatility, and what are the implications of such an adjustment on economic growth and stability? More specifically, it will be useful for policy makers to be aware of measures taken by the private sector, particularly financial institutions and corporate firms to lessen the adverse effects of exchange rate volatility on their businesses and performances.

2. Objective of the Study

This study aims to examine how the corporate and financial sector have adjusted in the post-Asia crisis financial environment where many exchange rate regimes have shifted to one of free float or managed float. The impact

1. Mr. Dagva Boldbaatar was Senior Economist of The SEACEN Centre seconded from The Bank of Mongolia where he is now Director of the Monetary Policy and Research Department. Dr. Yothin Jinjarak is Assistant Professor at the Nanyang Technological University, Singapore.

of the volatility of exchange rates on overall macro stability and economic growth is also examined.

Specifically, the impact of exchange rate volatility on different industrial sectors is analysed by the disaggregation of real effective exchange rate movement at the industrial level. This would enable us to see where the volatility would have most impact on and how this could be influence the behaviour of the corporate and financial sector, especially, in terms of their hedging practices.

However, it is only possible to examine the impact of exchange rate volatility on firm earnings if corporate data is readily available. The impact would also be dependent on various factors such as the market structure where the firm operates, target market diversifications, whether it is foreign or domestically owned and its balance sheet exposure.

Exchange rate volatility may also induce dollarisation if the market structure is undeveloped or hedging instruments are not available or the costs involved in using them are too high.

3. Recent Developments in Exchange Rate Movements and Policy Settings in Selected SEACEN Countries

In this section, various measures of exchange rates and volatility are introduced, using available data for countries participating in this collaborative research project. There are at least four different measures used, including bilateral, multi-lateral, nominal and real effective exchange rates. Volatilities of exchange rates can be expressed in various ways. The coefficient of variations is used for simple comparison of the periods, although the country researchers use different approaches that are suited to their technical analysis. Exchange rate volatility is very much subject to policy intervention. However, it also depends on the stage of the financial development and integration of the countries, and in terms of policies which authorities will take to smoothen out volatilities.

3.1 Nominal and Real Exchange Rates and Recent Developments

The exchange rate is a value of currency measured against another currency and/or basket of currencies. An example of bilateral exchange rate is the rate against the US dollar, which is widely used for expressing the value of a country's

currency due to its historic convention. The SDR of IMF[2] is one multilateral exchange rate. Figure A1 in Appendix 1 shows the bilateral and multilateral nominal exchange rates for countries participating in this project. Most of the countries were affected by the 1997 financial crises and they faced more volatile exchange rates following the crises, although the initial severe fluctuations have smoothened out gradually. Countries that were committed to stable exchange rates, relaxed or changed their exchange rate regimes. Malaysia, however, imposed a hard peg exchange rate setting, pegging to the USD, although in 2005, the exchange rate was de-pegged. The official exchange rate in Cambodia was relatively stable against USD, but the financial system in Cambodia is highly dollarized[3]. Sri Lanka seems least affected by the 1997 crisis in terms of severe exchange rate changes, although the later reinstatement of more a flexible exchange rate policy resulted in a more volatile environment.

Furthermore, countries that tie their exchange rate with the USD also face volatility against other currencies due to changes in the USD rate. Cambodia and Malaysia had more volatile exchange rate against major currencies included in the SDR basket. However, the SDR does not reflect specifics of countries in terms of their trade pattern. For that purpose, countries use Nominal Effective Exchange Rate (NEER)[4], composite index of nominal bilateral exchange rates weighted by the country's trade weight. Figure A2 in Appendix 1 shows the movements of NEER of some countries together with their bilateral exchange rates per USD. The graphs indicate the relative high importance of USD for some countries in their trading, i.e. for Korea, Philippines, Sri Lanka and Thailand as the movement of both NEER and their exchange rates in USD are very similar. Despite the fact that trade weighted exchange rate indices had shifted in level terms, it has not be seen that they are becoming more volatile after the crises as shown by the NEER.

If the NEER is the overall value of a national currency in comparison to currencies of main trade partners, the Real Effective Exchange Rate (REER) better reflects the impact of any change in the value of a currency into trade and overall competitiveness of an economy. The REER is the NEER adjusted by the inflation differentials between the home country and trade partners. Figure A3 in Appendix 1 shows the movements of the NEER and REER where most

2. See http://www.imf.org/external/np/exr/facts/sdr.HTM for definition and method of calculations.

3. See country chapter on Cambodia for the level of dollarisation.

4. See Chinn (2005) for detailed elaboration.

of the data are taken from the BIS. Thus, it is important to take both home countries' trade and competing countries' exports[5]. In countries where these two are not tracking each other, we assume that the inflation differentials between the home country and trade partners are considerably big. For instance, the Indonesian Rupiah was over-valued before the crisis and since 2002, it has become undervalued. For those countries where inflation is stable, we note that both real and nominal rates are moving together. Again it is difficult to confirm that REER has become more volatile in the last decade.

The trade weighted exchange rate indices are very practical for the analysis of exchange rate in a real economy, especially trade. However, because they are in aggregate form and are trade weighted; they will not fully indicate the impacts of exchange rate change on industries, due to the complexity of the economies of some countries, the different patterns of trade of which may differ from one industry to another. Therefore, industry based effective exchange rate is more useful for examining the impacts of exchange rate volatility in this study. Although, the composite indices of effective exchange rates would be sufficiently informative, bilateral rates are still important. Many financial contracts, especially portfolio type contracts, are influenced by the bilateral nominal exchange rates. In general, balance sheet exposure and transaction risks are subject to nominal exchange rates stated in the contract. On the other hand, bilateral exchange rates are available with high frequencies which will allow agents to gauge possible exposure and obtain preliminary estimates of direct impacts due to the exposure.

3.2 Exchange Rate Volatility and Exchange Rate Policy

In last decade, a few financial crises have occurred, including one in our region that changed many central banks commitment to fixed or hard pegged exchange rates. Limited flexibility of exchange rates tends to lead to accumulated misalignment and this could lead to much painful adjustment in case of severe exchange rate movements. Even if a country does not face severe exchange rate movements, continuous interventions are increasingly costly and have limits in this rapidly globalising financial world. However, authorities prefer that exchange rate volatility be limited, because of policy interest or broader macro economic goals, including inflation targets, external balance and financial stability. The defining factor here will be financial system's ability to absorb exchange rate volatility.

5. See BIS (2006) for more details.

As documented in Reinhart and Rogoff (2004), often devaluations of exchange rates in countries with fixed exchange rate regimes, reflect the shortcomings of the regime. In contrary, countries where the exchange rate is allowed more flexibility, succeeded in avoiding difficult real adjustments. This is the main reason why countries that pursued a fixed exchange rate policy shifted to a more flexible policy framework. The aftermath of the financial crises in Asia 1997 motivated many SEACEN countries in shifting their exchange rate policy stance. Countries participating in this project are among those that were affected by the crisis. One gauge to measure the impact is the severe exchange rate depreciation that can be analysed using various measures of exchange rates as mentioned before. From the SEACEN countries under study, Sri Lanka was the least affected in terms of sudden movements in exchange rate. Reactions to the crises were different for different countries. Apart from Malaysia, which introduced the hard peg and capital control as temporary measures against drastic capital movements, many of the countries allowed exchange rates to move relatively free. The hard peg that was implemented in Malaysia was relaxed on a step-by-step basis with the gradual recovery from the crisis.

Therefore, with this policy shift in allowing the exchange rate to move more flexibly, it is assumed that exchange rate volatility would be increasing. However, in the decade since the crisis, the reverse has been true in that exchange rate has become less volatile. In general, volatilities of exchange rates have been rapidly changing as can be seen in Figure 2 in the Appendix. Table 1 illustrates the policy change that has been implemented since the crisis. The Asian Crisis in 1997 acted as a catalyst for many SEACEN countries to review their exchange rate policy stance. Many of the countries adopted a floating or more flexible exchange rate regime after the crisis. The nominal exchange rates became more volatile in Indonesia, Korea, Philippines and Thailand where the impact of the crisis was most severe but whether real exchange rates were as volatile need to be analysed further.

Since six out of eight countries above adopted a more flexible exchange rate policies, it will be useful to compare exchange rate volatility before and after the policy revisions. To simplify matters, we calculated the coefficient of variations of bilateral exchange rate against USD, using monthly averages published in the IFS by the IMF and the NEER and REER published by the BIS for periods between January 1994 to December 1996, and January 2003 to September 2006. These time frames do not include the crisis period during

Table 1: Exchange Rate Policy Stance

Country	Regime Preceding Last Change	Date And Nature Of Last Change
Cambodia	Exchange rate regime is *de facto* managed float with limited variability. Economy is dollarized and the NBC promoting use of Cambodian Riel	
Indonesia	Managed float	Floating after Asian crisis, 14 August 1997
Korea	Crawling peg to USD with pre-announced band of +/-2.25%	Floating after Asian crisis, 16 December 1997
Malaysia	Pegged to USD since capital control introduced during Asian crisis 1998	Managed float, 21 July 2005
Philippines	Floating, with few restrictions on Capital inflows/outflows	Free floating after Asian crisis 1997
Sri Lanka	Pre-announced crawling band around USD (several revision of band width)	Independently floating, 2000
Taiwan	Managed float since 1979	Floating after Asian crisis, 17 Oct. 1997
Thailand	Managed float	Floating after Asian crisis, 2 July 1997

Source: Reinhart and Rogoff (2002), the CBC web site, country papers

which exchange rates of most countries in the region became extremely volatile[6]. The second period, however, does include periods of the hard peg before the very recent de-peg of the Malaysian Ringgit - volatility will thus be lower for Malaysia.

Table 2: Volatility of Exchange Rates Expressed by Coefficients of Variations[1] (Different Exchange Rate Measurements Before and After Asian Crisis 1997, Policy Revision in 2000 for Sri Lanka)

	KH	ID	KR	MY	PH	LK	TW	TH
National currency per USD (monthly average)								
Before: Jan.1994-Dec.1996	4.31	3.53	2.66	2.96	3.12	5.17	2.39	0.98
After: Jan.2003-Sep.2006	1.55	5.74	8.38	1.19	2.76	2.81	3.24	3.49
Nominal Effective Exchange Rate								
Before: Jan.1994-Dec.1996	na	4.41	2.18	2.70	3.31	na	1.74	2.12
After: Jan.2003-Sep.2006	na	7.46	7.37	2.37	4.14	5.28	1.77	2.23
Real Effective Exchange Rate								
Before: Jan.1994-Dec.1996	na	2.95	2.13	2.83	5.70	na	2.85	3.32
After: Jan.2003-Sep.2006	na	6.34	7.85	2.75	6.03	5.45	1.86	3.49

KH (Cambodia), ID (Indonesia), KR (Korea), MY (Malaysia), PH (Philippines), LK (Sri Lanka) TW (Taiwan), TH (Thailand)
Source: IFS of IMF and BIS statistics for NEER and REER

6. The period is more suited to countries that reviewed their exchange rate policy during Asian crises 1997, the figures for Malaysia need to be analysed more carefully where policy reaction to the crisis was different and for Sri Lanka where major revision occurred later in 2000.
7. Coefficients of variations here and in following Tables are calculated as Standard Deviations per unit of Mean in percentage.

Table 2 shows that recent exchange rate volatility for the Indonesian Rupiah, Korean Won, and Thai Baht, more than doubled in comparison to the pre-crisis period. However, in some countries such as Philippines and Sri Lanka, exchange rate variability of their respective currencies against USD was lower in recent years. The value of the Malaysian Ringgit was more stable than the pre-crisis period owing to the hard peg, while effective exchange rates were also less volatile. Generally, these three different measures indicate increases in exchange rate volatility.

To understand how exchange rate volatility has been changing, we examine the exchange rate volatilities for last decade including the crisis period by dividing the sample period of January 1996 until October 2006 into 3 sub-samples, each of about 44 months. Exchange rates in the SEACEN countries became gradually less volatile after the crisis (see Table 3). Since 2000, we see a gradual stabilisation of the currencies.

Table 3: Volatility of Bilateral and Multilateral Exchange Rates Measured by the Coefficient of Variations in Some of the SEACEN Countries[1]

Sub-sample periods
A: Jan.96 - Aug. 99; **B**: Sep. 99 - Apr. 03; **C**: May 03 - Oct. 06

	KH	ID	KR	MY	PH	LK	TW	TH
Daily exchange rates (National currency per USD)								
A	na	51.37	20.30	17.05	19.45	5.54	9.05	11.64
B	na	12.08	5.94	0.00	9.69	10.65	4.87	5.59
C	2.42	5.87	8.14	1.38	3.24	2.82	3.02	3.32
Nominal Effective Exchange Rate								
A	na	51.48	17.48	14.27	13.54	na	3.28	15.63
B	na	9.27	3.83	3.67	7.77	8.64	2.89	3.05
C	na	7.37	7.45	1.98	3.71	4.71	1.85	2.32
Real Effective Exchange Rate								
A	na	32.44	15.38	13.19	9.46	na	4.45	12.69
B	na	9.59	3.70	3.53	5.20	1.68	4.24	3.19
C	na	6.65	7.87	2.37	6.32	5.68	1.85	3.53

KH (Cambodia), ID (Indonesia), KR (Korea), MY (Malaysia), PH (Philippines), LK (Sri Lanka) TW (Taiwan), TH (Thailand)
Source: NEER and REER are the same as Table 2, daily rate per USD is taken from CEIC

8. For more complete data description please see Table A1 to Table A3 in Appendix 1

Although Table 2 indicates that volatility rose compared to the pre-crisis period, exchange rate volatility has been actually falling gradually in most of the cases. For Indonesia, Malaysia, and Taiwan, exchange rate volatilities have been reduced gradually. For Philippines and Thailand, only the volatility of the REER has been rising recently, while that of the Korean Won became more volatile since 2003. Looking at the exchange rate graphs of Figure A1 to Figure A3 in Appendix 1, it is noted that the exchange rate level in Korea has adjusted almost to the level of the pre-crisis period, while for other countries, they are still not back to the pre-crisis levels. Another observation from Table 3 was a comparative severity of the exchange rate shock generated from the crisis. The highest level of adjustment was for Indonesia, Korea and Thailand. Although exchange rate volatility has been reduced in the years since the crisis generally, their volatilities in comparison to the pre-crisis period is still higher and exchange rate policy settings are one of the main contributing factor. Many SEACEN countries have adopted a floating/managed floating regime and there is, therefore, no explicit commitment to the stability of the exchange rate, which in turn, increases the necessity for hedging against exchange rate risks for an economy. On top of policy settings, the volatility of exchange rates will depend on many other fundamental issues, including the country's trade dependence, level of openness, especially capital account openness, and institutional development that can distribute pressure on a currency over time.

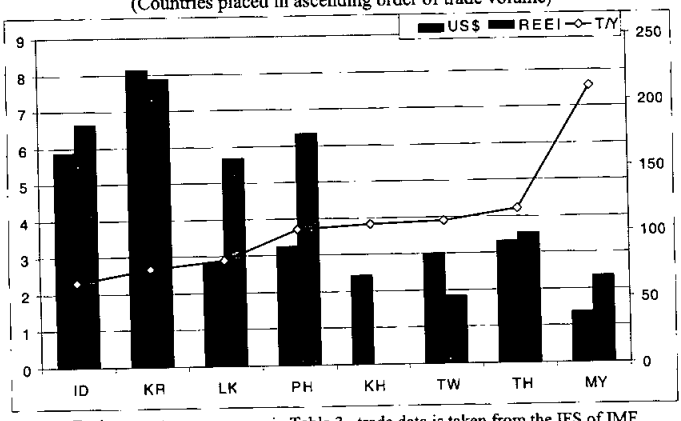
3.3 Exchange Rate Volatility and Macro Economic Variables

Exchange rate volatility should be analysed with other macro economic variables in order to understand why some economies are more resilient to impacts from volatilities. The foreign trade turnover is a useful indicator. A open and trade dependent economy would be more averse to exchange rate volatility as this increases trade uncertainty and costs for adjusting and hedging. Figure 1 depicts the trade turnover as share of GDP with daily exchange rate volatility per USD. The Figure shows what some empirical researches had confirmed – that exchange rate risk would slow trade development increasing the cost of transactions[9]. Trade volume here is the average of sums of export and import as percentage of GDP calculated using annual data from 1996 until 2005. Exchange rate volatility is taken from Table 3 as period C: May 2003 until October 2006. Therefore, the severe volatile periods of crisis were not included.

9. Academic research, including Bacchetta and Van Wincoop (2000) argues that fixed exchange rate does not necessarily lead to higher foreign trade. However, there is empirical evidence that exchange rate stability tends to increase international trade (Frankel and Rose, 2002).

Figure 1: Coefficients of Variations of Daily Exchange Rate per USD and REER for Period from May 2003 until October 2006, and Trade Turnover as Percentage of GDP (right axis)

(Countries placed in ascending order of trade volume)

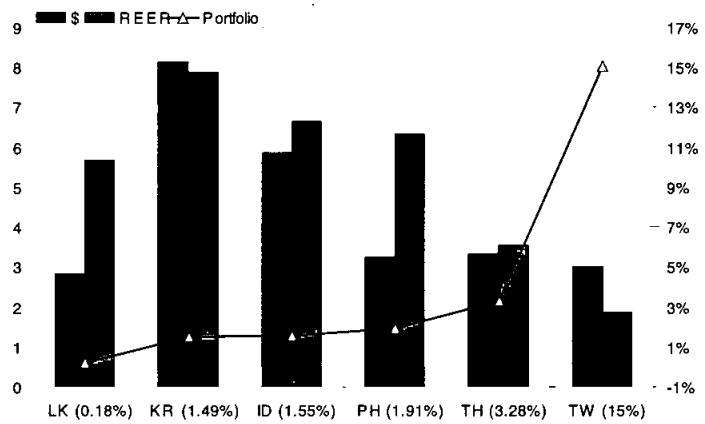


Source: Exchange rates are same as in Table 3, trade data is taken from the IFS of IMF

From the graph above, it can be seen that in countries where the trade turnover was lower, the exchange rates were volatile, meaning that authorities could better tolerate moderate levels of volatility. Indonesia and Korea were two countries where foreign trade was lower as a share of output and exchange rates were more volatile. Sri Lanka and Philippines were a little more trade dependent but the nominal bilateral exchange rates were kept under control. For other countries, foreign trade exceeded GDP and their exchange rate volatilities were relatively low both in terms of nominal and real measurement. This indicates that higher volatilities of exchange rate are associated with relatively lower trade volumes compared to GDP. It is not necessarily true that volatile exchange rate cause lower trade or authorities can tolerate volatilities due to the lesser dependency on foreign trade.

Financial development and integration will be other important factors that determine exchange rate movements. High levels of financial integration imply less volatile exchange rate, because there will be wide range of opportunities to leverage on financial hedging instruments and it will be cheaper when currency is stable. This in turn allows non-residents to take positions in home currencies resulting in higher foreign investments. Figure 2 illustrates this exchange rate volatility together with portfolio investment as a share of GDP.

Figure 2: Sum of Portfolio Investment Assets and Liabilities as Share of GDP (Right Axis) and Coefficient of Variations of Monthly REER, and Daily Nominal Rate per USD



Source: Exchange rate data from Table 3 above as period C, and portfolio investment from the IFS of the IMF

The sum of portfolio investment of the countries is used because some countries could be borrowers while others are investors - the gross rather than net variable is thus used. Figure 3 confirms that for all countries except Sri Lanka, the assumption of higher engagement in short term borrowing/lending of a country is associated with lower variability in exchange rate is valid. We could not verify this for Malaysia, the country with the lowest volatile exchange rate, due to the lack of data. Although short term borrowing/lending is not a full indicator for financial integration, it is one of the simplest gauges for measuring financial systems integration with the global market.

In addition, the composition of trade and trading partners are also important in terms of exchange rate volatility. Composition of foreign trade would be important due to its differences in pass-through into inflation and external imbalances. In some sense, this comes from difficulties in balancing inflation and the external balance goals of monetary policy. Trading partners' composition will be important when we analyse the impact of exchange rate volatility at the industrial level as it will reveal differences in exchange rate changes by industry and at the same time, show how much exchange rate volatility will impact the real sector.

In sum, exchange rate volatilities are the results and outcomes of economic fundamentals and policy actions. Macro economic conditions such as higher trade dependence and better integrated financial systems will be associated with less volatile exchange rates, with the former resulting from better policy interaction and latter being able to offer cheaper options to curb excess volatilities. Analysis

of how much volatilities will cost financial and corporate sectors will be explored further.

4. Literature Review

4.1 What are the Challenges?

Throughout the past one and a half centuries, a combination of human capital and institutional quality has been a key determinant of emerging market countries' ability to attract international investors from advanced countries (see Faria et al. (2006) for the characteristics of the two major waves of financial globalisation: 1870-1913 and the present day). A garden variety of factors contributes into country's desirable institutional quality, including good governance, prudent public finance, sound financial system, and efficient management of monetary policy.

How relevant is the exchange rate regime to the overall macroeconomic stability and the performance of corporate sector? The conventional wisdom is that lower exchange rate volatility promotes trade and investment. On one extreme, fixed exchange rate provides a nominal anchor and delivers macroeconomic stability. At the other end, the floats give the authority more monetary autonomy and are less prone to speculative attacks (see also Flood and Marion (1999)).

The major challenge facing the policymakers is a better understanding of whether there is a the long-term and short-term relationship, and the cyclical sensitivity of key components of the balance of payments (current and financial accounts) to real GDP growth, inflation, real exchange rate, energy prices, and real growth in major trading partners. These macroeconomic variables are endogenously determined, and thus it is difficult to have a comprehensive model to explain the overall dynamics of the economy featuring all of the variables. Another fruitful step in this direction is to study how the macroeconomic variables are ex post influenced by the policy choices.

In the context of monetary policy, the choice of exchange rate regimes has been found to be determining the flexibility of monetary policy that the authorities can conduct. Shambaugh (2004) finds that fixed exchange rates limit monetary autonomy. He studies the actual behaviour of exchange rates for regime classification and finds that countries classified as pegs follow base country

interest rates more than non pegs. Further, Calvo (2006) notes that emerging market economies are at a serious disadvantage relative to developed economies in that they lack an effective 'lender of last resort,' a disadvantage that becomes more acute under 'domestic liability dollarisation.' The economy's fragility may not be noticeable in normal and tranquil times, but its fault lines are revealed during turbulent periods, even in the absence of a major crisis. A reference or policy interest rate that is an instrument of choice for developed economies is inherently weak, and in the case of emerging market economies it could become weaker during periods of high volatility. Calvo argues that it may be advisable during the difficult period to switch to more robust instruments such as some kind of exchange rate peg, but to ensure that instrument switching is not a source of confusion for the private sector, and the central bank should explain the nature of the policy switch well in advance.

Empirical evidences show that exchange rate stability tends to increase international trade. In their seminal contribution, Frankel and Rose (2002) study data for over 200 countries and find that belonging to a currency union/board triples trade with other currency union members, resulting in at least one-third of a percent increase in capita income for every 1 percent increase in a country's overall trade. Klein and Shambaugh (2006a) find that fixed exchange rate between countries raises the amount of their bilateral trade, and this effect is of the same order of magnitude as policies such as a regional free trade arrangement.

Exchange rate regimes also affect a country's competitiveness via terms of trade and national price level. Broda (2006) finds that developing countries with fixed exchange rate regimes have national price levels that are 20 percent higher than those with flexible regimes. On the effects on terms of trade, Broda (2004) studies a post-Bretton Woods sample (1973-1996) of 75 developing countries and finds that fixed exchange rate regimes helped insulate more effectively the economy against terms of trade shocks on real GDP, real exchange rates, and prices. Giovanni and Levchenko (2006) examine industry-level data to document the riskiness of export patterns across countries and over time. They find that the risk content of exports is determined by both differences in diversification of export structure, and the average riskiness of exporting sectors. The poorest countries, while least diversified, are also among the least exposed to external risk. Further, the risk content of exports is strongly positively correlated with the variance of terms-of-trade and GDP growth, suggesting that export specialisation does affect macroeconomic volatility.

Recently a number of studies also show that exchange rate management contributes to the integration between the world capital markets and domestic economy. Uribe and Yue (forthcoming) find that shocks to country spread explain about 12% of business cycles in emerging market countries. However, the relative importance of country-trust versus currency-trust remains debatable. Caballero et al. (2004) argue that the lack of country-trust is a more fundamental and serious problem behind sudden stops of capital inflows. They give an example that Chile needs external insurance more than Australia does, precisely because its terms of trade shocks are amplified by the resulting contraction in the supply of external funds. So the original sin (high level of external foreign-currency denominated debts) is a greater problem for Chile than for Australia, but is not the primitive problem behind the need for substantial insurance; the problem for Chile is a lack of country-trust.

A broader implication of exchange rate stability has also been studied in the context of its influence on economic growth. Giovanni and Shambaugh (2005) examine the relationship between interest rates in major industrial countries and annual real output growth in other countries. They find that high foreign interest rates have a contractionary effect on annual real GDP growth in the domestic economy, but that this effect is centered on countries with fixed exchange rates. Aghion et al. (2006) study panel data set spanning the years 1960-2000 for the association between exchange rate volatility and real activities. They find that real exchange rate volatility can have a significant impact on long-term rate of productivity growth, but the effect depends critically on a country's level of financial development; for countries with relatively low levels of financial development, exchange rate volatility generally reduces growth, whereas for financially advanced countries, there is no significant effect.

4.2 What Have Been Done?

Against the presumed benefits of the peg is the fact that many emerging market countries have suffered currency crises, and the suspect is the practice of soft peg. Instead of moving to corner solutions of either hard pegs or floats, emerging market countries continue the soft peg but support it with international reserve accumulation. What is the rationale for this policy combination? Parsley and Popper (2002) show that many East Asian firms are significantly exposed to foreign exchange risk at the level appearing to be much more widespread than is typical for the large, western industrialised economies. They argue that exchange rate pegs do little to alleviate this exposure against currencies other

than the peg. The East Asian firms studied are most exposed to fluctuations in the U.S. dollar and not diminished over the last decade. Accumulation of international reserves thus seems to work as insurance. However, as Aizenman and Marion (2004) pointed out, following the Lucas Critique, the debt/reserves ratio may be less useful as a vulnerability indicator, and if a high debt/reserves ratio is a symptom of opportunistic behavior, a policy recommendation to increase international reserve holdings may be welfare-reducing.

Besides the precautionary motive, reserve accumulation is also currently viewed as mercantilist tool. Regardless of its effectiveness, the current reserve accumulation is a costly policy used to support the corporate sector in the emerging market countries. Aizenman and Lee (forthcoming) test the importance of precautionary and mercantilist motives in accounting for the hoarding of international reserves by developing countries. They find that the effects of financial crises have been localised, increasing reserve hoarding in the aftermath of crises mostly in countries located in the affected region, but not in other regions. Overall, their empirical findings are in line with the precautionary view. Nevertheless, evaluating the costs and benefits of active international reserve management is a complex and debatable one. As Aizenman (2006) points out, the hoarding of international reserves as an ingredient of an export led growth strategy is dubious. Done properly, the reserve management augments macroeconomic management in turbulent times, mitigating the impact of external adverse shocks and allowing for a smoother current account adjustment, the benefits which are important for commodity exporting countries, and countries with limited financial development. At current rate, the rapid accumulation of international reserves by emerging market countries is intriguing. Rodrik (2006) finds that since the early 1990s these reserves have climbed to almost 30% of developing countries' GDP and 8 months of imports. Assuming reasonable spreads between the yield on reserve assets and the cost of foreign borrowing, the income loss to these countries amount to close to 1% of GDP, too steep a price as an insurance premium against financial crises given the existing levels of short-term foreign borrowing.

4.3 What Else Can We Learn?

The actual movement of exchange rate may not correspond to the officially stated regime. This is because the suitable regime depends on country-specific conditions, and there is no such exchange rate regime is always right for all countries at all points in time. Calvo and Reinhart (2002) find that countries that say they allow their exchange rate to float mostly do not – there seems to be

a case of "fear of floating" among emerging-market economies. As discussed in Klein and Shambaugh (2006b), the classification scheme of exchange rates depends on the question posed. Calvo and Reinhart (2002) use both exchange rate and capital control (black market rates) choices to study the smoothing of policy regimes over time. Levy-Yeyati and Sturzenegger (2003) examine both exchange rate and reserves behavior to identify intermediate from floats and intervention. Shambaugh (2004) measures annual coding of exchange rate movement based on established band criteria as well as allowing for discrete devaluations to prevent breaking up a consistent regime in order to test the monetary implications of pegging; it is useful to study whether a country is pegged and stable in a given year.

Periodically, fixed regimes break, but they tend to re-form shortly after. Klein and Shambaugh (2006b) uses a classification scheme to code a country as having a fixed or a floating exchange rate similar to the method of Shambaugh (2004) and Obstfeld and Rogoff (1995). He considers a country as having a fixed exchange rate in a given calendar year, with its currency pegged to the currency of a base year, if its month-end official exchange rate stays within a +/- 2% band both each month and over the course of that year. An advantage of this procedure, as opposed to looking at relative volatility benchmarks is that this definition of a peg is clear, invariant over time, and matches the historical definitions of pegs such as the gold points in the Gold Standard, the bands in Bretton Woods and the EMS. Those countries/year observations that he codes as de facto pegs but are not de jure pegs, are typically instances generally recognize as pegs, such as East Asian countries in the early 1990s. Klein and Shambaugh (2006b) find that while pegs frequently break, many do last and those that break tend to reform, so a fixed exchange rate today is a good predictor that one will exist in the future; there is a fair number of last beyond five years, and once a peg lasts longer than a year or two, the probability that it will continue for one more year, conditional on lasting up until that year, begins to rise dramatically. Many countries re-form pegs quickly after experiencing the end of a peg spell. Asici et al. (2005) find that post-exits from the pegs are better when de-pegging occur in good macroeconomic conditions – an unnatural move for the policymakers – when world interest rates decline and in the presence of capital controls. Interestingly, good macroeconomic policies do not seem to help with post-exit performance.

Exposure to exchange rate volatility depends on several factors including, for example, the extent to which firms engaging in international trade, firm's

size and industry concentration. Thus, one expects the exposure to vary across industries, and so the distinction should be made between aggregate and industry-specific exchange rates. Campa and Goldberg (2005) study the extent of exchange rate pass-through into the import prices of 23 OECD countries and find evidence of partial pass-through in the short run, especially within manufacturing industries. Countries with higher rates of exchange rate volatility have higher pass-through elasticity and the extent of pass-through depends crucially on the composition of country import bundles.

Naturally, the question of interest is whether the industry-specific exchange rates are more effective in capturing changes in industry competitive conditions induced by exchange rate volatility. Is exposure concentrated in specific industries? Following Goldberg (2004), let rer^c_t denotes a country's bilateral real exchange rate with trading partner c at time t. This bilateral real exchange rate is constructed by multiplying a country's nominal exchange rate by the ratio of the CPI against that partner country. The trade weighted industry specific real exchange rate, ter^i_t, is given by:

$$x^{ic}_t / \Sigma_c \; x^{ic}_t = X^{ic}_t$$

$$m^{ic}_t / \Sigma_c \; m^{ic}_t = M^{ic}_t$$

$$ter^i_t = \Sigma_c [\; (0.5X^{ic}_t + 0.5M^{ic}_t \;) \times rer^c_t \;]$$

The industry-specific indices will inform the discussions on how the currency valuation changes influence specific industries and the extent to which each index co-moves or diverges from the aggregate economy-wide measures. The analyses that use aggregate exchange rate indices instead of industry-specific ones might not recognise the empirical importance of exchange rates for the producer profits of specific industries. One possibility is to examine the association between industry-specific return and industry-specific real exchange rates. Following Dominguez and Tesar (2006), the transmission channels from exchange shocks to corporate and financial sector can be defined using the following equation

$$R_{i,t} = \beta_{0,i} + \beta_{1,i} R_{m,t} + \beta_{2,i} \Delta S_t + e_{i,t}$$

where $R_{i,t}$ is the return on industry i at time t; $R_{m,t}$ is the return on the market portfolio; $\beta_{1,i}$ is the industry's market beta; ΔS_t is the change in the

relevant exchange rate; $\beta_{2,i}$ reflects the change in returns that can be explained by movements in the exchange rate after controlling for the market return. Each industry's exposure to exchange rates is therefore measured relative to the market average. Using the above econometric specification, the researchers can estimate the association between exchange rate exposure and industry-specific characteristics including multinational status, industry concentration, international trade (trade share in total output, share in the world market). Further, the industry-specific to be compiled by researchers can also be used to monitoring periodically the volatility of exchange rates at the industry level, in comparison to the typical aggregate real exchange rates already in use.

Since the early 1990s emerging market countries continue accumulating international reserves instead of reducing short-term external borrowing, suggesting that there must be hidden benefits of the borrowing on the corporate sector. Using a database of over 3,000 publicly traded firms from 15 developing countries, Bleakley and Cowan (2004) measure the risk of short-term exposure by estimating at the firm level the effect on investment of the interaction of short-term exposure and aggregate capital flows. They find that the effect is statistically zero, contrasting to the prediction of the maturity mismatch hypothesis.

The question remains for emerging market economies on how corporations can reap the benefits of external borrowing and domestic borrowing in foreign currencies, and at the same time protect themselves from the risks of exposure. A first step in this direction is to understand the exposure stands in the functionality of the global capital markets. The conventional wisdom is that exchange rate volatility increases sovereign risk. However, as pointed out by Broner et al. (2006) sovereign risk neither constrains welfare nor lowers credit; at most, it creates some additional trade in secondary markets. Note that the exchange rate exposure is not only from external borrowing, but also from domestic borrowing. Levy-Yeyati (2006) argues that, unlike the financial dollarisation (FD) of external liabilities, the dollarization of domestic financial assets has received comparatively less attention as a key source of balance sheet exposure. Essentially the domestic FD imposes limit on the central bank as domestic lender of last resort and influences the resulting exposure to dollar liquidity runs.

Essentially, corporations can use hedging instruments to reduce the exchange rate exposure. Conceptually, Moschini and Lapan (1995) show that the presence of both production and price risk implies that options become a useful hedging tool. Geczy et al. (1997) evaluate existing theories of hedging behaviour. They

point out that firms with greater growth opportunities and tighter financial constraints are more likely to use currency derivatives to reduce cash flow variation that might otherwise preclude firms from investing in valuable growth opportunities. Firms with extensive foreign exchange-rate exposure and economies of scale in hedging activities are also more likely to use currency derivatives. Further, the source of the exposure is an important factor in the choice among types of currency derivatives. Boyabatli and Toktay (2004) discuss the use of operational versus financial hedging. Financial instruments are effective in managing the exposures dependent on asset prices such as exchange rate, interest rate and commodity price. However, firms also have risks stemming from their operations that are not tradable in capital markets by means of financial contracts so that firms also draw on operational tools to hedge risks as an important component of firm-level risk management programmes. Hommel (2003) evaluates strategic complementarities between financial and option-based operative hedging. Once the firm commits to spending the fixed costs associated with the creation of flexibility, it has an incentive to modify its operations in response to exchange rate movements to reduce corporate risk exposure. The optimality of investing in flexible operations based on a value-maximisation rationale depends on the magnitude of the anticipated exchange rate volatility.

Empirical evidences from the U.S. show that the corporations there use both financial instruments and operational hedges to reduce the exchange rate exposure. Little is know, however, on the ability to hedge across firms and industries in emerging markets. Allayannis et al. (2001) study a sample of U.S. multinational non-financial firms during 1996-1998 and find that operational hedging is not an effective substitute for financial risk management. However, the more geographically dispersed a firm is, the more likely it is to use financial hedges. The end result on firm value is that operational hedging strategies benefit shareholders only when used in combination with financial hedging strategies. Allayannis and Ofek (2001) examine the use of foreign currency derivatives by S&P 500 non-financial firms during 1992-1993. They find that the use of foreign currency derivatives is positively related to the ratios of foreign sales to total sales and total foreign trade to total production. Firms also use foreign debt as an alternative in conjunction with the derivatives, although to a smaller extent. They conclude that foreign currency derivatives significantly reduce the exchange-risk that corporations face. Guay and Kothari (2003) study 234 large U.S. non-financial corporations using derivatives. They find that if interest rates, exchange rates, and commodity prices change simultaneously by 3 standard deviations, the median firm's derivatives portfolio, at most, generates $15 million in cash

and $31 million in value. These amounts are modest relative to firm size and operating and investing cash flows; corporate derivatives use appears to be a small piece of non-financial firm's overall risk profile.

Studying the practical issues of how corporations are affected and respond to the exchange rate volatility will contribute to our understanding on the macroeconomic implications of financial globalisation. Lane and Milesi-Ferretti (2005) report that the dynamics of net foreign asset positions crucially depend on an array of factors beyond the value of trade balance: stocks matter, as well as flows. In particular, they show the importance of the valuation channel of exchange rate adjustment: currency fluctuations influence the rates of return on the inherited stocks of foreign assets and liabilities, in addition to operating through the traditional trade balance channel. This in turn raises a set of substantive policy questions about the optimal external capital structure and the exploitability of the evaluation channel as an adjustment mechanism. This is particularly a pressing challenge to the emerging market countries since, as pointed out by Kose et al. (2006), various threshold effects play important roles in shaping the macroeconomic outcomes of financial globalisation. These thresholds include the level of development of domestic financial markets, the quality of institutions and corporate governance, the nature of macroeconomic policies (exchange rate regime), and the extent of openness to trade. Countries meeting these threshold conditions are better able to reap the growth and stability benefits of financial globalisation.

5. Overview of Country Chapters

This project analyses impacts of exchange rate volatility on the financial and corporate sectors of eight SEACEN economies. There are vast diversities in the SEACEN economies and therefore, the country chapters emphasise different issues. The Cambodia paper delves more on the central bank's attempt to enhance monetary policy control in a highly dollarised environment. Indonesia, Korea, and Taiwan conducted empirical analysis on how exchange rate volatility impact on company value. In addition, small scale interviews were conducted on companies' strategy to hedge against the risk. The respective exchange rate policies were explored and their outcomes were analysed – on whether volatilities cause considerable adjustments in the financial and corporate sector. More emphasis was given to the corporate sector while financial sector adjustments were mostly represented by the post crises consolidation and risk management strategies.

In the case of Cambodia, central bank policies in high dollarised environment are emphasised. For country chapters of Indonesia, Korea, Philippines, and Taiwan, empirical estimates of exchange rate volatility impacts are presented. The evolution of exchange rate policies in conjunction with regulatory developments are explored in the country chapters of Malaysia, Philippines and Sri Lanka while a economy-wide survey analysis of the corporate sector is presented in the Thailand chapter. From this various approaches, the analysis of various types of exchange rate measures are presented - on whether they cause any specific adjustments in the aforementioned sectors using fairly simple frameworks such as industry specific real effective exchange rates in the settings of the capital asset pricing model. The method has limitations, including the possibility that this empirical model will not detect any viable results if the companies are successful in their exchange rate risk mitigating strategies. In fact, if companies manage their exposures, there will be no adjustments due to the risk. Similarly, if a country is experiencing high volatility in the exchange rate, that volatility would not result in any specific adjustment, unless there is a severe shock, which was not the case for countries participating in this project. For instance, in case of Indonesia and Taiwan where exchange rates were volatile, the empirical analysis did conclude that there was significant impact on companies' values because of exchange rate volatility.

Exchange rate exposure for corporations will primarily depend upon its trade dependency. It could be an importing company that receives income in national currency or exporting company that pays costs in national currency, or even re-exporting company that do both. In this case, future cash flows will be subject to exchange rate risk. Here, we do not expect any similarities for the countries participating in this project apart from the fact that they are trade dependent. Another aspect of exchange rate risk would be from balance-sheet exposure. If a company holds assets or liabilities that are denominated in foreign currency, the company will be exposed to exchange rate risk.

The opportunity to mitigate exchange rate risk is also an important aspect in our analysis. If an exporter borrows in currencies of the destination countries, it is then a natural hedge which is the best option one could have. If this option is not available, the company is exposed to risk and can choose a strategy most suitable. The Indonesian paper has references to strategies for hedging risks. Companies should first avoid transactions that involve risks but if this is not possible, the companies can either transfer the risk to other parties through

financial instruments, and if this is too expensive, they have to bear the risk. These strategies are determined by the nature and leverage of the business, whether it has an option to relocate their business to the countries of trade, and market in which they operate.

An important internal aspect is also whether the company is multinational or foreign owned. Moguillansky (2003) analysed this issue in detail in the case of Latin American countries and we assume similarities in the strategies of multinationals, and hence we did not attempt to make similar analysis for multinationals here in Asia. However, another important internal aspect of the size of the company was mentioned in Indonesia, Korea, Taiwan, and Thailand which argue that smaller companies are more vulnerable to exchange rate changes and the more general survey in Thailand confirms it. Intuitively, bigger companies are more able to bear the costs for investment in financial instruments for hedging against exchange rate risk than smaller ones. On the other hand, we cannot confirm this with our empirical analysis. Good hedging will result in safer financial conditions in the face of volatile exchange rate environment. One possible method of investigating corporate actions to mitigate exchange rate risk would be via interviews and surveys. Interviews of a limited number of corporations in Indonesia and Taiwan and a broader survey in Thailand, conducted by the respective country researchers, confirm the aforementioned conclusions.

Beyond the internal aspects of companies is the availability of hedging instruments. Unavailability of hedging instruments is the result of the lack in sophistication of the financial market in a broad sense and lack of efficiency of market structure and infrastructure for derivative instruments in a narrower sense. The case of the Philippines is a good example of how important the financial structure and infrastructure are. The efficient workings of the complex system of regulations, legal provisions, multi-party binding agreements and payment settlement procedures cannot be over stated. In particular, efficiency and enforceability of contracts dependent upon the payment and settlement system is well argued in the Philippines chapter. In contrast, dollarisation in Cambodia impeded development of the national financial system of mitigating exchange rate risk. In general, a high level dollarisation would not require expensive hedging for corporations. However, when global exchange rate volatility heightens, there will be limited opportunities to mitigate the risk, since exchange rates are largely determined by the international market. The economy thus, has to bear the risk.

5.1 Financial Sector Adjustments after Asian Crisis

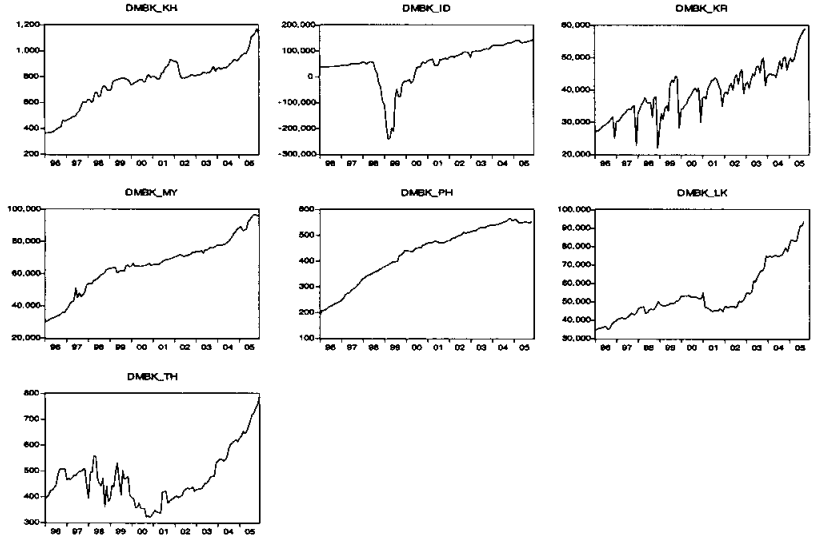
Exchange rate risk, due to increased volatility of exchange rate that impact banks' balance-sheet, are determined by the amount of assets which exceeds liabilities and vice-versa, in what is known as currency mismatches. If the overall currency exposure is beyond the limit of a bank's capacity of risk bearing, i.e., if the bank has insufficient equity capital, a sudden move in the exchange rate would cause considerable loss and perhaps plunge it into a crises. Moreover, if this risk is accompanied by a situation where liabilities are contracted in shorter maturity than assets, the risks are amplified even further. These weaknesses were clearly shown up in fixed exchange rate regimes. These aspects were studied in depth in many researches including Eichengreen and Hausmann (1999) which details financial fragility induced by the fixed exchange rate regime.

Along this line, if banks pursue a policy that ensure them safety in a volatile exchange rate environment, they would have to match their assets and liabilities in single currencies and their total exposures in foreign currencies should be within the limits of their capacity to bear the risk. Thus, sufficient capital with prudent foreign exchange policy is of prime importance. Banks' ability to attract capital is reflected in their profitability and efficiency of operations. Therefore, we assume that banks will improve their performance and increase equity capital besides innovations in financial instruments and accumulating reserves.

One dimension of the 1997 Asian financial crisis is the major shift of exchange rate movements from virtually stable to highly volatile. Thus, the financial sector's response in that period would roughly explain adjustments of the financial sector in the face of exchange rate volatility. Perhaps, the biggest response to the 1997 crisis was in the form of financial consolidation. Banks were merged in many of the SEACEN countries. Consolidation through mergers will increase equity of banks, improving profitability via cost and overhead management. There are other benefits such as better customer base, etc. The capitalisation of the banking system has been increasing during the last decade as a response to the 1997 crisis. Figure 3 depicts the capitalisation of deposit money banks.

In most cases, banks' equity capital increased, but in some countries they had an initial adjustment period before capital accumulated markedly, as in case

Figure 3: Capitalisation of Deposit Money Banks
January 1996 - December 2005

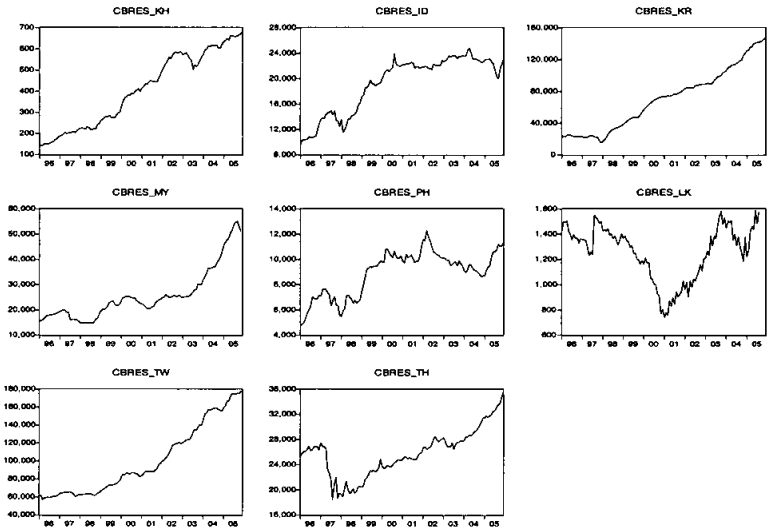


Source: IFS of the IMF

of Thailand. Banks which face problems would usually have decreasing equity due to various factors, including increased provision against loan loss and revaluation of balance sheet items. Here we see that only in Indonesia did banks' total equity capital record negative figures indicating the severity of adjustments. In Sri Lanka, the pace of equity capital accumulation picked up after the Rupee float. Capitalisation of Korean banks declined before reaching a high pace of growth. This is perhaps due to the negative adjustments of capital before mergers or reclassification of assets. While Taiwanese banks' capitalisation is not shown here, quarterly data available via the Central Bank if the Republic of China (Taiwan) web site indicate that it has been increasing recently.

Another aspect of financial sector adjustment after the crisis was total accumulation of foreign currency reserves in countries participating in this project. Figure 4 shows the countries' foreign reserves represented by the reserves of monetary authorities.

Figure 4: International Reserve of Monetary Authorities:
KH for Cambodia, ID for Indonesia, KR for Korea, MY for Malaysia, PH for Philippines, LK for Sri Lanka, TW for Taiwan, and TH for Thailand



Source: IFS of the IMF and Monthly web release of the CBRC for Taiwan

Most of the central banks are accumulating international reserves partly due to exchange rate adjustments as national currencies depreciate. International reserves in Sri Lanka was falling right after the financial crisis but has since recovered when the float was adopted in 2000. The accumulation of reserves is also a response to the capital reversal shock during the crisis period, since commercial banks have to match their exposures, thus limiting their accumulation of foreign reserves. Therefore, the overall balance-sheet exposure was noticeable in central banks reserves. Monetary authorities accumulate foreign reserves that would allow them to absorb major shocks to the economy.

In addition, there have been innovations in financial instruments that spread the risks of the corporate sector and which allow banks to leverage on international financial market to diversify exchange rate risk. As these changes are difficult to measure and are very country specific, they have been left out of our analysis. However, the Philippines country paper gives a very useful account of this aspect. Similarly, Malaysia's financial sector development is delved with in depth in the country chapter. One interesting product that is the MHMcC (2004)[10], which

10. Guonan Ma, Corrinne Ho and Robert N. McCauley (2004)

reviewed the market for non-deliverable forwards on six Asian currencies including Indonesian Rupiah, Korean Won, Philippines Peso, and New Taiwan Dollar.

5.2 Industry Specific Real Effective Exchange Rate

This research project employs industry specific exchange rates for the analysis of exchange rate exposure and its impact on non-financial corporate sector in the participating countries. A more complex approach for industry specific exchange rate was discussed in Goldberg (2004) for the USA. Country researchers calculated real effective exchange rate indices for each industry using trade weights specifically for that industry. Exports, imports and trade (sum of export and import) based weights were also used. These indices were then analysed to determine the competitiveness of each industry instead of the whole economy in case of aggregate real effective exchange rate. Hence, the exposure for companies of that particular industry is looked at. A more challenging task would be the use of indices for analysing certain companies' exposure which will be elaborated on later.

Technically, the calculation of the industry specific REER is not too complex. It is the arithmetic or geometric mean weighted by trade weights of the specific industry. The weights used could either be by fixed number of major trading partners' weight or by trade weights of countries for which trade flow volume is highest if trading partners are too diverse and changing. Thus, the industrial exchange rate index is:

$$reer_t^i = \prod_{c=1}^{C} \left(rer_t^c\right)^{w_c}$$

This is the real effective exchange rate for industry i, where c is trading partner, w_c is that trading partner's weight, at time t. rer_t^c is the real exchange rate for country c, that is the nominal rate adjusted by price index differential used for the calculation. For the purpose of deeper analysis, it can be calculated for export and import separately or trade weighted common exchange rate for industry. The real exchange rate is the nominal rate adjusted by the ratio of prices using CPI or PPI whichever is appropriate. Trade weights can also be used in place of time change against the constant for a fixed period of time, for instance within a year and etc. Most of these modifications are due to data limitations, hence a broader level of industrial classifications is desirable.

Generally, the country researchers encountered various difficulties, including the industry classification used in custom data and other data such as classification in stock exchange or company classifications which may not be necessarily the same[11]. When individual companies are analysed, there will the difficulty of classifying the company in the industry it operates in and even more so, if the company's operations are in more than one industrial sector. These are technical issues handled according to the researchers' discretion.

The calculated industry specific REER would differ significantly among industries and may diverge from aggregate one. Industry could be largely importing or exporting; their trade origin/destination could significantly differ from one another. Companies in certain industry could mainly comprise of big companies or SME, due to economy of scale of business they conduct or depending upon whether the companies are highly established or fairly new. In the case of Indonesia, the calculated industry specific REER for five major industries were analysed. All the industry specific REERs were mostly tracking each other and tended to appreciate during the period under review. Only the REER for the mining sector was significantly volatile and real appreciation was noted. For Korea, industry specific REER indicates real appreciation for all industries after a fall in value in the third quarter of 2000. The automobile and ship building industry's REER appreciated slightly and levelled off before the recent steep climb in 2005. For other industrial sectors, the REER appreciated gradually throughout 2001 and after.

In the case of Philippines, researchers used both multi-lateral economy-wide exchange rate and industry specific REER in parallel, for the purpose of comparative analysis on whether they cause changes in companies' values in a different pattern. The methodology used for calculating the industry specific REER is presented in Philippines' paper. One issue that was raised was regards with the researchers' strategy to use the REER on company level regression analysis. However, since corporations can operate across-industries, this creates the difficulty of selecting the appropriate industry specific REER to be used for empirical analysis[12]. The researchers overcame this difficulty and it was revealed that the industry specific REER performed very well, especially for the food and beverage industry.

11. See country chapters on Indonesia, Korea and Taiwan

12. It is clear that there will be no industry specific rates for non tradable and financial services.

Another comparison between industry specific and aggregate REER would be to examine correlations among them. This was done in the country chapters of Taiwan and Thailand. The Taiwanese REER for various industries was highly correlated with aggregate one apart from two industries for which the REER was highly volatile. In Thailand, correlation analysis found that most of the cases were well correlated with less than one fifth slightly correlated (correlation coefficient less than 0.7). When percentage changes of industry specific REER were examined against aggregate one, it was found that in Thailand, some industries showed a complete divergent pattern including a change in the opposite direction. In Taiwan, the mineral fuel and crude oil industry displayed different patterns, while this is true for the agriculture and fishery related industries in Thailand.

5.3 Implications on Companies' Value and Corporate Strategy to Mitigate Exchange Rate Risk

Using the above calculated real exchange rate, country researchers estimated the relationship between real exchange rate and performance of industries. Dominguez and Tesar (2006) studied exchange rate exposure of firms in selected countries using the following specification[13]:

$$R_{i,t} = \beta_{0,t} + \beta_{1,i} R_{m,t} + \beta_{2,i}\Delta S_t + \varepsilon_{i,t}$$

Where dependant variable $R_{i,t}$ is the return of firm i at time t. $R_{m,t}$ is the return on the market portfolio; $\beta_{1,i}$ is the firm's market beta; ΔS_t is the change in the relevant exchange rate.[14] Dominguez and Tesar (2006) found that exchange rate exposure is correlated with firm size, multinational status, foreign sales, international assets, and competitiveness and trade at the industry level. These aspects were discussed earlier, but here we look at how exchange rate exposure influences corporate value.

Because firm-level data are not readily available for countries included in this project, the specification of the above equation has been modified using industry-level data. In case of Philippines, the estimations were done at companies' level and the results were robust, in line with the assumptions

13. Their sample includes for the period 1980-1999: Chile, France, Germany, Italy, Japan, Netherlands, Thailand, and United Kingdom.

14. If the CAPM were the true model for asset pricing (that is, only market risk should be relevant to a firm's asset price, and therefore only changes in the market return Rm,t should be systematically related to firm returns), $\beta_{2,i}$ should be equal to zero.

discussed. Hence, $R_{i,t}$ represents the performance (e.g. stock-market return, output growth) of industry i at time t. The difference between the effects of aggregate real exchange rate and industry-specific real exchange rate on the industry performance was also analysed. That is, one can replace $\ddot{A}S_t$ with $\ddot{A}S_{i,t}$ to examine whether the industry i's specific real exchange is more relevant in capturing the impact of volatility on industry performance.

We expect that real appreciation will be costly for largely exporting but beneficial for importing companies. Thus, the level of engagement in trade will matter a lot. More than trade, the balance sheet exposure could be influential too. If the company is in a long position, there may be losses with appreciation and the reverse would be true for a short position. In addition, exchange rate volatility can cause instability in companies' earnings that may impact the value of business. If companies are engaged in foreign currency transactions but employ efficient method of hedging against exchange rate risk, we may not be able to capture the exposure with this type of analysis. When there is no significant impact of exchange rate change/volatility in companies' value or industry level, it would then be useful to conduct either a survey or sample based interview of corporations as has been done in a few of the participating countries.

In Taiwan, in some cases, the industry specific REER actually improves the empirical analysis. 4 out of 19 industries regression results were better with either the export or trade weighted industry specific REER. Another interesting aspect was for the Philippines, where the industry specific REER was used for the analysis of individual companies. As was mentioned earlier, it is challenging task to classify modern corporations into a single industry since they operate across sectors. However, in the case of the Philippines, the industry specific REER clearly explains developments for the food and beverage manufacturing industry where real appreciation negatively impacted company value in the majority of the selected companies.

For other countries, the analysis of the industry specific real exchange rate impact was not compared with aggregate one but nonetheless, its significance was perceived for some sectors. The industry specific REER helps to explain changes in companies' value on industrial sector level for agricultural sector in Indonesia and for all but the electrical and steel industry in Korea. Thus, in general, the usefulness of the industry specific REER for analysing companies' value has been established.

Our empirical analysis suggests that exchange rate volatilities have little or no impact on corporate values when industry level data used. Hence, there are few reasons for authorities and central banks to intervene today in comparison to the past decade since the crisis. However, the country analysis indicate that moving towards a flexible or independent floating regime was a gradual process at least in case of countries included in this research. Small scale interviews and surveys were conducted to determine the strategies the corporate sector employed to manage exchange rate risk, albeit not for all the countries. Nonetheless, where they were conducted, they proved insightful, revealing that the corporate sector is mitigating exchange risks successfully and the most common instrument employed are forward contracts.

In Sri Lanka, it is interesting to note that larger traders may cause exchange rate volatilities due to their payment pattern of avoiding busy periods of payments. Since the float of the Rupee, the market has adjusted to the exchange rate volatilities by using forwards and proof of this is the growth of the inter-bank forward market by almost six times between 2000 and 2006. Generally, it has been revealed in most of the participating SEACEN countries that exchange rate volatility has had little or no impact on corporate performance based on the survey of major importers and exporters. Perhaps, a certain degree of capital control that was in place may also have contributed to the manageable level of corporate exposures.

6. Conclusion

The last decade was the end of explicit commitment to the fixed exchange rate regime. Although, it is still debatable whether exchange rate should move or not, the lesson learnt from the 1997 Asian crisis was that a fixed exchange rate regime could have serious implications when the economy is not protected from severe exchange rate movements. The regime could undermine the resilience of the financial and corporate sector due to the commitment to stability of the exchange rate. Nevertheless, in the decade since the crisis, SEACEN economies have adjusted to an environment of more volatile exchange rates. The gradual decline in volatility could have contributed to economic performance and exchange rates adjusting to new levels. The managed float seems to be the main adopted regime and in some countries, the exchange rate has almost returned to the pre-crisis level.

The financial sector has increased capitalisation in response to the volatile exchange rate environment, boosting profitability and the capacity to absorb shocks including exchange rate volatility. Financial stability has increased as a result of accumulated foreign reserves by the monetary authorities, helping to raise foreign investors' confidence in bringing back capital to the region and allowing the economy to leverage the international financial market.

The corporate sector is always aware of exchange rate risk and is investing in instruments that allow it to mitigate exchange rate volatility. Financial derivatives are some of the instruments used widely. Empirical evidence reveals that exchange rate volatility does not influence corporate value significantly, due perhaps to the successful risk mitigating strategies by the corporations and also partially because of more prudent exchange rate policy.

This study used the industry specific exchange rates for the analysis of exchange rate exposure and its impact on non-financial corporate sector in the participating SEACEN countries. The calculation of real effective exchange rate indices for each industry using trade weights specifically for that industry is more useful for the analysis of exchange rate pressure on the real economy. The economy wide aggregate real effective exchange rate would not be able to capture the pressure of exchange rate when half of the economy is importing and the other half is exporting. With more precise data on trade of each industry, the real pressure generated through exchange rate change can be captured more accurately. From the empirical analysis of some industries, it is noted that industry specific real effective exchange rate could be used for further analysis. On the whole, the conclusion reached is that corporate value is not affected by exchange rate exposure and this is in line with the conclusion reached in other studies.

The corporate sector adopts strategies which mitigate exchange rate risk. The strategies vary depending on the availability of instruments. Larger companies are utilising financial instruments such as forwards, swaps and netting off cash flows that match balance sheet exposures. Smaller companies, however, have to face risks if there is no option to hedge. The cost and access to hedge instruments is an issue of infrastructure which allow companies to leverage on them. Authorities' efforts to establish an efficient infrastructure was discussed in the case of Philippines. Similarly, the Indonesian non-deliverable forwards market is being developed.

Finally, it was found that there have been few adjustments made in recent times to mitigate the volatility of exchange rate. The major adjustments were made mostly right after the crisis period and presently, markets have become increasingly efficient in dealing with the impact of exchange rate volatilities. The most important contributions by the authorities are measures to ensure resilience of financial institutions, improvement of the efficiency of market, development of legal and technical framework for financial instruments that help both financial and corporate sectors to diversify risks and ensuring that exchange rate policy is prudent which would not lead to misalignments that create excessive exchange rate exposure.

References

1. Aghion, P., Bacchetta, P., Ranciere, R. & Rogoff, K., (2006), "Exchange Rate Volatility and Productivity Growth: The Role of Financial Development", National Bureau of Economic Research, Inc, *NBER Working Papers:* 12117, May, pp.

2. Aizenman, J., (2006), "International Reserves Management and the Current Account" National Bureau of Economic Research, Inc, *NBER Working Papers:* 12734, pp.

3. Aizenman, J. & Lee, J., (forthcoming), "International Reserves: Precautionary versus Mercantilist Views, Theory and Evidence", *Open Economies Review,* pp.

4. Aizenman, J. & Marion, N., (2004), "International Reserve Holdings with Sovereign Risk and Costly Tax Collection", *Economic Journal,* 114, pp. 569-591.

5. Allayannis, G., Ihrig, J. & Weston, J. P., (2001), "Exchange-Rate Hedging: Financial versus Operational Strategies", *American Economic Review,* 91, pp. 391-395.

6. Allayannis, G. & Ofek, E., (2001), "Exchange Rate Exposure, Hedging, and the Use of Foreign Currency Derivatives", *Journal of International Money and Finance,* 20, pp. 273-296.

7. Asici, A. A., Ivanova, N. & Wyplosz, C., (2005), "How to Exit from Fixed Exchange Rate Regimes", *HEI Working Paper No.* 03/2005, Graduate Institute of International Studies, Geneva, pp.

8. Bacchetta, P. & Van Wincoop, E., (2000), "Does Exchange Rate Stability Increase Trade and Welfare?", *American Economic Review,* 90, pp. 1093-1109.

9. Bleakley, H. C. & Cowan, K., (2004), "Maturity Mismatch and Financial Crises: Evidence from Emerging Market Corporations", Department of Economics, UCSD, pp.

10. Boyabatli, O. & Toktay, L. B., (2004), "Operational Hedging: A Review with Discussion", *INSEAD Working Paper Series* 2004/12/TM, pp.

11. Broda, C., (2004), "Terms of Trade and Exchange Rate Regimes in Developing Countries", *Journal of International Economics,* 63, pp. 31-58.

12. Broda, C., (2006), "Exchange Rate Regimes and National Price Levels", *Journal of International Economics*, 70, pp. 52-81.

13. Broner, F., Martin, A. & Ventura, J., (2006), "Sovereign Risk and Secondary Markets", National Bureau of Economic Research, Inc, *NBER Working Papers:* 12783, pp.

14. Caballero, R., Cowan, K. & Kearns, J., (2004), "Fear of Sudden Stops: Lessons from Australia and Chile", National Bureau of Economic Research, Inc, *NBER Working Papers:* 10519, pp.

15. Calvo, G. A., (2006), "Monetary Policy Challenges in Emerging Markets: Sudden Stop, Liability Dollarization, and Lend of Last Resort", National Bureau of Economic Research, Inc, *NBER Working Papers:* 12788, pp.

16. Calvo, G. A. & Reinhart, C. M., (2002), "Fear of Floating", *Quarterly Journal of Economics,* 117, pp. 379-408.

17. Campa, J. M. & Goldberg, L. S., (2005), "Exchange Rate Pass-Through into Import Prices", *Review of Economics and Statistics,* 87, pp. 679-690.

18. Chinn, M. D., (2005), "A Primer on Real Effective Exchange Rates", *NBER Working Paper* 11521.

19. Dominguez, K. M. E. & Tesar, L. L., (2006), "Exchange Rate Exposure", *Journal of International Economics,* 1, pp. 188-218.

20. Faria, A., Mauro, P., Minnoni, M. & Zaklan, A., (2006), "The External Financing of Emerging Market Countries: Evidence from Two Waves of Financial Globalization", *IMF Working Paper* WP/06/205, pp.

21. Flood, R. & Marion, N., (1999), "Perspectives on the Recent Currency Crisis Literature", *International Journal of Finance & Economics,* 4, pp. 1-26.

22. Frankel, J. & Rose, A., (2002), "An Estimate of the Effect of Common Currencies on Trade and Income", *Quarterly Journal of Economics,* pp. 437-466.

23. Geczy, C., Minton, B. A. & Schrand, C., (1997), "Why Firms Use Currency Derivatives", *Journal of Finance,* 52, pp. 1323-1354.

24. Giovanni, J. d. & Levchenko, A. A., (2006), "The Risk Content of Exports", pp.

25. Giovanni, J. d. & Shambaugh, J., (2005), "The Impact of Foreign Interest Rates on the Economy: The Role of the Exchange Rate Regime" Dartmouth University, pp.

26. Goldberg, L. S., (2004), "Industry-specific Exchange Rates for the United States", *FRBNY Economic Policy Review,* pp. 1-16.

27. Guay, W. & Kothari, S. P., (2003), "How Much Do Firms Hedge with Derivatives?", *Journal of Financial Economics,* 70, pp. 423-461.

28. Hommel, U., (2003), "Financial Versus Operative Hedging of Currency Risk", *Global Finance Journal,* 14, pp. 1-18.

29. Klein, M. & Shambaugh, J., (2006a), "Fixed Exchange Rates and Trade", *Journal of International Economics,* 70, pp. 359-383.

30. Klein, M. W. & Shambaugh, J. C., (2006b), "The Nature of Exchange Rate Regimes", National Bureau of Economic Research, Inc, *NBER Working Papers:* 12729, December, pp.

31. Kose, M. A., Prasad, E., Rogoff, K. & Wei, S.-J., (2006), "Financial Globalization: A Reappraisal", *IMF Working Paper* WP/06/189, pp.

32. Lane, P. R. & Milesi-Ferretti, G. M., (2005), "Financial Globalization and Exchange Rates", *IMF Working Paper* WP/03/3, pp.

33. Levy-Yeyati, E., (2006), "Liquidity Insurance in a Financially Dollarized Economy", National Bureau of Economic Research, Inc, *NBER Working Papers:* 12345, pp.

34. Levy-Yeyati, E. & Sturzenegger, F., (2003), "To Float or to Fix: Evidence on the Impact of Exchange Rate Regimes on Growth", *The American Economic Review,* 93, pp. 1173-1193.

35. Moguillansky, G., (2003), "Corporate Risk Management and Exchange Rate Volatility in Latin America", CEPAL - SERIE Informes y Estudios Especiales No. 9.

36. Moschini, G. & Lapan, H., (1995), "The Hedging Role of Options and Futures Under Joint Price, Basis, and Production *Risk. International Economic Review,* 36, pp. 1025-1049.

37. Obstfeld, M. & Rogoff, K. (1995), The Mirage of Fixed Exchange Rates", *The Journal of Economic Perspectives,* 9, pp. 73-96.

38. Parsley, D. & Popper, H., (2002), "Exchange Rate Pegs and Foreign Exchange Exposure in East Asia", *International Finance* 0211001, pp.

39. Reinhart, C. M. & Rogoff, K. S., (2004), "The Modern History of Exchange Rate Arrangements: A Reinterpretation", *Quarterly Journal of Economics, 119,* pp. 1-48.

40. Rodrik, D., (2006), "The Social Cost of Foreign Exchange Reserves", *International Economic Journal,* 20, pp. 253-266.

41. Shambaugh, J. C., (2004), "The Effect of Fixed Exchange Rates on Monetary Policy", *Quarterly Journal of Economics*, 119, pp. 301-352.

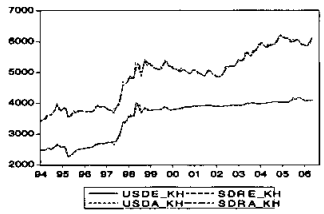
42. Uribe, M. & Yue, V. Z., (forthcoming), "Country Spreads and Emerging Countries: Who Drives Whom?", *Journal of International Economics.*

APPENDIX 1

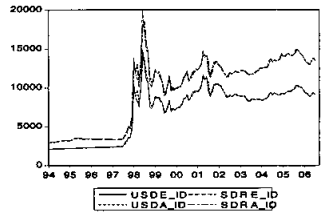
Figure A1: Nominal Exchange Rates: National Currency per USD[15] as Bilateral Rate and National Currency per SDR[16] as Multilateral Rate against Basket of USD, DEM, JPY, FRF and GBP.

Data source: IFS of IMF (see footnote for Taiwan data source)

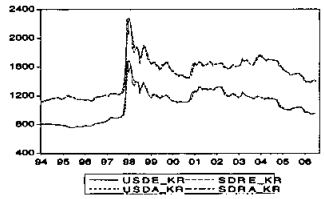
a) Cambodia



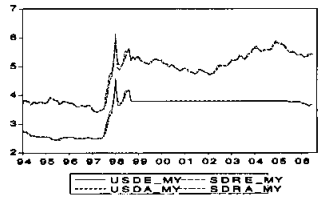
b) Indonesia



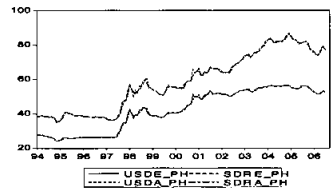
c) Korea



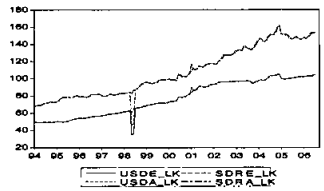
d) Malaysia



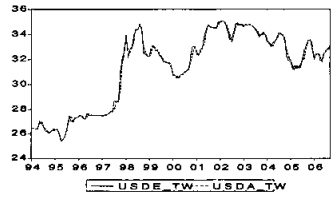
e) Philippines



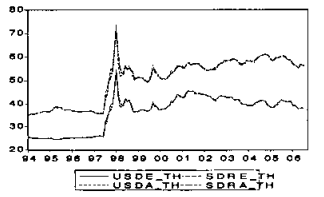
f) Sri Lanka



g) Taiwan[1]



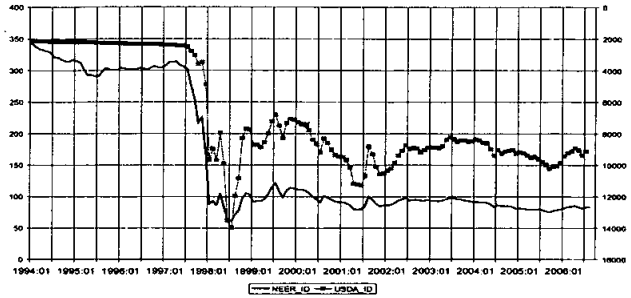
h) Thailand



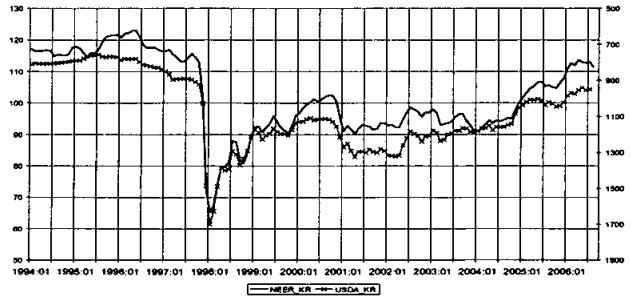
15. USDE_ is end of period exchange rates while USDA_? average of period exchange rates
16. SDRE_is end of period exchange rates and SDRA_? average of period exchange rates
17. Data source the CEIC: end period as Inter-bank closing, and average period as Inter-bank monthly average.

Figure A2: Exchange Rate per USD and NEER

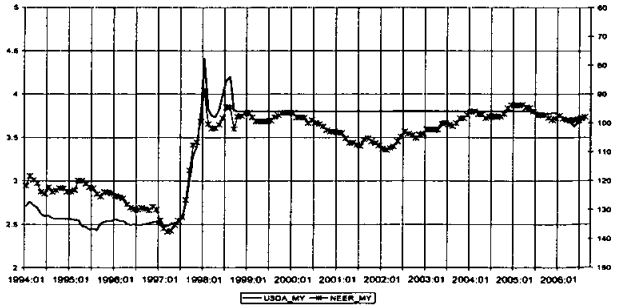
a) Indonesia



b) Korea



c) Malaysia



d) Philippines

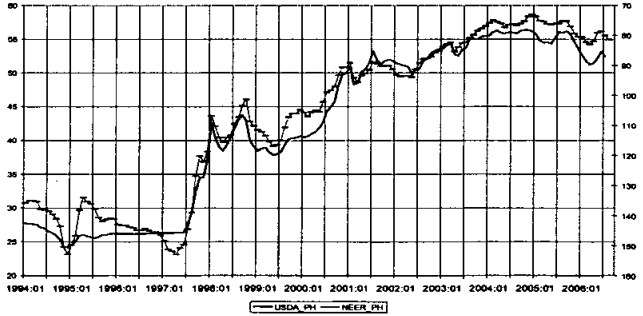
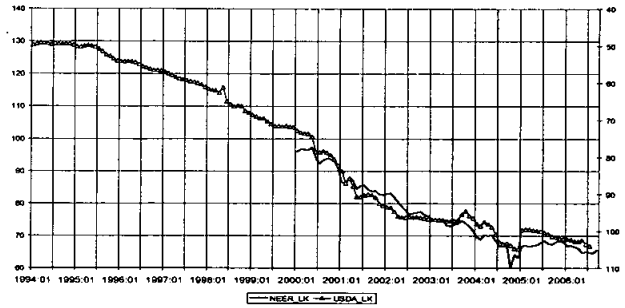
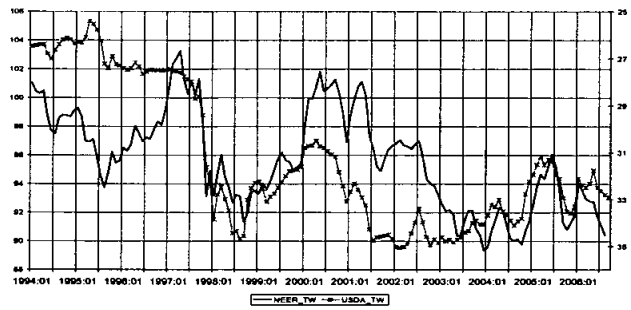


Figure A2: Exchange Rate per USD and NEER (continued)

e) Sri Lanka



f) Taiwan



g) Thailand

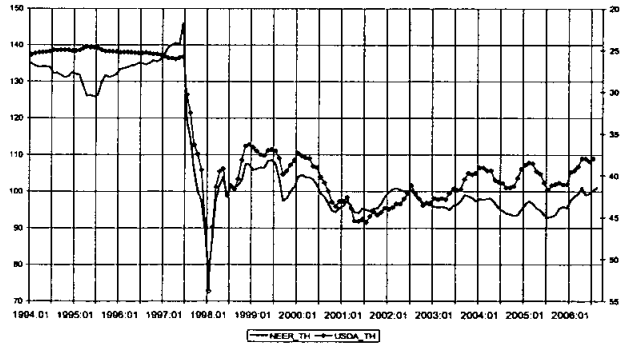
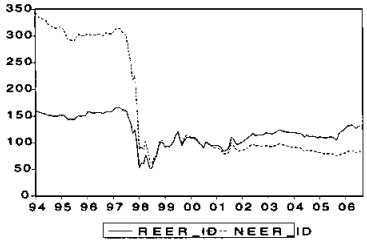


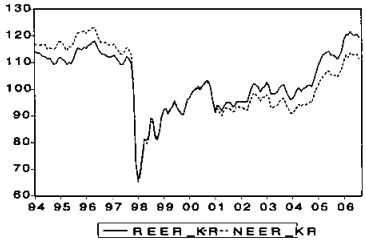
Figure A3: NEER and REER

Source: BIS website http://www.bis.org/statistics/eer/index.htm for Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand. In case of Sri Lanka the CBSL web site.

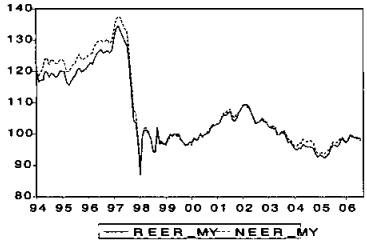
a) Indonesia



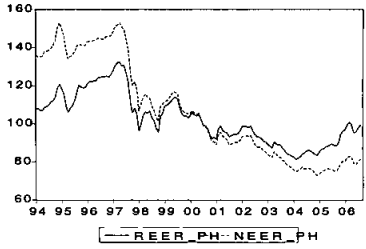
b) Korea



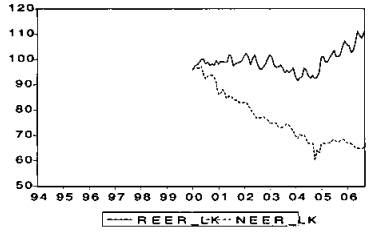
c) Malaysia



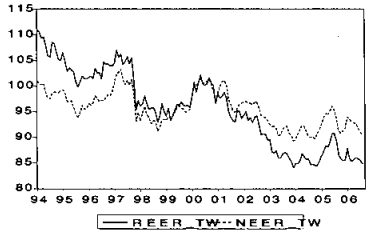
d) Philippines



e) Sri Lanka



f) Taiwan



g) Thailand

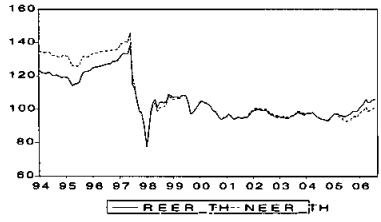


Table A1: Volatility f Daily Nominal Exchange Rate: Exchange Rate as National Currency per USD

	DAILY_KH	DAILY_ID	DAILY_KR	DAILY_MY	DAILY_PH	DAILY_LK	DAILY_TW	DAILY_TH
A: Sample: 1/03/1996 8/30/1999								
Mean		6802.591	1180.177	3.475	33.787	66.502	30.275	38.968
Median		7553.000	1200.600	3.800	35.184	66.433	28.727	37.684
Maximum		15174.000	1964.800	4.725	45.420	71.766	34.896	55.885
Minimum		2360.000	842.700	2.472	26.130	59.395	27.143	27.612
Std. Dev.		**3494.473**	**239.582**	**0.592**	**6.571**	**3.684**	**2.741**	**4.537**
Coefficient of variation[7]		**51.37**	**20.30**	**17.05**	**19.45**	**5.54**	**9.05**	**11.64**
Observations	0	653	789	660	847	407	1035	527
B: Sample: 9/01/1999 4/30/2003								
Mean		9066.693	1218.981	3.800	48.576	86.683	33.147	42.211
Median		8946.000	1213.500	3.800	50.526	90.081	33.447	42.871
Maximum		12040.000	1351.500	3.800	55.075	97.030	35.168	45.756
Minimum		6696.000	1104.900	3.800	39.665	71.031	30.302	36.961
Std. Dev.		**1095.463**	**72.352**	**0.000**	**4.706**	**9.234**	**1.615**	**2.359**
Coefficient of variation[7]		**12.08**	**5.94**		**9.69**	**10.65**	**4.87**	**5.59**
Observations	0	909	1086	909	898	877	944	903
C: Sample: 5/01/2003 10/30/2006								
Mean	4015.734	9071.328	1079.533	3.769	54.480	100.455	33.007	39.923
Median	4018.000	9111.500	1048.900	3.800	55.055	100.860	33.095	39.854
Maximum	4187.000	10746.000	1213.900	3.800	56.990	105.430	34.801	42.737
Minimum	3833.000	8124.000	930.700	3.583	49.908	94.080	30.790	37.264
Std. Dev.	**97.285**	**532.128**	**87.916**	**0.052**	**1.766**	**2.832**	**0.996**	**1.324**
Coefficient of variation[7]	**2.42**	**5.87**	**8.14**	**1.38**	**3.24**	**2.82**	**3.02**	**3.32**
Observations	643	842	997	857	853	835	864	844

[7] Standard deviation per unit of mean in percentage, i. e. =st.dev./mean *100

Source: CIEC daily database for Asian countries.

Table A2: Volatility of NEER (there is no data available for NEER of Cambodia)

	NEER_ID	NEER_KR	NEER_MY	NEER_PH	NEER_LK	NEER_TW	NEER_TH
A: Sample: 1996:01 1999:08							
Mean	200.008	101.347	113.875	128.138		96.560	116.555
Median	221.450	107.540	107.150	121.115		96.240	108.010
Maximum	314.030	123.080	137.670	152.990		103.260	146.040
Minimum	60.990	65.230	88.830	101.370		91.310	77.510
Std. Dev.	**102.968**	**17.714**	**16.248**	**17.349**		**3.166**	**18.223**
Coefficient of variations	**51.48**	**17.48**	**14.27**	**13.54**		**3.28**	**15.63**
Observations	44	44	44	44		44	44
B: Sample: 1999:09 2003:04							
Mean	94.521	95.512	103.210	94.034	85.055	97.086	98.090
Median	93.335	95.050	103.380	92.915	84.130	96.720	97.320
Maximum	114.090	102.450	109.310	107.290	97.320	101.800	104.590
Minimum	79.320	90.050	96.430	82.430	74.840	91.860	94.060
Std. Dev.	**8.758**	**3.662**	**3.789**	**7.311**	**7.351**	**2.808**	**2.988**
Coefficient of variations	**9.27**	**3.83**	**3.67**	**7.77**	**8.64**	**2.89**	**3.05**
Observations	44	44	44	44	40	44	44
C: Sample: 2003:05 2006:09							
Mean	85.183	101.289	97.508	77.825	68.161	91.916	96.571
Median	83.525	100.830	97.785	76.835	67.370	91.455	96.555
Maximum	97.830	113.700	101.160	83.890	74.660	96.070	101.150
Minimum	74.940	90.850	93.670	72.990	60.060	89.350	92.850
Std. Dev.	**6.281**	**7.541**	**1.930**	**2.887**	**3.211**	**1.702**	**2.245**
Coefficient of variations	**7.37**	**7.45**	**1.98**	**3.71**	**4.71**	**1.85**	**2.32**
Observations	40	40	40	40	41	40	40

Source: BIS statistics for Nominal Effective Exchange Rate, the Central Bank of Sri Lanka web site for Sri Lanka.

Table A3: Volatility of REER (there is no data available for REER of Cambodia)

	REER_ID	REER_KR	REER_MY	REER_PH	REER_LK	REER_TW
A: Sample: 1996:01 1999:08						
Mean	120.985	99.383	111.913	115.132		99.728
Median	122.220	104.225	103.945	113.070		99.570
Maximum	165.540	118.130	134.550	132.390		107.010
Minimum	50.900	66.280	87.050	95.680		92.990
Std. Dev.	**39.247**	**15.283**	**14.763**	**10.892**		**4.438**
Coefficient of variations	**32.44**	**15.38**	**13.19**	**9.46**		**4.45**
Observations	44	44	44	44		44
B: Sample: 1999:09 2003:04						
Mean	103.948	97.338	103.035	96.742	99.009	95.381
Median	104.515	97.510	103.490	96.210	98.925	95.175
Maximum	118.640	103.330	109.420	105.770	102.520	102.130
Minimum	84.540	90.410	96.290	87.320	95.900	86.930
Std. Dev.	**9.969**	**3.605**	**3.641**	**5.032**	**1.664**	**4.045**
Coefficient of variations	**9.59**	**3.70**	**3.53**	**5.20**	**1.68**	**4.24**
Observations	44	44	44	44	40	44
C: Sample: 2003:05 2006:09						
Mean	118.084	107.828	96.649	88.828	99.535	86.287
Median	117.900	107.585	96.485	87.400	99.010	85.870
Maximum	133.580	121.600	100.560	100.800	111.240	90.760
Minimum	105.070	96.210	92.320	81.350	91.670	84.060
Std. Dev.	**7.851**	**8.484**	**2.286**	**5.613**	**5.650**	**1.595**
Coefficient of variations	**6.65**	**7.87**	**2.37**	**6.32**	**5.68**	**1.85**
Observations	40	40	40	40	41	40

CHAPTER 2

EXCHANGE RATE POLICY SETTING IN CAMBODIA

by Nget Sovannarith[1]

1. Introduction

The exchange rate has been the focus point of studies since only the mid-twentieth century. The increasing numbers of independent states has meant the increasing numbers of currencies[2]. At the same time, international trade has reached unprecedented levels[3] and with the resultant increase in payment transactions, studies on exchange rate arrangements have intensified.

After World War II, leading countries in the world reached a consensus that the exchange rate should be fixed in order to facilitate international trade. The conclusion of the Bretton Woods Conference was to adopt a fixed exchange rate arrangement with the USD as an anchor currency with gold backing of one ounce of gold sold or purchased for 35 USD.

Under the auspices of the International Monetary Fund (IMF) and the World Bank after World War II, the Bretton Woods exchange rate arrangement was maintained until 1973. Since then, a flexible exchange rate regime was adopted internationally. However, there have always been attempts to form regional exchange arrangements[4]which obviously demonstrate the desire to stabilise the exchange rate.

---

1. Mr. Nget Sovannarith is Economist at the Governor's Office of the National Bank of Cambodia.
2. Since World War II, independent countries increased three fold. In 1946, there were 76 independent countries which now number 193 (Alesina A. and Barro R., 2000, "Dollarization", *American Economic Review,* 91(2),381-385)
3. Krugman and Obsfelt (2006) states that the world trade exceeded 10 billion US dollar in 2004 and more than 25% of world production is exchanged outside the national borders.
4. European Currency Unit and franc monetary zone in sub-Saharan Africa.

There have since been a number of regional fixed exchange arrangements and floating exchange rates globally. Before the Asian crisis in 1997, the fixed exchange rate arrangement had gained ground and there was global support for currency boards, dollarisation and even a monetary union. It was the dominant trend in the early 1990s to strengthen competitiveness and to curb the high inflationary pressure. The Asian crisis demonstrated that the fixed exchange rate arrangement is vulnerable, especially to speculative attacks. However, Cambodia, because of its limited monetary and financial integration, managed to avoid the financial crisis.

After the 1993 general election, Cambodia embraced a market-based economic system that quickly outperformed the centrally planned economic system. The market became the main driving force of productive activities.

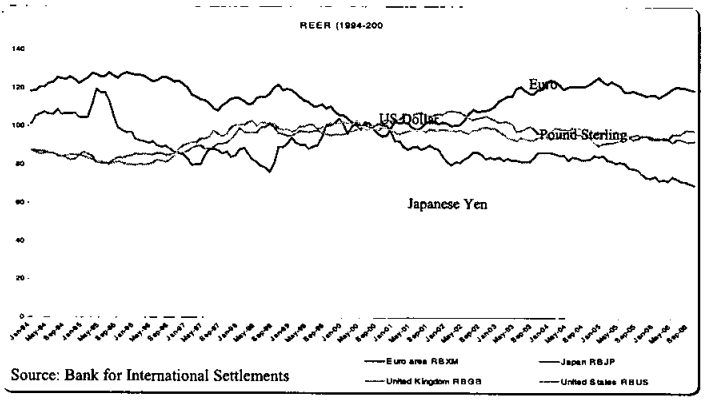
UNTAC (United Nation of Transitional Authority in Cambodia) intervened in Cambodia in the framework to build peace and stability in Cambodia. However, UNTAC unfortunately, contributed strongly to the high volatility of the Cambodian riel by injecting millions of dollars (although not the entire two billion dollars were absorbed into the economy) into the Cambodian economy. The confidence in riel fell through the floor[5].

Since 1993, the National Bank of Cambodia (NBC) has adopted a *de-facto*, managed floating exchange rate arrangement coupled with a dollarised economy. To stabilise the exchange rate movements, the NBC intervenes in the foreign exchange market as will be discussed in detail below.

Following the Asian crisis and the achievement of complete peace and stability in Cambodia, the riel found a level of controlled stability. However, the US dollar is still the dominant currency of exchange. Currently, if we examine the trends of the exchange rate volatility of strong currencies such as the United States dollar, Japanese yen and European euro, they are far from stable (cf. Figure 1).

5. UNTAC personnel paid everything in US dollar.

Figure 1: Exchange Rate Trends Of Strong Currencies



Source: Bank for International Settlements

The objective of our study is to answer the following questions. What is the exchange rate policy setting in Cambodia? Faced with a high level of volatility in the movement of strong currencies, how does the financial and corporate sector adapt to the situation? What are the policy measures that have been taken by Cambodian authorities to develop the foreign exchange market?

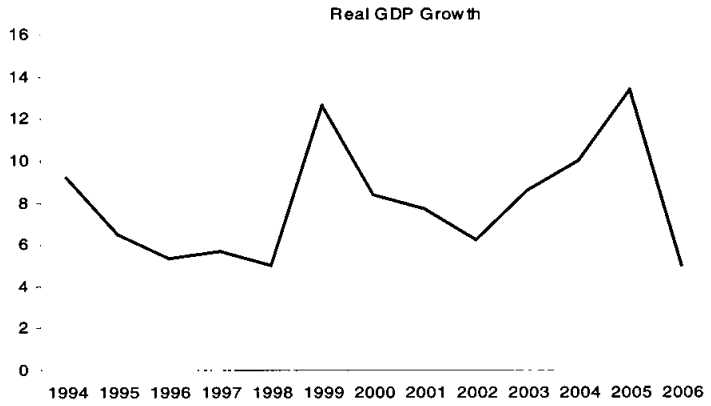
Section 2 will briefly focus on the recent economic developments while in Section3, methodology issues and the constraints of the study will be raised. The exchange rate volatility is analysed in Section 4. Exchange rate policy taken mainly to stabilise the rate will be put forward in the Section 5. The last part is the conclusion.

2. Recent Economic Development

The Cambodian economy is both transitional and also an economy recovering from a war. It had to build everything from scratch. The 1993 general election afforded Cambodians to devote all their efforts to rebuild their own country. At that time, the real GDP growth was a meager 4.1%. However, the nominal growth rate was about 13.2% as inflation seriously plagued the economy. It was not until 1995 and 1996 that economic growth reached satisfactory levels of about 7.6% and 7.0% respectively. Overall, the annual average growth rate stood at 5.5%. However, economic development has been pushed back by the July 1997 event. Psychological factors also affected investments in particular and economic activities in general with growth decelerating to about 2% in 1997. The inflation rate stayed, on average, at double digits till 1998 when the inflation rate reached 13.3%, up from 9.2% in 1997.

In the meantime, the exchange rate was very volatile. It was the period of adjustment to find the equilibrium exchange rate. Since 1993, the riel progressively lost its value against US dollar (*cf. infra*). Five years into the economic transition phase, Cambodia had difficulties reducing poverty. To address this issue, Cambodian authorities adopted structural adjustments which was encouraged and participated actively by the IMF. This took the form of the PRGF (Poverty Reduction and Growth Facilities) programme which adjusted macroeconomic variables such as the inflation rate and exchange rate to attain macroeconomic stability.

Figure 2: Real GDP Growth

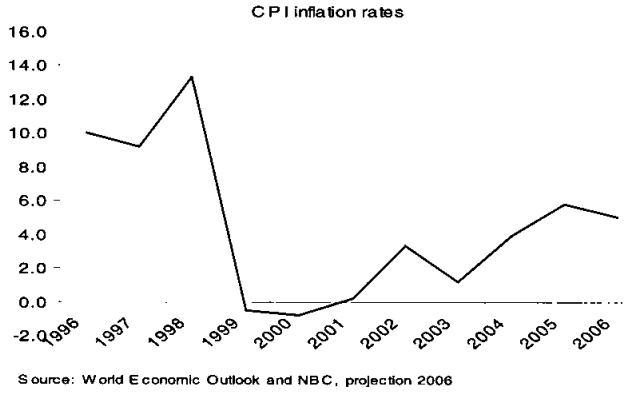


Source: World Economic Outlook and NBC, projection 2006

Real GDP growth in 2005 was the highest for a decade at about 13.4% compared with the already strong 10% in 2004. This was higher than originally expected as essential policy measures had been taken in various export oriented sectors such as garments and tourism. The expansion of the irrigation system was also an important step taken to increase productivity in the agricultural sector. While agriculture recovered substantially from a negative growth in 2004, other domestic activities remained robust, led by tourism and construction sectors. The annual average rate of GDP growth between 2000 and 2005 was 7.3 percent.

Economic growth through macroeconomic stability has been underpinned by prudential fiscal and monetary policies. Inflation has been well contained. Since 1999, the annual average inflation rate has been about 1%. However, the inflation rate rose sharply at 6% between 2004-2005 and the NBC had to intervene in the market to regulate the monetary supply and to stabilise the exchange rate.

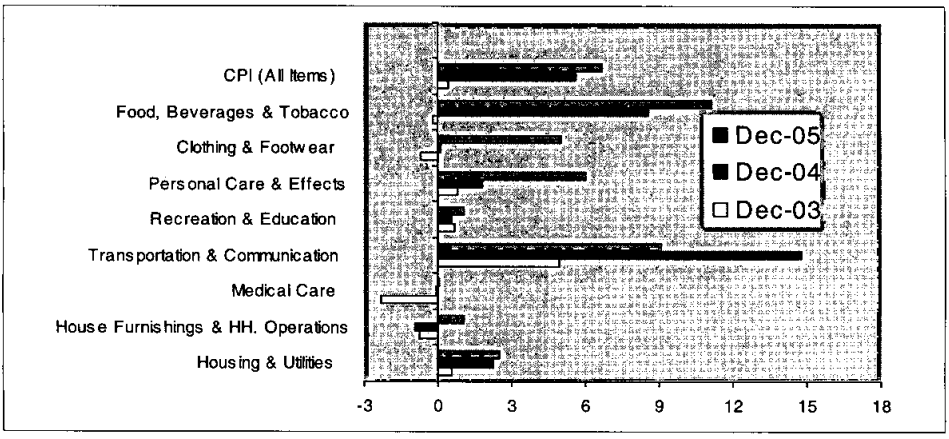
Figure 3: CPI Inflation Rate



Source: World Economic Outlook and NBC, projection 2006

The hike in the inflation rate in 2005 was mainly attributable to a surge in local food prices and also exacerbated by the direct and indirect influence of the consecutive growths in the price of imported fuel on the domestic consumer goods and services. As the import bill on fuels and lubricants increased, the impact of higher oil prices was somewhat pronounced in the depreciation of the riel against the dollar.

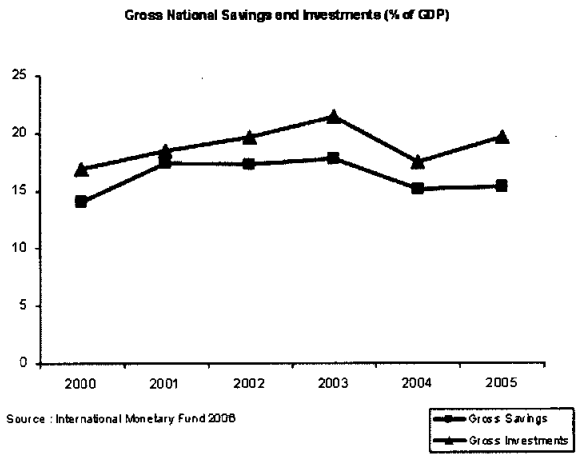
Figure 4: CPI and CPI by Sectors



Source: The National Bank of Cambodia, Annual Report 2005.

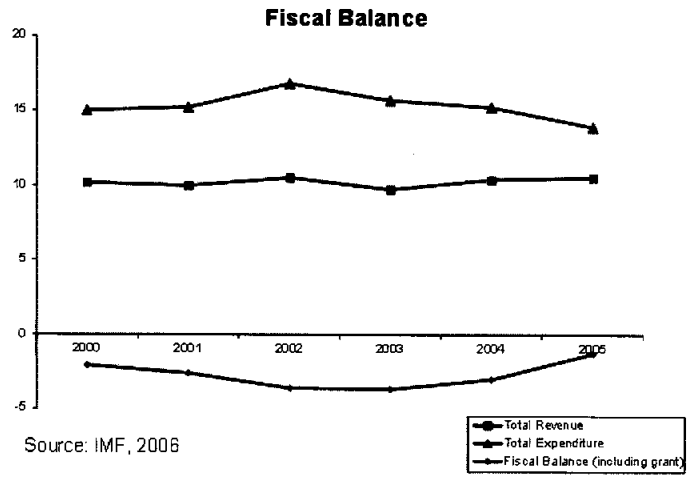
As shown in the graph below, both savings and investments have been proportionally constant during the first half of 2000s. In 2005, the percentage of gross national savings to GDP was about 15%, compared with 15.2% in 2004, whereas gross investment rose to 20% from 17.5% in 2004. Savings mobilisation has proven to be important in funding investments. Productivity would also be a main issue if an accelerated growth rate is on the economic agenda.

Figure 5: Gross National Savings and Investment (% Of GDP)



The overall fiscal balance was slightly negative in 2005, about 1.3% of GDP. This is a sign of the authorities' willingness to resolve fiscal issues. The debt monetisation by the NBC is not feasible, as it will destabilise prices and the exchange rate. The adjustment of the fiscal situation is needed to improve revenue collection and the revamping of expenditure classifications. In the meantime, the Cambodian fiscal deficit has been financed by international funds. The pressure on expenditure will limit infrastructure building seriously needed in the country.

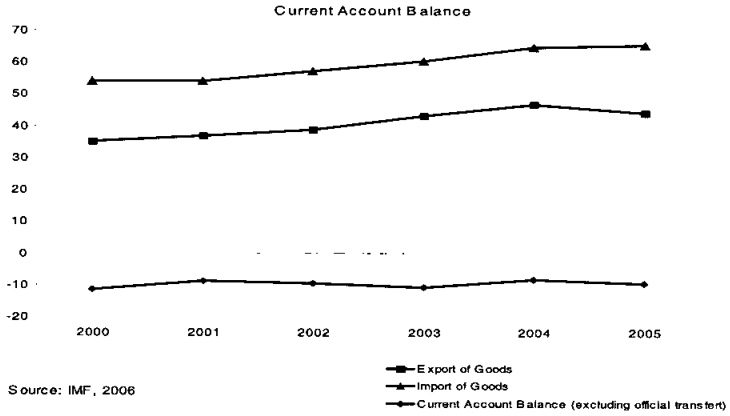
Figure 6: Fiscal Balance



Source: IMF, 2006

Cambodia, at the beginning of the new century, remains a net importer. The country is consuming more in the present and expectedly less in the future. The current account deficit is about 9.5% of GDP in 2005, up from 8.4% in 2004.

Figure 7: Current Account Balance



Source: IMF, 2006

The largest share of imports into Cambodia is raw materials for the textile industry. Therefore, lower garment imports in 2005 were not surprising as garment export growth also decelerated. On the contrary, the import bill on petroleum products increased remarkably, mainly a result of the price rise.

Consequently, the deficit in the trade balance was estimated to have risen by around 37 %. The external current account deficit rose to 10.6 % of GDP in 2005 from 9.9 % in 2004. Despite the high value of imports, accumulation of official reserves continued, thanks to the marked improvement in inflows related to FDI and external aids that enabled Cambodia to maintain its international reserves at 3 months of import coverage at end 2005.

Overall, the Cambodian economy is on the right track of development. Cambodian authorities especially the government, remain committed to their plans. It is a good demonstration of political will to have economic development plans, even though the desired results have yet to be attained. Plans include the Triangle Policy and Rectangular Strategy and the latest National Strategic Development Plan. Macroeconomic stability remains the main objective of these various plans with exchange rate stability being the main priority. However, the study of exchange rate volatility requires looking at the specific characteristics of Cambodia and also various methodological issues and constraints.

3. Methodological Issues and Constraints

The study of the exchange rate volatility in Cambodia has been limited by both theoretical and empirical studies. Most prices in Cambodia are dominated in US dollar and up to 95% of total liquidity is in US dollar (*cf Table*). The riel is held and circulated mainly in rural areas and is used by the urban population as "coins" complementing the US dollar in circulation and by the government (Lee and Mitra, 2006).

Only 4% of deposits in banks and 6% of bank loans, are in riel. The US dollar remains the dominant currency in the banking sector. The avoidance of exchange rate risks and not having enough riel-denominated investment instruments encourage further dollarisation in the banking sector.

Table 1: Deposits and Loans

Dec-05	Deposit in riel					Deposits in foreign currency					Total	% Riel
Billions of riel	Total	Demand deposit	Saving s Deposits	Fixed Deposits	Others	Total	Demand deposits	Savings deposits	Fixed deposits	Others		
Deposits	148	41	63	42	2	3780	959	1703	1072	46	3927	[redacted]

Dec-05	Advances in riel					Advances in foreign currency					Total	% Riel
Billions of riel	Total	Loans	Advances	Overdrafts	Others and Securities	Total	Loans	Advances	Overdrafts	Others & Securities		
Loans	159	101	1		56	2280	1470		777	33	2438	[redacted]

Source: The National Bank of Cambodia

Table 2 summarises the dollarisation process in the Cambodian economy since 1993. The Cambodian economy is very liquid and dollarised with nearly 96% of total deposits denominated in US dollar. Foreign currency deposit continued its increase during the whole period reaching 71% of M2 in 2005, which follows an increasing trend from previous periods.

Currency outside banks decreased from 57% of M2 in 1993 to 25.5% in 2005. The declining trend of currency outside banks may be the result of an improved banking system in general, and payment system, in particular. This is the first step to the better management of the monetary base in the economy. However, the monetary authority has to strengthen the banking system and implementation of monetary policy for if there is continued uncertainty regarding inflation and depreciation of the local currency, there will be a tendency for the public to shift gradually towards even greater dollarisation.

Table 2: Monetary Survey

	FCD	COB	Riel-D	M2	FCD/M2	COB/M2	FCD/COB	FCD/TD
	In billion of riel				in %			in %
1993	121.1	189.7	22.6	333.5	36.3	56.9	0.6	84.3
1995	365.6	250.9	32.6	649.1	56.3	38.7	1.5	91.8
1999	878.8	489.9	73.8	1,442.5	60.9	34.0	1.8	92.3
2001	1,538.6	577.6	87.5	2,203.7	69.8	26.2	2.7	94.6
2003	2,309.6	908.2	111.2	3,329.0	69.4	27.3	2.5	95.4
2004	3,079.1	1,114.7	135.5	4,329.3	71.1	25.7	2.8	95.8
2005	3,589.4	1,282.1	153.4	5,024.9	71.4	25.5	2.8	**95.9**

Source: The National Bank of Cambodia

According to Lee and Mitra, (2006), it is difficult to interpret the exchange rate as the relative value of currencies of two countries that would normally change in response to differentials in inflation and productivity growth or changes in the terms of trade. Rather, the exchange rate reflects changes in demand for riel by a small fraction of the urban population who hold riels cash balances for transaction purposes. Although most of the poor in the rural areas hold riel cash balances, they appear not to contribute much to exchange rate changes due to limited information and access to the foreign exchange market.

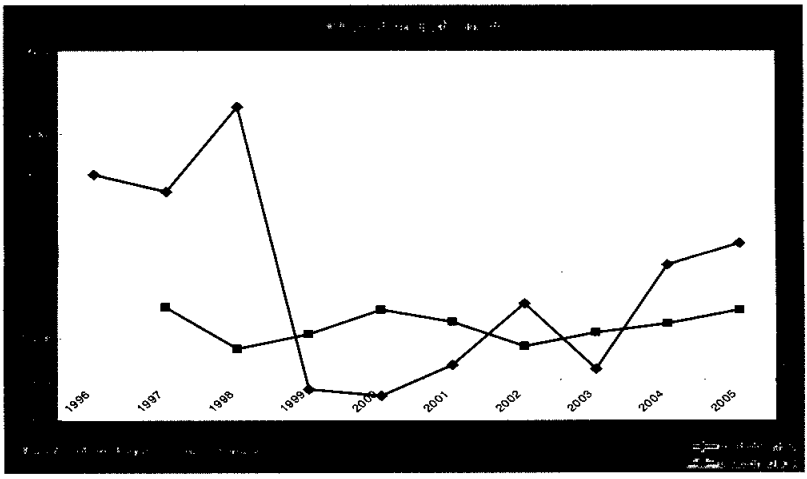
Excessive injection of riel in circulation would result in a depreciation of the riel against the US dollar. Furthermore, demand for riel is also sensitive to non-economic news such as political developments. Any negative news that raises country risk will immediately lead to further dollarisation and, on a much larger scale, to capital outflows (Lee and Mitra, 2006).

Any increase in the volatility of the exchange rate will push holders of riel to convert savings into US dollars. So, a small change in supply or demand could easily influence the exchange rate. In addition, the study of the impact on the returns or balance sheets of non-financial sector needs the industry level data, yet the latter is currently not available. This would limit the analysis of the impacts of exchange rates volatility on firms in Cambodia.

Our study and conclusion are based principally on observations and interviews with important stakeholders in the corporate and financial sectors. The resident corporate and banks could not turn to a derivatives market to hedge risk, as the derivatives market has not yet been institutionalised. Only the big players can have access to the international foreign exchange markets.

Lee and Mitra (2006) tried to locate the similarity in the trend between the inflation of the US and that of Cambodia. In their study, they examined the pass-through between the exchange rate and inflation rate and found that the relation between the inflation rate in the US and that in Cambodia is not significant (*cf. Figure 8*). Thus, the price level in the United States does not have any influence on the price level in Cambodia.

Figure 8: CPI Inflation Rate Trend in United States and Cambodia



As the impact of exchange rate volatility on prices is obvious, we would then examine the pass-through from exchange rate change to domestic inflation in a dollarised economy. The analysis is adapted from the work of Lee and Mitra (2006). The pass-through from exchange rate changes to domestic inflation in a dollarised economy needs to consider the "accounting effect".

$$P_T = P^*$$

P_T : the price of tradable goods in US dollar
P^* : world price in US dollar

The price level is defined in US dollar:

$P = P_T^{\varepsilon} P_N^{(1-\varepsilon)}$ where $0 \leq \varepsilon \leq 1$ and

$$P_N = P_N^{US\beta}\left(\frac{P_N^{KHR}}{e}\right)^{(1-\beta)}$$

P_N^{KHR} : the price of nontradables in riel

β : the share of the nontradable goods denominated in US dollar

e : the exchange rate where $de / dt > 0$ implies a depreciation.

As, the CPI is collected in riel, the observed price level:

$$P^{KHR} = eP_T^{\varepsilon} P_N^{(1-\varepsilon)}$$

$$\dot{P}^{KHR} = (\beta + \varepsilon - \beta\varepsilon)\dot{e} + \varepsilon \dot{P}_T + \beta(1-\varepsilon)\dot{P}_N^{US} + (1-\beta)(1-\varepsilon)\dot{P}_N^{KHR}$$

where $X = dX / X$

The pass-through by the accounting sense:

- $\beta = 1$: all prices are indexed and dominated in US dollar, pass-through is full
- $\beta = 0$: all nontraded goods are dominated and priced in riel, pass-through is ε
- $\varepsilon = 1$ and $\beta = 0$: the tradable sector is very large or there were no nontradable goods, pass-through is full ( )
- $\varepsilon = 0$: the tradable sector is very small or nonexistent, pass-trough is β. If most prices of nontradables are denominated in riel, then pass-trough is 0.

However, according to the study of Lee and Mitra (2006), the pass-through between the trading partner's inflation (United States) and domestic inflation is negative.

This result may be due to the following:

- A strong policy commitment to reduce the inflation rate after the Asian financial crisis.
- An increased weight of non-tradable goods dominated in local currency.
- Other large shocks arising from the non-traded goods sector.

The first case is more justifiable as macroeconomic stability is the main objective of the government's economic development plan.

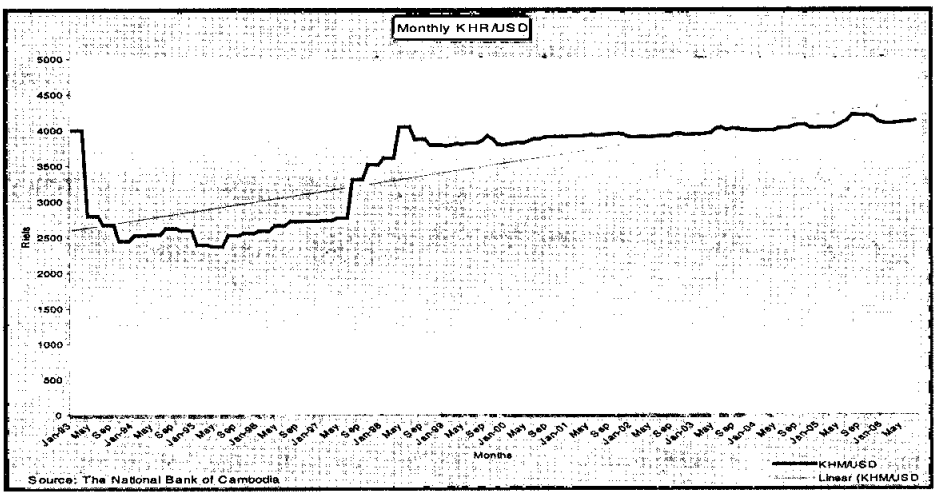
In terms of exchange rate volatility in Cambodia, we will first look at the characteristics of exchange rate variation and secondly, the policy setting in terms of exchange rate policy measures formulated to suit the specific context of the dollarised economy.

4. Exchange Rate Volatility

In Cambodia, there are two exchange rates. There is firstly the market rate which is surveyed daily in the market and secondly, an official rate, calculated by the NBC. Both serve as exchange rate indicators in Cambodia. To track changes in the exchange rate, we have to focus on the nominal exchange rates.

Looking at the long-term trend, the exchange rate of riel-US dollar has remained at 4000 riel for one dollar from 1993 into the early 2000s. From 1999 onwards, the exchange rate has been relatively stable.

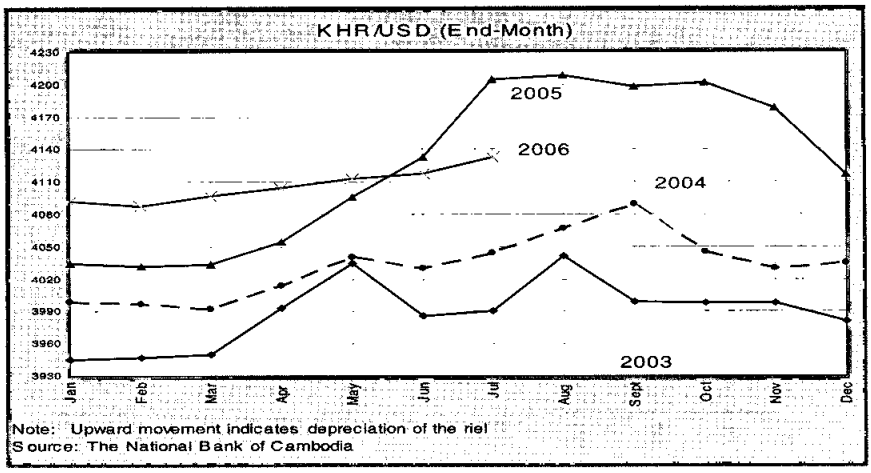
Figure 9: Monthly Exchange Rate Riel per One US Dollar



The exchange rate of the riel against USD has been cyclical. Tracking the general trend of the USD, the riel depreciated from the beginning of the second semester of the year and reached its highest level in the third quarter of the year (*Cf. Figure 10*). This is due mainly to the increase of the riel in the market in the second semester. Riel then gained ground as the year ended. After the harvest at the end of the year, farmers absorbed the riel from the market as their products are paid in riel. It is likely that seasonal factors associated with the collection of agricultural products during the harvest season exert an impact on the pattern of the demand and supply of riel.

In general, the value of the riel compared to the USD was largely stable during the first quarter of the year, but became weaker to some extent during the second and third quarter, and finally recovered gradually during the last quarter of the year. In 2006, the riel strengthened in the first semester and began to lose its value slightly in the second semester. This is not exceptional, if the cyclical analysis is strongly based. The volatility of the exchange rate follows the demand and supply of riel in the foreign exchange market but in the case of Cambodia, the exchange rate is based not only on one rate but two.

Figure 10: End-Month Exchange Rate Trend

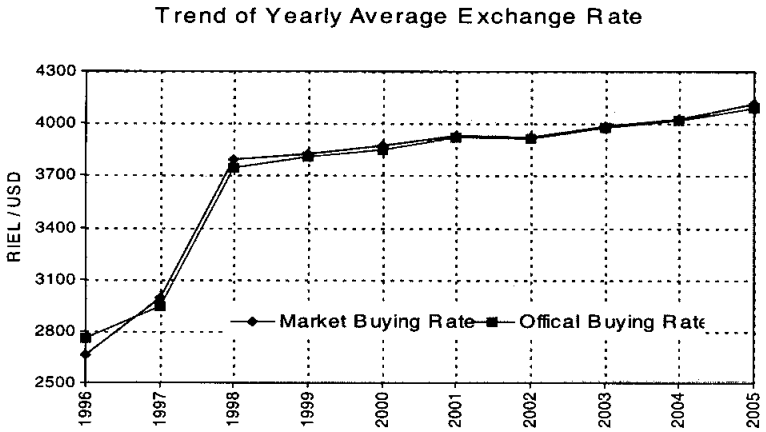


4.1 Market and Official Rates: A Dual Exchange Rate System

As stated earlier, there is a formal exchange rate and a market exchange rate. The former is calculated and adjusted on a daily basis to the market rate by the NBC. The latter is quoted on the foreign exchange market in which only a number of big money changers are the key players. Overall, the exchange rate arrangement is market based.

The official exchange rate is applied mainly for external transactions conducted by the government and state-owned enterprises and is used by banks for recording all transactions in foreign currencies. The NBC adjusts the formal rate in order to ensure that the formal and market rates do not differ from each other by more than 1%. The market rate is adopted by money changers in the foreign market and is used for retail transactions. While the market rate is a good indicator of the supply and demand of the domestic currency, it must be stated that exchange rate volatility is not always tied in with the economic fundamentals. Non-economic news is also an influential factor. We will further discuss the policy measures of the monetary authority in this dual exchange rate system.

Figure 11: Trend of Yearly Average Exchange Rate

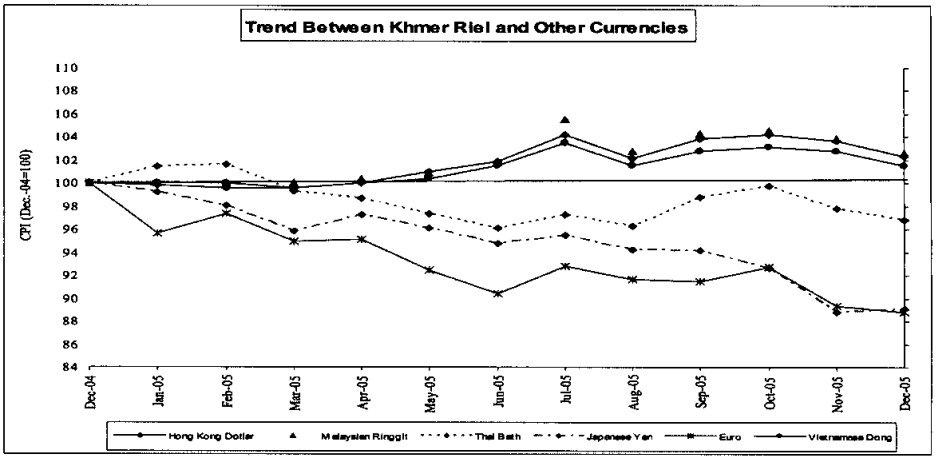


Source: The National Bank of Cambodia

4.2 Exchange Rate Evolution with Main Trading Partners

Apart from the United States and the European Union, the main trading partners of Cambodia are South East Asian countries such as Thailand and Vietnam, and East Asian countries such as China and Hong Kong. Looking at the cross country exchange rates to track the trend of exchange rate volatility with main trading partners, we find that the Hong Kong dollar, the Malaysian ringgit and the Vietnamese dong appreciated slightly against the riel *(Figure 12)*. However, the Thai baht, the Japanese yen and the Euro depreciated continuously against the riel.

Figure 12: Exchange Rate with Major Trading Partners



4.3 Trend between Khmer Riel and Other Currencies

Movements of the riel in 2005 indicated a mixed trend against a number of foreign currencies other than the US dollar. In the previous year, the value of the riel fell by 9 percent vis-à-vis the euro, but in 2005 the riel appreciated notably by 11.2 percent against the euro. Apparently, the wide interest rate differentials between the US and the ''euro area'' greatly supported the US dollar, leading to a further weakening of the euro relative to dollar.

Turning to Cambodia's neighbouring currencies, as of the end of the reporting year, the riel strengthened against the Thai baht and the Japanese yen by 3.2 percent and 10.9 percent, respectively. In the same period, it posted depreciations against the Malaysian ringgit, Hong Kong dollar, and Vietnamese dong by 2.6 percent, 2.3 percent, and 1.6 percent, respectively.

5. Exchange Rate Policy Setting in Cambodia

The Cambodian economy is largely dollarised (*cf. supra*) with the US dollar playing a very important role especially in terms of the store of value. The long-term policy is to promote the wider use of the local currency. In fact, in the banking sector, 95% of deposits are dominated in US dollar while nearly all goods are marked in USD. The small quantity of riel in the banking sector limits transactions in riel.

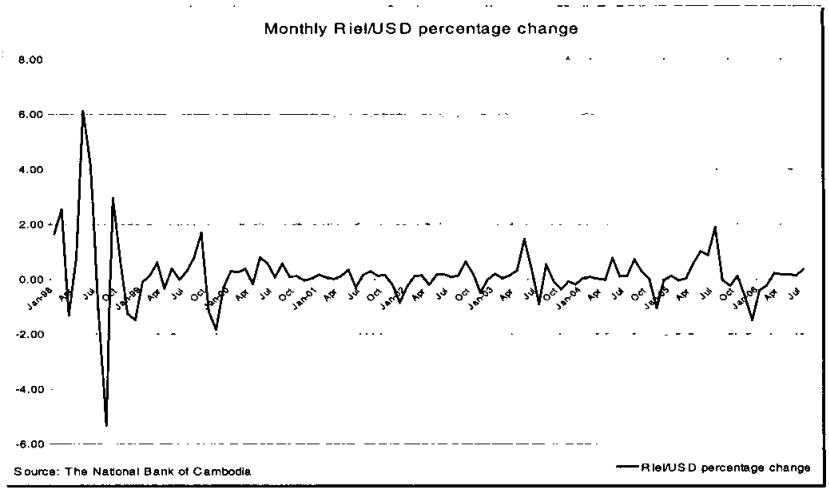
The economic development in Cambodia is very fragile having just emerged from sustained turmoil. The exchange rate is particularly volatile and slight disturbances, especially political ones, can seriously affect the market. Non-economic developments can influence the foreign exchange market as for instance, the news concerning the increase of 15% of civil servant salaries in the fourth quarter 2005, which affected the currency value.

Faced with this situation, corporate, financial and public sectors have their own measures to solve their specific issues. Companies invoice their bills in US dollar to avoid exchange rate risks. Invoicing in USD is the surest way to maintain the value by minimising risks caused by exchange rate changes. For instance, retailers who buy products from Thailand or Vietnam, will on the same day, convert their riel revenue into the foreign currency that they need to pay for their imports at the exchange bureau. In doing this, they avoid exchange rate risks. Most retail businesses prefer holding foreign currency rather than the weak local currency.

Deposits in banks are dominated in US dollars and only a small proportion is in riel. For instance, most banking transactions are in US dollars to avoid exchange rate risks. In December 2005, out of 18 banks, 8 did not accept deposits in riel, although it is legal tender. Most loans are also denominated in US dollars (94%). Out of 18 banks, only 4 grant facilities in riel for limited amounts.

However, both the government revenue and expenditure are in riel. Public institutions are the main players influencing the demand and supply of the national domestic currency. Any excessive injection of riel in the economy will result in its depreciation. Faced with this special situation, the NBC as the monetary authority intervenes directly in the market to regulate the demand and supply of domestic currency to stabilise exchange rate volatility. The NBC has to sell US dollars when the riel depreciates abnormally and purchase US dollars when the domestic currency continuously loses its value. Since 1999, exchange rate variability has been contained within the band of -/+2% (cf. Figure 13).

Figure 13: Monthly Riel per Dollar Percentage Change



The exchange rate policy conducted by NBC since the introduction of the market economy in the early 1990s is to stimulate price stability, support an environment for sustainable economic growth, and to decrease financial and business risks, by maintaining a stable exchange rate of the riel (NBC, 2005).

The foreign exchange market is dominated by money changers. The first task of the NBC is to bring them into the formal sector by first requiring them to register at the NBC. On the other hand, for banks, their riel dominated assets are too insignificant to encourage them to enter into the foreign exchange market. The moneychangers are the main players in the market. One of the objectives of the NBC in developing the foreign exchange market is to reduce the number of the small money changers. Regulating the big money changers is the first step in institutionalising the foreign exchange market.

The NBC intervenes from time to time in the local foreign exchange market in order to reduce temporary pressure in the foreign exchange market caused by psychological factors or seasonal increases in local demand for the US dollar. The NBC, however, refrains from intervening in the market to resist currency fluctuations triggered by changes in underlying internal economic fundamentals or currency adjustments that move in line with international foreign exchange markets.

After a long period of social instability, the Cambodian people have very little confidence in the local currency as there was a time when the currency became a useless piece of paper a day after a regime change. While the riel was struggling to regain the confidence of the public, the introduction of a strong currency like US dollar in the Cambodian economy served to strike another blow to confidence in the riel. The USD-riel exchange rate affects all aspects of Cambodian life as any change in the riel-US dollar rate would affect purchasing power, as most of goods are priced in US dollar.

The NBC has, therefore, to be very mindful of exchange rate variability. As an indicator of macroeconomic stability (which is the sole objective of the government), the exchange rate receives careful attention from all stakeholders.

In 2005, the nominal exchange rate of the riel against the US dollar, as measured by the market purchase rate, indicated a relatively large fluctuation compared to the previous year. The nominal exchange rate of the riel against US dollar rose by 82 riel or 2.03 percent, from 4,035 riel per US dollar at the end of 2004 to 4,117 riel per US dollar at the end of 2005.

All policy measures, even they are for the long term, are geared towards the promotion of the greater use of the riel. The depreciation of the riel will worsen from a weak demand for the riel in the market. Historically, the riel gained ground when market players need riel to buy agricultural products following the harvest season. Due to this trend, productive activities in the country have to be broadened. Diversification of domestic production can help to stimulate the demand for and circulation of riel. For instance, in 2006, the government of Cambodia created a committee called the "*one village, one product* committee" as the first step taken to study and promote domestic production, even though the effectiveness of this initiative cannot be verified at the moment.

Since 2000, the NBC has carried out a thorough banking sector reform. The reform ranges from re-licensing of commercial bank and application of the uniform chart of account. The first step of the reform is on banking supervision to strengthen the banking sector. Many laws and regulations have been passed to build a stronger legal foundation for the banking sector, in particular, and financial sector, in general. As a result, the savings and deposits in the banking sector have continued to increase.

All public transactions are now required to be paid in riel. These include water, electricity and tax liabilities. Civil servant salaries must be denominated and paid in riel as well. The government aims also to collect non-tax revenue in riel.

To promote wider use of the riel, the NBC has replaced old, dirty bank notes with new ones. To improve the quality of the riel, the NBC has frequently withdrawn the old and mutilated banknotes from circulation. Tax payers can come to the NBC to pay their taxes so that the NBC can recycle the banknotes. However, as these are limited channels by which banknotes can be returned to the NBC, very old notes remain in the circulation.

When the branch network of the NBC becomes active nationwide, old and mutilated banknotes will become rarer in the market. Furthermore, in the framework of public finance reform by which all public entities' accounts are to be opened and centralised, the NBC would facilitate the withdrawal of old notes.

The NBC funds banks and microfinance institutions by granting loans dominated in riel. Microfinance institutions have direct contact with nearly all riel holders and can be therefore instrumental, for savings mobilisation and promotion of investment instruments denominated in riel in the rural areas. For instance, the less well-off rural population can be encouraged to open deposit accounts at microfinance institutions to encourage transactions in riel.

In the framework to promote the use of the local currency and following major consultations with the stakeholders, the NBC is presently adopting various policy measures. First, in order to stimulate demand for the riel, public employees' salaries are paid through bank accounts which may encourage bank intermediation in riels and discourage civil servants from changing their riels into dollars as soon as they get paid. The order option to increase the demand for riel is to require that the prices of all goods and services be denominated in riel.

In the current situation, payment services in riel remain limited in terms of scale and quality. The efforts to install ATMs in important commercial centres and revitalise NBC's branches in provincial centres are major steps towards improving the quality of payment services.

Requiring retailers, including supermarkets to market their prices in riel is to familiarise the public with the riel. As a start, both USD and riel prices can be displayed with the gradual withdrawal of the USD price tags eventually.

Faced with the lack of financial infrastructure, steps have to be taken to improve the infrastructure of the financial sector. For instance, banks would accept more riel deposits if they could invest in riel denominated assets such as treasury bills which bear attractive interest rates. The legal base of secured transactions would have to be established to avoid the collateralisation of real assets.

6. Conclusion

The foreign exchange market in Cambodia remains semi-official as there are two quotations of the exchange rates. The first is the market rate which varies according to the demand and supply of the domestic currency. The other is the official rate, quoted daily by the NBC. The official exchange rate is used mainly for external transactions of the government and state-owned enterprises and is used by banks for recording all transactions in foreign currency.

Any attempt to eliminate either the market or official rate would encourage informal foreign exchange activities. For the time being, the dual exchange rate system is suitable for Cambodia in short term, while commitment to bring the informal sector into the formal one has to be strong. The first step is to require all moneychangers to register at the NBC before a complete institutionalisation of the foreign exchange market and inter-bank market.

After years of instability in the foreign exchange market, behaviour of banks, financial institutions and the private sector have encouraged the further dollarisation of the Cambodian economy, in the face of exchange rate volatility. Exchange rate volatility is not always caused by the changes in economic fundamentals as non-economic influences, such as political events, have a relatively great impact on exchange rate movements.

Cambodia had to strive to build everything from scratch and as late as the early 1980s, the economy was forced to adopt a barter system using rice as the medium of exchange. Looking ahead, in order to build a sound financial system, we need careful and pragmatic measures and effective decisions to keep pace with other countries in the region.

References

1. Coe, D.T. et *al.* (ed.) (2003), "Cambodia: Rebuilding for a Challenging Future", International Monetary Fund, Washington D.C.

2. Cowan, K. and *al.*, (2005), "Currency Mismatch, Balance Sheet Effects and Hedging in Chilean Non-Financial Corporations", *Central Bank of Chile WorkingPapers*.

3. Dominguez, K. and Tesar, L., (2006), "Exchange Rate Exposure", *Journal of International Economics* 68, pp.188-218.

4. Goldberg, L., (2004), "Industry-Specific Exchange Rates for the United States", *FRBNY Economic Policy Review*, May, 16 pages.

5. Krugman, P. (1999), "Balance Sheets, the Transfer Problem and Financial Crises", *International Tax and Public Finance*, Vol.6, No 4, pp. 459-472.

6. Krugman, P. and Obsfelt, M., (2006), "International Economics", Pearson Education Inc., 7th edition.

7. Lee I.H. and Mitra, S. (2003), "Pro-Poor Exchange Rate Policy", in Cambodia: Rebuilding for a Challenging Future," International Monetary Fund, Washington D.C.

8. Menzie, C., (2002), "The Measurement of Real Effective Exchange Rates: A Survey and Application to East Asia", *Working Paper,* University of California, Santa Cruz, 41 pages.

9. Moguillansky, G. (2003), "Corporate Risk Management and Exchange Rate Volatility in Latin America", Paper presented for the United Nations Univesity/World Institute for Development Economics, 36 pages.

10. Salvatore D et *al.* (ed.) (2003), "The Dollarization Debate", Oxford University Press.

11. Supaat, S. and *al.* (2003), "Investing the Relationship between Exchange Rate Volatility and Macroeconomic Volatility in Singapore", *MAS Staff Paper* No 25, 26 pages.

12. UNDP, (2004), "The Macroeconomics of Poverty Reduction in Cambodia," Washington D.C.

13. Zamarockzy, M. and Sa, S., (2003), "Economic Policy in a Highly Dollarized Economy, The Case Of Cambodia", *IMF Occasional Paper*.

14. Various issues of IMF: Cambodia: Statistical Index (2000, 2002, 2003, 2004, 2006)

15. NBC (website: www.nbc.org.kh):
    - Quarterly Reports of the National Bank of Cambodia
    - Economic and Monetary Statistics
    - Monetary Survey

CHAPTER 3

ADJUSTMENTS OF THE NON-FINANCIAL SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS IN INDONESIA

by Dr. Sahminan Pulungan[1]

1. Introduction

Following the crisis in 1997, Indonesia has shifted its exchange rate regime from managed floating to free floating. Not surprisingly, the most obvious result of the new regime is that exchange rate of the rupiah has become more fluctuating (see Sahminan, 2005b). The implication of a more fluctuating exchange rate on corporate sectors, however, is not so obvious. Under the managed floating regime before the 1997's crisis, it was easier for corporate sectors to manage exposures to exchange rate fluctuations: firms found it easier to assess the magnitude of the change in exchange rate. Although the government devalued the rupiah against the US dollar under the managed regime, it took place only very rarely. On the other hand, under the current regime—a free floating regime—the exchange rate can change abruptly.

The implications of exchange rate fluctuations on corporate sectors have continuously been debated both in academics as well as by practitioners. For many firms, fluctuations of exchange rate may represent a major risk, while for other companies such fluctuations are not a significant concern. Exchange rate changes can have substantial influences on the investment behaviour, pricing behaviour, and profitability of the firms that in turn influence the value of the firms. When the value of a firm is affected by fluctuations in exchange rate, the firm is said to be exposed to exchange rate risk. The effects of exchange rate fluctuations on a firm, of course, depend on factors inside the firm, including currency composition of the balance sheet of the firm, their dependence on

1. Economist at Directorate of Economic Research and Monetary Policy – Bank Indonesia. I would like to thank Dr. Perry Warjiyo, Endy Dwi Tjahyono, and Yati Kurniati for helpful discussions and comments. I also gratefully acknowledge any comments and support from other staffs at DKM - Bank Indonesia. The views expressed in this paper are those of the author and do not necessarily reflect those of Bank Indonesia. Any errors are my own. E-mail: sahminan@bi.go.id

imported inputs and the amount of output for exports. Moreover, the effect of the exchange rate fluctuations also hinges on hedging strategy of the firm[2].

The purpose of this paper is to examine the exchange rate exposure of the Indonesian non-financial sectors and hedging strategy undertaken by firms to deal with exchange rate risks. Specifically, the exposure of the non-financial sectors in Jakarta Stock Exchange (JSX) is estimated and the hedging strategy of non-financial firms in reducing exchange rate risks is examined. The industry-specific real exchange rate of the rupiah is used and the results of the paper shed light on the extent to which publicly traded firms in Indonesia are exposed to exchange rate fluctuations and their hedging strategy used by firms to minimise the risk emanating from exchange rate exposure.

The paper proceeds as follows. Section 2 reviews related literature on foreign exchange rate exposure. Section 3 presents conceptual frameworks of exchange rate exposure and empirical method. Section 4 lays out the method used to calculate industry-specific real exchange rate. Section 5 presents data and their descriptive statistics. Section 6 provides the estimation results of the exchange rate exposure models. Section 7 presents evidence on hedging strategy by a sample of publicly traded firms in Indonesia. The evidence on hedging is anecdotal rather than statistical, which is based on the interview on a number of firms. Finally, this paper concludes with Section 8.

2. Literature Review

This paper is related to the strand of literature on firms' exposure to exchange rate fluctuations. The study by Adler and Dumas (1984) seems to be one of the most cited studies on the definition and measurement of corporate exposure to exchange rate fluctuations. Their paper provides a concept of foreign exchange exposure and hedging of exchange rate risk based on a regression analysis. As Adler and Dumas (1984) argue, the regression coefficient concept of exposure can provide a single comprehensive measure that summarises the sensitivity of the whole firm to all various ways in which exchange rate changes affect it. In their paper, Adler and Dumas (1984) did not provide empirical estimates of their model.

2. Internal factors can also be the type of firm (domestic or multinational), market orientation of the firm (local or foreign), investment and financing policy.

Following Adler and Dumas (1984), studies on the exposure to exchange rate fluctuations have been growing. Bodnar and Gentry (1993) examines exchange rate exposure at industry level in Canada, Japan, and the US. They found that, in all three countries, some industries show significant exchange rate exposure while other industries do not face significant exposure. For a sample of Japanese multinational corporations, He and Ng (1998) conducted a study to examine the exposures of corporations to exchange rate fluctuations. They found that about 25 percent of the sample experienced significant positive foreign exchange exposure, and the extent of the exposure is determined by the export ratio, leverage ratio, and firm size. Recently, Bartram and Bodnar (2005), provided a survey of the existing research on the exchange rate exposure of non-financial firms. They showed that only a small percentage of firms have significant stock price exposure.

Another recent empirical study on the exchange rate exposure is Dominguez and Tesar (2006). Their study is a cross-country study using firm level data covering developing countries as well developed countries. Countries in their sample consist of Chile, France, Germany, Italy, Japan, Netherland, Thailand, and the UK. They found that the extent of exposure is robust at the country level and the direction of exposure depends on the specific exchange rate and varies over time. In addition, they also found that exposure is more prevalent in small-sized firms and, not surprisingly, in firms engaged in international activities.

From the theoretical side, Bodnar, Dumas, and Marston (2002) recently developed theoretical models to predict exchange rate exposure of firms. The models show how pricing behaviour of firms affect exposure of firms' profits to exchange rate. Their models resulted in an optimal pass-through decision by the firms to mitigate their exposure to exchange rate fluctuations. Unfortunately, using data of Japanese firms, empirical estimation of their models provide no consistent evidence. Bartram, Brown, and Minton (2006) have tried to resolve the puzzle on the foreign exchange rate exposure—discrepancy between theoretical predictions and observed foreign exchange exposure. They show that pass-through of exchange rate fluctuations to customers, choices of factory location, and financial products play an important role in creating discrepancy between theoretical predictions and observed foreign exchange exposure.

A study on the implications of exchange rate fluctuations on Indonesian non-financial firms can be found in Sahminan (2006). He estimated the effects of exchange rate fluctuations on the investments of the non-financial firms through balance-sheet effects. The sample in Sahminan (2006) covered non-financial

firms traded in the JSX. The data he used cover the period from 1995 to 2004 with yearly frequency. He found that exchange rate depreciation has a negative effect on the investment in current assets, but no significant effect on the investment in inventory.

In another study, Sahminan (2005a) examined the balance-sheet effects of exchange rate fluctuations on commercial banks in Indonesia. He used firm-level data of commercial banks in Indonesia that covers the period from January 1995 to December 1999 with monthly frequency. He found that due to a higher amount of foreign currency assets relative to the amount of foreign currency liabilities, exchange rate depreciation results in a lower probability of bank failures. But, through reduced profit on lending in foreign currency, exchange rate depreciation results in a higher probability of bank failures.

While there are many empirical studies on exchange rate exposure in industrialised countries, studies on exchange rate exposure in developing countries are limited. This paper is intended to fill such a gap in literature. Specifically, this paper contributes to the literature in a number of respects. First, it provides the estimates of industry-specific real exchange rate of the rupiah. Second, it provides empirical evidence on the exchange rate exposure of non-financial sectors in Indonesia. Finally, this paper provides anecdotal evidence on the foreign exchange hedging strategies of non-financial firms in Indonesia.

3. Concepts of Exchange Rate Exposure and Empirical Method

Adler and Dumas (1984), defines foreign exchange currency exposure as *"the amounts of foreign currencies which represent the sensitivity of the future, real domestic-currency (market) value of any physical or financial asset to random variations in the future domestic purchasing powers of these foreign currencies, at some specific future date."* The exchange rate fluctuations may affect traded goods and non-traded goods in different ways. By definition, non-traded goods are goods for which cannot be traded internationally for various reasons. By their nature, some goods and services must be produced and sold within the domestic economy. Sometimes goods and services are non-traded because of government policies which prohibit their export or import or due to their quality. Standard open economy macroeconomic models predict that the appreciation of the home currency induce a shift of resources from traded to non-traded sectors. The shifting in the allocation of resources causes the market value of capital in non-traded good industries to rise in the

short run given that the capital is sector specific. This predicts a positive relation between the appreciation and the value of non-traded sectors.

For traded goods (goods that can be traded internationally), the movements of exchange rate change the relative prices of inputs and outputs that in turn affects the firm's current and future operating cash flows and thus its value. Consider a country in which all inputs for production are available from domestic markets that are insulated from international conditions. An appreciation of home currency, *ceteris paribus*, lowers the amount of domestic currency needed to purchase foreign goods and raises the amount of foreign currency to purchase domestic goods. In terms of domestic currency, this appreciation reduces cash flows of exporters because it may cause a decrease in foreign demand and a lower price cost margin. On the other hand, if domestic input markets are not insulated from international conditions, *ceteris paribus*, an appreciation of home currency lowers the home currency price of internationally-priced inputs. This in turn causes a fall in production costs and the firm's profitability rises.

Other than purchasing and selling goods in foreign currency, exchange rate movements may also directly affect the values of assets and liabilities of a firm thorough a change in domestic currency values of foreign currency denominated assets and liabilities. For example, firms holding foreign denominated debt have current and future domestic currency cash flows that depend on exchange rates. Similarly, firms with foreign investments have current and future cash flows denominated in foreign currency and therefore the home currency value of this stream of cash flows depends on exchange rate. In general, the value of the firms with net foreign denominated assets decreases with an appreciation of home currency, and increases with depreciation of home currency.

Following Adler and Dumas (1984), the definition of exchange rate exposure can be formulated mathematically as follows. Consider random return, R, of a risky asset on a given future date, and number of states of nature K is finite with known probabilities. In a given state k, the outcome R_K is associated with a vector of state variables, $S_k = \{S_1,...,S_n\}_k$. In the case of exchange rate exposure, the state variable is exchange rate E. Adler and Dumas (1984) define exposure as the current expectation of the partial sensitivity of R to S_i given other variables held constant, that is

$$\text{Exposure of } R \text{ to } S_i = E(\partial R / \partial S_i) \qquad (1)$$

If R and S are jointly normal, exposure of R to S_i becomes the partial regression coefficient of S_i in a linear regression of R on S. The definition of exposure can then be rewritten as

$$E(\partial R / \partial S_i) = E\left\{\frac{\partial[(R)|S]}{\partial S}\right\}$$

$$= \frac{\text{cov}[S_i, R|S]}{\text{var}(S_i)}$$

$$= b_{R,S_i|\bar{S}} \qquad (2)$$

which is a regression coefficient on S_i in the regression of R on S.

Adler and Dumas (1984) argue that regression analysis is the best way to measure currency exposure. Although their argument that regression technique is the best way may be considered too bias, it does appear that this technique seems to be one of the best ways to measure the exposure. The study by Bodnar and Gentry (1993) on the exchange rate exposure, for example, employs the linear regression model to estimate currency exposure. Similarly, in estimating foreign exchange exposure, Dominguez and Tesar (2006) also employ the linear regression approach.

The empirical model in this paper follows the model widely used in assessing exchange rate exposure, as found in the literature. In this type of model, each firm's exchange rate exposure is measured relative to the market average. Letting R_{it} be the return of industry *i* at time *t*, and R_{mt} be return on market portfolio[3], then

$$R_{i,t} = \beta_{0,i} + \beta_{1,i} R_{m,t} + \beta_{2,i} \Delta E_{i,t} + \varepsilon_{i,t} \qquad (3)$$

3. In Dominguez &Tesar's (2006) paper, returns are weekly observations sampled on Wednesdays.

Where,

$\beta_{0,i}$ = constant terms

β_{1i} = industry i's market beta

β_{2i} = changes in returns due to movements in exchange rate

ΔE_{it} = change in relevant exchange rate

Coefficient β_{2i} captures the change in returns that can be explained by the exchange rate changes given market returns. In fact, the model above is the Capital Asset Pricing Model (CAPM) in which only market risks are relevant to firm's asset price in equilibrium. This implies that only changes in the market return are systematically related to firm returns. If the CAPM is the true model then β_{2i} should equal to zero, and there is no exchange rate risk. But if the stock return is significantly exposed to exchange rate risk then should β_{2i} differ from zero. If exchange rate is defined as foreign currency in terms of domestic currency per foreign currency, then a positive sign of β_{2i} means that an appreciation of domestic currency raises the value of the firm. On the contrary, a negative sign of β_{2i} means that appreciation of domestic currency reduces the value of the firm.

4. Industry-Specific Real Exchange Rate

While the analysis of real exchange rate movements at the national level relies on aggregate trade-weighted exchange rate, however, such a measure can be less effective when conducting industry-level analysis than the industry-specific measure of real exchange rate (Goldberg, 2004). The importance of particular countries as competitors within an industry can differ substantially from their importance in aggregate trade. The aggregate trade-weighted exchange rate does not take into account industry-specific distinctions concerning trade partners and competition.

To construct industry-specific trade-weighted real exchange rate, the method used by Goldberg (2004) is used. As pointed out by Dominguez and Tesar (2006), many (if not most) studies on the exchange rate exposure use trade weighed exchange rate. In this respect, three industry-specific real exchange rates are constructed: imports-weighted real exchange rate, exports-weighted real exchange rate, and imports and exports weighted real exchange rate. Letting XER_t^i be exports-weighted real exchange rate of product i,MER_t^i be imports-weighted real

exchange rate of product *i*, and TER_t^i imports and exports-weighted real exchange rate of product *i*, each of these measures can be formulated as:

$$XER_t^i = \sum_c w_t^{ic} \cdot RER_t^c \text{ , where } w_t^{ic} = \frac{EXP_t^{ic}}{\sum_c EXP_t^{ic}} \tag{4}$$

$$MER_t^i = \sum_c w_t^{ic} \cdot RER_t^c \text{ , where } w_t^{ic} = \frac{IMP_t^{ic}}{\sum_c IMP_t^{ic}} \tag{5}$$

$$R_t^i = \sum_c \left(\left(.5 \frac{EXP_t^{ic}}{\sum_c EXP_t^{ic}} + .5 \frac{IMP_t^{ic}}{\sum_c EMP_t^{ic}} \right) \cdot RER_t^c \right) \tag{6}$$

where EXP_t^{ic} is exports of product *i* to country *c*, IMP_t^{ic} is imports of product *i* from country *c*, RER_t^c is bilateral real exchange rate with country *c*, and subscript refers to time.

Table 1: Commodity Groups in Indonesian Trade and Jakarta Stock Exchange

Trade Sector*)	JSX Sector
Food and Live Animals	Agriculture
Beverage and Tobacco	Consumer Goods
Crude Materials, Inedible	Agriculture
Mineral, Fuels, Lubricants, etc.	Mining
Animal & Vegetable, Oils & Fats	Agriculture
Chemical	Basic Industry
Manufactured Goods	Manufacturing
Machinery and Transport	Manufacturing
Miscellaneous Manufactured Goods	Manufacturing

Note: *) Based on 1-digit SITC

The first step undertaken is to match trade sectors with the sectors in the JSX. Here, the one-digit Standard International Trade Classification (SITC) of the exports and imports is taken and the classification is matched with the JSX sectors, the results of which are shown in Table 1. The second step is to calculate the share of exports and imports of Indonesia's main trading partners. Countries included in the calculation of the weights are Japan, US, Singapore, Korea, China, Taiwan, German, and the UK. These countries are also the countries used by Bank Indonesia in calculating real effective exchange rate of the rupiah[4].

The composition of Indonesian exports by country of destination and imports by country of origin are presented in Table 2. As shown in Table 2, the US, Japan and Singapore are the main destinations of Indonesian exports. Meanwhile, although Japan and the US remain the main countries of origin of Indonesian imports, China also plays an important role. Finally, using equations (4), (5), and (6), together with the weights obtained in the second step, the industry-specific real exchange rates for agriculture, mining, consumer goods, basic industry, and manufacturing are calculated.

Table 2: Composition of Indonesian Exports by Country of Destination and Imports by Country of Origin, 2000-2006

Country	Exports by Destination	Imports by Origin
USA	15.01	10.53
Singapore	10.89	7.39
Japan	14.87	17.22
China	5.33	9.62
S. Korea	3.77	5.45
Taiwan	2.74	3.58
U.K.	2.52	1.92
Germany	2.76	4.68

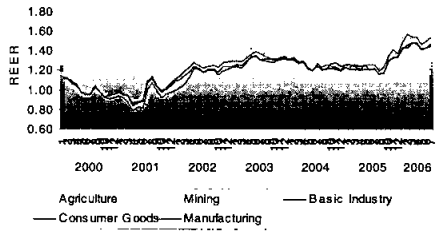
Source: Author's calculation

4. Bank Indonesia, for example, calculates monthly trade-weighted real exchange rate of the rupiah.

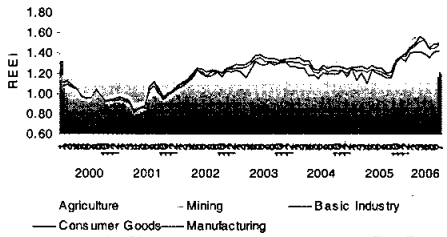
Figure 1 exhibits the movements of Indonesia's trade-weighted real exchange rates over the period of January 2000-July 2006. As shown in the Figure, trade-weighted real exchange rate for different sectors moved quite closely with each other. The coefficient correlations of the changes in industry-specific real exchange rates across industries range from 0.75 to 0.97. Similarly, using different weights, the dynamics of the real effective exchange rate also show quite similar patterns. Coefficient correlation of the changes in industry-specific real exchange ranges using different weights range from 0.75 to 0.99. From January 2000 to mid-2001, all industry-specific real effective exchange rate tended to depreciate, and then appreciate until mid-2003. In late 2005, a substantial appreciation of the real effective exchange rate took place.

Figure 1: The Real Effective Exchange Rate by Sector

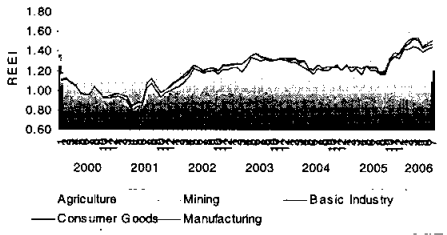
A: Imports Weighted



B: Exports Weighted



C: Exports & Imports Weighted



5. Data and Descriptive Statistics

Data that are used in this paper cover the period from January 2000 to July 2006 with monthly frequency. The stock index data by sector are obtained from the CEIC Database. The return on industry *i* is calculated as a percentage of the monthly change of the stock price index of sector *i* in the JSX. For the purpose of the study, only tradable sectors are taken, consisting of five sectors: agriculture, mining, basic industry, consumer goods, and manufacturing. The base year used to construct the index is the year 2000, considering that the macroeconomic situation in Indonesia was relatively stable in that year[5].

Table 3: Descriptive Statistics of the Monthly Stock Return

Sector	Mean	Std Dev	Min	Max
All	1.18	6.95	-13.75	15.20
Agriculture	2.02	10.77	-24.52	25.65
Mining	2.37	11.53	-15.44	63.62
Basic Industry	0.23	8.50	-19.34	18.88
Consumer Goods	0.91	7.72	-20.33	25.13
Manufacture	0.68	7.04	-14.23	18.62

Descriptive statistics of the stock return by sector is presented in Table 3. Over the period of the study, among the five sectors, mining is the sector with the highest return (2.37 percent), and basic industry is the sector with the lowest return (0.23 percent). Looking at the volatility—measured by coefficient of variation—, the return of the basic industry is the most volatile while the least volatile is the return of mining.

Descriptive statistics of the industry-specific real exchange rate are presented in Table 4. As shown in Table 4, among the five sectors, the trade-weighted exchange rate of the mining sector experienced the highest change while the trade-weighted exchange rate of mining experienced the lowest. Measured by coefficient of variation, the trade-weighted exchange rates of the

5. Year 2000 is also the most recent year used by Indonesia's Central Statistics Agency (BPS) as a base year for various economic indicators.

five sectors do not show substantial differences. Qualitatively, the statistics of the trade-weighted exchange rate using different weight also show consistency with one another.

Table 4: Descriptive Statistics of the Changes in Industry-Specific Real Exchange Rate Changes

Sector	Mean	Std Dev	Min	Max
Weight: Import				
Agriculture	0.40	4.28	-9.32	21.18
Mining	0.71	7.15	-16.40	35.38
Basic Industry	0.43	4.31	-10.64	21.86
Consumer Goods	0.44	4.65	-10.03	22.63
Manufacture	0.51	4.39	-9.47	22.21
Weight: Exports				
Agriculture	0.46	4.35	-9.59	21.81
Mining	0.55	4.76	-9.35	23.03
Basic Industry	0.47	4.34	-10.80	23.16
Consumer Goods	0.48	4.94	-10.95	18.81
Manufacture	0.46	4.32	-10.03	22.27
Weight: Imports & Exports				
Agriculture	0.42	4.24	-9.46	21.51
Mining	0.60	5.54	-12.92	28.87
Basic Industry	0.45	4.29	-10.72	22.50
Consumer Goods	0.45	4.55	-10.50	20.66
Manufacture	0.48	4.31	-9.75	22.24

6. Estimation Results

Using equation (3), the exchange rate exposure of every sector covered in this study is estimated and the results are presented in Table 5. The estimation is conducted using ordinary least square (OLS). In estimating the model, two issues may arise. The first is the possibility of simultaneity between the exchange rate and stock return. Despite the possible simultaneity, however, the partial

equilibrium assumption that the exchange rate is exogenous to the industry value is justifiable for a single industry. As argued by Bodnar and Gentry (1993), if the industry is a small part of a country's activity in international economy, the exchange rate depends much more on events in other industries than on events in the industry under consideration. Another issue is the possibility of high correlation between the market return and exchange rate return. The coefficient correlation between the market return and exchange rate return do not show high correlation, ranging from 0.14 to 0.38.

Table 5: Estimation Results of the Exposure Equations

Variables	Agriculture	Mining	Basic Industry	Consumer Goods	Manufacturing
Panel A: Using Import Weighted RER					
Constant	1.009	1.443	-1.006*	-0.158	-0.471**
	(1.041)	(1.129)	(-0.541)	(0.439)	(0.235)
Market return	0.730**	0.930**	1.005**	0.975**	0.959**
	(0.160)	(0.162)	(0.082)	(0.068)	(0.035)
RERm	0.465*	-0.042	0.127	-0.053	0.038
	(0.260)	(0.158)	(0.133)	(0.101)	(0.056)
No. of Obs.	78	78	78	78	78
Adjusted R^2	0.3024	0.2895	0.7000	0.7540	0.9157
Panel B: Using Export-Weighted RER					
Constant	0.980	1.502	-1.004*	-0.176	-0.466**
	(1.049)	(0.119)	(0.543)	(0.439)	(0.236)
Market return	0.756**	0.985**	1.010**	0.951**	0.961**
	(0.158)	(0.167)	(0.083)	(0.065)	(0.036)
RERx	0.399	-0.284	0.101	0.047	0.024
	(0.253)	(0.245)	(0.133)	(0.092)	(0.058)
No. of Obs.	78	78	78	78	78
Adjusted R^2	0.2960	0.3014	0.699	0.7540	0.9154
Panel C: Using Import and Export Weighted RER					
Constant	0.992	1.473	-1.005*	-0.165	-0.468**
	(1.043)	(1.126)	(0.542)	(0.440)	(0.236)
Market return	0.740**	0.949**	1.007**	0.961**	0.960**
	(0.159)	(0.164)	(0.083)	(0.067)	(0.036)
RERxm	0.447*	-0.137	0.116	0.0005	0.031
	(0.262)	(0.207)	(0.134)	(0.103)	0.058)
No. of Obs.	78	78	78	78	78
Adjusted R^2	0.3000	0.2930	0.699	0.7531	0.9156

Notes: Numbers in in the parentheses are standard error of the estimates

**) Significant at 5 percent alpha; *) Significant at 10 percent alpha

The estimation results show that, regardless of the weight used in calculating trade-weighted real exchange rate, the coefficients of the market return in all sectors are significant at 5 percent significance level. On the other hand, in none of the sectors was the coefficient of exchange rate significant at 5 percent significance level. The results are quite robust for the different weights used in constructing the industrial real exchange rates. Using different weights in calculating the trade-weighted real exchange rate, the qualitative results do not change.

At 10 percent significance level, only the coefficient of exchange rate in the agricultural sector is significant. This shows that a one percent increase (appreciation) in the real exchange rate leads to roughly a 0.5 percent increase in the stock return of agricultural sector. While this result contradicts the prediction of the theory that appreciation lowers export competitiveness that can lead to lower competitiveness, the conjecture is that that this result could be driven by the improving balance sheet of this sector as a result of appreciation. Companies which are highly indebted in foreign currencies may gain from appreciation in the exchange rate.

Table 6: Estimation Results of the Exposure Using Panel Data Regression

Variables	Model 1	Model 2	Model 3
Constant	0.160	0.164	0.161
	(0.430)	(0.431)	(0.431)
Market return	0.932**	0.935**	0.932**
	(0.051)	(0.051)	(0.051)
RERm	0.060		
	(0.069)		
RERx		0.045	
		(0.079)	
RERxm			0.057
			(0.077)
No. of Obs.	390	390	390
R^2	0.4974	0.4969	0.4972

Notes: Numbers in in the parentheses are standard error of the estimates
**) Significant at 5 percent significance level

In addition to estimating the model for each sector separately, a model for all five sectors using panel regression method is also estimated. The main issue in panel regression is whether the estimation uses fixed effects or random effects. As argued by Greene (2000), using the fixed effect model is a more appropriate approach when the difference between individuals can be viewed as parametric shifts of the regression function. On the other hand, the random effects model is preferable if individual specific constant terms are viewed as randomly distributed across cross-sectional units. Thus, the random effect is appropriate if the sample cross-sectional units were drawn from a large population. In addition, from a purely practical standpoint, the random effects model has some intuitive appeal since the dummy variable approach is costly in terms of degrees of freedom lost. Based on that argument, the random effect model is used in this paper[6]. As shown in Table 6, the real exchange rate does not significantly affect the stock return in the JSX. The results also show that there is no significant difference in the stock return across sectors in the JSX.

Overall, the estimation results—both regressions for individual sector as well as panel regression—show that, at 5 percent significance level, none of the sectors of the publicly traded firms in Indonesia is significantly exposed to exchange rate fluctuations. The results are consistent with the results found in the literature (see for example, Bartram, Brown, and Minton (2006)) where there was only a weak response of stock price index to exchange rate fluctuations. As found by Bartram, Brown, and Minton (2006), corporations may manage the exchange rate risk through various channels including passing part of the exchange rate through customers, and employing financial risk management strategies such as foreign exchange rate derivatives transactions. The following section discusses how firms in Indonesia manage the risk of exchange rate movements.

7. Hedging Practices on Foreign Exchange Risk in Indonesia

Adler and Dumas (1984) define hedges as *"the amount of the foreign-currency financial transactions required to render the future, real, domestic-currency market value of an exposed position statistically independent of unanticipated, random variations in the future domestic purchasing powers of these foreign currencies."* Hedging is not elimination of risk but rather a matter of choosing what risk one is willing to assume (Børsum and Ødegaard (2005)). According to Børsum and Ødegaard (2005), hedging does not necessarily

6. In fact, we also estimated using fixed effects, but none of the sector-specific parameter is significant at 5 percent significance level.

use financial derivatives, but instead can also be in the form of natural hedging which refers to situations where income and expenses are denominated in the same currency.

The survey literature found in Børsum and Ødegaard (2005) shows that the use of derivatives in non-financial firms is relatively high. Across countries, the companies using derivatives account for 40 percent to 60 percent, and the most frequently hedged risk is exchange rate risk, followed by interest rate risk. Moreover, they also found that the larger companies are more inclined to engage in hedging compared to smaller firms. Loderer and Pichler (2000) classify corporate exchange rate risk management into four possible strategies. First, a corporate avoids exchange rate risk through avoiding transactions that expose the company to exchange risk. Second, a corporate reduces the risk of loss through, for example, the choices of production locations. Third, a corporate passes the risk to others through hedging instruments, insurance, and diversification. Finally, a corporate chooses to bear the risk on the ground that risk to a certain level is a rational decision.

In the case of companies that do not hedge their exposure naturally, they may hedge through financial derivatives. The most important instruments for derivative financial markets for currency are forwards, swaps, and options (Børsum and Ødegaard, 2005). An outright foreign currency forward fixes the future exchange rate at a given value and a given future transaction date. Foreign currency swaps fixes the future exchange rate at a given value and given future transaction, but both parties swap cash flows. Foreign currency option is an agreement that guarantees a set exchange rate at a set future date for a set amount of currency, but the holder may choose whether to use the option or not.

Table 7 shows the over- the-counter (OTC) foreign exchange derivatives turnover in Indonesia in 2001 and 2004. These data are obtained from the Bank for International Settlement (BIS) triennial survey on foreign exchange markets. As the Table shows, foreign exchange derivatives in Indonesia were dominated by swaps. In total, the amount of foreign exchange derivative increased by 150 percent during the period of 2001-2004. The role of foreign exchange swaps increased substantially from 57 percent in 2001 to 89 percent in 2004.

Table 7: Daily Average of the OTC Foreign Exchange Derivative Turnover in Indonesia in 2001 and 2004

Foreign Exchange Derivative	April 2001		April 2004	
	In mill US$	(%)	In mill US$	(%)
Outright forwards	210	39.3	110	8.1
Foreign Exchange Swaps	305	57.1	1213	89.5
Currency Swaps	18	3.4	20	1.5
Options	-	-	11	0.8
Total	534	100	1355	100

Source: Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 2004 published by the BIS.

To take a closer look at hedging practices by firms in Indonesia, an anecdotal survey was conducted on a sample of non-financial firms. The firms in the sample are chosen based on their size in terms of value of assets. All the firms chosen are the publicly traded firms at the JSX, considering the exposure model are estimated for publicly traded firms. The questions asked in the questionnaire consist of: (i) foreign exchange transactions, (ii) method used to assess foreign exchange risk, (iii) hedging instruments used by the firms engaged in hedging, (iv) hedging motivation of the firms engaged in hedging, and (v) the reasons for not hedging for firms that do not engage in hedging.

A sample of twenty firms was taken and each was sent a questionnaire containing questions mentioned above. Out of the 20 questionnaires sent, there were 10 respondents. The information obtained from the questionnaire is as follows. Nine out of the 10 firms are engaged in purchasing and selling goods in foreign currencies, while 4 firms engage in borrowing and savings in foreign currencies. In assessing foreign currency risk, 4 firms employ exposure estimations while 6 firms employ cash flow and/or value at risk. Out of the 10 firms, 5 firms use financial hedging instruments in which 4 firms use forwards, 2 firms use swaps, and 3 firms use options. All firms engaged in hedging say that the motivation for hedging is to reduce fluctuations in income or expenses in foreign currency, while only 1 firm uses hedging to reduce cost of capital. For the firms that do not hedge, 1 firm says that it is sufficiently financially robust

to bear exchange rate fluctuations, 2 firms say that the cost of currency hedging is greater than its benefit, and 1 firm says that currency hedging is not available to the firm.

The findings from the anecdotal survey show that although firms are engaged in foreign currency purchasing and selling or foreign borrowing and saving, only part of them are engaged in hedging, where the main instrument used is forwards. For the firms that are not engaged in hedging, the main reason seems to be that the cost of hedging is larger than its benefit but it can also be the case that the firm is sufficiently robust financially to bear exchange rate fluctuations.

8. Conclusions

This paper presents evidence on exchange rate exposure of non-financial sectors in Indonesia. The study covers five sectors—agriculture, mining, consumer goods, basic industry, and manufacturing—in the JSX. The data covers the period from January 2000 to July 2006 with monthly frequency. Following a method widely used in estimating exchange rate exposure, the exchange rate exposure of the stock return at industry level at the JSX is estimated. The exchange rate used in this paper is the industry-specific real exchange rate. The industry-specific real exchange rate is constructed, weighted by Indonesia's trade with its eight main trading partners of Japan, US, Singapore, Korea, China, Taiwan, German, and UK.

The results show that, using different measures of industry-specific real exchange rates, none of the five sectors are significantly exposed to exchange rate fluctuations at 5 percent significance level. This means that using data at the industry level, the domestic currency returns of publicly traded firms are not affected by the movement in real exchange rate.

To examine how non-financial firms deal with exchange rate risks, an anecdotal survey of a sample of non-financial publicly traded firms was conducted. It was found that the hedging strategy of the firms in facing exchange rate risk varies across firms. Some firms engage in hedging while others do not. Hedging instruments used by the hedged firms include forwards, swaps, and options. For non-hedged firms, the main reason for not engaging in hedging is that the cost of currency hedging is greater than its benefit.

In sum, the exchange rate fluctuations since 2000 do not seem to significantly affect the value of the non-financial sectors in the JSX. On the other hand, given the fluctuating exchange rate, some firms do not engage in hedging mainly due to its cost. Developing and increasing the efficiency of markets for foreign exchange hedging would be essential to encourage firms to engage in hedging their foreign currency risks that in turn would make them more robust to the exchange rate fluctuations.

References

1. Adler, Michael, and Dumas, Bernard, (1984), "Exposure to Currency Risk: Definition and Measurement", *Financial Management*, No. 13, p.41-50.

2. Bartram, Söhnke, Brown, Gregory, and Minton, Bernadette, (2006), "Resolving the Exposure Puzzle: The Many Facets of Exchange Rate Exposure" *Working Paper.*

3. Bartram, Söhnke, and Bodnar, Gordon, (2005), "Exchange Rate Exposure Puzzle" *Working Paper.*

4. Bodnar, Gordon, Dumas, Bernard, and Marston, Richard, (2002), "Pass-through and Exposure" *Journal of Finance*, 57(1), 199-231.

5. Bodnar, Gordon, and Gentry, William, (1993), "Exchange Rate Exposure and Industry Characteristics: Evidence from Canada, Japan, and the USA." *Journal of International Money and Finance*, Vol. 12.

6. Børsum, Øystein G., and Ødegaard, Bernt Arne, (2005), "Currency Hedging in Norwegian Non-Financial Firms", *Economic Bulletin,* 05, Q3.

7. Dominguez, Kathryn, and Tesar, Linda L., (2006), "Exchange Rate Exposure", *Journal of International Economics*, No.68, p.188-218.

8. Greene, William H., (2000), *Econometric Analysis,* Upper Saddle River, N.J.: Prentice Hall.

9. Sahminan, Sahminan, (2005a), "Balance-Sheet Effects of Exchange Rate Depreciation: Evidence from Commercial Banks in Indonesia", *Working Paper.*

10. ———————————, (2005b), "Interest Rates and the Role of Exchange Rate Regimes in Major Southeast Asian Countries", *Buletin Ekonomi Moneter dan Perbankan*, 2005, 8(2), pp.141-180.

11. ———————————, (2006), "Balance-Sheet Effects of Exchange Rate Depreciation: Evidence from Non-Financial Firms in Indonesia", *Working Paper.*

CHAPTER 4

EFFECT OF CHANGE IN EXCHANGE RATE ON CORPORATE VALUE IN KOREA: ANALYSIS USING THE INDUSTRY-SPECIFIC REAL EFFECTIVE EXCHANGE RATE

by Eun Jong Jang

1. Introduction

The exchange rate undertaking the role of price variables for external transactions would be one of the difficult issues to overcome by companies with high dependency on external transactions rather than internal transactions like those in Korea. By adopting the free floating exchange rate regime in the later part of 1990s, exchange rate fluctuations have been occurring increasingly and accurately forecasting the movement of the exchange rate for businesses has become virtually impossible, made even more difficult by the uncertain external environment.

Exchange rate changes may impact on the corporate cost structure, price competitiveness and etc., to ultimately change corporate values. In the recent years, the global dollar has weakened and sustaining ordinary surplus to increase the Korean won currency has resulted in the won showing relatively strong trends compared to other currencies including dollar. This type of phenomenon may be advantageous to companies with higher debt ratios. However, on the other hand, it would decrease the corporate yield rate and heighten uncertainty which would impact negatively on the corporate value ultimately. It would be appropriate for authorities to reduce the variation via exchange rate smoothing techniques coupled with exchange rate hedging to minimise the negative impact of such an exchange rate change.

Existing studies that analyse the effect of exchange rate changes on corporate value have been mainly on the advanced countries such as the US and Japan. In particular, in the case of the US, the impact of exchange rate on the corporate value is minimal. Jorion (1990) analysed the impact on the nominal exchange rate on corporate yield rate (stock price yield rate) with 287 multinational companies in the US for 17 years from 1971, and proved that there was not much impact. In 1991, he analysed listed companies on the NYSE by 20 industries

and showed that the exchange rate does not have much correlation with the exchange rate. Bodnar and Gentry (1993) analysed the exchange rate impact for 39 US industries for 10 years from 1979, and only in 11 industries does exchange rate impact on the corporate value. Chow, Lee and Solt (1997) classified corporate value into stocks and bonds and analysed the relationship with the real exchange rate. For stocks, the real exchange rate change fell short of expectation of having a negative impact in short-term, but there was a positive relationship between the two on a long-term basis. In the case of bonds, there was a negative effect between the bond price and the real exchange rate for both the short and long-term.

There are a number of similar studies in Korea with most showing that exchange rate effect is not very significant. Lee Hyun-suk (2003) analysed the exchange rate effect of 260 companies by dividing the entire period into before and after the Foreign Currency Crisis for won/dollar exchange rate and yen/dollar exchange rate. He showed that the influence of the exchange rate has slightly expanded compared to the pre-Foreign Currency Crisis. However, the impact on bigger companies is not significant. Gwak Taewoon, Jung Chang-young, Shin Sung-hwi, and Choi Se-hyung (2003) analysed companies with relatively robust financial structures from the listed manufacturers with a certain level of exports and showed that only 38% of companies reported that exchange rate for the won/dollar exchange rate has influence on corporate value.

In this paper, analysis is made on whether the influence of the real effective exchange rate for each industry with respect to the asset price, such as stocks, on the manufacturing industry would be noticeable with the time frame focusing on the period after the Foreign Currency Crisis. For this purpose, the recent exchange rate trend and relationship of exchange rate and corporate value are discussed in Section 2 and Section 3. Section 4 presents the empirical analysis using a simple estimation formula while Section 5 discusses policy implications on the basis of the analysis of this paper.

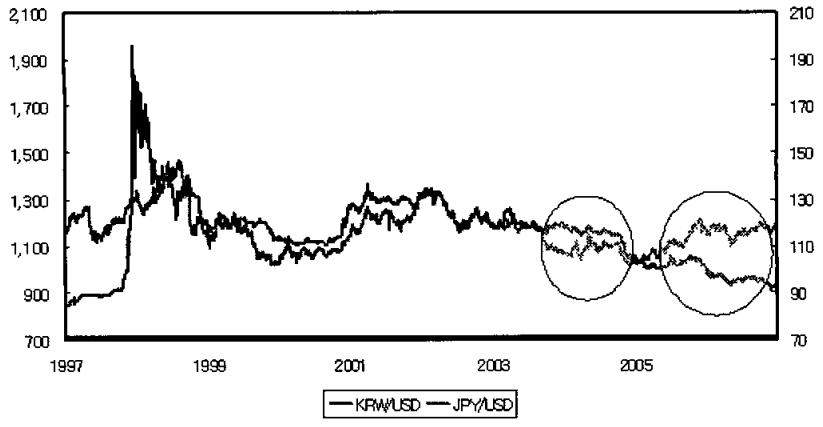
2. Recent Trend of Korea's Currency

After the Foreign Currency Crisis, the won/dollar exchange rate increased significantly (devaluation) and it has generally shown a downward stabilisation trend in 2000s. However, it has shown a temporary deviating trend from its long-term declining trend resulting from the emerging vulnerability of the Japanese economy which caused the increase of the yen/dollar exchange rate. This along with the consistent pattern of the won currency exchange rate resulted in the

increase in the won/dollar exchange rate in April 2001 to 1,365 won (the average exchange rate in 2001 was 1290.8 won). The synchronisation phenomenon on the yen and won has continued for several years and this is attributable to the fact that the participants in the foreign currency market recognise that the change in yen/dollar exchange rate is directly related to the price competitiveness of Korean products directly in competition with Japan. For example, in the case of Japanese cars sold to the US, when the yen/dollar increases, this would mean a decline in the price for the US consumers, and unless the price of Korean cars decreases in the same market, the demand for Korean cars may decline. In addition to this, concern for the decrease in the trade surplus of Korea impacts on the foreign currency market and this made the Korean won stronger than ever. Together with the free floating exchange rate regime after the Foreign Currency Crisis, the activation of the non-deliverable forward (NDF) market has also increased influences from offshore sources.

However, the financial and the trade deficits of the US and the willingness of the US government to accept a weak dollar have caused the continuing weak global dollar. Additionally, the opportunities for the interest parity trading (yen-carry trade) in light of the low interest rates in Japan came to be widened, the trend of "coupling" with the yen has been weakened in recent years, with a substantial strengthening in the won.

Chart 1
Recent Trends of KRW and JPY against USD



Note : Shaded area are periods of decoupling between Won and Yen

Looking at the trend of the won exchange rate based on the real effective exchange rate as announced by the Bank for International Settlement (BIS), it has been maintained at below the equilibrium level in 2004 (devaluation) and the trend has been to gradually expand the range of valuation (decline of exchange rate) to over 5.2% and 12.7% from the equilibrium for 2005 and 2006, respectively.

Table 1

Evaluation of KRW

Unit : KRW/USD, %

	2001	2002	2003	2004	2005	2006
REER[1](A)	1,189.7	1,193.3	1,118.5	1,081.8	1,077.4	1,076.7
Nominal ER[2](B)	1,290.8	1,250.6	1,182.3	1,143.7	1,024.1	955.1
Ratio of Gap[3]	-7.8	-4.6	-5.4	-5.4	5.2	12.7

Note: 1) Figures refer to KRW/USD which maintain REER Index 100.
(Based on the year 2000)
2) Average of market closing rate.
3) [A/B-1]*100 (+)sign refers to nominal exchange rate is over evaluated.

Source: Bank for International Settlements, The Bank of Korea

3. Relationship of Exchange Rate and Corporate Value

The exchange rate may be regarded as important for export companies only since it involves the price variables of external trade. However, in today's globalised environment, the importance of the exchange rate is no longer limited to the exporting companies. Even for domestic companies, in the case of importing and producing raw materials and etc. from overseas, exchange rate changes would have an impact and ultimately affect the cost of products.

A company pursues profit ultimately and the corporate value is total profit generated through corporate activities. These are not just limited to past profits but also expected profits in the future meaning that the corporate value would be the present value of future cash flows.

The exchange rate change impacts on the corporate future cash flow of a business, namely, its value, through various routes. In the case of companies with external transactions, their cash flows are mainly denominated in foreign currencies and if the exchange rate fluctuates, the value may differ when converting cash inflows and cash outflows in the local currency, which is referred to as the transaction effect.

In the meantime, when the currency value changes and gets reflected in the product price of companies, this may cause fluctuations on the product price in the global market with export demand expanding or decreasing accordingly. This is referred to as the price volume effect. In other words, the volume sold from the exchange rate change may bring about a change in corporate future cash flow. For example, when the won is valuated and is reflected in the product price of companies rather than through absorption via profit reduction, the price competitiveness would be eroded leading to a reduction in the demand on exports in general.

The corporate value may also differ depending on how the companies respond to exchange rate changes. The change in price competitiveness following the exchange rate change may set off responses such as improvements in marketing strategy and quality improvement. Also the corporate value can be changed in significant ways depending on the exchange hedging strategy for companies subscribing to foreign exchange change insurance or investing in derivative financial products.

4. Empirical Analysis

4.1 Model and Variable Description

The corporate value as defined earlier is the present value of future cash flows. However, obtaining data on future cash flows is difficult as variables such as sales, costs and others are often undisclosed by companies. Moreover, the discount rate would also be required in calculating the present value.

To overcome these difficulties, proxies have to be used such as the corporate stock price index. In a matured capital market such as the stock market, information on profits or risks of corporate business activities, financial activities, and investment activities is sufficiently reflected in the stock price index as a precondition of the so- called 'efficiency hypothesis'.

In this paper, the Capital Asset Pricing Model (CAPM) of Adler and Dumas (1984), one of the most fundamental and representative model to analyse the influence of the exchange rate on the corporate value, is applied in Korea. However, while existing domestic studies use the nominal exchange rate or simple real effective exchange rate concept, this paper attempts to apply the real effective exchange rate for each industry. Since the existing analyses failed to show any notable relationship between the exchange rate and corporate value

with the use of the nominal exchange rate, the introduction of the equilibrium exchange rate concept with the real effective exchange rate for each industry is attempted to minimise time serial problems including the various elements of circular changes or irregular changes.

Estimating Equation: $R_{it} - R_{ft} = \beta_{a,i} + \beta_{1,t} (R_{m,t} - R_{ft}) + \beta_{z,t} \Delta Ei + \varepsilon_t$

where

R_{it} is stock price yield rate of industry i in the month of t
$R_{m,t}$ is stock price yield rate of entire industry in the month of t
R_{ft} is yield rate of non-risk asset
ΔE is Rate of change for real effective exchange rate

Consequently, the above formula endeavours to isolate the influence of exchange rate risk amongst information included in the error column (non-systematic risk) excluding the market risk (systematic risk) from the CAPM. The model also includes the market restriction factors on the general model that measures the influence on the corporate value of the exchange rate.

In the meantime, the primary differential portion of log in stock price index with root unit is used rather than the stock price yield rate in the actual model. Also, in place of non-risk assets which is a theoretical concept and do not exist, the yield rate on national bond (3-year maturity) which has a low risk is used as the alternative index. The annual rate of the yield rate on national bond is converted into monthly units for the purpose of this model.

In order to determine the possibility of spurious regression, the unit root test was carried out for each data set. The test showed that unit roots exist for all data sets including the stock price index for each business, the KOSPI index, exchange rate, yield rate on national bond and others. The stock price index for each business and the KOSPI index are to proxy for the yield rate concept. However, the yield rate on the national bond is not such a strong proxy as it differs from the original concept in the CAPM. In the strictest sense, when unit roots exist, the dispersion of the time series data is inconsistent and is unable to meet the set conditions for the Gauss-Markov theory on the estimated value. Therefore, since the CAPM is being used, the yield rate on national bond is not differentiated and the raw data is used instead.

The data sets are in monthly units and the analysis is for the time period from 1999 to September 2006, excluding the period where there were abnormalities in the stock market following the Foreign Currency Crisis.

Table 2
Variable Schedule

Variable	Contents	Source
Ri[1)]	Average stock price index for individual industry (i)	Korea Exchange, separately calculated
Rm	Entire stock price index in the Stock Exchange	Korea Exchange
Rf	3-year maturity yield rate on national bond	FN Guide
E	real effective exchange rate	Separately calculated

Note: 1) Automobiles and ships are used for transportation, and the average stock price index of the said industry is calculated with the added weight average for the distributing stock numbers with the stock price index of the individual listed companies.

4.2 Calculation of Real Effective Exchange Rate for Each Industry

In general, the real effective exchange rate is a comprehensive index used to determine the external value of a country's currency and in evaluating the external competitiveness in the long-term. To be specific, we can derive the real effective exchange rate by dividing the nominal effective exchange rate with the added weighted average of key trading countries' currency by purchasing parity index.

Normally, the real effective exchange rate determines the trading partner countries based on the overall transaction volume or import and export of the country, and the key trading partner countries may be differentiated for each industry and accordingly, the implication of the 'real effective exchange rate for each industry' can be discovered. In this paper, the effect of exchange rate influence on the corporate value for each industry will be garnered from the application of the general real effective exchange rate on the basic model, the method used by Goldberg, Linda S. (2004).

Under the Standard International Trade Classification (SITC), 8 manufacturing industries with high external transaction ratio are classified, and the real effective exchange rate is formulated for each industry with a different value added weight with the trading partner countries based on the export volume, import volume and sum of import and export (trade volume).

With passing time, the trade pattern may differ and therefore, the added value of each industry is selected using the variable added weight method for each year. However, for simplification, trade with a third country is not considered and only the export amount, import amount and sum of import and export (trade amount) of the trading partner countries with Korea are reflected.

As for the purchase power parity index for rendering nominal data real, the Producer Price Index which reflects relatively well the price change of trading items is used. However, since the product composition is very different for each PPI by countries, it is very difficult to make direct comparisons for each country. To overcome this problem, instead of the Producer Price Index, the Consumer Price Index is used instead since the calculation is similar for most countries and data is easily obtainable.

Table 3

Classification of Industry

	SITC Code
Textiles	21, 26, 61, 65, 83~85
Chemicals	51~6,59
Steel	28,67,68
Machinery[1)]	72~75 (excluding 75997)
electricity & electronics	76,77,75997
Ship	793
Automobile	78
Precision Equipment	87,88

Note : 1) Including computer.

For the selection of a trade partner country, one of the following two methods is frequently used. The first is to fix the partner country. For example, a few countries with high volume trade transactions with Korea are selected and for calculating the real effective exchange rate, weight is added for exports and imports of these countries, which is a relatively simple calculation which is consistent with added ratio of the different countries. The other method is to calculate the ratio for export volume, import volume and sum of import and export (trade volume) from the overall export volume respectively. For example, only the countries with a significant ratio (85% of total of the country ratio) of each added-weight value category are included. This is slightly more complicated

than the mutually differentiated countries included in the added weighed value, but this calculation of the real effective exchange rate for each industry is more reflective of reality. In this current analysis, the latter method is used for countries with a country ratio of 85% (85% or more for some industries).

In the meantime, there is a need for the use of a standard time to determine whether the current exchange rate level is appropriate for determining the real effective exchange rate. The time frame chosen would also consider other comprehensive indices to reflect the domestic and overseas economic conditions, including GDP, price level, ordinary surplus and others. Among domestic academia, the time frames normally used for Korea are the periods of 1985, third quarter of 1989 through second quarter of 1990, and 1993. This analysis would use the period of 1993, the most current point in time.

Table 4

Main Economic Index

Unit : %

	1985	Q3.1989 ~ Q2.1990	1993
Growth rate of GDP	6.5	8.5	5.8
Growth rate of CPI	2.4	7.0	4.8
current balance	-8.0	11.4	9.9

From the real effective exchange rate for most industries, it can be seen the outcome is similar regardless of the different added weights such as export volume, import volume and trading volume. It shows that the real effective exchange rate for each industry exceeds the standard figure of 100 towards the end of 2004 and early 2005 when the value of the won currency was highly valuated. However, in the case of the "automobile and ship" industry, the won showed strengthening after the middle of 2005 and 2006 in terms of the real effective exchange rate.

4.3 Outcome of Estimation

From the regression estimations, it can be shown that the influence of the KOSPI index on the stock price index of individual industry is noticeable for all industries. The influence of the exchange rate showed slight differences depending on the industry. The impact of exchange rate on the corporate value (stock

price) of the electricity, electronics and steel industries is weak while it has a relatively strong influence on the chemical product and textile industries.

In particular, in the case of the shipping industry, the coefficient value of the change in exchange rate value is highest among the eight industries since the industry is highly sensitive to changes in exchange rate. The analysis shows that exchange rate changes make a significant difference in corporate profits since the ratio and scale of exports is very high for the shipbuilding industry in comparison to the other industries. Recently, shipbuilding companies tried to justify their declines in profit rates by citing a strong won in their futures transactions. However, since these transactions only began in recent times (after 2005), and a substantial part of key raw materials were procured from overseas, the above results of the analysis meet with expectations.

The textile industry and the chemical products industry mainly consist of small and medium companies rather than large companies and they are generally vulnerable to responses of other larger industries in the wake of exchange rate changes. Their corporate values (stock prices) are therefore, subject to the reactions to changes in the exchange rate which may differ from normal expectations.

Looking at the effects, exchange rate change has a negative effect on corporate value for the chemical products industry with respect to the three real effective exchange rates while for the shipbuilding industry, real effective exchange rate has negative impact for added weight on export, import and export in trading. The impact of the real effective exchange rate for the textile industry is negative for added weight on export.

Table 5

Estimation Result of Equation

		Automobile	ship	Chemical Product	E&E	Precision Equipment	Machinery	Steel	Textile
Export-weighted REER	β0	-0.01	-0.38*	0.00	0.02	0.05	0.03***	-0.39*	-0.03
		(-0.28)	(-2.96)	(0.04)	(0.84)	(1.22)	(1.83)	(-11.88)	(-1.10)
	β1	0.96*	0.00*	0.99*	1.04*	1.09*	1.05*	0.00*	0.97*
		(12.95)	(6.72)	(32.73)	(17.60)	(15.36)	(35.02)	(5.82)	(16.25)
	β2	-0.17	-1.58**	-0.55**	-0.29	-1.04	-1.15**	0.77	-0.89**
		(-0.37)	(-2.53)	(-2.25)	(-0.84)	(-1.55)	(-2.23)	(1.35)	(-2.05)
	AR(1)		0.97*					0.88*	
			(32.36)					(23.47)	
	MA(1)		-0.69*					-0.64*	
			(-6.76)					(-6.47)	
	$\overline{R^2}$	0.64	0.67	0.93	0.90	0.66	0.87	0.71	0.77
	D.W.	1.99	2.04	2.10	1.98	1.97	1.81	1.77	1.82
Import-weighted REER	β0	-0.01	-0.36*	0.00	0.02	0.06	0.04**	-0.33*	-0.04**
		(-0.41)	(-3.94)	(0.21)	(1.23)	(1.54)	(2.25)	(-11.97)	*
									(-1.82)
	β1	0.97*	0.00*	0.99*	1.04*	1.12*	1.07***	0.00*	0.96*
		(13.71)	(6.79)	(32.94)	(27.14)	(17.12)	(32.33)	(5.92)	(17.85)
	β2	1.77**	1.70*	-0.90*	-0.48	-1.59***	-0.99	0.35	1.09**
		(2.21)	(1.90)	(-3.46)	(-1.19)	(-1.69)	(-1.44)	(0.50)	(2.29)
	AR(1)		0.96*					0.88*	
			(29.52)					(23.06)	
	MA(1)		-0.72*					-0.64*	
			(-8.21)					(-6.63)	
	$\overline{R^2}$	0.66	0.67	0.93	0.90	0.67	0.87	0.70	0.76
	D.W.	1.99	1.78	2.15	1.98	1.87	1.91	1.76	1.90
Sum of Export & Import-weighted REER	β0	-0.00	-0.37*	0.00	0.02	0.06	0.04**	-0.38*	-0.04**
		(-0.15)	(-2.74)	(0.15)	(1.14)	(1.42)	2.27)	(-10.66)	*
									(-1.83)
	β1	0.98*	0.00*	0.99*	1.04*	1.11*	1.07*	0.00*	0.96*
		(12.41)	(6.68)	(32.82)	(27.03)	(16.43)	(33.27)	(5.84)	(17.81)
	β2	-0.23	-1.52**	-0.79*	-0.35	-1.31	-1.01	0.60	1.09**
		(-0.45)	(-2.47)	(-3.07)	(-0.91)	(-1.60)	(-1.39)	(1.06)	(2.22)
	AR(1)		0.97*					0.89*	
			(32.27)					(26.20)	
	MA(1)		-0.69*					-0.65*	
			(-6.78)					(-6.56)	
	$\overline{R^2}$	0.66	0.67	0.93	0.90	0.66	0.87	0.72	0.76
	D.W.	2.04	2.03	2.13	1.98	1.88	1.94	1.71	1.89

Note : 1) *, **, *** refer to significant alpha at 1%, 5%, 10% respectively.

2) Figures in parenthesis refer to t-value.

To examine the influence of the exchange rate on all the industries, cross section data for the eight industries were analysed using the panel method with time series from January 1999 to September 2006. The results show that for all three exchange rates, the KOSPI index and the market restriction factor were significant at a significance level of 1%, while the real effective exchange rate for each business was not significant. The results were derived through the seemingly unrelated regression (SUR) analysis under the hypothesis of the mutually related for errors between the industries with the influence of common variables not included in the same model, such as the oil price shock, that can impact the stock price index.

Table 6

Result of Panel Analysis

	Panel I[1)]	Panel II[1)]	Panel III[1)]
β0	0.001	0.001	0.001
	(0.11)	(0.16)	(0.15)
β0	0.999*	0.999*	0.999*
	(55.93)	(56.56)	(56.31)
β0	-0.011	-0.127	-0.113
	(-0.07)	(-0.70)	(-0.64)
$\overline{R^2}$	0.93	0.94	0.94
D.W.	1.95	1.95	1.95
No. of Obs	736	736	736

Note : 1) Panel I, II, III are applied by export, import and sum of export and import weighted REER.

2) *, **, *** refer to significant alpha at 1%, 5%, 10% respectively.

3) Figures in parenthesis refer to t-value.

5. Conclusion

In the paper, the change of the stock price for each industry, namely, the relationship of corporate value and the rate of change for real effective exchange rate of each industry is investigated. The analysis shows that it cannot reject the hypothesis that a change in stock price index (stock price) does not sensitively react to the exchange rate. This is conspicuous in the panel analysis. In the time-series analysis as well, the industries that react to all the three weighted real effective exchange rate are only the three industries of shipbuilding, chemical products and textile among the entire eight industries.

For a high external dependent economy such as Korea, the conclusion that the impact of exchange rate on the corporate value (stock price) is not significant may be conflicting with general expectations at first glance. However, when considering the fact that Korean industries are very large corporations rather than small and medium companies, these large companies have the abilities and skills required to respond adequately to changes in the external environment through various means of future exchange or various insurances.

The existing domestic studies have applied various kinds of exchange rates such as nominal exchange rate, actual exchange rate, real effective exchange rate for the analysis model, but the effect of exchange rate has not shown to be significant, and furthermore, when the 'equilibrium exchange rate' concept in real effective exchange rate for each industry is applied to this analysis model, there is not much difference from other existing conclusion, indicating that it is highly possible to conclude that the exchange rate cannot influence corporate value rather than there is some error calculating industry-specific real effective exchange rate data.

Notwithstanding the above results, there are some points which should be considered as yet. Firstly, as corporate value is developed over a long period of time, short-term exchange rate change may not be very useful for analyzing its impact. Secondly, there may be substantial information loss in the differentiation of the exchange rate just like this model. Furthermore, the "noise" of exchange rate may not be removed from each industry which may also affect the outcome of the results. Lastly, only "present" or "past" exchange rate data was used in the analysis, despite stock price may conclude future information such as expectation of stock market participants. That is we cannot be free of possibility of this kind of mismatching between two variables completely.

References

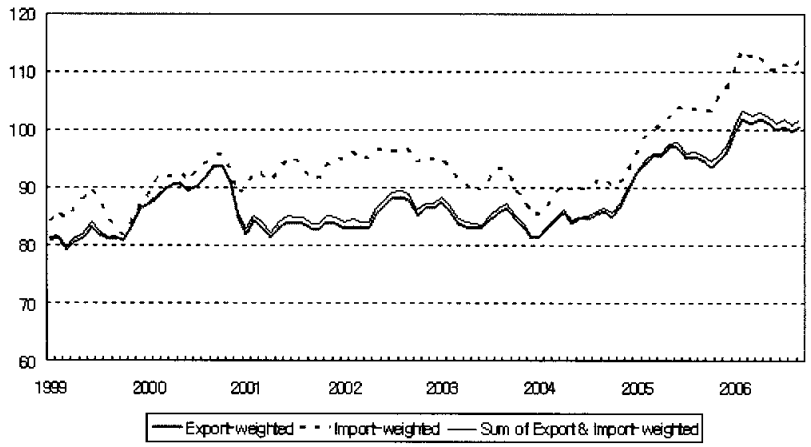
1. Adler, M., and Dumas, B., (1984),"Exposure to Currency Risk: Determination and Measurement", Financial Management.
2. Bodnar, G., and Gentry, W.,(1993), "Exchange Rate Exposure and Industry Characteristics. Evidence from Canada, Japan and The U.S.", *Journal of International Money and Finance.*
3. Chow, Edward H., Lee, Wayne Y., and Solt, Michael E., (1997), "The Exchange-Rate Risk Exposure of Asset Returns", *The Journal of Business.*
4. Goldberg, Linda S., (2004),"Industry Specific Exchange Rate for the United States", *Federal Reserve Bank of New York Economic Policy Review.*
5. Jorion, P., (1990), "The Exchange Rate Exposure of US Multinationals", *Journal of Business.*
6. _____, (1991), "The Pricing of Exchange Rate Risk in the Stock Market", *Journal of Finance and Quantitative Analysis.*
7. Kebin Cowan, Erwin Hansen, and Luis Oscar Herrera, (2005), "Currency Mismatches, Balance Sheet Effects and Hedging in Chilean Non-Financial Corporations", *Central Bank of Chile Working Papers.*
8. Taewoon Gwak, Chang-young Jung, Sung-hwi Shin, Se-hyung Choi, (2003), "Analysis on Strategy of Exposure Management", *International Trade Analysis,* Vol.8, No.2.
9. Chiho Kim, Seungwon Kim, (2002), "Estimation and Evaluation of Korea's Equilibrium Exchange Rate", KERI.
10. Chae Deug Yi, (2003), "Foreign Exchange Exposure and Hedging Determinant of Derivatives of International Transaction Firms", *Journal of International Management Studies,* Vol.14, No.3.
11. Jaerang Lee, Byung Chang Yi, (2005), "Industry Level Real Effective Exchange Rates for Korea", *Economic Papers,* Vol.9, No.1, Bank of Korea.
12. Hyon sok Lee, (2003), "The Foreign Exchange Exposure and Asymmetries on Individual Firms", *Korean Financial Management Studies*, Vol.20, No.1.

Appendix

Trends of Industry-Specific REER

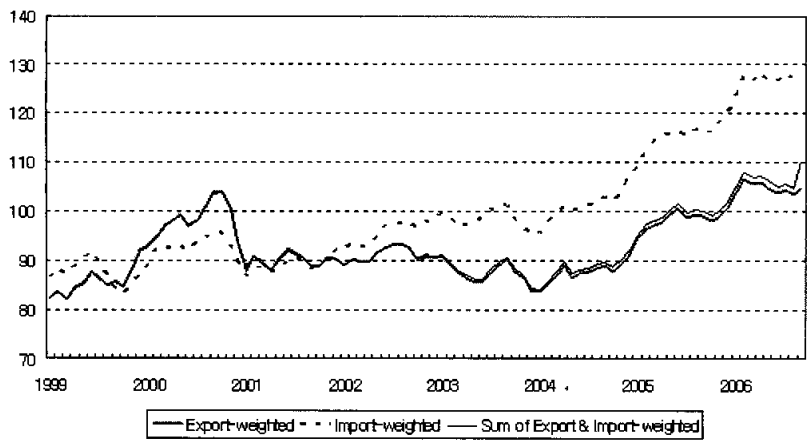
Trends of Industry-Specific REER

Automobile



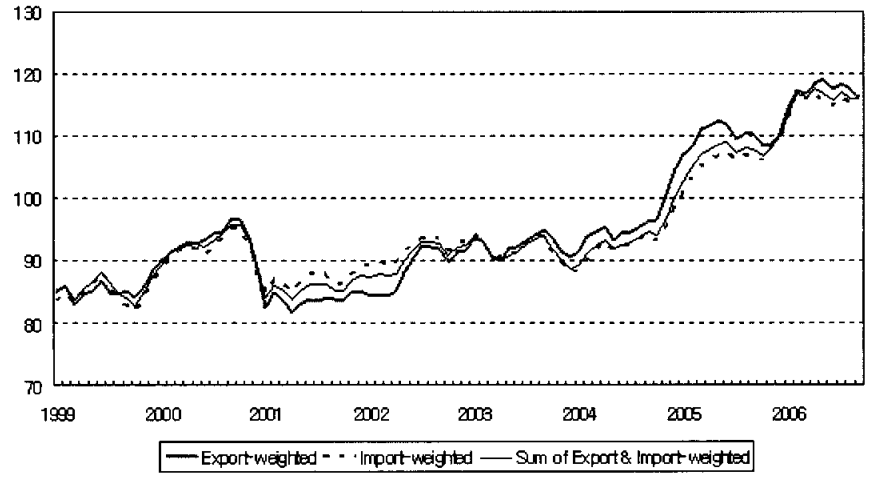
Note : 1) Based on the year of 1993.

Ship



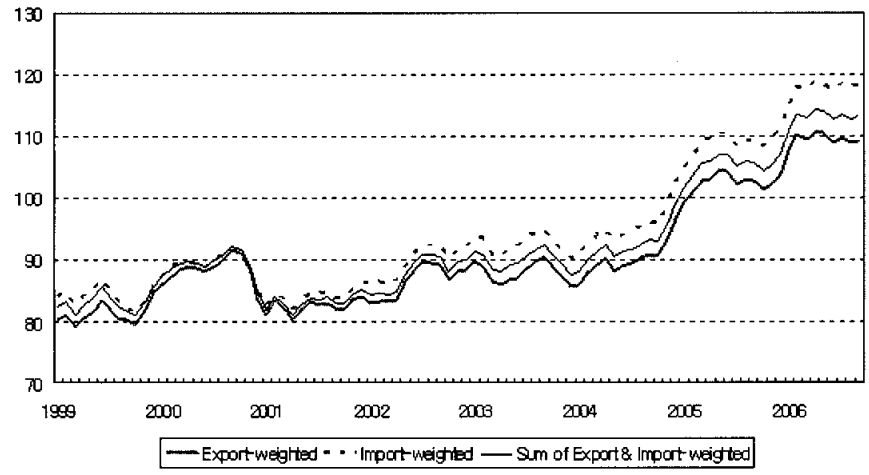
Note : 1) Based on the year of 1993.

Chemical product



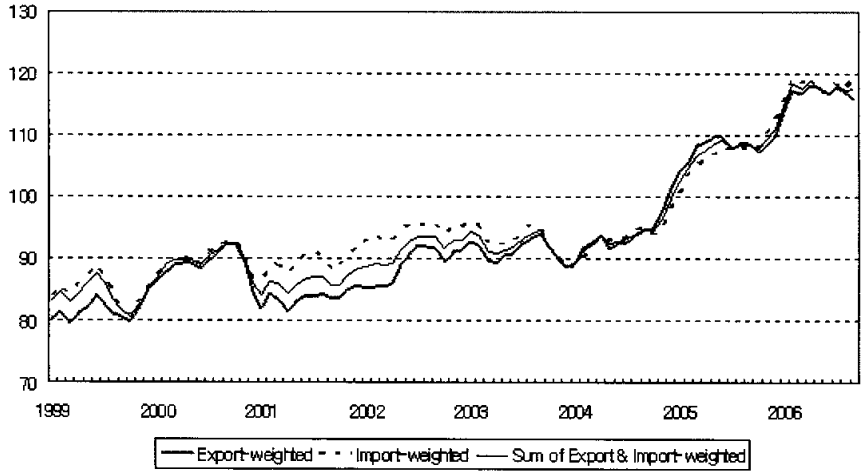
Note : 1) Based on the year of 1993.

Electricity & Electronics



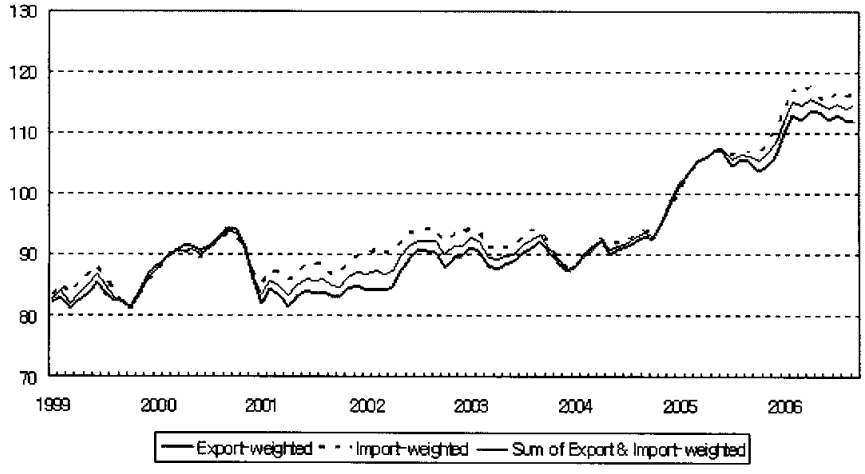
Note : 1) Based on the year of 1993.

Precision Equipment



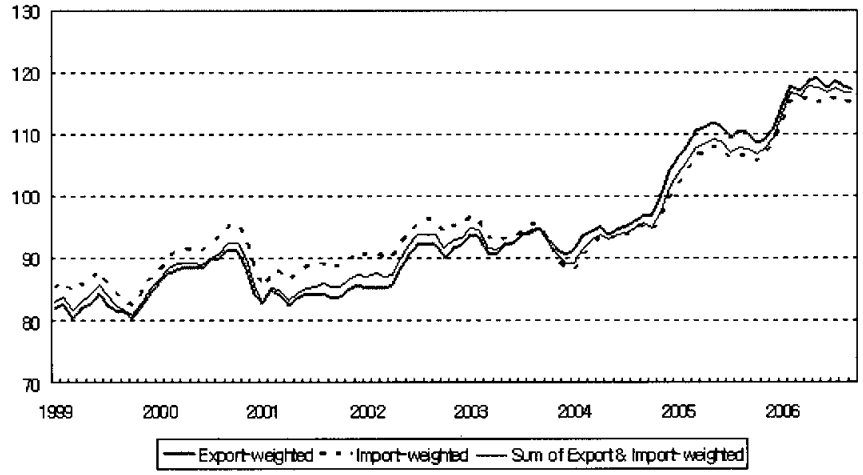
Note : 1) Based on the year of 1993.

Machinery



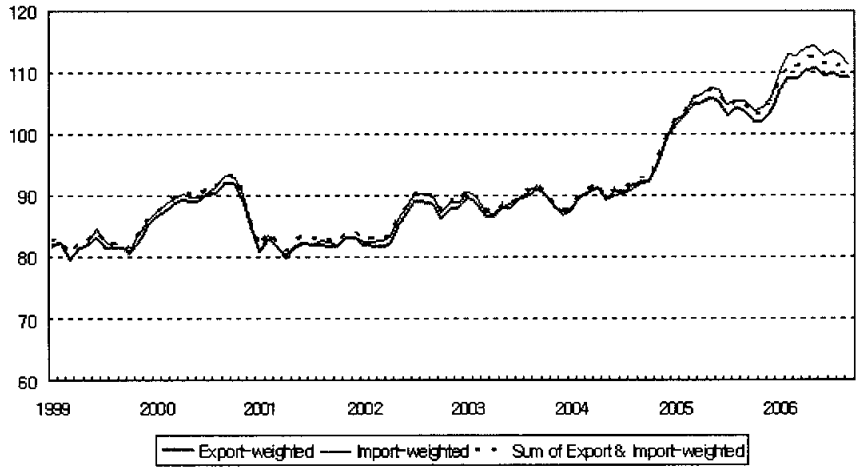
Note : 1) Based on the year of 1993.

Steel



Note : 1) Based on the year of 1993.

Textile



Note : 1) Based on the year of 1993.

Results of Unit Root Test

		Augmented Dickey Fuller Test (Null : Unit Root)	
		t-vlaue	critical value at 5%
Automobile	ΔRi	-5.56(5)	-1.94
	ΔEe	-6.23(1)	-1.94
	ΔEi	-6.09(1)	-1.94
	ΔEt	-6.25(1)	-1.94
ship	ΔRi	-9.36(0)	-1.94
	ΔEe	-6.00(1)	-1.94
	ΔEi	-5.40(1)	-1.94
	ΔEt	-5.70(1)	-1.94
Chemicals	ΔRi	-4.36(3)	-1.94
	ΔEe	-5.46(1)	-1.94
	ΔEi	-6.15(0)	-1.94
	ΔEt	-5.50(1)	-1.94
E&E	ΔRi	-8.62(0)	-1.94
	ΔEe	-5.93(1)	-1.94
	ΔEi	-5.74(1)	-1.94
	ΔEt	-5.81(1)	-1.94
Precision Equipment	ΔRi	-8.81(0)	-1.94
	ΔEe	-5.76(1)	-1.94
	ΔEi	-5.73(1)	-1.94
	ΔEt	-5.73(1)	-1.94
Machinery	ΔRi	-8.75(0)	-1.94
	ΔEe	-6.65(0)	-1.94
	ΔEi	-5.77(1)	-1.94
	ΔEt	-5.77(1)	-1.94
Steel	ΔRi	-8.26(0)	-1.94
	ΔEe	-5.76(1)	-1.94
	ΔEi	-5.81(1)	-1.94
	ΔEt	-5.78(1)	-1.94
Textile	ΔRi	-8.63(0)	-1.94
	ΔEe	-5.83(1)	-1.94
	ΔEi	-5.67(1)	-1.94
	ΔEt	-5.76(1)	-1.94
ΔRm		-8.75(0)	-1.94
ΔRf		-7.31(1)	-1.94

Note : 1) $\Delta E_e, \Delta E_i, \Delta E_t$ refer to differentiated data of Export-weighted, Import-weighted and Sum of Export & Import -weighted REER, respectively.

2) ΔRi, ΔRm refer to the rate of return of each industry and overall industry respectively.

3) ΔRf refers to the 3-year maturity yield rate on national bond.

4) Figures in parenthesis refer to lag.

CHAPTER 5

ADJUSTMENTS OF THE CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY IN THE SEACEN COUNTRIES: COUNTRY PAPER OF MALAYSIA

by Anas Faisal Aning[1]

1. Introduction

This paper attempts a preliminary study on the behaviour of the corporate sector balance sheet in response to increases in exchange rate volatility, especially during the Asian financial crisis. The general economic literature on the implications of exchange rate volatility on the corporate sector remains divided. For the ASEAN region, studies on the implications of exchange rate volatility have been hampered by the poor quality of data available. In this study, aggregate corporate sector data are used to present a picture of the response of the sector to exchange rate volatility during the crisis.

The causes and impact of the Asian financial crisis have been well documented. Corsetti, Pesenti and Roubini (1998), implicitly agreed to "market overreaction and herding (behaviour)" as having caused the extreme movements in the exchange rates, asset prices, and economic activity in South East Asia. They also pointed to structural and policy distortions with emphasis on current account imbalances, quantity and quality of financial over lending, and size of capital inflows in the countries of the region that have allowed speculators to begin their attack in the first place. Glick (1998), blamed "the growing current account deficits and somewhat overvalued real exchange rates" that needed to be addressed but largely had not anticipated "a crisis of the magnitude" to have transpired.

Bergin (2004) argued that "it is possible that countries could face higher costs" of exchange rate volatility. A quoted example was of the typical, small and open Asian countries that rely a great deal on international trade. The paper generally found that most multinationals that deal with international trade did not

1. The author wishes to thank Ahmad Razi and Shariman Alwani for invaluable hindsight and feedback, and to Mohd Helmi Ramlee for assistance on econometric studies. Mr. Anas Faisal Aning is Manager of the Financial and Fiscal Surveillance Division of the Monetary Assessment and Strategy Department of Bank Negara Malaysia.

feel that exchange rate volatility would increase the costs of doing business. One possible explanation for this is that as multinationals are heavily exposed to exchange rate movements, they are more likely to engage in foreign-exchange hedging activities that would minimise price disruptions and fluctuations. Moreover, the costs of insuring against exchange rate volatility would be relatively small for their large exposures. Wang and Barret (2002) also found a similar result, where they found that real exchange rate risk causes "insignificant effects" in most sectors, except for the agricultural sector.

For many smaller businesses however, the costs of hedging may have a direct negative impact on their bottom-line. For export-oriented companies, the costs for hedging may be too high to be efficient. An argument for the protection against short-term volatility is that variations in the short-term exchange rates would cause difficulties in pricing business products and in managing accounting books, with unfavourable implications on profitability[2].

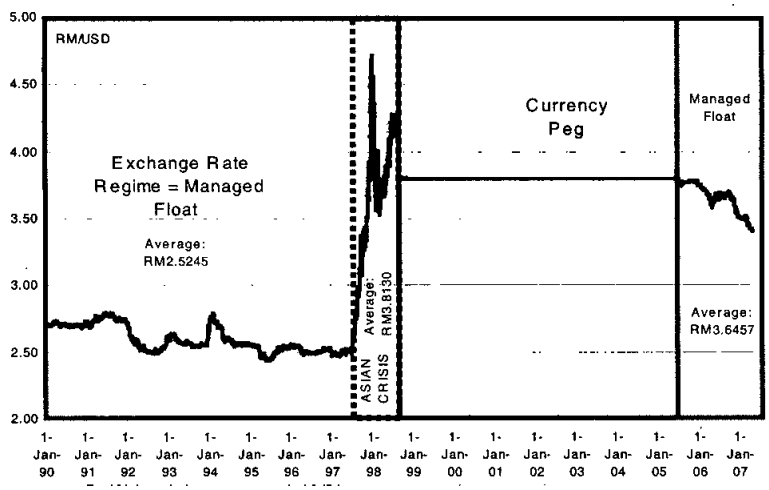
Our study seeks to understand how the Malaysian experience has been, in times of exchange rate volatility, with particular reference to the recent Asian Financial Crisis period. In Section 2, we first look into the changing volatility trends of the Malaysian ringgit since January 1995 up to September 2006. We analyse the Nominal Effective Exchange Rate (NEER) series compiled by the International Monetary Fund's (IMF) International Financial Statistics (IFS) database, for Malaysia and a few selected regional economies. In Section 3, the Granger-causality test is applied to investigate the relationship between the exchange rate (quoted as RM/USD) and the benchmark local stock market, the Kuala Lumpur Composite Index (KLCI) and a host of other sub-sectoral indices on the local Bursa Malaysia exchange. To further establish the cause-and-effect relationship between exchange rate volatility and stock prices, the Vector Error Correction Model (VECM) framework was used. In Section 4, we matched the volatility trends of the Malaysian ringgit to the balance sheet responses recorded for the corporate sector of Malaysian businesses, with particular reference to the Asian Financial Crisis' period.

2. Malaysia's National Economic Action Plan (released 1998) "Chapter 4: Promoting Market Stabilisation", http://www.mir.com.my/lb/econ_plan/contents/chapter4/d_pg1.htm

2. Exchange Rate Volatility in Malaysia

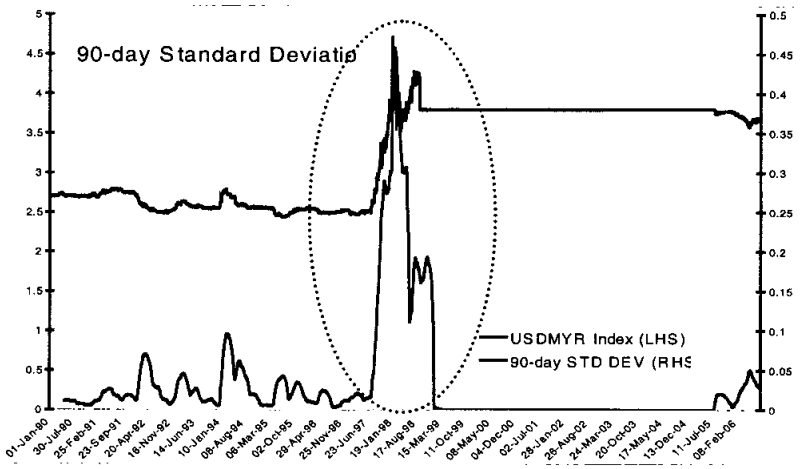
Malaysia's exchange rate management regime has changed significantly over the period under study. Prior to 1998, the Malaysian Ringgit was on a managed float regime where the ringgit exchange rate to the dollar averaged RM2.6246 from January 1995 leading to the crisis. Sharp upswings in the exchange rate were recorded during the periods leading up to the crisis, as the rate touched RM3.000 to USD1, on 16 September 1997. During the period of the crisis, the exchange rate fell as low as RM4.7125 to the dollar. The currency was pegged to the dollar at the rate of RM3.80 on 1 September 1998. The currency peg was lifted on 21 July 2005[3], as Malaysia returned to a managed float regime. Since the ringgit unpegging from late July 2005 to 15 May 2007, the exchange rate had averaged 3.6457, a strengthening of 10.5% against the dollar.

Chart 1: Malaysia's Exchange Rate Regime



3. The unpegging of the exchange rate was also accompanied by the lifting of certain other capital controls. See www.bnm.gov.my for more information.

Chart 2: Volatility of the Malaysian Ringgit

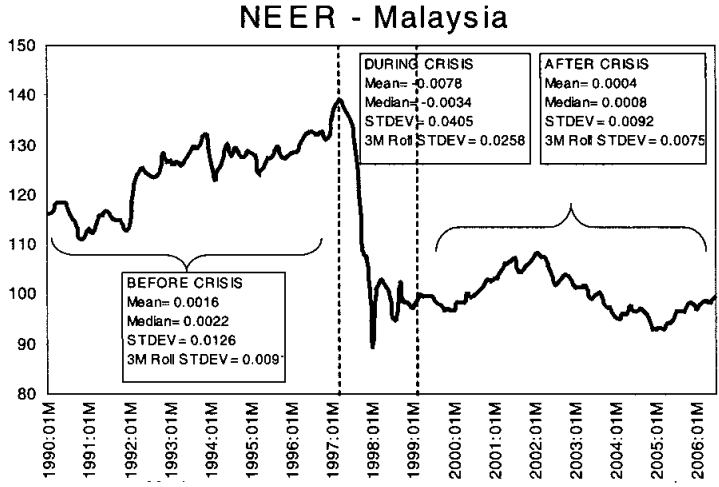


In terms of volatility, the 90-day rolling standard deviation, as shown in Chart 2, shows a significant increase of volatility in the exchange rate during the Asian Financial Crisis. Though there were other periods of volatility increases, they pale in comparison to those shown between 1997 and 1999. The increases in volatility between 1992 and 1994 were related to a period of high capital inflows. In particular, this period coincided with a significant shift in the nature of capital inflows into the country, where Malaysia experienced a larger amount of short-term inflows.

Chart 3 shows that the NEER has been more stable in the post-Crisis period[4]. Volatility in the exchange rate was a lot less after the crisis, compared to the period before the crisis. Again, it shows that the period after the Crisis was a lot more stable as compared to the period before the Crisis.

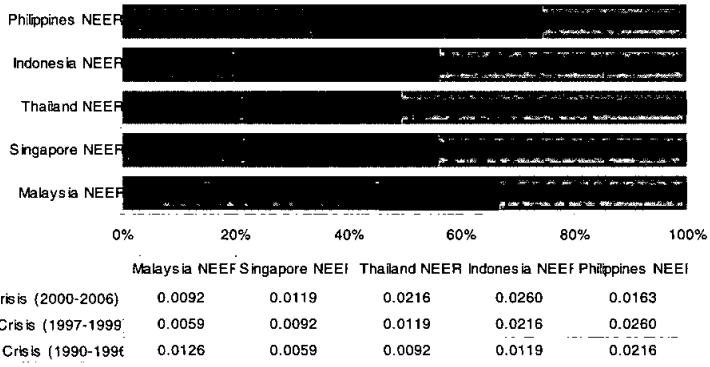
4. 3M Roll STDEV represents the average of a 3-month rolling standard deviation on the data observations.

Chart 3: Volatility of NEER Before, During and After the Crisis



In Appendix A, Table 1, we show comparisons of the exchange rates for the regional countries for the periods "Before the Crisis (1990-1997)" period, "During the Crisis (1997-1999)" and "After the Crisis (2000-2006)".

Chart 4: Regional NEER Comparisons



	Malaysia NEEF	Singapore NEEI	Thailand NEER	Indonesia NEEF	Philippines NEEI
After Crisis (2000-2006)	0.0092	0.0119	0.0216	0.0260	0.0163
During Crisis (1997-1999	0.0059	0.0092	0.0119	0.0216	0.0260
Before Crisis (1990-199(	0.0126	0.0059	0.0092	0.0119	0.0216

Interestingly, compared to other regional countries, Chart 4 shows that Malaysia faced a higher level of exchange rate volatility before the crisis as compared to the other two periods. The higher volatility experienced before the crisis reflected the movements of the other currencies within the basket of currency components that made up the NEER.

However, during the period of crisis, the exchange rate volatility faced by Malaysia was much lower as compared to other regional countries. A possible explanation for this is that while the ringgit depreciated against the US dollar and other major currencies, the ringgit also appreciated against the regional currencies of countries like Thailand and Indonesia. The effect is a netting-off of the difference, resulting in a lower volatility for the NEER.

For the period after the crisis, the Malaysian ringgit experienced lower volatility as compared to the region. This is mainly due to the pegging of the ringgit to the US dollar. While the ringgit remained unchanged against the US dollar, the lower volatility recorded the movements of the other currencies in the basket of currencies for the computation of NEER by the IMF.

To conclude, it is shown that there was a significant increase of volatility in the Malaysian exchange rate during the Asian Financial Crisis. The NEER seemed to have been more stable in the post Crisis period, as Malaysia implemented a fixed exchange rate regime, pegging its ringgit to the US dollar. When compared to other countries in the region, the exchange rate volatility experienced by Malaysia was among the highest before the crisis, but was comparatively lower during and after the crisis.

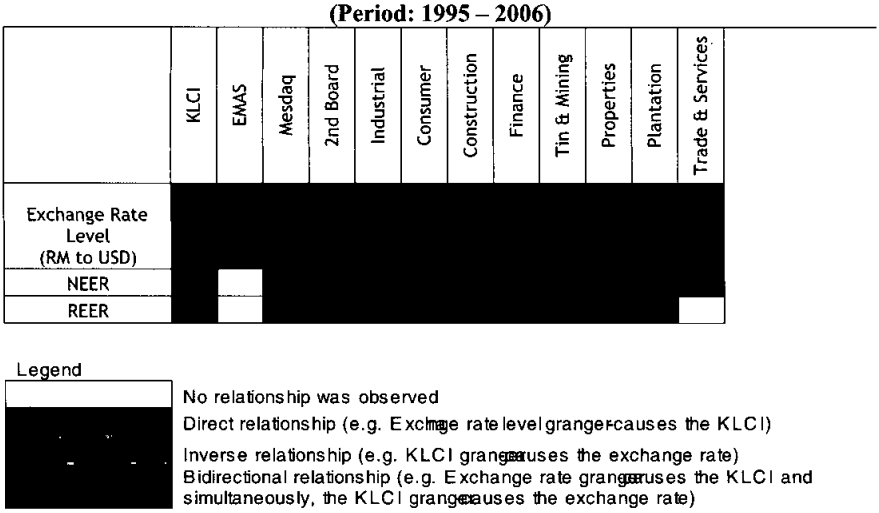
3. Establishing the Relationship between Exchange Rate Volatility and Corporate Sector Financial Performance

Before looking into the implications of exchange rate volatility on the corporate sector balance sheet, it is perhaps useful to study the relationship between exchange rate volatility and the financial performance of the corporate sector. Given that the share prices reflect the market's assessment and expectations of the financial performance of the listed companies, if exchange rate volatility were to have a negative impact on the companies, it is assumed that it would be reflected in the share prices of the said companies. Thus, the impact of exchange rate volatility on the corporate sector can be assessed by running a Granger-causality test between the exchange rate and the stock indices. Hisham (1998), in his study to find the relationship between stock price returns on the KLCI and the exchange rate, found that there is indeed a positive and significant correlation between selected stock counters and variations between the ringgit to the US dollar and the ringgit to the Japanese Yen. His study was limited to 30 stock counters in the KLCI.

For the test, the Vector Error Correction Model (VECM) is used based on cointegration relationships between the input variables. VECM has cointegration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

We ran Granger's causality test on the VECM inputs and found logical relationships for the overall indices[5]. For instance, the exchange rate was shown to have a direct causal relationship with all the indices. The same trend was observed when we used the NEER and the REER.

Table 1: VECM Granger Causality Table / Block Exogeneity Wald Test (Period: 1995 – 2006)



In conclusion, after applying the Granger causality test via the vector error correction model, we found that:

⊙ For the exchange rate level, there were single and direct relationships as follows:-

o The RM/USD exchange rate Granger-causes all stock market indices under study, with the exception of the Plantation Index.

5. Refer to Appendix B for the test-results.

For the NEER, except for the Mesdaq Index, the NEER Granger-causes all the major and sectoral indices.

o For the REER, the results again showed that generally, the REER Granger-causes the stock market indices.

Thus, the overall results do suggest that exchange rates affect the corporate sector stock prices. In so far as the stock prices reflect the outlook of the corporate sector financial performance, it is possible to surmise that exchange rate volatility could affect the corporate sector performance.

4. The Transmission of Exchange Rate Volatility to the Corporate Sector in Malaysia

For the purpose of our study, given that data on smaller businesses are not available, the Malaysian corporate entities are confined to the Kuala Lumpur Composite Index (KLCI) component stocks, which comprise of 100 stocks[6]. The rationale for choosing the component stocks in the KLCI is multifold. One, using the KLCI is a natural choice, given that it is the index that has the most exposure to the public, and therefore has better data availability[7] and transparency[8] compared to other less-followed indices. Two, as the index is a combination of 100 companies, the effects of data extremity will be kept to a minimum, since the figures are aggregated and reported as a whole. Three, by using the index, the companies are amongst the biggest, more internationalised and have foreign exchange transactions recorded in their accounting books, as compared to companies in the Second Board or the MESDAQ Market, for example.

6. However, given the strict rules that apply for listing on Bursa Malaysia and the KLCI, not all the 100 companies that made up the KLCI components stocks in 1995, remain as component stocks by 2006.

7. Figures from their respective balance sheets were derived via the Bloomberg Financial News Services database, spanning 1995 to 2005. All figures reported for the analysis on the corporate sector in this study would be on a cumulative basis and not segregated/specified.

8. Refer to Appendix C for a cumulative Table 7, including the number of data observations recorded for each year from 1995 to 2005. The smallest observation is 58 in the year 1995.

Chart 5: Total Assets and Components

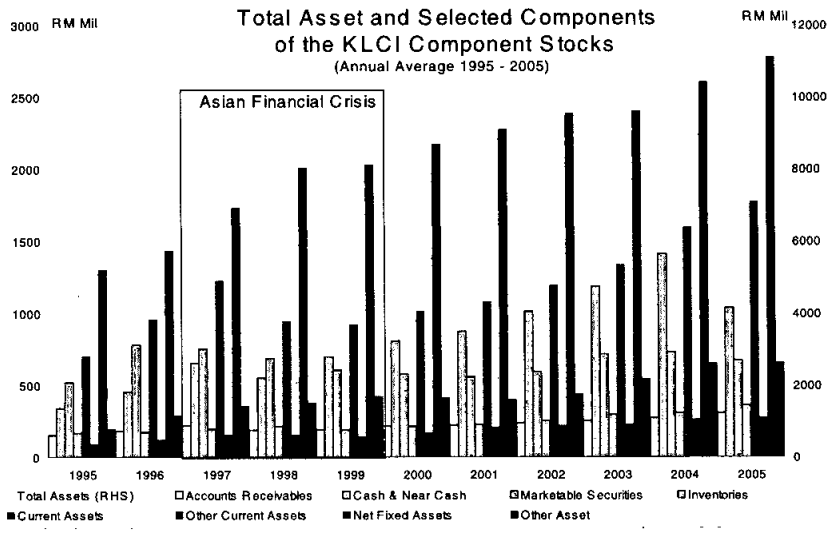
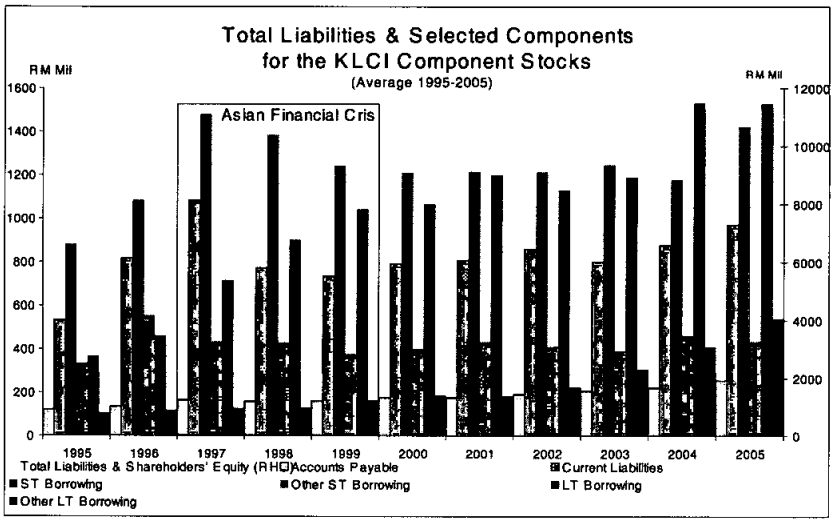


Chart 5 is on the aggregate amounts of total assets and its components for the KLCI component stocks since 1995. In Chart 6, the aggregate amount of total liabilities and its components since 1995, for the KLCI component stocks are shown. All figures are in millions of ringgit.

As implied in Charts 5 and 6 above, the total assets of the KLCI components stocks grew at an average rate of 8.9% from 1995 to 2005. While growth of assets slowed down significantly in the years after the crisis, it remained positive throughout the period of study. Growth in total liabilities also fell during the crisis, albeit recording a higher rise of 13.1% for the whole period of study.

Chart 6: Total Liabilities and Components



Next, changes in the individual balance sheet items are studied for the period. For ease of comparison, referring to Charts 7 and 8, we further broke down the assets category into liquid assets for the same period. The breakdown of the asset components into the more liquid assets and more immediate liabilities reveals that corporations tend to hold more cash and near cash items in the first year that the financial crisis struck. This tendency to hoard cash and liquid assets is reflective of the precautionary behaviour during periods of high uncertainty. Understandably, corporations may have only been reacting to the negative repercussions of the crisis during the period. Also of significance is that corporations tend to adjust their financial expenditures during a crisis, in that they quickly reversed their positions after the crisis period.

Additionally, positions in marketable securities also fell – which maybe less of a positive note, as these investments would ensure a respectable, although smaller returns during times of stress. As marketable securities normally carry a smaller yield, corporations may have disposed of them, opting to hold the safest and most liquid form of wealth which is cash. However, because marketable securities are possibly the most liquid short-term instrument an investor can hold to stay invested, even at a minimal return, they should not be dismissed without considering their potential and true worth[9] to the investor.

9. Liquidity is arguably the most important consideration for any investor in times of stress. Potential upside in returns will not be very significant if cashing-out of the investment is difficult.

Chart 7: Changes in Assets Components

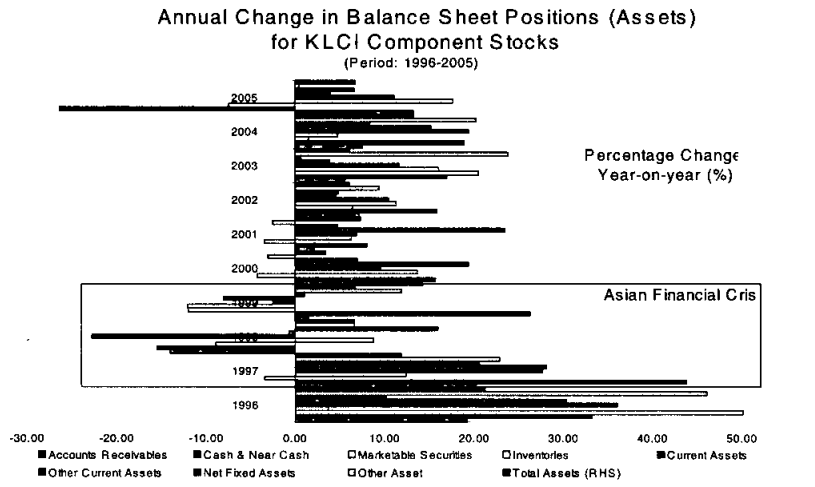


Chart 8: Changes in Liquid Assets Components

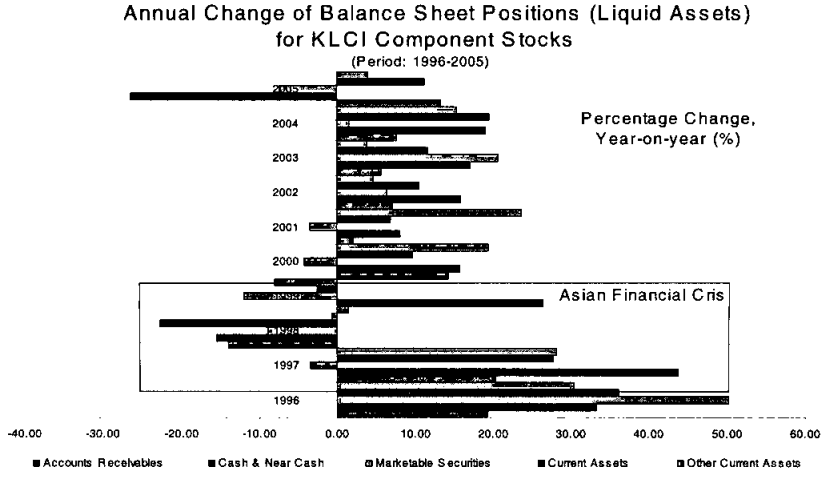


Chart 9: Changes in Liabilities Components

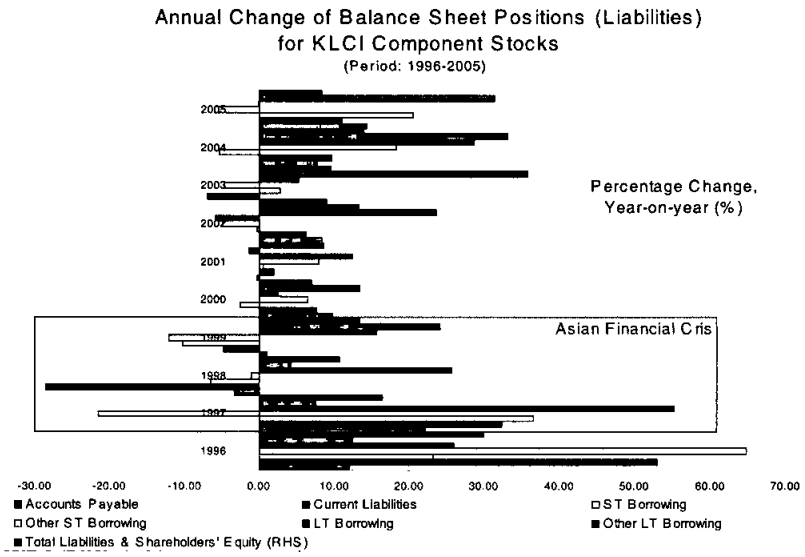
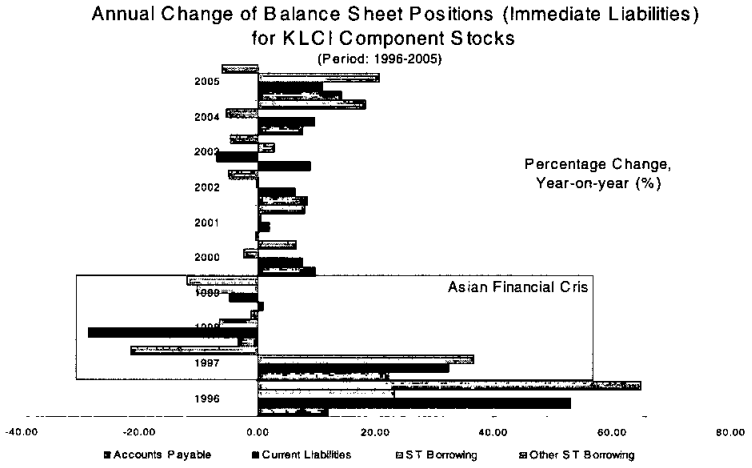


Chart 10: Changes in Immediate Liabilities Components



Referring to Charts 9 and 10, we also found that corporate entities in Malaysia were engaged in longer-term liabilities during the Crisis. Longer-term borrowings increased mainly due to issuances of private debt securities, to restructure financing needs and operations. As interest rates on bank financings

were expected to increase during the crisis, companies that were highly-rated opted to issue private debt securities. This phenomenon is especially true if the issuers expect interest rates to move upwards, prompting them to lock-in[10] the rates that were prevalent at the time of issuance.

Corporations also adjusted their immediate liabilities during the crisis. The overall current liabilities fell during the Asian Financial Crisis, led by a significant drop in short-term borrowings and accounts payable. When aggregated and compared between the "Crisis Years[11]" and the "Better Years[12]", we found that in general, the trend is somewhat similar to the finding before. Malaysian corporations kept cash and near cash items in "Crisis Years". While account receivables, inventory levels and current assets dwindled during this time, marketable securities recorded a negative growth. These trends are classic examples of prudent management of assets in times of stress.

Referring to Chart 11, in "Better Years", we noted that among others, current assets are mobilised more aggressively, together with inventory levels, as corporations continue to employ more resources to generate better bottom-line profits. Corresponding to the aggressiveness in conducting trades, liquid assets like cash and near cash items, and marketable securities also recorded a lower growth, as resources were channelled to more productive areas. In addition, in good times, Malaysian corporations were also more willing to extend more trade credit, as exemplified by the growth in account receivables. Again, as a result of focus on trade, inventory levels increased, resulting in a higher level of current assets.

10. Bank Negara Malaysia Annual Report 2004, section on Bond Market, page 157 onwards.
11. The average of "Crisis Years" were taken from observations in 1997, 1998 and 1999. See Appendix D, E, F & G for details.
12. The average of "Better Years" were from 2003, 2004 and 2005. See Appendix D, E, F & G for details.

Chart 11: Comparisons of Assets

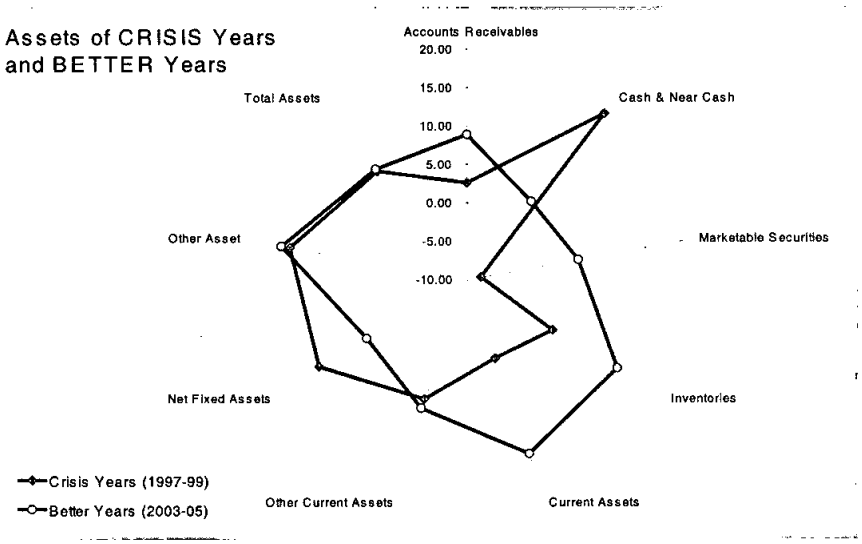
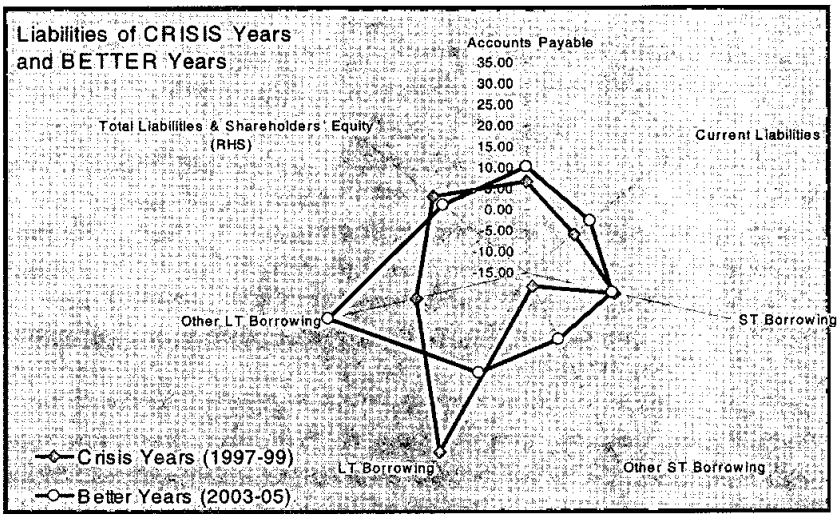


Chart 12: Comparisons of Liabilities



In terms of liabilities, other forms of short-term borrowings registered negative growth during "Crisis Years". Other forms of short-term borrowings include tax payables and dividend payables that become accrued in the same financial year. Current liabilities also registered a mild negative drop during "Crisis Years", as corporations reduce financial burdens during hard-times (notably, accounts payables also dropped in order to minimise risks as much as possible, and the likelihood of getting into a deeper financial crunch). Long-term borrowings, on the other hand, rose during this period. A possible explanation for this according to market sources, is that as corporations felt the pinch in short-term cash-flows during the "Crisis Years", they moved to restructure their debt repayments into longer periods.

5. Conclusion

In conclusion, the findings of the study indicate that volatility after the crisis, were lower in the regional countries that were affected by the Asian Financial Crisis, even when compared to periods before and during the crisis. For instance, in Malaysia's case, the exchange rate was more volatile than that of other regional currencies prior to the Crisis. When compared to other countries in the region, the exchange rate volatility experienced by Malaysia was among the highest before the crisis, and dropped to the lowest during and after the crisis.

The Granger Causality test successfully established direct relationships between the exchange-rate levels and the major and sectoral equity indices of Bursa Malaysia. In other words, the exchange rate does have a direct effect on equity indices on Bursa Malaysia.

Analysis of the balance sheets showed that corporations in general, became overly-cautious during the Crisis, as the expectations of risks increased. We found that corporations tend to hold more cash and near cash items in the first year that the financial crisis struck. This tendency to hoard cash and liquid assets is reflective of the precautionary behaviour during periods of high uncertainty. We also found that corporations tend to adjust their financial expenditures during a crisis and that corporate entities in Malaysia engaged in longer-term liabilities during the Crisis as they sought to restructure.

When we compared corporate behaviour between the "Better-Years" and "Crisis-Years", we saw that in "Better-Years", assets were mobilised more aggressively, together with inventory levels, as corporations continue to employ

more resources and channelled them to more productive areas to generate better bottom-line profits. Once the crisis struck, most forms of liabilities registered negative growth as corporations reduced financial burdens during hard-times in order to minimise risks as much as possible, and minimise the likelihood of getting into a deeper financial crunch. Long-term borrowings increased as corporations moved to restructure their debt repayments into longer periods.

References

1. Aghion, Philippe; Philippe Bacchetta, Romain Ranciere and Kenneth Rogoff, (2006), "Exchange Rate Volatility and Productivity Growth: The Role of Financial Development", *National Bureau of Economic Research Working Paper,* No. 12117,

2. Canales-Kriljenko, Jorge, and Karl Habermeier, (2004), "Structural Factors Affecting Exchange Rate Volatility: A Cross-Section Study," *International Monetary Fund Working Paper,* No. WP/04/147.

3. Chinn, Menzie D., (2002), "The Measurement of Real Effective Exchange Rates: A Survey and Applications to East Asia", Deepening Financial Arrangements in East Asia Conference.

4. Chinn, Menzie D., (2005), "A Primer On Real Effective Exchange Rates: Determinants, Overvaluation, Trade Flows And Competitive Devaluation", *National Bureau of Economic Research Working Paper,* No. 11521.

5. Cowan, Kevin; Erwin Hansen and Luis Oscar Herrera, (2005), "Currency Mismatches, Balance Sheet Effects and Hedging in Chilean Non-Financial Corporations", *Central Bank of Chile Working Paper,* No. 346.

6. Dominguez, Kathryn M.E. and Linda L. Tesar, (2006), "Exchange Rate Exposure", *Journal of International Economics,* pp188-218.

7. Frankel, Jeffrey, (2003), "Experiences and Lessons of Exchange Rate Regimes in Emerging Economies," *National Bureau of Economic Research Working Paper, No. 10032.*

8. Giancarlo Corsetti, Paolo Pesenti and Nouriel Roubini, (1998), "What Caused the Asian Currency and Financial Crisis? Part I: A Macroeconomic Overview", 1998 downloadable at http://www.nber.org/papers/w6833.pdf.

9. Klein, Michael W. and Jay C. Shambaugh, (2006), "The Nature Of Exchange Rate Regimes", *National Bureau of Economic Research Working Paper,* No. 12729.

10. Krugman, Paul, (1999), "Balance Sheets, the Transfer Problem, and Financial Crises", *International Tax and Public Finance*, pp459-472.

11. Malaysia's National Economic Action Plan, (1998), "Chapter 4: Promoting Market Stabilisation", http://www.mir.com.my/lb/econ_plan/contents/chapter4/d_pg1.htm.

12. Mohd Zaini Abd Karim, Amy Azhar Mohd Harif, Azira Adziz, (2006), "Monetary Policy and Sectoral Bank Lending in Malaysia", *Global Economic Review Vol. 35*, No. 3, pp303-326.

13. Paul Bergin, (2004), "Measuring the Costs of Exchange Rate Volatility", *FRBSF Economic Letter,* 2004-22; August 20, 2004 at http://www.frbsf.org/publications/economics/letter/2004/el2004-22.html

14. Reinhart, Carmen M. and Kenneth S. Rogoff, (2002), "The Modern History of Exchange Rate Arrangements: A Reinterpretation", *National Bureau of Economic Research Working Paper,* No. 8963.

15. Reuven Glick, (1998), "Thoughts on the Origins of the Asia Crisis: Impulses and Propagation Mechanisms", September 1998 downloadable at http://www.sf.frb.org/econrsrch/workingp/pbc/wppb98-07.pdf.

16. Saktiandi Supaat; Angela Phang Seow Jiun; Ng Heng Tiong and Edward Robinson, (2003) "Investigating the Relationship Between Exchange Rate Volatility and Macroeconomic Volatility in Singapore", *Monetary Authority of Singapore Staff Paper*, No. 25.

17. Wang and Barret, (2002), "A New Look At The Trade Volume Effects of Real Exchange Rate Risk", 2002, Cornell University, at http://aem.cornell.edu/research/researchpdf/wp0241.pdf .

18. Zairol Hisham, (1998), Dissertation Paper "A Study on Relationship between Changes in Stock Prices with Foreign Exchange Rates and Market Returns for 30 stocks from 100 Kuala Lumpur Stock Exchange Composite Index", *MARA Institute of Technology.*

APPENDIX A

Table A.1: NEER-PERIODIC STANDARD DEVIATION ON RETURNS	Before Crisis (1990-1996)	During Crisis (1997-1999)	After Crisis (2000-2006)
Malaysia NEER	0.0126	0.0126	0.0126
Singapore NEER	0.0059	0.0059	0.0059
Thailand NEER	0.0092	0.0092	0.0092
Indonesia NEER	0.0119	0.0119	0.0119
Philippines NEER	0.0216	0.0216	0.0216

VECM Granger Causality Table/Block Exogeneity Wald Test

Table B.1: Granger Causality Results for KLCI - MYRUSD

[ΔKLCI, ΔMYRUSD]		
Dependent Variable	ΔKLCI	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔKLCI	-	11.75513 (0.0028)*
ΔMYRUSD	0.472153 (0.7897)	-

Note: * indicates significant at 10% level of significance

Table B.2: Granger Causality Results for EMAS - MYRUSD

[ΔEMAS, ΔMYRUSD]		
Dependent Variable	ΔEMAS	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔEMAS	-	8.440262 (0.0147)*
ΔMYRUSD	3.481439 (0.1754)	-

Note: * indicates significant at 10% level of significance

Table B.3: Granger Causality Results for MESDAQ - MYRUSD

[ΔMESDAQ, ΔMYRUSD]		
Dependent Variable	ΔMESDAQ	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔMESDAQ	-	44.13115 (0.0000)*
ΔMYRUSD	0.632938 (0.7287)	-

Note: * indicates significant at 10% level of significance

Table B.4: Granger Causality Results for 2nd Board - MYRUSD

[Δ2nd Board, ΔMYRUSD]		
Dependent Variable	Δ2nd Board	ΔMYRUSD
	χ^2-statistics (p-values)	
Δ2nd Board	-	18.37304 (0.0001)*
ΔMYRUSD	1.030976 (0.5972)	-

Note: * indicates significant at 10% level of significance

Table B.5: Granger Causality Results for Industrial - MYRUSD

[ΔIndustrial, ΔMYRUSD] Dependent Variable	ΔIndustrial	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔIndustrial	-	17.83914 (0.0001)*
ΔMYRUSD	0.788540 (0.6742)	-

Note: * indicates significant at 10% level of significance

Table B.6: Granger Causality Results for Consumer - MYRUSD

[ΔConsumer, ΔMYRUSD] Dependent Variable	ΔConsumer	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔConsumer	-	11.85506 (0.0027)*
ΔMYRUSD	1.117707 (0.5719)	-

Note: * indicates significant at 10% level of significance

Table B.7: Granger Causality Results for Construction - MYRUSD

[ΔConstruction, ΔMYRUSD] Dependent Variable	ΔConstruction	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔConstruction	-	15.54344 (0.0004)*
ΔMYRUSD	1.508233 (0.4704)	-

Note: * indicates significant at 10% level of significance

Table B.8: Granger Causality Results for Finance - MYRUSD

[ΔFinance, ΔMYRUSD] Dependent Variable	ΔFinance	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔFinance	-	12.99571 (0.0015)*
ΔMYRUSD	0.564721 (0.7540)	-

Note: * indicates significant at 10% level of significance

Table B.9: Granger Causality Results for Tin & Mining - MYRUSD

[ΔTin & Mining, ΔMYRUSD]

Dependent Variable	ΔTin & Mining	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔTin & Mining	-	8.319169 (0.0156)*
ΔMYRUSD	2.009914 (0.3661)	-

Note: * indicates significant at 10% level of significance

Table B.10: Granger Causality Results for Properties - MYRUSD

[ΔProperties, ΔMYRUSD]

Dependent Variable	ΔProperties	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔProperties	-	9.033724 (0.0109)*
ΔMYRUSD	0.718524 (0.6982)	-

Note: * indicates significant at 10% level of significance

Table B.11: Granger Causality Results for Plantation - MYRUSD

[ΔPlantation, ΔMYRUSD]

Dependent Variable	ΔPlantation	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔPlantation	-	8.733046 (0.0127)*
ΔMYRUSD	5.915483 (0.0519)*	-

Note: * indicates significant at 10% level of significance

Table B.12: Granger Causality Results for Trade & Services - MYRUSD

[ΔTrade & Services, ΔMYRUSD]

Dependent Variable	ΔTrade & Services	ΔMYRUSD
	χ^2-statistics (p-values)	
ΔTrade & Services	-	11.30716 (0.0035)*
ΔMYRUSD	0.424064 (0.8089)	-

Note: * indicates significant at 10% level of significance

Table B.1.1: Granger Causality Results for KLCI - NEER

[ΔKLCI, ΔNEER] Dependent Variable	ΔKLCI	ΔNEER
	χ^2-statistics (p-values)	
ΔKLCI	-	18.95520 (0.0001)*
ΔNEER	0.166417 (0.9202)	-

Note: * indicates significant at 10% level of significance

Table B.1.2: Granger Causality Results for EMAS - NEER

[ΔEMAS, ΔNEER] Dependent Variable	ΔEMAS	ΔNEER
	χ^2-statistics (p-values)	
ΔEMAS	-	1.893440 (0.3880)
ΔNEER	0.567543 (0.7529)	-

Note: * indicates significant at 10% level of significance

Table B.1.3: Granger Causality Results for MESDAQ - NEER

[ΔMESDAQ, ΔNEER] Dependent Variable	ΔMESDAQ	ΔNEER
	χ^2-statistics (p-values)	
ΔMESDAQ	-	20.03563 (0.0000)*
ΔNEER	4.825723 (0.0896)*	-

Note: * indicates significant at 10% level of significance

TableB.1.4: Granger causality Results for 2nd Board - NEER

[Δ2nd Board, ΔNEER] Dependent Variable	Δ2nd Board	ΔNEER
	χ^2-statistics (p-values)	
Δ2nd Board	-	17.71872 (0.0001)*
ΔNEER	3.422151 (0.1807)	-

Note: * indicates significant at 10% level of significance

Table B.1.5: Granger Causality Results for Industrial - NEER

[ΔIndustrial, ΔNEER]

Dependent Variable	ΔIndustrial	ΔNEER
	χ^2-statistics (p-values)	
ΔIndustrial	-	21.93090 (0.0000)*
ΔNEER	0.925426 (0.6296)	-

Note: * indicates significant at 10% level of significance

TableB.1.6: Granger Causality Results for Consumer - NEER

[ΔConsumer, ΔNEER]

Dependent Variable	ΔConsumer	ΔNEER
	χ^2-statistics (p-values)	
ΔConsumer	-	19.90377 (0.0000)*
ΔNEER	0.590312 (0.7444)	-

Note: * indicates significant at 10% level of significance

Table B.1.7: Granger Causality Results for Construction - NEER

[ΔConstruction, ΔNEER]

Dependent Variable	ΔConstruction	ΔNEER
	χ^2-statistics (p-values)	
ΔConstruction	-	17.15302 (0.0002)*
ΔNEER	0.417927 (0.8114)	-

Note: * indicates significant at 10% level of significance

Table B.1.8: Granger Causality Results for Finance - NEER

[ΔFinance, ΔNEER]

Dependent Variable	ΔFinance	ΔNEER
	χ^2-statistics (p-values)	
ΔFinance	-	17.62331 (0.0001)*
ΔNEER	0.071772 (0.9648)	-

Note: * indicates significant at 10% level of significance

Table B.1.9: Granger Causality Results for Tin & Mining - NEER

[ΔTin & Mining, ΔNEER]		
Dependent Variable	ΔTin & Mining	ΔNEER
	χ^2-statistics (p-values)	
ΔTin & Mining	-	12.17099 (0.0023)*
ΔNEER	0.192641 (0.9082)	-

Note: * indicates significant at 10% level of significance

Table B.1.10: Granger Causality Results for Properties - NEER

[ΔProperties, ΔNEER]		
Dependent Variable	ΔProperties	ΔNEER
	χ^2-statistics (p-values)	
ΔProperties	-	9.803893 (0.0074)*
ΔNEER	0.098552 (0.9519)	-

Note: * indicates significant at 10% level of significance

Table B.1.11: Granger Causality Results for Plantation - NEER

[ΔPlantation, ΔNEER]		
Dependent Variable	ΔPlantation	ΔNEER
	χ^2-statistics (p-values)	
ΔPlantation	-	11.19360 (0.0037)*
ΔNEER	4.026609 (0.1335)	-

Note: * indicates significant at 10% level of significance

Table B.1.12: Granger Causality Results for Trade & Services - NEER

[ΔTrade & Services, ΔNEER]		
Dependent Variable	ΔTrade & Services	ΔNEER
	χ^2-statistics (p-values)	
ΔTrade & Services	-	18.16172 (0.0001)*
ΔNEER	0.803411 (0.6692)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.1: Granger Causality Results for KLCI - REER

[ΔKLCI, ΔREER] Dependent Variable	ΔKLCI	ΔREER
	χ^2-statistics (p-values)	
ΔKLCI	-	16.88662 (0.0002)*
ΔREER	0.187523 (0.9105)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.2: Granger Causality Results for EMAS - REER

[ΔEMAS, ΔREER] Dependent Variable	ΔEMAS	ΔREER
	χ^2-statistics (p-values)	
ΔEMAS	-	1.415823 (0.4927)
ΔREER	1.218986 (0.5436)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.3: Granger Causality Results for MESDAQ - REER

[ΔMESDAQ, ΔREER] Dependent Variable	ΔMESDAQ	ΔREER
	χ^2-statistics (p-values)	
ΔMESDAQ	-	18.05556 (0.0001)*
ΔREER	3.601749 (0.1652)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.4: Granger Causality Results for 2nd Board - REER

[Δ2nd Board, ΔREER] Dependent Variable	Δ2nd Board	ΔREER
	χ^2-statistics (p-values)	
Δ2nd Board	-	15.21487 (0.0005)*
ΔREER	2.489785 (0.2880)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.5: Granger Causality Results for Industrial - REER

[ΔIndustrial, ΔREER]

Dependent Variable	ΔIndustrial	ΔREER
	χ^2-statistics (p-values)	
ΔIndustrial	-	18.61532 (0.0001)*
ΔREER	0.791252 (0.6733)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.6: Granger Causality Results for Consumer - REER

[ΔConsumer, ΔREER]

Dependent Variable	ΔConsumer	ΔREER
	χ^2-statistics (p-values)	
ΔConsumer	-	16.73689 (0.0002)*
ΔREER	0.256844 (0.8795)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.7: Granger Causality Results for Construction - REER

[ΔConstruction, ΔREER]

Dependent Variable	ΔConstruction	ΔREER
	χ^2-statistics (p-values)	
ΔConstruction	-	14.98699 (0.0006)*
ΔREER	0.549382 (0.7598)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.8: Granger Causality Results for Finance - REER

[ΔFinance, ΔREER]

Dependent Variable	ΔFinance	ΔREER
	χ^2-statistics (p-values)	
ΔFinance	-	15.10764 (0.0005)*
ΔREER	0.088727 (0.9566)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.9: Granger Causality Results for Tin & Mining - REER

[ΔTin & Mining, ΔREER]

Dependent Variable	ΔTin & Mining	ΔREER
	χ^2-statistics (p-values)	
ΔTin & Mining	-	11.33899 (0.0034)*
ΔREER	0.104297 (0.9492)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.10: Granger Causality Results for Properties - REER

[ΔProperties, ΔREER]

Dependent Variable	ΔProperties	ΔREER
	χ^2-statistics (p-values)	
ΔProperties	-	8.843763 (0.0120)*
ΔREER	0.084498 (0.9586)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.11: Granger Causality Results for Plantation - REER

[ΔPlantation, ΔREER]

Dependent Variable	ΔPlantation	ΔREER
	χ^2-statistics (p-values)	
ΔPlantation	-	8.359592 (0.0153)*
ΔREER	3.647640 (0.1614)	-

Note: * indicates significant at 10% level of significance

Table B.1.1.12: Granger Causality Results for Trade & Services - REER

[ΔTrade & Services, ΔREER]

Dependent Variable	ΔTrade & Services	ΔREER
	χ^2-statistics (p-values)	
ΔTrade & Services	-	4.243000 (0.1199)
ΔREER	0.161760 (0.9223)	-

Note: * indicates significant at 10% level of significance

APPENDIX C

Data Observations for Assets

Table5	Accts. Receiv.	Cash & Near Cash	Market-able Sec.	Invent.	Other Current Assets	Current Assets	Total Assets
Sum	9522	23671	34986	[illegible]	[illegible]	48956	350487
Observations	63	[illegible]	[illegible]	[illegible]	58	58	69
Average (95)	152	343	522	[illegible]	[illegible]	708	5080
Sum	12269	33810	57949	11078	7754	63665	455644
Observations	67	74	74	63	63	63	74
Average (96)	183	457	783	176	123	963	6157
Sum	15636	50578	58228	13242	10566	82383	530269
Observations	71	77	77	67	65	67	77
Average (97)	220	657	756	198	158	1230	6887
Sum	13632	43836	54429	14620	10648	65528	587443
Observations	72	79	79	68	68	69	80
Average (98)	189	555	689	215	157	950	7343
Sum	14982	59574	51537	13992	10657	68509	666060
Observations	78	85	85	74	74	74	85
Average (99)	192	701	606	189	144	926	7836
Sum	17559	70548	50506	16333	13068	78106	712905
Observations	80	87	87	76	76	77	88
Average (00)	219	811	581	215	172	1014	8101
Sum	17936	76202	48753	17362	16354	84550	773859
Observations	80	87	87	76	77	78	89
Average (01)	224	876	560	228	212	1084	8695
Sum	20889	96396	56655	21107	18437	99380	876472
Observations	87	95	95	83	83	83	95
Average (02)	240	1015	596	254	222	1197	9226
Sum	22823	116359	70477	25102	19612	113628	959416
Observations	90	98	98	85	85	85	98
Average (03)	254	1187	719	295	231	1337	9790
Sum	24830	139857	71548	26307	22612	135740	1098167
Observations	91	99	98	85	85	85	99
Average (04)	273	1413	730	309	266	1597	11093
Sum	28436	104025	64919	31339	23786	152680	1184232
Observations	92	100	96	86	86	86	100
Average (05)	308	1040	676	364	277	1775	11842

APPENDIX D

Table D.1: Data on Assets for Crisis Years and Better Years

AVERAGE: PERIOD	CRISIS (1997-98)	CRISIS (1997-99)
TOTAL ASSETS	20.16%	20.01%
DEPOSITS PLACED & REVERSE REPOS	-4.76%	-0.28%
AMOUNT DUE FROM DESIGNATED FIs	36.93%	40.84%
LOANS	21.13%	18.75%
SECURITIES HELD	23.72%	11.29%
SECURITIES SOLD UNDER REPO	#DIV/0!	#DIV/0!
MISCELLANEOUS ASSETS	24.28%	32.61%

AVERAGE: PERIOD	BETTER (2003-04)	BETTER (2003-05)
TOTAL ASSETS	21.04%	17.93%
DEPOSITS PLACED & REVERSE REPOS	79.11%	64.07%
AMOUNT DUE FROM DESIGNATED FIs	29.98%	23.17%
LOANS	24.76%	20.31%
SECURITIES HELD	0.82%	2.64%
SECURITIES SOLD UNDER REPO	41.48%	37.58%
MISCELLANEOUS ASSETS	-2.36%	0.27%

APPENDIX E

Table E.1: Data on Liabilities for Crisis Years and Better Years

AVERAGE: PERIOD	CRISIS (1997-98)	CRISIS (1997-99)
TOTAL CAPITAL & LIABILITIES	20.16%	20.01%
CAPITAL	29.05%	22.26%
DEPOSITS ACCEPTED	17.47%	19.07%
AMOUNT DUE TO DESIGNATED FIs	73.46%	56.81%
MISCELLANEOUS BORROWINGS	11.11%	24.36%
MISCELLANEOUS DEBT SECURITIES ISSUED	110.79%	80.34%
MISCELLANEOUS LIABILITIES	18.56%	16.18%

AVERAGE: PERIOD	BETTER (2003-04)	BETTER (2003-05)
TOTAL CAPITAL & LIABILITIES	21.04%	17.93%
CAPITAL	18.16%	13.00%
DEPOSITS ACCEPTED	25.11%	20.62%
AMOUNT DUE TO DESIGNATED FIs	-6.01%	12.83%
MISCELLANEOUS BORROWINGS	53.90%	37.04%
MISCELLANEOUS DEBT SECURITIES ISSUED	14.24%	9.46%
MISCELLANEOUS LIABILITIES	6.23%	7.15%

APPENDIX F

Aggregate figure for KLCI Component Stocks

Table F.1: Aggregate Assets (RM million)

Year	Accounts Receivables	Cash & Near Cash	Marketable Securities	Inventory	Current Assets	Other Current Assets
1995	154	343	522	170	708	94
1996	183	457	783	176	963	123
1997	220	657	756	198	1230	158
1998	189	555	689	215	950	157
1999	192	701	606	189	926	144
2000	219	811	581	215	1014	172
2001	224	876	560	228	1084	212
2002	240	1015	596	254	1197	222
2003	254	1187	719	295	1337	231
2004	273	1413	730	309	1597	266
2005	309	1040	676	364	1775	277

Table F.2: Aggregate Liabilities (RM million)

Year	Accounts Payable	Current Liabilities	ST Borrow	Other ST Borrow	LT Borrow	Other LT Borrow
1995	121	535	881	336	367	106
1996	135	818	1085	555	462	119
1997	165	1083	1481	435	717	128
1998	160	773	1384	430	902	133
1999	162	737	1242	378	1042	165
2000	177	793	1211	403	1068	187
2001	177	809	1217	435	1201	184
2002	192	859	1213	413	1131	228
2003	209	800	1247	394	1190	309
2004	225	877	1180	466	1531	412
2005	257	973	1423	438	1529	541

APPENDIX G

Data Averaged Out over Three Years - For both Assets and Liabilities

Table G.1: Assets

Crisis Years (1997-99)	2.56	18.18	-8.11	3.05	0.80	6.46	12.53	13.78
Better Years (2003-05)	8.83	3.21	4.91	12.89	14.08	7.71	5.25	14.88

Table G.2: Liabilities

Crisis Years (1997-99)	6.59	-0.33	6.58	-11.57	32.20	11.93
Better Years (2003-05)	10.27	4.57	6.00	2.52	11.25	33.42

CHAPTER 6

ADJUSTMENT OF THE PHILIPPINE FINANCIAL AND CORPORATE SECTORS TO EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS

*by Agnes Yap and Cristeta Bagsic**

1. Introduction

Despite the low level of price volatility over a wide range of financial assets and markets in recent years, exchange rate volatility in most countries is currently only slightly below or exactly at its long-term average (for over three decades) (Panetta, et. al., 2006). Given this development, one question often raised is what impact increases in exchange rate volatility would have on a firm's profitability and market valuation. Measuring and managing exchange rate risk exposure is thus important for reducing a firm's vulnerabilities from major exchange rate movements. Exchange rate risk management is an integral part in every firm's decisions about foreign currency exposure (Allayannis, Ihrig, and Weston, 2001). Currency risk hedging strategies entail eliminating or reducing this risk, and require understanding of both the ways that the exchange rate risk could affect the operations of economic agents and techniques to deal with the consequent risk implications (Barton, Shenkir, and Walker, 2002). Selecting the appropriate hedging strategy is often a daunting task due to the complexities involved in measuring accurately current risk exposure and deciding on the appropriate degree of risk exposure that ought to be covered.

This paper examines the volatility of the economy-wide and industry-specific peso exchange rate since 1998 and assesses the impact of volatility on the profitability (in terms of stock price returns) of Philippine financial institutions and corporate firms. The results of the analysis provide some support that volatility in the foreign exchange market affects the profitability of these firms.

*. Ms. Agnes Yap is currently Acting Bank Officer VI at the Department of Economic Research while Ms. Cristeta Bagsic is Bank Officer IV at the Center for Monetary and Financial Policy both of the Bangko Sentral ng Pilipinas.

The paper is organised as follows: Section 2 discusses the Philippine foreign exchange rate policy, putting it into a historical perspective. Section 3 considers the current state of the Philippine foreign exchange market. Section 4 examines evidence of significant changes in the volatility of the peso during the period 1980-2006. This Section also presents an estimate of selected industry or sector exchange rates, reviews the traditional types of exchange rate risks faced by both Philippine financial institutions and corporate firms, and examines the foreign exchange exposure of selected banks and corporations using factor analysis. Section 5 provides an examination of the foreign exchange risk management practices adopted by Philippine financial and non-financial firms in relation to their foreign exchange exposure. It also considers the factors that have hampered the development of hedging instruments in the country as well as the significant financial market developments that led to the adjustments of financial and non-financial corporations to increases in foreign exchange volatility. Section 6 concludes with a summary of the paper's key findings and their policy implications.

2. Foreign Exchange Policy: Historical Perspective

To put the discussion on volatility trends in perspective, it is helpful to examine the evolution of the Philippine foreign exchange policy.

The Philippines has had over 4 decades of foreign exchange controls. In the 1950s, foreign exchange restrictions were imposed for balance of payments purposes. Far from inspiring confidence, this experience showed that fixed exchange rates and the associated controls distort resource allocation. These controls cumulate as the authorities plug the regulatory leakages, generating further distortions in resource allocation and imposing additional administrative costs on the government. In part, the control measures also fomented the development of a black market for the currency. Concerns over the difficulty of determining the appropriate level and magnitude of the daily or monthly adjustments in the rate as well as the reliability of the country's stock of reserves to credibly defend the exchange rate likewise took its toll on the economy.

In light of these considerations, foreign exchange controls were gradually dismantled. In 1970, the Philippines adopted the floating exchange rate regime because the government considered that occasional, large scale fluctuations (typical of the fixed exchange rate system) are more costly, destabilising and disruptive to the economy than the more frequent but more gradual changes that

may occur in a free float. A market-oriented exchange rate leads to better resource allocation as it adjusts to reflect changing conditions in the demand for and supply of foreign exchange. The adoption of a flexible exchange rate policy has also contributed to financial system soundness by allowing a greater role for the exchange rate in enabling the economy to adjust to external shocks and by encouraging banks to hedge their foreign currency risks. It has likewise enabled a more independent monetary policy to focus more on domestic sector concerns, e.g., providing sufficient liquidity to support the country's growth requirements.

In 1986, the government pursued structural reforms, including trade liberalisation. Import controls on a broad range of items were eliminated, the tariff structure was made more uniform, and discriminatory aspects of the domestic tax structure against imports were eliminated.

Reforms that enhanced the efficiency of the foreign exchange market were also introduced. Currency trading shifted from a short daily trading session to full off-floor interbank foreign exchange trading with the operation of the Philippine Dealing System (PDS) in April 1992.[1]

Positive developments in the political and economic environment in the early 1990s prepared the economy for further liberalisation and provided an opportunity for launching wide-ranging foreign exchange reforms. The consolidated measures were contained in CB Circular No. 1389 dated 13 April 1993.

Some of the major changes contained in CB Circular No. 1389 included the removal of foreign exchange surrender requirements, the liberalisation of access to foreign currency deposits liabilities, lifting of quantitative restrictions on current account transactions and removal of restrictions on the repatriation of foreign investments including profit remittances. With respect to the capital account, registration with the BSP of loans of the private sector and foreign direct investments is required only if the foreign exchange needed for future debt servicing, repatriation of capital and remittances of dividends and profits is to be funded through the banking system. All foreign borrowings by the public sector, however, must be referred to the BSP for prior approval. Outward

1. The Philippine Dealing and Exchange Corp. (PDEx) launched a new peso-dollar trading platform on 2 October 2006, replacing the Philippine Dealing System in providing the main reference rate for the US dollar-Philippine peso transactions used for foreign exchange conversions to local currency.

investments of residents exceeding US$6 million per investor per year require the prior approval of and registration with the BSP if funds are to be sourced from the banking system.

On 8 September 1995, the Philippines acquired Article VIII status with the International Monetary Fund (IMF) as a result of the lifting of all restrictions on current account transactions. Under Article VIII, the country committed that it shall not impose restrictions on payments and transfers for current international transactions nor engage in discriminatory currency arrangements or multiple currency practices, without the approval of the IMF. In addition, the country is also required to furnish IMF the necessary information for its activities.

The onset of the Asian financial crisis in July 1997 prompted the BSP to adopt a number of new regulatory measures. These measures were intended to ensure that the conduct of the banks' foreign exchange transactions were consistent with the efforts of the monetary authorities to restore stability in the foreign exchange market (Annex I). The liberalisation measures introduced in the early 1990s were directed at enhancing the supply of foreign exchange, through the reduction of transaction and financing costs, broadening financing options and promoting opportunities for portfolio diversification. However, there remain few restrictions on capital inflows and some controls on capital outflows (e.g., limits on over-the-counter purchases of foreign exchange by residents and limits on allowable outward investment by residents).

At present, the Philippines maintains an exchange rate policy that supports a freely floating exchange rate system whereby the BSP leaves to market forces the determination of the exchange rate, with some scope for occasional BSP action to dampen sharp fluctuations in the exchange rate. Consistent with the inflation targeting framework for monetary policy,[2] the BSP closely monitors developments in the foreign exchange market and, when necessary, uses intervention or adjustments in policy instruments (e.g., policy interest rates, reserve requirements) in cases where extreme movements in the peso threaten the inflation target. The BSP's response to exchange rate volatility is fully consistent with price stabilisation since fluctuations in the exchange rate tend to

2. Pursuant to the New Central Bank Act of 1993, the primary objective of the BSP is to maintain price stability conducive to a balanced and sustainable growth of the economy, and promote and maintain monetary stability and the convertibility of the peso. To achieve price stability, the BSP adopted inflation targeting as the framework for monetary policy starting 2002.

feed directly into domestic prices of imported goods and services, and indirectly, through the prices of goods and services that use imported inputs. The increase in prices of both the imported and import-intensive goods in turn, feed into demand for adjustments in wages and transport fares. Through this channel, exchange rate movements affect both the actual inflation and inflation expectations. The timely adoption of measures to curb potential demand pressures on the peso has preserved the overall stability of the foreign exchange market and reduced the volatility of the exchange rate in recent years. Moreover, the BSP maintains sufficient international reserves to enhance its ability to contain any excessive exchange rate volatility that may adversely affect the achievement of inflation objectives.

3. The Current State of the Philippine Foreign Exchange Market

The Philippine foreign exchange market is supported by a modern infrastructure. Interbank market transactions are carried out on an electronic trading platform called the Philippine Dealing System (PDS), Reuters dealing,[3] over-the-counter, or via brokers. The PDS captures all spot transactions, irrespective of the manner they were carried out.[4] Thirty two (32) of the 37 member banks are committed market makers although market feedback indicates that a group of 10 banks constitutes the most active market makers.

Foreign exchange market activity has expanded significantly in the past three years. Average daily turnover in the spot foreign exchange market has grown from around US$100-150 million per day in 2004 to around US$500 million at present. However, activity in the foreign exchange forward and swap markets did not expand as much. Average daily turnover in foreign exchange forwards and swaps is approximately US$100 million and US$150 million, respectively, with varying liquidity.

The Philippine peso forward market consists of an onshore deliverable and non-deliverable, as well as an offshore non-deliverable market. Bid/offer spreads are slightly wider in the offshore NDF market compared to the onshore deliverable market. However, the average transaction sizes in the onshore and offshore forward markets are about the same (US$3-4 million). In the off-shore NDF market, contracts based on the future spot price of the peso

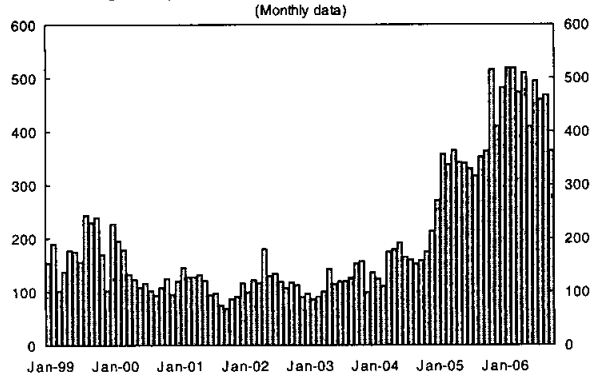
3 Mostly for third currency dealing

4 Spot transactions conducted by brokers outside the PDS are required to be mapped in the system in connection with the transaction.

are settled in US dollars, thus, avoiding the need to obtain peso onshore. The estimated daily turnover in the offshore and onshore peso NDF market of US$250 million is smaller compared with most Asian countries. In addition to the offshore NDF market, the BSP offers a Currency Rate Protection Programme (CRPP) facility, which is a non-deliverable forward facility.[5]

The interbank deposit market is shallow and the secondary market for money market instruments is limited. In this environment, foreign exchange swaps have emerged as a proxy for money market indices and become an important funding tool. Due to the lack of a liquid secondary market for money and bond instruments, market participants use a variety of instruments to build a yield curve for pricing financial derivatives. For example, the overnight rate provides the benchmark for pricing overnight and tomorrow/next day forwards. A three-month floating benchmark is generated out of the forward market and used for pricing interest rate swaps (IRS). Benchmark yields of active bonds are calculated and published on a daily basis by Bloomberg on behalf of the Money Market Association of the Philippines (MART). These provide a benchmark yield curve from 3 months up to 25 years.

Figure 1
Average Daily Market Turnover, January 1999–October 2006
(Monthly data)



Source: Philippine Dealing System (PDS)

5. The CRPP is a non-deliverable forward contract available to eligible corporations to hedge foreign currency obligations. Under this facility, only the net difference between the contracted forward rate and the prevailing spot rate is settled in pesos at maturity of the contract. The CRPP facility is aimed at alleviating the strain on the spot market due to demand pressure from unhedged borrowers wanting to cover their future foreign exchange requirements due to fears of further peso exchange rate changes.

4. Foreign Exchange Volatility

The Generalised Autoregressive Conditional Heteroskedasticity (GARCH) (see Bollerslev, 1986) is a popular model for modeling volatility of financial time series. GARCH(p,q) is modeled as:

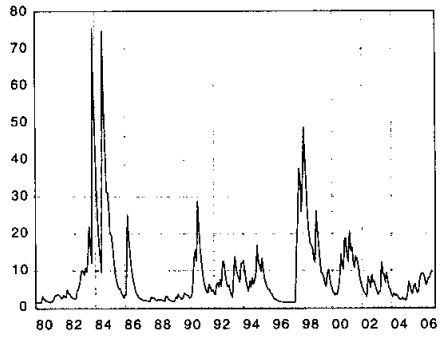
$$h_t = \alpha_0 + \sum_{j=1}^{p} \beta_j h_{t-j} + \sum_{i=1}^{q} \alpha_i a_{t-i}^2 ,$$

where h is the conditional variance, and a^2 is the ARCH term or the error terms. The number of lags of the ARCH and the GARCH terms are represented by p and q. The lagged values of h in the right hand side is the GARCH term.

We estimated as GARCH (1,1) processes the time-varying volatilities of the peso's value in US dollar (PHPUSD), and the real effective exchange rate measures using three baskets of currencies: major trading partners (Phil_MTP), broad competitors (Phils_Broad) and narrow competitors (Phils_Narrow).[6] The conditional standard deviations of these series are used to distinguish between periods of low and high volatility regimes. We find the volatilities of these economy-wide exchange rates to be highly correlated. We also find PHPUSD to be the most volatile (Figure 3), and Phils_Broad to be the least volatile.

Figure 2

Conditional Standard Deviation of the Peso (in USD)
(Annualized, in %; 1980.01-2006.10)



Sources: BSP for basic data; Authors' estimates

6. GARCH (1,1) uses both the first and second moments of the series to measure conditional volatility (which is a function of past values of log differences of the peso exchange rate).

Significant volatilities, across all economy-wide measures shown here, are seen during the mid-1980s when the Philippines experienced BOP problems, during the first half of the 1990s when an energy crisis hit the economy, and during the Asian crisis and its aftermath. The high levels of volatility in the 1980s and 1990s might be associated with the global deregulation and liberalisation of financial markets and capital flows, together with the rapid spread of IT technologies. In general, however, annualised volatilities in the past two years have come down compared to the late 1990s and early 2000s.

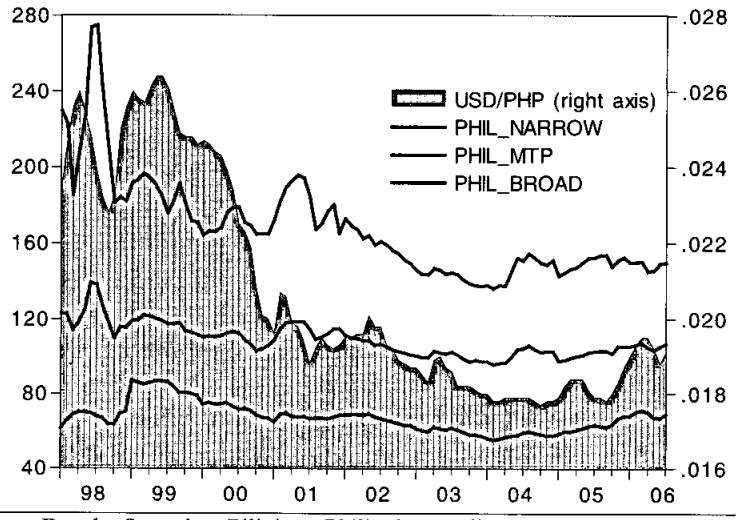
4.1 Industry-specific Exchange Rates

The BSP constructs exchange rates of the peso against three currency baskets:

- Basket of major trading partners: US dollar, Yen, Euro and UK Pound
- Broad basket of competitor currencies: Singaporean dollar, South Korean won, New Taiwan dollar, Malaysian ringgit, Thai baht, Indonesian rupiah, and Hong Kong dollar
- Narrow basket of competitor currencies: Malaysian ringgit, Thai baht, and Indonesian rupiah

Figure 3

Real Effective Exchange Rates and Philippine Peso-US Dollar Rate



Sources: Bangko Sentral ng Pilipinas, Philippine Dealing System

To inform our investigation, we estimate selected industry or sector exchange rates using the same baskets of currencies. The Harmonised System of Merchandise Classification is followed. We refer to the various REERs as *MTP*, *Broad* or *Narrow* and append as a prefix and identifier for the sector to which such REER pertains. For example, FBT_MTP refers to the REER for the food, beverage and tobacco manufacturing sector that we estimated using a basket composed of the currencies of the major trading partners of the Philippines.

For the level of disaggregation, we use the Section level, as indicated in Table 1. For instance, in calculating the sector exchange rates used in the analysis of the food, beverage and tobacco (FBT) manufacturing corporations, data recorded under Section 4 in Table 1 are used.

Table 1: Merchandise Classification

Section	Coverage
1	Live Animals; Animal Products
2	Vegetable Products
3	Animal or Vegetable Fats and Oils and Their Cleavage Products; Prepared Edible Fats; Animal or Vegetable Waxes
4	Prepared Foodstuffs; Beverages, Spirits, and Vinegar; Tobacco and Manufactured Tobacco Substitutes
5	Mineral Products
6	Products of the Chemical or Allied Industries
7	Plastics and Articles Thereof; Rubber and Articles Thereof
8	Raw Hides and Skins, Leather, Furskins and Articles Thereof; Saddlery and Harness; Travel Goods, Handbags, and Similar Containers; Articles of Animal Gut (Other Than Silkworm Gut)
9	Wood and Articles of Wood; Wood Charcoal; Cork and Articles of Cork; Manufactures of Straw, of Esparto or of Other Plaiting Materials; Basketware and Wickerwork
10	Pulp of Wood or of other Fibrous Cellulosic Material; Waste and Scrap of Paper or Paperboard; Paper and Paperboard and Articles Thereof
11	Textiles and Textile Articles
12	Footwear, Headgear, Umbrellas, Sun Umbrellas, Walking-Sticks, Seat-Sticks, Whips, Riding-Crops and Parts Thereof; Prepared Feathers and Articles Made Therewith; Artificial Flowers; Articles of Human Hair
13	Articles of Stone, Plaster, Cement, Asbestos, Mica or Similar Materials; Ceramic Products; Glass and Glassware
14	Natural or Cultured Pearls, Precious or Semiprecious Stones, Precious Metals, Metals Clad with Precious Metal, and Articles Thereof; Imitation Jewellery; Coin
15	Base Metals and Articles of Base Metal
16	Machinery and Mechanical Appliances; Electrical Equipment; Parts Thereof; Sound Recorders and Reproducers, Television Image and Sound Recorders and Reproducers, and Parts and Accessories of Such Articles
17	Vehicles, Aircraft, Vessels and Associated Transport Equipment
18	Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical or Surgical Instruments and Apparatus; Clocks and Watches; Musical Instruments; Parts and Accessories Thereof
19	Arms and Ammunition; Parts and Accessories Thereof
20	Miscellaneous Manufactured Articles
21	Works of Art, Collectors' Pieces and Antiques

Source: National Statistics Office, www.census.gov.ph

Starting with the monthly trade data generated by the Philippine National Statistics Office, series for exports and imports per month and per Section are generated separately. These series are the basis for the estimation of the monthly trade weights.

The trade weights used in calculating the industry REERs are simple averages of the exports and imports trade weights for a particular Section of the merchandise classification table.

The trade weights, for exports and imports, are estimated using the following formula:

$$x_{j,t} = \sum x^{c}_{j,t}$$

$$w_{j,t} = \frac{x_{j,t}}{\sum x_{j,t}}$$

where $x_{j,t}$ is the sum of exported (imported) commodities, c, classified in the Section to (from) country j at time t. To arrive at the country, $w_{j,t}$, these sums are then divided by the total exports (imports) of commodities classified in that particular section. Then, depending on whether we are getting the major trading partner REER, or the broad basket or narrow basket competitor currencies REERs, we sum the trade weights of the countries we are interested in order to construct a new basket, and get the final weight, $w^{\bullet}_{j,t}$

Given the weights $w^{\bullet}_{j,t}$ estimated, the nominal effective exchange rate series for a given sector and basket are estimated using the following formula:

$$SECTOR\_NEER\_Basket_t = \sum_{i=1}^{j} SECTOR\_\ w^{\bullet}_{j,t}\ (\textit{value of the peso in foreign currency})_t$$

where the exchange rates have been indexed to the value of the first observation of the estimation period to solve the problem of having different units.

To get the REER, we multiply each term in the NEER formula above by the ratio of the CPI of the Philippines to the CPI of the foreign country. The price indices have also been re-indexed to one common period. In our paper, we re-based the price indices to the first period in our estimation, January 1998.

The final REER is estimated by getting the simple average of the REER estimated from exports and imports data. As with the BSP estimated REERs, an increase (decrease) in the industry-specific REERs denote an appreciation (depreciation).

4.2 Exchange Rate Volatility Transmission

A common definition of exchange rate risk relates to the effect of unexpected exchange rate changes on the value of the firm (Madura, 1989). In particular, it is defined as the possible direct loss (as a result of an unhedged exposure) or indirect loss in the firm's cash flows, assets and liabilities, net profit and, in turn, its stock market value from an exchange rate move. To manage the exchange rate risk inherent in a firm's operations, a firm needs to determine the specific type of currency risk exposure, the hedging strategy and the available instruments to deal with these currency risks.

To measure the impact of exchange rate movements on a firm that is engaged in foreign-currency denominated transactions, i.e., the implied value-at-risk (VaR) from exchange rate moves, we need to identify the type of risks that the firm is exposed to and the amount of risk encountered (Hakala and Wystup, 2002). The three main types of exchange rate risk that we consider in this paper are (Shapiro, 1996; Madura, 1989):

- Transaction risk, which is basically cash flow risk and deals with the effect of exchange rate moves on transactional account exposure related to receivables (export contracts), payables (import contracts) or repatriation of dividends. An exchange rate change in the currency of denomination of any such contract will result in a direct transaction exchange rate risk to the firm;

- Translation risk, which is basically balance sheet exchange rate risk and relates exchange rate moves to the valuation of a foreign subsidiary and, in turn, to the consolidation of a foreign subsidiary to the parent company's balance sheet. Translation risk for a foreign subsidiary is usually measured by the exposure of net assets (assets less liabilities) to potential exchange rate moves. In consolidating financial statements, the translation could be done either at the end-of-the-period exchange rate or at the average exchange rate of the period, depending on the accounting regulations affecting the parent company. Thus, while income statements are usually translated at the average exchange rate over the period, balance sheet exposures of

foreign subsidiaries are often translated at the prevailing current exchange rate at the time of consolidation; and

- Economic risk, which reflects basically the risk to the firm's present value of future operating cash flows from exchange rate movements. In essence, economic risk concerns the effect of exchange rate changes on revenues (domestic sales and exports) and operating expenses (cost of domestic inputs and imports). Economic risk is usually applied to the present value of future cash flow operations of a firm's parent company and foreign subsidiaries.

Identification of the various types of currency risk, along with their measurement, is essential to develop a strategy for managing currency risk.

4.3 Exchange Rate Volatility Exposure

The foreign exchange exposure of a particular firm or industrial sector can be assessed approximately using factor analysis, as explained in Jorion (1990). The method consists of regressing the stock price return of the particular industry or firm on exchange rate changes while controlling for overall stock market movements. The standard econometric specification is given by:

$$\Delta\log(Price)_{i,t} = a_0 + a_1\ \Delta\log\ (ER)_{s,t} + a_2\Delta\log\ (PSEi)_t + e_t, \qquad (2)$$

where $\Delta\log(Price)_{i,t}$ is the stock market return of firm or industry i in period t, $\Delta\log\ (ER)_{s,t}$ is the change in a Philippine peso exchange rate vis-à-vis s currency or basket of currencies, $\Delta\log\ (PSEi)_t$ is the log-return of the Philippine stock market, and e_t is an independent and identically distributed error.

Monthly data from January 1998 to July 2006 were used in the regressions. Estimates of the parameters were obtained using the Newey-West autocorrelation consistent covariance estimator. We used this option to account for heteroskedasticity of an unknown form. In the presence of heteroskedasticity, the t-statistics and F-statistics resulting from an OLS estimation will not be reliable. In all instances[7], we show only regression results where the changes in the exchange rates and the market returns are both significant. The residuals of the regressions shown have passed White's heteroskedasticity test, and the Ljung-

7. Except for the results of the pooled regression in Appendix IV which have been shown to allow cross-country comparison of the results

Box test and Breusch-Godfrey LM test on serial correlation, as well as the Augmented Dickey-Fuller unit root test. A low p-value means rejection of the null hypothesis that the parameter is not significantly different from zero.

In interpreting the results of the regressions, a statistically insignificant coefficient for the change in the exchange rate does not necessarily mean that that firm or industry has no foreign exchange exposure. It could be that the firm is naturally hedged (i.e., foreign exchange liabilities are intentionally matched with revenues in the same foreign currency), or the firm successfully uses financial market instruments to cover its exposure.

In this paper, we investigate the foreign exchange exposure of selected listed firms in the Philippine Stock Exchange. These firms represent and directly affect more than 50 percent of the Philippine economy. This relationship to the overall economy has been stable over the last 25 years.

Table 2: Components of Real Gross Domestic Product

	1970-2005	1999-2005
Agriculture, Forestry and Fishery Sector	22%	20%
Industry Sector	36%	34%
Mining and Quarrying	1%	1%
Manufacturing	26%	24%
Construction	6%	5%
Electricity, Gas, and Water	3%	3%
Services Sector	42%	46%
Transportation, Communications, and Storage	6%	8%
Trade	15%	16%
Finance	4%	5%
Ownership of Dwelling and Real Estate	5%	5%
Private Services	7%	8%
Government Services	5%	5%

Source: NSCB for basic data

Table 3: Activities of the Selected Listed Philippine Firms

	Economics Activities
Banks	
Banco De Oro	commercial banking, investment banking, private banking, asset management, corporate finance, credit card operations, insurance, securities brokerage and realty management
Bank of the Philippine Islands	commercial banking, investment banking, private banking, asset management, corporate finance, credit card operation, securities distribution and insurance services
Equitable-PCI Bank	commercial banking, investment banking, private banking, asset management, corporate finance, credit card operation, leasing
Metropolitan Bank and Trust Co.	commercial banking, investment banking, private banking, asset management, corporate finance, credit card operation, treasury
Security Bank	commercial banking, investment banking, private banking, asset management, corporate finance, credit card operation, treasury
Conglomerates	
Ayala Corp	real estate and hotels, electronic and information technology, water utilities, automotive, investments in properties overseas, air charter services and food and agribusiness
Aboitiz Equity Ventures	electricity generation and distribution, banking and financial services, food manufacturing and transportation
Benpres Holdings Corp	broadcasting and cable TV, telecommunications, power generation and distribution, property development, information technology, health care delivery, and water distribution
DMCI Holdings	coal mining, general construction, infrastructure and real estate development, cement manufacturing, and real estate sales and development
JG Summit Holdings	food manufacturing (snacks, coffee, noodles, ice cream), telecommunications, air transportation , real estate and hotels, petrochemicals, textile, thrift banking operations, foreign exchange, securities dealing
Property Firms	
Ayala Land	residential developments, development and leasing or sales of office buildings, development and leasing of malls, development and sales of large-scale, mixed-use, masterplanned communities

Belle Corp.	real estate development for residential, leisure and recreation
Filinvest Land Inc.	development of residential subdivisions and construction of housing units
Megaworld Corp.	large-scale residential and office developments
SM Prime Holdings	development and operation of shopping centers
Food and Beverage Firms	
Alaska Milk Corp	manufacture, distribution and sale of milk products
Ginebra San Miguel	manufacture and sale of alcoholic beverages, fruit juices and snack foods, operation of water bottling plant, production of cassava-starch milk, an alternative raw material for the production of alcohol
Jollibee Foods Corp	development, operation and franchising of fast food stores (Jollibee, Chowking, Greenwich, and Red Ribbon brands); food manufacturing; and property leasing
RFM Corp.	manufacture and marketing of flour based mixes, pasta, canned, and processed meat, milk, juices, ice cream, and similar food products; development and sale of industrial estates, middle income horizontal residential projects and condominium projects; insurance, financing, and cargo handling
San Miguel Corp.	food and beverage manufacturing; breeding, hatching, processing and marketing of chicken; production and marketing of metal closures, two-piece aluminum cans, plastic crates, pallets, corrugated cartons, composites, glass containers, glass molds and polyethelene terephthalate (PET) plastic bottles. SMC operates in the Philippines, China, Australia, Indonesia, Vietnam and Thailand.
Swift Foods Inc	production and sale of poultry products, live and dressed/ processed chicken; production of broiler-hatching eggs
Universal Robina Corp.	manufacture and distribution of snack foods, beverage, noodles, and pasta and tomato-based products; manufacture of polypropylene films for packaging companies; manufacture and distribution of animal feeds, glucose and soya products; production and distribution of animal health products; sugar refining; and flour milling

4.3.1 Foreign Exchange Exposures in the Banking System

We investigated the overall performance of the Banking and Financial Services (BFS) sub-index of the Philippine Stock Exchange using Equation (2) for monthly data during the period 1998-2006 (Table 4). The real effective exchange rates used in these regressions are the economy-wide rates published by the BSP. Regression (1) uses the major trading partners REER, while Regressions 2, 3 and 4, use the peso-dollar nominal exchange rate, the broad competitors REER and the narrow competitors REER, respectively.

The BFS sub-sector appears to be affected by changes in the various measures of exchange rate changes. Changes in the Peso-US dollar exchange rate and in the value of the peso vis-à-vis the MTP basket both have positive and contemporaneous impacts on the sector. The magnitudes of the impacts likewise do not differ much. Meanwhile, changes in the value of the peso relative to the two competitors' currency baskets affect the performance of the

Table 4: Regression Results for Banks and Financial Services Returns Against Various Economy-wide Exchange Rates

1998.01-2006.07	Banks and Financial Services			
	Δlog(BFS_index)			
Variable	Regression (1)	Regression (2)	Regression (3)	Regression (4)
constant	0.001	0.003	0.002	0.002
(p-value)	*0.710*	*0.465*	*0.655*	*0.567*
RET_PSEI	0.943	0.925	0.984	0.976
(p-value)	*0.000*	*0.000*	*0.000*	*0.000*
DLPHIL_MTP	0.436			
(p-value)	*0.001*			
DLPHPUSD		0.482		
(p-value)		*0.029*		
DLPHIL_BROAD(-2)			0.396	
(p-value)			*0.003*	
DLPHIL_NARROW(-1)				0.169
(p-value)				*0.025*
Adjusted R-squared	0.814	0.805	0.809	0.802
Durbin-Watson stat	2.015	1.998	1.991	1.990

Sources: CEIC and BSP for basic data; Authors'estimates.

BFS index with lags of two months for the broad basket and one month for the narrow basket.

Additionally, analysis was performed using the log-returns of the stock prices of selected listed Philippine banks against the logarithmic changes of the Philippine Composite Index (PSEi) and the logarithmic changes of exchange rates. The banks included in our study are Banco de Oro (BDO), Bank of the Philippine Islands (BPI), Equitable PCI Bank (EPCI), Metropolitan Bank and Trust Company (MBT), and Security Bank (SECB). The combined assets of these banks comprised about 40 percent of the total assets of the banking sector (as of end-December 2006).

Our results indicate that the equity prices of publicly listed Philippine banks have been affected by the foreign exchange rate for the period 1998 – 2006 (Table 5). In the table, *No* means that the foreign exchange rate is not significant, and *Y* means that it is significant. The figures inside the parentheses, (..), are the lags. The sign of the coefficient of the log-change of the exchange rate is indicated in the square brackets.

The impact of the various measures of aggregate exchange rate on changes in stock prices of the five banks included in our study is mixed. However, each of them is affected by at least two measures. Peso appreciations relative to the US dollar either have no impact (Banco de Oro, BPI), or tend to lower the stock price (Equitable-PCI, Metrobank, Security Bank).

Table 5: Foreign Exchange Exposure of Selected Listed Philippine Firms

Sample period (1998-2006)	Economy-wide Exchange Rates				Industry Exchange Rates		
	PHPUSD	MTP	BROAD	NARROW	MTP	BROAD	NARROW
Banks							
Banco De Oro	No	No	Y(5)[+]	Y(5)[+]			
Bank of the Philippine Islands	No	Y[+]	Y[+]	Y(2)[+]			
Equitable-PCI Bank	Y[-]	Y[+]	No	Y(1)[-]			
Metropolitan Bank and Trust Co.	Y[-]	Y[+]	No	No			
Security Bank	Y(3)[-]	Y[-]	Y(4)[+]	Y[-]			
Conglomerates							
Ayala Corp	No	Y[-]	Y(2)[-]	Y(2)[-]			
Aboitiz Equity Ventures	Y[-]	No	Y[-]	Y[-]			
Benpres Holdings Corp	Y(3)[-]	No	Y(5)[+]	Y(3)[-]			
DMCI Holdings	No	No	No	No			
JG Summit Holdings	Y[-]	Y[+]	No	No			
Property Firms							
Ayala Land	No	No	No	Y[+]	Y(2)[+]	Y[+]	No
Belle Corp	No	Y[+]	Y(5)[+]	Y[-]	No	No	Y(1)[-]
Filinvest Land Inc	No	Y[+]	No	No	Y[+]	No	Y(2)[+]
Megaworld Corp	No	Y(4)[+]	Y[-]	No	No	Y[+]	Y(3)[-]
SM Prime Holdings	Y[+]	Y(3)[-]	No	No	Y[-]	Y[-]	Y[-]
Food and Beverage Firms							
Alaska Milk Corp	No	No	Y(5)[-]	Y(1)[-]	Y[-]	No	Y[+]
Ginebra San Miguel	No	No	Y(2)[-]	Y[-]	Y(1)[-]	Y(2)[-]	Y(1)[-]
Jollibee Foods Corp	No	No	Y(1)[+]	Y(1)[+]	Y(3)[-]	No	Y[+]
RFM Corp	No	No	Y[+]	Y(2)[+]	Y(4)[+]	Y(4)[-]	Y[+]
San Miguel Corp (A)	No	No	Y(2)[-]	Y(2)[-]	Y(1)[-]	Y[-]	Y[-]
Swift Foods Inc	No	Y(1)[+]	No	No	No	No	Y[-]
Universal Robina Corp	Y[+]	Y[+]	Y[+]	No	Y[+]	Y(4)[+]	Y(5)[+]

Source: Authors' estimates

4.3.2 Foreign Exchange Exposures in the Non-Financial Corporate Sector

Conglomerates

The logarithmic changes of end-month stock prices of five Philippine conglomerates are included in our study: Ayala Corporation (AC),[8] Aboitiz Equity

8. Ayala Corp. is the parent company of Ayala Land and Bank of the Philippine Islands.

Ventures (AEV), Benpres Holdings Corp. (BPC), DMCI Holdings (DMC), and JG Summit (JGS). Except for DMCI Holdings, they exhibit sensitivity to exchange rate changes.

As implied by the negative sign of the coefficients of the change in exchange rates, an appreciation, holding other factors constant, tend to lower equity values of majority of the conglomerates in Table 5. Probably reflecting its overseas holdings, appreciations of the peso relative to the three baskets of currencies affect Ayala Corp's equity value negatively.

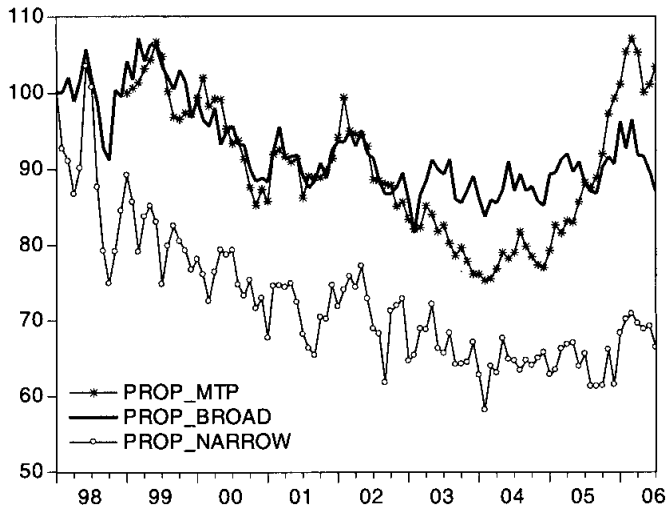
Property Sector

The stock price returns of five property firms are investigated. Monthly price data of Ayala Land Inc. (ALI), Belle Corporation (BEL), Filinvest Land Inc. (FLI), Megaworld Corporation (MEG), and SM Prime Holdings (SMPH) are used. The industry exchange rates are estimated using the trade weights from Section 13 of the HS, which included cement, stones, and other construction materials.

The REERs have been able to explain movements in prices better than the Peso-dollar rate. The observed positive relationship between a strong peso and the equity value of the selected property firms may be traced to the income effect and balance sheet effects of such an appreciation (e.g., lower interest payments in peso terms, lower debt stock in peso terms, lower costs of construction materials, higher margins). On the other hand, for businesses that rely on market segments dominated by clients dependent on overseas foreign exchange remittances, the positive effect on a stronger peso on the cost side will tend to be diluted or offset by a possible negative impact on sales turnover.

Figure 4

Industry-Specific Real Effective Exchange Rates:
Articles of Stone, Plaster, Cement, Asbestos, Mica or Similar Materials;
Ceramic Products; Glass and Glassware



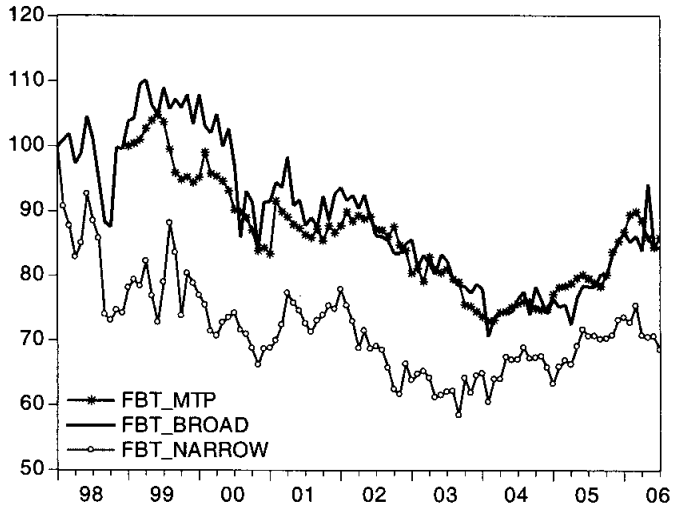
Source: Authors' Estimates.

Food and Beverage Manufacturing Sector

Equation (2) is used to investigate the effects of the exchange rate calculated for the Food, Beverage and Tobacco category (Section 2) of the Harmonised System of classification. The stock returns of seven (7) listed Food and Beverage Manufacturing companies are regressed against the logarithmic changes of the Philippine composite index (PSEi) and sectoral exchange rate measures and the Philippine peso to US dollar rate. The seven firms are: Alaska Milk Corporation, Ginebra San Miguel Corp., Jollibee Foods Corp., RFM Corp., San Miguel Corp. (A and B shares), Swifts Foods Inc., and Universal Robina Corp.

Our results show us that the PHPUSD affects the returns of one (URC) of the seven firms, while changes in the sectoral real exchange rates affect all of them. Table 5 shows that the FBT sector Narrow REER is significant in the equations for all of the food and beverage firms we selected. In general, the REERs performed better than the peso-dollar nominal rate in explaining the movements in the equity prices of the selected firms. Note, however, that the adjusted R^2's are not high, hinting that other factors not considered in our regressions for the selected food and beverage listed stocks affect their equity values.

Figure 5
Industry-Specific Real Effective Exchange Rates:
Prepared Foodstuffs; Beverages, Spirits, and Vinegar;
Tobacco and Manufactured Tobacco Substitutes



5. Adjustments to Exposure: Hedging Strategies and Instruments

The series of financial crises in the 1990s has heightened investors' interest for hedging instruments. In Asia, policy reforms partly included measures designed to facilitate the development of hedging instruments. In the Philippines, the entry of risk-mitigating financial instruments in the market has been hampered by a number of factors that included:

〈 *Evolving capital market.* The current state of the local capital market offers a less favourable market environment to promote the use of hedging instruments. The underlying complexities surrounding the use of such instruments require higher investment skills, sophisticated analytical tools and the presence of market infrastructure and systems necessary to support their use in the market.

〈 *Risk aversion of investors.* Lessons learned from the Asian financial crisis of 1997 and the resulting slow recovery of the corporate sector have compelled many local banks to remain risk averse, with investment/credit exposures limited mostly to risk-free liquid instruments (e.g., government securities) as well as conventional hedging instruments (e.g., foreign

exchange swaps and non-deliverable forwards) to cover foreign exchange rate risks.

〈 *Regulatory measures.* A number of measures have been put in place early on prior to the introduction of derivatives and related instruments in the market. While viewed as administrative and prudential in nature, the early issuance of these measures have somewhat clouded market perception on the nature of these new products that subsequently affected their impact and attractiveness in the local market.

5.1 Foreign Exchange Risk Management in Banks

The above cited factors may have ultimately increased the overall risk exposure of Philippine banks despite the recent reduction in foreign exchange volatility. Moreover, there are some limitations in the risk management practices of some banks.

Banks use diverse risk management technologies. However, foreign banks have access to better risk management techniques to deal with foreign exchange risk and other sources of market risk. Access to better risk management techniques through their links with head offices outside Philippines may explain partly why foreign banks have been more successful than local banks in obtaining expanded derivatives licenses.[9]

On-site examinations by the BSP have found that risk management systems in some banks may not capture well market risk, including foreign exchange risk. The use of parametric Value-at-Risk (VaR) techniques for measuring market risk in their trading portfolios leads to too frequent breaches of internal VaR limits. In the case of foreign exchange risk, parametric VaR may not be adequate since the distribution of the peso exchange rate exhibit fat tails.

9. Authorisation to engage in derivatives is set out in two different types of licenses, an expanded or a regular derivatives license. An onshore bank holding an *expanded* derivatives license may deal in swaps and forwards of any tenor, as well as other types of derivatives for their own account or on behalf of their customers. Despite holding a license for expanded derivatives, banks need a product-by-product approval prior to engaging in derivatives. By contrast, a *regular* derivatives license only allows banks to sell derivatives products to clients, provided they are used to hedge or match a pre-existing risk within the bank. A bank that does not have a derivatives license may still deal in currency swaps and forwards with tenors of one year and less, subject to pre-qualification requirements.

The limitations of risk management systems in some banks raise concerns on whether they could manage the risks associated to complex financial instruments such as structured products. Banks are authorised by the BSP to invest in principal-protected structured notes. The tenor of the notes is usually five years and there is optionality embedded in the note coupons, which can be linked to the peso-dollar exchange rate, foreign stock market indices, and domestic and/or foreign interest rates. These notes have high coupon payments since the buyer of the note is also selling optionality, or volatility, to the issuer of the note. Anecdotal evidence suggests that high coupon payments have made structured notes very attractive to local banks and high net worth individuals, who buy the notes from foreign banks. The notes, though held to maturity, are accounted for as assets-for-sales. The lack of secondary markets for these notes, however, makes marking-to-market the notes difficult. Most local banks investing in these structured notes would also require the use of simulation methods in order to be able to better assess the risks of these notes.

Box 1: Results of Survey on Exchange Rate Risk Management Practices of Banks and Non-Financial Corporate Sectors

Part of the study was a survey conducted involving some market participants, including major banks, both foreign and domestic, private non-financial corporations and a government-owned and -controlled corporation. The results of the survey noted several key points:

The spot foreign exchange market is well developed and has undergone considerable growth over the past three years (with volume increasing by approximately three-folds in that period). The improved macroeconomic situation, especially better fiscal conditions, as well as the positive economic environment, were repeatedly cited as important factors. Market infrastructure, including both trading and information, (on the *PDS*) as well as clearing and settlement (involving the local RTGS system *PhilPaSS* and the *PDDTS* or Philippines Domestic Dollar Transfer System) is considered safe and efficient.

However, the swap and especially the forward and options market lag far behind. Swaps have found a role as substitutes for the undeveloped money markets, but forward transactions are relatively infrequent due to reporting requirements, while the option market was described as being "in its infancy" due to regulatory constraints such as the open position limit. Credit and settlement concerns were also cited.

The major banks are considered to have a high level of risk management skills (with domestic banks lagging somewhat). Similarly, large corporations were considered to have advanced risk management in place.

Frequently mentioned obstacles to market development were burdensome documentation requirements and reporting requirements. The restrictive open limit position was cited as hampering market development, and also possibly having the perverse effect of actually increasing market volatility due to bank's inability to supply liquidity to customers.

Many observers suggested that the BSP can streamline the derivatives license process by unifying the categories and eliminating instrument by instrument approval.

5.2 Evolution of Financial Structure

Despite existing impediments in the development of the local capital market, recent financial and capital market reforms, including the modernisation of the country's payments and settlement system, have facilitated the adjustments of the financial and non-financial corporations to increases in foreign exchange volatility.

5.2.1 Capital Market Reforms

Developing the capital market is necessary to increase the menu of financial services and financial assets in a country. Several measures have already been undertaken to develop the Philippine capital market.

Specifically, the passage of the Securitisation Act of 2004 (Republic Act No. 9627) essentially sets the legal and regulatory framework for the sale of assets like loans, mortgages, receivables and other debt instruments as new securities to raise capital. The law also provided fiscal incentives to create a favourable market environment toward the development of the secondary market for these securitised assets. The law is expected to expand the menu of existing instruments available to investors and provide an avenue for portfolio diversification.[10] Moreover, it is foreseen to generate more funds for both the private and government sectors, which can then be used for productive endeavors. Similarly, the law is expected to facilitate the development of hedging instruments in the market.

5.2.2 Improvement in the Payment and Settlement System

In December 2002, the Philippine RTGS or Philippine Payments and Settlement System (PhilPASS) has been launched, covering wholesale interbank loan transactions among banks and non-banks, the purchase/sale of government securities under repurchase agreements between and among banks and the BSP, customer electronic fund transfer transactions and net check clearing results processed by the Philippine Clearing House Corporation. The system has improved the efficiency of the Multi-transaction Inter-bank Payment System

10. The law is expected to usher the development of a wide range of structured financial instruments in the market including the issuance of asset-back securities (ABS). These instruments are expected to play a greater role in the market, given their role in ameliorating assumed credit risk of banks and in lowering cost of credit for borrowers.

(MIPS 2 Plus)[11] by allowing the banks to interface directly to the automated accounting and settlement system of the BSP. The processing and final settlement of electronic fund transfer instructions take place continuously and individually, thereby achieving real time, final and irrevocable gross settlement of high value electronic fund transfers of banks and participating non-banks. The system is intended to eventually cover all transactions in the equities, fixed income, and money and foreign exchange markets.

In July 2003, the request of Megalink, Inc. to do intra-network settlements through PhilPASS was approved by the Monetary Board.

In November 2003, the real-time gross settlement for peso-dollar foreign exchange transactions was launched. The BSP, the Bankers Association of the Philippines (BAP), Citigroup Manila, and the Philippine Depository and Trust Corporation (PDTC) have formally launched a *Payment-versus-Payment* (PvP) electronic system for the local inter-bank spot and forward foreign exchange market. Under the PvP, final transfer in one currency takes place only if a final transfer in the other currency occurs[12]. Thus, the mechanism is expected to eliminate settlement risks inherent to peso-dollar foreign exchange transactions, spur trading activities and enhance market liquidity, leading to stronger growth of the financial sector. The PvP links two real-time gross settlement systems- the BSP's PhilPASS for peso transactions of commercial banks and Citigroup's Philippine Domestic Dollar Transfer System for dollar transactions of commercial banks- with PDTC as designated clearing entity for peso-dollar transactions of commercial banks under the BAP.

Beginning 23 August 2004, GS traded through the Philippine Dealing Exchange (PDEx) Trading System can now be settled under the PhilPaSS Delivery Versus Payment system (DvP). The Philippine Stock Exchange (PSE) is also expected to be connected to PhilPaSS.

---

11. MIPS is an electronic multilateral net clearing system that handles large amount inter-bank call loans and bank transfers. This has been partially replaced in July 2001 by the RTGS-based MIPS2 for payments of inter-bank call loans between banks and non-bank financial intermediaries performing quasi-banking functions. In November 2001, the RTGS-based MIPS2 Plus has been installed for payments of foreign exchange transactions and other bank operations.

12. Before, banks place pesos first before receiving equivalent dollars later in the day. If the amount requested is insufficient, however, buying dollars from a new source expose banks to the risk of transacting under a different foreign exchange rate.

5.2.3 Establishment of a Fixed Income Exchange

On 28 March 2005, the first phase of centralised electronic marketplace for Philippine fixed income, which cater initially to an interbank market, was launched by the Philippine Dealing and Exchange Corporation (PDEx). It is expected to expand its reach to include other institutional players and the broader public/ retail market within a year after it opens. It will adopt Model 1 of the DvP system using the demand deposit accounts of banks thru the PhilPASS and the BSP as nominee holder for securities.

5.2.4 Development of Hedging and Financing Instruments for Dealers

The Monetary Board has approved on 1 August 2003 the revised Memorandum of Agreement (MOA) for Cash Settled Securities Swap Transactions (CSSST) among the BSP, the Bureau of the Treasury (BTr), the Bankers Association of the Philippines (BAP), the Money Market Association of the Philippines (MART), and the Investment Houses Association of the Philippines (IHAP). CSSST is an agreement between financial institutions to simultaneously buy or sell government securities spot, and sell or buy comparable securities at a predetermined future date and price with the same counterparty. The CSSST takes advantage of the established settlement procedures of the Registry of Scripless Securities (RoSS) of the BTr. The CSSST effectively paves the way for the introduction of domestic securities lending in the Philippine market. In more developed financial markets, securities lending type activities are essential to the proper functioning and deepening of secondary market for securities.

In addition to developing hedging and financing instruments, the BSP has recently approved the application of a preferential reserve requirement of 2 percent on repo transactions of banks. This move will help reduce transaction costs and is expected to spur activity in the secondary market for government securities. On the other hand, the BSP has also allowed banks to engage in repos involving foreign currency denominated government securities booked as Trading Account Securities as the underlying security.

5.2.5 Developments in Risk Management Techniques

To strengthen risk management practices of banks with respect to derivatives, the BSP issued regulations prescribing the minimum standards for risk

management of derivatives. The regulation defined the basic risks inherent in derivatives and the basic elements of a sound risk management. This was intended to ensure that proper safeguards are in place to ensure the protection of market participants engaged in derivatives activities.

5.2.6 Tax Reform

On 17 February 2004, R.A. 9243, entitled "An act rationalising the provisions of the documentary stamp tax of the National Internal Revenue Code of 1997, as amended," was signed into law. Among the measures approved under the statute include the following: (1) waived the DST on secondary trading of debt and equity issues for a 5-year period; (2) raised DST on primary government or private debt issuances to ₱1 for every ₱100 worth of security from 30 centavos under the present system; (3) reduced DST on equity issues to ₱1 from the current ₱2; (4) shifted the basis for computing taxes from the amount of the policy to premium payments in the case of pre-need and insurance products. The law seeks to eliminate DST on secondary trading of financial instruments and lower transactions cost, consequently increasing the volume of financial transactions in the secondary market.

6. Conclusion and Policy Implications

This paper shows that annualised exchange rate volatilities in the Philippines in the past two years have declined compared to the late 1990s and early 2000s. This reflects to a considerable extent the improvements in the functioning and structure of the domestic financial markets. It likewise reflects the improvement in risk management practices in recent years, which have made the financial and corporate sectors better equipped now to mitigate the undesirable effects of large foreign exchange volatility.

However, the results of our regressions show that changes in the foreign exchange rates affect firm value. Furthermore, the gain in explanatory power of using industry exchange rates can shed light in the firm's exposure and allow firm managers to assess the vulnerabilities of their operations to macroeconomic variables. Thus, policies oriented towards eliminating inefficiencies in the foreign exchange markets gain greater importance.

What then are the policy implications of these findings?

The BSP can play a key role in promoting the development of the foreign exchange market by instituting further reforms in the country's foreign exchange regulatory regime. Improving macroeconomic fundamentals, ongoing banking and capital market reforms, and recent developments in the region provide a favourable setting for these reforms. The restructuring of the foreign exchange regulatory framework will make it more responsive to the needs of an expanding, more dynamic economy that is increasingly integrated with global markets.

However, harnessing gains from liberalisation requires a measured and multi-phase process that is consistent with the overall macroeconomic framework and the state of financial sector development.

Along this line, the BSP recently announced a package of reforms in the foreign exchange regulatory framework. The new package of reforms (which will take effect starting 2 April 2007), involves changes pertaining to current account and capital account transactions as well as to prudential regulations which were in place for almost 10 years . Specifically, the limit on allowable foreign exchange purchases by residents from banks to cover payments to foreign beneficiaries for non-trade purposes (excluding those related to foreign loans/ foreign currency loans and foreign investments) without supporting documents was increased from US$5,000 to US$10,000. Furthermore, the "no-splitting" restriction and notarisation requirement for applications to purchase foreign exchange were also lifted. On capital account transactions, the allowable outward investments by residents without prior BSP approval and registration was increased from US$6 million per investor per year to US$12 million. On prudential regulations, a symmetrical limit of 20 percent of unimpaired capital with an absolute limit of US$50 million will be imposed on both the overbought (OB) and oversold (OS) positions of banks.

The liberalisation of the foreign exchange regulatory framework is part of the continuing efforts by the BSP to improve the overall economic and financial regulatory environment. In the medium term, the BSP expects the confidence-boosting effects of these measures to result in more foreign exchange flows, including and importantly foreign direct investments. The freer flow of capital confers direct benefits in terms of providing additional resources to the domestic economy and allowing portfolio diversification by Philippine entities. In particular, it will allow individuals and businesses with legitimate transactions to have greater access to foreign exchange.

At the same time, liberalisation is expected to result in a number of important collateral benefits, including greater financial depth, technological transfer, and institutional development through better transparency and governance practices. It also promotes disciplined macroeconomic policies as increased exposure to global markets and players encourages prudent and responsible economic stewardship. The liberalisation measures are also expected to lead to a shift in foreign exchange transactions from the unsupervised foreign exchange market to the banking sector. This will improve data capture and result in better statistics on foreign exchange transactions, which are critical for informed policy assessments and formulation.

With the liberalisation of foreign exchange rules, banks are expected to continue to adopt safe and sound practices in undertaking their foreign exchange transactions.

In this regard, the BSP can play an important part in the development of hedging instruments by making foreign exchange risks transparent. The BSP operates in the foreign exchange market with an aim to smooth volatility and to accumulate foreign exchange reserves. While the primary goal of such operation is to implement the BSP's policy objective, a secondary objective should be to ensure that the strategies and techniques are conducive to the further development of the market and building its capacity to eventually manage risk on its own. The use by the BSP of a set of indicators in its market intelligence activities should help the BSP assess the development of prices, volatility and sentiment of the aggregated foreign exchange market.[13]

The BSP can also play an important role in the development of complementary markets to assist the development of the foreign exchange hedging instruments, specifically by supporting the following initiatives:

Development of an active money market. Liquidity in foreign exchange forwards and swaps would be enhanced by the development of an active money market. Short-term money markets have the closest link to foreign exchange

13. This set of indicators could include volatility based indicators (historical and implied volatility; the term structure of volatility, risk reversals) liquidity indicators (turnover, bid-offer spreads, average ticket size), and broad market indicators (carry indicators, risk appetite, regional, and emerging market barometers). The BSP can also utilise flow data by means of customer surveys and sectoral analysis. The BSP can develop market intelligence by maintaining routine and transparent dialogues with market participants.

markets. The interest rates established in the money market are vital for developing the foreign exchange market, especially for forward and swap transactions. A liquid and efficient inter-bank market in loans and deposits is essential to allow interest rate parity to function. The development of a reliable yield curve, derived from active secondary money and bond markets, would significantly enhance the ability to price forward and swap instruments.

Promotion of a well-developed government bond market. A well-developed government bond market also plays a key role in the development of hedging instruments. A liquid government bond market, in addition to its important role in government finance and monetary operations, provides a benchmark to other markets. Absence of a well-developed liquid securities market undermines the market's ability to price swaps, forwards and other hedging instruments. The functioning of the foreign exchange market could be improved by measures that address the functioning of the bond market. These include the introduction of a repo market, the establishment of a securities borrowing and lending facility and allowing for short selling, as well as the introduction of a non-deliverable bond futures contract.

The establishment of a credit registry and the introduction of credit ratings. The establishment of a credit registry and the introduction of credit ratings would support the demand for hedging instruments. There are signs that the slow development of the forward and swap market may also be associated with concerns in the financial system about creditworthiness. Developing tools to better assess credit and counterparty risk would remove such concerns from the foreign exchange transaction process.

Regulators can play an important role in promoting a favourable environment for rating agencies by promoting high standards of practices through (1) the accreditation process, (2) the development of standards, and (3) capacity building programme for the industry.[14] For example, regulators may require recognised rating agencies to comply with specified performance and training standards for their ratings output and rating analysts, respectively, and regularly monitor compliance with those standards. In addition, regulators may help in sponsoring programmes for training rating analysts, especially in terms of aligning their skills and practices with international standards.

14. The BSP issued Circular No. 404 (dated 19 September 2003) containing the guidelines for the recognition and derecognition process of rating agencies.

References

1. Adler, M., & Dumas, B., (1984), "Exposure To Currency Risk: Definition and Measurement", *Financial Management*, 13, (Summer), 41-50.

2. Allayannis, G., J. Ihrig, and J. Weston, (2001), "Exchange-Rate Hedging: Financial vs. Operational Strategies", *American Economic Review Papers and Proceedings,* Vol. 91 (2), pp. 391–395.

3. Barton, T.L., W.G. Shenkir, and P.L. Walker, (2002), "Making Enterprise Risk Management Pay Off: How Leading Companies Implement Risk Management", Brookfield, Connecticut: Fei Research Foundation.

4. Bollerslev, T., (1986), *"Generalized Autoregressive Conditional Heteroskedasticity", Journal of Econometrics*, 31, 307-327.

5. Calvo, G.A, (1998), "Capital Flows and Capital Market Crises: The Simple Economics of Sudden Stop", *Journal of Applied Economics,* Vol. 1, No. 1 November, pp 35-54

6. Calvo, G. A and CM Reinhart, (2000*), "Fear of Floating", NBER Working Paper* no w7993.

7. Choudri, EU and DS Hakura, (2001), *"Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter?", IMF Working Paper no.* 01/194

8. Galati, G., (2000), "Forex Trading Volume, Volatility And Spreads In Emerging Market Countries", *BIS Quarterly Review*, November, pp 49-51.

9. Hakala, J., and U. Wystup, (2002), *"Foreign Exchange Risk: Models, Instruments, and Strategies",* (London: Risk Publications).

10. Hausman, R, U. Panizza and E. Stein, (2000), Why Do Countries Float the Way They Float? *Working Paper,* Inter-American Development Bank, April.

11. Ho, C and R. Mc Cauley, (2003), "Living with Flexible Exchange Rates: Issues and Recent Experience in Inflation Targeting Emerging Market Economies", *Working Paper, Bank of International Settlements*, February.

12. Honohan, P and A. Shi (2002): "Deposit Dollarization and the Financial Sector in Emerging Economies", *World Bank Policy Research Working Paper* 2748

13. Jorion, P., (1990), "The Exchange Rate Exposure of U.S. Multinationals" *Journal of Business*, 63, No. 3, p331-345.

14. Madura, J, (1989), International Financial Management, 2nd ed. (St. Paul, Minnesota: West Publishing Company).

15. Mishkin, F S (2000):"Inflation Targeting in Emerging Market Countries", *American Economic Review,* Vol 9, no.2, pp 105-9, May

16. Panetta, F., et. al., (2006), "The Recent Behaviour of Financial Market Volatility", *BIS Papers* No. 29, BIS, August.

17. Shapiro, A.C, (1996), Multinational Financial Management, 5th ed. (Hoboken, New Jersey: Wiley).

Appendix

I. *DATA DESCRIPTION*

	Symbol
Banks	
Banco De Oro	BDO
Bank of the Philippine Islands	BPI
Equitable-PCI Bank	EPCI
Metropolitan Bank and Trust Co.	MBT
Security Bank	SECB
Conglomerates	
Ayala Corp	AC
Aboitiz Equity Ventures	AEV
Benpres Holdings Corp	BPC
DMCI Holdings	DMC
JG Summit Holdings	JGS
Property Firms	
Ayala Land	ALI
Belle Corp	BEL
Filinvest Land Inc	FLI
Megaworld Corp	MEG
SM Prime Holdings	SMPH
Food and Beverage Firms	
Alaska Milk Corp	AMC
Ginebra San Miguel	LTDI
Jollibee Foods Corp	JFC
RFM Corp	RFM
San Miguel Corp (A)	SMC
Swift Foods Inc	SFI
Universal Robina Corp	URC
Indices	
Philippine Stock Index	PSEi
Banking and Financial Services Index	BFS
Industry Sector Index	IND
Mining and Oil Sector Index	MO
Property Sector Index	PROP
Peso's aggregate value relative to the:	
US dollar (US$/Philippine peso)	PHPUSD
Major Trading Partners	Phil_MTP
Broad basket of competitors	Phil_Broad
Narrow Basket of Competitors	Phil_Narrow
Industry exchange rate relative to the basket of:	
Major trading partners	Prop_MTP
	FBT_MTP
Broad basket of competitors	Prop_Broad
	FBT_Broad
Narrow basket of competitors	Prop_Narrow
	FBT_Narrow

Data Sources:

Bangko Sentral ng Pilipinas: economy-wide REERs, and exchange rates for Japan, Euro Area, UK, Singapore, South Korea, Taiwan, Malaysia, Thailand, Indonesia, and Hong Kong.
Bloomberg: historical stock prices
CEIC Database: Consumer Price Indices for the US, Japan, Euro Area, UK, Singapore, South Korea, Taiwan, Malaysia, Thailand, Indonesia, and Hong Kong.
National Statistics Office: trade data
Philippine Dealing System: peso-dollar rates

II. *TABLES*

Table A-2.1: Correlation Matrix of Volatilities of Various Exchange Rate Estimates

VOLATILITY of...	Phil_Broad	Phil_MTP	Peso	Phil_Narrow
Phil_Broad	1.000	0.820	0.852	0.844
Phil_MTP	0.820	1.000	0.774	0.668
Peso	0.852	0.774	1.000	0.626
Phil_Narrow	0.844	0.668	0.626	1.000

Table A-2.2a: Descriptive Statistics of the Volatilities of Various Economy-wide Exchange Rate Estimates (January 1980- October 2006)

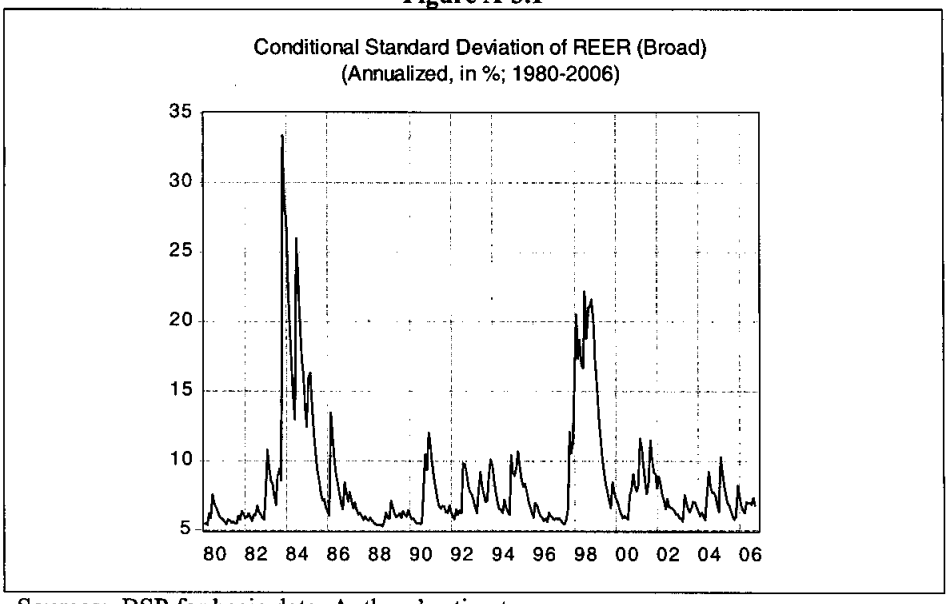
1980-2006	VOLATILITY of...			
	Phil_Broad	Phil_MTP	PHPUSD	Phil_Narrow
Mean	8.424814	10.13762	8.736114	11.27248
Median	6.924841	8.382341	5.522560	8.378319
Maximum	33.40505	33.65790	75.54441	47.14306
Minimum	5.278289	6.135467	1.328045	5.398020
Std. Dev.	4.192833	4.669968	10.18920	7.881573
Skewness	2.762513	2.409434	3.283224	2.653879
Kurtosis	11.62141	9.483773	17.25699	10.32978
# of Observations	321	321	321	321

Table A-2.2b: Descriptive Statistics of the Volatilities of Various Economy-wide Exchange Rate Estimates (January 2005- October 2006; in percent)

2005-2006	VOLATILITY of...			
	Phil_Broad	Phil_MTP	PHPUSD	Phil_Narrow
Mean	7.129	7.965	6.450	8.479
Median	6.911	7.863	6.475	8.225
Maximum	10.284	9.904	9.720	12.594
Minimum	5.777	6.620	2.043	6.434
Std. Dev.	1.061	1.230	2.240	1.423
Skewness	1.424	0.211	-0.212	1.251
Kurtosis	4.917	1.395	1.929	4.625
# of Observations	22	22	22	22

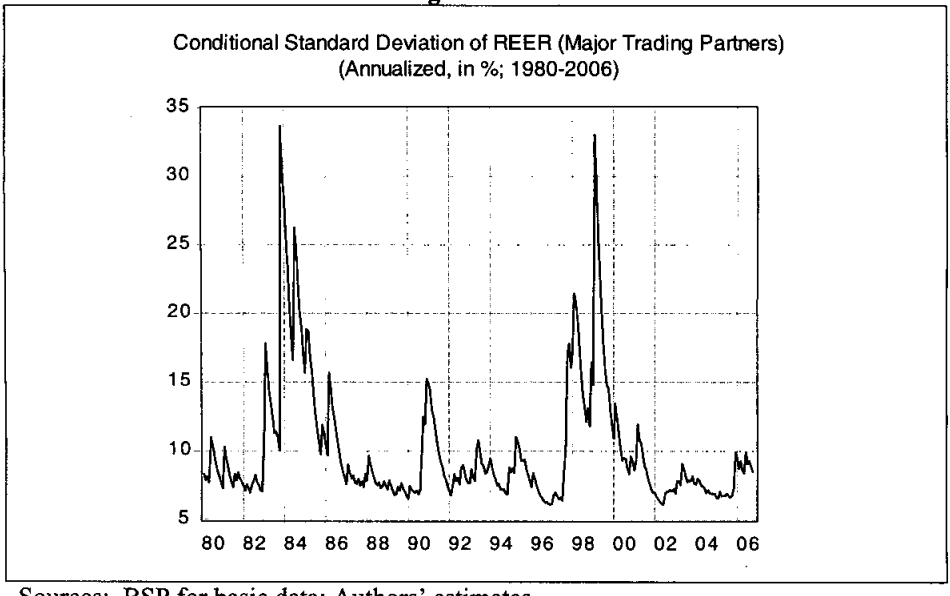
III. *FIGURES*

Figure A-3.1



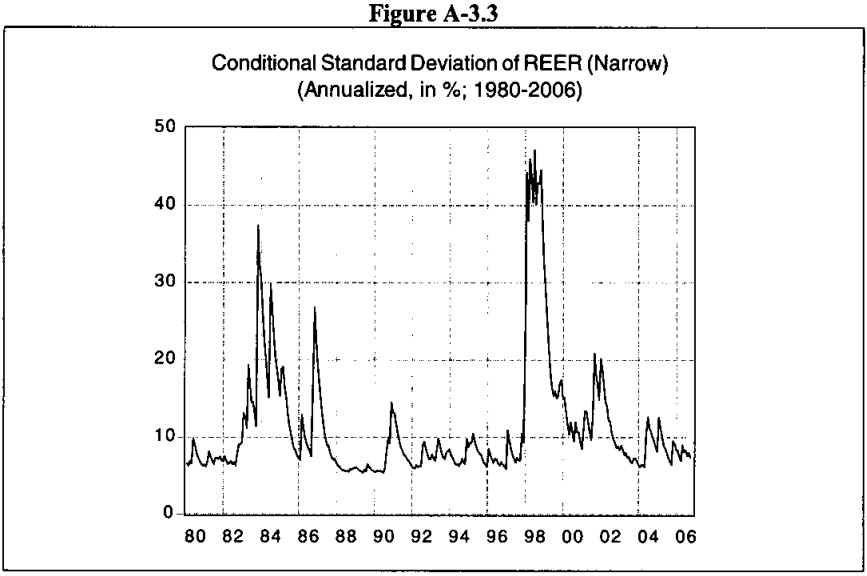
Sources: BSP for basic data; Authors' estimates

Figure A-3.2



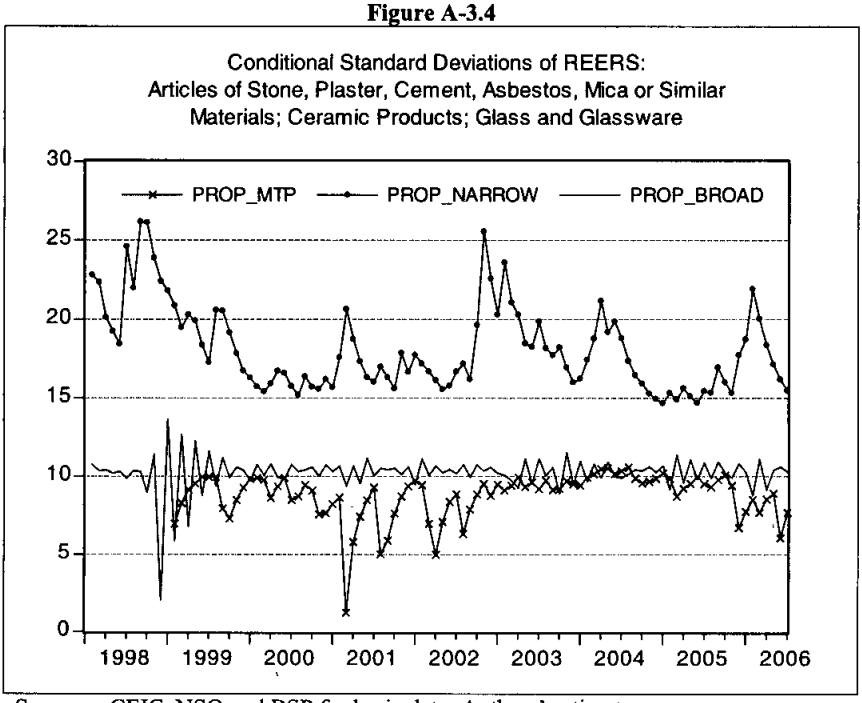
Sources: BSP for basic data; Authors' estimates

Figure A-3.3



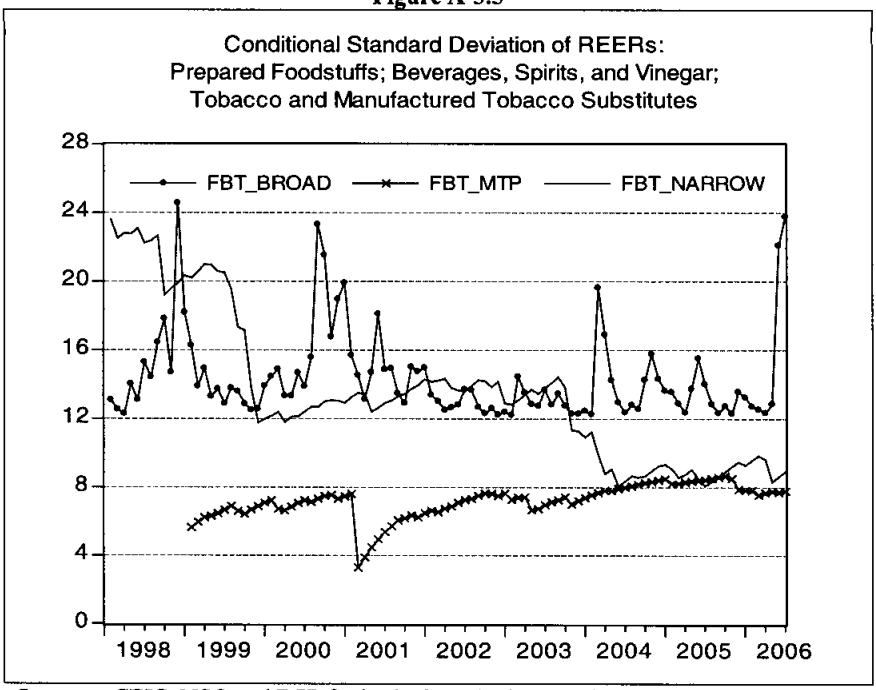
Sources: BSP for basic data; Authors' estimates

Figure A-3.4



Sources: CEIC, NSO and BSP for basic data; Authors' estimates.

Figure A-3.5



Sources: CEIC, NSO and BSP for basic data; Authors' estimates.

IV. *REGRESSION RESULTS (1998.01-2006.07)*

Basic model: $\Delta\log(Price)_{i,t} = a_0 + a_1 \Delta\log (ER)_{s,t} + a_2\Delta\log (PSEi)_t + e_t$,
(p-value) (p-value) (p-value)

A-4.1: BANKING SECTOR

Sample period (1998-2006)	Economy-wide Exchange Rates			
	PHPUSD	MTP	BROAD	NARROW
Banks				
Banco De Oro	No	No	Y(5)[+]	Y(5)[+]
Bank of the Philippine Islands	No	Y[+]	Y[+]	Y(2)[+]
Equitable-PCI Bank	Y[-]	Y[+]	No	Y(1)[-]
Metropolitan Bank and Trust Co.	Y[-]	Y[+]	No	No
Security Bank	Y(3)[-]	Y[-]	Y(4)[+]	Y[-]

A-4.1.1: Banco de Oro

$\Delta\log(BDO_t) = \underset{(0.768)}{0.003} + \underset{(0.035)}{0.956}\ \Delta\log(Phil\_Broad_{t-5}) + \underset{(0.002)}{0.709}\ \Delta\log(PSEi_t)$

Adj-R2: 0.325
F-statistic: 12.540
Durbin-Watson statistic: 1.962

$\Delta\log(BDO_t) = \underset{(0.567)}{0.005} + \underset{(0.002)}{1.502}\ \Delta\log(Phil\_Narrow_{t-5}) + \underset{(0.001)}{0.744}\ \Delta\log(PSEi_t)$

Adj-R2: 0.368
F-statistic: 14.947
Durbin-Watson statistic: 1.918

A-4.1.2: Bank of the Philippine Islands

$\Delta\log(BPI_t) = \underset{(0.588)}{0.003} + \underset{(0.001)}{0.495}\ \Delta\log(Phil\_MTP_t) + \underset{(0.000)}{1.080}\ \Delta\log(PSEi_t)$

Adj-R2: 0.697
F-statistic: 117.281
Durbin-Watson statistic: 2.147

$\Delta\log(BPI_t) = \underset{(0.428)}{0.003} + \underset{(0.076)}{0.344}\ \Delta\log(Phil\_Broad_t) + \underset{(0.000)}{1.102}\ \Delta\log(PSEi_t) \underset{(0.008)}{-0.262}AR(4)$

Adj-R2: 0.700
F-statistic: 76.557
Durbin-Watson statistic: 2.147

$\Delta\log(BPI_t) = \underset{(0.527)}{0.003} + \underset{(0.028)}{0.353}\Delta\log(Phil\_Narrow_{t-2}) + \underset{(0.000)}{1.175}\Delta\log(PSEi_t) \underset{(0.003)}{- 0.305}AR(4)$

Adj-R2: 0.728
F-statistic: 85.870
Durbin-Watson statistic: 2.073

A-4.1.3: Equitable-PCI Bank

$\Delta\log(EPCI_t) = \underset{(0.257)}{0.007} \underset{(0.098)}{-1.064}\Delta\log(PHPUSD_t) + \underset{(0.000)}{1.058}\Delta\log(PSEi_t) \underset{(0.015)}{-0.246}AR(5) \underset{(0.024)}{-0.187}AR(11)$

Adj-R2: 0.475
F-statistic: 21.339
Durbin-Watson statistic: 2.000

$\Delta\log(EPCI_t) = \underset{(0.581)}{0.004} + \underset{(0.000)}{0.756}\ \Delta\log(Phil\_MTP_t) + \underset{(0.000)}{1.136}\ \Delta\log(PSEi_t) - \underset{(0.000)}{0.277}\ AR(11)$

Adj-R2: 0.474
F-statistic: 28.051
Durbin-Watson statistic: 2.185

$\Delta\log(EPCI_t) = \underset{(0.897)}{- 0.0007} \underset{(0.044)}{- 0.369}\ \Delta\log(Phil\_Narrow_{t-1}) + \underset{(0.000)}{1.179}\ \Delta\log(PSEi_t) - \underset{(0.000)}{0.289}\ MA(11)$

Adj-R2: 0.576
F-statistic: 46.317
Durbin-Watson statistic: 2.124

A-4.1.4: Metropolitan Bank and Trust Co.

$\Delta\log(MBT_t) = \underset{(0.976)}{0.0002} - \underset{(0.099)}{0.803}\ \Delta\log(PHPUSD_t) + \underset{(0.000)}{0.960}\ \Delta(\log(PSEi_t))$

Adj-R2: 0.614
F-statistic: 81.246
Durbin-Watson statistic: 2.307

$\Delta\log(MBT_t) = \underset{(0.696)}{-0.002} + \underset{(0.032)}{0.530}\ \Delta\log(Phil\_MTP_t) + \underset{(0.000)}{1.000}\ \Delta(\log(PSEi_t))$

Adj-R2: 0.619
F-statistic: 82.981
Durbin-Watson statistic: 2.246

A-4.1.5: Security Bank

$\Delta\log(SECB_t) = \underset{(0.976)}{0.009} - \underset{(0.099)}{1.505}\Delta\log(PHPUSD_{t-3}) + \underset{(0.000)}{0.677}\Delta(\log(PSEi_t)) + \underset{(0.000)}{0.297}AR(12)$

Adj-R2: 0.230
F-statistic: 11.051
Durbin-Watson statistic: 2.018

$\Delta\log(SECB_t) = \underset{(0.489)}{0.011} - \underset{(0.047)}{0.907}\ \Delta\log(Phil\_MTP_t) + \underset{(0.002)}{1.076}\ \Delta(\log(PSEi_t)) + \underset{(0.008)}{0.248}\ AR(12)$

Adj-R2: 0.244
F-statistic: 10.560
Durbin-Watson statistic: 2.223

$\Delta\log(SECB_t) = \underset{(0.704)}{0.005} + \underset{(0.022)}{1.269}\Delta\log(Phil\_Broad_{t-4}) + \underset{(0.000)}{0.696}\Delta(\log(PSEi_t)) + \underset{(0.000)}{0.294}AR(12)$

Adj-R2: 0.267
F-statistic: 11.304
Durbin-Watson statistic: 2.138

$\Delta\log(SECB_t) = \underset{(0.370)}{0.012} - \underset{(0.051)}{0.700}\ \Delta\log(Phil\_Narrow_t) + \underset{(0.002)}{1.012}\ \Delta\log(PSEi_t) + \underset{(0.006)}{0.237}AR(12)$

Adj-R2: 0.251
F-statistic: 10.940
Durbin-Watson statistic: 2.159

A-4.2: HOLDING COMPANIES

Sample period (1998-2006)	Economy-wide Exchange Rates			
	PHPUSD	MTP	BROAD	NARROW
Conglomerates				
Ayala Corp	No	Y[-]	Y(2)[-]	Y(2)[-]
Aboitiz Equity Ventures	Y[-]	No	Y[-]	Y[-]
Benpres Holdings Corp	Y(3)[-]	No	Y(5)[+]	Y(3)[-]
DMCI Holdings	No	No	No	No
JG Summit Holdings	Y[-]	Y[+]	No	No

A-4.2.1: Ayala Corporation

$\Delta\log(AC_t) = -0.0002 - 0.568\Delta\log(Phil\_MTP_t) + 1.220\Delta\log(PSEi_t) - 0.271AR(1) + 0.196AR(20)$
(0.977) (0.064) (0.000) (0.000) (0.082)
Adj-R2: 0.690
F-statistic: 46.052
Durbin-Watson statistic: 2.031

$\Delta\log(AC_t) = -0.002 - 0.678\ \Delta\log(Phil\_Broad_{t-2}) + 1.295\ \Delta\log(PSEi_t) - 0.425\ MA(1)$
(0.618) (0.039) (0.000) (0.000)
Adj-R2: 0.742
F-statistic: 95.953
Durbin-Watson statistic: 1.985

$\Delta\log(AC_t) = -0.003 - 0.466\Delta\log(Phil\_Narrow_{t-2}) + 1.30\Delta\log(PSEi_t) - 0.338AR(1) - 0.125AR(3)$
(0.588) (0.016) (0.000) (0.000) (0.80)
Adj-R2: 0.740
F-statistic: 69.417
Durbin-Watson statistic: 2.057

A-4.2.2: Aboitiz Equity Ventures

$\Delta\log(AEV_t) = 0.016 - 1.603\ \Delta\log(PHPUSD_t) + 0.785\ \Delta\log(PSEi_t)$
(0.051) (0.011) (0.000)
Adj-R2: 0.401
F-statistic: 34.825
Durbin-Watson statistic: 2.163

$\Delta\log(AEV_t) = 0.008 - 0.970\ \Delta\log(Phil\_Broad_t) + 0.850\ \Delta\log(PSEi_t) - 0.279\ AR(1)$
(0.252) (0.003) (0.000) (0.013)
Adj-R2: 0.428
F-statistic: 25.948
Durbin-Watson statistic: 2.056

$\Delta\log(AEV_t) = 0.007 - 0.607\ \Delta\log(Phil\_Narrow_t) + 0.814\ \Delta\log(PSEi_t) - 0.291\ AR(1)$
(0.218) (0.000) (0.000) (0.006)
Adj-R2: 0.436
F-statistic: 26.778
Durbin-Watson statistic: 2.010

A-4.2.3: Benpres Holdings Corp.

$\Delta\log(BPC_t) = -0.018 - 1.287\ \Delta\log(PHPUSD_{t-3}) + 1.849\ \Delta\log(PSEi_t)$
(0.304) (0.079) (0.000)
Adj-R2: 0.383
F-statistic: 31.477
Durbin-Watson statistic: 2.218

$\Delta\log(BPC_t) = -0.02 + 2.11\Delta\log(Phil\_Broad_{t-5}) + 2.287\Delta\log(PSEi_t) + 0.12AR(12) + 0.28AR(15)$
(0.201) (0.031) (0.000) (0.82) (0.17)
Adj-R2: 0.393
F-statistic: 14.114
Durbin-Watson statistic: 2.318

$\Delta\log(BPC_t) = -0.023 - 0.638\ \Delta\log(Phil\_Narrow_{t-3}) + 1.838\ \Delta\log(PSEi_t)$
(0.199) (0.010) (0.000)
Adj-R2: 0.389
F-statistic: 32.229
Durbin-Watson statistic: 2.186

A-4.2.4: JG Summit Holdings

$\Delta\log(JGS_t) = 0.012 - 1.423\Delta\log(PHPUSD_t) + 1.112\Delta\log(PSEi_t) - 0.312AR(1) + 0.143AR(16) - 0.265MA(2)$
(0.140) (0.004) (0.000) (0.031) (0.062) (0.045)
Adj-R2: 0.355
F-statistic: 10.345
Durbin-Watson statistic: 2.063

$\Delta\log(JGS_t) = 0.012 + 1.228\Delta\log(Phil\_MTP_t) + 1.265\Delta\log(PSEi_t) - 0.220AR(1) - 0.128\ AR(8)$
(0.136) (0.000) (0.000) (0.037) (0.101)
Adj-R2: 0.460
F-statistic: 20.777
Durbin-Watson statistic: 2.044

A-4.3: PROPERTY SECTOR

Sample period (1998-2006)	Economy-wide Exchange Rates				Industry Exchange Rates		
	PHPUSD	MTP	BROAD	NARROW	MTP	BROAD	NARROW
Property Firms							
Ayala Land	No	No	No	Y[+]	Y(2)[+]	Y[+]	No
Belle Corp	No	Y[+]	Y(5)[+]	Y[-]	No	No	Y(1)[-]
Filinvest Land Inc	No	Y[+]	No	No	Y[+]	No	Y(2)[+]
Megaworld Corp	No	Y(4)[+]	Y[-]	No	No	Y[+]	Y(3)[-]
SM Prime Holdings	Y[+]	Y(3)[-]	No	No	Y[-]	Y[-]	Y[-]

A-4.3.1: Ayala Land Inc.

$\Delta\log(AC_t) = 0.001 + 0.215\ \Delta\log(Phil\_Narrow_t) + 1.443\ \Delta\log(PSEi_t)$
(0.908) *(0.064)* *(0.000)*
Adj-R2: 0.765
F-statistic: 165.282
Durbin-Watson statistic: 2.311

$\Delta\log(AC_t) = 0.005 + 0.397\ \Delta\log(Prop\_MTP_{t-2}) + 1.398\ \Delta\log(PSEi_t)$
(0.582) *(0.053)* *(0.000)*
Adj-R2: 0.758
F-statistic: 82.423
Durbin-Watson statistic: 2.091

$\Delta\log(AC_t) = 0.004 + 0.282\Delta\log(Prop\_Broad_t) + 1.373\Delta\log(PSEi_t) + 0.232AR(15) + 0.311MA(6)$
(0.689) *(0.058)* *(0.000)* *(0.007)* *(0.005)*
Adj-R2: 0.739
F-statistic: 61.736
Durbin-Watson statistic: 1.982

A-4.3.2: Belle Corporation

$\Delta\log(BEL_t) = -0.006 + 0.754\ \Delta\log(Phil\_MTP_t) + 1.379\ \Delta\log(PSEi_t) - 0.193\ MA(3)$
(0.604) *(0.069)* *(0.000)* *(0.007)*
Adj-R2: 0.327
F-statistic: 17.382
Durbin-Watson statistic: 2.209

$\Delta\log(BEL_t) = -0.002 + 1.437\ \Delta\log(Phil\_Broad_{t-5}) + 1.281\ \Delta\log(PSEi_t)$
(0.909) *(0.016)* *(0.000)*
Adj-R2: 0.322
F-statistic: 23.817
Durbin-Watson statistic: 2.204

$\Delta\log(BEL_t) = -0.008 - 0.675\ \Delta\log(Phil\_Narrow_t) + 1.392\ \Delta\log(PSEi_t)$
(0.536) *(0.016)* *(0.000)*
Adj-R2: 0.329
F-statistic: 25.774
Durbin-Watson statistic: 2.243

$\Delta\log(BEL_t) = -0.008 - 0.552\ \Delta\log(Prop\_Narrow_{t-1}) + 1.439\ \Delta\log(PSEi_t)$
(0.593) *(0.074)* *(0.000)*
Adj-R2: 0.319
F-statistic: 24.471
Durbin-Watson statistic: 2.140

A-4.3.2: Filinvest Land, Inc.

$\Delta\log(FLI_t) = 0.002 + 1.096\ \Delta\log(Phil\_MTP_t) + 2.159\ \Delta\log(PSEi_t)$
(0.856) (0.031) (0.000)
Adj-R2: 0.648
F-statistic: 94.090
Durbin-Watson statistic: 2.131

$\Delta\log(FLI_t) = -0.008 + 0.561\Delta\log(Prop\_MTP_t) + 2.056\Delta\log(PSEi_t) + 0.338AR(7) + 0.298A(15)$
(0.724) (0.054) (0.000) (0.007) (0.030)
Adj-R2: 0.690
F-statistic: 42.191
Durbin-Watson statistic: 2.299

$\Delta\log(FLI_t) = -0.001 + 0.322\ \Delta\log(Prop\_Narrow_{t-2}) + 2.026\ \Delta\log(PSEi_t) - 0.322\ MA(1)$
(0.905) (0.044) (0.000) (0.013)
Adj-R2: 0.681
F-statistic: 71.428
Durbin-Watson statistic: 1.935

A-4.3.2: Megaworld Corp.

$\Delta\log(MEG_t) = 0.010 + 1.756\ \Delta\log(Phil\_MTP_{t-4}) + 1.276\ \Delta\log(PSEi_t) - 0.189\ AR(2)$
(0.221) (0.001) (0.000) (0.029)
Adj-R2: 0.544
F-statistic: 38.828
Durbin-Watson statistic: 2.265

$\Delta\log(MEG_t) = 0.009 - 0.738\Delta\log(Phil\_Broad_t) + 1.149\Delta\log(PSEi_t) + 0.547AR(2) - 0.848MA(2)$
(0.002) (0.059) (0.000) (0.000) (0.000)
Adj-R2: 0.438
F-statistic: 20.319
Durbin-Watson statistic: 2.084

$\Delta\log(MEG_t) = 0.012 + 0.793\ \Delta\log(Prop\_Broad_t) + 1.227\Delta\log(PSEi_t) - 0.145\ AR(2)$
(0.224) (0.020) (0.000) (0.088)
Adj-R2: 0.426
F-statistic: 25.493
Durbin-Watson statistic: 2.066

$\Delta\log(MEG_t) = 0.010 - 0.536\ \Delta\log(Prop\_Narrow_{t-3}) + 1.410\ \Delta\log(PSEi_t) - 0.301AR(6) - 0.30MA(2)$
(0.074) (0.040) (0.000) (0.061) (0.003)
Adj-R2: 0.438
F-statistic: 18.957
Durbin-Watson statistic: 1.866

A-4.3.2: SM Prime Holdings

$\Delta\log(SMPH_t) = -0.001 + 0.554\ \Delta\log(PHPUSD_t) + 0.820\ \Delta\log(PSEi_t) - 0.187\ AR(6)$
(0.748) (0.045) (0.000) (0.068)
Adj-R2: 0.579
F-statistic: 44.540
Durbin-Watson statistic: 2.027

$\Delta\log(SMPH_t) = -0.001 - 0.375\ \Delta\log(Phil\_MTP_{t-3}) + 0.921\ \Delta\log(PSEi_t) + 0.223\ AR(8)$
(0.873) (0.055) (0.000) (0.004)
Adj-R2: 0.555
F-statistic: 38.398
Durbin-Watson statistic: 1.991

$\Delta\log(SMPH_t) = -0.001 - 0.295\Delta\log(Prop\_MTP_t) + 0.930\ \Delta\log(PSEi_t) + 0.245AR(8) - 0.332MA(6)$
(0.861) (0.075) (0.000) (0.007) (0.006)
Adj-R2: 0.599
F-statistic: 31.266
Durbin-Watson statistic: 1.899

$\Delta\log(SMPH_t) = -0.001 - 0.360\ \Delta\log(Prop\_Broad_t) + 0.787\ \Delta\log(PSEi_t) - 0.178\ AR(6)$
(0.900) (0.065) (0.000) (0.070)
Adj-R2: 0.582
F-statistic: 45.062
Durbin-Watson statistic: 2.022

$\Delta\log(SMPH_t) = -0.0004 - 0.173\ \Delta\log(Prop\_Narrow_t) + 0.754\ \Delta\log(PSEi_t)$
(0.940) (0.068) (0.000)
Adj-R2: 0.574
F-statistic: 69.088
Durbin-Watson statistic: 2.023

A-4.4: FOOD AND BEVERAGE MANUFACTURING

Sample period (1998-2006)	Economy-wide Exchange Rates				Industry Exchange Rates		
	PHPUSD	MTP	BROAD	NARROW	MTP	BROAD	NARROW
Food and Beverage Firms							
Alaska Milk Corp	No	No	Y(5)[-]	Y(1)[-]	Y[-]	No	Y[+]
Ginebra San Miguel	No	No	Y(2)[-]	Y[-]	Y(1)[-]	Y(2)[-]	Y(1)[-]
Jollibee Foods Corp	No	No	Y(1)[+]	Y(1)[+]	Y(3)[-]	No	Y[+]
RFM Corp	No	No	Y[+]	Y(2)[+]	Y(4)[+]	Y(4)[-]	Y[+]
San Miguel Corp (A)	No	No	Y(2)[-]	Y(2)[-]	Y(1)[-]	Y[-]	Y[-]
Swift Foods Inc	No	Y(1)[+]	No	No	No	No	Y[-]
Universal Robina Corp	Y[+]	Y[+]	Y[+]	No	Y[+]	Y(4)[+]	Y(5)[+]

A-4.4.1: Alaska Milk Corp.

$\Delta\log(AMC_t) = -0.001 - 0.558\Delta\log(Phil\_Broad_{t-5}) + 0.394\Delta\log(PSEi_t) - 0.191AR(4) + 0.35AR(13)$
(0.870) (0.015) (0.000) (0.066) (0.002)
Adj-R2: 0.260
F-statistic: 8.296
Durbin-Watson statistic: 2.280

$\Delta\log(AMC_t) = -0.0003 - 0.484\Delta\log(Phil\_Narrow_{t-1}) + 0.433\Delta\log(PSEi_t) - 0.237AR(4) + 0.38AR(13)$
(0.964) (0.006) (0.000) (0.006) (0.000)
Adj-R2: 0.348
F-statistic: 12.615
Durbin-Watson statistic: 2.239

$\Delta\log(AMC_t) = 0.001 - 0.417\Delta\log(FBT\_MTP_t) + 0.336\Delta\log(PSEi_t) - 0.153AR(4) + 0.298AR(13)$
(0.884) (0.057) (0.000) (0.082) (0.006)
Adj-R2: 0.209
F-statistic: 6.033
Durbin-Watson statistic: 2.047

$\Delta\log(AMC_t) = 0.001 + 0.30\Delta\log(FBT\_Narrow_t) + 0.43\Delta\log(PSEi_t) - 0.18AR(1) - 0.23AR(4) + 0.34AR(13)$
(0.819) (0.005) (0.000) (0.031) (0.027) (0.343)
Adj-R2: 0.331
F-statistic: 9.727
Durbin-Watson statistic: 1.995

A-4.4.2: Ginebra San Miguel

$\Delta\log(LTDI_t) = -0.006 - 1.427\ \Delta\log(Phil\_Broad_{t-2}) + 1.099\ \Delta\log(PSEi_t)$
(0.562) (0.007) (0.000)
Adj-R2: 0.491
F-statistic: 48.724
Durbin-Watson statistic: 2.125

$\Delta\log(LTDI_t) = -0.006 - 0.452\ \Delta\log(Phil\_Narrow_t) + 1.227\ \Delta\log(PSEi_t)$
(0.921) (0.070) (0.000)
Adj-R2: 0.456
F-statistic: 43.365
Durbin-Watson statistic: 1.838

$\Delta\log(LTDI_t) = -0.007 - 0.909\ \Delta\log(FBT\_MTP_{t-1}) + 0.633\ \Delta\log(PSEi_t)$
(0.507) (0.027) (0.001)
Adj-R2: 0.212
F-statistic: 12.817
Durbin-Watson statistic: 1.813

$\Delta\log(LTDI_t) = -0.004 - 0.645\ \Delta\log(FBT\_Broad_{t-2}) + 1.187\ \Delta\log(PSEi_t)$
(0.720) (0.015) (0.000)
Adj-R2: 0.457
F-statistic: 42.599
Durbin-Watson statistic: 2.048

$\Delta\log(LTDI_t) = -0.005 - 0.851\ \Delta\log(FBT\_Narrow_{t-1}) + 1.159\ \Delta\log(PSEi_t)$
(0.638) (0.002) (0.000)
Adj-R2: 0.481
F-statistic: 47.392
Durbin-Watson statistic: 2.119

A-4.4.3: Jollibee Foods Corp.

$\Delta\log(JFC_t) = -0.007 + 0.586\ \Delta\log(Phil\_Broad_{t-1}) + 0.748\ \Delta\log(PSEi_t) - 0.292\ AR(1)$
(0.294) (0.022) (0.000) (0.032)
Adj-R2: 0.403
F-statistic: 23.308
Durbin-Watson statistic: 2.013

$\Delta\log(JFC_t) = 0.007 + 0.297\ \Delta\log(Phil\_Narrow_{t-1}) + 0.754\ \Delta\log(PSEi_t) - 0.291\ AR(1)$
(0.283) (0.012) (0.000) (0.030)
Adj-R2: 0.395
F-statistic: 22.536
Durbin-Watson statistic: 2.005

$\Delta\log(JFC_t) = 0.013 - 0.347\ \Delta\log(FBT\_MTP_{t-3}) + 0.521\ \Delta\log(PSEi_t) + 0.238\ AR(13)$
(0.213) (0.093) (0.000) (0.010)
Adj-R2: 0.233
F-statistic: 8.406
Durbin-Watson statistic: 2.078

$\Delta\log(JFC_t) = 0.006 + 0.412\ \Delta\log(FBT\_Narrow_t) + 0.700\ \Delta\log(PSEi_t) - 0.305\ AR(1)$
(0.357) (0.029) (0.000) (0.016)
Adj-R2: 0.401
F-statistic: 23.352
Durbin-Watson statistic: 1.959

A-4.4.4: RFM Corp.

$\Delta\log(RFM_t) = -0.020 + 1.724\Delta\log(Phil\_Broad_t) + 0.778\Delta\log(PSEi_t) - 0.310AR(8) - 0.213AR(15)$
(0.021) (0.021) (0.004) (0.049) (0.033)
Adj-R2: 0.218
F-statistic: 6.853
Durbin-Watson statistic: 2.162

$\Delta\log(RFM_t) = -0.019 + 0.900\ \Delta\log(Phil\_Narrow_{t-2}) + 0.521\ \Delta\log(PSEi_t)$
(0.160) (0.045) (0.012)
Adj-R2: 0.097
F-statistic: 6.198
Durbin-Watson statistic: 2.155

$\Delta\log(RFM_t) = -0.019 + 1.971\ \Delta\log(FBT\_MTP_{t-4}) + 0.731\ \Delta\log(PSEi_t)$
(0.262) (0.029) (0.005)
Adj-R2: 0.150
F-statistic: 8.33
Durbin-Watson statistic: 2.007

$\Delta\log(RFM_t) = -0.024 - 0.824\ \Delta\log(FBT\_Broad_{t-4}) + 0.825\ \Delta\log(PSEi_t) - 0.276\ AR(8)$
(0.047) (0.042) (0.003) (0.104)
Adj-R2: 0.181
F-statistic: 7.411
Durbin-Watson statistic: 2.073

$\Delta\log(RFM_t) = -0.025 + 0.636\ \Delta\log(FBT\_Narrow_t) + 0.649\ \Delta\log(PSEi_t) - 0.273\ AR(8)$
(0.027) (0.057) (0.014) (0.071)
Adj-R2: 0.139
F-statistic: 5.889
Durbin-Watson statistic: 2.277

A-4.4.5: San Miguel Corp. (A shares)

$\Delta\log(SMC_t) = 0.002 - 0.451\Delta\log(Phil\_Broad_{t-2}) + 0.371\Delta\log(PSEi_t) + 0.243AR(2) + 0.174AR(11)$
(0.762) (0.007) (0.000) (0.003) (0.013)

Adj-R2: 0.214
F-statistic: 6.976
Durbin-Watson statistic: 2.008

$\Delta\log(SMC_t) = 0.002 - 0.279\Delta\log(Phil\_Narrow_{t-2}) + 0.36\Delta\log(PSEi_t) + 0.214AR(11) + 0.282MA(2)$
(0.752) (0.003) (0.000) (0.000) (0.006)

Adj-R2: 0.211
F-statistic: 6.895
Durbin-Watson statistic: 1.992

$\Delta\log(SMC_t) = 0.003 - 0.428\ \Delta\log(FBT\_MTP_{t-1}) + 0.207\ \Delta\log(PSEi_t) + 0.270\ AR(11)$
(0.662) (0.004) (0.003) (0.000)

Adj-R2: 0.182
F-statistic: 6.700
Durbin-Watson statistic: 2.061

$\Delta\log(SMC_t) = 0.006 - 0.157\ \Delta\log(FBT\_Broad_t) + 0.285\ \Delta\log(PSEi_t) + 0.179\ AR(2)$
(0.275) (0.077) (0.000) (0.024)

Adj-R2: 0.178
F-statistic: 8.123
Durbin-Watson statistic: 2.286

$\Delta\log(SMC_t) = 0.005 - 0.237\Delta\log(FBT\_Narrow_t) + 0.287\Delta\log(PSEi_t) + 0.198\ AR(2) - 0.217AR(6)$
(0.243) (0.026) (0.000) (0.035) (0.011)

Adj-R2: 0.219
F-statistic: 7.654
Durbin-Watson statistic: 2.236

A-4.4.6: Swift Foods, Inc.

$\Delta\log(SFI_t) = -0.019 + 1.795\ \Delta\log(Phil\_MTP_{t-1}) + 0.702\ \Delta\log(PSEi_t) - 0.216\ AR(2)$
(0.270) (0.002) (0.005) (0.059)

Adj-R2: 0.264
F-statistic: 8.298

Durbin-Watson statistic: 2.428

$\Delta\log(SFI_t) = -0.011 - 0.793\ \Delta\log(FBT\_Narrow_t) + 0.814\ \Delta\log(PSEi_t)$
(0.574) (0.092) (0.000)

Adj-R2: 0.114
F-statistic: 5.761
Durbin-Watson statistic: 1.836

A-4.4.7: Universal Robina Corp.

$\Delta\log(URC_t) = 0.019 + 0.947\ \Delta\log(PHPUSD_t) + 1.087\Delta\log(PSEi_t) - 0.290AR(6) - 0.374MA(1)$
(0.002) (0.081) (0.000) (0.004) (0.000)
Adj-R2: 0.436
F-statistic: 19.396
Durbin-Watson statistic: 1.908

$\Delta\log(URC_t) = 0.015 + 0.598\Delta\log(Phil\_MTP_t) + 1.153\Delta\log(PSEi_t) - 0.260AR(1) - 0.260AR(6)$
(0.035) (0.042) (0.000) (0.000) (0.012)
Adj-R2: 0.419
F-statistic: 18.098
Durbin-Watson statistic: 2.081

$\Delta\log(URC_t) = 0.018 + 1.026\Delta\log(Phil\_Broad_t) + 1.174\Delta\log(PSEi_t) - 0.287AR(1) - 0.268AR(6)$
(0.013) (0.035) (0.000) (0.000) (0.011)
Adj-R2: 0.435
F-statistic: 19.288
Durbin-Watson statistic: 2.087

$\Delta\log(URC_t) = 0.018 + 0.315\ \Delta\log(FBT\_MTP_t) + 0.848\ \Delta\log(PSEi_t) - 0.264\ AR(1)$
(0.049) (0.059) (0.000) (0.000)
Adj-R2: 0.224
F-statistic: 9.491
Durbin-Watson statistic: 1.920

$\Delta\log(URC_t) = 0.018 + 0.512\Delta\log(FBT\_MTP_{t-4}) + 0.942\Delta\log(PSEi_t) - 0.223AR(1) - 0.284AR(6)$
(0.010) (0.016) (0.000) (0.002) (0.008)
Adj-R2: 0.267
F-statistic: 9.266
Durbin-Watson statistic: 2.060

$\Delta\log(URC_t) = 0.018 + 0.462\Delta\log(FBT\_Narrow_{t-5}) + 1.004\Delta\log(PSEi_t) - 0.306AR(6) - 0.294MA(1)$
(0.006) (0.088) (0.000) (0.003) (0.007)
Adj-R2: 0.262
F-statistic: 8.984
Durbin-Watson statistic: 1.975

A-4.5: POOLED REGRESSION

$$\Delta \log(\textit{Sector Index})_t = \textit{fixed effect} + a_0 + a_1 \Delta \log(\textit{ER measure}_t) + a_2 \Delta \log(PSEi_t)$$
$$\textit{(t-stat)} \qquad \textit{(t-stat)} \qquad \textit{(t-stat)}$$

Using cross-section weights for fixed effects estimation, the results of pooled regression is as follows:

A-4.5.1: For regressions using Major Trading Partners Aggregate REER:

$\Delta(\log(BFS_{,t})) = 0.0004 + 0.002 + 0.440\ \Delta\log(PHIL\_MTP_t) + 0.956\ \Delta(\log(PSEi_t))$
(1.165) *(3.583)* *(20.640)*

$\Delta(\log(IND_{,t})) = -0.002 + 0.002 - 0.049\ \Delta\log(PHIL\_MTP_t) + 0.913\ \Delta(\log(PSEi_t))$
(1.165) *(-0.930)* *(45.973)*

$\Delta(\log(MO_{,t})) = 0.004 + 0.002 - 0.221\ \Delta\log(PHIL\_MTP_t) + 0.768\ \Delta(\log(PSEi_t))$
(1.165) *(-0.664)* *(6.139)*

$\Delta(\log(PROP_{,t})) = -0.002 + 0.002 + 0.052\ \Delta\log(PHIL\_MTP_t) + 1.226\ \Delta(\log(PSEi_t))$
(1.165) *(0.345)* *(21.594)*

Weighted Statistics
Adjusted R-squared: 0.884
F-statistic: 283.604
Durbin-Watson stat: 1.988

A-4.5.2: For regressions using Broad Aggregate REER

$\Delta(\log(BFS_{,t})) = 0.001 + 0.002 + 0.077\ \Delta\log(PHIL\_BROAD_t) + 0.979\ \Delta(\log(PSEi_t))$
(1.132) *(0.524)* *(20.037)*

$\Delta(\log(IND_{,t})) = -0.002 + 0.002 - 0.013\ \Delta\log(PHIL\_BROAD_t) + 0.911\ \Delta(\log(PSEi_t))$
(1.132) *(-0.218)* *(45.909)*

$\Delta(\log(MO_{,t})) = 0.003 + 0.002 - 0.310\ \Delta\log(PHIL\_BROAD_t) + 0.750\ \Delta(\log(PSEi_t))$
(1.132) *(-0.827)* *(6.033)*

$\Delta(\log(PROP_{,t})) = -0.002 + 0.002 + 0.004\Delta\log(PHIL\_BROAD_t) + 1.229\Delta(\log(PSEi_t))$
(1.132) *(0.024)* *(21.751)*

Weighted Statistics
Adjusted R-squared: 0.881
F-statistic: 276.133
Durbin-Watson stat: 1.973

A-4.5.3: For regressions using Narrow Aggregate REER

$$\Delta(\log(BFS_{,t})) = 0.0004 + 0.002 - 0.120\Delta\log(PHIL\_NARROW_t) + 0.968\Delta(\log(PSEi_t))$$
$$\textit{(1.152)} \qquad \textit{(-1.424)} \qquad \textit{(19.845)}$$

$$\Delta(\log(IND_{,t})) = -0.002 + 0.002 + 0.020\Delta\log(PHIL\_NARROW_t) + 0.913\Delta(\log(PSEi_t))$$
$$\textit{(1.152)} \qquad \textit{(0.572)} \qquad \textit{(45.763)}$$

$$\Delta(\log(MO_{,t})) = 0.003 + 0.002 - 0.024\ \Delta\log(PHIL\_NARROW_t) + 0.755\ \Delta(\log(PSEi_t))$$
$$\textit{(1.152)} \qquad \textit{(-0.110)} \qquad \textit{(6.018)}$$

$$\Delta(\log(PROP_{,t})) = -0.002 + 0.002 + 0.086\Delta\log(PHIL\_NARROW_t) + 1.236\Delta(\log(PSEi_t))$$
$$\textit{(1.152)} \qquad \textit{(0.873)} \qquad \textit{(21.808)}$$

Weighted Statistics
Adjusted R-squared: 0.882
F-statistic: 277.827
Durbin-Watson stat: 2.043

A-4.5.4: For regressions using the Peso-Dollar Exchange rate (USD:PHP)

$$\Delta(\log(BFS_{,t})) = 0.002 + 0.002 + 0.495\ \Delta\log(PHPUSD_t) + 0.937\ \Delta(\log(PSEi_t))$$
$$\textit{(1.355)} \qquad \textit{(2.261)} \qquad \textit{(18.460)}$$

$$\Delta(\log(IND_{,t})) = 0.002 + 0.002 - 0.067\ \Delta\log(PHPUSD_t) + 0.916\ \Delta(\log(PSEi_t))$$
$$\textit{(1.355)} \qquad \textit{(-0.743)} \qquad \textit{(43.533)}$$

$$\Delta(\log(MO_{,t})) = 0.002 + 0.002 + 0.226\ \Delta\log(PHPUSD_t) + 0.739\ \Delta(\log(PSEi_t))$$
$$\textit{(1.355)} \qquad \textit{(0.396)} \qquad \textit{(5.575)}$$

$$\Delta(\log(PROP_{,t})) = 0.002 + 0.002 - 0.149\ \Delta\log(PHPUSD_t) + 1.241\ \Delta(\log(PSEi_t))$$
$$\textit{(1.355)} \qquad \textit{(-0.575)} \qquad \textit{(20.677)}$$

Weighted Statistics
Adjusted R-squared: 0.883
F-statistic: 279.491
Durbin-Watson stat: 1.986

Annex I

Foreign Exchange Measures Implemented in 1997

At the onset of the 1997 Asian Financial Crisis, the BSP implemented the following measures to rationalise foreign exchange transactions:

(1) Required prior clearance on the sale of non-deliverable forward (NDF) contracts to non-residents, including offshore banking units (Circular 135);

(2) Adjusted the allowable overbought foreign exchange position of banks from not more than 20 percent to 10 percent, and further to 5 percent of their unimpaired capital or US$10 million, whichever is lower, and raised the oversold position from not more than 10 percent to 20 percent of unimpaired capital (Circular 137). Subsequently, under Circular 171, the BSP lifted the 20 percent limit of unimpaired capital on short or oversold foreign exchange position of commercial banks;

(3) Lowered the ceiling on the allowable over-the-counter (OTC) dollar sales of banks without need for documentation from US$100,000 to US$25,000, then US$10,000 to moderate the demand for dollars (OTC sales in excess of this amount are required to be supported by documentary proof/s on the nature of the dollar requirement (Circular Nos. 138 and 162);

(4) Required the consolidation of banks' accounts with their subsidiaries and affiliates in the computation of banks' foreign exchange positions (Circular Letters dated 05 and 07 September 1997 and 02 October 1997); and

(5) Required banks to submit reports of all forward sales contracts entered into with residents and non-residents and to submit reports of all cancellations or non-delivery of outstanding forward sales contracts (Circular 149).

To rein in liquidity in the system and limit the ability of banks to take foreign exchange positions, liquidity reserves were gradually raised from July to August 1997 while keeping statutory reserves intact (Circular Nos. 136, 139 and 140). However, as this policy tightened liquidity and increased overall interest rates, the BSP gradually reduced liquidity reserves from September to November 1997 (Circular Nos. 141 and 144). The BSP also introduced the Currency Rate Risk Protection Programme (CRPP) in December 1997 to temper panic buying of dollars by unhedged borrowers of foreign exchange (Circular 149). The BSP, together with the BAP, also established a foreign exchange pool system to provide dollar liquidity for the legitimate requirements of some companies.

CHAPTER 7

ADJUSTMENT OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS: THE CASE OF SRI LANKA

*by Y. Priyantha Jayasena**

1. Introduction

This paper makes an attempt to investigate the recent adjustments of both financial institutions and corporate firms in response to the rises in exchange rate volatility. The study covers the period from 1995 –2006 and uses balance of payment, monetary, stock market and government statistics. In addition, a survey was carried out among major exporting and importing corporates on the strategies adopted by them to mitigate exchange rate movements and volatilities.

The paper consists of two sections. Section 2 deals with the evolution of exchange rate management in Sri Lanka and the current status of capital mobility in the country while Section 3 analyses the composition, trends and behaviour in the foreign exchange market.

2. Evolution of the Exchange Rate System in Sri Lanka

Until 2002, the Central Bank of Sri Lanka was entrusted under the Monetary Law Act to undertake the responsibility of maintaining the stability of the external value of the Sri Lanka rupee in relation to foreign currencies, in line with macro economic fundamental. However, the Act was amended in 2002 making economic and price stability and the financial system stability as the main objectives of the Bank. Furthermore, the foreign exchange reserves of the country are also managed by the Bank as an agency function. The exchange rate system in Sri Lanka has evolved from a regime of fixed exchange rates to a managed float and finally to an independent float during the last 55 years. A summary of the evolution is given below.

*. The author is Senior Economist from International Finance Division of the Economic Research Department of the Central Bank of Sri Lanka.

2.1 Fixed Exchange Rate Regime

Sri Lanka, like most countries at that time adopted a fixed exchange regime at the time of setting up of the Central Bank in 1950, with the rupee linked to the pound sterling. The fixed exchange rate system was maintained through the 1960's and most of the 1970's with a rigid system of exchange controls. Throughout most of this period, there was heavy pressure on external reserves and as a result the exchange rate was devalued on several occasions. The rupee was first devalued by 20 per cent in 1967 in response to the continued depletion of reserves and devaluation of the pound sterling. The devaluation was supplemented with a system of dual exchange rate introduced in 1968. Under this system, which was known as the Foreign Exchange Entitlement Certificates Scheme (FEECS), there was an 'official' exchange rate applicable to essential imports and traditional exports, and another higher rate, applicable to all other exports and imports. The objective of the scheme was export diversification and import compression by allowing the market mechanism to regulate the flow of 'non-essential' imports. It was designed to bring the rupee cost of a wide range of such imports closer to the realistic value of foreign exchange.

The rupee was linked to the US dollar in 1971 at the prevailing parity of Rs. 5.95 per US dollar, allowing the parities against other currencies to the determined on the basis of their cross rates with the US dollar in international foreign exchange market, following the suspension of convertibility of US dollar for gold. However, following the flotation of the pound sterling in June 1972, the Sri Lanka rupee was again linked to the pound sterling at the prevailing parity of Rs. 14.94. Sri Lanka moved from a hard peg to a single currency, to a basket peg in May 1976, by determining the exchange rate with reference to an appropriately weighted basket of currencies. This step was necessitated by the need to insulate the rupee from random events abroad, which under the previous regime, tended to be transmitted to Sri Lanka via the link between the rupee and the pound sterling. With the use of a basket of currencies in the determination of the exchange rate, there was greater scope of the effects of underlying trends in the Sri Lankan economy to be represented in Sri Lanka's exchange rates vis-a-vis other currencies. The exchange rate was gradually re-adjusted under a crawling peg system between August and mid November 1977, allowing it to reflect changes in macroeconomic fundamentals with the intention of finding a more realistic rate of exchange for the rupee.

2.2 Managed Float with a Crawling Band

Sri Lanka moved to a liberalised economic policy in 1977 with the practical liberalisation of external trade and payments. The exchange rate system was unified resulting in an initial depreciation of about 46 per cent and the dual exchange rate system that prevailed was abolished. With the unification, the exchange rate was allowed to float, providing scope for the exchange rate to be determined largely on the basis of demand and supply in the market. At the initial stage of floating, the Central Bank's management of the exchange rate was considered essential, as the foreign exchange market was thin and the financial system was not mature enough to operate on its own. Accordingly, the Central bank announced daily rates at which it would buy and sell foreign exchange from and to the market within the narrow band.

The Central Bank initially quoted fixed daily rates for six major currencies under the new system. Since 1982, the Bank limited its quotation only to the intervention currency, the US dollar, allowing the commercial banks to determine the cross rates for other currencies based on market conditions. At the beginning, the margin between the buying and selling rates maintained by the Central Bank was Rs. 6.00 per US dollar 100. Due to the changes in macroeconomic fundamentals and foreign exchange market gaining greater degree of maturity, the domestic band of the exchange rate was adjusted on several occasions and finally revised to 10 per cent in January 2001, allowing market forces greater scope to determine the exchange rate. With the liberalisation of the exchange rate under the managed float system, the payments system was also liberalised and by 1994, it had removed all restrictions on current external transaction and accepted Article VIII of the Articles of Agreement of the IMF. Capital account transactions were also largely liberalised, except for restrictions on investments abroad and borrowings abroad by residents, and investments in domestic debt instruments by non- residents.

2.3 Independent Floating

In 2000, the exchange rate came under pressure due to an increased balance of payments deficit, largely due to high oil import prices and security related additional imports. After gradual widening and increase in the exchange rate bands in 23 January 2001, Sri Lanka moved to an independent floating system by allowing commercial banks to determine the exchange rate freely.

Under the new system, the Bank ceased to announce its buying and selling rates in advance. Instead it indicated that it would participate actively in buying and selling at or near market prices. The new system permitted free transactions in the market while stabilising the value of the rupee and helping authorities to build up official foreign assets. As experience of other countries that have floated their currencies has highlighted, there was a need for implementing precautionary measures during the transition period to help and stabilise the market and promote prudential conduct by commercial banks by restraining speculative activity. Therefore, the Central bank also implemented the following temporary measures in consultation with commercial banks and foreign exchange dealers.

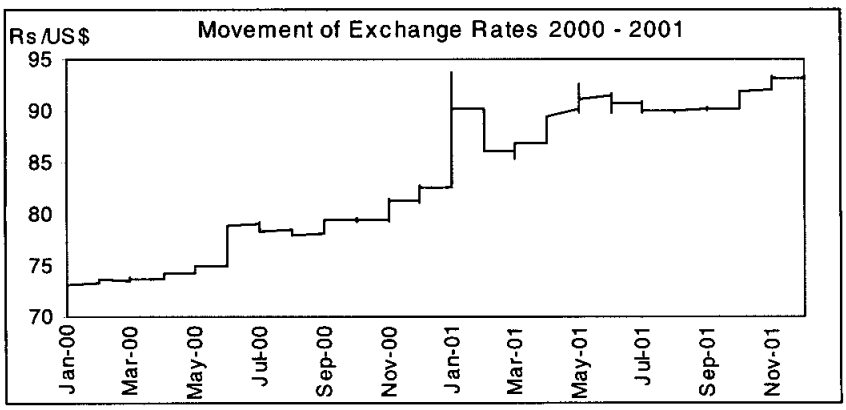
(a) Limits on daily working balances maintained by commercial banks in foreign exchange, on the basis of past exports-imports credit facilities granted by the bank, to prevent the bank from building up foreign exchange for unwarranted speculative activities.
(b) Requesting banks to ensure settlement of export credit by exporters by using exports proceeds within 90 days. This period was extended to 120 days in respect of exports, where it was customary to grant 120 days deferred payment terms to buyers. Higher interest was to be charged when settlement become overdue.
(c) Requesting banks to limit their forward market operations only to trade related transactions.
(d) Requesting forward sales and purchases of foreign exchange to be backed by a rupee deposit of 50 per cent to discourage speculative forward contracting. This was removed in 2002.
(e) Advising banks not to permit early or prepayment of imports bills, in anticipation of a depreciation.

These measures helped to create stability in the foreign exchange market. Many of these measures were relaxed and removed in the following years.

As experienced in a number of other countries immediately with the change in exchange rate regime, an overshooting of the rate was experienced (Chart 1). The rupee depreciated gradually during the first two days but overshot on the third day, even recording some transactions at Rs. 98 per US dollar. However, the market correction process for the overreaction started on the same day and the rate stabilised at around Rs. 88.9 per US dollar within a week's time. The weighted average exchange rate in the spot market recorded a depreciation of 9.1 per cent on 25 January 2001 compared with the pre-float level. However,

the rate of depreciation declined to 1 per cent by 7 March 2001. Similarly, the spread between the buying and selling rates of foreign currencies had narrowed drastically in the inter-bank foreign exchange market as well as in commercial bank transaction with customers. This was a relatively quick stabilisation of the exchange rate compared with the experience of other countries that floated their currencies. Fro example, Brazil's currency depreciated by 40 per cent on the first day of floating and 21 per cent in the first month of floating in January 1999. The Indian rupee depreciated by 16 per cent in the first month of floating in March 1993, the Korean won by 31 per cent in the first month of floating in December 1997 and the Swedish kroner by 28 per cent in the first five months of floating in 1992.

Chart 1: Overshooting of Exchange Rate



The following main factors contributed to the relatively quick stabilisation in the market following the free floating of the exchange rate in 2001:

(a) Release of pressure in the foreign exchange market gradually through regular adjustment of the exchange rate according to changes in macroeconomic fundamentals of the country and widening of the bands over a longer period to allow more flexibility in the market;
(b) Timely and effective implementation of precautionary measures with the introduction of the new regime;
(c) Safeguards provided by higher interest rate policy and continuation of capital controls; and
(d) Cordial and close relationship between market participant and the authorities.

The exchange volatility gradually eased as shown below. The exchange rate depreciated by about 14 per cent from between January 2001 to July 2006

2.4 Capital Account Liberalisation

The capital account in Sri Lanka is partially liberalised with portfolio investment in stock market open to foreign investors and a case-by-case approval being given to foreign borrowings and investments by the local corporate sector. Commercial banks are allowed to borrow in foreign currency equal to 15 per cent of their capital funds. In 2006, foreign investors were permitted to invest in government securities market up to 5 per cent of the total outstanding of the government securities. Foreign direct investments in the country are allowed and firms in the free trade zones are free from the capital controls.

In view of the capital controls, the exposure of corporates to exchange rate volatility is limited in Sri Lanka. On the other hand, the exposure levels of commercial banks to exchange rate movements are limited due to the prudential limit imposed on the net open position of such banks. Currently, the net open positions of commercial banks are restricted to 20 per cent of their capital funds.

3. Foreign Exchange Market in Sri Lanka

The main participants in the domestic foreign exchange market are commercial banks, the central bank, public corporations and the corporate entities directly engaged in export and import trade.

Table 1
Composition of Domestic FX Market, 2006

Banks	Percentage
State Banks	10.79
Local Banks	30.42
Foreign Banks	55.98
Central Bank	2.91
Total	100.00

Source: Central Bank of Sri Lanka

The domestic foreign exchange market of Sri Lanka is rather thin, with average daily interbank transactions of around US dollars 10 – 20 million, especially after the flotation of the rupee. The turnover in the interbank spot and forward foreign exchange market amounted to USD 3,580 million at end 2006. The average turnover of foreign exchange including forward transactions was around USD 298 million per month in 2006, which was an increase of 92 per cent over 2005.

The level of activity in the inter-bank foreign exchange market increased substantially during the last few years, reflecting higher international trade and remittances flows. Several measures introduced by the Central Bank in consultation with the players in the forex market also contributed for further expansion in the forex market. During the year 2006, the Central Bank permitted commercial banks to offer rupee based cross currency options to domestic corporate clients to expand the activities in the forex market. The customer market, which consists of foreign exchange sales and purchases to and from customers by commercial banks, also recorded an increase in the level of activity. The total volume of transactions in the customer market recorded the highest level since the floating of the rupee and reflects an 11 per cent increase over 2005. However, forward transactions in the customer market still remain negligible which indicates the need for more public awareness on the use of available instruments to hedge the exchange rate risk.

Table 2
Interbank Forward Market Transactions

Period	Forward Volume (US $ Million)					
	< 1 Month	1 Month	2 Months	3 Months	3 Months >	Total
2000	132.24	234.26	106.16	94.29	90.25	657.2
2001	146.45	74.88	21.5	25.62	15.65	284.1
2002	332.38	194.4	159.75	108.75	157.18	952.46
2003	403.00	294.40	170.95	219.25	354.80	1442.40
2004	272.14	385.15	68.19	89.56	211.15	1026.19
2005	392.80	425.29	228.67	245.53	565.75	1858.04
2006(b)	710.50	986.13	465.95	450.12	967.85	3580.55

The foreign exchange market shows some particular patterns during specific periods of the year in terms of seasonal behaviours. When there is a relatively large mismatch of the demand and supply of foreign exchange it could lead to significant fluctuations in the exchange rate from the normal path. If this occurs on a systematic basis, there is a seasonal pattern of the variation of the exchange rate. Before the festive seasons such as the Sinhalese New Year and Christmas, there is a high demand for imports and the exchange rate increases.

The volume of the foreign exchange transactions increases in the months of January, March, October and December. On the other hand, the volume of the foreign exchange transactions decreases in the months of February, June and September. However, this normal pattern could vary due to uncertainty or unexpected events that could occur in the economy.

The volume of forward transactions is influenced by the supply and demand factors. Demand is created by the importers and banks whereas the supply is created by exporters and banks. Theoretically, uncertainty and demand of forward contracts are positively related whereas it is negatively related to the supply of forward contracts. Accordingly, the relationship between uncertainty and the volume of forward contracts depends on which of the two (i.e. supply or demand) dominates the market. Sri Lanka's experiences during the last one and half years were also in line with this theory. When uncertainty arises, the difference between the forward premium and interest differential varies and the volume of forward transactions becomes small. Sri Lanka's foreign exchange forward market is dominated by suppliers and it is the supply side that has become the crucial factor for the development of the market. In the same way, when uncertainty decreases, the premium depends mainly on the interest differential and as a result, the volume of the forward volume increases.

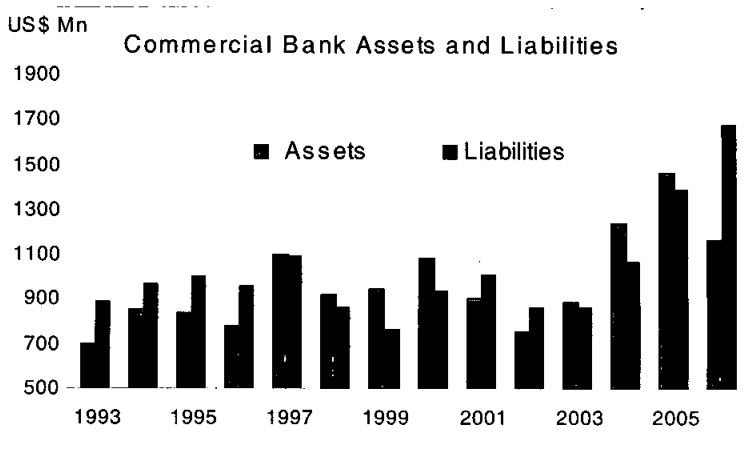
In the short term, markets can be moved by uncertainty created by rumours. However, once the rumour has been disproved, the market will tend to move back to its original position but often the market will remain suspicious, especially if the rumours are political in nature. The exchange rate depreciated substantially at times of elections due to the political instability.

3.1 Commercial Banks

In Sri Lanka, as in many developing countries, the commercial banks are the main players in the market since it is through them that foreign exchange

needs of the corporate sector are met. Of the commercial banks, foreign commercial banks are more active players in the foreign exchange market than the local commercial banks as shown in Table 1. However, foreign commercial banks face liquidity problems with domestic currency due to their thin deposit bases. Hence, these banks may sell foreign exchange in the spot market with a swap arrangement or forward cover to meet their rupee liquidity. It also appears that when a weaker bank comes into the market to purchase foreign exchange, the other banks immediately react by quoting a higher rate and the exchange rate moves upward. If other banks follow suit, it takes on a herd behaviour in the foreign exchange market whereby the banks pushes the exchange rates up.

Chart 2



However, the foreign exchange risk faced by commercial banks is, to a greater extent, mitigated due to the external and internal limits placed on the net open position of such banks. The fact that exchange gains of commercial banks have been a main contributor to their profitability shows that impact of the movements in the exchange rate, if any, has had a positive impact on their performance.

The Financial Sector Assessment Program (FSAP-2002) mission has found the following direct impact on banks' balance sheet when the rupee depreciates by 50 per cent (Table 3).

Table 3
Impact of Hypothetical Exchange Rate Shocks on Banks' Balance Sheets

Bank	Percentage
State banks	1.0
Private domestic banks	1.3
Foreign banks	1.3
All banks	1.1

Source: FSAP 2002.

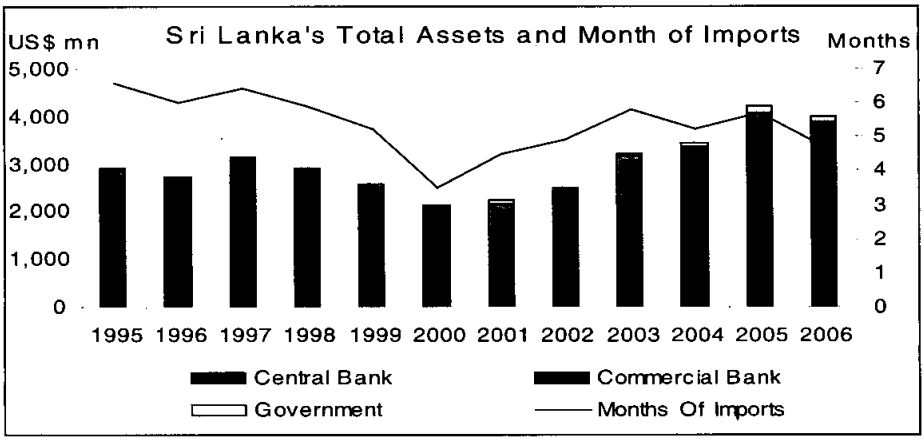
According to Table 3, the impact of exchange rate shocks is very low in the banking sector in Sri Lanka. This could be a result of both the foreign exchange exposure limits imposed on the commercial banks and the partially closed capital account. Widened exposure limits and the opening of the capital account could lead to the generation of a large exchange rate risk in the banking sector.

3.2 Central Bank

When the exchange rate fluctuates heavily within a very short period of time, the monetary authorities may intervene in the market. Under normal circumstances, the authorities prefer high volatility of interest rate or foreign exchange reserve position rather than volatility of the exchange rate. Under the independently floating exchange regime, the CBSL participates actively in buying and selling at or near market prices. When the exchange rate significantly increases from the previous day, the Central Bank intervenes in the market by selling foreign exchange with the aim of stabilising the exchange rate.

In this way, the CBSL tries to mitigate the pressure in the exchange market and create a smoothening of the exchange rate. Although the CBSL sells foreign exchange in the market in order to mitigate the pressure for depreciation, there need not be pressure for appreciation for the CBSL to actively engage itself in the purchasing of foreign exchange from the market.

Chart 3



3.3 Foreign Exchange Reserves

The external environment is represented by the country's foreign reserve position. When there is a favourable external environment, foreign reserves build up and vise-versa. Increases in the reserve position could lead to a stable exchange rate path and a decrease in the reserve position could increase uncertainty in the foreign exchange market. Hence, the reserves could lead to fluctuations of the currency.

3.3.1 Volatility in the Foreign Exchange Market

Exchange rate and other key macroeconomic variables are inter-related. This is particularly evident in a small open economy where the volatility of the exchange rate is influenced by a range of variables such as trade flows, foreign direct investment, currency crisis, debt servicing costs, portfolio composition and commodity prices. Preventing excessive volatility in exchange rates is important as it affects a country's trade competitiveness, the domestic prices and business confidence.

This paper uses one of the common measures of exchange rate volatility which is the standard deviation of the growth rates of real exchange rates. This measure is approximated by a time -varying measure defined as follows:

$$V_{t+m} = \left[\frac{1}{m} \sum_{i=1}^{m} \left(R_{t+i-1} - R_{t+i-2} \right)^2 \right]^{\frac{1}{2}}$$

Where 'R' is the natural log of the bilateral real exchange rate and 'm' is the order of the moving average.

Chart 4

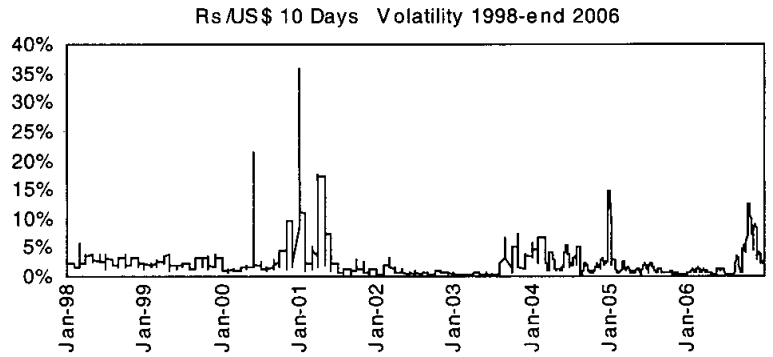
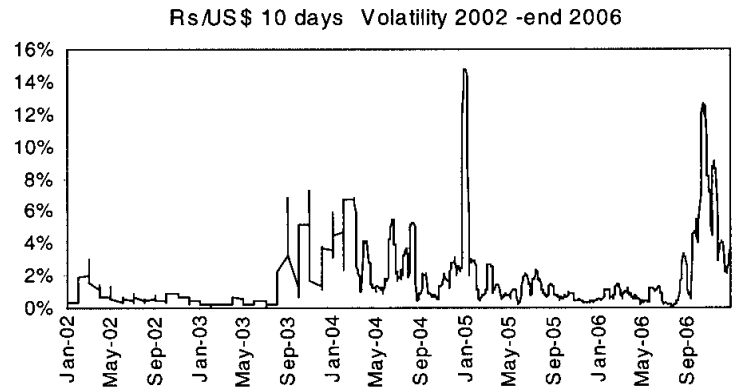


Chart 5



There have been several episodes of high volatility in foreign exchange during the period from 1998 -2006, mainly related to external events such as political developments, currency float, tsunami and high oil prices.

During the latter part of 2000 and January 2001, the exchange market experienced high volatility. Sri Lanka faced an unfavourable external environment from the second half of 2000 till the end of 2001 due to a sharp increase in the

price of petroleum products in the international market, the escalation of the war in the North and East of the country and political uncertainty. These developments resulted in the accumulation of a massive deficit of USD 522 million in the balance of payments in 2000 compared with a deficit of USD 263 million in 1999.

This in turn placed tremendous pressure on the external reserves and the exchange rate. This pressure on the exchange rate was gradually removed from the market after negotiations with the IMF, resulting in Standby Arrangements for Sri Lanka which improved market confidence. The pledge of USD 4.5 billion by the development partners at the Sri Lanka Development Forum in 2006 helped to stabilise the foreign exchange market. The Central Bank used this opportunity to build up its official reserves by purchasing foreign exchange from the market. The CBSL has purchased on net basis USD 127 million from the market in the year 2001 and USD 136 million thus far, this year.

Similarly, since latter part of 2003 till January 2005, the exchange rate had been relatively volatile due to the uncertainties created by political developments and the high oil prices and tsunami disaster. The highest volatility was experienced during January 2005 due to the expectation of a huge inflow of foreign exchange following the tsunami disaster. The main reason for the high volatility during 2006 was the high oil prices.

3.4 Corporate Sector

This includes both public corporations and private corporate sector entities as well. However, the exposure of public corporations are mainly related to the trade flows, unlike corporates which have a relatively a small quantum of capital related transactions too as shown in the Chart 6.

If there is a high demand for foreign exchange to cover import bills by the state owned enterprises, especially the Ceylon Petroleum Cooperation (CPC) and Co-operative Wholesale Establishment (CWE), the exchange rate deviates significantly from that of the previous day. As long as the public sector corporations continue to purchase dollars from the spot market to meet their import bills, there will be pressure on the exchange rate, especially when several public corporations act as a herd. The CPC now has a treasury which manages its foreign exchange through actively engaging in forward transactions and gradually amassing the amounts needed for payment.

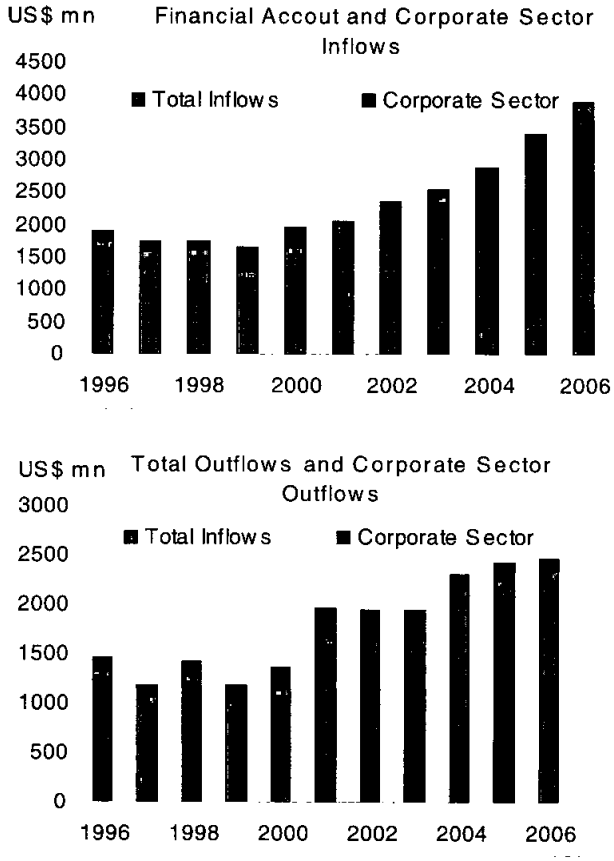
There is a high demand for foreign exchange to cover import bills by the large state owned enterprises, especially the Ceylon Petroleum Cooperation (CPC). The CPC tends to borrow dollars from foreign and local sources to meet their import bills. In turn, the state banks have financed the loans through non-resident foreign currency accounts, or through borrowings from local foreign banks, and directly through offshore borrowings. The maturity of the loans is typically three months and they are either repaid through dollar purchases or replaced with new loans for fresh bills due for settlement. This approach has also created a potential imposition of dollar demand and has left the CPC with considerable exposure to exchange rate risk on its balance sheet. Alternatively, the CPC can enter into forward contracts with any commercial bank according to their forecast on bill payments. The bank, in turn is expected to gradually build up its reserve position to cover the contract on the maturing date of the forward contract. This outstanding amount of the forward contract may be kept outside the exposure limit of the bank. In such an instance, the commercial bank that entered into forward contract with CPC is exposed to an exchange rate risk. However, it can reduce the risk by the gradual purchasing of spot or buying forward from other market participants. This process involves large volumes of forward transactions in the market and as a result, the forward market will be stimulated. In view of the CPC's successful management of its treasury operations, the other large public corporations should also be encouraged to establish their own treasuries. The CBSL could assist by providing training in treasury management skills for their staffs.

3.4.1 Corporate Sector Capital Account Flows

The private sector organisations, on the other hand, has taken various measures to ensure less pressure on the exchange rate when they purchase foreign exchange from the market to settle their import bills. However, it must be noted that the import bills of the private sector are generally smaller than those of the public sector corporations and as a result, they do not have a significant impact on the exchange rate. The private sector is of the view that the exchange rates generally pick up towards the end of month when the large public sector organisations come into the foreign exchange market to settle their large import bills during the last few days of the month. Hence, as a rule of thumb, they try to avoid this rush time by approaching the market within the first couple of weeks of the month. The private sector corporations also try to break up their import bills into several components when approaching the banks, thereby ensuring that they do not come to the market at once and add pressure to the exchange rate. The importers generally get a 90 days credit facility, which

allows them to request their banks to gradually build up foreign exchange reserves on their behalf. The private sector corporations also spread their foreign exchange purchases between the spot and forward markets in order to lower the exchange rate risk through diversification. When they have very large bills, they scatter them into small bundles and ask two or three banks to quote a rate only for the small bundle instead of for the total value of the bill. This way, they avoid increasing the demand for foreign exchange artificially by two to three times, had they approached these banks for quotations for the whole bundle. They also generally refrain from disclosing the true settlement date of the bills to their banks in advance.

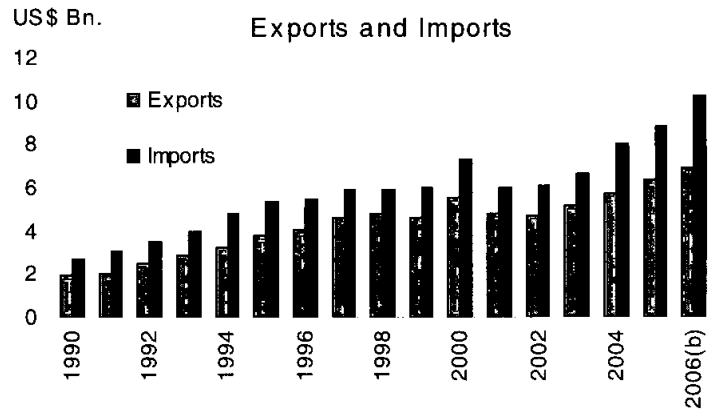
Chart 6



3.4.2 Foreign Exchange Volatility and Import and Export Trade

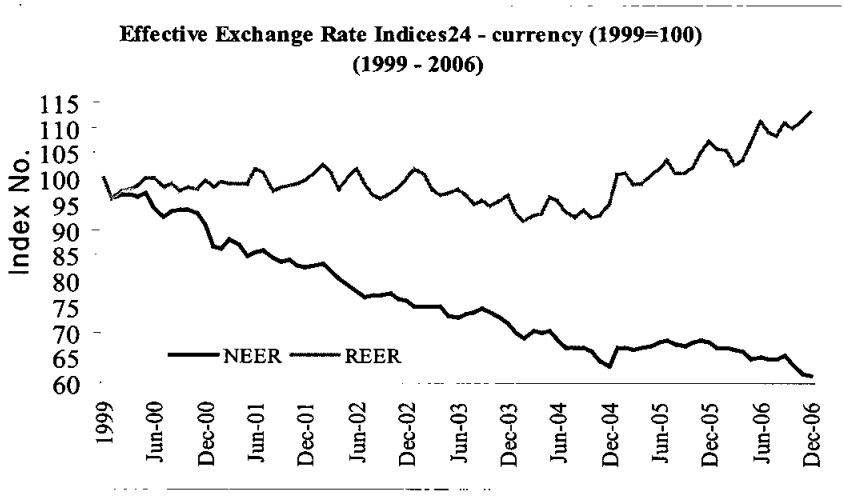
The relationship between trade and exchange rate volatility is well established. If commodity traders are risk averse or risk neutral, higher exchange rate uncertainty may lead to a reduction in the volume of trade. As a result of this extra uncertainty, the traders may demand a higher price to cover their exposure to currency risk which in turn, reduces the trade volumes.

Chart 7



The CBSL calculates REER based on two sets of data representing 5 countries and 24 countries. There are 12 countries which compete with Sri Lanka in the trade of goods and services that are represented in the 24 currency measure, whereas in the 5 currency measure, India is the only competitive country. Although a significant amount of trade is transacted with the U.S., the U.K., and the Euro region, the goods and services that are traded between them and Sri Lanka are not the type of goods and services that Sri Lanka could compete in with them. Therefore, the CBSL should pay more attention to the changes in the REER based on the 24 currencies rather than the one based on the 5 currencies as the former is a much more representative gauge of competitiveness.

Chart 8



The negative relationship between REER and net inflows could be found with available data since the covariance between the variables is minus 17.52. However, we failed to find any statistically significant coefficient between net exports and the REER.

As such, the relationship between net exports and the REER can be expressed as follows. If the real exchange rate is high, foreign goods are relatively cheaper, and domestic goods are relatively more expensive. Therefore, our net exports will be high. Accordingly, there is a negative relationship between net exports and the REER. On the other hand, the trade balance must equal saving minus investment. Hence, at the equilibrium real exchange rate, the supply of domestic currency available for net foreign investment should be equal to the demand for domestic currency by foreigners buying our net exports.

This may be due to the fact that exports or imports depend on not merely on the exchange rate but also on tax policy, income policy, political uncertainty and expectations.

4. Conclusion

This study makes an attempt to find the responses of the commercial banks and the corporate sector to the changes in exchange rates and its volatility and its policy implications. The paper finds little evidence to show that exchange

rate volatility has had a significant impact on the commercial banks and the corporate sector due to the degree of capital account liberalisaiton in the country and the prudential measures relating to the foreign exchange activities of commercial banks in force. As such, the implication on policy is limited and manageable.

References

1. Andres, Velasco, (2000), "Exchange Rate Policies for Developing Countries: What Have We Learned? What Do We Still Not Know?", United Nations Conference on Trade and Development, June.

2. Chandrawansa, P.H.O and Jayawardena M.K., (2002), "An Empirical Study of the Exchange Rate Volatility after the Floatation of the Rupee and Its Implications on the Economy", Sri Lanka (unpublished).

3. Corden, W.M.,(1985), "Inflation Exchange Rates and the World Economy", Clarendon Press, Oxford.

4. Devereux, M.B. and Engel C., (2002), "Exchange Rate Pass-Through, Exchange Rate Volatility, and Exchange Rate Disconnect", *DNB Staff Reports*, No 77.

5. Gerardo, Esquivel and Felipe Larrain B., (2002), "The Impact of G 3 Exchange Rate Volatility on Developing Countries", United Nations Conference on Trade and Development.

6. International Monetary Fund, (2002), The Report on Financial Sector Assessment Program in Sri Lanka.

7. International Monetary Fund (2004), Exchange Rate Volatility and Trade Flows – Some New Evidence, May.

8. Osler, C.L., (1998), "Rational Speculators and Exchange rate Volatility", Federal Reserve Bank of New York, February.

9. Ricardo, Caballero and Arvind Krishnamurthy, "Exchange Rate Volatility and the Credit Channel in Emerging Market: A Vertical Perspective", Massachusetts Institute of Technology, Northwestern University.

10. Annual Reports, Published by Central Bank of Sri Lanka

CHAPTER 8

ADJUSTMENTS OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR IMPLICATIONS IN THE SEACEN COUNTRIES: THE CASE OF TAIWAN

*by Kuang Huei Lee**

1. Introduction

Before the 1997 Asian Financial Crisis, many SEACEN countries adopted a fixed exchange rate regime where exchange rates fluctuate around an anchor within a narrow range. Following the crisis, most of these countries shifted to more flexible exchange rate arrangements with an outcome of rising exchange rate volatility. Also increasing the volatility was the gradual widening of the renminbi trading band and the growing imbalance of the global current account. Against this backdrop, how monetary policy makers and corporate sectors (including financial and non-financial sectors) should respond is a cause for concern.

Taiwan is a small open economy, which is generally assumed to be susceptible to exchange rate volatility. Changes in exchange rates affect macroeconomic conditions mainly because of their direct impact on import and export prices and on corporate profits. For instance, when the Taiwan dollar appreciates, the prices of Taiwan's exports in foreign currencies will increase (provided that the prices in Taiwan dollars stay the same). Hence, competitiveness of Taiwan's exports in international markets will decline. The resulting decrease in exports and increase in imports will erode Taiwan's corporate profits. But not all domestic firms lose. For example, firms that import raw materials for domestic production and/or consumption will likely profit from domestic currency

*. Kuang Huei Lee is Assistant Director General at The Central Bank of the Republic of China, (Taiwan). The Author thanks his colleagues, Mr. Chien-Yeh Yang, Ms. Hui-Wen Huang and Ms. Anita Huang, who provided valuable research assistance for data collection and English translation. Also thanks to the Taiwan Economic Journal for their data base assistance. The views expressed in this paper are those of the author and do not necessarily reflect the position of The Central Bank of the Republic of China, Taiwan.

appreciation. In addition to importers and exporters, real exchange rate movements affect domestic producers' competitiveness over overseas-based producers through relative price changes. An appreciating local currency will reduce prices of overseas-produced products as they are converted into the domestic currency. To compete with overseas producers, domestic producers will have to lower prices at the cost of their own profit margins.

To measure the impact of real exchange rate changes on macro economy, the variable most frequently employed is the real effective exchange rate (REER) index. The REER refers to the real exchange rate of the local currency vis-à-vis a basket of foreign currency weighted by trade.

Different industrial sectors show a different weight structure of trading partners. To apply the same trade-weight scale to all industries will fail to distinguish changes in the price competitiveness of one industry from another. Goldberg (2004) has therefore suggested using industry-specific real effective exchange rates to measure the price competitiveness of domestic industries when discussing the impact of exchange rates on corporate sectors and overall economy.

This research compiles an aggregate Taiwan dollar real effective exchange rate (REER) index and individual indices of Taiwan dollar REERs for 19 export/ import industries. A two-factor capital asset pricing model (CAPM) is then applied to the REER indices to analyse the impact of the Taiwan dollar real exchange rate variation on corporate returns. The empirical evidence of this research shows that with few exceptions, the effects of the Taiwan dollar real exchange rate variation on Taiwan's export/import industries are insignificant. This result may be due to firms' exchange rate hedging strategies and expansion of overseas investment, as well as the central bank's counter-cyclical exchange rate policy.

The following section explains the methods and results of compiling the aggregate and industry-specific Taiwan dollar REER indices. The correlations and volatility differences among these indices are then observed. Section 3 employs the two-factor CAPM to examine the degrees to which Taiwan dollar REER affects corporate returns. Section 4 discusses firms' response strategies to exchange rate volatility. Characteristics of Taiwan's exchange rate policy are summarised in Section 5. Section 6 presents the conclusion.

2. Measuring and Compiling the Industry-Specific Real Effective Exchange Rates

Taking the year 2000 as a base period, the real effective exchange rate (REER) index incorporates a basket of exchange rates of foreign currencies against the Taiwan dollar, price indices of Taiwan and its trading partners, and the export/import weight of the trading partners. These figures are then used to calculate the nominal effective exchange rate (EER) index and the purchasing power parity (PPP) index. The REER index equals the EER index divided by the PPP index. The formulas used are as follows:

1. Measuring the aggregate real effective exchange rate index

The aggregate real effective exchange rate index equals the nominal effective exchange rate index divided by the purchasing power parity index.

(1) REER=EER/PPP

The nominal effective exchange rate index is calculated as

$$(2)\quad EER = \prod_{j=1}^{n}\left(\frac{{}_{t}E_{ij}}{{}_{0}Eij}\right)^{w_{ij}}$$

The purchasing power parity index equals

$$(3)\quad PPP = \prod_{j=1}^{n}\left(\frac{{}_{t}p_{j}}{{}_{0}p_{j}}\Big/\frac{{}_{t}p_{i}}{{}_{0}p_{i}}\right)^{w_{ij}}$$

exchange rate: E_{ij} = foreign currency equivalent amount per unit domestic currency

$$(4)\quad \text{export weight: } w_{ij} = \frac{X_{ij}}{\sum_{j=1}^{n} X_{ij}}$$

$$(5)\quad \text{trade weight: } w_{ij} = \frac{X_{ij} + M_{ij}}{\sum_{i=1}^{n} X_{ij} + \sum_{i=1}^{n} M_{ij}}$$

where home country X_{ij} exports to country j, and home country M_{ij} imports from country j.

i = home country
P_i = price index of home country
P_j = price index of foreign country j

The REER index resulting from formula (4) is called the export weight REER index; while the index from (5) is trade weight REER index.

Fung et al. (2006) and Klau et al. (2006) indicate that re-export through Hong Kong accounts for a considerable share in China's external trade. This results in inconsistency between China's official trade statistics and those of its trading partners, as well as miscalculation of China's and Hong Kong's trade weights in currency baskets. To put it simply, in the currency basket of the unadjusted nominal effective exchange rate (EER) of the renminbi, for instance, Hong Kong may be over-weighted, while the other trading partners under-weighted. In the case of the unadjusted nominal EER of the Hong Kong dollar, China is likely to be over-weighted, while the others under-weighted. In the currency baskets of all the other trading partners, China will be under-weighted and Hong Kong over-weighted. Nominal EER measured under these circumstances do not necessarily reflect the final absorption of trade flows, and hence may not serve as an effective indicator of the overall impacts of exchange rate variations. Based on the above reason, directly using customs statistics to calculate the currency weights of the Taiwan dollar EER would be misleading. China would be under-weighted, while Hong Kong over-weighted. The Bureau of Foreign Trade of Taiwan's Ministry of Economic Affairs compiles the adjusted figures of Taiwan's exports to China (for adjusting methods, please refer to the Bureau's website). Taiwan's exports to Hong Kong are computed by subtracting Taiwan's exports to China released by the Bureau of Foreign Trade from the sum of Taiwan's exports to China and Hong Kong offered by the customs.

2.1 Measuring the Industry-Specific Real Effective Exchange Rate Index

In the above formula (4) export weight and formula (5) trade weight, assuming that *i* represents industry *i* in the home country, that *Xij* refers to the export value of industry *i* to country *j*, and that *Mij* is the import value of industry *i* from country *j*, then *Wij* will be the export weight or export-import (trade) weight of industry *i* in the home country. *Wij* is then used to calculate the export weight REER index or the trade weight REER index of industry *i*.

2.2 Results of the Aggregate Real Effective Exchange Rate Index

This research uses Taiwan's total export value and total export-import value to 12 countries or areas in year 2000, and each country's or area's weight in the total, to compile the aggregate export weight REER index and the aggregate trade weight REER index, respectively. Table 1 shows the currencies of the 12 trading partners, the aggregate export weights and the aggregate trade weights in 2000.

Table 1: Export-Import Weights of 12 Country/Regions in 2000

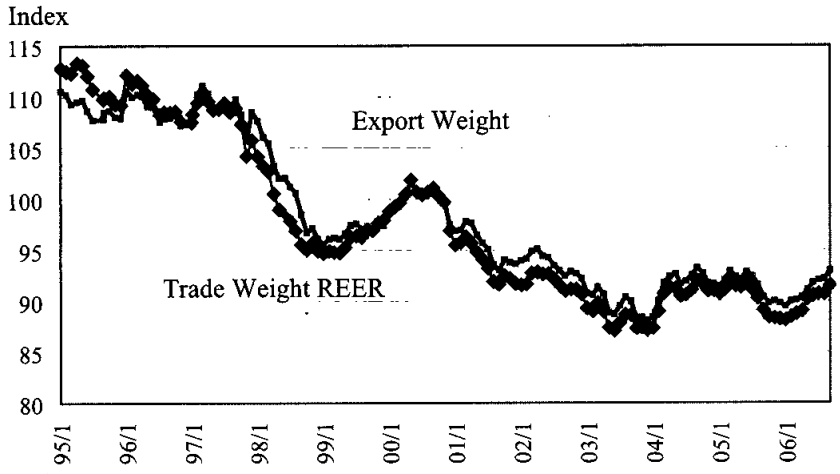
Country / Region	Currencies of Trading Partners	Export Weight	Export-Import Weight
Japan	Japanese Yen	12.39%	21.87%
Euro Area	Euro	16.55%	14.93%
United Kingdom	Great British Pound	3.37%	2.56%
Hong Kong	Hong Kong Dollar	7.02%	4.60%
South Korea	Korea Won	2.92%	5.11%
Singapore	Singapore dollar	4.07%	4.15%
China	Chinese Renminbi	19.52%	12.84%
Indonesia	Indonesian Rupian	1.29%	1.88%
Thailand	Thai Baht	1.91%	2.11%
Malaysia	Malaysian Ringgit	2.70%	3.54%
Philippines	Philippine Peso	2.27%	2.63%
United States	US dollar	25.99%	23.77%

Source: The Bureau of Foreign Trade of Taiwan's Minisry of Economic Affairs

These 12 trading partners account for 88% of Taiwan's total exports and 86% of Taiwan's total exports and imports.

With the 2000 base year, using the exchange rates of the above 12 currencies trading with the Taiwan dollar, relative price changes between Taiwan and the 12 countries, and the export weights and export-import weights of these countries in Taiwan, we measure the Taiwan dollar export weight REER index and export-import weight REER index from January 1995 to September 2006 (see Chart1).

Chart 1: Aggregate REER Indices of Taiwan Dollar



2.3 Results of the Industry-Specific Real Effective Exchange Rate Index

Taiwan's export-import statistics compiled by the customs are not classified by the standard industry codes. Instead, they are broken down by the Harmonised

Table 2: Industry Codes of Taiwan Exports and Imports by Harmonised System Classification

Industry Code	Industry Title	HS Codes of the Corresopding Taiwan Industry Codes
C27	Mineral fuels and crude oils	27
C29	Organic chemicals	29
C38	Miscellaneous chemicals	38
C39	Plastics and articles thereof	39
C40	Rubber and articles thereof	40
C47	Paper pulp and articles of paper	47,48
C54	Man-made filaments and staple fibers	54,55
C60	Clothes	60,61,62
C64	Footwear and gaiters	64
C70	Glass and glassware	70
C72	Iron and steel	72
C73	Articles of iron or steel	73
C74	Copper and articles thereof	74
C84	Mechanical appliances	84
C85	Electrical machinery and equipment and parts	85
C87	Vehicles and parts	87
C90	Precision instruments	90
C94	Furniture and lighting fittings	94
C95	Toys and sports requisites	95

System Commodity Code (HS codes) of the United Nations and then further divided by country or region. To obtain industry-specific REER index, we reorganise the two-digit HS codes into 19 industries. Table 2 shows the codes of the 19 industries used in this paper and their corresponding HS codes.

We then conduct a correlation analysis between the monthly changes in the REER index of each of the 19 industries and those of the aggregate REER index (see Table 3). Column 2 of Table 3 shows the correlation coefficients between the monthly changes of the aggregate export weight REER index and those of the industry-specific export weight REER index. Column 3 of Table 3 shows the correlation coefficients between the monthly changes of the aggregate export-import weight REER index and those of the industry-specific export-import weight REER index.

Table 3: Correlation between Aggregate REER and Industry-Specific REER (Feb. 1995 to Sept. 2006)

Industry Code	Correlation Coefficients for Export Weight	Correlation Coefficients for Trade Weight REER
C27	0.72	0.48
C29	0.77	0.95
C38	0.83	0.93
C39	0.81	0.88
C40	0.98	0.99
C47	0.74	0.92
C54	0.77	0.71
C60	0.90	0.81
C64	0.89	0.79
C70	0.97	0.91
C72	0.84	0.90
C73	0.95	0.94
C74	0.81	0.93
C84	0.96	0.98
C85	0.99	0.99
C87	0.95	0.96
C90	0.96	0.92
C94	0.88	0.95
C95	0.95	0.95

The REER indices of industries C40, C70, C73, C84, C85, C87, C90 and C95 exhibit trends very close to the aggregate REER index. On the other hand, industries C27 and C54 record relatively varied trends from the aggregate REER index. These results indicate that an industry's price competitiveness in international markets is to a large extent affected by the structure of its export-import destinations.

We further divide the time series of REERs into three periods: (1) from February 1995 to June 1997, before the outbreak of the Asian currency crisis, (2) from July 1997 to March 1998, during the Asian currency crisis, and (3) from April 1998 to September 2006, after the end of the Asian currency crisis. We measure the standard deviations of the monthly changes in export-import REERs in each period, and use them to analyse the differences in REER volatility among the industries, as well as comparing them to the volatility of Taiwan dollar exchange rates against the US dollar (see Table 4).

Table 4: Volatility of Aggregate REER and Industry-Specific REER

Industry Code	Feb. 1995 ~ Sept. 2006	Feb. 1995 ~ June 1997	July 1997 ~ Mar. 1998	Apr. 1998 ~ Sept. 2006
C27	2.64	0.70	7.47	2.04
C29	1.04	0.92	2.23	0.91
C38	1.07	1.14	1.46	1.02
C39	0.89	0.91	1.25	0.85
C40	0.94	0.93	1.46	0.90
C47	1.05	0.86	2.06	0.99
C54	1.08	0.98	2.01	1.01
C60	0.89	0.80	1.33	0.87
C64	1.06	1.05	1.51	1.02
C70	1.16	1.23	1.75	1.08
C72	0.94	0.98	1.36	0.89
C73	0.91	0.83	1.29	0.89
C74	0.91	0.87	1.51	0.86
C84	1.00	0.99	1.48	0.95
C85	0.86	0.75	1.67	0.79
C87	1.15	1.20	1.43	1.11
C90	1.10	1.20	1.30	1.05
C94	0.91	0.83	1.25	0.89
C95	0.95	0.91	1.31	0.91
Aggregate	0.90	0.84	1.50	0.86
TWD/US	1.47	1.10	3.20	1.26

Note:Volatility is measured by the standard deviation of monthly change rates of REER and TWD/US. TWD/US is the exchange rate of the Taiwan dollar against the US dollar.

As shown in Table 4, the volatility of nominal Taiwan dollar/US dollar exchange rates far exceeds that of the aggregate REER index. In particular, during the Asian currency crisis, the Taiwan dollar experienced volatility almost three times as high as in the preceding period, rising from 1.10% to 3.2%. Volatility of the aggregate REER index also rose from 0.84% in the first period to 1.5% in the second period. REERs usually display lower volatility than nominal exchange rates. However, the REER volatility of industry 27 is higher not only than other industries but also than nominal exchange rates.

Comparing exchange rate volatility in the three periods, we find no significant differences between the first and the third periods with the exception of industry C27. In other words, after the Asian currency crisis had passed, volatility of Taiwan dollar exchange rates and that of industry-specific REERs largely returned to normal levels. In the post-crisis period, many Asian countries have incurred greater exchange rate volatility due to a shift to floating rates or a widening of trading bands. On top of that, the running U.S. current account deficit has intensified global current account imbalances, exacerbating exchange rate volatility. Despite these facts, real Taiwan dollar exchange rates have not been significantly affected.

3. Effects of Real Exchange Rates on Returns of Industries in Taiwan

3.1 Model Specification

We choose the two-factor capital asset pricing model (CAPM), which is widely used internationally, to measure the effects of Taiwan dollar real exchange rate on the rate of returns of industries. The two-factor regression model is specified as follows:

$$(6)\quad R_{it} = \beta_{0i} + \beta_{1i} R_{mt} + \beta_{2i} DRER_{it} + \beta_{3i} D1997 + e_{it}$$

$$(7)\quad e_{it} = \rho_1 e_{it-1} + \theta_1 u_{it-1} + u_{it} \quad u_{it} \sim iid(0, \sigma_i^2)$$

e_i represents a process of ARMA(1 , 1).

R_{it} refers to the rate of returns of industry i, which is measured by the average monthly rate of returns on industry i's stock prices on the Taiwan Stock Exchange (TSE). We select 77 companies listed in the TSE, and then classify them into the 19 industries shown in Table 2 according to these companies'

product lines. The method used to calculate the TSE composite weighted stock price index is applied to produce the individual stock price indices of the 19 industries. The industry-specific rate of return is represented by the monthly changes of an industry's stock price index.

R_{mt} is the market rate of return, which is measured by the monthly rate of return on the TSE composite weighted stock price index.

$DRER_{it}$ refers to change rate of real exchange rate. To examine the effects of real exchange rates on industries, we will use four different sets of real effective exchange rate (REER) indices, i.e. the two sets of aggregate REER indices and two sets of industry-specific REER indices explained in Section 2. These are defined as follows:

$DRER\_X_i$ refers to change rate on the industry-specific export weight REER index.

$DRER\_T_i$ refers to change rate on the industry-specific export-import weight REER index.

DRER_X refers to change rate on the aggregate export weight REER index.

DRER_T refers to change rate on the aggregate export-import weight REER index.

D1997 is a dummy variable representing the Asian currency crisis, which equals 1 from July 1997 to March 1998. This variable is used to assess how the large swings in the exchange rates of Asian currencies affect Taiwan's industries.

β_1 is the market beta, or the influence of stock market risk on specific industries.

β_2 is real exchange rate exposure of specific industries.

β_3 is the impact of large exchange rate swings on specific industries during the Asian currency crisis.

3.2 Data Source Description

Statistic observations in this paper range from January 1995 to September 2006 in monthly frequency. The stock prices of 77 companies listed in the TSE

and the TSE composite weighted stock price index are obtained from the database of the Taiwan Economic Journal. We use these companies' stock prices to construct 19 industry stock price indices weighted by the market value of the listing companies. Two sets of aggregate REER indices and 38 sets of industry-specific REER indices are compiled in this research.

3.3 Regression Estimation Results

Regression estimation results using industry-specific export weight REERs as explanatory variables are shown in Table 5-1. The results with industry-specific export-import weight REERs as explanatory variables are in Table 5-2. The results with aggregate export weight REERs and aggregate export-import weight REERs as explanatory variables are shown in Table 5-3 and 5-4, respectively.

The regression estimation results indicate that only a few industries are susceptible to real exchange rate variation. For instance, industry C27 in Table 5-2 exhibits a positive correlation between appreciation of the domestic currency and the rate of return. This result is in line with expectations. Industry C27 consists of only one company, Formosa Petrochemical Corporation. The company imports oil as raw material of its commodities, which are sold in domestic markets as semi-products or for final consumption. Appreciation of Taiwan dollar real exchange rates reduces its production costs, helping to raise the rate of return. Industry C90 is also positively correlated to domestic currency appreciation. A high-technology industry, industry C90 features high international competitiveness and fast growth. Some of the companies' production bases are located overseas. Therefore, Taiwan dollar appreciation does not negatively affect this industry's rate of return.

Industries prone to be negatively affected by Taiwan dollar appreciation are industries C29 (Table 5-4), C40 (Table 5-2) and C84 (Table 5-1). Prices of their products are determined in international markets, which make it difficult to transfer the cost of domestic currency appreciation. Their rate of return tends to decline when Taiwan dollar appreciates.

The regression coefficients of dummy variable D1997 show that most of Taiwan's industries were mildly hurt by the Asian currency crisis. However, certain industries, such as industries C60 and C64, benefited substantially during the period. Both of them are labour-intensive traditional industries that export most of their products. Due to relatively high domestic wages and Taiwan dollar appreciation, they had continually moved their production bases to countries where

labour is cheaper. Therefore when Asian currencies depreciated sharply during the crisis, they benefited from lower production costs.

To sum up the regression estimation results, most of Taiwan's industries are little affected by real exchange rate variation. Most of them are slightly negatively affected by Taiwan dollar appreciation and very few are beneficiaries. This result reflects Taiwan's export-oriented industrial structure.

Moreover, the contagion effect led the Taiwan dollar to depreciate significantly along with other Asian currencies during the Asian currency crisis. For most of Taiwan's industries, domestic currency depreciation helps reduce production costs and raise profits. This helped minimise the damage caused by the Asian currency crisis on Taiwan's industries as a whole, as supported by the regression result of the dummy variable D1997.

4. Enterprises' Strategies in Response to Exchange Rate Volatility

Why are most of Taiwan's industries little affected by real exchange rate volatility? This may be closely related to the exchange rate hedging strategies adopted by enterprises over the years. To find out the answer, we visited more than 30 enterprises in Taiwan, all of them leading firms in their respective industries, and inquired how they hedge exchange rate risk. Based on our interviews with the financial officers of these enterprises, the following three measures are important:

1. Adopting natural exchange rate risk averting financial operations
   Many companies, especially in the electronics and information industry, try to raise the foreign currency accounts receivable and accounts payable in their assets and liabilities. These companies set up overseas subsidiaries. Overseas subsidiaries quote in US dollars when buying goods from other Taiwan-based companies. The parent company also quotes in US dollars when purchasing from overseas subsidiaries and receives US dollars when exporting products to other countries. Setting up overseas subsidiaries is an important means to reduce the differences between foreign currency accounts receivable and accounts payable. Taiwan's exporters have become so accustomed to this practice that local suppliers increasingly quote in US dollars in domestic markets.

2. Using exchange rate derivatives
   The most commonly used exchange rate derivatives are foreign exchange forwards and options. These financial instruments help close the gap between foreign currency accounts receivable and accounts payable and avert the exchange rate risk of foreign currency working capital.

3. Expanding overseas investment continually
   (i) Moving the production base for less competitive products to developing countries
   This may, on the one hand, reduce production costs and raise competitiveness, and on the other hand, increase overseas accounts payable, such as wages paid to overseas workers and purchases made overseas. Overseas companies borrow in foreign currencies and use the foreign currency income from exports to repay borrowings. The profits come from their oversea subsidiary are thus insulated from Taiwan dollar exchange rate volatility.
   (ii) Raising the efficiency of utilising domestic resources
   Producing higher value added products in Taiwan and upgrading domestic industries help weather the impacts of Taiwan dollar volatility.

5. Exchange Rate Stabilisation Policy Reduces Risk Faced by Enterprises

In addition to the effective response strategies adopted by enterprises, the dynamic exchange rate stabilisation policy of Taiwan's central bank also helps to lessen the impact of exchange rate volatility on enterprises.

Taiwan is a highly open economy marked by completely free external trade and capital movements. Exports greatly affect Taiwan's final absorption. A decline in exports often leads to a decline in the economy. To sustain economic growth, Taiwan's central bank adopts a flexible exchange rate policy conducive to continuous export expansion. This is called the policy of dynamic exchange rate stability.

The dynamic exchange rate stability policy of Taiwan's central bank is marked by two features:

1. In the short term, the central bank aims to maintain stability in the foreign exchange market and avoid excessive exchange rate volatility. From the perspective of partial equilibrium, the exchange rate is determined by market

demand and supply. However, in the short term, the exchange rate may be affected by psychological expectations, which are often self-fulfilling, and became more volatile than can be explained by economic fundamentals. To avoid the negative effects of exchange rate volatility on the real economy, Taiwan's central bank may step in to maintain stability in the market when seasonal, irregular factors or irrational expectations results in excessive exchange rate volatility.[1]

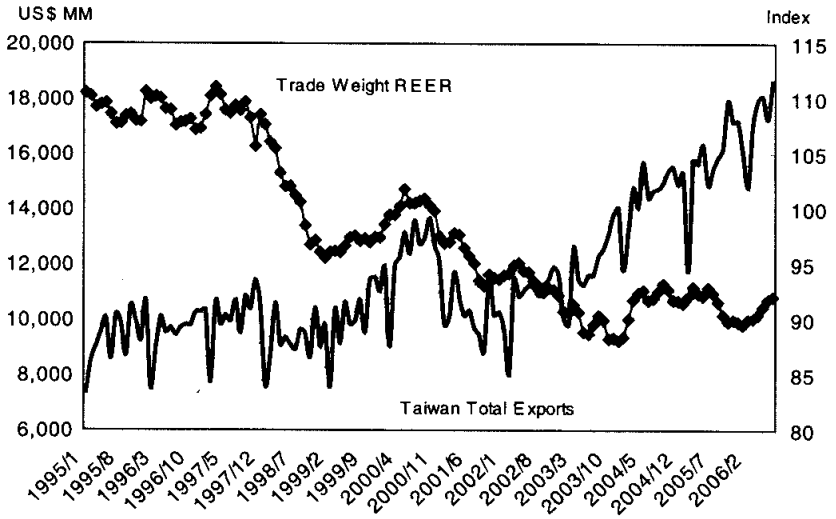
2. In the long term, as real exchange rates adjust in accordance with economic fundamentals, Taiwan's central bank cannot always adopt a leaning-against-the-wind approach. It is textbook common sense that an explicit exchange rate band announced by the central bank, such as a US dollar peg, helps smooth export and import volatility and stabilise the real economy. However, in the context of free international capital movements, a fixed change rate regime risks losing monetary policy independence. In case of market imbalance, it is also difficult to adjust the exchange rate band and fine-tune demand and supply to restore stability in the foreign exchange market. It is, therefore, important to acknowledge the fact that a highly open economy faces unpredictable external shocks from trade and capital movements at any time, all of which may greatly affects real economy activities. In theory, real exchange rates that adjust with economic fundamentals are conducive to stability of the real economy. This is referred to as the long-term dynamic exchange rate stability policy of Taiwan's central bank.

The long-term trend of the Taiwan dollar real exchange rate is counter-cyclical. As shown in Charts 2-1 and 2-2, when exports experience a slowdown in growth or a decline, US dollar supply from export income will decrease and so the Taiwan dollar REER index will fall. Conversely, when exports grow steadily, Taiwan dollar will appreciate on increasing supply of US dollars, causing the Taiwan dollar REER index to rise.

As mentioned earlier, Taiwan is an export-oriented economy. When export growth decelerates or falls to negative territory, a depreciation of real Taiwan dollar exchange rates help offset local industries' loss from declining profitability. Hence, a counter-cyclical exchange rate policy, which adjusts to cyclical changes in a timely manner, is conducive to reducing corporate risk.

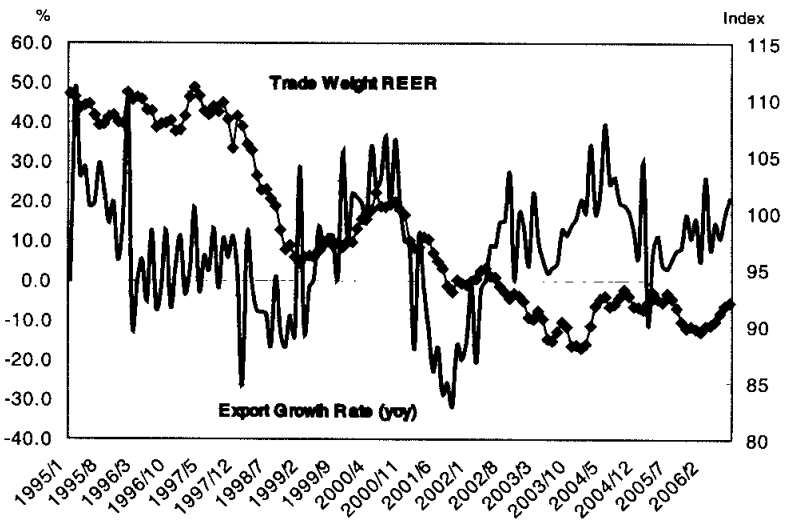
1. Referring to "The Quarterly Review of the Central Bank of the Republic of China (Taiwan), No. 1, Vol. 27, pp. 1-8".

Chart 2-1: Taiwan REER vs. Total Exports



Exchange rate fluctuation has such a limited impact on Taiwan industries' profitability because of two-fold reasons: the risk averting strategies adopted by enterprises and the stabilisation policy of monetary authorities. It is therefore inadequate to conclude from the empirical result in Section 3, which indicates an insignificant impact of real exchange rates on industry returns, that exchange rate stabilisation policy is unimportant to corporate management and macro-economy.

Chart 2-2: Taiwan REER vs. Growth Rate of Total Exports



Researchers have also pointed out that Taiwan's exchange rate policy helps achieve monetary targets. Hsu (2005) characterised exchange rate changes of the Taiwan dollar as counter-inflationary and counter-cyclical. When inflation exceeds targets, the central bank will allow the Taiwan dollar nominal EER to rise (i.e. appreciate) to contain inflationary pressure. In addition, when real output growth exceeds potential output growth, the Taiwan dollar nominal EER also rises to prevent over-heating. Dahl and Lo (2005) studied the case of Taiwan and concluded that monetary authorities of a small open economy that pursue price stability as its foremost objective should manage the exchange rate. Empirical evidence shows that exchange rates are an important channel that magnifies external shocks on Taiwan's prices. Therefore, effectively managing exchange rates may help insulate domestic prices from extraneous shocks transmitted through exchange rates and hence maintain price stability at home. In other words, the intervention measures adopted by Taiwan's central bank to confront excessive exchange rate volatility have been fairly effective.

6. Conclusion

It is generally assumed that small open economies are susceptible to the negative impact of exchange rate volatility on corporate profits. To measure the exchange rate exposure of Taiwan's industries, we compile industry-specific real effective exchange rate (REER) indices of 19 industries and the aggregate REER index. A regression model is then used to estimate the impact of REERs on industry returns. Our findings are summarised as follows:

The industry-specific REER index is very much affected by the industry's external trade structure, and is an adequate measurement of the exchange rate exposure of an individual industry.

In terms of real exchange rate volatility, after the Asian currency crisis, both the aggregate and industry-specific Taiwan dollar REER indices returned to the regular levels before the crisis. The global current account imbalance and Asian countries' shift to flexible exchange rate mechanisms have not affected Taiwan dollar real exchange rate volatility.

With few exceptions, most of Taiwan industries' rates of returns show an insignificant negative correlation with real exchange rate. This indicates that Taiwan is an export-driven economy.

According to our empirical results, a few industries in Taiwan were mildly hurt by the Asian currency crisis. However, some industries benefited from the large depreciation of Asian currencies. Overall, the damage caused by the Asian currency crisis on Taiwan industries was negligible.

Our interviews with enterprises show that Taiwan industries have adopted very effective strategies in responding to exchange rate volatility, largely reducing Taiwan dollar exchange rate exposure.

The central bank's policy of dynamic exchange rate stability also helps reduce enterprises' exchange rate risk. This policy may contribute to the fact that corporate returns are almost unaffected by real exchange rate fluctuation.

Lastly, the 77 sample enterprises selected for our regression analysis are all leaders in their respective industries. These large enterprises are more capable of averting exchange rate risk. Therefore, our estimation result that the fluctuations of Taiwan dollar do not significantly affect corporate returns does not necessarily apply to small and medium-sized enterprises, which are of a great number in Taiwan.

Table 5-1: Regression Estimation Results

(Sample periord: Feb. 1995 to Sept. 2006)

Industry Code	Ri	Coefficients of Explanatory Variables					
		Constant	Rm	DRER Xi	D1997	MA(1)	adj R^2
C27	R27	1.1211	-0.0611	0.7728		-0.4515	0.0578
		(2.6340)***	(-0.3483)	(0.9868)		(-2.5573)**	
C29	R29	0.6793	0.9316	0.7210	-2.4505		0.4085
		(0.8834)	(9.8683)***	(1.0685)	(-0.8141)		
C33	R33	0.7786	0.7306	0.6838	0.8076		0.3381
		(1.1159)	(8.5186)***	(0.9927)	(0.2953)		
C39	R39	0.8612	0.8631	-0.7644	-2.8517		0.4552
		(1.3356)	(10.8761)***	(-1.0620)	(-1.1194)		
C40	R40	0.4961	0.7343	-0.1150	0.2479	-0.1492	0.3481
		(0.7985)	(8.1292)***	(-0.1719)	(0.0980)	(-1.6930)*	
C47	R47	-0.1775	0.9412	-0.0137	-1.9589		0.4189
		(-0.2350)	(10.1363)***	(-0.0204)	(-0.6605)		
C54	R54	0.4098	1.0562	0.2509	-1.8602	-0.1596	0.5267
		(0.6968)	(12.5670)***	(0.4269)	(-0.7940)	(-1.8568)*	
C60	R60	0.0255	0.5148	0.2773	4.8251		0.2956
		(0.0450)	(7.4624)***	(0.4676)	(2.1797)**		
C62	R62	1.0067	1.0809	-0.5162	4.6345		0.5016
		(1.3531)	(11.8181)***	(-0.7349)	(1.5837)		
C70	R70	0.4398	0.3900	0.1232	-2.3793	-0.2062	0.1776
		(0.8455)	(4.9698)***	(0.1919)	(-1.1367)	(-2.4316)**	
C72	R72	0.8876	0.5739	0.0339	-2.7856		0.3078
		(1.5140)	(7.9591)***	(0.0570)	(-1.2049)		
C74	R74	0.1959	0.6951	0.3572	-0.3870		0.2818
		(0.2592)	(7.4731)***	(0.4538)	(-0.1286)		
C74	R74	-0.1290	0.9662	0.6142	-0.2648		0.4886
		(-0.1902)	(11.5923)***	(0.9268)	(-0.0985)		
C80	R80	-0.8118	0.6349	-0.8517	1.2345		0.4010
		(-1.5384)	(9.7382)***	(-1.6457)*	(0.5891)		
C85	R85	1.2502	1.1961	-0.2130	1.5806		0.7243
		(2.4559)**	(19.0865)***	(-0.3543)	(0.7895)		
C87	R87	0.3719	0.6387	-0.5593	3.4491		0.2789
		(0.5299)	(7.3933)***	(-0.8740)	(1.2437)		
C90	R90	2.1086	1.1402	0.6182	0.9242	-0.2307	0.4114
		(2.6231)***	(9.4451)***	(0.5736)	(0.3079)	(-2.4642)**	
C92	R92	0.1311	0.6400	-0.1171	1.7601		0.2775
		(0.1886)	(7.3943)***	(-0.1579)	(0.6338)		
C95	R95	1.3493	0.5485	-0.2341			0.1742
		(1.5051)	(4.8821)***	(-0.2514)			

Notes: 1) Sample periods for the return rates of industries C27, C90 and C95 are shorter, which begin from Mar. 2004, Mar. 1997 and Jan. 1998, respectively.

2) ***, **, * Indicate that the H_0 is rejected at 1%, 5%, 10% significant level. Numbers in ( ) express the t-value of the coefficients.

Table 5-2: Regression Estimation Results

(Sample periord: Feb. 1995 to Sept. 2006)

Industry Code	Ri	Coefficients of Explanatory Variables					
		Constant	Rm	DRER Ti	D1997	MA(1)	adj R^2
C27	R27	1.4640	-0.1246	1.1259		-0.6822	0.1541
		(5.2608)***	(-0.784)	(2.7426)***		(-5.1300)***	
C29	R29	0.4602	0.9482	-1.0067	-2.2658		0.4119
		(0.6001)	(9.9884)***	(-1.3972)	(-0.7541)		
C38	R38	0.7630	0.7174	0.7971	0.8808		0.3410
		(1.0996)	(8.30390)***	(1.2565)	(0.3226)		
C39	R39	0.9029	0.8598	-0.5036	-2.7015		0.4527
		(1.4017)	(10.8222)***	(-0.7133)	(-1.0596)		
C40	R40	0.3964	0.7496	-1.1215	-0.0605	-0.1561	0.3595
		(0.6480)	(8.2776)***	(-1.5560)	(-0.0246)	(-1.7592)*	
C47	R47	-0.2166	0.9423	-0.2696	-1.8960		0.4195
		(-0.2857)	(10.1526)***	(-0.3893)	(-0.6401)		
C54	R54	0.4020	1.0557	0.1743	-1.9160	-0.1569	0.5264
		(0.6795)	(12.5480)***	(0.2855)	(-0.8154)	(-1.8283)*	
C60	R60	0.0186	0.5145	0.2723	4.8244		0.2955
		(0.0329)	(7.45012)***	(0.4440)	(2.1775)**		
C64	R64	1.0013	1.0806	-0.5321	4.6681		0.5019
		(1.3459)	(11.8186)***	(-0.7814)	(1.5980)		
G70	R70	0.4200	0.3946	-0.0943	-2.4370	-0.2037	0.1776
		(0.8109)	(4.9956)***	(-0.1804)	(-1.1695)	(-2.3963)**	
C72	R72	0.8825	0.5742	-0.0230	-2.8082		0.3078
		(1.5089)	(7.9357)***	(-0.0378)	(-1.2165)		
C73	R73	0.2001	0.6935	0.4305	-0.3831		0.2822
		(0.2652)	(7.4441)***	(0.5286)	(-0.1280)		
C74	R74	-0.1814	0.9664	0.1470	-0.6353		0.4856
		(-0.2669)	(11.5208)***	(0.2022)	(-0.2383)		
C84	R84	-0.7498	0.6289	-0.3360	1.6965		0.3909
		(-1.4109)	(9.5405)***	(-0.6458)	(0.8114)		
C85	R85	1.2038	1.2011	-0.6045	1.5971		0.7263
		(2.3748)**	(19.2251)***	(-1.0535)	(0.8065)		
C87	R87	0.4188	0.6375	-0.2938	3.6416		0.2761
		(0.5982)	(7.3428)***	(-0.4926)	(1.3159)		
C90	R90	2.2017	1.1100	1.4190	1.2646	-0.2165	0.4228
		(2.7238)***	(9.2009)***	(1.5961)	(0.4227)	(-2.2965)**	
C94	R94	0.1326	0.6394	-0.1009	1.7784		0.2775
		(0.1907)	(7.4091)***	(-0.1338)	(0.6420)		
C95	R95	1.3334	0.5506	-0.3687			0.1749
		(1.4894)	(4.8980)***	(-0.3820)			

Table 5-3: Regression Estimation Results

(Sample periord: Feb. 1995 to Sept. 2006)

Industry Code	Ri	Coefficients of Explanatory Variables					
		Constant	Rm	DRER X	D1997	MA(1)	adj R^2
C27	R27	1.1166	-0.0647	0.2018		-0.3935	0.0303
		(2.3470)**	(-0.3618))	(0.2241)		(-2.1155)**	
C29	R29	0.4735	0.9409	-0.9672	-2.9705		0.4090
		(0.6150)	(9.9279)***	(-1.1253)	(-0.9764)		
C38	R38	0.7793	0.7258	0.6338	1.0916		0.3365
		(1.1123)	(8.4171)	(0.8104)	(0.3943)		
C39	R39	0.8612	0.8631	-0.7644	-2.8517		0.4552
		(1.3356)	(10.8761)***	(-1.0620)	(-1.1194)		
C40	R40	0.4007	0.7456	-0.9311	-0.1953	-0.1530	0.3547
		(0.6478)	(8.2074)***	(-1.1893)	(-0.0782)	(-1.7252)*	
C47	R47	-0.2043	0.9438	-0.2460	-2.0841		0.4192
		(-0.2698)	(10.1264)***	(-0.2910)	(-0.6966)		
C54	R54	0.3720	1.0566	-0.0495	-1.9260	-0.1552	0.5261
		(0.6273)	(12.4489)***	(-0.0661)	(-0.8056)	(-1.8136)*	
C60	R60	0.0303	0.5123	0.4456	4.9251		0.2970
		(0.0540)	(7.4178)***	(0.7114)	(2.2213)**		
C64	R64	0.9916	1.0862	-0.6174	4.4922		0.5017
		(1.3289)	(11.8267)***	(-0.7412)	(1.5236)		
C70	R70	0.4341	0.3910	0.0697	-2.3866	-0.2057	0.1774
		(0.8325)	(4.9777)***	(0.1017)	(-1.1267)	(-2.4256)**	
C72	R72	0.9052	0.5721	0.1818	-2.7045		0.3082
		(1.5395)	(7.9060)***	(0.2770)	(-1.1642)		
C73	R73	0.2444	0.6911	0.8433	-0.2217		0.2860
		(0.3249)	(7.4658)***	(1.0043)	(-0.0746)		
C74	R74	-0.1760	0.9662	0.1649	-0.5631		0.4856
		(-0.2580)	(11.5112)***	(0.2166)	(-0.2090)		
C84	R84	-0.8097	0.6317	-0.8082	1.3813		0.3973
		(-1.5262)	(9.6731)***	(-1.3645)	(0.6589)		
C85	R85	1.2618	1.1949	-0.1175	1.6069		0.7241
		(2.4813)**	(19.0914)***	(-0.2070)	(0.7998)		
C87	R87	0.3945	0.6372	-0.4334	3.5600		0.2764
		(0.5603)	(7.3546)***	(-0.5515)	(1.2799)		
C90	R90	2.0538	1.1531	0.1188	0.6708	-0.2410	0.4098
		(2.5829)**	(9.6070)***	(0.1121)	(0.2254)	(-2.5810)**	
C94	R94	0.1160	0.6402	-0.2395	1.7223		0.2779
		(0.1666)	(7.4715)***	(-0.3082)	(0.6261)		
C95	R95	1.2259	0.5583	-1.1673			0.1835
		(1.3738)	(5.0040)***	(-1.1046)			

Table 5-4: Regression Estimation Results

(Sample periord: Feb. 1995 to Sept. 2006)

Industry Code	Ri	Coefficients of Explanatory Variables					
		Constant	Rm	DRER_T	D1997	MA(1)	adj R^2
C27	R27	1.1229	-0.0603	0.0483		-0.3810	0.0288
		(2.3059)**	(-0.3353)	(0.0512)		(-2.0342)**	
C29	R29	0.4349	0.9489	-1.3587	-2.7569		0.4151
		(0.5685)	(10.0409)***	(-1.6432)*	(-0.9194)		
C38	R38	0.7872	0.7226	0.7335	0.9177		0.3379
		(1.1261)	(8.3685)	(0.9709)	(0.3350)		
C39	R39	0.8515	0.8670	-0.8860	-2.6422		0.4572
		(1.3245)	(10.9186)***	(-1.2752)	(-1.0488)		
C40	R40	0.3777	0.7529	-1.1804	0.0303	-0.1535	0.3595
		(0.6141)	(8.2890)***	(-1.5517)	(0.0123)	(-1.7304)*	
C47	R47	-0.1963	0.9437	-0.1845	-1.9949		0.4191
		(-0.2595)	(10.0999)***	(-0.2257)	(-0.6729)		
C54	R54	0.3455	1.0609	-0.2945	-1.9778	-0.1566	0.5267
		(0.5849)	(12.4690)***	(-0.4045)	(-0.8396)	(-1.8336)*	
C60	R60	0.0545	0.5078	0.6842	4.8393		0.3010
		(0.0975)	(7.3561)***	(1.1326)	(2.2093)**		
C64	R64	0.9560	1.0926	-0.9667	4.6071		0.5049
		(1.2869)	(11.9075)***	(-1.2041)	(1.5824)		
C70	R70	0.4235	0.3926	-0.0245	-2.4353	-0.2051	0.1774
		(0.8125)	(4.9746)***	(-0.0366)	(-1.1660)	(-2.4157)**	
G72	R72	0.9247	0.5691	0.3671	-2.7205		0.3095
		(1.5762)	(7.8532)***	(0.5789)	(-1.1832)		
G73	R73	0.2172	0.6914	0.6342	-0.5269		0.2839
		(0.2887)	(7.4396)***	(0.7799)	(-0.1787)		
C74	R74	-0.2041	0.9690	-0.0827	-0.6675		0.4854
		(-0.2996)	(11.5151)***	(-0.1123)	(-0.2500)		
C84	R84	-0.7577	0.6283	-0.3729	1.7247		0.3909
		(-1.4223)	(9.5486)***	(-0.6476)	(0.8261)		
C85	R85	1.2107	1.2014	-0.5848	1.5421		0.7263
		(2.3933)**	(19.2268)***	(-1.0696)	(0.7778)		
C87	R87	0.4137	0.6365	-0.2782	3.7272		0.2755
		(0.5880)	(7.3236)***	(-0.3658)	(1.3517)		
C90	R90	2.1795	1.1307	1.0285	0.8062	-0.2235	0.4148
		(2.6839)***	(9.3947)***	(0.9944)	(0.2723)	(-2.3823)**	
C94	R94	0.1486	0.6371	0.0455	1.8578		0.2774
		(0.2137)	(7.4155)***	(0.0606)	(0.6815)		
C95	R95	1.2860	0.5536	-0.6741			0.1771
		(1.4334)	(4.9371)***	(-0.6455)			

References

1. Dahl, Christian. M. and Melody Lo, (2005), "Assessing Exchange Rate Pass-Through: A New Empirical Approach", Manuscript, Purdue University

2. Dominguez, K. M. E. and L. L. Tesar, (2006), "Exchange Rate Exposure", *Journal of International Economics,* 68, pp 188-218.

3. Fung, S. S., Marc Klau, Guonan Ma and Robert McCauley, (2006), "Estimation of Asian Effective Exchange Rates: a Technical Note", *BIS Working Papers*, no 217, October.

4. Goldberg, Linda S., (2004), "Industry –Specific Exchange Rates for the United States", *Federal Reserve Bank of New York Economic Policy Review,* May.

5. Hsu, Chien Ting, (2005), "The Exchange Rate Management and Exchange Rate Reaction Function of Taiwan", *Quarterly Review of the Central Bank of the Republic of China (Taiwan)* 27 (3), pp 79-96.

6. Klau, Marc and S. S. Fung, (2006), "The New BIS Effective Exchange Rate Indices", *BIS Quarterly Review*, March 2006, pp 51-65

7. Lee, Jaerang and Byung Chang Yi, (2006), "Industry Level Real Effective Exchange Rates for Korea", *The Bank of Korea Economic Paper* No. 73, August.

8. Perng, Fai Nan, (2005), "Responses to the Impacts of Taiwan Dollar Appreciation on Industry Viability and Development", *Quarterly Review of the Central Bank of the Republic of China (Taiwan)* 27 (3) 27 (1), pp 1-8.

9. Wu, R.I. and Tseng, M. S., (2003), "Taiwan's Information Technology Industry", in Jomo K. S. (ed.) Manufacturing competitiveness in Asia, Routledge Curzon, New York.

CHAPTER 9

ADJUSTMENT OF THE FINANCIAL AND CORPORATE SECTOR TO THE RISE IN EXCHANGE RATE VOLATILITY AND THEIR POLICY IMPLICATIONS: THE CASE OF THAILAND

by Jirapol Mahuttikarn[1]

1. Introduction

With the current configuration of global imbalances and the globalisation in international trade and investment, FX risk is not only among the major contributing factors that impacts the economy, but also affects the wealth and competitiveness of Thai firms. The fact that the Thai economy has over the recent years become more open to trade, as reflected by higher share of exports and imports to GDP, implies that the Thai economy continues to be faced with FX risk, especially through the current account transactions. Although the Thai economy, at the macro level, is becoming more resilient to external vulnerability, true resilience against FX risk could only occur if economic units at the micro level recognise the exposure and develop an effective risk management system to cope with potential currency fluctuations.

This paper will first assess the impact of FX volatility on each industry in Thailand by examining the industry-specific exchange rate indexes. The paper will then explore the level of exposure mismatch for the Thai corporate sector by using corporate level exposure data. The last part of this paper will explore current FX risk management at the corporate level by incorporating information from corporate survey which was conducted to learn more on the impact of FX risk, the methods and instruments they employ to manage risks as well as the impediments that may prevent them from effective hedging practices.

1. Jirapol Mahuttikarn is Senior Economist in the Monetary Policy and Strategy Team, Monetary Policy Group, at the Bank of Thailand. The views expressed in this paper are the author's and may not represent those of the Bank of Thailand. The author is grateful to Yunyong Thaicharoen, Punpilas Ruangwisut, and Aleena Pitisant for their constructive comments and helpful suggestions, and to Sureeporn Wananupan who supplied the data for this paper.

2. Industry-Specific Exchange Rate Indexes

Because each industry has different trading partners and the export destinations of each industry can differ dramatically from the import sources of products of that same industry, we will try to examine the distinctions of exchange rate volatility impact on each industry in this Section. For this purpose, we construct the industry-specific exchange rate indexes (Goldberg, 2004) that reflect industry-by-industry distinctions by using the weights of Thai trading partners in the exports and imports of each Thai industry in 2004-2005 and compare these indexes to the aggregate index that use the weights of trading partners in the total international trade activity of the entire economy. Three industry-specific real exchange rate indexes are constructed, i.e., using the weights of each partner currency (country c) of the shares of that partner c in the Thai exports or imports of that specific industry i. The formulas for these indexes are provided in equation 1-3:

(1) Export-weighted: $xer_t^i = \sum_c w_t^{ic} * rer_t^c$, where $w_t^{ic} = \frac{x_t^{ic}}{\sum_c x_t^{ic}}$

(2) Export-weighted: $mer_t^i = \sum_c w_t^{ic} * rer_t^c$, where $w_t^{ic} = \frac{m_t^{ic}}{\sum_c m_t^{ic}}$

(3) Trade-weighted: $ter_t^i = \sum_c \left(\left(.5\frac{x_t^{ic}}{\sum_c x_t^{ic}} + .5\frac{m_t^{ic}}{\sum_c m_t^{ic}} \right) * rer_t^c \right)$

where rer_t^c are the bilateral real exchange rates of each Thai trading partner c. The bilateral real exchange is constructed by multiplying the country's nominal exchange rate by the ratio of the consumer prices indexes of Thailand against that partner country. For any industry indexed by i, these constructions define the export real exchange rate xer_t^c, the import real exchange rate mer_t^c, and the trade average real exchange rate ter_t^c.

Table 2.1: Correlation between Alternative Industry Exchange Rate Series

Measured contemporaneous correlation (corr)	Number of industries in each correlation grouping out of 27 industries: xer^i with Broad REER (1)	mer^i with Broad REER (2)	ter^i with Broad REER (3)
corr >= 0.90	13	10	14
0.90> corr >= 0.80	7	9	6
0.80> corr >= 0.70	2	3	3
0.70 > corr	5	5	4

Source: Author's calculations.

The three data columns report the number of industries in any size range of correlations between:
(1) an industry's export exchange rate and the broad index,
(2) an industry's import exchange rate and the broad index,
(3) an industry's trade-weighted exchange rate and the broad index,
Correlations use monthly data from 2000 – October 2006.

Table 2.1 presents three sets of correlation between various industry-specific exchange rate indexes and aggregate broad REER index. Compared with import index series, the export index series are more highly correlated with the broad index. These correlations exceed 0.90 for 13 industries and exceed 0.8 for additional 7 industries. This result reflects the fact that most of Thai goods are exported to major countries such as U.S., Japan, and euro-area countries, for which currencies of these countries account for a major share in the Broad REER index, whereas a large part of Thai imports comes from China and regional countries. The trade-weighted index, constructed using both export and import shares in partner weights, tracks the broad series more closely than the indexes that use either export or import weights alone.

Table 2.2: Percentage Change in Real Trade Weighted Exchange Rate from December 2000

Industry	xer^i	mer^i	ter^i	Broad REER
Fish, fresh and frozen	22.5	5.5	13.7	13.5
Telecommunication equipments	20.1	7.1	13.4	13.5
Petroleum products	19.6	17.2	18.4	13.5
Chicken, fresh and frozen	4.2	12.2	8.1	13.5
Sugar	-0.4	-14.6	-7.8	13.5
Vehicles, parts, and accessories	-5.6	24.3	8.3	13.5

Table 2.2 presents the percentage change in industry-specific exchange rate indexes and broad REER index since December 2000. The latest data in October 2006 shows that the current broad REER index appreciated 13.5 per cent from that in December 2000. However, the study of industry-specific exchange rate indexes indicates that the impact of exchange rate movements is different for each industry. The industries that lose more competitiveness are fish, fresh and frozen and telecommunication equipments. Their export indexes appreciated 22.5 and 20.1 per cent, respectively, from December 2000, whereas their import indexes appreciated only 5.5 and 7.1 per cent. This is because the major export market for these industries is Japan, for which the currency has the weakest value in the REER basket compared to that in December 2000. The industries that gain competitiveness are vehicles, parts, and accessories and sugar because their major export market are euro-area countries and Australia, for which their currencies have the strongest value in the REER basket.

3. The Study of Mismatch Using Individual Firm's Data from the Corporate Sector

As businesses with trade and foreign investment are exposed to risks from foreign exchange exposure, this Section will focus on the study of imbalances or 'mismatch' from international trade due to the disparity between foreign currency income and expense of firms. At the outset, this Section will evaluate the structure of firms with exposure to changes in the exchange rate in the aggregate, using the following firm data:

1. The 2005 international trade of juristic persons data of 43,344 firms from the export/import database of the Customs Department.

2. The 2005 external debt data of 1,977 firms from the external debt survey of non-bank businesses in 2005, data restricted to foreign currency debt (does not include debt denominated in Thai baht), and from the transaction report of domestic borrowing in foreign currency.

3. The 2004 International Investment Position (IIP) data of 1,204 firms from the Bank of Thailand.

Table 3.1: Firm Data Divided According to the Types of Exposure

Firm data	No. of firms
Export firms	23,898
Imports firms	35,361
Firms with foreign currency debt	1,977
Firms with foreign assets	1,025
Firms with foreign liabilities	983

The international trade mismatch is calculated by finding the difference between the values of exports and imports of each company and dividing that amount by the sum of exports and imports of each firm.

$$\textbf{Mismatch} = (X - M) / (X + M)$$

Where X = value of exports (million US dollars) and M = value of imports (million US dollars).

The ratio shows the extent of exposure to exchange rate risks of individual firms. The ratio ranges from –1 to 1, with –1 signifying that the firm only engages in imports and 1 signifying that the firm only engages in exports. If the export firm imports raw materials or if the import firm has income arising from exports in comparable proportions, the mismatch ratio will decline in absolute terms. As the ratio approaches 0, the trade mismatch of the firm will decline, indicating that the impact of the exchange rate change will also decline due to the canceling out of the effects in some parts. For example, a baht depreciation will cause the export value to rise but at the same time, will also increase the cost of capital in baht for imports.

From the mismatch findings, the following summary can be drawn for each firm category:

A. Export/Import Firms

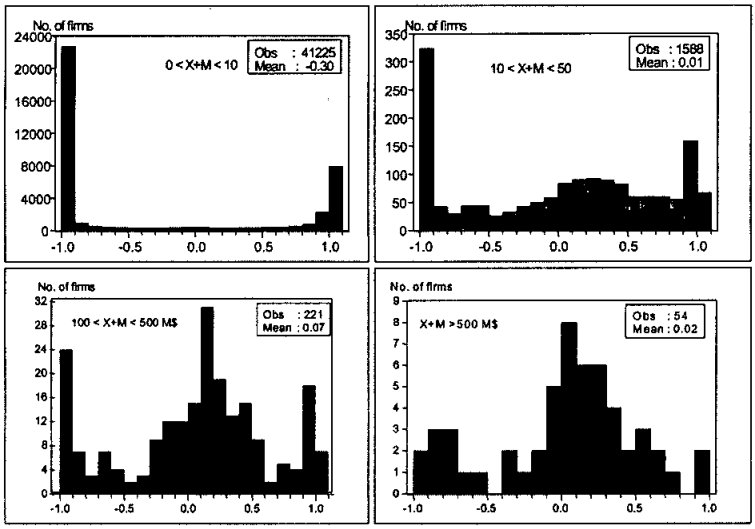
The mismatch ratio of 43,344 export/import firms using trade value data (sum of the export and import values) shows that as the size of the firm increases, the ratio approaches 0, which signifies that larger firms with high trade value tend to also import raw materials at higher costs. Therefore, as the exchange

rate changes, the impact on the firm will be lower due to the canceling out of the effects in some parts.

Table 3.2: Mismatch Ratio of Export/import by Firm Size

Type of firms	No. of firms	Average ratio (X – M) / (X + M)
No. of firms with exports or imports	43,344	-0.29
Trade value :		
0-10 USD	41,225	-0.29
10-50 USD	1588	0.01
50-100 USD	255	0.05
100-500 USD	221	0.07
More than 500 USD	54	0.02

Chart 1: Mismatch Ratio of Export/Import Firms by Export Value



2.]

B. Export/Import Firms with Foreign Investment

Of the export/import firms, the mismatch ratio is lower for firms with foreign investment than for domestic firms. This outcome reflects the size of the firm, as larger firms tend to have more foreign direct investment. Although export/ import firms with foreign direct investment only account for 0.1 percent of total export/import firms, exports amount to 31 percent of total export value, while

imports amount to around 30 percent of total import value. In addition, the Thai export component increasingly changed from one agriculture-based to manufacturing-based, particularly for high technology goods such as electronics and motor vehicles and parts. These tend to receive foreign investments and have high export value, and use a high proportion of raw materials from abroad. This signifies that export/import firms with foreign investments will be less affected by the exchange rate change than firms with no foreign investment.

Table 3.3: Mismatch Ratio of Export/Import Firms with Foreign Investment

	No. of firms	Share of country's total exports	Share of country's total imports	Average ratio (X – M) / (X + M))
Firms with foreign direct investment	735	31.0	29.8	-0.09
Firms without foreign direct investment	42,609	69.0	70.2	-0.29

C. Export/import Firms with Foreign Currency Debt

This study does not find any concrete evidence supporting the hypothesis that export/import firms, in particular net export firms, borrow in foreign currency to mitigate exchange rate risks by providing a natural hedge. There is no significant difference between the mismatch ratio between export/import firms with external debt and firms without external debt, indicating that the majority of firms borrow from abroad due to the source of fund or financial cost considerations, such as lower interest rates.

Table 3.4: Mismatch Ratio of Export/import Firms with Foreign Currency Debt

	No. of firms	Share of country's total exports	Share of country's total imports	Average ratio (X – M) / (X + M))
Firms with foreign currency debt	1,259	21.1	27.3	-0.22
Firms without foreign currency debt	42,085	78.9	72.7	-0.29

By and large, it can be said that changes in the exchange rate will affect Thai imports and exports as the majority of export/import firms, both with or without external debt and those without foreign investment, have a certain level of flow mismatch. In addition, as the majority of firms are of small size, the proportion of exports to imports does not balance out. Changes in the exchange rate are therefore, an important factor influencing Thai firms to prepare for and adapt to the risks. Nonetheless, the above-mentioned data has the following limitations:

1) The data does not include the indirect exchange rate effects on the corporate sector. For example, if a private firm buys goods or services imported from another firm, the importing firm could subsequently offload the burden arising from the exchange rate change onto the buyer.

2) The data does not incorporate the service sector.

3) Some firms may belong to a business conglomerate, which on the whole, have low mismatch. However, since the study uses data of the individual firm, the result may not accurately reflect the mismatch.

4) The data does not include off-balance sheet transactions.

4. A Survey of Business Operators' Opinions on the Effects and Risk Management of Changes in the Exchange Rate

Currently, there are no databases that can evaluate the readiness of the corporate sector in preparing for risks arising from the exchange rate. Consequently, this study conducts surveys vis-à-vis the opinions of firms on the effects and risk management of changes in the exchange rate[2]. The objective is to study the impact of exchange rate changes and the various risk management practices of the private sector. This is achieved by studying firms' adaptations to exchange rate risks, both by assessing business operations and the use of financial instruments in risk management as well as the obstacles involved[3].

2. In the international arena, this type of survey has been conducted by the Conference Board to study the effects of exchange rate changes on business operations and risk management by interviewing the CEO and CFO of multinational firms in various regions in the world.

3. Further details on the survey can be found in the Annex.

Although it can be said that exchange rate changes affect every type of business, whether directly or indirectly, this study focuses on export/import firms or firms with external debt as exchange rate changes directly affects this group. In addition, they tend to have a more concrete risk management system. The 2 databases used to randomly select firms for this study are as follows:

1) The 2004 exporter and importer database of the Customs Department.

2) The 2004 external debt survey of the Bank of Thailand.

The 2 databases account for the 44,062 firms used in this survey, which can be divided into 7 groups as follows:

Group 1: Export only firms
Group 2: Import only firms
Group 3: Export/Import Firms
Group 4: Firms with foreign currency debt
Group 5: Export only firms with foreign currency debt
Group 6: Import only firms with foreign currency debt
Group 7: Export/Import Firms with foreign currency debt

Table 4.1: Firm Data Distribution According to the Types of Exposure

Type of firms	No. of firms	Exports		Imports		Foreign Currency Debt	
		Value (Million of USD)	Share (per cent)	Value (Million of USD)	Share (per cent)	Value (Million of USD)	Share (per cent)
Group 1 : Exports only	7,923	5,900					
Group 2 : Imports only	19,132			6,975	7.5		
Group 3 : Exports and imports	15,030	69,975	72.8	60,877	65.3		
Group 4 : Foreign currency debt	718					6,407	27.8
Group 5 : Exports and foreign currency debt	60	399	0.4		6.1	444	1.9
Group 6 : Imports and foreign currency debt	223			540	0.6	1,977	8.6
Group 7 : Exports, Imports and foreign currency debt	976	19,905	20.7	24,905	26.7	14,186	61.6
Total	44,062	96,179	100.0	93,297	100.0	23,014	100.0

4.1 Criteria for Choosing the Control Group in the Survey

From the 44,062 firms, 3,000 firms were randomly chosen for each of the 7 groups, with each group divided into sections of small, medium, and large firms to diversify the control group and reflect the diversity of firms' behaviour. The hypothesis is that firms of varied size or varied business scope or business type will be not be similarly affected by exchange rate changes and have different risk management practices and adaptations. Firms are divided into groups using the amount of export/import values or the value of their foreign currency debt. Specifically, only firms with export/import values greater than 25,000 US dollars in 2004 were chosen and then divided into 3 equal sections (small, medium, and large) according to the export/import values. The 21 sub-groups resulted from calculating the ratio to the total number of firms that the survey was sent to. Nonetheless, in evaluating the outcome, the firm size obtained from the survey will be considered, such as the asset value or employment, which would more effectively measure the actual size of the firm.

In all, as of the time of this article, 747 surveys have been returned, representing a 25 percent return rate of surveys sent[4].

Table 4.2: The Control Group Data Distribution by Size and Types of Exposure

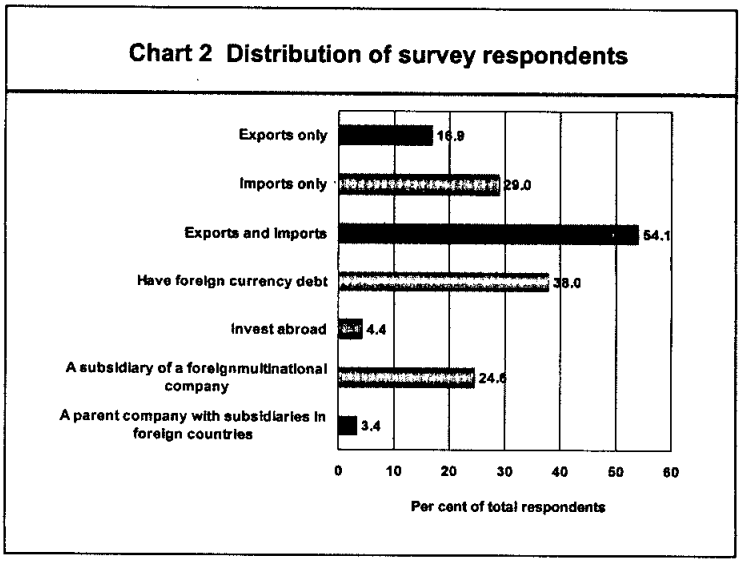
Firm group	Total firms		Firms in the control group			
	No. of firms	Share	No. of firms	Firm Size		
				Small	Medium	Large
Group 1 : Exports only	7,923	18.0	364	156	132	76
Group 2 : Imports only	19,132	43.4	545	264	199	82
Group 3 : Exports and imports	15,030	34.1	1,364	258	419	687
Group 4 : Foreign currency debt	718	1.6	218	67	58	93
Group 5 : Exports and foreign currency debt	60	0.1	36	7	10	19
Group 6 : Imports and foreign currency debt	223	0.5	109	27	31	51
Group 7 : Exports, Imports and foreign currency debt	976	2.2	364	17	46	300
Total	44,062	100.0	3,000	797	896	1,308

4. For the survey conducted by the Conference Board, 372 firms returned the survey out of 2,600 firms, a return rate of 14 percent.

Table 4.3: Survey Respondent Data Distribution by Size and Types of Exposure

Share of total firms	Small	Medium	Large	Very large
Size				
- Value of fixed assets	46.8	17.0	20.0	16.1
- No. of employees	38.5	24.8	24.3	12.4

FX Exposure level	0-20%	20-40%	40-60%	60-80%	80-100%
- Share of foreign sales to total sales	62.1	6.5	4.3	6.3	20.8
- Share of imports to production cost	53.8	13.4	12.2	9.9	10.7



4.2 Key Issues from Analysing Data of the Survey

4.2.1 Evaluation

The evaluation is as follows:

1) Calculating the average of the points of view in each question. For example, this can be done by assigning a number to each response through sequencing the order of importance from most important (4) to not important (1).

2) Calculating the ratio of respondents in each question. For example, finding the ratio of the people who answered "strongly agree" and "agree" to the total number of respondents.

The evaluation will also assess the various dimensions of the firm such as the size of the firm[5] and will test for Chi-square to verify whether separating the data according to the various dimensions of the firm will affect trade statistics[6].

As for the separation according to the firm size, the results will be presented according to the asset size. Nevertheless, the result using the number of employee criterion yields approximately the same result[7].

Furthermore, the different results obtained from the various firm size could be attributed to other aspects, such as the FX exposure of the firm, types of FX exposure (such as export, import, external debt), types of business (such as agriculture, manufacturing) or the aggregate of the various aspects. Consequently, further results will be presented using the logit or ordered logit model, simultaneously controlling for the different variables, in order to build a clear understanding of the aspects that impact or affect the size or importance of the firm in each of the questions.

5. This study will present the results by firm groups according to the asset value, as this criterion is more often used to classify firms by size than the number of employee criterion. In any case, the results using the number of employee criterion yield approximately the same results as those achieved in this article.

6. See Annex for further details on the Chi Square test results.

7. The correlation for the division into groups according to asset size and the number of employees equals 0.75.

4.2.2 Limitations of the Variables

The mismatch variable will only measure currency imbalances via the trade channel. The variables used in finding the ratio to calculate the level of mismatch consist of the export to total sales ratio and the raw material import to capital ratio. The denominators of the two variables differ, signifying that the variables may not only reflect the difference in the FX exposure level, but may also the profit margin. The best method would be to use the raw material import to total sales ratio, but this cannot be done due to data limitations. Nonetheless, this issue should not affect the result, as the equation includes variables which will help to explain the profit difference of firms in the corporate sector. Therefore, this limitation should not impact the main findings of the survey.

Table 4.4: The Variables Used in the Analysis

Type of variable	Variable	Abbreviation	Details
Firm Size	Fixed asset value	ASSET	Small=0-50, Medium=50-200, Large=200-1,000, Very large=>1,000 Million Baht
	No. of employee	EMP	Small=0-50, Medium=50-200, Large=200-1,000, Very large=>1,000 Persons
FX Exposure level	Foreign sales to total sales ratio	XTS	1 = 0-20%, 2 = 20-40%, 3 = 40-60%, 4 = 60-80%, 5 = 80-100%
	Imports to total production cost ratio	MC	1 = 0-20%, 2 = 20-40%, 3 = 40-60%, 4 = 60-80%, 5 = 80-100%
	International trade mismatch index	MISMATCH	Absolute value of (XTS-MC)
Type of firm	Exports only	XO	
	Imports only	MO	
	Exports and imports	XM	
	A subsidiary or branch of a foreign multinational company	FOR_OWN	
	A parent company with subsidiaries in foreign countries	BRA_AB	
	Invest abroad	INV_AB	
	Have foreign currency debt	FD	
Firm sector	Agricultural Sector	AGR	
	Labor Intensive Sector	LABOR	
	High-tech Sector	HITECH	
	Construction Sector	IND	
	Service Sector	SERVICE	

4.3 Results

4.3.1 The Importance and Impact of Exchange Rate Changes

Result 1: Issues related to the exchange rate has gained increasing importance in business operations.

The majority of firms feel that issues related to the exchange rate has gained increasing importance in business operations during the past 2-3 years, with 59.2 percent responding "strongly agree" and 37.4 percent responding "agree". The findings on the importance of the exchange rate on firms is consistent with the results from the Conference Board's survey as well as other studies (Marshall, 2000), which discovered that foreign firms with headquarters in emerging markets (particularly in Asia and Latin America) are of the view that the exchange rate plays a more vital role in business, compared to firms in developed countries. A key explanation could be these countries' experiences with the crisis in the past decade, which brought about the floating of the exchange rate in various countries, as well as psychological effects, still fresh in the memory of business operators in emerging markets.

It is interesting to note that the opinions regarding the exchange rate does not differ according to the size of the firm (Chart 3), reflecting the important role of the exchange rate in business, whether small or large. Chart 4 shows that the number of firms that "strongly agree" will vary according to the FX exposure to international trade ratio (measured by the export to total sales ratio or the raw material import to capital ratio), which may signify that firms that rely on exports and/or raw material imports in high proportions will be affected by exchange rate changes more that firms that rely on the domestic market for product sales or source of raw materials.

Chart 3 Firm with "Somewhat agree" and "strongly agree" on foreign exchange issues have become more Important to business operations

Per cent of total respondents

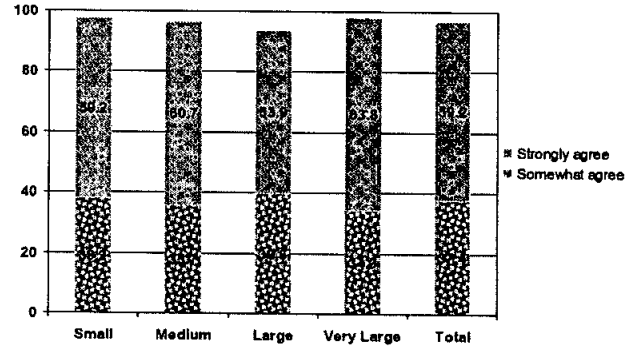
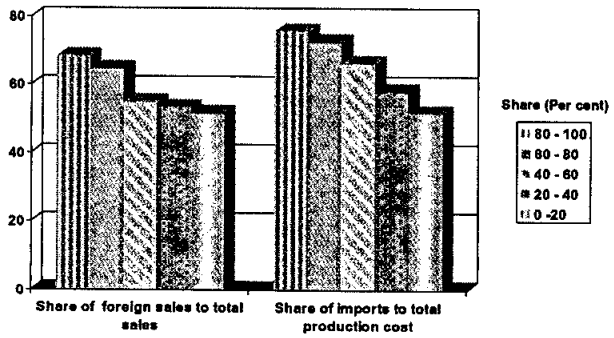


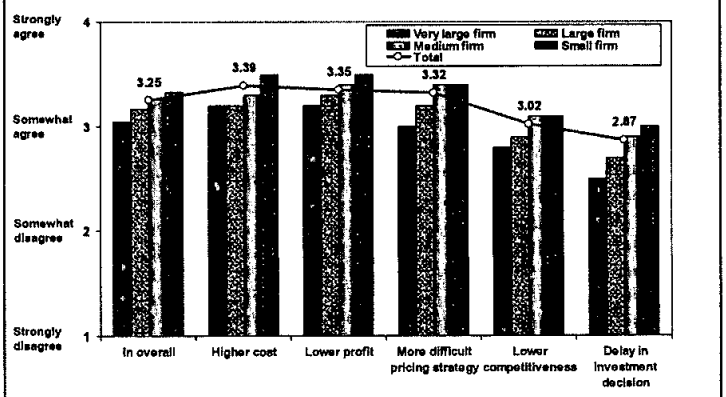
Chart 4 Firm with "strongly Agree" on foreign exchange issues have become more important to business operations

Per cent of total respondents



Result 2: Exchange rate risks cause impediments to business operations, particularly affecting competitiveness and cost of capital.

Chart 5 Firm's important difficulties arising from FX risk/volatility



Overall, the majority of firms feel that exchange rate risks/volatility causes impediments to business operations. Column 1 in Chart 5 show that the average response to the phrase "exchange rate risks cause impediments to business operations" is at 3.25, which is between "agree" (=3) and "strongly agree" (=4). In addition, the average response according to firm size is significantly different across groups (p-value of Chi-square test = 0.014), signifying that small firms are more affected by exchange rate volatility than larger firms. Nevertheless, this could be due to other reasons, such as higher FX exposure or less effective risk management. The views on risk management component will be explored later on in this paper.

As for the factors through which exchange rate volatility can create impediments to business operations, the survey showed that the top 3 factors that affects business operations most are higher cost of capital, lower profit, and increased difficulty in pricing. The average of the 3 factors are fairly similar (average of around 3.3-3.4), followed by lower competitiveness (3.0) and investment indecisiveness (2.87). In addition, for all the factors, small firms are statistically more affected than large firms.

To analyse the characteristics of the firm that will shed further light on the different impacts from the exchange rate changes, Table 4.5 shows the results from the Ordered Logit Model, with the level of agreement in ascending order (1=strongly disagree, 2=somewhat disagree, 3=somewhat agree, 4=strongly agree) as the dependent variable and the independent variable being the characteristics and general attribute of the firm previously mentioned.

The results show that smaller firms with higher imbalances in FX exposure will be statistically more affected by exchange rate risks, particularly creating more impediments to business operations for smaller firms than for large firms in all aspects. At the same time, the FX mismatch can help explain the gap between the orders of importance of all the factors except the investment slowdown, signifying that firms with a high gap between the export to total sales ratio and the raw material import to capital ratio would have a lower natural hedge and hence will be more affected by exchange rate changes.

The result from the equation also shows that when compared to firms with no direct FX exposure (no imports and exports which were used as the base in the equation), firms that import goods but does not export will be affected more by all the problem factors. As for firms that export but does not import and firms that export and import, the survey reports that the impact increases only through lower competitiveness and more difficult pricing strategy. This indicates that although export firms are not primarily affected in terms of the cost of capital, as the domestic raw materials or imported raw materials create a natural hedge which balances out the impact from the exchange rate changes. However, the impact from increased competitiveness and more difficult pricing strategy reflects the increasingly intense competition in the global export market compared to domestic competition. It is worth noting that manufacturing firms which are labour intensive, such as weaving, will be affected more by the exchange rate changes through increased competitiveness and more difficult pricing strategy than other sectors, reflecting the intense pricing competition of this sector in the global market, particularly in light of Chinese goods and countries with lower labour costs than Thailand.

Table 4.5: Impact of FX Risk/Volatility to Business Operation

	1 1.1	1.2	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5
	FX has become more important to business operation	Experienced important difficulties from FX volatility	Lower competitiveness	Higher cost	Lower profit	More difficult pricing strategy	Delay in investment decision
SIZE	0.114	-0.208 ***	-0.152 *	-0.144 *	-0.184 **	-0.241 ***	-0.279 ***
	(0.092)	(0.085)	(0.089)	(0.086)	(0.083)	(0.0880	(0.087)
MISMATCH	0.392 ***	0.143 **	0.143 **	0.104 *	0.160 ***	0.106 *	0.043
	(0.068)	(0.060)	(0.061)	(0.062)	(0.060)	(0.060)	(0.062)
XO	0.524	0.607	0.988 **	0.168	0.104	1.401 ***	0.503
	(0.478)	(0.497)	(0.425)	(0.469)	(0.478)	(0.534)	(0.450)
MO	1.349 ***	1.450 ***	1.298 ***	1.378 ***	0.827 *	1.465 ***	0.912 **
	(0.430)	(0.463)	(0.369)	(0.416)	(0.434)	(0.459)	(0.378)
XM	0.924 **	0.599	0.760 **	0.331	-0.027	1.197 ***	0.232
	(0.403)	(0.448)	(0.342)	(0.396)	(0.423)	(0.460)	(0.361)
FOR_OWN	-0.467 **	-0.366 *	-0.546 ***	-0.467 **	-0.328 *	-0.579 ***	-0.717 ***
	(0.220)	(0.219)	(0.212)	(0.216)	(0.214)	(0.210)	(0.223)
	0.263	0.328	0.425	-0.584	-0.107	0.214	-0.749 *
	(0.632)	(0.584)	(0.553)	(0.512)	(0.504)	(0.389)	(0.404)
INV_AB	0.658 *	-0.284	0.177	-0.020	0.041	-0.681 *	0.094
	(0.454)	(0.467)	(0.452)	(0.400)	(0.422)	(0.380)	(0.318)
FD	0.167	0.056	-0.126	0.185	-0.037	-0.071	0.093
	(0.203)	(0.193)	(0.193)	(0.188)	(0.188)	(0.185)	(0.189)
AGRI	0.126	-0.045	0.169	-0.422	-0.164	0.145	-0.123
	(0.398)	(0.353)	(0.350)	(0.348)	(0.336)	(0.342)	(0.329)
LABOR	-0.079	0.235	0.496 *	-0.062	0.025	0.471 *	0.296
	(0.362)	(0.315)	(0.291)	(0.313)	(0.319)	(0.321)	(0.285)
	0.023	0.241	0.201	-0.060	-0.085	0.367	0.118
	0.321	(0.280)	(0.248)	(0.271)	(0.265)	(0.265)	(0.238)
IND	-0.474	-0.431	-0.023	-0.041	-0.117	-0.533	-0.124
	0.470	(0.396)	(0.363)	(0.374)	(0.390)	(0.393)	(0.329)
Pseudo R2	0.085	0.062	0.053	0.055	0.045	0.073	0.055

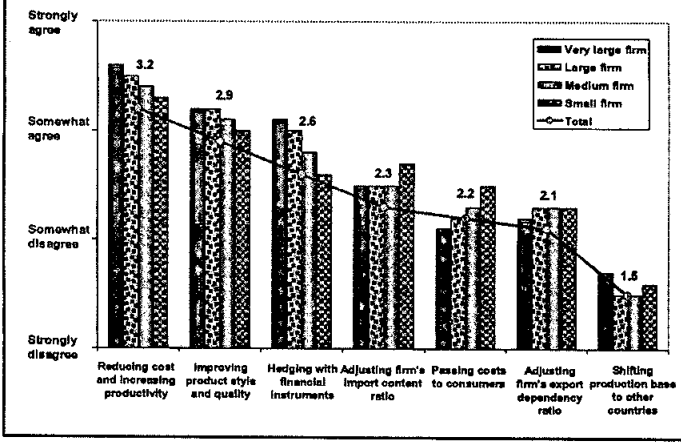
In addition, subsidiaries of multinational companies report being less affected than other groups and have lower tendency to give importance to exchange rate issues in the past 2-3 years. This could be attributed to the fact that firms in this category have better risk management systems, both in operational hedging and financial hedging, which effectively deals with impacts from the exchange rate volatility. As for Thai parent company with subsidiaries in foreign countries, data from the equation shows that this group gives more importance to exchange rate issues compared with Thai firms with no offices abroad. These firms are

also less affected by the pricing strategy, which could be due to the possibility of the relocation of their production base or the use of transfer pricing policy between firms in their network, reducing somewhat, the exchange rate pressure on export/import price.

Result 3: Thai business operators give importance to business flexibility to reduce the impact from exchange rate risks (operational hedging techniques), in particular, increasing productivity and developing product quality.

The data from this survey shows that Thai firms give importance to business flexibility to reduce the impact from exchange rate risks, particularly through increasing productivity to reduce cost as well as improving the appearance and quality of the products. The majority of firms gives more importance to both these factors and also considers operational hedging techniques, more than the use of financial instruments, which is in third place. This reflects the necessity of Thai firms to adapt to increasing pressure from international competition and is an example of economic exposure which necessitates the use of operational hedging techniques. Subsequently, in order of importance, firms prioritise the adjusting of the export dependency ratio, passing cost to consumers (pricing strategy), adjusting the import content ratio, and shifting the production base to other countries.

Chart 6 Firm's strategies in migrating the impact of FX exposure



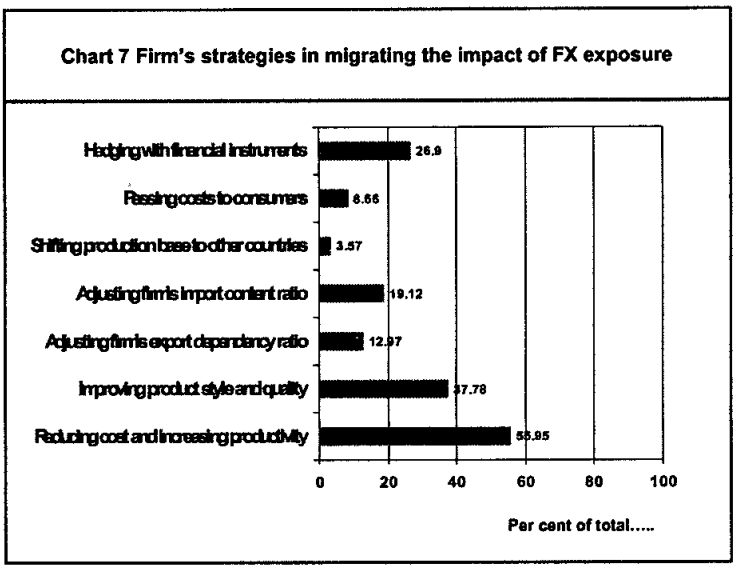


Chart 6 further analyses the relationship between the different features of the firm and the importance that firms place on the different adaptation methods mentioned above by using the Ordered Logit Model. The following conclusions can be drawn:

〈 Firms with international trade give more importance to improving productivity than firms without international trade, with larger firms, giving more importance than smaller firms. In addition, manufacturing firms that are labour intensive and manufacturing firms that are technology intensive give less importance to lowering the cost of capital. This finding reflects the capacity to improve the productivity of large firms and the intense competition in international trade. This is particularly true for the 2 sectors mentioned above which have lower profit margins and must therefore stress on lowering the cost of capital. This is also consistent with the previous result (see result 2) which showed that smaller firms are more affected by the higher cost of capital than larger firms.

〈 Firms that rely on domestic raw materials will give particular importance to developing product appearance, reflecting the strategy to differentiate their product.

〈 Financial hedging is more important for large firms than for small firms and is more important for firms with high FX mismatch than for firms with a

lot of natural hedge. The use of financial instruments to mitigate risks will be explored in detail in the next Section.

〈 Small firms give more importance to lowering the pressure by changing the pricing strategy than large firms, which may reflect the small firms' lower ability to decrease the cost of production and the need to pass-on the price burden to consumers, a strategy which may also affect sales. Moreover, firms that import but does not export give more importance to this strategy than firms in other groups, which may be due to the less intense competition in the domestic market compared to the export market.

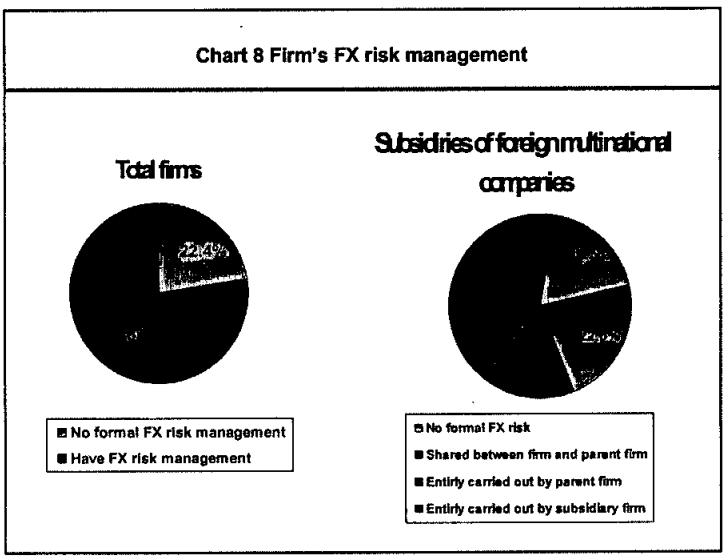
Table 4.6: Firm's Strategies in Migrating the Impact of FX Exposure

	1.9.1 Reducing cost and increasing productivity	1.9.2 Improve product style and quality	1.9.3 Adjusting firm's export dependency ratio	1.9.4 Adjusting firm's import content ratio	1.9.5 Shifting production base to other countries	1.9.6 Passing costs to consumers	1.9.7 Hedging with financial instruments
SIZE	0.290 ***	0.078	-0.280 ***	-0.220 ***	0.020	-0.219 ***	0.469 ***
	(0.092)	(0.085)	(0.087)	(0.081)	(0.094)	(0.088)	(0.081)
MISMATCH	0.025	0.014	-0.140 **	-0.222 ***	0.070	0.037	0.245 ***
	(0.065)	(0.061)	(0.070)	(0.063)	(0.073)	(0.065)	(0.061)
XO	1.059 *	1.034 *	1.805 ***	0.847 *	0.698	1.160 **	-0.507
	(0.577)	(0.548)	(0.512)	(0.457)	(0.571)	(0.493)	(0.476)
MO	1.119 **	0.260	0.186	1.667 ***	0.612	1.457 ***	0.301
	(0.532)	(0.485)	(0.465)	(0.431)	(0.529)	(0.443)	(0.417)
XM	1.089 **	0.602	1.818 ***	1.610 ***	0.893 *	0.831 **	0.181
	(0.516)	(0.474)	(0.428)	(0.388)	(0.496)	(0.422)	(0.401)
FOR_OWN	-0.120	-0.193	-0.514 **	-0.074	0.655 ***	-0.057	-0.331 *
	(0.222)	(0.225)	(0.240)	(0.201)	(0.240)	(0.220)	(0.200)
BRA_AB	0.524	0.009	0.055	-0.476	0.233	-0.072	0.116
	(0.567)	(0.537)	(0.312)	(0.415)	(0.591)	(0.488)	(0.471)
INV_AB	0.355	-0.275	0.089	-0.259	0.647 *	0.388	-0.311
	(0.522)	(0.504)	(0.295)	(0.362)	(0.438)	(0.439)	(0.397)
FD	-0.103	-0.068	0.069	0.075	-0.142	-0.026	0.113
	(0.202)	(0.198)	(0.209)	(0.193)	(0.209)	(0.188)	(0.189)
AGRI	0.470	0.081	0.740 *	0.007	0.108	-0.589 *	0.069
	(0.378)	(0.411)	(0.407)	(0.328)	(0.398)	(0.367)	(0.364)
LABOR	0.742 **	0.520	0.566 *	-0.155	-0.162	-0.599 *	-0.448
	(0.332)	(0.391)	(0.373)	(0.312)	(0.384)	(0.332)	(0.323)
HITECH	0.520 *	0.288	0.597 *	0.005	-0.015	-0.177	0.008
	(0.305)	(0.352)	(0.327)	(0.267)	(0.321)	(0.277)	(0.266)
IND	0.460	-0.116	0.742 *	0.194	-0.726 *	0.102	0.516
	(0.488)	(0.517)	(0.473)	(0.421)	(0.478)	(0.422)	(0.375)
Pseudo R2	0.034	0.019	0.072	0.040	0.029	0.032	0.054
Observation	522	505	458	480	459	499	497

〈 Export/import subsidiaries give importance to relocating the production centre abroad, whereas the majority of firms do not place importance on this strategy due to the complexity of the decision to relocate. In considering this alternative, various other factors beside the exchange rate must be considered (such as technology or the firm's core capabilities). This finding is also consistent with the Conference Board's survey results which found that a small number of international firms (less than 10 percent) view that relocation is an important strategy to mitigate risks.

4.3.2 Views on Exchange Rate Risk Management

Result 4: The corporate sector's risk management quality varies primarily according to firm size, with small firms more vulnerable in various risk management aspects.



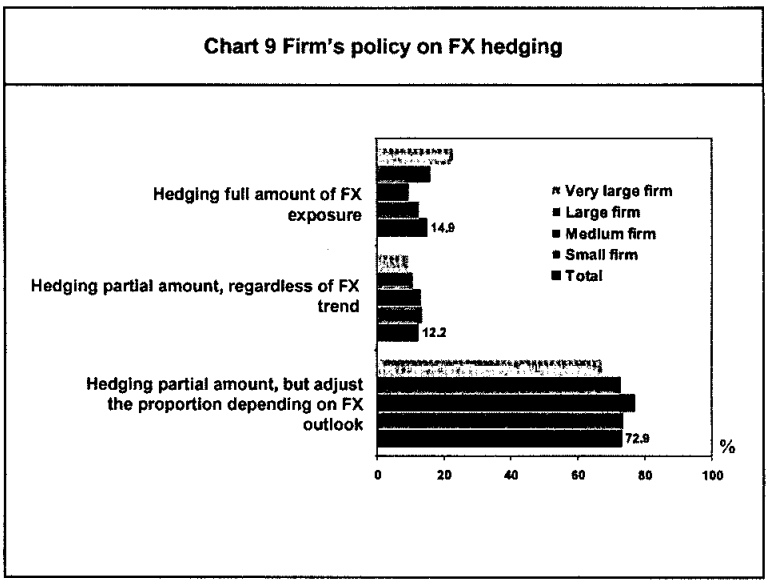
The result from the survey respondents found that 78 percent of firms have an exchange rate risk management system, which means that the rest of the 22 percent does not. Moreover, the ratio of firms that have an exchange rate risk management system will increase according to the firm size. The Logit Model equation used to consider whether firms manage risks or not (Table A2 in Annex),

shows that the characteristics of firms that statistically have a higher possibility of not managing risks are the small firms and export only firms (compared to import firms).

⊙ Policies to prevent risks: Ratio and impact from exchange rate trend

The prevention of risks to total risk ratio and the role of forecasting the exchange rate trend in order to prevent risks are important factors which will determine the effectiveness of exchange rate risk management for the firm. From the survey of firms that manages risks, we find that the majority of firms (73 percent) only prevent a portion of the risks, alternating between preventing more or less according to the exchange rate trend, and 15 percent preventing all risks. It is worth noting that large firms have a higher proportion of firms that prevent all risks than small firms (p-value of Chi-square test = 0.02).

Chart 9 Firm's policy on FX hedging



Although in principle, protecting against all types of risks is the most conservative strategy; this may not be the most appropriate strategy for all firms due to the difficulty in accurately assessing the risk level or exchange rate impact in all circumstances. In addition, in certain situations, it may not be possible to find the appropriate financial instruments. In any case, firms that choose to

prevent a portion of the risks, alternating between preventing more or less according to the exchange rate trend, may be more susceptible to exchange rate changes, particularly if the exchange rate does not move in the same direction as previously anticipated.

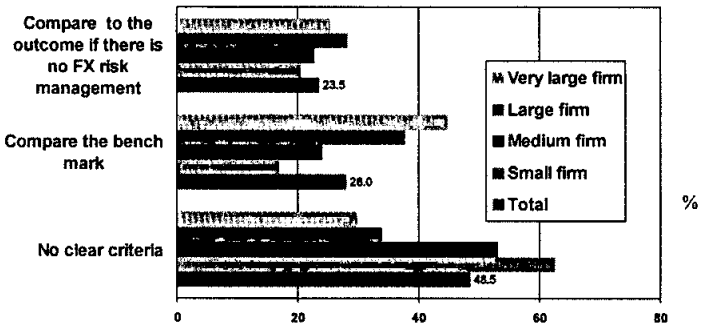
⊙ The criteria for evaluating the effectiveness of risk management

Firms with effective risk management should have a set of criteria in evaluating the effectiveness of risk management according to a pre-determined benchmark. This will send a clear signal to fund managers or risk management supervisors regarding the objectives in lowering risks that are consistent with the firm's strategy. The criteria could be in terms of the appropriate or acceptable profit/loss level, lowering profit/loss volatility, or the profit rate adjusted for risks. This framework would then be used to assess the performance of the fund manager to verify whether the objective has been achieved or if the outcome is close to the set target.

The issue at hand is that in various circumstances, the lack of a set criteria or the practice of comparing the actual profit/loss in situations without proper risk prevention may result in the inappropriate judgment of the fund manager. For example, the import firm's fund manager may decide to mitigate currency risks by forward selling the foreign currency, only to find that the baht has actually depreciated, thus lowering the profit. If this criterion was used in the evaluation process, the fund manager would be reprimanded and may cause the firm to inadequately prevent risks in the future.

Chart 10 shows that the survey results indicate that the majority of firms that manage exchange rate risks (48.5 percent) do not have clear criteria in assessing the effectiveness of risk management, while 28 percent set criteria and evaluate the criteria in situations with or without risk management, and only 23.5 percent set clear ex-ante benchmarks. It is worth noting that the size of the firm is related to the criteria used in the evaluation, with the "no criteria" group making up a higher proportion of small firms compared to large firms, while the proportion of large firms is higher for the group that evaluates the criteria in situations with or without risk management.

Chart 10 The criteria for evaluating the effectiveness of risk management



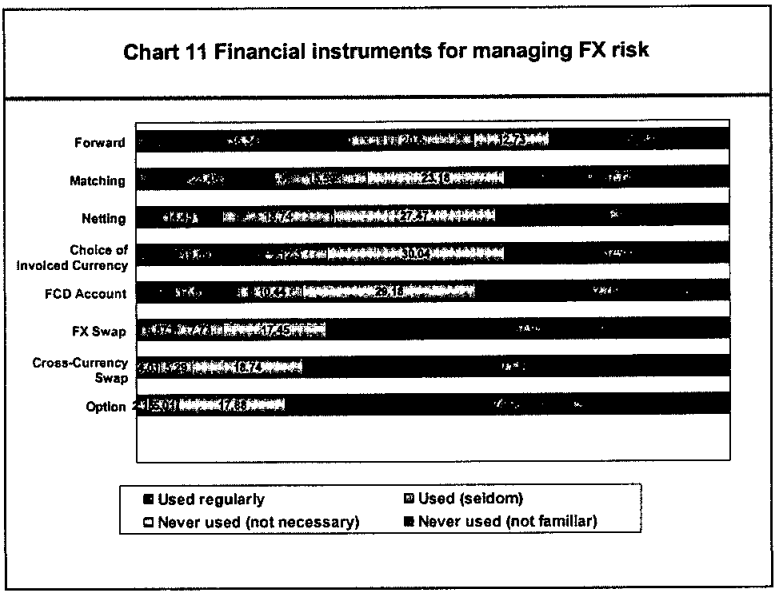
In sum, the data from this survey indicate that the quality of the risk management system is weaker for small firms compared to large firms in many dimensions. This includes having a higher probability of not managing risks, placing importance on using financial instruments to profit from exchange rate changes, or the lack of clear criteria to assess risk management effectiveness. This may reflect the perspective of business operators on the inappropriate risk management practices (such as making profit from exchange rate changes) as well as the lack of knowledge regarding the importance and appropriate methods of risk mitigation.

4.3.3 Methods and Financial Instruments Used to Prevent Risks

Result 5: A significant number of business operators are not familiar with the methods or financial instruments which can be used to prevent exchange rate risks.

In addition to using operational hedging to mitigate exchange rate risks on firms in the long run, firms will employ a variety of methods and financial instruments to prevent exchange rate risks in the short run. These methods can be divided into internal and external methods.

The internal methods form part of a firm's internal management process and do not rely on agreements/contracts with firms or organisations outside the conglomerate, while the external methods employ the use of financial contracts to insure against potential loss, namely, the use of financial hedging instruments (such as forwards, swaps, or options) or repayment of the firm's external debt. The majority of researches tend to focus on external methods as opposed to internal methods, even though the internal methods are an important part of the firm's risk management strategy. Key examples of the internal methods are matching assets/revenues and liabilities/costs in foreign currency, netting of receipts and payments with the same company, having a Foreign Currency Deposit Account (FCD Account), or invoicing transactions in low-risk currency.



In this survey, firms supplied information on the frequency of use of the various financial instruments to prevent exchange rate risks via either internal or external methods. Firms also supplied reasons behind the lack of use of the instruments, whether due to the lack of need or unfamiliarity with the instruments. Chart 11 shows the survey results, with the use of each financial instrument shown on a bar graph, with each bar divided into 4 sections corresponding to the firm's use. The sections are classified as "regularly", "seldom", "not necessary", and "not familiar".

The survey results show that financial instruments that firms employ most often to prevent risks are forwards (57 percent), followed by the 4 internal methods of matching (39 percent), netting (33 percent), invoicing transactions (32 percent), and FCD Account (28 percent). As for other derivative instruments classified as external methods, they are used with low frequency.

Chart 12 illustrates the characteristics of the firm that help explain the probability of the financial instruments' usage[8] ("regularly", "seldom", or "not familiar with the instruments"). As for the probability of using the various instruments, large firms tend to employ financial instruments more than small firms, except for netting and invoicing transactions. The internal methods are generally preferred by export/import firms (relative to export only firms or import only firms) and subsidiaries. Large firms with high FX mismatch or importers tend to employ forward instruments more. And lastly, for the more complex derivatives such as swaps and options, large firms or firms with branches abroad tend to employ these instruments.

Firms that are not familiar with the internal methods are likely to be small, either export or import only, and are not subsidiaries. Small export only subsidiaries[9] have a higher probability of being unfamiliar with forward instruments while small firms or firms without branches abroad have a high probability of being unfamiliar with complex derivative instruments.

8. Details from the Ordered Logit Model have not been included in this article, but can be obtained by contacting the author.

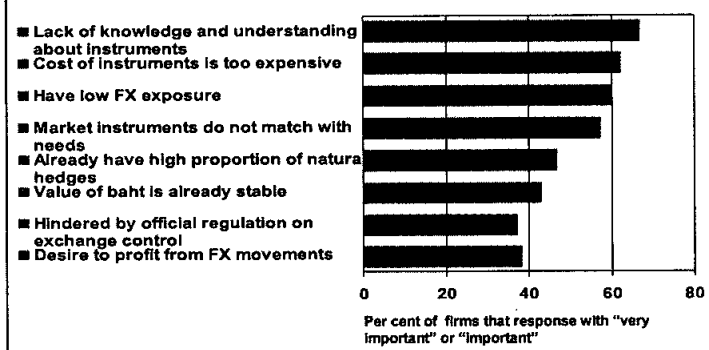
9. This could be due to the fact that a significant number of subsidiaries do not manage their own exchange rate risks.

Chart 12 Characteristics of firm that explain the probability of financial instruments' usage (from logit model)

[illegible]	Important factors for using [illegible]	Non-important factors of [illegible] instruments
Netting	High FX mismatch Both Exports and imports Subsidiary	Exports only Imports only Non-subsidiary
Matching	Large Firm Both Exports and imports Subsidiary	Small firm Exports only Non-subsidiary
Invoiced Currency	Both Exports and imports	Exports only
FCD account	Large Firm Both Exports and imports Have foreign debt Subsidiary	Small firm Exports only Imports only Non-subsidiary
Forward	Large Firm High FX mismatch Imports only Non-subsidiary	Small firm Exports only Subsidiary
FX Swap	Large Firm Have foreign subsidiary	Small firm Don't have foreign subsidiary
Cross Swap	Large Firm Have foreign subsidiary	Small firm Don't have foreign subsidiary
Option	Large Firm High FX mismatch Don't have foreign debt Non-subsidiary	Small firm Exports only Have foreign debt

Result 6: **Lacking knowledge and understanding are key obstacles to using financial instruments to prevent risks arising from exchange rate volatility**

Chart 13 Factors that hinder firms from using financial hedging



Firms that responded to the survey also stated the factors that hindered the use of financial instruments in preventing exchange rate risks. Chart 13 illustrates the obstacles ranging from "most" to "least important" such as follows: 1) the lack of knowledge and understanding about the instruments; 2) cost of instruments too high or expensive; 3) business transactions are of low FX exposure types; 4) market instruments do not match with the needs (such as the type or time-frame of contract); 5) high proportion of natural hedges; 6) value of the baht is already stable; 7) desire to profit from FX movements; and 8) hindered by official regulation on exchange rate control.

Chart 14 Important factors that hinder firms from using financial hedging (in order of importance)

Firm size	1	2	3
Small	Lack of knowledge about hedging instruments	Cost of instruments is too expensive	Instruments do not match with need
Medium	Lack of knowledge about hedging instruments	Cost of instruments is too expensive	Low FX exposure
Large	Lack of knowledge about hedging instruments	Cost of instruments is too expensive	Have high proportion of natural hedge
VeryLarge	Have high proportion of natural hedge	Cost of instruments is too expensive	Instruments do not match with need

Chart 14 shows that, according to firm size (small, medium, and large), the biggest obstacle is the lack of knowledge and understanding, followed by high cost. For very large firms, the main reason behind the low use of financial instruments is the high proportion of natural hedge, followed by the high cost of capital and instruments not matching with the needs.

Chart 15 Characteristics of firm that hinder firms from using financial hedging (from logit model)

Factor	Characteristics of firm that hinder firms from using financial hedging
Lack of knowledge about hedging instruments	Small firm Low FX mismatch Firm in labor intensive sector
Cost of instruments is too expensive	Don't have foreign debt
Low FX exposure	Low FX mismatch Exports only
Instruments do not match with need	Firm in hi-tech sector
Have high proportion of natural hedge	Large firm Firm in hi-tech sector
Value of baht is already stable	Small firm Low FX mismatch
Desire to profit from FX movement	Small firm Have foreign debt
Hindered by official regulation	Have foreign debt No foreign investment

To analyse the impact of the factors that hinder the use of financial instruments to prevent risks of firms, Chart 15 shows the result from the Ordered Logit Model equation, presenting the "most important obstacle (=4)" to the "least important obstacle (=1)" as the dependent variables (detailed results appear in Table A3 in the Annex). An interesting point to note is that the size of the firm is the main explanation for the difference in order of importance of the obstacles. For example, small firms have a higher tendency of the lack of knowledge and understanding, appraise the value of the baht as already stable, and desire profit from FX movements, while large firms tend to already have a high proportion of natural hedges, which lower the desire to prevent risks. As for the group of firms with external debt, they tend to be hindered by official regulations on exchange control more than other firms.

4.3.4 Summary of Survey Findings

Overall, the survey findings show that exchange rate issues have gained increasing importance in the Thai corporate sector as exchange rate risks create difficulty for business operations, mostly through the higher cost of capital and lower profit. Exchange rate changes also affect small firms with high FX mismatch more than other firms as well as affect the pricing strategy of business operators due to their low bargaining power.

The impact from exchange rate risks brought about the adaptation of the Thai corporate sector by giving more importance to exchange rate risk management, both in terms of operational hedging and financial hedging. For operational hedging, important approaches consist of improving productivity to lower costs and developing appearances and quality of the product.

The survey results point out the problems behind risk management in the corporate sector, particularly in the small firm group which has a higher probability of not having a risk management system and also a higher probability of using financial instruments for profit gains. They also tend to lack clear criteria in evaluating the effectiveness of risk management, which may lead to inappropriate risk management decisions. In addition, the survey found that the majority of firms only prevent a small portion of the risks and use exchange rate trends to determine that portion, a behaviour which may intensify the risks, particularly in the event of exchange rate volatility.

For financial hedging, the most preferred instrument are forwards, followed by various internal risk management procedures such as matching, netting, and having a FCD Account. It should be noted that a large number of firms are not familiar with these instruments, which are considered basic, which would significantly help mitigate exchange rate risks. This finding is consistent with the survey result which indicated that the lack of knowledge and understanding is the most important obstacle to using financial instruments, particularly for small firms, followed by high costs and instruments not matching firms' needs. All three elements are important in the formulation process of policies to improve risk management knowledge for business operators, particularly for SMEs, as well as policies to develop the market for various risk management instruments.

References

1. Yunyong Thaicharoen, Jirapol Mahuttikarn, and Punpilas Yutidhammadamrong, (2005), "Improving Financial Resilience of the Thai Economy Against Exchange Rate Risk", Bank of Thailand Economic Symposium Paper, August.

2. Linda S. Goldberg, (2004), "Industry-Specific Exchange Rates for the United States", FRBNY *Economic Policy Review,* May.

3. Foster, Gail and Eliza Winger, "Do Exchange Rates Matter? A Global Survey of CEOs and CFOs on Exchange Rates", The Conference Board Research Paper.

4. Marshal, Andrew P., (2000), "Foreign Exchange Risk Management in UK, USA and Asia Pacific Multinational Companies", *Journal of Multinational Financial Management* 10, pp.185-211

5. Kathryn M.E. Dominguez, Linda L. Tesar, (2006), "Exchange Rates Exposure", *Journal of International Economics*, Vol.68, p. 188-218.

6. Chayawadee Chai-anant, (2003), "Friends or Foes? Foreign Investors in the Thai Stock Market During 1994-1998", *Bank of Thailand Discussion Paper,* DP/04/2003.

7. Menzie D. Chinn, (2002), "The Measurement of Real Effective Exchange Rates: A Survey and Applications to East Asia", May.

8. Kevin Cowan, Erwin Hansen, Luis Oscar Herrera, (2005), "Currency Mismatch, Balance Sheet Effects and Hedging in Chilean Non-financial Corporations", *Central Bank of Chile Working Papers,* No. 346, December 2005.

9. Paul Krugman, (1999), "Balance Sheets, the Transfer Problem, and Financial Crises", November.

10. Arteta, Carlos, (2002), "Exchange Rate Regimes and Financial Dollarization: Does Flexibility Reduce Bank Currency Mismatches?", *International Finance Discussion Papers 738,* Board of Governors of the Federal Reserve System, September.

11. Assavasamran, Suvit, J. Thomas Connelly, Piman Limpaphayom and Thanomsak Suwannoi, "Managerial Ownership and Foreign Exchange Exposure: Evidence for Thailand after the Asian Financial Crisis".

12. Burnnett, Mhairi, (2003), "Financial Stability and the United Kingdom's External Balance Sheet", Bank of England Quarterly Bulletin.

13. Caballero, Ricardo, Kevin Cowan and Jonathan Kearns, (2004), "Fear of Sudden Stops: Lessons from Australia and Chile", *NBER Working Paper* 10519, May.

14. Chan-Lau, Jorge A., (2005), "Hedging Foreign Exchange Risk in Chile: Markets and Instruments", *IMF Working Paper* 05/37, February.

15. Edison, J., R. Levine, Ricci, and T. Slok. (2002), "International Financial Integration and Economic Growth", *NBER Working Paper Series,* No. 9164.

16. John Gionea. (2003), International Trade and Investment, An Asia-Pacific Perspective.

Table A1

	xer^i with Broad REER	mer^i with Broad REER	ter^i with Broad REER
Base metal products	0.997	0.912	0.977
Canned crustacean and others	0.880	0.775	0.868
Canned fish	0.720	0.815	0.864
Chemical products	0.868	0.999	0.971
Chicken, fresh and frozen	0.490	0.872	0.805
Computer and parts	0.964	0.808	0.903
Cuttlefish, fresh and frozen	0.884	0.140	0.614
Electrical appliances	0.950	0.918	0.996
Fabric	0.754	0.901	0.967
Fish, fresh and frozen	0.912	0.711	0.952
Footwear	0.643	0.841	0.788
Furniture and furnishing items	0.948	0.986	0.974
Garments	0.847	0.913	0.905
Integrated Circuit	0.923	0.882	0.904
Precious stone and jewelry	0.864	0.401	0.651
Petroleum products	0.820	0.866	0.846
Canned pineapple	0.635	0.854	0.874
Plastic raisin and products	0.907	0.955	0.953
Rice	0.926	0.036	0.403
Rubber	0.979	0.786	0.899
Rubber products	0.934	0.927	0.997
Shrimp, fresh and frozen	0.946	0.268	0.798
Spinning	0.888	0.985	0.973
Sugar	0.358	0.121	0.191
Telecommunication equipments	0.962	0.903	0.995
Tropical products	0.927	0.820	0.960
Vehicles, parts, and accessories	0.207	0.825	0.760

Table A2

Logit Model Describes the Probability that Firm Does Not Have Formal FX Risk Management

	Prob (No formal FX risk management)
SIZE	-0.613*** (0.125)
MISMATCH	-0.052 (0.084)
XO	-0.530 (0.577)
MO	-1.327*** (0.479)
XM	-1.212*** (0.460)
FD	-0.012 (0.263)
INV_AB	-0.518 (0.693)
FOR_OWN	-0.158 (0.296)
BRA_AB	-0.428 (0.663)
AGRI	-0.886* (0.608)
LABOR	0.173 (0.417)
HITECH	-0.113 (0.374)
IND	-0.695 (0.634)
CONS	-2.065*** (0.559)
Pseudo R2	0.1153
Observation	562

Probability = 1 means firm doesn't have formal FX risk management system

Probability = 0 means firm have FX risk management system

Figure in () is standard deviation

Table A3

Important Factors that Hinder Firms from Using Financial Hedging

	2.5.1 Cost of instruments is too expensive	2.5.2 Instruments do not match with need	2.5.3 Lack of knowledge about instruments	2.5.4 Have high proportion of natural hedge	2.5.5 Low FX exposure	2.5.6 Value of baht is already stable	2.5.7 Hindered by official regulation	2.5.8 Desire to profit from FX movement
SIZE	-0.027	-0.046	-0.217***	0.286***	-0.062	-0.222**	-0.020	-0.295***
	(0.075)	(0.081)	(0.080)	(0.088)	(0.076)	(0.093)	(0.086)	(0.086)
MISMATCH	-0.056	-0.004	-0.137**	-0.055	-0.281***	-0.210***	-0.035	0.064
	(0.069)	(0.070)	(0.070)	(0.072)	(0.071)	(0.071)	(0.065)	(0.063)
XO	-0.131	0.123	0.188	0.153	-0.411	-0.270	0.517	0.152
	(0.445)	(0.495)	(0.507)	(0.499)	(0.507)	(0.452)	(0.492)	(0.514)
MO	-0.034	0.108	-0.048	-0.103	-0.896**	-0.103	0.263	-0.591
	(0.368)	(0.421)	(0.443)	(0.386)	(0.453)	(0.390)	(0.429)	(0.455)
XM	-0.282	-0.059	-0.330	-0.003	-1.109***	-0.248	0.521	-0.008
	(0.330)	(0.382)	(0.421)	(0.349)	(0.423)	(0.340)	(0.398)	(0.408)
FOR_OWN	-0.055	-0.281	-0.012	0.112	0.017	-0.187	0.044	-0.155
	(0.211)	(0.218)	(0.234)	(0.224)	(0.215)	(0.241)	(0.218)	(0.220)
BRA_AB	-0.172	-0.462	-0.225	0.175	-0.256	0.008	0.624	-0.872*
	(0.503)	(0.515)	(0.678)	(0.695)	(0.471)	(0.580)	(0.609)	(0.497)
INV_AB	-0.101	-0.244	-0.408	-0.004	-0.536	0.071	-0.960**	0.003
	(0.403)	(0.422)	(0.633)	(0.521)	(0.441)	(0.522)	(0.487)	(0.452)
FD	-0.322*	-0.241	0.124	-0.007	-0.087	0.058	0.301*	0.306*
	(0.193)	(0.188)	(0.189)	(0.193)	(0.193)	(0.193)	(0.187)	(0.188)
AGRI	-0.051	0.072	0.404	0.102	0.179	0.283	-0.345	0.138
	(0.348)	(0.348)	(0.359)	(0.355)	(0.355)	(0.367)	(0.399)	(0.341)
LABOR	0.026	0.065	0.564*	0.372	-0.041	0.106	-0.144	0.002
	(0.326)	(0.327)	(0.371)	(0.306)	(0.335)	(0.323)	(0.337)	(0.314)
HITECH	0.314	0.609**	0.744**	0.605**	0.277	0.233	0.021	0.028
	(0.287)	(0.287)	(0.315)	(0.272)	(0.294)	(0.293)	(0.317)	(0.284)
IND	-0.537*	0.093	-0.004	0.490	-0.058	-0.562*	-0.117	-0.004
	(0.355)	(0.376)	(0.397)	(0.412)	(0.460)	(0.387)	(0.395)	(0.347)
Pseudo R2	0.012	0.016	0.026	0.021	0.035	0.023	0.010	0.025
Observation	466	445	472	404	464	432	433	433

Very Importance (=4) Not at all importance (=1)
Figure in () is standard deviation