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Macro-Prudential Approaches to Banking Regulation: Perspectives of Selected Asian Central Banks

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Abstract

New lessons, challenges, and debates have emerged from the subprime crisis in the United States. While the macroeconomic orientation is not new and has always been among the classic toolkits of central banks for ensuring financial stability, the current explicit articulation and specification of such a tool as a global standard is new. The objective of this study is to review and analyze the steps taken by the central banks and monetary authorities of select Asian countries to strengthen their prudential regulations, mainly the macro-prudential component of such regulations.

JEL Classification: E52, E58, G28

Contents

1. INTRODUCTION

The past two decades have witnessed banking and financial crises at a higher frequency than during the previous decades and with considerable costs to the economy. During past crises, the blame was often laid on macroeconomic policies, especially on fiscal policies and unsustainable, rigid exchange rate policies. Many, however, have passionately argued that bank regulators too should do more to ward off crises in the banking system. Borio (2003), in particular, underscored the need to strengthen two core and integrated components of the prudential regulation. The first is the micro-prudential element, which concentrates on the stability of banks. The second, the macro-prudential component, is concerned with preventing systemic crisis in the banking system.

Many have argued (including Borio 2003) that regulation has hitherto focused too much on the micro and too little on the macro. Understanding macro-financial links is also in concert with the increasingly recognized twin objectives of monetary and financial stability. Increasing competition and integration of the financial sectors globally have been underlined as factors behind the surging interest in this twin stability (Borio 2006). In addition, the rise in the frequency of financial crises has fueled the process.

The significance and therefore the need to strengthen prudential regulation of the banking system appear to have been well understood in the aftermath of the 2007–2008 global financial crisis. One much-debated shift in policy paradigm following the global financial crisis has been the increasing acceptance of the concept of macro-prudential policy, which takes into account the interconnectedness of the financial institutions, as well as between the financial sector and the economy, often referred to as macro-financial links.

For Asian policymakers, the intricate links between macroeconomic performance and financial stability have been recognized and appreciated since the 1997 Asian financial crisis. Numerous reforms of the financial sector have been initiated during the past decade. By and large, the outcomes have been encouraging and contributed to a much-healthier financial sector, especially banking. The capital position, liquidity position, and profitability of the banks in major East and Southeast Asian economies have strengthened greatly in recent years from the conditions prevailing in 1997 (Table 1).

Table 1: Financial Soundness Indicators

	Non-Performing Loans (% of Bank Loans)		Risk-Weighted Capital Adequacy Ratio (%)		Bank Return on Assets (%)	
	2007	**2009**	**2007**	**2009**	**2007**	**2009**
Cambodia	3.4	6.1 Sep/	23.6	32.2 Sep/	-	-
Fiji	6.0	3.3 Sep/	13.2	16.2 Sep/	-	-
Indonesia	4.02	3.9 Oct/	19.2	17.5 Oct/	2.8	2.7 Apr/
Republic of Korea	0.64	1.2 Sep/	12.0	14.3 Jun/	1.1	0.5 Dec 08/
Malaysia	6.4	4.6 Apr/	13.2	14.1 Nov/	1.5	1.5 Dec 08/
Mongolia	3.2	16.5 Sep/	14.2	7.5 Sep/	-	-
Myanmar	2.38	2.6 Sep/	43.4	57.3 Sep/	-	-
Nepal	10.3	3.6 Sep/	-1.71	4.3 Jun/	-	-
Papua New Guinea	1.68	1.4 Jun/	-	-	-	-
Philippines	4.45	3.3 Sep/	15.9	15.5 Mar/	1.3	0.8 Mar/
Singapore	1.5	2.3 Sep/	13.5	16.5 Sep/	1.3	1.1 Dec 08/
Sri Lanka	5.0	8.6 Sep/	13.6	14.1 Sep/	-	-
Taipei,China	1.83	1.4 Sep/	10.8	11.6 Sep/	0.14 Dec/	0.3 Jun/
Thailand	7.28	5.3 Sep/	15.4	16.4 Sep/	-	1.0 Dec 08/
Viet Nam	1.5	2.2 Sep/	-	-	-	-

Source: Siregar and Lim 2010.

But no crises are exactly alike. New lessons, challenges, and debates have emerged from the global financial crisis. While the macroeconomic orientation is not new and has always been in the classic toolkit of central banks for ensuring financial stability, the current explicit articulation and specification of such a tool as a global standard is new. The prime objective of this study is to present a broad review and analysis of the efforts by the central banks of key Asian emerging markets to strengthen their prudential regulations, particularly the macro-prudential component of such regulations.

The rest of the paper is organized as follows. To show the importance of prudential regulation, evidence of macro-financial links is discussed in Chapter 2. Chapter 3 looks at macro-prudential regulations implemented by Asia's emerging markets. Section 4 analyzes the importance of stress testing and the challenge of carrying out stress tests. Around the globe, efforts have been made to improve stress testing capacities at the level of commercial institutions and at the level of supervisors. This section focuses on what has been achieved in East and Southeast Asian emerging markets, and then reexamines present and future challenges to strengthen the stress testing capacities in these countries. Section 4 explores the crucial issue of cross-border supervision. Given the globalized financial institutions in Asia, the ability to conduct comprehensive stress testing depends on the quality of the supervision of these institutions. Section 6 examines efforts taken by Asian central banks to beef-up their capacity to manage liquidity in their banking system. Lastly, Section 7 presents the hotly-debated policy measures to shift from an efficient capital adequacy ratio to one that stresses robustness. Brief concluding remarks end the paper.

2. MACRO-FINANCIAL LINKS

In the decade prior to the 2007–2009 subprime crisis, central bankers around the globe had become confident they had been able to manage economic fluctuations, including inflation.[1] The success of these monetary authorities around the globe in achieving moderate single-digit inflation led central bankers to believe that they had not only conquered inflation, but that they could also minimize the booms and busts of business cycles. Financial imbalances were hidden, however, behind the stable inflation environment. Deepening financial liberalization and the tightening of global financial integration not only made it more difficult to detect imbalances, but, more importantly, it eased the spread of the financial crisis, as seen over the last several years. Therefore, in these changing financial landscapes, the success of monetary and macroeconomic policies hinges on the ability of policymakers to design monetary policies that take into account the links between the rest of economy and the financial sector, often referred to as macro-financial channels.

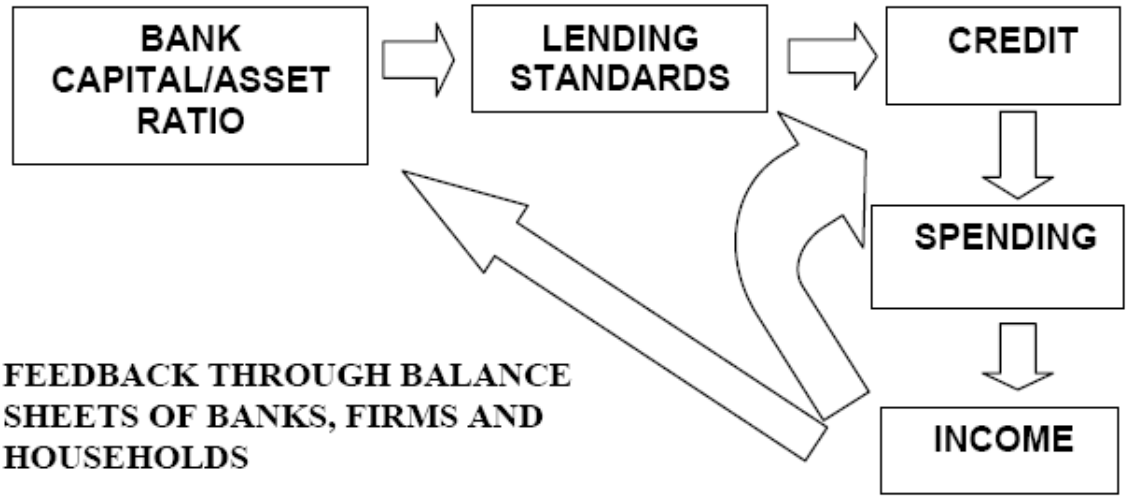
The importance of macro-financial links for Asian central banks is evident by their swift measures taken to incorporate financial stability as a key objective. Many economies, such as Malaysia; Singapore; Sri Lanka; and Taipei,China, for instance, have added financial stability as one of their central banks' statutory objectives. Similarly, central banks in more Asian countries, such as the Philippines and the Republic of Korea (hereafter Korea), have proposed amendments to their Central Bank Act to include financial stability in their mandates.

[1] Over the same period, more countries adopted inflation targeting policy as the anchor of their monetary policies, especially among emerging market economies. Prior to the 1997 Asian crisis, only five economies adopted an inflation targeting policy, and none were emerging market economies. By the end of 2006, 26 economies, more than half of them developing economies, had committed to inflation targeting policies.

Gray, Merton, and Bodie (2007) have argued that the existing monetary policy frameworks are "ill-suited" for current economic conditions because their focus is limited to the monetary system. Their view is not new and has been expressed in many earlier studies. Houben, Kakes, and Schinasi (2004) for instance said that "a financial system is in a range of stability whenever it is capable of facilitating (rather than impending) the performance of an economy, and dissipating financial imbalances that arise endogeneously or as a result of significant adverse and unanticipated events." This broader definition of financial stability moves beyond that of the monetary system, which simply focuses on individual banks in the banking system, to the system in its entirety and the links from the financial system to the real economy (Woolford 2001).

Bayoumi and Melander (2008) provided a basic framework (Figure 1) to consider the transmissions and implications of macro-financial links. The study examines interconnectivities between real sectors (investment activities) and strength of financial institutions to explain the global financial crisis in the US. The authors assumed an adverse shock would lead to deterioration in the quality of bank capital and capital adequacy levels. In turn, banks would be forced to alter their lending standards. A credit crunch would follow, which would weaken investment and spending, causing income to fall. The study also emphasized the second round or the feedback effect. An economic slowdown would weaken demand for credit. Concurrently, the deterioration of collateral during an economic crisis would worsen the quality of the bank's capital. Hence, more feedback effects would be likely to take place, depending on the severity of the economic and financial crisis.

Figure 1: Conceptual Framework of Crisis



Source: Bayoumi and Melander2008.

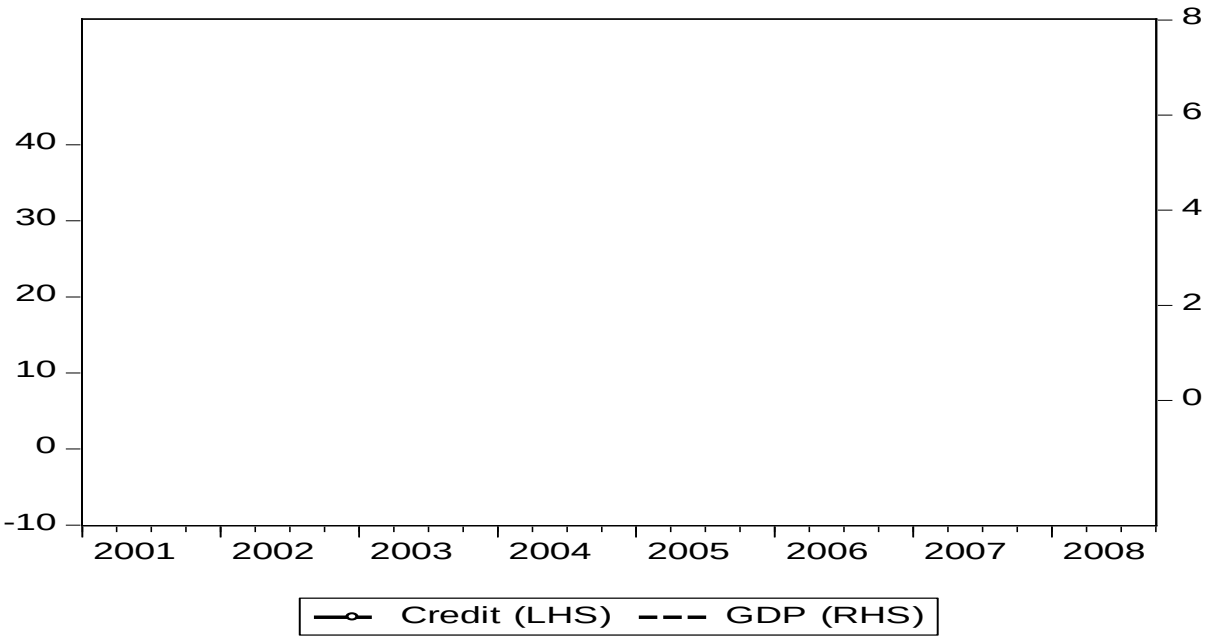
Accepting the macro-financial link, such as the one proposed above, is arguably the least difficult part. Estimating the impacts of these feedback loops is not a simple task, however. During a crisis, the occurrences of a few rounds of adverse feedbacks between the macroeconomic environment and financial conditions are common—also known as rounds of vicious circles. The consequences of the feedback effects associated with this macro-financial link on the effectiveness of monetary policy in particular have also been known to be amplified by the pro-cyclical nature of the financial system. Financial institutions have shown that they are vulnerable to aggressive lending when times are good; only to slash

lending when growth slumps. This behavior amplifies the impact of the economic cycle on bank lending and is termed "pro-cyclicality." The global financial crisis underscored the severity of the boom and bust consequences of the pro-cyclicality feature of bank lending in particular and the investment activities of the financial institutions in general.

To expose the incidence of "procylicality," past studies estimated the degrees of correlation between credit growth and gross domestic product (GDP) growth. As explained by Craig, Davis, and Pascual (2006), real GDP growth is considered a standard measure of the business cycle, while real credit growth reflects the role of the financial sector in the cycle. Based on the data series of 11 Asia-Pacific economies, their study claimed that the correlation of credit to GDP is much stronger on average when growth is weak, suggesting that procyclicality is greater during a recession. Figure 2 demonstrates that relationship in the case of Indonesia.[2] Similar trends can also be seen elsewhere in Asia.[3] In addition, the presence of pro-cyclicality is also confirmed by the established relationship between accumulations of household debt and GDP growth rates (Figure 3). A simple regression equation relating the two variables indicates that a rise in GDP in purchasing power terms (PPP) per capita contributes positively and significantly to a rise in the household debt-to-GDP ratio across the 17 countries, including those in Asia (Nakornthab 2010).

Figure 2: Annualized Credit Growth and GDP Growth in Indonesia

(%)



Source: CEIC database and author's calculation

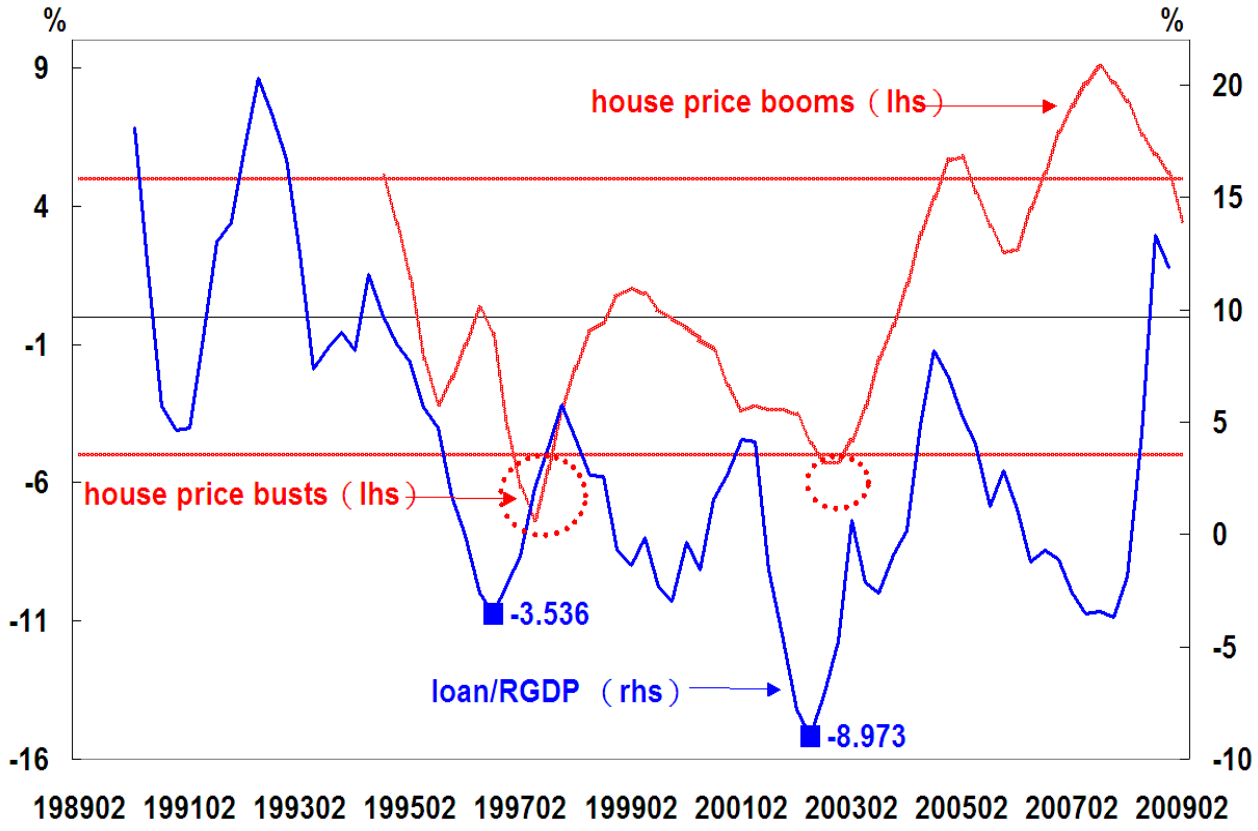
The procyclical nature of the financial sector can also be seen in the relationship between credit growth and asset price (particularly real house prices). As Figure 1 shows, the robust

[2] Unlike past economic and financial crises, the financial institutions in Indonesia and most of its neighbors had strong capital positions and good liquidity during the peak of the subprime crisis. The strong balance sheets of banks minimized the "procyclicality" impact of the economic slowdown.

[3] The co-movement between GDP growth rate and credit growth can also be seen in other East Asian and Southeast Asian economies. For brevity, only the case of Indonesia is presented here.

supply of bank loans and credit stimulated spending, especially during the years of soaring economic growth. In Asia, the property market has been attracting a large share of home and commercial loans. Consequently, the availability of such loans during times of strong growth fueled concerns about the emergence of a property bubble. Figure 3 illustrates the possible link between the availability of loans on home prices in Taipei,China. Similarly, the booms and busts of property prices in major Asian economies, such as the Philippines; Singapore; and Taipei,China have been found to be linked to the economic cycles (Nakornthab 2010). Craig, Davis, and Pascual (2006) warned that the correlations between property prices and credit growth are often asymmetrical in relation to the economic cycles in Asia. The study shows that property prices are more highly correlated with credit during a downturn. Interestingly, the recent global financial crisis has largely been the exception. Mostly due to the strong balance sheets of domestic banks contributing to sustained credit expansion, the correlation between economic downturn and falling property prices has not been as strong in some Asian economies, particularly in Southeast Asia.

Figure 3: Loan/RGDP and Home Price Booms and Busts in Taipei,China



RDGP = Real GDP

Source: Ho 2010.

Prenio (2008) reviewed ratings of banking assets in the Philippines during different economic cycles. The study shows that the percentage of banking assets that were downgraded surged following the 1997 Asian crisis (Table 2). The percentage of downgrades increased until 2002, before stabilizing and then declining marginally from 2003 onward when the country's GDP saw a period of stronger and more stable growth. Fortunately, less than 12% of universal banking assets of the Philippines at that time were

subject to external ratings under Basel II regulations. Hence, the economic downturn and the downgrading of ratings had a limited impact on the banks' capital requirements. It could have been different if a major share of bank assets had been subject to external credit ratings. In that case downgrades could have adversely impacted the capital adequacy position of the banks, which in turn would have resulted in a reduction of lending and real economic activity.

Table 2: GDP Growth and External Rating

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

Source: Prenio 2008.

The globalized banking system is another factor that needs to be recognized when assessing the impact of links between macroeconomic policies and financial market conditions. Studies show that while lending by small banks appears to be highly responsive to monetary policy shocks, the same is not true for larger banks. One explanation is that large banks may be more able to substitute reservable deposits with other external sources of funds (Cetorelli and Goldberg 2008). The same study also shows that large US banks with a global network are insulated from domestic monetary policy adjustments. But this does not necessarily imply that monetary policy transmission has become ineffective. Indeed, Cetorelli and Goldberg (2008) claim that the effects on lending of US monetary policy are easily underestimated if one only examines its impact on the local economy. Their

study examined the response of the foreign affiliates of these US banks to a change in domestic monetary policy, and found evidence to suggest there is an international mechanism for transmission of monetary policy. Cetorelli and Goldberg (2009) demonstrated that adverse liquidity shocks to developed-country banks, such as those that occurred in the US in 2007 and 2008, reduced lending in emerging markets through a fall in cross-border lending to banks and private agents and also through a fall in parent banks' support of foreign affiliates. The globalization of the banking system is not a new phenomenon in Asia and has increased over the past decade. Siregar and Choy (2010) found that international bank lending from private banks in seven Organisation for Economic Cooperation and Development (OECD) countries to nine East Asian economies fluctuated in tandem with the economic performance of the recipient countries. Accompanying the collapse of growth in major East Asian economies was a sharp decline in loans from commercial banks based in these seven OECD countries. The hardest hit economies, namely Indonesia, Korea, Malaysia, the Philippines, Thailand, which had experienced net private inflows averaging around US$160 billion per annum in 1995 and 1996, saw foreign liabilities drop by around 45% in 1998, as international banks were unwilling to roll over existing loans. Siregar and Choy (2010) examined plausible push and pull factors of the OECD banks' claims on the East Asian economies. Among the key factors, they found that trade between the Asian countries and the OECD economies in question contributed greatly to the flows of cross-border bank lending, again underscoring the importance of macro-financial links.

By the end of 2008, arguably the peak of the global financial crisis, several Asian economies turned from net debtors to net creditors. The gap between international interbank liabilities and assets has widened since September 2007. Australia, Indonesia, Korea, Malaysia, and Viet Nam saw a large buildup of net international interbank debt, suggesting capital inflows in this category, while Hong Kong, China; Japan; Singapore; and Taipei,China saw large outflows. The combination of major roles of foreign banks in the local economies and local banks in the global financial markets has complicated efforts to estimate the feedback effects transmitted by macro-financial channels.

3. FORGING AHEAD WITH MACRO-PRUDENTIAL REGULATIONS IN ASIA

In the present global financial landscape, prudential regulations have been a key option under consideration. The importance of macro-prudential instruments has been increasingly recognized as it is realized that conventional key policy interest rate manipulation is too blunt an instrument. "Micro-prudentialists" argue that a sound financial system requires sound institutions. Naturally, the proximate objective of the micro-prudential approach is to limit distress on financial institutions. This approach assumes that risk is exogenous—a partial equilibrium view. In contrast, "macro-prudentialists" maintain that in certain situations a rational course of action of an institution could result in undesirable aggregate outcomes. Based on the belief that risk is in part endogenous to the financial system, the objective of the macro-prudential approach is to limit the risk of financial distress to the economy

Despite such opposing views, macro- and micro-prudential instruments are intertwined. The key part of macro-prudential instruments is to employ existing micro-prudential tools to ensure a sound financial system. Macro-prudential measures can be categorized into three primary groups. The first are price and quantity-based measures designed to limit credit expansion. Reserve requirements and credit ceilings are typical measures. The second group of regulations is aimed at maintaining the quality of loans. Typical measures are loan-to-value ratios, debt-to-income rules, limits on currency mismatches, and improved credit

information. The third group of measures focuses on strengthening the resilience of the banking system to balance sheet shocks (assets and liabilities). Capital adequacy requirements and rules on the composition and types of foreign borrowing are some of the measures in this category.

The Committee on the Global Financial System (CGFS 2010) further classifies macro-prudential instruments by types of vulnerability in the financial system. To manage the leverage position of the banking system, capital ratio, risk weights, provisioning, credit growth, loan to value caps, and maturity caps are some of the macro-prudential instruments to be used. On liquidity risk or market risk, authorities can consider one or a combination of the following macro-prudential instruments: liquidity or reserve requirements, foreign exchange lending restrictions, and currency mismatch limits. Last, but not least, is the vulnerability arising from interconnectedness. To mitigate such exposure, concentration limits, systemic capital surcharges, and strict policies regulating bank subsidiaries are instruments to be considered.

The enforcement of macro-prudential measures to manage credit cycles is not a new phenomenon in Asia (Table 3). Since the 1997 crisis, authorities in Asia have collectively enforced macro- and micro-prudential regulations to supplement their monetary policy measures. One target area has often been to manage loan and credit extensions to the property market. Given the typically high profit margins from property credit and loans, policy rate adjustments have long been found to be insufficient to tackle strong credit expansions. The objective of these prudential measures has also been to prevent systemic risks for overall financial stability, as seen in the 1997 crisis.

Table 3: Selected Prudential Measures for Credit Booms in Asia

	LTV	Capital	Provision	Exposure Limit	Lending Criteria
Cambodia		2009		2008	
PRC	2001, 2005, 2006				2004
Hong Kong, China	1991, 1997			1994–1998	
India		2005, 2008, 2009	2005, 2006, 2007	2006	2007
Indonesia		2008		2004, 2005	
Korea	2003, 2006–2008				2006
Malaysia	1995–1998	2005, 2008, 2009		1997–1998	1995–1997
Mongolia		2008			
Nepal				2010	
Papua New Guinea		2003	2003	2000, 2001, 2003	
Philippines	1997, 2010			2010	
Singapore	2010			2010	
Sri Lanka		2008		2007	
Taipei,China	2010	Pre-2007		Pre-2007	Pre-2007
Thailand	2003				2004–2005
Viet Nam		2010	2010	2010	

PRC = People's Republic of China

Note: LTV = Loan-to-value ratio; Capital = capital requirements and reserve requirement; provision = loan provisioning rules; lending criteria = limits on debt repayment-to-income, debt repayment-to-debt or credit line-to-income ratio; exposure limit = credit exposure to a sector.

Source: SEACEN Questionnaire Survey (October 2010).

In recent years, such macro-prudential measures have been adopted to supplement macroeconomic policy measures by the authorities in their efforts to shift away from

generally expansionary policy stances during the peak of the global financial crisis. Instead of relying on interest rate policy adjustments, a combination of loan to deposit ratios and reserve requirement policies has been enforced by Bank Indonesia, for instance, to manage credit growth and risk taking in the domestic banking sector. As in the past, the primary objectives of the recent macro-prudential measures have been to manage pro-cyclicality and to reduce interconnectivity and systemic risk. To a large part, Asian central banks, like other central banks globally, closely monitor pro-cyclical movements in debt and leverages, especially those related to asset markets such as the property market. Singapore's objective, for example, has been to ensure a stable and sustainable property market where prices move in line with fundamentals. In February 2010, the loan-to-value (LTV) limit for housing loans extended by financial institutions was lowered to 80%. To discourage speculative "flipping" of properties, a Seller's Stamp Duty on all residential properties bought and sold within one year was introduced. In August 2010, the holding period for imposition of the Seller's Stamp Duty was increased from one year to three years. Singapore also tightened rules to ensure public housing is used as it should be, namely for occupation by the owner.

Bangko Sentral ng Pilipinas has also enforced LTV ratio requirements as a tool to limit risk exposure of the banking sector to the property market. To limit excessive investments and speculative activity in the residential property market; effective from 3 November 2010, home loans approved by financial institutions and development financial institutions (financial cooperatives) to borrowers who hold two home loan accounts will be subject to a maximum LTV ratio of 70%. The Bank of Thailand has also implemented such an adjustment LTV cap.

To manage interconnectivity and risk exposure, Bank Indonesia (BI), on the other hand, monitors daily liquidity positions of banks, especially institutions that are expected to have systemic and economic-wide implications. Commercial banks in Indonesia are also prohibited from extending loans to a single affiliated party by more than 10% of the total capital of that borrowing firm. Prohibition of complex derivative asset trading has also been enforced by a number of Asian central banks. Nepal Rastra Bank, for instance, imposes limits on investments, except for government and central bank securities. Another typical prudential measure to manage interconnectivity is limiting sectoral credit and interbank placements.[4] The Central Bank of Sri Lanka introduced the Direction on Maximum Amount of Accommodation regulation in 2007, to limit a bank's credit exposure to any person or company, or to any groups of people or companies.

A set of macro-prudential regulations has also been implemented to manage the impact of capital inflow surges, especially since the second half of 2009. To reduce short-term volatility, BI introduced in June 2010 a one-month holding period for its certificate (SBI) purchased in primary and secondary markets. Prior to this, BI began to shift the maturity structure from one month to 3- and 6-month tenors, and from weekly to monthly auctions. Longer maturity SBIs—SBI-9 months and SBI-12 months—were being considered at the time of writing in late 2010, with the purported aim of lengthening the maturity profile of investors. In November 2009, Korea imposed tighter regulations on currency trading, including new standards for foreign exchange liquidity risk management, restrictions on currency forward transactions of non-financial companies, and mandatory minimum holdings of safe foreign currency assets by domestic banks. These policies followed an earlier move to curb speculative foreign exchange transactions. In July 2010, to clamp down on

[4] The Bank of Papua New Guinea has imposed prudential standard on limits on inter-bank placements.

speculative foreign exchange trading by investors, the minimum amount of deposits for foreign currency margin trades was raised to 5% of the transaction value from 2%.

4. STRESS TESTING

4.1 Basic Framework

Stress testing (ST) is accepted as an integral component of macro-prudential tools. It is increasingly becoming a focal part of risk management tools. The term ST is a generic one, often used to describe various techniques and procedures employed by financial firms to gauge their "potential vulnerability to exceptional but plausible" events (Blaschke et al. 2001; Sorge 2004) It is an instrument for financial institutions to assess their risk profile and for supervisory authorities to examine the stability of the banking system. Federal Reserve Bank chairman, Ben Bernanke, argued in a speech in 2010 that "stress tests are a good way to augment models and other standard quantitative techniques for risk management. And they force bankers to think through the implications of scenarios that may seem relatively unlikely but could pose serious risks if those scenarios materialized."[5]

ST is an integral part of Pillar 1 and Pillar 2 of Basel II. Under Pillar 1 on minimum capital requirement, stress testing is a vital instrument to assess credit risk, market risk, and operational risk. Furthermore, the Pillar 1 framework requires banks using the Internal Models Approach to determine market risk capital to have in place a rigorous ST program. Similarly, banks using the advanced and basic internal ratings-based (IRB) approaches for credit risk are required to conduct credit risk ST to assess the robustness of their internal capital assessments and the capital cushions above the regulatory minimum. Under Pillar II on Supervisory Review Process, ST is required to measure interest rate risk, credit concentration risk (potential over-exposures to a specific class of asset, borrower, industry or region), and counter-party credit risk.

There are two ST techniques. The basic one is the sensitivity test, and the more popular one is scenario analysis. The difference between the two is that the sensitivity test focuses on the impact on a portfolio's value of a particular risk factor, such as interest rate or exchange rate risk. One frequently highlighted shortcoming of this approach is the lack of plausibility. Furthermore, critics point to the difficulties in separating one risk from another, and financial institutions often face multiple risks simultaneously.

Scenario analysis is seen as the leading ST technique due to its advantages over sensitivity analysis. To start, it is more realistic as it considers a number of risk factors simultaneously. Furthermore, this technique allows for a wide range of plausible selections. One is historical scenarios to replicate historical episodes of stress, such as Black Monday in 1987, the 1997 Asian financial crisis and the 9/11 terrorist attacks. This scenario's shortcoming is that no previous crisis has been repeated. A hypothetical scenario is another option where a plausible event that has not yet happened is considered. The advantage of this approach is with its flexibility to be more relevant to the individual bank's risk profile. But constructing a realistic and comprehensive hypothetical scenario can be a challenge.

In addition, ST can be carried out via two approaches (Table 4). The first one is known as the top-down approach, and the second is the bottom-up approach. The top-down approach is conducted by the supervisor of the banking sector. Given the available data supplied by

[5] Speech delivered at the Federal Reserve Bank of Chicago's 46th Annual Conference on Bank Structure and Competition. Chicago, IL. 6 May 2010.

member banks to the supervisor, different ST scenarios to measure credit risk exposures, in particular of each bank and the overall banking system, can be performed. Because they are executed and designed by a single institution (the supervisor of the banking sector for instance), the results for each bank are comparable. Furthermore, given the availability of data, this approach should be able to capture potential contagion effects.

Table 4: Summaries of Top-Down Versus Bottom-Up Approaches

	Top-Down Approach	Bottom-Up Approach
Conducted by	Central bank or supervisory agency developing the tools	Individual bank developing their own tools or using their internal model
Data	Using aggregate data of each bank or banking system available at the central bank	Using sub-portfolio/portfolio-level data or customer data of its individual bank
Impact Analysis	Assessing the impact of stress scenario on individual bank and banking system's portfolio quality and capital position	Assessing the impact of stress scenario on financial statements of each customer then aggregating the impacts to find overall impacts on each bank's portfolio and capital position
Pros	It is effective in examining credit risk. Stress test results can be compared across banks. It covers broader perspectives, including feedback effects from the financial system to the macro-economy, and contagion.	Due to its tailor-made and richer data sets, this can better reflect the market and liquidity risk profiles of each bank's portfolio.
Cons	Results may not reflect each bank's risk profile well.	With different methodologies used by each bank, it is difficult to compare the results across banks.

Source: Subhaswadikul 2010, and Zhu 2010.

In contrast, bottom-up ST is carried out by each bank with scenarios pre-defined by the supervisory authority. This approach is more advantageous because of the richer data sets a bank has as well as its more comprehensive understanding of the market and liquidity risks. But comparing the outcomes of the bottom-up approach can be difficult. Under the bottom-up approach, each bank has the latitude to select its methodologies and to apply its unique databases. Kishan and Opeila (2000) showed that loan supplies of poorly capitalized banks reacted more sensitively compared with well-capitalized peers. If the financial stability of banks differs, the transmission of monetary policy is likely to be adversely affected (De Graeve, Kick, and Koetter 2008). Furthermore, because of the limited availability of data on the banking system and its focus on each bank, this approach will not be able to capture comprehensively the contagion effect and the macro-financial feedback effects. Therefore, the standard practice would be to perform a top-down and a bottom-up approach.

In short, several pre-requisites have been underlined to ensure ST quality. The availability of quality data at a higher frequency level is imperative in a meaningful ST. Selecting plausible scenarios and building appropriate model(s) that would capture feedback effects would govern the outcome and the relevancy of ST. Lastly, follow-up measures to address the

outcomes of ST, such as adjustments in capital adequacy positions and other regulatory actions, are vital to be transparently reported and acted upon accordingly.

4.2 Joining the Bandwagon: Selected Experiences of Asia

Conducting ST regularly has gained momentum in the last few years because of the global financial crisis. But ST is in its infancy in many developing economies, including those in Asia. Major East and Southeast Asian economies, such as Hong Kong, China; Indonesia; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand started various sensitivity tests following the 1997 crisis. For example, since 1997, several Asian countries have started conducting macro-prudential surveillance (Financial Sector Assessment Programs, FSAP) with macro stress testing as an essential component of their financial systems jointly with the International Monetary Fund (IMF) and the World Bank. At the early stages of implementation, ST for these countries was done externally by the IMF team. But since late 2006, the central banks and monetary authorities have begun to implement basic modifications to the FSAP model. Thailand's case is summarized in Table 5, which is also representative for the general process occurring in Indonesia, Malaysia, and the Philippines. In addition, a number of South East Asian Central Banks (SEACEN) have also embarked on a similar effort. Sri Lanka's central bank, for instance, officially started its quarterly ST in 2009. Conversely, Nepal's central bank started a trial ST on commercial banks in early 2010.

Table 5: Bank of Thailand's Milestones on Stress testing

In 2007: • Participated in the stress testing component of the Financial Sector Assessment Program, a joint undertaking by the IMF and the World Bank. • Developed macroeconomic credit risk model to be used in top-down assessment of macro-credit scenario
In 2008: • Issued supervisory scenarios, including subprime crises; various macro-credit scenario, market and liquidity scenarios to commercial banks. These banks were expected to assess impacts via bottom-up approach.
In 2009: • Required foreign banks' branches in Thailand to perform liquidity stress testing in the second half of 2009. • Issues Pillar 2 guidelines which include stress testing in the second half of 2009.
In 2010: • Developed examination guidelines on credit risk, market risk and interest rate risk in banking book and liquidity stress testing. • Development of sectoral credit risk models, namely corporate models, personal loan models, property loan models, and housing loan models.

Source: Subhaswadikul 2010.

Before 2007 the sensitive ST technique was predominant. In 2008 and 2009, different scenario testing began to be explored to test various risks, mostly credit, liquidity, and market risks, by the central banks and monetary authorities in East and Southeast Asia. For credit risk, a number of scenario shocks are similarly shared in these countries (Table 6). The implementation of foundation internal rating base (IRB) for examining credit risk in major economies in Asia and Pacific is at an early stage (Table 7). The standardized approach has been implemented in most economies, but the datelines to push for foundation IRB and advanced IRB vary from 2008 to 2010 for most countries, with the exception of India where it is 2012–2014.

Table 6: Selected Macroeconomic Scenarios for Credit Risk Stress testing

	Scenarios
Hong Kong, China	Ranges for baseline and stress scenario via: (1) Domestic GDP growth rate; (2) GDP growth rate of mainland PRC; (3) interest rate; and (4) property price.
Indonesia	(1) A shift in credit collectability to lower level by 20% each; (2) a rise in the interest rate by 100 bps; (3) rupiah depreciation by 20% from the foreign exchange maturity profile of less than three months; (4) price of government bond drop by 20%; and (5) drops in real domestic GDP growth rate.
Malaysia	Macroeconomic parameters that are comparable to historical worst levels such as the 1997 Asian financial crisis, the 2001 dot-com bubble and the 2003 SARS outbreak. External factors such as prolonged slowdowns of global and regional economies.
Philippines	Ranges for baseline and stress scenario via: (1) Domestic GDP growth rate; (2) interest rate; (3) inflation rate; (4) remittance growth rate; (5) exchange rate (against the US dollar).
Singapore	Various macroeconomic shocks; shocks to global economy; dividend payouts and earning projections over stress horizon.
Taipei,China	(1) Fall in revenues of corporate borrowers; (2) decline in real income of household borrowers; and (3) decline in property collateral.
Thailand	Ranges for baseline and stress scenario via: (1) Domestic growth rates of GDP and its various components; (2) interest rate; (3) inflation rate (core and headline); (4) exchange rate (against the US dollar); (5) crude oil price; (6) trading partner GDP growth rates.

Source: Financial Stability Reports of the central banks and monetary authorities (various years) and SEACEN survey, October 2010.

Table 7: Time-Table

1 January, unless otherwise noted

	Credit risk			Operational risk		
	Standardized Approach	Foundation IRB	Advanced IRB	Basic indicators approach	Standardized Approach	Advanced measurement approaches
Australia	2008	2008	2008	2008	2008	2008
PRC	Not permitted	2010–13[2]	2010–13[2]	Undecided	Undecided	Undecided
Hong Kong, China	2007	2007	2008	2007	2007	Not permitted
India	2008–09[3]	2012–14	2012–14	2008–09[3]	2012–14	2012–14
Indonesia	2009	2010[4]	2010[4]	2009	2010[4]	2011[5]
Japan	2007[6]	2007[6]	2008[6]	2007[6]	2007[6]	2008[6]
Korea	2008	2008	2009	2008	2008	2009
Malaysia	2008	2010	2010	2008–10[7]	2008–10[7]	Undecided
New Zealand	2008	2008	2008	2008	2008	2008
Philippines	2007[8]	2010	2010	2007[8]	2007[8]	2010
Singapore	2008	2008	2008	2008	2008	2008
Taipei,China	2007	2007	2008	2007	2007	2008
Thailand	2008[4]	2008[4]	2009[4]	2008[4]	2008[4]	Not permitted

Notes: 1/Pillar 1 refers to minimum capital requirement; 2/Permitted only for internationally active banks; banks can implement an IRB approach as early as 31 December 2010, but must be implemented by 31 December 2013; 31 March 2008 for Indian banks with a foreign presence and foreign banks operating in India; 31 March 2009 for all other banks; 31 December; 30 June.

Source: Zhu 2010.

Similarly, the sophistication levels of the financial sectors govern the selections and designs of the scenarios for other types of shocks. The scenarios for the trading risk component of market risk and liquidity risk are influenced by the ranges of the menu of financial assets being traded. In Hong Kong, China, for instance, the scenarios would include a sharp shock to prices of structured financial asset, while for most emerging markets in Southeast Asia, the offering of structured products have been either tightly regulated or prohibited.[6]

There are several immediate challenges to the improvement of ST by the Asian central banks and commercial banks, particularly from the emerging markets. The first challenge is the availability of quality data. Limited high frequency and long time-series data at disaggregated levels prevent efforts to expand scenarios that can be tested, and therefore the comprehensiveness of the analyses that can be generated.

The second limitation with ST carried out by the relevant institutions in Asia is due to the models applied. As indicated before, the systems of models are relatively simplistic. They are mostly linear model equations, which may be suitable to examine risk exposures during "normal" economic circumstances, but not during times of economic crisis. The relatively simple set of models being applied by the monetary authorities, and central banks and the commercial banks in major economies in Asia have not incorporated the feedback effects. Different risks are frequently being treated and evaluated separately. As discussed earlier, the absence of feedback effects suggest that the ST results of these economies did not take into account second-round effects and critical systemic effects. Data and model limitations are the fundamental weaknesses in infrastructure and have been found to limit the ability of banks to identify and aggregate exposures across the wider financial system (BCBS, 2009).[7]

A further critical shortcoming with the implementation of ST by commercial banks in emerging markets in Asia is the lack of appreciation and commitment of the senior management of these banks. But this weakness is present globally, i.e., not unique to commercial banks in Asia. BCBS (2009: 8) claims that: "Prior to the crisis, stress testing at some banks was performed mainly as an isolated exercise by the risk function with little interaction with business areas. This meant, amongst other things, business areas often believed that the analysis was not credible." Often commercial banks carry out internal ST mainly to comply with the requests of the supervisory authority. In July 2008 the Institute of International Finance published its Final Report of the IIF Committee on Market Best Practices: Principles of Conduct and Best Practice Recommendations. The report underscored that for ST to have a meaningful impact on business decisions, the board and senior management should have an active role in evaluating ST results and impacts on a bank's risk profile.

By the same token, for the ST to be credible, the monetary authorities must ensure transparency of the entire process. An important aspect to be considered regarding ST is the disclosure of results.[8] ST results may be disclosed to the public in three ways (Tarullo 2010) namely: (i) by full disclosure of the release of detailed formation about the methodology and banks' specific outcome; (ii) through the release of detailed information but without specific results of individual banks (this is a more systemic approach); and (iii) through the release of aggregate results with forward looking assessments of the financial system.

[6] To promote product transparency and consumer protection, Bank Indonesia has prohibited banks from offering structured products, including foreign exchange transactions against the rupiah.

[7] It is recognized, however, that the complexity and the sophistication of the models does not guarantee the comprehensiveness of the results.

[8] To restore confidence in European banks, European Union leaders agreed in June 2010 to publish the results of the bank stress tests in July 2010.

To what extent would the central banks publicly disclose the process and the outcome of ST? Would the Asian central banks and bank regulators go as far as publishing the test results for each bank (as with the Supervisory Capital Assessment Program, SCAP, in the United States (US) in the first quarter of 2009), or would they just release the aggregate results of the test without revealing how each bank fared (as with the European Union [EU] bank ST results in 2009)? Definitely, encouraging financial institutions to disclose and publish ST results can improve financial market understanding (Haldenc 2009). But it is also important to realize that over disclosure may be damaging, especially for economies that are reliant on the role of banks as financial intermediaries (e.g., in Europe and Asia versus the US) (Nagy 2009). Because of its complexity, industry practitioners caution against the risk of misinterpretation of ST results by the public. If the support mechanisms are not made explicit beforehand, conducting tests publicly would not be recommended as it could lead to greater uncertainty and could even potentially destabilize markets (Kirchfeld and Clark 2010). Nagy (2009), however, points out that past experiences show that market reactions to test results have been positive. Similarly, Tarullo (2010) argued that the more frequent the release of test results, the better for the market as regular detailed disclosure is less likely to result in unpleasant surprises.

Table 8 shows the features of participation, frequency, and the dissemination process of ST among select SEACEN economies. As expected, a range of ST practices are being implemented in these countries. To ensure comprehensiveness of the testing, at least 60%, and in some cases as much as 100%, of the commercial banks are required to participate. Taipei,China and Thailand carry out tests annually, while others pursue a more frequent examination (quarterly and monthly). Based on the survey by The SEACEN Centre, a majority of the SEACEN central banks have no plans to publically disseminate the test results. Bank Indonesia, Bank Negara Malaysia, and the Central Bank of the Philippines partially disclose the aggregate results via their Financial Stability Review reports.

Table 8: Participation, Frequency and Dissemination of Stress Testing Results in Selected Asian Economies

	Number of Institutions Participated	Frequency	Public Dissemination of Results
Indonesia	100%	Monthly for credit, market and liquidity risk. Quarterly for macro-risk analysis.	Partial disclosure (no name of institution) via Financial Stability Review report
Malaysia	100% of financial institutions under the supervision of BNM.	Quarterly by financial institutions and semi-annually by Bank Negara Malaysia.	Partial disclosure (no name of institution) via Financial Stability Review report
Philippines	Top 10 (out of 38) Universal and Commercial Banks—around 62% of the Philippines Banking System in March 2010	Quarterly	Partial disclosure (no name of institution) via Financial Stability Review report
Singapore	20% of banks (or more than 65% of the banking system)	At least annually	No
Sri Lanka	All commercial banks	Quarterly	No
Taipei,China	92% of domestic bank, covering 98% of domestic bank asset.	Annually	No
Thailand	100% of local banks, covering of 80% of the portfolio of each bank.	Annually	No

Source: Financial Stability Reports of the Central Banks and Monetary Authorities (various years) and SEACEN survey October 2010.

Given the interconnectivity of the financial industry with corporate and household sectors, should the central bank and monetary authority consider conducting stress testing on those two sectors as well? In particular, recognizing the trend of household and corporate debt and increasing exposure to the banking sector, Bank of Thailand, for instance, has started to ST the household and corporate sector to boost its capacity to achieve and manage financial stability in the country.

A comprehensive analysis of ST results may also require systems thinking beyond national borders by taking into account international links and dynamics. As the recent case of structured credit and credit derivatives markets shows, the scale of cross-border banking is growing and has the potential to transmit shocks from one country to another on a large scale. ST modeling has not reached that level of sophistication to take into account cross-border dynamics. But supervisors can share vital cross-border information regarding their domestic financial situation. Cross-border banking will be discussed next.

5. SUPERVISION: BEYOND THE BORDERS

As highlighted above, having comprehensive information on the exposures of banks' balance sheet to shocks arising from macroeconomic conditions (internal and external) and activities of other financial and non-financial institutions is vital for the success of stress testing of each bank in particular and at the level of the banking system in

general. Efforts have focused on tackling the urgent need to strengthen the apparatus related to supervision of the bank and non-bank financial institutions.

For the Asian economies affected by the 1997 financial crisis, the struggle to augment supervisory capacities on the financial institutions started immediately after the crisis. Following the crisis, the debate turned to the need to have a more integrated financial supervisory system domestically to keep up with the advancement of the banking industry (Siregar and James 2006). Banks no longer provide conventional services, such as savings and loan. Their provisions have included investment and insurance services. Furthermore, the challenges facing the central bank as bank supervisor include possible inconsistencies between monetary policy objectives, the objectives of prudential supervision, and the objective of promoting a particular sector of the financial service industry. Past financial crises around the globe, including those experienced by developed economies, taught us that the objective of promoting a particular sector of the financial service industry is often dominant. In the 1980s, the US thrift industry suffered massive losses partly because the industry's prudential supervisor, the Federal Home Loan Board, was also in charge of promoting the housing industry. The 1997 Asian crisis highlighted how efforts to rescue troubled banks and corporations resulted in soaring inflation and "meltdowns" of currencies, particularly in Indonesia. In many emerging markets of Asia, the central bank continues to play a critical role as agent for development and there has always been strong political pressure to support small- and medium-sized enterprises. A assessment of this policy should be carried out to prevent future losses.

The recent US experience underlines the need to reinforce coordination among the domestic financial supervisory agencies (Wall 2009). The US Securities and Exchange Commission (SEC) is responsible for setting up accounting policies to assist investors in making informed decisions. The SEC believes that reported net income in each period should fairly reflect the results of the firm's operation for that period. The Federal Reserve Bank regulatory agencies, on the other hand, which are responsible for the prudential supervision of commercial banking regulations, believe that banks should build up loan loss reserves during good periods to cover losses that are likely to be incurred during weaker economic conditions. The two conflicting approaches could easily lead to inconsistent policies of reporting.[9]

Coordination among financial supervisors has arguably improved in Asia during the past decade. Bank of Korea conducts regular examinations of financial institutions with the Financial Supervisory Service (FSS), an independent integrated financial supervisory institution established in 1998. The Central Bank Act of Bank Indonesia, introduced in 1999, stipulated the commitment of Bank Indonesia, jointly with the Ministry of Finance, to establish an independent and integrated financial supervisory institution by the end of 2010. In Malaysia, the new Central Bank Act (CBA) of 2009, came into force in November 2009, providing a greater consolidated supervisory mandate for the central bank, Bank Negara Malaysia. Provisions under the new CBA 2009 include the power to require relevant information for the purpose of financial stability from banks and non-bank financial institutions, and to issue an order to any individual in the interest of financial stability.

Furthermore, in countries such as the Philippines and Indonesia, the establishment of a financial sector forum (FSF) has played a major role in promoting greater coordination of the supervisory agencies of financial institutions. The FSF aims to facilitate regular consultations and exchange of information among its members relating to the supervision and regulation of financial institutions. Its members are the

[9] A number US banks, including Sun Trust—a large regional bank in the US—were caught between the two regulators (Wall, 2009). The US Congress stepped in and mediated the policy conflicts between the two key regulatory agencies.

central bank, the securities and exchange commission, and the deposit insurance agency. In Indonesia, the ministry of finance is also a member of this FSF.

The global financial meltdown pushed the envelope on banking supervision and regulation. The presence of multinational banks, including the newly emerging regional multinational banks, forced the central banks to go beyond their borders and to get involved in cross-border supervision arrangements. As discussed, the globalized banks play a crucial role in the international transmission of monetary policies and economic shocks around the world. Naturally, cross-border cooperation and coordination will become increasingly vital as banking systems become even more globally integrated.[10] The effectiveness of various prudential measures to supervise cross-border financial institutions must therefore be improved with adequate cross-country supervisory cooperation and coordination to avoid loopholes, such as currency substitution, or switching from domestic lending in foreign currency to direct foreign credit.

The college of supervisors offers a potentially effective method to aid cross-border policy cooperation and coordination.[11] The college of supervisors is defined as permanent, although flexible, structure for cooperation and coordination among the authorities of different jurisdictions responsible for and involved in the supervision of the different components of cross-border banking groups (Committee of European Banking Supervisors [CEBS] 2010). As a general rule, the establishment of a supervisory college should be considered for significant financial institutions in size, their interconnectedness with other components of the financial system, and the role they play in the market, i.e., the extent to which it may cause systemic impact on the country's financial system, thereby affecting the region's financial stability.

A recent survey by the SEACEN Centre identifies regional and global banks that have strong presence in major Asian economies (Siregar and Lim 2010). Hong Kong Shanghai Banking Corporation (HSBC), Citibank, and Standard Chartered Bank are among the three major international banks that have wide and extensive networks of branches in Asia (Table 9). In addition to these three international powerhouses, multinational banks have also emerged in the region. From Malaysia, the Malaysian Bank (Maybank), the CIMB Bank of Malaysia, and Rashid Hussein Bank have expanded their networks beyond the major Southeast Asian countries. A number of Singaporean banks, namely the Development Bank of Singapore, the United Overseas Bank, and the Overseas Chinese Bank Corporation, have achieved similar success in becoming regional banks.

[10] As the global financial crisis shows, the lack of information on cross-border risk exposure resulted in under-appreciation of systemic risks and connections by supervisors and regulators (Kodres and Narain 2009).

[11] As of September 2009, there are more than 30 colleges to supervise complex institutions.

Table 9: Significant Financial Institutions

Central Banks	Top 3 Domestic FIs in your jurisdiction that have significant presence in the region	Top 3 foreign FIs in your jurisdiction that are originated from SEACEN member countries	Top 3 other foreign FIs (apart from originating from SEACEN member countries) that have significant presence in your country
Ministry of Finance, Brunei Darussalam	The domestic banks have a presence only within the country	- Maybank (Malaysia) - UOB (Singapore) - RHB Bank Berhad (Malaysia)	- Citibank - HSBC - Standard Chartered Bank
Bank Indonesia	- Bank Mandiri - Bank BRI - BCA	- CIMB Niaga (Malaysia) - Bank International Indonesia (MayBank Malaysia controls around 43%)	- Citibank - HSBC - Standard Chartered Bank
The Bank of Korea	- None	- DBS (Singapore) - UOB (Singapore) - OCBC (Singapore)	- Citibank - HSBC - Standard Chartered Bank
Bank Negara Malaysia	- Maybank - CIMB Group - Public Bank	- OCBC (Singapore) - UOB (Singapore) - Bangkok Bank (Thailand)	- Citibank - HSBC - Standard Chartered Bank
Bank of Papua New Guinea	- Bank South Pacific	- Maybank (Malaysia)	- ANZ Bank (Australia) - Westpac Bank (Australia)
Bangko Sentral ng Pilipinas	- Metropolitan Bank Corporation (Metrobank) - Philippine National Bank (PNB)	- Chinatrust (Taipei,China) - Maybank (Malaysia) - Korea Exchange Bank (Korea)	- Citibank - HSBC - Standard Chartered Bank
Monetary Authority of Singapore	- DBS Bank Limited - OCBC - UOB	- Maybank (Malaysia) - Bangkok Bank (Thailand) - RHB Bank (Malaysia)	- Citibank - HSBC - Standard Chartered Bank
Central Bank of Taipei,China	- Bank of Taiwan[12] - Taiwan Cooperative Bank[13] - Mega International Commercial Bank	- DBS (Singapore) - OCBC (Singapore) - Bangkok Bank (Thailand)	- Citibank - HSBC - Standard and Chartered Bank
Bank of Thailand	- Bangkok Bank - Kasikorn Bank - Siam Commercial Bank	- UOB (Singapore) - CIMB Thai (Malaysia) - OCBC (Singapore)	- GE Capital - ING - Standard Chartered

Note: Development Bank of Singapore = DBS; United Overseas Bank = UOB; Overseas Chinese Bank Corporation = OCBC; Hong Kong Shanghai Banking Corporation = HSBC; Rashid Hussein Bank = RHB.

Source: Siregar and Lim 2010.

As of May 2010, a number of major central banks in Asia have been invited to participate in colleges of supervisors. Bank Negara Malaysia for instance is involved in the colleges of supervisors organized by the Financial Stability Agency of United Kingdom for Standard Chartered Group, the BaFIN for the Deustche Bank group, and

[12] A commercial bank in the ADB member referred to as "Taipei,China".

[13] A commercial bank in the ADB member referred to as "Taipei,China".

the OFSI for Bank of Nova Scotia group. Similarly, the Monetary Authority of Singapore and the Central Bank of the Philippines have also participated in a number of colleges of supervisors organized for major European and US banks. But as of June 2010, there has not been any arrangement for supervisory colleges for the Asian regional multinational banks, such as those Malaysian and Singaporean banks discussed earlier.

A number of issues and challenges have been recognized by Asian central banks and monetary authorities during their participation in various colleges of supervisors. Some challenges are not particular to the Asian central banks, but are shared by many others globally. To start, it is imperative that information exchange be a two-way process and reflects the needs of the authorities involved to ensure effective prudential supervision. But supervisors may face legal and constitutional constraints to the sharing of vital information. Furthermore, given the sensitivity of the information to be shared, supervisors need to weigh and balance issues pertaining to national interests. In some circumstances when problems arise, there may be a divergence of interests where the home or host supervisor seeks to ring-fence problems at the national level and hence impede the early detection of emerging group-wide, cross border problems. Some central banks in Asia have also expressed concerns over differing levels of development of supervisory approaches and staffing capacity readiness.

The home and host countries issue may also arise due to the importance of the relevant financial institutions. For instance, a global financial institution may be deemed systemic and significant for the host supervisor of country A. Yet, for the home supervisor, the presence of its global financial institution in country A is only an insignificant share of the financial institution's global activities.[14] As such, one may apply the principle of proportionality (Trichet 2007). The principle of proportionality ensures efficiency and effectiveness as the supervisory relationship is structured so that a greater role is given to supervisors where the targeted group entities figure prominently in the jurisdictions (e.g., asset size). In this way, Trichet (2007) argues that potential incentive problems can be reduced.

6. LIQUIDITY RISK MANAGEMENT[15]

The importance of liquidity for the well-functioning and stability of the financial sector has been frequently underscored by past financial crisis. The recent global financial crisis reaffirms the importance of liquidity. Massive and rapid provision of liquidities into the interbank markets during the financial crisis by the central banks and monetary authorities around the world has been credited with the relatively faster than expected economic recoveries. The central bank's role as provider of market liquidity during disorderly and illiquid markets has been referred to as that of the market maker of last resort (MMLR). In a study, Buiter (2008) compares and contrasts the effectiveness of MMLR policies across a number of central banks in developed economies, namely, the Bank of England, the European Central Bank, and the Federal Reserve Board system. The policy measures to manage liquidity during the crisis have indeed been costly. Provision of the liquidity in the interbank market against credit-risky collateral has been actively pursued during the past few years and has placed central banks' balance sheets at risk. The experiences of central banks of small, open economies in

[14] For instance, the share of total assets of Citibank NA, the biggest foreign bank in Indonesia, is only 0.29% of total assets of Citigroup. Given the small share of Citibank Indonesia in the global assets of Citibank group, Bank Indonesia has so far been having difficulties in soliciting sufficient information on the soundness of this group from Citigroup's home regulator.

[15] The discussion in this section benefited greatly from Subhanij (2010) and the research project on measurement and management of liquidity conducted by the South East Asian Central Banks (SEACEN) Research and Training Centre in 2009.

Latin America show that systemic liquidity provision could lead to a sharp depreciation of the exchange rate and, in the long term, boost inflation (Jacome 2008). Indonesia experienced a similar situation during the 1997 crisis (Siregar 2005).

Given the high cost of liquidity provision, it is in a central bank's interest to reduce the incidences of systemic liquidity stresses. The objective of this section is to take stock of the challenges facing the management of liquidity of the financial sector, and more importantly, to evaluate what central banks in Asia have done to improve their capacities and to conform to the initiatives introduced by the Basel Committee on liquidity management.

There are three types of financial-sector liquidity to be considered. The first is funding liquidity, which refers to the ability of banks to meet their liabilities and unwind or set their due positions (BCBS 2008). The second is market liquidity, which refers to the ability to trade an asset at short notice, at low cost, and with minimal impact on its price (Sarr and Lybeck 2002). The third type is central bank liquidity. This is the least discussed, but during a crisis the ability of a central bank to inject liquidity into the market is essential for the functioning and stability of the financial sector, as seen during the recent global financial crisis.

A SEACEN Centre survey of central banks in Asia highlights factors affecting the liquidity of the financial sector (Table 10). The most common source of funding liquidity is the liquidity mismatch between assets and liabilities (that is assets being less liquid than liabilities). This is not a surprise given the basic function of a bank, namely to transform liquid short-term deposits into illiquid long-term loans. The second source of liquidity problems is inadequate, liquidity risk management. This factor appears to be the most crucial root cause of market illiquidity. This finding accentuates the urgency to develop comprehensive stress testing practices to strengthen liquidity risk management capacity. Shifts in monetary policy and supervisory regulation have also been identified as major factors that have impacts on funding liquidity, especially for newly emerging markets, such as Cambodia. The rise in the reserve requirement and minimum capital requirement are examples of the amendments of the supervisory regulations.

Table 10: Factors Affecting Liquidities

Factors affecting funding liquidity	
Inadequate liquidity risk management	Cambodia; Brunei Darussalam; Indonesia; Malaysia; Nepal; Sri Lanka; Taipei,China; Thailand; Viet Nam.
Lack of contingency funding plan	Indonesia; Malaysia; Nepal; Sri Lanka.
Regulatory changes	Cambodia; Malaysia; Nepal; Philippines; Thailand
Stresses in local financial market	Malaysia; Nepal; Philippines
Contagion effect	Indonesia; Korea; Malaysia; Philippines; Taipei,China; Thailand;
Asset-Liability mismatch	Brunei Darussalam; Cambodia; Indonesia; Korea; Malaysia; Myanmar; Nepal; Philippines; Sri Lanka; Taipei,China; Thailand; Viet Nam.
Lack of alternative funding	Indonesia; Korea; Malaysia; Nepal; Sri Lanka; Viet Nam.
Loss of confidence	Cambodia; Indonesia; Malaysia; Taipei,China; Thailand.
Factors affecting market liquidity	
Inadequate liquidity risk management	**Brunei Darussalam;** Malaysia; Nepal; Sri Lanka; Taipei,China; Viet Nam.
Global financial crisis	Indonesia; Korea; Malaysia; Philippines; Thailand.
Stresses in local financial market	Indonesia; Korea; Malaysia; Philippines.
Changes in monetary policy	Malaysia; Nepal; Sri Lanka; Thailand.
Lacks of liquidity in interbank and bond markets	Indonesia; Korea; Malaysia; Nepal; Philippines; Thailand.
Loss of confidence	Indonesia; Korea; Taipei,China; Thailand.
Contagion effect	Philippines; Taipei,China; Thailand.

Source: Subhanij (2010) and survey by the SEACEN Centre, December 2009.

For the more advanced and open economies of East and Southeast Asia, such as Indonesia; Korea; Malaysia; the Philippines; Taipei,China; and Thailand, global financial crisis and contagion effects are factors the financial institution and central banks must monitor in their liquidity management. Following the global financial crisis, the impact was felt in the bond markets where the outflow of foreign investment led to shortages of liquidity in the Korean bond market. The high loan to deposit ratios and the reliance on bond issuances fueled foreign investors' loss of confidence in Korea during the crisis.

Unlike the 1997 crisis, the banking sectors of the East and Southeast Asian countries were in a much better position during the recent crisis. Funding liquidity appears to be abundant in most parts of the region. Deposits continued to grow during the crisis, with the exception of Thailand. The strong deposits contributed to a healthy loan to deposit ratio, averaging at around 70% to 80%. Banks in the region hold a large amount of excess reserves. Liquid assets are more than adequate to cover short-term liabilities. Furthermore, the ratio of excess reserve to required reserve ranges from 20% to 2,000%, while the ratio of liquid assets to short-term liabilities has also been well above the minimum targets, ranging from about 25% to 125% (Table 11).

Table 11: Strong Funding Liquidity

(As of June 2009)

	Excess to required reserves (%)	Loan to deposit ratio (%)	Deposit growth rate (%)	Liquid asset to short-term liabilities (%)
Cambodia	220	83	2.44	46
Korea	2,304	108.12	3.42	122.6
Malaysia	324	81	1.61	24.78
Nepal	23	71	12.6	NA
Philippines	23.4	69.1	10.2	51.8
Sri Lanka	-0.73	78.5	8.3	34.7
Taipei,China	304.4	76.8	11.5	28.31
Thailand	399.1	102.8	-1.62	29.9

Source: Subhanij (2010) and survey by the SEACEN Centre, December 2009.

Reform initiatives taken after the onset of the 1997 crisis have boosted the strength of the banking sector of these Asian economies. Liquidity ratio, cash flow projections, and minimum quantitative limits such as liquid asset and reserve holdings have become commonly available instruments for liquidity management for these Asian commercial banks (Table 12). In addition, these banks must regularly report their liquidity positions to the supervisory institutions (Table 13). It is important to underline here that the quality and the degree of enforcement of these regulations vary from one jurisdiction to another. In the Philippines, for instance, required reserve is the highest in the region, at 19%, reflecting in part the authorities' concern about the health of the banking system. Classifications of liquid assets also vary from one country to another. For example, in Cambodia, liquid asset includes only cash and placements with banks. In Malaysia, apart from securities issued by the government and Bank Negara Malaysia, other securities, such as those issued by recognized government linked institutions, banker's acceptance, negotiable certificate of deposits, residential mortgage backed securities, and equities are also considered as liquid assets. Aligning the classification and the reinforcement of regulation with international standards is warranted.

Table 12: Bank's Liquidity Management

Instruments	Economies
Minimum holdings of liquid assets	Brunei Darussalam; Indonesia; Korea; Malaysia; Nepal; Philippines; Sri Lanka; Taipei,China; Thailand; Viet Nam.
Minimum holdings of reserves	Brunei Darussalam; Cambodia; Indonesia; Korea; Malaysia; Nepal; Philippines; Sri Lanka; Taipei,China; Thailand; Viet Nam.
Liquidity ratio	Brunei Darussalam; Cambodia; Indonesia; Korea; Malaysia; Philippines; Sri Lanka; Taipei,China; Thailand; Viet Nam.
Limits on concentration of funding	Cambodia; Indonesia; Korea; Malaysia; Sri Lanka; Taipei,China; Thailand.
Cash flow projections	Brunei Darussalam; Cambodia; Indonesia; Korea; Malaysia; Sri Lanka; Taipei,China; Thailand; Viet Nam.
Maximum cash outflow	Brunei Darussalam; Indonesia; Korea; Malaysia; Nepal; Philippines; Sri Lanka; Taipei,China; Thailand; Viet Nam.

Source: Subhanij (2010) and survey by the SEACEN Centre, December 2009.

Table 13: Liquidity Disclosure to Central Banks

	Report Submission	Components for Report						
		Deposit Concentration	Loan to Deposit Ratio	Short-term Liabilities Breakdown	Maturity Gap Report	Liquid Assets Breakdowns	Liquidity Ratios	Liquidity Gap Report
Cambodia	Yes	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Korea	Yes	X	X	Monthly	Monthly	Monthly	Weekly	Monthly
Malaysia	Yes	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Philippines	Yes	Monthly & Quarterly	Monthly & Quarterly	Monthly & Quarterly	Monthly & Quarterly	Monthly & Quarterly	Monthly & Quarterly	Monthly & Quarterly
Sri Lanka	Yes	Weekly	X	X	Monthly	X	Monthly	X
Taipei,China	Yes	Monthly	Monthly	X	Monthly	Monthly	Monthly	Monthly
Thailand	Yes	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Indonesia	Yes	Daily	Weekly & Monthly	Daily	Daily	Daily	Daily	Monthly
Viet Nam	Yes	X	X	X	X	X	Daily and Weekly	X

Note: "X" implies no reporting is required.

Source: Subhanij (2010) and Survey conducted by the SEACEN Centre, December 2009.

A number of new initiatives have been passed by the Basel Committee for Banking Supervision. In September 2008, bank regulators issued revised principles on how banks should manage liquidity (BCBS 2008). These sound principles provide supervisory guidelines on the key elements of a framework for liquidity risk management of banks. The principles consist of the following elements: board and senior management oversight; the establishment of policies and risk tolerance; the use of liquidity risk management tools such as comprehensive cash flow forecasting; limits

and liquidity scenario stress testing; the development of contingency funding plans; and the creation of a buffer of high-quality liquid assets to meet contingent liquidity needs. Supervisors are expected to evaluate the sufficiency of bank's liquidity risk management and liquidity exposure. Moreover, supervisors are expected to deal with the bank's risk management inadequacies or excess exposure to protect depositors and ensure financial stability.

A number of Asian economies, such as Brunei Darussalam, Indonesia, Malaysia, the Philippines, Sri Lanka, and Viet Nam have made contingency funding planning (CFP) a requirement for local commercial banks. Other economies, such as Cambodia; Korea; Taipei,China; and Thailand have incorporated the CFP into their prudential liquidity guidelines. But CFP enforcement differs between these economies. In Korea, banks have multi-stage contingency plans, obliging them to take appropriate crisis responses when liquidity indicators fall or rise above threshold levels. In Sri Lanka, only few banks have adhered to CFP.

Following the recommendation of the G-20 to establish a global framework for promoting stronger liquidity buffers of banks by 2010, the Basel Committee on Banking Supervision (BCBS) released a consultative document on an international framework for liquidity risk measurement, standards, and monitoring in December 2009.[16] Banks are expected to meet these standards and follow the principles set out in the September 2008 Sound Principles.[17] The two standards for liquidity risk are the liquidity coverage ratio and the net stable funding ratio. The liquidity coverage ratio specifies the amount of high-quality liquid assets a bank can employ to offset the net cash outflows it experiences under severe short-term stress scenarios. This is to promote the short-term resilience of banks by ensuring they have adequate high-quality liquid resources to survive an extreme stress scenario lasting one month.[18] The net stable funding ratio sets a minimum acceptable amount of stable funding based on the liquidity characteristics of a bank's assets and activities over one year. The objective is to promote resilience over longer-term time horizons by creating incentives for banks to fund their activities with more stable sources of funding.[19]

To bolster and improve consistency in international liquidity risk supervision, the BCBS developed monitoring tools to be used by supervisors to expand quantitative measures to monitor the liquidity risk profiles of banks globally. The proposed monitoring tools include contractual maturity mismatch (provides an initial, simple baseline of contractual commitments); concentration of funding (involves analyzing concentrations of wholesale funding); available unencumbered assets (measures the amount of unencumbered assets a bank has which could potentially be used as collateral for secured funding); market-related monitoring tools (includes monitoring market-wide data on asset prices and liquidity, among others; credit default swap spreads; and equity prices.

7. THE NEW CAPITAL STANDARDS UNDER BASEL III

Basel III represents a new era for global capital standards, with an emphasis on increasing the quality and level of banks' capital (Caruana 2010). Recognizing the pro-cyclical nature of banking activities and the close connectivity of macroeconomic and financial sector conditions, the primary objective of the new capital standard is to

[16] *Declaration on Strengthening the Financial System*, London Summit, 2 April 2009.

[17] Refer to Basel Committee on Banking Supervision no. 144 on Principles for Sound Liquidity Risk Management and Supervision (www.bis.org/publ/bcbs144.pdf).

[18] Liquidity coverage ratio = stock of high-quality liquid assets and Net cash outflows over a 30-day period ≥ 100%.

[19] Net stable funding = available amount of stable funding and required amount of stable funding > 100%.

improve the quality and the level of banks' capital. On September 2010, the Group of Governors and Heads of Supervision (the Basel Committee's governing body), announced higher global minimum capital standards for commercial banks. This follows the agreement reached in July 2010 on the design of capital and liquidity reform package, referred to as Basel III.

The Tier 1 minimum capital requirement, which includes common equity and other qualifying financial instruments based on stricter criteria, will be increased to 6%, compared with a minimum ratio of 4% under Basel II (Table 14). Under the new standard, a higher minimum capital requirement in common equity was raised from 2% to 4.5% of risk-weighted assets. A broader and stricter definition of risk-weighted assets has been imposed, particularly with the restrictive treatment of trading book, counterparty risk and securitizations. With the new, tighter treatment, common equity minimum capital increased effectively from roughly 1% to 4.5%. Hence, the new capital requirement is expected to increase the level of capital adequacy and the quality of loss-absorbing capital.

Table 14: New Capital Framework

	Common Equity	Tier 1 Capital	Total Capital
Minimum	4.5%	6.0%	8.0%
Conservation buffer	2.5%		
Minimum + conservation buffer	7.0%	8.5%	10.5%
Countercyclical capital buffer	1–2.5%	0–2.5%	

Source: Danske Markets 2010.

To improve the resilience of the banking sector, a 2.5% capital conservation buffer (CCB) is added on top of the 4.5% minimum capital requirement in the category of common equity, raising the top-quality equity capital requirement to 7%, compared with just 2% under the Basel II standards. There is also flexibility in the CCB as it can be drawn down in times of losses, thus mitigating procyclicality in times of stress for banks. The CCB has a macro-prudential dimension as it can impact credit supply (Caruana 2010b).

Another important aspect of the system-wide approach is the counter-cyclical buffer of (0–2.5%) of common equity or other fully loss absorbing capital, in addition to the CCB, to ensure systemically important financial institutions possess loss-absorbing capacity beyond the common standards. The cyclical buffer, aimed at achieving the broader macro-prudential goal, will be based on private-sector credit as excess aggregate credit growth has often been associated with systemic risk. It will be up to the national supervisors to exercise their judgment on the common point of reference and determine when to impose such a buffer.[20] There is no cost for withdrawal, in contrast to the CCB, which imposes some costs if it is drawn down (e.g., restrictions on earning distributions to stakeholders in the form of dividends, discretionary bonuses, etc., for banks approaching the regulatory minimum requirements).

Lastly, a non-risk-based leverage ratio (i.e., Tier 1 capital divided by total assets, with no risk weighting) which acts as a backstop (i.e., last resort) is proposed to address the risk of buildup of excessive leverage in the system (Caruana 2010). The backstop leverage ratio ensures that resulting distortions, if any, are within a certain range if risk based capital rules are found to be wrong. In general, the minimum total capital ratio

[20] However, the Basle Committee on Banking Supervision expects the national authority to invoke this requirement only infrequently.

remains at 8%, but the additional capital conservation buffer increases this ratio to 10.5% of risk weighted assets of which 8.5% must be Tier 1 capital. Member countries will start implementing Basel III on 1 January 2013, with the phase-in period extending in some cases to January 2019 (Table 15). For example, the phasing-in period for the capital conservation buffer is between 1 January 2016 and the end of 2018, becoming effective on 1 January 2019. But flexibility is given for national authorities to shorten the phasing-in period if appropriate.

Table 15: Phase in Arrangements of New Minimum Capital Requirements

	2013	2014	2015	2016	2017	2018	2019
Minimum common equity ratio	3.5%	4.0%	4.5%	4.5%	4.5%	4.5%	4.5%
Capital conservation buffer				0.625%	1.25%	1.875%	2.5%
Common equity plus capital conservation buffer	3.5%	4.0%	4.5%	5.125%	5.75%	6.375%	7.0%
Minimum Tier 1 Capital	4.5%	5.5%	6.0%	6.0%	6.0%	6.0%	6.0%
Total Capital	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Total Capital plus conservation buffer	8.0%	8.0%	8.0%	8.625%	9.125%	9.875%	10.5%

Source: BIS & Danske Markets 2010.

In general, Asian commercial banks are well capitalized (Table 1). Commercial banks in Asia have been maintaining the capital adequacy ratio (CAR) well above the Basel II requirement of 8%, with the exception of Nepal and Mongolia. By the end of March 2010, the commercial banks in Malaysia maintained systemic-wide risk-weighted and Tier-1 capital ratios of 15% and 13%, respectively, much higher than the Basel II regulatory minimum of 8% and 4%, respectively. The Monetary Authority of Singapore has enforced minimum Tier-1 CAR at 6% and total CAR at 10%. In addition to higher required Tier-1 CAR and total CAR, a number of the Asian central banks and monetary authorities encourage banks to hold more capital than minimum requirements through incentives measures. In Taipei,China, for instance, the Financial Supervisory Commission has a policy stipulating that if banks want to establish foreign branches and subsidiaries or buy back shares from the stock market, their capital adequacy ratios must be well above 10%. A greater flexibility to expand operations is also given to banks by the central bank in the Philippines, provided that banks maintain a higher level of CAR than the prescribed minimum 10%.

Furthermore, major central banks in Asia have moved from minimum prescriptive loan loss provisioning to a current asset impairment-based approach. Bank Negara Malaysia had adopted this asset impairment approach by the end of 2009, in line with the implementation of International Accounting Standard 39. The forward looking risk assessment is being considered by many East and Southeast Asian central banks in as they look to improve their estimation of capital adequacy targets.

But Mervyn King, governor of the Bank of England, said that the Basel III framework has not raised the capital requirement of banks sufficiently to prevent another crisis (King 2010). He based his observations on three criteria. First, a much higher level of capital than the one proposed is needed to counteract a change in sentiment during times of stress. Second, the Basel risk-weights approach is based on estimates during normal periods and in times of stress; these valuations become very poor estimates of underlying risks. Third, the Basel framework focuses on the asset side of banks' balance sheets and is therefore inadequate for dealing with risks arising from liquid assets and risky liability structures. As the financial sector system grows in sophistication—as is the case in advanced economies—banks are relying less and less on deposits for their lending and investment activities. Liquidity mismatches may

thus arise as the net stable funding ratio can be lower than required.[21] More explicit elaboration is arguably needed for Basel III on this liquidity issue.

Blinder (2010) argued that Basel III does not address the issue of over reliance on credit ratings. He asserts that rating agencies that have performed poorly on rating mortgage-backed securities and collateralized debt obligations will have a major role to play in the risk-weighting process under Basel III. He also argued that the process of letting banks use their internal model to measure risk remains in Basel III and this has proven to be disastrous for Basel II. Implementing Basel III will be a challenge for supervisors across different jurisdictions (Slaughter and May 2010). But it is fair to say that Basel III is trying to address systemic issues more methodically. The integrated approach, which includes resolution regimes, will take into account a combination of capital surcharges, contingent capital, and bail-in debt.

8. CONCLUDING REMARKS

The outlook for most Asian economies has appeared much more upbeat in the first quarter of 2010 than a year earlier. Growth rate projections for 2010 and 2011 reported by market analysts and multilateral agencies have in most parts been more buoyant than those of the governments of the countries. This partly reflected the swift and strong return of market confidence, as captured by the falling Emerging Market Bond Index and the credit default swap rates, especially since the second half of 2009. Together with the return of market confidence, capital flows into the countries have surged. Management of these capital flows will be critical to the strength of the economic recoveries of these countries and to the stability of the financial sector.

One pressing challenge for most central banks in Asia is to unwind the stimulus packages implemented during the height of the global financial crisis. The central banks of Malaysia and the Philippines have raised their policy rates, while the Monetary Authority of Singapore has expanded the ban for an appreciation of the local currency to cool inflationary pressure. Although the state of domestic economies should influence exit strategies, external factors remain a critical consideration for central banks in Asia. The outcome of any exit strategy is likely to have an impact on the capital flows and therefore the management, particularly on the potential risks, of these much-needed but volatile flows.

Like past crises, the recent global financial crisis has brought new challenges for the management of financial stability in particular and monetary policy in general. In this study, we examine a number of lessons and recent initiatives in macro-prudential regulations. Several are in the early stages of implementation and are likely to undergo adjustments and improvements. Stress testing has been recognized as a useful tool, but it remains to be seen how practical it is, especially for emerging markets. Similarly, the globalized banking system accentuates the urgency to push forward with the college of supervisors. But skeptics point to mounting challenges for central bankers, especially from the emerging markets, to move forward and take an active role. Despite such challenges, the lessons from the past crises are clear: that failure to act would prove costly and that the major economies in Asia greatly benefited from strenuous reforms initiated at the onset of the 1997 crisis.

[21] NFSR = [Stable Funding (capital, deposit, etc)]/[Assets*haircut ratio according to liquidity of assets]. This ratio should be higher than 100% (Ito 2010).

REFERENCES

Bayoumi, T. and O. Melander. 2008. Credit matters: Empirical Evidences of US Macro-Financial Links. *IMF Working Paper* WP/08/169.

Blaschke, E., M. T. Jones, G. Majnoni, and S. M. Peria. 2001. Stress Testing of Financial Systems: An Overview of Issues, Methodologies, and FSAP Experiences. IMF.

Basel Committee on Banking Supervision (BCBS). 2008. *Principles for Sound Liquidity Risk Management and Supervision.* September.

Basel Committee on Banking Supervision (BCBS). 2009. *Principles for Sound Stress testing Practices and Supervision*. January.

Blinder, A.S. 2010. Two Cheers for the New Bank Capital Standards: Why Do We Still Rely on the Rating Agencies, and Why Are We Still Allowing Lehman Brothers Levels of Leverage. Opinion, Wall Street Journal Online. http://online.wsj.com/article/SB10001424052748704523604575511813933977160.html.

Borio, C. 2003. Toward a Macroprudential for Financial Supervision and Regulation. *BIS Working Papers*, No. 128. February.

Borio, C. 2006. Monetary and Financial Stability: Here to Stay? *Journal of Banking and Finance*, 30: 3407–3414.

Buiter, W. H. 2008. Central Banks and Financial Crises. Paper presented at the Federal Reserve Bank of Kansas City Symposium. Jackson Hole, WY.

Caruana, J. 2010. Macroprudential Policy: Could It Have Been Different This Time? Speech at the People's Bank of China Seminar on Macroprudential Policy in Cooperation with the International Monetary Fund, Shanghai, 18 October.

Clark, J. 2009. Q&A: OsFi chief Champions Canada's Regulatory Framework. Risk. 19 June. www.risknews.net/public/showPage.html?page=863254

Committee of European Bank Supervisors (CEBS). 2010. Colleges of Supervisors—10 Common Principles, January 2009, www.c-ebs.org/getdoc/aeecaf1a-81b5-476a-95dd-599c5e967697/Clean-V3-formatted-CEBS-2008-124-CEIOPS-SEC-08-54-.aspx-2008-124-CEIOPS-SEC-08-54-.aspx.

Committee on the Global Financial System. 2010. Macroprudential Instruments and Frameworks: A Stocktaking of Issues and Experiences Working Paper No. 38. May.

Cetorelli, N., and L.S. Goldberg. 2008. Banking Globalization, Monetary Transmission, and the Lending Channel. *NBER Working Paper* No. 14101.

Cetorelli, N., and L.S. Goldberg. 2009. Globalized Banks: Lending to Emerging Markets in the Crisis. *Federal Reserve Bank of New York Staff Reports* No. 337. June.

Craig, R. S., E. P. Davis, and A. G. Pascual. 2006. Sources of Procyclicality in East Asian Financial Systems. In *Procyclicality of Financial Systems in Asia,* edited by S. Gerlach, and P. Gruenwald. Washington, DC: IMF.

De Graeve, F., T. Kick, and M. Koetter. 2008. Monetary Policy and Financial. In Stability: An Integrated Micro-Macro Approach. *Journal of Financial Stability* 4: 205–231.

Gray, D., R.C. Merton, and, Z. Bodie. 2007. New Framework for Measuring and Managing Macroinancial Risk and Financial Stability. *NBER Working Paper* No. 13607.

Hirtle, B., T. Schuermann, and K. Stiroh. 2009. Macroprudential Supervision of Financial Institutions: Lessons from the SCAP. *Staff Report* No. 409, the Federal Reserve Bank of New York, November.

Ho, D. C. 2010. Chapter 9 in *Asset Price Bubbles and Challenges to Central Banks*, edited by J.H. Kim. Kuala Lumpur: the SEACEN Centre.

Houben, A., J. Kakes, and G. Schinasi. 2004. Toward a Framework for Safeguarding Financial Stability, *IMF Working Paper* WP/04/101.

Ito, T. 2010. Banking Behaviour in the Midst of Financial Reform, presentation at SEACEN-Bank Indonesia High Level Seminar for Deputy Governors on Optimal Central Banking for Financial Stability. 9–11 December. Bali, Indonesia.

Jacome, L. 2008. Central Bank Involvement in Banking Crises in Latin America. *IMF Working Paper* 08/135.

King, M. 2010. Banking: From Bagehot to Basel, and Back Again. Speech at the Second Bagehot Lecture Buttonwood Gathering, New York City. 25 October. www.bankofengland.co.uk/publications/speeches/2010/speech455.pdf

Kishan, R. P., and T. P. Opiela. 2000. What do a million observations on banks say about the transmission of monetary policy? *American Economic Review*, 90 (3): 407–428.

Kirchfeld, A., and S. Clark. 2010. Deutsche Bank CEO Says EU Stress Tests Could Be "Dangerous". Bloomberg News, www.bloomberg.com/news/2010-06-10/ackermann-says-publishing-bank-stress-tests-data-could-be-very-dangerous-.html

Kodres, L. and A. Narain. 2009. What is to be Done. Finance and Development, IMF, No.1, Vol. 46. March.

Nagy, P. M. 2009. Stress testing of Banks and Policy Implications. EBRP Blog, European Bank for Reconstruction and Development, 31 July, www.ebrdblog.com/wordpress/2009/07/stress testing-of-banks-and-policy-implications

Nakornthab, D. 2010. Household Indebtedness and Its Implications for Financial Stability. *Research Project Paper*, the SEACEN Centre, Kuala Lumpur, Malaysia (forthcoming).

Prenio, J. Y. 2008. Overview of the Philippine Banking System in P.P. Wibowo, ed.

Understanding and Addressing the Pro-cyclicality Impact of Basel II in the SEACEN Countries. The South East Asian Central Banks Research and Training Centre. Kuala Lumpur, Malaysia.

Sarr, A., and T. Lybek. 2002. Measuring Liquidity in Financial Markets. *IMF Working Paper* 02/232, December.

Siregar, R.Y. 2005. Interest Rate Policy and Its Implication for the Banking Restructuring Programs in Indonesia during the 1997 Financial Crisis: An Empirical Investigation. In F. Sjoholm and J. Tongzon, eds. *Institutional Change in Southeast Asia*, Routledge Press. pp. 72–90.

Siregar, R. Y., and K. M. Choy. 2010. Determinants of International Bank Lending from the Developed World to East Asia. *IMF Staff Papers.* 57(2): 484–516.

Siregar, R. Y., and W. E. James. 2006. Designing an Integrated Financial Supervision Agency: Selected Lessons and Challenges for Indonesia. ASEAN Economic Bulletin. 23(1).

Siregar, R. Y. and C. V. Lim. 2010. The Role of Central Banks in Sustaining Economic Recovery and in Achieving Financial Stability. *Journal of Advanced Studies in Finance*, Vol.1. Summer.

Slaughter and May. 2010. Basel 3 Agreements at Last but Question Remains, Briefing,

September. www.slaughterandmay.com/media/1466594/basel_3_agreement_at_last_but_questions_remain.pdf

Subhanij, T. 2010. Liquidity Measurement and Management in the SEACEN Countries.

Research Project Paper, the SEACEN Centre. Kuala Lumpur, Malaysia (forthcoming).

Subhaswadikul, M. 2010. Stress Testing: The Experience of Bank of Thailand, power point presentation at the 3rd SEACEN-Deutsche Bundesbank Intermediate Course on Banking Supervision and Financial Stability: Stress testing. Kuala Lumpur. 11 May.

Sorge, M. 2004. Stress testing Financial Systems: An Overview of Current Methodologies. *BIS Working Papers* No. 165.

Tarullo, D. K. 2010. Lessons from the Crisis Stress Tests, Speech Presented at the Federal Reserve Board International Research Forum on Monetary Policy, Washington, DC, 26
March. www.federalreserve.gov/newsevents/speech/tarullo20100326a.htm

Wall, L. D. 2009. Prudential Discipline for Financial Firms: Micro, Macro, and Market Structures. *ADBI Working Paper* No. 176. December.

Woolford, I. 2001. Macro-financial Stability and Macro-prudential Analysis. *Reserve Bank of New Zealand Bulletin* 64(3).

Zhu, H. 2010. An Introduction of Stress testing. Power point presentation at the 3rd SEACEN-Deutsche Bundesbank Intermediate Course on Banking Supervision and Financial Stability: Stress testing. Kuala Lumpur. 11 May.