MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT

Nephil Matangi Maskay
(Project Leader)

MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT

Nephil Matangi Maskay
(Project Leader)

FOREWORD

For the past few decades, the nature of links between financial conditions and the real macro economy (the macro-financial link) has changed. The links have expanded and deepened significantly due mainly to the following two reasons. Firstly, financial liberalisation has expanded the availability of financial products and services, increasing the connection between financial markets, which in turn, has enhanced the channels through which financial conditions affect the real macro economy. Secondly, financial globalisation has amplified the adverse effect of financial contagion from one country to another, and subsequently, a financial crisis or turmoil in one country tends to easily affect the financial markets and the real macro economy of other countries through the above mentioned macro-financial links. The current US sub-prime mortgage crisis is a case in point of how the US financial crisis adversely affected, not only its domestic financial system and economy, but also the global financial system and economy. However, the current understanding of how the financial conditions affect the real macro economy seems to be insufficient. In particular, it is becoming more important to comprehend how monetary policy influences financial conditions. In light of these issues, this study explores the implication and nature of macro-financial links of SEACEN central bank policies and reviews the experiences of participating countries.

The study highlights that the function of allocation of resources in some SEACEN members has expanded and broadened beyond that of the monetary and financial system as a whole. This suggests that monetary policy management needs to be better coordinated and fine-tuned. The paper thus proposes that the country-specific formulation and implementation of monetary policy should be coordinated with financial policy. We hope that the findings and suggestions of this study may be valuable references to central bankers and other policy makers in the design of their respective monetary policies.

This collaborative research was led by Dr. Nephil Matangi Maskay, Director, Research Department of Nepal Rastra Bank and concurrently Visiting Research Economist of The SEACEN Centre, and participated by 10 country researchers from 8 member central banks and monetary authorities. The SEACEN Centre wishes to express its sincere gratitude to the participating member central banks and their country researchers for actively participating in this project and preparing the country chapters for their respective countries. They are namely, Mr. Ung Visoth from National Bank of Cambodia; Ms. Deasy Ariyanti from Bank Indonesia; Mr. Surendran Chelliah R. Karunairajah from Bank Negara Malaysia;

The views expressed in this study, however, are those of the authors and do not necessarily reflect those of The SEACEN Centre or the SEACEN member central banks/monetary authorities.

Dr. A. G. Karunasena   July 2010
Executive Director
The SEACEN Centre
Kuala Lumpur

TABLE OF CONTENTS

PART II: COUNTRY CHAPTERS

CHAPTER 2: MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT IN CAMBODIA
By Ung Visoth

CHAPTER 3: MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT IN INDONESIA
By Deasy Ariyanti

CHAPTER 4: MACRO-FINANCIAL LINKAGES AND MONETARY POLICY MANAGEMENT IN MALAYSIA
By Surendran Chelliah R. Karunairajah

CHAPTER 5: MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT IN MYANMAR
By Tin Maung Htike

EXECUTIVE SUMMARY

The macroeconomy is linked with the financial market by the latter performing the important function of allocating resources and risks, which facilitates overall economic growth. Importantly, the macro-financial link is closely intertwined with monetary policy management since it contributes to fine-tuning and making it more effective. However, fundamental changes related to both increasing globalisation and financial development suggest that the nature of this link has changed significantly.

Assessing the macro-financial linkages of the eight participating SEACEN member countries through three inter-linked perspectives, show diverse results but generally suggest that (i) the macro-financial link in SEACEN countries between the policy interest rate and output gap has been weak - this is despite controlling for direct financing, globalisation, financial sector development, among others; (ii) results point to the existence of the channel of interest rates for monetary transmission; (iii) monetary authorities responded to the global crisis both in terms of their domestic credit situations and also coordinated efforts with the major participants in the financial system.

The evidence from the above three perspectives of the study, suggests that the nature of the macro-financial links has changed. The function of allocation of resources in the majority of the participating SEACEN members has evolved beyond that of banking and non-bank financial intermediaries, i.e., the monetary system. Given this finding, the paper proposes that the country-specific formulation and implementation of monetary policy should be coordinated with financial policy. This study also proposes that the participating SEACEN members give greater emphasis to financial stability, as perhaps an ultimate target. More specific recommendations are:

- Enhance coordination and cooperation with domestic players; such as with the supervisory authority of the capital markets, etc. In this regard, it is first essential that the present financial structure and potential future development be assessed. Once this is done, appropriate levels of coordination and cooperation can be tailored to countries to match their unique characteristics. The specific modalities of this will have to be worked out but it is felt that such will effectively pre-empt financial crisis from occurring and to mitigate the impact of the financial crisis once it occurs.

- Lay the foundation for coordination with international bodies, such as the IMF etc. Again, it is essential that the present level of globalisation and potential future levels of globalisation be assessed. Once this is accomplished, necessary coordination can be tailored to match the countries' unique characteristics. This may start with information sharing, already being initiated in the SEACEN Expert Group on Capital Flows (SEG). This can eventually lead in the future to coordination in monetary and financial policy matters.

- Revise the monetary policy framework in this regard, paying close attention to the country's financial structure. This would necessitate the development of appropriate instruments and operating targets, conditional to the above recommendations. This may entail involvement in the process of monetary policy formulation and implementation, namely revising the monetary policy framework such as instruments and operating targets.

PART I: INTEGRATIVE REPORT

PART I: INTEGRATIVE REPORT

CHAPTER 1

MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT

By

Nephil Matangi Maskay, PhD[*]

1. Introduction

An appropriate monetary policy contributes to sustainable economic growth. Awareness of the nature of macro-financial links, which connects the financial sector with the macroeconomy, is essential to for the optimal fine tuning of monetary policy. However, over the last decades, the channels between financial conditions with the real macro economy have expanded and deepened significantly. This is due mainly to the following two reasons. Firstly, financial globalisation, which is reflected in the world becoming more interconnected through trade and finance, has amplified the adverse effects of financial contagion from one country to another. Secondly, financial liberalisation has expanded the availability of financial products and services, increasing the connection among financial markets which in turn, has enhanced the channels through which financial conditions affect the real macro economy.[1] In this context, it is imperative for monetary authorities to be aware of the nature of the macro-financial links in the present changing context.

———————
*. Director, Nepal Rastra Bank, Baluwatar, Nepal and Visiting Research Economist, The SEACEN Centre, Malaysia

Contact Details: Tel: + 977 1 4441048 (Fax) + 977 9803059409 (Mobile); E-mail: nmmaskay@nrb.org.np , nephil_m_maskay@hotmail.com. I am indebted to Tony Cavoli and Reza Siregar for providing valuable comments. The views do not reflect those of the Nepal Rastra Bank, The SEACEN Centre or SEACEN member central banks.

1. This is characterised as the spread of new financial intermediation, the wider use of financial innovation and the expansion into nontraditional banking activities, have made the channel more complex (IMF, 2006). In course of time this channel has been enriched to include other asset prices namely equity prices (such as from Tobin's q theory and wealth effects) and housing and land price. These enhance the existing interest rate channel, and thus are suggested to have an amplifying and propagating effect.

While the fundamental links between the macroeconomy and financial environment have remained the same, the episodes of financial crisis suggest that the current understanding of how the financial conditions affect the real macro economy is insufficient. In particular, it is becoming more important to comprehend the channels by which monetary policy influences financial conditions. Currently in many countries, price stability is a key objective of monetary policy management but it is apparent from the recent US sub-prime mortgage crisis that financial stability is also a vital part of monetary policy management. However, the current global crisis, which is an example of how the US financial crisis adversely affected not only its domestic financial system and economy but also the global financial system and economy, occurred in a period of low and stable inflation, suggesting that the focus simply on price stability may be insufficient. Therefore, in these changing financial landscapes, the success of monetary policy is dependent on the ability of policy makers to design monetary policies that explicitly take into account macro-financial channels, particularly during the emergence of financial turmoil/crisis.

This research endeavours to focus analysis on SEACEN member countries and assess the macro-financial linkages. Of the sixteen members (for more information, refer to the SEACEN web page at http://www.seacen.org), eight participated in the research project (namely Cambodia, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Taiwan and Thailand) while five other member countries (namely Fiji, Korea, Mongolia, Sri Lanka and Vietnam) responded to the project questionnaires. A snapshot of the participating countries – specifically the economy, population, area, geographical type - is provided in the stylised facts of Table 1.1. The statistics in Table 1.1 show the diversity of the eight countries' external and financial developments, financing structure (via presence of the stock market) and selection of targeting frameworks in 2009.

Despite this wide diversity, the monetary authorities have a common goal (explicit or implicit) of facilitating domestic economic growth. This calls for having optimal monetary management to provide an enabling environment in this regard.

However, over time, there is an apparent change in the macro-financial linkages as shown by the stylised openness and financial indicators of participating SEACEN members. Openness refers to the contribution from international trade, which is generally of goods and services but also involves capital (portfolio) flows or financial openness in some countries. These stylised openness indicators are shown in Figure 1.2 which plots the mentioned indicators across time:

Table 1.1: Stylised Country Statistics of Participating SEACEN Member Countries

SN	Country	Economy (mill. $)	Pop (mil.)	Area (sq. km)	GT	EI indicator	FD indicator	Stock Exch.	Monetary Framework
1	Cambodia	-	13.4	181,035	C	-	32.25%	None	-
2	Indonesia	510,779	230	1,919,440	A	49.6	22.68	Yes - 1977	Inflation Targeting
3	Malaysia - 2008	214,254	27.729	329,845	C	169.44%	98.36%	Yes - 1976	Interest Rate Targeting
4	Myanmar	-	56	677,000	B	-	-	None	-
5	Nepal - 2008	8,665 (PP)	30	147,181	B	46%	49%	Yes - 1994	Monetary Targeting
6	Philippines	55,700 (2009:1)	92.5 (2009:1)	299,404	A	76.65%	33.5%	Yes - 1992	Inflation Targeting
7	Taiwan - 2008	402,616	22.997	36,191.5	A	122.8%	140%	Yes - 1962	Monetary Targeting
8	Thailand	269,309.4	66.32	513,115	C	150.5%	95.2%	Yes - 1975	Inflation Targeting

Note: "-" refers to information being not available from the SEACEN country papers. 1. Economy (in US $ dollars) in 2008; 2. Population (in millions) from country reports; 3. Area (square kilometers) from country reports; 4. GT is Geographical type A. Island, B. Landlocked C. Neither A or B; 5. External Integration (EI) indicator is (X of goods and services + M of goods and services)/GDP; in 2008; 6. Financial Development (FD) indicator is the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP in 2008; 7. Presence of stock exchange and year of establishment; 8. Monetary Framework in 2009 from country reports. Source: Country Reports (SEACEN 2010 a – h)

Figure 1.1: Stylised Openness Statistics of Participating SEACEN Members

Openness Indicator - Nepal

Openness Indicator - Philippines

Openness indicator - Taiwan

6

Openness Indicator - Thailand
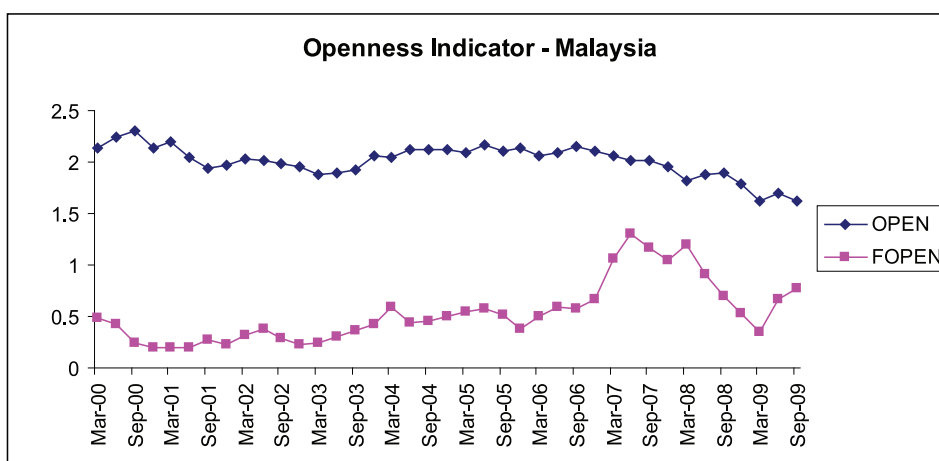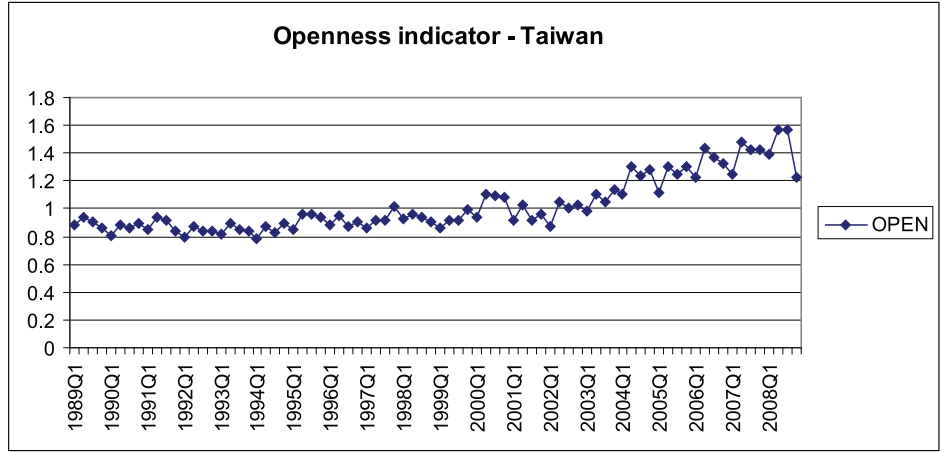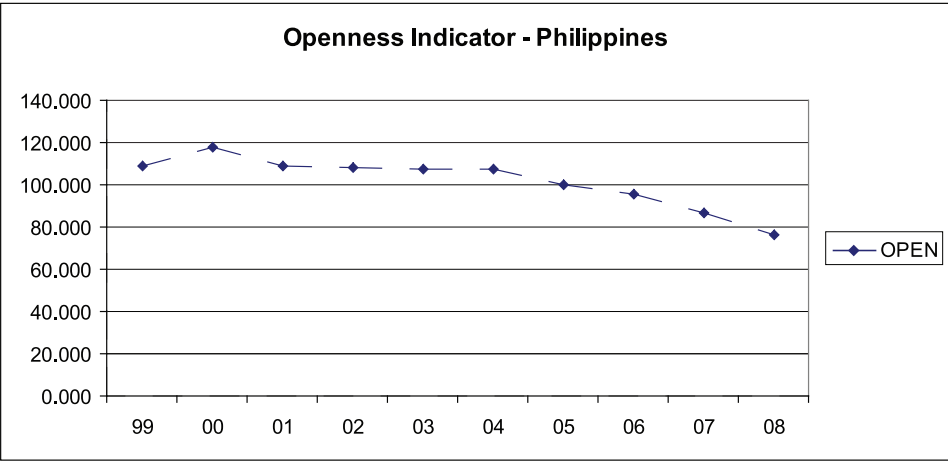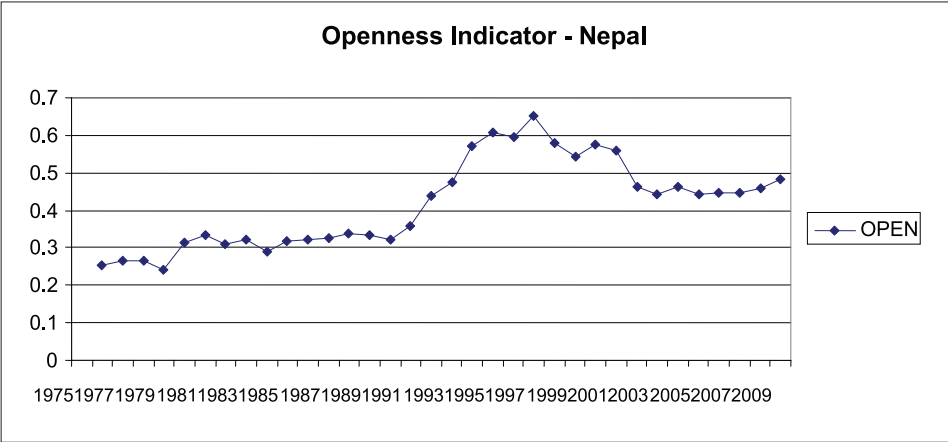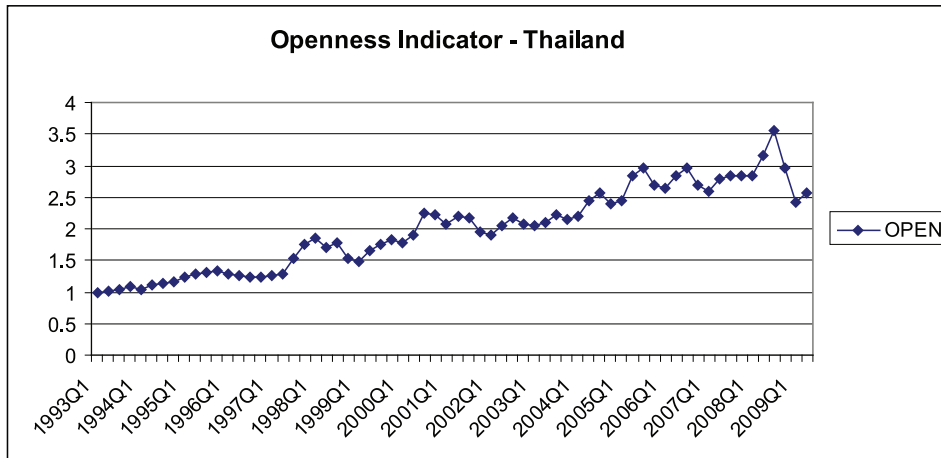
Two-pieces of information stands out: firstly, over time there are different magnitudes of trade integration with the global economy; secondly, that only some have participated in financial trade, reflected in financial openness. With regard to financial liberalisation, which is reflected in financial development, the perspective of financial deepening, proxied by the broad money (M2) to GDP and private sector credit (CRE) to GDP, along with that of financial broadening, proxied by the contribution of indirect financing that is equity and bonds to GDP, is taken. These stylised financial statistics are shown in Figure 1.2 which plots the trends of the afore-mentioned financial indicators:

Figure 1.2: Stylised Financial Statistics of Participating SEACEN Members

Financial Statistics - Malaysia

7

CRE ratio - Cambodia

Financial statistics - Nepal

Financial statistics - Taiwan

Financial Indicator - Thailand
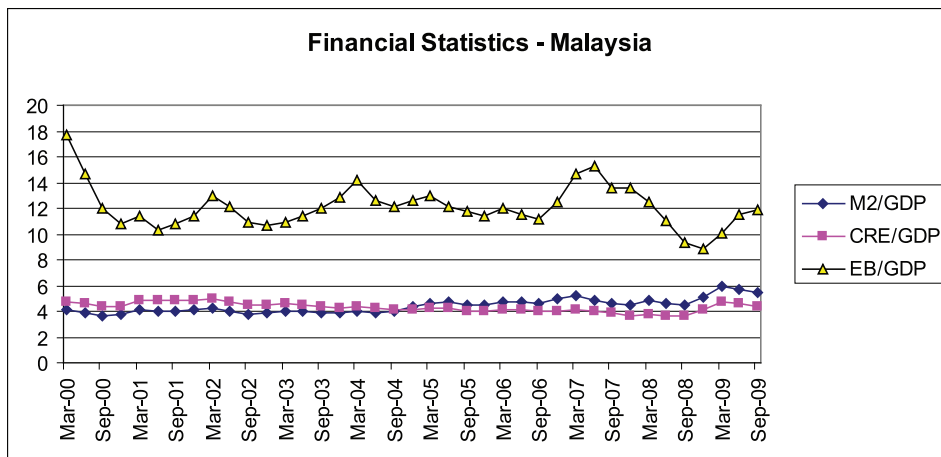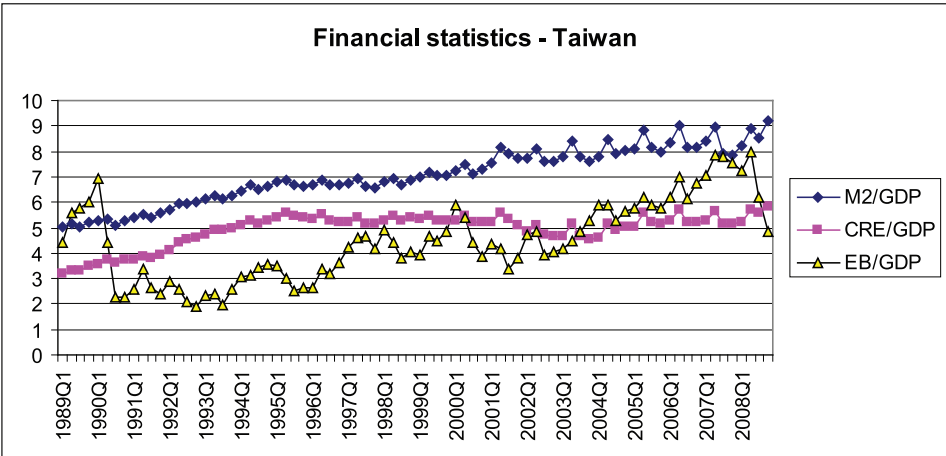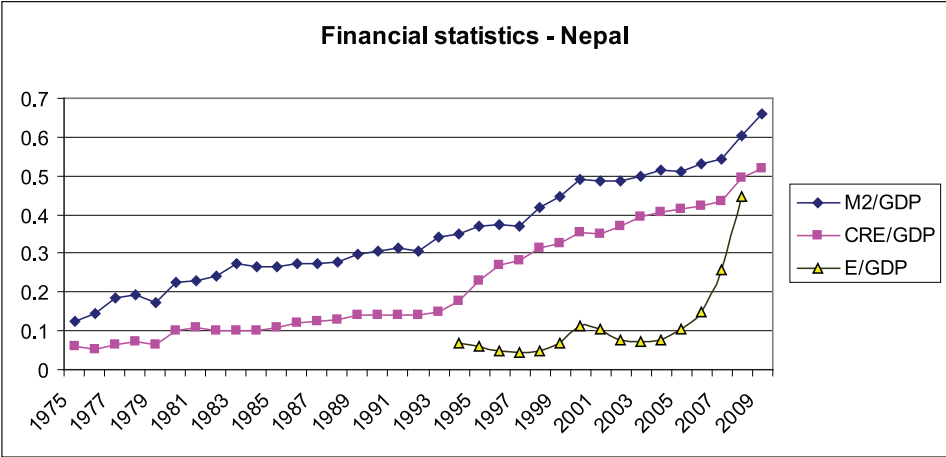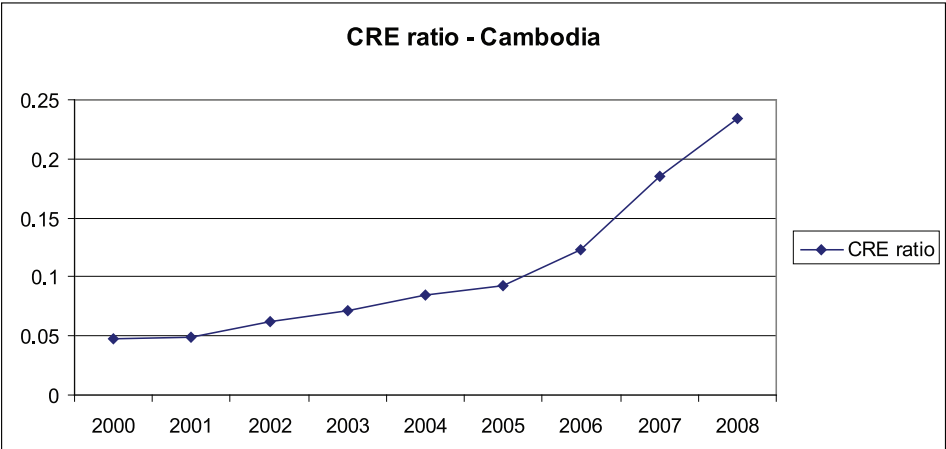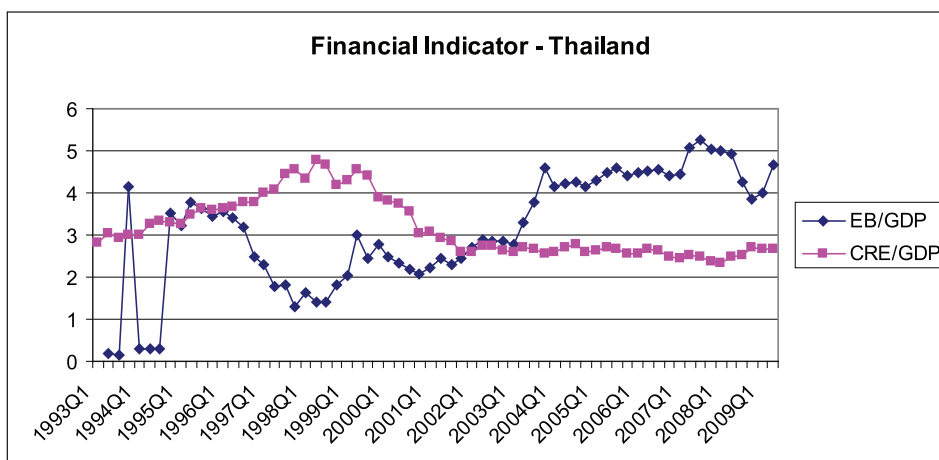
Source: Country Reports (SEACEN 2010 a – h)

The trends highlight that structural changes are occurring in the financial system. Six of the participating members have some level of financial sector deepening (except for Cambodia, where no stock exchange exists, and the Philippines, where there is little contribution from indirect financing). The contribution to the remaining countries in terms of indirect financing are similar (Taiwan) if not greater (Malaysia and Thailand) than the measure of CRE to GDP. In the case of Nepal, there is growing contribution of indirect financing shown by the increase in the measure of indirect financing over the period from 2004 to 2008, by 5.79 times, and rapidly moving towards the level of CRE to GDP. These stylised financial indicators suggest that there are significant changes taking place in the financial markets.

What changes have there been in terms of the macro-financial linkages and what implications does this have for monetary policy in the SEACEN countries? The motivation for this research study is to understand the nature of the macro-financial linkages in the region, to ensure that the most appropriate monetary policies will be implemented. In this regard, three interlocking perspectives were taken and these were developed into three main questions namely: (1) what is the assessment of these linkages in participating SEACEN countries? (2) what is the assessment of the monetary transmission of interest rates in participating SEACEN countries?; and (3) what are the responses of SEACEN monetary authorities to the present global crisis? Based on the above three enunciated questions, the project proceeds in a qualitative and quantitative manner whereby

country chapters are contributed by country economists[2] from the eight participating SEACEN member countries. This chapter integrates all eight country papers.

The structure of the report encompasses four parts excluding this introductory section. Section 2 discusses on the macro-financial linkages and monetary management. The third section discusses the three perspectives for assessing the macro-financial links in the SEACEN countries. The fourth section provides some policy recommendations and ends with concluding remarks.

2. Macro-financial Link and Monetary Policy Management

2.1 Macro-financial Link

The macroeconomy and the financial environment are closely linked. At a fundamental and basic level, the financial markets efficiently allocate resources and risks to facilitate wealth accumulation, which leads to overall development and growth. This relationship was, perhaps, first articulated by Schumpeter in 1911.

Another strand of literature emphasises the role played by financial development in reducing the cost of external financing by firms. Informational asymmetry or transaction costs make internal financing cheaper than external funds (as cited by Aziz, 2008 in Myers and Majluf, 1984). Financial development, thus, reduces these informational asymmetries and transactions costs. The most well known formalisation of this relationship is the McKinnon-Shaw hypothesis that government restriction by repressing financial development, adversely affects both the level of investment and productivity and thus overall growth. This argument has been reformalised in various ways (as cited by Aziz, 2008 in Bencivenga and Smith, 1991; Greenwood and Jovanovic, 1990; and Pagano, 1993), but the overall theme is the same.

One way the link can be characterised is via the textbook IS-LM analysis of the real and monetary sector, where changes in the interest rate, i.e. the cost of funds, leads to an opposite change in national income via allocation of

_____

2. They are: Mr. Ung Visoth from National Bank of Cambodia; Ms. Deasy Ariyanti from Bank Indonesia; Mr. Surendran Chelliah R. Karunairajah from Bank Negara Malaysia; Mr. Tin Maung Htike from Central Bank of Myanmar; Mr. Rajendra Pandit from Nepal Rastra Bank; Dr. Veronica Batallones Bayangos from Bangko Sentral ng Pilipinas; Mr. Chun-Nan Liao from Central Bank of the Republic of China (Taiwan); Dr. Kajorn Thanapase, Dr. Pornpinun Chantapacdepong, and Mr. Thiti Kedphitthaya from Bank of Thailand.

investment since an interest rate rise means a rise in the cost of funds and thus a reduction in national income. Thus, the link connecting the real sector with the financial markets can be characterised via the efficient allocation of scarce resources and risks.

2.2 Monetary Management

Monetary policy is formulated to take advantage of the macro-financial link. As most of the sources of financing in the past had come from the banking and non-bank financial intermediaries sector, i.e. the monetary system, the focus of monetary policy was accordingly on this area. This narrow focus on the monetary system, allows the respective monetary authorities to simplify and highlight the various channels of monetary policy, as shown in Table 2.1.

Table 2.1: General Monetary Framework

Instruments	Operating target		Intermediate Target	Goals
- Cash reserve ratio - Policy rate - OMO/FXO[3] - Moral suasion - Direct control (interest setting and credit ceiling)	- Short-term interest rate - Monetary base - Excess reserve of commercial banks - Domestic credit		- Monetary aggregate - Interest rate - Exchange rate - Inflation	- Price stability - Economic growth - Employment - Exchange rate stability - BOP surplus
----> Implementation of monetary policy			Formulation of monetary policy <----	

The above description of the major channels (namely narrow credit channel; broad credit channel; wealth channel; interest rate channel; and exchange rate channel) of monetary policy, allows the respective monetary authorities to fine-tune their monetary policy management. The configuration used by monetary policy makers is reflected in the well known monetary framework provided in the Figure 2.1 below:

---

3. Sterilisation refers to a Central Bank altering domestic credit in an equal and opposite direction relative to any variation in foreign exchange reserves so as to prevent the monetary base from changing.

Figure 2.1: Transmission of Monetary Policy
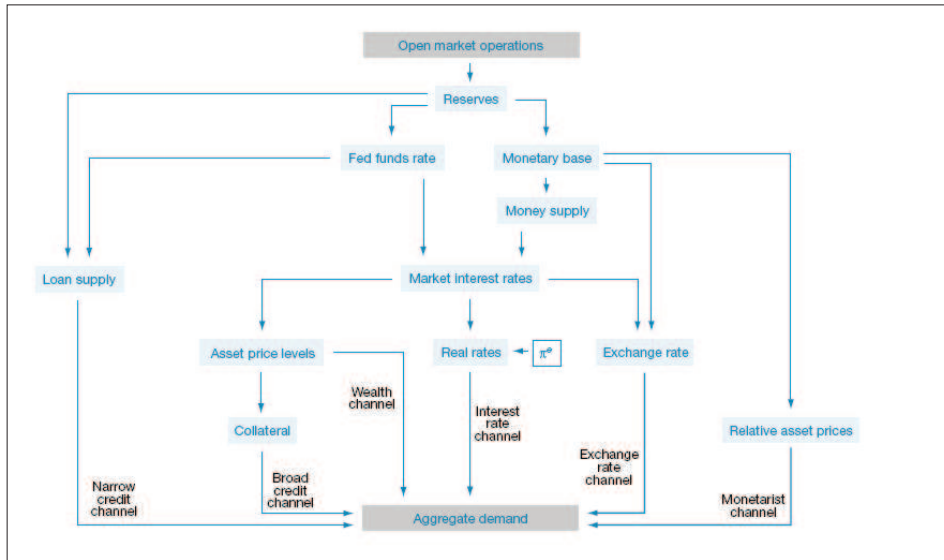
Source: Kutnner and Mosser (2002)

This framework moves from instruments in the "arsenal" of the monetary authorities, such as the policy rate (e.g., the bank rate in the control of the monetary authority), to the goals and ultimate target, such as economic growth, price stability, etc. As mentioned above, the formulation and choice of the monetary framework, is based on the nature of the macro-financial link. The targeting framework, e.g. monetary aggregate, interest, exchange rate or inflation targeting helps guide monetary policy management in the attainment of the ultimate goals.

While doing this exercise with regard to determining the optimal monetary framework, it is important to keep in mind that the strength and appropriateness of this transmission mechanism will vary from country to country, depending on the different levels of financial development and/or levels of external integration. An example of how results vary by country is provided by Patat (2007, p.1) who stated "the wealth effect is less important in the Euro-area than in the US as the equities market is less developed and the role of institutional and non-resident investors more decisive". This observation suggests that while the flow of funds is important, the factor which influences varies. Thus in the US, where it is suggested that wealth rather than the income effect predominates, the interest channel is less effective due to financial innovations, especially securitization.

2.3 Empirical Literature

Rudenbush and Svenson (1999; now RS, 1999)[4] looked at the macro-financial link and the relationship between the real interest rate and the macroeconomy - e.g. the marginal (contractionary) influence of the real interest rate on the output gap of the macroeconomy, as demonstrated by the following equation:

$$y_t = \alpha(w_t) + \sum_{j=1}^{p} \beta_j y_{t-j} + \beta_3(w_t)\left(\bar{i}_{t-1} - \bar{\pi}_{t-1}\right) + \varepsilon_t ; ; \tag{2.1}$$

Where:

$$\alpha\ (w_t)\ =\ \alpha_r$$

and

$$\beta_3\ (w_t)\ =\ \beta_3 {<} 1,$$

With:

❑ yt   = the percentage gap between actual real GDP and potential GDP

❑ $\bar{i}_{t-1}$ = interest rate (quarterly average federal funds rate at an annual rate)

❑ $\bar{\pi}_{t-1}$ = inflation rate (four quarter inflation in the GDP chain-weighted price index)

As stated by RS (1999, p. 207) "the third term (e.g. β_3) is a simple representation of the monetary transmission mechanism, which, in the view of many central banks, likely involves nominal interest rates (e.g., mortgage rates), ex ante real short and long rates, exchange rates, and possibly direct credit quantities as well". They conclude that this equation appears to be a workable approximation of the various intermediate transmission mechanisms, which suggest that it can represent the macro-financial link. The authors use US data from 1961:1 - 1996:2 and run a dynamic regression (e.g. an OLS-AR2) on the above-

_____

4.   Which is an extension of Johansen and Juselius (1994)

mentioned representation. The authors determine that β_3 is (0.10), which is statistically significant at the 5% level of confidence. The results suggest that there is the presence of a macro-financial link in the US and that monetary management has been effective in influencing the output gap.

However, the aforementioned changes in the macroeconomic and financial environment, namely globalisation and financial sector development, suggest that the channels connecting the macroeconomy with the financial markets, i.e. the nature of the macro-financial link, has changed. In this regard, Estrella (2002) extend RS (1999) to look at the degree of securitization and how this has affected the transmission mechanism of monetary policy. The author does this by conditioning the intercept term and β_3 in (2.1) by S_t, securitized home mortgages to the value of all, home mortgages (in percent); this results in:

$$\alpha\,(w_t) \;=\; \alpha_1 + \alpha_2 S_t \text{ and } \beta_{3,1}\,(w_t) \;=\; \beta_{3,1\,+}\,\beta_{3,2} S_t \qquad\qquad (2.2)$$

The changing nature of the macro-financial like has been further highlighted with the global crisis which originated in the US housing market. Mangal Goswami, Andreas Jobst, and Xin Long (2009; now as GJL, 2009) extended the above equation further by including a number of control variables (as explained further down) and found that securitization has, indeed, contributed to weaken monetary policy in the US.

This result is not really surprising. Gray, Merton, Bodie (2007, p.4) stated that the existing monetary frameworks are "ill-suited" for analysis since focus is limited to the monetary system. To address this deficiency, they have proposed the contingency claims analysis (CCA) framework. Such criticism of the monetary framework has spurred activities in the monetary authorities of developed countries and they have attempted to broaden analysis through measures such as using macroprudential indicators and focus on financial stability - a salient example in this regard is the International Monetary Fund's "Global Stability Report".

In this regard, Houben, Kakes and Schinasi (2004) have gone one step further and proposed a framework for ensuring financial stability. While there are a number of definitions for financial stability, Schinasi (2004, p.8) proposed a definition of financial system stability as follows – "A financial system is in a range of stability whenever it is capable of facilitating (rather than impeding) the performance of an economy, and of dissipating financial imbalances that arise endogenously or as a result of significant adverse and unanticipated events". This broader definition moves beyond that of the monetary system, which simply focuses on   "individual banks of the banking segment of the financial system,

but the system in its entirety and the linkages from the financial system to the real economy" (Woolford, 2001, p.30). However, the question remains if such analysis is appropriate for SEACEN member countries?

3. Assessment of Macro-financial Link in SEACEN Countries – Three Perspectives

The assessment of the macro-financial link in SEACEN countries is based on three inter-linked perspectives: (i) from the perspective of the overall relationship of the link of monetary policy and the macroeconomy; (ii) from the perspective of the monetary transmission channel of interest rate; and finally (iii) from the perspective of and the response of monetary authorities and key actors to episodes of global crisis. In this regard, this Section is divided into three parts along the lines of the above mentioned perspectives, with each comprising of brief literature review followed by a working model, empirical exercise ending with a discussion on the empirical findings. This Section then closes with a synthesis section of the results from the three inter-linked perspectives.

3.1 Assessment of the Macro-financial Link in SEACEN Countries – An Overall Perspective

3.1.1 Literature Review

As previously mentioned in the previous section, GJL (2009) extended the model of RS (1999) to address the growing level of financial development in the US. The assumption is that access to direct financing, has reduced the strength of financial intermediation (which is commonly characterized by indirect financing). In this regard, GJL (2009) examined whether securitization, a direct source of financing, has impacted the strength of the macro-financial link. GJL (2009) conditions include both the intercept term and β_3 in (2.1), on the ratio of securtization S_t, defined as the home mortgage rate to the value of all home mortgages (in percent). Conditioning the intercept term and β_3 in (2.1), as shown in 2.2 and repeated below, results in:

$$\alpha(w_t) = \alpha_1 + \alpha_2 S_t \text{ and } \beta_3(w_t) = \beta_{3,1} + \beta_{3,2} S_t \qquad (3.1.1)$$

The authors also introduced additional control variables (CV) which is an attempt to control for variability and allow for interest elasticity and its interaction effects. The alternative models introduced S_t and adjusted the base model by introducing CVs which affect both the intercept and slope of the regression.

The two CVs used by GJL (2009) are the financing ratio F_t^5 and credit growth,

which is defined as $K_t = \ln\left(\dfrac{\dfrac{\kappa_t}{GDP_t}}{\dfrac{\kappa_{t-1}}{GDP_{t-1}}}\right)$ where κ is private sector credit. GJL (2009)

then tested for the stochastic properties of the time series, such as whether the series have long term memory etc, which are then addressed.[6]

The authors ran (2.1) modified by (3.1.1) and found that securitization activities dampen the interest rate elasticity of output in the US. The authors use US data covering the span of 1970:3 - 2006:4 and show that the coefficient of the interaction between securitization and the real interest rate has a consistently positive and significant contribution. This implies that controlling for the relative share of securitized mortgages reduces the traditionally negative relation between output gap and real interest rates; this result is robust when controlling for other variability as mentioned above. The same methodology is also applied by the authors to the emerging market of South Africa. While GJL (2009) used the same base regression, the authors modified their alternative model by replacing the securitization ratio S_t with a dummy variable S_t', which registers the existence of securitized issuance at time t, so that:

$$\alpha\left(w_t\right) = \alpha_1 + \alpha_2 S_t' \text{ and } \beta_3\left(w_t\right) = \beta_{3,1} + \beta_{3,2} S_t' \tag{3.1.2}$$

The authors also found that the growing use of mortgage securitization in South Africa had, to some extent, eroded the general sensitivity of real output to monetary policy.

3.1.2 Working Model

Given the above discussion, where the presence of securitization dampens the elasticity of real interest rate, this study utilises the methodology of GJL (2009) on participating SEACEN members to assess the macro-financial link.

_____

5. This reflects the changing level of direct financing (i.e., equity, bonds, commercial paper or other capital-market based sources of external funding, with securitized issuance excluded) relative to indirect (or intermediated) financing (i.e., bank loans to the non-financial private sector, with household loans excluded)

6. All the time series are found to be stationary. However S_t is found to be integrated of order one. To address this, GJL (2009, p. 15) introduced a time trend t to control the "continuously increasing securitization on the relation between changes in output gap and monetary policy."

As shown in Table 1.2, the diversity in SEACEN members' FDs stands out. Furthermore, participating SEACEN members, baring Taiwan, do not have a significant experience with securitization.

Given this situation where the majority of members have no experience with securitization, the study looks at the presence and effect of direct financing through the capital market, which provides an alternative source of financing. In this regard, the variable EB is constructed as the ratio of the sum of both the market capitalization of equity markets (equity[marketcap]) and that of bonds to nominal GDP; so that:

$$EB = \frac{(Equity[marketcap] \; + \; bonds)}{GDP} \qquad (3.1.3)$$

Along the lines of GJL (2009), two versions for each country are estimated: the first is the base case (labeled below as Model 1); with the second being alternative cases (Model 2 and 2a as GJL (2009) but modified using EB). The choice of which alternate model is used (either Model 2 or 2a), is determined by the country researchers based upon their specific country situations. Analysis is done in both cases to determine if there is a significant effect of EB on the strength of monetary policy (i.e. the elasticity of the real interest rate).

Model 1: the base case as expressed in (2.1) where $\alpha(w_t) = \alpha_1$ and $\beta_3(w_t) = \beta_{3,1}$. Thus $\alpha(w_t) = \alpha_1$ is simply the intercept and $\beta_3(w_t) = \beta_{3,1}$ is simply the coefficient of the interest rate.

Model 2: Elasticity varying with EB ratio where (2.1) is enhanced such that $\alpha(w_t) = \alpha_1 + \alpha_2 EB_t + \sum \alpha_n CV$ and $\beta_3(w_t) = \beta_{3,1} + \beta_{3,2} EB_t + \sum \beta_{3,n} CV$; the first term represents the intercept and the EB variable (3.1.3) while β_3 is the coefficient of the interest rate, conditioned by the term EB and the CVs. The CVs represent growth of private sector credit κ to GDP (as per GJL (2009) above) which controls for the relative importance of the credit channel to growth of aggregate demand (also as a proxy for financial sector development), variables such as (1) openness in trade sectors, defined as $(X_t + M_t)/GDP_t$ which controls for globalisation and greater trade integration; and (2) other variables as necessary such as dummy for country specific shocks etc.

Model 2a: Elasticity varying with EB dummy where (2.1) is enhanced such that $\alpha(w_t) = \alpha_1 + \{\alpha_2 EB_t\}$ or $\alpha(w_t) = \alpha_1 + \{\alpha_2' EB_t'\}$ and $\beta_3(w_t) = \beta_{3,1} + \beta_{3,2} EB_t$ or $\beta_3(w_t) = \beta_{3,1} + \beta_{3,2}' EB_t'$; the variables are same as those described above but EB' is now a dummy variable.

3.1.3 Data and Empirical Testing

Based on the discussion of the above empirical methodology, each country has five series. There are namely (i) output gap (the difference of real GDP and potential GDP[7]); (ii) real interest rate (the difference of the policy interest rate and inflation); (iii) EB (Equity [marketcap] + Bonds)/Nominal GDP; (iv) EB (Year of establishment of stock exchange); (v) openness (the ratio of external trade to GDP); and (vi) credit growth. Each country paper uses only five time series since a choice is made regarding either time series (iii) or (iv). The span and frequency of the data used in the regression are provided in Table 3.1 below:

Table 3.1: Data Span and Frequency

SN	Country	Data Span	Frequency
1	Indonesia	1991:4 – 2008:4	Quarterly
2	Malaysia	2000:1 - 2009:3	Quarterly
3	Myanmar	1999 – 2008	Annual
4	Nepal	1974/75 - 2008/2009	Annual
5	Taiwan	1990:1 - 2008:4	Quarterly
6	Thailand	2000:3 – 2009:3	Quarterly

Source: Country Reports (SEACEN 2010 a – h)

Six of the eight countries participated except for Cambodia and Philippines. Additional to determining the span of the individual country trends, country researchers have also examined their stochastic properties using standard tests such as the augmented Dickey-Fuller (1981) test etc. A summary of this is provided in Table 3.2.

_____

7. Calculated by HP filter.

Table 3.2: Order of Integration of Time Series

SN	Country	Y (gap)	REALINT	EB	OPEN	K
1	Malaysia	I(0)	I(1)	I(1)	I(1)	I(1)
2	Myanmar	-	-	None	-	-
3	Nepal	I(0)	I(0)	Dummy	I(1)	I(0)
4	Taiwan	I(0)	I(1)	I(1)	I(1)	I(1)

Source: Country Reports (SEACEN 2010 a – h)

The series are identified as being both stationary as well as non-stationary. Nonetheless, the individual country researchers have addressed those, generally by taking first differences, to ensure that the time series are behave appropriately.

The study proceeds to run empirical exercises using OLS as an AR representation (the number of lags chosen is determined by the country researchers). After necessary diagnostics and corrective itineration by the country researchers, regressions are run based on Model 1 and either Model 2 or 2a. While the regressions are run step-wise, whereby the results of each variable are shown, Table 3.3 provides a focused summary of the empirical results of Model 1 and either Model 2 or 2a of macro-financial linkages in participating SEACEN countries. For the prior, the result is simply the elasticity of the real policy rate while for the latter, the result is provided by the elasticity of the real policy rate and its interaction with the EB variable (for detailed results, refer to the country chapters).

19

Table 3.3: Empirical Results of Macro-financial Linkages in Participating SEACEN Countries

SN		Macro-financial Linkage: Model 1	Macro-financial Linkage: Model 2	Macro-financial Linkage: Model 2a (Dummy)
1	Indonesia	Insignificant (-0.002)	-Insignificant (-0.001) EB Insignificant (-0.002)	
2	Malaysia	Significant (-0.00741)	Insignificant (-0.00592); DCM and DRIR(-1): Insignificant (-0.2773)	-
3	Myanmar	Significant (-0.0048)	none	none
4	Nepal	Insignificant (-0.0004)		Significant (0.0026) EB and RINT(-1): Insignificant (-0.0010)
5	Taiwan	Insignificant (-0.444)	Insignificant (-0.529); EB and D(REALINT(-1)): Insignificant (-2.388)	
6	Thailand	Significant (-0.005)		

Note: Two countries, namely Cambodia and Philippines did not participate in the exercise and their relevant boxes are filled with a "-". For the second model, the participating countries either used model 2a or 2b. The leftover choice is filled with a "-".Note: The results are based on the submitted and approved reports from participating SEACEN members. The results from Model 2 and 2a provide the results of the full model such that interest and elasticity varying with EB and, if available, OPEN and K, and joint test effect of EB, OPEN and K. Significance refers to the standard 5% level of significance. For detailed results please refer to the SEACEN country papers. Source: Country Reports (SEACEN 2010 a – h)

3.1.4 Discussion on Findings

In general, the results of the participating SEACEN members point to consistency with the theoretical and the empirical sign for the relation between real policy interest rate and output gap. In Model 1, the coefficient for all participating SEACEN members has a negative sign. This suggests that the real policy interest rate has an inverse relationship with the macroeconomy. However, this coefficient, in most cases turned out to be either statistically and economically insignificant or statistically significant but economically insignificant. This is the

case for Nepal and Taiwan. However, (with the exception of Malaysia) in Indonesia, Myanmar and Thailand, it was found that the elasticity is significant but not economically so, being about 10, 20 and 20 times smaller respectively than the elasticity coefficient found in RS (1999) for the US. The minor effect of the real policy interest rate on the macroeconomy suggests that monetary policy in its traditional mode, has not been significantly effective.

Enhancing the regression equation with inclusion of EB and CVs for globalisation and financial sector development, does not substantially affect the above-mentioned result. This is the case for Indonesia, Malaysia and Taiwan where the interaction of the real policy rate and measure of indirect financing is found to be insignificant. Surprisingly for Nepal, the coefficient for interest rate is significant albeit with a positive sign while being economically insignificant – it is more than 38 times smaller than the elasticity coefficient in RS (1999) for the US. For Nepal, the interaction of the interest rate with EB also proves to be statistically insignificant. For Myanmar, which does not have a stock exchange, the interaction of the real policy rate and financial development indicator is examined. However, the coefficient of the interaction term is insignificant. This suggests that financial sector development in Myanmar has not had an effect on the effectiveness of the real policy interest rate.

While openness in itself has an effect on the output gap (e.g. financial openness in Malaysia and trade openness in Indonesia), this is not the case for the interaction term of the variables representing globalisation with the real policy interest rate. This suggests that the channel by which the external economy affects the macroeconomy is not through the policy interest rate.

The results consistently show that over the period, the formulation of monetary policy has either not been able to influence the performance of real output or was statistically significant but had an economically insignificant effect. This suggests that the macro-financial link was not so effectively captured in the process of monetary policy formulation.

However, it is noted that during times of crisis, there is generally a statistically significant contribution to the elasticity of the real policy rates. This is the case for Malaysia and Taiwan where crisis dummy variables are included for the prior tech bubble and the present global crisis while for the latter, in addition to the two mentioned, a dummy for the SARS episode is included. This contrast with Indonesia, where a crisis dummy is introduced for both 1998 and 2005, but was found statistically insignificant. This may reflect a significant change in the

policy rate in response to a shock to the economy, thus having a magnified effect.

While the above observations are derived from the empirical results, the regression also looks at the coefficient between the output gap and the real policy interest rate. The stylised financial indicators in Figure 1.1 suggest that financial development has expanded the sources of financing from the traditionally indirect sources, i.e. deposit taking financial institutions, to include direct sources such as the stock and bond market. However, manipulating these does not significantly affect the results, highlighting the possibility of the existence of a so-called "residual", the unexplained component of the financial system greatly influencing the results. It is possible that there are other forms of alternative financing or sources of credit, which are beyond the regulated markets, namely indirect and direct financing sources.

Nevertheless, one criticism of the estimation formulation may be that the focus is on the monetary sector only. This is evident as the relationship of the policy interest rate is taken with the economy as a whole. To further explore the above results and the connectivity of the policy interest rate in the monetary system, the following Section analyses the monetary transmission channel of the effectiveness of the policy rate on affecting market rates, i.e. the interest rate pass-through exercise.

3.2 Assessment of the Macro-financial Link in SEACEN Countries – Perspective of Monetary Transmission Channel of Interest Rates

This Section explores one of the main pathways of monetary policy as described earlier in Table 2.1 - the interest rate channel. This channel is important since commercial rates influence the real economy via cost of capital and investment. All participating SEACEN members, except for Cambodia, acknowledge the importance of this channel in addition to others such as credit, exchange rate, asset and expectations; and use the policy rate as either an instrument or as an operational target. Similarly, a major source of financing of these economies is via the banking and non-bank financial intermediaries sector. In this regard, this Section evaluates the influence of the policy interest rate on market interest rates, i.e., the interest rate pass-through in the participating SEACEN member countries.

3.2.1 Literature Review

There is vast literature measuring the interest rate pass-through. However, the methodology for estimating this relationship has evolved. Previous papers have used the methodology of the dynamic multiplier method, which involves estimating a simple dynamic model where the relevant growth of the market rate is regressed on lagged values of itself and the growth of a policy rate. However, one drawback of such a specification is the loss of long-run information about the level of the variables. This deficiency is addressed by incorporating both short-term and long-term information in an error-correction framework. The relation between the market and policy rates can be described by:

$$i^m = \alpha + \beta \bullet i^p ,$$ (3.2.1)

where i^m is the market rate, i^p is the policy rate, α is a mark up, and β reflects the demand elasticity of market rates with respect to policy rates. With perfect competition in the loan market, an elasticity of β greater than 1 suggests that there is competition in the loan markets. Relatively elastic demand would signal that bank credit is not rationed. In such a setting, banks would want to lend money to both low- and high-risk borrowers, equalising returns on both types of lending by charging risk-adjusted rates to the high-risk borrowers. Hence, the risk adjustment in the rate may on average, cause market rates to react more than one-to-one to changes in the policy rate. On the other hand, relatively inelastic demand (an elasticity β lower than 1) is likely to be found when banks have substantial market power, either because no close substitutes for bank loans exists, i.e., when capital markets are underdeveloped, or because of the structure of the market for bank loans (De Bondt, 2002 as cited in Tieman, 2004).[8] Relationship (3.2.1) is a standard representation used by many authors to examine the relationship between the market and policy rates.[9]

_____

8. A wide range of factors influence the structure of the market, such as the degree of state ownership of the banking sector, and the degree and form of regulation, including market entry restrictions and menu costs.

9. For example, this relationship was examined by Tieman (2004) who used monthly data over the span January 1995 to February 2004 to examine the pass-through effect in Romania, Czech Republic, Hungary, Poland, the Slovak Republic, and Slovenia; Antão (2009) usedmonthly data from 1990 to 2002 in Portugal while Charoenseang and Manakit (2007) used monthly date from June 2000 to July 2006 for Thailand.

Relationship (3.2.1.), however, does not touch on the issue of timing. Market interest rates will not react instantly to changes in the policy rate. Even though banks will quickly adapt their short-term lending rates, medium- and long-term rates will react more slowly, or not at all, as they are primarily guided by expectations of future short-term rates. Moreover, average lending rates will adapt only gradually, as new loans replace old ones. These considerations point to a gradual adjustment of market rates to the new policy rates. Therefore, equation (3.2.1) should be interpreted as valid only in the long–run.

The long-run nature of equation (3.2.1) suggests a model in which equation (3.2.1) can be seen as a long-run equilibrium relationship, around which short-term dynamics abound. Such an approach is well-established in the literature. Engle and Granger (EG, 1987) suggest a two-step approach in which the long-run relationship is first fitted in levels, while the second step involves regressing the first differences of the dependent variables on their lagged values and lagged deviations from the long-run equilibrium relationship. This approach is labeled as error correction, and is warranted as long as the dependent and explanatory (independent) variables are cointegrated, i.e., both are non-stationary but there exists a linear combination of these series which is stationary. In general, interest rate series would not be expected to be non-stationary, as they normally do not exhibit a long-term trend. In developing economies, however, one might expect interest rate series to exhibit a declining trend as the process of development takes hold and the problem of inflation is reined in. This would imply that these series are integrated of order 1 (i.e. I(1)). To establish this hypothesis, the paper performs unit root tests on the series by applying the augmented Dickey-Fuller (1981) test on the individual series. In case both the policy rate and the market rate are I(1), the series may be cointegrated, which is subsequently tested using both standard EG as well as the Johansen (1988, 1991) statistical tests. When a cointegrating relationship is found, the suggested interpretation of equation (3.2.1) as a long-run equilibrium relationship, around which short-term dynamics abound, is justified from a statistical point of view. Thus, an error-correction model (ECM) specification is appropriate.

However, the ECM specification for interest rate pass-through has been specified differently by different authors. For example, Tieman (2004) specifies his ECM as:

$$\Delta i_t^m = \gamma_1 + \gamma_2 \Delta i_{t-1}^m + \gamma_3 \left(i_{t-1}^m - \beta \bullet i_{t-1}^p - \alpha \right) + \eta_t \tag{3.2.2}$$

Here, Δ is the difference operator, and the equation states that the first difference of market interest rates, Δi_t^m, depends on its own one-period lag, Δi_{t-1}^m, the deviation from the long-run relationship in the last period, $i_{t-1}^m - \beta \bullet i_{t-1}^p - \alpha$, and a constant, γ_1. In such an ECM, the coefficient γ_3 indicates the speed of adjustment of the short-run dynamics to the long-run equilibrium relationship.

On the other hand, Charoenseang and Manakit (2007) specify their ECM as:

$$\Delta i_t^m = \gamma_1 + \gamma_2 \Delta i_t^p + \gamma_3 \left(i_{t-1}^m - \beta \bullet i_{t-1}^p - \alpha \right) + \eta_t \tag{3.2.3}$$

where Δ is the difference operator, and the equation states that the first difference of market interest rates, Δi_t^m, depends on contemporaneous Δi_t^p, the deviation from the long-run relationship in the last period, $i_{t-1}^m - \beta \bullet i_{t-1}^p - \alpha$, and a constant, γ_1.

Likewise Antão (2009) specifies her ECM as:

$$\Delta r_{i,t} = \alpha_i + \sum_{k=1}^{p} \alpha_{i,k} \Delta r_{i,t-k} + \sum_{l=0}^{q} \beta_{i,l} \Delta r_{s,t-l} + \gamma_i u_{i,t-1} + \varepsilon_{i,t} \tag{3.2.4}$$

In her terminology, r_i is the retail rate and r_s is the market rate. As before, where $u_{i,t-1}$ is the lagged residuals from individual cointegrating regressions, this would be $r_{,t-1i} - \beta \bullet i_{s,t-1} - \alpha_i$. The residuals $\varepsilon_{i,t}$ are assumed to be iid(0, σ^2). The term $\gamma_i u_{i,t-1}$ captures the adjustment towards equilibrium and a significant negative γ_i is consistent with the series being cointegrated. The error correction parameter γ_i is the speed of adjustment and shows how much of the gap created by a change in the money market interest rate is closed in one month. It should be noted that in contrast to the above ECM formulations with a single lag, Antão (2009) determines the optimal lag length by utilising the standard Schwarz Information Criterion (SIC).

Despite the differences in the specification of the ECM, the coefficient γ_3 (or γ_i) has a similar interpretation and indicates the speed of adjustment of the short-run dynamics to the long-run equilibrium relationship. For all cases, this coefficient can be interpreted as a signal of the effectiveness of the interest rate instrument of monetary policy: a higher value of the coefficient signals a faster market response (i.e. adaptation) and hence a more effective first step in the interest rate channel of monetary transmission.

In some cases, a long run relationship between the policy and the market interest rates, will not be found. In these cases, a simple dynamic multiplier will be employed and the equation is as follows.

$$\Delta i_t^m = \alpha_i + \beta \bullet \Delta i_{t-1}^m + \gamma \bullet \Delta i_{t-1}^p + \varepsilon_{i,t}$$
(3.2.5)

where i_t^m is market interest rates; i_{t-1}^p is the policy rate; and γ is the coefficient of pass through. One example of this is Disyatat & Vongsinsirikul (2002) who looked at the case of Thailand.

3.2.2 Working Model

There are two models for this exercise based on the determination whether the policy rate and market rate share a long-term relationship. If a long-term relation exists, (3.2.2) is utilised while in the absence of a long-term relation; (3.2.5) is utilised.

3.2.3 Empirical Exercise

A quick scan of the participating SEACEN countries suggests that there is a wide range of experiences for interest rate determination. On the one extreme is Myanmar where interest rates are controlled and on the other extreme are Philippines, Taiwan and Thailand where market forces play a large role. In Cambodia, a dollarised economy, interest rates are also determined by market forces.

Five of the eight countries participated in the exercise with the exception of Cambodia, Myanmar and Philippines. For the exercise, two types of data are used: the policy rate and the different market rates. The á priori is generally the same instrument for the eight countries – the policy rate. The latter on the other hand are a wide spectrum of rates as described in Table 3.4.

Table 3.4: Statistics of Interest Rates

SN	Country	Policy Rate	Market Rate	Data Span & Frequency
1	Indonesia	BI rate	Deposit; Working Capital; Inv	1998:1 – 2008:9; monthly
2	Malaysia	Overnight Policy Rate	Average Lending Rate	2000:1 - 2009:3; quarterly
3	Nepal	Bank Rate	FD1YR; LEND; SAV	1990:1 - 2009:4; quarterly
4	Taiwan	Discount Rate	1 YR TD rate; LEND	1989:1 - 2008:4; quarterly
5	Thailand	Policy Rate	Credit; 3M, 6M,12M Deposit	20006 – 2009:7; monthly

Note: 1. "Policy Rate" is the column heading for country specific policy rates; 2. "Market Rate" is the various commercial rates; 3. "Data Span & Frequency" refers to the span of the data and their frequency.
Source: Country Reports (SEACEN 2010 a – h)

Based on the above Table for both policy and market rates, the times series test underwent the determining order of integration. Subsequently, they were tested pair wise for a long- term relationship (i.e. cointegration). A snapshot of the empirical results is provided in Table 3.5:

Table 3.5: Integration Test

SN	Country	Policy Rate - I(1)	Market Rate - I(1)	Cointegration
1	Indonesia	Yes	Yes/Yes/Yes	Yes/Yes/Yes
2	Malaysia	Yes	Yes	-
3	Nepal	Yes	Yes/Yes/Yes	No/Yes/Yes
4	Taiwan	Yes	Yes/Yes	No/No
5	Thailand	Yes	Yes/Yes/Yes/Yes	Yes/Yes/Yes/Yes

Integration tested by standard ADB while cointegration tested generally by Johansen.
Source: Country Reports (SEACEN 2010 a -h)

Based on the results in Table 3.5, all countries used (3.2.2b), except for Malaysia and Taiwan which did not find a long-term relationship between the policy and market rate. In this case (3.2.5) was utilised. The results of the interest pass-through exercise on participating SEACEN members is provided in Table 3.6.

Table 3.6: Results of Pass-through Exercise

SN	Country	Demand elasticity of growth of market rates with respect to growth of policy rates	Demand elasticity of market rates with respect to policy rates	ECM $(\gamma_3$ or $(\gamma_i))$
1	Indonesia		+	-0.24**/-0.13**/-0.11**
2	Malaysia	0.69***		
3	Nepal		1.1***/1.05***/0.76***	No/-0.01***/0.00
4	Taiwan	0.74(0.78)***/0.41(0.38)***	-	-
5	Thailand	-	0.26***/0.37***/0.42***/0.42***	-0.05***/-0.05***/-0.06***/-0.04***

Note: "*", "**", "***" are significance level respectively at 10%, 5% and 1% .
Source: Country Reports (SEACEN 2010 a – h)

3.2.4 Discussion on Findings

In general, the empirical exercise suggests that the monetary transmission channel of the interest rate is effective in a significant manner i.e., the policy rate influences the market rates. In Malaysia and Taiwan, the elasticity of growth of the policy and the market rates is statistically significant, while in Indonesia, Nepal and Thailand, the elasticity coefficients of the levels of the policy and market rates are statistically significant. In Nepal, the elasticity of the market rates with respect to the policy rate is about 3 times that of Thailand. For Thailand, an interest rate differential exists, based on the usage of the uncovered interest rate parity. This result suggests that there is a small response of the bilateral exchange rate with USD (SEACEN (2010 h)).

Despite the measure of statistical significance, the magnitude of the coefficient suggests a slow speed of adjustment of the commercial rate to the policy rate. To put the results in perspective, the ECM value of Romania (Tieman, 2004) differs from Nepal by a magnitude of 15 times while for Thailand by a magnitude of 3 times. This means that the short-term responsiveness of the commercial rates to the policy rate is sluggish which may suggest the efficiency of the financial system. However, the magnitude of the coefficient for Romania is similar to that of Indonesia. The magnitude of the coefficient may reflect the frequency of data used - Tieman (2004) used monthly data while the SEACEN countries, except for Indonesia and Thailand, used quarterly data. However, the lower frequency of data in the Nepal case would suggest that the adjustment coefficient is larger rather than smaller!

To a certain extent, this observation further suggests that monetary authorities effectively utilised the interest rate channel to affect market rates, initial impact of which is seen in the monetary system. The next Section looks at response of monetary authorities to crisis to obtain an indication of the channels of macro-financial linkages.

3.3 Assessment of the Macro-financial Link in SEACEN Countries – Perspective of Response of Monetary Authorities to Impact of Global Financial Crisis

This Section looks at the response of the respective monetary authorities to the impact of the ongoing global crisis. As the effect of the current global crisis is heterogenous, relatively more detailed examination will be undertaken for a sub-sample of crisis hit countries with a synthesis for the final part.

3.3.1 Literature Review

While there are different channels by which a financial crisis affects the real economy, a current view is that the credit channel is an important one. As highlighted by Mishkin (1996), a financial crisis reduces credit flow since it "sharply and severely increases asymmetric information problems...so that financial markets are no longer able to efficiently channel funds to those who have the most productive investment opportunities" (p. 15). Thus, during the period of financial crisis, the information problems lead the financial markets to reduce their allocation of credit. Bayoumi and Melander (2008) used this macro-

financial channel as an explanation for the ongoing crisis which started in US. They looked at "the banks' capital/asset ratio on lending standard, the link with consumer credit, mortgages, and corporate loans, and the corresponding components of private spending (consumption, residential investments and business investments)". They also highlighted the feedback loop through balance sheets of banks, firms and households. In their discussion, the authors' expressed the following conceptual model:

Figure 3.1: Conceptual Framework of Crisis
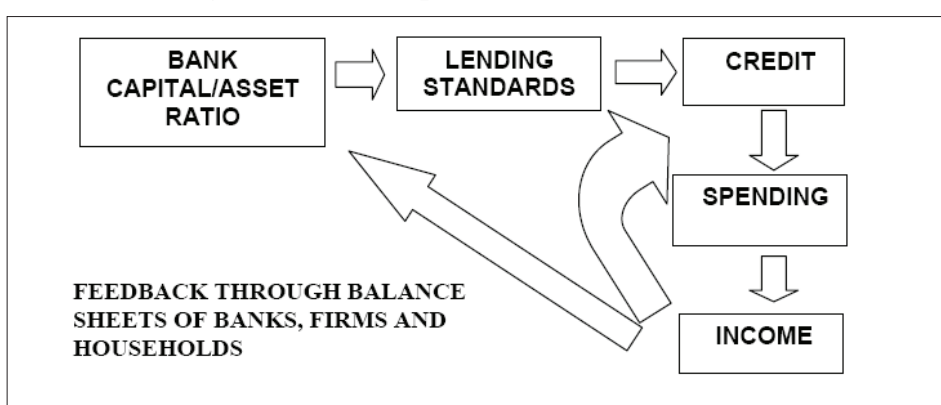
(Source: Bayoumi and Melander, 2008)

Using the above model, the authors estimated the effects of a negative shock on banks' capital/asset ratio on lending standards, which in turn affect consumer credit, mortgages, and corporate loans, and the corresponding components of private spending (consumption, residential investment and business investment). They also allowed for feedback from spending and income to bank capital adequacy and credit and hence, the full credit cycle is examined. Looking at the framework, the authors found that an exogenous fall in the bank capital/ asset ratio by one percentage point reduces real GDP by some 1½ percent through its effects on credit availability, while an exogenous fall in demand of 1 percent of GDP is gradually magnified to around 2 percent through financial feedback effects. Thus this framework suggests that domestic lending standards via the flow of bank credit, is a way by which GDP is affected.

Similarly, two of the SEACEN country papers utilised the credit channel to model and simulate how bank lending standards has an impact on GDP. The Philippines country paper uses a macroeconometric model approach. This adds

30

and re-specifies an existing dynamic, structural, and quarterly economy-wide macroeconometric model of the Philippines to examine the bank credit channel. The empirical results indicate that the bank credit channel matters in the monetary transmission mechanism of the Philippines. Specifically, bank capital, loan provisioning and lending standards are found to have significant effects on the lending activity by banks.[10] As concluded by the paper "These findings suggest that the effects of monetary policy in the Philippines can be propagated by the banking sector depending on its liquidity position" (SEACEN, 2010). Likewise, the Thailand country paper uses a Vector Error Correction model using four variables of credit, investment, income and BIS ratio to show that a relationship exist between bank credit and income, with feedback effect via the BIS ratio, back to bank credit. As stated in the paper "A one standard error shock to bank lending would decrease investment by about 0.25 % in 10 months and the shocks persist. The impact on income is more drastic, an exogenous and negative credit shocks are associated with a fall in investment of around 0.6 %" (SEACEN, 2010).

However, the ongoing global crisis is an example of how crisis spreads to other countries. As a contributor to the global crisis, Cetorelli and Goldberg (2008) looked at the bank lending channel in the US. They found evidence that the lending channel is weakened in globally-oriented banks since they rely on "internal capital market with their foreign affiliates to smoothen domestic liquidity shocks". This also contributes to the propagation of liquidity shocks by affiliated banks abroad. This channel, taken in the extreme, also leads to cross-country spread of crisis, e.g. contagion, via the balance of payments - this is seen in most of the regional/global crisis of the recent past. The Thailand country paper (SEACEN, 2010) looks at the spillover of international financial risk to Thailand employing a Dynamic Conditional Correlation multivariate GARCH model. The results of the paper generally indicate the presence of large volatility spill-over of broad credit (more than simply bank credit).

Three main areas were focused on for the country reports: (i) the inflation situation of the country; (ii) the response of the monetary authority; (iii) the coordination measures among the various players in the financial system, if any.

---

10. The total demand impact of an increase in bank lending is the sum of various effects in the money supply, Treasury bill rates, personal consumption and investment, all of which have significant impact on aggregate demand. In addition, the empirical results indicate a feedback loop from aggregate demand to bank credit through the financial accelerator mechanism.

3.3.2 Response to Global Crisis

Having discussed the bank credit channel and how both globalisation and financial sector development have contributed to comprehending the crisis, focus is now turned on the participating SEACEN members (Table 3.7).

Table 3.7: **Some Recent Indicators of Participating SEACEN Member Countries**

SN	Country	Inflation (%)			GDP growth (%)			Impact	EI
		2007	2008	2009:Q1	2007	2008	2009		
1	Cambodia	14	12.5		10.2	6.7	Exp to decline	Significant	NA
2	Indonesia	6.73	11.5		5.85	5.18		Non-significant	49.6
3	Malaysia	2	5.4	3.7	6.2	4.6	-6.2 (1Q)	Significant	169.44%
4	Myanmar	-	-	-	-	-	-	-	-
5	Nepal (FY)	7.7	13.2		5.3	4.7		Non-significant	45.8%
6	Philippines	2.8	9.3	3.2	7.1	3.8		Mixed	76.65%
7	Taiwan	1.8	3.53	0	5.70	0.06	-8.61 (1Q)	Significant	122.8%
8	Thailand	2.2	5.5	-0.29	4.9	2.5	-7.1%	Significant	150.5%
	Fiji	4.3	6.6		-0.5	-0.1		Mixed	148
10	Korea	2.5	4.7		5.1	2.2		Significant	92.3
11	Mongolia	17.8	22.1		10.2	8.9		Significant	9.4
12	Sri Lanka	-	-	-	-	-	-	-	-
13	Vietnam	8.3	22.97	reduced	8.4	6.2	3.1 (1Q)	Significant	158.45

Note: "-" refers to information not found in either the country reports or questionnaires.
Note: 1. "Inflation" 2. "GDP Growth" at constant prices; 3. "Impact" assessment of global crisis from country reports; 4. EI is (X+M)/Y in 2008, Source: Country Reports (SEACEN, 2010)

The statistics suggest that the nature of the impact has been heterogeneous as reflected in the different overall growth rates of the participating SEACEN economies. The individual country reports take this observation one step further and give a deeper analysis of impact. The eight countries can be divided into two groups - those with non-significant or mixed impact from the global crisis and those with a significant impact from the global crisis. There are four countries in the first group namely, Indonesia, Myanmar, Nepal, and Philippines and four in the second group namely Cambodia, Malaysia, Taiwan and Thailand. As the study looks at the response of crisis, the focus is on the second group of countries.

Cambodia: (1) The inflation rate in Cambodia during 2007 and 2008 was 14% and 12.5% respectively. (2) The response of the National Bank of Cambodia (NBC) was more towards the "demand side rather than supply side pressure" with the introduction of a package of monetary and financial measures. These included (a) increasing the reserve requirement ratio from 8% to 16%, for foreign currency deposits (the ratio has recently been reduced to 12% amid the downward risk to economic growth); (b) introducing a 15% ceiling on commercial bank credit to the real estate sector; (c) introducing internal and external auditing for banks; (d) enhancing the capital base through the increase in minimum capital requirement; (e) improving the classification of banks assets and provisioning; (f) improving the valuation of collateral used for bank lending; (6) strengthening credit information sharing system; (g) strengthening the system for implementing reserve requirements; (h) strengthening bank liquidity management; (i) strengthening corporate governance of banks and financial institutions; and (j) continued strengthening of the banking system through rigorous implementation of on-site and off-site inspections and supervision. The measures are aimed at addressing the rising inflation and strengthening the soundness of the banking sector. (3) In addition to these actions by NBC, there was coordination with the fiscal policy of the Royal Government of Cambodia to maintain financial stability and enhance confidence. The country report (SEACEN, 2010 a) did not indicate coordination with other domestic or international players.

Malaysia: (1) Malaysia during this time experienced low inflation – in 2007 inflation was 2%, which slightly increased in 2008 to 5.4%, in part to monetary loosening, leveling off in 2009:Q1 to 3.7%. (2) The response of Bank Negara Malaysia (BNM) was to implement a loose monetary stance with various efforts directed towards ensuring access to credit by all sectors of the economy. These efforts included: (a) intensifying efforts to strengthen the capacity of financial service providers to better support the needs of businesses; (b) establishing two new financing schemes to assist businesses in enhancing their efficiency and productivity as well as to manage their cash flow difficulty; (c) establishing the Integrated Contact Centre to have in place avenues for borrowers encountering financing difficulties to seek assistance; (d) setting up of Danajamin[11] to support

––––––––––

11. Danajamin Nasional Berhad is Malaysia's first Financial Guarantee Insurer and is AAA-rated. Danajamin was established in May 2009, as part of the RM60 billion stimulus package announced by the Government of Malaysia on 10 March 2009. Danajamin has an issued and paid-up capital of RM1 billion with a capacity to underwrite policies of up to RM15 billion. They provide financial guarantee insurance to issues of private debt and Islamic securities. Their mission is to facilitate capital-raising by Malaysian companies from the capital markets by providing financial guarantee insurance to protect the holders of private debt securities against any missed payments or defaults. They are licensed under the Insurance Act 1996 and are regulated and supervised by Bank Negara Malaysia.

corporations in raising funds in the bond market by providing credit enhancements to viable businesses. (3) In addition to these actions by BNM and the Ministry of Finance, they together with their counterparts in Singapore and Hong Kong announced on 16 October 2008 that all deposits will be fully guaranteed by the Government through the Malaysia Deposit Insurance Corporation until December 2010. Going forth, the Monetary and Financial Stability Committee (MFSC) of the Executives Meeting of East Asia-Pacific (EMEAP) Central Banks[12] had put in place an integrated regional surveillance and crisis management framework to assist EMEAP economies in addressing concerns arising from the crisis that affects regional countries. This cooperative framework provides a key platform for the region to share information and assess the impact of the evolving global financial crisis on regional economies and the implications for central banks in the region. These suggest that BNM's measures was coordinated with the Ministry of Finance along with both domestic and international players.

Taiwan: (1) Taiwan during this time experienced a period of low and stable inflation – in 2007 inflation was 1.8%, which slightly increased in 2008 to 3.53%, in part to monetary loosening, but decreased in 2009:Q1 to 0%. (2) The response of the Central Bank of the Republic of China (Taiwan) (CBC), Taiwan's central bank, was to pay close attention to the liquidity conditions of financial institutions to maintain financial stability. The measures being taken are: (a) lowering the policy rate and required reserve ratios: the CBC cut policy rates seven times by a total of 237.5 basis points, since September 2008. In addition, in response to deteriorating economic and financial developments at home and abroad, on 18 September, the CBC reduced required reserve ratios on NT dollar deposits, with an estimated effect of injecting liquidity worth NT$200 billion; (b) expanding repo facility operations: from 26 September 2008 onwards, the CBC expanded Repo facility operations to ensure sufficient sources of liquidity for financial institutions; (c) relaxing requiring funds of banks: the CBC announced that it allowed banks to use certificates of deposits issued by the CBC or redeposits with the CBC to borrow collateral loans or request early withdrawals whenever needs arise; (d) providing preferential housing loan programme: on 22 September 2008, the CBC joined other government agencies to provide Preferential Housing Loan Programme worth NT$200 billion to help homebuyers and support the sluggish housing market. (3) In addition to these measures by CBC, other domestic stakeholders, namely the Government and the Financial Supervision Commission, were also involved in coordination activities to maintain financial stability and enhance confidence. There was no coordination with international players.

---

12. A dedicated committee compromising of 11 central bank deputies in the East and Asia and Pacific region.

Thailand: (1) Thailand during this time also experienced a period of low and stable inflation (headline) – in 2007 inflation was 2.2%, which slightly increased in 2008 to 5.5%, due in part to monetary loosening, decreased in 2009:Q1 to -0.29%. (2) The response of Bank of Thailand (BoT) to the crisis to ensure the smooth functioning of the Thai financial system included (a) providing a blanket deposit guarantee, which was supposed to end in August 2008 but has been extended for another period of 3 years up to August 2011. This helped bolster depositors' confidence and maintain a level-playing with banks in other countries; (b) ensuring that there was ample liquidity in the money market. For example, during the period that USD liquidity tightened following the drying up of USD liquidity overseas, the BoT conducted additional sell-buy swap transactions to provide more USD liquidity in the market, which proved instrumental in stabilising the money market; (c) monetary policy has been substantially eased. In December 2008, with the risk of growth surging significantly whilst risks of inflation subsiding, the MPC decided to lower the policy interest rate by 100 basis points from 3.75% to 2.75%. The extensive monetary easing continued until mid 2009. In the first three meetings of the year, the policy rate was cut in a series by 75, 50 and 25 basis points. It was in May when the MPC assessed that monetary policy had been substantially eased and the policy rate of 1.25% was sufficiently low to be maintained at that level. Subsequently, the policy interest rate of 1.25% was maintained throughout 2009. (3) The BoT had also coordinated with domestic commercial banks as well as with international actors (regional central banks as well as IMF) to maintain financial stability and enhance confidence. In addition to these, the Government of Thailand undertook measures to cushion the impact on the real economy[13].

3.3.3 Discussion on Findings

Despite the four SEACEN members facing a similar slowdown in the growth rate of output, there was a diversity in monetary responses. For example, Cambodia tightened monetary policy while Malaysia, Taiwan and Thailand loosened monetary policy. Each of the four countries responded with a prioritization of its own internal situation.

_____

13. The measure taken by the Government of Thailand was a Fiscal Stimulus Package which introduced two fiscal stimulus programmes to soften the adverse effects of the global economic downturn and to revive the domestic economy. The first stimulus package or SP1, was composed of tax measures and supplementary budget to restore short-term confidence by boosting domestic consumption. The second stimulus package or SP2 focused on enhancing the country's competitiveness in the medium-term (FY2009-2012) by investing in various projects ranging from small to mega-projects.

The actions of the monetary authorities suggest that there is general agreement that the problem was due to liquidity and that the solution was to address it through monetary policy credit measures. For Cambodia, this resulted in a tightening of credit conditions in the banking sector, while for Malaysia, Taiwan and Thailand, there was a loosening of credit conditions. Except for Thailand, where monetary measures were focused on the banking sector, the response of Malaysia and Taiwan were for a broader credit focus.[14]

In all the countries, measures were undertaken by both their respective monetary authorities and governments. However, in the case of Malaysia, Taiwan and Thailand, there were additional levels of coordination. In Malaysia and Thailand, there was implicit involvement of the capital markets but explicit coordination with external actors. In Taiwan, there was also explicit coordination with domestic actors, but none for external actors.[15] This result is surprising given that Taiwan has the highest level of EI in 2008.

It is also observed that some countries with a high economic impact also had low and stable inflation levels - e.g. Taiwan which suffered the largest decline in output of -8.61% in 2009:1Q, had the lowest inflation level in 2007 and 2008 at 1.8% and 3.53% respectively. It was closely followed by Malaysia and Thailand as well as Korea (from the questionnaire response). At first glance, this suggests a contradiction, since those countries that had a low and stable inflation environment were considered to have positive performance. However, this relationship warrants more in-depth analysis since it may reflect a relationship with the openness indicator. Malaysia, Taiwan and Thailand have the highest External Indicator in 2008 of all the participating countries at 169.4, 122.8 and 150.5 respectively – this is suggestive evidence that the countries are more exposed to contagion effects. Thus given the above impact, it is not so surprising that Taiwan also has the highest external indicator in 2008.

3.4 Synthesis of Findings

The three inter-linked perspectives give information on the existing macro-financial links in the SEACEN countries.

_____

14. Fiji, Mongolia and Vietnam, the members in the questionnaire, also focused on bank credit. However, Korea focused on broad credit.

15. This was also the case for Korea where there was coordination with both internal and external actors.

There is either a statistically and economically insignificant link or a statistically significant but generally an economically insignificant link between the real policy rate and the output gap. The findings suggest, in general, that monetary policy via the real policy rate over the period is not so economically effective in affecting the macroeconomy by means of reducing the output gap.[16] This finding is plausible given the extent of globalisation and financial sector development. However, this result does not significantly change even with direct financing as well as inclusion of other control variables as mentioned above. The result points to the nature of the financial system having changed substantially where the present monetary instruments are unable to fully affect the sources of financing in the macroeconomy. An implication of these results is that *monetary policy via the traditional monetary channel namely that of interest rate, has not been effective in affecting the whole macroeconomy of the participating SEACEN member countries.*

Interestingly during the period of crisis, the results suggest that monetary policy is not effective – this is seen in the significant coefficients of dummy variables for both Malaysia and Taiwan. While this came out in the regression as the policy rate, the measures taken by the SEACEN monetary authorities with regard to credit conditions, suggest that the credit channel may be more important during times of crisis. In this regard, Mishkin states that proponents of this channel describe it as "amplifying and propagating conventional interest rate effects" (Mishkin, 1996, 18) where both are closely intertwined. It is no surprise that during the period of crisis, this channel seems to predominate.

Looking at the monetary channel of the interest rate, however, suggests that there is significant pass-through, with the policy rate being able to affect the market rates. This suggests that the respective central banks are effective in this regard. However, the limitation that focuses simply on the bank and non-bank financial intermediaries is noted, e.g. the monetary system. *Thus by eliminating the monetary system, both perspectives taken together suggest that the financial system has expanded and broadened beyond the present monetary system but this has not been internalised in the monetary policy management process.*

_____

16. There is an alternative interpretation for this empirical result: that monetary management has been very effective at stabilising the output gap; the findings of the results are all consistent with this explanation. Unfortunately, the data quality and quantity preclude the use of sophisticated methodology for participating SEACEN members to test this observation. However, there are consistent results in member countries.

The responses of the monetary authorities to the global crisis partially acknowledge that there are different players in the financial system beyond those in the banking and non-bank financial intermediaries sector. The respective monetary authorities addressed both credit conditions and coordinated with respective stakeholders (domestic but at times also international). This is in line with the prior results of the significant contribution of monetary policy during crisis. The country studies suggest that the authorities responded more to the domestic situation rather than the external situation. This may be attributed to the genesis of the crisis where it originated externally.

4. Policy Recommendations

The evidences from the above three perspectives of the study suggest that the nature of macro-financial linkages has changed. This study suggests that the function of allocation of resources in the majority of the participating SEACEN members has expanded beyond that of the banking and non-bank financial intermediaries sector, e.g. the monetary system, in the majority of participating SEACEN member countries.

The paper thus proposes that the participating SEACEN members give greater emphasis to financial stability, as perhaps an ultimate target, which necessarily implies that the formulation and implementation of monetary be coordinated with financial policy. More specific recommendations include the following:

- Enhance coordination and cooperation with domestic players, such as with the capital markets supervisory authority etc. In this regard, it is essential that the present financial structure and potential future development be assessed. Once this is done, appropriate levels of coordination and cooperation can be tailored to the country to match its unique characteristics. The specific modalities of this will have to be worked out but it is felt that this will effectively pre-empt financial crisis from occurring and to mitigate the impact of the financial crisis once it occurs.

- Lay the foundation for coordination with international stakeholders such as the IMF etc. Again, it is essential that the present level of globalisation and potential future levels of globalisation be assessed. Once this is done, the coordination if necessary, can be tailored to countries to match their unique characteristics. This may start with information sharing, as already initiated with the SEACEN Expert Group (SEG) on Capital Flows. This can eventually lead in the future, to coordination in monetary and financial policy matters.

- Revising the monetary framework, paying close attention to the country's financial structure. This would necessitate that there be development of appropriate instruments and operating targets. These developments are conditional on the above recommendations. This may entail involvement in the process of monetary policy formulation and implementation, namely revising the monetary framework such as instruments and operating targets.

5. Concluding Remarks

The study attempts to provide a better understanding of the changing nature of the macro-financial linkages. Given the diverse levels of openness and financial development, it is difficult to make generalities. Nonetheless, the study tentatively concludes with the observation that a broader definition of the financial sector is necessary, which takes into consideration the unique characteristics of the SEACEN members.

There are a number of limitations and caveats: (i) the integrative nature of the report, with SEACEN members having a wide range of data quality and quantity as mentioned above, may not have fully captured all country insights; (ii) there are some caveats on the economic indicators, for example, for the measure of potential output in the output gap and there are alternative measures beyond the standard measure used in this study; (iii) while the study does not focus on interaction of asset prices (such as inflation performance) and monetary policy tasks, this is an important issue which can be a subject for further exploration - this important point was made in Cavoli (2010) who has also suggested that the exchange rate regime be controlled; (iv) there are also some technical limitations due to the varying levels of financial development which have a direct impact on the use of techniques for addressing problems such as simultaneity. It would also be ideal to be able to test the robustness of these results as a regular practice. These caveats point to areas of further research in this important area of monetary policy management.

REFERENCES

Antão, Paula, (2009), "The Interest Rate Pass-Through of the Portuguese Banking System: Characterization and Determinants" *Banco de Portugal Working Papers* 5 | 2009. Available at the Internet address: http://www.bportugal.pt/publish/wp/2009-5.pdf

Aziz, Jahangir, (2008), Real and Financial Sector Linkages in China and India WP/08/95 Available at: www.imf.org.

Bayoumi, Tamim and Ola Melander, (2008), "Credit Matters: Empirical Evidence of US Macro-Financial Linkages" *IMF Working Paper* WP/08/169 available at: www.imf.org

Cavoli, Tony, (2010), "Review of Macro-Financial Links and Monetary Policy Management".

Cetorelli, Nicola and Linda S. Goldberg, (2008), "Banking Globaliation, Monetary Transmission, and the Lending Channel", Paper Presented at the 9th Jacques Polak Annual Research Conference Hosted by the International Monetary Fund, Washington DC on November 13 - 14, 2008 Available at www.imf.org.

Charoenseang, June and Pornkamol Manakit, (2007), "Thai Monetary Policy Transmission in an Inflation Targeting Era", *Journal of Asian Economics,* 18 (2007) 144–157.

Claessens, Stijn, (2004), "Managing Volatility and Crises A Practitioner's Guide" in Finance and Volatility at www1.worldbank.org/economicpolicy/documents/.../pgchapter04.pdf

Dickey, D., and W. Fuller, (1981), "Likelihood Ratio Tests for Autoregressive Time Series with a Unit Root," *Econometrica*, Vol. 49, pp. 1057-1072.

Disyatat, P., & Vongsinsirikul, P., (2002), Monetary Policy and theTransmission Mechanism in Thailand, Bank of Thailand, 2002, Symposium on the Road to Sustainable Growth: Getting the Fundamental Right, Available at the Internet Address: www.bot.or.th.

Engle, R., and C. Granger, (1987), "Co-integration and Error Correction: Representation, Estimation and Testing", *Econometrica*, Vol. 35, pp. 251-276.

Estrella, Arturo, 2002, "Securitization and the Efficacy of Monetary Policy," *Economic Policy Review*, Federal Reserve Bank of New York, Vol. 8, No. 1, (May), pp. 243–55.

Frank, Nathaniel and Heiko Hesse, (2009), "Financial Spillovers to Emerging Markets During the Global Financial Crisis", *IMF Working Paper* WP/09/104, Available at: www.imf.org

Gray, Dale F, Robert C. Merton and Zvi Bodie, (2007), "New Framework for Measuring and Managing Macrofinancial Risk and Financial Stability", *Working Paper* 13607, Available at: http://www.nber.org/papers/w13607.

Goswami, Mangal, Andreas Jobst, and Xin Long (2009), "An Investigation of Some Macro-Financial Linkages of Securitization", *IMF Working Paper* WP/09/26, Available at: www.imf.org.

Houben, Aerdt, Jan Kakes, and Garry Schinasi, (2004) "Toward a Framework for Safeguarding Financial Stability", *IMF Working Paper* WP/04/101, Available at: www.imf.org.

IMF, (2006), "How do Financial Systems Affect Economic Cycles?", World Economic Outlook, Chapter 4, September 2006.

Johansen, S., (1988), "Statistical Analysis of Cointegrating Vectors," *Journal of Economic Dynamics and Control*, Vol. 12, pp. 231-254.

Johansen, S., (1991), "Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models", *Econometrica*, Vol. 59, pp. 1551-1580.

Johansen, Søren and Katarina Juselius, (1994), "Identification of the Long-Run and Short-Run Structure: An Application the IS—LM Model", *Journal of Econometrics*. Vol. 63, No. 1, pp. 7–36.

Kuttner, K.N. and Patricia Mosser, (2002), "The Monetary Transmission Mechanism: Some Answers and Future Questions", *Economic Policy Review*, Federal Reserve Bank of New York, Vol.8, No.1, pp.243-55.

Mishkin, Frederic S. (1996), "The Channels of Monetary Transmission: Lessons for Monetary Policy", National Bureau of Economic Research, Available at: www.nber.org

Patat, Jean-Pierre, (2007), "Monetary Policy Transmission Channels - A Comparison between the Euro-area and the US", Available at: www.europarl.europa.eu/comparl/econ/emu/20070321/patat_en.pdf

Rudebusch, Glenn D., and Lars E. O. Svensson, (1999), "Policy Rules for Inflation Targeting," in: John B. Taylor (ed.), *Monetary Policy Rules*. Chicago: University of Chicago and National Bureau of Economic Research.

Schumpeter, J.A., (1911), The Theory of Economic Development (London: Oxford University Press, reprinted 1969).

SEACEN (2010a), Country Report Cambodia.
SEACEN (2010b), Country Report Indonesia.
SEACEN (2010c), Country Report Malaysia.
SEACEN (2010d), Country Report Myanmar.
SEACEN (2010e), Country Report Nepal.
SEACEN (2010f), Country Report Philippines.
SEACEN (2010g), Country Report Taiwan.
SEACEN (2010h), Country Report Thailand.
SEACEN (2010i), Questionnaire Response of Fiji.
SEACEN (2010j), Questionnaire Response of Korea.
SEACEN (2010k), Questionnaire Response of Mongolia.
SEACEN (2010l), Questionnaire Response of Sri Lanka.
SEACEN (2010m), Questionnaire Response of Vietnam.

Tieman, Alexander, (2004), "Interest Rate Pass-Through in Romania and Other Central European Economies", *IMF Working Paper* WP/04/211, Available at the Internet address: www.imf.org.

Wikipedia, "Inflation Targeting". http://en.wikipedia.org/wiki/Inflation_targeting.

Woolford, Ian, (2001), "Macro-financial Stability and Macroprudential Analysis", *Reserve Bank of New Zealand Bulletin,* Vol. 64 No. 3, Available at http://www.rbnz.govt.nz/research/search/article.asp?id=3712.

PART II: COUNTRY CHAPTERS

CHAPTER 2
MACRO-FINANCIAL LINKS
AND MONETARY POLICY MANAGEMENT IN CAMBODIA

By

Ung Visoth[1]

1.   Introduction

It was remarkable that Cambodia experienced high economic growth and strong political stability during the last decade. The new Royal Government of Cambodia (RGC) resumed its duties with a firm commitment and determination to further accelerate development and the implementation of comprehensive reform.

The global financial crisis made the Cambodia's economic outlook uncertain. The recent financial turmoil has severely affected the US, EU, Japan, Korea, including many other medium and smaller countries. The shocks from the global financial crisis reverberated across many developed and developing countries. Cambodia, being a small country with an open economy, is very exposed to external influence.

Its economic growth, which was estimated at 6.7% in 2008, is expected to decline in 2009. The economic slowdown is mainly due to: (i) reduction in external demand (the US slowdown, in particular, will have a significant impact on the textile sector, which, in turn, is likely to result in a considerable drop in the national exports); (ii) uplifting of safeguard measures by the US on China's garment exports; (iii) decline in tourism activities caused by lower income and less spending on holidays and traveling; and (iv) weakening of the performance of the construction sector, affected by a weakened global economy leading to the reduction in foreign direct investment (FDI). Cambodia's agriculture sector, however, is expected to maintain its good performance but this sector is not strong enough to be an engine of growth.

---

1.   Deputy Division Chief, Balance of Payments Statistics Division, Economic Research and Statistics Department,vNational Bank of Cambodia. The views expressed in this paper are those of author and they do not necessary represent the official position of the National Bank of Cambodia.

Following the introduction in Section 1, Section 2 describes the background of the National Bank of Cambodia (NBC). Section 3 highlights its general policy for monetary management. Section 4 reviews the trends in the macroeconomic data. Section 5 focuses on monetary policy management and the macroeconomy. Section 6 identifies the impact of the global crisis on the real economy. The conclusion, including the major issues and policy recommendations, are presented in Section 6.

2. Background of the National Bank of Cambodia

During the Khmer Rouge regime, Cambodia's banking system was completely destroyed. The NBC building was bombed to the ground and the riel banknotes were abandoned. Following Cambodia's liberation from the Khmer Rouge on 7 January 1979, the NBC was re-established on 10 October 1979.

As Cambodia's monetary authority, the NBC re-issued new riel banknotes on 20 March 1980, with the support of the allied countries. The riel banknote issuance was strongly supported by the public. The riel banknotes served payment settlement and gave rise to banking activities and the state budget system.

The NBC gradually reformed the banking system since 1989. The provincial and municipal banks were simultaneously transformed into specialised provincial and municipal banks. The function of the state budget cashier was transferred to the Ministry of Economy and Finance in late-1991. Foreign investment made its appearance in the banking sector in Cambodia in mid-1991.

The NBC also contributed effectively in restoring the standard of living and in alleviating massive starvation after Cambodia's liberation through its credit policy focusing on solidarity groups and state-owned enterprises. The NBC's credit policy contributed in promoting economic activities, including agriculture, fishing, handicraft, industry and trade.

From the nation-wide general elections in 1993, Cambodia's banking system was restored, with the establishment of 32 commercial banks under its domestic laws. The banking system was transformed from a mono-banking system to a two-tier banking system by separating the functions of the central bank from commercial banking activities. This required the NBC to strengthen its role and to improve its management capacity in supervising and regulating the commercial banks.

3. General Policy for Monetary Management

The NBC, the central bank, does not use direct monetary instruments. The interest rate is completely liberalised, and there are no quantitative restrictions on bank lending. The indirect tools of monetary policy, such as reserve requirements and refinancing facilities, have been introduced to avoid distortion-inducing credit controls. Given the lack of instruments, the monetary authority has successfully used foreign exchange interventions to regulate riel liquidity and to smooth fluctuations in the exchange rate. Restrictions were imposed on monetary financing of the budget deficit to control the creation of base money.

3.1 Foreign Exchange Rates

Cambodia has a very liberal foreign exchange control regime designed to encourage international trade and support the confidence of foreign investors. The NBC has adopted a managed floating exchange rate regime. At present, the NBC sets a daily official exchange rate as well as the rate set by the parallel free market. The official rate is maintained within about 1% of the free market rate and is used only for official transactions. The US dollar auction is made in order to realign the fluctuation of the exchange rate caused mainly by psychological factor. The NBC has no intention to intervene to resist the downward pressure on the exchange rate, except in circumstances of disorderly market movements.

3.2 Interest Rates

The scope of NBC's monetary policy is very limited. No interest rate is set as benchmark because of the dollarised economy. The inflation target has not been announced, but the monetary target has been set with assistance from the International Monetary Fund (IMF). It is noted that the NBC determined a refinancing base interest rate of 0.5% per month or 6% per year for the riel refinancing for commercial banks in order to allow the banks more flexibility to set their interest rates since January 2002.

4. Trends in Macroeconomic Data

4.1 Real GDP Growth

In 2008, the performance of Cambodia's economy was generally satisfactory, with the GDP growth of around 6.7% despite the pressure of high oil price and

soaring food prices since the end of 2007. Normally, looking at the quarterly data, the economic activities would usually contract slightly in the second quarter due to their seasonality and pick up during the third and fourth quarters. However, the economy declined notably in the second quarter of 2008 with the negative growth as high as -8.2% of GDP (affected by high energy and food prices, compounded by the uncertainties of the pre-election period), then it recovered up to 7.3% of GDP in the third quarter partly owing to: (i) policies introduced to mitigate the adverse effect of soaring food and petroleum product prices in order to curb inflation, (ii) political stability following the general election at the end of July 2008, and (iii) surge in the agriculture activities during the harvest season. However, the impact of the financial crisis that had erupted in the US and spread outwards to the advanced economies during the second semester started to influence Cambodia's economy in the fourth quarter, resulting in negative growth of -3.6% of GDP, in contrast historically to the economic performance of the fourth quarter which is typically strong.

Figure 1
Quarterly Real Growth Rate
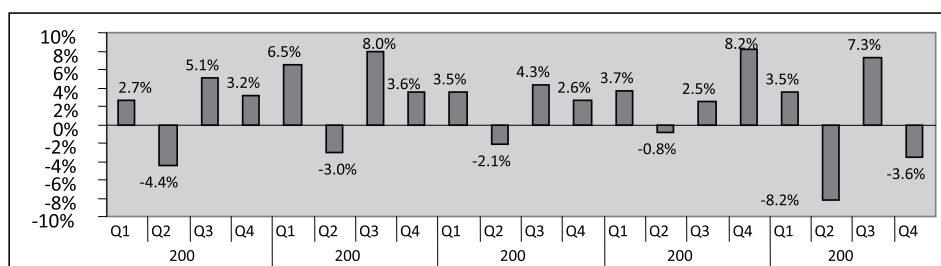
Source: National Institute of Statistics

In 2008, the economic performance was characterised by two key features: (1) the agriculture sector played a substantial role in maintaining GDP growth as other sectors contracted negatively, affected by external factors; and (2) fiscal tightening, combined with ongoing reforms in public finance, have provided fiscal space for the authorities to address the immediate issue of soaring inflation driven by oil and food price shock.

During the last five years (2003-2007), the average growth rate was 10.6%, reaching its peak at 13.3% in 2005. The growth rate was 10.8% in 2006, 10.2% in 2007 and 6.7% in 2008. The growth rate is predicted to decline further in 2009. The significantly slower growth in the coming years appears to be part

48

of the business cycle, which at the same time is compounded by the impact of the global financial crisis.

Figure 2
Economic Growth Rate 1994-2008

Percentage
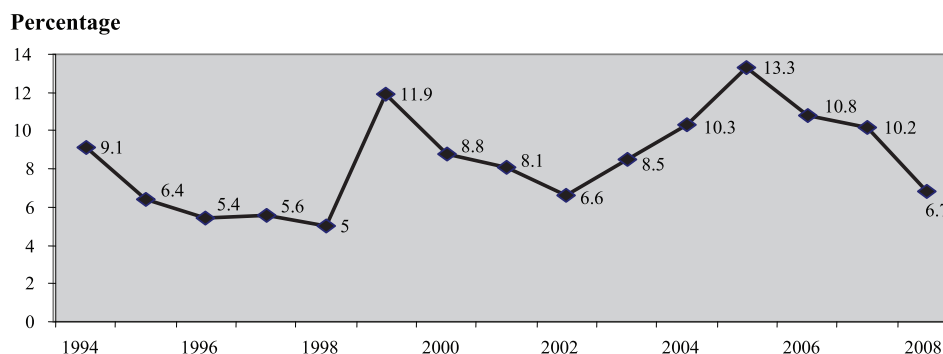
Source: National Institute of Statistics

4.2 Exchange Rates

Despite the global financial crisis, the local currency has remained broadly stable. The exchange rate of the riel against the US dollar moved largely within the range of 4,000 riel and 4,143 riel per US dollar. The riel depreciated around 1.1% in May 2009, as compared to the same period of last year, and it depreciated around 0.8% between end-May 2009 and end-December 2008.

Figure 3
Exchange Rate Movement

Source: National Bank of Cambodia

49
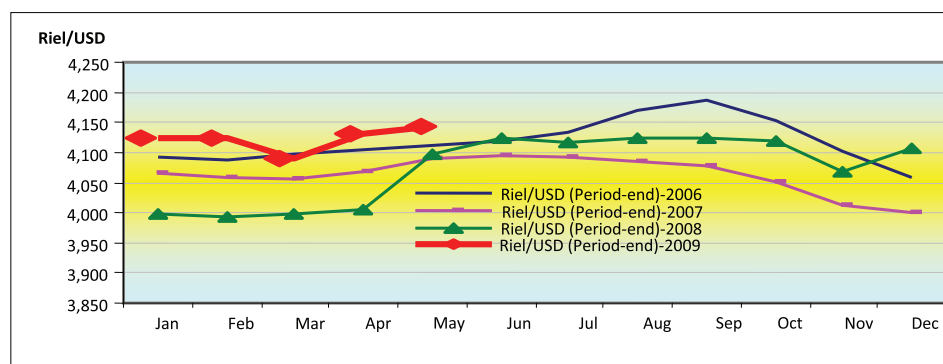
4.3 Inflation

Year-on-year (YoY) change in the overall consumer price index reached its peak of 35.6% in May 2008, and continued to fall declining to 12.5% at the end of 2008 and to 6.2% in February 2009. The decrease in year-on-year inflation was largely a result of the slowdown in global fuel and commodity prices. Inflation, excluding food price, declined to 6.7% in December 2008 and 4.1% in February 2009, from a year peak of 22.3% recorded in August 2008.

Figure 4
Consumer Price Index
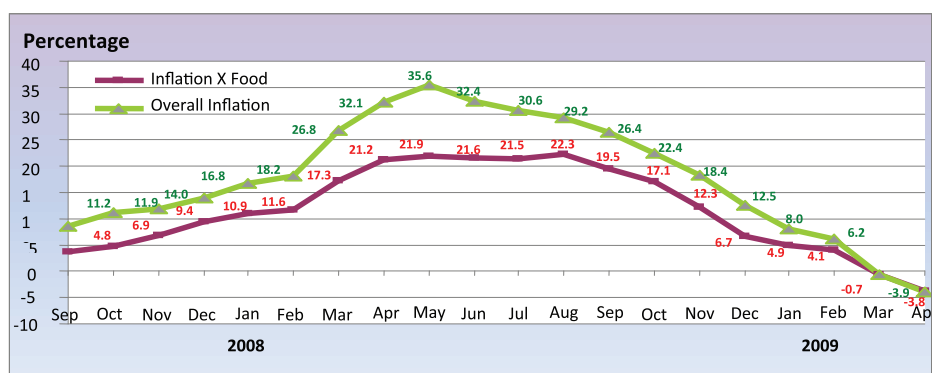
Source: National Bank of Cambodia

4.4 Monetary Aggregates

In 2008, broad money (M2) increased by 548.2 billion riel (4.8%) from a stock position of 11,310.7 billion riel as of end-December 2007 to 11,858.9 billion riel as of end- December 2008. The rise in broad money (M2) was mainly due to the expansion in currency outside banks of 305 billion riel (15.3%) coupled with the growth in foreign currency deposits of 136.8 billion riel (1.5%), whereas time and saving deposits and demand deposits increased by only 63.8 billion riel (52.7%) and 42.5 billion riel (68.3%), respectively. The increases in foreign currency deposits were reflected in increases in term deposits of 1,145.2 billion riel (41.4%) and demand deposits of 149.9 billion riel (6.5%), while savings deposits decreased by 1,049.1 billion riel (23.2%).

50

Figure 5
Structure of Money Supply
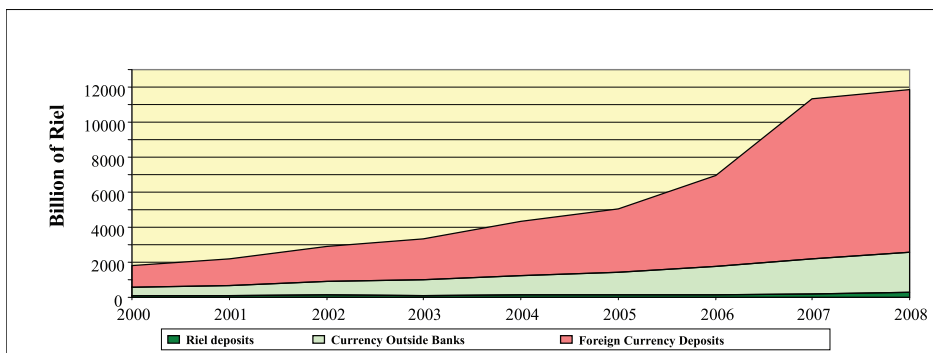
Source: National Bank of Cambodia

The monetary development was characterised by further improvement in local business and foreign investor confidence in the Cambodian economy and the banking sector. It also mirrored the increasing use of banking services and the deepening of financial intermediation within the economy with the rising number of financial service providers, the continuous modernisation of payment services in several large commercial banks, and government encouragement under the public finance management reform programme for people to use banking services.

4.5 Interest Rates

Since 2000, Cambodia's banking sector continuously experienced relatively large excess reserves, while the growth in banks' lending also recorded sharp acceleration in June 2008. Such rapid expansion was viewed as a source of the surge in domestic demand in the recent period. To deal with the increasing inflationary pressure, the NBC increased the minimum reserve requirement ratio for foreign currency deposits from 8% to 16%, effective from July 2008. Meanwhile, the credit risks in the international markets continued to rise and the global credit crunch seemed to affect capital inflows into Cambodia, which in turn put pressure on liquidity in the local banking sector. As a result, the deposit rates generally increased while the lending rates declined.

The weighted average interest rates on 12-month deposits showed a gradual increase from December 2006, and posted a noticeable increase in August 2008.

51

The rates on riel and US dollar deposits, which accounted respectively for 6.4% and 4.8% as of end-2006, increased to 7.1% and 4.9% in December 2007, and continued to increase to 7.7% and 6.3% in December 2008.

Figure 6
Interest Rate Movements
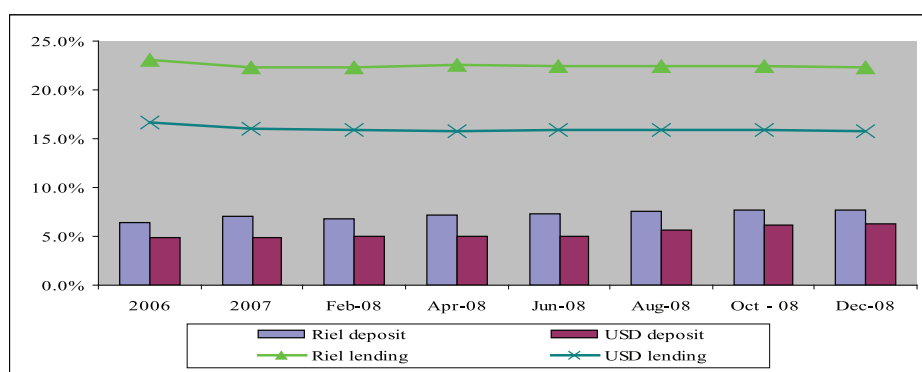
Source: National Bank of Cambodia

During the same period, the weighted average lending rates on 12-month lending went down steadily. The lending rates of riel and US dollar decreased from 23.1% and 16.7% in December 2006 and down to 22.4% and 15.8%, respectively, in December 2008.

4.6 International Reserves

The international reserve position has been favorable and doubled during the last three years, from US$1.1 billion in December 2006 to US$2.15 billion in December 2008, which was sufficient to finance about 3 months of imports. It took 12 years for Cambodia's gross foreign reserves to increase from US$100 million in 1994 to US$1 billion in 2006.

Figure 7
Gross International Reserves 1999-2008
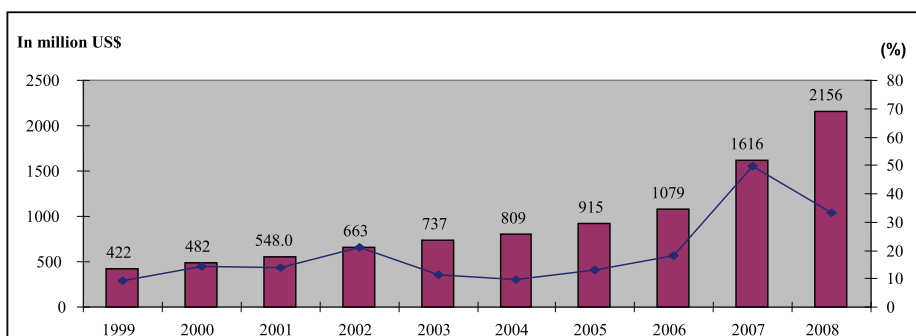
Source: National Bank of Cambodia

4.7 Balance of Payments

Cambodia's balance of payments for 2008 is estimated at an overall balance in surplus of US$345.1 million, a decrease of US$67.7 million (or 16.4%), as compared to the overall surplus balance estimated for 2007. The decreased surplus was mainly due to an increase of US$486.0 million (or 69.7%) in the balance on capital and financial account, while the current account balance deficit (excluding official transfers) increased by US$542.1 million (or 74.0%). The ratio of the current account balance deficit (excluding official transfers) to gross domestic products (GDP) was 12.3% in 2008, as compared to 8.5% in 2007.

Figure 8
Trade Balance 1999-2008

Source: National Bank of Cambodia

53
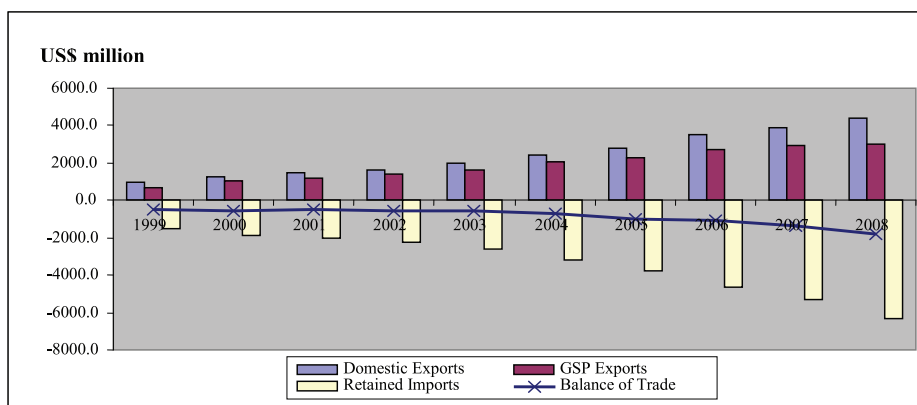
The current account balance exhibited a deficit of US$1,275.0 million in 2008, an increase of 74.0%, compared to the previous year's deficit. This increased deficit was mainly due to increases of 32.1% and 17.6% in the deficits of the balance on goods and net income, respectively. During the year, net service surplus decreased 4.4% while net private transfers decreased 2.7%.

In 2008, the domestic exports amounted to US$4,423.7 million, an increase of US$549.8 million (or 14.2%) compared to the previous year's exports. The main contributing factors to this increase were the increases of US$64.2 million and US$485.6 million in garments and other domestic exports, respectively. Garment and textile exports rose 2.2% as compared to an estimate of 7.9% for 2007. The main reason for this lower growth of garment exports was the global financial crisis which resulted in reduction of foreign demand, especially garment imports into the US. Furthermore, the US and the EU are planning to remove the restricted access of China's imports of garments in early 2009. This will lead to a great challenge for Cambodia's garment industry. During the year, other domestic exports increased US$485.6 million (or 52.1%). The main contributors of the increase were the increases in price of paddy rice, furniture, fish, rubber and other agriculture products.

During the same period, the estimate of retained imports was valued at US$6,296.5 million, up US$1,007.3 million (or 19.0%) on the estimate for 2007. The key contributor to this growth was an increase of US$576.7 million (or 42.8%) in petroleum imports, which accounted for 30.6% of retained imports. The other retained imports such as imports of garment materials and other products rose 2.0% and 15.7%, respectively.

Net service surplus was US$587.2 million in 2008, down US$27.1 million (or 4.4%) on the previous year's surplus, resulting from an increase of US$100.2 million in service receipts while service payments to non-residents increased US$127.4 million. The increases in receipts of travel and transportation services were the main contributors. Because of the ongoing implementation of open-sky policy of the Royal Government of Cambodia, which allows for direct international flights to Siem Reap, the number of foreign visitor arrivals increased to 2,159,771 visitors, as compared to 2,015,128 visitors in 2007. South Korea remained the leading country, which accounted for 14% of the total foreign visitor arrivals in Cambodia, followed by Vietnam (10%), Japan (8%), US (7%) and China (6%). During the year, the net income account deficit was US$408.7 million, an increase of US$61.1 million (or 17.6%). This increased deficit resulted from an increase in investment income remitted to non-residents.

In 2008, the balance on current account and capital account recorded a deficit of US$789.2 million, as compared to the previous year's deficit of US$243.6 million. The net official transfers recorded an inflow of US$485.8 million, down US$3.5 million (or 0.7%) on a net inflow of US$489.3 million for 2007, reflecting official development assistance that the Royal Government of Cambodia obtained from its development cooperation partners, multilateral and bilateral. Foreign direct investment registered a net inflow of US$794.7 million, down 8.3% on a net inflow of US$866.2 million for the previous year. Of this net inflow, direct investment in banks and non-banks sector amounted to US$344.1 million and US$450.6 million, respectively.

5. Monetary Policy Management and the Cambodian Macroeconomy

5.1 Monetary Framework

Monetary policy is one of the tools among the instruments, regulations and measures established by the NBC to manage cash flow, cash circulation and maintenance of purchasing power of cash issued by the NBC. The NBC's main responsibility is to conduct monetary policy in the Kingdom of Cambodia. According to Article 3 of the Law on the Organisation and Conduct of the National Bank of Cambodia, "the principle mission of the Central Bank is to determine and direct monetary policy aiming at maintaining price stability in order to facilitate economic development within the framework of the Kingdom's economic and financial policy."

5.2 Banking Sector

Cambodia's financial sector remains competitive. The rapid increase in deposits in the commercial banks testifies to the growing public confidence due to the transparency of financial sector policies and investment levels in the sector. In response to the global financial crisis, measures have been taken to recapitalise banks and financial institutions, improve audit, strengthen supervision and ensure liquidity of the banking system.

As of July 2009, the banking sector of Cambodia consisted of 27 commercial banks, of which 5 are foreign bank branches and 22 are locally incorporated; 6 specialised banks, of which one is a state-owned bank and 5 are privately owned; 20 licensed microfinance institutions (MFIs); and 2 representative offices from the Standard Chartered Bank and the Vietnam Bank for Agriculture and Rural Development. In June 2004, there were only 14 commercial banks, 3

specialised banks, and 9 licensed microfinance institutions. During the last five years, the increased number of banking institutions and the modernisation of banking products and services have contributed to an improvement of intermediation in the banking sector. Below are some of the key indicators of the banking system in Cambodia.

5.2.1 Liquidity and Solvency

The banking system has remained healthy and sound since its restructuring in 2000. According to Figure 9, the balance sheet structure of the banking sector registered a slight shift, as total equity to total assets increased to 22% in 2008 from 17% in 2007. This increase was due to the additional capital contribution from six new banks in 2008, including five commercial banks and one specialised bank. The liquidity ratio decreased to 81%, but remained above the regulatory limitation of 50%. It appears that rapid credit expansion and slow deposit growth has put pressure on liquidity in the banking system.

Since Cambodia is a cash-based economy, rapid credit disbursement resulted in less liquid assets as deposits grew at a slower pace. The solvency ratio went up to 28% in 2008 from 24% in 2007. The improvement in equity and net worth of the banks was due to additional capital of new banks and existing banks, pushing up the solvency ratio. The newly established banks are likely to have a higher solvency ratio than the existing banks.

Figure 9
Liquidity and Solvency Ratios

Source: National Bank of Cambodia

56
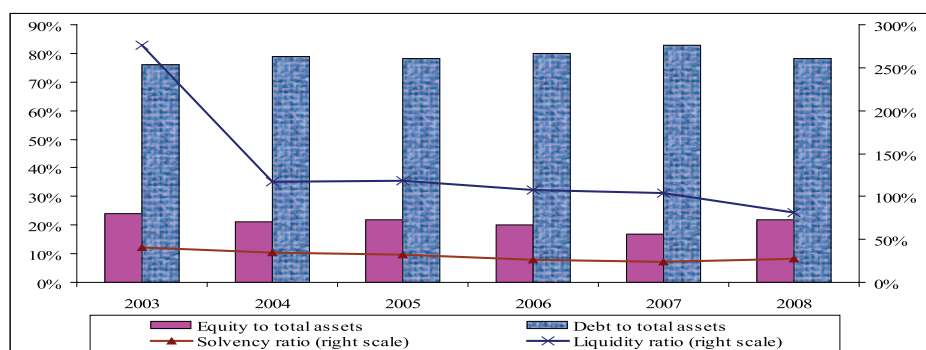
5.2.2 Non-performing Loans

In 2008, the ratio of non-performing loan was at 3.7% (see Figure 10), which is considerably low in light of the rapid credit growth in the banking system. One of priorities of the NBC is capacity building that includes on-the-job training in domestic and overseas. In the meantime, many initiatives have been made to streamline prudential regulations consistently with the international practice. A new classification on credit classification and provisioning has been adopted for implementation and will provide a better tool for portfolio assessment. The technique for credit review is also being transferred from the most experienced bank examiners from developing countries to the NBC's young but capable supervisors.

Figure 10
Non-performing Loan and Loan to Related Parties
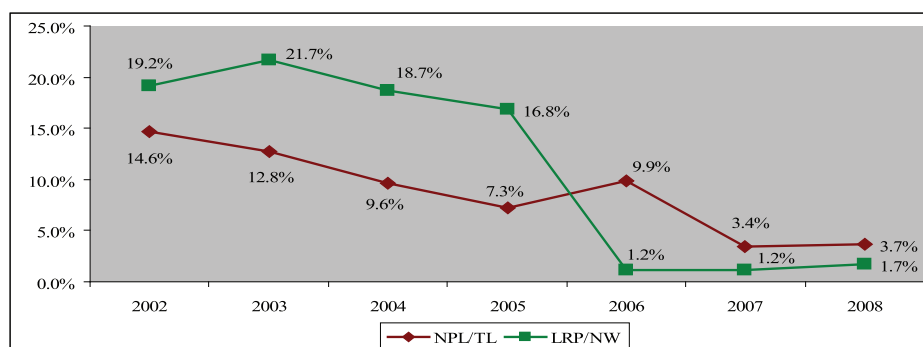
Source: National Bank of Cambodia

According to Figure 10, loans to related parties remained relatively stable at less than 2% of net worth, below the prudential limitation of 10%, resulting from strict enforcement of prudential regulations.

5.2.3 ROA and ROE

The return on assets (ROA) was stable at 2.9% as compared to the last two years. The prominent earning assets of banks are mostly loans, which represent about 58% of total assets. The following earning assets are deposits with the NBC which accounted for 23% of total assets. As the financial market is underdeveloped, particularly with regard to the adequacy of interbank market, banks invest their funds as deposits with the NBC to earn interest. Hence, the

efficient use of assets to make earnings is significant from lending activities. On the other hand, the return on equity (ROE) for the banking system declined to 13.1% in 2008 from 16.6% in the previous year. The establishment of six new banks operating in 2008 was a main factor for this decline, as these banks made losses during their initial operations. However, the ROE ratio remains at a satisfactory level.

Figure 11
ROA and ROE
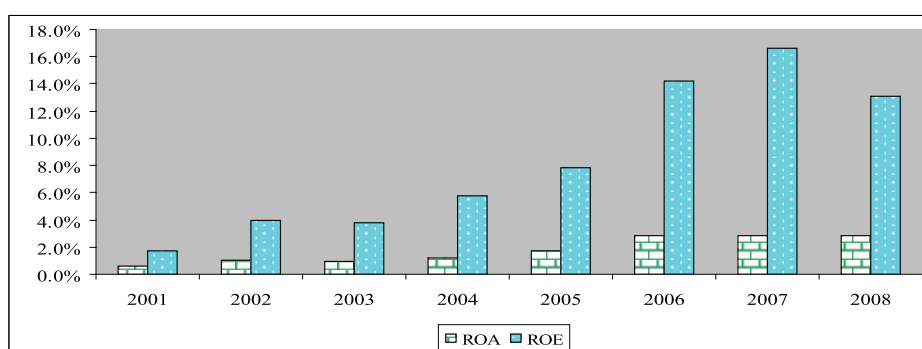
Source: National Bank of Cambodia

5.2.4 Credit to Private Sector

The NBC took swift action to support local economic development by facilitating credit flow in the economy. The cap on credit to the real estate sector was abolished and the reserve requirement was reduced to 12% in early 2009. In the meantime, only customer deposits were subject to the reserve requirement, while bank's placement and borrowing of funds were excluded from the reserve requirement. The technique for reporting and monitoring reserves was also amended to provide more flexibility for banks in managing their liquidity. The issuance of these new classification requirements notwithstanding, the NBC took initiatives to ease banks' liquidity pressure to provide more room for them in extending credit to customers as well in injecting more funds to stimulate economic growth.

The lifting of the 15% ceiling imposed on the real estate sector does not imply that the supervisory authority is subjecting banks to more exposure in real estate risk. The banking community at large had already recognised the risk inherent in real estate investment and largely agreed with the requirement to adopt adequate procedures to mitigate the risks. A few banks closely dealing

with real estate investment and residential mortgage financing have been closely monitored. By the end of 2008, credit exposure to the real estate sector in the banking system accounted for 7.5% of the total portfolio, while credit to the construction sector was recorded at 7.9%.

Figure 12
Credit Classified by Industry in 2008
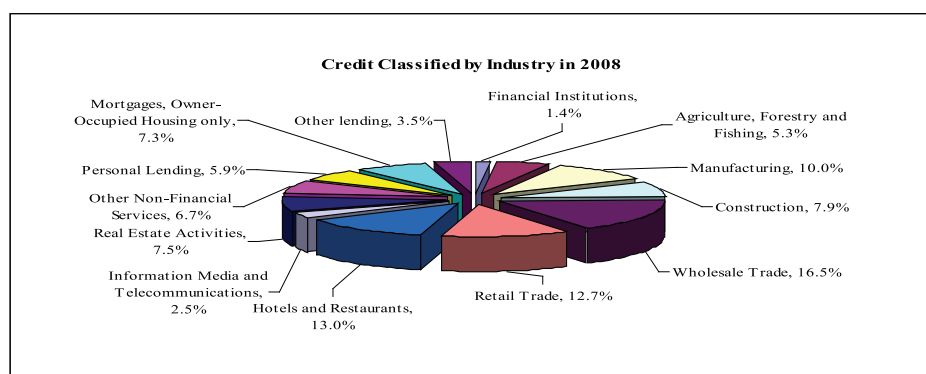
Source: National Bank of Cambodia

Over the medium to long term, the government is committed to implement the measures identified in the Financial Sector Development Strategy 2006-2015. This document updates and revises the Vision and Financial Sector Development Plan for 2001-2010, which was formulated by the Royal Government of Cambodia working closely in conjunction with the ADB technical team in December 2001, to address the priorities and sequencing over the period of 2006-2015. The priorities include improvement of prudential regulations, payment system and supervision, strengthening of on-site and off-site inspection, and capacity building for professional staff.

5.3 Government Sector

In 2008, the fiscal position remained strong as the result of public financial reform initiated since 2004. The budget revenue increased to the highest level of 12.4% of GDP, compared to the previous years. Prudential fiscal policy, by rationalising spending priority and creating fiscal space for specific government intervention, mitigated the impact of the economic and financial crisis. As a

result, the expenditure was maintained at the level of 14.8% of GDP, the current budget surplus amounted to 3.9% of GDP and the overall budget deficit (excluding grants) reduced to 2.2% of GDP. In the context of the current global financial crisis, and given our long-term development objectives, the budget envelope for 2009, stated in the law for financial management 2009, was prepared to support and stimulate growth.

Domestic revenue increased by 31.6% to 5,290 billion riel in 2008 from 4,021 billion riel in 2007. The increase was mainly due to: (i) the growth in tax revenue, which rose by 30.4% to 4,430 billion riel from 3,397 billion riel during the same period; and (ii) an improvement in collection of non-tax revenue, which increased by 27% to 781 billion riel in 2008 from 615 billion riel in 2007.

Figure 13
Government Budget as Percentage of GDP
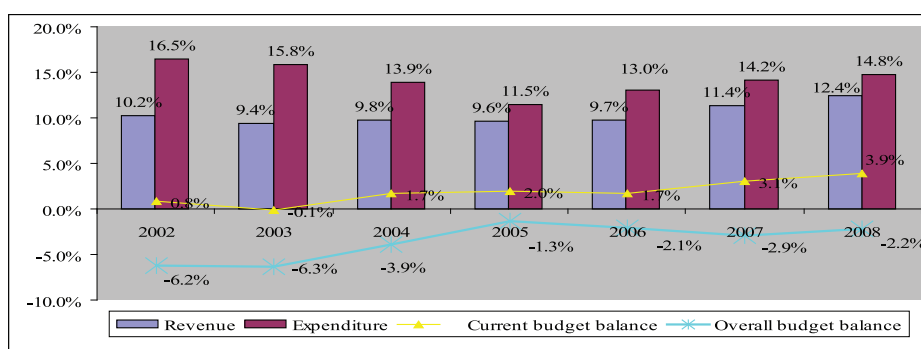
Source: Ministry of Economy and Finance

The improvement in revenue performance is opening up fiscal space for higher expenditures in agriculture, irrigation, roads, and energy, as well as for growth in social sector spending. The government has indicated its intention to significantly increase spending on rural infrastructure, by allocating a large share of the IMF's Medium-Term Debt Relief Initiative (MDRI) funds (US$33 million) to fund small rural irrigation projects in the eastern provinces during 2006-2008.

60

Figure 14
Government Budget 2002-2008

(In billion of riels)	2002	2003	2004	2005	2006	2007	2008
Domestic revenue	1,729	1,765	2,127	2,625	3,259	4,021	5,290
Of which:							
Tax revenue	1,216	1,220	1,577	1,911	2,270	3,397	4,430
Non-tax revenue	497	513	530	563	611	615	781
Expenditure	2,774	2,929	2,970	2,964	3,875	4,993	6,212
Current expenditure	1,575	1,758	1,746	1,967	2,374	2,874	3,594
Current budget balance	138	-25	362	506	508	1,080	1,616
Overall budget balance	-1,045	-1,164	-843	-339	-616	-1,030	-922

Source: Ministry of Economy and Finance

According to Figure 14, total expenditure increased by 24.4% to 6,212 billion riel in 2008 (14.8% of GDP) from 4,993 billion riel in 2007. The current expenditure rose to 3,594 billion riel in 2008 from 2,874 billion riel in 2007. Payroll accounted for 36% of the total current expenditure, representing about 3.1% of GDP. The budget performance improved substantially in 2008, owing to the implementation of the Public Financial Management (PFM) reform, reflecting in the improvement in fund disbursement and tighter budget preparation. Capital expenditure comprises locally financed expenditure by domestic revenue and externally financed capital expenditure by bilateral and multilateral development partners in the form of grants and concessional loans. Capital expenditure funded by the government is mainly concentrated in three ministries: the Ministry of Public Works and Transport, the Ministry of Water Resources and Meteorology, and the Ministry of Rural Development.

Figure 15
Government Budget as Percent of GDP

	2002	2003	2004	2005	2006	2007	2008
Domestic revenue	10.2%	9.4%	9.8%	9.6%	9.7%	11.4%	12.4%
Expenditure	16.5%	15.8%	13.9%	11.5%	13.0%	14.2%	14.8%
Current budget balance	0.8%	-0.1%	1.7%	2.0%	1.7%	3.1%	3.9%
Overall budget balance	-6.2%	-6.3%	-3.9%	-1.3%	-2.1%	-2.9%	-2.2%
Government debt	23.3%	24.9%	24.8%	23.6%	22.2%	23.7%	28.1%

Source: Ministry of Economy and Finance

Figure 15 shows that the current budget surplus increased to 3.9% in 2008 from 3.1% of GDP in 2007 and the overall budget deficit declined to 2.2% in 2008 from 2.9% in 2007. The overall budget deficit in 2008 was financed by concessionary loans and grants provided by Cambodia's development partners. The fiscal strategy of Cambodia does not allow domestic financing of the fiscal deficit.

The RGC gives priority to increasing public investment in physical infrastructure, including transportation and irrigation to increase agriculture output and reduce manufacturing costs, and in implementing social safety nets. The RGC is very careful in monitoring the implementation of the budget on both expenditure and revenue sides. Moreover, the budget operations and deliberations are carefully considered and weighted to balance the need to stimulate growth and sustain macroeconomic stability.

5.4 Dollarisation in Cambodia

Dollarisation took place in Cambodia as a result of a series of shocks and events that reduced public confidence in the value of the national currency, the riel. In 1991-1993, the United Nations Transitional Authority in Cambodia (UNTAC) was one of the largest and most expensive operations in UN history, at a cost of US$1.7 billion (Tal, Michel, & Nguon, 2007). US dollars flowed into the nation, creating a new shock against the national currency, and the US dollar started to be used as medium of exchange and unit of account, and eventually also as a store value, alongside the local currency. However, the riel remains the currency used normally in domestic transactions. Since 1993, the US dollar has been widely used. In Cambodia, the US dollar serves all the functions of money as: (i) a valuation instrument, (ii) a settlement instrument, and (iii) a saving instrument for the people.

The use of foreign currencies has gradually increased since the opening of the country to the outside world. In particular, the US dollar and Thai baht flooded into the Cambodian market when the RGC promoted foreign investment in 1989 in compliance with its free market-oriented policy. The foreign currencies are used by both residents and non-residents of Cambodia, such as foreign firms, aid agencies, embassies, and non-governmental organisations. These organisations incur their expenditure in US dollar, including their stuff salary payments. The riel, on the other hand, is used by the government and the central bank for salary payment to their employees. The riel is the preferred currency for small transactions in both urban and rural areas.

5.4.1 Advantages of Dollarisation

First advantage is *switching from using gold to banknotes denominated in US dollar.* During the early 1990s, the US dollar was widely used for transactions and wealth storage, replacing the use of gold which was common practice in Cambodia. As a result, the monetisation of the economy has encouraged savings.

Second advantage is *preventing capital flight and promoting financial deepening.* The dollarisation provides the opportunity for the domestic financial system to encourage domestic intermediation. Domestic savings denominated in foreign currency deposits have increased substantially since the opening up of the Cambodian economy in 1993.

Third advantage is *lowering the risk of currency devaluation.* As the demand for the riel remained low and the market very small, there was little incentive for speculators to gain from short-term change in the price of the riel. Dollarisation has protected Cambodia against contagion in the face of the Asian crisis beginning in 1997. Hence, investors have confidence in doing business in Cambodia.

Fourth advantage is *facilitating the integration process of Cambodia's trade in the international economy.* A stable currency promotes macroeconomic stability and provides for a predictable business environment. Moreover, the use of the dollar helps to reduce currency conversions and lower transaction cost.

5.4.2 Disadvantages of Dollarisation

First disadvantage is *undermining the effective conduct of monetary policy.* Since the commercial banks' loan and customers' deposits are largely denominated in foreign currencies, mostly the US dollar, and the demand for domestic currency is low, the NBC is unable to develop monetary policy instruments and play its role as lender of last resort for banks facing liquidity problems.

Second disadvantage is *damaging the nation's sovereignty.* Using the US dollar undermines national pride as the national currency is a symbol of the country's sovereignty.

Third disadvantage is *minimising the income from seigniorage.* The difference between the cost of producing and distributing money and the eventual

income withdrawn form lending this money is so called "Seigniorage". The US government gains seignorage benefits from Cambodia. The net annual income foregone is estimated in the range of US$20 million to US$90 million per year.

6. Impact of Crisis on Real Economy in Cambodia

The global financial crisis impacted Cambodia's financial and economic systems, particularly causing a decline in sources of financing, private investment capital outflow, and a fall in demand in the key Cambodian markets. As a result, the most vulnerable sectors affected by the crisis are the garment, tourism, agriculture, construction and real estate sectors.

6.1 Impact of Crisis on Sectors

6.1.1 Garment Sector

The garment sector has been affected by the crisis as 90% of the investment capital comes from overseas, and producers rely on exports to the unstable foreign markets, such as the US and Europe. The garment export increased slightly by 2% in 2008 due to a plunge in purchasing orders, and it is predicted to contract by 5% in 2009.

The RGC sees a need to improve the institutional framework to reduce barriers and difficulties in doing business in Cambodia which can help lower production and transportation costs. Also the government seeks sources of financing for business activities, diversifying markets and improvement of industrial relations between employers and workers. In addition, the government seeks appropriate funds to provide scholarships for special skill training, including the provision of short-term training to young and laid-off workers.

6.1.2 Tourism Sector

With a tighter budget, it is likely that Cambodia sees very little progress in 2008 as the country received only 2.1 million tourists in that year equivalent to 6% increase, as compared to the previous year, and 2.3% below the government's target. It is estimated that the hotel and guesthouse industry in the popular provincial destinations dropped by 30-40% as compared to the previous year.

The RGC now pays greater attention in strengthening the tourism sector over the short, medium and long terms, by ensuring peace, security, political

stability, social order and tourist safety; building more infrastructures; improving legal framework and institutional capacity; developing human resources; and diversifying the tourist market.

6.1.3 Agriculture Sector

This sector, contributing about 30% of the GDP, is still growing due to the increase in domestic investment. However, the global financial crisis has reduced the demand for raw materials in agriculture which, in turn, impacted on the production and price of agricultural products in Cambodia.

In order to support the agriculture sector, the RGC continues to enforce a zero- tariff policy on imports of agricultural materials such as seeds, fertilizers, pesticide, and agricultural equipments, etc. The government is drafting legal procedures for investment projects especially in agricultural product processing, such as investment projects in rice stockpiling and processing.

6.1.4 Construction Sector

Construction constitutes 7% of the GDP. New investment in this sector declined since the global financial crisis, and more than 30% of the construction jobs have been lost as projects were cancelled or scaled back. A number of construction projects have been down-sized and some other projects have been suspended. Two factors that hindered lending to the housing sector are declining personal income and investment in the real estate sector.

6.1.5 Real Estate Sector

The real estate sector which contributes around 8% of the GDP is expected to suffer from the crisis. The decline in this sector poses risk to either domestic or foreign investment, with property prices declining continuously since the end of 2008 until early 2009. Although the market share of foreign buyers is not high, their strong purchasing power greatly influences the price level, thus affecting the profit and future of the sector. In the past, the property buyers were typically speculators, who inflated property prices in anticipation of increase in demand from foreigners and local people for property to increase. These speculators generally borrowed money to finance their activities, and they now face difficulty in meeting the loan repayments against the trend of declining property prices.

6.2 Policies Supporting Sectors

6.2.1 Garment Sector

The RGC has been proactively supporting this sector through various fiscal and other facilitation measures, such as tax incentives, special skill and training, trade financing/credit, promotion of supporting industries (product clusters), as well as improvement in labor standard, dispute resolution, and better industrial relations between employers and employees with collaboration from trade unions.

6.2.2 Tourism Sector

The RGC continues to pay greater attention in strengthening its strategy and policies over the short, medium and long terms, by ensuring peace, security, political stability, social order and tourist safety; building more infrastructures; improving legal framework and institutional capacity; developing human resources; and diversifying tourist market/destinations.

6.2.3 Agriculture Sector

The RGC has given serious thought to agricultural production in terms of costs, output as well as capacity in purchasing, stockpiling and processing Cambodian rice, by providing: (1) short-term credits for collecting paddy/rice from farmers at appropriate price to maintain price stability and ensure food security; (2) Medium-term credit to rice millers to increase capacity in stockpiling drying and processing; and (3) Zero tariff on importing agriculture materials such as seeds, fertilizers, pesticide and agricultural equipments, etc. The RGC is also working on streamlining the legal procedures for agricultural investment projects and supporting businesses and enterprises in this sector through incentives provided under the investment law.

6.3 Monetary Policy Management Reactions

6.3.1 Monetary Policy and Financial Stability

In general, the monetary policy of the NBC seeks to respond to demand-side rather than supply-side inflationary pressures. In this context, in addition to the government's efforts to address supply-side issues, the monetary policy of 2008 was focused on mopping up the excess liquidity from the economy, which emanated mainly from the continuous foreign exchange inflows over the past

years, so as to achieve the appropriate liquidity levels and dampen the inflationary pressures in the economy.

The rapid increase in the inflationary rate since 2007, which continued into mid-2008, was fundamentally triggered by external factors, reflecting in the rising oil prices in the world market and increasing global food prices. Meanwhile, core inflation also rose, accompanied by high monetary and credit growth and a booming real estate sector, indicating that demand and other domestic factors may in addition exert some influence on the recent inflation.

Moreover, from the lessons learned elsewhere in the world on asset bubble boom and bust in the real estate sector, the NBC has also taken steps to avoid the over-involvement of banks in the real estate sector that could have adverse consequences for them. While monetary policy influences monetary aggregates, regulatory policies have been used to supplement the monetary measures.

On the whole, in response to rising inflation and the need to strengthen the soundness of the banking sector, the NBC introduced a package of monetary policy and financial stability measures which consisted of the following:

- Increase in the reserve requirement ratio from 8% to 16% for foreign currency deposits (the ratio has recently been reduced to 12% amidst the downward risk to economic growth);
- Introduction of a 15% ceiling on commercial bank credit to the real estate sector (the requirement has been recently phased out, and replaced by some structural measures);
- Introduction of bank internal and external auditing;
- Enhancement of bank capital base through increase in the minimum capital requirement;
- Improvement in the classification of bank assets and provisioning;
- Improvement in the valuation of collateral used for bank lending;
- Strengthening of the credit information sharing system;
- Strengthening of the system for implementing reserve requirements;
- Strengthening of bank liquidity management;
- Strengthening of corporate governance of banks and financial institutions; and
- Continuous strengthening of the banking system through rigorous implementation of on-site and off-site inspection and supervision.

6.3.2 Fiscal Policy

The RGC implemented an accommodative fiscal policy in response to the hike in inflation in early 2008 as a result of high oil prices and the food crisis. The government tightened fiscal policy by rationalising budget expenditure and increasing government bank deposits, while providing social safety nets and subsidies to dampen inflation. As inflation subsided in late-2008 or early 2009, the government implemented a fiscal stimulus policy in order to sustain economic growth. The measures are indicated as follows:

- Provision of subsidies on petroleum imports (to prevent 100% pass-through of the increase in oil price in the international market into the Cambodia economy);

- Provision of temporary and short-term subsidies to the Electricité du Cambodge (EDC) to maintain electricity tariffs at the same level (subsidies to power generation amounted around US$30 million);

- Assignment of priority by the RGC, in its expenditure policies of 2008 and 2009, to increasing public investment in physical infrastructure, including transportation, irrigation, agricultural production expansion, manufacturing cost reduction and implementation of social safety nets, such as the 20% salary raise for civil servants and armed forces, as well as food emergency programme implemented in conjunction with the ADB;

- Continued mobilisation of all kinds of revenues, either fiscal or non-fiscal, by the Ministry of Economy and Finance and all the relevant ministries/ agencies, effectively in order to meet the objectives set in the 2009 Financial Act; and

- Consistent monitoring of the national budget (both revenue and expenditure sides) by the Ministry of Economy and Finance and proposal of the necessary accommodative measures to the Head of the Royal Government of Cambodia for consideration and adoption.

7. Conclusion

7.1 Major Issues

Presently, Cambodia faces related risks that require a targeted policy response:

- First, a sudden stop or reversal of capital inflows which would have a magnified impact on a dollarised economy, which already is subject to

inflationary pressures. This could trigger difficulties in financing the current account deficit.

- Second, a major slowdown in growth with an accelerator effect on the investment sector already weak and dependent on foreign inflows, as well as on the banking sector, which could be caused by external (e.g. a deeper global recession) or domestic (e.g. an inability to respond to higher prices of rice) factors.

- Third, the domestic financial sector is vulnerable and can be affected by loss of public confidence, or can falter from a rapid deterioration of asset quality either because the current risks were underestimated or misreported, or because of a slowdown of the economy or fall in property prices.

- Fourth, the risk of inflation remains even though this threat has somewhat receded.

7.2 Policy Recommendations

In order to respond to and mitigate these critical risks, the government should focus on the following:

- *Mitigation of financial sector risks:* tighten banking supervision of existing banks; applying tighter fit and proper tests for licensing; and undertake preparatory work for a domestic banking crisis;

- *Mitigation of inflation risks:* adjust policy mix, depending on risk of slower growth, mainly through fiscal policy—to accelerate revenue growth while containing spending—with support from monetary policy by further stabilising the exchange rate;

- *Mitigation of the risk of capital outflows and difficulties in financing the current account deficit:* include improvement of the investment climate—to mitigate the risk of a drastic slowdown in trade and FDI; depreciation of the local currency—to be balanced with inflation concerns; encouragement of domestic savings; continuation of high mobilisation of external assistance; and

- *Mitigation of the risk of a rapid slowdown in growth:* cautious policy mix, fix investment climate (e.g. trade facilitation, simplification of regulatory requirements, and so forth).

REFERENCES

Asia Economic Forum, (2008), "Asia in a Globalising World: Challenges, Priorities, Leadership, and Future Directions", Proceedings of the 4th Asia Economic Forum 2008.

Economic Review and Policy Dialogue (ERPD) Report for Cambodia, ASEAN+3 Finance and Central Bank Deputies' Meeting (AFDM+3) in Pattaya, Thailand on April 2009.

Kang C., Sok S., Kim S., and Liv D., (2009), "Impact of the Global Financial and Economic Crisis on Cambodia: A Rapid Assessment", Cambodia Institute of Development Study.

Mario de Zamaróczy and Sopanha Sa, (May, 2002), "Macroeconomic Adjustment in a Highly Dollarised Economy: The Case of Cambodia", *IMF Working Paper* (WP/02/92).

National Bank of Cambodia, "The History of NBC", < http://www.nbc.org.kh/history-nbc.asp>

National Bank of Cambodia, (1996), "Law on the Organisation and Conduct of National Bank of Cambodia", Phnom Penh, Cambodia.

National Bank of Cambodia, (2009), Cambodia Balance of Payments Statistics Bulletin, No.24, 2nd Quarter 2009.

National Bank of Cambodia, (2008), Banking Supervision Department, Annual Report 2008.

National Bank of Cambodia, Quarterly Bulletin, 2nd Quarter 2009, No.28.

National Institute of Statistics, (NIS), (2008), "Statistical Yearbook of Cambodia 2008", Ministry of Planning, Phnom Penh, Cambodia.

National Bank of Cambodia, (2001). "Prakas on Determination of Refinancing Base Interest Rate", No.B5-01-201 Pro Kor, 25 December 2001.

Royal Government of Cambodia, (2007), "Financial Sector Development Strategy 2006-2015", Phnom Penh, Cambodia.

Son K., (2009), "The Financial Crisis Affect and Government's Policy Measure", The 5th Asia Economic Forum on Asia's Challenges and Opportunities During the Time of Global Economic and Financial Crises, 6-7 April 2009.

Tal N. I.; Michel D.; and Nguon S., (2007), "Dollarisation in Cambodia", National Bank of Cambodia.

CHAPTER 3
MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT IN INDONESIA

By

Deasy Ariyanti[1]

1. Introduction

Monetary policy is implemented with the aim of achieving a selected few objectives in the long run. In many countries, central banks have a single long-run objective defined in terms of inflation target. Mishkin (2007) states that targeting inflation offer several advantages, like enabling the central bank to focus on domestic considerations and respond to shocks to the domestic economy. Also, in contrast to targeting the monetary aggregates, the strategy does not depend on a stable relationship between money and inflation.

However, the critics of inflation targeting have noted that it might potentially increase output instability (Mishkin, 2007). Furthermore, the trade-off between the variability of output and inflation (as proposed by Taylor, 1996) is also critical to be considered for a country adopting inflation targeting regime for determining the appropriate range of inflation target. Increasing importance of the central bank policy rate demands careful inspection on how the policy rate is transmitted throughout the transmission mechanism channels to affect the monetary policy goal. This has raised the importance of clarifying the role of interest rate in explaining output movements.

Another interesting question is how trade openness and financial depth could affect the performance of the central bank policy rate to influence output. Recent state of economic openness becomes an unavoidable issue to be taken into account when evaluating the performance of monetary policy. Krebs and Maloney (2004) suggest that trade openness serves as cushioning against country specific shocks due to the notion that the world economy is less sensitive to shocks than individual countries.

---

1. Writer is a Researcher in the Centre for Central Banking Studies, Bank Indonesia. This working paper should not be reported as representing the views of Bank Indonesia. Email: deasy_a@bi.go.id

In addition, a well-functioned financial institution is expected to augment capital accumulation and technological innovation as sources of growth. Financial sector development can be viewed from the the development of available instruments, market infrastructure, and to what degree financial sector could minimise information distortion and reduce transaction cost. Krause and Rojan (2006) suggest that a more developed financial market significantly contribute to explaining a more efficient monetary policy implementation. Another study by Dynan et al. (2006) states that financial depth allows the private economic agents to smooth out their expenditure, thus minimising fluctuations in economic activity.

In the light of this backround, this paper offers an observation on real interest pass-through and the impact of real interest rate and alternative financing and trade openness on the output gap in Indonesia. Section 2 of this paper will present the stylised fact of the general economic conditions in Indonesia. Section 3 will focus on a review of monetary management Indonesia, this will be followed by a brief look on monetary policy transmission in Indonesia in Section 4. The model and data will be laid out in Section 5. The empirical results and the discussion will be presented in Section 6, followed by the conclusion in Section 7.

2.   Stylised Fact

The resiliency of the Indonesian economy towards global economic recession has put Indonesia under constant attention. It is relevant to ask whether the attractiveness of its macroeconomic and market figures have been based on sound and healthy economic fundamentals or merely derived from temporary sources of economic upturn.

Indonesia is blessed with abundant resources and fertile soil. As the fourth most populous country in the world (after China, India, and USA), its 230 million of people—dispersed in 1,919,440 km^2 of area—has pronounced its domestic consumption as the country's growth booster. The contribution of private and government consumption in Indonesia's GDP has amounted no less than 60 % since the year of 1960s thus far. It is also worth noting that private consumption is the dominant aspect behind the large number, covering 40.63 % of food expenditure and 46.92% of nonfood expenditure (Q1:2009). In this context, Indonesia's massive population has created a natural advantage for the economy.

However, the solid volumes of consumption and export have not been matched by the development of the investment volume. As for all economies, investment is a critical success factor driving sustainable development through

74

several channels, like inducing employment opportunities, technological spillover and progress, and innovation creation. The lack of investment improvement may eventually degrade private consumption and undermine investment as the major growth source. Figure 1 depicts the sluggish condition of investment in terms of its role in economic growth.

Figure 1
Composition of GDP
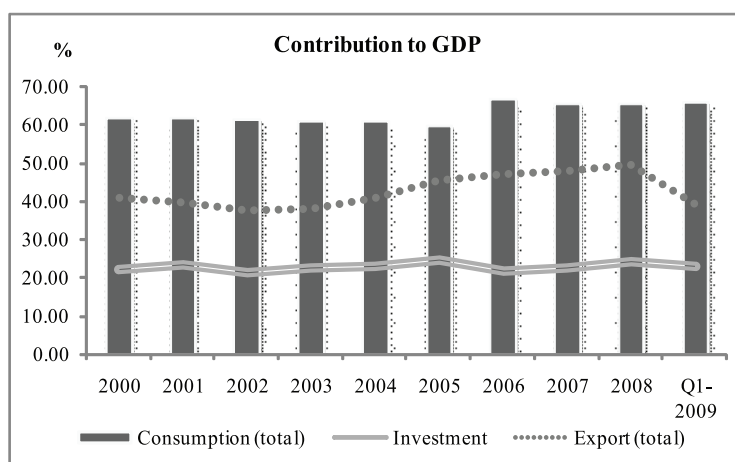
As evaluated by the IFC Doing Business 2009 survey, Indonesia is ranked as the 129th out of 181 countries surveyed in terms of Ease of Doing Business, losing two notches from 127th from 2008 position. The survey ranked Indonesia far behind its regional peers such as Vietnam (92nd), Malaysia (20th), Thailand (13th), or Singapore which achieved top spot as the most attractive place to do business in terms of Ease of Doing Business.

Poor physical infrastructure conditions and weak governance have been indicated as the major obstruction behind the deterioration of the investment climate. It is still perceived as a fragile economy due to its past history of 32 years of weak governance of the New Order. As underlined in The World Bank governance indicators, real investment condition in Indonesia—in terms of governance condition—are among the weakest in the region. However, through several waves of social and political reforms, the indicator has became less negative in 2008, encouraging optimism about the prospect of political stability in Indonesia.

Another plague to the investment climate in Indonesia is its infrastructure conditions, particularly in the rural areas. Despite macroeconomic stability that has been well-maintained since the recovery of the Asian crisis, physical infrastructure development, particularly with regard to electricity, telecommunication, road access, and transportation remain unresolved issues in the improvement of the investment climate. It is indeed a huge challenge for policy makers to prioritise those issues.

Severe infrastructure conditions have somewhat created another problem to banks' willingness to lend. Banks perceived higher risk in real sector investment due to the poor conditions of the physical infrastructure. Given the situation, the development of alternative financing should be the main concern in order to enhance the scope and access of funding in the hope of promoting the investment climate in Indonesia through infrastructure support.

2.1 The Impact of Global Crisis to Indonesia

When explaining the impact of the recent global financial crisis on Indonesia's economic performance, we must not fail to notice the striking contrasts between its past and present macroeconomic and institutional landscape when dealing with the 1997-1998 Asian crisis and the recent global financial crisis. The resultant macroeconomic improvement from the economic and political reforms following the 1997-1998 Asian crisis is an important contributing factor of Indonesian resiliency towards the global crisis, as can be seen in Figure 2.

Figure 2
Indonesia's Macroeconomic Underlying of Two Crises

Macro Economic Background				
	Asian Crisis		Global Financial Crisis	
	1997	1998	2007	2008
Inflation (% y-o-y)	19.28	67.23	6.73	11.50
Exchange Rate (average)	2952	9841	9164	9759
Economic Growth	1.08	-18.26	5.85	5.18
Export/GDP	23.0	45.2	27.0	27.0
Reserve Position (USD Mn)	21,418	23,762	56,920	51,639

76

Moving further, when the 2007 subprime crisis brought about an array of problems in the developed economies, the Indonesian domestic financial sector was hardly affected due to its minimal exposure to subprime products. However, there was significant loss of confidence in the emerging market assets that led to liquidity tightness in the domestic banking industry. This loss of confidence eroded economic growth, which until Q3:2008 had expanded by an average of 6% (y-o-y), slowing suddenly to 4% (y-o-y) in Q2:2009 (see Figure 3). This downturn was for the most part due to its declining export performance as a result of a slump in global economic growth.

Nevertheless, the modest growth of Indonesian export contribution to GDP has somewhat prevented its balance of payment position to fall further. The trade slowdown experienced in 2007 affected the GDP growth but the downturn was compensated by a stable consumption rate, as a main source of growth in Indonesia. In spite of the pressures from the global economy, the Indonesian economy has managed higher growth as compared to the other countries in the region. The country's economic performance is supported by considerably high levels of domestic demand. Thus, consumption has helped prevent a further loss of economic growth during the recent global crisis.

Figure 3
GDP Growth (%- y-o-y)
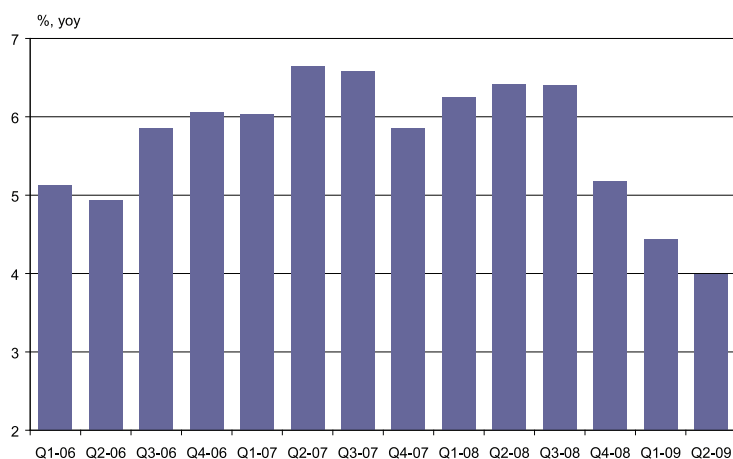
3. Review on Monetary Management in Indonesia

The monetary policy framework of Bank Indonesia (BI) has undergone significant changes during the last 30 years. The severe Asian financial crisis can be seen as an important milestone. The framework of monetary policy in Indonesia is evolving along with the evolution of the exchange rate, reserve system and institutional changes of the central bank of the country.

The evolution of the position and tasks of the BI are summarised in Figure 4 below:

Figure 4
Evolution of Bank Indonesia's Objective, Tasks, and Position

Channel	Before Crisis	Crisis	After Crisis
	Total Effect	1997/1998-1999/2000	2000:1 – 2005:3
Exchange Rates	Present but not strong.	Strong via direct pass-through.	One of the strongest channel via direct pass-through.
Asset Price	Not functioning well.	Start functioning via investment channel (1996-2003).	One of the strongest channel of monetary policy transmission to headline (CPI) inflation via investment channel.
Interest Rate	Occurred but not strong.	Not functioning well.	Functioning well via cost of capital channel.
Balance Sheet	Not effective.	Stronger, possibly due to extreme monetary contraction and high rupiah depreciation.	Present.
Credit	Not effective.	Stronger, possibly due to extreme monetary contraction and high rupiah depreciation.	Present.
Expectation	No test due to lack of data.	Not effective.	-

Source: Bank Indonesia

78

Under Act No. 23 of 1999 concerning Bank Indonesia, as amended by Act No. 3 of 2004, the ultimate goal of the BI is to achieve and to maintain the stability of the rupiah (Article 7). The stability of the value of the rupiah comprises two aspects, namely, the stability of the rupiah value against goods and services and the stability of the exchange rate of the rupiah against other currencies. The first aspect is indicated by the rate of inflation, and the latter is reflected by the position of the rupiah against other currencies. This mandate clearly defines the role of the central bank in the economy. Therefore, the BI can focus more closely on the achievement of its single objective.

The prescribed single objective is intended to establish a clear target which is to be achieved by the BI within its limits and responsibilities. In this way, the achievement of the objective of the BI will be easily measurable.

Following the Asian crisis, monetary management operation was hampered by serious problem for several years due to structural changes in the aftermath of the crisis. A study of the BI concluded that the structural changes have elevated interest rates as taking a more important role in influencing inflation. In this regard, the monetary policy framework has moved away from the more pragmatic, eclectic approach to a new framework which is more in line with sound monetary policy principles associated with what is known as Inflation Targeting Framework (ITF).

The ITF is a monetary policy framework marked by announcements of the inflation target to be achieved over the next several periods. The operational target in monetary operation is the BI rate, replacing the base money used in the previous monetary policy framework. The BI rate serves as a reference rate and is expected to be more easily comprehended. It also provides greater certainty for the market players and for the public.

The ITF framework is characterised by four principles of sound monetary policy:

1. The inflation target, as its overriding objective, is the key contribution of monetary policy in the improvement of the welfare and living standard of the population.

2. A forward-looking strategy in the formulation of the monetary policy stance by considering the forecasts of inflation, economic growth, and by taking into account of other macroeconomic policies.

3. Determining the monetary policy stance with constrained discretion.

4. Compliance with the principles of good governance.

The BI inflation target is based on the consumer price index (CPI). CPI-based inflation in Indonesia is highly related to extreme price movements for certain goods and services, especially the foodstuffs category. The choice between headline and core inflation as the inflation target has always been a debatable issue. Considering that price movements in Indonesia are greatly correlated to supply shocks, the BI uses core inflation as a reference in determining its monetary policy stance.

4. Brief Look at Monetary Policy Transmission in Indonesia

Before narrowing the discussion to the interest rate pass-through and interest rate elasticity of output, we take a brief review about how channels of monetary policy work in Indonesia. In theory, there are six channels of monetary policy transmission, namely: (1) exchange rate channel; (2) asset price channel; (3) interest rate channel; (4) balance sheet channel; (5) credit channel; and (6) expectation channel.

Against the backdrop of macroeconomic dynamics in Indonesia, the monetary policy transmission channels had changed significantly. Among the various channels through which monetary policy can affect demand, we could see from Figure 5, that before the 1997/1998 crisis, the exchange rate channel and interest rate channel had taken the role of transmitting the monetary policy at the period. During the period of the Asian financial crisis, the asset price channel, the balance sheet channel, and the credit channel started to grow stronger in affecting demand. With the implementation of the significant reforms in the financial infrastructure and policy frameworks in response to the Asian financial crisis, the majority of available transmission channels started to affect the demand side of the economy.

Figure 5
Summary of Monetary Policy Transmission in Indonesia

Channel	Before Crisis	Crisis	After Crisis
	Total Effect	1997/1998-1999/2000	2000:1 – 2005:3
Exchange Rates	Present but not strong.	Strong via direct pass-through.	One of the strongest channel via direct pass-through.
Asset Price	Not functioning well.	Start functioning via investment channel (1996-2003).	One of the strongest channel of monetary policy transmission to headline (CPI) inflation via investment channel.
Interest Rate	Occurred but not strong.	Not functioning well.	Functioning well via cost of capital channel.
Balance Sheet	Not effective.	Stronger, possibly due to extreme monetary contraction and high rupiah depreciation.	Present.
Credit	Not effective.	Stronger, possibly due to extreme monetary contraction and high rupiah depreciation.	Present.
Expectation	No test due to lack of data.	Not effective.	-

Source: Goeltom, 2008.

The changing structure and changing framework of monetary policy in Indonesia has affected the interaction pattern among the economic variables. In the construction of the current monetary policy framework, the role of interest rate is becoming more important.

5. Model and Data

5.1. Interest Rate Adjustment in Indonesia

Indonesia's financial sector is highly dominated by its banking industry. Therefore, the interest rate pass-through condition from the central bank policy rate to the commercial bank rates should be carefully inspected. Previous research by De Bondt (2002), using the Euro area data and using the single-equation error-correction model and VAR, has shown that there is a significant long-run relationship between the policy interest rate and retail interest rates. The pass-through effect is incomplete but faster in the long run. Similar findings are also revealed in the study by Tieman (2004) using the Central European countries'

data. Another study by Chionis and Leon (2005) suggests that after Greece joins the European Monetary Union, the transmission and convergence of its interest rates to its long-run equilibrium have became faster.

This study employed the error-correction model to investigate the relationship between the monthly policy interest rate with the monthly commercial rates in Indonesia. This is done based on assumption that the changes in monetary policy rate will be reflected in the changes in the commercial bank rates. In this regard, the operational variables for the commercial rate used are the commercial bank average deposit rate, average commercial bank working capital rate, and average commercial bank investment rate. The interest rate adjustment model is as follow:

$$\Delta br_t = \alpha_0 + \alpha_1 \Delta pr_t + \alpha_2 y_{t-1} + \varepsilon_t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

Where:

br = commercial banking rate (average working capital rate, average investment rate, average deposit rate)
pr = policy rate
u = error-correction term

An important consideration when dealing with time series data is whether the data is stationary or nonstationary. Tests of stationarity is carried out using the Phillip-Perron unit root tests and all the variables are found to be integrated of order 1 [I(1)].

If the group of variables are individually integrated and has at least one linear combination of these variables that is stationary, then the variables are said to be cointegrated. Observing cointegrating relationship enables us to examine the long-run relationship among the variables. The error-correction model and vector error-correction model will be adopted in this study. Tests of cointegration among variables are performed using both the Engle-Granger method and the Johansen approach.

5.2. Interest Rate Elasticity of Output

In its effort to influence inflation using the nominal interest rate, the central bank sets the real interest rate via the nominal interest rate. The IS equation captures how the real interest rate is related to the output gap. The increase in the real interest rate leads to lower investment, lower output and, hence, a

lower output gap. The output gap and inflation are related according to the logic that a positive output gap will put upward pressure on labor cost that eventually will lead to inflation, and vice versa. The key hypothesis is, the higher the output gap, the higher the inflation will be. The OLS-AR model is based on the original dynamic IS curve by Rudebusch and Svensson (1999) as well as by Johansen and Juselius (1994) and Goswami et al. (2009).

The empirical model aims to determine the marginal effect of the real interest rate on the output gap in Indonesia and also the impact of trade openness and the increase of alternative financing to the output gap in Indonesia.

The first model used is the IS model as specified:

$$y_t = \alpha(w_t) + \sum_{j=1}^{p} \beta_j y_{t-j} + \beta_3(w_t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \varepsilon_t$$ ....…………………………. (2)

Where:

y_t	=	output gap defined by the logarithm difference between actual real output and potential output
$\bar{\pi}_{t-1}$	=	year on year CPI inflation rate
$(\bar{i}_{t-1} - \bar{\pi}_{t-1})$	=	real interest rate

The second model will relate the IS equation dynamic to the instrument variable with the aim of observing the impact of alternative financing and trade openness on the output gap, and thus determine the efficacy of monetary policy. The representation is as follow:

$$y_t = \alpha(w_t) + \sum_{j=1}^{p} \beta_j y_{t-j} + \beta_3(w_t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \beta_4 EB + \beta_5 OPEN + \beta_6 CRD + \varepsilon$$ …………………….. (3)

Where:

y_t	=	output gap defined by the logarithm difference between actual real output and potential output
$\bar{\pi}_{t-1}$	=	year on year CPI inflation rate
$(\bar{i}_{t-1} - \bar{\pi}_{t-1})$	=	real interest rate
EB	=	Ratio of market capitalisation + bonds to GDP

Open   = Trade openness, defined by ratio of Export to GDP

CRD   = Ratio of total bank credit to GDP

Lags of the variables will be determined using the Akaike Information Criteria as well as the Schwarz Criteria.

5.3. The Data

The main problem in conducting empirical studies on developing countries is the availability and the reliability of the data. For the study of real interest rate pass-through, the BI rate is used as proxy of the policy interest rate while the deposit rate, working capital rate, and investment rate are employed to represent the commercial bank rates. The sample covers the monthly data for the period of M1:1998 to M9:2008.

For the study of the interest rate elasticity of output, this study covers 69 quarterly observations from Q4:1991 to Q4:2008. The data consists of the working capital loan rate, inflation rate (y-o-y), gross domestic product (GDP), ratio of export to GDP, ratio of market capitalisation of equity and bonds to GDP, and ratio of total credit to GDP. Ideally, the real interest rate data should be obtained by subtracting ex ante inflation expectations from the nominal interest rate. Due to the data availability, we should make the calculation by a more straight forward approach by the subtracting the interest rate from the nominal interest rate (working capital rate) to obtain the real interest rate data. The potential output figure is obtained using the Hoddrick-Prescott filter.

It should be considered also that there had been changes in the base year for the calculation of the GDP in 1993 and 2000, change in the monetary policy regime, and change in the compilation method of the BoP, according to the BoP manual applied. The structural break due to the financial crisis should be considered when performing the estimation and interpreting the results.

A widely observed fact is that the real interest rate tends to be high during the period of disinflation and Indonesia is no exception to the statement. Figure 6 shows that the real interest rate in Indonesia fell drastically during the Asian financial crisis in 1997-1999 due to the soaring inflation level at that point of time. The recent periods are characterised by fluctuations in the real interest rate.

Figure 6
Real Interest Rate
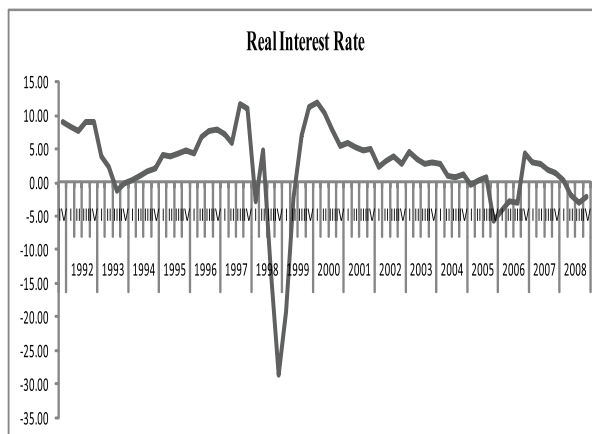
Figure 7
Actual and Potential GDP
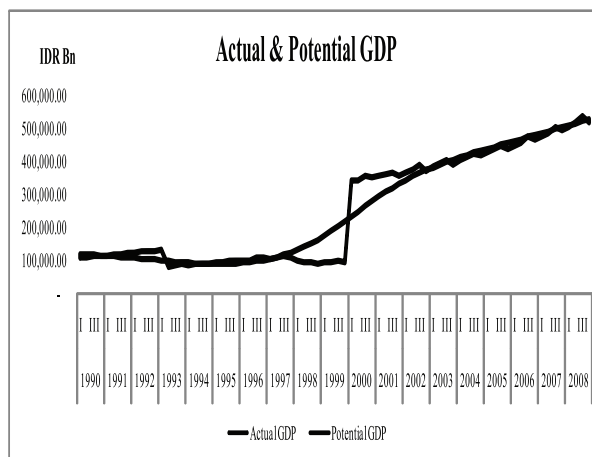
6. Empirical Results

6.1. Interest Rate Pass-Through

The observation is divided into three groups. The first group is the full sample of the study, covering the period between January 1998 to September 2008. Unit root tests are performed using the Phillip-Perron criteria. The commercial

rates are found to be integrated of order 1[I(1)] and cointegration tests are performed on pairs of the series of policy rate and commercial rates. The cointegration relationship among the rates confirms the long-run relationship between the policy rate and the commercial bank rates. The results of the ECM estimation are as follow:

Figure 7
Interest Rate Pass-Through

	Variable	Full Sample	Before June 2003	After June 2003
Deposit Rate	C	-0.06	-0.12	-0.03
		(-0.52)	(-0.47)	(-1.70)
	DPR	0.73**	0.72**	1.06**
		(15.34)	(10.69)	(19.94)
	EC(-1)	-0.24**	-0.25**	-0.41**
		(-4.19)	(-2.92)	(-7.31)
	Adj R^2	0.65	0.51	0.30
Working Capital Rate	C	-0.08	-0.10	-0.06
		(-1.63)	(-1.07)	(-3.82)
	DPR	0.13**	0.12**	0.55**
		(8.12)	(5.34)	(10.97)
	EC(-1)	-0.13**	-0.15**	-0.07**
		(-7.28)	(-4.86)	(-3.40)
	Adj R^2	0.65	0.5	0.31
Investment Rate	C	-0.04	-0.01	-0.07
		(-0.92)	(-0.18)	(-5.00)
	DPR	0.05**	0.04**	0.44**
		(3.87)	(2.10)	(9.69)
	EC(-1)	-0.11**	-0.16**	-0.02
		(-5.25)	(-3.98)	(-1.51)
	Adj R^2	0.88	0.76	0.68

Sample time period is divided into 3 sets. Full sample period covers monthly data from M1:1998 to M9:2008. The result of the estimation are based on Equation (1). Coefficients with * and ** indicate the 10% and 5% level of statistical significance. t-statistics are reported in parentheses.

For all types of commercial rate, the policy rate is highly significant in explaining the long-run and short-run movements of the commercial rate. The main parameter of interest in the ECM equation is the significance and sign of the error-correction variable which indicates the speed of the pass-through towards long-run equilibrium. The sign of the error-correction variable is expected to be negative. From the estimation results, the deposit rate is moving more

expeditiously than the working capital rate and investment rate in response to changes in the policy rate at 5% uncertainty level.

The full sample of monthly data of 1998-2008 is then divided into two groups of samples after the Chow Break Point test confirms the occurrence of structural break in June 2003. All the series are cointegrated showing that the estimation through the ECM is acceptable. The error- correction coefficient estimates for the deposit rate, working capital loan rate, and investment rate is 0.25; 0.15; and 0.16, respectively. There is a consistent pattern between the estimation results of the full sample set and the sample set before the structural break that the deposit rate is moving more aggressively in response of changes in the policy rate.

The third group of sample is the period after the structural break, covering the period of July 2003 to September 2008. Estimation on this third set of sample shows an increasing speed of adjustment in the deposit rate but a decreasing speed in the working capital loan rate and investment rate towards its long-run equilibrium after the structural break. This may be due to several factors like increasing credit risk, or to the fact that the deposit rate contains no volatile risk premium.

In conclusion, the estimation results for the data series of deposit rate, working capital rate, and investment rate suggest that the interest rate pass-through from the policy rate to the commercial rate has effect. In the long term, the deposit rate moves more aggressively than the working capital rate and investment rate in response to a shift in the policy rate Hence, the BI rate has becomes more significant in affecting the deposit rate, while the working capital and investment rate are less affected.

6.2 Interest Rate Elasticity of Output

From the basic IS equation, the interest rate elasticity of output is found to be statistically insignificant. After the addition of economic openness, financial deepening, ratio of total credit to GDP, and dummy variable for the Asian crisis, the sensitivity of output to monetary policy remains insignificant. The only significant variable in explaining the output is openness, which indicates that trade openness of the Indonesian economy has altered its output variation.

Among the indicators monitored by central banks is the output gap. It is an indicator of inflationary pressures. A positive output gap is perceived as excess

87

demand that may need to be balanced with an increase in the interest rate to prevent overheating of the economy. The real interest rate is expected to affect the output gap by influencing investment.

Figure 8
Estimation Result

	Basic IS Equation		IS Equation with Control Variable	
	Without Dummy	With Dummy	Without Dummy	With Dummy
α	-0.01	-0.003	0.45	0.46
	(0.07)	(0.07)	(0.28)	(0.29)
β_1 Loggap(-2)	0.73	0.09	0.08	0.08
	(0.15)	(0.15)	(0.15)	(0.15)
β_1 Real(-1)	0.0005	-0.002	-0.002	-0.001
	(0.003)	(0.003)	(0.004)	(0.004)
Open	…	…	-0.01*	-0.01*
			(0.008)	(0.008)
EB	…	…	-0.002	-0.002
			(0.004)	(0.004)
Crd	…	…	-0.001	-0.001
			(0.04)	(0.04)
Dummy Crisis	…	-0.03	…	0.01
		(0.09)	…	(0.09)
AR(1)	0.03	0.72	0.65	0.65
Adj R^2	0.55	0.57	0.55	0.54

Note: Sample time period of Q4:1991 to Q4:2008 (69 quarters). The results of the estimation are based on Equation (2) and Equation (3). * and **indicate the 10% and 5% level of statistical significance. Standard error is reported in parentheses. Dummy crisis is introduced for 1998 and 2005 crisis to control breaks in estimation.

The insignificance of the real interest rate coefficient on the output gap in Indonesia can be attributed to several factors. In an economy with relatively high inflation, the real interest rate tends to remained at high levels. Eventually, this has a bearing on the investment decisions of the economic agents, weakening the relationship between the interest rate and investment decision. In this respect, the aforementioned weakened interest rate pass-through in Indonesia after the 1997-1998 economic crisis is emerging as a relevant explanation.

Furthermore, the impact of economic openness on output has also modified the relationship among the variables traditionally involved in monetary policy transmission. It enters the equation with a negative sign. Theoretically, the relationship between trade openness and output is not settled. The earlier research carried out has shown that trade openness has positive robust effects on growth

and income level (Irwin and Tervio, 2002; Alcala and Ciccone, 2004). Calderon and Schmidt-Hebbel (2008) argue that the impact of economic openness on growth volatility may vary depending on country characteristics. Tornell et al. (2003) show that the increase in trade liberalisation is typically followed by financial liberalisation, and thus financial fragility in case of the developing countries.

However, the statistical insignificance of the interest rate elasticity of output should not be seen as an indication that the monetary policy transmission is hampered. Rogoff (2003) emphasises that, in a more open country, the monetary policy has smaller effects on real activity. Economic openness also has permanent effects on the inflation rate by reducing the gap between the central bank's target level of output and the natural rate of output. A study by Isik and Acar (2006) supports the theoretical expectations that a larger economic openness will result in a smaller effect of a change in monetary policy. As stated by Karas (1999), wage demands will increase more in a highly open economy in response to a depreciation following an increase in the money supply. Changes in the value of domestic money will influence economic agents and will result in a steeper aggregate supply curve. Consequently, monetary expansion will have more affect on prices and less on output.

A healthy financial system is expected to facilitate higher growth. Thus, the factors that negatively affect the intermediation process will bring negative shock to the real economy. Checetti and Krause (2001) suggest that improvements in the financial depth and intermediation process have contributed to the lowering of inflation and output variability. Yet, the statistical insignificance of the financial depth variable in affecting the output is probably due to the modest state of financial deepening in Indonesia.

7. Conclusion

In this paper, we have portrayed the interest rate pass-through and the interest rate elasticity of output in Indonesia. Using quarterly data of the period of Q4:1991 – Q4:2008 of the actual GDP, real interest rate, ratio of market capitalisation and bonds to GDP, and ratio of export to GDP, we estimate the impact of the real interest rate on the output gap, and the dynamic equation of the output gap using the control variable of alternative financing and openness. Additionally, the empirical exercise for the interest rate pass-through is done using the monthly data of the policy interest rate and commercial bank rate, covering the period from M1:1998 to M9:2008.

This study shows evidence that even though the interest rate pass-through from the policy rate to the commercial bank rate is in place, the interest rate is not a significant explanatory variable in explaining output variation. The weakened relationship between the real interest rate and the output gap cannot be augmented even after inclusion of the control variable (trade openness and financial depth). However, trade openness in Indonesia has altered the relationship among the variables involved in monetary policy transmission by significantly affecting the output gap.

The findings of this paper are taken from a very simple model. Further possible extension for this study is to focus on the impact of economic openness on monetary policy efficacy. One major shortcoming of this paper is the use of the HP filter in estimating the value of the output gap. Over the span of this study, Indonesia has gone through several structural changes, like the adoption of different monetary and exchange rate regimes and financial and fiscal restructuring, and such dynamics could not be appropriately addressed by the HP filter in computing the output gap. Accordingly, the conclusions drawn on the basis of these estimations ought to be treated with caution.

REFERENCES

Alcala, F. and Antonio Ciccone, (2004), "Trade and Productivity", *Quarterly Journal of Economic,* 119 (2): 613-646.

Bank Indonesia, Indonesian Annual Economic Report, Various Years.

Bank Indonesia, History of Bank Indonesia, < http://www.bi.go.id/web/en/tentang%20BI/Museum>

Cashmore, Nick, (2009, "Time to Take a Fresh Look", Asia Pacific Market, May.

Calderon, Cesar and Klaus Schmidt-Hebbel, (2008), "Openness and Growth Volatility", *Working Papers,* Central Bank of Chile, No. 483.

Cecchetti, Stephen G. and Krause, Stefan, (2001), "Financial Structure, Macroeconomic Stability, and Monetary Policy", *NBER Working Papers* No. 8354, National Bureau of Economic Research, Inc.

Dynan, K. E., et al, (2006), "Can Financial Innovation Help to Explain the Reduced Volatility of Economic Activity?", *Journal of Monetary Economics*, 53, pp. 123-50.

Chionis, Dionysios dan Leon, Costas A., (2006), "Interest Rate Transmission in Greece: Did EMU Cause a Structural Break?", *Journal of Policy Modeling*, 28 (2006) 453-466.

CLSA Asia Pacific Market, Weekly Commentary, June 3, 2009.

De Bondt, Gabe, (2002), "Retail Bank Interest Rate Pass-Through: New Evidence at the Euro Area Level*", European Central Bank Working Paper Series,* No. 136.

Goeltom, Miranda S., (2007), "Essays in Macroeconomic Policy: The Indonesian Experience*,* Jakarta, Indonesia

Goeltom, Miranda S., (2008), "The Transmission Mechanisms of Monetary Policy in Indonesia," *BIS Papers* No. 35, Bank for International Settlements.

Goeltom, Miranda S., (2010), "From Crisis to Crisis: A Central Banker Perspective". Jakarta: Gramedia Press.

Goswami, Mangal, et al., (2009), "An Investigation of Some Macro-Financial Linkages of Securitization", *IMF Working Paper*, WP/09/26.

Glen, J. and Pinto, B., (1994), "Debt or Equity? How Firms in Developing Countries Choose", *Discussion Paper* No. 22, The World Bank.

International Finance Corporation and The World Bank, "Doing Business 2009", Washington DC.

Isik, Nihat and Acar, Mustafa, (2006), "Does the Effectiveness of Monetary Policy on Output Depend on Openness?", *Journal of Economic and Social Research*, 8(1), 1-18.

Irwin, Douglas A. and Tervio, Marko, (2002), "Does Trade Raise Income? : Evidence from the Twentieth Century", *Journal of International Economics,* Elsevier, Vol. 58(1).

Krause, Stefan and Rioja, Felix, (2006), "Financial Development and Monetary Policy Efficiency", *Emory Economics* 0613, Department of Economics, Emory University, Atlanta.

Krebs, Krishna and Maloney, B., (2004), "Trade Policy, Income Risk, and Welfare", *Brown University Working Paper*.

Mishkin, Frederick, (2007), "Monetary Policy Strategy". Massachusetts: MIT Press.

Morgan Stanley, (2009), "Adding Another 'I' to B-R-I-C Story?", Indonesia Economics. June 2009.

Rogoff, Kenneth, (2003), "Globalization and Global Disinflation", Federal Reserve Bank of Kansas City, *Economic Review,* Fourth Quarter, 45-78.

Romer, David, (1993), "Openness and Inflation: Theory and Evidence," *Quarterly Journal of Economics*, 108: 869-903.

Sarwono, Hartadi A. and Warjiyo, Perry, (1998), "Mencari Paradigma Baru Manajemen Moneter dalam Sistem Nilai Tukar Fleksibel: Suatu Pemikiran untuk Penerapannya di Indonesia". Buletin Ekonomi Moneter dan Perbankan 1, No. 1: 5-23.

The World Bank, Worldwide Governance Indicators, 2009.

Tieman, Alexander, (2004), "Interest Rate Pass-Through in Romania and Other Central European Economies", *IMF Working Paper* WP/04/211.

Tornel, Aaron, et al., (2003), "Liberalization, Growth, and Financial Crises: Lessons from Mexico and the Developing World", *Brooking Papers on Economic Activity*, 2003, 2, pp. 1-112.

Wynner, Mark A. and. Kersting, Erasmus K., (2007), "Openness and Inflation," *Staff Papers,* Federal Reserve of Dallas.

CHAPTER 4
MACRO-FINANCIAL LINKAGES AND
MONETARY POLICY MANAGEMENT IN MALAYSIA

By

Surendran Chelliah R. Karunairajah[1]

Introduction

Malaysia is an emerging market economy that is increasingly becoming integrated with global economies and financial markets. Its economic structure has grown significantly from a domestic agriculture based economy to a competitive small open economy with an innovative manufacturing sector to an expanding service sector.

The most notable period in Malaysia's economic history was the 1997/98 financial and economic crisis that had dented the steady track record of continuous GDP growth experienced in the early 1990's. It was this important event that triggered the restructuring of a financial sector that has become more resilient, efficient, competitive and responsive to changing economic requirements. The recent global financial crisis has demonstrated how the financial sector through greater financial globalizations can have severe implications to the real economy. For a central bank, it has become increasingly important to better understand the linkages between the financial sector and the macro-economy when formulating and implementing monetary policies as it affects the effectiveness of policies.

This paper aims to assess the efficacy of monetary policy on output given greater macro-financial linkages since the Asian Financial Crisis and to analyze the impact of the present crisis on the real macro-economy. The paper is divided

into five parts. The first and second part of the paper provides some background information on monetary policy management and macro-financial linkages since the Asian financial crisis. The third part presents the empirical model for testing the impact of monetary policy on output. This is followed by the fourth part which discusses how the better understanding of macro-financial linkages has allowed for more effective monetary policy management during the present global financial crisis. The conclusion is presented in the fifth part.

1. Monetary Policy Management in Malaysia

The responsibility for formulating and implementing monetary policy in Malaysia is entrusted to Bank Negara Malaysia, the Central Bank of Malaysia. Given that the economic and financial landscape is now significantly different since the Asian financial crisis in 1997/98, the monetary policy management in Malaysia has also undergone significant changes. The two major milestones in the conduct of monetary policy in Malaysia have been the introduction of the New Interest Rate Framework in April 2004 and the implementation of the new Central Bank Act of Malaysia 2009 in November 2009.

The New Interest Rate Framework was introduced on 26 April 2004 to signal the monetary policy stance more effectively and to enhance the efficiency of the monetary policy transmission mechanism. This involved the introduction of the new policy rate, the Overnight Policy Rate (OPR) and improvements to the conduct of monetary operations. Changes made were designed to enhance the effectiveness of monetary policy by facilitating the transmission of the policy rate to market rates and ultimately to key macroeconomic variables.

The framework adopted the overnight tenure due to its minimal expectations content and high degree of controllability. The OPR replaced the 3-month intervention rate as the indicator of monetary policy stance and is effectively the target for the average overnight interbank rate (AOIR). The AOIR is the interest rate at which banking institutions borrow and lend funds among themselves for duration of one day. The AOIR in turn serves as the operating target for the daily liquidity operations. To reflect the unchanged monetary policy stance at the time of implementation of the new framework, the OPR was set at the prevailing AOIR of 2.70%.

Changes to the OPR will affect banking institutions' fund costs and this will only indirectly affect other short term and long term interest rate tenures in wholesale and retail markets. However, the degree of change in the other tenures

depends on competition within financial institutions and current liquidity situation. With the new framework, banking institutions are now allowed to set their BLRs based on their respective cost structures and business strategies as a shift to more market-based pricing of bank assets and promotion of greater competition. The flexibility in the pricing of the spreads has allowed wider access to financing for borrowers who previously faced difficulty in accessing funds. This is part of the initiative under the Financial Sector Master Plan (FSMP) to ensure greater efficiency in the allocation and distribution of the resources in the financial system.

Figure 1: Bank Negara Malaysia Selected Historical Rates
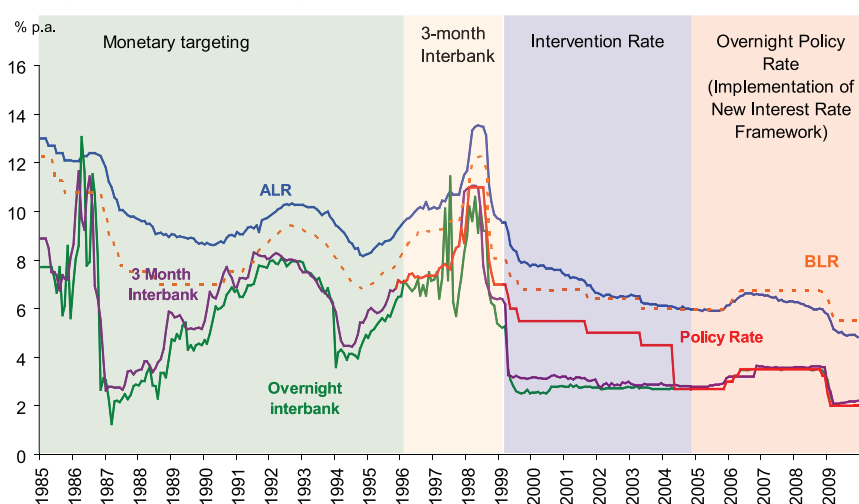
Source: Bank Negara Malaysia

The other major milestone in monetary policy management at Bank Negara Malaysia has been implementation the Central Bank Act of Malaysia 2009. The purpose of the new Central Banking Act was to ensure that the Bank remains effective in performing its functions given significant changes in the economic and financial landscape, both domestic and internationally[2]. This was also to provide greater clarity to the Bank's mandate, governance and accountability. With regard to monetary policy, the new Act is set to institutionalize good practices by setting clear guidelines on the objective, processes, governance and

---

2.   Speech by Governor Tan Sri Zeti Akhtar Aziz at the Ceremony for the 50th Anniversary for Bank Negara Malaysia

accountability in the conduct of monetary policy. The Act stipulates that monetary policy shall be autonomously formulated and implemented by Bank Negara Malaysia while also formally and legally recognizing the Monetary Policy Committee (MPC) as the body responsible for formulating monetary policy.

1.1 Monetary Policy in Malaysia

Bank Negara Malaysia formulates monetary policy based on the objective "to pursue a monetary policy which serves the interests of the country with the primary objective of maintaining price stability giving due regard to the developments in the economy". Monetary policy is implemented through the consistent targeting of the OPR level so as to ensure sufficient liquidity in the ringgit interbank money market.

The Monetary Policy Committee consists of the Governor, Deputy Governors and other appointed members. The Committee convenes six[3] times a year to decide on the appropriate level of the OPR. The committee adopts a collegial approach to the decision making process. As Chairman, the Governor has a crucial role in leading the discussion and deliberation process, as well as in building a consensus decision amongst members.

Prior to deliberating and reaching the decision on the appropriate stance of monetary policy, an assessment of the developments of the domestic and external economy and general price level are carried out. This is done on a formal platform to allow for a comprehensive discussion. There are five main categories of indicators that BNM monitors closely for the purpose of monetary policy. They are,

- Prices and output
- International developments
- Financial prices
- Monetary and credit conditions
- Banking and financial system risks

The fact that BNM plays the role of the monetary authority, as well as a regulator and supervisor of the financial sector, provides it with valuable information and policy flexibility to more effectively deal with emerging risks.

---

3. Prior to the gazetting of the Central Bank of Malaysia Act 2009, the Monetary Policy Committee convened eight times a year. The Central Bank Act also allows for further meetings if and when the committee feels necessary.

The monetary policy decision is announced after every meeting through the issuance of a monetary policy statement (MPS). The MPS provides the public with the Bank's assessment of the present state of the economy, outlook and the current monetary policy stance. The ability of monetary policy communications to reinforce policy credibility and anchor expectations has provided strong support to the effectiveness of monetary policy transmissions to the real economy. The Bank also releases the Monthly Statistical Bulletin (MSB), which contains the latest available statistics of various banking, economic and financial market data, on a monthly basis to the public.

1.2 Monetary Policy Transmission

The figure below provides a schematic depiction of the current view of the transmission mechanism process in Malaysia. A change in the policy rate is transmitted primarily through the financial markets. This follows through to the goods and labour market and ultimately affects aggregate output and prices. Changes in the current and projected output and inflation then feed back into monetary policy decision-making. The four main monetary policy transmission channels in Malaysia are the interest rate channel, exchange rate channel, bank lending channel and balance sheet channels.

- *Interest rate channel* - Changes to the policy rate directly influences other short term rate interest rates and therefore affects the cost of borrowing and the availability funds in bank deposits. This is turn affects economic activity and inflation pressures.

- *Exchange rate channel* - Changes in the policy rate influences the exchange rate through capital flows. Changes to the exchange rate level then affects the demand and supply for exported and imported goods and thus on economic activity and inflation pressures.

- *Credit channel* – Changes in monetary policy affects the cash flows and balance sheets of financial institutions. This in turn affects credit growth that in turn affects investment and thus economic activity and inflation pressures.

- *Balance sheet channel* – Changes in the policy rate will affect the balance sheet of both households and businesses through changes in cash flows depending on debt levels. Given that the value of shares and properties may vary with interest rate movements, the credit worthiness of households and

99

firms may also change accordingly. This would affect the credit standards of financial institution and thus affect credit growth.

There have been a number of studies on the monetary transmission mechanism in Malaysia and the strengths of the various channels. Some studies have also included the asset price channel in their analysis. Alwani (2006) shows that between the interest rate channel, the asset price channel, the exchange rate channel and the credit channel, the credit and exchange rate channels were the more important channels in Malaysia between 1982 and 2003. The exchange rate channel was found to be important during the period when the exchange rate was under a managed float prior to the 1997/98 financial crisis and remained important in the period when the exchange rate was fixed to the US dollar. It was also noted that that different channels work at varying strengths at different stages of economic development. Thus knowledge of which channel is effective at any one time also tells us something about the progress of development of the financial sector.

Tang (2006) found that the interest rate channel is the most important channel in the short run while the credit channel becomes more important after. He also found that the asset price channel followed by the exchange rate channel are also found to be influential in transmitting monetary policy shocks to output in the short horizon.

Figure 2: Monetary Transmission Mechanism
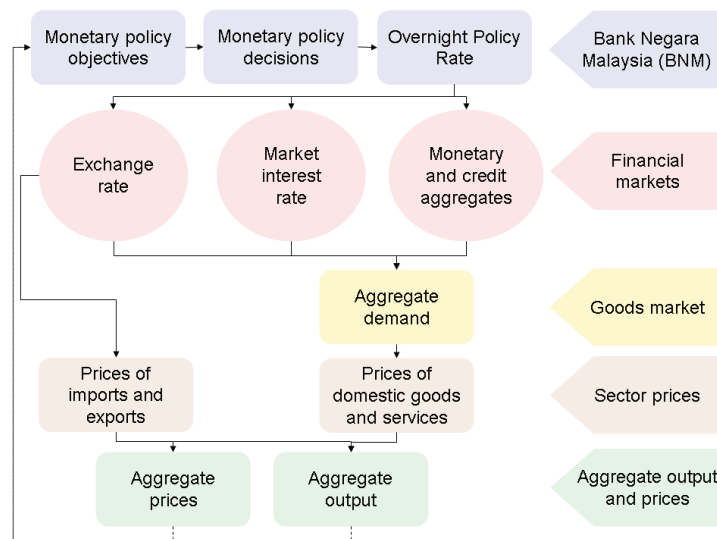
Source: Bank Negara Malaysia, Internal document

1.3 Monetary Policy Operations

The core objectives of monetary policy operation are to achieve the OPR target set by the MPC and to ensure sufficient liquidity in the ringgit interbank money market. The Bank influences the amount of funds available in the interbank money market through its daily liquidity operations to steer the AOIR towards OPR. There is also an interest corridor of +/- 25 basis points around the OPR to prevent excessive volatility in the AOIR. The corridor is made effective by the provision of Standing Facilities where BNM stands ready to borrow or lend funds to interbank participants at the lending or borrowing rates.

The Bank has a range of market based instruments to manage liquidity in the inter bank money market. Instruments are used according to characteristics of each instrument and its effectiveness in managing a particular liquidity situation. The present instruments are,

- Uncollaterised direct borrowing
- Repos (repurchase agreements)
- Bank Negara monetary notes (BNMS)
- Outright sales and purchases of Government securities

Uncollaterised direct borrowing remains the principal monetary instrument as it is highly flexible whereby new borrowings can be conducted in the inter-bank market through the Full Automated System for Tendering and Issuance (FAST) System. The maturities of these borrowings range from overnight to 3 months depending market conditions and the maturities or outstanding borrowings.

Repo transactions are also carried out to absorb surplus liquidity in the banking system as they cost less for the Bank in sterilizing excess liquidity compared to direct borrowing. BNM introduced the Institutional Securities Custodian Programme (ISCAP) in 2005 and the issuances if Bank Negara Monetary Notes (BNMNs) beginning 2006 to facilitate repo operations. These measures have continued to deepen the secondary market liquidity of the domestic bond market and short term bills market.

Bank Negara Malaysia also uses an array of Shariah compliant instruments to influence the Islamic inter-bank market liquidity with the main instrument being Wadiah Acceptance (guarantee custody). The primary objective of the Bank's monetary policy operations in the Islamic money market is to ensure sufficient liquidity for the efficient functioning of the Islamic interbank market.

The Bank also uses the Commodity Murabaha Programme (CMP) to facilitate liquidity management. For longer term liquidity management, the Bank issues Bank Negara Monetary Notes-I (BNMN-i) and Sukuk Bank Negara Malaysia Ijarah (SBNM-I).

Greater advancement of financial markets over the years has allowed for the rapid innovation of new financial instruments. In response to this, monetary policy operation at the Bank continues to evolve through the creation of new instruments and adjustments to the operating procedures as financial market advance.

2. Macro-Financial Linkages in Malaysia and its Implications on Monetary Policy

The Asian financial crisis of 1997/98 was an important event that changed the financial landscape of Malaysia. The lessons learnt and the initiatives[4] taken have laid the strong foundations for the rapid growth of the financial sector, which has seen its contribution to GDP grow from 9.2% in 2000 to 11% in 2008. Over time, the domestic financial system has become increasingly linked to the global financial system and is consequently being influenced by it. This section aims to highlight the various financial market developments that have taken place and its implications on the conduct of monetary policy in Malaysia.

2.1 Development of the Capital Market Since the 1997/98 Financial Crisis

The evolution of the financial system has seen its transformation to a highly diversified, market orientated, and more consolidated and financial system. As noted by Ooi (2006), there have been five key developments in Malaysia's financial system since the 1997/98 Asian Financial Crisis. They are mainly,

- Development of a banking sector that is more resilient, efficient, competitive and responsive to the changing economic requirements after going through a wave of consolidation and mergers.
- A diversified financial system providing access to a wide range of financing and investment facilities. This includes developing the capital market in order to diversify the sources of financing away from the banking system.

_____

4. Among the initiatives were the Financial Sector Master Plan (FSMP) and the Capital Market Master Plan (CMP) which were implemented to develop the financial sector as an enabler of growth

- A dual financial system where the non-interest rate based Islamic financial system operates alongside the interest rate based conventional banking system.
- A wider array of facilities and sources for small and medium size enterprises (SMEs) to access financing for the business.
- A higher degree of financial openness through gradual liberalisation and establishing Malaysia as an International Islamic Financial Centre.

A key development in the last decade has been the rapid growth of the capital market and a shift away from the bank based financial system. With this development, household and firms have been provided with alternative avenues to invest their savings and obtain their funding through the emergence of a broader range of investment and borrowing instruments. The size of the capital market[5] has grown 132.3% between 2001 and 2009 compared to bank loans outstanding, which has grown 88.2% over the same period.

Figure 3: Loans Outstanding Against Size of Capital Market
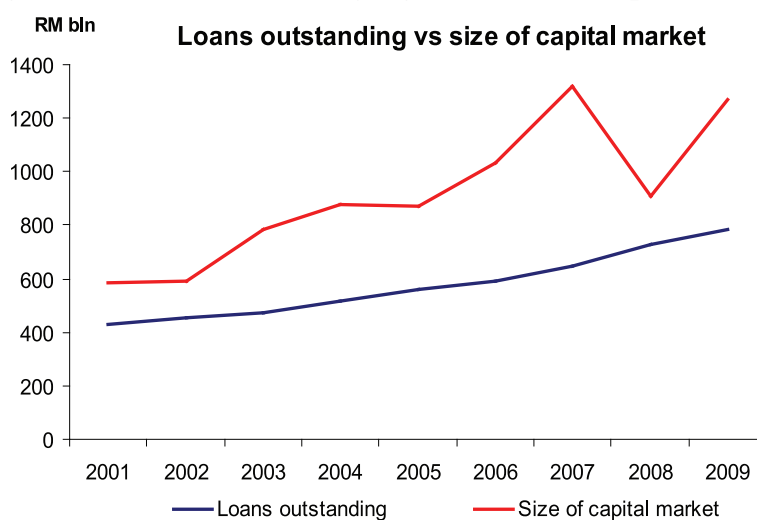
Source: Bank Negara Malaysia

_____

5. Size of capital market is taken as the sum of market capitalisation of the equity market and total bonds outstanding.

Financial sector development and liberalization has expanded the availability of financial products and services to a wider range of market players, which in turn has enhanced the channels through which financial conditions affect the real macro-economy. Over the last decade, more funds from households have entered the capital market through investments in unit trust funds. These funds would have otherwise been saved in bank deposits and be loaned out by banks. The capital market also plays an increasingly significant role for firms to finance capital expenditures. This has supported the growth in private debt securities (PDS), which has grown 164.4% since 2001. The growing size of the capital market together with greater financial openness[6] has not only deepened the link between the macro economy and the financial sector, but has also broadened the ties to external financial markets.

Figure 4: Size of the Malaysian Capital Market
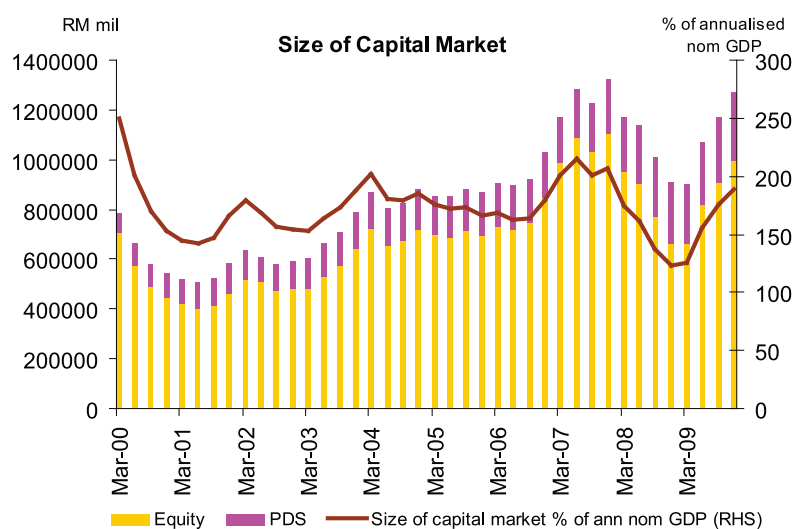
Source: Bank Negara Malaysia and Bursa Malaysia

_____

6. Growing size of portfolio flows.

Figure 5: Financial Openness in Malaysia
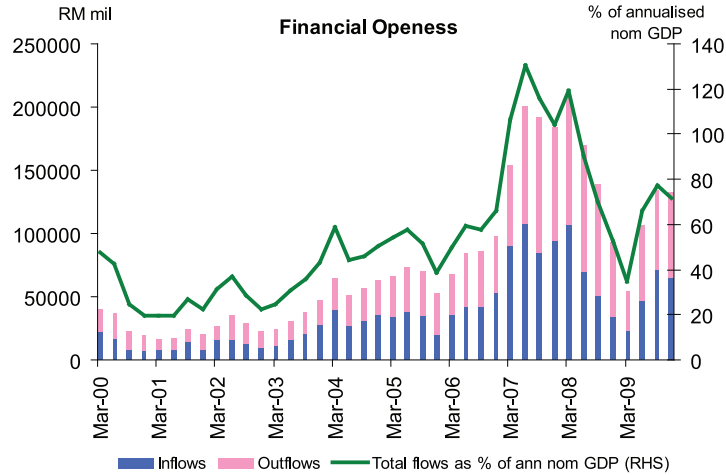
Source: Bank Negara Malaysia

2.2 Monetary Policy Implications Given Greater Presence of the Capital Market

The effectiveness of monetary policy is to a large extent affected by the existence and degree of development of capital markets[7]. Depending on the type of financial market development, the efficacy of monetary policy may vary whereby certain transmission channels may be enhanced while others may be weakened. Singh *et al* (2007) have tested the interest rate pass-through and the monetary transmission mechanism of the policy rate on the Malaysian economy given various types of financial market developments. Countries with more developed capital markets in terms of breadth and depth of bond and equity markets will tend to have stronger interest rate pass-through compared to a bank based financial system. The impact on the monetary policy transmission mechanism would depends largely on the holdings of interest-sensitive assets of non-financial agents in their balance sheets and the proportion of small and medium size enterprises (SMEs) that depend on bank loans for financing. It was also noted that capital market development tends to strengthen the interest rate channel and weaken the credit/bank lending channel.

---

7. Singh *et al* (2007)

105

Tang (2006) stated that a deep and broad capital market can act as an additional shock absorber and diversifier of risks away from the over-resilience on the banking sector. Further to this, the capital market also provides information on the state of the monetary conditions and the outlook of the economy and inflation. The relative strength of the asset price channel in influencing output at the shorter horizon provide the justification for the central bank to be more vigilant on developments in the stock market as the stock market may convey useful information on monetary conditions. It was suggested that the development in the government and private debt securities market should be further intensified in order for monetary policy to be transmitted to the wider economy as this would have further reaching influence beyond the banking sector.

With the ongoing recovery process of the financial and economic crisis, it is important to understand how the development of the capital market and greater financial liberalization may have affected the efficacy of monetary policy on output. In the next section, we analyse the effectiveness of monetary policy on output given the growing role of the capital market and increasing financial liberalization.

3. Assessing Macro-Financial Linkages and the Role of Monetary Policy in Malaysia

In this section, two hypotheses will be tested to gauge the overall efficacy of monetary policy given greater macro-financial linkages[8].

a) To test the overall efficacy of the real interest rate on the output gap in the presence of alternate financial aggregate. This impact of changes to the policy rate on output can be generally shown by the IS-LM analysis, where the real interest rate is inversely related to the change in national income via investment and a shift in output.

b) To test the efficacy of the pass-through of the policy rate to the commercial rates in the presence of alternate financial aggregate.

_____

8. As in accordance with the project guideline, this paper only aims to analyse the overall effectiveness of monetary policy on output and does not seek to attempt to identify or evaluate the effectiveness of the monetary transmission channels in the present case.

3.1 Empirical Model and Methodology

3.1.1 Modeling the Transmission of Real Interest Rates to Output Gap in the Presence of Alternate Financial Aggregate

Following Goswami *et al* (2009), the Ordinary Least Squares (OLS) model is based on the dynamic IS equation constructed by Rudebusch and Svensson (1999) as well as Johansen and Juselius (1994) which specify the marginal influence of the real interest rate on the output gap. The model is adapted to tests the efficacy of a change in the real interest rate on the output gap.

The model is as follows,

$$y_t = \alpha + \sum_{j=1}^{p} \beta_j y_{t-j} + \beta_4 \left(\bar{i}_{t-1} - \bar{\pi}_{t-1} \right) + \varepsilon_t$$

Where,

y_t	- output gap
$\bar{i}_{t-1}$	- interest rate (Overnight rate)
$\bar{\pi}_{t-1}$	- inflation rate (log of CPI)
$\bar{i}_{t-1} - \bar{\pi}_{t-1}$	- real interest rate
p	- maximum lag order
j	- number of lags

Also,

$$\alpha = \alpha_1 \text{ and } \beta_4 = \beta_4 < 0$$

Based on Goswami *et al* (2009), $\beta_4 < 0$ in theory as a decline in interest rates should cause real GDP to increase as an increase in real interest rate will cause investments and consumption to increase and vice versa. The focus of the analysis is on the changes in the β_4 coefficient to estimate the impact of the real interest rates on the output gap[9].

_____

9. The coefficient of the real interest rate is a simple representation of the monetary transmission mechanism. Rudebusch and Svensson (1999) conclude that this equation appears to be a workable approximation of the various intermediate transmission mechanisms.

In order to estimate the impact of the real interest rate on the output gap with the presence of a growing capital market and greater financial openness, the dynamic IS equation constructed by Rudebusch and Svensson (1999) is estimated in two variations as in Estrela (2002)[10]. The coefficients of the real interest rate of the base model and variation to it are then compared to observe the impact of the real interest rate on the output gap.

The base model is estimated as an OLS in two variations as below.

Model 1- Elasticity varying with size of financial aggregates (IS dynamic equation of output gap)

Model 1(a) will use the size of the capital market (CM) to model an alternative source of financing. In order to assess the effect of the size of the CM on the efficacy of the real interest rates, the dynamic IS equation is expanded (Estrella (2002)) to include CM. To test the effects of CM on the reaction to monetary policy moves, we allow the coefficient of the real interest rate and the intercept term to vary with CM. The rationale is that there is an alternative source of financing besides the banking system. This will reduce the role of banks as the main source of raising funds. The base model is then modified where,

$$\alpha_1 = \alpha_{1,0} + \alpha_{1,1} CM_t$$

and

$$\beta_4 = \beta_{4,0} + \beta_{4,1} CM_t$$

Thus,

$$y_t = \alpha_{1,0} + \alpha_{1,1} CM_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_3 y_{t-3} + (\beta_{4,0} + \beta_{4,1} CM_t)\left(\bar{i}_{t-1} - \bar{\pi}_{t-1}\right)_{t-1} + \varepsilon_t$$

The dependent variable is the output gap while the independent variables include a constant term, size of the capital market, three lags of output gap and the real interest rate.

Model 1(b) will use the degree of financial openness (FO) to model greater financial liberalisation. In order to assess the effect of the size of the FO on

---

10. Estrella (2002) tests the effects of mortgage securitization on the reaction to monetary policy moves by allowing the coefficient of the real interest rate and the intercept to vary with the extent of securitization.

the efficacy of the real interest rates, again the dynamic IS equation is expanded to include FO. To test the effects of FO on the reaction to monetary policy moves, we allow the coefficient of the real interest rate and the intercept term to vary with FO. The base model is then modified where,

$$\alpha_1 = \alpha_{1,0} + \alpha_{1,1}FO_t$$

and

$$\beta_4 = \beta_{4,0} + \beta_{4,1}FO_t$$

Thus,

$$y_t = \alpha_{1,0} + \alpha_{1,1}FO_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_3 y_{t-3} + (\beta_{4,0} + \beta_{4,1}FO_t)\left(\bar{i}_{t-1} - \bar{\pi}_{t-1}\right)_{t-1} + \varepsilon_t$$

The dependent variable is the output gap while the independent variables include a constant term, size of the capital market, three lags of output gap and the real interest rate.

Model 2 – Elasticity varying with size of capital market (CM) and financial openness (FO) together (IS dynamic equation of output gap with instrument variable controls for alternative financing).

Model 2 will adjust the base model to test for the effects of CM and FO on the impact of real interest rates on the output gap, by allowing the coefficient of the real interest rate and the intercept term to vary with the size of the capital market and financial openness. This gives us a way to analyse the influence of financial globalization on the development and growth of the capital market.

Where,
$$\alpha_1 = \alpha_{1,0} + \alpha_{1,1}CM_t + \alpha_{1,3}FO_t + \alpha_{1,3}CM_tFO_t$$

and
$$\beta_4 = \beta_{4,0} + \beta_{4,1}CM_t + \beta_{4,2}FO_t + \beta_{4,3}CM_tFO_t$$

This simply conditions β_4 the coefficient of the interest rate as well as the intercept, by the term CM and the control variable, FO.

The dependent variable is y_t, while the independent variables are the constant terms (which includes the constant, CM and FO along with interaction variables),

lagged y_t, the elasticity of the real interest rate $(i.e.\ i_{t-1} - \bar{\pi}_{t-1})$ and various elasticity terms conditioned by the real interest rate.

3.1.2 Modeling the Interest Rate Pass Through in the Presence of an Alternate Financial Aggregates

A modified form of OLS is applied just to test the hypothesis whether the size of the capital market and financial openness affects the policy rate (OPR) pass-through to the level of the base lending rate (BLR). This is done to enhance the analysis of the overall efficiency of the real interest rate on the output gap. The model is as follows,

$$IR_t = \alpha + \beta_1 IR_{t-1} + \beta_2 PR_{t-1} + \beta_3 CM_t + \beta_4 FO_t + \beta_5 CM_t FO_t PR_{t-1}$$

Where,

IR_t -   is the bank lending rate (in Malaysia's case, the base lending rate (BLR) is used)

PR_{t-1} -   is the policy rate (in Malaysia's case, the overnight policy rate (OPR) is used)

CM -   id the size of the capital market

FO -   is the degree of financial openness

As with the previous comparative analysis between the base model, Model 1(a) and Model 2(a), the same shall be applied to the policy rate pass-through. In this instance the coefficient of the policy rate shall be observed.

3.2 Data

The models were estimated using quarterly data from 1Q 2001 to 3Q 2009 to take into account the various efforts to develop the capital market and financial liberalization after the crisis. This is also the period in which both the Financial Sector Master Plan (FSMP) and the Capital Market Master Plan (CMMP)[11] came into effect. A description of the data is provided in Appendix 1. The data was obtained for mainly from Bank Negara Malaysia and IMF's International Financial Statistics (IFS).

––––––––––
11. See Appendix VI.

Using the Philips-Perron and the Augmented Dickey–Fuller unit root test, it was discovered that all variables were found to be integrated of order one (I(1)) with the exception of output gap and financial openness. Hence, the first difference for the I(1) variables were taken.

The series were corrected for three important events that occurred during the period being tested and a dummy was generated for each. They are,

- two periods of namely the bursting of the tech bubble in the US in 2001 and the 2008/2009 global financial crisis which caused a contraction in both global and domestic economic growth. One dummy variable was created to take into account these two events.
- the period of the imposition of a currency peg to the US Dollar from September 1998 to July 2005.
- the implementation of the New Interest Rate Framework that came into effect in April 2004.

3.3 Empirical Results and Findings

The table in Appendix IV and Appendix V provides the estimation results for the empirical models as outlined previously. It is acknowledged that there may be some shortcomings to the empirical results given the short time series used and the estimation of some variables.

3.3.1 Empirical Results

The results of the model based on the adaptation of Goswami *et al* (2009), 1st column of the table in Appendix IV presents estimates for the base model and the negative sign for the interest elasticity is confirmed. All coefficients are significant at the 10% significant level. The model indicates that the output gap decreases 0.007% for every 1% increase in the real interest rate. The columns 2-5 contains estimates of Model 1 and Model 2 in which only the intercept term, only the interest elasticity, or both terms are allowed to vary with the size of the capital market (CM) and the degree of financial openness (FO). It can be seen that only when the intercept and elasticity of interest rate is allowed to vary with CM only are the results statistically significant.

The result of the policy rate pass-through to the BLR in Appendix V presents the estimates of the base model and its interaction with CM and FO. All coefficients of the policy rate in all five regressions are significant at the 1%

significant level. The results indicate that the size of the capital market with greater financial openness enhances the pass-through of the policy rate to the BLR. The impact is the greatest in case of the joint effect of the size of capital market and financial openness interacting with the policy rate whereby the size of the coefficient increases from 0.6932 to 0.8914. The results also highlight the fact that larger degree of financial openness has a larger pass-through compared to the size of the capital market.

3.3.2 Findings

Based on the adaptation of Goswami *et al* (2009), the results above suggest that the size of the capital market does not significantly impact the elasticity of the real interest rate on output. The coefficients or the real interest rate between the base model and Model 1(a) show that the size of the capital market reduces the elasticity of real interest rates on output. The coefficient of the elasticity on interest rate decreases from 0.000741 to 0.000703, the magnitude is almost negligible and may not have a significant impact.

A possible reason for the neutral impact could be that a larger more developed capital market (that provides an alternative for financing away from the banking system) may weaken the credit channel but strengthen the interest rate channel. Hence, the real interest rate would have an overall neutral impact on the output gap. A study by Singh *et al* (2007) concludes that in most aspects, an increase in financial sector development tends to strengthen the interest rate channel while weakening the credit/ bank lending channel. The interest rate channel is most likely to strengthen unless in the advancement of payment technology which enables consumption smoothing. On the other hand the credit channel is likely to weaken unless the economy consists of a large proportion of SMEs that continue heavily on bank loans for financing. This explanation for the results above however requires further empirical testing on the transmission channels to test its validity in Malaysia's case in present time.

The strong pass-through of the policy rate to the BLR given a larger size of the capital market and higher degree of financial openness is consistent with empirical studies done on Malaysia[12]. Ooi (2006) shows that greater development

----

12. Singh *et al* (2007)

of the financial sector since the Asian Financial Crisis may have increased the efficiency of the policy rate pass-through. The main factors contributing to this are,

- The emergence of stronger financial institutions through various rationalization and consolidation exercises together with the establishment of new industry oversight bodies. The resulting stronger balance sheets from the financial restructuring have allowed the various financial institutions to focus on their operational efficiency. As a result, the interest rate pass-through both from the policy rate to the interbank rates and the retail rates has risen significantly.

- A more diversified financial system and financial sector have provided households and business with access to a broader range of financing and investment facilities. Development of the capital market has provided businesses with an alternative source of financing away from the banking system. The higher level of maturity of the capital market has allowed market participants to price risk and return more efficiently and in the process has possibly enhanced the transmission of monetary policy.

- A developed and sophisticated financial infrastructure has enhanced the quality of services, improved the price discovery process and increased liquidity in the financial markets. This has enabled more efficient monetary operations through the use of various market based instruments.

- Increased financial inclusion of households and businesses has enhanced the effectiveness of the financial intermediation function. The significant improvement in the access to financial services for segments that were traditionally underserved by the financial system has contributed to greater financial inclusion.

4. Impact of Financial Crisis on the Real Economy and Monetary Policy Management

Financial globalization had amplified the adverse effects of financial contagion among various financial markets and asset classes. This, combined with the strengthening financial-macro linkages over the last decade, intensified the impact of the financial crisis on economic activity. The widespread fallout from the US sub-prime crisis and the collapse of Lehman Brothers in September 2008 led to the sharp deterioration in global monetary and financial conditions and consequently to declining economic activity in advanced economies in 2009.

113

4.1 Impact of the Global Financial Crisis on Malaysia's Economy Given Greater Macro-financial Linkages

Malaysia was relatively unperturbed by the first wave of the global financial crisis given the limited exposure of the domestic financial sector to the unfolding of the US sub-prime turmoil. Despite this, greater financial integration with international financial markets caused the domestic financial market performance to deteriorate and volatility to increase. Malaysia was adversely affected by the sharp decline in domestic financial asset prices as the worldwide de-leveraging by investors caused large outflows of portfolio funds.

Initial claims that regional emerging economies have decoupled from advanced economies was short lived as the financial crisis began to contract external demand. The second wave of the financial crisis had begun to hit the real-economy. Being a small open economy, Malaysia's was negatively impacted by the rapid deterioration in global economic conditions. Real GDP growth declined from 6.3% in 2007 to 4.6% in 2008. The average real GDP for the first three quarters of 2009 contracted by 3.8%, amidst a significant deterioration in external demand, following the deepening recession in advanced economies. The large decline in external demand led to a steep contraction in exports and industrial production and a slowing in the pace of private investment activity, which also affected labour market conditions.With the decline in exports, production and investment activities, business's access to financing became constrained.

However, the resilience of the banking sector and role of the capital market as an alternative source of financing ensured that the financial intermediation process functioned effectively and smoothly. Since the Asian financial crisis, the financial sector has evolved to become more diversified, efficient and resilient, thus enabling it to perform the intermediation function and augment its contribution to growth. This has strengthened the fundamentals of the financial sector and provided sufficient buffer to mitigate the impact of external shocks. The existence of a financial sector continues to support the intermediation and reinforced the expansionary fiscal and monetary influences on domestic demand. Domestic conditions improved markedly towards the end of the year with firm indications of a sustainable recovery.

4.2 Response to the Crisis by Bank Negara Malaysia

At the outbreak of the crisis, Bank Negara Malaysia and the Ministry of Finance together with their counterparts in Singapore and Hong Kong announced

on 16th October 2008 that all deposits will be fully guaranteed by the respective governments until December 2010. The Monetary and Financial Stability Committee (MFSC) of the Executives meeting of East Asia-Pacific (EMEAP) Central Banks[13] had put in place an integrated regional surveillance and crisis management framework to assist EMEAP economies in addressing concerns arising from the crisis that affects regional countries. This cooperative framework provided a key platform for the region to share information and assess the impact of the evolving global financial crisis on regional economies and the implications for central banks in the region.

Foreseeing worsening domestic economic conditions, Bank Negara Malaysia took pre-emptive and appropriate policy responses to avoid a severe economic downturn through a combination of measures including loosening monetary policy. The policy rate and the statutory reserve requirement (SRR) were reduced by varying amounts at three consecutive MPC meetings provide a more accommodative monetary environment and to reduce the cost of intermediation. Domestic economic conditions were expected to remain challenging in the coming quarters with the continued deterioration in the global economy.

**Figure 10: Bank Negara Malaysia
Monetary Policy Decisions Since 2008**

Date	OPR		SRR	
	Change (bps)	Rate (%)	Change (bps)	Rate (%)
24 Nov 2008	-25	3.25	0	3.50
21 Jan 2009	-75	2.50	-150	2.00
24 Feb 2009	-50	2.00	-100	1.00

In addition to the loosening of the monetary policy stance Bank Negara Malaysia took various efforts directed towards ensuring access to credit to all sectors of the economy. Measures undertaken by BNM can be divided into three broad categories.

a) Liquidity measures were used to ensure the adequacy of funds in the banking system, allowing the financial intermediation process to functions efficiently and without interruptions.

_____

13. A dedicated committee compromising of 11 central bank deputies in the East and Asia and Pacific region.

– shortened the maturity of its monetary operations, allowing banks more flexibility liquidity responses in dealing with capital outflows

– instituted a full guarantee on deposits placed with banks to preserve confidence in the financial system

– widened access to its liquidity facility beyond banks to include insurance and takaful operators

b) Interest rates measures to reduce the cost of financing and provide support to domestic demand.

– To ensure greater transmission from the policy rate to retail lending rates BNM also encouraged banks to reduce monthly loan repayments on floating rate loans

– The Bank also issued Bon Simpanan Merdeka amounting to RM2 billion to provide higher returns to the segment of savers that depend on interest income for their livelihood, mainly Malaysian citizens aged 56 and above. With a nominal return of 5% per annum, the real return on the bond is expected to average above 2.5% in 2009.

c) Measures to improve households and businesses access to financing.

– Conducting dialogues with the banking institutions and the business community to bridge the concerns faced by both parties

– Special funds to help SMEs with viable businesses obtain financing
    (i)   SME Assistance Facility - Aug'08
    (ii)   SME Modernisation Facility - Aug'08
    (iii) Micro Enterprise Fund - Nov'08
    (iv)   SME Assistance Guarantee Scheme - Jan'09
    (v)   Working Capital Guarantee Scheme - Apr'09
    (vi)   Industry Restructuring Loan Guarantee Scheme - Apr'09

– More intensive outreach efforts to assist borrowers under distress, including providing avenues for debt resolution and restructuring

    ▪ For individuals, the Credit Counselling and Debt Management Agency (AKPK) provide assistance to develop a personalised debt repayment plan for individual borrowers, in consultation with their banks.

116

- For SMEs, the Small Debt Restructuring Committee was established to undertake independent assessment on the viability of the businesses and propose a loan restructuring and financing requirement of the affected businesses.

- For the corporate sector, the Enhanced Corporate Debt Restructuring Committee helps corporations to restructure their debt, including bank loans and private debt securities.

- One year loan moratorium for retrenched workers for repayment on their housing loans

– The establishment of Danajamin (Financial Guarantee Institution); Danajamin will provide credit enhancements to corporations with viable businesses and investment grade ratings to enhance their access to the Malaysian bond market.

– In addressing general enquiries relating to banking services and credit issued from individuals and businesses, BNM established the Integrated Contact Centre comprising BNM Link, BNM Telelink and Complaints Management and Advisory section within the Bank. In addition, *ABMConnect* Toll Free Channel was set up in December 2008 by the Association of Banks in Malaysia (ABM) in collaboration with banking institutions.

– The Bank also ensured sufficient dollar liquidity to support international trade through its foreign reserves. This is to avoid a shortage of dollar liquidity from hampering Malaysia's international trade activities.

5. Conclusion

The study of macro-financial linkages and monetary policy management in Malaysia has raised various issues concerning the interactions between financial market development and monetary policy management during times of crisis. It was with the lessons learnt during the Asian financial crisis and understanding of the financial sector development that the Bank was able to respond with effective measures. As in the recent financial and economic crisis, by implementing specific measures to improve the access to financing, the economy was allowed to recover at a faster pace than most countries.

Given the dynamic nature of the financial sector in the face of greater financial globalization, it is vital that policy makers continue to monitor the macro-

financial linkages and to assess the impact of monetary policy. Though this paper attempts to address a specific linkage, there are linkages such as securitization that may need to analysed. Research into the black box of the monetary transmission mechanism would provide more useful information on the various channels and changes to these channels given greater financial market development. Being able to do so is important in understanding what policies to adopt, how to implement them, and what impact polices have on the economy.

As with previous empirical studies, it is important to continue to reassess monetary policy management as the financial markets develop and integrates with the global financial markets. With Malaysia's vast experience of reforms and capacity building measures, which included further improvement to the supervisory framework, Malaysia's financial system is expected to remain resilient and continue to affectively perform its intermediation function. The current crisis as the previous one, has taught Bank Negara Malaysia through insightful experiences, valuable lessons in the conduct of monetary policy. This together with the Central Bank Act 2009 has improved the management of monetary policy through,

o   A more thorough and wider policy formulation process that looks at various aspects of the economy, price stability and financial stability.

o   Improved surveillance of the economy especially financial markets to better understand financial-macro linkages.

o   Expansion and provision of alternative/ back up for monetary policy operation tools that have the ability to reinforce the monetary policy pass through.

o   Coordinated efforts through greater dialogue and information sharing with regional and international counterparts.

o   Having a better understanding of macro-prudential measures and its interaction with monetary policy management.

REFERENCES

Akhtar Aziz, Zeti. Keynote Address at the Ceremony for the 50th Anniversary of Bank Negara Malaysia, 8th February 2009.

Alwani, Shariman N.S., (2006), "Evaluating the Effectiveness of the Monetary Policy Transmission Mechanism in Malaysia", Phd Thesis,The Faculty of the Graduate School of Arts and Sciences, Brandeis University

Bank Negara Malaysia, (2009), Central Bank Act 2009.

Bank Negara Malaysia, (2009), Annual Report 2009 and Financial Stability and Payment Systems Report 2009.

Bank Negara Malaysia (2008), Annual Report 2008 and Financial Stability and Payment Systems Report 2008.

Bank Negara Malaysia, (2004), Annual Report 2004 and Financial Stability and Payment Systems Report 2004.

Bank Negara Malaysia, (2008), Monetary Policy Statement, 24 November 2008.

Bank Negara Malaysia, (2009), Monetary Policy Statement, 21 January 2009.

Bank Negara Malaysia, (2009), Monetary Policy Statement, 24 February 2009.

Bayoumi, Tamim and Ola Melander, (2008), "Credit Matters: Empirical Evidence of US Macro-Financial Linkages", *IMF Working Paper* WP/08/169.

Tang, Hsiao Chink, (2006) "Monetary Policy Transmission in Malaysia: An Empirical and Methodological Exploration", Phd Thesis, Australian National University

Estrella, Arturo, (2002), "Securitization and the Efficacy of Monetary Policy", *Economic Policy Review*, Federal Reserve Bank of New York, Volume 8, No, 3, Page 243-255.

Goswami, Mangal, Andreas Jobst and Xin Long. (2009), "An Investigation of Some Macro-Financial Linkages and of Securitization", *IMF Working Paper* WP/09/26.

119

Khong, Farina Adam, Mohd Atan and Awang Zaidi, (2008), "Country Paper: MALAYSIA", 2nd SEACEN-CeMCoA/ BOJ Intermediate Course on Macroeconomic and Monetary Policy Management, Seoul Korea.

Ooi Sang Kuang, (2006). "The Monetary Transmission Mechanism in Malaysia: Current Developments and Issues", Bank of International Settlements, *Paper* No. 35.

Rudebusch, Glenn D. and Lars E. O. Svensson, (1999), "Policy Rules for Inflation Targeting" National Bureau of Economic Research, *NBER Working Paper Series* 6512.

Singh, Sukhdave, Ahmad Razi, Norhana Endut and Helmi Ramlee, (2007), "Impact of Financial Market Developments on the Monetary Transmission Mechanism", Conference on Financial Market Development and Their Implications for Monetary Policy Organised by Bank of International Settlements and Bank Negara Malaysia.

Yam, Joseph, (2009), Address at the Ceremony for the 50th Anniversary of Bank Negara Malaysia, 8th February 2009.

Key Macroeconomic Indicators

	1988	1998	2008
Macroeconomic conditions			
Real GDP (annual growth, %)	9.9	-7.4	4.6
Gross national savings (% of GNI)	32.5	42.2	37.9
Inflation (%)	2.5	5.3	5.4
Unemployment rate (%)		3.2	3.3
Nominal per capita income (RM)	-	12,134	25,796
Real GDP by sector (annual growth, %)			
Agriculture	4.8	-4.5	3.8
Mining & quarrying	6.3	1.8	-0.8
Manufacturing	15.3	-13.7	1.3
Construction	2.5	-23.0	2.1
Services	7.2	-0.8	7.3
Real GDP by expenditure (annual growth, %)			
Private expenditure			
Consumption	15.5	-10.8	8.4
Investments	17.9	-55.0	1.5
Public expenditure			
Consumption	2.9	-7.8	11.6
Investments	8.6	-8.7	0.7
External sector			
Current account balance (% of GNI)	5.4	14.0	18.2
Total trade (% GNI)	95.3	192.1	166.1
BNM International reserves			
Months of retained import	5.1	5.7	7.6
Coverage of short-term external debt			
External debt (% of GDP)	53.5	60.0	31.9
Debt service ratio (%)	13.1	7.1	2.7
Fiscal sector			
Overall balance (% of GDP)	-3.6	-1.8	-4.8
Government debt (% of GDP)	96.4	36.4	41.5
Monetary and financial sector			
Monetary aggregates (annual growth, %)			
M1	13.1	-14.6	8.3
M3	8.1	2.7	11.9
Private sector financing (% of GDP)			
Banking system loans (% of GDP)	84.6	151.8	98.4
Banking system deposits (% of GDP)	98.5	153.7	131.6
Loan-deposit ratio (%)	-	92.6	73.5
Financing deposit ratio (%)	-	99.4	81.1

Source: Bank Negara Malaysia

Definition of Data Used for the Estimation

Variable	Definition	Calculation
ygap	Output gap	Difference between real output and potential output. Potential output is computed by using the Hodrick-Prescott (HP) filter on real output
rir	Real interest rate	Overnight Policy Rate (OPR) interest rate less average inflation for the quarter
cm	Size of capital market	Sum of market capitalization and private debt securities outstanding over annualized nominal GDP
fo	Financial openness	Sum of inflows and outflows of portfolio investment over quarterly nominal GDP
dumir	Dummy for period of implementation of new interest rate framework	
dumfx	Dummy for period of ringgit peg to US Dollar	
dumcr	Dummy for two period when economy was faced with negative growth	
blr	Base lending rate	

Diagnostic Tests

Tests	Null hypothesis	Results	Decision
Wald Coefficient test	Coefficients are jointly insignificantly different from zero	F-stat = 8.1138 Prob = 0.0080	Reject the null
White's test	Variance is homoscedastic	Obs*R-square = 24.887 Prob. Chi-Square(21) = 0.2521	Do not reject the null
Jarque Bera test	Model is normally distributed	Jarque Bera = 0.12468 Prob = 0.27062	Do not reject the null
Ramsey reset test	Model is specified correctly	F-statistic = 0.5829 Prob. F(1,31) = 0.4516	Do not reject the null

Estimation Results for Impact of Real Interest Rate on Output Gap

		ygap			Model 2	
Sample period: 2001 Q1 - 2009 Q4						
Observations: 36						
		Base model	Model 1(a)	Model 1(b)		
		Base	Intercept and elasticity varying with size of capital market	Intercept and elasticity varying with financial openness	Intercept and elasticity varying with capital market and financial openness	Intercept and elasticity varying with capital market, financial openness and joint effects
		1	**2**	**3**	**4**	**5**
1	c	-0.00071	0.004462	-0.00041	0.003264	0.001669
	(p-value)	0.9472	0.6893	0.9643	0.7305	0.8644
2	dcm		-0.03755		0.02712	0.033842
	(p-value)		0.1944		0.455	0.3672
3	dfo			-0.12357	-0.1468	-0.14998
	(p-value)			0.0008	0.0035	0.0119
4	dcm*dfo					0.32301
	(p-value)					0.2851
5	ygap(-1)	0.181566	0.168197	0.176097	0.146876	0.129152
	(p-value)	0.1805	0.2079	0.1438	0.2333	0.3287
6	ygap(-2)	-0.59333	-0.65142	-0.54808	-0.54631	-0.57427
	(p-value)	0.000	0.000	0.000	0.000	0.000
7	drir(-1)	-0.00741	-0.00703	-0.00098	-0.00328	-0.00592
	(std. error)	0.0276	0.057	0.7894	0.4244	0.2424
8	dumir	0.013138	0.011085	0.010533	0.011064	0.010399
	(p-value)	0.1644	0.2378	0.1835	0.1636	0.2024
9	dumfx	-0.0129	-0.01734	-0.01093	-0.01482	-0.01464
	(p-value)	0.1778	0.0889	0.1806	0.0906	0.1106
10	dumcr	-0.03521	-0.02727	-0.04157	-0.04142	-0.03868
	(p-value)	0.0049	0.0347	0.0002	0.001	0.0076
11	dcm*drir(-1)		-0.02586		-0.02418	-0.03053
	(p-value)		0.2728		0.2245	0.2773
12	dfo*drir(-1)			0.091962	0.091922	0.054901
	(p-value)			0.0155	0.0158	0.284
13	dcm*dfo*drir(-1)					-0.06253
	(p-value)					0.8079
	R - square	0.651834	0.686858	0.77791	0.796069	0.806538
	Akaike info criterion	-4.96984	-4.96476	-5.30833	-5.28252	-5.224106
	Schwarz criterion	-4.66194	-4.56888	-4.91245	-4.79866	-4.652280
	Durbin-Watson stat	1.815853	1.843684	2.006239	2.107426	2.255254
	F- statistic	9.048942	7.402871	11.82153	9.759038	7.990526

Appendix V

Estimation Results for Interest Rate Pass Through Model

Sample period: 2001 Q1 - 2009 Q4						
Observations: 36						
		blr				
		1	2	3	4	5
1	c	-0.02448	-0.02295	-0.03494	-0.02939	-0.03277
	(p-value)	0.5045	0.5434	0.3194	0.4231	0.3845
2	dcm		-0.06111	-0.09143		-0.11882
	(p-value)		0.5215	0.4161		0.3318
3	dfo			0.060291	0.03617	0.105811
	(p-value)			0.6988	0.7724	0.5572
4	dcm*dfo					-0.20486
	(p-value)					0.827
5	dblr(-1)	-0.00956	0.001222	-0.1517	-0.12599	-0.17213
	(p-value)	0.9131	0.9906	0.1936	0.301	0.1615
6	dir	0.693236	0.71011	0.898558	0.766473	0.891489
	(p-value)	0.000	0.000	0.000	0.000	0.000
7	dumir	0.043832	0.038829	0.041597	0.048493	0.044798
	(p-value)	0.1768	0.2497	0.1808	0.1369	0.1637
8	dumfx	-0.02156	-0.02106	-0.01257	-0.02083	-0.01793
	(p-value)	0.4927	0.5172	0.6739	0.5047	0.5789
9	dumcr	-0.10603	-0.0998	-0.14598	-0.12664	-0.14445
	(p-value)	0.0449	0.0727	0.0142	0.0215	0.0185
10	dcm*dir		-0.40018	-1.79891		-3.76409
	(p-value)		0.5734	0.0466		0.1282
11	dfo*dir			2.427298	1.190472	1.151092
	(p-value)			0.0144	0.1186	0.5046
12	dcm*dfo*dir					17.8382
	(p-value)					0.3828
	R - square	0.875338	0.878282	0.886104	0.905368	0.90849
	Akaike info criterion	-2.2553	-2.43201	-2.49842	-2.57261	-2.49504
	Schwarz criterion	-2.4271	-2.08012	-2.14653	-2.13274	-1.9672
	Durbin-Watson stat	1.823762	1.954815	1.590782	1.711039	1.661692
	F- statistic	42.13015	28.86292	31.11961	27.6388	21.66051

1) Financial Sector Master Plan (FSMP)

The Financial Sector Master Plan was launched in 2001 with the objective *'to develop a more resilient, competitive and dynamic financial system with best practices, that supports and contributes positively to the growth of the economy throughout the economic cycle, and has a core of strong and forward looking domestic financial institutions that are more technology driven and ready to face the challenges of liberalisation and globalisation'[14].*

The Plan is to implement the 115 broad recommendations within a period of 8-10 years in three phases, subject to achieving specified milestones and safeguards. The first phase is on building the domestic capacity, the second phase in which domestic competition increases and the third phase in which the pace for the integration with the international market is increased.

Figure 5: Phases of the Financial Sector Master Plan

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PHASE 1			PHASE 2			PHASE 3			

With the implementation of the Plan, the Malaysian financial sector has undergone significant transformation and progress. This is particularly most evident in the banking sector which has undergone restructuring, consolidation, and rationalisation. Gradual deregulation and liberalization has also altered the financial landscape bringing with it improved performance and enhanced resilience.

2) Capital Market Master Plan (CMP)

The Capital Market Master Plan (CMP) was launched in February 2000. It set the clear strategic position and future direction of capital market development for Malaysia. The CMP is premised upon six key objectives, expressed in 152 recommendations and seeks to chart the strategic positioning and future direction of the Malaysian capital market for the next 10 years. It is intended to provide market participants with strategic clarity as to the vision and objectives for the capital market amid the changing market place.

––––––––––

14. Financial Sector Master Plan (2001)

Figure 6: Phases of the Capital Market Master Plan

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PHASE 1 Strengthen domestic capacity and develop strategic and nascent sectors			**PHASE 2** Further strengthen key sectors and gradually liberalise market access		**PHASE 3** Further expansion and strengthening of market processes and infrastructure towards becoming a fully developed capital market, and enhancing international positioning in areas of comparative and competitive advantage.				

Source: Securities Commission

127

CHAPTER 5
MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT IN MYANMAR

By

Tin Maung Htike[1]

1. Geography and Trade Patterns

Myanmar is bordered on the north and northeast by China, on the east and southeast by Laos and Thailand, on the south by the Andaman Sea and the Bay of Bengal, and on the west by Bangladesh and India. Myanmar covers an area of 677,000 square kilometers, or 261,228 square miles. As forest covers about 52.3% of the total land area and only about 14.8% is under cultivation, it still has a vast potential of land resources for cultivation and expansion of cultivable land. Myanmar's economy is heavily dependent on the agriculture sector, which constitutes about half of the economy (49%), the industrial sector accounts for roughly (35%), with services and the trade taking up the rest. The present population is about 56 million. Myanmar Standard Time is six hours and thirty minutes ahead of the Greenwich Means Time. Since late-1988, Myanmar replaced economic central planning with a more liberalised economic policy based on a market- oriented economy. Myanmar's foreign trade is mainly with the Asian countries, followed by the European countries and other countries. Myanmar is situated in a very significant geographic location and has good possibilities of benefiting from the rapidly expanding economies of its neighbors, particularly, the People's Republic of China, India and Thailand.

2. General Policy for Monetary Management

2.1 Current Banking System in Myanmar

The financial system in Myanmar has been restructured since 1989-90 at the inception of the market-oriented economic system. In order to establish a sound and efficient financial system to facilitate the operation of its market-driven economy, the relevant amendments were made to the existing laws and the following new laws were promulgated for the banking sector.

---

1. Research Officer, Research and Training Department, Central Bank of Myanmar.

(a) The Central Bank of Myanmar Law (1990)
(b) The Financial Institutions of Myanmar Law (1990)
(c) The Agriculture and Rural Development Bank Law (1990)
(d) The New Saving Bank Law (1990)

The current banking system in Myanmar comprises the Central Bank of Myanmar (CBM), the four state-owned banks, with well over 500 branches, and 15 private-owned domestic banks which are permitted to operate since May 1992. The state-owned banks include the Myanma Economic Bank (MEB), the Myanma Foreign Trade Bank (MFTB), the Myanma Investment and Commercial Bank (MICB), and the Myanma Agriculture and Rural Development Bank (MARDB).

As the monetary authority, the CBM formulates and implements monetary policy, with the following aims: (1) Preserve the value of the Myanmar currency; (2) Promote efficient payment mechanisms; (3) Provide for the liquidity, solvency and proper functioning of a sound financial system; and (4) foster the monetary, credit and financial conditions essential for orderly, balanced and sustained economic development.

2.2 Monetary Policy Instrument

At present, the CBM mainly uses interest rate policy as the main monetary policy instrument while reserve requirements and open market operation have also been used to a certain extent.

2.2.1. Interest Rates

In Myanmar, the interest rate and credit channels are regarded as more effective than other channels. The CBM uses interest rate as the main monetary instrument. The CBM has made adjustments to its policy in response to changes in the economic requirements of the country. The CBM has raised its rate from 11% to 12.5% in January 1995, and then to 15% in April 1996. The Central Bank rate was reduced to 12% from 15% on April 1999, and then to 10% in April 2000. The CBM has raised its rate from 10% to 12% on April 1, 2006. Consequently, the CBM prescribed the maximum interest rates for deposits and lending of commercial bank at 12% and 17%, respectively. The lending rate for special projects is 15%. Moreover, the CBM also increased the interest rate on 3-year Treasury bond and 5-year Treasury bond from 8.5% and 9.0% to 10.5% and 11%, respectively, with effect from April 1, 2006.

2.2.2. Open Market Operation

At present, Myanmar does not have a properly developed capital market. The CBM, on behalf of the government, has issued 3- and 5-year Government Treasury Bonds starting from 1 December 1993, as an initial step to facilitate the emergence of a capital market as well as to partly finance the budget deficit. The domestic private-owned banks are the main buyers of the Treasury bonds as they have easy access to the discount window facility against Treasury bonds which are classified as a reserve requirement and liquid asset. With a view to establishing a stock exchange, the first securities firm, Myanmar Securities Exchange Co. Ltd., was established in June 1996 as a joint venture between the Myanmar Economic Bank and the Daiwa Institute of Research Co. Ltd., of Japan.

2.2.3. Prudential Requirements

The CBM presently administers a prudential policy so as to maintain macroeconomic stability and promote domestic savings. Prudential policy is necessary for any country seeking to achieve and maintain growth with macroeconomic stability. The CBM regulates the operations of banks by enforcing the following prudential requirements.

2.2.3.1. Minimum Reserve Requirements

(a) 10% of total deposits, regardless of the type of deposits whether demand or time deposit, are required to be maintained by each bank as the minimum reserve requirement;

(b) 75% of the required reserves are to be deposited with the Central Bank and 25% of the reserves may be maintained in the form of cash; and

(c) Required reserves for a bank to be maintained with the Central Bank must not exceed 35% of the total liabilities of the bank. However, in the event of serious inflationary pressure, the Central Bank may increase the 35% ceiling required reserves. (Article 58 of the CBM Law, Regulations 3 & 4 of the Regulations of Financial Institution Instruction No. 1/2007).

2.2.3.2. Liquidity Control

Banks are required to maintain the level of their liquid assets against their eligible liabilities at not less than 20% (Articles 58 and, 59 of the CBM Law, Central Bank's Instruction No.4).

2.2.3.3. Capital Adequacy Ratio

The risk-weighted assets of a bank shall not exceed ten times the combined total of its capital and reserves (Article 31 of the FIM Law).

2.2.3.4. Legal Lending Limit

Banks shall not lend more than 20% of their capital plus reserves to a single individual, an enterprise, or an economic group (Article 32 of the FIM Law).

2.2.3.5 Methods of Calculation of Prudential Requirement

The methods for the calculation of the Reserve Ratio, Capital Adequacy Ratio and Liquidity Ratio are as follows:

(a) Reserve Ratio $= \dfrac{\text{Deposit with CBM + Cash in Vaults}}{\text{Total Deposit}}$

(b) Capital Adequacy Ratio $= \dfrac{\text{Paid-up Capital + Reserves + Profit \& Loss A/C}}{\text{50\% of Loan + 20\% of Cheques \& Bills + 20\% of Fixed Assets}}$

(c) Liquidity Ratio $= \dfrac{\text{Liquid Assets}}{\text{Eligible Liabilities}}$

Apart from examining the reserve ratio, capital adequacy ratio and liquidity ratio, the Banking Supervision Department regularly examines other various ratios, such as loans-to-deposit ratio, total assets-to-deposits ratio, total assets-to-loans ratio, non-performing loans-to-total loans ratio, to get a clear picture of the health of the financial institutions. The picture that emerges from the close scrutiny of

132

the various ratios, reveals the condition of the financial institutions. Particularly for financial institutions whose operations are below par, necessary action has to be taken, by penalising them with the payment of penalty charges. The important ratios are reported to the Central Bank Board for its information and action.

2.2.4. Credit Control

Carrying out credit operations, financial institutions shall comply with the principles of risk avoidance, diversification and liquidity, as well as with directives issued by the Central Bank; and they shall acquire and keep the legal documents for the relevant credit operations. The banks are required to build up and maintain a general provision account amounting to at least 2% of the total outstanding loans/advances at the end of the year; and they are also required to maintain specific provision for doubtful and/or bad loans on a case-by-case basis [Articles 28, 29 and 11(d) of the FIM Law, Central Bank's Instructions No.6].

2.3 Exchange Rate Regime and Deregulation of Foreign Exchange Transaction

Myanmar has a fixed exchange rate system. The Myanmar currency, the kyat, is officially pegged to the SDR at 8.50847 per SDR 1. Myanmar applies margins of 2% to spot transactions based on the fixed kyat SDR rate since 1975. Before 1988, the functions of foreign exchange control were undertaken by the MFTB, a state-owned commercial bank. Now, after the introduction of a market economy in 1988 and following the promulgation of the Central Bank of Myanmar Law in 1990, all the functions of foreign exchange control are now vested with the CBM. The exercise of foreign exchange control is to this day based on the Foreign Exchange Regulation Act, 1947. The Foreign Exchange Budget is managed by the Ministry of Finance and Revenue.

2.3.1. Deregulation of Foreign Exchange Transaction

The economy of Myanmar converted to a market-oriented system since September 1988. In conformity with this system, in November 1988, the Foreign Investment Law was promulgated for the first time since 1960. In January 1989, the government issued a new notification granting permission for all Myanmar citizens to open foreign currency accounts with the Foreign Trade Bank with regard to foreign exchange they have received on account of: pensions and compensations from abroad; services rendered to foreign governments,

international organisations and companies; rentals received from houses, motor vehicles, etc. Private importers are allowed to open foreign currency accounts with foreign exchange from their export proceeds at the MFTB. In addition, those exporters are entitled to import under valid import licenses issued by the Ministry of Commerce. State banks, authorised to conduct foreign banking business, have been paying interest on 6-month fixed foreign currency deposits of $1,000 and above, with the certified average rates for foreign exchange transactions determined on daily basis by the MFTB.

The CBM has issued Foreign Exchange Certificates (FECs) since February 1993 for the enhancement of foreign exchange earnings and for the convenience of tourists visiting Myanmar as well as foreign investors. FECs are exchangeable with six hard currencies or with acceptable traveller cheques. FECs can be used by both residents and non-residents alike for various types of payments within Myanmar.

3.   Trends in Macroeconomic and Financial Data

3.1 Economic Growth

Myanmar has shifted its economic direction from a centrally planned economy to a market-oriented one since late-1998. Since then, the economy is steered by successive short-term plans. A short-term Four Year Plan (1992/93 to 1995/96) has been implemented with a very satisfying average annual growth rate of 7.5%, a rate far higher than the initial target of 5.1%. During the second Five Year Short-Term Plan (FYSP) (1996/97 to 2000/2001), real GDP growth in 1997/98 and 1998/99, slowed down to an average annual rate of 6.23%. This was partly as a result of the contagion effects of the regional financial crisis. In FY of 1999/2000, the growth rate increased to more than 10%, with the agricultural sector leading the expansion. In addition, the manufacturing and processing, energy and mining sectors have also grown rapidly. In the third FYSP spanning from 2001/02 to 2005/06, significant growth has been achieved with the high average annual growth rate of 13.09%. The agricultural sector remains the main driving force of the country's economic growth. Moreover, the good performance in other sectors of the economy also contributed to the achievement of high growth rates.

Myanmar is now implementing its fourth FYSP starting from 2006/07 to 2010/2011. In 2008/09, the third year of the fourth FYSP, the real GDP slowed down to 10.1% from 12.0% in 2007/08 due to Cyclone Nargis which hit the

lower and middle region of Myanmar on 2 May 2008, causing widespread destruction to farmlands, homes, food supplies and infrastructure. The annual plan target of 2009/10, the forth year of the fourth FYSP, has been set at 12.1%.

Figure(1)
GDP Growth Rate(%)
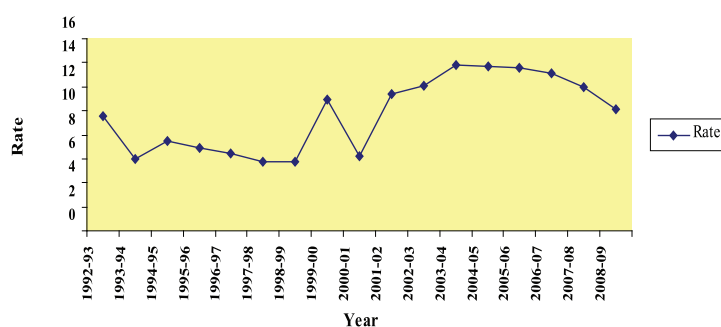
3.2 Inflation

The annual inflation accelerated to 49% in FY of 1998/1999. However, the inflation has declined since April 1999. By December 1999, the annual inflation rate has fallen to 18% partly due to a more stable external environment, as well as to a better harvest in the second half of 1999/2000. However, the CPI inflation increased again and reached the peak of 58.1% in 2002/03 and then it gradually declined to 24.9% in 2003/04 and further to 3.8% in 2004/05. The soaring global oil prices during that period did not have much effect on domestic prices as the government sold energy at a subsidised rate then. However, due to the increase in government salaries as well as to the abolishment of the subsidised energy prices, the inflation has risen once again in 2008 and stood at 32.9%. However, the inflation rate declined to 22% in 2009 due to the impact of declining world commodity prices.

3.3 Monetary Development

The rate of money supply decreased from 26.46% to 17.37% in 2008 as compared to last year. It was mainly due to a fall in domestic credit to the public sector. The net domestic credit decreased from 26.3% to 20.5% and quasi money also slowed down from 32.3% to 21.3%.

135

Figure(2)
Consumer Price Index
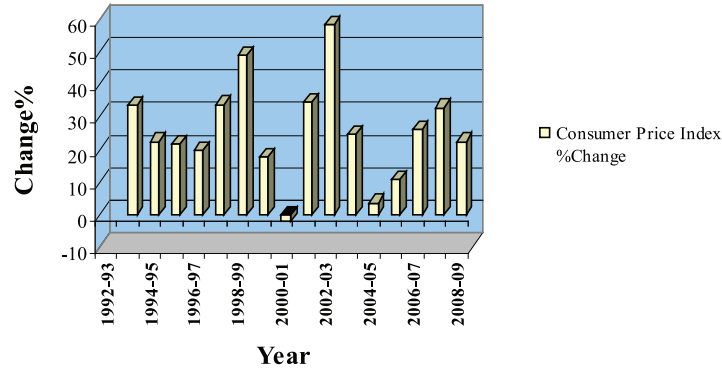
Figure(3)
M2 to GDP ratio & M2 Annual Change
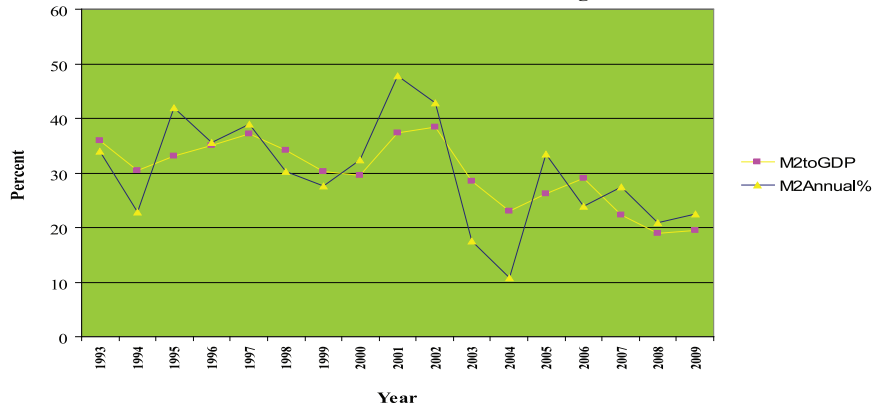
3.4 Fiscal Development

On the fiscal front, in order to improve the existing fiscal imbalance, appropriate measures have been taken on both the revenue and expenditure side. On the revenue side, in order to increase tax revenue, measures have been taken to strengthen tax administration and collection, and to reduce tax evasion and increase contributions from the State Economic Enterprises (SEEs). On the expenditure side, unproductive expenditures have been discouraged and prioritisation has been encouraged. Due to these efforts, the fiscal deficit which stood at 3.9% of GDP in 2007/08 declined to 1.6% in 2008/09. Myanmar has to rely mainly on its own resources for infrastructure reform and development which is crucial for the development of the country. Myanmar's budget still remains in deficit.

3.5 External Development

Myanmar's external position, in deficit for more than two decades, has improved and turned into surplus since 2002/03, mainly due to the increase in exports and decline in imports through export promotion measures, systematic management of the foreign trade system, and strong demand for Myanmar exports (mainly energy, forestry, marine and agricultural products) at that time. The improved position has led to a surplus in the current account balance and, consequently, the overall balance of position has also been in surplus for more than five years. The gross official reserve is also on the rise and currently covers twelve months of import.

Figure(4)
Current A/C and Financial A/C

Figure(5)
Budget Deficit % of GDP

Figure(6)
Export & Import
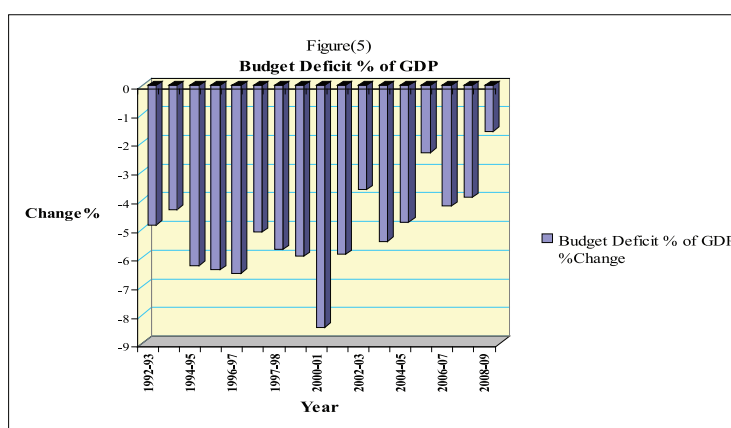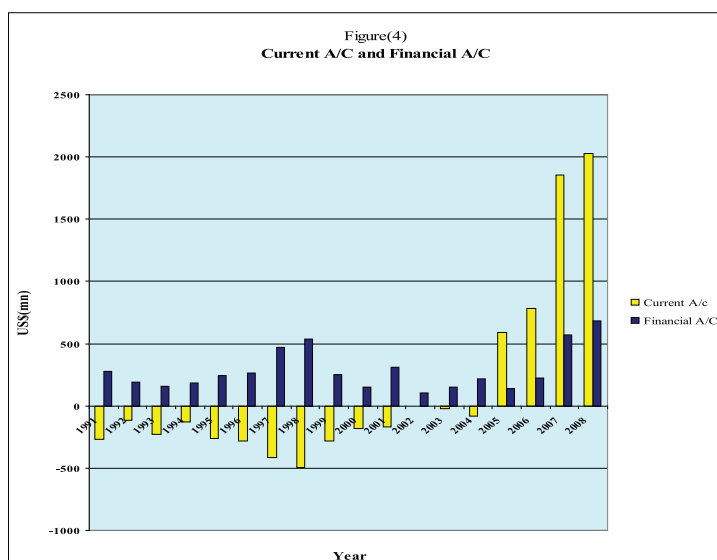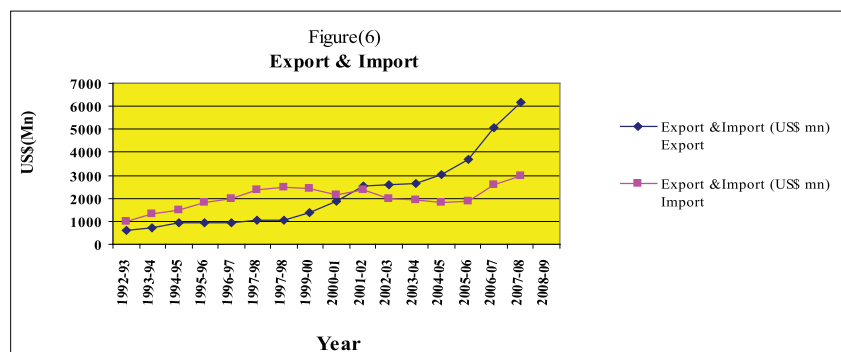
4. Monetary Policy Management and the Macroeconomy

4.1 Monetary Policy Transmission in Myanmar

The interrelationships between the financial system and the macroeconomic conditions depend mainly on the effectiveness of monetary policy transmission channel. In Myanmar, changes in the reserve requirements, interest rates and credit policies are the main transmission channels of monetary policy in recent years. Interest rates played only a limited role in regulating and allocating credit but were important in mobilising savings.

At present, the main objectives of monetary policy management are to control monetary expansion in support of the objectives of combating inflation and promoting domestic savings. In recent years there have been no significant changes in monetary policies including interest rate policy. Although there have been no changes in the interest rate policy, the service charges is levied loans by commercial banks. This charge was reduced to 1% from 3% with effect from 1 July 2009.

To mobilise domestic savings and reduce the fiscal deficit, the CBM has been issuing two types of Treasury bond (3-year and 5-year Treasury bonds) to the public, to partly finance the budget deficit. In addition, the CBM issued a 2-year treasury bond in denomination of ten million kyats with the interest rate of 10.5% per annum on 1 January, 2010. The bond financing of the fiscal deficit provides an opportunity in capacity building for the CBM in managing the monetary aggregates and adjusting the interest rates in response to changing macroeconomic conditions. In order to shift away from direct central bank financing of the consolidated fiscal deficit and encourage the mobilisation of domestic financial

resources, it is necessary that the fiscal measures be complemented by monetary measures.

4.2 Monetary Aggregate

The ratio of M_2 to gross domestic product (GDP) decreased from 29% in 2006 to 22.22% in 2007 and the ratios of 2008 and 2009 continuously decreased to 19.39% and 19%, respectively.

In 2008/09, loans to private sector by the state-owned bank increased by 16.5% but loans to the private banks decreased 14.70% and demand deposits at the state-owned banks and private banks increased 51.7% and 20%, respectively.

Although, saving certificates which is only issued by the MEB decreased by 3.3% in2008/09, time deposits of the state-owned banks and private banks soared by 68.0% and 79.1%, respectively.

In 2008/09, saving deposits at the state-owned banks and private banks rose by 30.8% and 29.6%, respectively.

Table 1
Monetary Aggregate

Fiscal Year	2003-04	2004-05	2004-06	2006-07	2007-08	2008-09
Loans to Private Sector						
State-owned Banks	24486	44627	51599	71020	100626	117247
Private Banks	29265	40098	45028	45538	42430	36191
Demand Deposit						
State-owned Banks	10040	14609	16870	25492	28162	42732
Private Banks	9391	14485	17827	22645	28214	33853
Saving Certificates	2382	2714	2825	2965	3179	3073
Time Deposits						
State-owned Banks	365	500	543	870	892	1499
Private Banks	1302	776	639	925	1431	2563
Saving Deposit						
State-owned Banks	39179	59635	72082	91698	126106	164971
Private Banks	27993	45030	47244	73879	104036	134881

4.3 Model Specification

The empirical model assessing macro-financial linkages and monetary policy is based on the original dynamic IS curve by Rudenbush and Svensson (1999). This model primarily tests the hypothesis that securitisation limits the efficacy of monetary policy to change the real economic variable.

In this paper, we use the leading macroeconomic indicators, such as the inflation rate, gross domestic product, 3-month deposit rate, working capital from FY1993/94 to FY2008/09, for time series analysis. All these data are expected to significantly impact on the output gap on macroeconomy with marginal influence from the real interest rate in Myanmar.

To analyse and assess the macro-financial linkages and monetary policy in Myanmar, the original dynamic IS curve by Rudenbush and Svensson (1999) is applied. In this paper, therefore, we develop the IS equation and the IS equation with control variable and interaction.

IS Equation 1:

LOGGAP = C - REAL 1(-) + LOGGAP (-2) + AR

IS Equation 2:

LOGGAP = C + LOGGAP (-1) + REAL 1(-) – OPEN + CRGROWTH - CRGROWTH*OPEN– REAL1 (-1) + REAL1 (-1)*CRGROWTH

To create the abovementioned equation, this paper generates the output gap, real interest rate 1, real interest rate 2, credit growth and openness, and they are estimated as follow:

Output gap (gap) that is estimated from GDP.

Real interest rate 1(Real1) is generated from inflation minus 3-month deposit rate.

Real interest rate 2 (Real2) that is calculated from inflation minus working capital.

Openness is estimated from export and GDP ratio.

This paper uses the OLS regression and the results and analysis are as follows:

IS equation 1:

LOGGAP = 0.857805 – 0.004895*REAL 1(-) + 0. 253806LOGGAP (-2)
         (6.43)   (0.002)   (0.215)

          D-W=2.00   R2 =0.62

Analysing the above IS Equation 1,

Dependent Variable: LOGGAP
Method: Least Squares
Date: 12/02/09   Time: 16:41
Sample (adjusted): 1999 2008
Included observations: 10 after adjustments
Convergence achieved after 86 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.857805	6.429186	0.133424	0.8982
REAL1(-1)	-0.004895	0.002489	-1.966707	0.0968
LOGGAP(-2)	0.253806	0.214697	1.182160	0.2819
AR(1)	0.945763	0.333625	2.834809	0.0298

R-squared	0.749362	Mean dependent var	-0.169553
Adjusted R-squared	0.624043	S.D. dependent var	0.221666
S.E. of regression	0.135915	Akaike info criterion	-0.864397
Sum squared resid	0.110838	Schwarz criterion	-0.743363
Log likelihood	8.321984	F-statistic	5.979631
Durbin-Watson stat	2.000881	Prob(F-statistic)	0.031023

Inverted AR Roots	.95

Highlights

1. Real interest rate (lag 1) in Myanmar significantly affects the output gap, at 5% significance level.

2. Real interest rate data is generated from subtraction of inflation rate from working capital rate.

3. The estimation gives R squared of 79% which means that 79% of the variation in the output gap can be explained by the real interest rate. DW statistic is 2,0 after introducing AR(1), suggesting that autocorrelation problem is properly solved.

4. The negative sign of the real interest rate is as expected.

IS equation 2:

LOGGAP = C + LOGGAP (-1) + REAL1(-2) – OPEN +
        CRGROWTH -   CRGROWTH*OPEN– REAL1 (-1) +
      REAL1 (-1)*CRGROWTH

        (0.22)   (0.558)   (0.003)   (606.886)   (1.082)

        (1906.435)   (3.107)   (0.011)

        D-W=2.06   R2 =0.88

Analysing the above IS Equation 2:

Dependent Variable: LOGGAP
Method: Least Squares
Date: 12/02/09   Time: 17:00
Sample (adjusted): 1997 2008
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.217466	0.078525	2.769395	0.0504
LOGGAP(-1)	0.558167	0.082951	6.728845	0.0025
REAL1(-2)	0.003482	0.002112	1.648912	0.1745
OPEN	-606.8864	127.8073	-4.748449	0.0090
CRGROWTH	1.082579	0.502302	2.155237	0.0974
CRGROWTH*OPEN	-1906.435	1191.543	-1.599972	0.1849
REAL1(-1)*OPEN	-3.107533	3.811590	-0.815285	0.4607
REAL1(-1)*CRGROWTH	0.011405	0.008847	1.289100	0.2669

R-squared	0.959459	Mean dependent var	-0.129261
Adjusted R-squared	0.888511	S.D. dependent var	0.228603
S.E. of regression	0.076330	Akaike info criterion	-2.072771
Sum squared resid	0.023305	Schwarz criterion	-1.749500
Log likelihood	20.43663	F-statistic	13.52353
Durbin-Watson stat	2.068878	Prob(F-statistic)	0.012089

Equation 2: IS equation with Control Variable and Interaction

Highlights

1. Using 5% significance level, the output gap in Myanmar is significantly affected by the lagged value of the output gap (LOGGAP(-1), openness of Myanmar economy (OPEN), and credit growth in Myanmar (CRGROWTH).

2. If we consider 10% as our significance level, then the real interest rate (REAL1) will be significant, too, in explaining the output gap.

3. This estimation gives R squared of 95%. DW statistics is 2, 06, indicates that the classical assumption of no autocorrelation is not violated.

5. Impact of Crisis on the Real Economy

5.1 Monetary Policy Management Reactions to Deal with Banking Crisis in Recent Years

5.1.1 The 1997 Asian Financial Crisis

In response to the economic slowdown in FY 1998/99, partly due to the contagion effect of the Asian financial crisis in 1997, the Myanmar authorities embarked on a major agricultural push to tap an alternative source for export earnings. A package of incentives, including customs duty exemptions, permission for exports and cut in lending rates, is being offered to private entrepreneurs who are engaged in reclaiming wastelands in order to boost agricultural production. With a view to reviving domestic production sectors, interest rates were first reduced in April 1999 led by the Central Bank's lowering of the discount rate from 15% to 12% and which were further lowered in April 2000. The Central Bank cut its discount rate by 2 percentage points to 10%, leading to a reduction in commercial bank rates and the rates on medium-term government Treasury bonds. Thus, the maximum lending rate was reduced to 15%. Since then, the 3-year and 5-year Treasury bonds bear interest rates of 8.5% and 9% per annum, respectively.

5.1.2 The 2003 Banking Crisis in Myanmar

In February 2003, a decline in public confidence triggered a massive run on the private banks in Myanmar. In September, the deposits of these banks were depleted by two thirds, and the funds withdrawn were retransferred to the state-owned banks. A severe liquidity shortage developed in the private banks which prompted central bank action. The CBM required the private banks to adhere to a deposit-to-capital ratio capped at 7, thereby constraining their ability to collect new deposits. But, early 2004, deposits started to recover for the private banks from a low level. In June three private banks merged. At the peak of the crisis, six problem banks were prohibited from accepting new deposits and extending new credits. Later, three banks were allowed to resume normal operations, while two were closed, and one remained under a special supervisory

regime. On 1 April 2006, the Central Bank rate was raised to 12% from 10% in order to effectively mobilise domestic resources and also to encourage and enhance quality lending. Accordingly, the deposit and lending rates were also adjusted to 12 % and 17%, respectively. In 2006/07, the cap on deposit-to-capital ratio was increased. Now, all banks are required to maintain 10% of total deposits as minimum reserves and to keep capital adequacy ratios and raise paid-up capital. The CBM has been monitoring private banks' financial position on a daily basis and is upgrading its supervision on- and off- site.

5.1.3 The Recent Global Financial Crisis

As the financial sector in Myanmar is not significantly integrated with rest of the world, the direct impact of the current global financial crisis on Myanmar's financial sector is not likely to have much bearing on Myanmar. However, the Central Bank is concerned about the increasing asset price of real estate and decreasing public confidence in banks and financial institutions caused by the global crisis and the volatility of the world crude oil prices. Keeping with the existing economic and financial developments, the CBM has taken various measures to strengthen the soundness of the banking system. The Ministry of Finance and Revenue (MFR), the apex of the financial system, has formed a think-tank group to assess the impact of the global financial crisis to make the necessary recommendations and to effectively coordinate and cooperate with relevant institutions.

5.2 Monetary Authority Policy Reactions related to Financial Crisis for Financial Stability

5.2.1 Lender of Last Resort

The role of the CBM in its capacity as lender of last resort is to provide liquidity assistance to help banks resolve a short-term funding difficulty. Pursuant to the CBM Law of 1990, the CBM is empowered, as the lender of last resort, to give loans to commercial banks during both normal times and systemic crisis to solve liquidity problems. In early 2003, a few large banks experienced panic runs owing in part to the loss of depositors' confidence sparked by the spillover effects of the failure of general services companies outside the banking sector. The incidents have been resolved after central bank intervention as lender of last resort and provision of adequate liquidity assistance to the banks. Owing to these efforts almost all the commercial banks have returned to stable condition and banking business is back to full swing operation. There are two types of lender of last resort facilities extended by the CBM to commercial banks:

(a) The Short-term Funding Facility extend to banks experiencing liquidity difficulties under normal conditions.

(b) The Emergency Financing Facility for a problem bank that is experiencing liquidity difficulty that has systemic impact, but is still complying with the level of solvency prescribed by the central bank.

5.2.2 Merger and Revocation of Private Banks

The CBM approved the merger of three private co-operative banks in 2004 and revoked the licenses of three domestic private banks in 2005 due to their failure to comply with the existing Financial Institution Law, 1990.

5.2.3 Monitoring Financial Position of Private Banks

With a view of strengthening the reserve position of banks, CBM amended its minimum reserve requirements with effect from 12 April 2007 (10% of total deposits is required to be maintained as a minimum reserve requirement). The CBM closely monitors the private banks on a daily basis by analysing their daily returns and financial position, in addition to on-site examination and off-site monitoring. The CBM has issued a series of instructions and guidelines for bank inspectors to review bank compliance with AML/CFT requirements. The CBM has been supervising banking activities and encouraging the banks to be in compliance with the international standards and norms.

6. Conclusion

6.1 Major Issues (Problems and Prospects)

In terms of having effective monetary and fiscal policies in moving forward in the medium term, Myanmar faces a number of constraints and several economic challenges: high inflation, huge fiscal deficit, weakness in the investment climate, etc. As Myanmar has yet to have a money market, open market operations cannot be used as an effective monetary instrument, like in the other countries. There is also a need to develop a basic institutional structure, such as a capital market, and get connected with the international financial markets. Myanmar intends to establish a securities market, and as a first step towards that direction, the first security firm, Myanmar Securities Exchange Co. Ltd., was established in June 1996 as a joint venture between the Myanmar Economic Bank and the Daiwa Institute of Research Co. Ltd., of Japan. The draft of the

Security and Exchange Law is in the final stage of reading and is awaiting approval by the authorities. The CBM is expected to familiarise people with the basic knowledge about the financial products and securities market. The integration of Myanmar's financial sector with the world financial markets is a major challenge and prospect for our Central Bank. In anticipation and with regard to this challenge, the proficiency of the Banking Supervision and Bank Regulation functions will be crucial for they will have an important role to play.

6.2 Policy Recommendations

The CBM has to address the following issues and problems. The priorities are to:

(i)   Reduce the fiscal deficit which would help to control inflation;

(ii) Unify the exchange rate;

(iii) Strengthen domestic resource mobilisation and external resources; and

(iv) Promote investment, both domestic and foreign.

In Myanmar, interest rates, which are currently far below the inflation rate and real rates are negative, should eventually and gradually be liberalised. Improvements in monetary policy and operations are needed to keep inflation under control.

REFERENCES

The Central Bank of Myanmar Law (1990)

The Financial Institutions of Myanmar Law (1990)

Regulations for Financial Institutions (1992)

Guide to SEACENBank Watch (2008)

International Financial Statistics (July, 2009)

Ryoo, Sangdai, (2006), "Operational Framework of Monetary Policy in the SEACEN Countries", The SEACEN Centre.

Soekarni, Mulyana, (1995), "Financial Reforms and Transmission Mechanism of Monetary Policy in the SEACEN Countries", The SEACEN Centre.

Bayoumi, Tamin and Ola Melander, (2008), "Credit Matters: Empirical Evidence of US Macro-Financial Linkages", *IMF Working Paper* WP/08/169, International Monetary Fund.

Mishkin, Frederic S, (1996), "The Channels of Monetary Transmission: Lesson for Monetary Policy", *NBER Working Paper 5464*.

CHAPTER 6
MACRO-FINANCIAL LINKS AND
MONETARY POLICY MANAGEMENT IN NEPAL

By

Rajendra Pandit[1]

1. Background

Nepal is a least developed landlocked country in South Asia. The country is sandwiched between the two most populous and emerging economies in the world, India in the East, South and West and China in the North. With an area of 147,181 square kilometers, the population of the country is 30 million (CBS, GON, 2009).

Agriculture is the mainstay of Nepal's economy. The growth of GDP has remained fairly stable, albeit at a low level. With a gross national per capita income of US$484 in 2009, 31% of the total population is still under the absolute poverty line (GON, CBS, 2004). The country has gradually opened up its external sector. It has experienced a substantial level of workers' remittance inflow, which contributes towards the expansion of the country's economic activities. Internal political conflict, which started in 1995 and ended with a comprehensive peace agreement in 2006, seriously affected the Nepalese economic and social environment.

The Nepalese financial sector has progressed gradually. However, the momentum has picked up in recent times in terms of both the number and volume of transactions. The influence of the financial sector on real economic activities needs to be analysed. Another aspect that needs to be examined is the effectiveness of monetary policy, i.e. whether or not there exists a significant relationship between the real interest rate and output gap. The objective of this paper is to evaluate the macro-financial linkages in Nepal. The paper also attempts to recommend the important policy options. The remaining part of this paper is organised as follows. Section 2 presents an overview of the Nepalese economy. Section 3 discusses the monetary management and monetary policy framework

---

1. Deputy Director, Research Department Nepal Rastra Bank, email: rpandit@nrb.org.np; rajen_pan@yahoo.com

of Nepal, and this is followed in Section 4 by an analysis of the macroeconomy and monetary policy. Finally, in Section 5, the impact of the recent financial crisis is discussed, wrapping up with the conclusion and recommendations.

2. Overview of Nepalese Macroeconomic Situation

2.1 Domestic Output

Figure 1
Average GDP growth
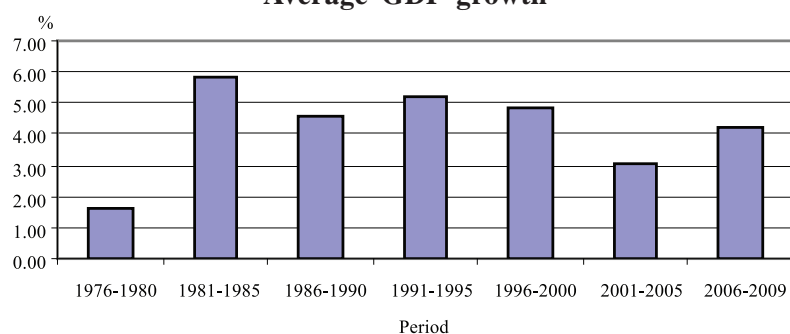
Source: Central Bureau of Statistics, GON

The growth of the GDP averaged 4.4% during 1976-2008. The growth rate has remained fairly stable at a low level. The real GDP is estimated to grow by 4.7 % in 2009 on account of a weak agricultural sector as well as industrial production. Agriculture, which contributes 36% of the GDP, is the single highest contributor in the national output (CBS, GON, 2008/09). The industrial sector has suffered due to domestic internal conflict, political instability and weak law and order situation. The Gross National Saving (GNS) and Gross Fixed Capital Formation (GFCF) remained broadly stable. The GFCF stood at 21.3% of the GDP in 2009. In 2001, it stood at 19.2% of the GDP. The low level of GDP growth rate is attributed to the low level of GFCF.

2.2 Inflation

Figure 2
Inflation
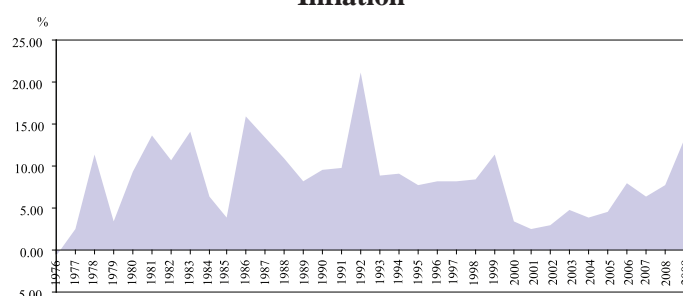
Source: Nepal Rastra Bank

During the period since the NRB started producing inflation statistics, the annual rate of inflation has averaged 8.2%. Inflation hovered at a record level of 21.1% in 1992. The reasons for the unprecedented level of inflation in 1992 were the devaluation of Nepalese rupee against the US dollar and other convertible currencies by 20.9% and the upward price adjustment in the administrated prices of goods and services, like milk, petroleum products, education fee, telephone and electricity charges (NRB, 2006). The CPI registered a growth of 13.2% in 2009, despite a fall in the price level worldwide.

2.3 External Sector

Nepal's external sector has witnessed a mixed performance. In the trade sector, total trade, imports and trade balance have been gradually increasing. Trade imbalance increased from an average of 5.7% during 1975 -1979 to an average of 18.7% in 2005-2009. However, the improvement of exports has not been satisfactory. The exports to GDP ratio picked up marginally to 8.4% in 2005-2009 from 5.8% in 1975-1980. On the other hand, Nepal's total trade is still highly concentrated with India. Of the total trade, the share of India was 58.2% in 2009. As far as trade openness is concerned, total trade to GDP ratio, which generally measures the openness of the country, has been increasing from the beginning. This ratio stood at 48.5% in 2009, which was 25.5% in 1975.

151

Figure 3
International Reserve and Remittance Inflow
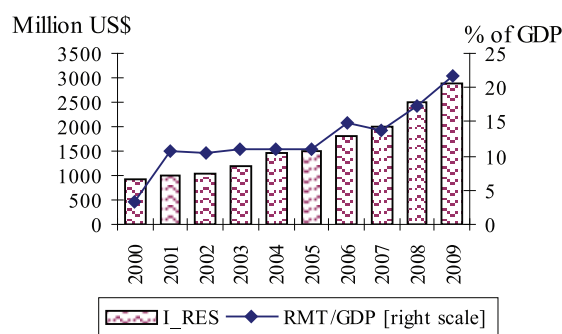
Source: Nepal Rastra Bank

The balance of payment (BOP) has shown a mixed performance. For the period forward from 1976 when the NRB started compiling BOP, the years of 1995, 1996, 1997 and 2002 witnessed a BOP deficit. Looking at the trend of the foreign exchange reserves for the last 15 years, the total reserves have witnessed an upward trend except for a slight fall in 1996. Nepal's BOP and foreign exchange reserves have been primarily remittance-driven. Workers' inward remittances have picked up significantly since 2001. Remittances soared to 10.7% of GDP in 2001 from 3.3% in 2000. It further increased to 21.8% of the GDP in 2009.

2.4 Monetary Sector

The average growth of broad money (M2) stood at 18.2% during 1975 to 2009. M2 increased by 27.7% in 2009. Net foreign assets (NFA) increased by 24.1% whereas net domestic assets (NDA) rose by 29.7% in 2009. The share of the NDA and NFA stood at 65% and 35%, respectively, in 2009. The high share of the NDA is due to the expansion in government and private sector credit.

2.5. Financial Sector Development

The modernisation of the financial system in Nepal began in 1937, when the first banking institution, namely, the Nepal Bank Limited was established. Before and even after the establishment of this semi-government commercial bank, the Nepalese economy operated on a dual currency system. The Indian currency was more commonly used than the Nepalese currency. To address this and other

152

issues, the Nepal Rastra Bank (NRB) was established on April 26, 1956 as the Central Bank of Nepal. At the time when the NRB was established, the country's financial and monetary system was characterised by (1) The existence of only one commercial bank operating with a few branches (2) A dual currency system with financial transactions dominated by the use of Indian currency (3) a volatile exchange rate against the Indian currency (4) A very low degree of monetisation in the country, and (5) The dominance of an unorganised financial market. Therefore, in the initial period, the efforts were focused on evolving the NRB as the monetary authority and bringing the monetary system under its control.

With the adoption of the economic and financial liberalisation policy since the 1980s, the Nepalese financial sector has witnessed rapid growth over the past two-and-a half decades. Increased private sector involvement makes the money and capital market more active and attractive for investment. A large portion of the population has access to modern financial services, and innovative banking products and services have been introduced in the financial market.

The Nepalese financial system consists of banks and financial institutions (BFIs), which include commercial banks, development banks, finance companies and micro-finance development banks (MFDBs). The Banks and Financial Institution Act, 2006 (BAFIA) classifies these financial institutions into four categories, i.e. A, B, C and D, respectively. In addition, some cooperatives and financial intermediary non-governmental organisations (FINGOs) are also carrying out limited banking transactions. As of mid- July 2009, 26 commercial banks, 63 development banks, 77 finance companies, 15 micro-finance development banks, 16 cooperatives and 46 FINGOs are under the supervisory purview of the NRB. The financial sector development commenced after some deregulation policies were adopted by NRB. These deregulations included interest rate liberalisation, abolishment of the directed lending programme, such as priority sector lending, reduction in the reserve requirement, and relaxation of entry barriers, such as the licensing and branch expansion. Nevertheless, the Nepalese financial system has yet to prove it is efficient, robust and well-diversified. Despite these developments, some parts of the rural countryside are still beyond the reach of financial services, resulting in slow monetisation.

Figure 4
Number of Banks and Financial Institutions
under NRB Supervisory Purview*

Year	Commercial Banks	Development Banks	Finance Companies	Micro Credit Dev. Bank	Cooperatives /NGOs
Before 1980	2	2	-	-	-
1980-1990	5	2	-	-	-
1990-2000	13	7	47	7	65
2000-2009	26	63	77	15	62

*- Apart from these, 25 Insurance Companies, one Citizen Investment Trust, one Employee Provident Fund, Deposit and Credit Guarantee Corporation and Nepal Stock Exchange are also in operations under the regulatory purview of the Government of Nepal.
Source: Nepal Rastra Bank

Figure 5 (a)
Indicators of Financial Deepening
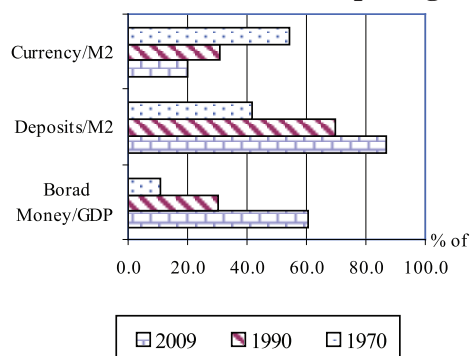
Figure 5 (b)
Total Loan and Deposit (% of GDP)

Source: Nepal Rastra Bank

154
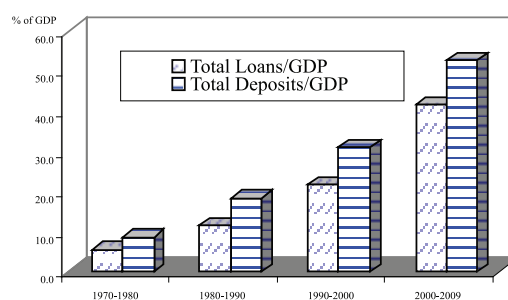
The indicators of financial deepening in the country can be measured by broad money/GDP ratio and deposits/M2 ratio, among others. Looking at the growth trend of M2/GDP ratio, although it has picked up gradually, it still remains at a low level. The M2/GDP ratio stood at 64.6% in 2009, as compared to 30.5% in 1990 and 11.1% in 1970. Therefore, it can be said that the growing number of financial institutions are gradually contributing to the monetisation and deepening of the economy and financial sector in Nepal. On the other hand, the currency broad money ratio declined significantly from 54.5% in 1970 to 20.2% in 2008, which shows the increasing role of financial deposits in the financial system. Deposits of the deposit-taking financial institutions have picked up significantly in recent times. The growing number of financial institutions, with their service expansion in the rural areas, coupled with the encouraging remittance inflows, have helped increase the resource mobilisation of the financial system. This, in turn, has contributed to the rapid expansion of credit.

The secondary transaction of corporate shares started in 1994 in Nepal. It has shown tremendous growth in terms of transactions and number of listed companies in recent years. This is due to the higher profitability of banks and financial institutions and adequacy of liquidity in the economy. Dividends as well as capital gain have attracted investors to the stock market. The market capitalisation ratio has increased from 5.0% in 1995 to 53.3% in 2009.

Figure 6
Stock Market Indicators
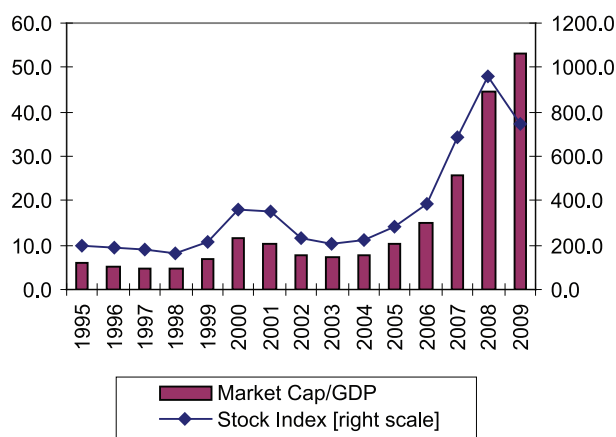
Source: www.nepalstock.com

155

The degree of financial deepening with respect to the bond market, particularly the corporate bond market, relatively has been lagging behind. The bond market is dominated by government bonds. The corporate bond market has yet to be developed as a promising alternative source of financing for the private non-financial sector. Therefore, it is clear that there remains ample room for financial sector development, especially with regard to the corporate bond market.

3. Monetary Management and Monetary Policy Framework

3.1 Monetary Management

3.1.1 Removal of Dual Currency System

In the past, the Indian currency (IC) and the Nepalese rupee were both regarded as legal tender. The greater fluctuation in the market exchange rate of Nepalese rupee vis-a-vis Indian currency created uncertainties in the economy. After the establishment of the NRB, the central bank started issuing Nepalese currency and fixed the exchange rate in relation to IC. The dual currency system was completely abolished by 1966, one decade after the central bank came into existence; and today only the Nepalese currency is legal tender in the country.

3.1.2 Introduction of Credit and Monetary Management Policies

Pursuant to the NRB Act, 1955, the NRB formulated the Credit Control Regulation in September 1966. From then, the NRB started issuing directives to licensed commercial banks and other financial institutions for compliance on matters relating to monetary, credit and banking policies.

3.1.3 Introduction of Cash Reserve Ratio

The Cash Reserve Requirement (CRR) for commercial banks was announced for the first time in December 1966. Commercial banks were required to maintain with the NRB a minimum amount of cash reserves equivalent to 8% of their total deposit liabilities. This ratio reached as high as 12% in September 1989 (out of which 8% to be held with the NRB and 4% in their vaults). Currently, CRR is set at 5.5% for banks and other depository institutions.

3.1.4 Liquidity Requirement

In 1970, the country experienced strong upward pressure on prices of goods and services. High inflationary pressure in the international level further aggravated the domestic price situation. To control the further distortion in price and BOP,

the NRB introduced the Statutory Liquidity Ratio (SLR) in October 1974. Accordingly, the SLR was fixed at 32%, which had to be maintained by the commercial banks in the form of investments in government bond and other liquid assets. With the view of providing commercial banks autonomy in the choice of investment portfolio, the NRB lifted the SLR provision of 25%. The NRB re-introduced the SLR in March 1992 and abolished it in July 1993. The Bank subsequently re-introduced the SLR in July 2009.

3.1.5 Refinance Rate/Bank Rate

In January 1967, the NRB introduced for the first time refinancing facility for commercial banks to encourage them to provide export and industrial credit. The NRB fixed the interest rate at 6% per annum against fully secured export and industrial credit. In order to strengthen the effectiveness of monetary policy, the NRB redesigned the rediscounting and refinancing facilities by offering three windows: basic refinancing, selective refinancing, and lender of last resort. The bank rate is the interest rate charged by the NRB whenever the commercial banks borrow from the central bank as a last resort measure. Currently, the bank rate is 6.5%, effective since October 2008.

3.1.6 Open Market Operations

The auction system for the primary issuance of Treasury bills began in November 1988. Currently, 28-day, 91-day, 180-day, and 364-day treasury bills are issued on auction basis. With effect from June 1994, the NRB began to operate secondary open market operations (OMOs). Under it, the NRB started selling government securities to absorb liquidity and buying securities to inject liquidity. An Open Market Operation Committee was formed under the chairmanship of the Deputy Governor of the NRB. The NRB introduced repo as a short-term instrument to inject liquidity since March 1997. To further develop open market operations, the most effective instruments of monetary policy introduced since 2004, are: reverse repo and outright sale and outright purchase auctions. In June 2005, the system of auction was introduced for the primary issuance of development bonds.

3.1.7 Interest Rate Deregulation

The NRB did not use any monetary policy instrument during its first decade of operation. The NRB began controlling interest rates in August 1966. Accordingly, the minimum interest rates on saving deposits and fixed deposits

157

were fixed at 4% and 6%, respectively. The NRB announced a new interest rate structure in April 1971. Subsequently, the NRB start adjusting the interest rate in response to the movement of certain macroeconomic variables, such as inflation.

Nepal faced serious BOP problems during 1982-85. As a result, the country adopted an economic stabilisation programme in December 1985 supported by the IMF. After completing this programme, Nepal entered into the Structural Adjustment Programme (SAF) of the IMF. Under the framework of the SAF, a number of reform measures were introduced. Entry barriers in the financial sector were relaxed. Likewise, partial deregulation of interest rates was announced in 1986. Under it, banks were given autonomy to fix interest rate by not deviating one percentage point fixed by the NRB. Interest rates, both deposit rates and lending rates, have been completely liberalised since August 1989. The objective has been to create a more competitive environment in the financial sector. A number of policy changes were made in the financial sector. The monetary management shifted towards indirect measures from direct control. There was a shift towards indirect monetary policy stance.

3.2 Framework of Monetary Policy in Nepal

By definition, monetary policy refers to policy actions of the central bank initiated with a view of achieving macroeconomic objectives, especially domestic price stability, by influencing the quantum of money stock and the cost of money. The construction of the monetary policy framework involves establishing and selecting monetary policy objectives, intermediate targets, indicators and instruments. This section briefly explains the framework under which the monetary policy is conducted in Nepal.

Figure 7
Monetary Policy Framework in Nepal

158
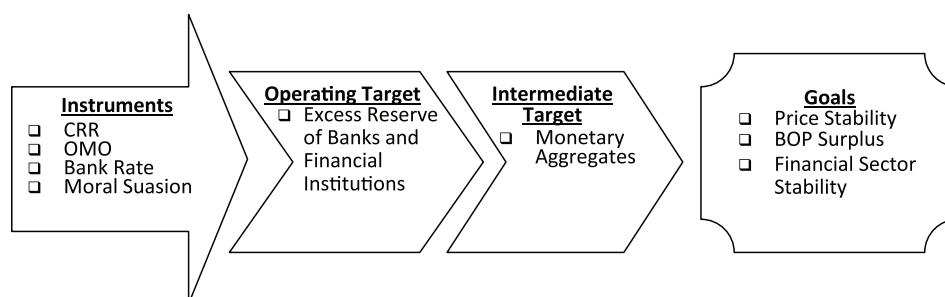
3.2.1 Goal Setting

Setting an ultimate target is not straightforward. Monetary targeting was the popular framework in 1970s, whereas price stability or inflation targeting has become the popular framework in most countries after 1990. In a developing country like Nepal, the central bank faces a number of challenges to be addressed through monetary policy. The objectives of monetary policy range from achieving a higher rate of economic growth, domestic price stability, financial sector stability, external sector stability, to reducing poverty levels and unemployment.

Different objectives have their own significance and the choice of the appropriate objectives depends on the country's circumstance. Sustained and accelerated economic growth is important especially for developing countries like Nepal. Likewise, the problem of underemployment cannot be confronted without having a higher rate of economic growth. Macroeconomic stability, which is both domestic and external sector stability, cannot be undermined. Moreover, the current financial crisis underscores the importance of financial sector stability.

With regard to the objectives of monetary policy in Nepal, the NRB Act, 2002, clearly specifies, among others, the following main objectives:

(1) Achievement of domestic price stability;

(2) Maintenance of the country's balance of payments (BOP) stability;

(3) Facilitation of sustained economic growth; and

(4) Securing of financial sector stability

3.2.2 Intermediate Target

Monetary authorities introduce intermediate monetary policy target variables as missing links between the policy instruments and the final targets. Monetary authorities use policy instruments to control the intermediate targets and try to achieve the final goals by influencing the intermediate variables. Therefore, the intermediate target is not important itself but it is a useful means of achieving the final target. The selection and estimation of the intermediate policy target variable is an important part of monetary programming. The intermediate target of monetary policy should be chosen so that it moves in line with the ultimate targets as well as the operating targets. In Nepal, the monetary aggregate which is primarily broad money (M_2) is chosen as an intermediate target for the conduct of monetary policy.

159

3.2.3 Operational Target

The conduct of monetary policy requires the selection of an operating target. The NRB has taken the excess liquidity of banks and financial institutions as an operating target of the monetary policy in order to quickly identify the liquidity position in the system. Before this, the operating target for the conduct of monetary policy was the net domestic assets (NDA) of the NRB. Reserve money and short-term interest rate could be the other candidates for selection as operating target.

3.2.4 Monetary Policy Instrument

After the adoption of the economic liberalisation policy, the NRB shifted from using direct to indirect monetary policy instruments. The following are the instruments currently in use:

3.2.4.1 Bank Rate

The bank rate is the rate which is charged to financial institutions while utilising the lender of last resort facilities from the NRB. Currently, the bank rate is 6.5%. The NRB has opened the window for refinance to the problematic and export-oriented industries. The refinance rate for such selected credit is 1.5-2.0%. Banks and financial institutions rarely approach the NRB for its bank rate facility.

3.2.4.2 Cash Reserve Ratio

The Cash Reserve Ratio (CRR) is the fraction of the deposit liabilities of the financial institution, which is kept in the NRB. The CRR is currently set at 5.5%, an increase by 0.5 percentage point from September 2008.

3.2.4.3 Open Market Operations

Among the indirect monetary policy instruments, OMOs have been effective in influencing liquidity for monetary management purpose in Nepal. OMOs directly change the size of the monetary base through buying/selling of government securities in exchange for hard currency. In order to conduct OMOs systematically and in an orderly manner, the NRB has brought into use liquidity monitoring and forecasting framework (LMFF).

Figure 8
Liquidity Monitoring and Forecasting Framework (LMFF)

Liquidity management is a part of the larger risk management framework of the financial services industry. Failure to address the liquidity issue may lead to dire consequences, including banking collapse, and aggravate further the instability of the financial system. In fact, most bank failures are due to difficulties in managing the liquidity problems. The current world economic crisis unfolded from the liquidity crisis in the banking system. This is also the reason why most central banks are very concerned with the liquidity position of financial institutions and with strengthening the liquidity framework. Moreover, the availability of adequate liquidity is necessary for supporting growth. Liquidity excess would pose a challenge to financial stability and liquidity shortage would hamper the growth of the economy. Therefore, the task of liquidity management is essential in fulfilling the requirement of expected liquidity. The Liquidity Monitoring and Forecasting Framework (LMFF) was established in the NRB in 2004. The LMFF is prepared, based on the weekly balance sheet of the NRB to monitor and forecast the liquidity position of the banking system. The Open Market Operations Committee takes the volume of liquidity indicated by the framework as a guide for open market operations. While forecasting the liquidity, the LMFF takes into account intervention in the foreign exchange market, government treasury position, issue/maturity of monetary instruments, usage of standing liquidity facilities, currency in circulation as sources of change in bank deposits and the liquidity of the banking system.

The NRB introduced the Standing Liquidity Facility (SLF) in 2004/05 as a window for availing liquidity to banks and financial institutions against government securities. The SLF facility is provided to counterparties up to the limit of 90% of the value of the securities for a maximum of 5 days. Presently, the penal rate is determined by adding 3% on the recent 91-day Treasury bill rate or repo rate of past 30 days, whichever is higher.

4. Analysis on Macroeconomy and Monetary Policy

A macro-financial linkage is an important tool to analyse the interrelationships between the financial system and macroeconomic conditions. This linkage can also explain the adverse feedback loop that could lead to a further deterioration

161

of real economic conditions. The feedback loop is the adverse effect on the financial system by weak real economic activities. This again retards the economic activities through second-round effects. The discussion of this linkage has become more significant in light of the recent world financial crisis of 2008-09.

This paper uses the framework for policy analysis of macro-financial linkages conceptualised by Bayoumi and Melander (2008). This framework helps to explain the interaction of the financial sector and the country's national output.

Figure 9
Macro-Financial Linkages Framework
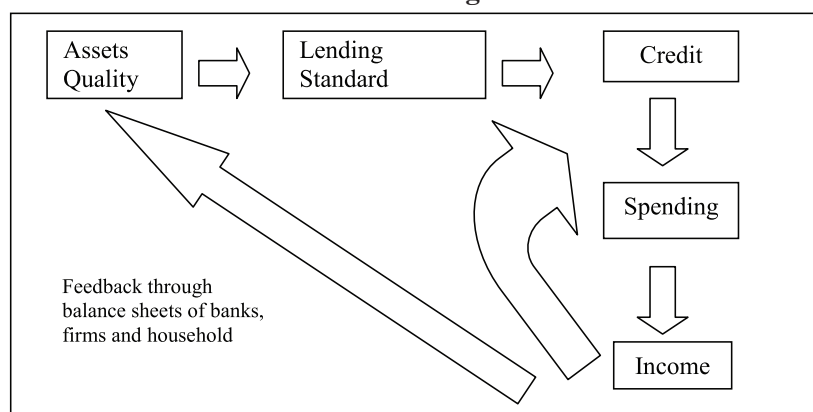
Based on this framework, the quality of assets deteriorates due to negative shocks, such as asset price bust, oil price shock, or some other adverse shocks, like decline in tourism earnings, or remittance inflows, etc., in the Nepalese case. The first effect on bank assets is through its lending standards. Banks tighten their credit policy which makes it more difficult to borrow from banks in order to prevent further deterioration of asset quality. Banks' cash flow could be affected and banks become more cautious for further lending. This is done to improve the bank's balance sheet. Tightening the lending norms reduces the quantity of credit and may be confined to the so-called prime borrowers. This leads to a decline in credit availability to households and firms. This affects the households' consumption, residential investment and business capital formation. The reduction on spending directly affects income, which includes personal disposable income, business profit and the country's gross domestic product. With the decline in income, the feedback takes place through bank assets and spending of households and firms.

4.1 Transmission Mechanism

The monetary policy transmission mechanism plays an instrumental role with regard to the strength of the macro-financial linkages. The link between the financial sector and macroeconomic variables can be defined as the monetary transmission. The monetary transmission mechanism determines the potential effects of monetary aggregates on the general economy. Understanding the links between the financial and real sectors of the economy would help policy makers interpret movements in the financial aggregates more precisely. These linkages mainly depend on the effectiveness of the monetary policy transmission channel. Among the channels of monetary transmission, this paper tests the interest rate channel to determine the effectiveness of the linkages. The following transmission channels are widely discussed[2]:

- Interest rate channel

    Money supply↑ › Interest rate↓ › Investment↑ › Output↑

- Assets price channel

    Money supply↑ ›interest rate↓› stock prices↑›Investment↑↓ Output↑, and

    Money supply↑ ›Interest rate↓›Prices of housing and land↑›Consumption↑ Investment ↑ › Output↑

- Credit channel

    Money supply↑ › Interest rate bank↓›Bank loan↑↓ Consumption↑ › Investment↑ › Output↑

- Exchange rate channel

    Money supply↑ ›interest rate↓› Exchange rate↑› Net exports↑›Output↑

- Expectation Channel

4.2 Model Specification and Empirical Analysis

According to the framework of macro-financial linkages as explained in the beginning of this section, the key link in the chain goes from credit to spending (Bayoumi and Melander, 2008). In a bank dominated financial system, the supply of credit and rate of interest are largely dependent on monetary policy. The monetary authority can influence the bank lending through the alteration of the monetary policy instruments. In this paper, the interest rate effect is analysed to

_____

2.   For a detailed discussion see, Miskin (1995) and Taylor (1995).

assess the macro-financial linkages of the financial system to real economic activities. Generally, a lower money supply reduces the flow of funds to the banks and other financial institutions, causing higher interest rate and less lending by the banks. Accordingly, this paper examines whether or not the interest rate is an important determinant of real economic activities, such as gross domestic product. The empirical model assessing the monetary policy is based on the original dynamic IS curve by Rudenbush and Johanson (1999) as well as by Johanson and Juselius (1994), and specifies the marginal (contractionary) influence of the real interest rate on the output gap. To test the effectiveness of the interest rate channel of monetary transmission mechanism, the result of the study on the interest rate pass-through from policy rate to market rates is utilised (see Figure 15). This paper follows the model based on Goswami, et al. (2009) as follows:

$$y_t = \alpha(w_t) + \sum_{j=1}^{p} \beta_j y_{t-1} + \beta_3(w_t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \varepsilon_t \tag{1}$$

The signs of the coefficients $\alpha(w_t) > 0$, and $\beta_3(w_t) < 0$ are expected[3].

To assess whether the intercept and elasticity of the coefficient of real interest rate variable are affected, the above model is further extended to include alternative financing variable and other control variables, such as credit growth and openness indicator and interaction variables, so that

$$\alpha(w_t) = \alpha_1 + \alpha_2 EB_t + \sum \alpha_n CV \text{ and } \beta_3(w_t) = \beta_{3,1} + \beta_{3,2} EB_t + \sum \beta_{3,n} CV \tag{2}$$

Where,

$.y_t$ = Output gap defined by the logarithm difference between actual real output and potential output, denoted by LGAP in the representation equation.
i_t = Bank rate determined by the NRB, taken as a proxy for policy interest rate which is used to signal the ex-ante monetary policy stance.
δ_t = Inflation rate determined by CPI period average.
$i_{t-1} - \pi_{t-1}$ = Real interest rate, denoted by REALINT in the representation equation below.

_____

3. The Taylor Rule indicates a positive relationship between real interest rate and output gap (Goswami et al. 2009). On the other hand, Goswami et al. reveal the alteration of a traditionally negative relationship between output gap and real interest rates. However, they control the model using the relative share of securitised mortgages. Rudenbush and Svensson (1999) have also found the same sort of relationship as that of Goswami.

EB = Alternative financing dummy denoted by DUMNEPSE in the representation equation below. Since the alternative source of financing such as securitisation or bond/equity of private non-financial institutions are virtually non-existent, the establishment of the Nepal Stock Exchange Ltd. is used as a dummy variable to represent EB. CV = Control variables. Two control variables are used, i.e. private sector credit growth and trade openness indicator. BANKCRED and OPEN is denoted private sector credit growth and openness indicator in the representation equation below. For BANKCRED, if k is the credit growth, then

$k_t = \ln\left(\frac{K_t/GDP_t}{K_{t-1}/GDP_{t-1}} \right)$ as the logarithmic difference of private sector credit to GDP over two subsequent periods. Also OPEN is the growth of openness, which is logarithm difference of total trade to GDP ratio.

4.3 Data Definition and Graphical Impression

The annual data series from 1975 to 2009 are used for this study. There exist 38 observations in the sample. The bank rate is taken as the policy rate of the NRB. This is the rate charged by the NRB to banks and financial institutions when they avail the central bank's fund as lender of last resort (LOLR). Likewise, the annual inflation data, represented by the consumer price index (CPI), is taken. The real GDP data was generated using 2001 base-year price. The data in level form has been changed to logarithm except for the interest rate. The potential output is calculated by smoothing the real GDP using a Hodrik Prescott filter. The data sources are Central Bureau of Statistics (CBS) and Nepal Rastra Bank (NRB).

Figure 10 Real GDP and Potential Output	Figure 11 Output Gap
Source: Central Bureau of Statistics, GON and author's derivation	
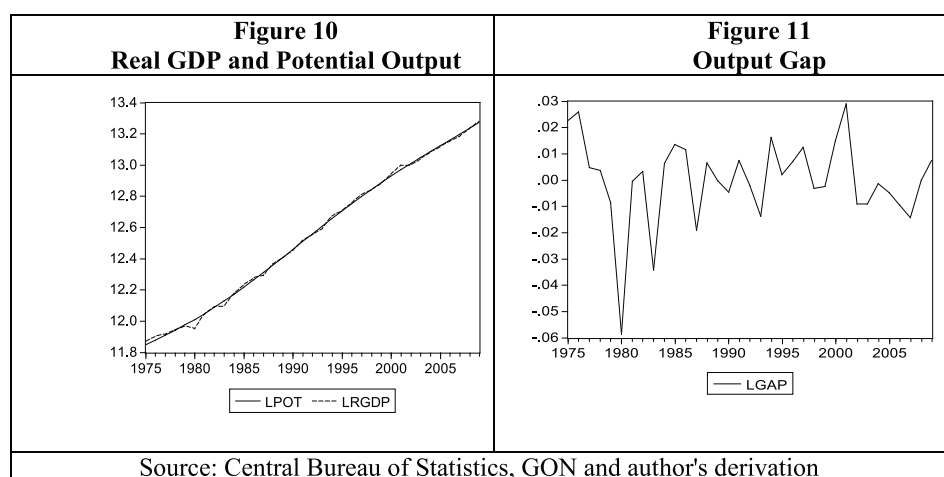
Among the various methodologies to estimate the potential output, a Hodrick-Prescott filter (HP) is used because of its simplicity and the estimates are shown above in Figures 10 and 11. Figure 10 displays the real GDP and potential output and Figure 11 shows the output gap, which indicates the fluctuations. Figures 12 and 13 below show the nominal interest rate, inflation and real interest rate.

Figure 12
Inflation and Nominal Interest Rate

Figure 13
Real Interest Rate

Source: Nepal Rastra Bank
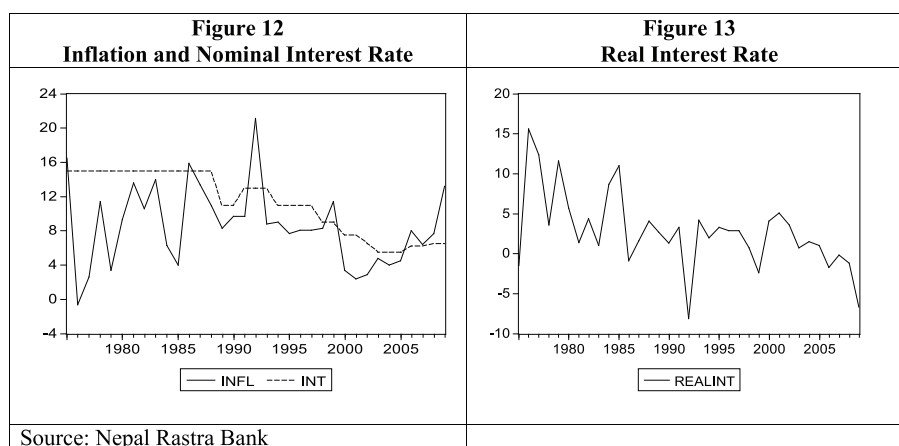
4.4 Empirical Result

4.4.1 Unit Root Test

The first part of this section analyses the test of stationarity of the variables used for this study, whereas the second part presents the empirical results of the study. The most commonly used Augmented Dicky-Fuller (ADF) univariate test is carried out to test the null hypothesis of a unit root against the alternative that the process is stationary. The results are shown in the Figure 14 below.

Figure 14
Testing for Unit Root of the Variables: H_0 is Unit Root

Variables	Mackinnon Critical Value		ADF Statistics	Comments
	1%	5%		
LGAP	-3.6394	-2.9511	-5.1694	Reject H_0
REALINT	-3.6394	-2.9511	-4.2006	Reject H_0
BANKCRED	-3.6463	-2.9540	-6.2181	Reject H_0
OPEN	-3.6537	-2.9571	-5.0834	Reject H_0

From the above results, we can reject the null hypothesis of non-stationary of all variables of interest except the openness indicator. Since the series OPEN is detected to have unit root, a time trend is introduced to the regression equation.

The representation equations for model (1) and (2) above are as follows:

$$LGAP = C(1) + C(2)*LGAP(-t) + C(3)*REALINT(-1) \qquad (3)$$

$$LGAP = C(1) + C(2)*LGAP(-t) + C(3)*REALINT(-1) + C(4)*DUMNEPSE + C(5)*BANKCRED + C(6)*OPEN + C(7)*REAINT(-1)*DUMNEPSE + C(8)*REALINT(-1)*BANKCRED + C(9)*REALINT(-1)*OPEN + C(10)*REALINT(-1) *DUMNEPSE*BANKCRED*OPEN \qquad (4)$$

Figure 15
Interest Rate Pass-through in Nepal

Maskay and Pandit (2009) examine the interest rate pass-through in Nepal. Their exercise covers the phase of interest rate liberalisation commencing from the first quarter of 1989/90 to the fourth quarter of 2008/09 with the examination of the sub-period from the promulgation of the NRB Act 2002, the period starting from the third quarter of 2001/02 to the final quarter of 2008/09. The study has tested whether the central bank policy rate has any impact on market interest rate, namely, the saving rate, one-year fixed deposit rate, and lending rate.

Using the equation, $i^m = \alpha + \beta \bullet i^p$, the long-run relationship between the bank rate and the market interest rate is examined. They find that there is a significant long-run elasticity coefficient of policy rate to the different market interest rate in the full sample. However, for the sub-sample, the coefficient of the lending and saving rates shows a paradoxical picture. Maskay and Pandit further employ an error – correction model (ECM) of interest rate pass-through, initially specified by Tieman (2004):

$$\Delta i_t^m = \gamma_1 + \gamma_2 \Delta i_{t-1}^m + \gamma_3 \left(i_{t-1}^m - \beta \bullet i_{t-1}^p - \alpha \right) + \eta_t$$

A test for ECM was run and the ECM relationship is found only for the lending rate. The ECM term is significant at the 1% level of confidence, but is small, i.e. the speed of adjustment is quite slow. For the sub-sample, the coefficient for the ECM relationship is not statistically significant from zero. Despite the measure of statistical significance, the magnitude suggests a slow speed of adjustment. To put this in perspective, the finding contrasts with other countries by a number of times – e.g. with regard to the Romanian case as presented by Tieman (2004), the ECM value differs from Nepal by a magnitude of 15 times! Thus, the exercise suggests that there does appear a small short-term corrective relationship for the lending rate only during the full-sample period, while no such relationship occurs for the sub-period.

Figure 16: Regression Results

Variables	Model I	Model II		
		LGAP		
		NEPSE dummy included as EB	EQ 2 with BANKCRED & OPEN included as additional CV	EQ 3 with interaction variables included
	EQ 1	**EQ 2**	**EQ 3**	**EQ 4**
Constant	-0.0005 (0.15)	-0.0002 (-0.44)	-0.0056 (-1.11)	-0.0101 (-2.11)
LGAP(-1)	0.1366 (0.78)	0.1191 (.067)	-0.0179 (-0.10)	-0.0523 (-0.30)
REALINT(-1)	-0.0004 (-0.60)	-0.0002 (-0.33)	0.0010 (1.34)	0.0026 (2.85)
DUMNEPSE	-	0.0046 (0.78)	0.0124 (1.96)	0.0087 (1.34)
BANKCRED	-	-	-0.0814 (-2.06)	0.0134 (0.23)
OPEN	-	-	0.0174 (0.486)	0.0591 (1.14)
REALINT(-1)* DUMNEPSE	-	-	-	-0.0010 (-0.56)
REALINT(-1)* BANKCRED	-	-	-	-0.0091 (-1.09)
REALINT(-1)* OPEN	-	-	-	-0.0165 (-1.59)
REALINT(-1)* DUMNEPSE* BANKCRED*OPEN	-	-	-	0.1323 (1.23)
R2	0.03	0.05	0.20	0.49
Adj R2	-0.03	-0.05	0.16	0.26
D-W	2.05	2.03	1.7	2.1

Analysing the above result, the output gap was found to have a very weak or insignificant relationship with the real interest rate in Model I. However, in line with the expectation, the sign of the coefficient is found to be negative in Equations 1 and 2. The elasticity of the real interest rate turned positive after the inclusion of the control variables and the interaction variables. The coefficient of the real interest rate is significant at 5% level with a positive sign, which is not consistent with the theory and with our expectation. Therefore, the output gap shows a very low level of sensitivity with regard to the real interest rate. According to the above empirical study, the monetary policy in Nepal has yet to exert a favorable impact on real output through the real interest rate. The introduction of the control variables along with the interaction variables helped increase the elasticity of the real interest rate, albeit adversely. The goodness of fit, R^2, of the estimated equation is also very low in all the equations.

It was established from the study finding that the bank rate or the policy rate is not effective in influencing the real economic activities. This implies that there is a weakened relationship in the traditional macroeconomic and financial linkage. There are various possible reasons explaining for the weak relationship between the real interest rate and the output gap.

1. The bank rate facility has rarely been utilised. The monetary policy for 2004/05 also concurred about ineffectiveness of the bank rate facility. Moreover, the Standing Liquidity Facility (SLF) has been introduced since 2004/05. This also indicates that the bank rate may not be a good indicator of monetary policy stance in influencing the market interest rate offered by banks and financial institutions.

2. The broad money to GDP ratio, as an indicator of financial deepening of the economy, is still low, which stands at 64.6% in 2009. This indicates that the process of monetisation in the economy has been gradually improving. The financial system apparently is faced with some constraint in influencing output. People from a large part of the country live outside the reach of financial services. This has led to an increase in transactions in the informal sector lending. Therefore, the availability of credit matters more than the cost of lending for Nepal (Khatiwada, 2005).

3. In the sample period, the country saw deterioration in the domestic security situation due to political conflict. This seriously affected the country's economic activities and financial services also tended to concentrate more in the market centers. These factors will definitely limit the effectiveness of monetary policy.

4. In the empirical study by Maskay and Pandit (2009), the interest rate pass-through shows that the market interest rates are less sensitive to the policy rate. This means that the interest rate channel of monetary policy is less effective in influencing the real economic activities.

5. The study of Maskay and Pandit (2009) further provides various possible reasons for the weakened relationship between the bank rate and the market interest rate:

   a. The elevated level of remittance inflows causes influx of liquidity in the banking system. Because of this large inflow, the ratio of remittances to GDP increased from 1.7% in 1990 to 21.8% in 2009. In consequence the

169

policy measures to raise the bank rate seemed insufficient to affect the commercial banks' cost of fund.

b. As mentioned above, greater liquidity in the form of remittance flows into the domestic market may have circumvented the influence of the domestic policy rate. Also, the SLF introduced in 2004/05, provides liquidity, up to 90% of collateral, for a maximum of 5 days. Furthermore, the interest rate for using liquidity under the SLF is not linked to the policy rate. Thus, the Lender of Last Resort (LOLR) facility whose cost of funds is represented by the policy rate, has not been effective.

c. The bank rate signals the ex-ante monetary policy stance. The transactions in the open market operations may not have been carried out in line with the ex-ante policy stance. This means that there is a deviation between ex-ante and ex-post monetary policy stance.

6. Inflation in Nepal is dominated by the Indian consumer price inflation. In such a situation, the monetary policy in Nepal will have little role to control the domestic inflation as well as the real economic activities.

5. The Impact of Recent Financial Crisis on Nepalese Economy

The Nepalese economy is small and relatively open in recent times. Its capital account is not opened, whereas its current account has been fully opened. The current account, as measured by the sum of current receipts and current payments amounted to about 78.3% of GDP in 2009, up from 35.5% in 1990. Because of this gradual increase in openness, Nepal certainly needs to be vigilant in order to minimise the adverse impact of international development. With regard to capital account liberalisation, a very cautious approach has been adopted. While foreign direct investment inflows are encouraged, debt flows in the forms of external borrowing, and portfolio investment in government securities, corporate bonds, and in the stock market are subject to restriction. The non-financial corporate sector is not allowed to invest abroad or to acquire companies. Resident individuals are permitted outflows subject to reasonable limits. The Nepalese financial sector is still not well connected to the world financial markets.

With regard to the financial system, the NRB has issued directions and guidelines to implement the BASEL II framework in the commercial banking sector from July 2008. The minimum capital-to-risk weighted assets ratio would be 10%, but a higher level of capital is prescribed. The NRB has also issued

prudential measures in respect of exposure to particular sectors, e.g. real estate and margin-lending against equities. Banks were advised to put in place a proper risk management system to contain the risk involved. In view of the rapid increase in loans to the real estate sector, the monetary policy of 2008/09 raised concerned about asset quality and potential systemic risks posed by such exposure.

The macro-effects of the recent global financial crisis have been muted due to relatively low degree of financial integration and overall strength of domestic demand. Thus, the Nepalese economy remained relatively resilient despite the fact most of the economies around the globe are faced with the most severe economic crisis since World War II. As Nepal is a small, open economy that is gradually opening up its external sector, one may expect the impact of the global contraction through the Balance of Payment (BOP) channel. A contraction in global demand squeezes employment opportunities, affects changes in global interest rates, exchange rates, and prices, and can bright about an adverse impact on the economy.

5.1 External Sector

The impact on the BOP primarily occurs through remittances, exchange rate, tourism, exports, and falling interest income due to fall in interest rate in the advanced countries. A comparison of the selected external sector indicators for 2007, 2008 and 2009 shows that the period-end exchange rate of the Nepali rupee vis-à-vis the US dollar depreciated by 5.6% in 2008, and depreciated by a further 13.9% in 2009. Consequently, the current account balance recorded a surplus of US$364.2 million 2008 from a deficit of US$12.8 million a year ago. Notwithstanding the depreciation of 14% between 2008 and 2009, the magnitude of the current account surplus increased substantially to US$539 million in 2009. It was mainly a reflection of a steady increase in remittances from US$1,420.7 million in 2007 to US$2,194.5 million in 2008, and further to US$2,727.7 million in 2009. Following the crisis characterised by a liquidity crunch and a sharp contraction in consumer demand in the advanced countries, one would expect a fall in exports, tourism receipts, and remittances. Fortunately, as Figure 17 shows, all these receipts continued to move upwards even in dollar value in 2009.

Figure 17
Selected External Sector Indicators (US$ million)

Indicators	2007	2008	2009	2008 % Δ	2009 % Δ
Exports	842.5	911.6	874.7	8.2	-4.0
Current a/c balance	-12.8	364.2	539.0	-	48.0
Travel: Credit	143.6	286.9	363.7	99.8	26.8
Income: Credit	205.7	206.8	214.7	0.5	3.8
Remittances	1420.7	2194.5	2727.7	54.5	24.3
Change in NFA	83.8	456.4	490.8	444.6	7.5
Gross Forex Reserve	2546.3	3104.0	3587.3	21.9	15.6
Prd. End Exchange Rate	65.1	68.8	78.4	5.6	14.0

Source: Nepal Rastra Bank

The gross foreign exchange reserves of the Nepalese banking system in dollar value increased by 21.9% to US$3.1 billion in 2008, and further went up by 15.6% to US$3.6 billion in 2009. The exchange rate depreciated in line with the depreciation of the Indian rupee following withdrawal by foreign institutional investors (FIIs) from the Indian capital market in the immediate aftermath of the crisis. On the one hand, the FIIs were withdrawing from investments in the Indian stock market and, on the other, the private sector commercial borrowing significantly declined, thus resulting in the depreciation of the Indian currency. Given the pegging of the Nepalese rupee against the Indian currency, the Nepalese currency also depreciated.

5.2 Inflation

The impact on inflation will emanate from the exchange rate and from changes in the price of international commodity. The crisis may have both positive and negative impact on inflation. Due to the crisis, the price of oil dropped from a peak of US$145 per barrel to around US$40[4]. The fall in oil price was also accompanied by a global fall in food prices and in the prices of construction materials. On the other side, the depreciation of the Nepalese currency put upward pressure on inflation through imports. Most of the countries of the world experienced a significantly low level of inflation. However, the average headline inflation stood at 13.2% in 2009, as compared to that of 7.7% in 2008 on account of domestic supply-side constraint as well as expansion in the credit and monetary aggregates.

––––––––––––

4. Currently, the price of energy is around $75 (www.bloomberg.com, December 1, 2009).

5.3 Impact on Employment

The impact on employment, particularly employment of Nepalese workers working abroad, will emanate from demand contraction in those countries as spillover effects of contraction in the advanced countries. The number of Nepalese workers going oversea for foreign employment has been substantially increasing over the past few years. As a result, remittance inflows reached as high as 21.8% of the GDP in 2009 from 3.0% in 1999. Due to recent world economic crisis, employment opportunities around the globe shrank significantly. The sharp fall in employment had a negative impact on the number of Nepalese workers going abroad. The number of workers that obtained final approval from the Department of Foreign Employment, Government of Nepal, declined by 12% in 2009, as compared to that of 2008. Despite the decline in the number of workers going abroad, workers' remittance inflows increased by 47% to Rs.210 billion and by 24.3% in US dollar terms in 2009. This was due to the savings of the returnees.

6. Conclusion and Recommendations

This empirical study hints at the necessity of making monetary policy more effective in influencing the real economic activities in Nepal. The weak or the adverse relationship found in this study is an indication of the ineffectiveness of the interest rate policy of the central bank. Introduction of a viable and effective policy interest rate for Nepal is recommended. The effectiveness of the financial system also depends on the development of alternative financing sources for the private sector. Corporate bonds and debentures are the main instruments among the alternative sources of direct financing. The NRB should also endeavor to strengthen its capacity for effective monetary management by influencing the volume and cost of money in the economy. When monetary management becomes less effective, the central bank loses its credibility. The interest rate policy should be recast in a changing context. For this, it is necessary that the NRB should consider setting a target range, such an interest rate corridor.

The Nepalese financial sector has grown significantly in recent years. This will certainly pose a systemic risk to the system and financial sector stability. This also adds more challenges for making monetary policy effective. On the other side, the real economic activity, as reflected by the GDP, has not improved in line with the pace of development in the financial sector. For sustainable development of the financial system, a prudent and effective regulatory and supervisory framework should be in place. Although the Nepalese financial system

has not been fully integrated with the world financial system, the wave of globalisation will gradually connect it to the international market. Therefore, the NRB should be ever so vigilant to initiate counter-cyclical policies in a timely manner and develop an effective monetary policy framework to mitigate the potential risks associated with the global financial distress, as the Nepalese financial system progressively develops and gets integrated into the world economy.

REFERENCES

Bayoumi, T. and Melander, O, (2008), "Credit Matters: Empirical Evidence on U.S. Macro-Financial Linkages", *IMF Working Paper*, No. WP/08/169.

Cooley, T. F., (2005), "Channels of Monetary Policy", *Federal Reserve Bank of St. Lewis Review,* page 131-142.

Dickey, D. and W. Fuller, (1981), "Likelihood Ratio Tests for Autoregressive Time Series with a Unit Root", *Econometrica*, Vol. 49, pp. 1057-1072.

Goswami, Mangal; Jobst, Andreas; and Long, Xin, (2009), "An Investigation of Some Macro-financial Linkages of Securitisation", *IMF Working Paper,* No. WP/09/26. Available at <www.imf.org>

Government of Nepal, (2004), "Nepal Living Standards Survey 2003/2004", Kathmandu: Central Bureau of Statistics.

Johansen, S. and Juselius, K., (1994), "Identification of the Long-run and the Short-run Structure: An Application to the IS-LM Model", *Journal of Econometrics*, 63, 7-36.

Kaufman, Herbert M., (1992), "Money and Banking". USA: D.C. Heath and Company.

Khatiwada, Y. R., (2005), "Monetary Policy", Nepal Rastra Bank in 50 years. Kathmandu: Nepal Rastra Bank.

Maskay, N. M. and Pandit, R., (2009), "Interest Rate Pass-through in Nepal", *Nepal Rastra Bank Working Paper,* No. NRB/WP/05.

Mishkin, F. S., (1995), "Symposium on the Monetary Transmission Mechanism", *Journal of Economic Perspectives*, Vol. 9, pp. 3-10.

Nepal Rastra Bank,"Monetary Policy", Various Years, Available at <www.nrb.org.np>

Nepal Rastra Bank, (2002), "Nepal Rastra Bank Act, 2002". Kathmandu: Nepal Rastra Bank.

Nepal Rastra Bank, (2006), "NRB Strategic Action Plan 2006-2010", Available at <www.nrb.org.np>

Nepal Rastra Bank (1996), "40 Years of Nepal Rastra Bank", Kathamndu: Nepal Rastra Bank.

Nualtaranee, J., (2004), "Transmission Mechanism of Monetary Policy", Available at <www.wb-cu.carchula.ac.th/papers/transmission.htm>

Ra S. and Singh, B., (2005), "Measuring the Economic Cost of Conflict", *ADB Working Pape*r, No. 2.

Rudebusch, G. D. and Svensson L. E., (1999), "Policy Rules for Inflation Targeting".

Thapa, N. B., (2005), "Interest Rate", Nepal Rastra Bank in 50 years, Kathmandu: Nepal Rastra Bank.

Tieman, Alexander., (2004), "Interest Rate Pass-through in Romania and Other Central European Economies", *IMF Working Paper*, No. WP/04/211. Available at <www.imf.org>

Walsh, C. E., (1998), "Monetary Theory and Policy", Cambridge, MASS: MIT Press.

CHAPTER 7
MACRO-FINANCIAL LINKS AND MONETARY
POLICY MANAGEMENT IN THE PHILIPPINES

By

Veronica B. Bayangos [1]

1. The Philippine Economy in Brief

The Philippines has a significant range of economic assets to draw upon for its development—an English-proficient and relatively educated populace, global demand for its labor force particularly its massive number of Filipino overseas workers, abundant natural resources and a private sector with relatively strong dynamic sectors, namely, the electronics, offshore information technology and tourism sub-sectors (World Bank 2008).

Over the last twenty eight years, the Philippine economy showed buoyancy in marked deteriorating conditions, however, long-term growth was relatively modest considering the pace of economic performance of its South East Asian neighbours. [2] The significant divergence occurred during the 1980s when other South East Asian countries' real GDP growth averaged about 6.4% annually, compared to 1 % growth in the Philippines. The differences had narrowed by the 1990s, when most of the South East Asian countries suffered from the currency crisis in 1997. There was some improvement from 2001 to 2008, but the Philippines continued to fall further behind in average growth.

Unlike its neighbours, the Philippines have not experienced a sustained period of rapid growth, say of more than 7%, since the 1970s. There are competing explanations to the sources of growth in the Philippines during the last twenty eight years. Three major views appear to be significant. The IMF (2006a) and Balisacan and Hill (2003) shared the view that the rather bumpy trend of economic growth is attributed to the country's large vulnerability to external shocks, such

---

1. Dr. Veronica Batallones Bayangos is Bank Officer V from the Center for Monetary and Financial Policy (CMFP) of the Bangko Sentral ng Pilipinas (BSP). This country paper is part of the SEACEN Research Project on Macro-Financial Links and Monetary Policy Management. The usual disclaimer applies.

2. South East Asian countries include Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand.

as terms of trade shock in the 1970s, global interest hikes in the early 1980s that led to the debt crisis in 1983, power crisis in 1992 to 1993, currency crisis in 1997 and the global financial turmoil that started in 2007 in the United States. An interesting point to note in Cororaton (2002) paper is the impact of economic instability on total factor productivity (TFP) growth. In the growth literature, the impact of inflation on growth is contested. However, there is a common thread among the studies on growth. Sufficiently high inflation rates can slow down economic growth in the long term.[3]

In the case of the Philippines, the highest rate of inflation rate was recorded at 47.1% in 1984 and was halved to 23.2% in 1985. Real GDP declined by 9.1% and 7.0 % in 1984 and 1985, respectively, as economic and political shocks set in. These developments show that Philippine inflation is not only higher but at some periods has undermined economic growth.

In general, average inflation exhibited a downtrend from 1981 to 2008. The highest rate of inflation rate was recorded at 47.1% in 1984 but subsequently dropped to 0.4 % in 1986. A persistent pick up started in 1987 until it reached 18.5% in 1991. There was a steady decline until it rose to less than 10.0% in 1996. Since the currency crisis in 1997, inflation steadily declined (except in 2001 following the rise in oil prices at the end of 2000) to 9.7% in 1998 to 4.4% in 2000. Since the adoption of IT in 2001, it is clear that inflation has been benign until its significant pick up to 7.6% in 2005 and further to 9.3% in 2008.

And still another view, the rather modest and uneven real GDP growth trend can be explained by looking at the standard growth accounting (IMF 2006a). It reveals that the rather low growth in the Philippines is largely attributable to sluggish capital formation and low total factor productivity. In particular, physical capital (investment) grew at a slower pace than other developing countries in the 1980s and 1990s, while TFP growth was negative or zero. There are some improvements though in the early 2000, largely reflecting the rise in productivity of the services sector. In particular, the relatively stagnant level of capital is argued to be reflective of, among others, the low level of savings that would be required to finance the required level of investment.

Central to these observations in economic growth are two major policy strategies which have become salient during the last twenty eight years — enhancing revenue and fiscal balance and restructuring and liberalisation of the

──────────

3.   See Mishkin and Posen (1997) and Sarel (1995).

economy. The relatively low ratio of tax revenue to GDP in most years has meant that the government has never invested adequately in physical and social infrastructure, generating serious bottlenecks in mobilising the Philippines' considerable resources. As of end-December 2008, the National Government budget deficit reached ₱68.1 billion, or 0.9% of nominal GDP.

Another critical development though is the capital and financial account liberalisation adopted with the broad view to remove the structural constraints that had distorted the development of the economy.[4] The liberalisation of foreign direct investment, along with financial and foreign exchange markets became major parts of the structural adjustment adopted in 1981. Figure 1 compares trade openness and financial deepening from 1999 to 2008.[5] Trade openness is measured as the sum of exports and imports of goods and services relative to nominal GDP while financial deepening is measured as private sector credit relative to nominal GDP. Across this period, it could be seen that trade openness outweighs financial deepening as the line is tilted towards trade openness.

Figure 1

Financial deepening and trade openness (1999-2008, % to Nominal GDP)

Source of basic data: Department of Economic Statistics, BSP.

_____
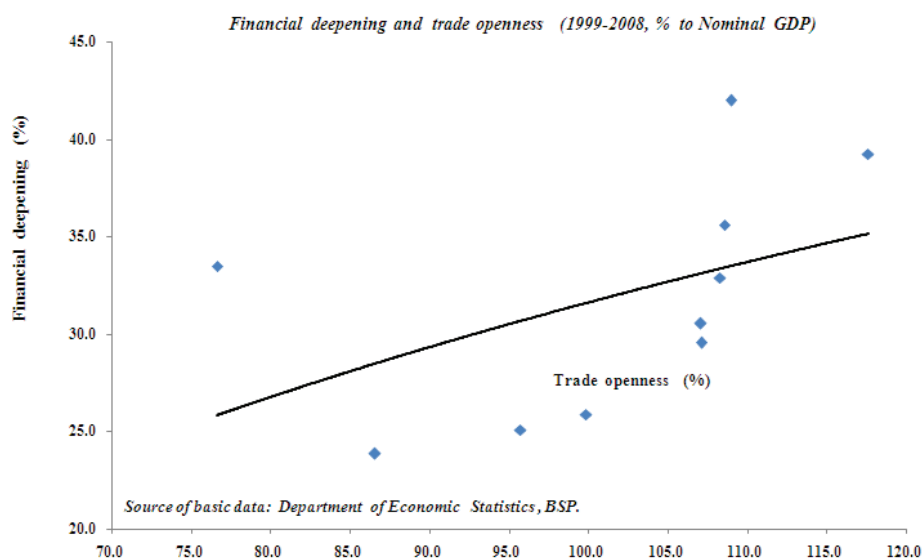
4. On 24 August 1992, the CBP issued Circular No. 1353 liberalizing foreign exchange regulations throughout the country.

5. The relatively shorter time series (1999 to 2008) is used to avoid inconsistency. The Philippine balance of payments has adopted the new IMF format of balance of payments statistics (BPM5).

179

Indeed the conduct of monetary policy over these years has become difficult. Against this background, the monetary authorities switched to inflation targeting (IT) as framework of monetary policy in early 2002.

2. Monetary Framework and Management

The primary objective of the Bangko Sentral ng Pilipinas' (BSP) monetary policy is to promote price stability conducive to a balanced and sustainable growth of the economy. The BSP's framework for conducting monetary policy is based on the interplay of a set of policy variables, as follows: the ultimate policy objective, the instruments of monetary policy and the operating and intermediate targets. The BSP is also tasked to promote and maintain monetary stability and the convertibility of the Philippine peso. In this connection, the BSP formulates and implements monetary policies to support the objective of price stability.

For most of the 1980s and early 1990s, the BSP had adopted monetary targeting. Using this framework, the BSP takes into account output growth and inflation targets, as set by economic planning authorities, and then using given velocities, sets about achieving the monetary targets appropriate to the income and price objectives. To attain price stability, the actual movements of monetary aggregates (domestic liquidity or M3, base money and reserve money) must be maintained within programme targets.

However, detailed regression results show that this relationship has broken down. Vital (2003) surveyed demand for money studies in the Philippines. The broad conclusion is that a simple version of money demand equation would not yield long-run equilibrium condition. This is due to the impact of financial liberalisation and globalisation which have seen the growth of financial innovations.

Beginning the second half of 1995, it was felt that the effectiveness of monetary policy could be enhanced by complementing monetary aggregate targeting with some form of IT. In this modified approach, the monetary authorities place greater emphasis on the price objective and less weight on the intermediate monetary target. The approach essentially allows base money targets to be adjusted upwards by the amount that international reserves exceed expected levels, as long as inflation stays within a targeted range. Broadly, this appears to be a prudent response to the new challenges posed by globalisation by reducing the risk of reaching policy decisions based on projections using a weakened relationship between money and inflation.

In turn, the resurgence of capital inflows in the 1990s have gradually changed the landscape of the conduct of transactions in the domestic economy, broadened the options for sourcing liquidity, and introduced new dimensions to the conduct of monetary policy.

In 2002, the BSP switched to IT framework. Given the long and variable lags of monetary policy and inflation, IT essentially works by conveying expectations to the markets about the future course of monetary policy. It is expected that markets will attempt to assess the future direction of policy from policy statements and speeches of policy committee members. To the extent that policymakers expect to ease or tighten in the future, conveying an expectation that policy rates will move in a given direction typically will immediately change long-term rates and asset prices in ways that support the objectives of that policy. This indicates that long-term interest rates may move sooner than would otherwise be the case, in effect reducing the lags in the effect of monetary policy on aggregate demand.

The IT regime can be represented by a simple reaction function whose behaviour is affected by central bank preferences – the inflation target, the inflation forecast, the policy instrument and the approximate knowledge of the period it takes for the policy instrument to have its maximum effect on inflation.

The IT approach starts with the BSP announcing to the public an explicit quantitative target conducive to sustained economic growth. The BSP then generates inflation forecasts based on its inflation models that capture the various transmission mechanisms of monetary policy. These forecasts are then compared with the inflation target. The BSP uses CPI inflation (published by the National Statistics Office) as its policy target, expressed in a range for a given year and is set by NG in coordination with the BSP. The repurchase agreement (RP) and reverse repurchase agreement (RRP) are used as BSP's key policy variables to signal shifts in the monetary policy stance.[6] The conduct of IT is left to the Advisory Committee (AC) of the BSP.

The Philippine experience with IT that is from 2000 to present has highlighted the importance of BSP's operational policy rate (overnight RRP) in bringing headline inflation closer to inflation target. However, there were periods in which

---

6. There are, however, exemptions (or escape clauses) when targets are breached. These exemptions include those originating from volatility in the prices of agricultural products, natural calamities or events that affect a major part of the economy and significant government policy changes that directly affect prices such as changes in the tax structure, incentives and subsidies (BSP 2004).

breaches from low-end and high-end inflation targets were seen (2001, 2004-2006 and 2008). Factors affecting these breaches have stemmed from a confluence of global and supply-side factors beyond the control of the BSP, such as the big surge in the international prices of oil and food commodities in 2008, resulting in higher domestic rice and pump prices of fuel. Supply shocks, which continued over a longer period, contributed to second-round effects, affecting wage and price-setting behaviour of businesses and households.[7]

While open market operations (OMOs) have continued to be vital as BSP's main instrument of monetary policy, reserve requirement and rediscounting have been redesigned after 1997 to enhance their roles as liquidity management rather than credit allocation. This strategy indicates rather clearly that BSP's response to market conditions have even heightened with the floating exchange rate regime. On a more substantive point, it could be argued that many of the instruments used by the BSP are meant to control liquidity and interest rates.

To a large extent, the BSP relied on its traditional instruments, RPs, RRPs, BSP holdings of government securities and the newly created Special Deposit Account (SDAs).[8] There were episodes of significant tightening in response to inflationary pressures and narrowing interest rate differentials, owing to volatility in the foreign exchange market and rising world oil prices. The SDAs provided an alternative or the placement of banks' excess funds after the currency crisis, in view of the Bureau of Treasury's partial rejection of the high bid rates on Treasury bills.[9]

Nevertheless, research at the BSP indicates that inflation expectations have become a potent channel of monetary transmission under IT and that the BSP policy rate and inflation target announced by the BSP are important factors in shaping inflation expectations (Bayangos et. al. 2009b). This holds even as inflation expectations in the Philippines remain largely linked with macroeconomic fluctuations and private agents appear to have backward-looking expectations.[10]

7. It is important to note that with the onset of the global financial turmoil in 2007, BSP's reaction included measures to address the health of the financial system. The BSP's reaction revolves around regulatory forbearance and continuing banking reforms.

8. In 2008, the BSP opened a US dollar repurchase agreement (repo) facility to support the orderly functioning of the financial system as the main conduit for the implementation of monetary policy. The US dollar repo facility is expected to augment dollar liquidity in the market that would help address any temporary market tightness. In turn, this will help ensure the ready availability of credit for imports and other qualified funding requirements. However, the demand for using this facility remains modest as of December 2009.

9. Unlike the RRPs and RPs, this instrument is non-collateralized. It is priced at a premium over the RRPs.

During the latter part of 2008, the BSP had been quick in bolstering confidence in financial markets with its timely communication with market participants with information on the exposure of the banking system to troubled financial assets and the ability of the banking system to withstand the fallout from the US financial institutions.

In addition, the BSP's Monetary Board approved guidelines allowing financial institutions to reclassify financial assets from categories measured at fair value to those measured at amortised cost. Financial institutions may now reclassify their investments in debt and equity securities from their Held for Trading or Available for Sale categories to the Held to Maturity or the Unquoted Debt Securities Classified as Loans until the end of the year. In addition, the BSP also allowed banks not to deduct unrealised mark-to-market losses in computing for the 100% asset cover. This reduced the need for banks to source dollars from the foreign exchange market.

3. The Philippine Financial System

The Philippine financial system (defined to include commercial banks, thrift banks, specialized government banks, rural banks and non-banks financial intermediaries) continues to be dominated by the banking sector.

The number of banking institutions declined to 818 as of end-December 2008 from 847 as of end-December 2007, reflecting continued mergers and consolidation as well as the closure of weak banks. The total number of banking institutions consisted of 38 universal/commercial banks (U/KBs), 77 thrift banks (TBs) and 703 rural banks (RBs). The operating network of the banking system, consisting of head offices and branches, increased to 7,848 as of end-December 2008 from 7,744 in the previous year due to the rise in the number of branches/ agencies of U/KBs, TBs and RBs.

Meanwhile, total resources of the banking system rose to ₱5.9 trillion as of end-December 2008, from its year-ago level of ₱5.2 trillion in 2007. The increase in the system's resources was due largely to the expansion in banks' deposits with the BSP and other banks and loans and discounts. Universal/commercial banks continued to account for almost 90% of the total resources of the banking system.

However, there appears to have been some financial disintermediation over the years, as financial depth has steadily declined. Measured by the ratio of broad money (M2) to nominal gross national product (GNP), financial depth

represents the degree to which the economy is monetarised.[11] Accordingly, the larger the ratio, the greater the capacity central bank has to implement monetary policy effectively.

In 1996, the Philippine financial depth was 51.8%, compared with 101.1% in Malaysia and 81.5% in Thailand. This declined to 45.9% in 1999, to 40.0% in 2000 and further to 30.6% in 2008.[12] This steady decline in financial depth is also reflective of constraints in the banking sector. Based on surveys conducted by the BSP over the past three months of 2009, lending standards among banks have indeed tightened following the global financial turmoil that started in 2008. The latest senior loan officer survey for March 2009 showed that majority of respondents (six out of nine banks) indicating moderately tighter lending standards in terms of collateralization requirements and credit screening. Respondents also cited the uncertainty in the economic outlook as the main reason for their cautious lending stance.

Meanwhile, after the 1997 crisis, banks increased their loan-loss provisions as non-performing loans (NPLs) continued to build up. Provisioning has loosened up as banks' asset quality improved in recent years although total provisions as a percentage of loans remain higher than pre-1997 levels.

On the demand side, credit demand from the corporate sector remained subdued, as many businesses were still restructuring their existing debt with financial institutions. In fact, results of the latest Business Expectations Survey (BES) of the BSP showed that businessmen are generally pessimistic about their prospects for the first quarter of 2009 due to the negative impact of the global financial turmoil on the Philippines.[13] Meanwhile, the steady stream of risk-free government securities gave banks some respite to offset the decline in corporate lending and helped the government maintain a low interest rate regime despite its ballooning budget deficit.

––––––––––

10. In particular, Bayangos et al (2009b) shows that, indeed, inflation expectations are a potent channel of monetary transmission. They have also found that past inflation expectations, inflation target announced by the BSP, actual inflation, actions of the BSP, the stance of fiscal policy, as well as wages have been instrumental in shaping inflation expectations. A crucial finding though in the paper is the significance of past inflation expectations in determining expectations, indicating that private sector agents are backward-looking when forming inflation expectations.

11. The measure is akin to Williamson and Mahar (1998).

12. The 2008 figure uses the DCS concept.

13. The quarterly BES indicated that overall confidence index of business enterprises dropped to a negative 23.9%, the lowest since the first quarter of 2002.

Major source of domestic financing are banks. About 98% of domestic credit, including the purchase and sale of government securities, is channelled through the banking system. The largest lenders are the U/KBs. Smaller lenders include the regular commercial banks (KBs), TBs and RBs. However, growth in banking credit has been sluggish after the currency crisis as the general economic downturn reduced the demand for loans, low profitability, and a steady increase in the level of NPLs. From a high of 51% growth in December 1996, outstanding credits to the private sector contracted by 1.2% in December 1999 and by 0.3% in December 2005, before it crept up to 16.8% in December 2008. In terms of its relative share to nominal GDP, private sector credit has decelerated since the Asian financial crisis in 1998, before it recovered to 33.5% percent of GDP in 2008.

However, bank credit has become an important transmission in explaining the behaviour of other financial indicators over the years as shown in the Granger causality tests. In addition, Gonzales 2009 showed that bank credit and provisioning are pro-cyclical with the Philippine business cycle in the 1990s. In particular, during times of economic boom (early 1990s), domestic credit grew, while at times of economic downturn (late 1990s), domestic credit contracted.

Using a lag of three quarters, results of the Granger causality tests from the first quarter of 1998 to the second quarter of 2009 showed that bank credit to the private sector is part of a complex set of economic interactions.

In particular, there is a bi-directional causality between the private sector credit (seasonally-adjusted) and the real GDP (seasonally-adjusted) and between non-performing loan loss provision ratio and non-performing loan ratio. At 10% level of significance, the (Granger) causation appears to run from capital-to-asset ratio to private sector credit (seasonally-adjusted), real money supply (seasonally-adjusted) to the private sector credit (seasonally-adjusted).

Beyond credit, few formal alternative sources of funding exist. The Philippine Stock Exchange (PSE) is relatively small (there are only 246 listed companies and total market capitalisation estimated at 33.3% of GDP at end-December 2008, and thinly traded. Most listed companies only float 10-20% of their shares at the PSE.

The PSE index (PSEi) closed at end-December 2008 at 1,872.9 points, 48.3% lower than its close at end-December 2007. Philippine shares mostly fell in the year to end-October 2008, as relatively high inflation and the economic slowdown

in the US and other major markets undercut growth in the domestic economy. Global stocks tumbled 4.5% on 16 September 2008 following the collapse of US investment bank Lehman Brothers, but the Fed's rescue of financial giant American International Group helped the market recover the following day. Along with financial markets across the world, Philippine stocks fell mostly in the rest of September, October and November 2008.

Value turnover for the whole of 2008 reached ₱645.6 billion, down sharply by 42.9% from the value posted in 2007. Meanwhile, share turnover velocity, defined as the ratio between the turnover of domestic shares and their market capitalisation,[14] provides a measure of market liquidity. On average, stock market turnover velocity grew by 54.0 % from 2003 to 2007. In 2008, stock market turnover fell to 24%. With the onset of the global financial turmoil, South East Asian equity markets experienced a tightening in market liquidity. Price volatility reached highs in line with global market trends and turnover decreased sharply (ADB 2009).

Indeed, the global financial turmoil that started in 2007 illustrates the close interconnectedness of global and regional financial markets in propagating shocks, with evidence of spillovers through the equity market channel as seen by significantly high correlation between global, regional and market price movements. The extent of market integration can be seen in the average monthly cross-country turnover velocity from 1999 to 2008 of South East Asian countries and those of Deutsche Borse AG, London Stock Exchange (LSE), Osaka Securities Exchange (OSE), New York Stock Exchange (NYSE) and the National Association of Securities Dealers Automated Quotation (NASDAQ). Interestingly, the analysis shows that average correlations of turnover velocity of South East Asian countries are significantly higher between the region's markets than with those outside the region, except for Indonesia. In fact, for South Korea, Philippines and Thailand, the turnover velocity is negatively correlated with those outside the East Asian countries' stock markets.

The corporate debt market is virtually non-existent, but the volume of government debt is substantial, equaling twice the value of PSE market capitalisation in 2003. Investors in the debt and equities markets are predominantly corporations with strategic holdings and institutional investors including pension funds, banks and insurance companies. The surge of capital inflows led to the

_____

14. The value is annualized by multiplying the monthly moving average by 12.

opening of the derivatives market, but the nature and strategy to regulate them proved to be a major challenge to the monetary authorities.

To determine the relative importance of financial variables to real output growth, this paper estimates the significance of real interest rates, indicated by the difference between the 91-day Treasury bill rate (*TBR91*) and inflation (*INFL*), real peso-dollar rate (*RFXR*), credit to the private sector (*PCREDIT*), stock market value (*STOCK*) and bond trading volume (*BOND*), including the government and corporate bonds, from March 2000 to June 2009. Table 1 specifies the Philippine output gap dynamics. Rather than modeling the output gap by a purely stochastic process, the variables are chosen that can provide extra information on the evolution of the output gap. In addition, the variables employed in the equation characterise a set of financial variables that may largely affect the actual output, not necessarily the potential output. Although these factors are vital in explaining the output performance in the short-run, they are viewed to be more effective on the demand side, and thus, neutral for the behaviour of potential output in the short run. Therefore, these variables appear in the output gap equation to account for the deviation of actual output from its potential level.

Using generalised method of moments (GMM) and at 5% level of significance, the regression results in Table 1 show that changes in *TBR91-INFL*, *RFXR* and *PCREDIT* drive the behaviour of the output gap. By contrast, changes in *STOCK* and *BOND* yielded insignificant coefficients.

Of course, the impact of changes in *TBR91-INFL, FXR ad PCREDIT* on output gap is part of a complex set of interactions in the economy. Existing studies often apply a single-equation regression to test the impact but that may offer only limited insight in complex adjustment processes. In the next section, this paper introduces a more complete macroeconomic model that includes the relevant institutions, markets and agents and the various interactions between them. Arguably, such approach gives a better insight into the macro-financial linkages in the Philippines.

Table 1

Dependent Variable: POTGAP
Method: Generalized Method of Moments
Date: 12/22/09   Time: 10:40
Sample: 1998Q1 2009Q2
Included observations: 46
Kernel: Bartlett, Bandwidth: Fixed (3), No prewhitening
Simultaneous weighting matrix & coefficient iteration
Convergence not achieved after: 499 weight matrices, 500 total coef
      iterations
Instrument list: TBR91 INFL FXR PCREDIT POTGAP(-1)
Lagged dependent variable & regressors added to instrument list

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.195985	0.222273	-0.881731	0.3832
TBR91-INFL	0.080000	0.000728	5.901772	0.0000
RFXR	0.150000	0.000328	3.780000	0.0005
LOG(PCREDIT)	0.180000	0.152000	2.780000	0.0002
LOG(STOCK)	0.112000	0.012500	0.012500	0.1120
LOG(BOND)	0.003000	0.031000	1.258000	0.1885
AR(1)	0.001230	0.001961	0.627458	0.5339

R-squared	0.717839	Mean dependent var		0.003347
Adjusted R-squared	0.825800	S.D. dependent var		0.020716
S.E. of regression	0.013587	Sum squared resid		0.007384
Durbin-Watson stat	1.934500	J-statistic		0.054926

Inverted AR Roots	.00	

4.   Tracing the Macro-financial Linkages in the Philippines

4.1 Macro Model Structure, Diagnostics and Model Solution

This paper traces the Philippine macro-financial linkages by adding and re-specifying the Bayangos and Jansen (2009) model from March 1999 to June 2009. In particular, Bayangos and Jansen (2009) did not give much attention to bank credits as a monetary policy transmission channel. Bank credits were an exogenous inflow on the money supply. Shocks to bank credits would lead to changes in money supply and this would have a small effect on the 91-day Treasury bill which would subsequently affect consumption and investments. The innovation of this study is that the credit channel has been explicitly introduced

188

into the model as an endogenous variable with a number of impacts on the macro economy. Figure 2 provides a simplified overview of Philippine monetary transmission, including the credit channel.

To a broad extent, this quarterly open economy model is New-Keynesian ala Ball (1999), where inflation and output are backward looking, thus deliberately abstaining from any optimizing foundation. Central to this model are important nominal rigidities in describing the macro economy. In addition, there are lag effects in the transmission mechanism.

The agents in this macro model include the (a) households, (b) domestic firms, (c) the government, (d) the rest of the world provides capital, goods and services demanded by the domestic economy and a market for domestic production and (e) the central bank. In this model, the central bank has the task of anchoring the nominal side of the economy. The central bank adopts an inflation targeting framework (IT) and is a flexible inflation targeter and sets a short-term interest rate to achieve an inflation target, and, consequently provides nominal stability. Given these lags and price and wage rigidities, the use of a simple interest rate rule is required to anchor inflation in the long run.

Figure 2
Bank Credit and the Monetary Policy Transmission Mechanism

Moreover, this model describes an economy in which there is an excess supply; hence, aggregate output is demand-determined in the short to medium run.[15] How agents react within various markets is crucial. This model characterises the markets in which: (a) goods markets are monopolistically competitive (Blanchard and Kiyotaki 1987), leading to profits for firms to charge non-competitive sticky prices (Calvo 1983), which clear all of domestic production to satisfy demands (net of imports) for consumption, investment, government spending and exports; (b) the labor equilibrium is not perfectly competitive; households and firms negotiate into a non-competitive real wage and are engaging in sticky nominal contracts (Calvo 1983). Firms make a mark-up when setting prices, which is responsive to demand and monetary conditions; and (c) asset markets (domestic and foreign) are imperfect.

Nevertheless, asset markets are imperfect. The nominal exchange rate is allowed to transitorily deviate from purchasing power parity (PPP) so that movements occur in the real exchange rate. In addition, the nominal short-term interest rates play the leading role as the instrument of monetary policy.

The transmission mechanism starts with the BSP's domestic interest rate policy. The overnight reverse repurchase rate (*RRP*) is prescribed as the nominal interest rate which follows a behavioural equation required to anchor inflation in the long run (Clarida, Gali and Gertler 2000).

The overnight *RRP* adjusts to inflationary pressure measured by the difference between the inflation forecast and the inflation target announced by the Government and the output gap. This is seen as,

$$r^p = \alpha + \beta\,(\,\pi^f - \pi^*\,) + \rho\,(\,q_t - q^*\,) + \varepsilon,\qquad\qquad(1)$$

where r^p is the *RRP*, α connotes the neutral monetary policy stance [16], π^f is the one-quarter ahead inflation forecast, π^* is the medium-term inflation target announced by the Government, q is real output, q^* is potential real output , and an error term, ε .

The RRP rate is transmitted to the benchmark interest rate, r , through the natural arbitrage condition. In this model, the benchmark interest rate is the 91-day Treasury bill rate. As seen in equation (2), r is also affected by other

---

15. Typically Keynesian approach in describing an economy.

16. In some studies, the constant represents the desired *RRP* rate that is expected to prevail when inflation and output are at their target growth.

variables, such as the overnight RRP r^p, inflation rate π, foreign interest rate r^f, real money supply m and an error term ε.

$$r = \alpha + \beta\, r^p \rho\, \pi + \gamma\, r^f - \vartheta\, m + \varepsilon, \qquad (2)$$

Equation 2 states that the 91-day Treasury bill rate is higher, the higher the RRP rate, the higher the inflation rate, the higher the foreign interest rate, and the lower the level of money supply. In this equation, there is a direct channel from the BSP's policy rate to the 91-day Treasury bill rate.

Changes in the 91-day Treasury bill rate are then carried over to the changes in the other market interest rates, such as savings and lending rates through the natural arbitrage condition. It is also assumed that the short-run domestic inflation is relatively sticky, indicating that inflation expectations for the short term are similarly sticky. This further implies that by controlling the nominal overnight RRP rate, the BSP can also affect the short-term real RRP rate or the difference between the short RRP rate and short-term inflation expectations. Through market expectations of future real rates, longer real rates (that is, longer than overnight rates) also are affected. Thus, the lowering of the overnight RRP is expected to lower short and longer real interest rates, and consequently affect economic activity.

Changes in the RRP rate affect changes in the nominal peso-dollar rate. This model embeds the UIP cum risk premium to exchange rate determination, while fully flexible exchange rate regime is assumed. This assumption underlies the baseline dynamics of nominal exchange rate for an important reason. Indeed, the UIP condition relies on arbitrage arguments which are expected to be true although arbitrage is often subject to limits (Shleifer and Summers 1990; Shleifer and Vishny 1997; Wollmershauser 2003), it is nonetheless one of the basic building blocks of economic decision making. The UIP is seen as,

$$E_t e^n_{t+1} - e^n_{t+1} = r_t^f - r_t^d + u^e_t \qquad (3)$$

where the difference between the foreign interest rate r^f and domestic interest rate r^d represents the interest rate differential, $E_t e^n_{t+1}$ is the expected nominal exchange rate and u^e_t as the risk premium (Leitemo and Soderstrom 2004, West 2003 and Wollmershauser 2006). This risk premium is assumed to follow the stationary process,

$$u^e_{t+1} = \rho_e u^e_t + \varepsilon^e_{t+1}, \qquad (4)$$

where $0 \leq \rho_e < 1$. In this equation, ρ_e could capture the UIP disturbances or effects of persistent movements in the risk premium. Equation (4) then feed into the BSP reaction function in equation (1).

To determine the link between the real exchange rate and the nominal exchange rate, it is assumed that deviations from purchasing power parity occur in the short-run.

Changes in the overnight RRP rate also affect bank credits. Indeed, the literature on the relationship between bank credits and growth is controversial. In recent years, much attention in the literature devoted to developed countries has been given to the role of credit markets, and in particular of banks in the monetary policy transmission mechanism (Boughrara and Ghazouani, 2009; Kashyap et al., 1993; Kashyap and Stein, 1994).

There are two recent alternative views on the role of banks in the monetary transmission mechanism.[17] One approach consists of the narrow credit channel or the bank lending channel (Bernanke and Blinder 1988). Under this explanation monetary policy changes directly affect banks' balance sheets with a reduction in bank loans, which in turn affect output. In this case, output changes are directly caused by changes in bank loans.

The bank lending channel operates as follows: a monetary tightening reduces bank reserves and bank deposits because of reserve requirements. If the decline in deposits cannot be offset by other funds (for instance, non-deposit funds that are not subject to reserve requirements) or by a decline in bank's securities holdings, the interest rate may increase and the supply of loans may decline. This may lead to reduced real output. If banks are unable to perfectly substitute this drop in deposits by an increase in non-insured debt, the cost of raising such debt may similarly rise. As a result, the supply of loans falls, leading to lower real output.

Another view is called the broad credit channel. According to this view, monetary policy affects interest rates and output in a way similar to the money channel or influences output through a different channel. A monetary tightening

_____

17. It should be recalled that the standard money view of monetary policy postulates that bank loans have no special role. Monetary shocks affect output through changes in monetary aggregates, as in the traditional *IS-LM* model. Bank loans are simply determined by demand and consequently tend to move with investment and output. In this case we can think of money causing both output and lending.

reduces firms' collateral or cash flow, which makes it more risky to lend to some firms and implies a flight to quality in lending.

Despite the revival of interest in the role of banks in the monetary policy, the precise role played by banks in that process remains controversial. Interest in the "bank lending channel" has been boosted by the growing literature on asymmetric information in financial markets, and also by the fact that large fluctuations in the aggregate economy are often brought about by small shocks under the hypothesis of the financial accelerator (Bernanke et al. 1996). This revival of interest has been also intensified by the East Asian currency in 1997 and the global financial turmoil in 2008. The knowledge of the existence of the lending channel is useful for pursuing relevant policy actions. If bank capital depletes into recessions the lending channel weakens, and consequently, traditional prescriptions for a recession might not work.

This study uses the Bayoumi and Melander (2008) model which traces the impact of changes from bank capital-asset ratio to bank lending standards to credit supply and finally to aggregate spending. In addition, the model highlights the financial accelerator and wealth feedback loops. However, in Bayoumi and Malender (2008), the balance sheets of firms and households are included. In the absence of a longer and consistent series of the flow of funds for the Philippines, the model in this study is limited to the consolidated balance sheets of commercial/universal banks, thrift and rural banks.

The first link is from the capital-asset ratio to lending standards. Capital requirements on banks are imposed by the BSP, so a negative shock on capital asset ratio constrains the capacity for lending. Thus, banks are induced to tighten their lending standards in order to reduce the quantity of credit and restore the capital- asset ratio. Lending standards are usually non-price loan terms, which reflect credit availability. A tightening of loan standards causes a decrease in the quantity of credit. When credit availability falls, there is a direct effect on spending due to credit constraints, notably through consumption and investment.

The final link is the feedback loop from income through the balance sheets of banks. The feedback takes place through two different channels. The first channel works through the effect of an economic slowdown on bank balance sheets. As spending and income fall, loan losses gradually increase and the capital to asset ratio deteriorates further. The second feedback channel is due to deterioration of incomes and balance sheets for banks, which has a further adverse financial-accelerator effect on credit availability. Taking these feedback

193

mechanisms into account, the final effect of a capital-asset ratio shock on aggregate economic activity is larger than the direct effect. Eventually, bank credit declines while the capital-asset ratio starts to improve.

Bank credit together with net other items [18], determine the level of money supply. It should be noted that in the model, money supply is an indicator of the quantity of money that the economy requires, without the BSP setting any target for it. From the liability side, the impact of changes in the overnight RRP and other market interest rates affect deposit liabilities and currency in circulation in the monetary system.

In sum, changes in interest rates, exchange rates and bank credit to the private sector lead to changes in the real sector through consumption, investment, fiscal balances and net trade variables.

All the changes in spending behaviour, when added up across the whole economy, generate changes in aggregate pending. Total domestic expenditure plus the balance of trade in goods and services reflects the aggregate demand in the economy, and is equal to gross domestic product (GDP).

GDP (demand) feeds into the GDP (production) side which consists of two sectors: the primary sector (agriculture) and the advanced sector (industry and services). The output of the agriculture sector is exogenous in the model. This leaves us with the industry and services sectors which are assumed to have excess capacity. Hence, supply responds to the level of aggregate demand.

Potential output and the resulting gap as measure of future inflationary pressures have regained importance under the IT framework. Output gap in this model is estimated based on Dakila (2001) in which it is expressed as the difference between the log of a one quarter moving average of supply side (industry and services) GDP (deseasonalised series) and potential output. [19]

The output gap (*POTGAP*) then feeds into the wholesale price index. The whole price index in this model is affected by (1) the average prices of merchandise imports in pesos, the excess liquidity as indicated by real money

---

18. Net other items account is taken as residual. Technically, it includes other net domestic assets and neo other items from the depository corporations' survey.

19. Also cited in Angeles and Tan (2004).

supply relative to gross domestic product , the average compensation (or wages) for industry and services sectors and the output gap. This specification makes the pricing decision based on a flexible mark up.

In this specification, the main link between monetary policy and wholesale price index, and consequently on inflation is the output gap. Hence, there is an impact of monetary policy on expenditure. In addition, the real money supply strengthens the link to price level and consequently between monetary policy and the production sector.

Meanwhile, changes in the wholesale price drives prices of the industry and services sectors, and finally the final demand prices. Final demand prices are dependent on the relative weights of industry and services sector prices and are contained in the implicit GDP deflator. This then is the basis of headline inflation.

Because of the forward-looking nature of inflation targeting, the role of inflation expectations in this transmission mechanism becomes crucial. Indicators of inflation expectations include the two-year ahead inflation forecast.

The estimation of long-run inflation expectations follows a hybrid structure that contains both forward-looking and backward-looking expectations. The structure includes rational component of inflation, indicated by the medium-term (three to five years) inflation target announced by the Government and contemporaneous and inertial components indicated by current and past inflation rate. The rational component is based on Demertzis' and Viegi's (2005) work on inflation targets as focal points for long run inflation expectations. The idea is that in the absence of concrete information of inflation expectations, the only information that agents have is the quantitative inflation target announced by the Government.

In the empirical estimation, the macro model uses a more detailed approximation of gross domestic product (GDP). This provides the impact of RRP, 91-day Treasury bill rate, lending rate, peso-dollar rate, and bank lending channel into the different components of expenditure and sectoral output separately, allowing us to identify monetary policy transmission variables more accurately. Inflation expectations provide the bridge between the relatively short term RRP to rather long-term rates such as the 91-day Treasury bill, savings and lending rates.

Hence, the analytical structure discussed so far captures changes in monetary policy to inflation is seen in the aggregate demand, production-cost and the money supply variables. Changes in the short and longer real interest rates and bank lending lead to changes in consumption and investment and thereby, affect aggregate demand and output in the economy (Mishkin 1996).

4.2 Diagnostics and Model Solution

The updated macro model has 70 equations which are grouped into seven major blocks: monetary sector, public sector, prices and expenditures, including balance of payments, production and employment. In particular, bank credit is seen to affect money supply, market interest rates and total expenditure (Figure 2). Of these 70 equations, 32 are simultaneous equations estimated using generalized method of moments (GMM, 4 equations), two-stage least squares (13 equations) and ordinary least squares (12 equations). The choice of instruments for the GMM and two-stage least squares are assumed to be all the lagged endogenous variables and all current and lagged exogenous variables in the whole system. These equations are largely overidentified, while the rest are identified. There are 32 recursive equations largely estimated using ordinary least squares (OLS) while the remaining 6 are identities.

Unit root and co-integration group tests are conducted to two groups of equations which are added and re-estimated. Group 1 includes financial indicators such as capital-to-asset ratio, bank lending standards, bank credit to the private sector, deposit liabilities and the 91-day Treasury bill rate. On the other hand, Group 2 includes real sector variables such as personal consumption expenditure, private construction expenditure and expenditure on durable equipment.

Results show that all the series in levels and first differences are stationary at the 5% and 10% levels of significance. The results further suggest that the time series under investigation are integrated of order one, I(1). In terms of the number of co-integrated relationship(s) in the two groups, the results show that Group 1 shows more co-integrated relationships than Group 2 at the 5% and 10% levels of significance.

Each of the 32 simultaneous equations is assessed for basic and higher-order diagnostic tests. The signs and magnitudes of individual coefficients in each equation, such as t statistics, the adjusted, Durbin Watson and F statistics are all examined. All calculated F values are higher than the critical values, at the 5% to 10% levels of significance, thereby indicating a significant degree of

196

reliability of coefficients of determination. Results of higher order test statistics of residuals are similarly examined. Results of the Jarque-Bera test show that all of the series are normally distributed. With a lag order of up two and at a 5% to 10% level of significance, Breusch-Godfrey results show that not all equations exhibit serial correlation.

The model is solved in a system simultaneously using Fair-Taylor method.[20] Meanwhile, terminal conditions are assumed to hold in a specified time period. Forward solution is similarly used for equations that contain future (forward) values of the endogenous variables.

4.3 The Philippine Monetary Policy Transmission Mechanism

The estimated macro model captured changes in monetary policy to inflation through the aggregate demand (output gap), production-cost and the money supply variables. The analyses in this section will use short-run, and in some instances long-run multipliers.[21] Table 2 provides the estimated and results of diagnostic tests of the main macro-financial variables in the model.

Equation 1 states the BSP's reaction function since 2000 that is consistent with the IT requirements. It shows that nominal RRP rate reacts to inflationary pressure seen in the difference between inflation forecast and inflation target, output gap or the difference between actual GDP and potential GDP. [22] In addition, equation 1 implies that the BSP raises *RRP* rate by 0.30 percentage point whenever the difference between inflation forecast and target is expected to rise by one percentage point. The coefficient of the output gap implies that the BSP increases *RRP* rate by 0.13 percentage point when it is positive or an excess in aggregate demand is anticipated.

_____

20. This is an iterative algorithm, where each equation in the model is solved for the value of its associated endogenous variable, treating all other endogenous variables as fixed.

21. The long-run multiplier is derived based on the following: in the model with lagged dependent variable, $y_t = c + ax_t + by_{t-1} + e_t$, the long run multiplier (m) of a change in x is $m = \dfrac{a}{(1-b)}$.

22. Currently, the BSP uses three estimation methods to measure the output gap for the Philippines: Hodrick-Prescott filter, the constant elasticity of substitution (CES) production function approach, and the structural vector autoregression (SVAR) approach. For purposes of analysis, the study uses the average of the output gap estimates from the three methods.

The long-run impact though seems to be moderate. The BSP has to raise the *RRP* rate by 0.38 percentage points when inflationary gap increases by one percentage point and 0.16 percentage points when there is excess aggregate demand.[23]

Table 2
Estimated Equations

VARIABLES	Lag (quarter)	Monetary and Banking Sector							Real Sector		
		RRP (Equation 1)	FXR (Equation 2)	ECAR (Equation 3)	LENDING (Equation 4)	PCREDIT (Equation 5)	DEPLIAB (Equation 6)	TBR91 (Equation 7)	PCE (Equation 8)	CONS (Equation 9)	DUREQ (Equation 10)
Constant		5.68	1.20	4.65	11.80	-2.28	7.99	0.67	-0.16	1.73	19.06
Log(GDP)	1					0.20					
Log(GDP)	2						0.16				
Log(GDP)	3			0.66 */							
Potgap	1	0.13									
Log(DISY)									0.98		
Log(REMIT)							0.36				
Log(CONS)	1									0.79	
Log(DUREQ)	2										-0.82
CA/GDP	2		-0.14								
RRP	2	0.21						0.25			
TBR91	1										
TBR91-XINFL	1								-0.46		
LIBOR90	1					-0.04					
LIBOR90-TBR91	1		0.02								
FXR	1		0.73					0.20			-0.15
Log(DEPLIAB)	1							0.21			
LENDING	2			-0.28 */							
LENDING	1				-0.26	-0.02					
LLOSS						0.28					
ECAR	1				0.31	-0.08					
NPL	1					-0.97	-0.11	-2.06			
Log(PCREDIT)	1						0.20		0.12		0.21
PCNGDP (Moving average)	4									0.44	
XINFL				0.26	1.39	-0.87	-0.10	0.70		-0.05	
FINFL-INFTAR		0.30									
AR(1)		0.87		0.17	-0.81	-0.78		-0.18		-0.58	0.29
AR(2)				0.15	0.28	-0.83		-0.55		-0.23	0.62
AR(3)											
Diagnostic Tests:											
Adjusted R^2		0.84	0.91	0.41	0.42	0.90	0.84	0.97	0.92	0.62	0.62
Prob (F statistic)			0.01	0.03			0.00		0.00	0.00	0.00
Durbin Watson		2.01	1.97	2.01	2.02	1.92	1.73	2.05	2.05	2.01	1.89
Prob (Jarque-Bera)		0.21	0.18	0.51	0.21	0.12	0.11	0.22	0.41	0.12	0.31
White Heteroscedasticity		0.14	0.28	0.16	0.96	0.23	0.92	0.30	0.36	0.75	0.90
Breusch-Godfrey		0.25	0.19	0.98	0.24	0.65	0.24	0.39	0.20	0.03	0.24
Prob (Ramsey RESET Test)		0.19	0.26	0.30	0.30	0.33	0.05	0.08	0.10	0.12	0.52
J-statistic		0.08	0.03			0.01		0.05			

*/ Not significant at 5% and 10% levels of significance.

Meanwhile, the lagged *RRP* rate received the bigger importance in terms of the magnitude of coefficient (0.21 in equation 1, Table 2) compared to the output gap. This is not unusual though, as most quarterly macro models exhibit this behaviour. This estimation takes the more conventional wisdom that this gradual adjustment reflects policy inertia (or an action of not adjusting once-for-all to changing conditions) or interest rate smoothing behaviour by BSP.

_____

23. The long-run multiplier is derived based on the following: in the model with lagged dependent variable, $y_t = c + ax_t + by_{t-1} + e_t$, the long run multiplier (m) of a change in x is $m = \dfrac{a}{(1-b)}$.

The results also show that the impact of the BSP policy rate changes on the 91-day Treasury bill rate is larger (0.25 in equation 7, Table 2) compared with pre-IT period (Bayangos 2007). [24] A preliminary regression analysis using GMM leaves the impression that a slight change in the overnight *RRP* would bring significant impulses to market interest rates (Table 3b). The *TBR91* is further driven by nominal peso-dollar rate changes, non-performing loan ratio and inflation expectations.

The interest rates for the RRP are determined by the BSP based primarily on the outlook for inflation over a two-year horizon (or the estimated length of the lag of monetary policy). A crucial observation prior to the adoption of IT was that the 91-day Treasury bill rate became a bit sensitive to foreign interest rates, although the gap is substantial at more than 10 percentage points in nominal terms in 1998 (Bayangos 2007; Bayangos 2006; Bayangos 2000).

However, the link between the RRP rate and interbank rate (IBCL) and bank lending rate have tightened after the adoption of IT in 2002, as seen in the ordinary coefficient of correlation in Table 3a. This indicates that the overnight RRP could lead in setting the IBCL and lending rate.

The *TBR91* then feeds into the nominal peso-dollar rate (*FXR*) in equation 2 through the interest rate differential (*LIBOR90-TBR91*), and along with risk premium drive the behaviour of *FXR*. The magnitude of risk premium is seen in the coefficient of lagged FXR. [25] This means that a positive interest rate differential, that is when the 90-day Libor is higher than the 91-day T-bill rate, and an increasing (positive) risk premium signify a depreciating *FXR* in the future. In equation 2, a one percent increase in the interest differential leads to a 0.12% depreciation of the peso-dollar rate.

_____

24. In Bayangos (2007), the impact of the changes in the overnight RRP rate on the 91-day Treasury bill rate is estimated at 0.18 percentage point from first quarter 1988 to first quarter 2002.

25. n numerous studies, this is sometimes referred to as inertia. This is not unusual following the uncertainty and shocks affecting movement of the peso-dollar rate.

Table 3a

Covariance Analysis: Ordinary
Date: 07/31/09   Time: 14:56
Sample (adjusted): 1990 -2001, 2002-2008
Included observations: 12 after adjustments

Correlation/	IBCL		Lending rate		Overnight RRP		91-Day Tbill rate	
t-Statistic	90-01	02-08	90-01	02-08	90-01	02-08	90-01	02-08
IBCL	1.00							

Lending rate	0.69	0.56	1.00	1.00				
	3.04	2.75	-----	-----				
Overnight RRP	0.21	0.99	0.34	0.47	1.00	1.00		
	0.67	14.70	1.14	1.19	-----	-----		
91-day Tbill rate	0.61	0.14	0.98	0.78	0.35	0.09	1.00	1.00
	2.46	0.32	15.48	2.79	1.17	0.21	-----	-----

Table 3b: Market Interest Rate Pass-through

Dependent Variable: RRP
Method: Generalized Method of Moments
Date: 12/21/09   Time: 17:03
Sample: 1997Q1 2009Q2
Included observations: 48
Kernel: Bartlett, Bandwidth: Fixed (3), Prewhitening
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 8 weight matrices, 9 total coef iterations
Instrument list: TBR91   SDR LR
Lagged dependent variable & regressors added to instrument list

	Coefficient	Std. Error	t-Statistic	Prob.
C	2.648906	0.619615	4.275083	0.0001
TBR91	0.689590	0.128951	5.347703	0.0000
SDR	0.107338	0.147018	3.730000	0.0040
LR	0.001435	0.088089	2.740000	0.0012
AR(1)	0.414736	0.140077	2.960782	0.0050
R-squared	0.882404	Mean dependent var		8.605833
Adjusted R-squared	0.871465	S.D. dependent var		2.992143
S.E. of regression	1.072738	Sum squared resid		49.48293
Durbin-Watson stat	1.921328	J-statistic		0.028130
Inverted AR Roots	.41			

200

Since the currency crisis in 1997, the exchange rate has become even more volatile due to a confluence of domestic and external factors. This is seen as the risk premium has been a significant factor during the past decade or so in the determination of nominal peso-dollar rate (Bayangos 2007). In 2003, the peso depreciated against the US dollar by 4.8% to average P54.20/US$. The weakening of the peso was traced to war jitters in the Middle East during the first quarter, lingering concerns over the budget deficit and investor reaction over Moody's Investors' Service decision to place the country's currency as well the political and security reasons. Since 2003, the peso appreciated against the US dollar following the surge of overseas Filipino remittances and the overall surplus in the current account. At end-December 2008, the peso settled at P44.47 against the US dollar.

Overseas Filipino (OF) remittances surged particularly in the 1990s. [26] Data show that the magnitude of remittances to the Philippines has been significant, both in absolute terms and as a percentage of GDP. As of end-December 2008, remittances reached US$16.4, the highest level since the 80s. Latest available data in 2009 (January to October) showed the OF remittances at US$14.3 billion, the bulk of which continued to come from the U.S., Canada, Saudi Arabia, U.K., Japan, Singapore, United Arab Emirates, Italy, and Germany. In 1996, remittances accounted for only 5.2% of GDP. This has risen to around 10% in recent years.

Nevertheless, the inclusion of the exchange rate in assessing domestic financial conditions stems from the empirical literature that it is an important price since it does not only affect aggregate demand but also aggregate supply.

In the Philippines, an important indication of the importance of the exchange rate in the economy is the ratio of total trade of goods and services to GDP. As earlier indicated, this ratio was almost stable at around 108% in 2001, had steadily dropped to almost 100% in 2005, and further to 77% in 2008. The drop in the ratio in 2008 reflects the impact of the global financial turmoil on Philippine exports. Although the ratio has steadily dropped from the early 2000 to 2008, the relatively high ratio indicates that the exchange rate is one of the most important prices in the economy.

----

26. Remittances in this paper cover transfers sent by both Filipino migrants and overseas workers. In the Philippines, remittances data are sourced from the balance of payments statistics.

Changes in the RRP rate affect bank lending standards. Following Gambacorta and Mistrulli (2003), banks' capital-to-asset ratio, in excess of the 10% BSP requirement (*ECAR*),[27] is determined by real output, inflation expectations and lending standards and capital-to-asset ratio in excess of the 10% requirement, lagged by one quarter.[28]

Banks' capital-to-asset ratio then feeds into the lending standards of banks *(LENDING)*. Banks lending standards are defined as the difference between the average bank lending rate and overnight RRP rate. A widening of the difference between the average banking rate and the overnight RRP rates suggests tightening of the lending standards by banks while the narrowing of the difference indicates easing of the lending standards.

In Bayoumi and Melander (2008), lending standards are based on answers from the quarterly Federal Reserve Bank's survey of bank loan officers. However, in the absence of a longer series on survey results from bank loan officers, this model uses the difference between the average bank lending rate and the overnight RRP rate.[29] Equation 4 shows that bank lending standards are influenced by inflation expectations, loan loss provision and lending standards, lagged by one quarter.

In equation 5, bank credit to the private sector *(PCREDIT)* is driven by real output, lagged by one quarter, 90-day Libor, bank lending standards, non-performing loan ratio and inflation expectations. The equation shows that a higher level of GDP leads to higher bank credit to the private sector. By contrast, higher 90-day Libor, inflation expectations, non-performing loan ratio, higher capital-to-asset ratio and tight lending standards lead to lower credit to the private sector.

This study re-specified five endogenous equations in the model to capture the impact of bank credit to the private sector on money supply *(MS)*, 91-day Treasury bill rate (*TBR91*), personal consumption *(PCE)*, private construction *(CONS)* and durable equipment *(DUREQ)*. Equation 4 shows that real bank deposits (*DEPLIAB)* are driven by credit to the private sector (*PCREDIT*) and remittances *(REMIT*) so that changes in these two variables will have an impact

27. It should be noted that in the case of the BIS, the requirement is 8 percent.

28. However, it should be noted that the impact of real output on banks' capital asset ratio is not significant. This indicates that the feedback loop or the wealth effects are not that strong.

29. The BSP started to conduct senior bank loan officers' survey only in March 2009.

on the money supply. And real deposits have, as equation 5 shows, an impact on the 91-day Treasury bill rate *(TBR91)*.

Changes in bank credits are positively related with demand for real consumption *(PCE)* in equation 8, real private construction *(CONS)* in equation 9 and real durable equipment *(DUREQ)* in equation 10. It should be noted that equations 9 and 10 comprise the major indicators for gross domestic capital formation. This relationship indicates that bank credits increase when demand for consumption, private construction and durable equipment accelerate, and vice versa. Equation 8 also shows that disposable income drives real personal consumption. In this macro model remittances drive disposable income significantly. This interaction strengthens the pro-cyclical impact of remittances on personal consumption and on real output (Bayangos and Jansen 2009).

The simulation properties of the macro model are assessed using the mean absolute percent error. The results indicate that the major macroeconomic variables can be predicted within reasonable error margins. A simulation exercise is employed to assess the impact of a one percentage point decline in the overnight RRP rate on selected macro and financial variables. Results show that a one percentage point decline in the overnight RRP rate leads to a loosening of bank lending standards and higher bank credits to the private sector. This in turn leads to higher bank deposits and money supply but higher 91-day Treasury bill rate. Meanwhile, the lower 91-day Treasury bill rate will lead to higher spending for personal consumption and gross capital formation. All in all, a loosening of monetary policy stance brings real sector impacts and that bank credit appears to be a relevant channel in transmitting effects to the real sector.

5. The Impact of the Global Financial Crisis in the Philippines

The impact of the global financial crisis was felt through the asset markets, financial sector and the real sector. Like many other emerging markets, the Philippine economy slowed down considerably in 2008. Data show that real GDP growth rate in 2008 fell to 3.8%, compared to 7.1% in 2007. However, like many other emerging markets, the slowdown was not primarily a result of the global financial crisis. Rather, the deceleration in the Philippine economy was largely brought about by a surge in inflation triggered by the sharp rise in food and fuel prices and to a lesser extent the US recession.

Inflation jumped to 9.3% in 2008 after averaging only 2.8% in 2007. The negative effect of high inflation came through various channels: households

postponed consumption expenditures, particularly durable goods; the high cost of fuel scaled back services in the transportation sector; and higher prices caused an increase in the cost of production (Yap et al 2009).

Another important factor was the pronounced deceleration in construction activity following a surge related to the 2007 elections and the initial implementation of President Gloria Arroyo's infrastructure programme. National income accounts showed that a fall in the growth rate of personal consumption expenditures and fixed investment in 2008. In particular, investment in public construction contracted by 0.4% in 2008 after surging by 29.2 % in 2007.

On the production side, significant slowdowns occurred in manufacturing, electricity, gas, and water, trade, and finance services. The manufacturing sector was buffeted by the 29.2% contraction in exports during this period. The food manufacturing sector was able to offset the contraction in other sub-sectors, particularly electronics and furniture, in the first three quarters of 2008. This is the reason that value added in manufacturing actually grew slightly faster in 2008 compared to 2007. Unfortunately this momentum was not sustained in the fourth quarter of 2008 and first half of 2009.

The rather surprising outcome was the reversal in the service trade sector. The latter, which contributes 17% to GDP, is normally spared the most significant effects of economic downturns. The combined performance in the fourth quarter of 2008 and first half of 2009 shows only a mild growth of 2.1% which contrasts with the 6.7% average growth in the previous three years. One possible reason for this result is the slowdown in consumption expenditure to only 2.9% in the three combined quarters. In particular, consumption grew by a mere 1.3% in the first quarter of 2009 and 2.2% in the second quarter. A critical development in consumption was the rather moderate growth of overseas remittances. Data, however, indicate a slowdown in the growth of remittances to only 3.8% in the first seven months of 2009 compared to 18.2% in the same period in 2008.

The financial turmoil that emerged in the aftermath of the Lehman Brothers debacle magnified tensions in the global interbank and credit markets. As a result there was a virtual freeze in liquidity in US and European financial markets which stopped and, in many cases, reversed capital flows to emerging and developing countries. In large part, the latter reflected sales of debt and equity securities by non-residents, selective withdrawals of bank deposits held with domestic banks and a decline in inflows of foreign direct investment (World Bank 2008).

The immediate impact of the liquidity squeeze in international capital markets was a rise in the price of risk—as measured by bond spreads—a sharp drop in equity prices, and exchange rate volatility. Data revealed that the foreign currency government bond spread for the Philippines jumped from 155 basis points in June 2007 to 549 basis points in November 2008. Meanwhile, the main index of the Philippine stock market fell by 24 percent between July 2008 and January 2009 - which is the relevant period for monitoring the immediate impact of the financial crisis. The Philippine stock market was actually one of the least affected by the global financial crisis in the Asia-Pacific region.

The exchange rate also exhibited volatility with the peso depreciating by 16.6% between March 1, 2008 and November 30, 2008 after appreciating by 39% against the US dollar between September 20, 2005 and February 29, 2008. Between July 2008 and January 2009, the peso depreciated by only 3%. Similar to stock prices the peso was one of the currencies least affected by the crisis.

Asset prices across the Asia-Pacific region largely recovered between February and May of 2009. A more stable global environment led to resurgence in foreign portfolio equity investment into emerging markets. However, the situation remains fluid and management of volatile capital flows is still an important but unresolved issue in East Asia. Monitoring the impact of these events on the real sector of the economy is important. Rising bond spreads will raise the cost of financing external debt with attendant effects on the fiscal position of the national government.

Meanwhile, portfolio flows have been shown to have a negligible impact on consumption and investment (Yap 2008). Hence, the gyrations in the stock market are not expected to have a strong effect on the real sector. Stock market and exchange rate volatility do affect macroeconomic stability and this has implications for private investment. Data revealed that investment in durable equipment contracted by 18.5% in the first quarter of 2009 and a further 18.9% in the second quarter. In terms of international trade, prices of traded commodities are mostly set in the global market. Exchange rate movements, therefore, affect profitability of exporters rather than demand for their products. Profitability of exporters, however, has an impact on their investment and employment decisions. Exchange rate movements affect the propensity to import, the degree of protection of import-substituting industries, and the peso value of remittances from abroad.

The Philippine financial sector has largely weathered the crisis. Crucial prudential indicators show the relative health of the banking systems in terms

of capital adequacy, profitability, and liquidity cushions As mentioned earlier on, NPLs were fairly stable in 2008 and early 2009. A similar pattern can be observed with the CARs. Meanwhile, the loans to deposit ratio has also been steady, reflecting the absence of any sharp market reaction to the crisis.

In 2008, most banks continued to report relatively high rates of return on assets and equity, and did not experience increases in impaired assets. This performance reflects the insignificant exposure of Philippine banks to the toxic structured mortgage products that were extensively sold globally. Given largely domestically-focused business and relatively strong economic activities in 2007, profitability of Philippine banks has generally remained high in 2008.

Undoubtedly, the Philippine financial sector remains vulnerable to further shocks that emanate from global financial centers. However, there has been no meltdown yet similar to the events of the currency crisis in 1997. The resilience stems from more prudent policies and a more conservative approach by the banking system. It would be difficult to establish which factor has been more important. Nevertheless, policies implemented in the aftermath of the 1997 crisis did play a role in limiting the impact of the 2008 global liquidity crunch. The BSP, however, must remain vigilant and implement measures to maintain stability of the financial sectors.

6.   Conclusion

Following the Asian financial crisis in 1997 and the global financial turmoil in 2008, interest in the nature of macro-financial linkages has intensified. At the heart of this growing interest is the concern in the presence of bank credit channel in transmitting monetary policy impulses into the real sector in a globalising environment. However, the empirical relationship between bank credit and growth is controversial. In particular, the estimation of the behaviour of bank credit channel is complicated by problems of endogeneity, associated difficulties in finding adequate instruments to explain the behaviour of bank credit, and measurement issues.

This paper explores the changing monetary and financial environment in the Philippines after inflation targeting has been adopted. Furthermore, the study revisited the macro-financial linkages in the Philippines by re-estimating the monetary policy transmission mechanism. The study uses the approach that builds on adding and re-specifying a dynamic, structural, quarterly economy-wide macroeconometric model of the Philippines from 1999 to 2009 to examine the monetary policy transmission to the real sector. The evidence on the bank

credit channel is obtained by examining the cyclical dynamics of bank credit and estimating a bank credit behaviour that takes into account not only the monetary policy indicator and macroeconomic variables, but also specific banking indicators to monetary policy actions such as bank lending standards, capital-to-asset ratio and loan provisioning. The main question is whether the bank credit channel matters in transmitting impulses to the real economy in the Philippines.

The empirical results indicate that the transmission of monetary policy through the interest rate and exchange rate channels have become more pronounced compared with pre-IT period (1999-2002). The paper also shows that bank credit channel matters in the Philippine monetary transmission mechanism. Specifically, bank capital, loan provisioning and lending standards are found to have significant effects on the lending activity by banks, further reinforcing the interest-rate pass through from the overnight RRP rate to market rates.

The total demand impact of an increase in bank lending is the sum of various effects in the money supply, Treasury bill rates, personal consumption and investment, all of which have significant impact on aggregate demand. In addition, the empirical results indicate a feedback loop from aggregate demand to bank credit through the financial accelerator mechanism. These findings suggest that the effects of monetary policy in the Philippines can be propagated by the banking sector depending on its liquidity position.

REFERENCES

Asian Development Bank (2004)*, Philippines: Private Sector Assessment (Draft), Asian Development Bank, Manila, Philippines, September.

Asian Development Bank (2009)*, Philippines: Private Sector Assessment (Draft), Asian Development Bank, Manila, Philippines, September.

Balisacan, Arsenio M. and Hal Hill eds., (2003), The Philippine Economy: Development, Policies and Challenges, Oxford University Press.

Blanchard, Olivier J. and N. Kiyotaki, (1987), "Monopolistic Competition and the Effects of Aggregate Demand", *American Economic Review* 77, p. 647-666.

Ball, Laurence N., (1999), "Policy Rules for Open Economies", in: J.B. Taylor, (ed.), *Monetary Policy Rules*, Chicago, The University of Chicago Press, pp. 127-156.

Bangko Sentral ng Pilipinas, (2006), BSP Annual Report 2006 , BSP, Manila, Philippines.

Bangko Sentral ng Pilipinas, (2005), BSP Annual Report 2005 , BSP, Manila, Philippines.

Bangko Sentral ng Pilipinas, (2004), Inflation Report, BSP, Manila, Philippines, Third Quarter.

Bayangos, Veronica and Karel Jansen, (2009), "The Macroeconomics of Remittances in the Philippines*", Institute of Social Studies Working Paper* No. 470, March.

Bayangos, Veronica, Joselito Basilio, Danvee Floro and Eloisa Glindro, (2009b forthcoming), "Quantifying the Expectations Channel in the Philippines: Some Preliminary Results", *BSP Working Paper Series,* BSP.

Bayangos, Veronica B., (2007), Inflation Targeting and Exchange Rate Uncertainty, Shaker Publishing, Maastricht, The Netherlands, ISBN. No. 978-90-423-0329-4.

208

Bayangos, Veronica B., (2006), "Exchange Rate Uncertainty and Monetary Transmission in the Philipines", *Institute of Social Studies Working Paper* No. 434, September.

Bayangos, Veronica B., (2000), "A Real Monetary Conditions Index for the Philippines: Is It Useful?", *Institute of Social Studies Working Paper* no. 309, November.

Bayoumi, Tamim and Ola Melander, (2008), "Credit Matters: Empirical Evidence on U.S. Macro-Financial Linkages", *IMF Working Paper* No. WP/08/169, July.

Bernanke, B.S., and Blinder, A.S., (1988), "Credit, Money, and Aggregate Demand", *American Economic Review* 78, pp.435-439.

Bernanke, B.S., Gertler, M., and Gilchrist, S., (1996), "The Financial Accelerator and the Flight to Quality", *Review of Economics and Statistics* 78, pp.1-15.

Boughrara, Adel and Samir Ghazouani, (2009), "Is There a Bank Lending Channel of Monetary Policy in Selected MENA Countries? A Comparative Analysis", Paper for the Equity and Economic Development 15th Annual Conference, 23-25 November 2008, Cairo, Egypt.

Calvo, Guillermo ,(1983), "Staggered Prices in a Utility Maximizing Framework", *Journal of Monetary Economics*, 12, 3, p. 383-398.

Cororaton, Caesar, (2002), "Total Factor Productivity in the Philippines", *PIDS Discussion Paper Series* No. 2002-01 (Revised).

Gambacorta, Leonardo and Paolo Emilio Mistrulli (2003), "Bank Capital and Lending Behaviour: Empirical Evidence in Italy," Banco de Italia, *Temi di Discussione,* No. 486, September.

Gochoco-Bautista, Maria Socorro and Dante Canlas, (2003), (Chapter 5): Monetary Policy and Exchange Rate Policy, The Philippine Economy, Development, Policies and Challenges, eds. Oxford University Press.

Gonzales, Jose Ernesto, (2009), "The Fundamentals of Procyclicality of the Financial System," *BSP Economic Newsletter*, No. 09-03, July.

Kashyap, A.K., Stein, J.C., and Wilcox, D.W., (1993), "Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance", *American Economic Review* 83, pp.78-98.

Kashyap, A.K., and Stein, J.C., (1994), "Monetary Policy and Bank Lending", in Mankiw, N.G., (eds.), *Monetary Policy*, pp.221-256, University of Chicago Press, Chicago.

Mishkin, Frederic S. and Adam S. Posen, (1997), "Inflation Targeting: Lessons from Four Countries", *Federal Reserve Bank of New York Economic Policy Review*, August 1997: 9-110.

International Monetary Fund, (2006a), 'Philippines: Selected Issues,' IMF Country Report No. 06/181. May.

International Monetary Fund, (2006b), International Financial Statistics Yearbook 2006, IMF.

Sarel, Michael, (1995), "Nonlinear Effects of Inflation on Economic Growth", *IMF Working Paper* 95/96, Washington, D.C., International Monetary Fund, May 1995.

Vital, Olivia, (2003), "Money Demand and the Philippine Economy", *Money and Banking in the Philippines*, Bangko Sentral ng Pilipinas.

World Bank, (2008), Philippines: Country Profile, World Bank.

Yap, Josef T., (2008), "Managing Capital Flows: the Case of the Philippines", *PIDS Discussion Paper* 2008-04.

Yap, Josef T., Celia M. Reyes and Janet S. Cuenca, (2009), "Impact of the Global Financial and Economic Crisis on the Philippines", *PIDS Discussion Paper Series* No. 2009-30, October.

CHAPTER 8
MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT IN TAIWAN

By

Chun-Nan Liao*

1. Introduction

Taiwan is an oceanic nation of about 23 million people, located in a key position in East Asia. As a small and highly open economy, its growth heavily relies on external trade. Due to resource deficiency, Taiwan has been devoted to promoting the services industry and the information technology (IT) industry for a long time. Currently, the services sector dominates Taiwan's economy, making up more than 70% of GDP. As a global leader in IT production, the export share of IT products in Taiwan has remained at around 30% in recent years, the highest share among all export categories.

The World Trade Organization (WTO) statistics data indicate that Taiwan was the 18th largest export country and 18th largest import country in world trade in 2008. Owing to the outstanding performance of exports, Taiwan has enjoyed a huge current account surplus in the past few decades. As of the end of September 2009, Taiwan had the world's fourth-largest foreign exchange reserves, amounting to US$332.24 billion.

After the Cold War, many countries embarked upon political and economic liberalisation. This development, followed by the high-tech revolution, promoted the trend toward globalisation. Globalisation leads to the increase in the flows of funds, goods, services and financial assets. The adverse impact of a panic could spread from one market to neighbouring countries or even the whole world in a very short period of time. The US sub-prime mortgage crisis is a good example. The crisis easily affected the financial markets and real economy of other countries through macro-financial links. Furthermore, weakening external demand could seriously harm the real economy of other countries with higher dependence on external trade like Taiwan. Therefore, high dependence on external

———————
∗. The author is Senior Economist at the Department of Economic Research of the Central Bank of the Republic of China (Taiwan).

trade, volatile international flows and interwoven financial risks could pose serious threats to domestic economic and financial stability under globalisation.

Since 1992, the Central Bank of the Republic of China (Taiwan) (CBC), Taiwan's central bank, has adopted the monetary targeting regime. Although monetary targeting has run smoothly for the past 17 years in Taiwan, there are increasing challenges. These include the emergence of new financial products and increasing cross-border capital flows. The former will blur the definition of money and affect the stability of money demand, while the latter will pose a challenge not only to monetary control, but also to exchange rate stability.

In addition, financial market deregulation measures in Taiwan, such as licensing new securities and bills finance companies, encouraging companies to go public, and speeding up the approval of mutual funds, have helped Taiwan's financial markets to grow in breadth and depth. An increasing number of individuals and enterprises turned to financial markets for funding and investment. The importance of direct finance has thus gradually increased relative to indirect finance. The rise of direct finance may undermine the effectiveness of monetary policy, as bank lending is a major channel in the monetary policy transmission mechanism.

The real economy and financial environment are closely linked. A better understanding of how financial conditions affect the real economy is very essential. The US sub-prime mortgage crisis, which spread to other countries, mainly resulted from the rapid development of financial globalisation, financial derivatives and asset securitisation. In view of the high degree of globalisation, the rise of direct finance and the popularity of new financial products (including asset securitisation and financial derivatives), we would like to explore whether the above development can influence monetary policy interest rate pass-through, which can in turn affect the real economy in Taiwan.

The remainder of this paper is organised as follows. First, we shall introduce the CBC's basic framework of monetary policy management, including the formulation and implementation of monetary policy in Section 2. We shall then analyse the trend of macroeconomic and financial data in Taiwan since 1970 in Section 3. Then we shall embark on an empirical analysis of macro-financial links in Section 4, exploring how the rise of direct finance will affect interest rate pass-through and influence monetary policy transmission by changing the impact of interest rates on aggregate demand. Section 5 will focus on the impact of financial crisis, including the East Asian crisis and the present global financial

crisis, on real economy in Taiwan, and discuss how the CBC reacts to such a financial crisis. Conclusions and policy implications will be provided at the end.

2. Monetary Policy Management in Taiwan

2.1 Basic Framework of the CBC's Monetary Policy Management

Because changes in monetary policy affect the economy with considerable time lags, the CBC pays close attention to some intermediate targets such as monetary aggregates. In practice, the CBC adopts a monetary policy framework where it periodically checks whether operating targets have been achieved in the short run, and in turn measures intermediate targets to assess how effectively monetary policy is being transmitted to achieve its final goals (see Chart 1).

Chart 1
Basic Framework of the CBC's Monetary Policy
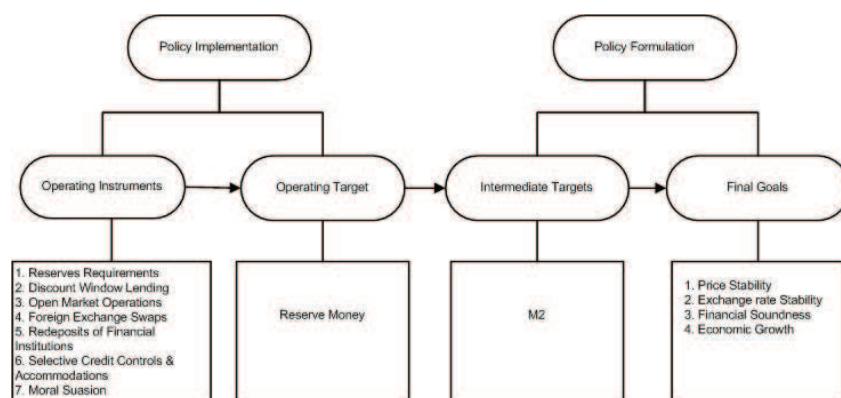
Since the mid-1980s, the CBC has adopted a framework of monetary targeting. The CBC chooses a broad monetary aggregate (M2) to be the intermediate target and reserve money to be the operating target. Since 1992, the CBC has been publishing intermediate targets on a yearly basis.

The CBC initially affects reserve money and inter-bank call loan rates with policy instruments, which in turn affect various monetary aggregates, interest rates and other financial and economic variables, and eventually achieves final goals of monetary policy. The following four subsections describe final goals and other targets.

2.1.1 Final Goals

Based on the Central Bank of China Act, the CBC's final goals include to promote financial stability, to guide sound banking operations, to maintain domestic price and exchange rate stability, and to foster economic development within the scope of the aforementioned objectives.

With regard to promoting financial stability, it contains two aspects: first, to prevent large fluctuations in financial asset prices, and second, to reduce systemic risk by providing necessary liquidity. The US sub-prime mortgage crisis resulted in a worldwide financial turmoil, indicating that financial stability is also a vital part of monetary policy management.

To maintain financial stability, the CBC closely monitors international and domestic economic conditions, and adopts appropriate measures when necessary. In addition, as the lender of last resort, the CBC provides the necessary liquidity to prevent systemic risk.

The soundness of the financial system is essential to the transmission of monetary policy. When the financial system is healthy and efficient, monetary policy can be effectively carried out.

Because the Taiwan economy is highly open and its ratio of external trade to GDP is relatively high, large swings in the NT dollar exchange rate may adversely affect economic and financial conditions. Therefore, the CBC regards managing large swings in the NT dollar exchange rate as one of its final policy goals.

In addition to achieving the three final goals mentioned above, the CBC might implement expansionary monetary policy to help stimulate economic growth during economic downturns. For instance, the CBC conducted an expansionary monetary policy in order to stimulate domestic demand as external demand turned sluggish during the Asian financial crisis, when the global IT bubble burst, and during the US sub-prime mortgage crisis.

2.1.2 Intermediate Targets

Since 1992, the CBC has adopted the monetary targeting regime. For policy formulation, the CBC selects the M2 monetary aggregate as the intermediate target. The CBC estimates money demand function using econometric methods

in December of each year to determine the target zone of M2 growth for the coming year. The projected growth rate of M2 demand from the money demand model will be used as the mid point of the M2 target range for the year.

The target zone serves as a guide for monetary policy operations throughout the year. Around the middle of the year, the CBC checks whether the growth of M2 has stayed within the target zone. If not, the CBC will analyse the causes and review whether the CBC should revise the target zone or adopt response measures to fine-tune, such as maintaining an appropriate growth of reserve money.

2.1.3 Operating Target

For policy implementation, the CBC chooses reserve money as the operating target for its daily operations. This variable is directly managed through policy instruments and is closely related to the intermediate target, M2. At the beginning of each month, the CBC determines the monthly target for reserve money. Policy instruments are then used to keep reserve money within the target range.

Although an intermediate targeting strategy is adopted, the CBC does not only follow a simple rule of monetary targeting. It also relies on discretionary judgments to fine-tune its monetary management. To accommodate rapidly changing economic and financial conditions, the CBC also uses a wide range of financial and economic indicators in the formulation and implementation of monetary policy.

Financial indicators include short-, medium-, and long-term interest rates, exchange rates, excess reserves, bank deposits and credit, and the balance of payments. Macroeconomic indicators cover imports and exports, export orders, industrial production, the rates of economic growth, inflation, and the unemployment rate.

2.1.4 Policy Instruments

The CBC uses various monetary policy instruments to achieve its operating target. These instruments include required reserve ratios on deposits, discount window facilities, open market operations (including repurchase agreements (RPs) in government securities or in negotiable certificates of deposit (NCDs) issued by the CBC), taking or releasing the redeposits of some financial institutions (mainly from the postal saving deposits of the Chunghwa Post Company), foreign

exchange swaps, selective credit controls and moral suasion. Among these policy instruments, the discount rate, reserve requirements, and open market operations are relatively important.

The discount rate is the CBC's main policy rate. In practice, the CBC can affect the volume of discount loans in two ways. One is by setting the discount rate; the other is by affecting the quantity of the loans through its administration of the discount window. Both are important policy tools as the volume of discount loans affects reserve money and monetary aggregates.

In addition to its use as a tool for monetary control, discounting is also important in preventing financial panics. The CBC, like all other central banks worldwide, is the lender of last resort for banks. In other words, when banks have no one else to borrow from, they may come to the CBC for discount loans—loans that are particularly effective for providing liquidity to the banking system during a banking crisis because the reserves are immediately channeled to the banks that need them most.

2.1.5 Monetary Transmission Mechanism in Taiwan

Monetary policy directly influences the level of bank reserves and money market interest rates, and through various channels, the effects of monetary policy are transmitted throughout the economy. Kutnner and Mosser (2002) demonstrated the transmission mechanism of monetary policy as Chart 2. Of these various channels, the credit channel, the interest rate channel, and the exchange rate channel are often discussed in Taiwan.

Over the past years, banks have played a very important role in Taiwan's financial system because they dominated the channel of funds between lenders and borrowers. In this environment, the credit channel was relatively important in the transmission mechanism of monetary policy. However, as direct finance in capital markets becomes more essential for borrowers and investors, the function of bank intermediation will be weaker than before. In other words, the significance of the interest rate channel is expected to further increase, while that of the credit channel will diminish in the future.

Chart 2
The Transmission of Monetary Policy
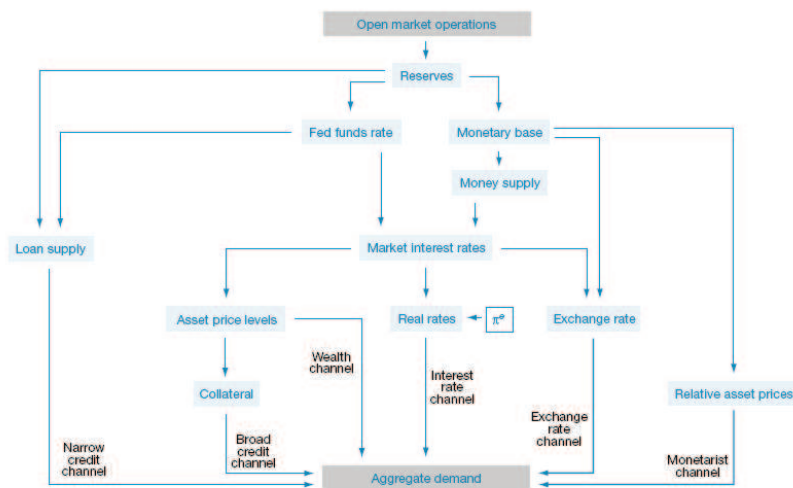
The structural changes of financial markets and the liberalisation of interest rates in the 1980s created a greater role for interest rates to transmit the effects of monetary policy. The degree to how much the interest rate channel works depends on the depth and width of financial markets. In addition, in order to make the interest rate channel work, the introduction of various financial instruments and the reform on financial system may be needed.

To enhance the interest rate channel, open market operations are used not only to manage liquidity, but also to maintain interest rate stability. In the past, while the discount rate was cut significantly, the lending rates of commercial banks, for a while, remained inflexible. To increase the transparency and flexibility of interest rate adjustments and make the monetary transmission mechanism more responsive to policy interest rate cuts, the CBC encouraged banks to introduce adjustable rate mortgages (ARMs) and adopt the new base rate lending system from June 2001 onwards. By 2005, all domestic banks and community financial institutions had adopted ARMs and the base rate system. The CBC required financial institutions to link prime rates to base rates from January 2006 onwards and, at the same time, conducted target examinations on banks' new pricing practice. In addition, from November 2008 onwards, the local banks agreed that clients could apply to reset their mortgage rates from quarterly to

217

monthly adjustments in three months, improving the transmission mechanism of the CBC's rate cuts.

On the other hand, to increase the link between policy rates and market rates, the CBC issues the short-term CDs with maturities ranging from 30 days to 182 days on a non-competitive bidding basis to guide market rates towards the desired level.

From 2006, the CBC resumed to issue one-year CDs through an interest rate auction. The advantages of issuing longer-term bills and deposits are to reduce the need for larger turnover of shorter-term sterilisations on a daily basis and to enhance the effectiveness of monetary policy.

Under a more flexible exchange rate regime, there is a greater degree of control over the money supply, in particular when capital is mobile. In these circumstances, the exchange rate becomes an important channel for the transmission of monetary policy. A change in the money supply would lead to a change in interest rates through capital flows, which results in the appreciation/ depreciation of the domestic currency. The interest rate and exchange rate effects of domestic monetary policy need to be taken more into account together. Coordination between monetary and exchange rate policies is essential. However, it is not easy to identify the exchange rate channel in Taiwan because its effects are often mixed with those of the interest rate channel.

External trade and international capital flows may influence domestic interest rates and NT dollar exchange rates, and hence affect Taiwan's highly open economy. In the past, the high growth of Taiwan's economy could be partly attributed to our outstanding external trade performance. The depreciation of the NT dollar against the US dollar has a great impact on our external trade. On the other hand, because the appreciation of the NT dollar against the US dollar can alleviate the pressure of imported inflation in Taiwan, and to some extent, it also accomplishes the CBC's primary objective of price stability. Therefore, the exchange rate channel is still an important monetary transmission channel in Taiwan.

3. Trends in Macroeconomic and Financial Data in Taiwan Since 1970

3.1 Key Macroeconomic Indicators

3.1.1 Real GDP Growth Rate and Inflation

The economic performance of Taiwan over the past two decades has generally been solid with steady growth and stable prices. Between 1989 and 2008, the average annual growth rate of real GDP (at 2001 constant prices) was 5.3%, and the average CPI (2006=100) inflation rate was 2.2% (Figure A1).

After the collapse of Lehman Brothers in September 2008, the global financial crisis battered economies worldwide, including Taiwan. Taiwan's economic growth heavily relies on external demand. As a result, Taiwan's economy contracted in the second half due to weakening external demand and suffered near zero growth for 2008 as a whole.

3.1.2 Money Supply

With few exceptions, the actual annual growth rates of M2 have remained within the yearly target zones set by the CBC since 2000 (Figure A2).

The target zone of M2 growth for 2009 is 2.5% to 6.5%. Due to the increase in the inflows of capital and the gradually enhanced effects of lowering interest rates, the average annual growth rate of M2 for the first nine months of 2009 was around 7.4%, higher than the 6.5% upper limit of the target zone.

3.1.3 Interest Rates

For recent years, the discount rate has reached a historical low, reflecting the CBC's easing monetary policy. Since the third quarter of 2008, bank lending rates and one-year time deposit rates also exhibited a declining trend as the discount rate, reflecting ample liquidity in the banking system (Figure A3).

3.1.4 Exchange Rate, Foreign Exchange Reserves and Overall BOP

Over the past two decades, the overall balance of payments was in good shape most of the time. This mainly resulted from huge current account surpluses.

For the first half of 2009, the overall balance of payments registered a surplus of US$24.71 billion, reflecting an increase in the CBC's reserve assets.

Foreign exchange reserves have increased significantly since 2001. Foreign exchange reserves reached US$291.7 billion at the end of 2008 (Figure A4), and increased by US$40.54 billion over the year to US$332.24 billion at the end of September 2009

As for exchange rates, the NT dollar against US dollar exhibited a relatively stable condition for the past decade. The yearly average of the NT dollar exchange rate against the US dollar fluctuated within the range of 30 and 35 between 1998 and 2008 (Figure A4).

3.2 Financial Development indicators

Broad money M2 divided by nominal GDP (*liqliab*) has showed an upward trend since 1982 (Figure A5). The figure reached a historic high of 217.3% in 2008, indicating stronger supply of funds in deposit markets.

Regarding the businesses size of commercial banks, the total asset of commercial bank divided by the sum of commercial banks and central bank assets (*commbank*) reached 84% in 2000, a historically high level (Figure A5). This was mainly because the government allowed the entry of new banks. The figure declined to around 74% for the past few years.

The total credit extended by commercial banks and other deposit-taking banks to the private sector as a ratio of nominal GDP (*bankcred*) showed a marked upward trend since 1970. It reached a higher level of 140.1% in 2008 (Figure A5).

3.3 Stock Market Development Indicators

The total market value of stocks in the domestic stock market divided by GDP (*mktcap*) was often an indicator of stock market performance. Due to the severe impact from the US sub-prime mortgage crisis, this ratio in Taiwan declined to 94.9% in 2008 from 170.4% in 2007.

The Taiwan Stock Exchange weighted stock price index (TAIEX) and the ratio of stock transaction value to GDP (*valtrade*) exhibited similar movements

since 1976. This ratio in 2008 was 211.6%, slightly lower than the average of 225.4% for the past decade (Figure A6.1).

The turnover rate of Taiwan's stock market is defined as the total transaction value divided by the total market value of listed stocks (*turnover*). It showed that the stock market has been active, because the average turnover rate reached 261% for the past two decades (Figure A6.2). When market participants have different expectations about the future stock market development, this will usually spur market turnover.

3.4 External Integration Indicators

3.4.1 Openness of Trade Sector

Taiwan is a small and highly open economy, and the major impetus of economic growth comes from external demand. The ratio of external trade (i.e. exports plus imports) to GDP has been increased from around 60% in 1970 to 144% in 2008 (Figure A7). That means trade integration in Taiwan becomes more and more important. Higher dependence on external trade will not only affect the exchange rates, but also impact our economy if a huge change in external demand takes place. As mentioned above, the interest rate and exchange rate effects of domestic monetary policy need to be taken more into account together.

3.4.2 Status of Current Account

With respect to the current account, there was a significant pattern in Taiwan for many years, that is, a larger trade surplus on goods account and a smaller surplus on income account, coupled with a relatively smaller deficit on current transfers and services account.

Because the trade balance in goods accounts for the largest portion of the current account balance, the goods account has dominated the current account for many years. For the first half of 2009, the current account posted a surplus of US$22.59 billion.

Since 2001, there has been a large current account surplus in Taiwan each year, which contributes to Taiwan's overall balance of payments (Figure A8).

3.4.3 Status of Financial Account

According to the past data, capital account balance tends to be more volatile, because capital flows are sensitive to the changing domestic and global economy as well as market conditions.

Many factors may influence financial flows, such as the changes in US interest rates and the US dollar, management strategies of domestic banks (such as the need for hedging, portfolio management), and the government's policies.

For the first half of 2009, financial account showed a net inflow of US$38.84 billion, with a US$84.24 billion net inflow in other investment and a US$15.05 billion and US$36.68 billion net outflow in foreign direct investment and portfolio investment, respectively.

3.5 Indicators of Key Financial Aggregates

Financial institutions assets divided by GDP had shown a continued upward trend since 1970, exceeding 350% in 2008 (Figure A9.1).

The ratio of equities to GDP has indicated an increasing trend since the 1990s, reflecting firms raising funds from an active stock market. Compared with equities, the bond market was less developed in Taiwan. The ratio of outstanding bonds to GDP reached 20% for the first time in 2003 and stayed at around 20% for the past few years (Figure A9.2).

The Statute for Financial Assets Securitisation and The Statute for Real Estate Securitisation were enacted in July 2002 and July 2003, respectively. Therefore, the development of assets securitisation is still in early stage in Taiwan. The ratio of beneficiary securities on asset securitisation to GDP is still very low, less than 3% in 2008 (Figure A9.2).

4. Monetary Policy Management and the Macro Economy in Taiwan

From the above analysis for the trend of macroeconomic and financial indicators, we discovered some important features in Taiwan. First, the importance of direct finance has gradually increased relative to indirect finance. Apart from borrowing from banks, the other two ways for firms to raise funds are from equities and bonds markets. We will call these two ways direct finance for the rest of this paper. Second, due to higher trade integration, Taiwan's

performance of economic growth heavily relies on external demand. Because the IT bubble burst crisis and the present global financial crisis battered Taiwan's real economy, not only did Taiwan show a negative economic growth in 2001, but it is also projected to exhibit a contraction in 2009. Both are related to weak external demand. Third, deposit rates and bank lending rates obviously exhibited changes in the same direction as the discount rate changes. That implies that interest rate pass-through may exist in financial system.

Next, in this paper, we mainly examine if direct finance can affect the transmission channel of monetary policy to bank lending rates and deposit interest rates (early and middle link). Besides, we will explore if direct finance can affect monetary policy transmission (final link) by weakening the impact of interest rate changes on aggregate demand.

4.1 Empirical Model

4.1.1 Model Specification of Monetary Transmission in the Presence of Direct Finance

In this section, our study is based on the dynamics IS Curve by Rudenbush and Svenson (1999), Estrella (2002) and Goswami et al. (2009). This model initially was used for testing the hypothesis that securitisation limits the efficacy of monetary policy to affect real economic variables. The rationale for this is that now banks can substitute traditional liabilities to finance credit supply, with money demand more likely to be met at a given policy or target rate set by monetary authorities. This equation models the effect of the change in real interest rates on the output gap. Estrella (2002) and Goswami et al. (2009) specified dynamic IS equation as follows.

$$y_t = \alpha(w_t) + \sum_{j=1}^{p} \beta_j y_{t-j} + \gamma_1(w_t)\left(\bar{i}_{t-1} - \bar{\pi}_{t-1}\right) + \varepsilon_t ; \tag{1}$$

where
$$\alpha(w_t) = \alpha$$
$$\gamma_1(w_t) = \gamma_1 < 0$$

The variable y_t is output gap (denoted by LOGGAP in the representation below) defined by the logarithm difference between actual real GDP (at 2001 constant prices) and potential real GDP[1]. For this study, potential real GDP is

_____
1. Potential GDP refers to the highest level of real GDP that can be sustained over the long term.

223

computed by using the Hodrick and Prescott (HP) filter. As for the optimal lag length p, we sequentially add lagged y_t variables in the equation and at each stage to test their statistical significance and the serial correlation of residuals. $\bar{i}_t$ represents the four-quarter average of the current and lagged policy interest rate; $\bar{\pi}_t$ is the four-quarter average of the current and lagged CPI inflation rate[2]; $\bar{i}_t - \bar{\pi}_t$ represents the real interest rate (denoted by REALINT in the representation below); ε_t is random disturbance term.

As stated by Rudenbush and Svenson (1999, p. 207), γ_1 is a simple representation of the monetary transmission mechanism, which, in the view of many central banks, likely involves nominal interest rates (e.g. mortgage rates), ex ante real short and long rates, exchange rates, and possibly direct credit quantities as well. Equation (1) appears to be a workable approximation of these various intermediate transmission mechanisms. In fact, γ_1 should be negative in theory. It means that the fall in real interest rate will enhance real GDP, and the rise in real interest rate will reduce real GDP.

This paper will focus on the changes in γ_1 coefficient. By looking at alternative regressions to analyse the effect of direct finance, two models are examined: the base case (below Model I) and the alternative cases (below Model II). The alternative model adjusts the base model by introducing direct finance (EB) and other control variables (CVs), which affect both the intercept and slope of the regression. EB is calculated as the sum of equity and bond to GDP; namely, EB = (market capitalisation of equities market plus outstanding amounts of bonds markets)/GDP. Comparison is done between both cases, and we shall focus on whether there is significant contribution reflected in the slope term or not. The empirical model is estimated using OLS.

Model I: the base case [IS dynamic equation of output gap]

$$\text{Where} \quad \alpha(w_t) = \alpha_1 \quad \text{and} \quad \gamma_1(w_t) = \gamma_1$$

Thus dependent variable is y_t, the explanatory variables include a constant term, lagged y_t, the real interest rate (i.e. $\bar{i}_t - \bar{\pi}_t$)

_____

2. $\grave{A}t$ is quarterly CPI (base year=2006) inflation in percentage points, i.e. 100*(ln Pt – ln Pt-1).

Model II: Intercept and elasticity varying with EB [IS dynamic equation
of output gap linearly with Instrument Variable Controls for
direct finance and other control variables]

where $\alpha(w_t) = \alpha_1 + \alpha_2 EB_t + \sum \alpha_n CV$ and $\gamma_1(w_t) = \gamma_{1,1} + \gamma_{1,2} EB_t + \sum \gamma_{1,n} CV$;

To test the effects of EB and other CVs on the reaction to monetary policy
moves, we allow the coefficients of the real interest rate $\gamma_1(w)$, and the intercept
term $\alpha(w)$, to vary with EB and other CVs. In this paper, the openness in the
trade sector (OPEN) variable is control variable, which equals the ratio of the
sum of exports (including merchandise and services) plus imports (including
merchandise and services) to nominal GDP. Thus, dependent variable is y_t, and
the independent variables are the constant terms (which includes the constant,
EB and OPEN), lagged y_t, the elasticity of the real interest rate (i.e. $\bar{i}_t - \bar{\pi}_t$) and
various elasticity terms conditioned by the real interest rate such as EB and
OPEN variables along with interaction variables.

4.1.2 Model Specification of Interest Rate Pass-through in the Presence of Direct Finance

After exploring monetary transmission in the presence of direct finance, we
further do a test for interest rate pass-through. This equation can simply be
based on the structural identification of the policy rate affecting market interest
rates. In addition, we will understand how the rising direct finance affects the
interest rate pass-through of monetary policy on the level of market interest
rates. If the policy interest rate and market rates have a unit root, we will test
for a co-integration relationship.

If there is co-integration relationship existing between the policy interest
rate and market rates, then we will employ error-correction model (ECM) to
analyse the interest rate pass-through. If not, we will refer to Goswami et al.
(2009) to specify the interest rate pass-through equation as follows.

$$irmk_t = \alpha + \sum_{j=1}^{p} \beta_j irmk_{t-j} + \sum_{j=0}^{p} (\gamma_{j+1,1} + \gamma_{j+1,2} EB_t) ird_{t-j} + \varepsilon_t \qquad (2)$$

$$\gamma_{j+1,1} > 0$$

where $irmk_t$ is market interest rates, denoting either bank lending rates (denoted
by IRLOAN in the representation below) or one-year time deposit interest rates
(denoted by IRTDY1 in the representation below); ird_t is the   discount rate

(denoted by IRDIS); EB represents direct finance as before; p is lag length. Theoretically, $\gamma_{j+1,1}$ shall be positive in equation (2).

4.2 Empirical Result

4.2.1 Unit Root Test

We first analyse all empirical data discussed in this paper. Non-integration and level stationary of endogenous variables shall be confirmed when we use OLS estimation method. Thus, we analyse the stochastic properties of each variable in our sample period in order to ascertain mean reversion by ruling out stochastic behavior.

Unit root tests will be run based on Phillips-Perron (1988) and the Augmented Dickey-Fuller (ADF). Table 1 shows the results of unit root test, using data from 1990:Q1 to 2008:Q4.

Table 1
Unit Root Test Result
(1990:Q1 ~ 2008:Q4)

Variable Names	PP Test	ADF Test
Level		
$LOGGAP_t$	-5.17***(13)	-2.99**(5)
$REALINT_t$	-1.41(4)	-1.56 (4)
$IRDIS_t$	-1.57 (4)	-1.77 (1)
$IRLOAN_t$	-1.01 (5)	-0.98 (1)
$IRTDY1_t$	-1.22 (2)	-1.07 (1)
EB_t	-2.06 (2)	-1.99 (0)
$OPEN_t$	-1.75 (75)	0.23 (8)
First Difference		
$D(LOGGAP_t)$	-10.70***(16)	-4.01*** (4)
$D(REALINT_t)$	-8.87***(4)	-4.18*** (3)
$D(IRDIS_t)$	-4.92 ***(1)	-4.75 ***(0)
$D(IRLOAN_t)$	-3.87***(8)	-4.12***(1)
$D(IRTDY1_t)$	-4.12***(7)	-4.62 ***(1)
$D(EB_t)$	-7.23***(8)	-6.97***(1)
$D(OPEN_t)$	-18.84***(26)	-2.98**(7)

Note 1. There is only an exogenous regressors (i.e. constant term) included in PP and ADF test equation.
    2. The number of parentheses refer to Newey-West automatic bandwidth selection for PP test, and automatic selection of lag length based on SIC for ADF test, respectively.
    3. *,**, and *** indicate the 10%, 5% and 1% level of statistical significance (two-tailed).

In this paper, we obtain that the output gap (LOGGAP) is I(0) level stationary. As for the real interest rate (REALINT), discount rate (IRDIS), bank lending rate (IRLOAN), one-year time deposit interest rate (IRTDY1), direct finance (EB), and the openness of external trade (OPEN) are all I(1) level non-stationary. Therefore, we take the first difference for these I(1) variables in OLS estimation[3].

4.2.2 Analysis of Monetary Transmission in the Presence of Direct Finance

Table 2 presents the estimation results of equation (1), using data from 1990:Q1 to 2008:Q4. The first column presents estimates of the base case equation (1), which is similar to that in Rudebusch and Svensson (1999), except for y_{t-3}, which originally specified as AR (2). From Table 2, we know that one, two, and three period of lag output gap is significant in explaining current output gap.

It is worth emphasising that, from Table 2, we found that there are three possible obvious structural changes in the second quarter of 2001, 2003 and in the fourth quarter of 2008, respectively. The second quarter of 2001 and 2003 stands for the IT bubble burst crisis and Severe Acute Respiratory Syndrome (SARS), respectively, both caused a sharp slowdown in real GDP. The fourth quarter of 2008 was due to the spread of worldwide financial crisis. As a result, there is a big discrepancy between actual real GDP and potential real GDP in the three different time periods. Thus, we create three dummy variables D2001Q2, D2003Q2 and D2008Q4, which take a value equal to 1 in the second quarter of 2001 and 2003, and fourth quarter of 2008, respectively (others equal to 0), to correct the discrepancy. In addition, S1 and S3 are significantly different from zero, which denote seasonal dummy variables of the first quarter and the third quarter, respectively.

On the other hand, output gap does not significantly respond to the lagged real interest rate. The coefficient of first difference of REALINT(-1) is negative, but insignificantly different from zero. As real GDP comprises real consumption, real investment and net real exports, so this result could be attributed to three possible reasons. First, real interest rate is not the only factor influencing real private investment, and more other factors, such as world economic growth,

──────────

3.   Actually, some papers introduced a time trend (t) in OLS estimation.

export orders growth, expectation of domestic economic growth, tax and political environment, could affect real private investment as well. Second, with a relatively high savings ratio (i.e. gross national savings divided by GNP) of above 25% in Taiwan, the reduction in real interest rates could result in the fall in real private consumption. Third, Taiwan is a small and highly open economy, so exchange rates may play a key role in stimulating economic growth as well, besides the policy interest rate.

Columns 2-4 in Table 2 contain estimation results of variants of equation (1), in which only the intercept, only the interest rate elasticity, and both terms are allowed to vary with D(EB). We found that D(EB) cannot influence the constant term and the slope of equation (1). First, we see from Table 2 that if only the intercept is allowed to vary, this additional parameter is not significantly different from zero. When only the interest rate elasticity is allowed to vary, the OLS estimation results indicate that the interaction term of D(EB) and the difference of real interest rates has a positive coefficient and is not statistically significant. Even though direct finance is more rapidly developed than before in Taiwan, it does not seem to significantly affect the response of output to the changes in monetary policy. This could be because small and medium-sized enterprises account for nearly 98% of all enterprises in Taiwan, which still heavily rely on bank credit. As a result, direct finance may not undermine the transmission of monetary policy. If the intercept and the interest elasticity are allowed to vary with D(EB), we found that the coefficients of D(EB) and of the interaction term of D(EB) and the difference of real interest rates are still insignificantly different from zero.

After adding D(OPEN) control variable, we found that the coefficients for the interaction term of D(EB) and the difference of real interest rates, the interaction term of D(OPEN) and difference of the real interest rates, all have negative signs but are not statistically significant (see column 5 in Table 2). In other words, it is not evident that higher D(EB) and D(OPEN) have changed the transmission mechanism of monetary policy. Also, for the joint effect of D(EB) and D(OPEN) variables, the result indicates that the openness of trade sector does not statistically amplify or dampen the impact of direct finance on the effect of monetary policy (see column 6 in Table 2).

We need to point out here that different control variables, such as credit growth, have been examined in the intercept and slope terms, and those which have been found to be insignificant from zero have been excluded.

Table 2
OLS Estimation: IS Dynamic Equation of Output Gap Linearly with Instrumental Variable Controls for Direct Finance and Openness of Trade Sector*
(1990:Q1 ~ 2008:Q4)

	Model I	Model II				
		LOGGAP				
	Base case	Intercept varying with EB	Elasticity varying with EB	Intercept and Elasticity varying with EB	Intercept and Elasticity varying with EB and OPEN	Intercept and Elasticity varying with EB and OPEN, and joint effects of EB and OPEN
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.307	0.269	0.318	0.238	0.473*	0.498*
	(1.55)	(1.36)	(1.59)	(1.17)	(1.68)	(1.74)
LOGGAP(-1)	0.977***	0.989***	0.972***	1.002***	0.984***	0.975***
	(14.08)	(14.32)	(13.76)	(13.86)	(13.38)	(13.04)
LOGGAP(-2)	-0.485***	-0.484***	-0.491***	-0.474***	-0.397***	-0.380***
	(-5.18)	(-5.22)	(-5.17)	(-5.02)	(-3.62)	(-3.39)
LOGGAP(-3)	0.306***	0.322***	0.312***	0.316***	0.287 **	0.280***
	(2.79)	(2.96)	(2.81)	(2.88)	(2.53)	(2.43)
D(REALINT(-1))	-0.444	-0.421	-0.406	-0.476	-0.584	-0.529
	(-1.09)	(-1.05)	(-0.98)	(-1.15)	(-1.38)	(-1.22)
D2001Q2	-3.779***	-3.743***	-3.802***	-3.694***	-3.611***	-3.775***
	(-3.09)	(-3.10)	(-3.09)	(-3.04)	(-2.96)	(-3.04)
D2003Q2	-4.444***	-4.476***	-4.440***	-4.493***	-4.497***	-4.451***
	(-3.66)	(-3.73)	(-3.64)	(-3.72)	(-3.71)	(-3.64)
D2008Q4	-6.522***	-6.071***	-6.525***	-5.921***	-7.346***	-5.620***
	(-5.23)	(-4.80)	(-5.21)	(-4.57)	(-4.38)	(-2.08)
S1	-2.217***	-2.329***	-2.201***	-2.391***	-3.038***	-3.135***
	(-4.90)	(-5.14)	(-4.82)	(-5.13)	(-4.46)	(-4.51)
S3	1.598***	1.847***	1.561***	1.986***	1.771***	1.864***
	(3.45)	(3.80)	(3.30)	(3.70)	(3.11)	(3.10)
D(EB)		1.556		2.054	2.496	2.641*
		(1.56)		(1.60)	(1.88)	(1.93)
D(OPEN)					-3.872	-3.390
					(-1.334)	(-1.12)
D(EB)*D(OPEN)						-13.504
						(-0.91)
D(EB)*REALINT(-1)			0.750	-1.209	-1.999	-2.388
			(0.49)	(-0.62)	(-0.96)	(-0.99)
D(OPEN)*REALINT(-1)					-2.178	-2.112
					(-0.42)	(-0.39)
D(EB)*D(OPEN)*REALINT(-1)						21.810
						(0.78)
Adj. R^2	0.796	0.801	0.794	0.799	0.799	0.796
Durbin-Watson Stat.	2.168	2.299	2.172	2.339	2.138	2.100
F Statistic	33.564	31.113	29.882	28.051	23.877	20.463
Prob(F Statistic)	0.000	0.000	0.000	0.000	0.000	0.000

*: Different control variables (CVs), such as credit growth, have been examined in the intercept and slope, and those which have been found to be insignificant from zero have been excluded.

Note 1. t statistic are in parentheses.
2. *, **, and 888 indicate the 10%, 5%, and 1% level of statistical significance (two-tailed).
3. The shaded areas highlight the coefficient values of the interest rate elasticity of the output gap.
4. D2001Q2, D2003Q2, D2008Q4 denote dummy variables of the IT bubble burst crisis, SARS, global financial crisis, respectively.
5. S1 and S3 denote seasonal dummy variables of the first quarter and the third quarter, respectively.

4.2.3 Analysis of Interest Rate Pass-through in the Presence of Direct Finance

First, let us take a look at Figure A3 at first. From Figure A3, we found there is a positive relationship among the discount rate, bank lending rates, and one-year time deposit interest rates. Because IRDIS, IRLOAN and IRTDY1 are I(1), we then adopt the Johansen(1988) technique to test their co-integration relationship.

The trace test λ_{trace} and maximum eigenvalue test λ_{max} in Table 3 both show that no cointegration relationship exists at the 5% significance level between the discount rate and bank lending rates, and between the discount rate and one-year time deposit interest rates. Thus, we apply equation (2) to analyse interest rate pass-through.

Table 3
Cointegration Test
(1990:Q1 to 2008:Q4)

Model	D(IRLOAN)		D(IRTDY1)	
	Base case	Elasticity varying with D(EB)	Base case	Elasticity varying with D(EB)
	(1)	(2)	(1)	(2)
Constant	-0.039**	-0.041**	-0.039**	-0.040**
	(-2.56)	(-2.62)	(-2.52)	(-2.62)
D(IRLOAN(-1))	0.288***	0.279***		
	(2.94)	(2.73)		
D(IRDIS)	0.405***	0.384***	0.744***	0.782***
	(6.54)	(5.11)	(10.94)	(9.67)
D(IRDIS(-1))	0.148*	0.205**	0.201***	0.199**
	(1.81)	(2.27)	(2.88)	(2.41)
D(EB)*D(IRDIS)		-0.008		0.429
		(-0.02)		(1.14)
D(EB)*D(IRDIS(-1))		-0.565		-0.339
		(-1.45)		(-0.79)
Adj. R^2	0.660	0.661	0.742	0.734
Durbin-Watson Stat.	1.956	1.989	1.747	1.776
F Statistic	49.547	30.265	105.39	52.84
Prob(F Statistic)	0.000	0.000	0.000	0.000

Note 1. r represents the number of different cointegration vectors.
2. * denotes rejection of the null hypothesis at the 5% level.
3. The number of lag period is 4 quarters.

230

Table 4 presents the OLS estimation results of bank lending and deposit interest rates pass-through, using data from 1990:Q1 to 2008:Q4. The first column presents the estimates of the base case equation (2), and it shows that both the change in bank lending rates and deposit rates are sensitive to the change in the discount rate.

Next, we would like to know by allowing D(IRDIS) and D(IRDIS(-1)) to vary with the D(EB) in equation (2), whether the change in bank lending rates (D(IRLOAN)) or the change in one-year time deposit interest rates (D(IRTDY1)) will be affected. As a result, we find the interaction coefficient (i.e. D(EB)*D(IRDIS) and D(EB)*D(IRDIS(-1))) between D(EB) and the difference of the discount rate, as well as the one period lag discount rate, have negative signs but are not statistically different from zero in D(LOAN) equation. This indicates that the rise of direct finance does not seem to dampen the sensitivity of the change in bank lending rates to the change in the discount rate. On the other hand, the change in direct finance also does not affect the sensitivity of the change in deposit interest rates to the change in the discount rate.

Table 4
OLS Estimation Results of the Lending and Deposit Rate Pass-through, Linearly with Instrumental Variable for Direct Finance
(1990:Q1~2008:Q4)

Model	D(IRLOAN)		D(IRTDY1)	
	Base case	Elasticity varying with D(EB)	Base case	Elasticity varying with D(EB)
	(1)	(2)	(1)	(2)
Constant	-0.039**	-0.041**	-0.039**	-0.040**
	(-2.56)	(-2.62)	(-2.52)	(-2.62)
D(IRLOAN(-1))	0.288***	0.279***		
	(2.94)	(2.73)		
D(IRDIS)	0.405***	0.384***	0.744***	0.782***
	(6.54)	(5.11)	(10.94)	(9.67)
D(IRDIS(-1))	0.148*	0.205**	0.201***	0.199**
	(1.81)	(2.27)	(2.88)	(2.41)
D(EB)*D(IRDIS)		-0.008		0.429
		(-0.02)		(1.14)
D(EB)*D(IRDIS(-1))		-0.565		-0.339
		(-1.45)		(-0.79)
Adj. R^2	0.660	0.661	0.742	0.734
Durbin-Watson Stat.	1.956	1.989	1.747	1.776
F Statistic	49.547	30.265	105.39	52.84
Prob(F Statistic)	0.000	0.000	0.000	0.000

Note 1. t statistics are in parentheses.
   2. *, **, and *** indicate the 10%, 5%, and 1% level of statistical significance (two-tailed).
   3. The shaded areas highlight the coefficient values of the first difference interest rate pass-through.

5. Impact of Crisis on Real Economy in Taiwan

5.1 Examination of Recent Macroeconomic and Financial Indicators

5.1.1 Seriously Contraction of Real GDP

Due to the impact of the global financial crisis, Taiwan's real GDP (at 2001 constant prices) has contracted significantly since the second half of 2008. Following the 8.61% negative growth of the fourth quarter of 2008, Taiwan's real GDP still shrank a record 10.13% in the first quarter of 2009, largely due to a sharp fall in export and private investment spending. Taiwan's real GDP contracted by 7.54% in the second quarter, better than the first quarter in 2009 (see Table 5).

5.1.2 A Slow Pace of Contraction in Export, Export Orders and Industrial Production

Due to weak external demand, export orders have exhibited a negative growth for twelve consecutive months since October 2008. Besides, export also has posted thirteen consecutive months' negative growth since September 2008 (see Table 5). However, with a slow pace of contraction, month by month, the poor performance of exports and export orders are generally improving from February 2009 onwards, due to the gradual recovery of worldwide economy. In the future, as long as external demand continues to improve, Taiwan's real economy is likely to gradually recover as well.

5.1.3 A Higher Unemployment Rate

Taiwan's labour market softened from September 2008, mainly attributable to a weakened economy at home and abroad. Taiwan's average unemployment rate in the first nine months of 2009 reached 5.85%, up 1.92 percentages point from the same period of 2008 (see Table 5).

5.1.4 Maintaining a Low Policy Interest Rate

In order to stabilise the domestic financial system and promote domestic economic growth, the CBC continued to cut its policy rate (i.e. the discount rate) seven times, and the discount rate dropped to 1.25% in February 2009. Following the decreased discount rate, the inter-bank overnight call-loan rate has sharply dropped to around 0.10% (see Table 5).

5.1.5 Continued Low NPL Ratios

The global financial crisis set off by the US housing bubble burst has severely undermined financial systems in the US and Europe. In contrast, Taiwan's financial system remains relatively stable, financial intermediation functions normally, and problems such as liquidity shortage and undercapitalisation are generally absent. In 2001, the average non-performing loan (NPL) ratio of domestic banks once exceeded 10% due to the burst of IT bubble. Later on, banks actively dealt with non-performing loans and wrote off bad loans, plus enhanced risk management and internal audit, the NPL ratio continued to decline. For the past two years, the NPL ratio of domestic banks is relatively low, maintaining below 2% (see Table 5).

5.1.6 Weak Demand for Bank Loans

Due to less globalisation of domestic banks and less investment in complicated new financial products, the spread of the global financial crisis resulted in relatively limited loss of domestic banks. As a result, the NPL ratio of domestic banks is still low. Sluggish growth of bank loans reflected weak demand for funds, and banks' conservative lending attitude during economic recession. The weak demand for bank loans is related to the uncertainty of future economic prospects and the public's lack of confidence.

5.1.7 Gradually Rising Market Capitalisation of Stock Market

The market capitalisation of stock markets is highly correlated with the performance of stock market. Severely hit by the US sub-prime mortgage crisis, TAIEX dropped to around 4,000 points in November 2008. As a result, the market capitalisation of stock markets also decreased sharply from September 2009 to November 2009. Later, some factors, such as financial crisis tending to stabilise, the stimulus of easing monetary policy and fiscal packages, and rush orders from Mainland China, all contributed to the bounce of Taiwan stock market. In addition, the recent remarkable improvement in cross-strait relationship and clear signs of recovery for the global economy also help push up the market capitalisation of Taiwan stock market. Compared with January 2009, market capitalisation of Taiwan stock market in September 2009 increased by 76.2% (see Table 5).

Table 5
Recent Performance of Taiwan's Macroeconomic and Financial Indicators

Unit ：%

year /month	Macroeconomic Indicators						Financial Indictators				
	Economic Growth Rate (at 2001 constant prices)	Exports Growth (counted in US dollar)	Exports Order Growth	Industrial Production Growth	Unemploy-ment Rate	CPI Inflation (2006=100)	Discount Rate (end of month)	Interbank Overnight Call-Loan Rate	Non-performing Loan Ratio of Domestic Banks	Bank Loan Growth	Market Values of Stock Market (Billion of NT$)
2001	-2.17	-16.9	-11.5	8.4	4.57	-0.01	2.125	3.69	11.27	-2.72	10248
2002	4.64	7.1	11.2	7.5	5.17	-0.20	1.625	2.05	8.85	-2.17	9095
2003	3.50	11.3	12.6	9.1	4.99	-0.28	1.375	1.10	6.08	4.38	12869
2004	6.15	21.1	26.5	9.3	4.44	1.61	1.750	1.06	3.80	10.71	13989
2005	4.16	8.8	19.2	3.8	4.13	2.31	2.250	1.31	2.24	8.13	15634
2006	4.80	12.9	16.7	4.7	3.91	0.60	2.750	1.55	2.13	2.57	19377
2007	5.70	10.1	15.5	7.8	3.91	1.80	3.375	2.00	1.84	2.40	21527
2008	0.06	3.6	1.7	-1.8	4.14	3.53	2.000	2.01	1.54	2.49	11707
2008/1		11.8	16.9	12.7	3.80	2.94	3.375	2.09	1.83	2.81	19140
2		18.3	18.1	16.1	3.94	3.86	3.375	2.08	1.79	2.07	21383
3	6.25	22.7	12.8	9.8	3.86	3.94	3.500	2.08	1.69	2.16	21735
4		13.9	15.7	10.5	3.81	3.88	3.500	2.11	1.65	2.03	22645
5		20.5	14.5	5.7	3.84	3.71	3.500	2.10	1.61	2.54	21892
6	4.56	21.2	9.3	5.2	3.95	4.97	3.625	2.11	1.55	3.22	19137
7		7.9	5.5	1.9	4.06	5.81	3.625	2.17	1.54	3.31	17894
8		18.2	5.4	0.7	4.14	4.68	3.625	2.16	1.53	3.34	17975
9	-1.05	-1.6	2.8	-1.2	4.27	3.10	3.500	2.09	1.53	3.53	14584
10		-8.3	-5.6	-12.5	4.37	2.39	3.000	1.93	1.54	4.14	12403
11		-23.3	-28.5	-28.3	4.64	1.94	2.750	1.41	1.60	4.13	11365
12	-8.61	-41.9	-33.0	-32.0	5.03	1.27	2.000	0.87	1.54	2.49	11707
2009/1		-44.1	-41.7	-43.3	5.31	1.48	1.500	0.23	1.57	1.17	10844
2		-28.6	-22.3	-27.2	5.75	-1.33	1.250	0.14	1.61	0.28	11636
3	-10.13	-35.8	-24.3	-25.8	5.81	-0.15	1.250	0.14	1.63	-0.18	13199
4		-34.3	-20.9	-20.0	5.76	-0.46	1.250	0.13	1.63	-0.23	15098
5		-31.5	-20.1	-18.4	5.82	-0.09	1.250	0.10	1.61	-0.93	17349
6	-7.54	-30.4	-10.9	-11.3	5.94	-1.98	1.250	0.10	1.50	-1.29	16215
7		-24.5	-8.8	-7.9	6.07	-2.32	1.250	0.10	1.47	-1.45	17893
8		-24.6	-12.0	-9.6	6.13	-0.81	1.250	0.10	1.44	-0.9	17330
9		-12.7	-3.0	1.0	6.04	-0.86	1.250	0.10	1.38	-1.19	19108

Source: DGBAS, Ministry of Economic Affairs, Ministry of Finance, and Central Bank of the Republic of China (Taiwan).

In summary, the performance of economic indicators in the recent global financial crisis is actually similar to those when IT bubble burst in 2001. For instance, the severe contraction of real GDP, increasing unemployment rate, negative growth in exports, industrial production, and export orders, etc, all resulted from weak external demand. However, there was at least one significant difference between this global financial crisis and the IT bubble burst crisis. During the IT bubble burst period, the slowdown in economic growth adversely affected the financial conditions of enterprises while the steadily rising

234

unemployment rate weakened individuals' ability to service their debt. As a result, the NPL ratio reached 11.27% at the end of 2001, and peaked at 11.74% in March 2002. This was partly owing to an accelerating slide in the local economy resulting from the impact of September 11 terrorist attacks in the US, and the inclusion of a vast amount of bad loans associated with the take-over of 36 problem community financial institutions by 10 domestic banks.

On the other hand, during the global financial crisis in 2008-2009, the government allowed unemployed workers and some troubled enterprises to defer their payment of principal and interests for housing loans and business loans, respectively, and extended housing loan periods to 30 years. Furthermore, the Small and Medium Enterprise Credit Guarantee Fund raised the guarantee coverage percentage on borrowings made by small and medium-sized enterprises, and banks strengthened their risk management. As a result, the NPL ratio just slightly rose, compared with prior to this global financial crisis.

This paper uses the Chart 3 framework conceptualised by Bayoumi and Melander (2008) to explain macro-financial link during financial crisis period. The IT bubble burst period is a good case for explaining macro-financial links.

Chart 3
A Framework for Macro-Financial Link

Source: Bayoumi and Melander (2008).

235
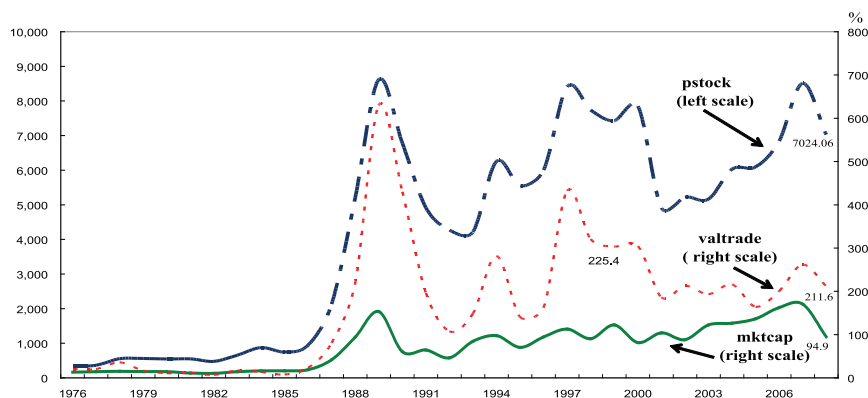
During the IT bubble burst period, a sharp contraction in real GDP due to weak external demand resulted in the rising unemployment rate and falling industrial production, and households and firms could not service their debt, thus NPL continued to rise. Due to the increasing NPL ratio, banks' capital adequacy ratios (CARs) fell. Thus banks were induced to tighten their lending standards to reduce the quantity of credit and restore the CARs. The channel in Chart 3 can be demonstrated by arrows from INCOME ---> CARs ---> Lending Standards ---> Credit. As a result, a tightening of lending standards caused a decrease in the quantity of credit, as shown in the second link. When credit availability fell, there was a direct effect on spending due to credit constraints. This is a key link from CREDIT to SPENDING in Chart 3. Income fell as spending dropped. The final link is the feedback loop from income through balance sheets of banks, firms and household. As spending and income fell, loan losses gradually increased and the NPL ratio deteriorated further. Due to the deterioration of incomes and balance sheets for firms and households, the borrowing from banks decreased. This channel is represented by an arrow from INCOME to CREDIT in Chart 3. Taking this feedback mechanism into account, the final effect of the NPL ratio shock on aggregate demand is larger than the direct effect. To prevent the problem from getting worse, the government helped set up the asset management company in May 2001 to absorb bad loans, and encouraged banks actively to deal with non-performing loans and write off bad loans. Therefore, as the feedback loop was split, the NPL ratio fell gradually. The NPL ratio declined from 11.27% at the end of 2001 to 8.85% at the end of 2002 (Table 5).

The economic performance in the East Asian Financial Crisis period in 1997-1998, actually, was relatively healthy and favorable. This may be related to the better domestic real economy, continued surplus in the current account, low external debt, high foreign exchange reserves, rapid reaction of firms, and orderly opening of the capital account. Therefore, East Asian Financial Crisis just had a little adverse impact on macro-financial link.

The spread of the global financial crisis in the second half of 2008 simply resulted in relatively limited loss for domestic banks, due to less globalisation and less investment in complicated new financial products of domestic banks. Furthermore, the government took some measures to stabilise the financial system. As a result, income fell due to weak external demand, but the NPL ratio of domestic banks was still low. Bank loans exhibited sluggish growth, mainly because of weak demand for funds, and partly because of banks' conservative lending attitude during the early stage of economic recession. Fall in credit leads to decreased spending and income.

Global financial crisis leads to global economic recession. With a relatively sound financial system, the external demand shock resulted from global recession has a bigger adverse impact than financial shock on the real economy. As long as the global economy continues to recover, coupled with an easing monetary policy and an expansionary fiscal policy, this finally will exert a good macro-financial links.

In the next section, we will analyse and discuss how the CBC used monetary policy management to react to financial crisis, explaining further how the CBC and the other government agencies coordinate to maintain financial stability.

5.2 Monetary Policy Management Reaction to Financial Crisis in Recent Years

5.2.1 East Asian Financial Crisis Period in 1997- 1998

Globalisation leads to rapid capital flows. Especially, short-term capital flows are more volatile. If a country's foreign exchange rate is inflexible, then the expectation of currency appreciation could lead to a surge in capital inflows. Surging capital inflows could give rise to excessive growth in bank credit and money supply, as well as speculative bubbles in real estate and stock markets. Once the bubbles burst, sudden reversals of capital flows will result in a currency crisis, as well as a collapse of the financial system, and eventually undermine the economy. This phenomenon was actually observed across a number of Asian economies during the Asian financial crisis in 1997-1998.

During the 1997-1998 crisis periods, large capital outflows from Asia exerted a downward pressure on the NT dollar, tightened Taiwan's financial conditions, and threatened the stability of the economy. The CBC took the following response measures:

5.2.1.1 Reducing Depreciation Expectations of the NT Dollar

The CBC stepped in the foreign exchange market from July to October in 1997 to curb depreciation expectations of the NT dollar. As a result of heavy intervention, foreign exchange reserves fell by US$7 billion within four months. At the same time, monetary conditions tightened, interest rates went up and stock prices fell sharply.

5.2.1.2 Alleviating the Volatility in the Money Market and Conducting a Flexible Exchange Rate Policy

As the Asian financial crisis showed no signs of abating, the CBC decided to change its policy approach in order to shield the asset markets and the real economy from the damage caused by the prolonged monetary tightness. In mid-October 1997, the CBC ceased to defend the exchange rate, and at the same time lowered required reserve ratios.

The NT dollar consequently exhibited a sharp downward trend from mid-October 1997 onwards and reached a low of 34.4 against the US dollar in mid-January 1998, depreciating by 17% within three months.

5.2.2 Global Financial Crisis in 2008-2009

After the collapse of Lehman Brothers in September 2008, the global financial crisis battered economies worldwide. Because the financial crisis escalated in the US and the Europe, the risk of a global downturn had risen drastically.

As greater globalisation links economies around the world closely together, Taiwan, a small and highly open economy, is susceptible to a global economic downturn. Slackened demand from abroad caused Taiwan's exports growth to turn negative since September 2008, greatly restraining the contribution of external demand to economic growth. Moreover, financial market stress at home as well as abroad, and rising unemployment curtailed domestic consumption and investment. These factors increased the downside risks to Taiwan's economic growth. For a few months, economic indicators, such as exports growth, industrial production, consumption and employment, were less than satisfactory.

During the global financial crisis, the CBC paid close attention to the liquidity conditions of financial institutions to maintain financial stability. At the same time, due to subsiding inflationary pressure, the CBC took some response measures to promote economic growth.

5.2.2.1 Lowering the Policy Rate and Required Reserve Ratios

The CBC cut policy rates seven times by a total of 237.5 basis points since September 2008. With an efficient interest rate pass-through, both long-term and short-term market interest rates have fallen, significantly reducing the burden of mortgage borrowers and enterprises. Besides, in response to deteriorating economic and financial developments at home and abroad, on September 18, the

CBC reduced required reserve ratios on NT dollar deposits, with an estimated effect of injecting liquidity worth NT$200 billion.

5.2.2.2 Expanding Repo Facility Operations

From September 26, 2008 onwards, the CBC expanded Repo facility operations to ensure sufficient sources of liquidity for financial institutions. Eligible counterparties include banks, bills finance companies, Chunghwa Post, securities firms and insurance companies. The term of the facility is set within 180 days (initial 30 days) to provide market access to longer-term liquidity.

5.2.2.3 Relaxing Requiring Funds of Banks

The CBC announced that it allowed banks to use certificates of deposits issued by the CBC or redeposits with the CBC to borrow collateral loans or request early withdrawals whenever needs arise.

5.2.2.4 Providing Preferential Housing Loan Program

On September 22, 2008, the CBC joined other government agencies to provide Preferential Housing Loan Program worth NT$200 billion to help homebuyers and support the sluggish housing market.

5.3 Monetary Authority's Policy Reactions to Financial Crisis for Financial Stability

Financial stability primarily refers to the stability of the financial system, while the stability of the financial system includes the stability of financial institutions and financial markets. Once a disruption in the financial system occurs, the CBC can function as a lender of last resort and provide necessary accommodation to the troubled financial institutions or maintain the normal and smooth operations of financial markets. The setting of monetary policy as a whole cannot change dramatically if the disruption is a special case.

5.3.1 East Asian Financial Crisis Period in 1997- 1998

As mentioned above, implementing a flexible exchange rate policy in mid-October 1997 was an important turning point to address financial crisis. More importantly, the CBC fended off speculative attacks in the foreign exchange market by prohibiting domestic institutional investors from engaging in non-delivery

forward (NDF) transactions to block speculators' access to NT dollar funds in May 1998.

As a result, the downward pressure on the NT dollar was largely relieved, and the exchange rate of the NT dollar fluctuated between 32.0 and 34.9 against the US dollar during the remainder of the crisis period. Monetary conditions have become moderately easy. As Asian currencies rebounded strongly in September 1998, the CBC implemented a more relaxed monetary policy to stimulate domestic demand. The CBC's policy actions include lowering required reserve ratios and the discount rate, appropriating the postal savings redeposits to assist banks in extending mortgage loans to the first-time home buyers and project loans for small and medium-sized enterprises. These measures largely mitigated the negative impact of the Asian financial crisis on the Taiwan economy. The event also demonstrated the close economic ties among East Asian countries and the growing influence of international capital flows on the policies of Asian central banks.

In brief, the CBC reacted to the above-mentioned adverse conditions by removing distortions from the foreign exchange market and adopting an accommodative monetary policy. As a result, Taiwan was largely unscathed by the crisis.

5.3.2 Global Financial Crisis in 2008-2009

As mentioned above, cutting policy rate and required reserve ratios provide additional sources of liquidity for financial institutions and promote economic growth. In fact, these measures also help safeguard financial stability.

To maintain financial stability, the government took the following actions. For instance, in order to quickly shore up the financial system, bolster the confidence of depositors, safeguard the financial condition of financial institutions, and promote the healthy, sustainable development of the financial markets, the government declared full guarantee coverage on all bank deposits and inter-bank call loans, effective from October 7, 2008 until December 31, 2010. To coordinate these full guarantee measures, the Financial Supervision Commission (FSC) exercises tighter supervision of related operations, and works hand-in-hand with the CBC to closely monitor for any irregularities in inter-bank call loans.

To implement the guarantee, the FSC urges financial institutions to pay close attention to asset-liability management and improve their disclosure of financial and business information; strengthens capital adequacy regulations and financial soundness; strengthens corporate governance, internal controls, and internal audit systems.

In addition, the Small and Medium Enterprise Credit Guarantee Fund has raised the guarantee coverage percentage on borrowings made by small and medium-sized enterprises.

Besides, in response to a sharp fall in domestic stock market during the global financial crisis period, the FSC announced some measures designed to maintain an orderly and stable stock market and bolster investors' confidence.

1. Coordinated the National Financial Stabilization Fund to support the domestic stock market to maintain the stability of stock market.

2. Temporarily reduced the limit on short selling for borrowed and margin stocks from September 30, 2008 to December 31, 2008

3. Any stock market manipulation and the spreading of rumors and false information will be vigorously investigated.

4. Encouraged banks, security companies and listed companies to carry out a stock buyback.

6. Conclusion

In this paper, we found that output gap does not significantly respond to the lagged real interest rate. As real GDP comprises real consumption, real investment and net real exports, this result could be attributed to three possible reasons. First, real interest rate is not the only factor influencing real private investment, and other factors, such as world economic growth, export orders growth, expectation of domestic economic growth, tax and political environment, could affect real private investment as well. Second, with a relatively high savings ratio (i.e. gross national savings divided by GNP) of above 25% in Taiwan, the reduction in real interest rates could result in the fall in real private consumption. Third, Taiwan is a small and highly open economy, so exchange rates may play a key role in stimulating economic growth as well, in addition to the policy interest rate.

Moreover, we do not find strong evidence that a rise in direct finance has lowered the degree of sensitivity of real GDP to the change in the policy interest rate. In other words, the change in direct finance does not appear to affect the macro-financial link significantly. This could be because small and medium-sized enterprises account for nearly 98% of all enterprises in Taiwan, which still heavily rely on bank credit. This finding implies that the CBC does not need to undertake a larger monetary move to achieve its intended objective in terms of economic growth, while taking into account a rising trend of direct finance.

We also found that both the change in bank lending rates and deposit rates are sensitive to the change in the discount rate. However, the change in direct finance does not seem to affect the sensitivity of bank lending rates and deposit interest rates, respectively, to changes in the discount rate, either.

Nevertheless, this does not mean that direct finance is not important in macro-financial links. On the contrary, we need to continue to pay more attention to watch the development of direct finance, even about globalisation, asset securitisation, financial derivatives, etc. Those factors all may disturb the transmission mechanism of monetary policy and bring new challenges to financial stability in Taiwan in the future.

Financial soundness plays a key role in macro-financial links. The East Asian financial crisis, IT bubble burst crisis and recent global financial crisis have all highlighted the importance of financial soundness. In the era of globalisation, financial soundness is essential in protecting an economy from the contagion of crises in other countries. Confronting a rise in globalisation, direct finance and financial innovation, financial institutions need to handle increasingly complicated risk management problems.

Taiwan is a small and highly open economy, and the performance of economic growth heavily relies on exports. Taiwan's economy was hit severely by weak external demand caused by recent worldwide financial crisis. Fortunately, Taiwan's financial system remains stable and runs smoothly; therefore, easy monetary policy could help promoting domestic economic growth during financial crisis period. Furthermore, fiscal stimulus packages can also make up for some losses in external demand. These stimulus measures include issuing shopping vouchers of NT$3,600 for each person, expanding public infrastructure investment, lowering tax rates, subsiding worker income, promoting employment, providing industry bailout, etc.

Besides, the government took some measures to stabilize the financial system, such as allowing unemployed workers and some troubled enterprises to defer their payment of principal and interests for housing loans and business loans, respectively, and extending housing loan periods to 30 years. Also, the Small and Medium Enterprise Credit Guarantee Fund has raised the guarantee coverage percentage on borrowings made by small and medium-sized enterprises. As a result, income fell due to weak external demand, but the NPL ratio of domestic banks was still low. With a relatively sound financial system, the external demand shock resulted from global recession has a bigger adverse impact than financial shock on the real economy.

Finally, the CBC and the FSC should continuously work in close collaboration to monitor and evaluate the related risk exposures of financial institutions as well as the impact of their risk exposures on other sectors.

REFERENCES

Bayoumi, Tamim and Ola Melander, (2008), "Credit Matters : Empirical Evidence of US Macro-Financial Linkages," *IMF Working Paper* WP/08/169, <http//www.imf.org>.

Estrella, Arturo, (2002), "Securitisation and the Efficacy of Monetary Policy," *Economic Policy Review*, Federal Reserve Bank of New York, Vol.8, No.1, pp.243-55.

Goswami, M., Andreas Jobst, and Xin Long, (2009), "An Investigation of Some Macro-Financial Linkages of Securization," *IMF Working Paper* WP/09/26 <http//www.imf.org>.

Johansen, Soren, (1988), "Statistical Analysis of Cointegration Vectors, "Journal of Economic Dynamics and Control, Vol. 12, pp.231-54.

Phillips,P.C.B. and P. Perron, (1988), "Testing for a Unit Root in Time Series Regression," *Biometrika*, Vol. 75, pp.335-46.

Rudebusch, Glenn D., and Lare E. O. Svensson, (1999), " Policy Rules for Inflation Targeting," in : John B. Taylor(ed.), *Monetary Policy Rules*, Chicago: University of Chicago and National Bureau of Economic Research.

Kuttner, K.N. and Patricia Mosser, (2002), "The Monetary Transmission Mechanism: Some Answers and Future Questions," *Economic Policy Review*, Federal Reserve Bank of New York, Vol.8, No.1, pp.243-55.

Figure A1
Economic Growth Rate and CPI Inflation

Economic Growth Rate (Real GDP at 2001 Constant Prices)
CPI inflation (2006=100)

1979~2008 (yoy) GDP growth 6.3%
          (yoy) CPI inflation 3.2%
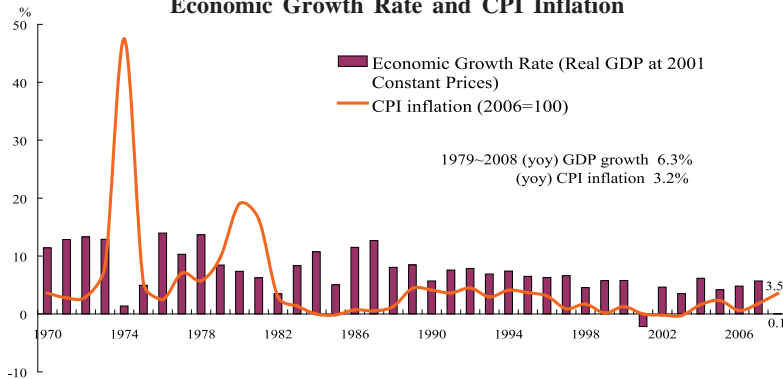
Source: Directorate-General of Budget, Accounting and Statistics (DGBAS), ROC.

Figure A2
Growth Rate and Target Zine of M2
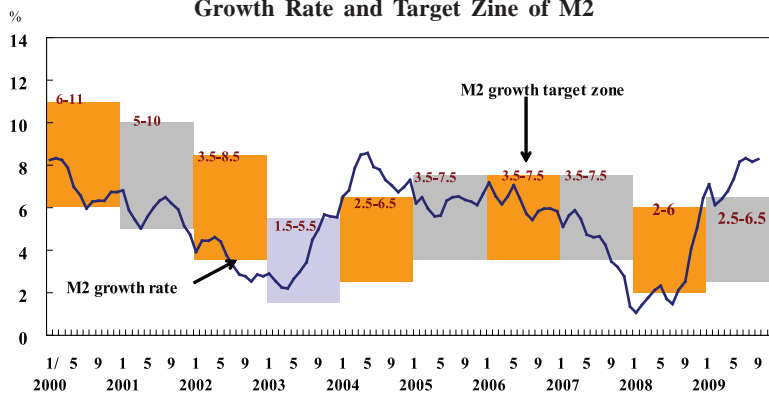
M2 growth target zone

M2 growth rate

Source: Department of Economic Research, Central Bank of the Republic of China (Taiwan).

Figure A3
Interest Rate

discount rate
one-year time deposit rate
bank lending rate
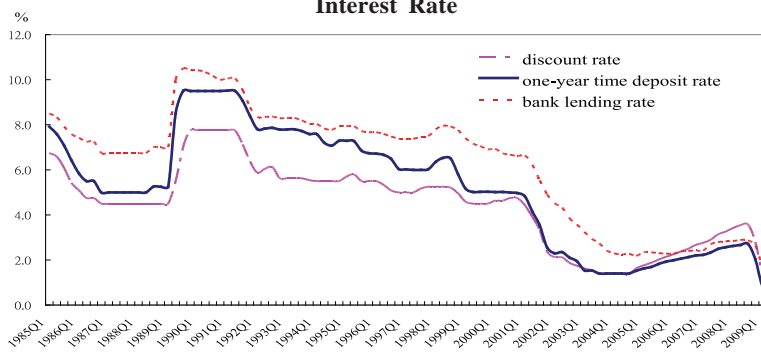
Source: Department of Economic Research, Central Bank of the Republic of China (Taiwan).

insert
Figure A4
Exchange Rate, Foreign Exchange Reserves and Overall BOP
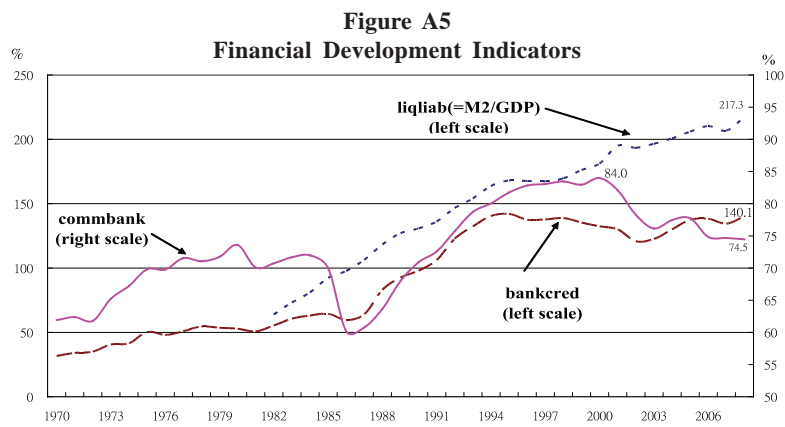
Figure A5
Financial Development Indicators

Source: Department of Economic Research, Central Bank of the Republic of China (Taiwan).

Figure A6.1
Stock Market Development Indicators

Source: Department of Economic Research, Central Bank of the Republic of China (Taiwan).

Figure A6.2
Stock Market Development Indicators (cont'd)
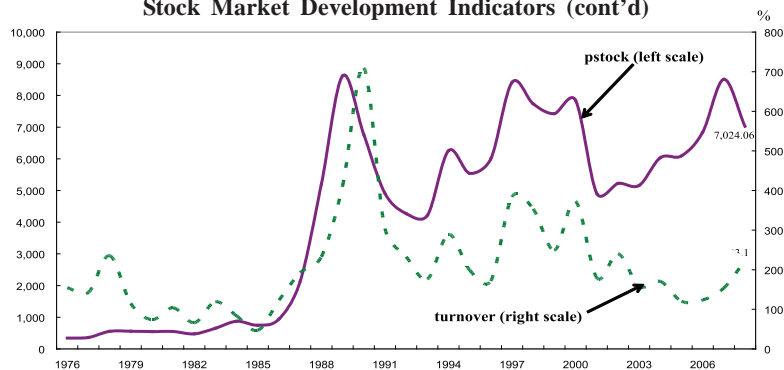
pstock (left scale)

7,024.06

turnover (right scale)

Source: Department of Economic Research, Central Bank of the Republic of China (Taiwan).

Figure A7
Openness of External Trade

143.8

(X+M) / GDP

Source: Directorate-General of Budget, Accounting and Statistics, ROC.

Figure A8
Status of Current Account and Financial Account
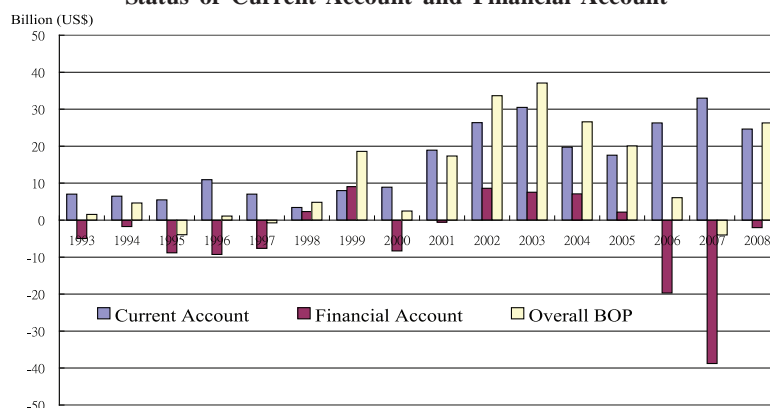
Billion (US$)

■ Current Account   ■ Financial Account   □ Overall BOP

Source: Department of Economic Research, Central Bank of the Republic of China (Taiwan).

247

Figure A9.1
Indicators of Key Financial Aggregates
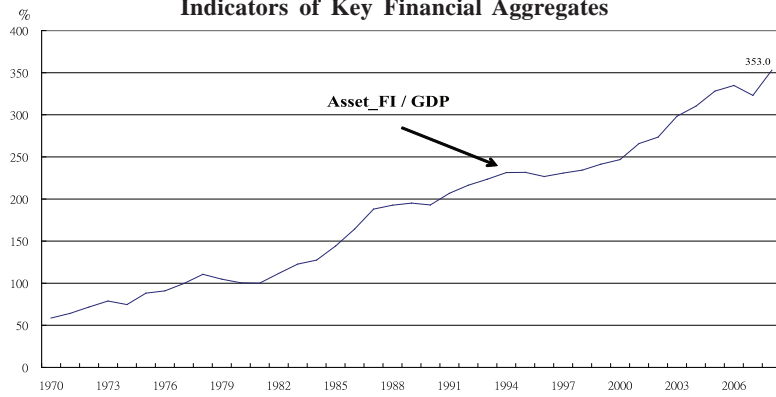
Source: Department of Economic Research, Central Bank of the Republic of China (Taiwan).

Figure A9.2
Indicators of Key Financial Aggregates (cont'd)
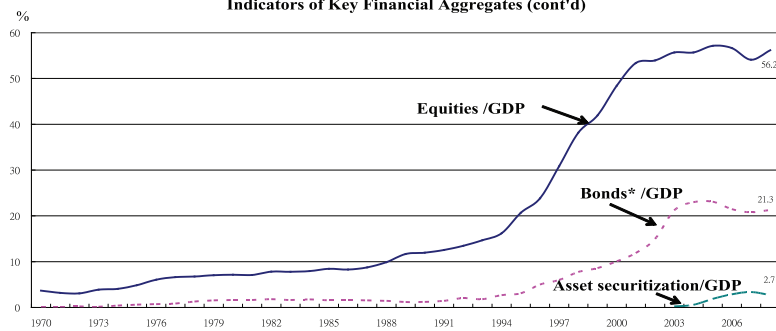
Source: Department of Economic Research, Central Bank of the Republic of China (Taiwan).
* : including overseas bonds.

CHAPTER 9
MACRO-FINANCIAL LINKS AND MONETARY POLICY MANAGEMENT IN THAILAND

By

P. Chantapacdepong, T. Kedphittaya, and K. Thanapase[1]

1. Introduction

The topic of macro-financial link has been one of most heated issues debated amongst economists and central bankers during the global economic crisis. The current crisis was unprecedented in terms of its scale, complexity, and speed of transmission. Despite the fact that a series of coordinated actions by central banks and governments have helped to stabilise the markets somewhat, many of the underlying problems remain.

When the crisis initially erupted, some suggested that the effect of the crisis would remain contained within the financial sector. This expectation, as it turned out, was not true. The contagion expanded from the financial to the real sector. Through both the financial as well as the trade and investment channels, these shocks had been also propagated to emerging economies. The negative feedback loop between the deterioration in the real economy and the financial sector had added to the uncertainty. This calls for careful review of how such a crisis evolved and how central banks can prevent a similar situation from happening again. This paper is a step in that direction, as we questioned ourselves about the lessons we have learned from the crisis, especially lessons regarding the linkage between the macro and financial sectors and its implication for monetary policy. In particular, it is crucial to gain an understanding of the channels through which monetary policy influence financial conditions.

This paper is structured as follows. Following the introduction, Section 2 briefly surveys Thailand's economic development and the evolution of monetary policy in Thailand. Section 3 discusses the impact of the financial crisis on real

---

economy as well as financial market and highlights the measures taken by the Bank of Thailand (BOT) to shore up confidence and restore the economy. Section 4 explores empirically the possible financial linkages and financial spillover between the US and Thailand as well as analyses the impact of the tightening credit condition on economic activity, such as investment and income, which in turn could affect the bank's financial position. Section 5 discusses and investigates both descriptively and empirically how monetary policy has been transmitted to the macroeconomy in Thailand. Section 6 in conclusion wraps up with a summary of the objective and methodology of the study.

2. Overview of Thailand's Economic Development and Framework of Its Monetary Policy

This section presents a broad overview of Thailand's economic development and framework of monetary policy. The survey is divided into two periods: the pre- and post-1997 Asian Financial Crisis.

2.1 Pre-1997 Asian-crisis Period

Since the 1980s, Thailand had enjoyed a remarkably good economic performance with relatively high economic growth and low inflation rate. With regard to monetary policy, the BOT adopted a fixed exchange rate regime with the value of the baht pegged to a basket of currencies. The focus of monetary policy during this period was to provide a stable environment that facilitated international trade and investment.

Figure 1
Thai Economic Growth and Inflation
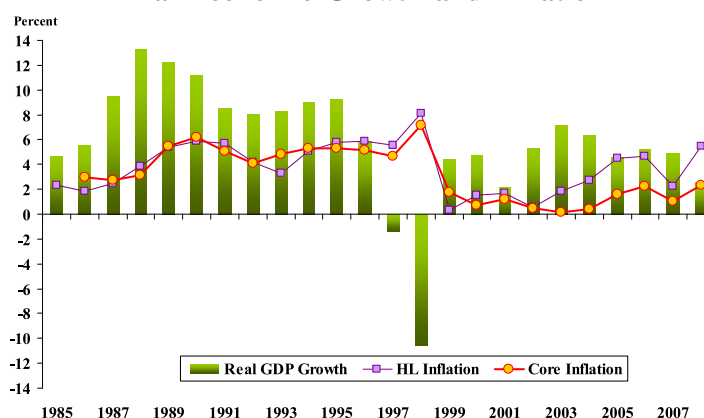
Source: BOT, MOC, NEADB

During 1987-1995, Thailand enjoyed a fast economic expansion with an average growth of 9.9% per year as illustrated in Figure 1. The inflation rate was somewhat low with an annual average of 4.6%. With a narrow fluctuation, the exchange rate was fixed between 24.92 - 25.74 THB/US$. In the mid-1990s, Thailand was rated by the World Bank as one of the fastest-growing economies in the world.

The main factors supportive of the economic expansion in Thailand during this period included a high rate of private investment, an impressive growth in export sector as well as massive inflow from abroad. During the years 1987 to 1990, the rate of investment growth was more than 20%, nearly double the size of Thailand's overall GDP growth rate. The share of investment to GDP increased to more than 40%, which was deemed fairly high by both historical and international standards. Moreover, thanks to Thailand's low wages, the level of foreign direct investment (FDI) increased dramatically, especially in export industries. As a result, Thailand's export grew very fast with an average annual growth rate of 22.3% between 1990 and 1996. The financial liberalisation scheme during early 1990s also induced huge capital inflow to the country. The net capital inflow increased rapidly from US$9.7 billion in 1992 to about US$21.9 billion in 1995.

Notwithstanding the impressive growth rate, there were signs suggesting that Thailand's miracle growth rate was slowing down and would prove to be unsustainable. The country's ability to sustain the impressive growth of the 1990s was in doubt. Growing deficits in the current account, the overvaluation of the Thai baht, the high volume of non-performing loans, together with the escalating instability of the entire banking system caused great concern among foreign investors. The result was a massive outflow of foreign investments placing increasing pressure on the local currency. Substantial capital outflows in the first half of 1997 came as a result of widespread speculation of the devaluation of the baht. The volume of outflows involved was so large enough that the floating of the exchange rate became inevitable. On July 2, 1997, in order to avoid further loss of the country's foreign reserve, the BOT abandoned the currency peg in favour of a free-floating regime.

2.2 Post-1997 Asian-crisis Period

The Asian financial crisis was an important turning point for policy makers in Thailand and our regional peers, as the lessons learned from the crisis led to many important policy reform initiatives, all of which were aimed at strengthening

the robustness and the risk management discipline of the domestic financial systems. In the case of Thailand, after having restored financial stability in the early 2000s, financial reform became a top priority, with emphasis on instilling prudent regulations and strong risk management.

Following the abandonment of the fixed exchange rate in July 1997, the macroeconomic policy priority turned towards the restoration of both internal and external stability. With the assistance from the IMF, Thailand commenced to put in place a series of economic adjustments to solve the structural problem and shore up confidence. "Monetary Targeting" was adopted as a new monetary policy framework in Thailand during (1997- 2001) in order to control money supply and affect economic growth. Under this framework, the domestic narrow money (M2a) was used as an immediate target as the BOT was of the view that M2a seemed to be most stable, predictable and comparable, especially when compared to M3. The ultimate objective of this framework was low inflation and sustainable growth.

The Thai economy recovered at a very fast pace after the crisis in 1997. The economic growth recovered from a contraction of 10.5% in 1998 to expand approximately 4.4% in 1999 and has continued to grow around 5% during 2000-2005. The inflation rate also decreased dramatically from 8.1% in 1998 to 1.5% in 2000. The export of goods and services also recovered from a contraction of 5.5% in 1996 to 17.5% in 2000, becoming a main growth engine of the country, as illustrated in Figure 2.

Figure 2
Contribution of Export to Thai GDP
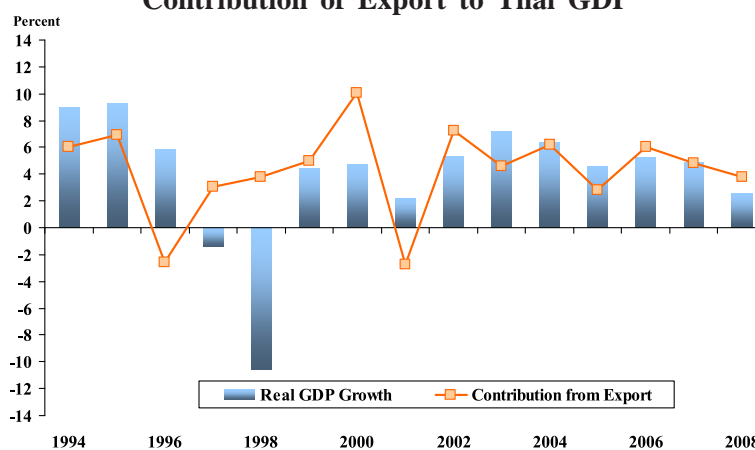
Source: NESDB, calculated by BOT

Since the crisis in 1997, the development of the Thai capital market was accorded high priority by the authority with the launch of the Capital Market Master Plan. The Plan aimed to facilitate direct financing and to intensify the development of domestic capital market in line with international best practices. The first phase of the Plan (2002-2005) focused on enhancing the attractiveness and liquidity of market. Whereas the second phase of the Plan (2006-2010) focused on the capital market's efficiency in mobilising funds and providing a quality alternative for personal savings, by targeting not only an increase in market capitalisation and price stability, but also the full valuation of stock. The capital market development was indeed a response to the global trends towards disintermediation and securitisation where intermediation shifts away from being the principal agent towards the provision of fee-based services. As shown in Figures 3 and 4, the role of the bond and equity markets have been increasing, but bank lending remained a major source of funding in Thailand.

Figure 3
Size of Thai Financial Markets
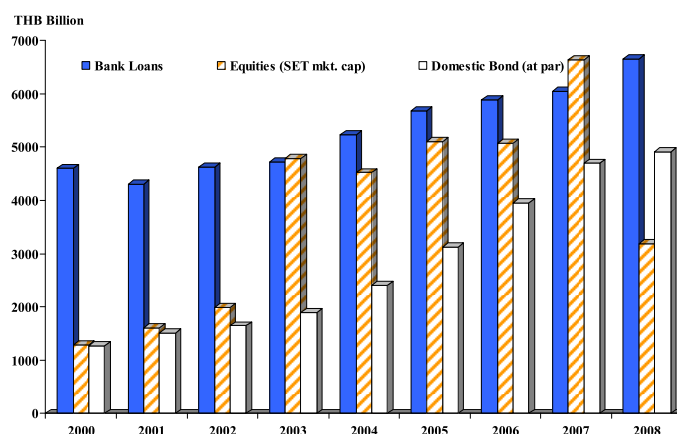
Source : BOT, Thai BMA
Reark : Data in 2008 is as of November

Figure 4
The Thai Financial System

Data as of December 2008
(Total assets=24.1 billion baht)

Stock and bonds market 36 %

AMC + SMC 2%

Bond market 21%

Stock Market 15%

Financial inst. 42%
(10.1 billion bht.)

Foreign
commercial
banks 12.8%

Finance
companies
0.4%

Co-op
4%

SFI 9%
(2.1 billion bht.)

Thai
commercial
banks 86.8%

Credit
fancier
0.01%

Non-banks 2%

Insurance   3%

Others   3%

Other financial corporations 8%

ODC + SFI 51%
Total assets = 12.2 billion baht

Source: Bank of Thailand, SET, Thai BMA, Cooperative Auditing Department, Fiscal policy office.

2.3 A Decade of Inflation Targeting

Figure 5
Thailand's Monetary Policy Framework

Percentage

Policy Easing

Policy Tightening

Policy Easing

GDP growth

Headline inflation

Policy rate

Care inflation

2000Q1 2001Q1 2002Q1 2003Q1 2004Q1 2005Q1 2006Q1 2007Q1 2008Q1 2009Q1
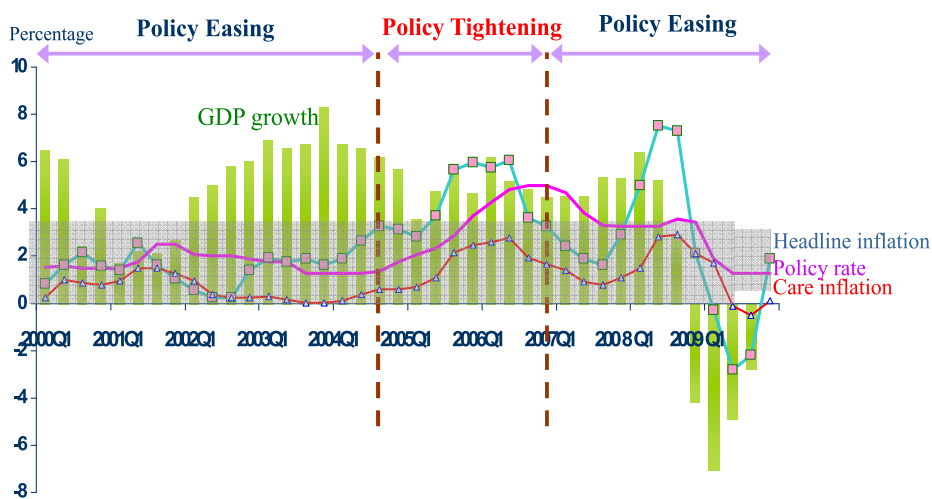
Source: BOT, Ministry of Commerce, NESDB.

254

After the completion of the IMF programme, the BOT carefully and extensively sought the most appropriate monetary policy for Thailand - the regime that would best anchor market expectations and strengthen the credibility of monetary policy. A return to a fixed exchange rate regime was not deemed a viable option in light of capital inflow volatility. Targeting board money was considered inappropriate due to instability in the relationships between money aggregates, output, and inflation.

As a result, the BOT resorted to adopt "Inflation Targeting" in May 2000. Under inflation targeting, the BOT established a Monetary Policy Committee (MPC) to set the monetary policy in order to attain price stability. The BOT chose to target core inflation, which excluded volatile raw food and energy prices, to remain within the range of 0-3.5%.

Figure 6
Inflation Targeting in Thailand
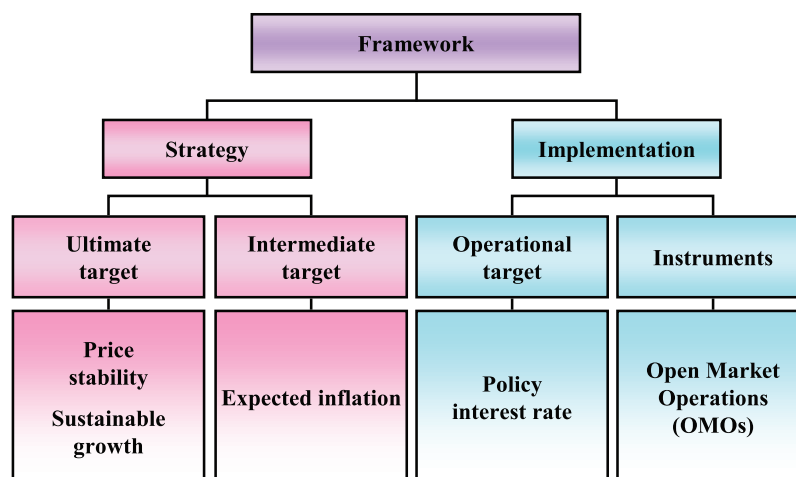
The BOT implemented its monetary policy by influencing short-term money market rates via the selected key policy rate, currently the 1-day repurchase rate. The MPC signalled shifts in monetary policy stance through announced changes in the key policy rate. The BOT used a variety of monetary policy instruments to implement MPC's interest rate decisions.

255

The operational framework of the BOT's monetary operations is presented in Figure 6 above. It consisted of a set of instruments which can be classified into three categories, namely: (1) Reserve Requirements; (2) Open Market Operations (OMO); and (3) Standing Facilities.

By making "price stability" the primary long-term goal of monetary policy, "an inflation targeting" framework serves to: (1) improve communication between policy makers and the public; (2) provide discipline and accountability in the making of monetary policy; and (3) place greater emphasis on forward-looking economic forecast. In doing so, it helps to anchor inflation expectation as well as lessen uncertainty, thereby improving business planning and commercial investment decisions.

In 2009 and 2010, the target range was set at 0.5-3.0% per annum, slightly narrower than the old range of 0.0-3.5% adopted since 2000. The lower bound of the range was adjusted upwards by 0.5% to limit the risk of deflation, while the upper bound was lowered by the same amount to signal no change in the overall monetary policy stance. The target was reviewed annually by the MPC. Although the target range is quite wide by international comparison, the MPC deemed it as suitable for a small and open economy like Thailand. In particular, the target range has allowed some room for the MPC to steer the economy through soft patches without compromising its commitment to low and stable inflation in the medium term. Adverse effects on inflation expectation have also not emerged given the country's fairly good inflation record, even in the period before the adoption of inflation targeting.

Under the new Bank of Thailand Act (2008), the monetary policy objectives were spelled out clearly, the selection and dismissal process of the MPC members were detailed and the term of office of the Governor was specified. The MPC was also required to set a target of monetary policy in conjunction with the Minister of Finance every year before submitting the target for cabinet approval. Should inflation breach the announced target, the MPC is obliged to send an open letter to the cabinet explaining why the target has been breached, specifying the direction of monetary policy going forward. These elements provided a far better legal infrastructure for monetary policy formulation in Thailand.

2.3.1 Flexible Inflation Targeting

It should be noted that inflation targeting does not mean that the MPC must adhere strictly to the inflation target without consideration of other factors. Indeed,

since May 2000, the BOT adopted the so-called **"Flexible Inflation Targeting"**. Rather than assessing inflation outlook alone, the MPC also assessed "potential imbalances" in seven key sectors that may lead to financial fragility and hence jeopardise sustainable growth in the long run. These areas include (1) External sector; (2) Non-financial corporate sector; (3) Household sector; (4) Government finance and public debt; (5) Real estate; (6) Financial markets; and (7) Financial institutions.

By monitoring these indicators, the MPC made sure that other stability concerns were not overlooked in the monetary policy decision-making process. In other words, the framework also ensured that the BOT remained vigilant regarding threats to financial stability. From 2003 to 2006, a series of macro-prudential measures were introduced, aiming at restraining the then rapid growth of credit, especially credit-card loans and mortgage loans. The preventive measures that were introduced included placing limits on the loan-to-value ratio for luxury mortgages, raising minimum repayment requirements for credit cards and personal loans, and strengthening the NPL provisions by fair valuation standards of IAS39. It is important to note that the BOT introduced these measures at a time when the Thai economy was still growing at a fast pace and exports were robust. This measure was met with strong criticism initially. In retrospect, these measures have been useful in curtailing excessive leverage and household indebtedness, thus helping to maintain stability in our domestic financial system.

Overall, the flexible inflation targeting framework has served Thailand well in reining in aggregate demand pressures. Notwithstanding the current shocks, inflation and inflation expectations over the medium term are expected to remain within the target band. The framework also ensures that BOT remain vigilant regarding threats to financial stability.

3. Impact of Global Financial Crisis on Real Economy and Financial Market

When the global crisis first erupted, many analysts believed that the economy of Thailand would be an oasis of calm in the on-going financial turmoil. However, as the crisis unfolded, it became apparent that no part of the world was immune to the current crisis. Like other countries in Southeast Asia, Thailand weathered the negative impact from the crisis, and the Thai financial system thus far has remained broadly resilient.

Figure 7
Thailand's Profile and Short-term External Debt

Thailand's profile	1997Q4	2008Q2
L/D ratio of banks	129	92
Corporate D/E ratiofi	4.6	0.98
External debt (bn USD)	109.3	66.7
External debt (% GDP)	65.9	29.3
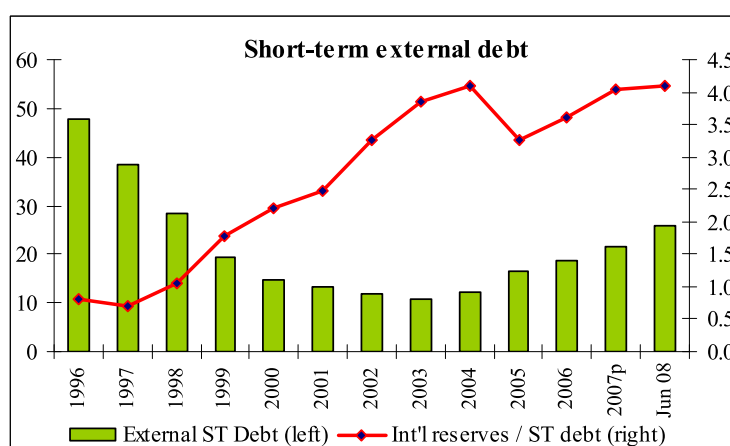
Unlike many developed countries, and unlike Thailand back in 1997, a low degree of leverage has partially helped stem the spread of 'risk aversion' to the Thai economy. In particular, high foreign reserves and a low external debt burden have helped cushion the country's vulnerability to external financial shocks. Figure 7 compares Thailand's profiles during the 1997 crisis and the current global financial crisis.

Figure 8
Commercial Banks' Financial Structure
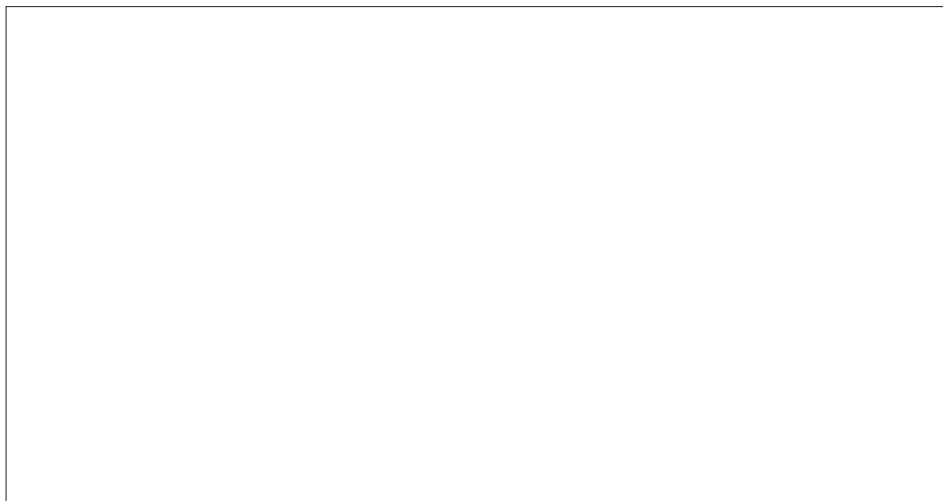
Source: Bank of Thailand.

Thanks in part to the crisis of 1997, the Thai banking system had undergone a dramatic change and has a fairly healthy structure. The direct impact of the global crisis on the balance sheets of Thai banks was limited. As of September 2008, on the asset side, the exposure to assets of troubled banks aboard were negligible, accounting only for less than 1% of their total assets. On the liability side, Thai banks depended primarily on a broad base of retail depositors, which have been protected by a deposit guarantee scheme. Meanwhile, wholesale borrowing had been a minor source of financing for banks. With the recent extension of the full guarantee scheme, there had been no panic on the part of retail depositors, and the risk of bank run was minimal. Thai banks were not exposed to the severe deleveraging process. Liquidity of Thai banks remained ample, reflected by fairly large amounts of deposits compared to those of loans. Figure 8 presents the components of the commercial banks' financial structure.

Figure 9
Thai CDs Sovereign vs. Stock Market Index (SET)

Source: Bloomsberg
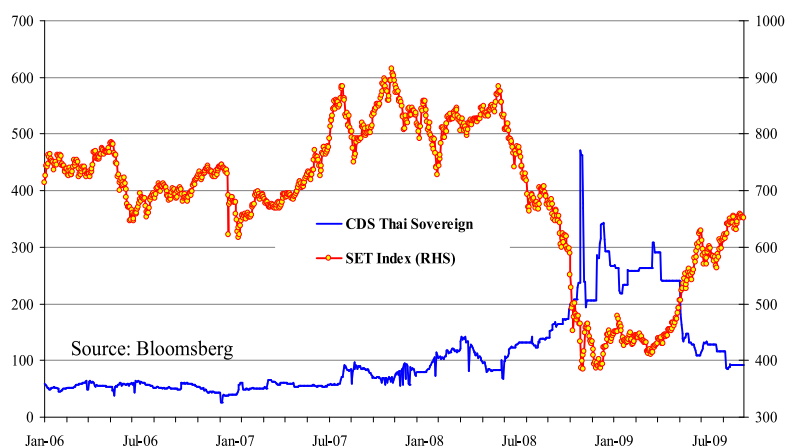
With regard to financial markets, following the collapse of the Lehman Brothers in September 2008 that triggered a full-blown global financial crisis with global risk aversion drastically heightening, CDS spread for Thailand, the cost of insuring against sovereign default, had suffered increasing widening as the crisis unfolded as illustrated in Figure 9. The Thai Stock market index, SET index, also saw a dramatic fall from 684.44 in August 2008 to 431.52 in February 2009 as investors' risk appetite dramatically decreased as a result of a re-pricing of risks and flight to quality and liquidity. The Thai baht depreciated (vs. US$) along with other regional currencies from 34.024 THB/US$ in September 2008 to 36.046 THB/US$ in February 2009. However, the movement of THB against 21 trading partners (NEER-21) exhibited a slight increasing trend, reflecting the fact that the economy suffered less capital outflows compared to many regional countries (Figure 10).

260

Figure 10
Nominal Exchange Rate of Thai Baht
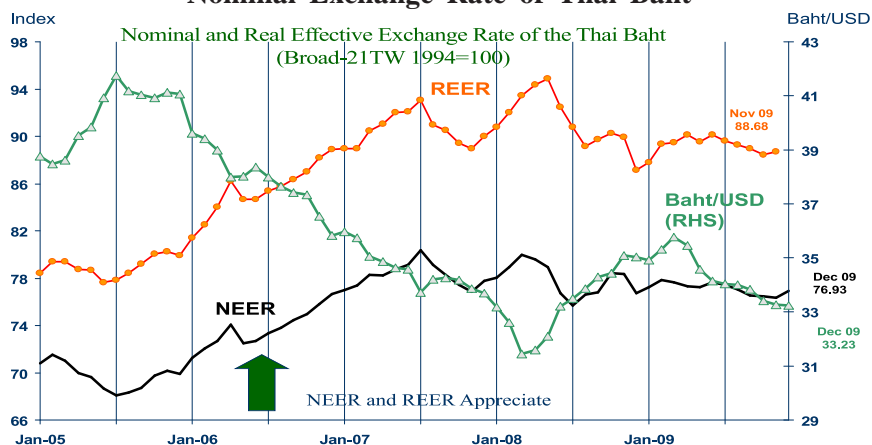
Source: Bank of Thailand.

It is worth pointing out that the causality of potential risks to Thailand's economy (and probably also for other countries in SE Asia) may be different from that of an advanced economy. For Thailand, the potential risks seemed to run from worsening macroeconomic conditions to the financial system (i.e., deterioration of loan quality and thus risk aversion), and not the other way round as in the US or the UK, for example. In other words, while in the advanced countries the contagion spread from the financial to the real sector, in Thailand, the slowdown in the real sector would affect the financial sector, which in turn, had a second-order impact on the real sector.

Notwithstanding the limited impact in the first round, Thailand had been affected by *a strong impact in the second round,* which came primarily via the exports channel. As presented in Figures 11 and 12, the impact of the global crisis on the real sector had been severe due to *Thailand's high degree of trade integration with the global economy.* The contraction of goods export (in quantity terms) to major markets was observed by -26.2% in the first half of 2009, as compared to 25.8% in the first half of 2008. The manufacturing index had meanwhile shown signs of weakness, posing employment concerns, which could, in turn, lead to a further deterioration in private consumption and investment as well as banks' credit quality. Even though the NPL ratio was low, the delinquency rates for both corporate and consumer loans started to climb upwards.
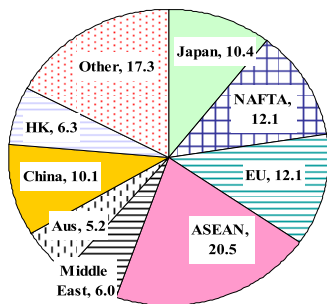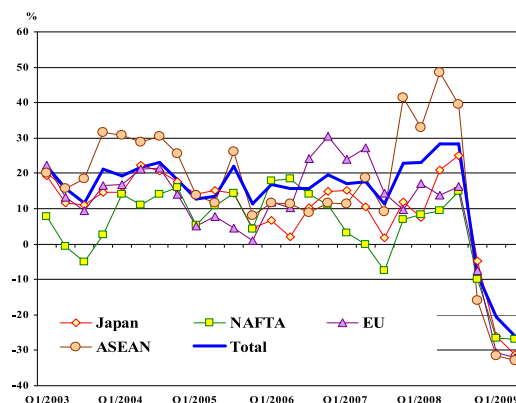
261

Figure 11
Share in Export

Figure 12
**Export Growth Classified by Destination**

With the gloomy economic outlook, banks became more cautious in extending loans. The Senior Loan Officers' Survey done in October 2008 (see Figure 13) showed that banks continued to tighten their credit standards in Q3:2008 for both corporate and consumer loans. Banks also anticipated a further tightening of credit standard in Q4:2008. In light of this, banks are likely to charge higher interest rates (relative to MLR) on their borrowers, especially SMEs which have limited alternative sources of funding, to cover higher credit risks.

Figure 13: Banks Continued to Tighten their Credit Standards in Q3:2008
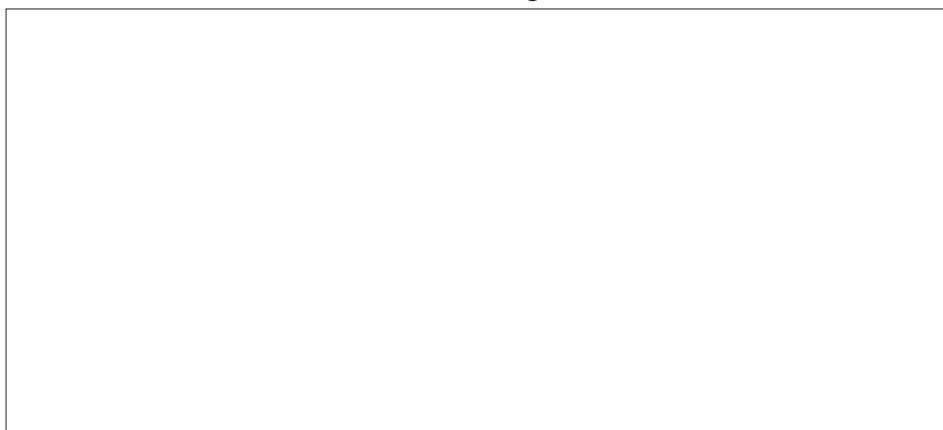
The data on credit growth showed that since October 2008, credit growth continually decreased in tandem with commercial banks' tighter credit standard and softening demand. The credit growth contracted from more than 10% in October 2008 to -4.6% in June 2009 (Figure 14). Among the sectors that were most affected were the production, commerce and financial sectors.

Figure 14
Credit Growth
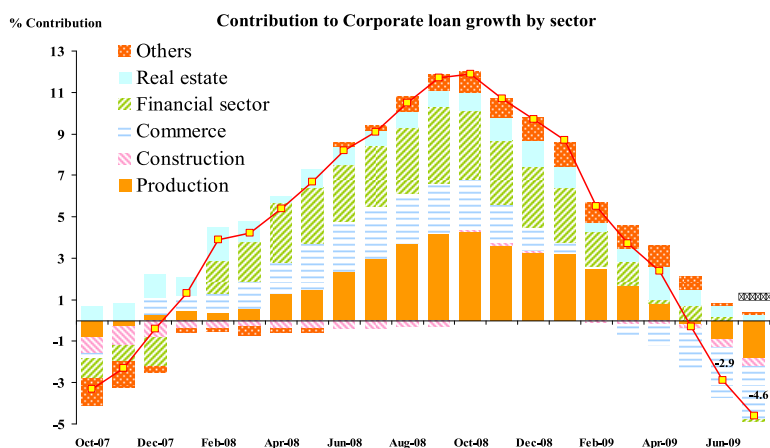
3.1 Measures Taken in Response to the Global Crisis

In response to the crisis, the Thai authorities had taken steps to ensure the smooth functioning of the Thai financial system and to cushion the impact of the crisis on the real economy. The following were some of the important measures taken:

3.1.1 Fiscal Stimulus Packages

The Thai government introduced two fiscal stimulus programmes to soften the adverse effects of the global economic downturn and to revive the domestic economy. The *first stimulus package* (or SP1) composed of tax measures and supplementary budget amounting THB116.7 billion (US$3 billion), which was introduced in January 2009, was aimed at restoring short-term confidence by boosting domestic consumption. Both measures helped absorb the impact of the economic crunch on the Thai people by reducing their living costs and boosting domestic consumption.

263

The *second stimulus package (*or SP2), totalling THB1.43 trillion, (US$41 billion) focused on enhancing the country's competitiveness in the medium-term (FY2009-2012) by investing in various projects ranging from small to mega-projects. About 50% of the total investment financing came from domestic borrowing, which cause the government budget deficit to go up by an additional of 2% of GDP. Thus far, the Thai government had tried to stimulate the economy both in the short- and medium-term. Both stimulus packages were deemed sufficient to support economic activities in Thailand during 2009-2012. Although the contribution of both the stimulus packages is relatively small in relation to the country's GDP, it had the simulative effect to restore investor confidence and induce more private-sector investment going forward.

3.1.2 Blanket Deposit Guarantee

The blanket deposit guarantee, which was supposed to end in August 2008, had been extended for the period of another three years to August 2011. This was to help maintain depositors' confidence and maintain a level-playing field with banks in other countries. It should be noted that the authorities had already paved the way for an exit of this guarantee, thereby limiting the long-run fiscal burden, by announcing a definite end of the scheme within three years.

3.1.3 Provision of Ample Liquidity

The BOT, as the ultimate provider of THB liquidity, has ensured there was ample liquidity in the money market. For example, during the period that US$ liquidity tightened following the drying up of US$ liquidity overseas, the BOT conducted additional sell-buy swap transactions to provide more US$ liquidity to the market, which proved instrumental in stabilising the money market.

3.2 Substantial Easing of Monetary Policy

The monetary policy has been substantially eased. In December 2008, with the risk to growth surging significantly whilst risks inflation subsiding, the MPC decided to lower the policy interest rate by 100 basis points from 3.75% to 2.75%. The extensive monetary easing continued until mid-2009. In the first three meetings of the year, the policy rate was cut in a series of 75, 50 and 25 basis points. It was in May when the MPC assessed that monetary policy had been substantially eased and the policy rate of 1.25% was sufficiently low and it decided to maintain policy rate. Subsequently, the policy interest rate of 1.25%

was maintained throughout 2009. Figure 15 illustrates the commercial banks' interest rate adjustment.

Figure 15
Commercial Banks' Interest Rate Adjustment
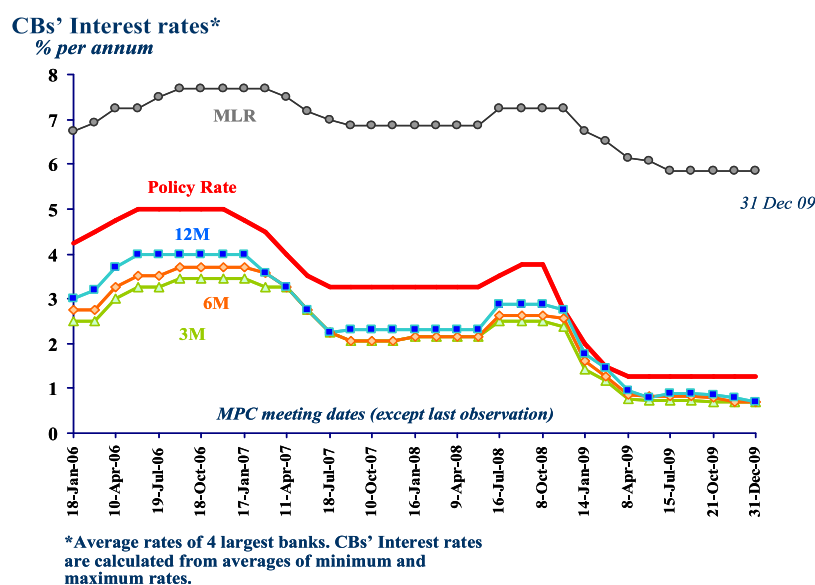
These cuts were aimed to do the following: (1) changed the expectations of banks regarding the path of the policy rate, thereby accelerating their reduction of the reference lending rates; (2) alleviated financial burdens of firms and households, thereby mitigating the NPL risks and the feedback from weakening the macroeconomic conditions to the functioning of the financial sector; and (3) shored up business and consumer confidence while fiscal stimulus has not been fully materialised.

Since December 2008, dramatic cuts in policy rate brought about gradual cuts in commercial banks' rates. The loan rate (MLR) has been lowered more slowly than the deposit rate since it takes time for commercial banks to restructure the cost of capital. With the total policy rate cut of 2.50 % per annum, commercial banks' deposit and loan rates have been adjusted down about 1.86 and 1.39% per annum, respectively. As of end of August 2009, the prime lending rates of large banks stands around 5.86%, while one-year deposit and 3-month rates are at 0.73% and 0.88%, respectively.

4. Evidence on Macro-financial Link in Thailand

In this section, we shall examine the evidence on macro-financial linkage in Thailand, especially during the global financial crisis. By doing so, we shall proceed as follows: (1) we first analyse the possibility of financial linkages and financial spillover between the US and Thailand. The objective of this subsection is to analyse the vulnerability of the Thai financial system to an external financial sector shock. The Dynamic Conditional Correlation multivariate GARCH model by Engle (2002) shall be used to measure the extent of co-movement of the financial variables in Thailand and in the US. (2) We next analyse the impact of the tightening credit condition on economic activity, such as investment and income, which in turn affect banks' solvency. This would subsequently tighten the credit condition further.

4.1 Spillover from International Financial Risk to Thailand

It is widely discussed that the volatilities in financial markets tend to move together over time across markets and assets. Several questions arose among policy makers and investors, especially during the global financial crisis, such as, does a shock on the US financial market lead to/or increase the volatility of the market in the other countries, and if so, to what extent? Is the volatility transmission from a market to another considered direct (through conditional variances) or indirect (through conditional covariance)? Do the correlations of asset returns between two markets change over time? Are they higher during period of higher volatility (during financial crisis)?

In this section, the purpose of our research is to examine the impact of the collapse of the US financial market on the Thai financial system through their financial inter-linkages. The study focuses on the co-movement of key financial variables in the US compared to those in Thailand. Specifically, the proxies for general stress in the inter-banking market, market volatility and default risk of major financial institutions in the US are compared with the stock market indices, CDS indices, and the proxy for liquidity condition of the Thai financial market. The analysis is conducted in a similar manner as Frank and Heese (2009), which studies the financial spillover between the US and emerging markets. The Dynamic Conditional Correlation (DCC) multivariate GARCH model, which was first introduced by Engle (2001) will be employed to analyse the co-movement of markets by inferring the correlation of changes in the financial variables examined.

With respect to the financial variables of the US, the spread of the 3-month US$ Libor and overnight index swap (OIS) represent the funding liquidity and stress of money market, while S&P500 index is used to measure the return in financial markets. To measure the default risk of the market, we follow Frank and Heese (2009) by using the average of the credit default swap rate of a number of banks, such as Citigroup, Bank of America, JP Morgan, Wachovia, Merill Lynch, Morgan Stanley, Goldman Sachs, Lehman Brothers, HSBC, Royal Bank of Scotland, UBS and Deutsche Bank.

These are daily data and collected from Bloombergs. For the Thai financial variables, the 1-month interest rate swap point between the USD and baht are used to gauge the dollar liquidity of Thai financial market and the SET index is used to measure the return in the equity market. Lastly, we use the CDS spread of the PTT, the largest public company in Thailand as a proxy to gauge the credit risk of the private company in Thailand.

Provisionally, we can briefly discuss the impact of the US crisis on the Thai financial system from the standpoint of its asset and liability side. On the asset side, the exposure of Thai banks to the financial products in the US is very small. Thanks to the 1997 crisis, the Thai financial institutions are quite conservative in their investment and lending. Considering the liability side, the financial de-leveraging process during the crisis suddenly hit Thailand and the regional countries. Money was withdrawn from the high-risk, high-return assets, especially those in the emerging markets. The withdrawn funds were either used to replenish capital in the troubled financial institutions, or to invest in safer assets in the face of risk aversion. With this, there are three major impact on the Thai financial system. The first impact is the dollar liquidity shortage right after the de-leveraging process; however, the impact lasted for a very short duration. The second impact is the drop in the price of equity after the funds were withdrawn. This can be seen by the plunge of the Thailand SET index. Lastly, the CDS, which is a proxy for credit risk for borrowers in Thailand and other Asian countries, are widened as much as those in Europe and United States, although the exposure to subprime mortgages and toxic financial assets was minimal. This is owing to the heighten risk aversion and higher risk premia. Kim, Loretan and Remolona (2009) argued that contagion in the Asian credit markets stemmed not only from *a reassessment of credit risks,* but also more importantly from *a global re-pricing of risk.*

Nevertheless, the baht liquidity in the money market and the financial institutions was not much affected by the crisis. As mentioned earlier, the spread between the overnight interbank rate and the policy rate were very narrow (Figure 16), reflecting that the liquidity condition in the money market remained sound.

Figure 16: **Overnight Interbank Rate and Policy Rate**
(1-day Bilateral Repurchase Rate)
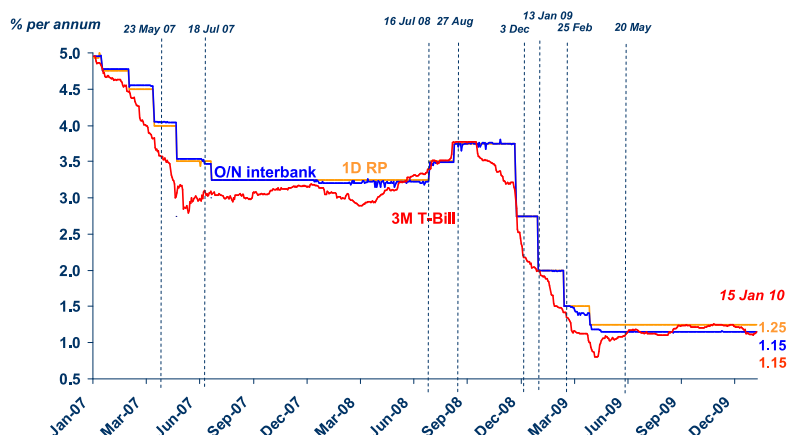
As shown in Appendix Figure A1, the US 3-month Libor-OIS spread and CDS, adapted to measure funding liquidity, had widened since late 2007 and peaked around Q4:2008 following the collapse of Lehman Brothers and a rescue of Bear Sterns. As for Thailand, the Thai monetary market was also affected by the crisis but only for a short period, as evidenced in Appendix Figure A1.

With regard to the equity market, the Thai and the US stock market are severely affected by the global financial crisis. The Thai SET index and the S&P 500 are apparently correlated and moved in the same direction. The Thai SET index decreased from the peak of 2008 at 884.19 in May to the bottom at 384.15 in October 2008 as a result of both global risk aversion and political uncertainty. The recovery path, however, has become noticeable since Q2:2009, due to a sign of global economic recovery and more political stability.

In order to examine the co-movement of the key financial variables in the US, as compared to those in Thailand, the DCC GARCH model is employed, since it has flexibility of univariate GARCH models coupled with parsimonious

parametric model for correlations. The estimation is simple and consists of two steps. The first is a series of univariate GARCH estimates, and the second the correlation estimate. The DCC GARCH model can be briefly presented as follows:

$$H_t = D_t R_t D_t, \qquad \text{where} \qquad D_t = diag\left\{\sqrt{h_{i,t}}\right\} \tag{1}$$

and R_t is a correlation matrix containing the conditional correlations as can directly be seen from rewriting this equation as:

$$E_{t-1}\left(\varepsilon_t \varepsilon_t^{'}\right) = D_t^{-1} H_t D_t^{-1} = R_t, \qquad \text{since} \qquad \varepsilon_t = D_t^{-1} r_t \tag{2}$$

A special property of dynamic conditional correlation models is that R_t is allowed to be time varying. D_t is a diagonal matrix comprised of the standard deviations implied by the estimation of univariate GARCH models, which are computed separately. $\sqrt{h_{it}}$ is the ith element of the standard deviation from the GARCH model. The DCC model can be formulated as the following statistical specification[2]:

$$r_t | \zeta_{t-1} \sim N(0, D_t R_t D_t) \qquad \text{where} \qquad D_t = diag\left\{\sqrt{h_{it}}\right\} \tag{3}$$

$$D_t^2 = diag\left\{\omega_i\right\} + diag\left\{\kappa_i\right\} \ r_{t-1} r_{t-1}^{'} + dia \ \left\{\lambda_i\right\} \circ D_{t-1}^2 \tag{4}$$

$$\varepsilon_t = D_t^{-1} r_t \tag{5}$$

$$Q_t = S \circ (\mu' - A - B) + \varepsilon_{t-1} \varepsilon_{t-1}^{'} \tag{6}$$

$$R_t = diag\left\{Q_t\right\}^{-1} Q_t diag\left\{Q_t\right\}^{-1} \tag{7}$$

$$S = E\left[\varepsilon_t \varepsilon_t^{'}\right] \tag{8}$$

Let r_t denotes an $n \times 1$ vector of asset returns, exhibiting a mean of zero. Each series of the assets returns follows a univariate GARCH process, as presented in Equation (4).

The time series plots of the selected financial data are presented in the Appendix (Figures A1). From visual inspection, all the series are non-stationary and the unit root test confirms this notion. Therefore, first differences of the

————————

2. See Engle (2002) for details of the model.

data are taken and are presented in the Appendix (see Figures A3), so that they can be applied to the DCC-GARCH estimation. Not surprisingly, the return of the series exhibits volatility clustering, which we can fit into GARCH (1,1) model. The volatility of the return is also quite large during the US crisis.

We first examine the impact of the financial crisis on the conditional volatilities of each financial variable. A plot of GARCH volatilities of these series in Figure 20 reveals that volatility of many important financial variables, such as the CDS spread, US and Thai stock markets index, Libor-OIS spread, VIX and MSCI index, shoot up during the US financial crisis. The conditional volatility of the Thai stock market index is determined by both the domestic and external factors. The conditional volatility of the stock market exhibited a sharp spike during 18-19 December 2006 as a result of the introduction of the 30% unremunerated reserve requirement (URR) measures. Nevertheless, this had a very short-term impact on investor sentiment, thus the increase in conditional volatilities is not persistent. Although the introduction of the URR measure resulted in the plunge of the stock index by 108 basis points overnight, it recovered quickly. Nevertheless, a rise in the conditional volatility of the Thai stock market during the global financial crisis was persistent. In other words, we observe a clear volatility clustering. Considering the stock index data during 15 August to 29 October 2009, the stock index declined from 884 basis points to 384 basis points.

Furthermore, the correlation between each return series was estimated with the DCC integrated method. First, we analyse the correlation between the Libor-OIS spread and the swap point for baht and US dollar for 4 years of daily data starting from January 2007 to present. These two variables measure the dollar liquidity in the US and in Thailand, respectively. Then we look at the daily correlation between the Libor-OIS spread and the Thailand stock market, in order to examine the impact of the stress in the US financial market on the Thai equity market. Additionally, we examine the daily correlation between the US and Thai stock market. Finally, the daily correlations between the risk premia in the credit default swap market of the two countries are examined, which will explain the spill-over of the risk aversion between the two countries. The time series plots of the conditional correlation between the returns of each variable are illustrated in Figures A5 in the Appendix.

The results generally indicate the presence of large volatility spill-over across not only the region but the asset markets. ***First***, the inter-linkages between the funding stress (Libor-OIS spread) and the US stock market were highly correlated.

Figure 17 represents the coefficients of the conditional correlation which show the magnitude of the volatility spillover on average over the 2007 to 2009 period. The results from this figure indicate that over the period of 2007-2009, the coefficient of the correlation between the Libor-OIS spread and the S&P500 index is -0.29. The negative relationship between the Libor-OIS spread and the stock market index implies that the narrow spread between the Libor and the OIS rates corresponds with the higher stock market index. The narrow spread represents a normal liquidity condition in the money market, where there is no funding stress, while the rise in the stock index represents the sound liquidity condition and the good sentiment.

Interestingly, the spillover between the funding stress in the US and the Thai stock market is significant but relatively mild. This is because the domestic sentiment factor, such as political turmoil, also plays a big part in the Thai stock market determination. On average, the coefficient of correlation between the Libor-OIS spread and the SET index is -0.08, which is smaller than the relationship between the Libor-OIS spread and the S&P500 index.

Considering the time series plots of the conditional correlation coefficients in Appendix Figure A5, there is a sharp increase in the correlation between the Libor OIS spread and both the SET index and the S&P500 during the crisis moment. The conditional correlation coefficients between the Libor-OIS spread and S&P500 index shot up to around -0.6 during the crisis period. For the Libor-OIS spread and the SET index, the conditional correlation coefficient was -0.15 during the crisis period, which was twice the average correlation coefficient over the period studied.

The *second* main finding suggests that the implied correlation between the Thai CDS spread, which is a proxy for risk premia, and the US CDS spread is 0.19 on average. This implies that high volatilities in the US CDS market positively and significantly associate with the Thai CDS market. Considering the time series plots of the conditional correlation coefficient in Appendix Figures A5, it sharply increased at the beginning of the subprime crisis and the coefficient was 0.3 during the crisis. This shows the contagion of the risk perception among markets.

The results also show that the conditional correlation between the funding stress in the US and the dollar liquidity in Thailand, as measured by the baht/USD swap point, is marginal. There is a negative coefficient of conditional correlation of -0.04, implying that there is no significant relationship across time.

271

However, from the time series plots, the correlation coefficient exhibits a sharp spike of around -0.08 during the collapse of Lehman Brother, and around -0.10 during the large loss in the hedge fund[3] in the US during August to September 2007.

Additionally, there is a positive relationship between the volatilities in the stock market and in the CDS market. This is partly because these two markets have inter-linkages and are dependent on investors' sentiment.

Finally, the sentiment index, such as VIX, MSCI, significantly correlates with the Libor-OIS spread. The general stress in the financial market is highly associated with investor (hedger) sentiment.

Figure 17
Coefficients of the Conditional Correlation
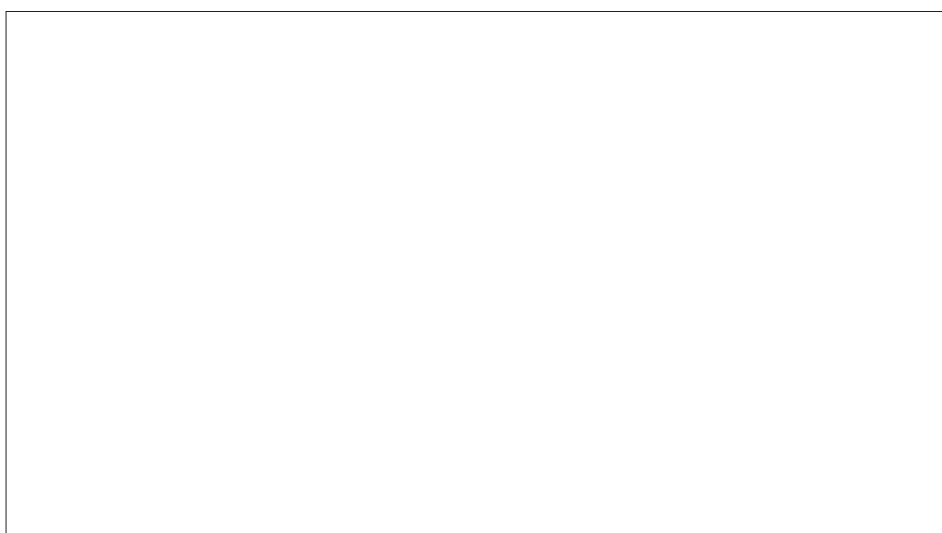
4.2 Impact on Credit and Balance Sheet Channels and the Real Economy

This section develops a framework for analysing macro-financial linkages in Thailand by considering the credit channel. As already mentioned, there has been improvement in banking regulation after the crisis in 1997. Apart from this,

––––––––––

3. In early August, 2007, many quantitative hedge funds suffered large losses. That was the first "illiquidity wave" on the interbank market that started on August 9. At that time, the perceived default and liquidity risks of banks rose significantly, driving up the LIBOR rate.

the management of the Thai commercial banks have become more conservative, both in terms of portfolio investment and credit supplied. With the global financial crisis, banks are more cautious in their lending. The Senior Loan Officer Survey presented in Figure 13 shows that the credit standard has been tightened. As a result, economic activities, such as consumption, investment, and production, were affected and deteriorated, both because of the weak economic sentiment influencing demand and tightened credit availability. We found that the commercial banks' delinquency rate started to climb from 2.9 % in January 2008 to reach its peak at 4.7 % in March 2009. This, in turn, affected the banks' solvency, which subsequently leads to the question concerning the extent of the impact of banks' solvency on commercial bank lending.

Apparently, the impact of the global financial crisis affected on Thailand and other emerging market economies in a different way than in the US, UK and Europe. We experienced the second round effect of the global financial crisis in such a manner that the negative shocks spread from the real sector to the financial sector. In our study, the financial crisis impacted differently than what was found in the study of Bayoumi and Melander (2008). In their work, they investigated how banks' solvency affected credit and economic activity and the possibility of an adverse feedback loop from economic activity to the financial system, with second-round effects on the macroeconomy through reduced credit availability. In contrast, our model starts from the second round effect of the global financial crisis which affects the credit availability and economic activities. Subsequently, the adverse impact on the real sector is transmitted to the financial sector, which further tightens the credit condition.

We investigated the impact of the financial sector through the condition of commercial banks' balance sheet. We utilised the Bank for International Settlements (BIS) capital adequacy ratio, which is the ratio between the risk-bearing capital and the risk-weighted assets. This ratio gives an indication of the solvency of a bank, measuring its financial health. If the bank fails to meet this requirement, it will not likely survive. The benchmark ratio is 8%. Following the second round effect of the global financial crisis, the debate over an easing of the bank capital-ratio rule was rather heated in many countries, such as Thailand and South Korea. The proposal for the loosening up of the capital-ratio rule for commercial banks is to prevent them from curtailing loans when the global economy is mired in recession. Easing on this type of regulation is justified temporarily as it may facilitate faster economic recovery and avoid the worse-case scenario such as credit crunch. However, the opponents to this view uphold that relaxation in the bank capital-ratio rule may hurt the banks' financial

soundness in the long run. During the crisis, banks may want to tighten their lending standards and beef up their capital base to brace for solvency in the corporate sector.

This section clarifies the paradox by studying the relationship between commercial banks' net credit (CREDIT), private investment (INVEST), the level of output (OUTPUT), and the BIS ratio (BIS). These variables are in natural logarithms. The frequency of the data is monthly, and the period of observation is between January 2000 and May 2009. The outstanding private credit data of the four largest commercial banks in Thailand are employed, which account for 60 % of total credits issued by commercial banks (as of November 2009). The BIS ratio is also from the four largest commercial banks. To give an idea of the historical relationships among the variables considered in this paper, Figure 20 illustrates the time series plots of the variables. The plots indicate that all the series are trending and potentially follow an I(1) process. The visual inspection suggests that these series appear to have common stochastic trends, which can plausibly be modelled as cointegrated. We initially assessed the stochastic properties of the data by a unit root test and then perform statistical tests for cointegration. The Augmented Dickey-Fuller tests on these series fail to reject the null hypothesis of unit root and the statistical test also confirms the cointegrating relationship between variables.

The econometric methodology employed in this part uses Johansen's cointegrated vector-error correction analysis to identify the long-run relationship between variables. Given non-stationarity and comovement of the variables in our model, cointegrating VAR analysis provides a framework for estimation, inference, and interpretation. This specification is useful in analysing the long-run equilibrium behaviour of the model, while the short-run fluctuations representing deviations from the equilibrium is allowed.

The vector-error correction model is specified as follows:

$$\Delta y_t = \Pi\, y_{t-1} + \sum_{i}^{k-1} \Gamma_i \Delta y_{t-i} + \mu + \varepsilon_t$$

where y_t is a (n×1) vector of the n endogenous variables, consisting of:

$$[CREDIT,\ OUTPUT,\ INVEST,\ BIS]$$

respectively. ì is a (n×1) vector of constants, Γ_i represents a (n×(k-1)) matrix with coefficients associated with the short-run dynamic effects, ε_t denotes a vector of white noise residuals, and Π is a (n×n) coefficient matrix. If the matrix

274

has reduced rank (0<r<n) , it can be split into a (n×r) matrix of speed of adjustment coefficients α, and a (r×n) matrix of cointegreting vectors β. r is considered as number of linearly independent cointegrating vectors. The former indicates the importance of the cointegrating relationships in the individual equations of the system and the adjustment to disequilibrium, while the latter represents the long-run equilibrium relationship, so that $\Pi = \alpha\beta'$.

4.2.1 Empirical Results

In order to get uncorrelated residuals for the VEC model, the two lags were selected by the HQIC method, the SBIC method, and the sequential likelihood-ratio (LR) test. The number of cointegrating equations was selected using the Johansen's multiple trace test procedure and the maximum Eigenvalue test. The statistics strongly suggest the existence of a single cointegrating vector. Since inference on the parameters in α depends crucially on the stationarity of the cointegrating equations, we checked the specification of the model by predicting the cointegrating equation and graph them over time. The cointegrating equations are stationary, the number of cointegrating equations are correctly specified. The stability check indicates that the model is not misspecified since the graph of the Eigenvalues shows that none of the remaining Eigenvalues appears close to the unit circle.

The estimation results of the VECM with a single cointegrating equation and two lags on all four series are presented in Appendix Table A4. Overall, the output indicates that the model fits quite well. The estimation results exhibits a long-term joint time series dynamics of four endogenous variables within a linear system of simultaneous equations, while controlling for inter-temporal adjustments. In this model, the long-run behaviour of income, credit, BIS ratio and investment significantly share a cointegrating vector and the relationship is restricted to converge to their cointegrating relation. The coefficient of all variables in the cointegrating equation is statistically significant, as are the adjustment parameters. The estimates have the correct sign and imply rapid adjustment towards equilibrium. In our previous notion, we have estimated:

$$\hat{\alpha} = \left(\text{-0.036, 0.129, 0.053, -0.016}\right)$$

$$\hat{\beta} = \left(1,\text{-2.486,-1.833,1.250}\right)$$

$$\hat{\Gamma} = \begin{pmatrix} -0.011 & -0.040 & 0.005 & 0.029 \\ 0.535 & -0.336 & 0.648 & 0.234 \\ 0.065 & -0.051 & 0.320 & 0.081 \\ -0.022 & -0.070 & 0.012 & -0.089 \end{pmatrix}$$

A cointegrating equation suggests that:

$$\text{CREDIT}_{t-1} \; \text{-2.486 OUTPUT}_{t-1} \; \text{-1.833 INVEST}_{t-1} \; \text{+1.250 BIS}_{t-1}$$
$$\qquad\qquad (\text{-7.69}) \qquad\qquad\quad (5.37) \qquad\qquad (3.80)$$

is a stationary series. The number in parenthesis is t-statistics for each parameter. This is a long-term equilibrium relationship of the four variables, where $\hat{\alpha}_i$ represents the speed of adjustment to the equilibrium. If there is an unexpected shock that results in a fall of the credit, the four variables will adjust themselves toward the equilibrium again. With the shock, the credit is below the equilibrium level, it then adjusts itself upward to equilibrium level. Investment and output also fall back to the credit level at the same time the credit is adjusting. Lastly, the BIS ratios also increase to catch up with the equilibrium level. Additionally, the cointegrating equation suggests a positive relationship between credit, investment and income in the long run. Interestingly, higher capital adequacy ratio required tends to reduce the amount of credit, investment and income.

Figure 18
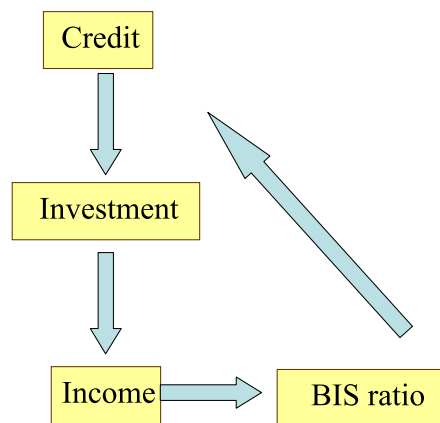**Relationship between Financial and Real Sector**

276

Figure 19
Forecast Error Variance Decomposition

FEVD of	Period	Net credit	Output	Invest	BIS
Credit	1	100.00	0.00	0.00	0.00
	2	99.41	0.51	0.06	0.02
	5	95.39	4.20	0.19	0.23
	10	90.76	8.52	0.26	0.45
	15	88.43	10.72	0.29	0.56
	20	87.16	11.91	0.31	0.62
	30	85.90	13.10	0.32	0.68
Output	1	0.01	99.99	0.00	0.00
	2	3.23	89.18	3.55	4.04
	5	3.19	85.03	6.09	5.69
	10	3.37	81.80	7.81	7.01
	15	3.44	80.43	8.54	7.58
	20	3.48	79.68	8.94	7.90
	30	3.52	78.87	9.37	8.24
Invest	1	0.13	5.26	94.61	0.00
	2	0.09	14.72	85.16	0.04
	5	0.11	43.61	55.98	0.30
	10	0.34	61.67	37.16	0.83
	15	0.46	67.51	30.98	1.06
	20	0.51	70.10	28.22	1.16
	30	0.56	72.38	25.80	1.26
BIS	1	14.71	0.02	0.12	85.15
	2	15.61	0.22	0.14	84.02
	5	16.72	0.18	0.30	82.81
	10	16.88	0.36	0.37	82.39
	15	16.90	0.50	0.40	82.20
	20	16.90	0.59	0.42	82.09
	30	16.90	0.69	0.43	81.97

277

The results also show that in the short run, a restriction in credit availability can possibly deteriorate economic activity that will, in turn, spur a further tightening in credit conditions. To elaborate this point, a fall in credit results in lower investment ($\hat{\Gamma}_{31}$=0.065) and income in the short run ($\hat{\Gamma}_{21}$=0.535).

A worsening economic condition, subsequently, results in a higher BIS ratio as banks tighten their lending standards and beef up their capital base ($\hat{\Gamma}_{42}$=-0.070).

As mentioned earlier, the purpose of this paper is to analyse the impact of the global financial crisis on bank lending, which could aggravate investment and income and consequently affect financial stability. Figure 18 presents a framework for the macro-financial linkage in our model. According to the Cholesky forecast-error variance decomposition (FEVD) results, as presented in Figure 29, shocks to credit are important in explaining fluctuation in output, investment and BIS ratio.

Fluctuations in the credit are predominantly self-explanatory in the very short run and long run. These shocks would explain up to 86% in the long run. The second largest shock that caused variability of credit was output. Shocks to output are able to explain approximately 13% of the long-run variability of the credit. Shocks to investment and banks' capital adequacy ratio have trivial effects on the variability of the credit.

The variability of output in the short run and long run are associated mainly with itself. The investment shock has a dominant effect in keeping fluctuation in output. Shocks to investment can explain approximately 9% of the long-run variability of output. Shocks to the BIS ratio and shocks to credit can be explained by 8% and 4% of the long-run variability of the credit, respectively.

Fluctuations in investment in the short run are explained mainly by itself. However, in the long run, its effect will decrease. In the long run, shocks to output are predominantly able to explain 72% of investment variability. The shocks to the BIS ratio are able to explain 1% of the fluctuations in investment, while the shocks to credit surprisingly have small and trivial effect.

Figure 20
**Time Series Plots between Variables**
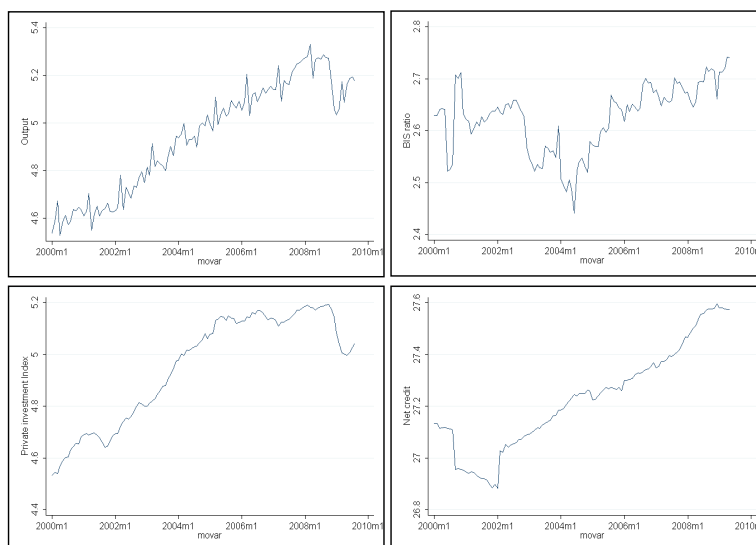
The variability of the BIS ratio in the short run and long run are associated mainly with itself, notably 82% in long run. The shocks to credit are able to explain 17% of the long-run fluctuation in the BIS ratio. The shocks to output and investment have very small effect to cause fluctuations in the BIS ratio.

Figure 21
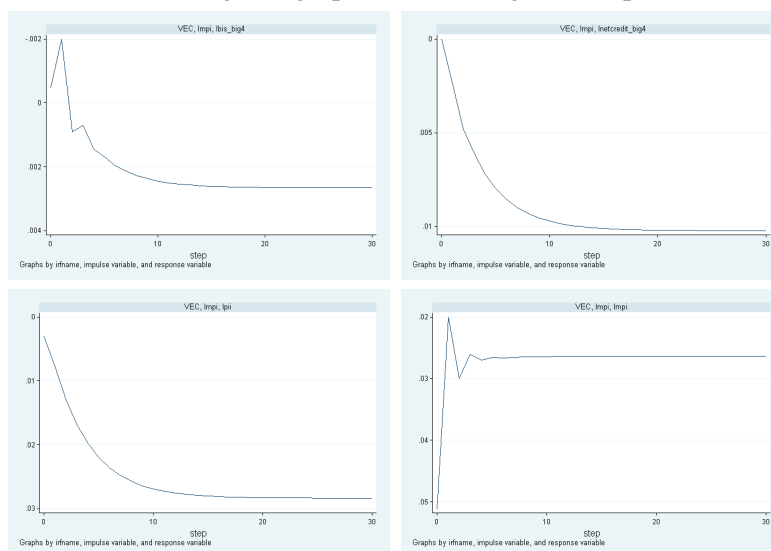**Impulse Response Function of Credit**
(Reversing the graph to show negative impact)
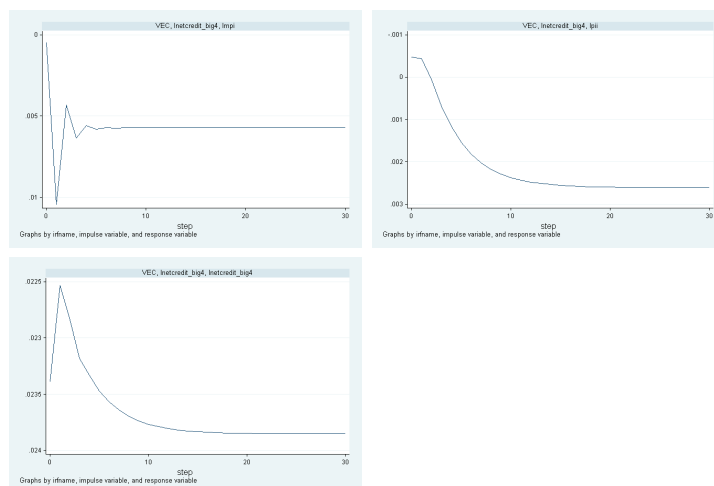
We next estimated the orthogonalised impulse-response functions (IRFs). While the IRFs from a stationary VAR die out over time[4], the IRFs from a cointegrating VECM do not always die out. As the I(1) variables modelled in a cointegrating VECM are not mean reverting, the effect of some shocks will not die out over time. The dynamic movement of each variable due to a one standard-error shock to credit are presented in Figure 21.

Figure 22
Impulse Response Function of Investment
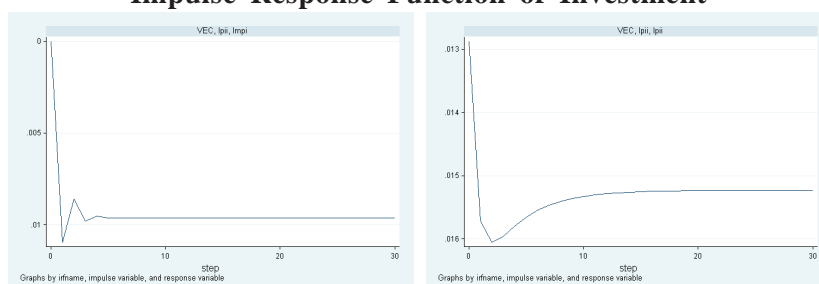
(Reversing the graph to show negative impact)

Figure 23
Impulse Response Function of Output
(Reversing the graph to show negative impact)

_____

4. Since each variable in a stationary VAR has time invariant mean and variance, the effect of shock to any variables must die out so that the variable can revert to its mean.

Figure 24
Impulse Response Function of BIS Ratio
(Reversing the graph to show negative impact)
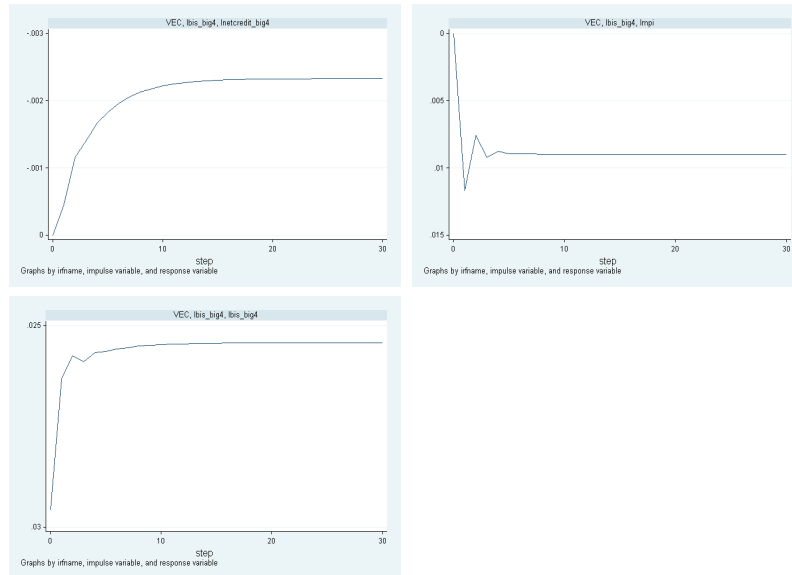
Our analysis started with a negative exogenous shock to the bank lending system, which is the case for Thailand and many regional countries. According to our finding, the negative shocks to credit will lead to lower investment and the shocks have permanent effect on investment. A one standard-error shock to bank lending would decrease investment by about 0.25% in 10 months and the shocks persist. The impact on income is more drastic, an exogenous and negative credit shocks associate with a fall in investment of around 0.6% (see Figure 21). The effect is also permanent. It is notable that during the global financial crisis, most of the loan demand in Thailand is for working capital rather than for new investment. As a result, a shock to credit results in a stronger impact on income rather than on investment. Lastly, the negative shocks on credit have permanent effect on itself.

Lastly, we explored the impact of the BIS ratio on credit, output and investment in the short run and long run. The result suggests that the tighter capital adequacy ratio is associated with lower credit and income in both the short and long term.

5. Transmission Mechanism of Monetary Policy in Thailand

As discussed in Section 3 of this paper, the Monetary Policy Committee (MPC) has the responsibility to set the appropriate policy interest rate in order to keep the inflation within the target range. Indeed, the change of policy rate could affect monetary condition through a number of transmission channels, namely: interest rate, credits, exchange rate and asset prices channels. The objective of this part is to discuss how the changes in the monetary policy stance could affect the real economy and to gauge the importance of each channel during the period after the BOT's adoption of inflation targeting regime in 2000, and especially during the recent monetary policy easing as a response to the global economic downturn. Figure 25 presents the overview of the monetary policy transmission mechanism.

Figure 25
Monetary Policy Transmission Mechanism
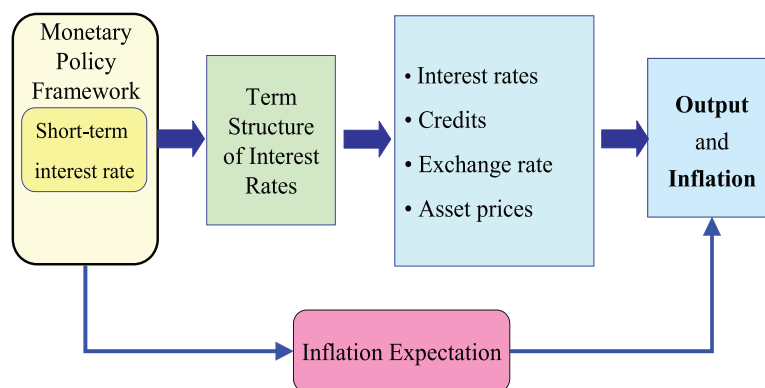
Before investigating the transmission mechanism in each channel in detail, we shall first assess the effect of a change in monetary policy toward output gap. Goswami, Jost and Long (2009) estimated the marginal effect of real policy interest rate on the output gap using OLS-AR(2) model as follows:

$$y_t = \alpha + \beta_1 \ y_{t-1} + \beta_2 \ y_{t-2} + \beta_3 \ (realpolicy_t) + \ \varepsilon_{t,}$$

given that the output gap (y_t) and the real policy interest rates follow I(0) process. However, such model specification is prone to suffer from the serial correlation problem due to occurrence of the lag dependent variable on the right-hand side of an equation (see details in Wooldridge [2003], page 415).

Before performing the OLS regression for the case of Thailand, we first analyse the stochastic properties of each variable in our sample. Based on the Augmented Dickey Fuller (ADF) test (Dickey and Fuller, 1979 and 1981) and Philips-Perron (PP) (1988) unit root tests, we find that the output gap follows I(1) process, while the real policy interest rates are I(0) level stationary. In order to avoid the spurious regression, we estimate the relationship between the first difference of output gap and the real policy rate as follows:

$$(y_t - y_{t-1}) = \alpha + \beta(realpolicy_{t-2}) + \varepsilon_{t,}$$

where y_t is output gap, which is defined by log different between actual real GDP and the potential output[5] at period t. $realpolicy_t$ represents real policy interest rate at period t, calculated from the difference between the policy rate and headline inflation. The data are quarterly observed from Q1:1993 to Q2:2009. The results from the OLS regression are as follows:

$$(y_t - y_{t-1}) = -0.151 \ (realpolicy_{t-2}) + \varepsilon_{t,}$$
$$(-2.59)$$

where the figure in parenthesis represents the t-statistics.

The results showed that change in output gap was significantly determined by the real policy interest rate. The sign of the coefficient on real policy interest rate implies a negative relationship between the lag of the real policy interest rate and the change in output gap. The interpretation for the above equation is not straight forward. Due to the nature of the data, we cannot find the direct relationship between the real policy rate and the output gap. The interpretation of the results above is that there is a lag of policy rate passes through for 2 quarters. An increase in the policy interest rates 2 quarters ahead results in the negative change in the output gap, in other words, output gap in period t decreased from period $t-1$.

In the following sections, we shall investigate in greater detail the transmission mechanism of policy interest rate to the real economy in four channels, namely: interest rate, credit, exchange rate and asset price channel.

_____

5.   The potential output is calculated from applying the HP filter to the real GDP data.

5.1 Interest Rate and Credit Channel

The first two channels of transmission mechanism are the interest rate and credit channel. These two channels are closely intertwined. Typically, a change in the policy interest rate leads to an immediate change in money market rates. The policy rate should eventually also lead to a change in commercial bank reference lending and deposit rates, impinging on the level of liquidity in the financial system and of individual commercial banks. Due to the fact that the domestic economy depends normally on the financial sector for funding, these changes are passed through to consumption and investment. The speed of pass-through depends however on how well domestic financial markets are developed. Firms that get financing from the money markets - via issuance of bonds, for instance, should feel the impact of interest rate changes immediately for new projects, while older projects may have locked in previous rates. The extent to which households and firms borrow funds from commercial banks to finance their consumption and investment expenditure -such as personal loans, mortgages, - is also likely to influence their responsiveness to interest rate's change, prompting them to change their demand and investment behaviour accordingly.

As illustrated in Figures 27, the pass through of policy interest rate to money market rates had been almost instantaneous and of the same direction as the change in the policy rate, particularly at the short end. Long-term bond yields relied mostly on market expectations of future policy rate changes, but the response was also swift. In markets that were thin and not fully developed, such as in the case of Thailand, demand and supply factors apparently also played a role. In addition, as financial markets became progressively more open and interconnected with international financial markets, external factors that could be beyond control of central bank, such as US bond yields, also played a crucial role in driving domestic bond yield movement

Figure 26
Transmission Channel: 1. Interest Rates and Credit Channel
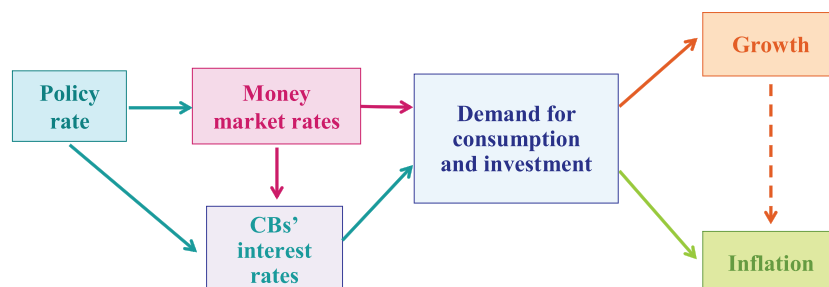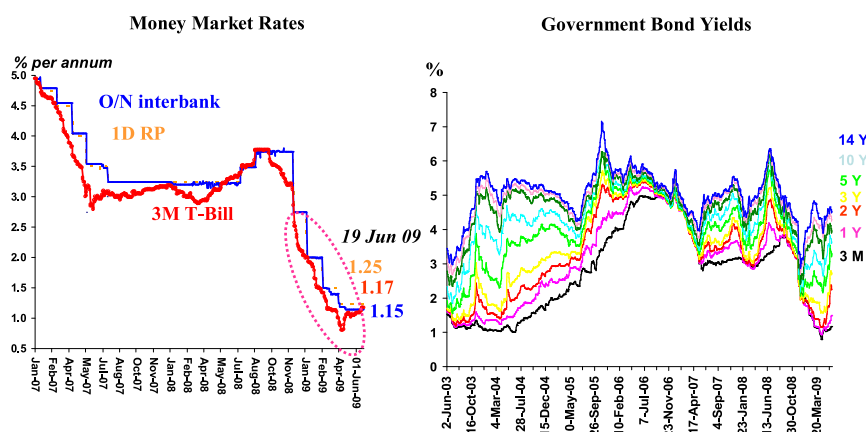

Figure 27
The Pass Through of Policy Interest Rate to Money Market Rates

With regards to the pass-through from policy rate to retail rates, commercial bank deposit and lending rates responded notably to changes in the policy rate albeit with some lags. Since the adoption of inflation targeting and the use of a policy interest rate to signal changes in the monetary policy stance, commercial bank rates have moved in tandem with policy rate movements. In gauging the degree of the pass-through to retail rates, we analysed the relationship between monetary policy and the average markets rates of the 5 biggest banks, i.e. lending rate and 3-month, 6-month and 12-month deposit rates. Based on the methodology used in Chareonseang and Manakit (2007), we adopted the cointegrating and error correction procedure to analyse this relationship. The period of the data examined is between June 2000 and July 2009, that was the period during which the BOT used inflation targeting as a monetary framework. Firstly, we analyse the long-run relationship by estimating the following equation:

285

$$i_t = \alpha_0 + \alpha_1\, Policy$$

where i_t represent market rates and *Policy* represent overnight RP which is policy interest rate . The pass-through would be complete if $\alpha_1 = 1$. We divided our data into two sets, M6:2000 to M12:2006 and M6:2000 to M12:2009. This was in order to for us to investigate if the pass-through of interest channel had changed at all during the more recent period.

The empirical results tested for the long-run relationship in Figure 28 showed the co-movement between policy and market interest rate. The results confirmed that all market rates and policy rate were I(1) variables. The results also showed the markup for the credit was higher than deposit rates while the degree of policy pass-through to deposits were higher than the pass-through to credit rate. It is interesting to note that the degree of pass-through to lending rate, during M6:2000 to M7:2009, was slightly higher than for the period during M6:2000 to M12:2006, while the pass-through to all deposit rates were slightly lower in the latter period.

Figure 28
Long-run Relationship and Degree of Pass Through

$$i_t = \alpha_0 + \alpha_1 Policy + \varepsilon_t$$

i_t	Mark up: α_0 (t-statistics)		Degree of Pass through: α_1 (t-statistics)	
	2000 m6 – 2006 m12	2000 m6 – 2009 m7	2000 m6 – 2006 m12	2000 m6 – 2009 m7
Credit	6.2206 (3.3097)	6.1615 (43.4193)	0.2531 (3.3097)	0.2607 (4.9584)
3-month deposit	1.1590 (6.9854)	1.1059 (7.6386)	0.4043 (5.7044)	0.3652 (6.8095)
6-month deposit	1.0543 (6.3892)	1.0377 (7.1233)	0.4833 (6.8568)	0.4179 (7.7433)
12-month deposit	1.2597 (6.1172)	1.2806 (7.1764)	0.5230 (5.9459)	0.4228 (6.3959)

In Figure 29, we used the error correction model to estimate the short-run dynamics pass-through of policy rate. The results also showed the co-movement between policy and market interest rates as we have seen from the long-run equation. In the short-run equation, however, the results showed that the degree of pass-through was higher in recent years, as reflected by higher, while the speed of adjustment to equilibrium was lower. We found mean-reverting to the long-run equilibrium only when including the recent period data.

Figure 29
Short-run Relationship and Degree of Pass Through

$$\Delta i_t = \beta_0 + \beta_1 \Delta Policy + \beta_2 \varepsilon_{t-1} + e_t$$

	β_1 (t-statistics)		β_2 (t-statistics)		Mean adjustment lag*	
	2000 m6 – 2006m12	2000 m6 – 2009 m7	2000 m6 – 2006m12	2000 m6 – 2009m7	2000 m6 – 2006m12	2000 m6 – 2009 m7
Credit	0.1283** (1.5055)	0.1934** (3.0376)	-0.0467 (-2.4397)	-0.0468** (-2.4603)	4.5072	17.2350
3-month deposit	0.1509** (1.6825)	0.2530** (3.1486)	-0.0672 (-3.0875)	-0.0546** (-2.3103)	12.6354	13.6813
6-month deposit	0.1735** (1.8736)	0.2984** (3.5132)	-0.0703 (-3.1133)	-0.0568** (-2.2870)	11.7568	12.3521
12-month deposit	0.1704** (1.5291)	0.2802** (2.9221)	-0.0536 (-2.4607)	-0.0403 (-1.7612)	15.4776	17.8610

*Mean adjustment lag $= \dfrac{1 - \beta_1}{\beta_2}$

** 5% statistically significant

In conclusion, the evidence showed that the degree of the pass-through of policy rate to lending (credit) was higher in the recent year while the degree of the pass-through to deposit rates was slightly lower. The results also suggested that the degree of pass-through of policy to deposit rate was higher than to credit rate. Among the factors which affected the degree and speed of the pass-through were the levels of liquidity in the banking system as well as the degree of financial intermediation. The shift in financial intermediation away from bank-based lending, as indicated by the decline in the ratio of bank credits to GDP since the financial crisis, together with the excess liquidity in banking sector, probably explained the low degree of pass-through during M7:2000 - M12:2006 (2003-2005 in particular). However, the overall speed of transmission via the interest rate channel increased thereafter, as a major segment of the economy still relied on financial intermediation through bank lending.

287

5.2 Exchange Rate Channel

Another important transmission channel is the exchange rate channel. As is normally the case for the small and open economy, the exchange rate plays a crucial role in the monetary policy's deliberation. This is because the exchange rate can have a significant impact on the real economy through external competitiveness as well as foreign investors' sentiment. In order to analyse the monetary policy transmission through the exchange rate channel, the analysis is partitioned into two processes: (1) the pass-through from the policy interest rate to the exchange rate channel and (2) the pass-through from the exchange rate to the real economy.

5.2.1 Pass-through from the Policy Interest Rate to the Exchange Rate

According to Uncovered Interest Parity theory, if the exchange rate is allowed to move flexibly, a change (increase/decrease) in the policy interest rate tends to lead to an immediate change (strengthening/softening) in the domestic currency. This is because the interest rate differential could drive capital flows. The change in exchange rate could also affect the growth of the real economy through changes in net exports and the subsequent adjustment of the current account, and could affect inflation to the extent that the prices of imports are affected.

The extent to which the monetary policy could transmit via the exchange rate channel depends on a number of factors, namely: (1) the responsiveness of the exchange rate to interest rates, given the linkages between the FX market and money markets, and whether any barriers exist between the two markets; (2) the degree of trade and financial openness – specifically, the more open a country, the more likely it will be affected by exchange rate movements; (3) the sensitivity of net exports to exchange rate variations, which also depends on how well exporters and importers are able to manage their exchange rate risks; (4) the degree of development of the domestic financial markets, in terms of linkages between FX and money markets as well as the amount and attractiveness of the financial instruments and assets; and (5) policy credibility, which depends on the central bank's policy goals and its choice of monetary policy framework, and the extent to which it manages the exchange rate.

Figure 30
Thai-US Policy Interest Rate Differential
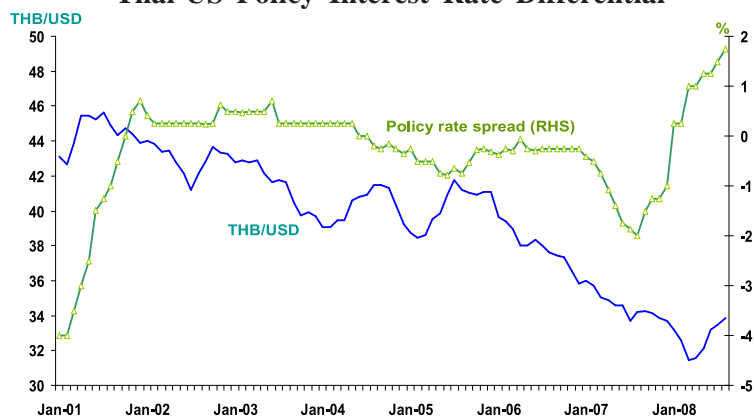
In the case of Thailand, as shown in Figure 30, the evidence suggested a relatively small impact of the interest rate differential on Thailand's exchange rate movements. Despite a somewhat stable interest rate differential during 2002-2006, for example, the Thai baht appreciated against the US dollar. This could indeed be explained by the deterioration in the market sentiment over the US twin deficits as well as market's expectation that the Chinese currency would revalue. These factors led to large capital inflows into Thailand and the region, thereby the appreciation of Thai Baht. This incident was in line with the study done by the BOT that was published in the October 2004 Inflation Report. The study found that, unless the interest rate differential was large enough, its impact on the exchange rate would be minimal compared to the daily exchange rate volatility. To be more specific, the study showed that an increase in the policy rate of 25 basis points would lead to the appreciation of Thai baht by merely 0.02%. In other words, it could be said that the Thai exchange rate was determined by a number of factors and the interest rate differential was just one of them. The impact of interest rate differential tends to be small and easily outweighed by the exchange rate volatility (Figure 31).

Figure 31
The Effectiveness of Exchange Rate Channel is Relatively Weak
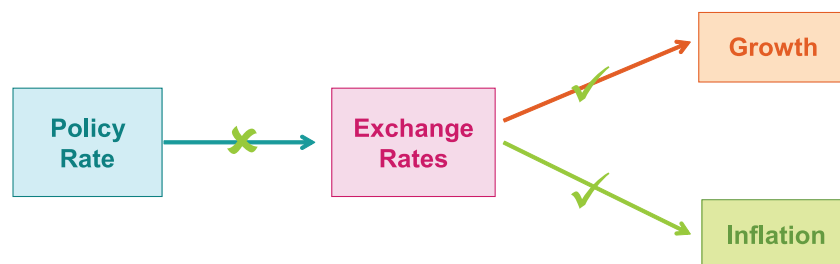
5.2.2 Pass-through from Exchange Rate to the Real Economy

Turning to the pass-through from exchange rate to the real economy, generally, the change in exchange rate could also affect the growth of the real economy through changes in net exports and the subsequent adjustment of the current account. Changes in the exchange rate could also impact inflation through changes in the cost of imported goods. Sriphayak and Vongsirikul (2006) used BOTMM to investigate the importance of the channels of monetary policy transmission mechanism. The study found that the influence of the exchange rate channel became more prominent, when comparing the data between Q1:1994 - Q3:2002 and Q1:1994 - Q1:2006. A more recent internal study adopted the Vector Error Correction Model to investigate the pass-through of the exchange rate to the real economy. The result suggests that, as of Q4:2008, a 1% depreciation in the exchange rate between Thailand and the US leads to a 0.07% increase in economic growth and a 0.05% increase in headline inflation (Figure 32).

Figure 32
Effect* of 1% Depreciation in Nominal Effective
Exchange Rate (NEER)**

	As of Q4 08
Economic growth	**+0.07**
Headline inflation	**+0.05**
Core inflation	**+0.03**

Note: *average effect in 1 year

** From Vector Error Correction Model

290

In summary, as a small and open economy, the Thai economy was inevitably affected by the changes in exchange rate. The effectiveness of the exchange rate channel has been relatively weak, given the unstable response of exchange rate to policy rate changes, as well as the small response of exchange rate to the interest rate differential between the domestic and foreign interest rate. However, the exchange rate channel is still important to inflation and GDP growth under the floating exchange regime.

5.3 Asset Prices

Another channel that the monetary policy could transmit to the real sector is through the fluctuations in asset prices. Prolonged low interest rates, for example, could bring about a shift to alternative assets - including both financial and real assets - leading to increased wealth and higher growth. The high growth could also lead to a rise in inflationary pressure and actual inflation. On the contrary, the monetary tightening could dampen equity prices by making equity less attractive compared to bonds (higher interest rate). Lower equity price, in turn, could lead to a fall of household wealth and therefore consumption and investment.

The extent to which the asset price channel could transmit to the real economy depends on a number of factors, such as: (1) the degree of development and liquidity of the domestic financial markets, including the availability and attractiveness of alternative financial assets for investment; (2) the intermediary role of commercial banks, and the shift into financial markets and financial assets; (3) policy credibility, specifically, whether or not the public believes that the central bank is focused on tackling inflation and/or curbing asset price bubbles, for example.

5.3.1 Equity Price and Property Price

As illustrated in Figure 33, house price indices both for single detached house as well as town house had been increasing continuously since 2000. This was partly due to the low interest rate environment and the greater access to banks loans, coupled with some government stimulus measures involving a property transfer tax reduction. This led to an increase in housing credit and mortgage loans especially during 2002-2003. The acceleration of housing credit prompted the BOT to issue a prudential guideline for the property sector in December 2003. This prudential guideline had slowed the housing credit somewhat

in the later periods. Nevertheless, the house prices continued to increase as a result of higher construction and transportation cost.

Figure 33
**Asset Price Movements: House and Stock Prices**
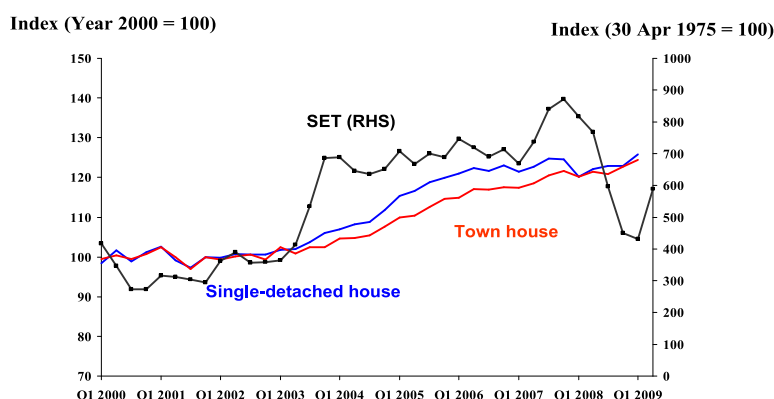
Source: Government Housing Bank, SET and Bank of Thailand

With regard to stock prices, after the strong economic recovery, the Thai stock market strengthened significantly especially in 2003 before levelling off during 2004-6. The period 2007 to early 2008 saw the stock market pick up again before a drastic fall in Q4:2008 as a result of a global risk aversion. Nevertheless, the stock market rebounded unexpectedly fast in 2009. At the end of Q3:2009, as the global financial market started to calm down, the stock market increased rapidly to the pre-Lehman level.

As a channel for transmission mechanism, the asset price channel remained a weak channel. There were few internal studies by the BOT on the issue of asset price channel. Using Vector Auto-regression (VARs) approach, Disyatat and Vongsirikul (2002) found that a role of equity prices, specifically the Stock Exchange of Thailand's price index (SET), in the monetary policy transmission channel was less important than other channels during the period between 1993 and 2001. In this study, an increase of the policy rate by one standard deviation or around 200 basis points led to an immediate but small fall in equity price of approximately 4% that lasted around 6 months. Another study by Sriphayak and Vongsirikul (2006), using the BOTMM , concluded that equity prices were more sensitive to interest rate change than property prices and that, in Thailand, the asset price channel gained in effectiveness but remained weaker when compared to other transmission channels.

Figure 34.1   Figure 34.2

Composition of Household Wealth Composition of Financial Assets
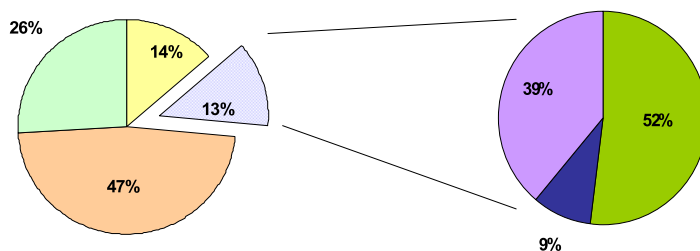
Source: National Statistical Office's Socio-Economic
Survey, 2006 and 2007
Note: Data on financial assets is from 2006 survey.

Source: Bank of Thailand, March
2009

As Figure 34 suggests, most of the household wealth was in the form of residential and commercial real estate (non-financial assets), and these assets were quite illiquid. Even financial assets held by households were mostly deposit accounts, and not securities whose values were sensitive to changes in the policy interest rate. Therefore, it is not surprising that both private investment and private consumption did not respond significantly to changes in equity prices.

In sum, since the adoption of the inflation targeting regime, the interest rate and credit channels had generally been the most important transmission mechanism channel. Nevertheless, their importance had declined during the period between 2003-2005 due to heightened risk aversion as well as excessive liquidity in the banking sector. In the more recent period, it had become apparent that this channel started to regain its strength. The exchange rate channel and asset price channel had been more important during the inflation targeting regime period. Despite being less important when compared to interest rate and exchange rate channel, the role of asset prices as a transmission mechanism channel is expected to be stronger going forward because households are likely to participate more in asset markets and the assets constituted an increasing portion of households' wealth.

6. Conclusion

This paper studied the linkage between the macro and financial sectors and its implications for monetary policy. An objective of the paper was also to gain a better understanding of the channels through which monetary policy could

293

influence financial conditions. The paper started with a brief discussion of Thailand's economic development and the evolution of monetary policy in Thailand in order to give readers some background for analysis. Then it discussed in the impact of the financial crisis on the real economy as well as financial markets and what BOT had done to shore up confidence and restore the economy. Empirically, the paper explored the possibility of the financial linkages and financial spillover between the US and Thailand as well as it analysed the impact of the tightening credit condition on economic activity, such as investment and income, which, in turn, could affect the banks' financial position. Lastly, the paper discussed and investigated the main channels through which monetary policy could be transmitted to the macroeconomy in Thailand.

REFERENCES

Bank of Thailand, (2003), Inflation Report, January.

Bank of Thailand, (2004), Inflation Report, October.

Bank of Thailand, (2006), Inflation Report, July.

Bayoumi and Melander, (2008), "Credit Matters: Empirical Evidence on U.S. Macro-Financial Linkages", *IMF Working Paper*, WP08/169, July.

Brunnermeier, Markus K., (2009), "Deciphering the Liquidity and Credit Crunch 2007-2008", *Journal of Economic Perspectives*, No. 23, 77-100.

Bystrom, Hans, (2005), "Credit Default Swaps and Equity Prices: The iTraxx CDS Index Market", *Working Paper*, Lund University.

Chai-anant, C.; Pongsaparn, R.; and Tansuwanarat, K., (2008), "Role of Exchange Rate in Monetary Policy under Inflation Targeting: A Case of Thailand", Bank of Thailand Symposium Paper, SP03/2008, September.

Charoenseang, J. and Manakit, P., (2007), "Thai Monetary Policy Transmission in an Inflation Targeting Era", *Journal of Asian Economics*, No.18, p.144-157.

Devereux, Michael B. and Yetman, James, (2009), "Financial Deleveraging and the International Transmission of Shocks", *Working Paper*.

Disyatat, P. and Vongsinsirikul, V., (2002), "Monetary Policy and the Transmission Mechanism in Thailand", *Bank of Thailand Discussion Paper*, No. DP/04/2002, October.

Engle, R., (2002), "Dynamic Conditional Correlation: A Simple Class of Multivariate Generalized Autoregressive Conditional Heteroskedasticity Models", *Journal of Business & Economic Statistics*, Vol. 20, No. 3 (Jul., 2002), pp. 339-350.

Engle, R. F. and Granger, C. W. J., (1987), "Cointegration and Error Correction: Representation, Estimation, and Testing", *Econometrica*, 55, 251-276.

Engle, R. and Sheppard, K., (2001), "Theoretical and Empirical Properties of Dynamic Conditional Correlation Multivariate GARCH", Working Paper, 2001-15, UCSD.

Frank, N. and Hesse, H., (2009), "Financial Spillovers to Emerging Markets during Global Financial Crisis", *IMF Working Paper*, WP09/104, May.

Gonzalo, J., (1994), "Five Alternative Methods of Estimating Long-run Equilibrium Relationships", *Journal of Econometrics*, 60, 203-233.

Hafner, C. and Franses, P. H., (2003), "A Generalized Dynamic Conditional Correlation Model for Many Asset Returns", Econometric Institute Report EI 2003-18, Erasmus University, Rotterdam.

Kim, Don; Mico, Loretan; and Eli, Remolona, (2009), "Contagion and Risk Premia in the Amplification of Crisis: Evidence from Asian Names in the CDS Market", *Working Paper*.

Sriphayak, A. and Vongsinsirikul, V., (2006), "Asset Prices and Monetary Policy Transmission in Thailand", BIS Annual Autumn Central Bank Economists' Meeting 2006 on Understanding Asset Prices: Determinants and Policy Implications, October.

Shorter, G., (2008), "Bear Stearns: Crisis and 'Rescue' for a Major Provider of Mortgage-Related Products", CRS Report for Congress, March 26, 2008.

Waiquamdee, A.; Disyatat, P.; and Phongsaparn, R., (2005), "Effective Exchange Rates and Monetary Policy: The Thai Experience", *Bank of Thailand Discussion Paper,* No.DP/04/2005, May.

Watson, Mark, (1994), "Vector Autoregressions and Cointegration", in Engle, R. F. and D. L. Mc-Fadden (eds.), *Handbook of Econometrics*, Vol. 4, Amsterdam: North-Holland, 1994, pp. 2843-915.

Wooldridge, Jeffrey M., (2003), "Introductory Econometrics", 2nd Ed. Mason, OH: South-Western.

Worthington and Higgs, (2004), "Transmission of Equity Returns and Volatility in Asian Developed and Emerging Markets: A Multivariate GARCH Analysis", *Int. J. Finance Econ.* 9 (2004), pp. 71–80.

Table A1

The variables for the Multivariate GARCH estimation in Section 4.1

(Daily data from September 2006-December 2009)

Variables	Description	Sources
Libor-OIS	Spread between Libor and the US Dollar Overnight Index Swap rates	Bloomberg
US CDS	Average of credit default swap rates of a number of banks such as Citigroup, Bank of America, JP Morgan, Wachovia, Merill Lynch, Morgan Stanley, Goldman Sachs, Lehman Brothers, HSBC, Royal Bank of Scotland, UBS and Deutsche Bank.	Bloomberg
TH CDS	PTT pcl. company credit default swap rates	Bloomberg
Swap pt.	1-month interest rate swap point between the USD and Baht	Bloomberg
SET	Thailand stock market index	The Stock Exchange of Thailand
S&P 500	Standard and Poor's 500 Index	Bloomberg
VIX	The Chicago board options exchange SPX volatility index (reflecting a market estimate of future volatility. The calculation is based on the weight average of implied volatility for a wide range of strikes)	Bloomberg
MSCIW	MSCI World index	Bloomberg
MSCIEMA	MSCI index for emerging market and Asia	Bloomberg

Table A2
Parameters for the Vector Error Correction
Model (VECM) Regression

1) Long-run Parameters

Parameters of Cointegrating Vector

	Coefficient	Std. Error
Credit	1	
Output	-2.486	0.323
Investment	1.833	0.341
BIS	1.250	0.329

2) Short-run Parameters

Alpha Adjustment Matrix

	Coefficient	Std. Error
Credit	-0.036	0.021
Output	0.129	0.226
Investment	-0.053	0.012
BIS	-0.016	0.025

Other Short-run Parameters

	Coefficient	Std. Error
D(Credit)		
Lag D(Credit)	-0.011	0.103
Lag D(Output)	-0.040	0.045
Lag D(Invest)	0.005	0.148
Lag D(BIS)	0.029	0.078
D(Output)		
Lag D(Credit)	0.535	0.226
Lag D(Output)	-0.336	0.099
Lag D(Invest)	0.648	0.324
Lag D(BIS)	0.234	0.171
D(Invest)		
Lag D(Credit)	0.065	0.059
Lag D(Output)	-0.051	0.026
Lag D(Invest)	0.320	0.084
Lag D(BIS)	0.081	0.044
D(BIS)		
Lag D(Credit)	0.022	0.142
Lag D(Output)	0.070	0.062
Lag D(Invest)	0.012	0.203
Lag D(BIS)	-0.089	0.107

298

Table A3
Result from GARCH (1,1) Estimated in Section 4.1

Variables	ARCH coefficient α	GARCH coefficient β	Constant Mean	Constant Variance
D(Libor-OIS)	0.5991***	0.6560***	-0.0007*	0.0688
	(3.391)	(11.720)	(-1.705)	(1.613)
D(US CDS)	0.4770***	0.7111***	0.0241*	0.0005
	(2.796)	(8.729)	(1.766)	(0.531)
D(TH CDS)	0.4639**	0.741***	-0.0447	1.1678*
	(2.126)	(14.170)	(-0.258)	(1.700)
D(Swap pt.)	0.6636	0.6942***	-0.0066	0.0022
	(1.629)	(9.269)	(-0.699)	(0.884)
D(SET)	0.2526***	0.3593*	0.5724	49.9479
	(2.851)	(1.896)	(1.417)	(1.555)
D(S&P 500)	0.0812***	0.9066***	0.4952	4.3279
	(5.697)	(59.700)	(1.058)	(1.442)
D(VIX)	0.2018***	0.7836***	0.005	0.146
	(3.457)	(14.580)	(0.105)	(1.421)
D(MSCIW)	0.0899***	0.8991***	0.5955	3.2635*
	(5.944)	(62.210)	(1.343)	(1.663)
D(MSCIEMA)	0.0984***	0.8845***	2.6900***	24.2618*
	(4.844)	(42.260)	(2.622)	(1.755)

Note: *, **, *** denotes significant at 1%, 5% and 10%, respectively

Table A4
Result from MGARCH Estimated in Section 4.1

List of Series	
1.D(Libor-OIS)	6. D(S&P 500)
2. D(US CDS)	7. D(VIX)
3. D(TH CDS)	8. D(MSCIW)
4. D(Swap pt.)	9. D(MSCIEMA)
5. D(SET)	

Conditional Variance between Series

$\rho_{2,1}$	0.1517*** (2.949)	$\rho_{8,1}$	-0.2575*** (-5.349)
$\rho_{3,1}$	0.0235 (0.5893)	$\rho_{9,1}$	-0.2044*** (-3.962)
$\rho_{4,1}$	-0.0358 (0.3847)	$\rho_{3,2}$	0.1912*** (3.555)
$\rho_{5,1}$	-0.0753* (0.0680)	$\rho_{4,2}$	-0.0740 (-1.332)
$\rho_{6,1}$	-0.2862*** (0.000)	$\rho_{5,2}$	-0.2085*** (-4.550)
$\rho_{7,1}$	0.2969*** (4.065)	$\rho_{6,2}$	-0.2457*** (-4.931)

Conditional Variance between Series

$\rho_{7,2}$	0.2177*** (4.243)	$\rho_{9,4}$	0.0564* (1.795)
$\rho_{8,2}$	-0.3824*** (-8.189)	$\rho_{6,5}$	0.1864*** (4.108)
$\rho_{9,2}$	-0.3681*** (-8.815)	$\rho_{7,5}$	-0.1569*** (-3.489)
$\rho_{4,3}$	-0.0223 (-0.684)	$\rho_{8,5}$	0.3589*** (5.450)
$\rho_{5,3}$	-0.1628*** (-3.100)	$\rho_{9,5}$	0.4121*** (6.957)
$\rho_{6,3}$	-0.0327 (-0.907)	$\rho_{7,6}$	-0.8554*** (-76.63)
$\rho_{7,3}$	0.0173 (0.450)	$\rho_{8,6}$	0.8730*** (95.80)
$\rho_{8,3}$	-0.0926** (-2.553)	$\rho_{9,6}$	0.6422*** (25.81)
$\rho_{9,3}$	-0.1001** (-2.554)	$\rho_{8,7}$	-0.7333*** (-39.82)
$\rho_{5,4}$	0.0321 (0.886)	$\rho_{9,7}$	-0.5403*** (-18.57)
$\rho_{6,4}$	0.0337 (0.975)	$\rho_{9,8}$	0.8395*** (69.75)
$\rho_{7,4}$	-0.0351 (-1.025)	α	0.0084*** (3.798)
$\rho_{8,4}$	0.0359 (1.153)	β	0.9508*** (67.21)

Note: *, **, *** denotes significant at 1%, 5% and 10%, respectively.

Figure A1
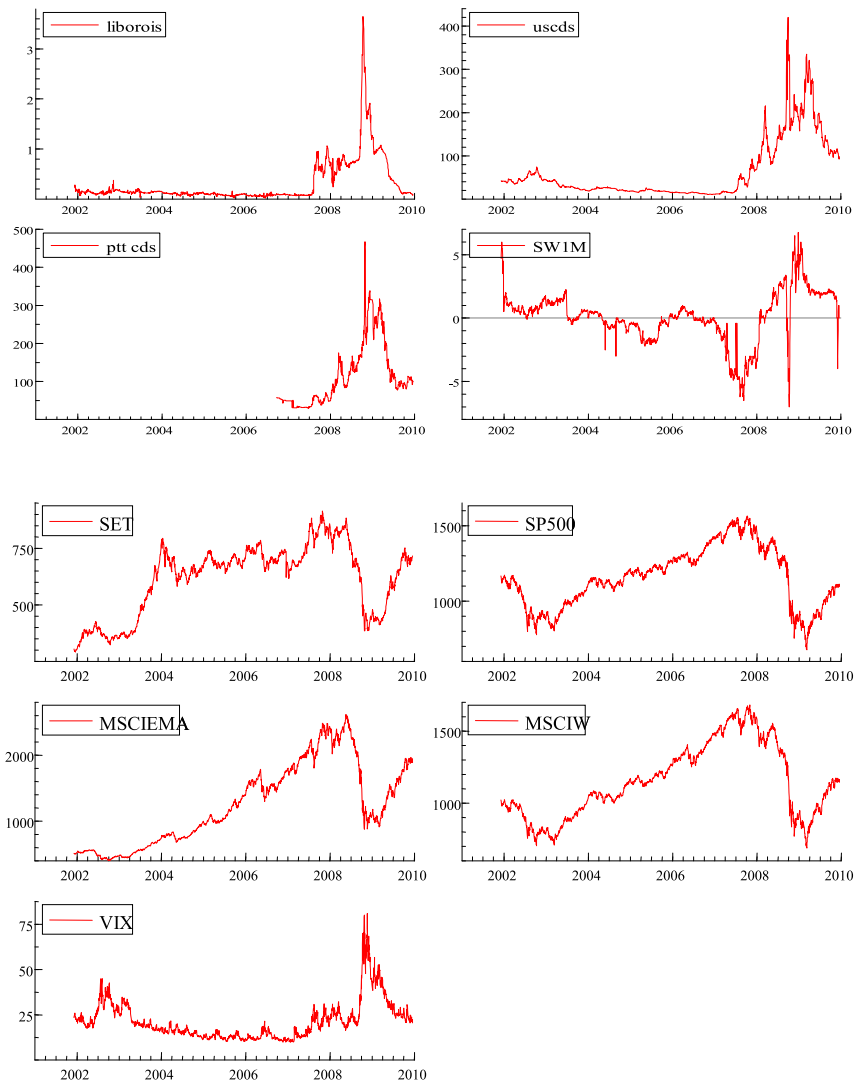**Financial Variables**.

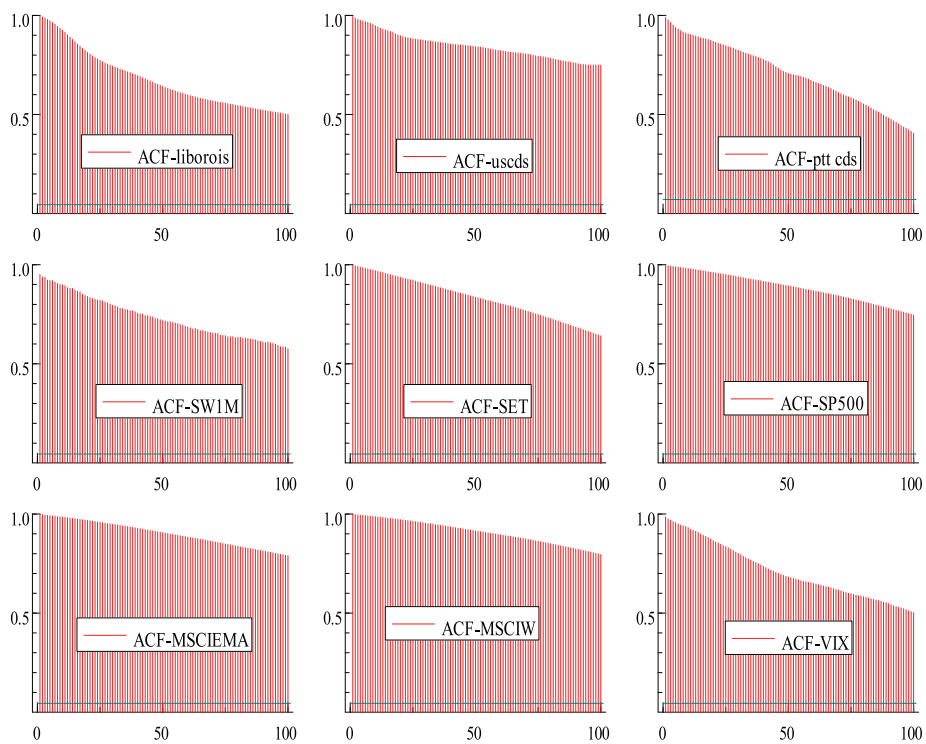**Figure A2**
Autocorrelation Function of Financial Variables
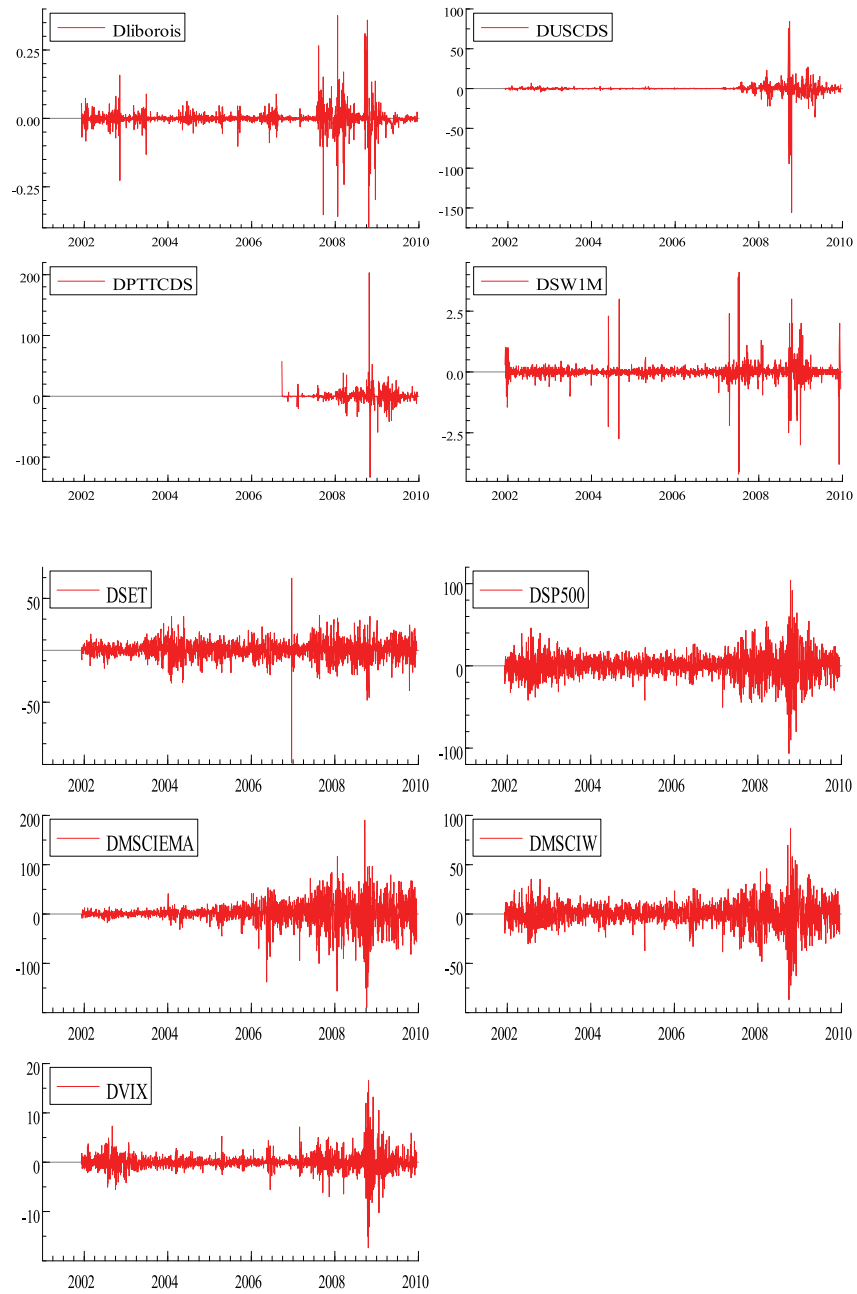
Figure A3
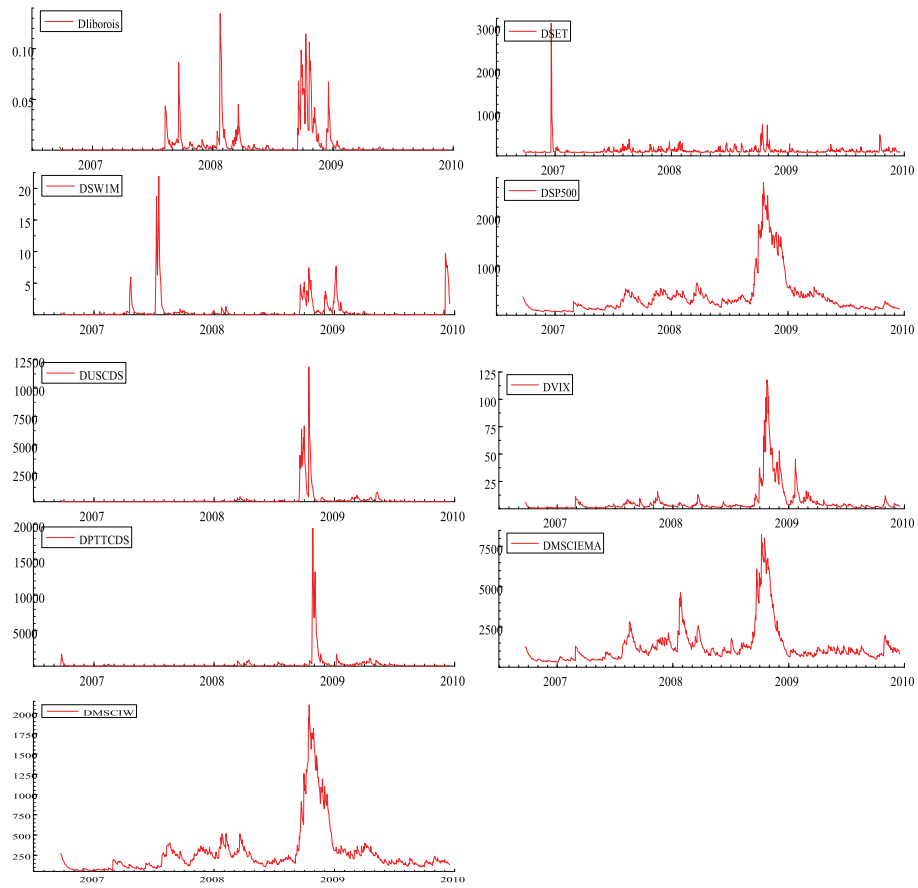**Returns of Financial Variables**
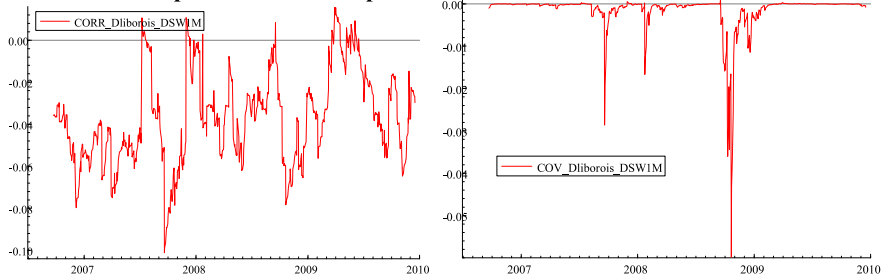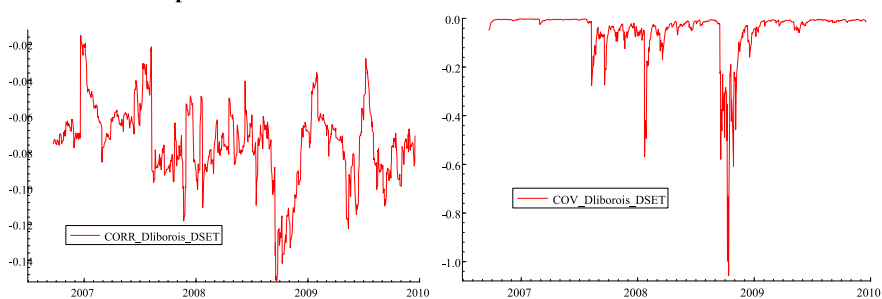
Figure A4
Conditional Variance

Figure A5
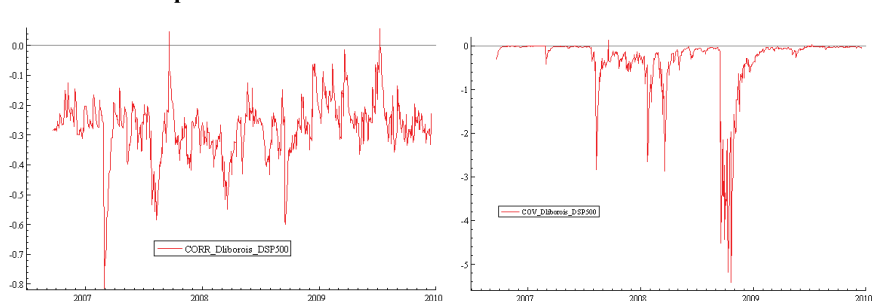**Conditional Correlation and Conditional Covariance**

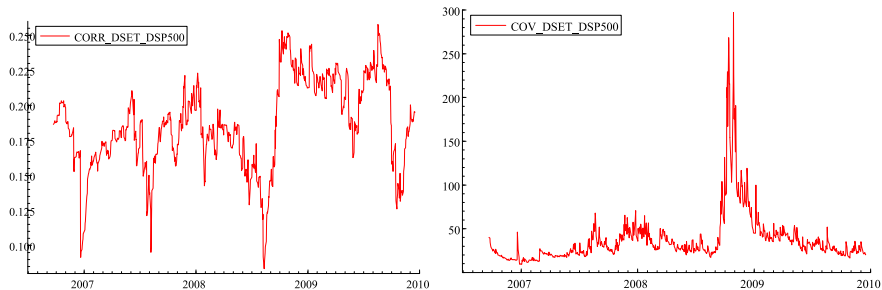a. **Libor-OIS Spread and the Swap Point**
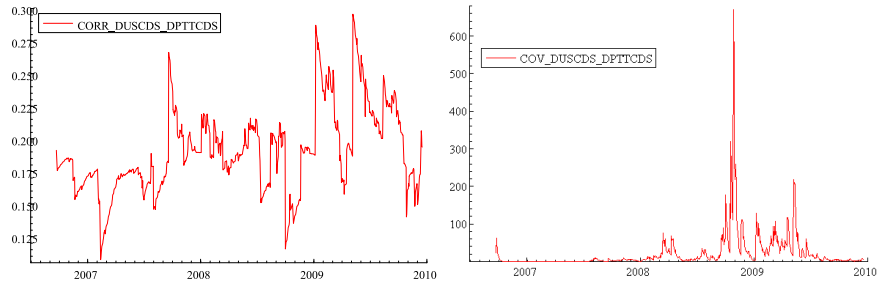

b. **Libor-OIS Spread and the SET Index**

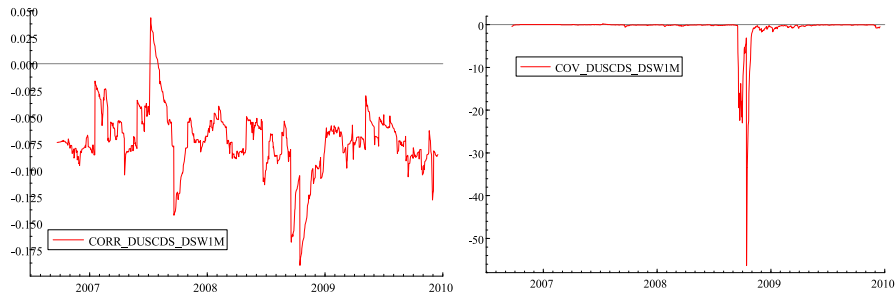c. **Libor-OIS Spread and the S&P500 Index**

d. **SET and S&P500**

305

e. **CDS-US and CDS-Thai**

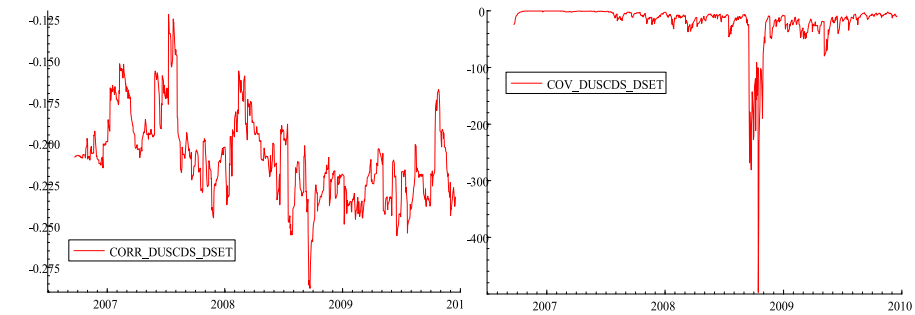f. **CDS-US and Swap Point 1 Month**

g. **CDS-US and SET Index**

h. **Libor-OIS Spread, VIX Index and MSCI World Index**