UNDERSTANDING AND ADDRESSING THE PRO-CYCLICALITY IMPACT OF BASEL II IN THE SEACEN COUNTRIES

Pungky Purnomo Wibowo
(Project Leader)

FOREWORD

Given that most SEACEN member countries are moving towards Basel II in the near-to-medium term, many national regulators face potential problems in implementing the new Accord. One important concern is the possibility of the pro-cyclicality impact that may have adverse effects on the economy following the implementation of the new capital accord.

This research project on *Understanding and Addressing the Pro-Cyclicality Impact of Basel II in the SEACEN Countries* is a collaborative effort between The SEACEN Centre and nine member central banks, namely, National Bank of Cambodia, Bank Indonesia, Bank Negara Malaysia, The Bank of Mongolia, Nepal Rastra Bank, Bangko Sentral ng Pilipinas, Central Bank of Sri Lanka, Central Bank of the Republic of China (Taiwan) and State Bank of Vietnam. This research project, which is part of the SEACEN Centre's research activities for Operating Year 2007/08, aims to analyze the pro-cyclicality impact of Basel II in the SEACEN Countries. The focus would be to examine some of the key linkages between Basel II requirements and the business cycle. In this regard, the main objective is to have a discourse on the intrinsically difficult issues of how risks move over the course of a business cycle and the regulatory responses to reducing risks affecting financial stability, and the attendant macroeconomic costs that could arise from Basel II.

The study is divided into two major sections. Part I provides the integrative report and regional analysis authored by Dr. Pungky Purnomo Wibowo, Visiting Research Economist of The SEACEN Centre and concurrently Project Leader from Bank Indonesia, who is at present a Senior Researcher in the Financial System Stability Bureau of the Directorate of Banking Research and Regulation. Part II consists of country chapters authored by country researchers from nine participating member central banks.

The SEACEN Centre wishes to thank Dr. Pungky Purnomo Wibowo for his efforts as the Project Leader and also the country researchers from the participating SEACEN member central banks for their contributions to the research project, namely, Mr. Ouk Sarat, Section Chief, Bank Supervision Department, National Bank of Cambodia; Mr. M. Ardian, Junior Banking Researcher, Banking Research and Regulation Directorate, Bank Indonesia; Ms. Nurhayati Mohd. Khalid, Senior Executive, Prudential Financial Policy Department, Mr. Raymond Yeo, Manager, Financial Conglomerates Supervision Department and Mrs. Diana Paharodzi, Senior Executive, Financial Conglomerates Supervision Department, Bank Negara Malaysia; Mr. Battulga Ulziibat, Supervisor, Supervision Department, The Bank of Mongolia; Mr. Maha Prasad Adhikari, Director, Bank Supervision Department, Nepal Rastra Bank; Mr. Jermy Y. Prenio, Acting Bank Officer IV, Office of Supervisory Policy Development, Bangko Sentral ng Pilipinas; Ms. H. A. Hettihewa, Assistant Director, Bank Supervision Department, Central Bank of Sri Lanka; Mr. Johnny T.C. Hou, Assistant Director General, Economic Research Department, Central Bank of the Republic of China (Taiwan); and last but not least, Ms. Ly Thi Tho, Deputy Manager, Banking Supervision, State Bank of Vietnam.

The Centre also gratefully acknowledges the support of The SEACEN Centre's staff in completing this study. The views, conclusions and recommendations expressed in this Report are those of the authors and do not necessarily reflect those of The SEACEN Centre or its member central banks/monetary authorities.

Dr. A.G. Karunasena   June 2008
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PART II: COUNTRY CHAPTERS

CHAPTER 2
PRO-CYCLICALITY IMPACT OF BASEL II IN CAMBODIA
by Ouk Sarat

CHAPTER 3
PRO-CYCLICALITY IMPACT OF BASEL II IN INDONESIA
by Muhamad Ardian Dwinanto

CHAPTER 6
PRO-CYCLICALITY IMPACT OF BASEL-II IN NEPAL
by Maha Prasad Adhikari

CHAPTER 7
PRO-CYCLICALITY IMPACT OF BASEL II IN THE PHILIPPINES
by Jermy Y. Prenio

CHAPTER 8
PRO-CYCLICALITY IMPACT OF BASEL II IN SRI LANKA
by H. Anuradha Hettihewa

CHAPTER 9
PRO-CYCLICALITY IMPACT OF BASEL-II IN ROC (TAIWAN)
by Johnny T. C. Hou

CHAPTER 10
PRO-CYCLICALITY IMPACT OF BASEL II IN VIETNAM
by Ly Thi Tho

One of the central pillars of the new Basel-II regulatory framework is the concept of risk-based capital requirements. In this regard, under the internal-rating-based (IRB) approach, the amount of capital that a bank will have to hold against a given exposure will be a function of the estimated credit risk of that exposure. One important concern is that the new regulatory capital requirement (CAR) will exacerbate business-cycle fluctuations.

In this regard, in a downturn, when a bank's capital base is likely to be eroded by loan losses, the existing (non-defaulted) borrowers will be downgraded by the relevant credit-risk models, forcing the bank to hold more capital against its current loan portfolio. As a result, it would be quite costly for banks to raise fresh external capital in down times. Banks would be forced to cut back on lending activity (bank lending channel), thereby contributing to a worsening of the initial downturn.

Based on the empirical studies for several SEACEN countries, we find that that there is no strong evidence that there is pro-cyclicality impact of Basel II implementation. Nonetheless, SEACEN countries must give serious consideration to their economic situations, especially in case of unfavourable developments, when implementing Basel II for their banking sectors.

INTEGRATIVE REPORT
PART I

UNDERSTANDING AND ADDRESSING THE PRO-CYCLICALITY IMPACT OF BASEL II IN THE SEACEN COUNTRIES

by Dr. Pungky Purnomo Wibowo[1]

1. Introduction

Economic reforms and financial liberalization have caused a bank lending boom in most of Asian countries as banks are the most important financial intermediaries. This has led to surges in consumption and asset prices with the corporate and financial sectors experiencing very high growth rates. It is widely claimed that financial liberalization is crucial to the boosting of economic development (Levin, 1997)[2]. However, it can also increase macroeconomic vulnerability of financial institutions' portfolios especially for the banks. It is widely known that most of the Asian banks engaged in massive high-risk projects[3]. After enjoying persistently high economic growths for three decades, Indonesia along with Thailand and South Korea, in the recent past, experienced a turbulent "twin crisis"- a *currency crisis* and a *banking crisis*, which stood out as one of the major crises of the 20th century[4].

Its impact was devastating and was felt across the Asian countries. The domestic currencies depreciated drastically, causing major defaults by firms and commercial banks which had borrowed unhedged foreign currency denominated loans. Several banks were critically under-capitalized, even long before the crisis commenced. Reductions in bank capital resulting from the unstable markets drastically diminished the channel for bank loans since bond markets were still not fully functioning as alternative sources of external financing. The crisis is now considered to be over but Indonesia will continue to experience its effects for years to come.

Since Asian commercial banks remain the most important financial intermediaries even after a series of financial deregulation[5], fragility in banking institutions can still be considered as a main source of financial instability that can finally lead to a crisis as

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[1] The author is currently a Senior Researcher for the Financial System Stability Bureau, Directorate of Banking Research and Regulation of Bank Indonesia. He was Visiting Research Economist at The SEACEN Centre for Operating Year 2007/08.

[2] Financial liberalization generally incorporates interest rate deregulation, an increase in bank branch office expansion and financial deepening (the ration of money to GDP), and end to preferential credit, less credit to the government sector and more credit to the private sector (Levin, 1997). The importance of the financial liberalization is also supported by McKinnon-Shaw and Fry (1995 and 1997) who argue that financial repression in the form of ceilings on interest rates leads to negative real rates distorting the economy.

[3] One of the indicators of an increasing risk in Indonesian commercial banks' portfolio is the massive increase in Non-Performing Loans in certain economic sectors for certain groups of borrowers by all groups of banks (state banks, private banks, foreign banks, mix or joint banks and regional banks).

[4] There are many literature on the causes of the Asian crisis. There are two main polar views of the causes of the crisis. The first view argues that the main cause of the crisis were weak economic fundamentals and policy inconsistencies (Krugman (1998), Mishkin (1999a)). The second view is that the root of the crisis was pure contagion and market irrationality (Radelet and Sachs (1998a and 1998b), Furman and Stiglitz (1998) and Stiglitz (1999 and 2002)). Meanwhile, some other commentators such as Corsetti, Pesenti and Roubini (1998) and Djiwandono (1999) took the middle ground arguing that both contagion and poor economic fundamentals caused the Asian crisis. Financial crises do not occur only in the presence of weak fundamentals, as weak fundamentals can also trigger a "bank run" psyche which in turn can have disproportionately adverse effects on the real economy.

[5] The uniqueness of commercial banks is proposed by Guttentag and Lindsay (1968, p.991) by demonstrating that commercial banks have a greater capacity for varying aggregate volume of credit than other financial intermediaries with the consequence that banks are potentially more important sources of cyclical instability. In this sense, shifts in the demand by commercial banks for reserves have a significantly greater impact on total loans extended by all intermediaries (banks and non-banks) than do similar shifts in the demand for reserves by non-bank intermediaries. This characteristic is also interpreted as bank uniqueness (also supported by Fama (1980 and 1989)). They argue that it is clear that banks are a much more potent engine of credit creation even if the expansion process is not exclusively a bank phenomenon.

mentioned above (Crockett, 1997). Banks interact directly with sectors of the economy through their roles as intermediaries. They hold a greater variety of assets and liabilities than any other financial institutions. Hence, any changes in the conduct of monetary policy with regard to credit and money are reflected in adjustments of their portfolios and those of their clients.

Therefore, the effectiveness and consequences of monetary policy require an understanding of the behavioural characteristics of commercial banks (Andersen and Burger, 1996). Hence, information about banks' portfolio behaviour[6] is often viewed as a requirement for a complete understanding of the workings of the financial system of the economy as a whole and particularly of the monetary policy transmission mechanism (Baltenperger, 1980).

There is a common understanding therefore that ensuring the soundness of the banking system would create financial stability in in Asia. The Basel II Accord is viewed as a new regulation that could help to achieve a sound banking system. The New Accord is composed of three complementary "pillars": Pillar 1 is a regulatory standard for minimum capital requirements. The objective of Pillar 1 is the better alignment of regulatory capital requirement with "economic capital" which is demanded by investors and counterparties. Under this current Accord, all commercial lending is obliged to the same 8% capital requirement regardless of the creditworthiness of the borrower and collateral strength of the loan. The failure to distinguish among commercial loans of very different degrees of credit risk has instigated the incentive to move low-risk instruments off balance sheet and retain only relatively high-risk instruments.

In this regard, according to Jones (2000), financial innovations that arose in response to this incentive have given banks with the means to "arbitrage" differences between regulatory and economic capital. Meanwhile, Pillar 2 is about the supervisory review process which sets forth broad principals and some specific guidelines for the review of capital adequacy that are intended to push both banks and supervisors beyond the mechanical application and satisfaction of Pillar 1 standards. Specifically, banks are expected to establish and document internal processes for assessing capital adequacy relative to portfolio risk. Pillar 3 is regarding market discipline aimed at improving the transparency of banks to counterparties and investors as banks will be required to disclose detailed information on their risk profile and capital adequacy[7].

These developments in the financial sector, especially the banking sector, have played a major role in shaping macroeconomic outcomes in many Asian countries. Financial developments have reinforced the momentum of underlying economic cycles, and in some cases have led to extreme swings in economic activity and a complete breakdown in the normal linkages between savers and investors. According to Borio and others (2005), these experiences have led to concerns that the financial system would be excessively procyclical leading to unnecessary amplified swings in the real economy. These concerns have led

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[6] " banks are assumed to have a desired composition of their asset portfolios which depends on the entire constellation of yields on all financial assets the banks are legally allowed to hold. This composition is to be viewed as a set of long-run preferences which, because of time and uncertainty, must depend on expected as well as current yields. These preferences for individual assets are assumed to be consistent with rational maximizing behaviour by the banks. Thus, for example, the desired volume of loans will depend positively on its own yield… and negatively on all other yields ". (Borrio, 1984, p.24).

[7] Specific reporting requirements in Pillar 3 include IRB capital for each of the major portfolio components (e.g. corporate, retail mortgages, securitization exposures) as well as for the bank as a whole.

to a need for changes in prudential regulation, accounting standards, risk measurement practices and the conduct of monetary policy to improve not only the financial system but also macroeconomic stability.

2.   Objectives of the Study

This paper aims to analyze the above concerns and discuss possible options for policy responses. The focus would be to examine some of the key linkages between Basel II in the financial system and the business cycle. In this regard, the main objective is to have a discourse on the intrinsically difficult issues of how risk moves over the course of a business cycle and the regulators' responses to reducing the risk of financial stability, and the attendant macroeconomic costs that could arise from Basel II. Specifically, this study would endeavor to answer some important questions as follows:

1.   How does Basel II affect the economy and banking industry in SEACEN countries in terms of regulation?
2.   Would the regulatory capital requirement as stipulated by Basel II overstate the magnitude and economic significance of pro-cyclicality in the New Accord relative to the existing capital requirement in SEACEN countries?
3.   How would the lending react to riskier behaviour as a result of tightening capital constraints and alternative proposed modifications to the New Accord?

The results of this study could hopefully be useful for the monetary authorities in the SEACEN countries in analysing the impact of Basel II and determining the appropriate policies for the pro-cyclicality impact of Basel II on the macro economy and financial system as a whole. Country chapters would include those from Cambodia, Indonesia, Malaysia, Mongolia, Nepal, Philippines, Sri Lanka, Republic of China (Taiwan) [here after referred to as ROC (Taiwan)], and Vietnam. The country chapters would focus on the development of Basel implementation and the impact of Basel II pro-cyclicality on their economies.

3.   Salient Features of Basel II Implementation in the SEACEN Countries

3.1   Basel II Implementation in the SEACEN Countries

The new capital framework or Basel II implicates tremendous changes for the banking industry. The framework consists of three pillars that cover a wide range of risks. The first pillar introduces a new capital requirement calculation that is more risk-sensitive. The formal capital requirement consists of capital charged from credit risk, market risk and operational risk. The second pillar gives a new concept regarding active supervision process from the authority and also promotes the implementation of risk management in the banking industry. The third pillar promotes active participation from the market and stakeholders for the oversight of the banking industry.

The main focus of Basel II is to achieve better differentiation according to credit quality of the counterparty than that achieved by using the few broad categories of counterparty weights in the first Basel Accord. In particular, for sovereign risks, Basel II breaks away from former rules (IMF Special Data Dissemination Standards, Basel Core Principles for Effective Banking Supervision, IOSCO 30 Objectives and Principles, and others) and does not rely on any mechanical assessment of credit quality. Instead Basel II will rely on the expertise from recognized external credit assessment institutions (ECAIs) by employing the standardized approach or the internal-ratings-based approach (IRB).

The standardized approach is a natural extension of the current regulations with more credit quality based categories of counterparty weights. It will be available to all banks without the eligibility criteria. In this case, the final round of revisions favors a broader scope of counterparty weights with more 'buckets'. It also includes a special treatment of asset securitization and some new credit conversion factors for short term commitments. On the other hand, the IRB approach would use a differentiation of assets among 6 asset classes which involves corporate, banks, sovereign, retail, specialized lending and equities in the banking book. Banks adopting IRB must apply it on all asset classes and for all business units within a reasonably short period of time. Moreover, banks opting for the advanced stream will also have to calculate their credit capital requirement under the foundation approach for 2 years. The capital requirement for the advanced approach will be floored at 90% of that of the foundation approach. Historical data of 5 years will be required at the end of a 3 year transition period.

In employing IRB, banks need to fulfill the composition of minimum requirements, compliance with minimum requirements, rating system design, risk rating system operations, corporate governance and oversight, use of internal ratings, risk quantification, validation of internal estimates, supervisory loss given default (LGD) and exposure at default (EAD) estimates, requirements for recognition of leasing, calculation of capital charges for equity exposure and disclosure requirements. Moreover, banks must demonstrate to supervisors that the model meets certain minimum requirements at the outset and on an ongoing basis. It also has to be supported by rating and risk estimation systems and processes which could provide for a meaningful assessment of borrower and transaction characteristics, meaningful differentiation of risk; and reasonably accurate and consistent quantitative estimates of risk.

As many in the banking industry are in agreement that this framework can make operations of the banking industry more prudent, many European countries have already implemented the Basel II framework in 2006. Some South East Asia countries have started implementing Basel II in 2007 beginning with the standardized approach. The full implementation will mostly take place in 2010 as presented in Table 1.

Table 1
Basel II Implementation in SEACEN Countries

No	Country	Standardised Approach	Advanced Approach
1	Malaysia	2008	2010
2	Philippines	2007	2010
3	Indonesia	2008	2010
4	ROC (Taiwan)	2007	2008
5	Vietnam	-	2008
6	Sri Lanka	2008	-
7	Mongolia	2008	2010
8	Combodia	-	-
9	Nepal	2008	2010

While most of SEACEN countries will implement Basel II in 2007-2008, the strategies will be different. Most of them will start implementing Basel II by allowing banks to use the standardized approach with the advanced approach following later. Vietnam is the only country allowing banks to implement the standardized and the advanced approaches at the same time.

Based on the reports of the nine participating countries for this project, it is clear that ROC (Taiwan) and the Philippines are two countries that are considered to be ready for in the implementation of Basel II in comparison with the other countries. Both countries adopted the standardized approach of Basel II in 2007 as a first step. In the Philippines, prior to 2007, they gradually phased in elements of Basel II into the existing BSP risk-based capital framework to set the stage for the eventual full adoption of the entire Basel II standardized provisions. These elements included the lower capital requirements for highly rated credit exposures for corporate entities and higher capital requirement for non-performing loans.

Implementing the Basel II Framework will not be an easy task for the SEACEN countries. The main challenges are how to tailor the framework to suit the varied country conditions, preparing the infrastructure such as regulations, systems, etc., and educating supervisory authorities and the banking industry regarding the framework. In some countries, the support from the government would be vital while in others, it may be less so.

To implement Basel II successfully, the preconditions such as the mechanisms for providing an appropriate level of systemic protection must be in order. Most of the countries have serious concerns on issues such as the legal-foreclosure framework and its links to Basel II implementation. They have to ensure that the legal-foreclosure framework is sufficiently robust to assure the effectiveness of credit risk mitigation techniques and appropriateness of credit risk weights in Basel II.

As a result of the above concerns, some policy implications can be gleaned, especially in terms of laying the necessary foundation to implement the Accord in the following table:

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Table 2
Readiness for Implication of Basel II

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No	Policy Implications	Malaysia	Philippines	Indonesia	Taiwan	Vietnam	Sri Lanka	Mongolia	Cambodia	Nepal
1.	A base line level of supervising infrastructure is already in place.	√	√	√	√	√	√	√	√	√
2.	Focus on addressing material gaps in the supervisory infrastructure, such as:									
	- Preconditions need to be improved.	√	√	√	√	√	√			√
	- Modifications are required to the legal framework.	√	√	√	√	√	√			√
	- Any changes are required to key prudential regulations.	√	√	√	√	√	√			√
	- Aspects of the supervisory review process need to be strengthened.	√	√	√	√	√	√			√
	- The current state of bank governance and risk management practices at its regulated banks.	√	√	√	√	√	√			√
	- Does the home/host country arrangements need to be enhanced.	√	√	√	√	√	√			√

3.2 Roadmap for Basel II Implementation

The SEACEN countries under review have generally adhered to the BIS schedule for Basel II implementation by first adopting the standardized approach. Many of the countries (Indonesia, Malaysia, Sri Lanka and Nepal) have more or less similar roadmaps as presented below:

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Table 3
Roadmap of Basel II Implementation

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PILLAR 1				PILLAR 2		PILLAR 3
				Others Risks		**Transparency**
Regulation Issuance	Parallel Run (Standardized) or Validation Process (Internal Model)	Effective Capital Requirement	Improvement of on line reporting system	Regulation Issuance	Effective Capital Requirement	Regulation Issuance
Q3 2007 Q3 2007	Q1 2008-Q4 2008 Starting Q3 2007	Q1 2009 Q2 2008	Q4 2008 Q2 2008	Q3 2007	Q1 2009	Q1 2009 Q1 2009
Q3 2007 Q4 2009	Q1 2008-Q1 2009 Starting Q1 2010	Q1 2009 Q4 2010	Q4 2008 Q4 2010			Q1 2009 Q2 2011
Q3 2007 Q4 2009	Q1 2008-Q1 2009 Starting Q1 2010 Starting Q2 2010	Q1 2009 Q4 2010 Q2 2011	Q4 2008 Q4 2010 Q2 2010			Q1 2009 Q2 2011 Q2 2011

Conversely ROC (Taiwan), Vietnam and the Philippines have made slightly more progress in implementing Basel II, especially in the area of credit risk. This is particularly so for the Philippines as can be seen from its road map as follows:

Figure 1
Basel II Implementation in the Philippines

2005	2006	2007	2008	2009	2010
Pillar 1 (Minimum capital requirement)					
Gradual phasing in of certain Basel II provisions (securitization SA, past dues, highest credit quality corporates)		Credit Risk - standardized approach Operational Risk - basic indicator and standardized approaches			Credit Risk - FIRB and AIRB allowed Operational Risk - AMA allowed

Pillar 2 (Supervisory Review) - a continuing process

Pillar 3 (Market Discipline) - gradual implementation starting 2007

3.3 Overview of CAR of the Banking Industries in the SEACEN Countries

Most of the SEACEN countries have capital adequacy ratios (CARs) which are higher than required by the Bank for International Settlements (BIS). Nonetheless, banks have continued strengthening their capital positions in preparation for Basel II implementation. A good example is the Philippines where capital is boosted with issuances of innovative capital instruments such as unsecured subordinated debts that would qualify either as hybrid Tier 1 capital or Tier 2 capital. As of end-March 2007, the banking system's consolidated CAR of the Philippines stood at 18.83%. This is well above the 10% and 8% requirements of Bangko Sentral ng Pilipinas (BSP) and international standards, respectively. It is worth noting that since the BSP adopted a capital adequacy framework based on the Basel standards in 2001 (which was based on the 1988 Basel Accord), the banking system's consolidated CAR has not gone below 15% (Figure 2). With the implementation of Basel II, data from the validated parallel run reports of universal banks showed that CAR, on average, will decrease by only around 300 bps.

Figure 2
Capital Adequacy Ratio in the Philippines

Capital Adequacy ratio
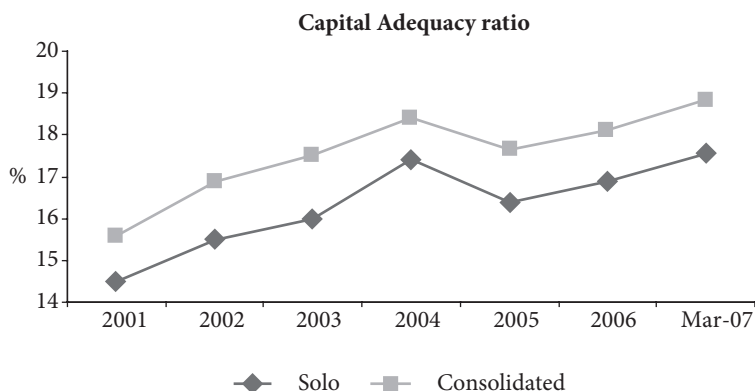
In the case of ROC (Taiwan), the Regulations Governing the Capital Adequacy Ratio of Banks were implemented in 1992 followed by the Enforcement Rules of the Act of Privatization of Government-Owned Enterprises (amended in 1992). Resulting from these regulations and rules, three banks, namely, Chan Hwa Bank, First Bank and Hua Nan Bank were privatized in 1998. Meanwhile, the Regulations Governing the Capital Adequacy Ratio of Banks were revised to incorporate market risk capital requirements. Of the total assets of all financial institutions, assets of private banks rose from 8.9% in 1991 to 51.5% in 2001, while those of public banks declined from 53.7% to 19.7% during the same period.

The minimum capital adequacy ratio in Sri Lanka is 10% as against Basel's recommendation of 8%. The risk-weighted assets (RWA) has increased by 35% on average during the last 7 years as a result of the increase in share of loans from 58% in year 2000 to 65% of total assets in 2007. The aforementioned growth is a result of the increase in risk weights on 'loans secured by primary mortgage over residential property' and 'other loans and advances' up to 55% (from 50%) and 110% (from 100%) respectively. Subsequently, Tier II capital increased by 42% on average, which is higher than the increase of RWA (34% on average) while the CAR increased by 2.04 bp over the last 7 years. A continuous improvement in the CAR was recorded during the last 2 years as a consequence of enhancement of minimum capital requirement of licensed banks and the infusion of new capital by foreign banks with the change in the computation base for single borrower limit (SBL).

Figure 3
Risk-Weighted Assets and CAR in Sri Lanka
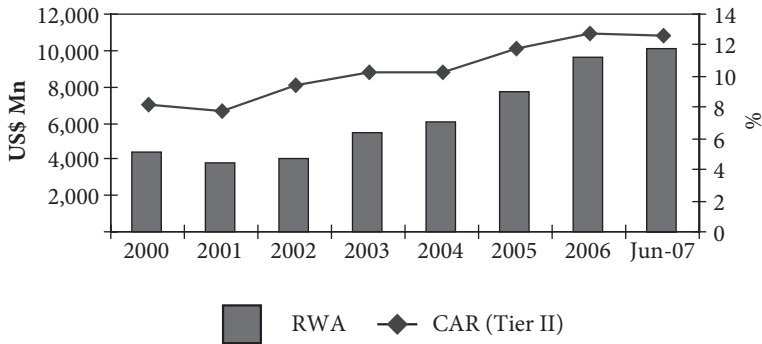
In the case of Indonesia, commercial bank's capital improved along with higher profitability. The capital adequacy ratio, as an indicator of banking resilience in dealing with risk, improved from 19.3% in 2005 to 21.27% in 2006; remaining above the limit imposed by Bank Indonesia. The upswing in the CAR is a consequence of an array of consolidation efforts incorporated in the Indonesian Banking Architecture (API) policy structure. Along with CAR improvement, the overall national banking resilience has strengthened enough to minimize potential financial sector instability.

Figure 4
Bank CAR, Capital and Risk-Weighted Asset in Indonesia
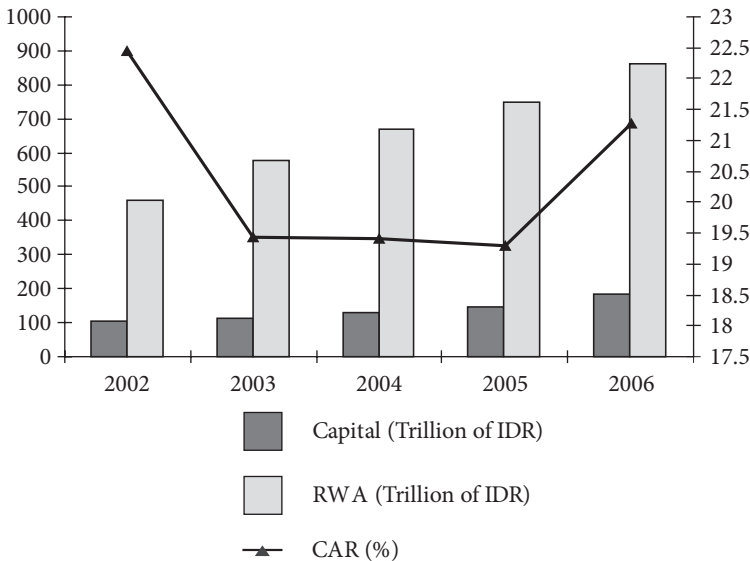
Capital ratios in Malaysia remain high, stable and well in excess of the minimum requirement. The risk-weighted capital ratio (RWCR) and core capital ratio (CCR) had consistently averaged at approximately 13% and 10% respectively from 2000 to May 2007. During the earlier periods after the Asian financial crisis in 1997, recapitalization efforts were largely driven by the Government via a special purpose vehicle, the Danamodal Nasional Berhad (Danamodal) which was established to ensure the preservation of healthy capital levels to absorb the high losses experienced in the financial sector. As at May 2007, total capital in the banking system stood at RM107billion, while the risk weighted assets stood at RM743.9billion.

In Mongolia, the total capital of its banking sector fell below zero during the financial crisis which occurred during 1996-2000. The Bank of Mongolia and the Government implemented necessary measures to overcome the crisis such as refinancing, restructuring, and regulatory measures which have made a significant impact on banking indicators. As a result, banks' capital has strengthened as well as their risk-bearing capacity. The minimum capital requirement for banks increased gradually, from around USD 1 million in 2000 to USD 7 million in March 2006. As the profitability of banks has been high in the last several years, a significant part of the capital increase has emanated from their income. In addition, the opening of Mongolian banks to foreign as well as domestic investors has resulted in the increase in the total capital of the banking sector from USD 27.3 million in 2000 to USD 284.4 million in September 2007 while the capital adequacy ratio which has fluctuated between 14 and 24 percent, is 1.8-3.0 times higher than the Basel minimum requirement.

Figure 5
Capital & Capital Adequacy Ratio in Mongolia (2000-2007.09)
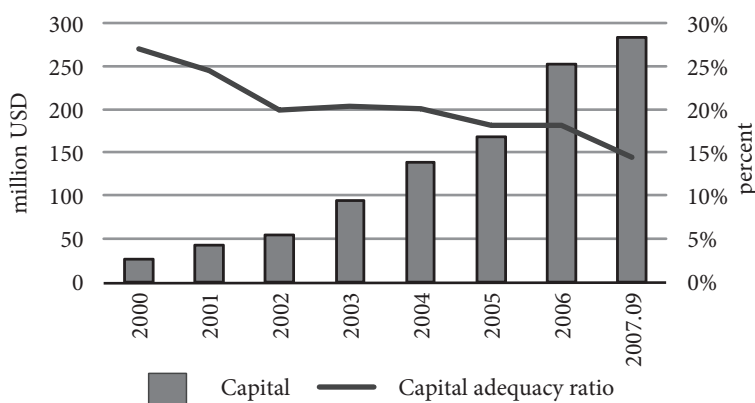
In the case of Cambodia, the CAR of the banking system as a whole has been carefully monitored although it remains well above the regulatory limit. The ratio decreased from 58% in 2001 to 26% in 2006, higher than the prudential limit of 15%, and well above the 8% requirement of the capital accord. This trend is largely due to the increase in risk weighted assets particularly loans disbursement and loans commitment. However, in spite of banks' increasing regulatory capital through the topping up of capital and profit generation, rapid credit expansion have placed enormous pressures on banks. Moreover, the absence of proper credit rating has meant that banks have little choice but to weigh counterparty risk at 100% although the customers may prove to be strong and viable.

Figure 6
The CAR Ratio in Cambodia
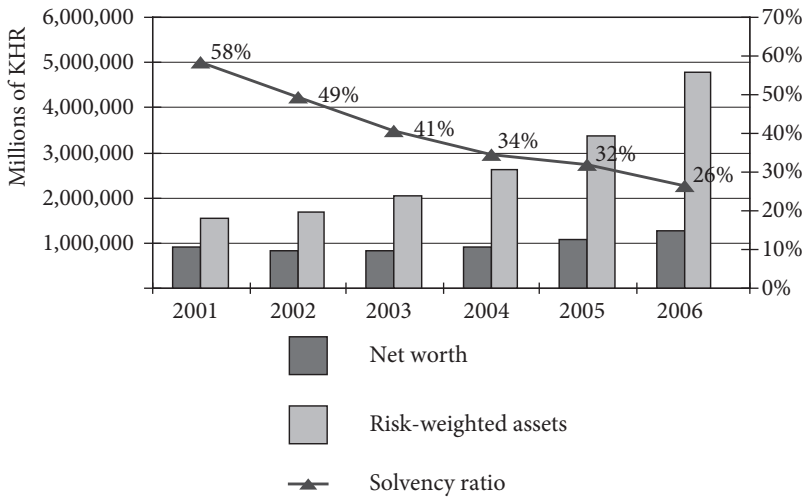
The Nepalese banking system comprises 23 commercial banks, 58 development banks, 79 finance companies and a few micro finance institutions, making up the major portion of the financial assets in the country. Nepal started its financial liberalization efforts two decades ago while the central bank, Nepal Rastra Bank (NRB) has been working towards a transparent and prudent regulatory framework for banks and financial institutions. These regulations have contributed greatly to the growth of banks in the financial system. However, due to political problems and issues related to the appropriate allocations of resources, the Nepalese economy has not performed very well in the last few years, as reflected by the rather low GDP growth and increased unemployment rate, albeit with moderate inflation. Mirroring the economic development, the growth in NPA has increased while the overall bank capital has been negative, albeit showing significant improvement from -14.96% in 2002 to -1.66% in 2007.

Vietnam's banking system has undergone substantial reforms over the past decade which have included the transformation from a mono-banking system to a two-tiered, market-driven banking system with participation from financial institutions under various types of ownership (state-owned, joint-stock, joint-venture and foreign). The reform of its banking system has been implemented in tandem with economic reforms in its taxation system, policies for public finance companies, monetary policy and reforms in state-owned enterprises. These financial and economic reforms have resulted in a stronger banking industry in Vietnam. While there is no explicit CAR data, the Tier 1 Capital and Total Assets of Vietnam's banking industry are presented in the following figure:

Figure 7
Tier 1 Capital and Total Assets in Vietnam
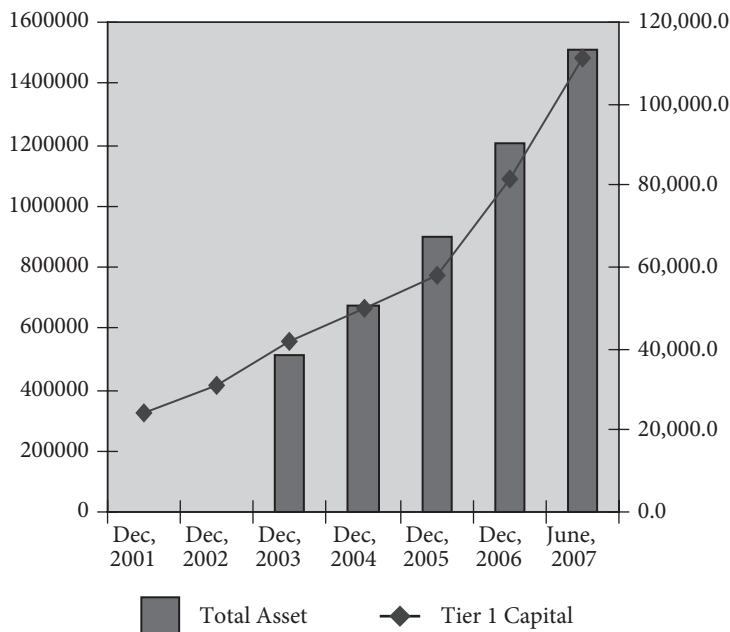
3.4 Pro-cyclicality Impact of Basel II

Economic reforms and financial liberalization caused a bank lending boom in Asian countries through banks, being the most important financial intermediaries. This led to soaring consumption and asset prices with the corporate and financial sector experiencing a very high growth rate. While financial liberalization is crucial to boosting economic development (Levin, 1997)[8], it can also increase macroeconomic vulnerability of financial institutions' portfolios. As mentioned earlier, Asian banks engaged in massive high-risk projects[9] which subsequently led to the financial crisis[10].

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[8] Financial liberalization generally incorporates interest rate deregulation, an increase in bank branch office expansion and in financial deepening (the ration of money to GDP), and termination of preferential credit, less credit to the government sector and more credit to the private sector (Levin, 1997). The importance of the financial liberalization is also supported by Fry (1995 and 1997) who argue that financial repression in the form of ceilings on interest rates leads to negative real rates distorting the economy.

[9] One of the indicators of increasing risk in Asian commercial banks' portfolio is the massive increase in Non-Performing Loans in certain economic sector for certain group of borrowers by all groups of banks (state banks, private banks, foreign banks, mix or joint banks and regional banks).

[10] There is a lot of literature on the causes of the Asian crisis. There are two main polar views of the causes of the crisis- the first argues that the main cause of the crisis were weak economic fundamentals and politic consistencies (Krugman (1998).

This crisis was mostly caused by insufficient capital both in the corporate and banking sector. It has been recognized, advocated mainly from the work of Miller and Modigliani in 1958, that the independency value of a firm rests on its capital structure in a frictionless world with full information and complete markets - capital being the main issue in the financial sector. However, this idea had just taken hold as late as 1988 when the bank regulators and authorities of the G10 finally agreed to adopt the Basel Accord[11] for common capital requirements and had only been recently adopted across countries. A specific standardization was employed to provide a level playing field for banks within member countries and to establish the soundness and stability of the international banking system by encouraging banks across countries to comply with a set of common solvency requirements.

In this regard, Diamond and Dybvig (1983) argued that the primary aim of capital adequacy regulation is to reduce risk-taking that may undertaken by banks. Most industrial countries now have deposit insurance to prevent bank runs and to protect small and uninformed depositors. Furlong and Keely (1989) also proposed that banks that are subject to a flat insurance premium, may have excessive incentives to take risks, since their payoff functions are convex with respect their net worth. As a result, capital adequacy may mitigate this problem since the marginal value of the deposit insurance option with respect to asset risk falls with declining leverage.

The concerns of the minimum capital requirement have also been a strategic issue for less developed countries like those in Asia where possible negative impact of capital requirements seems to be more relevant, given the larger role of the banking system in these countries. In order to protect the depositors from possible moral hazards of shareholders, it is optimal to transfer the bank's control rights from its shareholders to the regulator who represents the interest of the bank's depositors, before its capital is depleted (Dewatripont and Tirole, 1994).

While there are advantages to be garnered from the Basel Accords, especially Basel II, which aims to reduce the incentive for capital arbitrage by increasing the risk sensitivity of regulatory capital charges, there are also some concerns about the possibility impacts in the early phase of its implementation. In this regard, increased risk sensitivity of capital charges may cause an unexpected pro-cyclical effect if the quality of the banks' assets is closely in line with the business cycle. As a result, this could be counterproductive to the capital regulation's original goal of enhancing financial stability not only of individual banks but of the whole financial system.

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[11] In theory, although capital adequacy requirement could limit risk-taking by banks, there are some concerns about the existing Basel I regulation. The main concern for Basel I is that its method of calculating the capital-to-risk- asset ratio does not accurately show the riskiness of banks' portfolios, and therefore does not give adequate incentives for controlling their risk exposures. Therefore, to address these problems, the Basel Committee on Banking Supervision revised the regulation set out by the 1988 accord, with the objective of developing more risk-sensitive standardized internal measurement approaches to capital adequacy. In this regard, one major proposal for reform is to incorporate the borrowers' credit risk in calculating the capital adequacy ratio (Pillar I).

In general, the pro-cyclicality impacts of minimum capital as required in Basel II[12] could summarized in two main ways. First, in relation to the financial sector, capital charges would be possibly subject to large swings should the perception of asset risk move in synchronization with business fluctuations. This situation could cause an increased volatility of asset prices or loan interest rates with the potential of creating dangerous boom-and-bust cycles in the loan markets. Secondly[13], increased volatility in the financial sector may lead to volatility in the real sector. Since banks are required to hold more capital against increased credit risk in an economic downturn, they would partly pass on the increased costs of capital to their borrowers. In this regard, it could possibly lead to a "credit crunch" phenomenon which will be reflected by the increase in interest rates. As a result of the lack of alternative sources of finance, firms would cut back on investment spending thereby aggravating the downturn.

4.   Empirical Tests

4.1   Hypothesis

1.   The impact of Basel II varies across SEACEN countries in terms of regulation as it is influenced by economic performance and the business cycle.
2.   The impact of regulatory capital requirement of Basel II is not always significant to the expected target of economic growth in each SEACEN country.
3.   The bank has reacted to the constraint of a tightening of capital by reducing credit to its riskier borrowers[14].

4.2   Methodology and Data

The main goal of Basel II is to enhance financial stability by introducing incentives for banks to develop better measures of risk management, to hold appropriate and more sensitive capital and to improve the transparency of their risk profile. It is interesting to see that there is a certain relationship between modern thinking in monetary policy and the framework derived for financial stability in Basel II.

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[12]   Basel II offers banks the choice of adopting either the new standardized approach or the internal rating based (IRB) approach to measure credit risk. Under the new standardized approach, the risk-weights will be based on rating provided by an external credit assessment institution so that claims on borrowers with sound credit rating will have lower risk-weights. Under the IRB approach, bank will be allowed to use their own internal models to assess credit risk in their portfolios, subject to strict methodological and disclosure standards. The IRB approach allows greater risk-sensitivity compared to the standardized approach, since it uses a wider range of risk-weights. In this regard, the supervisors are responsible for ensuring that banks adopting the standardized approach will comply with its conditions and requirements, while making sure that each bank using the IRB approach has a sound internal risk assessment process (pillar 2). Furthermore, banks adopting the IRB approach are expected to fulfill a set of disclosure requirement to ensure that market participants have adequate information to discipline errant banks (pillar 3).

[13]   This second scenario could be viewed as more damaging than the first scenario. In this regard, the volatility of regulatory capital may be partly offset by banks holding an extra buffer of its own capital while economic losses of the second scenario are difficult to evade.

[14]   Kasyap and Stein (2004, p.23) suggested that active management muddles together the direct effect of a tightened capital constraint with the bank's endogenous response. For example, suppose we look at the evolution of a bank's actively managed portfolio during a recession and find that average credit quality … is roughly unchanged. Should we conclude from this that there is no cyclicality problem deserving of policymaker attention? Probably not-it may just be that the bank has reacted to a tightening capital constraint by cutting off credit to its riskier borrowers, which is precisely the policy problem that concern us.

To analyze the benefits of Basel II and to conduct the analysis of pro-cyclicality of the framework, we must analyse its impact on both "financial output trend" and "volatility". Based on previous researches, there are several views as follows: first, as suggested by Taylor and Goodhart (2005), Basel II is likely to intensify pro-cyclicality although it is not clear about the magnitude. Secondly, Basel II is not likely to give much impact on pro-cyclicality since it is viewed that lending behaviours are more affected by economic capital rather than by regulatory capital and thus, are not likely to be significantly affected by Basel II. This argument is supported by Ayuso, Perez and Saurina (2004) that banks hold significant capital buffers that although maybe pro-cyclical would end up in an overall moderating effect.

Channels through which the pro-cyclical impact of Basel II could be felt are depicted as follows:
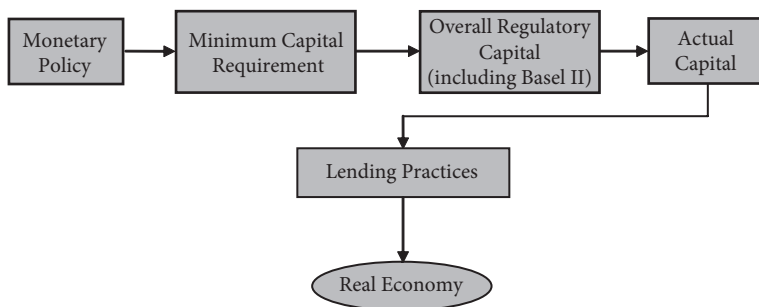
4.2.1 Vector Autoregression (VAR) Approach for Analyzing the Pro-Cyclicality Impact of Basel II

Analysis of pro-cyclicality impact of Basel II through lending on the real economy as presented from the model above would be based on the empirical standard semi-structural vector autoregression (VAR) models. This VAR model would be employed since this methodology avoids the need for a complete specification of a structural model of the economy.

As mentioned above, it would be appropriate to incorporate monetary policy and Basel II through lending and its impact on the real economy, as this VAR approach would be more consistent and fruitful. In this context, Bernanke et. al. (1997, pp. 95-96) propose the employment of a VAR in measuring monetary policy and other changes in certain aspects in banking portfolio (as suggested by Kashyap et. al., 1997).

Moreover, Rudebusch (1998) emphasizes that the ability of a VAR to produce useful results relies mostly on the ability to separate reactive policy actions from exogenous ones besides other crucial aspects of economic structure such as a sample period, structural breaks, variable selection, lag length and information sets. He suggests that the most important procedure is to distinguish monetary policy actions from exogenous ones. Here, endogenous (or reactive) policy responds to developments in the economy, while exogenous (or autonomous) policy consists of all other actions.

Vector autoregressive (VAR) models are widely employed in the empirical analysis of monetary policy issues. This methodology avoids the need for a complete specification of a structural model of the economy. The VAR analysis of the monetary transmission mechanism began when the failure of the traditional Cowles Commission models was rationalized by two main critics, Lucas (1976) and Sims (1980).

The traditional structural models proposed by the Cowles commission and semi-structural VAR models designed to analyze the impact of monetary policy can be described as follows:

$$(4.2.1) \qquad A\begin{bmatrix} Y_t \\ M_t \end{bmatrix} = C(L)\begin{bmatrix} Y_{t-1} \\ M_{t-1} \end{bmatrix} + B\begin{bmatrix} v_t^Y \\ v_t^M \end{bmatrix}$$

Where Y and M are vectors of macroeconomic variables (such as output and prices) and variables controlled by the monetary authority (such as interest rates and monetary aggregates containing information on monetary policy), respectively. Matrix A defines the contemporaneous relations among the variables and $C(L)$ is a matrix finite-order lag polynomial. $v \equiv \begin{bmatrix} v^Y \\ v^M \end{bmatrix}$ is the vector of structural disturbances. The non-zero off-diagonal elements of allow some shocks to influence more than one endogenous variable in the system.

Here, the traditional structural model approach is designed to identify the impact of monetary variables on macroeconomic quantities in order to decide the value to be set for the monetary instruments (M) to achieve a given target of the macroeconomic variables (Y), by assuming exogeneity of the M since these are the instruments controlled by the central banks. In this case, identification in the traditional structural models is obtained without assuming the orthogonality of structural disturbances.

The Lucas critique deals with structural models above when the coefficients explaining the impact of monetary policy on the macroeconomic variables depend on the monetary policy regimes. In this case, no model estimated under a specific regime can be applied to simulate the effects of a different policy regime. The Sims critique applies to identification from a different perspective, pointing out that the restrictions needed to support structural exogeneity in Cowles Commission-type models are "incredible" in an environment where agents optimize inter-temporally.

Moreover, Sims (1980) introduced the unrestricted VAR into macro-econometrics. It stands at the other extreme from the large-scale models and focuses on fitting a "model" to the data at the expense of theoretical consistency. Unlike the simultaneous-equation model, a VAR model is a-theoretic. According to Sims, if there is simultaneity among a set of variables, they should all be treated equally. Generally, a finite-order VAR is a multivariate model in which each endogenous variable is regressed on its own lags and lags of all other variables in the system, where the number of lags determines the order of the VAR. The objective of the VAR is to investigate the dynamic response of the system to the shocks without having to depend on "incredible identification restrictions" inherent in structural models, or "controversial restrictions" from economic theory.

Since the individual coefficients in the estimated VAR models are often difficult to interpret, it is useful to evaluate the so-called impulse response functions (henceforth, IRF). The IRF traces out the response of any dependent variable in the VAR system to shocks in the error terms for several periods in the future. The IRF is the centrepiece of VAR analysis. However, a possible deficiency of this analysis is that the impulse responses do not consider the "endogenous" component of monetary policy, such as any feedback rule linking it to state of the economy. But, since it is hard to identify and single out the original source of the many shocks hitting the economy and to which policy responds, the consequences of these changes in monetary policy are more difficult to interpret as they combine the effect of the original shocks and that of the policy reaction.

In the context of the deficiencies of IRF above, Rudebusch (1998) suggests that a VAR may produce impulse responses that are inconsistent with other, exogenous, aspects of monetary policy. Thereby, in employing VAR to measure monetary policy, we must embody exogenous influences; and these must represent other actions of monetary policy that are extraneous to the VAR. Rudebusch proposes that one way to overcome this problem is by identifying a policy shock time series and then find the effects of policy essentially by regressing everything else on that policy shock series. Here, the -period impulse response of a variable to a monetary shock could be calculated as the sum of the first coefficients of a regression of the variable on lagged exogenous shock; he suggests that there is no consequence in omitting other relevant variables since they are uncorrelated with the exogenous monetary policy shocks by construction[15].

Nevertheless, following Ford et. al. (2002), we take this problem into consideration by investigating the structural residuals from the inter-bank call money or other representative interest rate in each country equation in our VARs against some indicators of exogenous monetary policy and the past behaviour of monetary policy as presented.

In this regard, the monetary innovations derived from a given VAR only have meaning if these monetary innovations can be related to changes in exogenous monetary policy due to alterations in direct monetary policy instruments, such as a need to adjust the interest rate issued by the Central Bank or other monetary variables in order to engender the shocks to such an interest rate itself.

4.2.2 The Formal VAR Model

This study will apply the same approach as other analysis. To address the aforementioned issues, the effects of a monetary policy shock on banks' balance sheets and economic variables would be analyzed using the standard semi-structural VAR approach by Bernanke and Blinder (1992) of the form given in equation (4.2.2) as follows:

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[15] Christiano et al. (1996a and 1996b) support the argument of Rudebusch by proposing that the procedure of omitting other relevant variables is asymptotically equivalent to the usual one based on interpreting the coefficients of a full VAR as suggested by Sims (1980). In this case, Sims (1980) purposed that should each VAR measure a different independent component of the true monetary policy exogenous shock, each VAR could precisely and correctly estimate the appropriate impulse response.

(4.2.2) $Sy_t = A(L)y_t + \varepsilon_t$

$A(L)$ is a matrix polynomial in the lag operator L for a VAR (p):

(4.2.3) $A(L) = A_1L + A_2L^2 + K + A_pL^p$

The MA representation of 2 is:

(4.2.4) $y_t = \Phi(L)\varepsilon_t$

where $\Phi(L) = [S-A(L)]^{-1}$. The structural parameters of the contemporaneous endogenous variables are contained in S. y_t is the vector of endogenous variables in the system including one policy (indicator) variable and non-policy variables. While for ε_t, the vector of structural disturbances, $E[\varepsilon_t]=0$ and as in Sims (1980)[16], $E[\varepsilon_t\varepsilon_t'] = I_n$. In this case, $E[\varepsilon_t\varepsilon_t']$ will be I_n if $y_t = n \times 1$, the matrices S and A_p being conformable with the y vector. L^p is the lag operator, where p describes the order of the VAR.

Deterministic terms can be added on the right-hand side, as is frequently the case in a Johansen's analysis of co-integration, by adding a term ΨD_t. We do so in order to allow dummies to capture possible structural breaks. Then, a reduced form[17] of the equation (4.2.2) is estimated by OLS:

(4.2.5) $y_t = S^{-1} A(L)y_t + S^{-1}\Psi D_t + u_t$

where

(4.2.6) $u_t = S^{-1}\varepsilon_t$, and

(4.2.7) $E(u_t u_t') = \Omega = (S^{-1}\varepsilon_t)(S^{-1}\varepsilon_t)'$
$= (S^{-1})(\varepsilon_t\varepsilon_t')(S^{-1})'$
$= (S^{-1})(S^{-1})'$ given the assumption:
$E[\varepsilon_t\varepsilon_t'] = I_n$

So S^{-1} is the Cholesky decomposition of Ω, the reduced-form covariance matrix. Furthermore, the dynamic responses to shocks are summarized by the moving average (MA) representation (assuming that the process is invertible):

(4.2.8) $y_t = [I - S^{-1}A(L)]^{-1}u_t = [I - S^{-1}A(L)]S^{-1}\varepsilon_t$

It is assumed that all the roots of $\left|I_n - (S)^{-1} A(L)\right| = 0$ remain outside the unit circle in the absolute value, or are in 1 in the presence of cointegration and unit roots. In this sense, the companion matrix has roots that are less than one in the absolute value or are equal to plus 1. In these circumstances, the VAR is (mathematically) stable.

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[16] That is, they assumed covariance matrix is diagonal, which implies that the structural disturbances are orthogonal (mutually independent) (Sims, 1980).

[17] t is assumed that the errors are i.i.d and are normally distributed, being independent of any vector D_t; and that $y_{t-1}, y_{t-2}, K, y_{t-p}, D_t, t = 1,2,K,T$, are not perfectly collinear.

Therefore, the Cholesky decomposition of Ω provides the zero restrictions (to complement the $\frac{1}{2}p(p+1)$ constrains) on Ω needed to identify the elements of S^{-1}. The latter is lower-triangular:

$$\begin{bmatrix} S_{11} & 0 & 0 & 0 \\ S_{21} & S_{22} & 0 & 0 \\ S_{31} & S_{32} & S_{33} & 0 \\ M & M & M & M \\ S_{n1} & S_{n2} & S_{n3} & S_{nm} \end{bmatrix}$$

The system is then a recursive model or Wold-causal chain; the way in which the variables affect each other is determined by their position in the ordering. In this sense, the contemporaneous innovations in the other variables influence all those below them in the chain and none of those variables above them in the order. The ordering of the variables in the system therefore, influences the recursive chain of causality among the shocks in any given period.

Therefore, according to Sims (1992), the policy variable, such as a leading indicator of monetary policy, is ordered first if we assume that there is no contemporaneous feedback from non-policy variables onto the policy variables. Thus, we assume that monetary policy decisions are set without considering the simultaneous evolution of economic variables. This assumption is applied if information on non-policy variables is not readily available to the monetary or policy-making authorities. Furthermore, had we assumed that the policy variables respond to contemporaneous feedback from non-policy variables, the policy variable should be ordered last.

However, in our study, given the high frequency data (monthly) that we employ in constructing our VARs and the existence of information lag from non-policy variables[18], we prefer the former identifying restriction. Nevertheless, since the correlations across residuals ε_t are very small, the ordering is actually not significant. This condition is supported by Enders (1995) who stated that if $\left| e_{\varepsilon_i \varepsilon_j} \right| < 0.2$, then $i \neq j$, the ordering of variables in a VAR is not relevant.

Alternative decompositions to Cholesky as proposed above are those by Sims (1980), Lutkephol (1991), Koop et. al. (1996), and Pesaran and Shin (1997). Pesaran and Shin, for example, suggest the generalised impulse response analysis for unrestricted VAR and cointegrated VAR models. Unlike the traditional impulse response analysis, their approach does not entail orthogonalization of shocks. For a non-diagonal error variance matrix, the orthogonalized and the generalized impulse responses correspond only in the case of the impulse responses of the shocks to the first equation in the VAR.

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[18] Interest rate data (the policy variables) is readily available while non-policy variables such as real output, stock market index and price were available with a lag.

Pesaran and Shin (1997) suggest that the orthogonalized and the general impulse response functions differ in a number of respects. The generalized impulse responses are invariant to the reordering of the variables in the VAR. Pesaran and Shin also admit that there are many alternative reparameterizations that could be used to calculate the orthogonalized impulse responses and there is no exact guidance as to which of these possible parameterization alternatives should be employed. On the other hand, they view the generalized impulse responses as reliable tools to measure the historical patterns of correlations observed for different shocks.

Furthermore, we could potentially develop our approach in this study by investigating the possibility of cointegration. Under the existence of cointegration, we can use the resultant VECs to examine the structural shocks by exploiting the cointegrating vectors to constrain the long-run multipliers in the systems using the KPSW model (King, Plosser, Stock and Watson, 1991) decomposition. Here, if cointegration exists in our VARs, then the impulse responses could be evaluated from the resultant Vector Error Correction Mechanism (VECM). In this context, the KPSW decomposition model which investigates the cointegrating relationships, which is also based on the Cholesky decomposition, gives an alternative methodology for uncovering impulse responses than the straight use of the Cholseky decomposition on the VECM.

Given the importance of the possibility of cointegration in our VARs estimation, before the VAR specification is explained and the empirical results are presented, the test to investigate the presence of cointegration was first conducted in all the VARs, which confirmed that the approach as proposed by KPSW could not be invoked as there were no evidences of cointegration in our estimations. However, there were nominal evidences since all of our VARs contained dummy variables of which the critical values for the trace statistics (Johansen, 1995) had to be estimated by the Monte Carlo studies since the standard ones are based on the presence of special forms of dummy variables, which must have an expected value of zero.

The models proposed for estimation and the variables they contain therein are presented in Table 4. In examining the effects of monetary policy on the bank's balance sheet, we adopt Gertler and Gilchrist (1993) and Kashyap and Stein (1995) in specifying the VAR. Gertler and Gilchrist (1993) have also employed this kind of VAR.

Based on the possible relationship as found by Gertler and Gilchrist, the system involving nine variables VARs was developed with the following ordering: inter-bank money market overnight rate, bank deposits, bank loans, minimum bank capital (regulatory minimum capital as required by Basel II for the second VAR to see the differences as comparison to minimum bank capital), bank securities, stock market index, output (real GDP) and prices (Consumer Price Index or CPI). In this case, a random innovation on one variable often occurs simultaneously with innovations to another variable in the system. In order to overcome this, as noted above, the innovations are orthogonalized by a Cholesky decomposition in which the covariance matrix of the resulting residuals is the lower triangular.

By including conditioning variables, stock market index, output and prices, which are likely to be associated with the aggregate demand for loans, the VAR could determine how loan supply responses vary across different capital (minimum bank capital and regulatory minimum capital). In addition, we also employ the exchange rate in the VAR. The reason for this is that the exchange rate (as proposed in the "money view") plays an important role in relatively small and open economies like Indonesia and other SEACEN countries. Here, any changes in the exchange rate affect the banks' balance sheet variables, stock market index, output and prices.

Moreover, if we are to conduct tests for the presence of co-integration within a specific VAR, it is necessary to determine the order of integration of the variables. In general, to use the standard procedures developed by Johansen (1995), we require them all to be I(1), i.e., to be stationary in their first difference. In addition, as Philips (1986) demonstrated, any OLS regressions which are based on the levels of the variables will be a spurious one. However, the implication that only stationary, I(0), variables should be included in VARs has tended not to be accepted. We first concentrate on tests for the presence of unit roots, that is, for the existence of I(1) variables.

These are three "important" tests for unit roots - the augmented Dickey-Fuller (ADF), Phililips-Perron and Perron's (1997) structural break test. These tests are conducted to see if the null hypothesis can be rejected and if so, the series y are considered to be stationary, $y \sim I(0)$. Whilst, a non-rejection of the unit-root null hypothesis for level data raises the question as to whether its first difference is stationary, $y(1)$. This testing procedure by further differencing, can be continued until stationary series are achieved. This testing procedure is justified when we assume that most economic series are I(1).

4.2.3 *The Lending Behaviour Responses to Riskier Borrowers as a Result of Tightening Capital due to Basel II*

For this, the above same model is used by dividing the loans data based on borrower risk type such as investment grade and non investment grade. However, for simplification, the loans data is segregated into investment loans, working capital loans and consumption loans.

Based on the logical framework described above, it is realized that the panel data approach can be employed to gauge the lending behaviour across countries due to the differences in the way each country implement Basel II. However, since there is a varied time frame in the implementation of the Accord in each country, we prefer to use the same model to determine the condition of lending behaviour in each country.

4.2.4 Data

To estimate the above described model, this study will use monthly data from 1998:01 to 2006:12 for each variable: interest rates (issued by authority), exchange rates, deposits, loans, actual capital (and regulatory capital requirement), securities, stock market index, consumer price index and output.

Table 4
Data Specifications

No	Notation	Variable Specification	Unit	Sample Range
1	Interest Rates	Official Interest Rates issued by Authority or Money Market Interest Rates	Percentage	1998:01-2006:12
2	Exchange Rates	Domestic Currency to USD Rate	Unit	1998:01-2006:12
3	Deposits	Total Third Party Fund in Banking Industry	US$ Million	1998:01-2006:12
4	Loans	Total Loans	US$ Million	1998:01-2006:12
5	Actual Capital	Total Actual Capital by Banking Industry	US$ Million	1998:01-2006:12
6	Regulatory Capital Requirement	Total Regulatory Capital Requirement (after Basel II)	US$ Million	1998:01-2006:12
7	Securities	Securities owned by Banks	US$ Million	1998:01-2006:12
8	Inflation Rate	Consumer Price Index	Percentage	1998:01-2006:12
9	Stock Market Index	Stock Market Index in Capital Market	Unit	1998:01-2006:12
10	GDP	Gross Domestic Product (usually issued quaterly)	US$ Million	1998:01-2006:12

4.3 The Overall Simulation Results for the SEACEN Countries

This paper has so far discussed the implementation of Basel II[19] in some SEACEN countries. The overall simulation results for the SEACEN countries are presented in the following section.

Based on our simulation, it is observed that the impact of a monetary shock will affect deposits and loans in the short run in most SEACEN countries under review. However, in the long run, the effect is most likely to be insignificant, indicating that the banking industry is well capitalized.

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[19] Basel II aims to strengthen banks' incentives to control their risk exposures relative to Basel I, which relies on a more simple method of risk measurement. In this regard, Basel II is also likely to reduce the scope for capital arbitrage. Basel II effectively employs information about the borrowers' creditworthiness held internally by banks by allowing financial institutions that fulfill certain requirements to adopt the IRB approach. Therefore, in several respects, Basel II is considered to be superior to Basel I.

The country characteristics also have a bearing on whether the impact on pro-cyclicality from Basel II will be significant. For example, in ROC (Taiwan), although the implementation of Basel II will affect bank lending, the impact on the economic growth is not significant due to its export-oriented economy. ROC (Taiwan) is dependent on exports as the main engine of economic growth and is more susceptible to changes in the world economy.

Overall, based on the simulation results of the SEACEN countries, it can be concluded that the impact of the pro-cyclicality of Basel II implementation is insignificant. While there are some impacts on the CAR or capital, banks would still be more than able to perform their intermediary function due to the more than ample average CAR of the banking industry in SEACEN countries vis-à-vis the minimum requirement of 8%.

5. Conclusion, Recommendations and Future Researches

5.1 Conclusion

We have investigated empirically whether there are differential effects of monetary policy and simulations of Basel II implementation on banks' balance sheet were carried out across countries, particularly on loans and other bank balance sheet components such as deposits and securities and their implications on each country's economy. The study covers different time periods for the various countries due to data limitation.

In summary, interesting and important findings of the pro-cyclicality impact of Basel II are as follows:

1. The increase in capital requirements as a result of Basel II does not have significant pro-cyclicality impact on lending and on GDP since most of the countries have average CARs which are well above the 8% minimum requirement. We can therefore conclude that most of the SEACEN countries are placing more emphasis on banking and financial stability especially in the wake of the financial crisis in 1997.
2. The more developed the economy of a country as reflected by the development of its capital market, the less pro-cyclicality impact there would from Basel II implementation and visa versa. As can be seen from the impulse response functions, when there is a "constraint" on bank lending, an increase in the impulse response functions of the capital market (stock market index) follows, indicating that the private sector have easy access to the capital market as an alternative source of financing.
3. There is no indication at all that the implementation of Basel II would cause a credit crunch, a situation where the supply of bank loans is lower than its equilibrium level at the prevailing interest rates.
4. In the case of a "tight monetary policy" as reflected by the increase of interest rates, there could be "more" pro-cyclicality impact from Basel II implementation especially on banks' lending behavior which could cause a slowdown in economic growth as represented by the decrease in the GDP impulse responses.

5.2 Recommendations

Based on the empirical results for the various SEACEN countries, some recommendations can be drawn as follows:

1. As a result of Basel implementation, the experience of the 1997 financial crisis and the need to mitigate risks, it is important for SEACEN countries to maintain capital requirements as proposed by Basel Regulation, especially in light of the US mortgage crisis which had widespread negative impact on the global economy. The better a bank's capital, the better would be its capability to mitigate risks.
2. It is also important to consider the implementation of Basel II with the economic performance of each individual country since each country has its own business cycle which can differ from the others. It is vital therefore for each country to make the right decision in terms of the timing of the implementation of Basel II in light of its economic performance. For example, in the case of a situation of an economic slowdown, careful consideration need to be given on the pro-cyclicality impact of the Basel II especially on loans extended by banking industry.
3. Following from the above, to improve the capability of banks to mitigate risks as a consequence of the increase in capital requirement of Basel II, monetary and banking authorities have to set prudential standards and supervise banks to decrease their NPLs especially since NPLs hinder the way capital requirement works on the macroeconomic variables.

5.3 Further Researches

Possible follow-up researches on the pro-cyclicality impact of Basel II may be suggested as follows:

1. To widen the VARs by utilizing the complete components of assets and liabilities to provide more integrated results and give a more comprehensive picture on the SEACEN banks following the change in Basel II capital requirements and in the conduct of monetary policy.
2. An important variable such as NPLs could be considered as they are becoming more important in affecting banks' behavior as a result of Basel II implementation.
3. There are, of course, theoretical foundations that can be employed to derive the pro-cyclicality impact of Basel II. However, any extension of the work in another direction may be more useful if there is data available for a longer period of time; and the components of loans can be divided based on economic sectors and usage since these would provide more analyses and evidence on the pro-cyclicality impact of the increase in required capital due to Basel II on bank lending.

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COUNTRY CHAPTERS
PART II

PRO-CYCLICALITY IMPACT OF BASEL II IN CAMBODIA

by Ouk Sarat[1]

1. Overview

In order to understand the state of the financial sector in Cambodia, it is important to note that at present banks are the only major financial institutions and the financial market is underdeveloped. Upon the promulgation of the Law on Banking and Financial Institutions in December 1999, the entire banking system was restructured and 16 banks were either voluntarily or forced to liquidate. Following this restructuring exercise, confidence in the banking system eroded and restoring confidence has been a difficult and an ongoing mission for the National Bank of Cambodia.

1.1 Progress of the Banking System in Cambodia

The performance in the banking system has improved in the past few years. As of 2006, the banking system in Cambodia consisted of 16 commercial banks, 6 specialised banks, and around 40 microfinance institutions. Customer credit increased in average by 28% in the past five years. To the same extent, customer deposits grew at a yearly average of 26%. The number of depositors and borrowers in the banking system also rose to 400,000 and 600,000 respectively. This rapid growth is a sign of the return of confidence in the banking system. Customers perceive that Cambodian banks are much safer now than ever before and indeed, they are enjoying the various services being currently offered by banks. Banks have not only extended their loans to various kinds of businesses within the economy but also increased the volume of their participation in the development of those business sectors.

Figure 1
Customers' Deposit and Credits
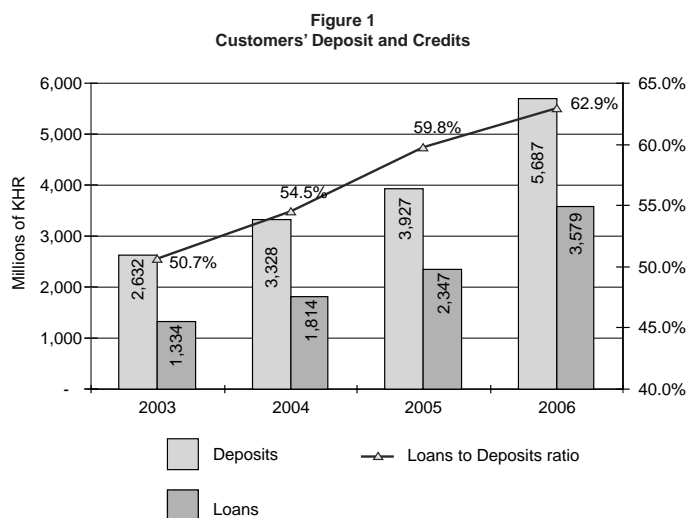
Source: National Bank of Cambodia

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The increase in total assets of the Cambodian banking system also tracked that of customer credits and deposits since banks are only involved in traditional banking activities such as providing loans, accepting deposits, and settling payments while the capital market is non-existent. Compared to GDP, total assets in the banking system rose from 21% in 2003 to 29% in 2006. However, this proportion is relatively low compared those of other countries in the region, confirming that the Cambodian banking system is still at the infancy stage.

Figure 2
Total Assets of the Banking System
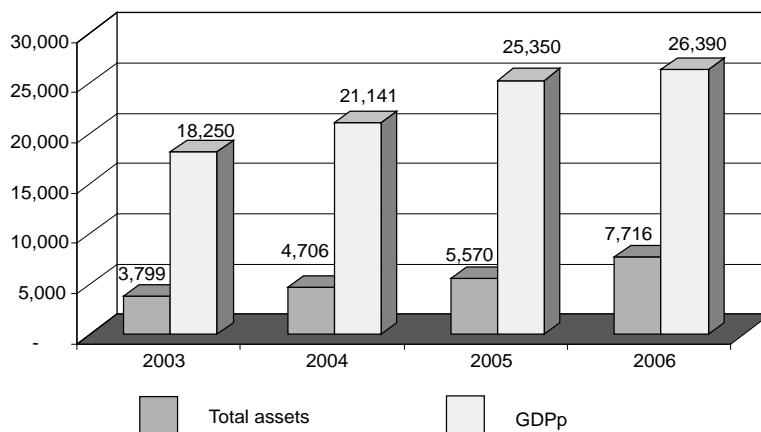
Source: National Bank of Cambodia

Cambodia has been recognised as a highly dollarised economy in the region, making it difficult for the central bank to manage money supply through the policy rate. While the interest rate gap for commercial banks has narrowed over the past three years, the lending rate remains high at around 17% per annum while deposit rate is still low at around 5% per annum. The high lending rate is largely explained by the lack of reliable information provided by the borrowers and in many cases, the information cannot be verified or realisable due to poor accounting practice. Their repayment capacity cannot be assessed through their cash flows. Hence, most lending approvals are likely to be based on property collateral with high interest rate to compensate for the high credit risk and operating costs. At the same time, due to the lack of reliable information, banks are reluctant to lend and this has resulted in excessive liquidity. In order to reduce their cost of holding high liquidity, banks lower the deposit rates.

Figure 3
Interest Rate on Credits and Deposits
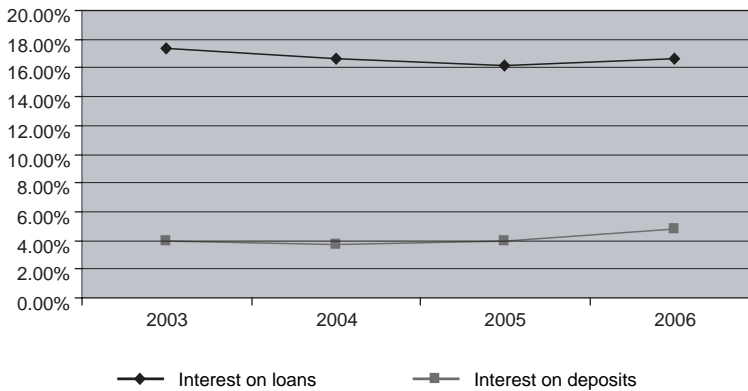
Source: National Bank of Cambodia

1.2 Potential Weaknesses

Despite progress in the Cambodia banking system, some weaknesses have been observed. First of all, credit seems to present a much greater risk to the system. Credit portfolios have increased rapidly which have a potential for risks. Since the restructuring programme in 2002, non-performing loans declined markedly from 15% to only 8% in 2005, largely due to the strengthening of the organisational structures of both the supervisory authority and financial institutions. Strong enforcement of prudential regulations had been put into place and weak institutions were subject to possible liquidation if they did not present a sound and reliable restructuring plan. The financial institutions especially commercial banks, were able to strengthen their operations through the recruitment of more experienced staff, tighter disbursement of credit and being very selective with customers.

The nonperforming loans had increased to 9% in 2006 but this figure is expected to be lower by the end of 2007. While the fast growth of credit has given supervisory authority a lot of concerns, financial institutions have continued to relax their lending procedures in return for higher profits. Approvals on credit disbursement are largely reliant on property collateral rather than positive cash flows of the borrowers. With the property market booming in Cambodia, borrowers have been getting increased access to bank financing. This development is of concern to supervisory authorities since financial institutions would suffer massive losses should property prices reverse their current trend. In addition, credit risk management within commercial banks remains very poor as some financial institutions do not have the resources or the required skill to mitigate credit risk. At the same time, credit information sharing between financial institutions is still at the very initial stage. However, some banks still remain very optimistic about the credit quality and have continued to expand their loan portfolios.

Figure 4

Non-performing Loans
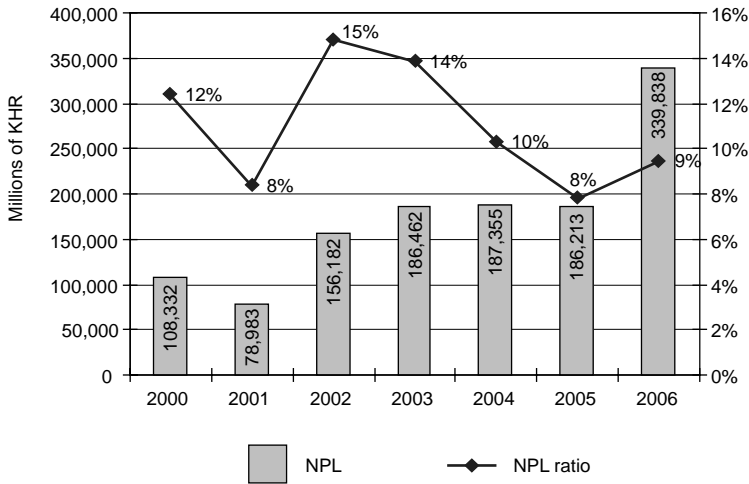
Source: National Bank of Cambodia

Besides rapid credit expansion, credit concentration or exposures of the individual customer or group of customers pose a major threat to the banking system. Total exposures to net worth in the banking system increased from 26% in 2002 to a peak of 90% in 2005. Prudential regulation in Cambodia forbids financial institutions from lending to an individual customer or group of customers in excess 20% of their net worth while the demand for credit is likely to be much more than that. As Cambodia is developing, it needs huge amounts of capital to finance large projects such as infrastructure development, industrial parks, financial centres, tourist locations, and so on. These projects are entirely financed by commercial banks as the capital market, especially the bond and equity market, is non-existent. The supervisory authority has permitted such financing for the development of the country since they are relatively secure. At the end of 2006, the revised regulation on the management of large exposures was issued for implementation. With this amended regulation, sound and strong financial institutions would have increased opportunities to finance large projects while relatively small institutions would have to reduce their exposures to comply with the regulation. Following this, the total exposures in the banking system dropped significantly to 47% of the net worth. Despite this improvement, credit exposures remain a major threat to the stability of the system, given that any project failures would put pressure on the soundness of banks and financial institutions.

Figure 5
Large Exposures
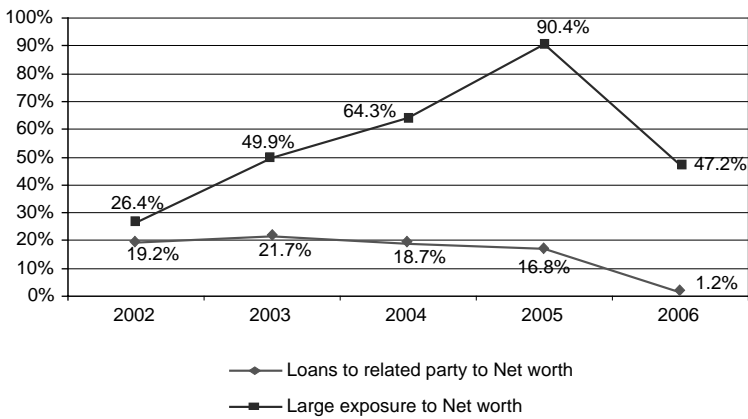
Source: National Bank of Cambodia

Another weakness is the concentration of credits in various economy sectors. The rapid credit growth has not only caused concern for non-performing loans but also for the concentration of credit in the booming sectors. Loans to the services, retail and wholesale sectors have increased considerably reflecting the growing number of tourist and consumer spending. Tourism is a major sector sustaining the growth of the Cambodian economy. However, this sector is highly vulnerable to both internal and external factors. Internal and external destabilising factors such as political conflict or an outbreak of avian flu would greatly put the sectors at risk as well as the banking system and economy as a whole. The increase in personal consumption loans is also a matter of concern. Previously, banks have always focused on commercial loans and were reluctant to issue consumption loans due to the lack of collateral and necessary legal framework. However, banks currently are increasingly extending personal consumption loans although customers' incomes may not be sufficiently adequate and stable for repayment. Housing loans are becoming increasingly popular in Cambodia and many contractors operate with direct funding from commercial banks. With both buyers and contractors having access to the same source of funding, a reverse in residential prices would cause severe financial problems to banks and financial institutions.

Figure 6
Credits by Economic Sectors

Total net credits classified by type of businesses 2006 (billions of KHR)
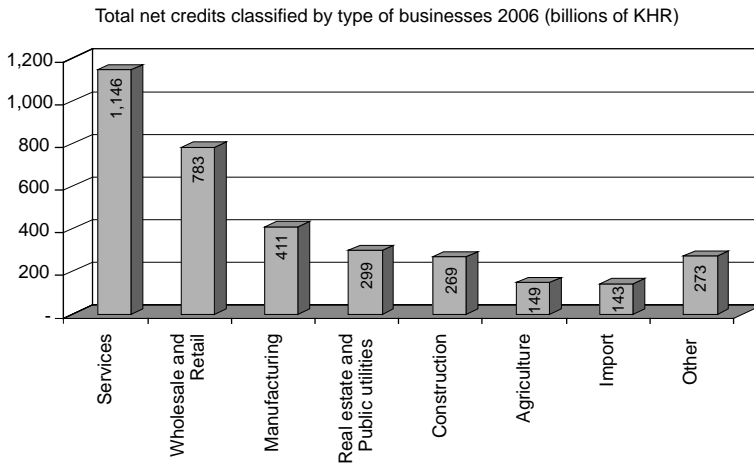
Source: National Bank of Cambodia

In addition, the prudential provisions of the Cambodian banking system are still weak in the areas of liquidity, solvency, profitability, and sound corporate governance. The low ratio of loans to deposits has resulted in excess liquidity that banks have difficulty in managing. The regulation which requires banks to maintain all their local deposits in the country coupled with the lack of finance instruments, have obligated banks to place their excess liquidity in the central bank, earning moderate interest rates. Banks generally have a high liquidity ratio exceeding the regulatory requirement of 50% of the net worth. However, from the prudential perspective, given that the banking system is highly dollarised and the limited role of the central bank as lender of last resort, such highly liquidity is required which has caused banks to face a tradeoff between liquidity and profitability.

Figure 7
Liquidity Ratio
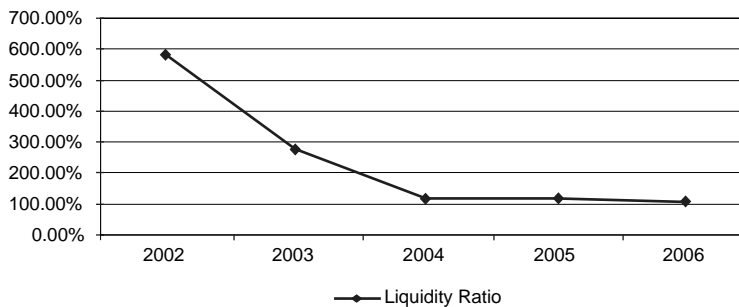
Source: National Bank of Cambodia

The solvency ratio of the Cambodian banking system is closely monitored although it remains well above the regulatory limit. The ratio decreased from 58% in 2001 to 26% in 2006, higher than prudential limit of 15%, and above the 8% of capital accord. This trend is largely due to the increase in risk weighted assets, particularly for loans disbursement and

loans commitment. Despite the increase in regulatory capital of banks from time to time through raises in capital and profit generation, rapid credit expansion has put enormous pressure on banks. The lack of credit rating has also left no choice for banks except to weigh counterparty risk at 100% although some customers credit standing has proven to be strong and viable.

Figure 8

Solvency Ratio
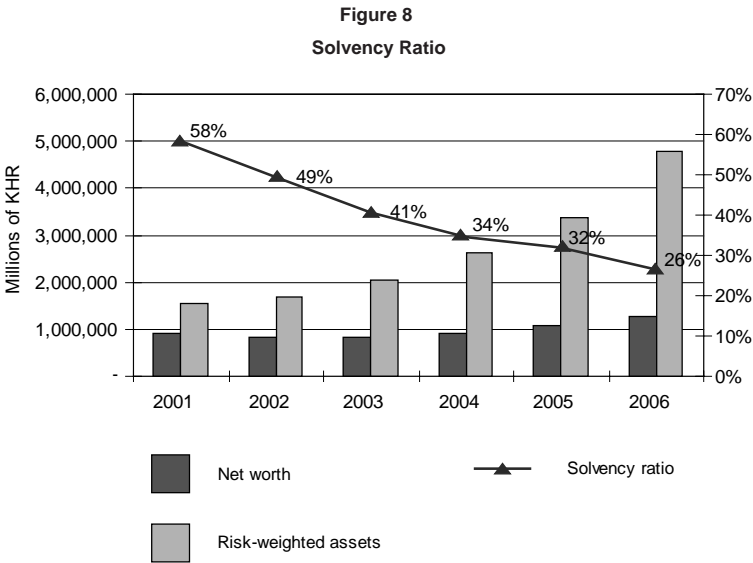
Source: National Bank of Cambodia

The performance of banks in Cambodia seems to be encouraging with improving returns on assets and equity overtime. At the end of 2006, ROA and ROE stood at 2.8% and 14% respectively. Despite this improvement, profitability of banks in Cambodia remains relatively low compared to neighbouring countries. High operating costs are a key factor in the relatively low profits of banks. Poor physical infrastructures as well as lack of legal frameworks have made it difficult and costly for banks to obtain necessary information about customers. Even as banks have set high interest rates for loans and made efforts to generate income through charging fees and commissions, the high operating costs have generally resulted in low profits for banks.

Figure 9
Profitability Ratio
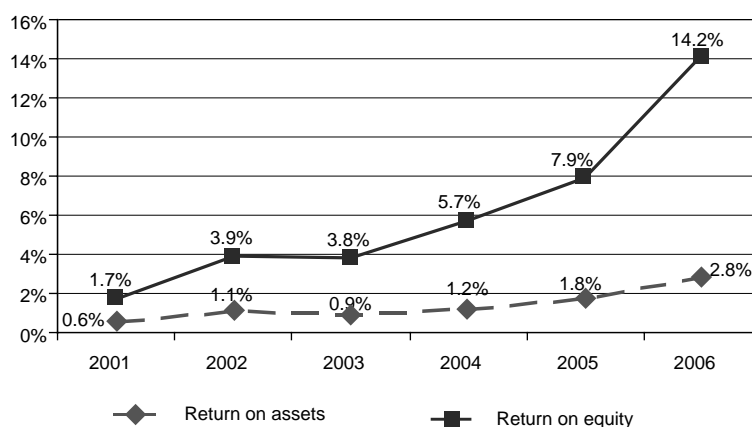
Source: National Bank of Cambodia

Corporate governance is becoming increasingly imperative for banks and financial institutions in Cambodia. The majority of Cambodia's banks do not satisfy the regional standards of corporate governance as the country lacks regulations on governance. Poor banking practices arising from poor corporate governance have already proven to be a serious problem within banks. Poor internal control, risk management, and performance have been observed in many banks and this would lead banking system fragility. While regulations on corporate governance is urgently required, time is needed to educate the public on its importance and thus, the instilling of market discipline on banks.

The banking system in Cambodia is highly concentrated which presents a strong systemic risk. Of the total licensed banks, the top 5 banks hold 71% of total deposits and the top three banks have 62% of total credits. This implies that the stability and soundness of these banks is a major factor in ensuring that the already weak confidence in the banking system would not erode further. It has always been the regulatory authority's stance to allow banks to compete freely and fairly in the market and to foster competition by allowing access to entrance of foreign banks. There is no limitation on foreign participation in banks operating in Cambodia. The recent growing number of banks is expected to ease the systemic problem.

1.3 Development of Prudential Norms

The regulatory and supervisory system is aimed at promoting fair competition among financial institutions while safeguarding the integrity of the financial system. Continuous development of prudential norms has been identified as key to achieving this vision. Given that the Cambodian banking system is at rudimentary stage and faces several weaknesses, the regulatory and supervisory authority understands the need to enhance efficiency in banking supervision and the need to upgrade prudential norms in Cambodia in line with international best practices.

1.3.1 Enhance Efficiency in Banking Supervision

The regulatory and supervisory authority in Cambodia has identified three aspects to enhance efficiency in banking supervision. First, the supervisory authority recognises the need to improve regulatory framework. This task is an ongoing process and involves numerous changes in prudential regulations. However, at the current stage, three regulations are being prioritised for upgrading, including the regulation on internal control, net worth calculation, and open position in foreign currency. Second, the supervisory process also needs to be enhanced. The supervisory authority has done a lot in terms of capacity building and procedures but there is still room for improvement since Cambodia has yet to comply with the Core Principles for effective banking supervision. The authority is considering the phasing out progressively of the reporting paper which is a source of doubloons and mistakes for both banks and supervisor. The authority also intends to improve the computerisation of the supervision process through strengthening and complementing the database system to enable supervisors to make a better judgment on problem banks and financial institutions. Lastly, strengthening enforcement is the key factor for enhancing efficiency in banking supervision. In the past, there were excessive time lags in the supervisor's reactions to identified breaches of regulations. The authority is currently adopting a more collective mode of decision making process in order to be more proactive in enforcing prudential regulations and standards. It also intends to promote virtuous circles in the banking system by developing internal controls, fostering competition, increasing transparency through published financial statements, and promoting cooperation among banks.

1.3.2 Implementation of the Basel II

According to an informal assessment by the International Monetary Fund (IMF), several concerns raised in the 25 Core Principles were not covered by Cambodian laws and regulations, mainly because of its irrelevance in the current banking system. This is no doubt this is one of the main obstacles towards a successful implementation of the Basel Accord. Another barrier is the level of development of the banking system. The banking system in Cambodia is very young (there is still a lack of public confidence and regulatory and legal frameworks) and lack sophistication (in terms products offered, information system, and human resources). In response, the regulatory authority has set a higher capital adequacy ratio for banks than the standard set by Basel I. While Basel I has not been fully implemented with various obstacles in the way, the authority is now focusing on the compliance with the 25 Core Principles, the foundation of effective bank supervision. In light of this, so far as Basel II is concerned, Cambodia would need time for its compliance since its financial market is not yet developed and financial products are still very rudimentary consisting mainly of short-term credits with collaterals. Therefore, many market risks (stock exchange risk, interest rate risk) are not really present and coupled with this is that the technical aspects required by the New Accord is not available in Cambodia. The lack of statistical data and human resources make it difficult for the supervisory authority to implement Basel II.

1.4 Objectives of the Study

In this paper, we would like to answer some important questions as follows:

1. How does the Basel II affect the economy and banking industry in Cambodia in terms of regulation?
2. Would the requirement of regulatory capital requirement as required by Basel II overstate the magnitude and economic significance of pro-cyclicality in the New Accord relative to the existing capital requirement in Cambodia?
3. How the lending behaviour responds to the riskier behaviour as a result of tightening capital constraints; and alternative proposed modifications to the New Accord?

The results of this study could hopefully be used by the monetary authority to analyse the impact of Basel II and aid in choosing the appropriate policies to counteract possible pro-cyclicality impacts on the financial system and macro economy as a whole.

2. Data Analysis

2.1 Data

The data used in this study are presented in the Table below. Monthly data from 2001:01 until 2007:06 were used depending on their availability.

Table 1
Data Specification

No	Notation	Variable Specification	Unit	Sample Range
1	Interest Rates	N/A	Percentage	N/A
2	Exchange Rates	Domestic Currency to USD Rate	Unit	2001:01-2007:06
3	Deposits	Total Third Party Fund in Banking Industry	Million KHR	2001:01-2007:06
4	Loans	Total Loans	Million KHR	2001:01-2007:06
5	Investment, Working Capital and Consumption Loans	Investment, Working Capital and Consumption Loans	Million KHR	2001:01-2007:06
6	Actual Capital	Total Actual Capital by Banking Industry	Million KHR	2001:01-2007:06
7	Regulatory Capital Requirement	Total Regulatory Capital Requirement (after Basel II)	Million KHR	2001:01-2007:06
8	Securities	Securities owned by Banks	Million KHR	2001:01-2007:06
9	Consumer Price Index or Inflation Rate	Total import of petroleum	Percentage	2001:01-2007:06
10	Stock Market Index	Stock Market Index in Capital Market	Unit	2001:01-2007:06
11	GDP	Gross Domestic Product	Million KHR	2001:01-2007:06

2.2   Model Specification

2.2.1   Logical Framework

We have seen that the main goal of Basel II is to enhance financial stability by introducing incentives for banks to develop better measures and manage risk, to hold appropriate, more sensitive capital and to improve the transparency of their risk profiles. It is interesting to note that there is a certain relationship between current thinking in monetary policy and the framework derived for financial stability in Basel II.

In order to analyse the value added of Basel II and to conduct the analysis of pro-cyclicality of the framework, we must analyse its impact on both "financial output trend" and "volatility". Based on previous researches, there are several views on this as follows: firstly, as suggested by Taylor and Goodhart (2005), Basel II is likely to intensify pro-cyclicality although they are not clear about its magnitude. Secondly, Basel II is not likely to give much impact on pro-cyclicality since it is viewed that lending behaviours are much more affected by economic capital rather than by regulatory capital. This argument is supported by Ayuso, Perez and Saurina (2004) that banks hold significant capital buffers and moving pro-cyclical would lead to an overall moderate effect.

Channels through which pro-cyclical impact of Basel II works could be seen as follows:

Chart 1
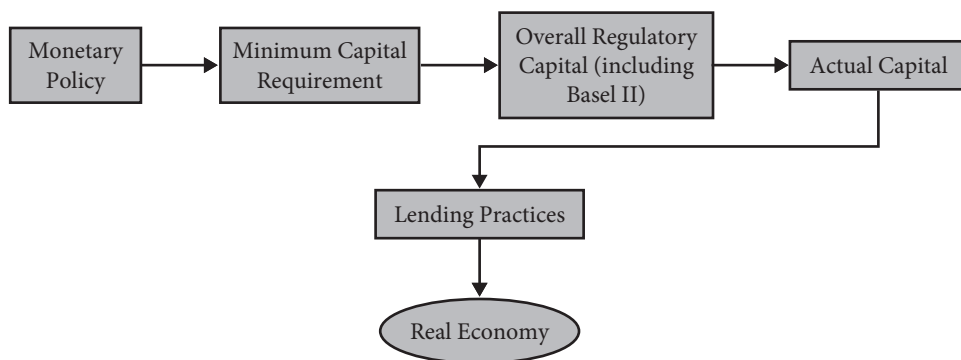
2.2.2   The Model

The Pro-Cyclicality Impact of Basel II

Analysis of pro-cyclicality of Basel II through lending on the real economy as presented in the model above would be based on empirical standard semi-structural vector auto regression (VARs) models. This VAR model would be employed since it avoids the need for a complete specification of a structural model of the economy.

As mentioned above, since we would like to incorporate monetary policy and Basel

II through lending and its impact on the real economy, this VAR approach is expected to be consistent and useful. In this context, Bernanke et al (1997, pp. 95-96) propose the employment of a VAR in measuring monetary policy and other changes such as banking portfolio (as suggested by Kashyap et al, 1997). Moreover, Rudebusch (1998) emphasises the ability of a VAR to produce useful results relying mostly on its ability to separate reactive policy actions from exogenous ones besides other crucial aspects of the economic structure such as the sample period, structural breaks, variable selection, lag length and information sets. He suggests that the most important procedure is to distinguish monetary policy actions from exogenous ones. Here, endogenous (or reactive) policy responds to developments in the economy, while exogenous (or autonomous) policy consists of all other actions.

Like those analyses, this study will apply the same approach. In order to address the issues above, we employ the semi-structural VAR approach by Bernanke and Blinder (1992) of the form given in equation (1). It can be presented as follows:

(1) $Sy_t = A(L)y_t + \varepsilon_t$

$A(L)$ is a matrix polynomial in the lag operator L for a VAR (p):

(2) $A(L) = A_1 L + A_2 L^2 + K + A_p L^p$

The MA representation of 2 is:

(3) $y_1 = \Phi(L)\varepsilon_t$

Where $\Phi(L) = [S\text{-}A(L)]^{-1}$. The structural parameters of the contemporaneous endogenous variables are contained in S. y_t is the vector of endogenous variables in the system including one policy (indicator) variable and non-policy variables. While for ε_t, the vector of structural disturbances, $E[\varepsilon_t]=0$ and as in Sims (1980)[2], $E[\varepsilon_t \varepsilon_t^{'}] = I_n$. In this case, $E[\varepsilon_t \varepsilon_t^{'}]$ will be I_n if $y_t = n \times 1$, the matrices S and A_p being conformable with the y vector. L^p is the lag operator, where p describes the order of the VAR.

Deterministic terms can be added on the right-hand side, as is frequently the case in a Johansen's analysis of cointegration, by adding a term ΨD_t. We do so in order to allow dummies to capture possible structural breaks. Then, a reduced reduced form[3] of equation (1) is estimated by OLS:

(4) $y_t = S^{-1} A(L)y_t + S^{-1}\Psi D_t + u_t$

where

(5) $u_t = S^{-1}\varepsilon_t$, and

---

[2]   That is, they assumed covariance matrix is diagonal, which implies that the structural disturbances are orthogonal (mutually independent) (Sims, 1980).

[3]   It is assumed that the errors are i.i.d and are normally distributed, being independent of any vector D_t; and that $y_{t-1}, y_{t-2}, K, y_{t-p}, D_t, t = 1,2,K,T$, are not perfectly collinear.

(6) $E(u_t u_t^{'}) = \Omega = (S^{-1}\varepsilon_t)(S^{-1}\varepsilon_t)^{'}$
$= (S^{-1})(\varepsilon_t \varepsilon_t^{'})(S^{-1})^{'}$
$= (S^{-1})(S^{-1})^{'}$ given the assumption:

$E[\varepsilon_t \varepsilon_t^{'}] = I_n$

So S^{-1} is the Cholesky decomposition of Ω, the reduced-form covariance matrix. Furthermore, the dynamic responses to shocks are summarised by the moving average (MA) representation (assuming that the process is invertible):

(7) $y_t = [I - S^{-1}A(L)]^{-1}u_t = [I - S^{-1}A(L)]S^{-1}\varepsilon_t$

It is assumed that all the roots of $\left|I_n - (S)^{-1}A(L)\right| = 0$ remain outside the unit circle in absolute value, or are in 1 in the presence of cointegration and unit roots. In this sense, the companion matrix has roots that are less than one in absolute value or are equal to plus 1. In those circumstances the VAR is (mathematically) stable.

Therefore, the Cholesky decomposition of Ω provides the zero restrictions (to complement the $\frac{1}{2}p(p+1)$ constrains) on Ω needed to identify the elements of S^{-1}. The latter is lower-triangular:

$$\begin{bmatrix} S_{11} & 0 & 0 & 0 \\ S_{21} & S_{22} & 0 & 0 \\ S_{31} & S_{32} & S_{33} & 0 \\ M & M & M & M \\ S_{n1} & S_{n2} & S_{n3} & S_{nn} \end{bmatrix}$$

The system is then a recursive model or Wold-causal chain; the way in which the variables affect each other is determined by their position in the ordering. In this sense, the contemporaneous innovations in the other variables influence all those below them in the chain and none of those variables above them in the order. The ordering of the variables in the system therefore influences the recursive chain of causality among the shocks in any given period.

Therefore, according to Sims (1992), the policy variable such as leading indicator of monetary policy, is ordered first if we assume that there is no contemporaneous feedback from non-policy variables onto the policy variables. Thus, we assume that the monetary policy decisions are set without considering the simultaneous evolution of economic variables. This assumption is applied if information on non-policy variables is not readily available to the monetary or policy-making authorities. Furthermore, had we assumed that the policy variables respond to contemporaneous feedback from non-policy variables, the policy variable should be ordered last.

However, in our study, given the high frequency data (monthly) that we employ in constructing our VARs and the existence of information lag from non-policy variables[4], we prefer the former identifying restriction. Nevertheless, since the correlations across residuals

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[4] Interest rate data (the policy variables) is readily available while non-policy variables such as real output, stock market index and price were available with a lag.

ε_t are very small, the ordering is actually not significant. This condition is supported by Enders (1995) who stated that if $\left| e_{\varepsilon_i \varepsilon_j} \right| < 0.2$ therefore $i \neq j$, the ordering of variables in a VAR is not relevant.

Furthermore, we must explain the models that we propose for estimation and the variables that they contain (see Table 1). In examining the effects of monetary policy on the bank balance sheet, we adopt Gertler and Gilchrist (1993) and Kashyap and Stein (1995) in specifying the VAR. For an example, Gertler dan Gilchrist (1993) also employed this kind of VAR.

Based on such possible relationship as found by Gertler and Gilchrist above, we built the VAR model using nine variables in the following order: inter-bank money market overnight rate, bank deposits, bank loans, minimum bank capital (regulatory minimum capital as required by Basel II for the second VAR to see the differences as comparison to minimum bank capital), bank securities, stock market index, output (real GDP) and prices (Consumer Price Index or CPI). In this case, a random innovation to one variable often occurs simultaneously with innovations on another variable in the system. Therefore, in order to overcome this, the innovations are orthogonalised by a Cholesky decomposition in which the covariance matrix of the resulting residuals is the lower triangular.

By including conditioning variables, stock market index, output and prices, which are likely to be associated with the aggregate demand for loans, the VAR could determine how loan supply responses vary across different capital (minimum bank capital and regulatory minimum capital). In addition, we also employ the exchange rate in the VAR. The reason for this is that the exchange rate (as proposed in the "money view") plays an important role in relatively small and open economies of the SEACEN countries. Here, any changes in the exchange rate affect the banks' balance sheet variables, stock market index, output and prices.

Moreover, if we are to conduct tests for the presence of cointegration within a specific VAR, it is necessary to determine the order of integration of the variables. In general, to use the standard procedures developed by Johansen (1995), we require all of them to be I(1), i.e., stationary in their first differences. In addition, as Philips (1986) demonstrated, any OLS regressions which are based on the levels of the variables will be a spurious one. However, the implication that only stationary I(0) variables should be included in VARs has tended not to be accepted. We first concentrate on tests for the presence of unit roots, that is, for the existence of I(1) variables.

There are three "important" tests for unit roots, the augmented Dickey-Fuller (ADF) Phililips-Perron and Perron's (1997) structural break test. These tests are conducted in order to test the null hypothesis to be rejected, then the series y are considered to be stationary, $y \sim I(0)$. Whilst, a non-rejection of the unit-root null hypothesis for level data raises the question as to whether its first differences is stationary, $y(1)$. This testing procedure by further differencing, can be continued until stationary series are achieved. This testing procedure is justified when we assume that most economic series are I(1).

The Lending Behaviour Responds to Riskier Borrower as a Result of Tightening Capital

The model above was used but the loans data was differentiated by borrower risk type such as investment grade and non-investment grade. For simplification, the loans data was divided into investment loans, working capital loans and consumption loans.

Based on the framework described above, the panel data approach can actually be used instead to differentiate lending behaviours across SEACEN countries resulting from the implementation of Basel II in the various countries. However, due to the varying time frames for implementing Basel II, the same model was employed to analyse lending behaviour in each country.

2.3 Empirical Results

This analysis will look at how the implementation of Basel II will impact on the banking industry and country output, with the assumption that Cambodia has already implemented the Basel II framework. Given that Cambodia is a highly dollarised-economy, the monetary authority is not able to use interest rate as a monetary tool to stabilise the economy. Instead, the exchange rate for stabilisation has been adopted in Cambodia in the management of monetary policy. In this study, the effect of exchange rate fluctuation on credits, deposits, capital adequacy ratio, consumer price index, and gross domestic product is simulated. The simulation with 10% and 15% increase in CAR were conducted to observe the effect of exchange rate on all variables.

2.3.1 *Simulation with 10% increase in CAR*

Due to Cambodia's highly dollarised economy, we see in the simulation that if there is a shock on the exchange rate, the loan response will be declining by being negative in the first 2 months. After that, the loan response is steadily increasing and remains stable in the 5th months and forward. This response is due to a real sector that is highly dependent on the banking industry for financing as there is no capital market in the country as yet. With the large gap between loan rates and deposit rates, any increase in loan rates will most likely be followed by a response in increasing deposit rates. This is confirmed since the average deposits rate and average lending rate in Cambodia are moving in the same direction over the past five years. The deposit response increased for the first two months and remained stable for the next 2 months. After that, it decreased slightly but still remained above the horizontal line. The response in bank loan causes the CAR to respond in the opposite direction. The CAR response increased for the first 3 months, decreased in the next two months and remained stable along the horizontal line after that.

This can be observed in the current situation of Cambodia. The movement of the exchange rate has little effect on deposits and credits since around 95% of these are held in foreign currencies especially US dollar. The confidence in the local currency remains very low and almost every transaction is made in US dollar. Indeed, the comprehension of the need to protect against exchange rate risk is low among the public and even most business entities. Therefore, deposits or credits would not be much affected due to a fluctuation in

the exchange rate. The effect of exchange rate on CAR is also insignificant in Cambodia. Given that credit constitutes a large part of assets and the weighting for assets denominated in local and foreign currencies are the same, the total risk weighted assets would virtually remained unchanged even if there were a large movement in the exchange rate. At the same time, prudential regulations in Cambodia also require banks and financial institutions to hold minimum capital requirements in foreign currency especially US dollar, which makes it highly improbable that the CAR would change in case of an exchange rate shock.

Figure 10

Response to Cholesky One S.D. Innovations
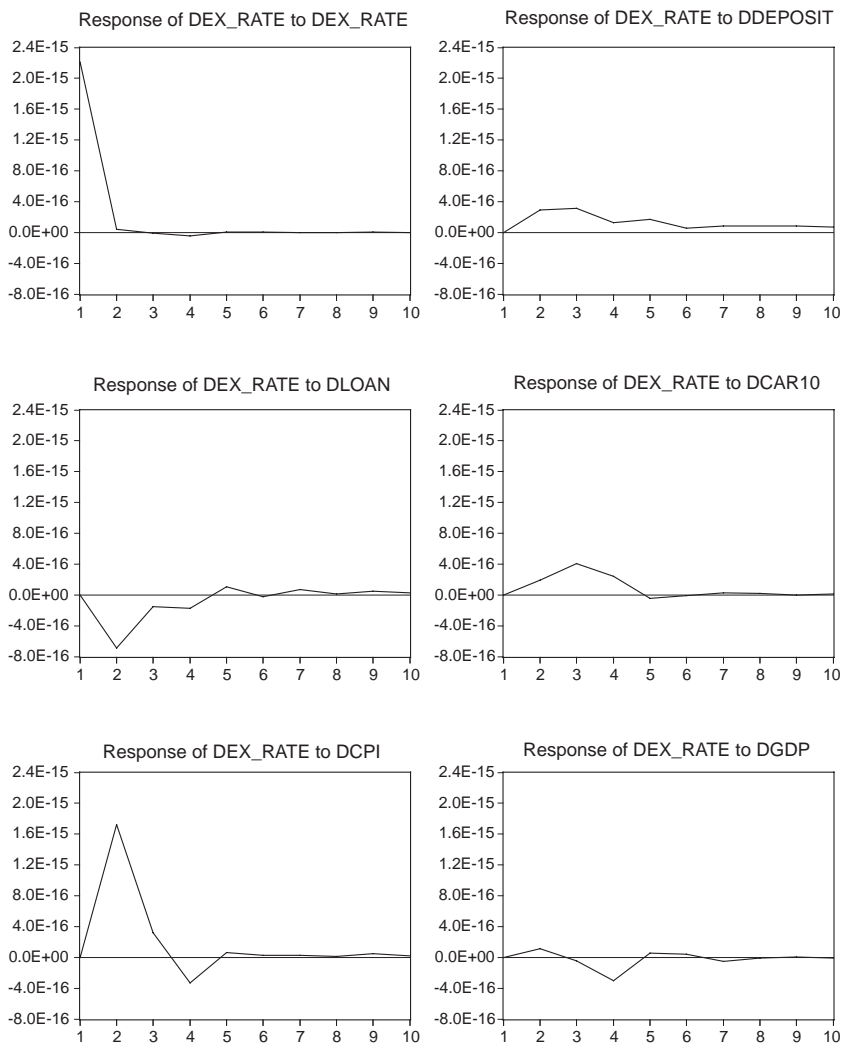
The shock also makes CPI movements increase significantly for the first 2 months, although after 2 months, the response decreased significantly by becoming negative and remain stable around the horizontal line thereafter. In the case of Cambodia, the exchange

rate is highly correlated with inflation. CPI is mostly composed of imported goods from neighbouring countries especially Thailand and Vietnam. Although the exchange rate between the US dollar and local currency is relatively stable, the local currency is depreciating against currencies of neighbouring countries. Consequently, the imported price has been increasing over the past few years and has translated into higher CPI as well as higher inflation.

The impact of the exchange rate shock is not significant on the GDP. The GDP response remained stable around the horizontal line although in the 2nd to 5th month, the response is decreasing. This response in the GDP is somewhat interesting. The Granger Causality test was carried out to determine the relation between exchange rate movement and GDP. Using 5% confidential level, we see from the test results that hypothesis GDP does not granger cause exchange rate was rejected. This means that GDP affects exchange rate. On the other hand, the hypothesis ex_rate does not granger cause GDP is not rejected which means that the movement on the exchange rate will not have direct impact on the GDP.

One possible reason why the GDP response remains stable in the event of an exchange rate shock is that the main contributions to the GDP are from private investments. Cambodia is a small open economy and most private investments are in the form of foreign direct investments since domestic investments are relatively small and portfolio investments are non-existent. For several years, FDI has always been a major driving force stimulating economic growth and poverty reduction. Annual FDI inflows averaged at 4% over the past five years while the stock of FDI reached more than 40% of the GDP. Recently, these capital inflows have put a huge pressure on the exchange rate to appreciate. However, sterilisation of foreign capital by the central bank has been able to maintain the stability of the US dollar and Riel exchange rate. This has also led to a depreciation of the domestic currency against neighbouring trading partners such as Thailand and Vietnam. This has led to the gradual increase in the inflation rate with the increase in imported prices. However, despite the depreciation, market expectations and investors' confidence remain good and steady economic growth has been maintained.

Table 2
Pairwise Granger Causality Test GDP Vs Exchange Rate

Pairwise Granger Causality Tests
Date: 01/18/08 Time: 16:47
Sample: 2000:12 2007:06
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
GDP does not Granger Cause EX_RATE	77	3.18835	0.04712
EX_RATE does not Granger Cause GDP		6.60272	0.00233

Overall, based on the accumulated response from our simulation, we can see that the shock from the exchange rate will not have any significant impact on all the variables. After implementing Basel II, due to the high dependence on the banking industry, banks can still perform their main activities as intermediaries while GDP would remain stable.

Table 3
Accumulated Reponse of Exchange Rate to Cholesky
(D.F Adjusted) One S.D Innovations

Period	DEX_RATE	DDEPOSIT	DLOAN	DCAR10	DCPI	DGDP
1	2.21E-15	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.25E-15	2.92E-16	-6.86E-16	1.90E-16	1.72E-15	1.12E-16
3	2.24E-15	6.06E-16	-8.38E-16	5.96E-16	2.05E-15	6.64E-17
4	2.20E-15	7.32E-16	-1.01E-15	8.39E-16	1.71E-15	-2.38E-16
5	2.20E-15	9.03E-16	-9.08E-16	7.95E-16	1.77E-15	-1.80E-16
6	2.21E-15	9.57E-16	-9.30E-16	7.84E-16	1.80E-15	-1.38E-16
7	2.20E-15	1.04E-15	-8.60E-16	8.13E-16	1.83E-15	-1.90E-16
8	2.20E-15	1.13E-15	-8.47E-16	8.34E-16	1.84E-15	-1.99E-16
9	2.20E-15	1.21E-15	-7.97E-16	8.31E-16	1.89E-15	-1.92E-16
10	2.20E-15	1.28E-15	-7.73E-16	8.47E-16	1.91E-15	-2.03E-16

Cholesky Ordering: DEX_RATE DDEPOSIT DLOAN DCAR10 DCPI DGDP

From the impulse response simulation, the variance decomposition shows the contribution of changes in exchange rate to the changes in each variable. A one standard deviation change in exchange rate contributes 5.88% change in bank lending. There is no significant impact on bank lending and the contribution to the GDP is also not significant (1.3%).

Table 4
Variance Decomposition

Period	S.E.	DEX_RATE	DDEPOSIT	DLOAN	DCAR10	DCPI	DGDP
1	2.21E-15	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.91E-15	57.76346	1.009013	5.560234	0.426630	35.09253	0.148135
3	2.98E-15	55.20241	2.075755	5.575811	2.270569	34.71043	0.165032
4	3.03E-15	53.34318	2.179433	5.724073	2.835656	34.74472	1.172935
5	3.04E-15	53.05629	2.483094	5.816326	2.841507	34.59890	1.203888
6	3.04E-15	53.02099	2.513484	5.817829	2.840837	34.58461	1.222256
7	3.04E-15	52.92417	2.590265	5.860294	2.844777	34.53136	1.249134
8	3.04E-15	52.88143	2.660178	5.857359	2.846944	34.50494	1.249151
9	3.04E-15	52.81564	2.731236	5.877608	2.843450	34.48380	1.248265
10	3.04E-15	52.77780	2.787185	5.879679	2.844116	34.46252	1.248705

Cholesky Ordering: DEX_RATE DDEPOSIT DLOAN DCAR10 DCPI DGDP

2.3.2 Simulation with 15% increase in CAR

Simulation with 15% increase in CAR shows similar results as the simulation with the 10% increase in CAR. A shock in the exchange rate will reduce credits in the first four months and remain stable that. The effect on deposits is also strong in the first six months and is relatively stable there onward. The inverse response in the CAR is observed after the second month and becomes relatively stable beyond the fifth month. A shock in the exchange rate pushes CPI to go up sharply in the first two months and then decline within

the next two months. The CPI will adjust to initial equilibrium after the fifth month onward. The effect on GDP is also strong where income goes down from the second month until the fifth month. To sum up, the effect of exchange rate on all variables is not significant. It can be concluded that the banking industry is still able to perform its intermediary role after the implementation of Basel II.

Figure 11

Response to Cholesky One S.D. Innovations
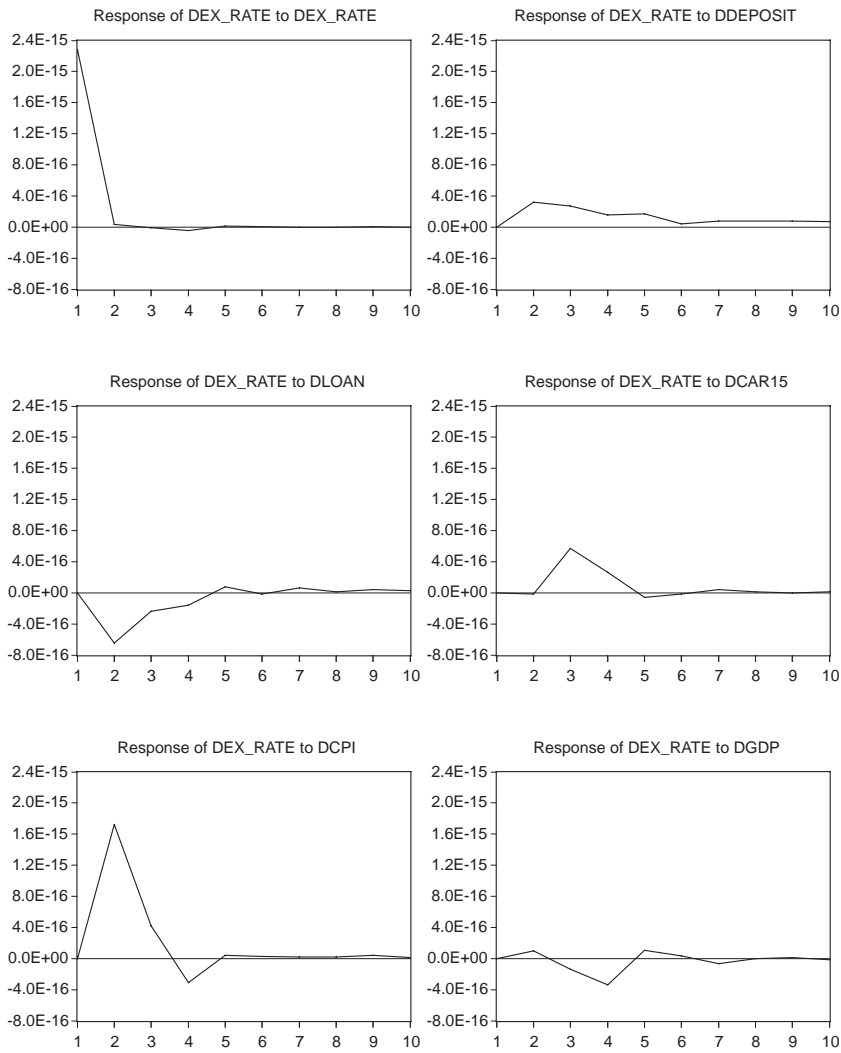
3. Summary and Conclusion

The Cambodian banking system is at a rudimentary stage where the confidence is low with fewer products offered. There is also a low level of intermediation and relatively weak business operations. However, the regulatory framework is being reformed to comply with the Core Basel Principle after the restructuring in 2000. This exercise would be carried out for many years to come and the adoption of the new capital accord is considered unviable for the time being and also too burdensome for the system as a whole. However, this study attempts to explore the empirical evidence whether implementation of the Basel II is feasible for Cambodia.

The results from this study shows that the adoption of the Basel II will impact the banking system and the economy for the very short-term and will stabilize beyond that. Additional capital requirements will diminish lending while increasing deposits during the first six months and remain relatively stable after that. The effect on CPI and GDP is also significant in the first five months but would adjust back to initial equilibruim from the sixth month onwards. In conclusion, since the impact of additional capital is not significant for all varibles, the adoption of the Basel II would be feasible for Cambodia.

PRO-CYCLICALITY IMPACT OF BASEL II IN INDONESIA

by Muhamad Ardian Dwinanto[1]

1. The Impact of Basel II on the Indonesian Economy and the Banking Industry

1.1 Development of Basel II

The International Convergence of Capital Measurement and Capital Standards: A Revised Framework or known as Basel II, is a revision of the Basel Capital Accord document issued by the Basel Committee on Banking Supervision (BCBS) in 1988 (Basel I) and also an amendment of the 1996 Accord. The Basel Capital Accord has been criticised for weaknesses in various aspects, including the Accord's inability to reflect the bank's actual risk profile

Feedback, comments and suggestions from practitioners led to BCBS' proposal to revise the Basel Capital Accord to (i) improve the soundness and stability of the banking system through viability and adequacy of banking capital, (ii) improve banking competition by leveling the playing field, and (iii) establish a more comprehensive approach in anticipating risks and provide alternative approaches in calculating capital adequacy that commensurate with a bank's risk profile. Although the BCBS recommendation is for internationally active banks, the basic principles of the Basel II framework is applicable for all banks regardless of their level of complexities.

If Basel I focused on the estimation of bank's capital adequacy to manage the solvency problems, Basel II provides a wider spectrum or perspective. In Basel I where there is only one approach for capital adequacy calculation for Pillar 1 – minimum capital requirement - in Basel II, there is the standard or advanced approaches that banks can use to calculate the capital charged for every type of risk. For example, for credit risk, a bank can use either the standardised approach or the Internal Rating-based approach. Also for operational risk, a bank can use the Basic Indicator approach, standardised approach or advanced measurement approach.

Besides providing new approaches for calculating the bank capital adequacy, Basel II also proposes the supervisory framework for supervision authorities (Pillar 2 – supervisory review process) to ensure that the bank's capital calculation is aligned with the bank's risk profile and also transparency framework (Pillar 3 – market discipline) that will bring in the involvement of the public and market practitioners to establish market discipline in the banking industry.

1.2 The Overview of Basel II Implementation in Indonesia

As one of the largest country in South East Asia, Indonesia has an important role to play in maintaining financial stability in the region. With 130 commercial banks, Indonesia realises that maintaining financial stability will be a challenging task. Having gone through the financial crisis, Bank Indonesia (BI) as the banking regulator, believe in the need to implement more prudent regulations to promote the stability of the banking industry.

Since the revision of the BCBS' framework for *International Convergence of Capital Measurement and Capital Standards*, or more popularly known as Basel II, BI has set the time frame for its implementation as BI realises that the framework is not only focused on capital requirement, but also encourages the implementation of good risk management.

To facilitate the implementation of the Basel II framework and also to foster improvement in banks' risk management, BI is setting up a working group that consists of representatives of the banking industry. As this working group will discuss all aspects of the Basel II framework, BI expects that the banking industry will be well-informed on its implementation.

As part of the preliminary assessment on the impact of Basel II implementation, BI conducted a quantitative impact study 5 (QIS 5) in 2006 and 2007. Based on the results of the 2007 study, the average risk weight assets increased 13.89%, mainly due to the impact in the operational risk capital charge.

Based on the survey of the banking industry, Basel II implementation will be started with the Standardised Approach for credit risk and Basic Indicator Approach for operational risk. To ensure that the implementation is suitable for the Indonesian situation, BI has already issued the consultative paper that consists of national discretions for implementing the Standardised Approach, which is targeted for implementation in 2008. As for market risk, the Standardised Approach has already been implemented in 2006.

The implementation of the Advance Approach is not mandatory for all banks. Those that wish to implement the Advance Approach must have prior approval from BI. BI allowed banks to use the Advance Approach for market risk in 2007, while for the Approach for other risks is expected to be implemented in 2010.

Table 1
Roadmap of Basel II Implementation in Indonesia

Implementation of Risk Measurement Approach	PILLAR 1				PILLAR 2		PILLAR 3
	Regulation Issuance	Parallel Run (Standardized) or Validation Process (Internat Model)	Effective Capital Requirement	Improvement of Reporting	Other Risks		Transparency
				On line System	Requlation Issurance	Effective Capital Requirement	Requlation Issurance
Market Risk							
Standardized	Q3 2007	Q1 2008 - Q4 2008	Q1 2009	Q4 2008			Q1 2009
Internat Model	Q3 2007	begin Q3 2007	Q2 2008	Q2 2008			Q1 2009
Credit Risk							
Standardized	Q3 2007	Q1 2008 - Q1 2009	Q1 2009	Q4 2008	Q3 2007	Q1 2009	Q1 2009
IRBA	Q4 2009	begin Q1 2010	Q4 2010	Q4 2010			Q2 2011
Operational Risk							
Basic Indicator	Q3 2007	Q1 2008 - Q1 2009	Q1 2009	Q4 2008			Q1 2009
Standardized	Q4 2009	begin Q1 2010	Q4 2010	Q4 2010			Q2 2011
AMA	Q4 2009	begin Q1 2010	Q2 2011	Q2 2010			Q2 2011

1.3 Overview of the Indonesian Banking Industry

The Indonesian banking system consists of 2 types of banks – the commercial banks and the rural banks. The commercial banks can provide any type of services related to banking transactions and also may operate within the country or abroad. On the contrary, several restrictions have been placed on rural banks such as limiting their operating territories and services. In term of services, the rural banks cannot offer demand deposits and cannot participate in activities using foreign currency. Hence, rural bank businesses are purely focused on taking deposits and granting loans.

Currently, the banking industry is still playing a very important role in Indonesia's financial system with around 80% of financial assets belonging to banks. As of September 2007, there are 130 banks with 9619 offices in Indonesia, an increase of 5% as compared to December 2006. The increasing number of offices indicates that the public's access to bank services is increasing. However, the actual number of banks decreased due to the merger of 2 banks to rationalise operations and garner benefits from economy of scale, in the wake of similar phenomenon globally.

Overall, the banking industry in 2006 has demonstrated relatively satisfactory performance in the midst of unsound real sector risk from banking perspectives. Numerous structural problems in the real sector made it necessary for prudential regulations to be enforced, particularly in the disbursement of credit. In 2006, banking credit grew by 14.1%, which was well below the initial target of 20% as well as actual credit growth in 2005 (Table 3). Low credit growth, albeit with improvements in credit quality, was reflected by a drop in both gross and net NPL ratios due to the restructuring of non-performing corporate loans at two state-owned banks. To manage low credit growth, funds raised from the public were invested in low-risk assets. This strategy boosted banking profitability, as reflected by the rise in net interest income (NII). The developments outlined above triggered an increase in the capital adequacy ratio (CAR), which remained above the minimum level set forth by Bank Indonesia. In general therefore, banking resilience in 2006 was slightly better than in 2005, which in turn, reduced potential instability in the financial system.

The role of banking intermediation, particularly credit disbursement, was confronted by numerous constraints; evidenced by the fall in credit supply and demand. From the demand side, soaring interest rates for credit together with weaker purchasing power initiated a slump in credit demand. This was reflected in the value of undisbursed loans, which escalated to IDR163.3 trillion in 2006 from IDR50.9 trillion in 2005. From the supply side, numerous unresolved structural issues resulted in heightened banking perception of risk in the real sector which precipitated extra vigilance in terms of policies for the disbursement of credit. Consequently, the distribution of new credit in 2006 decelerated compared to 2005.

Table 2
Growth of Total Commercial Banks and Bank Offices

Category of Bank	2002	2003	2004	2005	2006	2007								
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
State Owned Banks														
Total Banks	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Number of Office	1885	2072	2112	2171	2548	2562	2573	2586	2588	2614	2644	2718	2743	2751
Foreign Exchange Commercial Banks														
Total Banks	36	36	34	34	35	35	35	35	35	35	35	35	35	35
Total Banks Offices	3565	3829	3947	4113	4395	4413	4432	4432	4445	4450	4483	4522	4565	4599
Non-Foreign Exchange Commercial Banks														
Total Banks	40	40	38	37	36	36	36	36	36	36	36	36	36	36
Total Banks Offices	528	700	688	709	759	762	766	766	767	773	774	775	776	776
Development Banks														
Total Banks	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Total Banks Offices	909	1003	1064	1107	1217	1220	1228	1228	1232	1249	1249	1250	1254	1259
Joint Venture Banks														
Total Banks	24	20	19	18	17	17	17	17	17	17	17	17	17	17
Total Banks Offices	53	57	59	64	77	77	79	85	88	88	91	93	94	94
Foreign Owned Banks														
Total Banks	10	11	11	11	11	11	11	11	11	11	11	11	11	11
Total Banks Offices	61	69	69	72	114	119	121	125	127	129	134	134	139	140
Total														
Total Banks	141	138	133	131	130	130	130	130	130	130	130	130	130	130
Total Banks Offices	7001	7730	7939	8236	9110	9153	9199	9240	9265	9303	9375	9492	9571	9619

Table 3
Commercial Banks Performance

Category	2002	2003	2004	2005	2006
Total Assets (Trillion of IDR)	1112.2	1196.2	1272.3	1469.8	1693.9
Deposit (Trillion of IDR)	835.8	888.6	963.1	1127.9	1287
Credit (trillion of IDR)	410.29	477.19	595.1	730.2	832.9
LDR (Credit/Deposit)	49.1	53.7	61.8	64.7	64.7
NII (Trillion of IDR)	4.01	3.2	6.3	6.2	7.7
ROA %	1.9	2.5	3.5	2.6	2.6
NPL Gross (%)	8.1	8.2	5.8	8.3	7
NPL Net (%)	2.1	3	1.7	4.8	3.6
CAR (%)	22.44	19.43	19.42	19.3	21.27

The credit growth target for 2006 was not achieved as a consequence of sluggish performance. Credit expansion increased by IDR 102.8 trillion to IDR 832.9 trillion at the end of December 2006, or grew by 14.1% (y-o-y). This was far below the target set forth in the Business Plan at the beginning of 2006, namely 20%. However, credit growth did surpass the revised target of 12%-13%. As banking deposits grew by 14.1% (y-o-y), the loan to deposit ratio (LDR) remained unchanged at 64.7% compared to 2005.

Table 4
Bank Credit

Description	Amount (Trillion of Rp)					Growth (%)					Share (%)				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
Category of Use															
Working Capital	206.6	231.2	289.6	354.5	414.7	13.8	11.9	25.3	22.4	17.0	55.7	53.1	51.8	51.0	52.3
Investment	84.4	94.5	118.7	134.4	151.2	11.3	12.0	25.6	13.2	12.5	22.7	21.7	21.2	19.3	19.1
Consumption	80.0	109.4	151.1	206.7	226.3	36.5	36.8	38.1	36.8	9.5	21.6	25.1	27.0	29.7	28.6

Working capital credit recorded the highest growth. Along with robust credit growth in the trade sector, working capital credit grew by 17.0% (y-o-y), followed by growth of investment credit by 12.5% (y-o-y). Consumption credit growth plunged compared to 2005 due to the composition of debtors which comprise primarily of household debtors who are highly sensitive to interest rate fluctuations.

Figure 1

Bank Deposit, Credit and LDR
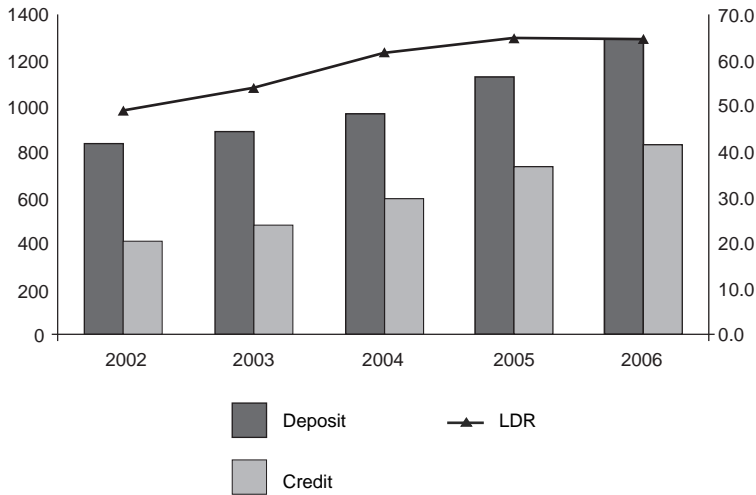
The restructuring of non-performing corporate loans undertaken by two state-owned banks influenced the quality of banking credit positively as evidenced by the gross NPL, which fell from 8.3% in 2005 to 7.0% in 2006 (bringing net NPL down from 4.8% to 3.6%). The restructuring programme primarily affected corporate debtors in the industrial sector, who make intense use of the investment credit facility. As a result, gross NPL for the industrial sector as a whole plummeted from 15.6% to 10.5% and in terms of investment credit, from 15.2% to 10.3%, over the same period. Meanwhile, the deterioration in purchasing power led to a drop in consumption credit quality as shown by the rise in gross NPL of consumption credit from 2.2% to 2.9%.

The investment strategy of banks, the interest rate differential and credit restructuring influenced banking profitability positively. Credit disbursement growth, bank placements in low-risk securities, high interest rate differential between credit and deposits all contributed to the rise in income. In terms of expenditure, credit restructuring to improve credit quality was able to cut the cost of earning asset losses allowance, which in turn, improved bank profitability marked by the increase in NII from IDR 6.2 trillion in 2005 to IDR 7.7 trillion in 2006. However, the increase in net interest income did not enhance the return on assets (ROA) of banks as a consequence of the balance of income and asset growth.

Along with higher profitability, commercial banks' capital also improved. The capital adequacy ratio, as an indicator of banking resilience in dealing with risk, improved from 19.3% in 2005 to 21.27% in 2006; remaining above the limit imposed by Bank Indonesia. The upswing in CAR is a consequence of an array of consolidation efforts promulgated in the Indonesian Banking Architecture (API) policy structure. Along with CAR improvement, the overall national banking resilience has improved enough to minimise the potential of financial sector instability.

Figure 2
Bank CAR, Capital and RWA

| | Capital (Trillion of IDR) | —▲— CAR (%) |
| | RWA (Trillion of IDR) | |
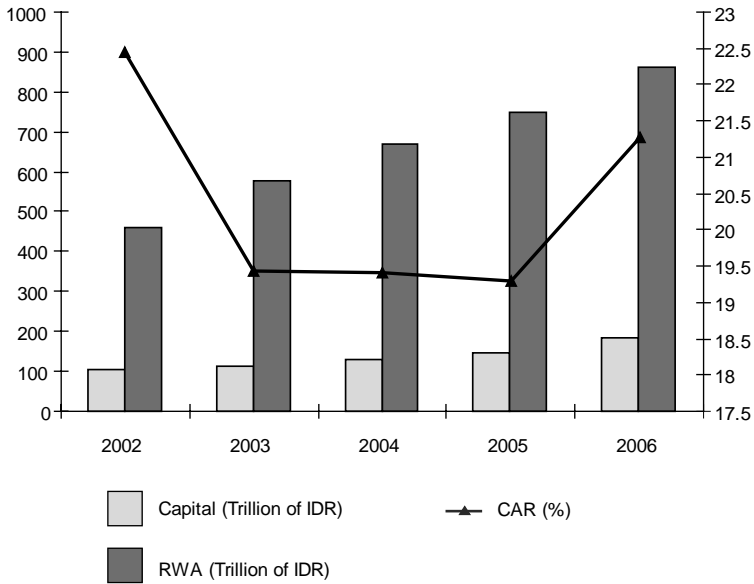
2. The Regulatory Capital Requirement of Basel II and its Pro-cyclicality Impact in Indonesia.

2.1. Model Specification

Vector autoregressive (VAR) models are widely employed in the empirical analysis of monetary policy issues. This methodology avoids the need for a complete specification of a structural model of the economy. This Paper will employ the semi structural VAR models to analyse the impact of pro-cyclicality of Basel II.

The traditional structural models proposed by the Cowles Commission and the semi structural VAR can be described as follows:

$$A\begin{bmatrix} Y_t \\ M_t \end{bmatrix} = C(L)\begin{bmatrix} Y_{t-1} \\ M_{t-1} \end{bmatrix} + B\begin{bmatrix} v_t^Y \\ v_t^M \end{bmatrix} \tag{1}$$

Where Y and M are vectors of macroeconomic variables (such as output and prices) and variables controlled by the monetary authority (such as interest rate and monetary aggregates containing information on monetary policy), respectively. Matrix A defines the contemporaneous relations among the variables and $C(L)$ is a matrix of finite-order lag polynomial. $v \equiv \begin{bmatrix} v_t^Y \\ v_t^M \end{bmatrix}$ is the vector structural disturbances. The non-zero off-diagonal elements of B allow some shocks to influence more than one endogenous variable in the system.

Based on the Bernanke and Blinder (1992), the equation (1) can be presented as

$$Sy_t = A(L)y_t + \varepsilon_t \tag{2}$$

Where $A(L)$ is a matrix polynomial in the lag operator L for a VAR (p):

$$A(L) = A_1 L + A_2 L^2 + \ldots + A_p L^p \tag{3}$$

The MA representation of (3) is

$$y_t = \Phi(L)\varepsilon_t \tag{4}$$

where $\Phi(L) = [S - A(L)]^{-1}$. The structural parameters of the contemporaneous endogenous variable are contained in S. y_t are the vector endogenous variables in the system including one policy (indicator) variable and non-policy variables. While for ε_t, the vector structural disturbances, $E[\varepsilon_t] = 0$ and, as in Sims (1980), $E[\varepsilon_t \varepsilon_t'] = I_n$. In this case, $E[\varepsilon_t \varepsilon_t']$ will be I_n if $y_t = n \times 1$, the matrices S and A_p being conformable with the y vector. L^p is the lag operator, where p describes the order of the VAR.

Deterministic terms can be added on the right-hand side, as is frequently the case in a Johansen's analysis of cointegration, by adding a term ΨD_t. We do so in order to allow dummies to capture possible structural breaks. Then, a reduced form[2] of equation (1) is estimated by OLS:

$$y_t = S^{-1}A(L)y_t + S^{-1}\Psi D_t + u_t \tag{5}$$

where

$$u_t = S^{-1}\varepsilon_t, \text{ and} \tag{6}$$

$$E(u_t u_t') = \Omega = (S^{-1}\varepsilon_t)(S^{-1}\varepsilon_t)' \tag{7}$$
$$= (S^{-1})(\varepsilon_t \varepsilon_t')(S^{-1})'$$
$$= (S^{-1})(S^{-1})'$$

given the assumption: $E[\varepsilon_t \varepsilon_t'] = I_n$

So S^{-1} is the Cholesky decomposition of Ω, the reduced-form covariance matrix. Furthermore, the dynamic responses to shocks are summarised by the moving average (MA) representation (assuming that the process is invertible):

$$y_t = [I - S^{-1}A(L)]^{-1}u_t = [I - S^{-1}A(L)]S^{-1}\varepsilon_t \tag{8}$$

It is assumed that all the roots of $\left| I_n - (S)^{-1} A(L) \right| = 0$ remain outside the unit circle in absolute value, or are in 1 in the presence of co-integration and unit roots. In this sense, the companion matrix has roots that are less than one in absolute value or are equal to plus 1. In those circumstances the VAR is (mathematically) stable.

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[2]   It is assumed that the errors are i.i.d and are normally distributed, being independent of any vector D_t; and that $y_{t-1}, y_{t-2}, K, y_{t-p}, D_t, t = 1,2,K,T,$ are not perfectly collinear.

Therefore, the Cholesky decomposition of Ω provides the zero restrictions (to complement the $\frac{1}{2} p(p+1)$ constrains) on Ω needed to identify the elements of S^{-1}. The latter is lower-triangular:

$$\begin{bmatrix} S_{11} & 0 & 0 & 0 \\ S_{21} & S_{22} & 0 & 0 \\ S_{31} & S_{32} & S_{33} & 0 \\ M & M & M & M \\ S_{n1} & S_{n2} & S_{n3} & S_{nn} \end{bmatrix}$$

The system is then a recursive model or Wold-causal chain; the way in which the variables affect each other is determined by their position in the ordering. In this sense, the contemporaneous innovations in the other variables influence all those below them in the chain and none of those variables above them in the order. The ordering of the variables in the system therefore influences the recursive chain of causality among the shocks in any given period.

Therefore, according to Sims (1992), the policy variable such as leading indicator of monetary policy, is ordered first if we assume that there is no contemporaneous feedback from non-policy variables onto the policy variables. Thus, we assume that the monetary policy decisions are set without considering the simultaneous evolution of economic variables. This assumption is applied if information on non-policy variables is not readily available to the monetary or policy-making authorities. Furthermore, had we assumed that the policy variables respond to contemporaneous feedback from non-policy variables, the policy variable should be ordered last.

However, in our study, given the high frequency data (monthly) that we employ in constructing our VARs and hence, the existence of information lag from non-policy variables[3], we prefer the former identifying restriction. Nevertheless, since the correlations across residuals ε_t are very small, the ordering is actually not significant. This condition is supported by Enders (1995) who stated that if $\left| e_{\varepsilon_i \varepsilon_j} \right| < 0.2$ for $i \neq j$, the ordering of variables in a VAR is not relevant.

Furthermore, we must explain the models that we propose to estimate and the variables that they contain. In examining the effects of monetary policy on the bank balance sheet, we adopt Gertler and Gilchrist (1993) and Kashyap and Stein (1995) in specifying the VAR. For an example, Gertler dan Gilchrist (1993) also employed this kind of VAR.

Based on such possible relationship as found by Gertler and Gilchrist above, we develop the system involving nine variables VARs with the following ordering: inter-bank money market overnight rate, bank deposits, bank loans, minimum bank capital (regulatory minimum capital as required by Basel II for the second VAR to see the differences as comparison to minimum bank capital), bank securities, stock market index, output (real GDP) and prices (Consumer Price Index or CPI). In this case, a random innovation on one variable often occurs simultaneously with innovations on other variables in the system. Thereby, in order to overcome this as noted above, the innovations are orthogonalised by a Cholesky decomposition in which the covariance matrix of the resulting residuals is the lower triangular.

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[3] Interest rate data (the policy variables) is readily available while non-policy variables such as real output, stock market index and price are available with a lag.

By including conditioning variables, stock market index, output and prices, which are likely to be associated with the aggregate demand for loans, the VAR could determine how loan supply responses vary across different capital (minimum bank capital and regulatory minimum capital). In addition we also employ the exchange rate in the VAR. The reason for this is that the exchange rate (as proposed in the "money view") plays an important role in relatively small and open economies like Indonesia and other SEACEN countries. Here, any changes in the exchange rate affect the banks' balance sheet variables, stock market index, output and prices.

Moreover, if we are to conduct tests for the presence of cointegration within a specific VAR, it is necessary to determine the order of integration of the variables. In general, to use the standard procedures developed by Johansen (1995), we require them all to be I(1), i.e., to be stationary in their first differences. In addition, as Philips (1986) demonstrated, any OLS regressions which are based on the levels of the variables will be a spurious one. However, the implication that only stationary, I(0) variables be included in VARs has tended not to be accepted. We first concentrate on tests for the presence of unit roots, that is, for the existence of I(1) variables.

There are three "important" tests for unit roots - the augmented Dickey-Fuller (ADF), Phililips - Perron and Perron's (1997) structural break test. These are conducted in order to test whether the null hypothesis is rejected, meaning the series y is considered to be stationary, $y{\sim}I(0)$. Whilst, a non-rejection of the unit-root null hypothesis for level data raises the question as to whether its first difference is stationary, $y(1)$. This testing procedure by further differencing can be continued until stationary series are achieved. This testing procedure is justified when we assume that most economic series are I(1).

2.2. Data Specification

In this Paper, we will adopt Gertler and Gilchrist (1993) and Kashyap and Stein (1995) in specifying the VAR. The system that we will use involves nine variables VAR in the following ordering: Bank Indonesia Certificate rate (Rate), exchange rate (Ex_rate), third party funds in the bank (Dep), bank loans (Loan), capital adequacy ratios (CAR), bank securities (Sec), Stock Market Index (Stock), Consumer Price Index (CPI) and output (real GDP).

To consider the impact on the Basel II implementation in the simulation, we will employ the result from the Quantitative Impact Study (QIS) 5 as the add-on in the CAR. The QIS 5 itself is constructed based on the data of June 2007 (for the complete data specification please see the Appendix).

The simulation process was done using Eviews 4 and the time frame of the monthly data was from September 2000 to June 2007. The data sources were from monthly bank reports, the Jakarta Stock Exchange and Indonesia statistical data.

2.3. Empirical Results

2.3.1 Unit Root Test

According to Johansen (1995), in order to perform VAR model estimations and impulse response function analysis, we first must make sure that all variables are *I(0)*, that is stationary in their first differences. Table 5 shows the results of the ADF test. Using 5% confidential level, all variables appear to be stationary in their first differences. Hence, all variable in our sample are considered to be stationary, *y~I(0)*.

After the requirement on stationarility has been fulfilled, we attempted to use the VAR model to analyse the effect of pro-cyclicality from Basel II implementation. The VAR model and impulse responses are expected to answer some questions are of concern to us. Would the regulatory capital requirement as stipulated by Basel II overstate the magnitude and economic significance of pro-cyclicality in the New Accord relative to the existing capital requirement in Indonesia? How would the lending activities respond to the riskier behaviour as a result of tightening capital constraint?

Table 5
ADF Unit Root Test

Augmented Dickey-Fuller (ADF) Unit Root Test

Variable	At level		1st Difference	
	t-stat	prob*	t-stat	prob*
SBI Rate	-3.0224	0.1330	-3.9179	0.0156
Exchange Rate	-2.8366	0.1889	-8.0784	0.0000
Deposit	-0.0149	0.9954	-9.5291	0.0000
Loan	-0.9865	0.9397	-8.1763	0.0000
CAR	-5.0659	0.0004	-13.8312	0.0001
Securities	-1.4926	0.8243	-9.9025	0.0000
Stock Price Idx	-0.1055	0.9940	-8.0681	0.0000
CPI	-1.6092	0.7809	-7.8201	0.0000
GDP	-1.3876	0.8569	-10.0856	0.0000

Note: The test using Automatic selection lag length (Schwartz Info Selection with Maximum lags: 5), *MacKinnon (1996) one-sided p-values.

2.3.2 Simulation Results

We examined the VARs that include the nine variables of the Bank Indonesia Certificate rate as monetary indicator, exchange rate, third party funds in the bank, bank loans, capital adequacy ratios, bank securities, Stock Market Index, Consumer Price Index and output (real GDP). The impulse response analysis includes 10 months and is supplemented by the cumulative impulse response (10 months) and the variance decomposition (10 months). The variance decomposition enables us to determine the proportion of the volatility in a series after any time interval that is explained by each of the model shocks.

The effect of monetary policy (SBI rate) on the aggregate components of banks' balance sheet (deposit, loans, CAR and securities), the exchange rate, stock price index, CPI and output for all period were estimated by computing the impulse response function derived from nine variable VARs. as described in Figure 3.

Figure 3
Response of SBI Rate to Cholesky (D.F. Adjusted)
One S.D Innovations
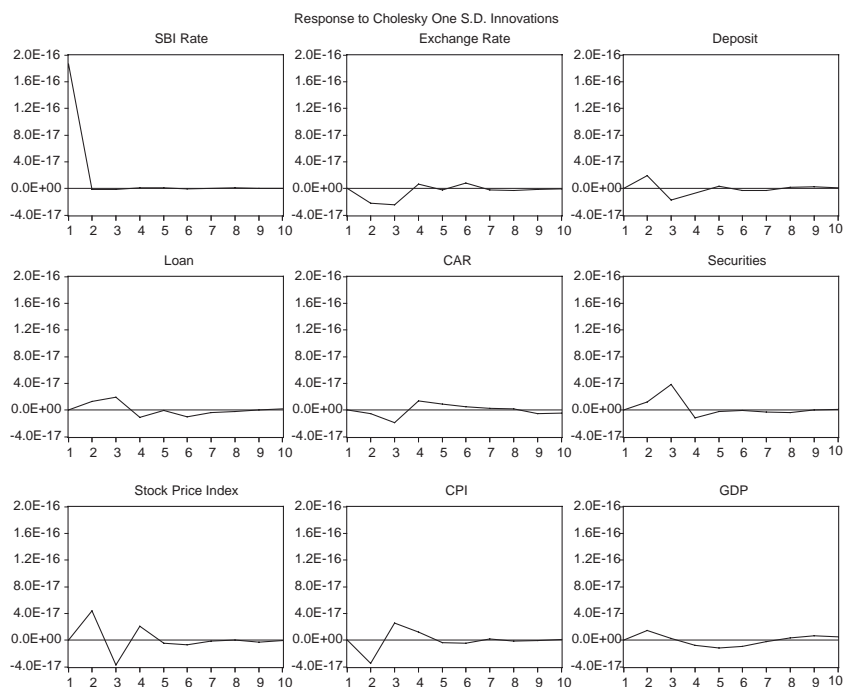
It is obvious that based on Figure 3 that the bank deposit response positively for the first 2 months (short run effect) before moving down to negative in the next 3 months. For the rest of the months, the bank deposit response is relatively stable along the horizontal line. This short run effect on deposit and current average CAR that is above 20%, implies that bank loans response positively in the first 3 months (short run effect) but after that, the response starts to decline by becoming negative before getting back positive again in the 10th month. As a consequence, with the bank loan response, the CAR shows the opposite response. It moves negatively in the first 3 months before increasing to positive for the rest of the months. For bank deposits, it shows almost a similar pattern as that for bank loans.

As a developing country, one of the parameters that is very important is the exchange rate. Clearly we can see that the exchange rate moved negatively in the first 3 months as an impact of the shock in the SBI rate before turning positive after that[4]. The shock on the SBI rate encourages the banks to obtain short term profit by buying securities or SBI. This is reflected in the securities response which moved positively in the first 3 months before going down below the horizontal line and remaining stable thereafter.

With a well-developed capital market, the shock in the SBI rate was not translated significantly in the Indonesian stock price index as movement in the stock price index is not only caused by movement in the SBI rate but also by other variables such as country outlook, economic and financial stability, political condition etc. The stock price index responded positively for the first 2 months before declining to negative in the 3rd month. Afterwards, the response increased above the horizontal line and remained relatively stable around the horizontal line.

In terms of output, the GDP response moved positively for 2 months and subsequently declined below the horizontal line for 4 months and increased again to being positive. This response is in line with the bank lending response. Using a confidence level of 5% in the Granger Causality test (Table 6), we can see that the hypothesis for GDP does not granger cause LOAN was rejected by the data and vice- versa, showing that bank lending does affect GDP and GDP does affect bank lending.

Table 6
Pairwise Granger Causality Test GDP vs LOAN

Pairwise Granger Causality Tests
Date: 01/03/08 Time: 15:59
Sample: 2000:09 2007:06
Lags: 5

Null Hypothesis:	Obs	F-Statistic	Probability
GDP does not Granger Cause LOAN	77	4.48039	0.00142
LOAN does not Granger Cause GDP		6.42435	6.4E-05

On the other hand, the Granger Causality test also shows that the capital market does not affect GDP and vice versa as shown in Table 7. Using a 5% confidence level, the hypothesis GDP does not granger cause IHSG and vice versa are not rejected. Hence, the GDP does not affect IHSG and IHSG does not affect GDP. This evidence shows that although the capital market is already well-developed, the contribution to the GDP is not significant. The investments from the capital market do not significantly affect the GDP.

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4   Please see appendix for Granger Causality test SBI Rate vs Exchange Rate

Table 7
Pairwise Granger Causality Test GDP vs IHSG

Pairwise Granger Causality Tests
Date: 01/15/08 Time: 14:24
Sample: 2000:09 2007:06
Lags: 5

Null Hypothesis:	Obs	F-Statistic	Probability
GDP does not Granger Cause IHSG	77	1.44989	0.21828
IHSG does not Granger Cause GDP		1.20368	0.31723

Overall, based on the accumulated response from our simulation (Table 8), we can see that the shock from the SBI rate will not have any significant impact on all the variables. After the implementation of Basel II, banks will still have the capacity to perform their main role as intermediaries, as reflected in the current average CAR in the Indonesian banking industry which is above 20% and which has not restrained the banking industry from lending to the public. There is therefore no significant effect on the GDP.

From the impulse response simulation, the variance decomposition (Table 9) shows us the contribution of changes in SBI rate to the changes in each variable. For each magnitude of one standard deviation change in SBI rate is a contribution of 1.7% change in bank lending. With the current average CAR in the banking industry being much above the minimum capital requirement, banks can still perform lending activities. There was no significant impact on bank lending and the contribution to the GDP was also insignificant (1.3%).

Table 8
Accumulated Response of SBI Rate to Cholesky (D.F. Adjusted)
One S.D. Innovations

Period	DRATE	DEX_RATE	DDEP	DLOAN	DCAR_SIM	DSEC	DIHSG	DCPI	DGDP
1	1.86E-16	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.85E-16	-2.20E-17	1.89E-17	1.26E-17	-5.81E-18	1.23E-17	4.41E-17	-3.48E-17	1.43E-17
3	1.84E-16	-4.63E-17	1.17E-18	3.20E-17	-2.44E-17	5.09E-17	7.07E-18	-9.32E-18	1.68E-17
4	1.85E-16	-4.00E-17	-5.89E-18	2.09E-17	-1.04E-17	3.89E-17	2.81E-17	2.92E-18	8.89E-18
5	1.85E-16	-4.23E-17	-2.49E-18	2.02E-17	-1.87E-18	3.63E-17	2.33E-17	-1.02E-18	-2.78E-18
6	1.85E-16	-3.45E-17	-5.51E-18	9.68E-18	3.15E-18	3.57E-17	1.63E-17	-5.81E-18	-1.22E-17
7	1.85E-16	-3.68E-17	-8.65E-18	6.21E-18	5.28E-18	3.30E-17	1.45E-17	-3.99E-18	-1.44E-17
8	1.86E-16	-3.96E-17	-7.01E-18	4.26E-18	7.02E-18	2.93E-17	1.45E-17	-5.67E-18	-1.08E-17
9	1.86E-16	-4.09E-17	-4.82E-18	4.21E-18	1.77E-18	2.93E-17	1.12E-17	-6.00E-18	-3.98E-17
10	1.86E-16	-4.13E-17	-3.88E-18	5.70E-18	-2.67E-18	3.05E-17	1.07E-17	-4.73E-18	1.27E-18

Cholesky Ordering: DRATE DEX_RATE DDEP DLOAN DCAR_SIM DSEC DIHSG DCPI DGDP

Table 9
Variance Decomposition

Period	S.E.	DRATE	DEX_RATE	DDEP	DLOAN	DCAR_SIM	DSEC	DIHSG	DCPI	DGDP
1	1.86E-16	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.98E-16	88.41268	1.228292	0.910324	0.401613	0.085956	0.385761	4.962063	3.090717	0.522592
3	2.11E-16	78.14935	2.424951	1.512981	1.208728	0.856039	3.695099	7.479789	4.196887	0.476170
4	2.14E-16	76.08043	2.450156	1.581923	1.446622	1.262671	3.912789	8.248983	4.414360	0.602070
5	2.14E-16	75.63093	2.447449	1.597628	1.439118	1.414555	3.904220	8.248691	4.422009	0.895405
6	2.15E-16	75.03014	2.559117	1.604625	1.668498	1.457923	3.874115	8.290009	4.436513	1.079054
7	2.15E-16	74.94819	2.568230	1.624173	1.692550	1.466084	3.885342	8.288030	4.438835	1.088559
8	2.15E-16	74.87384	2.581534	1.627758	1.699073	1.471157	3.910162	8.279734	4.440521	1.116223
9	2.16E-16	74.72654	2.580230	1.635722	1.695771	1.527656	3.902482	8.286927	4.432020	1.212649
10	2.16E-16	74.63937	2.577657	1.635718	1.699159	1.568155	3.901166	8.277812	4.430323	1.270635

Cholesky Ordering: DRATE DEX_RATE DDEP DLOAN DCAR_SIM DSEC DIHSG DCPI DGDP

3.   Summary and Conclusion

The Basel II Accord is a new capital framework initiated by the BCBS with the main purpose to enhance the risk management practices of the banking sector. Many studies have cited that one of the inherent risks in implementing Basel II is its pro-cyclicality effect. However, the empirical analysis for Indonesia from September 2000 to June 2007 shows that the pro-cyclicality impact of Basel II is insignificant, the reasons of which are as follows:

1.   Indonesia is planning to implement the Basel II framework starting with the Standardised Approach. Based on the QIS 5 results in 2007, the implementation of Basel II will increase RWA by 13.87%. In other words, there will be a decrease in CAR of about 1-2%. With the current average CAR of Indonesian banks, the implementation of Basel II will not cause significant impacts on the banking sector.

2.   As a developing country, Indonesia's economic growth still depends mostly on consumption. Although the implementation of Basel II may affect the banking sector, the impact on industrial development will be insignificant as the well-developed Indonesian capital market would provide alternative sources of funding.

3.   The Granger Causality test shows that bank lending affects GDP and GDP unidirectional affects bank lending. On the other hand, the capital market does not affect GDP and vice versa, showing that although the capital market is well-developed, it does not contribute significantly to GDP as the banking sector still has a major impact on GDP. Hence any regulation that impact on bank lending behaviour would also likely affect GDP.

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Supporting Eviews Simulation

A. AR Stability

In performing VAR, we must first confirm the stability of AR to ensure that the model is stable. After few experiments, the maximum lag that the AR stable is 5.

Roots of Charactersitics Polynomial
Endogenous variables: DRATE DEX_RATE DDEP DLOAN
DCAR_SIM DSEC DIHSG DGDP DCPI
Exogenous variavles: C RATE
Lag specification: 1 5
Date: 01/03/08   Time: 08:24

Root	Modulus
0.492975 + 0.854578i	0.986574
0.492975 - 0.854578i	0.986574
0.846250 + 0.493317i	0.979541
0.846250 - 0.493317i	0.979541
0.949595	0.949595
-0.380662 - 0.815979i	0.900403
-0.380662 + 0.815979i	0.900403
0.656981 + 0.604380i	0.892692
0.656981 - 0.604380i	0.892692
-0.131139 + 0.855109i	0.865106
-0.131139 - 0.855109i	0.865106
-0.603715 - 0.594577i	0.847345
-0.603715 + 0.594577i	0.847345
-0.800458 - 0.270066i	0.844789
-0.800458 + 0.270066i	0.844789
-0.835458 - 0.088263i	0.840108
-0.835458 + 0.088263i	0.840108
0.391921 - 0.728986i	0.827661
0.391921 + 0.728986i	0.827661
0.207478 - 0.796867i	0.823434
0.207478 + 0.796867i	0.823434
0.579533 + 0.583056i	0.822078
0.579533 - 0.583056i	0.822078
0.821983	0.821983
-0.405707 - 0.708090i	0.816082
-0.405707 + 0.708090i	0.816082
0.010349 - 0.808500i	0.808566
0.010349 + 0.808500i	0.808566
0.722679 - 0.263357i	0.769170
0.722679 + 0.263357i	0.769170
-0.628162 + 0.424883i	0.758362
-0.628162 - 0.424883i	0.758362
-0.702770 + 0.242265i	0.743356
-0.702770 - 0.242265i	0.743356
0.355614 - 0.577831i	0.678491
0.355614 + 0.577831i	0.678491
-0.160405 - 0.643484i	0.663176
-0.160405 + 0.643484i	0.663176
-0.198359	0.198359
-0.074838	0.074838
-0.000877 + 0.000639i	0.001085
-0.000877 - 0.000639i	0.001085
0.000337 - 0.001028i	0.001082
0.000337 + 0.001028i	0.001082
0.001080	0.001080

No root lies outside the unit circle.
VAR satisfies the stability condition.

B.   Optimal Lag
      We try to find out what the optimal lag is for our simulation.

VAR Lag Order Selection Criteria
Endogenous variables: DRATE DEX_RATE DDEP DLOAN DCAR_SIM
DSEC DIHSG DGDP DCPI
Exogenous variables: C DRATE
Date: 01/03/08   Time: 08:22
Sample: 2000:09 2007:06
Included observations: 76

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2831.323	NA	2.97E+21	74.98218	75.53420*	75.20279*
1	-2746.927	144.3618	2.76E+21*	74.89281	77.92890	76.10618
2	-2665.742	119.6413*	3.02E+21	74.88794	80.40809	77.09406
3	-2586.674	97.79396	4.09E+21	74.93879	82.94302	78.13767
4	-2493.632	93.04221	5.02E+21	74.62189*	85.11019	78.81353
5	-2430.082	48.49898	2.13E+22	75.0819	88.05346	80.26548

* indicates lag order selected by the criterion
LR: Sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

      Using the VAR lag order selection criteria, the candidate for optimal lag is 4, 2, 1 and
0. From our analysis, we conclude that lag 2 will give the highest value for adj R-square in
our main variable.

C.   Residual Correlation Matrix

	DRATE	DEX_RATE	DDEP	DLOAN	DCAR_SIM	DSEC	DIHSG	DGDP	DCPI
DRATE	1.000000	0.013393	0.001373	-0.001143	-0.003615	-0.025902	0.029759	-0.016508	0.001434
DEX_RATE	0.013393	1.000000	0.602853	0.718150	-0.167021	0.317830	-0.297069	-0.136214	-0.097882
DDEP	0.001373	0.602853	1.000000	0.707450	-0.192501	0.403104	-0.246177	-0.230553	-0.041112
DLOAN	-0.001143	0.718510	0.707450	1.000000	-0.238376	0.377357	0.011841	-0.266514	-0.083560
DCAR_SIM	-0.003615	-0.167021	-0.192501	-0.238376	1.000000	-0.163914	-0.046612	0.091472	0.526061
DSEC	-0.025902	0.317830	0.403104	0.377357	-0.163914	1.000000	-0.274428	-0.061476	0.089436
DIHSG	0.029759	-0.297069	-0.246177	0.011841	-0.046612	-0.274428	1.000000	-0.129561	-0.202598
DGDP	-0.016508	-0.136214	-0.230553	-0.266514	0.091472	-0.061476	-0.129561	1.000000	-0.029735
DCPI	0.001434	-0.097882	-0.041112	-0.083560	0.526061	0.089436	-0.202598	-0.029735	1.000000

      Based on the residual correlation matrix above, we can see that in the majority, the
correlation value is below 0.2. Hence based on Ender (1995), the ordering of variables in a
VAR is not relevant.

D.   Pairwise Granger Causality Test Securities vs SBI Rate

Pairwise Granger Causality Tests
Date: 01/15/08 Time: 13:50
Sample: 2000:09 2007:06
Lags: 5

Null Hypothesis:	Obs	F-Statistic	Probability
RATE does not Granger Cause EX_RATE	77	3.35991	0.00916
EX_RATE does not Granger Cause RATE		2.12967	0.07269

Note: using 5% confidential level

Based on the test results above, we can see that the hypothesis for exchange rate does not granger cause rate is not rejected while the other hypothesis is rejected. The exchange rate does not affect SBI rate but SBI rate affects exchange rate.

Data Specification

Data Sources

The data used in this paper is derived from commercial bank monthly reports, Jakarta Stock Exchange and Indonesia statistical data. The commercial bank monthly reports are unaudited bank monthly submissions to the central bank.

Data Simulation
On the simulation, the CAR variable is constructed from:

$$CAR = \frac{Capital}{RiskWeightAssets}$$

The capital variable used original data while the risk weight assets variable used original data with additional top-up of 13.89% (QIS 5 results). The top-up is assumed as the additional increase as a result Basel II implementation.

Definition
Credit Data

Credit data constitutes the credits recorded in the balance of a Bank and does not take into account, the channel of credit recorded in the off-balance sheet, unless otherwise stated. Credits include credit claims from citizens and non-citizens (Rural Bank data only includes credit claims from citizens).

Non-Performing Data

Non-performing loan data is shown as the gross non-performing loan without taking into account the reserves formed in anticipation of the risk of losses.

Risk Weighted Assets

consist of:
1. Assets in the balance sheet that are ranked according to the level of risk of the credit in question.
2. Several accounts in the off balance sheet that are ranked according to the level of risk of the credit in question.

Third Party Deposit

Non-bank third party deposits funds consisting of demand deposit, savings deposit and time deposit.

Credit

The provision of funds or related claims based on an agreement or contract to borrow/ loan funds between banks and another party that obliges the borrower to pay off his/her debt according to a designated schedule and interest charges, including:

1. The purchase of Money Instruments by clients, complete with a Note Purchase Agreement (NPA).
2. The transfer of claims involved in factoring activities.

Capital Adequacy Ratio (CAR)

CAR = Capital / RWA

Capital, consist of:

1. **Tier One Capital**
2. **Supplementary capital**

Tier One Capital consists of:

1. Paid-In Capital
2. Additional capital reserves, consisting of:
    a. Plus Factors:
        1. Agio
        2. Capital contributions
        3. General reserves
        4. Designated reserves
        5. Last year's earnings after taxes
        6. Current year's earnings after taxes (50%)
        7. Positive adjustment resulting from the conversion of overseas branch office financial reports.
        8. Paid-In Capital
    b. Minus Factors:
        1. Disagio
        2. Retained losses
        3. Current earnings
        4. Negative adjustment resulting from the conversion of overseas branch office financial reports.
        5. Decrease in value of portfolio equity investments that are ready to be sold.

Tier one capital is calculated minus goodwill.

Supplementary capital consists of:

1. Fixed assets re evaluation reserve
2. PPAP general reserve (maximum 1.25% of RWA)
3. Borrowed capital
4. Subordinated loans (maximum 50% of tier one capital)
5. Increase in the value of portfolio investments that are ready to be sold at the highest 45%.

Return on Assets Ratio (ROA)

ROA = Annual Profit before taxes / Average Assets

Loan to Deposit Ratio (LDR)

LDR = Credit/Third Party Funds Credit is total credit to third party (not including third party bank). Third Party Funds consist of demand deposit, savings deposit and time deposits (not including interbank)

Non-Performing Loan Ratio (NPL)

NPL = Credits that are sub-standard, doubtful and loss) / Total Credits

Net Interest Income (NII)

NII = Interest Income – Interest charges
Annual net interest income is used for the calculation of NIM

PRO-CYCLICALITY IMPACT OF BASEL II IN MALAYSIA

by Nurhayati Mohd Khalid[+], Diana Paharodzi*, Raymond Yeo*

1. Introduction

The Basel II framework was introduced by the Basel Committee of Banking Supervision (BCBS) via its paper entitled "*International Convergence of Capital Measurement and Capital Standards*" issued in June 2006. The Basel II framework, which replaces the current broad-brush Capital Accord introduced in 1988, was designed to be more risk sensitive in computing regulatory capital vis-à-vis the risk levels in a banking institution. In accommodating the different levels of sophistication among banking institutions, it introduces an array of options ranging from the simplest, such as the SA for credit risk, to the most sophisticated such as the Internal Ratings Based (IRB) approach.

The objective of the Basel II framework is to ensure resilience and stability of the banking system in order to promote financial stability and sustainable economic growth. The Basel II framework intends to ensure that banking institutions have sufficient capital levels that can adequately absorb losses and provides incentives which advocates improvement in risk management practices.

While the framework may contribute towards developing more robust banking institutions, concerns have been raised on the likely procyclical effects of implementing Basel II, exacerbating fluctuations in the economic-cycle. The framework which incorporates capital charges based on the quality of underlying assets may require banking institutions to allocate more capital in order to maintain an acceptable level of RWCR in an economic downturn. While banking institutions' capital is eroded by provisions or write-offs from defaulted assets, the risk-weighted assets amount would increase as higher risk charges are imposed on downgraded or defaulted assets, further suppressing the RWCR level. In this regard, banking institutions may react by tightening lending standards which in turn would contribute to a credit crunch and further aggravate the economic condition.

While research has been done to assess the possible impact of procyclicality, its magnitude can only be seen upon actual occurrence. Nevertheless, these studies may assist in formulating appropriate policy responses, whether in the conduct of monetary policy, modification of relevant prudential policies or implementation of risk management practices.

Therefore, this paper attempts to assess whether Basel II implementation, namely the SA, would result in procyclicality to the Malaysian economy. This study is conducted for the research programme of the South East Asian Central Banks (SEACEN) Research and Training Centre which sees the participation of nine SEACEN countries. The methodology chosen and processes involved in this study were largely derived from the discussions within the group of members involved in this research project.

2.   Overview of the Banking Sector and Basel II Implementation in Malaysia

Malaysia has a comprehensive financial system that continues to evolve in response to the changing domestic and international landscape. Malaysia operates a dual banking system (conventional and Islamic banking) consisting of commercial banks, investment banks and Islamic banks. Islamic banking activities are conducted either through Islamic banking windows or via Islamic bank subsidiaries set up by conventional banks. The composition of banking institutions in the banking system[3] regulated by BNM, the Central Bank, as at December 2007 is given below:

Table 1
Number of Banking Institutions as at December 2007

Banking Institutions	Number
Commercial Banks	22
Investment Banks	14
Islamic Banks	11
Total	47

Assets of the banking system grew approximately 81% to USD360.7 billion as at end of 2007 from USD173.4 billion as at end of 2000. Larger growth was experienced after 2003, when the country began stronger recoveries from the 1997 Asian Financial Crisis. Growth continues to be generated from, among others, the increase in the assets of the Islamic banking system as well as higher volume of trading activities in both equity and bond markets.

Outstanding loans in the banking industry expanded by 54.6% to USD194.5 billion as at end of 2007 from USD109.6 billion as at end of 2000. There has been greater diversification of loans over the years as the focus gradually moves from predominantly corporate lending towards a more balanced mix with retail lending. In 2007, the loans extended to the household sector and small and medium enterprises (SMEs) accounted for 55.1% and 17.7% of total outstanding loans of the banking system respectively.

Growth in deposits mobilised by the banking sector expanded by 84.7% from USD123.8 billion in 2000 to USD262.8 billion in 2007. Growth has also been seen in terms of diversity and product range. As at end of 2007, deposits accounted for 172.5% of GDP.

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[3]   From this paragraph onwards, banking system refers to institutions in the banking industry only.

Non-Performing Loans (NPLs) continued to improve resulting in the overall decline in net NPL ratio based on the 3-month classification basis from 9.7% at the end of year 2000 to 3.2% as at end of 2007, the lowest level in a decade. Efforts in ensuring a lower NPL level continues through better risk management practices as well as higher recoveries.

Capital ratios remained high, stable and well in excess of the minimum requirement. The Risk-Weighted Capital Ratio (RWCR) and Core Capital Catio (CCR) had consistently averaged at approximately 13% and 9.9% respectively throughout 2000 to 2007. As at end of 2007, total capital in the banking system stood at USD34.3billion, while the risk-weighted assets stood at USD242.1 billion.

A new interest rate framework was introduced in 2004, whereby the Overnight Policy Rate (OPR) replaced the three-month intervention rate as the policy rate which serves as an indicator of the monetary policy stance. The OPR was set at the prevailing average overnight interbank rate of 2.70% in 2004 and reached an average rate of 3.50% as at end of 2007. The Base Lending Rate (BLR) for commercial banks experienced a reduction in the years 2004 and 2005 at approximately 5.98% but increased to 6.72% as at end of 2007. The average overnight interbank rate of the Malaysian banking industry was less than 2.66% in the year 2000, increasing to 3.50% as at end of 2007.

In 2005, Malaysia shifted to a managed float exchange rate regime under which the value of the Ringgit would be determined by economic fundamentals, marking the end of the fixed-exchange rate regime introduced in 1998. The Ringgit strengthened against the US Dollar (USD) over the years reaching RM3.31 to the USD as at end 2007 as compared to the fixed-exchange rate of RM3.80 to the USD in the year 2000.

The Malaysian capital market has assumed an increasingly significant role in mobilizing and allocating resources to finance capital expenditures to both the public and private sectors. Finance, insurance, real estate and business services sectors are the main issuers of the debt securities since 1999 as the corporate sector increasingly taps the bond market to raise funds. Total outstanding debt securities amounted to USD169.3 billion as at end 2007. In the secondary market, the volume of debt securities traded has increased significantly in recent years, with sale and purchase transactions amounting to USD117.1 billion in 2007.

BNM's approach to prudential regulation and supervision has also evolved in response to the changing landscape and maturity of the financial sector. The prudential framework has gradually moved away from overly prescriptive regulations and a one-size-fits-all approach to a more principled-based regime that is adaptive to changing market conditions and innovations. With the growing maturity of the market and its players' capabilities, this approach facilitates differentiated regulation and supervision based on the size, complexity and risk of individual banking institutions. It also emphasises improved disclosures to achieve more effective market discipline. Greater flexibility is accorded to institutions that have strong risk management and corporate governance practices in place. The principled-based regulatory regime is reinforced by the adoption of a risk-based approach to supervision. In 2006, the Risk-Based Supervisory Framework (RBSF) for the supervision of financial institutions was further enhanced to facilitate the early identification of emerging risks and provided a more structured and forward-looking approach to assess financial institutions' risk profiles and risk management systems.

For the banking sector, initiatives taken to prepare the banking institutions for Basel II have been aimed at promoting better risk management capabilities and practices, building capacity and facilitating greater operating flexibility with appropriate prudential safeguards. Malaysia's adoption of the Basel II accord is based on the following principles:

- The need to accommodate capacity building efforts, via among others, a more flexible timeframe, with strong emphasis on gradual enhancement of the risk management framework for all banking institutions;
- Maintaining an appropriate balance between the costs and benefits of regulation by emphasising the business justification for the adoption of IRB approaches instead of imposing a regulatory mandate; and
- The need to establish an enhanced supervisory methodology to assess internal models and advanced risk management systems.

Malaysia is adopting a two-phased approach for Basel II implementation. The SA for credit risk and Basic Indicator, Standardised and Alternative Standardised Approaches for operational risk will be implemented in January 2008. The IRB approaches for credit risk will only be made available from 2010.

3. Methodology

3.1 Logical Framework

The logical framework, as suggested by Dr. Pungky Purnomo Wibowo, the lead researcher for this research project, is based on the following channel in Figure 1 below:

Figure 1
The Logical Framework on Flow of Events in the Economy
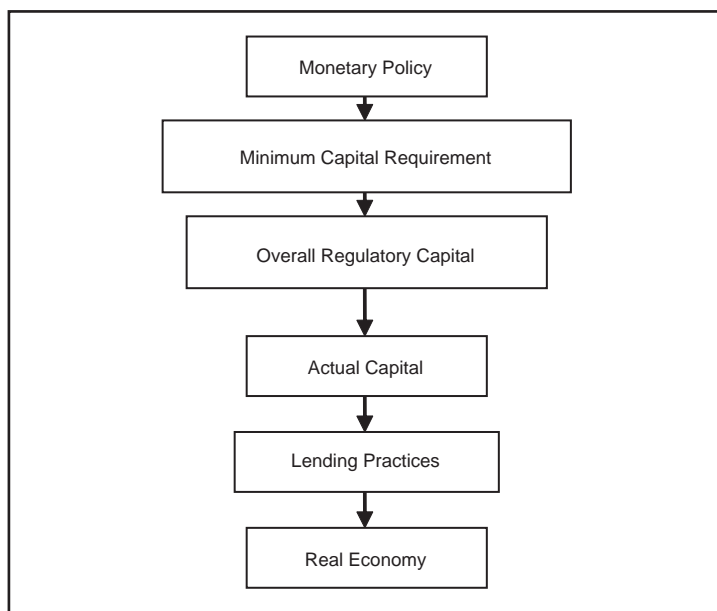
The logical framework describes the relationships and flow of events which links the capital framework of banking institutions to the economy. Although there are numerous possibilities for a trigger event which causes cycles within the economy, the logical framework above chose the monetary policy tool as the trigger event causing economic reactions. Changes in monetary policy, such as an increase in interest rates would affect the pricing and performance of assets such as loans. Increased NPLs would cause provisioning levels to rise, thus reducing the regulatory capital levels of banking institutions. Consequently, banking institutions' lending behaviour may change, in their effort to minimize losses from lending activities, causing negative growth in loans or a credit crunch, which eventually affects the real economy.

3.2 The Model

A semi-structural Vector Autoregression (VAR) model is used in this paper to investigate the dynamic effects and relationships between economic variables. The VAR model, which is conducted in EViews 6 for the purpose of this research paper, enables the assessment of the responses of the endogenous variables to a shock of key variables of interest. It is a system of equations in which each variable is regressed on a constant and on its own lags, as well as the lags of the other variables in the VAR system. The VAR model is chosen as it avoids the need for a complete specification of a structural model of the economy by treating every endogenous variable in the system as a function of the lagged values of the entire variables in the system.

In this paper, we employed the semi-structural VAR approach by Bernanke and Blinder (1992) of the form given in equation (1), which can be presented as follows:

(1) $Sy_t = A(L)y_t + \varepsilon_t$
       where y_t is a vector of endogenous variables and
       ϵ_t is a vector of structural disturbances

$A(L)$ is a matrix polynomial in the lag operator L for a VAR(p):

(2) $A(L) = A_1L + A_2L^2 + K + A_pL^p$

       where L^p is a lag operator and
       p is the order of VAR

The Moving Average (MA) representation of (2) is:

(3) $y_1 = \phi(L)\varepsilon_t$

       where $\phi(L) = [S - A(L)]^{-1}$

A reduced form of equation (1) is estimated by Ordinary Least Squares (OLS):

(4) $y^t = S^{-1}A(L)y_t + S^{-1}\psi D_t + u_t$

       where;

(5) $u_t = S^{-1}\varepsilon_t$, and

(6)
$$E(u_t u_t^{'}) = \Omega = (S^{-1}\varepsilon_t)(S^{-1}\varepsilon_t)^{'}$$
$$= (S^{-1})(\varepsilon_t \varepsilon_t^{'})(S^{-1})^{'}$$
$$= (S^{-1})(S^{-1})^{'}$$

given the assumption: $E[\varepsilon_t \varepsilon_t^{'}] = I_n$

Therefore, S^{-1} is the Cholesky decomposition of Ω, the reduced-form covariance matrix. Furthermore, the dynamic responses to shocks are summarised by the MA representation (assuming that the process is invertible):

(7) $y_t = [I - S^{-1} A(L)]^{-1}u_t = [I - S^{-1} A(L)]S^{-1}\varepsilon_t$

It is assumed that all the roots of $\left| I_n - (S)^{-1} A(L) \right| = 0$ remain outside the unit circle in absolute value, or are in 1 in the presence of cointegration and unit-roots. In this sense, the companion matrix has roots that are less than one in absolute value or are equal to plus 1. In those circumstances the VAR is (mathematically) stable.

Therefore, the Cholesky decomposition of Ω provides the zero restrictions (to complement the $\frac{1}{2} p(p+1)$ constrains) on Ω needed to identify the elements of S^{-1}. The latter is lower-triangular matrix. The way in which the variables affect each other is determined by their positions in the ordering. In this sense, the contemporaneous innovations in the other variables influence all those below them in the chain and none of those variables above them in the order. The ordering of the variables in the system, therefore influences the recursive chain of causality among the shocks in any given period. This study identifies shocks using the Cholesky decomposition, which imposes a recursive structure on the VAR model.

3.3   Assumptions Used Under the Basel II Assessment

The empirical analysis involves simulations based on the data of RWCR under the Basel II implementation. This data was derived from RWCR obtained during the 6-month parallel run which started from June 2007. The results showed, on average, that there was only a slight reduction in RWCR compared to those under the Basel I framework. Hence, this parallel run results data, taking into consideration the possible higher risk sensitivity of Basel II compared to Basel I, are used to simulate the RWCR under Basel II for the purposes of this study.

Nevertheless, the risk-sensitivity effect of the Basel II framework under the SA is expected to be fairly limited due to the following reasons:

(i)   Most of banking institutions' exposures are unrated, which means that there may be no significant changes in the applicable risk weights;

(ii)   Even the exposures which are rated may not experience volatile ratings migration. This is because the risk weights applied are mapped to ratings used by the External Credit Assessment Institutions (ECAIs) that employes 'through-the-cycle' methodologies and are therefore relatively stable over economic periods; and

(iii)   Malaysia exercises the national discretion provided under Basel II framework for defaulted exposures whereby a lower risk weight is charged if higher provisioning levels are made. Therefore, exposures may not necessarily receive a higher risk weight upon default as the risk weights applicable would depend on the level of provisioning.

4.   Data

The application of the VAR model to study the impact of Basel II implementation on the economy typically uses variables that represent policy instruments, transmission channels and the final targets, namely price or output.

The analysis involves the usage of nine variables in the manner of ordering and sources as given in Table 2. The data, collected on monthly a basis, consists of time series from January 2000 to September 2007. The sample period was chosen due to readily available monthly data for all the series involved. The data on RWCR based on the Basel II framework (*RWCR2*) were derived from the historical data of RWCR under the Basel I framework (*RWCR1*) which were adjusted based on the results received during the Basel II parallel run reporting period.

Table 2
List of the Variables in the VAR Model

Variable	Data	Represents	Source
INTER_RATE	Average overnight money of interbank money market	Interest Rates (Policy Instrument)	Monthly Statistical Bulletin, BNM
TOT_DEP	Total Deposits of Banking System	All types of deposits including demand and fixed deposits	Monthly Statistical Bulletin, BNM
TOT_LOAN	Total Loans of Banking System	Credit Channel	Monthly Statistical Bulletin, BNM
REER	Real Effective Exchange Rate (Trade Weighted Value of RM)	Exchange Rate Channel	Internal reports, BNM
RWCR1	Risk Weighted Capital Ratio of Basel I	Capital Adequacy Ratio	Monthly Statistical Bulletin, BNM
RWCR2	Risk Weighted Capital Ratio of Basel II	Capital Adequacy Ratio	Internal reports, BNM
KLSE	Kuala Lumpur Stock Exchange (Composite Index)	Stock Market Index	Monthly Statistical Bulletin, BNM
CPI	Consumer Price Index (2005=100)	Price Level	Internal reports, BNM
GDP_M	Gross Domestic Product	Output	Internal reports, BNM

5. Stationarity of Variables

In order for the variables to be analysed for the effects of economic shocks, stationarity of variables must be achieved to ensure that the variables reflect constant fluctuations and do not exhibit any form of patterns. Only when the variables in the systems are stationary, VAR stationarity can be achieved. However, referring to the plots of variables in levels in Appendix A, we cannot conclude that any of the variables are stationary. Moreover, most variables exhibit seasonality and therefore transformations are required to remove the seasonal components. Table 3 is a summary of the stationarity tests which were performed on all the variables and the transformation conducted to achieve stationarity.

Table 3
Summary of the Stationarity Testing

Variable	Unit Root Test				Transformation required to achieve stationarity	Definition upon transformation
	Augmented Dickey-Fuller		Philips-Perron			
	Level	First Difference	Level	First Difference		
INTER_RATE	-1.0700 (0.7246)	-3.4937 (0.0103)	-0.3595 (0.9105)	-10.0859 (0.0000)	First difference	Change in interest rate
TOT_DEP	-0.8410 (0.8016)	-8.5665 (0.0000)	-1.3076 (0.7363)	-8.5902 (0.0000)	First difference Seasonal adjustment	Growth in total deposits in the banking system
TOT_LOAN	-0.9162 (0.7783)	-8.1204 (0.0000)	-1.0914 (0.7158)	-8.1224 (0.0000)	First difference Seasonal adjustment	Growth in total loans in the banking system
REER	-3.3902 (0.0142)	-9.9532 (0.0000)	-3.3366 (0.0164)	-10.0956 (0.0000)	First difference Seasonal adjustment	Real appreciation of exchange rate
RWCR1	-2.8285 (0.0582)	-3.7828 (0.0044)	-2.6504 (0.0868)	-13.0217 (0.0001)	First difference	Change in RWCR (Basel I)
RWCR2	-4.4896 (0.0004)	-7.9642 (0.0000)	-4.3109 (0.0008)	-19.7811 (0.0001)	First difference	Change in RWCR (Basel II)
KLSE	-2.2957 (0.1759)	-6.9764 (0.0000)	-1.7890 (0.3834)	-6.8472 (0.0000)	First difference Seasonal adjustment	Growth in Kuala Lumpur Composite Index
CPI	-1.7005 (0.4272)	-9.7896 (0.0000)	-1.5854 (0.4853)	-9.7956 (0.0000)	First difference Seasonal adjustment	Inflation rate
GDP_M	-2.3848 (0.1493)	-5.0807 (0.0001)	-1.4724 (0.5425)	-5.1694 (0.0000)	First difference Seasonal adjustment	Growth in output

1. All tests were performed with intercept, excluding trend
2. Numbers in parentheses are p-values of respectives unit root test statistics
3. At 5% significance level.

Both the *Augmented Dickey-Fuller* (ADF) and *Phillips-Perron* (PP) tests were performed to examine whether the series exhibited a unit-root.

H_0 = *The series is non – stationary* (*there is pressence pf unit-root*)
H_1 = *The series is stationary* (*there is no pressence of unit-root*)

The null hypotheses of the tests state that the series is a unit-root, i.e. non-stationary. Based on the results in Table 3, the non-stationary null hypothesis for most of the variables (at level) cannot be rejected at 5% level. First-differencing of all variables shows that all of the series appear to be stationary with the rejection of the unit-root hypothesis. The plots of the transformed variable are illustrated in Appendix B. The charts reflect stationarity with the formal testing for each of the variables in the VAR system. From the stationarity tests, all nine variables at level are non-stationary, which means that the series is I(1). However, the same set of series becomes stationary when first-differenced which means that the differenced-series is I(0) at 5% significance level.

6. Specification of the VAR Model

6.1 Identification and Order of Variables

There are circumstances where the ordering of variables could affect the reliability of a VAR model and therefore, the ordering of variables would need to be tested to assess its effect on the VAR model used for this study. In Generalized Impulses Analysis, Pesaran and Shin (1998) constructed an orthogonal set of innovations that does not depend on VAR ordering. In this study, as the Cholesky's impulses analysis were employed, we performed sensitivity tests in order to check whether the different sets of orders of variables would result in different VAR models. Several tests were conducted by changing the orders of variables and it was concluded that ordering of variables did not affect the VAR model. Refer to Appendix C. The shaded columns demonstrate that various test statistics were consistent irrespective of the order of variables.

6.2 Lag Length of VAR (*p*)

The determination of an optimum lag length is to avoid an 'underfitted' or 'overfitted' VAR model. We began to determine the optimum lag length of the model by using a lag length of 6 and the number of lag lengths is reduced sequentially until an optimum lag length, *p*, is reached. Subsequently, the *Akaike Information Criteria* (AIC) and *Schwarz Information Criteria* (SIC) are used as selection criteria to select the lag length order. Lower AIC and SIC values imply a better model. Interestingly, both criteria selected lag 1 as the optimum order lag length. Thus, the VAR model is estimated to study the procyclicality impact of Basel II in Malaysia. Table 4 provides the test statistics of AIC and SIC in selecting the lag order of the VAR model.

Table 4

Table 4
VAR Lag Order Selection Criteria Statistics

Lag	AIC	SIC
1	**16.4516**	**19.1510**
2	17.3468	22.5135
3	17.4296	25.1002
4	16.7818	26.9941
5	15.3863	28.1789
6	14.0132	29.4255

Figure 2 shows results of the stationarity test for VAR which was conducted using *EViews 6*. All the inverse unit-roots of the characteristic AR polynomial lie within the unit circle. Since all the inverse roots have modulus less than one and lie inside the unit circle, the estimated VAR is concluded as stationary and stable.

Figure 2
VAR Stationarity Test Inverse Roots of AR Charateristic Polynomial

Roots of Characteristic Polynomial	
Endogenous variables: D_INTER_RATE DG_TOT_DEP DG_TOT_LOAN DG_REER D_RWCR1 D_RWCR2 DG_KLSE DG_CPI DG_GDP_M	
Exogenous variables: C	
Lag specification: 1 1	
Root	Modulus
0.570074	0.570074
-0.265350 - 0.289457i	0.392678
-0.265350 + 0.289457i	0.392678
0.367688	0.367688
-0.23806	0.238064
-0.1871	0.187098
0.171945	0.171945
0.063537- 0.110788i	0.127714
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

Inverse Roots of AR Characteristic Polynomial
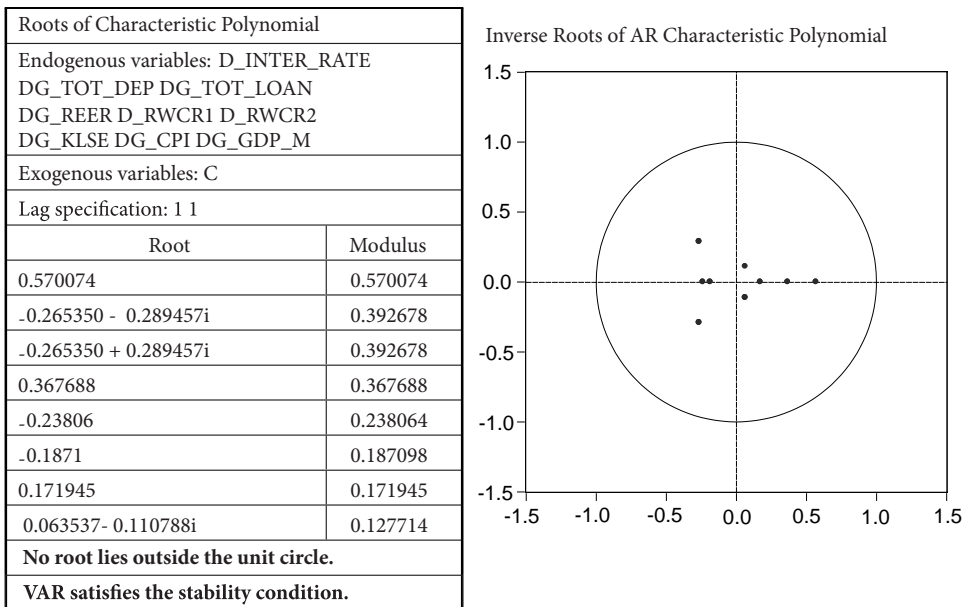
7. Results and Analysis of the Empirical Findings

The Impulse Response Function (IRF) shows the response of the system over a specified time period due to a shock in one of the variables (innovations) in the system. The analysis of the IRF will aid in the interpretation of the dynamic effects of a shock in one of the endogenous variables. In order to assess the impact of the Basel II implementation, we analysed the sensitivity of the variables that we were interested in (variables of interest) to the shock in the chosen innovations. Therefore, we established several steps in analysing the IRF as follows:

(i)   The impact of changes in interest rates to RWCR. This is done in order to estimate the relationship or sensitivity of the RWCR due to any changes in monetary policy; and

(ii)   The impact of changes in RWCR to loans and GDP. This is done in order to assess whether RWCR changes would have any relationship to the movements in loans and GDP. A comparison between the effects of Basel I and Basel II is made in order to establish the extent of the differences of impact, if any, under the two frameworks.

Chart A plots the estimated IRF of the *RWCR2* as the endogenous variable to one-standard deviation shock in the interest rate, reflecting a one-off episode of a contraction in monetary policy. An increase in interest rates initially results in a fall in *RWCR2* in the first two months. As interest rates increase, the cost of borrowing increases leading to more defaults from borrowers. This may result, among others, in higher charge for provisions, leading to a reduction in capital base and hence, reduction in RWCR level. However, the *RWCR2* turns around after the second month to reach its previous level and stabilises within four months. We can also see that the impulse response of *RWCR2* to interest rate around the horizontal axe is near zero and falls within the confidence interval completely. We can therefore say that interest rate movement does not have a significant impact on *RWCR2*.

Chart A
IRF (Response: RWCR2 and Innovation: Inter_Rate)

Response of D_RWCR2 to Cholesky One S.D. D_INTER_RATE Innovation
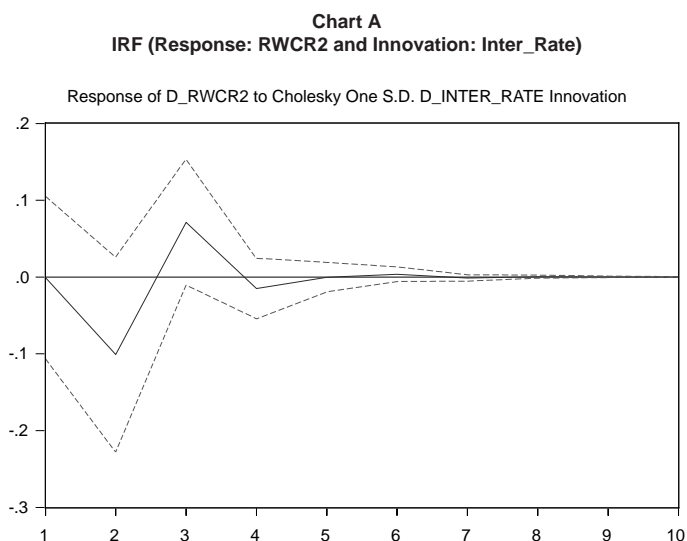
Chart B plots the estimated IRF of loans as the endogenous variable to one-standard deviation shock in the RWCR under Basel I framework (*RWCR1*), reflecting a one-off episode of a contraction in available capital of banking institutions. An increase in *RWCR1* has a negligible effect within the first two months. Increase in loan growth can be seen after the second month as higher RWCR allows banking institutions to allocate more funds for lending activities. However, loans turn around after the third month to reach its previous level and stabilises within four months. We can also see that the impulse response of loans to *RWCR1* around the horizontal axis is near zero and falls within the confidence interval completely. We can therefore say that the *RWCR1* movement does not have a significant impact on loans.

Chart B
IRF (Response: Tot_Loan and Innovation: RWCR1)

Response of DG_TOT_LOAN to Cholesky One S.D. D_RWCR1 Innovation
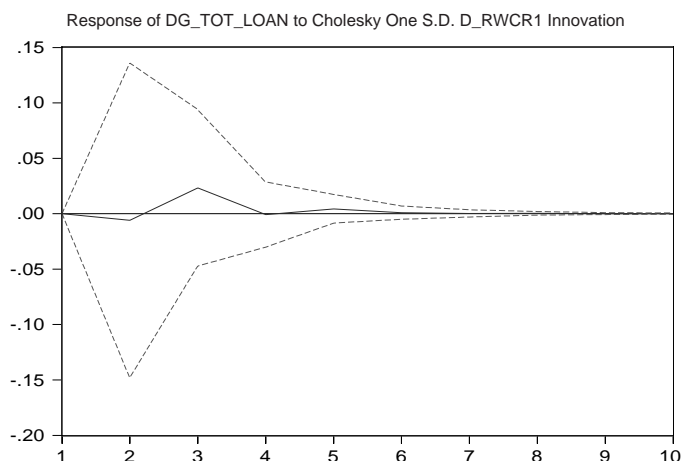
Chart C plots the same effect based on RWCR under Basel II (*RWCR2*). Similarly to impact from *RWCR1* movement, an increase in *RWCR2* would cause an increase in loan growth after the second month. Loan growth turns around after the third month to reach its previous level and stabilises within four months. We can therefore say that *RWCR2* impact does not differ significantly from *RWCR1* impact on loans.

Chart C
IRF (Response: Tot_Loan and Innovation:RWCR2)

Response of DG_TOT_LOAN to Cholesky One S.D. D_RWCR2 Innovation
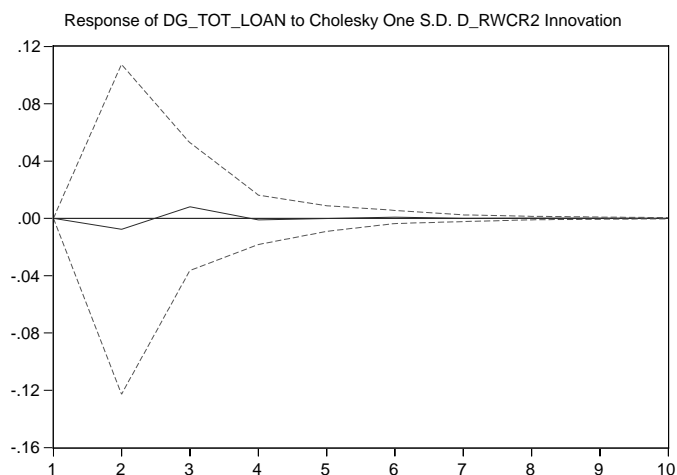
Under Chart D an increase in *RWCR1* initially results in a slight increase of *GDP* growth in the first month as an increase in RWCR allows banking institutions to allocate more funds for lending activities which facilitates loan growth and eventually increases GDP. However, the *GDP* growth starts to reduce after the 1st month to stabilise at its previous level at the third month. We can also see that the impulse response of *GDP* to *RWCR1* around the horizontal axe is near zero and falls within the confidence interval completely. We can therefore say that the *RWCR1* movement does not have a significant impact on *GDP*.

Chart D
IRF (Response: GDP_M and Innovation: RWCR1)

Response of DG_GDP_M to Cholesky One S.D. D_RWCR1 Innovation
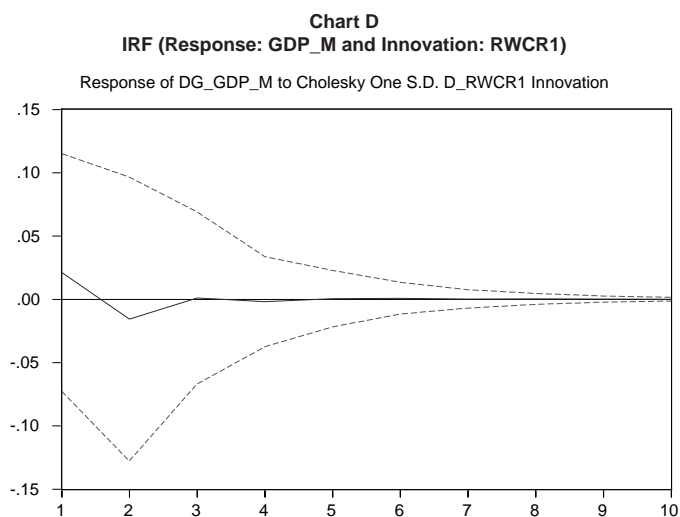
Similarly under Chart E, an increase in *RWCR2* initially results in a slight increase in *GDP* for the first month and continues to increase gradually until the third month. However, the *GDP* starts to fall after the third month to stabilise at its previous level at the fifth month. As it takes a slightly longer period (at the fifth month) for the *RWCR2* to stabilise compared to *RWCR1* (at the third month), we can say that *RWCR2* has a slightly greater impact than *RWCR1* on *GDP* growth.

Chart E
IRF (Response: GDP_M and Innovation: RWCR2)

Response of DG_GDP_M to Cholesky One S.D. D_RWCR2 Innovation
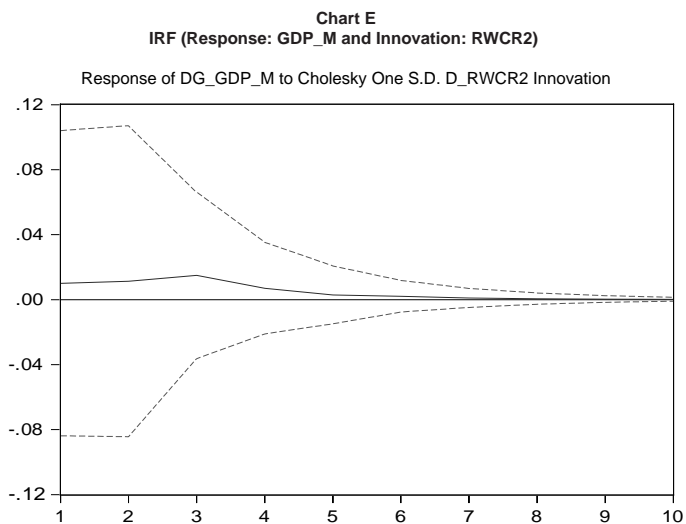
8.   Analysis of Study

There is naturally some degree of procyclicality in the economy. As mentioned by Gerlach and Gruenwald (2006), a normally functioning economy would have some degree of financial sector procyclicality. The issue now is whether there is excessive procyclicality caused exclusively by Basel II implementation. There may be some basis to the claim that Basel II will cause excessive procyclicality as banking institutions are an important financial intermediary and credit channel is an important transmission channel to the Malaysian economy. This is confirmed by the findings by Borhan Nordin (2005), which establishes that the most important monetary policy transmission mechanism in Malaysia is the credit channel.

Nevertheless, empirical evidence suggests that there is an insignificant procyclicality impact of both Basel I and the SA under Basel II to the Malaysian economy. In addition, there is no significant difference between the potential impact between Basel I and Basel II on procyclicality to the economy. There is also no significant impact on RWCR due to the movements in interest rates suggesting that RWCR is not highly sensitive to monetary policy interventions. This is due to the following reasons:

(i)   As opposed to the IRB approach, the risk-sensitive feature of the SA in the Malaysian scenario remains limited and is expected to remain somewhat similar to the impact under the Basel I framework. This is due to the limited rated exposures of banking institutions in Malaysia and the usage of external ratings under the SA in applying the applicable risk weights. As mentioned by Catarineu-Rabell, Jackson and Tsomocos (2003), ratings issued by external rating agencies would not increase the procyclicality impact as 'over-the-cycle' rating methodologies, which are more stable over the cycles, are used compared to internal rating schemes which fluctuate more rapidly over time.

(ii)   The Malaysian capital market is well developed to facilitate the portfolio diversification by banking institutions into capital market instruments which can serve to cushion the impact of losses from lending activities. In other words, banking institutions can minimise the losses in lending activities from the returns derived from capital market investments in low risk securities, thus minimising reductions in the capital base. Refer to Appendix D on comparison of investment levels between securities and loans by banking institutions.

(iii)   Banking institutions maintain RWCR levels on average at 12%-13% which are well above the minimum requirement of 8%. Therefore, regulatory capital requirements do not constrain the activities of banking institutions as drastic measures, such as significant reductions in lending activities, are not required in order to maintain a desired RWCR level. Chart F below shows the movement in the average RWCR level of banking institutions throughout the sample period. We can see that banking institutions have maintained an effective average level of 4% to 5% of capital above the minimum requirements.

Chart F
Movement of RWCR Level
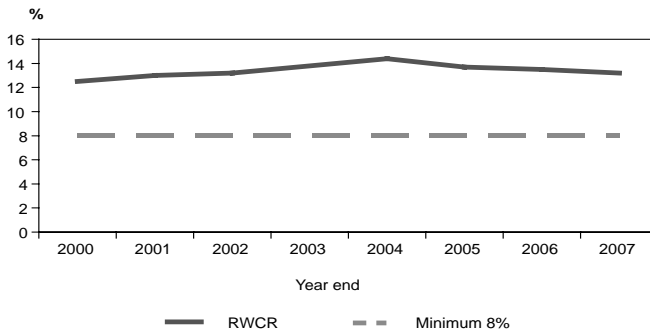
Notwithstanding the above findings, in view that the majority of Malaysian banking institutions adopt the SA, its impact to banking institutions' lending behaviour and eventually the financial system should be continuously monitored in order to avoid any possibility of excessive procyclicality. It is currently premature to assess accurately the procyclical impact of SA implementation and whether an intervention is required. In turn, when the causes have been identified and the impact assessed, the choice of which policy instrument to use comes into play. Among others, supervisors may consider using the discretion provided under Pillar II requirements to limit any material procyclical impact of Basel II. There will also be a need to ensure that surveillance is enhanced in areas potentially contributing to RWCR volatility such as impact of downward adjustment for equity prices and value of collaterals in a downturn environment. Nevertheless, the choice of policy tool to combat excessive procyclicality has itself spawned an entire debate, with no clear answers.

In anticipation that many banking institutions aspire to adopt the IRB approach moving forward, the larger concern is on the implementation of the IRB approach, which derives regulatory capital calculation using internal estimates. As reiterated by Gerlach and Gruenwald (2006), the time horizon on which banking institutions assess risk would have an impact on the degree of procyclicality and it is more likely to be exarcebated by banking institutions that uses point-in-time rating schemes which is based on average default rates over the cycle. However, the actual impact of the IRB implementation is also difficult to assess as its impact to banking institutions' lending practices may vary depending on their risk rating practices and internal capital calculation currently. For sophisticated banking institutions, the IRB approach only brings capital regulation in line with current economic capital allocation practices. The requirements of the Internal Accounting Standards (IAS) 39 could possibly introduce further volatility via fair value measurement requirements. In order to better understand the total impact to the financial system, these combined effects would need to be monitored and assessed holistically.

9.   Conclusion

The empirical results of a semi-structural VAR model used in this study indicate insignificant effects in terms of procyclicality of the Basel II implementation to the Malaysian economy.

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Plost of the Variables in Levels (Un-differenced)
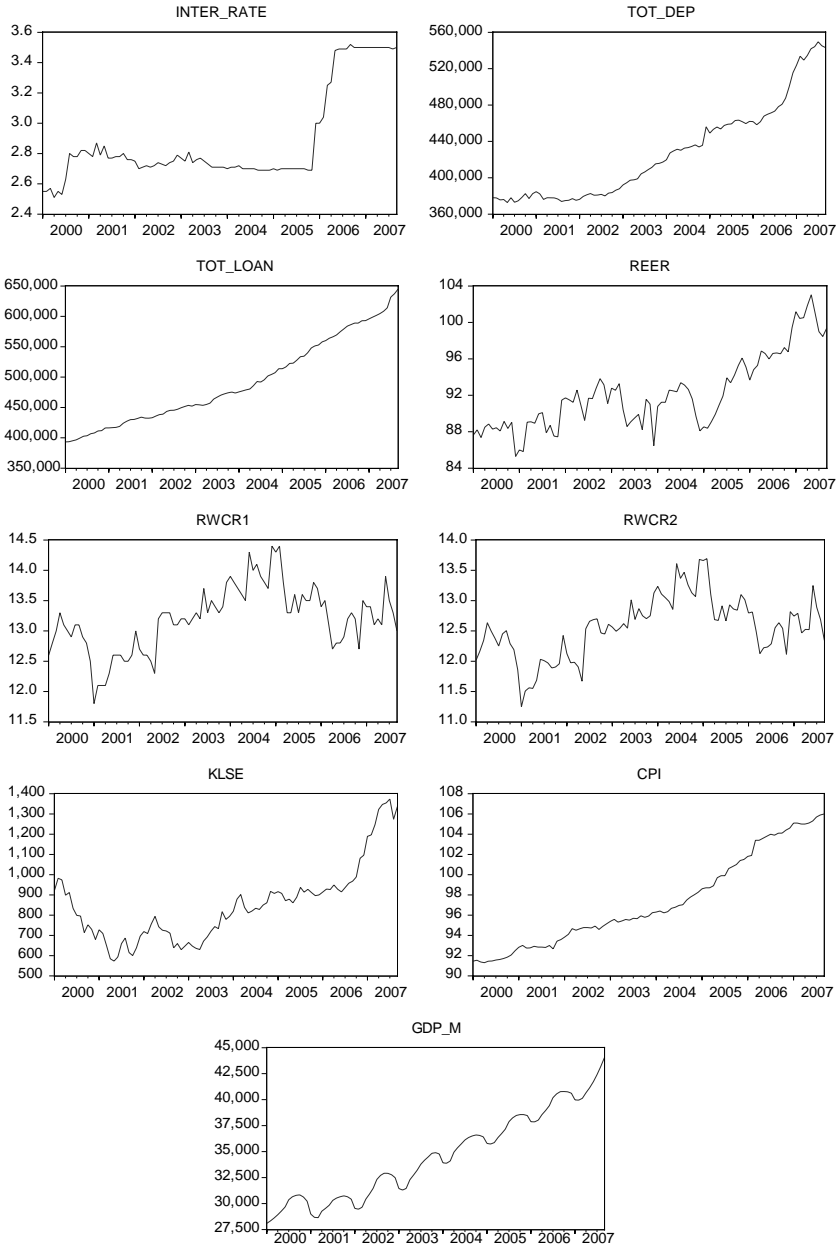
Plots of the Transformed Variables
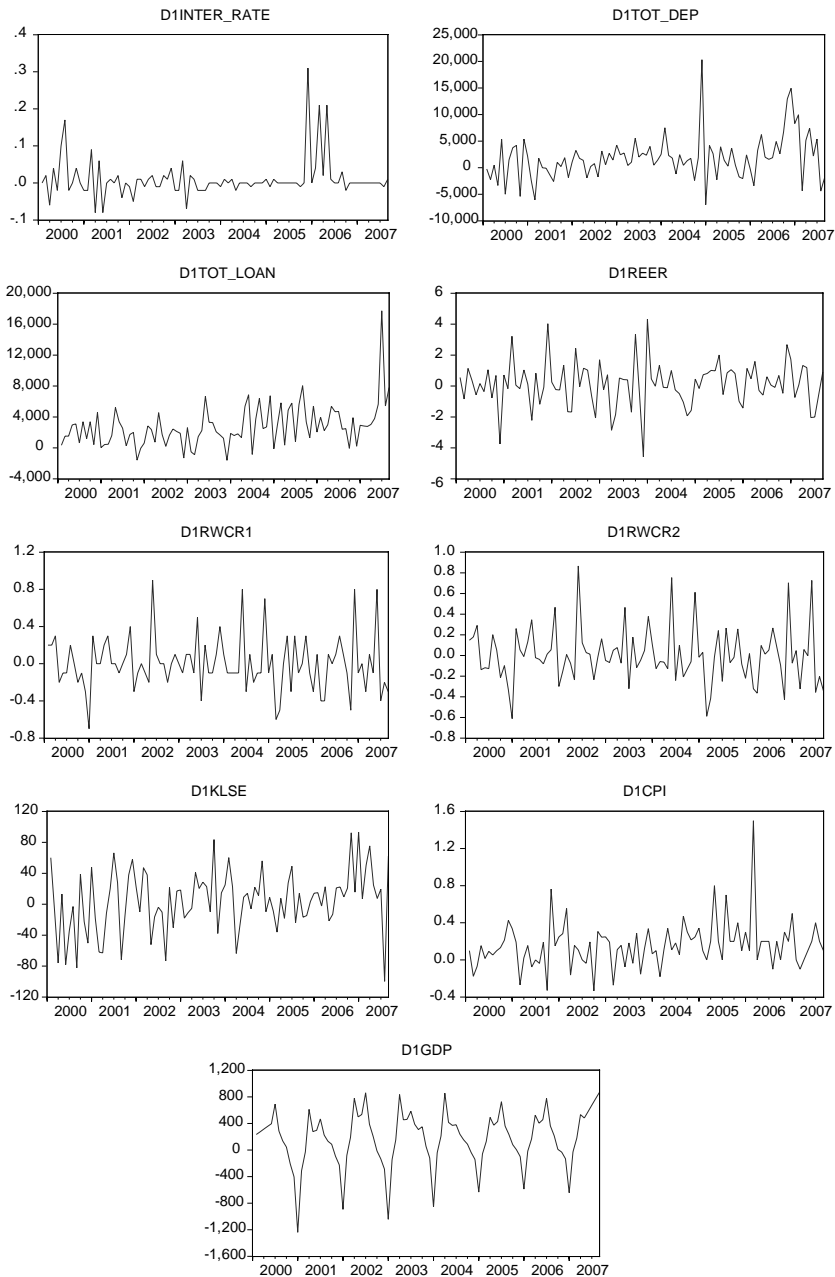
Order 1

	D_INTER_RATE	DG_TOT_DEP	DG_TOT_LOAN	DG_REER	D_RWCR1	D_RWCR2	DG_KLSE	DG_CPI	DG_DP_M
R-squared	0.06134	0.162392	0.045585	0.204623	0.141728	0.302628	0.149433	0.128727	0.34729
Adj. R-squared	-0.061094	0.053138	-0.078903	0.100878	0.029779	0.211667	0.038489	0.015082	0.262154
Sum sq. resids	0.211985	113.5875	26.03865	366.2065	5.870365	15.27209	3250.84	9.271605	12.86931
S.E. equation	0.055428	1.283042	0.614306	2.303767	0.291681	0.470462	6.863936	0.366567	0.43187
F-statistic	0.501006	1.486378	0.366181	1.972365	1.266008	3.326992	1.346926	1.132715	4.079232
Log likelihood	121.771	-126.4396	-68.25645	-172.6792	-9.414665	-47.18101	-258.9264	-27.46774	-40.41935
Akaike AIC	-2.829646	3.454167	1.981176	4.624791	0.491511	1.447621	6.808262	0.94855	1.276439
Schwarz SC	-2.529716	3.754097	2.281106	4.924721	0.791441	1.747551	7.108193	1.24848	1.576369
Mean dependent	0.009114	0.149495	0.045786	0.069297	0.011392	0.002532	0.834052	0.00281	0.086297
S.D. dependent	0.053809	1.318553	0.591416	2.429568	0.296123	0.52987	6.99997	0.369363	0.502771

Order 2

	DG_KLSE	D_INTER_RATE	DG_GDP_M	D_RWCR1	DG_TOT_DEP	DG_TOT_LOAN	DG_REER	D_RWCR2	DG_CPI
R-squared	0.149433	0.06134	0.34729	0.141728	0.162392	0.045585	0.204623	0.302628	0.128727
Adj. R-squared	0.038489	-0.061094	0.262154	0.029779	0.053138	-0.078903	0.100878	0.211667	0.015082
Sum sq. resids	3250.84	0.211985	12.86931	5.870365	113.5875	26.03865	366.2065	15.27209	9.271605
S.E. equation	6.863936	0.055428	0.43187	0.291681	1.283042	0.614306	2.303767	0.470462	0.366567
F-statistic	1.346926	0.501006	4.079232	1.266008	1.486378	0.366181	1.972365	3.326992	1.132715
Log likelihood	-258.9264	121.771	-40.41935	-9.414665	-126.4396	-68.25645	-172.6792	-47.18101	-27.46774
Akaike AIC	6.808262	-2.829646	1.276439	0.491511	3.454167	1.981176	4.624791	1.447621	0.94855
Schwarz SC	7.108193	-2.529716	1.576369	0.791441	3.754097	2.281106	4.924721	1.747551	1.24848
Mean dependent	0.834052	0.009114	0.086297	0.011392	0.149495	0.045786	0.069297	0.002532	0.00281
S.D. dependent	6.99997	0.053809	0.502771	0.296123	1.318553	0.591416	2.429568	0.52987	0.369363

Order 3

	D_RWCR1	DG_REER	DG_KLSE	DG_GDP_M	DG_TOT_LOAN	D_RWCR2	DG_CPI	DG_TOT_DEP	D_INTER_RATE
R-squared	0.141728	0.204623	0.149433	0.34729	0.045585	0.302628	0.128727	0.162392	0.06134
Adj. R-squared	0.029779	0.100878	0.038489	0.262154	-0.078903	0.211667	0.015082	0.053138	-0.061094
Sum sq. resids	5.870365	366.2065	3250.84	12.86931	26.03865	15.27209	9.271605	113.5875	0.211985
S.E. equation	0.291681	2.303767	6.863936	0.43187	0.614306	0.470462	0.366567	1.283042	0.055428
F-statistic	1.266008	1.972365	1.346926	4.079232	0.366181	3.326992	1.132715	1.486378	0.501006
Log likelihood	-9.414665	-172.6792	-258.9264	-40.41935	-68.25645	-47.18101	-27.46774	-126.4396	121.771
Akaike AIC	0.491511	4.624791	6.808262	1.276439	1.981176	1.447621	0.94855	3.454167	-2.829646
Schwarz SC	0.791441	4.924721	7.108193	1.576369	2.281106	1.747551	1.24848	3.754097	-2.529716
Mean dependent	0.011392	0.069297	0.834052	0.086297	0.045786	0.002532	0.00281	0.149495	0.009114
S.D. dependent	0.296123	2.429568	6.99997	0.502771	0.591416	0.52987	0.369363	1.318553	0.053809

Movement of Change in Investment Levels

The chart below shows the comparison of change in investment levels between securities and loans by banking institutions. We can see that there is somewhat an inverse relationship on the change of investment level between securities and loans, whereby there is an increase in the growth rate for securities and reduction in the growth rate of loans during economic downturn and vice-versa. This signifies that there is potentially a shift in banking institutions' investment behaviour into alternative sources of income of higher quality, such as low risk securities, when there is a reduction of income from lending activities. This would assist banking institutions in conserving capital levels during an economic downturn.

Chart G
Movement of Chance in Investment Levels between
Loans and Securities
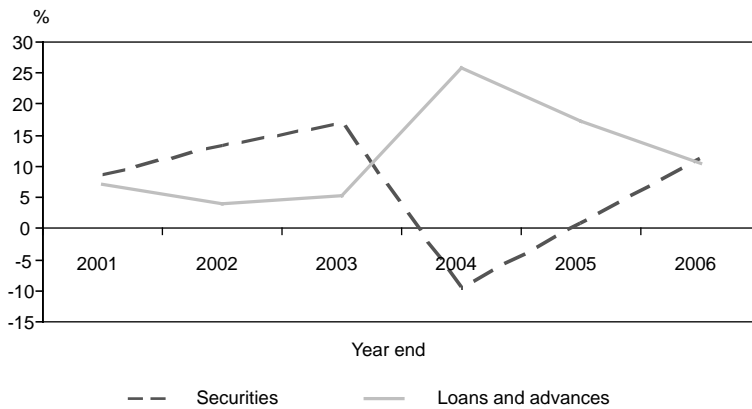
PRO-CYCLICALITY IMPACT OF BASEL II IN MONGOLIA

by Battulga Ulziibat[1]

1. The Impact of Basel II in the Mongolian Economy and the Banking Industry

1.1 Development of Basel II

Credit institutions, in their capacity as financial intermediaries, play a special role in today's economies and confidence in the stability of the banking sector is essential for this. In this context, the solvency of banks is especially relevant.

One of the most important tasks of financial intermediaries is the professional management of credit, market, liquidity and other risks. These risks must not become a threat to the solvency of the institutions or lead to instabilities in the financial sector. Over and above the institutions' own risk provisioning measures, specific regulatory rules were therefore laid down for credit institutions, primary among which are the capital adequacy requirements.

The 1988 Capital Accord (Basel I), which was applied until the end of 2006, concentrated solely on the minimum capital for banks as the decisive factor for limiting risks and therefore also for the losses in the case of insolvency of an institution. Basel I included capital requirements that involved only credit and market risks and were based on a slightly differentiated calculation method than for the calculation of the capital requirements for credit risk.

Building on Basel I, the new Basel Framework for the International Convergence of Capital Measurement and Capital Standards (Basel II) aims to improve the stability and soundness of the financial system. The key objective of the new capital adequacy framework is to adjust banks' capital requirements to reflect more accurately the actual incurred risk than in the past and to take into account the recent innovations in the financial markets as well as institutions' risk management. Additional focal points of the new framework are basic principles for qualitative banking supervision and the expansion of disclosure requirements in order to enhance market discipline.

In order to achieve this, the Basel Framework is divided into three pillars, the second and third of which are new in comparison to Basel I.

Pillar 1 consists of minimum capital requirements including requirements for credit risk, market risk and operational risk. To determine the capital requirements for these three risk areas within the framework of an evolutionary approach, various risk measurement

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methods are available such as the basic, standardised approaches as well as more advanced and more risk-sensitive approaches that are based on internal methods of banks. The more advanced and more precise risk measurement methods can lead to capital relief. Pillar 1 lays down a flexible framework within which a bank, subject to supervisory approval, may apply an approach that best suits its complexity and risk profile. The approaches for calculating the required underlying capital for market risks, by which Basel I was extended in 1996, were adopted in the Basel Framework.

Pillar 2 consists of the supervisory review process (SRP), which adds a qualitative element to the quantitative minimum capital requirements of Pillar 1. The SRP mainly aims to identify the overall risk of an institution and the main influential factors on its risk situation and to evaluate them from a supervisory perspective.

Pillar 3 refers to market discipline, i.e., institutions are to be subject to enhanced disclosure requirements in order to make use of the disciplining forces of the markets as a complement to the regulatory requirements.

Basel II is mainly directed at large, internationally active banks. The basic concept should, however, be also suitable for application to banks of varying levels of complexity and business activities. During the development of the Basel II Framework, which started in 1998, there was an intensive dialogue between the banking supervisors, the banking industry, policy makers and other interested parties. Three consultation papers and several Basel Committee impact studies contributed to the development of rules that are in line with common practice.

With the help of quantitative impact studies (QIS), in which banks made test calculations for the respective current rule proposals, it was possible to estimate the resulting future capital requirements. On this basis, the risk weight formulas were adjusted so that, when institutions change to more advanced measurement approaches, they still have moderate incentives for capital reduction with the previous worldwide capital level staying more or less the same.

The Basel Framework was published in June 2004, extended by trading book aspects and the treatment of the double default effects for guarantees in July 2005 and came into force at the end of 2006.

1.2   Overview of Basel II Implementation in Mongolia

Although the supervisory framework of the Mongolian banking sector has been developing in recent years, the risk management systems of banks are still relatively weak. While The Bank of Mongolia did not adopt the Basel Accord officially, it had tried to follow its recommendations. Currently, Mongolian banks abide by the Basel I method for measurement of credit risk for reporting regulatory capital. Banks are allowed to use the VaR method for market risk measurement if they have developed the required system. In practice, however, only one bank is authorised to use this approach currently.

According to the "Medium-term Development Strategy of Banking Sector", implementation of Basel II will begin in 2010-2011, but there has yet to be any detailed plan for now.

Regarding Pillar 1 of Basel II, Mongolian banks do not estimate the capital adequacy indicators based on the standardised approach, mainly due to lack of and/or rather limited activities of rating agencies in Mongolia. Therefore, The Bank of Mongolia has adopted several guidelines on the IRB approach as an alternative. These include guidelines on credit risk, market risk, and operational risk. In addition, the minimum capital adequacy ratio of 10 percent, which is higher than the Basel minimum ratio by 2 percentage points, acts as the capital buffer recommended by Pillar II. Also, The Bank of Mongolia has taken several measures to address Pillar III with the intention of increasing market discipline through enhanced transparency and disclosure.

1.3   Overview of the Mongolian Banking Sector

Mongolia started the transition from a centrally planned economy to a market economy in 1990. Along with the transition towards a market economy, one of important policy issues was developing an efficient financial system. Prior to 1991, a one-tier banking system existed in Mongolia. In 1992, a new banking law was introduced which enabled the reorganisation of the banking system into a two-tier structure. Since then, The Bank of Mongolia has taken the role of a central bank, responsible for the implementation of monetary policy and supervision of financial institutions. State-owned and private commercial banks were opened to provide financial services in the country.

At the start of the transition, the banking sector was underdeveloped and vulnerable as there was a lack of understanding in profit oriented approaches in business, and the supervisory framework was weak. Output contractions led to inability of enterprises to pay their loans, resulting in a high rate of non-performing loans which eventually led to a banking sector crisis. From 1996 to 2000, many banks became insolvent, and the credibility of customers fell significantly. The Bank of Mongolia worked together with the Government of Mongolia to strengthen the banking sector and as a result, credibility of customers improved.

The Mongolian banking sector is growing and financial intermediation is deepening over the last eight years. The range of financial services offered by banks has increased and the scope has widened. Banks have also improved their corporate governance.

By September 2007, Mongolia's banking sector comprised a total of 16 commercial banks, with a total 952 branches and 8,828 staff.

1.3.1 Total Assets

As of September 2007, the total assets of the banking sector amounted to USD 2,472.8 million, with an average annual increase of 36.8 percent since 2000 (Figure 1).

Figure 1

Total Assets of Mongolia's Banking Sector (2000-2007.09)
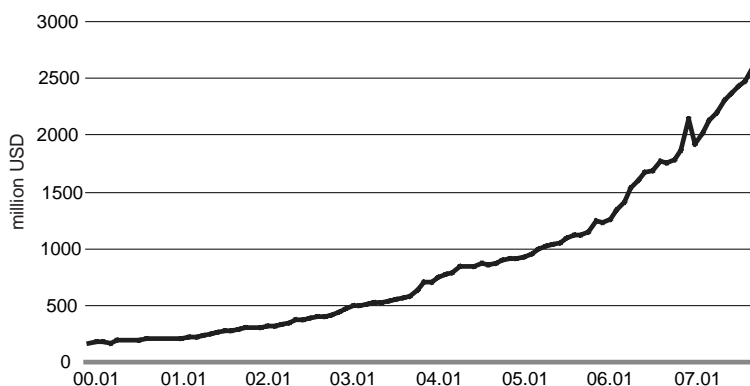
During the same period, the total liabilities of the banking sector reached USD 2,185.1 million, with an average annual increase of 37.1 percent. The aggregate owners' equity of the banking sector totaled USD 287.7 million.

Figure 2
Structure of Assets
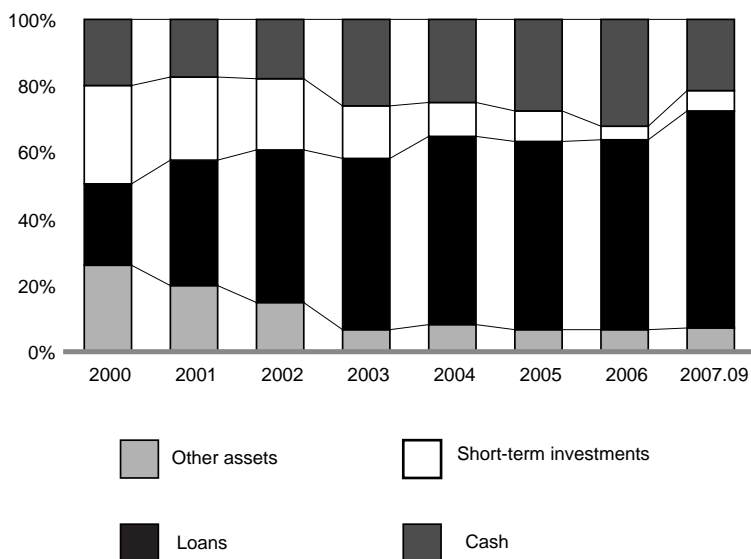
Loans as a proportion of total assets gradually climbed from 28.6 percent in 2000 to 67.1 percent in September 2007. Short-term investments as a proportion of total assets fell steadily and stood at 6.0 percent, which was a result of the increase in loans. The proportion of cash in total assets was relatively stable and stood at 21.6 percent (Figure 2).

1.3.2 *Loans and Deposits*

In recent years, deposits of households, companies and other institutions have steadily increased. As of September 2007, banking deposits totaled USD 1,698.8 million, with an average annual increase of 35.0 percent from the end of 2000. Deposits to GDP ratio have increased significantly and reached 45.3 percent by September 2007 (Figure 3). This is an indication of the restoration of public confidence in banks.

Figure 3
Deposits of Banks and Deposits-GDP Ratio
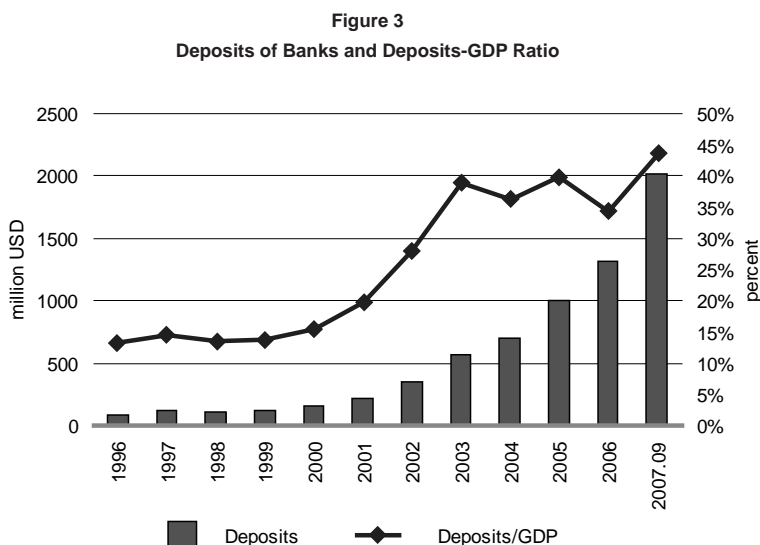
As funds of the banking sector have risen, loans to the private sector have also increased steadily. In 2000, total loans of the banking sector were USD 61.8 million issued to 1700 customers, in contrast to total loans of USD 1,659.7 million issued to 483 thousand customers in September 2007.

Figure 4

Deposits & Loans of Banks and Loan-Deposit Ratio (2000-2007.09)
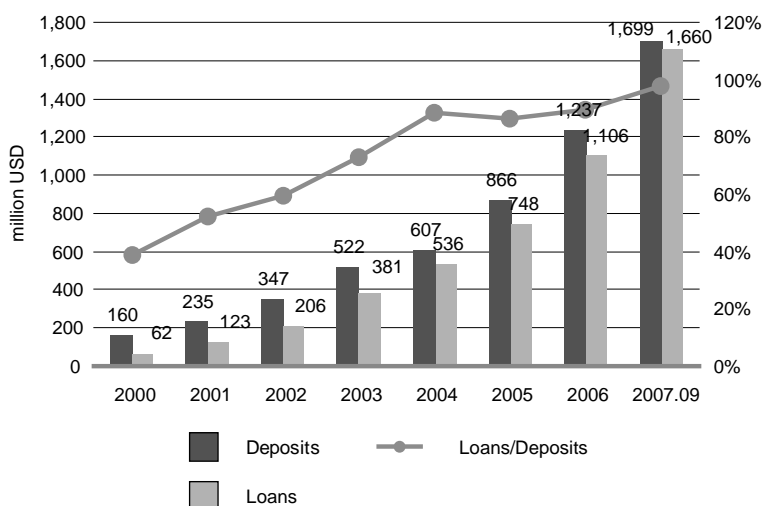
As of September 2007, the gap between banks' deposits and loans continued to decline, reaching USD 39.1 million, compared to USD 98.4 million in 2000. The loan-deposit ratio was 97.7 percent, an average annual decline of 8.8 percentage points (Figure 4). In recent years, banks not only intensively raised their loans, but also successfully expanded their range and reach of services, especially in rural areas.

Figure 5

Total Outstanding Loans by Economic Sector (September 2007)
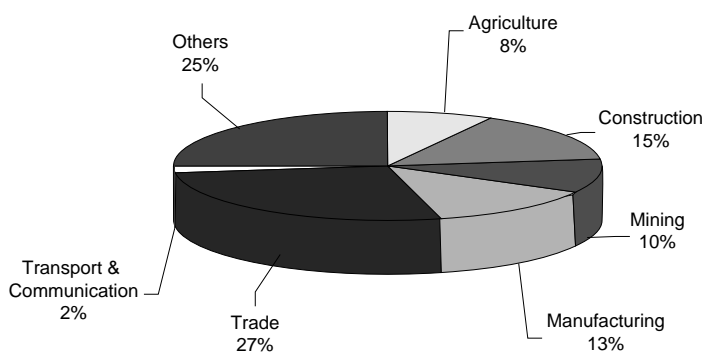
As seen from the breakdown of loans by economic sector, loans issued to the construction sector and mining sector increased, thanks to growth at these sectors. Loans issued to other sectors were relatively stable (Figure 5).

1.3.3   Capital Adequacy

The total capital of the banking sector fell below zero during the financial crisis which occurred during 1996-2000. The Bank of Mongolia and the Government of Mongolia implemented necessary measures to overcome the crisis such as refinancing, restructuring, and regulatory policies. As a result, banks' capital was increased and the risk-bearing capacity was strengthened. The minimum capital requirement for banks increased steadily, from around USD 1 million in 2000 to USD 7 million in March 2006. Profitability of banks was high in last several years with a significant part of their capital increase coming from their income. Mongolian banks have also been opened to foreign as well as domestic investors. As a result, total capital of the banking sector rose from USD 27.3 million in 2000 to USD 284.4 million in September 2007. The capital adequacy ratio fluctuated between 14 and 24 percent, which is 1.8-3 times higher than the Basel minimum requirement (Figure 6).

Figure 6
Capital & Capital Adequacy Ratio (2000-2007.09)
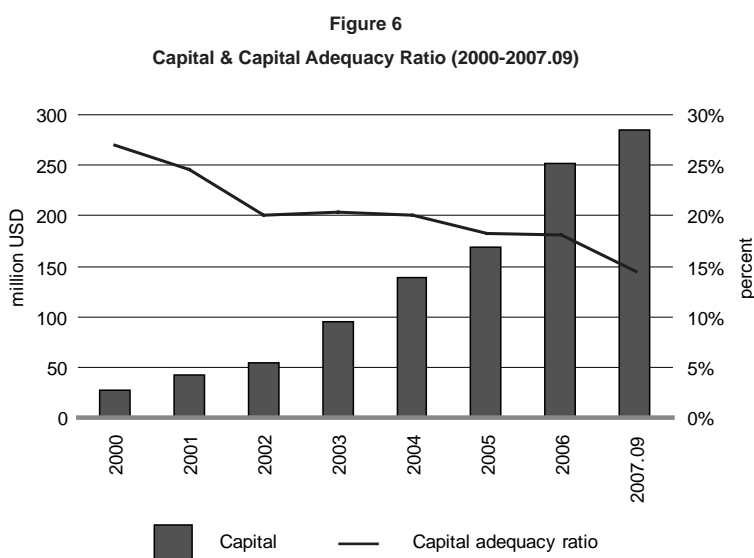
1.3.4   Asset Quality

Commercial banks have strengthened credit management in recent years. As a result, quality of assets improved as demonstrated by the NPL ratio. By September 2007, the NPLs of all commercial banks measured by the five-category loan classification standard totaled USD 58.2 million. The NPL ratio was 3.5 percent, with a decrease of 18.1 percentage points since 2000 (Figure 7).

Figure 7

NPL and its Ratio (2000-2007.09)
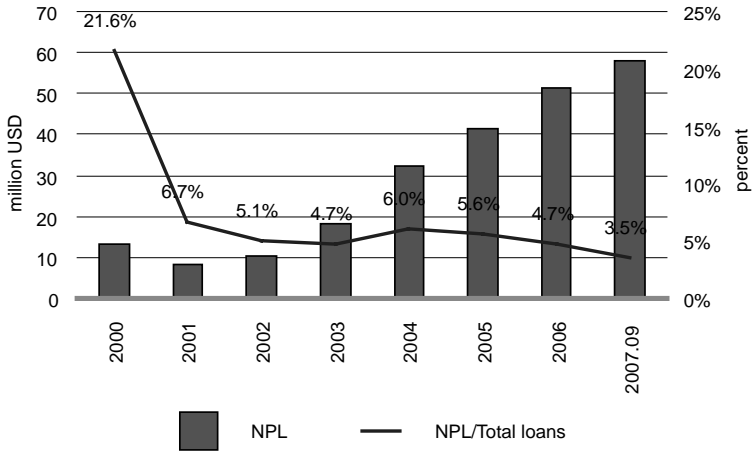
1.3.5 Profitability and Interest Rates

Expansion of banks' branches and competition among banks contributed to reducing interest rates of loans and kept deposit rates high, which resulted in gradual decrease of net interest margin (Figure 8).

Figure 8

Average Loan Rate, Deposit Rate & Net Interest Margin (2000-2007.09)
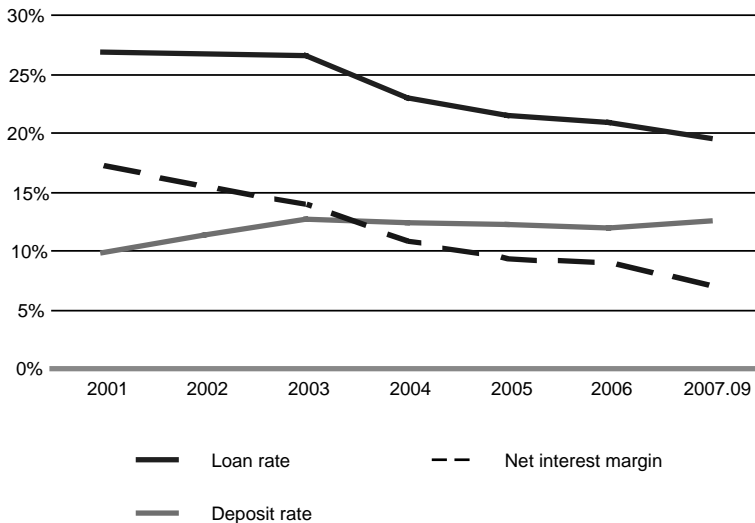
Profit of banks increased even as net interest margin was declining due to enhanced earning abilities of banks. In September 2007, the average rate of net return on total assets (ROA) and net return on equity (ROE) of banks were 2.7 percent and 26.1 percent respectively. The income portfolio of banks improved dramatically and became more diversified, with fee-based income accounting for 8.5 percent of total income. Thus, the overall profitability and financial sustainability of the banking sector improved considerably (Figure 9).

Figure 9

Profit of Banks (2000-2007.09)
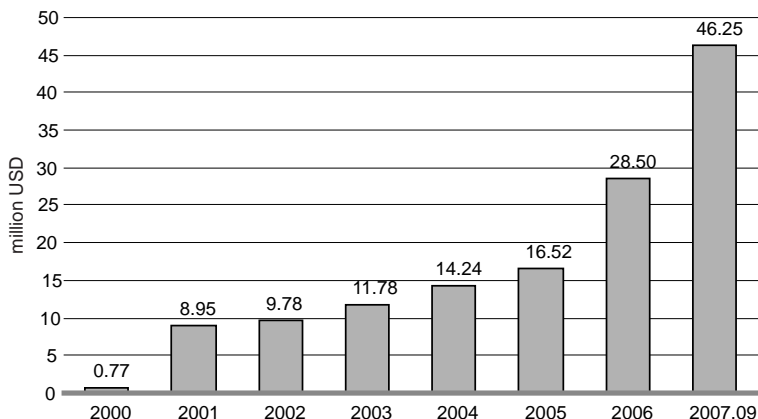
2.   Pro-cyclicality Impact of Basel II in Mongolia

2.1   Model Specification

Our analysis of pro-cyclicality of Basel II through lending on the real economy would be based on the empirical standard semi-structural vector autoregressive (VARs) model. This model avoids the need for a complete specification of a structural model of the economy.

We employ the semi-structural VAR approach by Bernanke and Blinder (1992) of the form given in equation (1). It can be presented as follows:

$$Sy_t = A(L)y_t + \varepsilon_t \qquad (1)$$

where $A(L)$ is a matrix polynomial in the lag operator L for a VAR (p):

$$A(L) = A_1 L + A_2 L^2 + \ldots + A_p L^p \qquad (2)$$

The MA representation of 2 is:

$$y_t = \Phi(L)\varepsilon_t \qquad (3)$$

where $\Phi(L) = [S - A(L)]^{-1}$. The structural parameters of the contemporaneous endogenous variable are contained in S. y_t is the vector of endogenous variables in the system including one policy (indicator) variable and non-policy variables. While for ε_t, the vector of structural disturbances, $E[\varepsilon_t] = 0$ and as in Sims (1980)[2], $E[\varepsilon_t \varepsilon_t'] = I_n$. In this case $E[\varepsilon_t \varepsilon_t']$ will be I_n if $y_t = n \times 1$, the matrices S and A_p being conformable with the y vector. L^p is the lag operator, where p describes the order of the VAR.

The deterministic terms can be added on the right-hand side, as is frequently the case in a Johansen's analysis of co-integration, by adding a term ΨD_t. We do so in order to allow dummies to capture possible structural breaks. Then, a reduced form[3] of equation (1) is estimated by OLS:

$$y_t = S^{-1} A(L) y_t + S^{-1} \Psi D_t + u_t \tag{4}$$

where

$$u_t = S^{-1} \varepsilon_t, \text{ and} \tag{5}$$
$$E(u_t u_t') = \Omega = (S^{-1}\varepsilon_t)(S^{-1}\varepsilon_t)' \tag{6}$$
$$= (S^{-1})(\varepsilon_t \varepsilon_t')(S^{-1})'$$
$$= (S^{-1})(S^{-1})' \text{ given the assumption:}$$
$$E[\varepsilon_t \varepsilon_t'] = I_n$$

So S^{-1} is the Cholesky decomposition of Ω, the reduced-form covariance matrix. Furthermore, the dynamic responses to shocks are summarised by the moving average (MA) representation (assuming that the process is invertible):

$$y_t = [I - S^{-1} A(L)]^{-1} u_t = [I - S^{-1} A(L)] S^{-1} \varepsilon_t \tag{7}$$

It is assumed that all the roots of $\left| I_n - (S)^{-1} A(L) \right| = 0$ remain outside the unit circle in absolute value, or are in 1 in the presence of co-integration and unit roots. In this sense, the companion matrix has roots that are less than one in absolute value or are equal to plus 1. In those circumstances the VAR is (mathematically) stable.

Therefore, the Cholesky decomposition of Ω provides the zero restrictions (to complement $\frac{1}{2} p(p+1)$ constraints) on Ω needed to identify the elements of S^{-1}. The latter is lower-triangular:

$$
\begin{bmatrix}
S_{11} & 0 & 0 & 0 \\
S_{21} & S_{22} & 0 & 0 \\
S_{31} & S_{32} & S_{33} & 0 \\
M & M & M & M \\
S_{n1} & S_{n2} & S_{n3} & S_{nn}
\end{bmatrix}
$$

---

[2]   That is, they assumed covariance matrix is diagonal, which implies that the structural disturbances are orthogonal (mutually independent) (Sims, 1980).

[3]   It is assumed that the errors are i.i.d and are normally distributed, being independent of any vector D_t; and that $y_{t-1}, y_{t-2}, K, y_{t-p}, D_t, t = 1,2,K,T,$ are not perfectly collinear.

The system is then a recursive model or Wold-causal chain; the way in which the variables affect each other is determined by their position in the ordering. In this sense, the contemporaneous innovations in other variables influence all those below them in the chain and none of those variables above them in the order. The ordering of the variables in the system therefore influences the recursive chain of causality among the shocks in any given period.

Therefore, according to Sims (1992) the policy variable, such as leading indicator of monetary policy, is ordered first if we assume that there is no contemporaneous feedback from non-policy variables onto policy variables. Thus, we assume that monetary policy decisions are set without considering the simultaneous evolution of economic variables. This assumption is applied if information on non-policy variables is not readily available to the monetary or policy-making authorities. Furthermore, should we assume that the policy variables would respond to contemporaneous feedback from non-policy variables, the policy variable should be ordered last.

However, in our study, given the high frequency data (monthly or quarterly) that we employ in constructing our VARs and hence, the existence of information lag from non-policy variables[4], we prefer the former identifying restriction. Nevertheless, since the correlations across residuals ε_t are very small, the ordering is actually not significant. This condition is supported by Enders (1995) who stated that if $\left| e_{\varepsilon_i \varepsilon_j} \right| < 0.2$ for $i \neq j$, the ordering of variables in a VAR is not relevant.

Furthermore, we must explain the models that we propose to estimate and the variables that they contain (see Table 1). In examining the effects of monetary policy on the bank balance sheet, we adopt Gertler and Gilchrist (1993) and Kashyap and Stein (1995) in specifying the VAR. For an example, Gertler and Gilchrist (1993) also employed this kind of VAR.

Based on such possible relationship as found by Gertler and Gilchrist above, we developed the system involving nine variables VARs with the following ordering: inter-bank money market overnight rate, bank deposits, bank loans, minimum bank capital (regulatory minimum capital as required by Basel II for the second VAR to detect the differences in comparison to minimum bank capital), bank securities, stock market index, output (real GDP) and prices (Consumer Price Index or CPI). In this case, a random innovation to one variable often occurs simultaneously with innovations to other variables in the system. In order to overcome this issue, as noted above, the innovations are orthogonalised by a Cholesky decomposition in which the covariance matrix of the resulting residuals is the lower triangular.

By including conditioning variables, the stock market index, output and prices, which are likely to be associated with the aggregate demand for loans, the VAR could determine how loan supply responses vary across different capital requirements (minimum bank capital and regulatory minimum capital). In addition, we also employ the exchange rate in the VAR as it (as proposed in the "money view") plays an important role in relatively small and open

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[4]   As interest rate data (the policy variables) is readily available, while non-policy variables such as real output, stock market index and price were available with a lag.

economies like Mongolia and other SEACEN countries. Here, any changes in the exchange rate affect the banks' balance sheet variables, stock market index, output and prices.

Moreover, if we are to conduct tests for the presence of co-integration within a specific VAR, it is necessary to determine the order of integration of the variables. In general, to use the standard procedures developed by Johansen (1995), we require them all to be I(1), which are stationary in their first differences. In addition, as Philips (1986) demonstrated, any OLS regressions which are based on the levels of the variables will be a spurious one. However, the implication that only stationary, I(0), variables should be included in VARs has tended not to be accepted. We first concentrate on tests for the presence of unit roots, that is, for the existence of I(1) variables.

There are three "important" tests for unit roots, the augmented Dickey-Fuller (ADF), Phillips-Perron and Perron's (1997) structural break test. These tests are conducted in order to test whether the null hypothesis is rejected, then the series y are considered to be stationary, *y~I(0)*. A non-rejection of the unit-root null hypothesis for level data raises the question as to whether its first differences is stationary, $y(1)$. The testing procedure, by further differencing, can be continued until a stationary series is achieved. This testing procedure is justified when we assume that most economic series are I(1).

2.2   Data

To estimate the models described in the previous section, we will use monthly data from 2000:01 to 2006:12 for each variable: interest rate (determined by The Bank of Mongolia), exchange rate, loans, deposits, capital adequacy ratio, securities, consumer price index, stock market index, and output (GDP).

Table 1
Data Specification

No.	Notation	Variable Specification	Unit	Sample Range
1	bomrate	The Bank of Mongolia rate	percentage	2001:01-2006:12
2	exrate	Tugrik to USD rate	unit	2001:01-2006:12
3	loan	Total loans	million USD	2001:01-2006:12
4	deposit	Total third party funds at banks	million USD	2001:01-2006:12
5	car	Capital adequacy ratio	percentage	2001:01-2006:12
6	securities	Securities owned by banks	million USD	2001:01-2006:12
7	cpi	Consumer price index	percentage	2001:01-2006:12
8	index	Stock market index on MSE	unit	2001:01-2006:12
9	gdp	Gross domestic product	million USD	2001:01-2006:12

Since Mongolia did not conduct a Quantitative Impact Study (QIS) 5, we do not have add-on data for CAR needed for calculating the impact of Basel II implementation. However, as the add-on is same on all CAR data, we assume results of simulations will be same without the add-on. We derived monthly GDP data through extrapolation because only quarterly GDP data were available.

EViews 4.1 was used for the simulation while data sources included banks' monthly reports, National Statistics Office of Mongolia, and the Mongolian Stock Exchange.

2.3   Empirical Results

2.3.1   Unit Root Test

When estimating the VAR model, we must first check if all data are I(0), i.e. stationary. As shown in Table 2, some data are not I(0) at their levels and 1st differences, but all are I(0) in their 2nd differences. Hence, we will use 2nd differences of data in further simulations.

Table 2
Augmented Dickey-Fuller (ADF) Unit Root Test

Variable	At level		1st Difference		2nd Difference	
	t-stat	prob*	t-stat	prob*	t-stat	prob*
The Bank of Mongolia rate	-2.8702	0.0528	-9.1458	0.0000	-17.4906	0.0001
Tugrik to USD rate	-1.3121	0.6212	-6.7649	0.0000	-12.5706	0.0001
Total loans	4.4939	1.0000	-1.4097	0.5742	-22.5998	0.0001
Total third party funds at banks	6.2489	1.0000	-2.5793	0.1011	-13.5655	0.0001
Capital adequacy ratio	-1.4115	0.5735	-8.9044	0.0000	-12.3469	0.0001
Securities owned by banks	-1.4452	0.5567	-15.8564	0.0001	-9.2886	0.0001
Consumer price index	5.9769	0.0000	-12.3568	0.0001	-8.2913	0.0001
Stock market index on MSE	5.5990	1.0000	1.8754	0.9998	-11.0250	0.0001
Gross domestic product	-1.8958	0.3329	-5.3481	0.0000	-14.7264	0.0001

Remark: The test was performed using Automatic selection lag length (Schwartz Info Criterion with maximum lag of 5), * - MacKinnon (1996) one-sided p-values

We will use VAR model in next section to analyse pro-cyclicality impact of Basel II in the economy.

2.3.2   Simulation Results

We estimated the VAR models using the nine variables above. Then using its results, we derived the impulse response of variables for 20 months, followed by cumulative impulse response for 20 months, and variance decomposition for 20 months. While impulse response functions trace the effects of a shock of one endogenous variable on the other variables in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks on the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR.

The effect of monetary policy (BoM Rate) on the components of consolidated banks' balance sheet (deposits, loans, CAR, and securities), exchange rate, stock market index, inflation, and GDP for all periods were estimated by computing the impulse response function derived from nine variables VAR as shown in Figure 10.

Figure 10
Response of BoM Rate to Cholesky (D.F. Adjusted) One S.D. Innovations

Response to Cholesky One S.D. Innovations
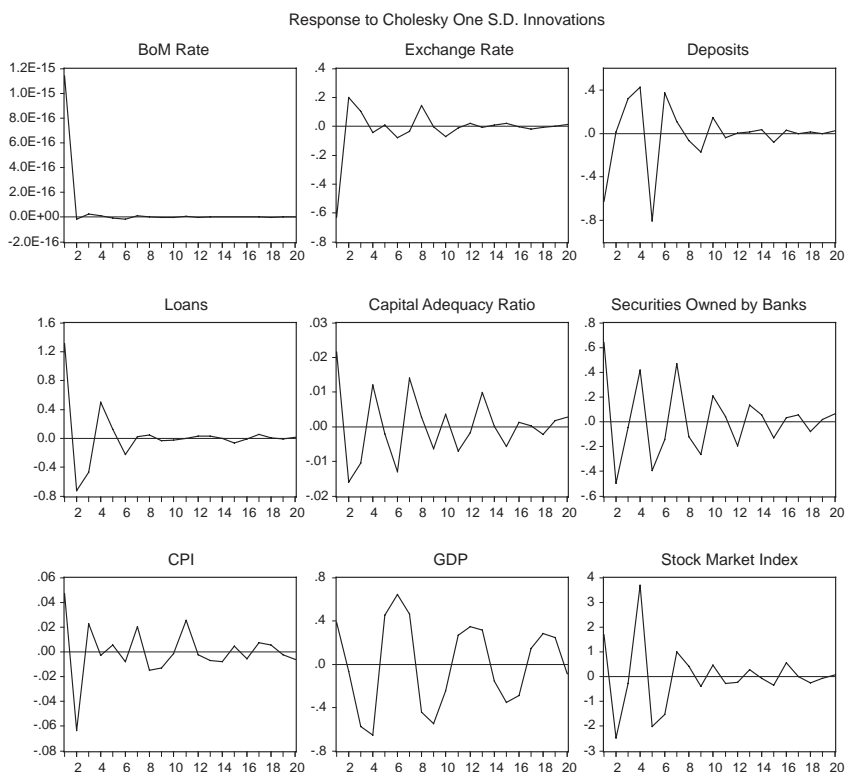
As seen from Figure 10, bank deposits respond negatively for the first 2 months before positively for the next 2 months. It then turns negative in the 5th month and positive for the 6th month. In the following months, bank deposits' response is relatively stable over the horizontal line. Bank loans respond positively for the first month, then negative for the next 2 months after turning to positive for the 4th month. It becomes negative for the 6th month and stays relatively stable for the following periods. Bank deposits and bank loans show opposite patterns with difference of one month. As for the CAR, it shows a similar pattern with loans, but is more unstable.

Since Mongolia has a small economy, the exchange rate plays an important role in the market. Exchange rate moved negatively for the first month, then turned positive for the next 2 months. For the rest of the period, it was mostly negative except for the 8th month.

Since the capital market is underdeveloped, the response of the stock market index to a change in the BoM rate is relatively unstable. It is also the case with securities owned by banks as banks are only allowed legislatively to buy a relatively small amount of securities.

In terms of output, the GDP response is similar to the loans response, but is more unstable. From the results of the Granger causality test (Table 3), we can see that the hypothesis GDP does not granger cause Loans was rejected and vice versa, with a confidence level of 5%. It means that bank lending does affect GDP and GDP also affects bank lending.

Table 3
Pairwise Granger Causality Test GDP vs. Loans

Pairwise Granger Causality Tests
Date: 02/10/08 Time: 18:14
Sample: 2000:01 2006:12
Lags: 5

Null Hypothesis:	Obs	F-Statistic	Probability
GDP does not Granger Cause LOAN	77	3.56874	0.00645
LOAN does not Granger Cause GDP		14.5942	1.3E-09

On the other hand, the Granger causality test shows that (Table 4) capital market does not affect GDP and vice versa. This evidence is feasible since the number of listed companies is very few and trading amount is small. Hence, investment from the capital market does not affect GDP significantly.

Table 4
Pairwise Granger Causality Test GDP vs. Stock market index

Pairwise Granger Causality Tests
Date: 02/10/08 Time: 18:14
Sample: 2000:01 2006:12
Lags: 5

Null Hypothesis:	Obs	F-Statistic	Probability
INDEX does not Granger Cause GDP	77	1.91502	0.10360
GDP does not Granger Cause INDEX		1.43283	0.22414

Based on the accumulation response from the simulation, we conclude that a shock from the BoM rate does not have significant effect on other variables. If we implement Basel II, banks still can play their intermediation role. One reason is that the average CAR of Mongolian banks is high enough, thereby not limiting their lending activities. Hence, there will be no significant effect on GDP.

The variance decomposition from the simulation shows the contribution of changes in the BoM rate to changes in each variable. If the BoM rate changes by one standard deviation, loans would move by 1.7 percent. Since the current average CAR is above 14%, banks can still do their lending activities. Also contribution on GDP of 1.5 percent shows there is no significant impact.

Table 5
Accumulated Effect of Cholesky (d.f. adjusted) One S.D. BoM Rate Innovation

Period	D(BOMRATE, 2)	D(EXRATE, 2)	D(DEPOSIT, 2)	D(LOAN, 2)	D(CAR, 2)	D(SECURITIES, 2)	D(CPI, 2)	D(GDP, 2)	D(INDEX, 2)
1	1.14E-15	-0.626553	-0.628473	1.309971	0.021429	0.641910	0.046808	0.383009	1.687246
2	1.12E-15	-0.428910	-0.613013	0.587518	0.005476	0.144944	-0.016608	0.316071	-0.795661
3	1.14E-15	-0.323272	-0.289577	0.118156	-0.005073	0.098915	0.006090	-0.257462	-1.074763
4	1.15E-15	-0.364445	0.136389	0.613972	0.006896	0.517262	0.003482	-0.909256	2.617905
5	1.14E-15	-0.354340	-0.672089	0.739694	0.004786	0.125189	0.009230	-0.458583	0.594234
6	1.13E-15	-0.431738	-0.298281	0.516378	-0.008138	-0.019696	0.001175	0.186359	-0.941079
7	1.14E-15	-0.467772	-0.188450	0.541682	0.005828	0.446944	0.021315	0.648968	0.053716
8	1.14E-15	-0.322673	-0.251330	0.590119	0.008515	0.324480	0.006346	0.208668	0.467014
9	1.14E-15	-0.327793	-0.420871	0.559508	0.002097	0.058712	-0.006831	-0.341745	0.082087
10	1.14E-15	-0.398415	-0.273220	0.536040	0.005666	0.268730	-0.008477	-0.588086	0.552821
11	1.14E-15	-0.408711	-0.312655	0.531789	-0.001409	0.310864	0.016862	-0.318850	0.271102
12	1.14E-15	-0.387230	-0.309150	0.566031	-0.003049	0.117599	0.014523	0.029651	0.038618
13	1.14E-15	-0.392925	-0.295016	0.600066	0.006777	0.252227	0.007671	0.346547	0.313752
14	1.14E-15	-0.385706	-0.260193	0.597063	0.006957	0.310041	-0.000156	0.190527	0.237271
15	1.14E-15	-0.366768	-0.341941	0.529478	0.001199	0.182005	0.004607	-0.162611	-0.120287
16	1.14E-15	-0.368353	-0.311652	0.517996	0.002529	0.214748	-0.001112	-0.453833	0.445937
17	1.14E-15	-0.389417	-0.313720	0.570193	0.002728	0.271182	0.006262	-0.308087	0.442479
18	1.14E-15	-0.397084	-0.299126	0.577199	0.000470	0.194839	0.011802	-0.025792	0.183235
19	1.14E-15	-0.394868	-0.298764	0.565142	0.002243	0.213277	0.009643	0.220747	0.122938
20	1.14E-15	-0.383797	-0.273440	0.578148	0.004937	0.277967	0.003617	0.133798	0.188586

Cholesky Ordering: D(BOMRATE, 2) D(EXRATE, 2) D(DEPOSIT, 2) D(LOAN, 2) D(CAR, 2) D(SECURITIES, 2) D(CPI, 2) D(GDP, 2) D(INDEX, 2)

Table 6
Variance Decomposition of BoM Rate

Period	S.E.	D(BOMRATE, 2)	D(EXRATE, 2)	D(DEPOSIT, 2)	D(LOAN, 2)	D(CAR, 2)	D(SECURITIES, 2)	D(CPI, 2)	D(GDP, 2)	D(INDEX, 2)
1	1.14E-15	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.27E-15	79.67952	0.202374	1.925425	0.705152	12.95088	0.283489	3.803711	0.019350	0.430100
3	1.35E-15	70.36072	0.805520	6.338478	0.721151	12.23886	3.007212	4.121718	0.022010	2.384355
4	1.38E-15	67.99776	0.791006	6.394276	1.547347	13.73867	2.921822	3.983070	0.320901	2.305148
5	1.42E-15	64.17144	0.803099	6.202640	2.745512	12.97003	3.389714	3.758830	0.738139	5.220592
6	1.44E-15	62.26632	1.127890	7.735164	2.793118	12.99103	3.353301	3.915653	0.716329	5.101196
7	1.46E-15	60.93922	1.157508	7.629435	2.871820	12.89698	4.458748	3.837415	0.740090	5.465784
8	1.46E-15	60.24382	1.250503	7.705887	2.847649	13.05199	4.617957	3.804276	1.043979	5.433934
9	1.47E-15	59.80672	1.251719	7.697999	3.051210	13.07130	4.615202	3.847661	1.123201	5.534988
10	1.47E-15	59.50494	1.263551	7.834835	3.127173	13.04776	4.593672	3.949113	1.145267	5.533685
11	1.48E-15	59.27855	1.258763	7.806350	3.137206	13.21056	4.614788	3.943550	1.237666	5.512569
12	1.48E-15	59.08894	1.256853	7.790698	3.132120	13.25395	4.640270	3.934844	1.291276	5.611051
13	1.48E-15	58.96134	1.254270	7.781895	3.149798	13.23682	4.675023	4.028297	1.313624	5.598930
14	1.48E-15	58.77097	1.250329	7.757210	3.150346	13.19423	4.705238	4.164473	1.334609	5.672602
15	1.48E-15	58.72561	1.250200	7.764031	3.150800	13.20688	4.709797	4.171727	1.351480	5.669475
16	1.48E-15	58.67747	1.249369	7.757714	3.157949	13.19772	4.709494	4.169583	1.386851	5.693848
17	1.48E-15	58.62427	1.249586	7.751081	3.160200	13.18581	4.744931	4.174666	1.149479	5.689977
18	1.49E-15	58.56993	1.248460	7.750021	3.157326	13.17857	4.800653	4.180572	1.426190	5.688285
19	1.49E-15	58.54354	1.248401	7.750806	3.155932	13.17553	4.817198	4.179520	1.443119	5.685957
20	1.49E-15	58.52302	1.247995	7.748090	3.157991	13.17113	4.818890	4.182037	1.466585	5.684259

Cholesky Ordering: D(BOMRATE, 2) D(EXRATE, 2) D(DEPOSIT, 2) D(LOAN, 2) D(CAR, 2) D(SECURITIES, 2) D(CPI, 2) D(GDP, 2) D(INDEX, 2)

3.   Summary and Conclusion

Basel II is a new capital framework issued by the Basel Committee on Banking Supervision, the purpose of which is to maintain financial stability through enhanced risk management in banking sector, accurate supervisory framework, and greater transparency. However, there are some issues associated with its implementation, one of which the most talked about is the pro-cyclicality effect of Basel II on the real economy. This paper studied the existence of the above effect on Mongolia, and concludes that the pro-cyclicality impact of Basel II is not significant in case of Mongolia, the main reasons being as follows:

1.   The average CAR of Mongolian banks is well above the minimum capital requirement. Mongolia did not conduct QIS 5 and hence information on the increase of risk-weighted assets from the implementation of Basel II is not available. However, considering the fact that minimum capital requirement of 10% for Mongolian banks is higher than the Basel II minimum requirement of 8%, we can conclude that the implementation of Basel II will not have significant impact on the banking sector.

2.   The results of the study show that bank lending and GDP affect each other, while capital market and GDP does not affect each other. Since the banking sector comprises about 95% of assets in the financial market, the banking sector has a major impact on GDP. Therefore, any regulation that affects bank lending behaviour is likely to affect GDP also.

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Simulation

VAR Stability

The estimated VAR is stable (stationary) if all roots lie inside the unit circle. We ran all possible simulations, and found out that maximum lag, which VAR is stable, is 5.

Roots of Charactersitics Polynomial
Endogenous variables: D(BOMRATE, 2) D(EXRATE, 2)
D(DEPOSIT, 2) D(LOAN, 2) D(CAR, 2) D(SECURITIES, 2)
D(CPI, 2) D(GDP, 2) D(INDEX, 2)
Exogenous variavles: C D(BOMRATE, 2)
Lag specification: 1 5
Date: 02/10/08   Time: 03:55

Root	Modulus
0.509165 + 0.844522i	0.986137
0.509165 - 0.844522i	0.986137
0.301410 + 0.926707i	0.974492
0.301410 - 0.926707i	0.974492
-0.957012 + 0.058113i	0.958775
-0.957012 - 0.058113i	0.958775
-0.461056 - 0.810674i	0.932612
-0.461056 + 0.810674i	0.932612
-0.863266 + 0.333991i	0.925623
-0.863266 - 0.333991i	0.925623
0.111186 + 0.909726i	0.916495
0.111186 - 0.909726i	0.916495
-0.803508 + 0.403183i	0.898990
-0.803508 - 0.403183i	0.898990
-0.237124 + 0.865124i	0.897032
-0.237124 - 0.865124i	0.897032
0.787862 - 0.423533i	0.894486
0.787862 + 0.423533i	0.894486
0.587765 - 0.672085i	0.892841
0.587765 + 0.672085i	0.892841
-0.508097 + 0.716905i	0.878700
-0.508097 - 0.716905i	0.878700
-0.643779 + 0.542101i	0.841620
-0.643779 - 0.542101i	0.841620
-0.080620 - 0.818722i	0.822681
-0.080620 + 0.818722i	0.822681
-0.799083	0.799083
-0.234990 + 0.749017i	0.785014
-0.234990 - 0.749017i	0.785014
-0.482307 + 0.499667i	0.694469
-0.482307 - 0.499667i	0.694469
0.577067 - 0.375816i	0.688654
0.577067 + 0.375816i	0.688654
0.220992 + 0.633025i	0.670491
0.220992 - 0.633025i	0.670491
0.479240 + 0.389609i	0.617629
0.479240 - 0.389609i	0.617629
-0.414170 - 0.285809i	0.503213
-0.414170 + 0.285809i	0.503213
0.035731	0.035731
0.000948 + 0.000694i	0.001174
0.000948 - 0.000694i	0.001174
-0.000366 - 0.001080i	0.001167
-0.000366 + 0.001080i	0.001167
-0.001163	0.001163

No root lies outside the unit circle.
VAR satisfies the stability condition.

Optimal Lag

We ran "VAR lag order selection criteria" to find out optimal lag for the simulation.

VAR Lag Order Selection Criteria
Endogenous variables: D(BOMRATE, 2) D(EXRATE, 2)
D(DEPOSIT, 2) D(LOAN, 2) D(CAR, 2) D(SECURITIES, 2)
D(CPI, 2) D(GDP, 2) D(INDEX, 2)
Exogenous variavles: C D(BOMRATE, 2)
Date: 02/10/08   Time: 03:55
Sample: 2000:01 2006:12
Included observations: 75

Lag	LogL	LR	FPE	AIC	SC	HQ
0	125.0634	NA	4.65E-13	-2.855023	-2.298826*	-2.632940*
1	209.4717	144.0569	4.33E-13	-2.945912	0.113172	-1.724454
2	293.9480	123.8986	4.36E-13	-3.038614	2.523357	-0.817780
3	397.2349	126.6986*	3.13E-15*	-3.632931	4.431928	-0.412721
4	487.5278	89.08897	4.22E-13	-3.880741	6.687005	0.338844
5	578.7931	68.14477	9.07E-13	-4.154482*	8.916151	1.064478

* indicates lag order selected by the criterion
LR: Sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

As shown above, various criteria nominated 0, 3, and 5 as an optimal lag. From results of VAR simulations, lag 3 gave highest Adjusted R-squared value for BoM rate.

As seen from results of VAR residual correlation matrix above, the majority of correlations between residuals are below 0.2. Therefore, we can conclude that ordering of variables in the VAR simulation is not significant based on Ender (1995).

Residual Correlation Matrix

VAR Residual Cross-Correlations
Ordered by: lags
Date: 02/10/08   Time: 04:08
Sample: 2000:01 2006:12
Included observations: 77

	D (BOMRATE,2)	D (EXRATE,2)	D (DEPOSIT,2)	D (LOAN,2)	D (CAR,2)	D (SECURITIES,2)	D (CPI,2)	D (GDP,2)	D (INDEX,2)
D(BOMRATE,2)	1.000000	-0.106253	-0.036672	0.110793	0.019342	0.049528	0.023276	0.014930	0.015478
D(EXRATE,2)	-0.106253	1.000000	-0.039604	-0.412601	-0.046327	-0.089091	0.104078	0.098491	0.220288
D(DEPOSIT,2)	-0.036672	-0.039604	1.000000	0.048361	-0.109458	0.164794	-0.185623	0.106218	-0.284666
D(LOAN,2)	0.110793	-0.412601	0.048361	1.000000	-0.025706	0.129748	-0.068321	0.107571	-0.005361
D(CAR,2)	0.019342	-0.046327	-0.109458	-0.025706	1.000000	0.250995	-0.307637	0.216516	0.035106
D(SECURITIES,2)	0.049528	-0.089091	0.164794	0.129748	0.250995	1.000000	-0.153484	0.281214	0.001813
D(CPI,2)	0.023276	0.104078	-0.185623	-0.068321	-0.307637	-0.153484	1.000000	0.065209	-0.338572
D(GDP,2)	0.014930	0.098491	0.106218	0.107571	0.216516	0.281214	0.065209	1.000000	-0.001941
D(INDEX,2)	0.015478	0.220288	-0.284666	-0.005361	0.035106	0.001813	-0.338572	-0.001941	1.000000

PRO-CYCLICALITY IMPACT OF BASEL-II IN NEPAL

by Maha Prasad Adhikari[1]

1.   Introduction

The international economy, since the second half of the 20th century has been characterised by economic reforms, globalisation as well as liberalisation. A number of countries have benefited from such reforms and liberalised economic policies and their economies have seen amazing developments as a result. One important part of economic reforms is related to financial intermediation, which has caused aggressive credit growth leading to inflation, higher consumption and other related impacts on the economy.

It is widely claimed that financial liberalisation is crucial for boosting economic development. It has been proven in the past that countries enjoy high growths through their reform and liberal financial policies. Countries that are emerging competitively in the international market resulting from their liberal financial policies are capable of attracting foreign investments which have positive impacts on productivity and overall economic growth. The reforms in the financial sector comprise of adoption of international best practices and prudential regulations. The recent development in the international banking arena is related to Basel-II.

The New Capital Accord, namely Basel-II, requires banks to compute their capital in relation to the riskiness of their assets. The assessment of riskiness of a bank's assets is a difficult task. The final documents issued by the Basel Committee on Banking Supervision (BCBS) in June 2004 have clarified many areas related to the banking industry although the effective implementation of the new framework and their consequences have yet to determined in the industry. It is well accepted that financial institutions must be managed in a safe and sound manner so as to assure financial stability. Financial stability should not be compromised at any cost, and this is seen in the the various advanced approaches recommended by the new accord. Basel-II would improve internal risk management practices through the capital measurement process that will have a substantial impact on banks' soundness on a sustainable basis.

There are several challenges for the accord's implementation. The riskiness of assets at a particular point of time may not necessarily be the same at another point of time. Similarly, under the Internal Rating Based (IRB) approach, the amount of capital that a bank will have to set aside against a given exposure will depend on the function of the estimated credit risk of the exposure. It is also evidenced that the IRB approach for credit risk is an innovation and also the ultimate objective of Basel-II for credit risk. Based on this approach, one important concern raised by most economists is that new framework would result in worsening credit growth and affect the business cycle adversely. In this regard in a down turn, when loan losses are increased due to poor quality of assets, capital may be eroded.

It may reduce the lending capability of individual banks and force them to require more capital for existing exposures. At the same time, it is quite costly for the bank to raise more capital during difficult periods. In this situation, the bank may need to reduce its existing exposure and lending activities, contributing to further worsening of the downturn of the economy. Hence, the concern which arises during implementation is that, such movement on the riskiness and risk based capital framework may have cyclical impact on credit growth and overall economic activities.

Bank themselves are the true assessor of their riskiness under the IRB approaches. They may underestimate their capitals during booms by way of enhancing and aggressively exposing high risks during those times and may underestimate downturns by squeezing lending, providing excessive loan loss provisions that may erode existing capital. In this way, if banks mis-assess risks over the course of the business cycle, the potential for credit booms and busts is increased. This can lead to greater financial amplification of the business cycle and increase the risk of financial instability. In this sense, it is difficult to measure capital requirements at different points of time on a systematic basis. What should be the optimum level of capital: regulatory capital or economic capital? Since Basel-II closely aligns regulatory capital to the economic capital of an individual bank, it must be reasonable and accepted by the international community. There is one argument that capital should be built up in good times, so that when the bad times come, a sufficient buffer exists to absorb losses thereby managing the risk of solvency of the bank.

This research study aims to analyse the procyclicality impact of Basel-II in SEACEN countries in the context of Nepal. How does Basel-II affect the economy and the banking industry in SEACEN countries? Does the regulatory capital as required by Basel-II overstate the magnitude and economic significance of procyclicality in new accord relating to existing accord? How does the lending behaviour respond to the riskier behaviour as a result of tightened capital constraint?

2.   Overview of the Nepalese Banking System

The Nepalese banking system comprises of 23 commercial banks, 58 development banks, 79 finance companies and some micro finance institutions. Among these financial institutions, commercial banks hold the majority of the banking assets in the country. Nepal has initiated its liberalisation policy for the last two decades. The central bank has initiated a transparent and prudent regulatory framework for banks and financial institutions and the effectiveness of the central bank's regulatory framework is also reflected in the stock market. Some of the regulations imposed by the central bank are capital adequacy related regulation, loan classification, loan loss provisioning, single obligor limit, accounting and transparency, risk management, corporate governance, cash reserve ratio, deprived sector lending etc. These regulations have contributed to the soundness of Nepal's financial system.

In addition to regulations, Nepal Rastra Bank (NRB) has initiated the financial sector reform programme since 2002/03 to make government owned banks more competitive with the private sector banks. Based on existing situation, the effective implementation of capital related regulations and their uniform application in the system is not practicable. The existing minimum capital requirement regulation in the Nepalese banking system is based on the 1988 recommendation of the BCBS. For the new capital standard, Nepal will take into account the applicability and practicality of the new framework in the Nepalese context.

During the last decade, the performance of the Nepalese economy has not been very encouraging due to the insurgency in the country and issues related to the appropriate allocations of resources within the country. GDP growth has remained low with moderate inflation and unemployment is a normal phenomenon. The level of the NPA is high while overall capital of the banking industry is negative.

The following table reflects the various key indicators of the commercial banking system of Nepal.

Table 1
Some Indicators of Commercial Banks in Nepal

In Million Nrs.

	Particulars	2002	2007 April
1	Total loans and advances	118028	224161
2	Total deposits	183716	319969
3	Loan to deposit ratio	64.24%	70.05%
4	Risk weighted assets	156996	282646
5	Capital adequacy ratio	-14.96%	-1.66%
6	NPL	30.41%	12.41%
7	Number of commercial banks	16	20
8	Total Assets	191352	390633
9	Interest rate		
	9.1 On Treasury Bill (91 days)	5.5%	1.8%
	9.2 Saving deposits (Highest)	6.0%	5.0%
	9.3 Mortgage lending (Highest)	14.5%	13.5%
	9.4 Retail/Working Capital lending (Highest)	10.0%	8.5%
10	Exchange rate	78.6	65.48
11	GDP Growth	3.9%	2.5%

Nrs.=Nepalese Rupee.

3.   Development of Basel-II

The Nepalese banking industry has been improving with the introduction of new products and practices. For the last few years, the use of credit cards and IT services in the banking business has been growing. As such, the banking system is also encountering increased risks created by these new business operations. Not only has there been an increment in the volume of deposits, loans & advances and new products, the banking culture and inherent risk management practices in most banking entities have also improved. However, the overall market development is still poor, characterised by poor governance public/private entrepreneurship.

The international community in the global financial system is focused on the convergence for the capital standard, which is vital for financial stability and cushioning from unusual shocks in the financial system or in an individual institution. The international convergence on capital measurement and capital standard or Basel-II is in place, although it is a complicated framework for implementation.

NRB has initiated its journey towards Basel-II although its achievement is still a long way off considering its level of banking development and market sophistication. The IRB approach for credit risk, internal module for market risk and AMA for operational risks would need concerted effort and time to achieve. Since the conceptual framework is useful for improving market behaviour on the existing framework, NRB has decided to embark on the new framework by adopting the simplest approaches of Basel-II. The implementation is phased out by way of parallel run in the first year of 2007/2008. The approaches selected for the initial implementation are the Simplified Standardised Approach for credit risk, net open position approach for market risk and basic indicator approach for operational risk. With respect to the Pillars, all the three Pillars are concurrently reinforced. Under Pillar 2, specific supervisory actions known as prompt corrective actions (PCA) have also been initiated for the implementation.

4.   Nature and Definition of Data

The procyclicality impact of the implementation of Basel-II is attempted in this research paper. Historical quarterly data prior to implementation of Basel-II are used and they consist of the following: gross non-performing loans, net non-performing loans, total credits, different portfolio of credit, total deposits, deposit products, investment in securities, Tier –1 Capital, Tier-2 Capital, risk weighted assets, capital adequacy ratio, total assets, net interest margin, interest rates, exchange rates, GDP, CPI and stock market index

4.1   Gross Non-Performing Loans

The present regulation of NRB requires all commercial banks to categorise their credit into four categories, namely (1) Pass (2) Sub-Standard (3) Doubtful and (4) Loss. The classification criterion is based on overdue periods of the loan. Loans overdue for more than 90 days are considered as NPL. Non-performing loans (NPL) of private sector banks are used for the purpose of this paper since historical data for the government owned bank are not reliable and also because of the enforcement of capital regulation in government owned banks. Similarly, regulatory directives are too difficult to enforce on state owned bank and hence data related to private sector banks are used. The data are in million US$ of NPL of the private sector banks in the Nepalese banking sector while the sample period is 2003:Q2 to 2007: Q1.

4.2   Net Non Performing Loans

Loans overdue for more than 90 days are considered as NPL. The net NPL data used is related to the private sector commercial banks only. The net NPL data are reflected in million US $ of NPL in the private sector banks in the Nepalese banking sector reduced by the amount of provision made on those NPL and the sample period is 2003:Q3 to 2007:Q1.

4.3   Total Credits

Total credits of the Nepalese banking industry as well as private sector bank credit are separately collated for the purpose of the analysis. In order to make the analysis consistent, only the private sector banks' total credit is used. The data are in million US $ of loans and advances in the private sector banks while the sample period is 2003:Q3 to 2007:Q1.

4.4 Different Portfolio of Credits

The loan data of six prominent commercial banks are used for the analysis. All loans with long term maturity of more than one year except for retail products are placed under term loan while all revolving type loans, overdraft facilities, cash credits, TR loans and all other working capital financing are categorised under the working capital loans while all retail type consumer loans are categorised under the consumer loans. The total portfolio data are in million US $ of loans and advances of selected banks and the sample period is 2000:Q3 to 2007:Q1.

4.5 Total Deposits

Total deposits of the whole commercial banking sector as well as of private sector banks are separately collated for the study. The amount of total deposits are in million US $. Data related to the whole banking industry are for the period of 2000:Q3 to 2007:Q1 while those for private sector banks are from 2003:Q2 to 2007:Q1.

4.6 Deposits Mix

In the Nepal, deposits are categorised as time deposits, saving deposits, current deposits, call deposits, margin deposits, etc. Current deposits and margin are non-interest bearing deposits while all other deposits are interest bearing. The deposit mix used reflects the total deposit mix of the Nepalese banking industry including state owned banks. The amount of deposit mix is in million US $ amount and the sample period is 2000:Q3 to 2007:Q1.

4.7 Investment in Securities

Investment in securities comprise of total investment portfolio of commercial banks in Nepal and consist of equity, government bond/ treasury bills and other placements. Government bonds and treasury bills account for more than 65% of total investments. The data are in million US $ amount and the sample period is 2000:Q3 to 2007:Q1.

4.8 Tier-1 Capital of Private Sector Banks

Only the Tier-1 Capital of private sector banks is used. The core capital data is based on the existing eligible capital as stipulated by the existing framework. The amount of Tier-1 Capital is also in million US $ amount and the sample period is 2000:Q3 to 2007:Q.

4.9 Tier-2 Capital of Private Sector Banks:-

The Tier-2 Capital of private sector banks is used for the analysis. The supplementary capital data collated are based on the existing eligible capital as stipulated by the existing framework. The amount of Tier-2 Capital is in million US $ amount while the sample period is 2002:Q2 to 2007:Q1.

4.10 RWA Estimation Based on Basel-II of Private Sector Banks

The Risk Weighted Assets (RWA) of private sector banks applied for the study are based on the Nepalese QIS conducted in 2004 using the selected approach for implementation from the Nepalese perspective. The new Nepalese framework are spelt out in the simplified standardised approach for credit risk, net open position basis for market risk and basic indicator approach for operational risk. Data are based on assumptions and results of the NQIS are not actual. The amount of RWA is in million US $ amount and the sample period is 2003:Q2 to 2007:Q1.

4.11 Capital Adequacy Ratio (CAR)

The CAR of private sector banks alone is taken for the analysis and the data are derived from the actual capital adequacy ratio based on the existing capital adequacy framework and not the new framework. The amount of CAR is presented in terms of percentage of total existing capital in relation to the total existing RWA. The sample period is from 2002:Q2 to 2007:Q1.

4.12 Total Assets

The total assets reflect the gross assets stated in the balance sheet of all commercial banks in Nepal including state owned banks. The amount of total assets is also in million US $ amount covering the period of 2000:Q3 to 2007:Q1.

4.13 Net Interest Margin (NIM) of Private Sector Banks

The NIM of private sector banks which reflects the gross interest income reduced by interest expenses incurred during the respective period of time, is used for this study. The interest incomes normally fluctuate in different time periods depending on the collection efforts made by the banks during those quarters. The amount of total NIM is in million US $ amount for the period of 2003:Q3 to 2007:Q1.

4.14 Interest Rates

- The NRB bank rate is a published rate by the central bank. It is normally published while announcing the monetary policy in mid-July and also at the mid-term review around early February every year. The sample period is 2000:Q3 to 2007:Q1.
- Government securities are issued basically in the form of national saving bond, development bond and treasury bills. Out of these securities, treasury bills are the most popular and interest sensitive instrument in the market. The NRB manages all government instruments and there are treasury bills of different maturities, such as 28 days, 91 days, 182 days, and 364 days. For the purpose of this research, the 91 days TB rate is considered due to its popularity and significant volume of trade in the market for the period of 2000:Q3 to 2007:Q1.
- Time deposits or fixed deposits as they are known in Nepal, are the rates decided within the bank depending on the tenure of the deposit and also the liquidity position of the banks and their ALM strategy. For the purpose of this study, the highest published rate within the range of time deposit is considered for the period of 2000: Q3 to 2007:Q1.
- Saving deposits of banks consist of various products such as saving plus, special saving etc and their interest rates differ within the bank and among banks. For the study, the highest published rate of saving deposits is used for the sample period of 2000:Q3 to 2007:Q1.
- The lending rate of a term loan is also different among banks. The highest rate of term lending is used for this study for the sample period: 2000:Q3 to 2007: Q1.
- The lending rate for working capital loans is also different among the banks. The highest rate of working capital loan is considered here using the sample period of 2000: Q3 to 2007:Q1.
- Retail lending or consumer lending is a new concept in the Nepalese market and was introduced 5-7 years back and is now gaining popularity. The rates vary among banks ranging from 1% to 2 %. For this study, the highest published rate is considered for the period 2000:Q3 to 2007:Q1.

4.15 Exchange Rates

Nepal Rastra Bank has adopted full convertibility in the current account and partial convertibility in the capital account. More importantly, the exchange rates with all other convertible currencies are on a float whereas the rate with the Indian currency is fixed. The NRS vs. US $ rate fluctuates on a day-to-day basis. The exchange rate data are for 2000:Q3 to 2007:Q1 and expressed in terms of Nepalese Rupee per US dollar.

4.16 Gross Domestic Product (GDP)

Nominal GDP at factor cost as well as nominal GDP at producer's prices are used for this study and are in terms of million US $. Data related to GDP growth is also used and the sample period is 2000:Q3 to 2007:Q1.

4.17 Consumer Price Index (CPI Index)

The consumer price index is derived by the central bank based on its data base collected from various locations of the country. The national urban consumer price index is one of the important indexes constructed by the central bank. The national urban consumer price index is used for the period of 2000:Q3 to 2007:Q1.

4.18 Nepal Stock Exchange Index (NEPSE Index)

The Nepal Stock Exchange is the only stock exchange in the country. The Nepalese Stock Index is the NEPSE Index. As the stock market is not matured, data related to the stock index are used as an index based on base figures. The sample period is for 2000:Q3 to 2007:Q1.

5. Empirical Results

There are minor changes in the RWA based on the new framework compared to the existing RWA in each quarter. The increase in capital requirement is basically due to the introduction of capital charges for operational risk, which is well compensated by the reduction in the credit risk by way of risk weight based on net of specific provision. Similarly, the rebate by way of credit risk mitigates (CRM) and the retail portfolio will also have an impact on the overall capital position for maintaining it at par with the existing framework.

The increment on the overall Risk Weighted Assets (RWA) from Basel-I to Basel-II ranges from 2% to 9% for different quarters.

Chart 1

RWA
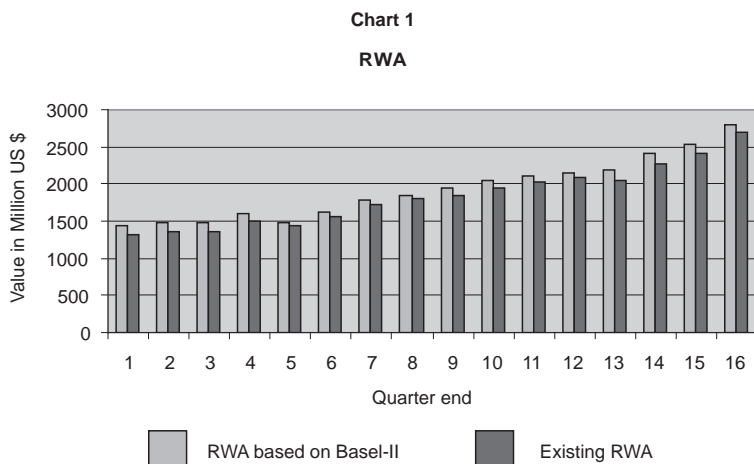
The new Nepalese framework requires banks to maintain CAR of 10% at minimum. Out of that 6% must be of Tier-1 Capital. The quarter with the highest existing capital adequacy ratio (CAR) of 13.95% was reduced to 12.81% due to the Basel-II implementation. Similarly, the quarter with the lowest capital adequacy of 9.58% is reduced to 9.21% due to the Basel –II implementation. On the Tier-1 Capital side, the existing CAR ranges from 11.74% to 7.5% for different quarters. This was reduced from 11.31% to 7.5% for those respective quarters.

Chart 2
Capital Adequacy Ratio
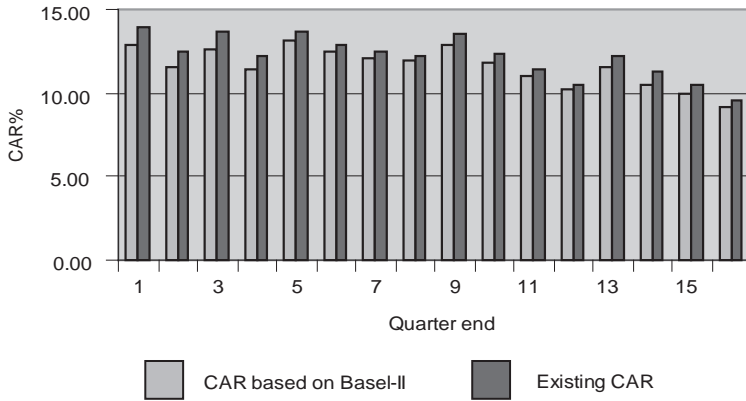
The data analysed included the risk weighted assets and the capital adequacy ratio. The increase or decrease in the RWA as an aggregate from the sample based on a quantitative impact study was computed. The increase or decrease in the quarterly data is used to simulate the RWA. Based on the RWA simulation, data on CAR was calculated. The CAR simulation and the RWA simulation were used as proxies for the impact of Basel-II implementation based on the VAR model used for the research study.

The results of the simulation are as follows:

Chart 3

Response to Cholesky One S.D. Innovations
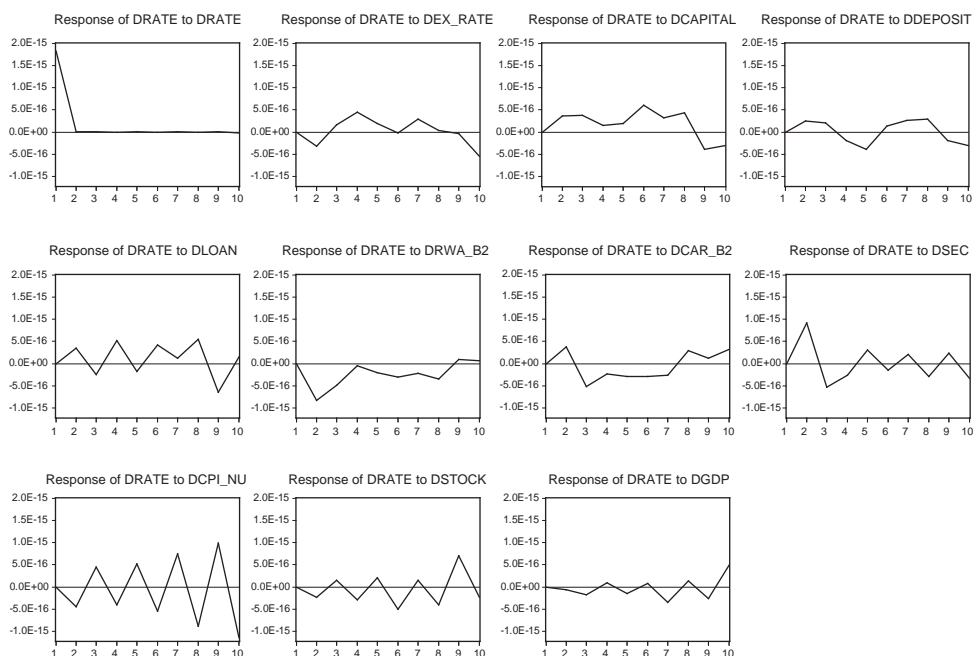
6. Issues from Research Workshop Group Discussion

Several issues were raised during the second SEACEN research workshop on the procyclicality impact of Basel-II as follows:

1. The policy regarding risk based capital requirement will have a procyclicality impact if the approach selected is more advanced and responsive to the riskiness of the counterparty. The simpler the approach selected, the less will be the procyclicality impact. It will be more cyclical as the approach moves to a more advanced one. At the same time, however, a simpler approach may have a sudden impact on the economy rather than on a continual basis.

2. Procyclicality also depends on the buffer capital available in the banking industry. If the banking industry is well capitalised with a holding buffer with substantially high capital adequacy ratio compared to the required, the impact will be minimal. However, if the banking industry is poorly capitalised and has a marginal buffer level, the new framework will have some impact from procyclicality.

3. The procyclicality impact is also dependent on the state of liberalisation of the economy. Where the economy is open with accessible foreign capital flow into the market, the new tightening policy will have less procyclicality impact. In other words, financing needs shall be met through foreign investments and other modes of foreign financing. Whereas, if the economy is not open and foreign flow of capital is restricted, there will be more procyclicality impact from the new framework.

7.   Conclusion and Recommendation

The impact of the new framework in the Nepalese context would be that the private sector banking industry would be able to gear their Tier -1 Capital from the existing capital. However, in view of the existing level of exposure, it is envisaged that there will be a shortage of total capital. With the implementation of Basel-II, the lending capacity of the banking industry is expected to be reduced slightly due mainly to the cost incurred for maintaining soundness and stability of the financial system.

Based on the observations, there seems to be some procyclicality impact in the Nepalese context due mainly to two factors. First, the existing total capital of the banking industry is negative and private sector banks' capital is also tight. Coupled with this is the fact that there is no buffer in the system. Second, foreign capital flow is not able to match the demand of the market.

The study is based on the data prior to the implementation of Basel-II. This initial analysis on procyclicality may not be valid after the implementation of the new capital framework. Hence, it is recommended that another study on procyclicality impact be conducted after the implementation of Basel-II when data on the business cycle can also be plotted.

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PRO-CYCLICALITY IMPACT OF BASEL II IN THE PHILIPPINES

by Jermy Y. Prenio[1]

1.   Overview of the Philippine Banking System

The Philippine banking system is made up of three types of banks – commercial banks (further subdivided into universal and regular commercial banks), thrift banks, and rural and cooperative banks. Universal banks, aside from undertaking commercial banking functions, are allowed to engage in the activities of investment houses and to invest in the equity of companies engaged in activities not related to banking. Thrift banks, on the other hand, cater mainly to the consumer retail market and small- and medium-sized enterprises. Rural and cooperative banks, meanwhile, are expected to provide banking services in the rural areas.

As of end-March 2007, there are 861 banks in the Philippines. Of that number, 39 are commercial banks, 84 are thrift banks, and 738 are rural and cooperative banks. In terms of assets, as of end-2006, the Philippine banking system has total assets of P4.86 trillion, or roughly 81% of the country's GDP in the same period. Of that figure, 88% is owned by commercial banks, while only 9% and 3% are owned by the thrift banks and rural banks, respectively.

The banking system's assets grew by 12.6% in 2006, supported by strong growths in main sources of funds: deposits at 17.7%, capital accounts at 11.3%; as well as a new source of funding – unsecured subordinated debt – which posted a hefty 48.9% increase.

Total loan portfolio as of end-2006, meanwhile, reached P2 trillion, which is a 10.5% increase from the previous years' P1.8 trillion. This expansion in lending – which is the highest in 8 years – has been primarily driven by consumer lending on the back of strong private consumption resulting from steady inflow of overseas Filipino workers' (OFWs) remittances.

This expansion in total loan portfolio has been accompanied by improving asset quality. End-June 2007 NPL and NPA ratios stand at 5.8 percent and 6.4 percent, respectively, which are quite close to their pre-Asian crisis levels. This resulted from banks' need to clean up their books prior to the implementation of Basel II, which in turn led to significant asset disposals either through special purpose vehicle (SPV) – driven transactions (A SPV Law was passed in 2001 and extended in 2006 to give incentives to banks selling their NPAs to special purpose vehicles) or other innovative models of asset disposition (i.e., joint venture agreements, public auctions, and debt write-offs). So far, around P126 billion of NPAs have already been disposed by the banking system.

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Profitability measures have also been respectable with net income after tax growing at 29%, while ROA and ROE figures registering at 1.3% and 10.6%, respectively.

Banks have also been strengthening their capital positions in preparation for the Basel II implementation, with some resorting to the issuances of innovative capital instruments such as unsecured subordinated debts that qualify either as hybrid Tier 1 capital or Tier 2 capital. As of end-March 2007, the banking system's consolidated capital adequacy ratio (CAR) stood at 18.83%. This is well above the 10% and 8% BSP and international standards, respectively. It is worth noting that since the BSP adopted a capital adequacy framework based on the Basel standards in 2001 (based on the 1988 Basel Accord), the banking system's consolidated CAR has not gone below 15% (Figure 1). With the implementation of Basel II, data from the validated parallel run reports of universal banks showed that CAR, on average, will decrease by only around 300 bps.

Figure 1

Capital Adequacy Ratio
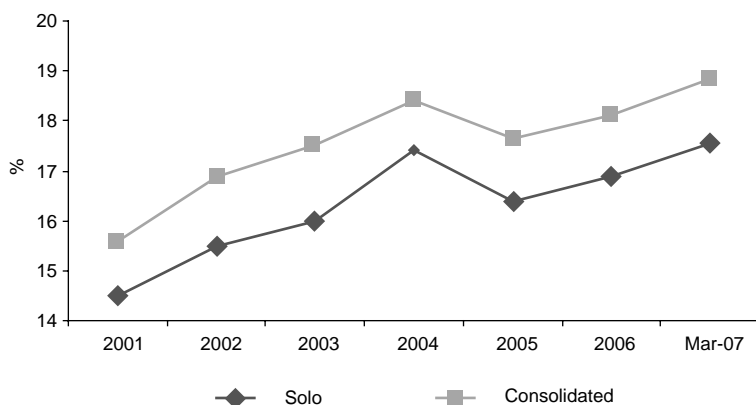
2. Background on Basel II Implementation in the Philippines

As early as December 2004, the BSP already announced to the banking industry its Basel II implementation plan (Figure 2). The plan envisaged universal and regular commercial banks, as well as their subsidiary banks and quasi-banks, to adopt the standardized approaches of Basel II by 2007. The advanced approaches of Basel II, on the other hand, may be allowed by 2010. Prior to 2007, however, the plan provided for a gradual phasing in of Basel II elements into the then existing BSP risk-based capital framework in order to set the stage for the eventual full adoption of the entire Basel II standardized provisions. These elements included the lower capital requirements for highly rated credit exposures to corporate entities and higher capital requirement for non-performing loans.

Figure 2

Basel II Implementation in the Philippines

2005	2006	2007	2008	2009	2010

Pillar 1 (Minimum capital requirement)

Gradual phasing in of certain Basel II provisions (securitization SA, past dues, highest credit quality corporates)	Credit Risk - standardized approach Operational Risk - basic indicator and standardized approaches				Credit Risk - FIRB and AIRB allowed Operational Risk - AMA allowed

Pillar 2 (Supervisory Review) - a continuing process

Pillar 3 (Market Discipline) - gradual implementation starting 2007

It is worth mentioning that even before the official implementation plan was released in 2004, the then existing risk-based capital framework of the BSP – which was based on the 1988 Basel Capital Accord – already contained elements of Basel II. The Basel II elements adopted earlier included the lower capital requirements for highly rated credit exposures to sovereigns and banks, and lower capital requirements for portfolios of loans to small and medium enterprises (SMEs).

In 2005, the BSP issued the draft guidelines for the adoption of Basel II in the Philippines. The guidelines were exposed for comments for over a year, then on 4 August 2006 the final guidelines were issued for implementation in July 2007.

The significant changes in the BSP's risk-based capital adequacy framework brought about by the Basel II adoption include greater reliance on external ratings, addition of a capital requirement for operational risk, and enhanced market disclosure.

3. Possible Pro-cyclicality Effect of the Various Capital Frameworks

Under the 1988 Accord-based capital framework, assets were divided into 4 classes – exposures to sovereigns, exposures to banks, residential mortgage, and all others – and an asset's capital requirement depended on its classification. Thus, in this kind of framework, capital requirements change over time only if a bank's portfolio structure changes, e.g., shift from more corporate loans to more residential mortgage. This is the reason why the 1988 Capital Accord was not seen as having a strong cyclical component.

Some have argued, however, that capital adequacy requirements, in general, can reinforce macroeconomic fluctuations by requiring banks to raise additional capital in economic downturns (see for example Blum and Hellwig (1995)). In view of this, it is this paper's intention to look into the possible *additional* procyclicality impact of the Basel II framework as it is implemented in the Philippines, rather than the *inherent* procyclicality of regulatory capital requirements per se.

3.1 Pro-cyclicality of the Basel II Credit Risk Framework

Under the Basel II framework, capital requirements for credit risk exposures of banks are assessed using either the external credit ratings (standardized approach) or banks' internal credit ratings (the more advanced internal ratings-based, or IRB approach). Of the two, the use of internal ratings has been the focus of study on the procyclicality impact of Basel II because of two reasons. The first is that banks' internal ratings systems have a 'point-in-time' orientation and a one-year horizon. This means that changes in current economic conditions are likely to generate a change in internal ratings of credit exposures, and hence their corresponding capital requirements. The second reason is the fact that collateral value, which mitigates the credit risk of an exposure thus also reducing the capital requirement, becomes inflated during strong economic growth and becomes significantly low during recession. Hence, collateral would lead to more reduction in capital requirement in the former, and less in the latter, thereby exacerbating the procyclicality effect of the 'point-in-time' orientation of banks' internal credit ratings.

The external ratings approach, on the other hand, while may be less sensitive to the cycle, is also not immune from procyclical movements. For instance, it has been observed that there are many more downgrades occurring in recessions than in booms. In addition, downgrades may occur in large steps and only after the risk has materialized. This may lead to more sudden and larger jumps in capital requirements than would be the case with the internal ratings approach.

4. Possible Pro-cyclicality Effect in the Philippines

Of the two mentioned Basel II credit risk approaches, however, the more relevant to the Philippines – and hence the focus of this paper – is the external ratings approach, which is already being implemented since July 2007. Although the internal ratings approach may be allowed starting 2010, only 6 domestic banks have signified their interest to shift to this approach.

4.1 Ratings Downgrade and Economic Growth

In the above discussion, it was mentioned that procyclicality of the external ratings approach may result from the observed significant increase in downgrades during recessions. The next question then is whether these same ratings downgrades have also been observed during economic recessions in the Philippines.

It should be noted that rated issuances in the Philippines are very limited (Table 1) and it was only in 1992 to 2001 that it increased to a relatively 'significant' level. Thus, any analysis with regard to percentages of rating downgrades should be done with caution and, if anything, the results should only be seen as something indicative.

Table 1

Year	Rated issuances
1988	3
1989	3
1990	3
1991	9
1992	17
1993	22
1994	23
1995	22
1996	33
1997	32
1998	27
1999	26
2000	23
2001	21
2002	13
2003	12
2004	11
2005	15
2006	16

Source: PhilRatings

Comparing GDP growth and percentages of ratings downgrades (Table 2), one can see that the percentage of ratings downgrades shot up in 1998 – basically from nil to 18.75% - when the Philippine economy contracted by 0.6% because of the Asian crisis. However, percentage of ratings downgrades remained high since then until 2002 even if GDP growth has returned to positive territory. Ratings downgrades peaked at 26% in 2001 when the economy almost went into a recession with GDP growth registering at only 1.80%. The limited evidence, at the least, seems to indicate the occurrence of significant ratings downgrades during economic downturns in the Philippines.

Table 2

Year	GDP Growth	% of Upgrades	% of Downgrades
1992	0.30%	0.00%	0.00%
1993	2.10%	0.00%	0.00%
1994	4.40%	0.00%	0.00%
1995	4.70%	0.00%	0.00%
1996	5.80%	9.09%	9.09%
1997	5.20%	3.03%	3.03%
1998	-0.60%	0.00%	18.75%
1999	3.40%	3.70%	14.81%
2000	4.00%	7.69%	15.38%
2001	1.80%	4.35%	26.09%
2002	4.40%	4.76%	14.29%
2003	4.90%	7.69%	7.69%
2004	6.40%	0.00%	8.33%
2005	4.90%	9.09%	9.09%
2006	5.40%	6.67%	0.00%

Source: PhilRatings

The next question now is whether ratings downgrades during an economic downturn in the Philippines would translate to changes in banks' capital requirements that are enough to result in reduction in lending. The assumption is, if aggregate bank lending would decrease as a result of increase capital requirements, then this would mean less funds available for productive activities in the economy, and hence this would result in a reduction in real economic activity which could further fuel the economic downturn.

4.2   Possible Impact of Ratings Downgrades During a Recession on Banks' CAR

Based on the validated results of the parallel run of the existing BSP risk-based capital adequacy framework and the BSP Basel II implementing guidelines, only around 11.42% of universal banking assets have external credit ratings upon which their risk weights can be based. If we include regular commercial banks – which are also included in the scope of Basel II implementation in the Philippines, and which we may surmise as having even lesser holdings of exposure with external credit ratings – we may conservatively assume that 10% of total banking assets that are subject to Basel II in the Philippines have external credit ratings.

This means that external credit ratings downgrades during economic downturns would have very little impact on banks' capital requirements. Assuming only 26% of the 10% rated banking assets will be downgraded during a recession (the 26% is based on the highest percentage of downgrades experienced thus far in a given year), and assuming further that these downgrades will result in increase in capital requirements from 0% to 10% (effectively from 0% to 100% risk weight - a rather very conservative assumption), the current capital

adequacy ratio (CAR) – assuming there is an economic downturn now – will decrease by only 80 bps[2] (Please see Table 3 for computation).

Table 3

Simulated Car Under a Recession	
(in PHP millions, using end - 2006 figures)	
Total qualifying capital	448,278
Risk weighted assets (RWA)	2,422,501
Capital adequacy ratio (CAR)	18.5%
Total assets	4,289,285
10% of total assets (**assumed to be externally rated**)	428,929
Externally rated assets that will be downgraded during a recession (assumed to be 26%)	111,521
Simulated RWA under recession	2,534,023
Simulated CAR under recession	17.7%
Possible reduction in CAR	0.8%

This 80 bps, however, will matter if banks' capital requirements are binding. But looking at the CARs of the commercial banking industry since 2001 (the year Basel I was implemented by the BSP), it is very clear that the said industry is far from being capital constrained. Average CAR for 2001-2006 period is 17.35% (Table 3) - 7.35% higher than the regulatory minimum[3]. Put another way, this means on average actual capital of banks for 2001 to 2006 is 74% higher than the minimum regulatory capital requirement.

4.3   Determinants of Actual Levels of Capital

Alfon et. al. (2004) provides some reasons why actual capital levels may be greater than the regulatory minimum. First is that actual capital levels may be a result of internal capital drivers. These range from banks' own assessment of risks which may be more comprehensive than the regulatory assessment, motivation by bank management such as future acquisitions, and bank management's desire to minimize the adjustment cost in raising capital. The last one may be of interest to the procyclicality issue. It is said that cost of raising capital varies with the cycle, where economic downturns are associated with rising cost due to adverse market perceptions. In order to avoid this rising cost, which occurs at the very time when regulatory capital requirement are supposed to increase, banks may choose to raise capital in good times and hold it as a buffer. This may therefore have an offsetting effect on the procyclicality of regulatory capital requirements.

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[2]   The author would like to point out, however, that the simulated change is only based on possible changes in RWA that will be caused by ratings downgrades. Reductions in CAR that may be caused by possible reductions in the value of capital during an economic downturn, as well as other portfolio adjustments of banks during an economic downturn, are not taken into account. It should be added though that these excluded factors also play a role even under the existing framework. Thus, their procyclicality effect is already there even before the Basel II implementation.

[3]   In addition, distribution of the latest CARs of individual domestic universal and commercial banks show that most fall within the 18%-20% range. This means that, on average, capital requirements for all assets would have to almost double before the minimum regulatory capital ratio is breached.

The second reason why actual capital levels may be greater than the regulatory minimum is the effect of market discipline. This may take the form of shareholders and investors demanding capital levels that they think appropriate to compensate for the risks that they bear, or a bank forced to hold a certain level of capital to access certain capital markets or to maintain a certain external credit rating. The third reason cited was the influence of other non-capital charge regulatory factors, such as the desire to avoid regulatory scrutiny or intervention should the actual capital levels approach the minimum.

4.4 Actual Capital vs. Regulatory Minimum

The next question then is whether the observed buffer capital – the excess of actual capital over regulator minimum –dampens the transmission of changes in the regulatory minimum through to actual capital levels and potentially bank lending. This dampening may not occur if actual capital moves with the regulatory minimum. As Taylor and Goodhart (2004) points out, "the balance of evidence appears to suggest that any additional cyclicality in regulatory capital requirements is likely to lead to some movement in actual capital (albeit of an unknown magnitude)."

For the Philippines, the BSP implemented a Basel-type capital requirement only in 2001, hence the limited data (Table 4) gives an unclear relationship between actual capital and regulatory minimum. Even data on capital issuances of banks seem to indicate that these issuances are but a result of regulatory relaxation rather than cyclical reactions[4].

Table 4

Year	HT1 and T2 issuances 1/	GDP Growth	Required Regulatory Capital	Actual Capital
2002	6,663	4.40%	-0.71%	7.43%
2003	26,500	4.90%	6.65%	11.77%
2004	6,000	6.40%	5.55%	13.63%
2005	4,500	4.90%	4.85%	-0.33%
2006	29,850	5.40%	5.30%	9.76%

1/ Issuances of Hybrid Tier 1 capital and Tier 2 capital; in PHP millions

5. Concluding Remarks

In summary, the adoption of the Basel II standardized approach for credit risk by the BSP may have very little procyclicality effect, if at all, because of two reasons: (i) the limited number of rated credit exposures of Philippine banks, and (ii) the significant excess in banks' actual capital over the regulatory minimum.

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[4] The significant increase in issuances in 2003 followed the release of a BSP Memorandum, dated 17 February 2003, outlining the guidelines for the issuance of unsecured subordinated debt, while that in 2006 followed the release of Circular No. 503 dated 22 December 2005 allowing the use of Hybrid Tier 1 capital.

The use of external credit ratings to determine the capital requirement of a credit exposure is one element in the Basel II framework that makes it more procyclical than the old 1988 framework. Thus, banks' limited exposure to externally rated credits makes their capital requirements very similar to that in the old framework, and hence curtails the procylicality effect of Basel II.

Moreover, the significant excess in banks' actual capital over the regulatory minimum means that banks are not capital constrained. Thus, any increase in capital requirements during an economic downturn may not result in reduction in lending since banks still have enough capital buffers to work with. The only caveat to this analysis is if actual capital levels move with the regulatory minimum. Such co-movement may still potentially lead to a transmission of changes in the regulatory minimum through to bank lending. Unfortunately, the relatively recent adoption of the Basel capital standards in the Philippines provides us with very little information as to the relationship of actual levels of capital and the regulatory minimum. At the moment, however, it can be said that changes in the level of banks' actual capital is driven more by regulatory relaxation than cyclical reaction.

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PRO-CYCLICALITY IMPACT OF BASEL II IN SRI LANKA

by H. Anuradha Hettihewa*

1.   Introduction to Sri Lanka's Banking System

The banking sector is the dominant sub-sector within the financial sector of Sri Lanka with a total assets of US$ 21bn accounting for around 60% of the total financial system assets of US$ 36bn. Total assets of the banking industry was around 1.4 times the GDP as at the end of 2nd quarter of 2007. The banking system comprises of 23 Licensed Commercial Banks (LCBs)[1] and 15 Licensed Specialised Banks (LSBs)[1] with a total number of 38 banks. LCBs include 2 state banks, 12 foreign banks and 9 domestic private banks (Table1).

Licensed commercial banks (LCBs), which undertake a wide array of financial services including payment services, dominate the banking sector in Sri Lanka with a share of about 82.5 per cent of banking assets. The deposits held by the public with LCBs constituted 89 per cent of money in circulation in the consolidated broad money supply (M2b) and 75 per cent of broad money supply, M4 (it covers the balance sheets of the CBSL, LCBs, LSBs and Finance Companies), which is a broader monetary aggregate. Further, of the bank branch network, 3,516 banking outlets or 89 per cent of the total bank branches operating in the country are operated by LCBs providing banking services to a broader geographical clientele. Two LCBs have overseas branches, though their overseas operations to operate exchange houses overseas, especially to attract migrant remittances to take advantage of the growing remittance business.

Licensed specialised banks (LSBs), the other category of banks, which mainly cater to projects with long-gestation periods or strategic sectors for socio economic development are relatively less systemically important in comparison to the LCBs, both in terms of size and their impact on the payment and settlement system. These banks account for about 17.5 per cent of total assets of the banking sector. The contribution of deposits of LSBs to the money supply (M4) was 18 per cent compared with 75 per cent by LCBs.

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[1] The difference between LCBs and LSBs are; LSBs cannot accept demand deposits and cannot deal in foreign exchange transactions.

Table 1
Expansion of Banking Industry

Category	2004		2005		2006		Sept. 2007	
	No. of Banks	No. of Branches	No. of Banks	No. of Branches	No. of Banks	No. of Branches	No. of Banks	No. of Branches
Licensed Commercial Banks (LCBs)	22	1,374	22	1,417	23	1,530	23	1,572
- Domestic Banks	11	1,342	11	1,380	11	1,491	11	1,531
- Foreign Banks	11	32	11	37	12	39	12	41
Licensed Specialised Banks (LSBs)	14	406	14	369	14	376	15	393
Total	36	1,780	36	1,786	37	1,906	38	1,965
Banking Density[2]		7.1		7.2		7.6		8.6

Even though the banking sector comprises of 23 LCBs and 15 LSBs, 6 LCBs account for the major share of banking sector assets. These LCBs, which are often referred to as systemically important banks (SIBs), consist of two state commercial banks and the four largest domestic private commercial banks. SIBs represent about 77.5 per cent of total assets of the commercial banking sector. In terms of deposits, the SIBs hold a market share of 82.6 per cent and 68.7 per cent of LCB sector and banking sector deposits, respectively. Therefore, the stability and soundness of the six SIBs are vital. Hence only LCBs' financials has been considered for this paper.

2.   Overview of Basel II Implementation in Sri Lanka

2.1   Development of Basel II in Sri Lanka

Sri Lanka adopted Basel I in 1993. Credit risk was the only risk element captured in the calculation of capital adequacy under Basel I. In April 2005, CBSL enhanced the minimum capital requirement of LCBs from Rs.500Mn to Rs.2,500Mn and of LSBs from Rs.200Mn to Rs.1,500Mn to strengthen the banking industry, which inturn facilitates implementing Basel II in Sri Lanka. The existing licensed banks were given time till December 2009 to meet the shortfall of the minimum capital requirement.

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2   Number of bank branches per 100,000 persons.

As a pre-requisite to the implementation of Basel II, Central Bank of Sri Lanka (CBSL) has introduced the capital charge for market risk for the capital adequacy computation under Basel I, based on the standardised measurement method, with effect from 31 March 2006. To facilitate this, guidelines on the 'Classification of Investment Securities' were issued by CBSL.

CBSL has decided to implement Basel II for all banks with effect from January 2008. The Standardised Approach will be adopted for calculating credit risk, Standardised Measurement Method for market risk and the Basic Indicator Approach for calculating operational risk. CBSL may consider allowing banks to migrate to Internal Ratings Based (IRB) approaches after adequate skills have been acquired, both in banks and at the supervisory level.

At present, the minimum capital adequacy ratio stipulated in Sri Lanka is 10% as against the Basel's recommendation of 8%.

2.2 Overview of Basel II Implementation in Sri Lanka

Since the implementation of Basel II involves enhanced banking risk management practices, CBSL formed a Basel II Sub-Committee of the Sri Lanka Banks' Association (SLBA) in January 2006 in order to finalize the modalities for implementing Basel II. Further, the Sub-Committee formed a forum for the banking industry to discuss the implementation issues and solutions for them. The regulations in terms of the legal provisions for the implementation of Basel II were issued in 2006 and the banks were required to have a parallel application of the new rules commencing from the first quarter of 2006.

A 'Consultative Paper on the Implementation of the New Capital Adequacy Frame Work – Basel II' was issued in June 2007 with the simplest approaches, revising the draft guidelines issued in March 2006. It has incorporated Pillar 3 requirements and resource requirement for the implementation of IT infrastructure. The banks were required to undertake a parallel run on a quarterly basis, based on such revised guidelines commencing June 2007 until the implementation of Basel II in January 2008.

Parallel computation accuracy check of around 20 banks was carried out for the quarter ended June 2007 and banks have been encouraged to develop their systems to facilitate the Basel II requirements and for accurate reporting on it. The impact study of Basel II on all banks found that the average capital adequacy ratio decline by 10 percentage points. At the same time the Basel II help desk of the Department of Bank Supervision, CBSL was set up in June 2007 to assist the banking industry in clarifying the Basel II capital adequacy computation as per the 'Consultative Paper on the Implementation of the New Capital Adequacy Frame Work – Basel II'. Awareness programmes have been arranged for the banking industry staff of Sri Lanka with the issuance of the Consultative Paper and supervisory training arrangements for the staff of Bank Supervision Department have been carried out for the last few years to facilitate the implementation.

2.3 The Banking Indicators in Sri Lanka

The banking indicators in Sri Lanka are detailed in Annex. 1. The asset quality and capital adequacy of the banking industry have improved over time, providing greater risk absorption capacity of banks.

3. The Nature and Definition of Data

3.1 Data Sources

To estimate the VAR model, this study uses monthly data from 2000:01 to 2007:06 for each variable: interest rate (issued by CBSL), exchange rate, deposits, loans, capital, risk weighted assets, capital adequacy ratio, securities owned by banks, consumer price index, stock market index, and GDP (Table 2).

Table 2
Data Sources

Notation	Variable Specification	Data Source
IR	Interest Rates	Monthly Economic Indicators
ER	Exchange Rates	International finance Statistics
TDEP	Deposits	Bank Supervision Database
TCR	Loans	Bank Supervision Database
TII	Capital	Bank Supervision Database
RWA	Risk Weighted Assets	Bank Supervision Database
CAR	Capital Adequacy Ratio	Bank Supervision Database
SOB	Securities Owned by Banks	Bank Supervision Database
CPI	Colombo Consumer Price Index	Department of Census and Statistics
SMI	Stock Market Index	Colombo Stock Exchange
GDP	Gross Domestic Product	Department of Census and Statistics

Data collected from the Department of Bank Supervision (BSD), Database of CBSL , are based on audited annual accounts and unaudited monthly returns sent to BSD by each LCB including the domestic banking units, offshore banking units and all branches.

3.2 Definitions

Definitions of variables are annexed (Annex. 2).

3.3 Data Simulation

Basel II will be implemented in Sri Lanka in January 2008. Until such time Basel I is the regulatory requirement for capital adequacy. Therefore when converting Basel I data to Basel II data, the following assumptions were made based on the June 2007 parallel computation results under Basel II; (a) Tier I and total capital base under Basel II is equal to 90% of Basel I; and (b) Proportion of claims risk weighted assets reported in June 2007 under Basel II were used for past data (Figure 1). Further quarterly data on Tier I capital, total capital and GDP were assumed to be linearly distributed in the intervening months.

Figure 1
Simulated RWA & CAR
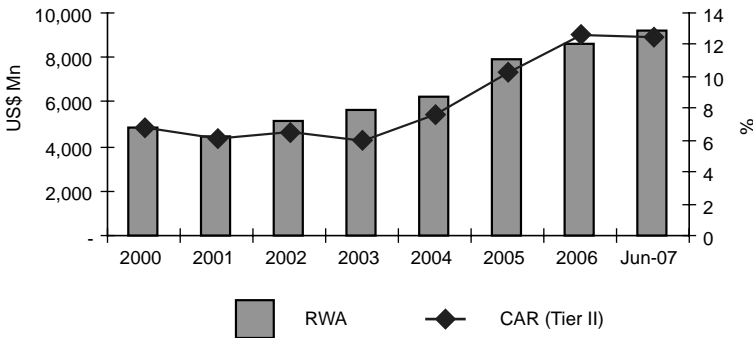
4. Specifications of the VAR Model

4.1 The Semi-Structural VAR Model

Analysis of pro-cyclicality of Basel II through lending on real economy would be based on empirical standard semi-structural Vector Auto Regression (VARs) models by Bernanke and Blinder (1992) of the form given in equation (1). The VAR model would be employed since this methodology avoids the need for a complete specification of a structural model of the economy. It can be presented as follows:

(1) $Sy_t = A(L)y_t + \epsilon_t$

$A(L)$ is a matrix polynomial in the lag operator L for a VAR (p):

(2) $A(L) = A_1L + A_2L^2 + K + A_pL^p$

The Moving Average (MA) representation of 2 is:

(3) $y_t = \Phi(L)\epsilon_t$

Where $\Phi(L) = [S - A(L)]^{-1.}$

Then, a reduced form of equation (1) is estimated by OLS:

(4) $y_t = S^{-1} A(L)y^t + S^{-1}\Psi D_t + u_t$

Where;

(5) $u_t = S^{-1} \epsilon_t$, and

(6) $E(u_t u_t) = \Omega = (S^{-1}\epsilon_t)(S^{-1}\epsilon_t)'$
           $= (S^{-1})(\epsilon_t \epsilon_t)(S^{-1})'$
           $= (S^{-1})(S^{-1})'$ given the assumption:
       $E[\epsilon_t \epsilon_t'] = I_n$

So S^{-1} is the Cholesky decomposition of Ω, the reduced-form covariance matrix. Furthermore, the dynamic responses to shocks are summarized by the moving average (MA) representation (assuming that the process is invertible):

(7) $y_t = [I - S^{-1} A(L)]^{-1} u_t = [I - S^{-1}A(L)]S^{-1} \epsilon_t$

It is assumed that all the roots of $\left| I_n - (S)^{-1} A(L) \right| = 0$ remain outside the unit circle in absolute value, or are in 1 in the presence of cointegration and unit roots. In this sense, the companion matrix has roots that are less than one in absolute value or are equal to plus 1. In those circumstances the VAR is (mathematically) stable.

Therefore, the Cholesky decomposition of Ω provides the zero restrictions (to complement the $\frac{1}{2} p(p +1)$ constrains) on Ω needed to identify the elements of S^{-1}. The latter is lower-triangular matrix. The way in which the variables affect each other is determined by their position in the ordering. In this sense, the contemporaneous innovations in the other variables influence all those below them in the chain and none of those variables above them in the order. The ordering of the variables in the system, therefore influences the recursive chain of causality among the shocks in any given period. This study identifies shocks using the Cholesky decomposition, which imposes a recursive structure on the VAR model.

4.2   Variables of Interest

In examining the effects of monetary policy on the bank balance sheet, we adopt Gertler and Gilchrist (1993) and Kashyap and Stein (1995) in specifying the VAR. Based on such possible relationship as found by Gertler and Gilchrist above, we develop the system involving eleven variables VARs as described in the 4.1 above.

5.   Results of the Empirical Study

5.1   Unit Root Tests

We first examine the stationarity of each stochastic variable applying three standard tests for the stationary process, Augmented Dickey-Fuller (ADF) tests and Phillips-Perron (PP) tests. The computer software applied is E-Views 5. All specifications include a constant term, either with or without a trend, and up to nine lags.

According to the ADF tests (Table 3), most of the Augmented Dickey-Fuller test statistic values are smaller than the critical values. Therefore null hypotheses (variables have unit root) are accepted. However for deposits, loans, capital and RWA, ADF test statistics without a linear trend (τ_μ) rejects the null hypotheses, I(0). Further first differences of all variables appear to be stationary.

Table 3
ADF Unit Root Tests

Level	τ_μ	τ_τ	Difference	τ_μ	τ_τ
IR	-1.8572 (0.3509)	-2.0181 (0.5831)	D(IR)	-4.4367 (0.0005)	-4.5556 (0.0023)
ER	-1.9283 (0.3181)	-2.5827 (0.2891)	D(ER)	-2.8947** (0.0000)	-3.4616** (0.0000)
TDEP	1.8827 (0.9998)	-2.1426 (0.5150)	D(TDEP)	-2.8947** (0.0000)	-3.4616** (0.0000)
TCR	2.8109 (1.0000)	0.7043 (0.9996)	D(TCR)	-2.8947** (0.0001)	-3.4616** (0.0000)
TII	1.2685 (0.9984)	-1.1760 (0.9089)	D(TII)	-2.8947** (0.0003)	-3.4616** (0.0000)
RWA	2.1653 (0.9999)	-1.4229 (0.8475)	D(RWA)	-2.8947** (0.0001)	-3.4616** (0.0000)
CAR	-0.5039 (0.8844)	-1.7749 (0.7087)	D(CAR)	-2.8951** (0.0005)	-3.4616** (0.0000)
SOB	-0.4454 (0.8956)	-2.8661 (0.1785)	D(SOB)	-2.8947** (0.0000)	-3.4616** (0.0000)
CPI	-2.8384 (0.0571)	-2.8567 (0.1817)	D(CPI)	-2.8947** (0.0000)	-3.4616** (0.0000)
SMI	0.0371 (0.9589)	-2.9420 (0.1547)	D(SMI)	-2.8947** (0.0000)	-3.4616** (0.0000)
GDP	-1.2951 (0.6285)	-2.3831 (0.3855)	D(GDP)	-2.8972** (0.0010)	-3.4648** (0.0000)

Notes: (1) τ_μ, Exogenous: Constant; τ_τ, Exogenous: Constant with Linear Trend. (2) Numbers in parentheses are MacKinnon (1996) one-sided p-values. (3) ***Indicates significant at 1%, ** significant at 5%, and * significant at 10%. (4) Lag Length: 9 (Automatic selection based on Schwarz Information Criterio, MAXLAG = 9).

As the generation of the data series on the variables is likely subject to a structural change, the Phillips-Perron test is used for checking stationarity. In the case of Sri Lanka, the interest rates including repurchase rate announced by CBSL exhibit a structural break at the beginning of 2001 (Figure 10 in Annex), when the Sri Lanka Rupee was floated and interest rates were increased to support the exchange rate.

Table 4
PP Unit Root Tests

Level	τ_μ	τ_τ	Difference	τ_μ	τ_τ
IR	- 1.6335 (0.4614)	- 1.6813 (0.7515)	D(IR)	- 3.5064*** (0.0000)	4.0657*** (0.0000)
ER	- 2.037209 (0.2707)	- 2.479361 (0.3375)	D(ER)	- 3.506484*** (0.0000)	- 4.065702*** (0.0000)
TDEP	2.184213 (0.9999)	- 2.114753 (0.5303)	D(TDEP)	- 3.506484*** (0.0000)	- 4.065702*** (0.0000)
TCR	3.480839 (1.0000)	0.455629 (0.9990)	D(TCR)	- 3.506484*** (0.0001)	- 4.065702*** (0.0000)
TII	1.863054 (0.9998)	- 0.984560 (0.9404)	D(TII)	- 2.894716** (0.0003)	- 3.461686** (0.0000)
RWA	2.083687 (0.9999)	- 1.479555 (0.8295)	D(RWA)	- 3.506484*** (0.0001)	- 4.065702*** (0.0000)
CAR	- 0.323862 (0.9161)	- 1.754417 (0.7184)	D(CAR)	- 3.506484*** (0.0000)	- 4.065702*** (0.0000)
SOB	- 0.445498 (0.8956)	- 3.124933 (0.1070)	D(SOB)	- 2.894716** (0.0000)	- 3.461686** (0.0000)
CPI	- 2.693357 (0.0792)	- 2.639231 (0.2644)	D(CPI)	- 2.894716** (0.0000)	- 3.461686** (0.0000)
SMI	0.248234 (0.9742)	- 2.892021 (0.1701)	D(SMI)	- 3.506484*** (0.0000)	- 4.065702*** (0.0000)
GDP	- 2.427774 (0.1371)	- 2.759018 (0.2164)	D(GDP)	- 2.894716** (0.0000)	- 3.461686** (0.0001)

Notes:(1) τ_μ, Exogenous: Constant; τ_τ, Exogenous: Constant with Linear Trend. (2) Numbers in parentheses are MacKinnon (1996) one-sided p-values. (3) ***Indicates significant at 1%, ** significant at 5%, and * significant at 10%. (4) Bandwidth: 4 (Newey-West using Bartlett Kernel spectral estimation method).

As per the results of PP tests (Table 4), the non-stationary null hypothesis of the unit roots for most of the variables cannot be rejected. However for deposits, loans, capital and RWA, PP test statistics without a linear trend ($\tau\mu$) rejects the null hypotheses, I(0). Further first differences of all variables appear to be stationary with the rejection of the unit root hypotheses even at a 1% significant level. Therefore, first differences of all eleven variable series in the sample are integrated of order zero, I(0).

5.2 Impulse Response Effects

Since the time series data for eleven first difference variables are stationary, we conduct the VAR model estimation and perform the impulse response analysis. Impulse responses show the responses of the point-to-point growth in GDP to a one-standard deviation (positive) change (shock) in the other endogenous variables in the model. In this paper we attempt to investigate the degree of pro-cyclicality impact of Basel II in Sri Lanka. Our objective is to scrutinize whether the requirement of minimum regulatory capital as per Basel II overstate the magnitude and economic significance of pro-cyclcicality in the new accord relative to the existing capital requirement in Sri Lanka. The following graphs (Figure 2) show the impulse response of GDP to one standard deviation change (shock) in the other endogenous variable in the model.

Figure 2
Response to Cholesky One S.D. Innovations
Response to Cholesky One S.D. Innovations ± 2 S.E

Response of DGDP to DCPI

Response of DGDP to DSMI

Response of DGDP to DTDEP

Response of DGDP to DTCR

Response of DGDP to DCAR

Response of DGDP to DSOB
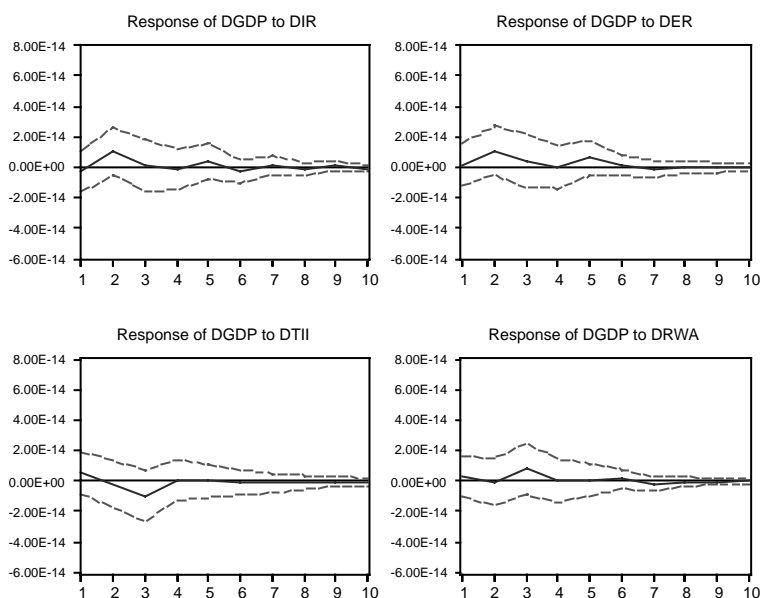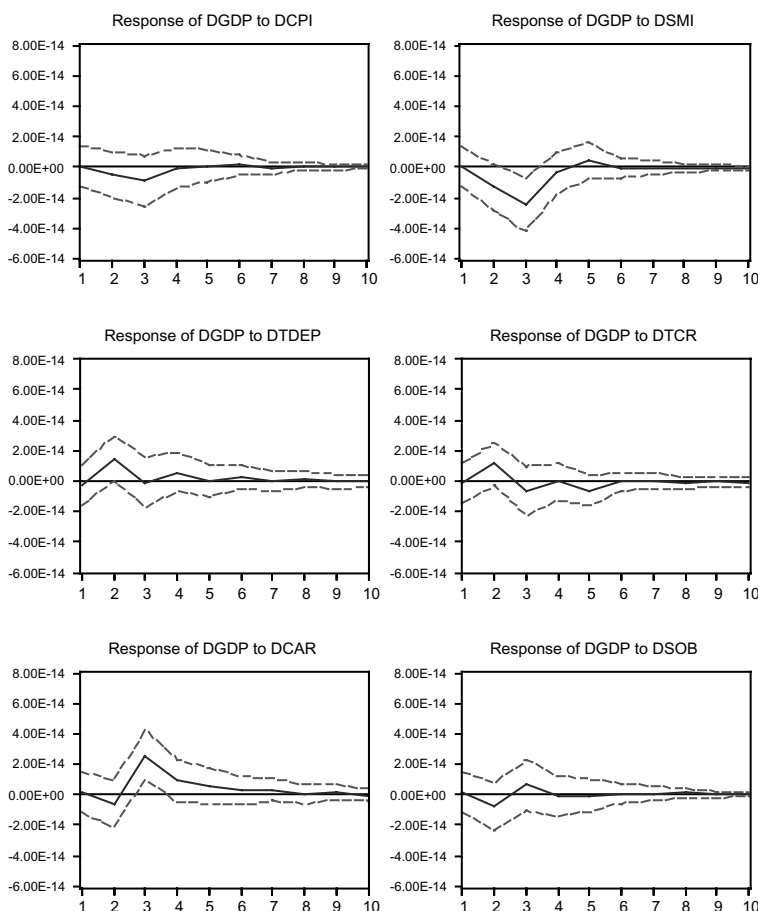
Since the impulse responses of interest rates, exchange rates, deposits, loans, capital, RWA, securities owned by banks, consumer price index to GDP around the horizontal axes are near zero and falls into the confidence interval completely, such variables do not have any significant effect on the GDP. Although the responses to such variables are not significant, it can be seen that the direction of the changes in the point-to-point growth in the GDP in response to changes in those variables is empirically consistent.

However, at a significant level of 5 per cent, the responses to the CAR and stock market index are less significant within 2 – 4 months given that both the upper and lower bounds of these response functions are different from zero in one direction. The point-to-point growth in the GDP increases within 2 – 3 months in response to CAR and the shock dies out towards the 10th period. On the other hand, point-to-point growth in the GDP decreases within 2 – 3 months in response to stock market index and the shock disappears towards the 10th period.

Given that the capital adequacy ratio affect the real economy through bank lending, the impulse response of loans to one standard deviation innovations in CAR is considered (Figure 3). The results demonstrate that the CAR does not have any significant effect on bank lending and vice versa.

Figure 3
Response of CAR and Loans

Response to Cholesky One S.D. Innovations ± 2 S.E

Response of DTCR to DCAR

Response of DCAR to DTCR
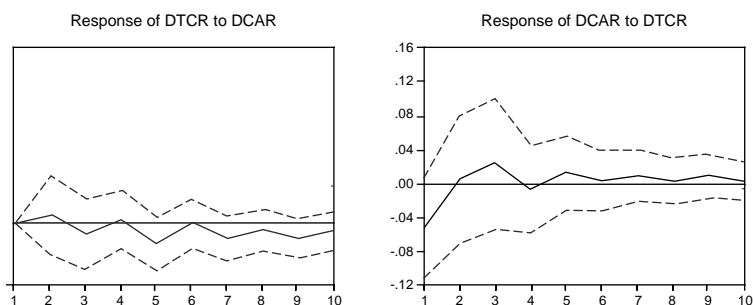
5.3   Variance Decomposition

Further to the impulse response, variance decomposition of the point-to-point growth in the GDP gives the changes in the variable GDP attributable to each of the other selected variables (Table 5). As per the results after 10 months, about 58% of the variance in the point-to-point growth in GDP is from itself; about 12% of the variance is from the point-to-point growth in CAR and stock market index; about 3% of the variance is from the point-to-point growth in loans; etc. Therefore it provides evidence to the results of impulse response and shows that there is an impact of CAR and stock market index on the GDP of Sri Lanka.

Table 5
Variance Decomposition of Selected Variables

Period	S.E.	DTCR	DCAR	DSMI	DGDP
1	0.796430	0.061346	0.079524	0.013177	98.45242
2	0.871272	2.588927	0.775492	3.559900	80.97232
3	0.935180	2.636844	10.97052	11.74212	60.98933
4	0.966261	2.590618	12.02848	11.69593	59.73992
5	0.980835	3.172277	12.21901	11.75016	58.46251
6	0.992951	3.164396	12.25014	11.70327	58.20823
7	0.996491	3.154707	12.36958	11.66411	58.00382
8	1.000248	3.181118	12.35636	11.65451	57.94022
9	1.001258	3.180373	12.38959	11.65324	57.90416
10	1.002365	3.189056	12.38589	11.64931	57.88105

6.   Analysis of the Empirical Results

As seen from the empirical results, the insignificant effect was noted for interest rates, exchange rates, deposits, loans, capital, RWA, securities owned by banks and consumer price index. However, it showed a minor significant effect of CAR and stock market index. As per the simulated data for Basel II (Figure 1), it was noted that the capital adequacy ratio dropped to 6% during the year 2003, which was below the 8% minimum requirement during that period. Thereafter it increased to around 8% as CBSL revised the guideline of CAR to 9% in 2002. However, CAR improved to around 12% with the direction issued by CBSL amending the minimum CAR to 10% since 2003.

7.   Summary and Conclusion

In this paper, we have analysed whether the requirement of regulatory capital as required by Basel II overstate the magnitude and economic significance of pro-cyclicality relative to the existing capital requirement in Sri Lanka.

Monthly data was selected from 2000:01 to 2007:06 for each variable: interest rate (issued by CBSL), exchange rate, deposits, loans, capital, risk weighted assets, capital adequacy ratio, securities owned by banks, consumer price index, stock market index, and GDP.

The literature surveys indicate mixed results on whether the requirement of regulatory capital as required by Basel II overstate the magnitude and economic significance of pro-cyclicality relative to the existing capital requirement.

The results of this study, which was based on simulated data, indicate that the impact of changes in CAR on GDP of Sri Lanka is marginal in the short run. However, the lending behaviour in Sri Lanka is mainly based on collateral and not on information. On the other hand, the Basel II capital adequacy framework focuses on information based lending rather than collateral based lending as it considers external rating of customers, etc. Therefore, with greater use of external ratings in lending activities by banks, the results of this study would differ in future.

This study was supported by the simulated data for Basel II based on the results of the parallel computations. The results drawn from using actual data under Basel II could be different from the current findings.

The scope of the study could be expanded to examine whether different results would be obtained if data relating to different categories of borrowers based on their risk profile (eg: corporate customers, SME customers, etc) are used instead of aggregate data.

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The Banking Indicators in Sri Lanka

The data of key financial indicators of the banking industry are from year 2000 to June 2007.

1. Total Assets

Total assets of Sri Lanka's banking industry have increased by 31% on average (Figure 9). This increase has been supported by the enhancement of capital of licensed banks followed by high credit growth during last two years.

Figure 4
Total Assets
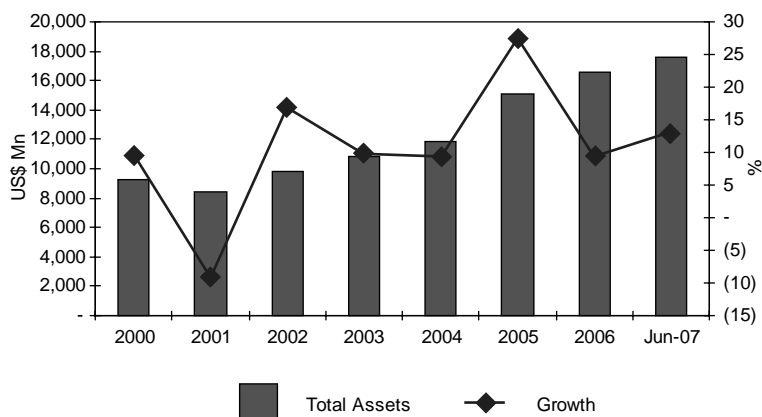
2. Deposits

Total deposit base increased on average 18% – 20% during last 5 years (Figure 5) and consists of 74% of rupee deposits and 26% of foreign currency deposits. Rupee deposits comprise mainly of demand (15%), savings (36%) and time (44%) deposits.

Figure 5
Total Deposits

150
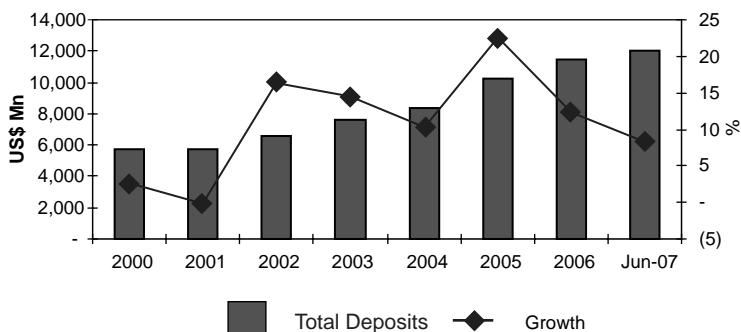
3. Loan Performance

Loans and advances portfolio of Sri Lanka banking industry has been growing on average 24% - 25% during last five years. 21% of such portfolio consists of overdrafts. In terms of loans, which are 72% of total portfolio, 29% are trading, 19% are consumption, 16% housing and 9% industrial loans.

Figure 6
Loan Performance
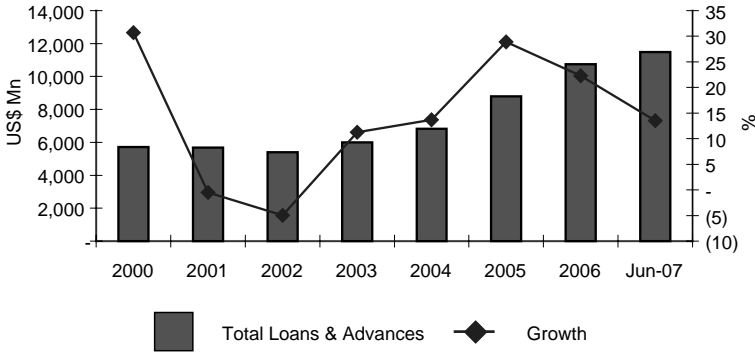
4. Non-Performing Loans (NPL)

While loans and advances portfolio grew by 37% on average, NPL (gross) increased only by 11%. As a result NPL (gross) showed a 12.27pp decline since year 2000.

The provision coverage has currently increased from 59% in January 2005 to 67% in June 2007. As a result the net NPL ratio decreased to 1.87% by end June 2007.

Figure 7
NPL Ratios
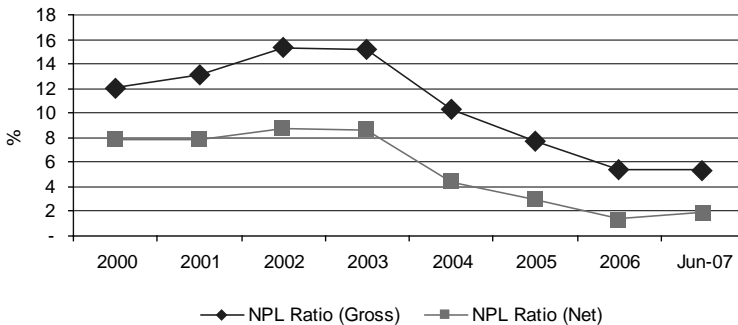
5.   CDR (Credit/Deposit Ratio)

CDR has been increasing in recent past as a result of high credit growth (Figure 6). The ratio currently stands at 95.79% as against 87.49% as at the end 2000.

Figure 8
Credit/Deposit Ratio
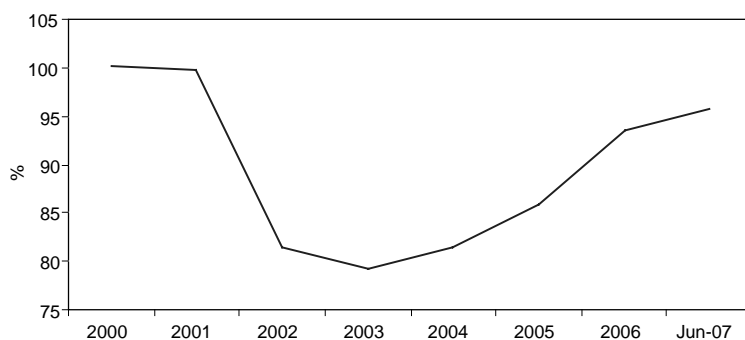
6.   RWA (Risk Weighted Assets)

RWA has increased by 35% on average during last 7 years as a result of the increase in share of loans from 58% in year 2000 to 65% of total assets in year 2007 (Figure 7).

Further, the aforementioned growth resulted from the increase in risk weights on 'loans secured by primary mortgage over residential property' and 'other loans and advances' up to 55% (from 50%) and 110% (from 100%) respectively.

7.   CAR (Capital Adequacy Ratio)

As Tier II capital increased by 42% on average, which is higher than the increase of RWA (34% on average), CAR has increased by 2.04pp over the last 7 years.

A continuous improvement in CAR was recorded during the last 2 years as a consequence of enhancement of minimum capital requirement of licensed banks and the infusion of new capital by foreign banks with the change of computation base for single borrower limit (SBL).

8.   Interest Rates

Main policy interest rates of the Central Bank of Sri Lanka are repurchase rates and reverse repurchase rates. There are several money market interest rates including weighted average call money market rate, Treasury bill rates (91 days, 182 days, 364 days) and Sri Lanka inter bank offer rates (SLIBOR – overnight, 7 days, 1 month). In addition, average prime lending rates (AWPR – weekly) of LCBs are also issued by CBSL.

These interest rates have the same volatility (Figure 10) and are highly correlated. However, repurchase rate which is one of main official interest rate is considered in this study.

Figure 9

RWA & CAR
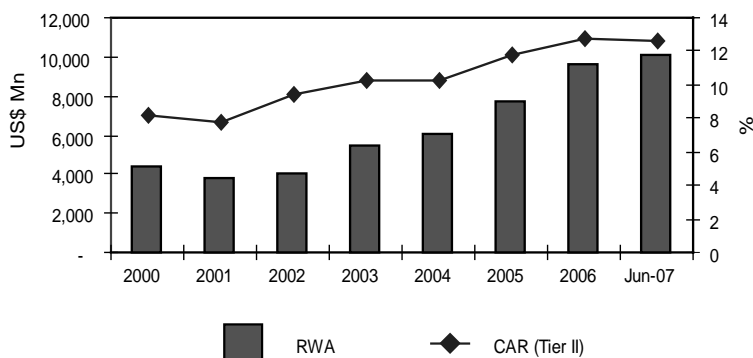
9. Exchange Rate

Both month end exchange rate and monthly average rate of Sri Lanka Rupees to USD rate showed the same growth rate and similar pattern of volatility during the period (Figure 11). Therefore month end exchange rate has been used for the final model.

Figure 10

Interest Rates
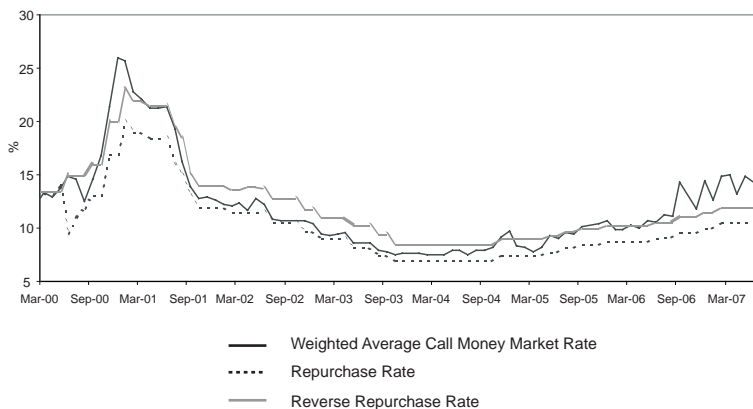
Figure 11

Exchange Rates (USD/LKR)

——	Month End Rate
·····	Monthly Average Rate
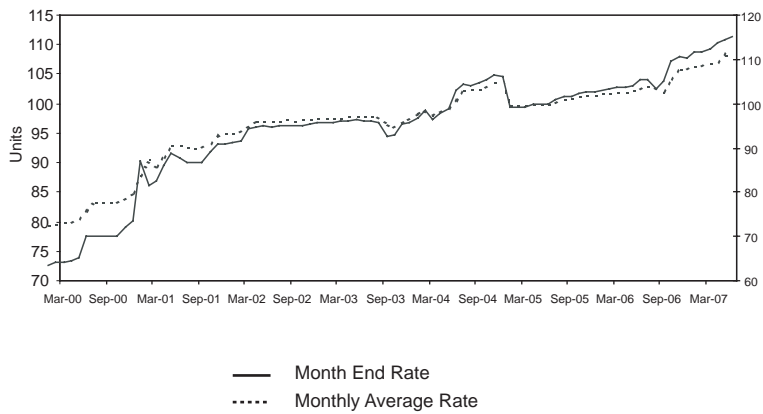
Definitions of Variables

1. **Capital Adequacy Ratio (CAR)** = $\dfrac{\text{Regulatory Capital}}{\text{Total Risk Weighted Amount}} \leq 10\%$

2. **Regulatory Capital** = Tier I + Tier II + Tier III capital
    Tier I capital includes;
    a. Paid-up ordinary shares/ common stock/ assigned capital
    b. Non-cumulative, non-redeemable preference shares
    c. Share premium
    d. Statutory reserve fund
    e. Published retained profits/ (accumulated losses)
    f. General and other reserves
    g. Surplus/ loss after tax arising from the sale of fixed and long-term investments
    h. Unpublished current year's profit/ losses
    i. Minority interests (consistent with the above capital constituents)
    j. Approved perpetual debt capital instruments
    k. Less: Goodwill; Net deferred tax assets; Other intangible assets; Advances granted to employees of the bank for the purchase of shares of the bank under a share ownership plan; Amount due from head office & branches outside Sri Lanka in Sri Lanka Rupees (applicable only to branches of foreign banks); Amount due to head office & branches outside Sri Lanka in Sri Lanka Rupees (-)(applicable only to branches of foreign banks); Amount due from head office & branches outside Sri Lanka in Foreign Currency (applicable only to branches of foreign banks); 50% of Investments in Unconsolidated Banking and Financial Subsidiary Companies; and 50% of Investments in Unconsolidated Banking and Financial Subsidiary Companies

    Tier II capital includes;
    a. Revaluation reserves (approved by CBSL)
    b. General provisions
    c. Hybrid capital instruments (Debt/Equity)
    d. Minority interests arising from preference shares issued by subsidiaries
    e. Approved subordinated term debt
    f. Less: 50% of Investments in Unconsolidated Banking and Financial Subsidiary Companies; and 50% of Investments in Unconsolidated Banking and Financial Subsidiary Companies

Tier III capital includes Approved Short Term Subordinated Debt. This must at a minimum: (i) be unsecured, subordinated and fully paid up, (ii) have an original maturity of at least two years, (iii) not be repayable before the agreed repayment date unless the prior consent of CBSL is obtained and (iv) be subject to a lock-in clause which stipulates that neither interest nor principal may be paid (even at maturity) if such payment means that the bank falls below or remains below its minimum capital requirement.

3. **Risk Weighted Assets (RWA)** = Risk Weighted Amount for Credit Risk + (Total Capital Charge for Market Risk + Total Capital Charge for Operational Risk) * 10

PRO-CYCLICALITY IMPACT OF BASEL-II IN ROC (TAIWAN)

by Johnny T. C. Hou*

1. Overview of Basel-II Implementation in ROC (Taiwan)[1]

1.1 Development of Basel-II

The Basel Committee on Banking Supervision was set up under the Bank of International Settlements (BIS) in 1974. In 1988, it issued the Basel Capital Accord, or Basel-I, which required banks' capital-adequacy ratios to be not less than eight percent.

The Basel Committee issued the "International Convergence of Capital Measurement and Capital Standards: a Revised Framework," referred to as the New Basel Capital Accord, or Basel-II, in June 2004. The main goal of Basel-II is to strengthen risk management within the banking industry by emphasizing the three pillars of minimum capital requirements, supervisory review process, and market discipline.

1.2 Overview of Basel -II Implementation in ROC (Taiwan)

ROC (Taiwan) is a small, open and emerging economy, known for its "economic miracle." In addition to its remarkable economic growth, ROC (Taiwan) is also advanced in sound financial market development through the government's promotion of financial liberalization and institutional reforms (Chiu 1998).

Prior to the 1990s, ROC (Taiwan)'s financial system was characterized by regulation and conservatism. Stable growth, rather than market competition and efficiency, was the primary concern of banks. Their average return-on-equity ratio exceeded 20 percent (TABF 2005). Nevertheless, the government paid considerable attention to Basel-I issued in 1988. Article 44 of the *Banking Act* was revised accordingly in 1989 requiring the capital-adequacy ratios of banks to be not less than eight percent.

Since the 1990s, the government has speeded up financial liberalization to keep abreast of the globalization trend and the domestic economic development. The Ministry of Finance (MOF) promulgated the *Regulations Governing the Establishment of Commercial Banks* in April 1990. From then to 1992, 16 new private banks were set up, each with a minimum capital requirement of NT$10 billion. Many investment and trust companies and credit cooperatives were also converted into commercial banks. Hence, Taiwan's financial sector entered an era of intense competition.

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*　This paper is part of the SEACEN research project. The views expressed in this paper are those of the author and not necessarily those of the Central Bank of the Republic of China (Taiwan).
[1]　ROC (Taiwan) refers to the Republic of China (Taiwan).

In 1992, the *Regulations Governing the Capital Adequacy Ratio of Banks* were implemented. Furthermore, the *Enforcement Rules of the Act of Privatization of Government-Owned Enterprises* were also amended in 1992. Subsequently, the privatization of Chan Hwa Bank, First Bank, and Hua Nan Bank was completed in 1998. Meanwhile, the *Regulations Governing the Capital Adequacy Ratio of Banks* were revised to incorporate market-risk capital requirements. Of the total assets of all financial institutions, assets of private banks rose from 8.9 percent in 1991 to 51.5 percent in 2001, while those of public banks declined from 53.7 percent to 19.7 percent during the same period.

In 2001, financial holding companies were allowed to be established. A cross-agency Basel-II task force was also set up. As financial holding companies merged together sub-sectors, boundaries within the financial sector were increasingly blurred. The supervisory framework with sub-sector-based division and responsibilities shared by three authorities was thus severely challenged. To consolidate the framework into one single organization, the Financial Supervisory Commission (FSC) was inaugurated in July 2004.

In 2005, in compliance with the Basel-II capital accord issued by the BIS, the *Regulations Governing the Capital Adequacy Ratio of Banks* were revised by the FSC. Starting in 2007, Basel-II was formally implemented in ROC (Taiwan).

The New Basel Capital Accord not only changes the capital calculation and reserve method, but it also asserts the concept of establishing and promoting a banking risk-management system. Taiwan aims to follow the BIS schedule for Basel-II implementation in accordance with the international regulations (FSC 2004, 2006).

1. Setting up a Basel-II Joint Taskforce
   To facilitate banks' appropriate actions to implement Basel-II and to foster improvement in banks' risk-management practices, the Banking Bureau of the FSC and the Bankers Association of the Republic of China established the Basel-II Joint Task Force in 2001. The Task Force comprises 28 domestic banks and two non-profit organizations—the Joint Credit Information Center (JCIC) and the Taiwan Academy of Banking and Finance (TABF).
2. Major achievements of the Task Force
   By the end of July 2006, the Basel-II Joint Task Force had completed the following work (with the relevant research results published on the FSC's website (FSC 2006).
2.1 It completed analyses of the implications of the final release of Basel-II (June 2004).
2.2 It conducted three studies on the quantitative impact of Basel-II based on banks' data of 2002, 2003 and 2005.
2.3 It proposed a tentative draft of the capital requirements for banks' operational risk, credit risk, market risk and securitization.
3. Integrated platform for credit- risk analytical databases
3.1 According to the Internal Ratings-Based (IRB) approach, the minimum data observation period for Probability of Default (PD) estimates is five years, while that for Loss Given Default (LGD) and Exposure at Default (EAD) estimates is seven years. Banks face a serious problem of insufficient data available to apply the IRB approach.
3.2 The JCIC set up an Integrated Data Research Platform and is in the process of constructing the Integrated Credit Assessment Models Platform, which would be accessible for banks in ROC (Taiwan).

4. Quantitative impact study on ROC (Taiwan)'s banking sector

A quantitative impact study on all the 47 domestic banks was conducted by the Basel- II Joint Task Force based on the tentative draft of the capital requirements as of June 30, 2005. The Standardized approach to credit risk and the Basic Indicator (BI) approach to operational risk were applied and the following results were found:

4.1 The average capital adequacy ratio decreased by 0.35 of a percentage point, reflecting the impact of the change in credit-risk capital.

4.2 The ratio decreased by about one percentage point resulting from the required capital for operational risk.

5. Approach to implementing Basel- II in ROC (Taiwan)

ROC (Taiwan) aims to follow the BIS schedule for Basel- II implementation. In January 2007, the Standardized approach and the Foundation Internal Ratings-Based (FIRB) approach to credit risk became available, and so did the BI approach and the Standardized approach to operational risk.

5.1 For banks failing to adjust themselves to this new framework, the FSC may extend time limits according to their readiness.

5.2 For banks wishing to adopt the IRB approach, the FSC will leave the choice of approach entirely to the banks, support and encourage them, but not in a compulsory manner. According to a recent survey conducted by the FSC, for credit risk four banks are planning to adopt the FIRB approach and the rest are planning for the Standardized approach. For operational risk, eight banks are planning for the Standardized approach and the rest are planning for the BI approach.

6. Risk-based and market-based regulatory system

6.1 Banks are required to report capital adequacy ratios on a quarterly basis since May 2007.

6.2 Starting in 2008, the FSC will periodically review and evaluate banks' internal capital adequacy assessments and the robustness of their internal control systems. The FSC will also require each bank to perform a self-assessment of its capital-adequacy strategy annually.

6.3 Starting in 2008, the FSC will set up a mechanism to disclose timely information on banks' financial and business activities, corporate governance, and risk management operations.

The FSC plans to guide banks towards a more sophisticated risk-sensitive management system and establish a more resilient and reliable banking system in Taiwan.

1.3   Pro-cyclicality Effect of Basel-II

Mendis (2005) pointed out that the ultimate objective of Basel-II is "financial stability." Caruana (2006) also explained the main reason for implementing Basel-II: "No bank can maintain public trust for long if it lacks sufficient capital, so supervisors impose capital requirements to safeguard the banking system. Since capital is the last line of defense against bank insolvency, regulatory capital requirements are one of the fundamental elements of banking supervision." He further noted, "Basel-II will contribute to a more resilient and stable banking system that is capable of promoting sustainable economic growth."

However, concerns have been raised regarding the likely pro-cyclicality effects of Basel-II. Alan Greenspan (2002) addressed this concern: "It is evident that regulatory rules can add to ongoing macroeconomic and asset quality cyclicality. Rules are constraints or limits that require responses as those limits are approached. Sometimes those limits - say capital constraints -may induce tighter lending standards or shrinking balance sheets for a number of institutions at the same time, engendering significant real business-cycle effects. We must, therefore, be aware of the implications beyond the original intent of a rule and consider its associated tradeoffs."

Eva *et al* (2003) remarked, "Rating schemes that are designed to be more stable over the cycle, akin to those of the external rating agencies, would not increase pro-cyclicality, but ratings that are conditioned on the current point in the cycle, akin in some respects to a Merton approach, could substantially increase pro-cyclicality."

An empirical study on the correlation between industry sector default rates and business cycles based on ROC (Taiwan)'s data suggests that Basel-II tends to be pro-cyclicality. For example, Point-in-Time (PIT) ratings can be replaced by Through-the-Cycle (TTC) ratings in the Standardized approach and FIRB approach to alleviate some negative effects, but pro-cyclicality cannot be completely removed (Sheng 2005a, 2005b).

Repullo and Suarez (2007) used a calibration method on a dynamic general equilibrium model to analyse the impact of the transition from Basel-I to a more risk sensitive Basel-II on capital buffers. Basel-II capital requirements slightly reduce the long-term risk of bank defaults, but exacerbate the pro-cyclicality of capital buffers. The high buffers in boom times will be insufficient to meet capital demands in bad times, causing apparent credit crunch.

In theory, the pro-cyclical effects of Basel-II mainly result from the following factors:

1)   Basel-II implementation will amplify pro-cyclicality as Basel-II adopters severely tighten credit standards in response to rising capital requirements in bad times.

2)   Herding behaviour: The uniformity imposed by Basel-II in calculating capital requirements will result in homogeneous assessment of risk, which in turn will amplify herding behaviours in the marketplace.

ROC (Taiwan) had promoted minimum capital ratios in compliance with Basel-I since 1989. Starting in 2007, Basel-II has been implemented to enhance the risk sensitivity and risk management of financial institutions.

In practice the extent to which the impact of the pro-cyclical effects of Basel-II on the ROC (Taiwan) economy is an empirical question. What follows is an empirical study using the VAR approach suggested by The SEACEN Centre on ROC (Taiwan)'s existing data.

2. Specifications of the VAR Model

Sims' (1980) classic paper "Macroeconomics and Reality" argued that vector autoregression (VAR) would be a useful tool in constructing and evaluating the influences of monetary policies and business-cycle fluctuations. Given a minimal set of assumptions, structural VARs allow one to estimate the dynamic effects of economic shocks. Furthermore, the VAR approach sidesteps the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of the entire variables in the system.

The estimated impulse-response functions provide a natural way to evaluate the interactions and shocks of the key macroeconomic variables of interest. Christiano *et al* (2006) concluded that structural VARs are unlikely to lead to misleading inferences in practice, even when misspecified. In particular, they found that even with misspecified structural VARs, the bias in the estimated impulse responses is typically small relative to the width of the confidence interval. Their conclusions suggest that when correctly used, structural VARs can provide a useful insight into the character of aggregate fluctuations.

2.1 The Semi-Structural VAR Model

Analysis of the pro-cyclicality effects of Basel-II through lending on the real economy would be based on empirical standard semi-structural VAR models (as suggested by the research project leader Dr. Punkgy, 2007). In this paper, we employ the semi-structural VAR approach of Bernanke and Blinder (1992) of the form given in equation (1). It can be presented as follows:

$$Sy_t = A(L)y_t + \varepsilon_t$$

$A(L)$ is a matrix polynomial in the lag operator L for a VAR (p):

$$A(L) = A_1L + A_2L^2 + K + A_pL^p$$

The moving average representation is:

$$y_t = \Phi(L)\varepsilon_t$$

Where $\Phi(L) = [S - A(L)]^{-1}$

We then employ the OLS method to estimate the reduce-form equation:

$y_t = S^{-1} A(L)y_t + S^{-1}\Psi D_t + \mu_t$, Where $\mu_t = S^{-1}\varepsilon_t$,
$E(\mu_t\mu_t^{'}) = \Omega = (S^{-1}\varepsilon_t)(S^{-1}\varepsilon_t^{'})^{'} = (S^{-1})(\varepsilon_t\varepsilon_t^{'})(S^{-1})^{'} = (S^{-1})(S^{-1})^{'}$,

Given the assumption: $E[\varepsilon_t] = 0, E[\varepsilon_t\varepsilon_t^{'}]=I_n$

Thus, S^{-1} is the Cholesky decomposition of, the reduced form covariance Ω matrix, given that the structural) innovations are orthogonal. Furthermore, if the process satisfies invertibility conditions, the dynamic responses to shocks are summarized by the moving average representation:

$y_t = [I - S^{-1} A(L)]^{-1}\mu_t = [I - S^{-1} A(L)]^{-1}S^{-1}\varepsilon_t$

It is assumed that all the eigenvalues of $\left|I_n - S^{-1} A(L)\right| = 0$ remain outside the unit circle in absolute value, or are 1 in the presence of cointegration and unit roots. In this sense, the companion matrix has characteristic roots that are less than one in absolute value or are equal to plus 1. Under those circumstances the VAR is mathematically stable, and the system is then a Wold-causal chain or recursive model.

The residuals covariance matrix of the recursive model is a lower-triangular matrix. Strictly assuming the way in which the variables affect each other is determined by their position in the ordering. That is, the contemporaneous innovations in the other variables influence all those below them in the chain and none of those variables above them in the order. What our study relies on to identify shocks is the Cholesky decomposition, which imposes a recursive structure on the VAR model. In brief, the ordering of the variables in the system influences the research result.

2.2 Variables of Interest

This paper is based on the relationship found by Gertler and Gilchrist (1993) and Kashyap and Stein (1994) in specifying the VARs. We develop the system involving nine variables VARs with the following ordering (see variables listed below): exchange rates (Exr), inter-bank money market rates (Oni), bank deposits (Depo), bank loans (Loan), capital adequacy ratios (CAR), regulatory minimum capital as calculated by Basel-II standards), bank securities (Secu), stock-market indices (Pstk), general prices as represented by the Consumer Price Index (CPI), and output (real GDP).

Table 1
Data Specifications

Notation	Variable Specification	Data Source
Exr	Exchange rates: NTD/USD	Financial Statistics Monthly
Oni	Interbank call loan rate	Financial Statistics Monthly
Depo	Bank deposits	Supervisory Database, CBC
Loan	Bank loan	Supervisory Database, CBC
CAR	Capital adequacy ratio	Supervisory Database, CBC
Secu	Bank securities	Supervisory Database, CBC
Pstk	Stock market index	Financial Statistics Monthly
CPI	Consumer Price Index	Price Statistics Monthly
GDP	Real GDP	Quarterly Economic Trends

Notes: financial statistics databases of Taiwan in AREMOS, and supervisory databases of CBC.

Although in generalized impulses analysis, Pesaran and Shin (1998) constructed an orthogonal set of innovations that does not depend on the VAR ordering, however, in this study we still employ Cholesky impulses analysis.

3. Results of the Empirical Study

As Philips (1986) demonstrated, any OLS regressions that are based on the levels of the time series variables are spurious. We first examine the stationarity of each stochastic variable. Two standard tests for the stationary process, Augmented Dickey-Fuller (ADF) tests and Phillips-Perron (PP) tests, are applied to examine the null of the unit roots in each variable.

The computer software applied is Eviews6. All specifications include a constant term, either with or without a trend, and up to nine lags. The sample period consists of quarterly data from the first quarter of 1998 to the fourth quarter of 2006, and the data sources include the financial statistics databases of Taiwan in AREMOS and the supervisory databases of the Central Bank of the Republic of China (Taiwan) (CBC).

3.1 Unit Root Tests

Table 2 reports the ADF test results. It is difficult to draw definitive conclusions from such a study. Based on the results in Table 2, the non-stationary null hypothesis for most of the level variables cannot be rejected. For CAR and Loan in particular, the ADF test statistics with drift suggests that with or without a linear trend they are I(0). However, the first differences of most variables appear to be stationary with the rejection of the unit root hypotheses. For the CPI in particular, the ADF test suggests that the CPI is I(2) at the standard significance level. But the evidence is not conclusive.

Table 2
ADF Unit Root Tests

Level	τ_μ	τ_τ	Difference	τ_μ	τ_τ
Exr	-1.97	-1.93	D(Exr)	-5.78***	-5.69***
	(0.3001)	(0.6186)		(0.0000)	(0.0000)
Oni	-2.25	-1.39	D(Oni)	-3.04**	-3.61**
	(0.1934)	(0.8465)		(0.0411)	(0.0442)
Depo	-0.18	-2.20	D(Depo)	-7.49***	-7.36***
	(0.9316)	(0.4743)		(0.0000)	(0.0000)
Loan	-0.24	5.94***	D(Loan)	-2.33	-2.38
	(0.9707)	(0.002)		(0.1682)	(0.3798)
CAR	-2.66*	-2.34	D(CAR)	-9.72***	-9.79***
	(0.0914)	(0.4032)		(0.0000)	(0.0000)
Secu	-1.76	-1.59	D(Secu)	-6.06***	-6.27***
	(0.3937)	(0.7756)		(0.0000)	(0.0000)
Pstk	-2.14	-1.73	D(Pstk)	-4.83***	-4.21***
	(0.2307)	(0.7166)		(0.0004)	(0.0124)
CPI	-0.73	-2.04	D(CPI)	-1.99	-1.99
	(0.8240)	(0.5566)		(0.2910)	(0.5856)
GDP	0.49	-1.17	D(GDP)	-10.04***	-3.09
	(0.9837)	(0.9013)		(0.0000)	(0.1269)

Notes: (1) τ_μ, Exogenous: Constant; τ_τ, Exogenous: Constant with Linear Trend. (2). Numbers in parentheses are MacKinnon (1996) one-sided p-values. (3) *** Indicates significant at 1%, ** significant at 5%, and * significant at 10%. (4) Lag Length: 9 (Automatic selection based on Schwarz Information Criterion, MAXLAG = 9)

Table 3
Philips-Perron Unit Root Tests

Level	τ_μ	τ_τ	Difference	τ_μ	τ_τ
Exr	-2.04	-2.00	D(Exr)	-5.79***	-5.69***
	(0.2705)	(0.5801)		(0.0000)	(0.0002)
Oni	-2.62*	-0.78	D(Oni)	-2.92*	-3.52*
	(0.0983)	(0.9584)		(0.0536)	(0.0535)
Depo	-0.12	-2.20	D(Depo)	-7.47***	-7.34***
	(0.9388)	(0.4743)		(0.0000)	(0.0000)
Loan	-0.24	-1.33	D(Loan)	-4.90***	-4.95***
	(0.9716)	(0.8633)		(0.0003)	(0.0017)
CAR	-2.82*	-2.75	D(CAR)	-9.72***	-9.56***
	(0.0653)	(0.2258)		(0.0000)	(0.0000)
Secu	-1.76	-1.60	D(Secu)	-6.06***	-6.27***
	(0.3931)	(0.7724)		(0.0000)	(0.0001)
Pstk	-2.14	-1.73	D(Pstk)	-4.75***	-4.85***
	(0.2307)	(0.7166)		(0.0005)	(0.0022)
CPI	-0.94	-2.28	D(CPI)	-9.35***	-13.46
	(0.7649)	(0.4328)		(0.0000)	(0.0000)
GDP	0.49	-2.93	D(GDP)	-6.22***	-6.80***
	(0.9841)	(0.1653)		(0.0000)	(0.0000)

Notes: (1) τ_μ, Exogenous: Constant; τ_τ, Exogenous: Constant with Linear Trend. (2) Numbers in parentheses are MacKinnon (1996) one-sided p-values. (3) ***Indicates significant at 1%, ** significant at 5%, and * significant at 10%. (4) Bandwidth: 2 (Newey-West using Bartlett Kernel spectral estimation method)

It appears that part of the ADF test results is not sensible economically. We perform the Philips-Perron (PP) unit root tests to follow up. The PP test statistics are shown in Table 3. By the results in Table 3, the non-stationary null hypothesis of the unit roots for most of the level variables cannot be rejected. For Oni and CAR in particular, the PP test statistics with drift suggests that they are I(0) at a 10 percent significance level. However, the first differences of all variables appear to be stationary with the rejection of the unit root hypotheses at a one percent significance level, except that the Oni is stationary at a 10 percent significance level. Therefore, the first differences of all nine variable series in our sample are integrated of order zero, I(0).

Given that we do not know which Data Generating Process (DGP) is more realistic, it is inappropriate to "choose" between the two tests on the basis of power. What we can say, though, is that the test statistics, which reverse the null and alternative hypotheses of a few variables, has not obviously hurt the capacity of distinguishing between stationary and non-stationary series. Visually, all the nine level series appear I(1) and all the nine first difference variable series appear I(0) at least; the Philips-Perron test statistics in Table 2 support this.

3.2 Impulse-Response Effects

The implication that only stationary, I(0), variables should be included in VARs has been accepted in our data sample. Since the time-series data for the nine first-difference variables are stationary, we conduct the VAR model estimation and perform the impulse-response function analysis directly. For short-run economic analysis, we do not have the risk of spurious correlation. Empirically, a shock to the i-th variable not only directly affects the i-th variable, but the effect is also transmitted to all the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse-response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables.

In this paper we attempt to investigate the magnitude of the pro-cyclicality effects of Basel-II. Would the regulation of the minimum capital requirements, as required by Basel II, overstate the magnitude and economic significance of pro-cyclicality in the new Accord relative to the existing capital requirements in ROC (Taiwan)? This is our concern. Since the impulse-response functions trace the effects of innovation shocks to one endogenous variable on the other variables in the VAR, visually all 9x9 combined graphs are too complicated to understand. So we only display the variables of interest, that is, the impulse response of changes in GDP to one standard deviation innovations in CAR. In Graph 1, the vertical axis indicates the impulse-response magnitude of one standard-deviation changes of CAR.

Graph 1

**Response of D(GDP) to Cholesky
One S.D. D(CAR) Innovation**
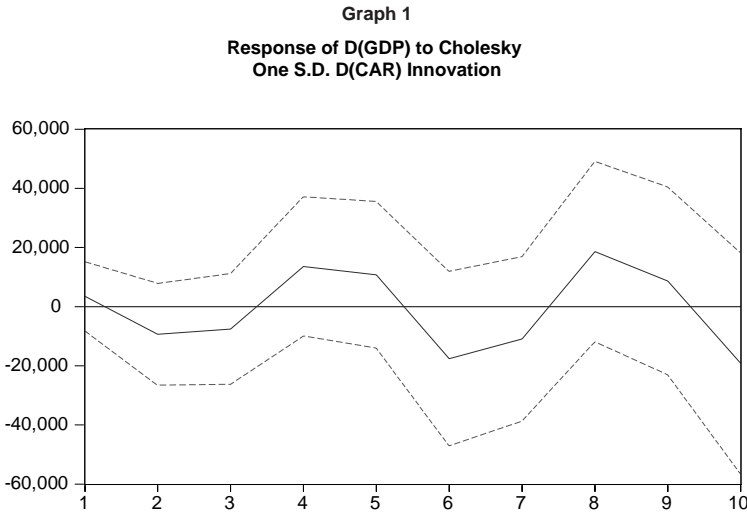
Graph 1 shows the impulse response of CAR to GDP around the horizontal axis is near zero and falls into the confidence interval completely. CAR does not have any significant effects on the real GDP. Strictly speaking, the capital-adequacy ratios affect the real economy through bank lending. For further study, we graph the impulse response of changes in Loan to one standard-deviation innovations in CAR (see Graph 2). The results is the same, CAR does not have any significant effects on bank lending.

Graph 2

**Response of D(LOAN) to Cholesky
One S.D. D(CAR) Innovation**
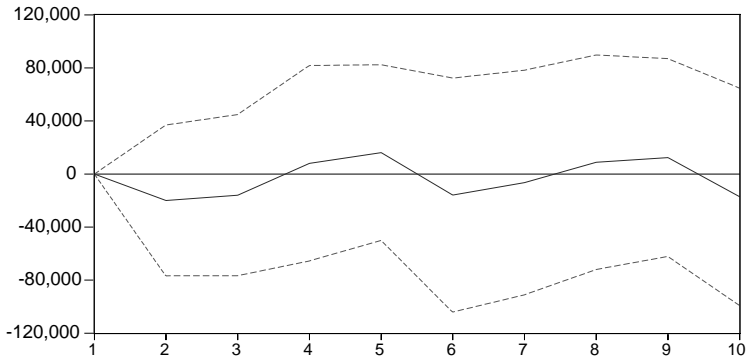
Since the impulse-response results of the VAR model simulations are difficult to interpret, we use selected VAR estimates for complementary description (see Table 4). The student-t statistics in Table 4 show that the overall estimate coefficients of CAR to Loan and GDP are not significantly different from zero.

Table 4
Selected Vector Autoregression Estimates

	D(Loan)	D(GDP)
D(CAR(-1))	-7114070 (-0.56734)	-4375570 (-1.23606)
D(CAR(-2))	3895023 (0.37145)	-2591037 (-0.87527)
D(Loan(-1))	0.274118 (1.08878)	0.036641 (0.51552)
D(Loan(-2))	1.029488 (2.85209) ***	0.033877 (0.33245)

Notes: Numbers in parentheses are t-statistics.

An interesting finding in Table 4 is that bank lending does not have any significant effects on GDP. We graph the result of Loan innovation to response of GDP (see Graph 3). In Graph 3, Loan does not have any significant effects on GDP.

Graph 3

Response of D(GDP) to Cholesky
One S.D. D(Loan) Innovation
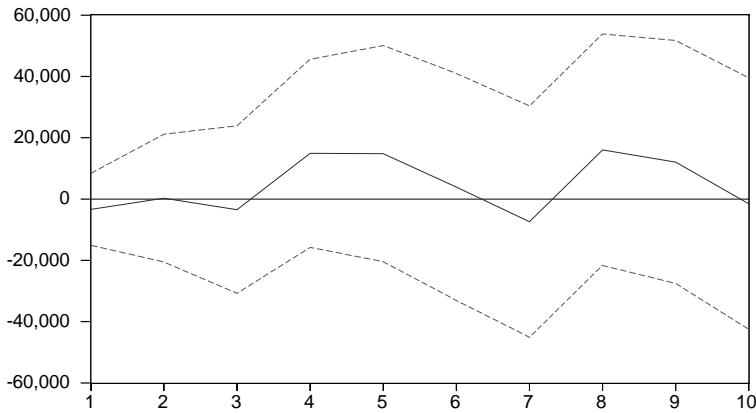
3.3 Contemporary Relationships

Even in the short run, it may not be plausible that bank lending does not have any significant relation with the economy. Since only the lagged endogenous variables appear on the right hand-side of the equations in the VAR model, the results may be subject to the restrictions of no structural relations. For simplicity, we adopted a measure of correlation to check this relation. The contemporary correlation coefficient is very high, 0.962 (see Table 5). Loan and real GDP does have a common linear trend. We applied the Granger-causality test on the concurrent level variable of Loan and GDP (see Table 6). The result implies there is unidirectional causality. GDP does not Granger-cause LOAN was rejected by the data, and LOAN does not Granger-cause GDP was not. It shows that bank lending does not affect GDP and that GDP unidirectionally affects bank lending.

Table 5
Correlation Matrices
Sample: 1998:Q1 to 2006:Q4

	GDP	Loan
GDP	1.000000	0.961509
Loan	0.961509	1.000000

Table 6
Pairwise Granger Causality Tests (Lags: 4)
Sample: 1998:Q1 to 2006:Q4

Null Hypothesis:	Obs	F-Statistic	Probability
GDP does not Granger Cause LOAN	32	3.56302	0.0211
LOAN does not Granger Cause GDP		1.01558	0.4200

We summarize the empirical findings as follows:

1. We applied two standard-unit root tests to evaluate the attribute of data series for our VAR model. The variables of interest include exchange rates, inter-bank money-market rates, bank deposits, bank loans, capital-adequacy ratios, bank securities, stock market indices, general prices as represented by the CPI, and real GDP in ROC (Taiwan). All the variables are non-stationary series, I(1), and the entire first-difference variable series appear stationary, I(0).

2. We conducted VAR model estimation and performed the impulse-response function analysis and variance decomposition (see appendix 2) within the sample period from 1998:Q1 to 2006:Q4. The evidence of the impulse response and VAR model estimates show that changes in CAR variation are not likely to have any significant impact on real GDP. It implies that Basel-II requirements on bank capital do not significantly affect the pro-cyclicality of the ROC (Taiwan) economy.

3. We adopted the Granger causality test for bank lending and real GDP. It shows that bank lending does not affect GDP and that GDP unidirectionally affects bank lending. It means that bank lending is demand-oriented, and that bank lending is not an effective monetary transmission channel in ROC (Taiwan).

4. Analysis of the Empirical Results

The above pro-cyclicality impact study used the sample period of 1998:Q1 to 2006: Q4. *The Reference Dates of Business Cycles* issued by the Council for Economic Planning and Development (CEPD) identifies ten business cycles in ROC (Taiwan). Our sample period covers a trough (Dec. 1998), a peak (Sept. 2000) and another trough (Sept. 2001), constituting at least one complete cycle. This complies with the BIS's requirement for risk analysis, i.e. "For a meaningful differentiation of risk, there are requirements to ensure that historical data horizons cover appropriate economic downturn conditions".

In addition, Basel-II capital-adequacy ratios are expressed as a percentage of the total risk-based capital to risk-weighted assets (see Appendix 1). Risk-based capital is the banks' source of credit extension, while risk-weighted assets represent the banks' credit exposure. In this empirical analysis, two conditions must be satisfied to conclude that Basel-II implementation has significant pro-cyclical effects on ROC (Taiwan)'s real economy. First, capital-adequacy ratios have significantly affected bank lending; second, bank lending has a significant impact on GDP. The empirical results based on ROC (Taiwan)'s 1998:Q1 to 2006:Q4 data indicate that the effects of capital-adequacy ratios are insignificant. The reasons are summarised as follows:

4.1 Nonbinding Constraints of Basel Capital Requirements

In 1998, market-risk capital calculation was included in Basel-I requirements in ROC (Taiwan). Since then, the banks have abided by the rule that capital-adequacy ratios must not fall below eight percent. The banks have also reported their capital-adequacy ratios to relevant supervisory agencies on a semi-annual basis. Prior to 2003, the banks' average capital-adequacy ratio exhibited a gradually declining trend, down from 12.36 percent in the first half of 1998 to 10.29 percent in the end of 2003. The ratio recorded a low point of 10.14 percent in the first half of 2004, moved up steadily to 11.35 percent in the first half of 2005, and then took a downward turn to 10.87 percent at the end of 2006 (see Graph 4).

During the sample period, the capital-adequacy ratios of banks in ROC (Taiwan) did not drop below 10.14 percent, which was higher than the 8 percent minimum requirement of Basel-II. Even after accounting for the one percentage point drop from the operational risk calculation, as shown in the quantitative impact study on ROC (Taiwan)'s banking sector (see Section 1.2), ROC (Taiwan)'s banks still outperform the Basel-II requirement. In short, Basel capital requirements are not binding constraints upon banks in ROC (Taiwan) and, therefore, have very limited impact on bank lending.

Graph 4
ROC (Taiwan)'s Capital Adequacy Ratio (CAR)

CAR

All data were on a quarterly basis
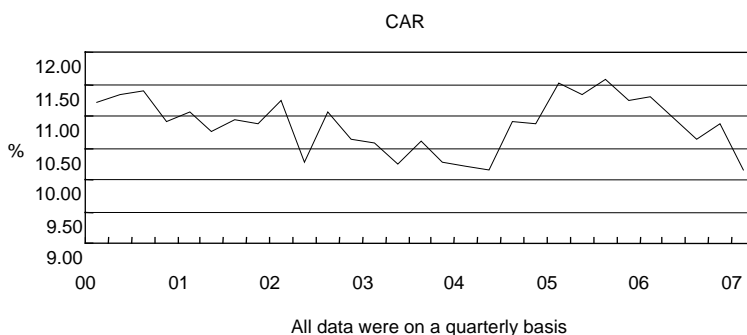
4.2 Insignificant Pro-cyclicality Effects of Basel-II

ROC (Taiwan) is a small, open economy that is highly dependent on external trade. In 2006, the country's trade dependence (measured by the sum of its nominal exports and imports as a percentage of GDP) was 134.31 percent. With exports being the engine of economic growth, ROC (Taiwan)'s economic performance is driven by changes in the global economy. The expansion or contraction of ROC (Taiwan)'s economy is closely related to the contribution of the exports of goods and services to GDP (see Table 7). As external demand is largely the determining factor, the constraints of Basel-II on bank lending do not significantly affect economic growth.

Table 7
Sources of ROC (Taiwan)'s Economic Growth (By Expenditure)

Item	2000	2001	2002	2003	2004	2005	2006	2007f
Real Growth Rate (%)								
Gross Domestic Product	5.8	-2.2	4.6	3.5	6.2	4.1	4.7	4.4
Private Consumption	4.6	0.7	2.6	1.5	4.5	2.8	1.5	3.0
Government Consumption	0.7	0.5	2.1	0.6	-0.5	0.9	-0.2	1.3
Investment	9	-19.9	1.1	1.7	19.5	0.2	1.0	1.9
Increase in Inventory	..	..	..	..	..	..	..	..
Exports of Goods & Services	18.9	-7.8	10.6	10.4	14.4	7.6	10.3	6.5
(Less): Imports of Goods & Services	15.0	-13.0	7.1	8.1	18.9	3.6	5.4	3.8
Contribution (percentage point)								
Gross Domestic Product	5.8	-2.2	4.6	3.5	6.2	4.1	4.7	4.4
Private Consumption	2.8	0.4	1.6	0.9	2.7	1.6	0.8	1.7
Government Consumption	0.1	0.1	0.3	0.1	-0.1	0.1	-0.0	0.2
Investment	2.1	-4.7	0.2	0.3	3.6	0.0	0.2	0.4
Increase in Inventory	-1.2	-0.4	0.4	0.4	0.9	-0.4	0.0	-0.1
Exports of Goods & Services	9.0	-4.1	5.4	5.5	8.2	4.7	6.5	4.3
(Less): Imports of Goods & Services	7.0	-6.6	3.2	3.7	9.1	1.9	2.9	2.1

Source: Directorate-General of Budget, Accounting and Statistics, *Quarterly National Economic Trends*, Taiwan Area, R.O.C.
f: forecast

Moreover, a large proportion of ROC (Taiwan)'s exports are high technology and medium-to-high technology products, which combined to make up 71.2 percent of total exports in 2006. In particular, the high production values and favorable prospects of its electronic sectors, including foundries, ICs, flat-panel displays, TFT-LCDs, IC packaging and testing, attract abundant foreign and domestic capital through direct finance. They do not normally resort to bank lending. Therefore, Basel-II does not have a significant impact on ROC (Taiwan)'s industrial development (see Table 8).

Table 8
The Standard and Characteristic Classification of Exports
(Classification of Technology and Industry by OECD)

	High-Technology	Medium-High-Technology	Medium-Low-Technology	Low-Technology
1998	37.1	25.0	16.1	21.8
1999	40.6	24.4	15.6	19.4
2000	44.4	23.8	14.8	17.0
2001	42.4	25.0	15.5	17.1
2002	42.7	25.8	15.9	15.6
2003	42.9	26.5	16.7	13.9
2004	44.6	26.4	17.2	11.8
2005	43.9	26.8	18.9	10.4
2006	45.9	25.3	19.7	9.1

Sources: Ministry of Finance, *Monthly Statistics of Exports and Imports Taiwan Area*, the Republic of China.

4.3 Ineffective Credit Channel

A Granger causality test shows that bank lending does not affect GDP and that GDP unidirectionally affects bank lending. That is, bank lending does not affect, but is affected by the demand side. Because credit is not an effective channel of monetary transmission mechanism, Basel-II requirements on bank capital do not significantly affect the economy.

Chu and Lin (2007) investigated the effectiveness of the bank-lending channel by using the theory of the monetary transmission process of an open economy. They found that bank credit is not an effective monetary transmission channel in ROC (Taiwan). In theory, the impact of the credit channel on money supply is uncertain. The empirical study using aggregate data on deposit banks in ROC (Taiwan) also concluded that even when money supply expands, bank lending would not necessarily increase.

5.   Conclusion

Risk is the business of finance. The implementation of Basel-II helps the risk management of ROC (Taiwan)s financial institutions conform to international practices, thus raising the competitiveness of ROC (Taiwan)'s financial sector. It may be possible for individual financial institutions to tighten lending in bad times to maintain the Basel-II minimum capital adequacy, potentially causing a credit crunch. However, the empirical study on ROC (Taiwan)'s data from 1998:Q1 to 2006:Q4 shows the pro-cyclical impact of Basel-II to be insignificant. The reasons are summarized as follows:

1.   Basel capital requirements are not binding constraints. The capital-adequacy ratios of banks in ROC (Taiwan) stood at 10.87 percent at the end of 2006, higher than the eight percent minimum capital requirement of Basel-II. Even after subtracting the one percentage point from the operational risk calculation, the Basel capital requirements are still not binding constraints upon banks in ROC (Taiwan) and, therefore, are unlikely to exert any significant impact on bank lending.

2.   ROC (Taiwan) is an export-oriented economy, relying on exports as the engine of growth and susceptible to changes in the world economy. At the same time, its high technology and medium-to-high technology sectors account for a major part of ROC (Taiwan)'s export industries. Their high production values and favorable prospects make it easy for these sectors to raise funds via direct finance instead of bank lending. Even as Basel-II may affect bank lending, the impact on industry development are not significant.

3.   The credit channel is not effective in the monetary transmission mechanism in ROC (Taiwan). A Granger causality test shows that bank lending does not affect GDP. Hence, Basel-II requirements on bank capital do not have significant pro-cyclical effects on the ROC (Taiwan) economy.

Historically, ROC (Taiwan) implemented the Basel-I capital accord in 1992 and incorporated market-risk capital calculation in 1998, but Basel-II was just implemented in 2007. The implementation of Basel-II, in theory, aims to guide banks' management towards market -oriented and risk-sensitive directions, but in practice, it can lead to structural changes in banks' management and lending behaviors. Information contents of the sample period in this study do not necessarily reveal future changes in banks' management. Although Repullo and Suarez (2007) were able to simulate pro-cyclicality effects by using a calibration method on a dynamic general equilibrium model, this is only possible when based on the presumption that banks' management behaviors remain unchanged.

Despite the fact that banks' current capital-adequacy ratios remain high, the minimum capital requirement of Basel-II, whether based on the Standardized approach or an IRB approach, will affect banks' capital buffers at least in theory. Furthermore, ROC (Taiwan) banks' average capital-adequacy ratios have declined in recent years, making Basel II capital requirements an important factor in financial stability and should be closely and continuously watched in the future. The Central Bank of the Republic of China (Taiwan) (CBC) needs to continue enhancing the Financial Stability Mechanism and promoting the Financial Sector Assessment Program to achieve its operational objective to maintain financial stability.

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Data Properties and Definitions

■   *Data Sources*

All the data of the banking industry from the supervisory databases of CBC are collected based on unaudited figures submitted by each domestic bank's corporate headquarters, including the domestic banking units, offshore banking units and overseas branches. However, the information disclosed on the banks' websites has been audited by banks or Certified Public Accountants (CPAs).

■   *Definitions*
•   *Total Risk-based Capital / Risk-weighted Assets*

$$\frac{\text{Qualifying capital}}{\text{Credit-risk-weighted assets} + (\text{Market-risk-equivalent assets} + \text{Operation-risk-equivalent-assets})*12.5}$$

•   *Qualifying capital*

Qualifying capital = Tier 1 capital + Tier 2 capital + Tier 3 capital - deduction items

A.   *Tier 1 capital* includes:
1.   Common stockholder's equity
2.   Noncumulative subordinated debt without maturity dates
3.   Noncumulative perpetual preferred stock
4.   Capital reserves (except the appreciation reserves of fixed assets)
5.   Retained earnings (deducting the insufficiency of operation reserves and loan loss provisions)
6.   Minority interest
7.   Cumulative effect of equity adjustments
8.   Less: goodwill and treasury stock

B.   *Tier 2 capital* includes:
1.   Perpetual preferred stock
2.   Cumulative subordinated debt without maturity dates
3.   Appreciation reserves of fixed assets
4.   45 percentof unrealized holding gains of long-term equity investments
5.   Operation reserves
6.   Convertible debt securities
7.   Allowance for loan and lease losses (except the reserves created against identified losses)
8.   Long-term subordinated debt and long-term non-perpetual preferred stock

C.   *Tier 3 capital* includes short-term subordinated debt and short-term non-perpetual preferred stock. The two items should be unsecured; be fully paid up; have an original maturity of at least two years; be not redeemable before the arranged date; include a lock-in clause precluding payment of either interest or principal if the payment would cause the issuing organization's risk-based capital ratio to fall below the minimum requirement.

D.   Deduction items
1.   Booking value of investments in other banks that are not consolidated for accounting purposes and held more than one year.
2.   Booking value of investments in non-bank subsidiaries, excluding the investments in banking-related subsidiaries that are consolidated.

E.   Restrictions
1.   Tier 2 capital for credit-risk capital charge may not exceed 100 percent of Tier 1 capital for credit-risk capital charge.
2.   Long-term subordinated debt and long-term non-perpetual preferred stock included in Tier 2 capital may not exceed 50 percent of Tier 1 capital.
3.   Tier 3 capital can only be used for market-risk capital charge.
4.   The sum of Tier 2 and Tier 3 capital for market-risk capital charge may not exceed 250 percent of Tier 1 capital for market-risk capital charge.
5.   The sum of eligible Tier 2 and eligible Tier 3 capital may not exceed 100 percent of Tier1 capital.

- ### Risk-weighted assets
    The risk-weighted assets shall be determined by multiplying the capital requirements for market risk plus operation risk by 12.5 and adding the resulting figure to the sum of risk-weighted assets for credit risk.

Variance Decomposition Table

Variance Decomposition

Variance Decomposition of D(LOAN):

Period	S.E.	D(EXR)	D(ONI)	D(DEPO)	D(LOAN)	D(CAR)	D(SECU)	D(PSTK)	D(CPI)	D(GDP)
1	0.875	3.544	0.083	15.973	80.399	0.000	0.000	0.000	0.000	0.000
		-7.830	-4.002	-10.615	-12.106	0.000	0.000	0.000	0.000	0.000
2	0.920	3.541	10.496	13.003	68.871	1.311	1.956	0.183	0.208	0.432
		-10.551	-11.430	-8.417	-12.886	-4.049	-4.642	-4.334	-1.557	-0.853
3	0.991	8.182	5.651	7.432	70.313	1.154	2.510	2.991	0.113	1.654
		-12.518	-9.223	-6.506	-13.813	-3.593	-3.565	-5.335	-1.577	-0.993
4	1.084	6.962	13.723	6.635	62.269	1.037	4.811	2.906	0.280	1.376
		-12.970	-12.384	-6.530	-13.119	-4.214	-4.372	-6.149	-1.883	-0.868
5	1.117	5.265	10.870	6.940	69.077	0.945	3.704	2.031	0.192	0.976
		-13.118	-12.471	-7.576	-16.043	-4.877	-3.613	-5.483	-1.533	-0.645
6	1.173	5.871	17.216	6.443	62.491	1.016	3.966	1.951	0.192	0.855
		-12.235	-14.057	-8.416	-15.450	-5.727	-4.088	-7.177	-1.829	-0.577
7	1.202	5.171	15.883	5.674	65.399	0.895	3.382	1.987	0.203	1.407
		-12.726	-14.421	-8.738	-16.917	-5.386	-4.182	-6.548	-2.355	-0.764
8	1.231	6.359	18.239	5.278	60.956	0.841	4.926	1.838	0.315	1.248
		-12.813	-15.569	-9.138	-17.313	-5.452	-4.369	-6.652	-2.224	-0.745
9	1.242	5.729	16.888	5.405	63.331	0.828	4.779	1.647	0.279	1.113
		-13.245	-16.387	-9.986	-18.613	-5.888	-4.384	-6.836	-2.036	-0.685
10	1.286	6.860	18.059	5.516	60.997	0.935	4.702	1.606	0.273	1.052
		-13.143	-16.483	-10.285	-18.908	-6.788	-4.234	-7.378	-2.476	-0.691

Variance Decomposition of D(GDP):

Period	S.E.	D(EXR)	D(ONI)	D(DEPO)	D(LOAN)	D(CAR)	D(SECU)	D(PSTK)	D(CPI)	D(GDP)
1	0.257	1.362	8.794	28.780	0.611	0.636	3.257	7.151	18.668	30.741
		-7.018	-8.264	-12.828	-3.016	-3.249	-5.709	-5.225	-7.921	-7.388
2	0.364	8.063	9.464	21.028	0.446	3.842	14.010	5.725	15.133	22.289
		-11.383	-12.084	-9.721	-6.353	-6.273	-8.055	-5.357	-5.601	-5.147
3	0.412	23.723	5.504	17.885	0.495	3.291	10.473	9.135	10.375	19.118
		-13.166	-10.251	-8.199	-6.842	-4.609	-4.888	-6.842	-5.063	-4.093
4	0.427	19.035	8.006	16.927	4.067	5.668	14.535	7.414	9.204	15.144
		-10.657	-11.913	-7.229	-9.163	-5.916	-5.842	-7.050	-3.785	-3.374
5	0.433	21.435	8.331	14.543	5.331	5.258	13.756	9.873	7.343	14.130
		-11.946	-13.009	-8.370	-10.310	-5.504	-5.779	-6.632	-3.419	-3.506
6	0.447	19.743	7.841	13.819	5.068	8.121	15.789	9.103	7.426	13.091
		-10.598	-12.796	-8.179	-9.876	-5.955	-6.032	-7.726	-3.364	-3.114
7	0.457	18.297	6.941	15.494	4.943	8.207	14.479	9.909	7.456	14.274
		-10.884	-12.905	-7.991	-11.095	-5.788	-5.733	-7.195	-3.378	-2.996
8	0.463	16.682	6.284	14.485	6.599	10.277	16.381	8.928	7.497	12.867
		-11.051	-13.061	-7.760	-11.073	-6.514	-6.045	-7.688	-3.361	-2.817
9	0.470	17.636	5.786	13.908	6.762	9.437	15.795	10.164	7.074	13.439
		-10.709	-13.612	-7.787	-12.357	-6.650	-5.329	-7.445	-3.676	-2.767
10	0.477	16.444	5.407	13.385	6.307	11.262	17.845	9.567	7.148	12.635
		-10.909	-13.973	-8.321	-13.043	-6.918	-5.773	-7.930	-3.697	-2.720

Cholesky Ordering: D(EXR) D(ONI) D(DEPO) D(LOAN) D(CAR) D(SECU) D(PSTK) D(CPI) D(GDP)

Standard Errors: Monte Carlo (100 repetitions)

PRO-CYCLICALITY IMPACT OF BASEL II IN VIETNAM

by Ly Thi Tho[1]

1. The Vietnam Banking System – Basel II Implementation in Vietnam

Vietnam has a population of 84 million people, growing at an estimated one million people per year. Vietnam joined the World Trade Organization in November 2006. Cash is the dominant medium of exchange for most economic transactions of individuals and small businesses. With a large and growing population, an expanding economy, and a considerable number of people without access to banking facilities, Vietnam is an attractive growth market for banks. The banking sector is growing at a very rapid pace with assets and liabilities increasing by more than 30% per year, which has improved bank intermediation, thus fueling economic growth.

Vietnam's banking system has undergone substantial reform over the past decade. The reform includes transforming a mono-banking system into a two- tier, market-driven banking system, with participation from financial institutions under various types of ownership: state-owned, joint-stock, joint-venture and foreign. The reform of the banking system has also been undertaken in line with economic reform in various aspects such as taxation, public finance, monetary policy and state-owned enterprises reform.

1.1 Structure of Vietnam's Banking System

- State-owned commercial banks: This group controls approximately 70 percent of assets and liabilities in the banking sector. Five of the seven banks are likely to be partially equitised during the next several years through the government's plans for financial modernisation. Two remaining institutions, a social policy bank and a development bank, remain under government control. Lending by this group is characterised by decentralised processes with loan decisions and files located in branch networks throughout the country. Public confidence in state-owned banks is high due to their close association with the government. State-owned banks are gradually shifting to computerised operating platforms with some offering innovative consumer products.
- 35 joint stock company banks: This group controls roughly 20 percent of assets and liabilities in the banking sector. Most are headquartered in Hanoi and Ho Chi Minh City with a few located in smaller cities. Joint stock company banks are thought to be the fastest growing among the three categories. Operations vary greatly across the group, but generally, the annualised growth of assets may well exceed 40%.

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- 43 foreign entities: 37 branches of foreign banks, 6 joint ventures. This group has a market share of about 10 percent of assets and liabilities in the sector. These banks which have latest management practices and foreign capital, brings with them, a wide variety of products and innovations. As a group, foreign banks are also growing faster than State-owned commercial banks and are steadily increasing their market share.
- Vietnam banking system also includes the People Credit Fund System (Centre People Credit Fund and Regional People Credit Funds), financial companies and leasing companies.

Table 1
Number of Financial Institutions

Category of Bank	Number of banks					
	2001	2002	2003	2004	2005	2006
State-owned bank	5	5	5	5	5	5
Policy bank	1(*)	1(*)	1	1	1	2
Joint stock bank	45	39	37	36	33	35
Joint venture bank	4	4	4	4	5	6
Foreign bank's branch	25	26	27	28	31	37
Central People credit fund	1	1	1	1	1	1
Regional People credit fund	21	-	-	-	-	-
Local credit fund	906	888	897	905	905	905
Financial company	7	7	5	5	6	9
Leasing company	9	9	8	9	9	12

Chart 1

The Performance of Key Indicators in the Banking Industry (Deposit, Loan and Basic Interest Rate Performance)
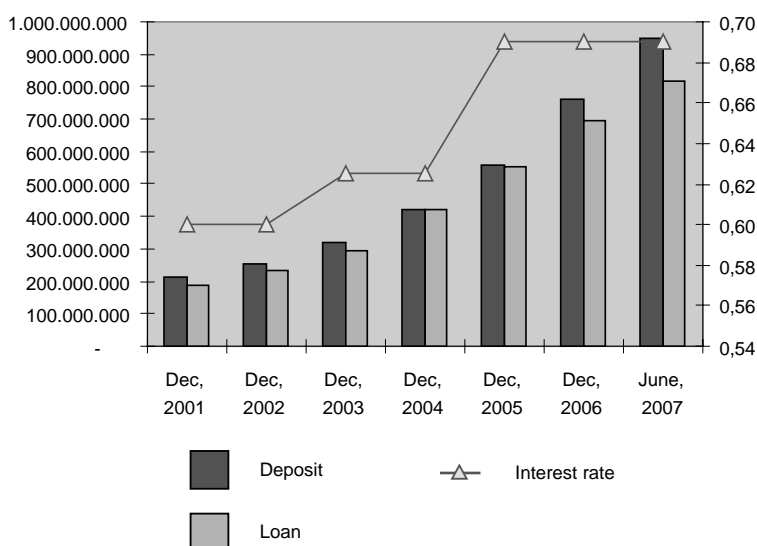
Chart 2

GDP and CPI Performance
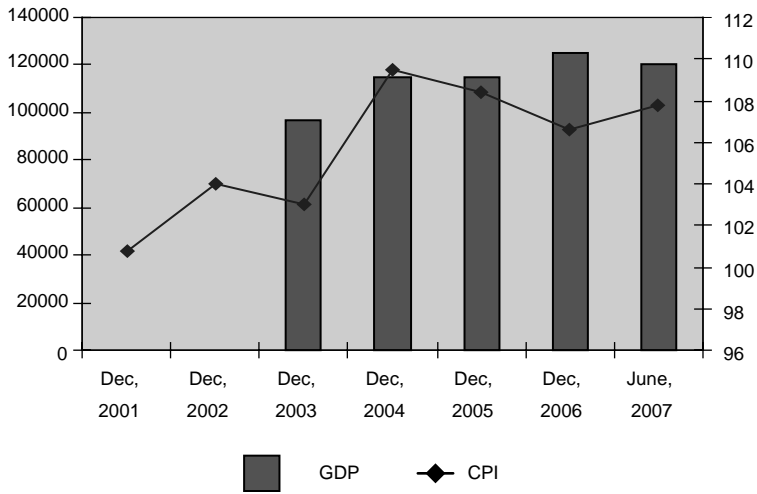
Chart 3

Tier 1 Capital and Total Assets
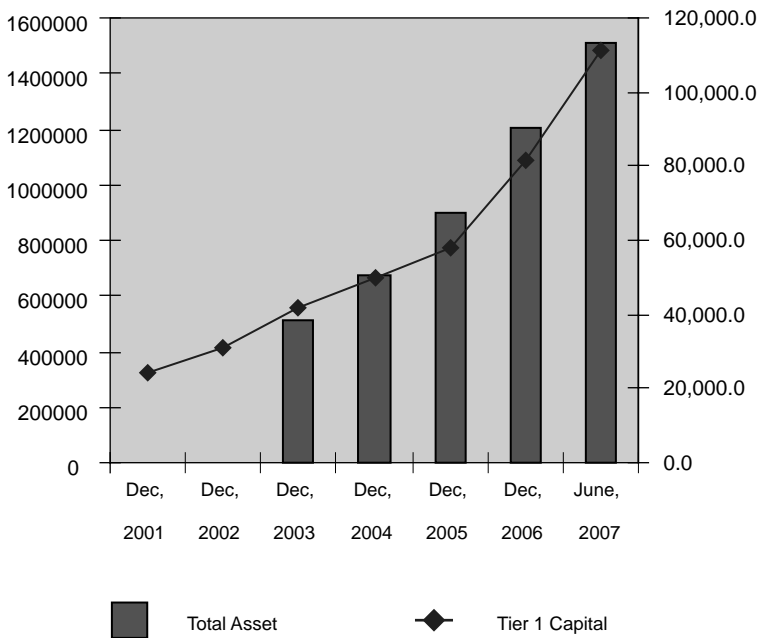
1.2 Development and Implementation of Basel II in Vietnam

1.2.1 Overview of Banking Supervision in Vietnam

The Banking Supervision Department of the State Bank of Vietnam (SBV) has fewer than 700 employees and is organised in two tiers: departments of the SBV head office, and individual work groups at each of the SBV's 64 branches. The Banking Inspectorate conducts examinations of banks operating in Vietnam at the individual branch level as well as at each bank's head office. This methodology is used owing to the decentralised nature of the lending process of the State-owned banks. Separate reports are prepared for each branch office inspected.

Currently, examinations are compliance-based and the Administration Division of the SBV plans on-site activities annually. SBV's laws, regulation, and instructions are adhered to strictly by inspectors and their reports look mainly into the review of compliance with legal and prudential requirements. The inspectors' length of time of inspection in banks and preparation of reports are both set by law although there is no standardised report format, no legal requirement for the frequency of on-site examinations, and no uniform way to categorise and file examination working papers.

For off-site supervision, a relatively small number of staff process large amounts of data, mostly on a monthly basis, from banks. There is a general sense of concern in SBV regarding the quality of data received. As a result, the off-site group makes periodic systematic reports regarding the data received, summarised by category (state-owned, joint stock, foreign), and individual banks. SBV feels that data quality must be improved, with greater emphasis placed on qualitative analysis, risk implications, and conclusions.

Some functions usually associated with banking supervision are handled in separate departments of the SBV. Licensing of banks is managed by the Banks and Non-Bank Credit Institutions Department. Issuance of regulations for credit institutions is a collaborative effort that includes the Banking Supervision Department, although final decisions do not rest with the Department. The existing structure may need some reform for improving effectiveness.

1.2.2 Orientations for Developing the Banking Supervision System

With a view to meeting the practical requirements of development of Vietnam's banking system and complying with international best practices and standards on banking supervision, the existing structure of the State Bank Inspectorate need to be reformed to develop an effective banking supervision system (in terms of legal framework, organisational model, personnel and supervision approach). This includes the establishment, on the basis of the existing Banking Supervision, a general departmental body under the State Bank. This needs a step by step approach, towards 2010, to create preconditions for an overall financial supervision body with a higher legal status and role in performing the function of supervising all financial activities, including banking, securities and insurance. The principal objectives and responsibilities of this body shall be to ensure the stability of the

financial system with strict compliance to the laws on monetary and banking activities and the protection of public interests.

To further improve preconditions for an effective supervisory system:

- To give priority to reforming the organisation and operation of the existing Banking Supervision Department for increased independence and uniformity in operations, directions and management of banking activities under the auspices of the Governor of the State Bank.
- To improve the legal framework as well as technical infrastructure for bank supervision, SBV is currently structuring 4 new laws - Law on Credit Institutions, Law on State Bank of Vietnam, Law on Supervision and Law on Deposit Insurance. This is to ensure that the supervision body for safe banking activities, shall have all necessary powers for supervision of the system and that it observes the provisions of the Laws in their operations.
- To modernise and effectively apply information technologies to banking inspection and supervision.
- To restructure the licensing and operation of banks and simplify licensing procedures. This is to facilitate the establishment and development of credit institutions, particularly non-bank ones, providing them with equal access to the market and the provision of monetary and banking services. This would also enhance market discipline and raise the criteria for establishment of credit institutions and the safety requirements in banking activities so as to ensure that newly established credit institutions shall have capacity to compete and have a wide scope of safe and quality operations with up-to-date technology.

To update banking supervision methods and increase their effectiveness:

- To improve the quality and effectiveness of off-site and on-site inspection work, of which off-site supervision shall be regarded as an important operation for early risk warning in banking activities; to use results and operations of internal audit and independent audit as a tool to support the process of off-site and on-site inspection.
- To improve regulations and prudential measures in banking activities; regulations and policies on management of all types of credit institutions and banking activities and at the same time, to improve the contents, methods and processes of supervision and inspection to make them compatible with the development of information and banking technologies on the basis of application of the core principles for effective banking supervision established by the Basel Committee on Banking Supervision as well as of international standards on banking supervision (Basel Capital Accord - Basel I, 1988 and amendment in 1996). This would lead to the gradual and steady process towards the compliance of the core principles and standards under the new capital accord (Basel II) after 2010.

1.2.3 *The Development and Implementation of Basel II in Vietnam*

At present, Vietnamese credit institutions have just started to conform (since January 2006) to the CAR (under Basel I) which still does not include market risk (Decision No. 457/QD-NHNN issued in April 2005 in which banks are required to report capital adequacy ratio on quarterly basis since January 2006). Besides, the calculation of credit risk is mainly based on the quantitative criteria (classifying loans into 5 groups).

The objective of banking supervision is to ensure the stability of the banking system as stated in Decree 91/1999/ND-CP which states that banking supervision activities are to include the inspection of the adherence of legislation of monetary and banking activities as well as the observance of the provisions of banking operation licenses. The current legal framework is yet to be sufficiently comprehensive and compatible for banking supervision activities using the risk-based supervision methodology. The Banking Supervision Department is drafting the new Decree which will replace Decree 91/1999/ND-CP, planned to be issued by the end of this year.

Procedures on Supervision of Risk Management Processes of Banks Including Liquidity Risk, Interest Rate Risk, and Operational Risk as well as All Other Risks

Since the Banking Supervision Department of the SBV mainly performs compliance supervision of banks, procedures on the assessment of the risk management processes and qualitative factors of risk management practices of banks are not adequately performed by the supervisors. The lack of skills and knowledge of supervisors in risk management procedures is also a weakness at this time.

The Banking Supervision Department is developing regulations on minimum requirements of risk management for credit institutions to provide guidance to banks for the establishment of a comprehensive risk management framework and encourage banks to develop their own proposals.

Minimal Capital Requirement for Different Type of Banks

Minimum legal capital requirements are specified for all banks based on the category. However, in practice, such requirements have remained unchanged for a long time. The regulation on minimal capital requirement for each type of banks was issued in 1998 and has just been changed last year. According to this new regulation, banks must maintain minimum regulatory capital of 3,000 billion VND by 2010 (equal to nearly 200 million USD).

Regulation on Loan Classification and Loan Loss Provision

On 19 April 2005, the State Bank of Vietnam issued Decision No 493/QD-NHNN on Asset Classification and Loan Loss Provision, in accordance with international best practices. Banks are preparing for this loan loss provision in accordance with the Article 6 – Decision 493/2005/QD-NHNN which requires the provisioning to be mainly based on the overdue status of loans and not on the realistic expectation of repayments. Bank inspectors are currently only checking the compliance with regulations rather than assessing realistic repayments.

However, Article 6 will only be valid until 2008 and will be replaced by Article 7 of the Decision 493 which requires credit institutions to apply the qualitative method to classify debts and make provisions.

Independent Evaluation of a Bank's Policies Related to the Granting of Loans and Making of Investments

It is required by BASEL that supervision should include evaluation of a bank's policies relating to the granting of loans and investments. While supervisors perform adequate assessment of the lending policies, the evaluation of a bank's policies for investments is not thoroughly performed by supervisors.

Procedures on Supervision of Market Risks

Apart from regulation on foreign exchange exposures, there are no laws and regulations relevant to market risks for securities, futures, options, or derivatives. In particular, Vietnam has not implemented the market risks amendments to the Basel Accord because banks and authorities in Vietnam have yet to pay adequate attention to these risks. It is also noted that inspectors' current knowledge and skills about market risks and derivatives is limited.

SBV currently looks into whether banks set limits for market risks, including their FX business and whether they have in place, information and internal control systems to ensure the compliance of limits. However, the level of verification by the SBV varies considerably and is dependent on the class of bank being inspected and on the skills and knowledge of supervisors

Anti-Money Laundering

Anti-money laundering stipulation has recently been introduced in Vietnam. The legal framework on anti-money laundering in Vietnam is Decree 74/2005/ND-CP dated 7 June 2005, issued by the Government on the prevention of money laundering. However, up to date there are no specific laws on anti-money laundering.

Generally, the framework is broadly compliant with Basel and other international standards relating to the prevention of financial crime but considerable work has to be undertaken within the SBV and banks to implement the new legal framework.

From July 2007, the Anti-Money Laundering Information Center has been separated from Banking Supervision and is acting as an independent Department of the State Bank of Vietnam.

Monitoring Trends and Developments of a Bank

Currently, there is limited statistics for the monitoring of trends and development of supervised banks and as such SBV officials have considerable difficulty in monitoring trends.

Prudent Limits on Large Exposures to a Single Borrower or Closely Related Group of Borrowers

In general, regulations of the SBV are in line with Basel on large exposures except for the maximum limit of total exposures to a closely related group of borrowers. In accordance with Basel, 25 percent of a bank's capital is the maximum limit for total exposures for a closely related group of borrowers while Decision 457 allows the limit to 60%.

Procedure for Controlling Country Risk and Transfer Risk in International Lending and Investment Activities of Banks and for Maintaining Appropriate Reserves Against Such Risks

Since overseas lending and investments of Vietnamese banks are very limited, the SBV and commercial banks have not issued or developed procedures on the assessment of country risk.

Recently, on 24 May 2006, the government, approved Decision 112-2006-QD-TTg of the government related Scheme on Development of Vietnam's Banking Sector up to 2010 and Orientations toward 2020. Of note, the planned reforms include:

–   In 2008, the National Assembly will consider and pass a new Law on the SBV, Law on Credit Institutions and Law on Deposit Insurance (currently deposit insurance is regulated at decree level only). A Law on Supervision of Safety of Banking Activities is also planned.
–   Forex regulations will be relaxed to further liberalise current transactions and capital transactions.
–   Regulations on market access for foreign investors will be reformed to fulfill Vietnam's commitments to the US, the EU, the WTO and others to open the banking and finance market.

1.2.5   *Several Important Policies/Events Influencing the Banking Industry*

There are several important issues that influence Vietnam's banking industry. Firstly, Vietnam has maintained a high economic growth rate over the past five years. Secondly, the country's CPI has been relatively stable. While the CPI was affected by the rising prices

of petrol, steel, plastics and foodstuff, the government's gradual removal of price subsidies for petrol, electricity, coal, cement and steel while expanding total payments to increase national foreign reserves, have stabilised the CPI.

Thirdly, cultural and educational, healthcare, scientific and technological activities have expanded nationwide. Job generation, poverty reduction and the elimination of hunger and prevention of epidemics were intensified.

Fourthly, administrative reform is making major progress, focusing on procedures for streamlining paperwork, clearly defining responsibility for positions, and solving entrepreneurs' issues in the fastest possible way.

Fifthly, Vietnam's accession to the WTO in November 2006, opened opportunities for international cooperation in financial and monetary activities between central banks, in areas of monetary policy management and strengthening supervision and risk prevention. Vietnamese banks will be able to take advantage of increased capital, modern technology, management best practices, and develop comparative advantage in order to compete internationally and penetrate foreign markets. Vietnamese banks will also have opportunities to improve the quality of their products and services, to diversify their activities based on advanced banking technology, to develop a dynamic, secure, efficient banking system that follows the international best practices, to support the strategy for industrialisation and modernisation of the country and to promote trade liberalisation.

Decision No. 112/2006/Qd-Ttg of 24 May 2006, Approving the Scheme on Development of Vietnam's Banking Sector Up to 2010 and Orientations Toward 2020

- To thoroughly modernise and comprehensively develop credit institutions to be comparable to financial institutions in other ASEAN countries, the institutions shall be diversified in terms of ownership and types, with broader scope of operation. At the same time, foundations are being laid for credit institutions after 2010, that are advanced and meet international standards and are able to compete with other banks in the region and the world.
- To ensure that credit institutions, including state-owned ones, are profit oriented and carry out business activities on market principles.
- To develop a system of credit institutions operating safely and efficiently with advanced technologies, management skills and international practice and standards.
- To develop non-bank credit institutions for a more diversified and balanced financial system.
- To develop and diversify banking products and services, especially capital mobilisation, credit allocation and payments to provide adequate, timely and convenient banking services and utilities for the economy.
- To develop a banking service market, especially a credit market for sound and fair competition among credit institutions of all types, providing easy access for organisations and individuals to banking services and to prevent and limit undesirable credit operations.
- To further restructure the banking system.

- To separate policy credit from commercial credit on the basis of distinguishing the lending function of policy banks from the monetary business function of commercial banks.
- To ensure the business autonomy and accountability of credit institutions.
- To create conditions for domestic credit institutions to improve their management capability, professional level and competitiveness.
- To ensure the business right of foreign banks and financial institutions according to Vietnam's international commitments.
- To closely associate banking reform with enterprise reform, especially state enterprise reform.
- To continue strengthening and developing joint-stock companies.
- To promptly manage poor performing credit institutions to prevent their collapse.
- To ensure operations of public credit funds are secure and efficient.

The motto for the development of credit institutions is therefore "Safety- Effectiveness - Sustainable Development - International Integration".

Table 2
Monetary and Banking Indicators for 2006-2010

1. Inflation (%/year)	Lower than the economic growth rate
2. Average growth of aggregate payment tools (M2)(%/year)	18-20
3. M2/GDP ratio by the end of 2010 (%)	100-115
4. Cash in circulation outside bank/M2 up to 2010 (%)	Not exceeding 18
5. Average credit growth rate (%/year)	18-20
6. Capital adequacy by 2010 (%)	Not lower than 8
7. Non-performing loans/total debt balance by 2010 (%)	Under 5
8. The banking supervision International standard by 2010	standard (Basel I)
9. Minimum international reserve by 2010	12 import weeks

Some commercial banks shall have an equity capital equivalent to USD 800 - 1,000 million by 2010, strong brand names and international competitiveness. Vietnam will also strive to form at least one financial group operating for multiple purposes in domestic and foreign financial markets.

2.   Simulation

The purpose of this Paper is to identify the magnitude of pro-cyclicality effects of Basel II. The over-riding question is whether the regulation of minimum capital requirements under Basel II overstate the magnitude and economic significance of the pro-cyclicality in the new Accord relative to the existing capital requirements in Vietnam?

Due to limitation of data in Vietnam (RWA and CAR are not available from 2000 to 2006) and since impulse response functions trace the effects of innovation shocks on one endogenous variable on other variables in the VAR, the interest rate variable is employed to measure monetary shock, either in recession or in boom situations. DRATE is used to measure the impact of pro-cyclicality of Basel II, with the incorporation of data for Tier 1 Capital (instead of RWA and CAR), which is very much influenced and affected by the Basel II regulation. This would enable us to relate what happened in the economy with the change in regulation of Basel II (RWA and CAR).

In order to do so, the impulse response of changes in interest rate to one standard deviation innovation in loans, deposits, Tier 1 capital, CPI, GDP are presented as follows:

Chart 4

Simulation with Initial Data Impulse Response

Response To Cholesky One S.D. Innovations
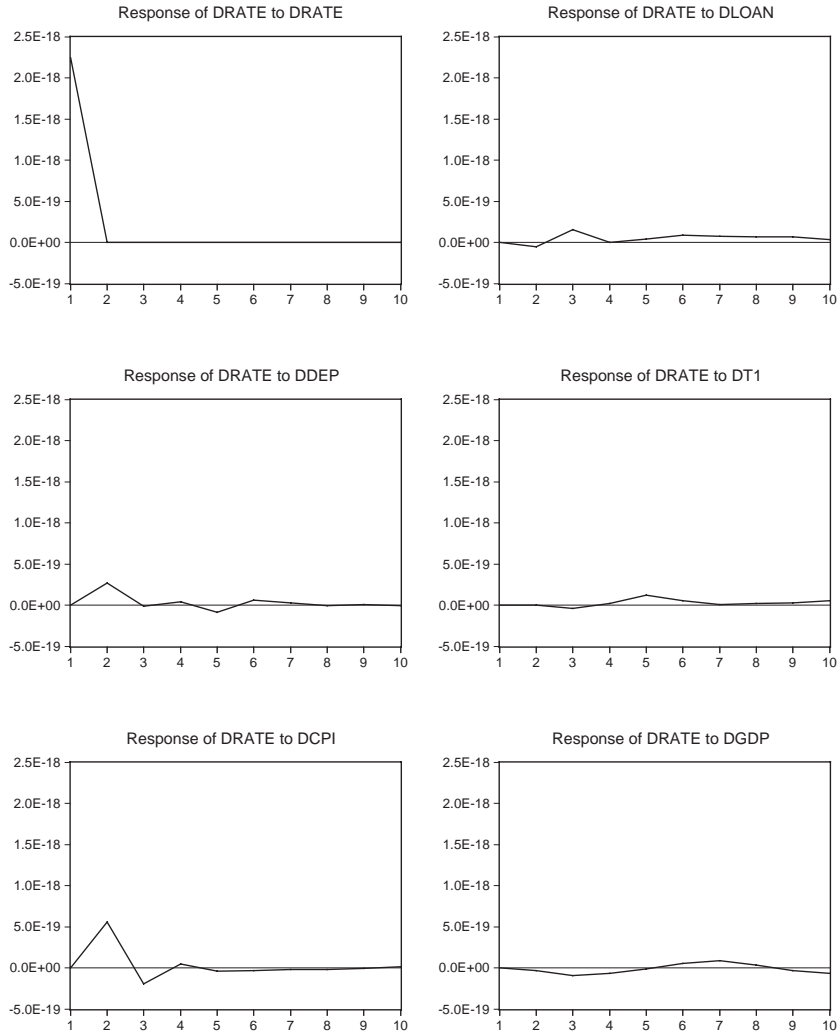
Table 3
Accumulated Response

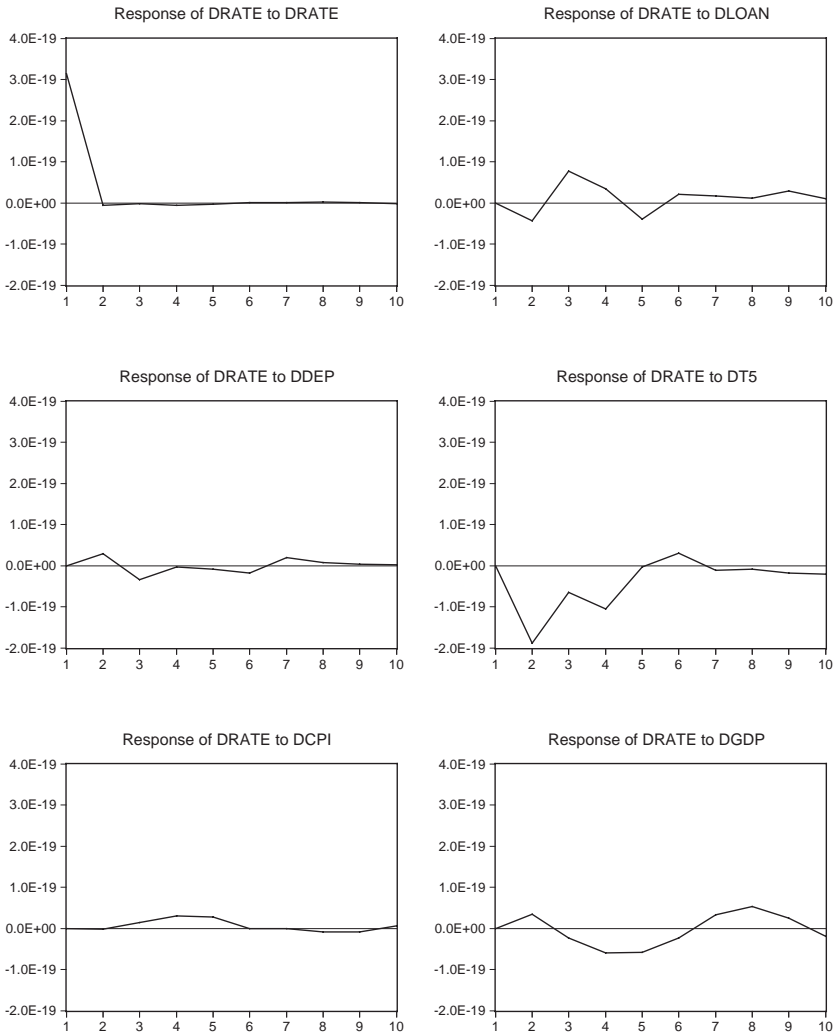| Period	DRATE	DLOAN	DDEP	DT1	DCPI	DGDP
1	2.24E-18	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.24E-18	-5.55E-20	2.69E-19	4.58E-22	5.59E-19	-3.37E-20
3	2.24E-18	9.56E-20	2.53E-19	-3.96E-20	-3.65E-20	-1.30E-19
4	2.24E-18	9.70E-20	2.96E-19	-1.96E-20	4.11E-19	-2.01E-19
5	2.24E-18	1.40E-19	2.11E-19	9.92E-20	3.71E-19	-2.12E-19
6	2.25E-18	2.28E-19	2.70E-19	1.51E-19	3.35E-19	-1.56E-19
7	2.25E-18	3.00E-19	2.99E-19	1.57E-19	3.13E-19	-6.92E-20
8	2.25E-18	3.64E-19	2.92E-19	1.80E-19	2.92E-19	-3.24E-20
9	2.25E-18	4.28E-19	3.01E-19	2.05E-19	2.88E-19	-6.58E-20
10	2.25E-18	4.60E-19	2.95E-19	2.56E-19	2.99E-19	-1.35E-19

Cholesky Ordering: DRATE DLOAN DDEP DT1 DCPI DGDP

Table 4
Variance Decomposition

Period	S.E.	DRATE	DLOAN	DDEP	DT1	DCPI	DGDP
1	2.24E-18	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.33E-18	92.83801	0.056776	1.332277	3.87E-06	5.752017	0.020921
3	2.34E-18	91.63097	0.471307	1.319573	0.029157	6.358153	0.190838
4	2.35E-18	91.47645	0.470552	1.351437	0.036331	6.384931	0.280297
5	2.35E-18	91.06477	0.501086	1.476497	0.291514	6.384597	0.281531
6	2.36E-18	90.76193	0.639203	1.534500	0.339860	6.386318	0.338187
7	2.36E-18	90.53134	0.732534	1.545406	0.339517	6.378685	0.472517
8	2.36E-18	90.42628	0.805508	1.544407	0.348324	6.379177	0.496302
9	2.36E-18	90.32653	0.877803	1.544110	0.359881	6.372523	0.519150
10	2.36E-18	90.19349	0.895067	1.542478	0.406166	6.365232	0.597572

Cholesky Ordering: DRATE DLOAN DDEP DT1 DCPI DGDP

Chart 5

Simulation with Additional 5% in Tier 1 Impulse Response

Response To Cholesky One S.D. Innovations

Response of DRATE to DRATE

Response of DRATE to DLOAN

Response of DRATE to DDEP

Response of DRATE to DT5

Response of DRATE to DCPI

Response of DRATE to DGDP

Table 5
Accumulated Response

Period	DRATE	DLOAN	DDEP	DT5	DCPI	DGDP
1	3.13E-19	0.000000	0.000000	0.000000	0.000000	0.000000
2	3.06E-19	-4.41E-20	2.91E-20	-1.89E-19	-2.65E-21	3.37E-20
3	3.05E-19	3.37E-20	-4.89E-21	-2.53E-19	1.20E-20	1.04E-20
4	2.99E-19	6.74E-20	-8.59E-21	-3.59E-19	4.20E-20	-4.86E-20
5	2.96E-19	2.78E-20	-1.69E-20	-3.62E-19	6.99E-20	-1.07E-19
6	2.97E-19	4.85E-20	-3.53E-20	-3.31E-19	6.87E-20	-1.31E-19
7	2.98E-19	6.56E-20	-1.53E-20	-3.43E-19	6.79E-20	-9.84E-20
8	3.00E-19	7.67E-20	-7.33E-21	-3.52E-19	5.94E-20	-4.51E-20
9	3.00E-19	1.06E-19	-4.31E-21	-3.70E-19	5.05E-20	-2.02E-20
10	2.99E-19	1.16E-19	-1.99E-21	-3.91E-19	5.66E-20	-3.97E-20

Cholesky Ordering: DRATE DLOAN DDEP DT5 DCPI DGDP

Table 6
Variance Decomposition

Period	S.E.	DRATE	DLOAN	DDEP	DT5	DCPI	DGDP
1	3.13E-19	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	3.71E-19	71.26976	1.413562	0.615235	25.87208	0.005128	0.824232
3	3.87E-19	65.48280	5.342203	1.336841	26.57157	0.149197	1.117396
4	4.08E-19	58.91486	5.489412	1.210562	30.60656	0.673481	3.105123
5	4.15E-19	56.90559	6.213884	1.208852	29.56471	1.102286	5.004676
6	4.18E-19	56.17440	6.378925	1.387560	29.71503	1.088914	5.255173
7	4.20E-19	55.57380	6.477218	1.599512	29.47581	1.077610	5.796049
8	4.24E-19	54.59047	6.430719	1.606276	28.99812	1.099182	7.275233
9	4.26E-19	54.02177	6.828187	1.594557	28.88217	1.131335	7.541987
10	4.27E-19	53.74522	6.848649	1.589318	28.95848	1.146386	7.711953

Cholesky Ordering: DRATE DLOAN DDEP DT5 DCPI DGDP

Chart 6
Simulation with Additional 10% on Tier 1 Impulse Response
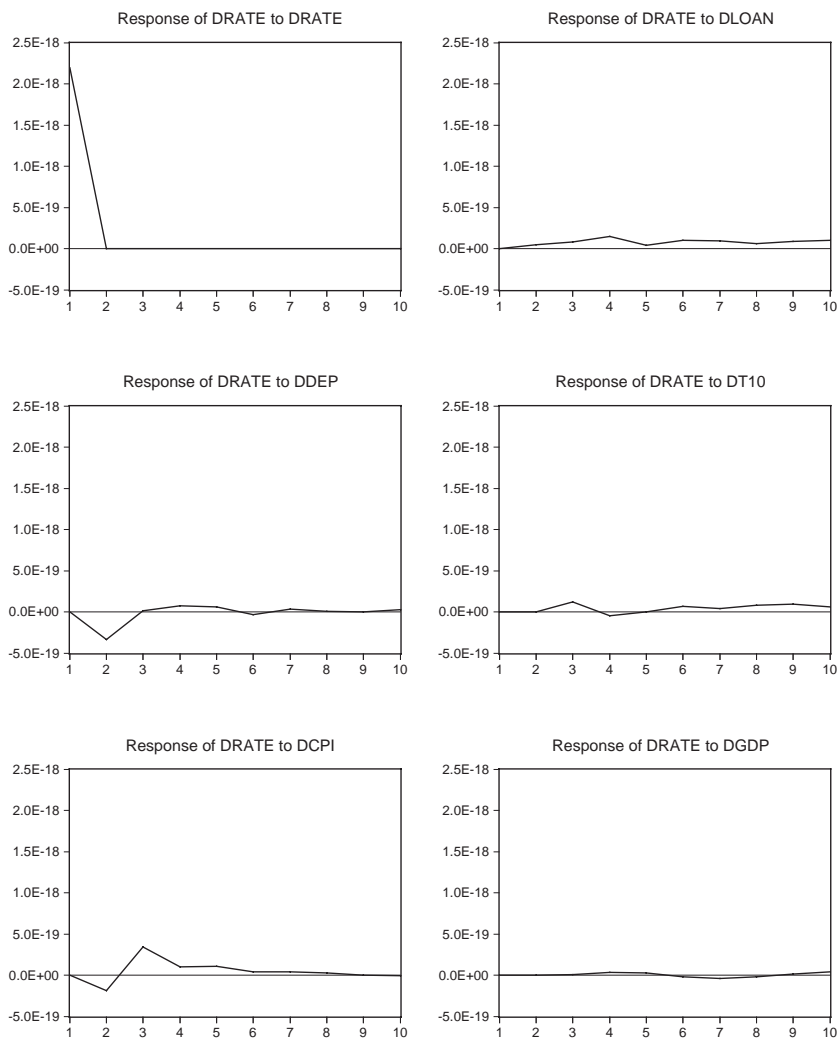
Response To Cholesky One S.D. Innovations

Response of DRATE to DRATE

Response of DRATE to DLOAN

Response of DRATE to DDEP

Response of DRATE to DT10

Response of DRATE to DCPI

Response of DRATE to DGDP

Table 7
Accumulated Response

Period	DRATE	DLOAN	DDEP	DT10	DCPI	DGDP
1	2.20E-18	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.20E-18	4.67E-20	-3.35E-19	2.73E-21	-1.85E-19	0.000000
3	2.20E-18	1.31E-19	-3.21E-19	1.23E-19	1.54E-19	7.14E-21
4	2.20E-18	2.81E-19	-2.45E-19	7.37E-20	2.57E-19	3.80E-20
5	2.20E-18	3.25E-19	-1.86E-19	7.25E-20	3.66E-19	6.34E-20
6	2.20E-18	4.27E-19	-2.19E-19	1.42E-19	4.05E-19	4.00E-20
7	2.20E-18	5.20E-19	-1.85E-19	1.85E-19	4.42E-19	-3.02E-21
8	2.20E-18	5.80E-19	-1.77E-19	2.63E-19	4.67E-19	-2.51E-20
9	2.20E-18	6.65E-19	-1.75E-19	3.59E-19	4.64E-19	-1.38E-20
10	2.20E-18	7.63E-19	-1.46E-19	4.22E-19	4.54E-19	2.60E-20

Cholesky Ordering: DRATE DLOAN DDEP DT10 DCPI DGDP

Table 8
Variance Decomposition

Period	S.E.	DRATE	DLOAN	DDEP	DT10	DCPI	DGDP
1	2.20E-18	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.23E-18	97.00854	0.043932	2.256716	0.000150	0.690658	0.000000
3	2.26E-18	94.40827	0.180307	2.200164	0.285681	2.924578	0.000998
4	2.27E-18	93.62804	0.621119	2.293713	0.331561	3.106101	0.019465
5	2.27E-18	93.30339	0.655632	2.353742	0.330436	3.324960	0.031844
6	2.28E-18	92.97067	0.855277	2.367262	0.421713	3.342797	0.042283
7	2.28E-18	92.70552	1.018044	2.383299	0.455883	3.359583	0.077666
8	2.28E-18	92.51228	1.084675	2.379588	0.572332	3.364308	0.086816
9	2.29E-18	92.21737	1.220820	2.372051	0.747015	3.353772	0.088977
10	2.29E-18	91.93510	1.398679	2.381571	0.820564	3.345286	0.118802

Cholesky Ordering: DRATE DLOAN DDEP DT10 DCPI DGDP

Chart 7

Simulation with Additional 15% on Tier 1 Impulse Response
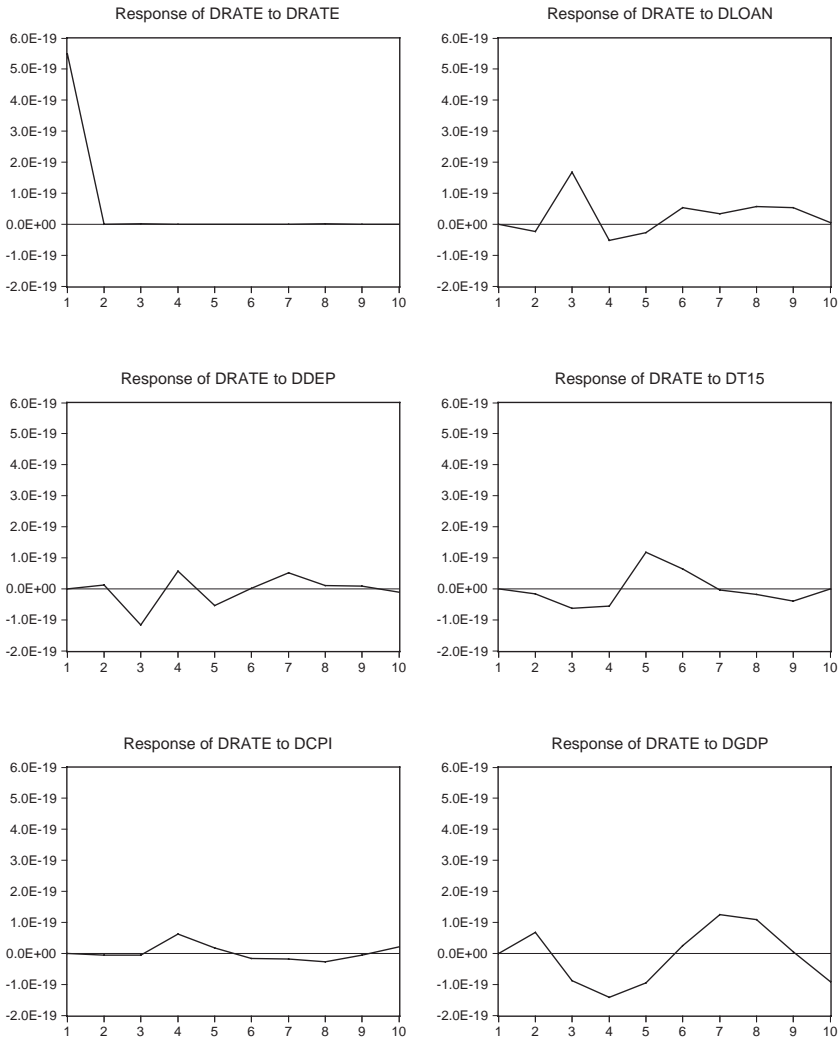
Response To Cholesky One S.D. Innovations

Response of DRATE to DRATE

Response of DRATE to DLOAN

Response of DRATE to DDEP

Response of DRATE to DT15

Response of DRATE to DCPI

Response of DRATE to DGDP

Table 9
Accumulated Response

Period	DRATE	DLOAN	DDEP	DT15	DCPI	DGDP
1	5.49E-19	0.000000	0.000000	0.000000	0.000000	0.000000
2	5.49E-19	-2.45E-20	1.29E-20	-1.73E-20	-5.32E-21	6.74E-20
3	5.51E-19	1.43E-19	-1.05E-19	-8.09E-20	-1.11E-20	-2.08E-20
4	5.50E-19	9.09E-20	-4.77E-20	-1.37E-19	5.07E-20	-1.63E-19
5	5.50E-19	6.29E-20	-1.01E-19	-2.02E-20	6.73E-20	-2.59E-19
6	5.50E-19	1.16E-19	-1.00E-19	4.30E-20	5.13E-20	-2.34E-19
7	5.50E-19	1.51E-19	-4.83E-20	3.82E-20	3.26E-20	-1.10E-19
8	5.51E-19	2.08E-19	-3.85E-20	1.92E-20	4.48E-21	-2.01E-21
9	5.51E-19	2.62E-19	-3.06E-20	-2.14E-20	-1.35E-21	2.98E-21
10	5.51E-19	2.66E-19	-4.20E-20	-2.19E-20	2.00E-20	-8.81E-20

Cholesky Ordering: DRATE DLOAN DDEP DT15 DCPI DGDP

Table 10
Variance Decomposition

Period	S.E.	DRATE	DLOAN	DDEP	DT15	DCPI	DGDP
1	5.49E-19	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	5.54E-19	98.16688	0.195612	0.053872	0.097475	0.009209	1.476952
3	6.01E-19	83.58414	7.909409	3.872026	1.204780	0.016986	3.412663
4	6.28E-19	76.54902	7.923539	4.367848	1.910732	0.982821	8.266043
5	6.49E-19	71.68163	7.605869	4.773173	5.047530	0.986342	9.905460
6	6.55E-19	70.39437	8.134621	4.687658	5.891331	1.028605	9.863411
7	6.69E-19	67.29830	8.038823	5.087479	5.637453	1.061400	12.87654
8	6.82E-19	64.94076	8.472275	4.930102	5.517840	1.194564	14.94446
9	6.85E-19	64.29354	9.007281	4.894282	5.814190	1.189894	14.80081
10	6.91E-19	63.09636	8.843541	4.830419	5.705969	1.262704	16.26101

Cholesky Ordering: DRATE DLOAN DDEP DT15 DCPI DGDP

Table 11
Granger Causality Test: Loan vs GDP

Pairwise Granger Causality Tests
Date: 01/04/08   Time: 15:34
Sample: 2001:03 2007:06
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
LOAN does not Granger Cause GDP	74	52.2881	1.5E-14
GDP does not Granger Cause LOAN		3.56825	0.03352

In the first case of simulation with initial data, Chart 4 shows that the impulse response of interest rate on loan, deposit, Tier 1, CPI, GDP is around the horizontal axis. We could say that interest rate does not have any significant effects from loans and Tier 1 Capital, meaning that changes in loan behaviour leading to changes in Tier 1 Capital do not have shocks on monetary policy.

In the second case, simulation is made with an additional 5% in Tier 1 (with the assumptions that NPL increase and RWA increase as well as the CAR). The response of the interest rate to loans fluctuated slightly in the first six months (Chart 5). The response of the interest rate to Tier 1 Capital decreased in the first five months, increased in the sixth month and was stable around horizontal axis, meaning that when Tier 1 Capital increase 5%, interest rate may decrease in response to Tier 1 Capital and loans, albeit having insignificant effects.

In the third case, simulation is done with an additional 10% in Tier 1 (with the assumptions NPL increase, RWA increase, as with the CAR). The response of interest rate to loans and Tier 1 is almost the same with interest rate increasing slightly in the first 3 months, then stabilising a little above the horizontal axis.

In the fourth case, simulation is done with an additional 15% in Tier 1. The response of the interest rate to loan decreased slightly in the first 2 months, subsequently increasing in the next month and fluctuating there after. The response of the interest rate to Tier 1 Capital decreased in the first 3 months and increased sharply in the fourth month, meaning that when Tier 1 Capital increases 15%, interest rate changes most in fourth case, albeit still insignificant.

The Granger Causality Test was used for bank lending and GDP which showed that bank lending does not affect GDP and vice versa. This means that bank lending is demand oriented and is not an effective monetary transmission channel in Vietnam.

3.   Conclusion

Implementation of Basel II and compliance with international best practices, would aid in the risk management of Vietnam's credit institutions. However, the empirical tests, based on data from 2000 to 6/2007, shows that the pro-cyclical impacts of Basel II are insignificant for Vietnam. The reasons are as follows:

1.   Vietnam has just implemented Basel I in 2006 and as such data is not sufficient for the empirical test. The requirement for banks to maintain Basel II adequacy capital ratio during a downturn cycle, is somewhat akin to implementing monetary policy tightening. Banks have to decrease loans and be more prudent in lending activities. However, at present, Vietnam has insufficient data to prove this.

2. The capital of credit institutions (Tier 1) is not affected by loan behaviour (risk weighted assets). In recent years, especially in 2006 and 2007, Vietnamese credit institutions (Joint stock commercial banks) have dramatically increased regulatory capital and at the same time, improved their financial status (decreasing NPL by state owned commercial banks). During the rehabilitation of the banking system, the capital of credit institutions in last few years, have regulatory orientation than risk based requirement.

3. The CAR at present is higher than 8% (according to Basel I calculation).