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**ADB Working Paper Series**

**The Role of Macroprudential Policy  
for Financial Stability in East  
Asia's Emerging Economies**

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**Abstract**

This paper analyzes the role and scope of macroprudential policy in preventing financial instability in the context of East Asian economies. It analyzes the behavior of the housing market in a dynamic setting to identify some of the factors responsible for the volatility of housing markets and their susceptibility to boom-bust cycles, which it identifies as a key source of financial imbalances in these economies. It then discusses the causal nexus between price and financial stability and the roles and complementary nature of macroprudential and monetary policies in addressing aggregate risk in the financial system. The paper identifies currency and maturity mismatches, which contributed to the 1997–1998 Asian financial crisis, as ongoing concerns in these economies although the high levels of reserves in the region now act as a buffer.

**JEL Classification:** E52, E58, G01, G15, G28

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## 1. INTRODUCTION

Episodes of financial crises in both advanced and emerging economies over the past decade and a half leave little doubt that the stability of consumer prices does not necessarily ensure financial stability. Although there is no universally accepted definition and operational measure of financial stability, wide swings in asset prices and the boom–bust credit cycles during much of the great moderation era bear witness to the fact that price stability is not a sufficient condition for financial stability in either advanced or emerging economies. East Asia has been no exception. The prices of stocks and housing have displayed wide swings whereas consumer prices have remained relatively stable (as shown in the appendix). These divergent movements have cast doubt on the presumption that price stability would ensure stability of financial markets and institutions.

In the run-up to the 1997–1998 Asian financial crisis, the boom in the real estate markets in many emerging economies in Asia, which was fueled in part by capital inflows, resulted in increased financial imbalances that were manifested in soaring asset prices, a large increase in leverage in financial institutions and corporations, and deterioration of the currency and maturity mismatches in the balance sheets of banks and other nonbank financial institutions. The cumulative effects of these imbalances eventually touched off a financial meltdown.

In the aftermath of the 1997–1998 crisis, East Asian economies—in particular those hit by the crisis—made concerted efforts to improve the efficiency and stability of their financial systems. Banks and other nonbank financial institutions strengthened risk management, improved governance, and fortified themselves with equity capital more than what is needed to meet the Bank for International Settlements (BIS) capital adequacy requirements. On the macroeconomic policy front, these countries have embraced more flexibility in managing the exchange rate system. To complement these reforms they have also amassed large foreign exchange reserves as insurance against future crises.

However, ten years after recovering from the Asian financial crisis, some of these countries fell victim to the 2008–2009 global economic crisis. As it turned out, they were as vulnerable to reserve currency liquidity shortages as they had been in 1997. When foreign lenders and investors liquidated their investments in domestic financial assets or refused to renew their loans to East Asian banks in the second half of 2008, countries such as the Republic of Korea (henceforth Korea) and Singapore had to seek a currency swap line with the United States (US) Federal Reserve to avoid a liquidity crisis.

Most emerging economies in East Asia are yet to develop policy instruments effective in sustaining financial stability. In countries adopting inflation targeting as the framework of monetary policy, the main tool used, the policy rate, is largely tied up with anchoring expectations on the future rate of inflation. Fiscal policy, on the other hand, is mostly reserved for countercyclical aggregate demand management. In realization of the limited scope of monetary and fiscal policy for securing financial stability, the BIS is advocating the use of “macroprudential” policy—a recalibration of “microprudential” regulations for macroeconomic purposes—as a means of safeguarding economies against the accumulation of financial imbalances.

The purpose of this study is to analyze the role and scope of macroprudential policy in controlling the behavior of financial institutions in managing assets and liabilities and

market failures that render the financial system vulnerable to periodic crises in the context of the East Asian economy. For this purpose, this paper identifies two major sources of financial instability that have plagued many East Asian emerging economies—speculation and the boom–bust cycle in the housing market as a representative of real property markets, and the balance sheet mismatches of currency and maturity at banks and other financial institutions, which were at the top of the list of financial frailties of East Asia’s emerging economies at the time of the Asian financial crisis.

Section 2 discusses the causal nexus between price and financial stability and the role and complementary nature of macroprudential policy in addressing systemic risk that the financial system is exposed to at any point in time and over the business cycle. Section 3 analyzes the behavior of the housing market in a dynamic setting to identify some of the factors responsible for its volatility and susceptibility to the boom–bust cycle. Section 4 attempts to evaluate the effectiveness of macroprudential policy in leaning against the boom–bust cycle in the real property market. Section 5 is devoted to an examination of the causes and consequences of the currency and maturity mismatches as a source of financial instability in a cross-sectional dimension. This is followed in section 6 by an assessment of the effectiveness of macroprudential policy in addressing the systemic risk that the twin balance sheet imbalances could give rise to. Concluding remarks are in a final section.

## **2. FINANCIAL INSTABILITY IN A LOW-INFLATION ENVIRONMENT, SYSTEMIC RISK, AND MACROPRUDENTIAL POLICY**

### **2.1 Why is Price Stability not enough?**

Before a series of financial crises wreaked havoc on a number of emerging economies in Asia and other parts of the world in the late 1990s and early 2000s, the dominant view had been that financial stability, however defined, was predicated on price stability (Schwartz 1995).<sup>1</sup> Examining the history of financial instability in the US from 1789 to 1996, together with the experiences of the United Kingdom and Canada, Bordo and Wheelock (1998) agreed with Schwartz by saying that a monetary policy that focuses on limiting fluctuations in the price level would tend to promote financial stability.

Since the early 2000s, however, this view has been regarded with growing skepticism as it has become evident that financial imbalances in the form of the boom and bust, excessive leverage in financial institutions and households, and deterioration in maturity and currency mismatches in the balance sheets of banks and other financial institutions could build up in a non-inflationary environment. In addition, the unwinding of these imbalances could destabilize the financial system and even trigger a financial crisis.

In describing the divergence between price and financial stability, a series of papers published by the staff of the BIS have coined a new term, known as the “paradox of financial instability,” in which “the financial system looks strongest when it is most fragile”

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<sup>1</sup> According to Schwartz (1995), one of the major causes of financial instability is fluctuations in the inflation rate which tend to amplify the uncertainty in estimating the potential real returns on investments and most severe episodes of instability occurred typically in disinflationary environments.

(Borio and Drehmann 2009).<sup>2</sup> Borio and White (2004) ask, for instance, “Why has the full peace dividend of the war against inflation ostensibly not materialized?” Caruana (2010) claims that the 2008–2009 crisis is another episode proving that achieving stability of consumer prices through monetary policy is not enough to ensure financial stability. What is then the causal nexus between price and financial stability?

During the past two decades of the great moderation a low and stable rate of inflation in an environment of greater predictability of economic policy fostered a false sense of safety and complacency with regard to financial stability. Together with a lower cost of borrowing brought about by price stability, this feeling of security led to a fall in the aversion to risk taking, which in turn resulted in excessive leverage in financial institutions and households. When combined with “procyclicality” of lending at banks and other financial institutions, the greater appetite for risk culminated in a high degree of volatility of prices and the boom–bust cycle in real and financial asset markets.

A low rate of inflation may not necessarily guarantee financial stability, but a high rate of inflation may coincide with falling asset prices, as shown in section 4.3 This means that effectiveness of policies for financial stability would hinge on a clear understanding and empirical identification of the nexus between price and financial stability. But such identification has been complicated by the difficulty of defining and measuring financial stability. There is no general agreement on an operational definition of financial stability that is appropriate and fit for policy purposes. Unlike price stability, which can be represented in terms of a price index, financial stability defies such precise measurement. For the purpose of this paper it would suffice to use a definition described in a qualitative term, such as the stability of key financial institutions and markets.<sup>3</sup>

## 2.2 Systemic Risk and Macroprudential Policy

According to a Committee on the Financial System (CGFS) paper ( BIS 2010), systemic risk is “a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy(Page 2).” Borio (2009) and Hannoun (2010) identify two types of disruption that could cause the accumulation of financial imbalances. One type is financial cycle—the procyclicality over the business cycle in lending at banks and other nonbank financial institutions. Another type is cross-dimensional disruption arising from direct exposure of financial institutions to a set of common shocks or risk factors, as in the case of holding the same or similar assets, or indirect exposure through network links, as in the case of assuming counterparty risks.<sup>4</sup>

Although monetary policy should be an integral component of any policy framework for managing systemic risk, it has its limitations, in particular when consumer and asset prices move in the opposite directions. In economies adopting inflation targeting, the policy rate is not an efficient tool to restrain excessive leverage and risk taking. For example, a higher policy rate may be able to stabilize high asset prices, but when speculation sets in it is likely to do so at the cost of a larger output gap if consumer price

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<sup>2</sup> See Borio and Lowe (2002), Borio and White (2004), White (2006), Borio and Shim (2007), and Caruana (2010).

<sup>3</sup> Other definitions include one by the European Central Bank (ECB), which defines financial stability as “a condition whereby the financial system is able to withstand shocks without giving way to cumulative processes, which impair the allocation of savings to investment opportunities and the processing of payments in the economy” (Padoa-Schioppa 2003).

<sup>4</sup> See Crockett (2000), Borio (2003), and White (2004) on the procyclicality of lending.



inflation is below the target rate (Blanchard, Dell’Ariccia, and Mauro 2010). This limitation has aroused interest in, and brought on, efforts to develop and refine macroprudential policy as a means of managing excessive leverage, procyclicality in bank lending, and real and financial asset speculation.

Macroprudential policy is defined as “the use of prudential tools with the explicit objective of promoting the stability of the financial system as a whole, not necessarily of the individual institutions within it” (Clement 2010). To be more specific, macroprudential policy has two objectives: one is to mitigate the financial cycle or procyclicality over time, and the other is to make the financial system more resilient given the cycle by moderating systemic risk caused by “interlinkages between the common exposures of all financial institutions” at a point in time (CGFS 2010; Hannoun 2010). To be sure, the objectives are not mutually exclusive, as greater financial system resilience would enable the system to better lean against financial cycles.

A large number of microprudential instruments could be recalibrated for macroeconomic objectives of sustaining financial stability.<sup>5</sup> These tools are basically designed and implemented to limit the distress of individual financial institutions, but Hannoun (2010) argues that they could be utilized to mitigate systemic risk as they can complement the instruments of monetary policy. Some of the instruments that may be used to strengthen financial system resilience include capital and liquidity requirements and restrictions on leverage in particular types of lending and currency mismatches. In particular, regulatory authorities may separate out vital requirements to reflect their potential threat to the stability of the financial system (Borio 2009).<sup>6</sup>

A host of microprudential tools may also be reoriented to help lessen procyclicality. They include countercyclical capital charges, forward-looking provisioning for loan losses, capital conservation rules for banks that ensure prudent profit retention, the loan-to-value ratio, the repayment period, margin requirements, capital requirements against real estate lending, and the countercyclical adjustment of exposure to the real estate sector, to be tightened in the upswing and loosened in the downswing phase (Hannoun 2010).<sup>7</sup> These tools could be adjusted frequently and quantitatively.

It should be noted that the preceding categorization is based on broad correspondence between the instruments and the two objectives of macroprudential policy, as some of these instruments, such as the loan-to-value ratio, can improve the resilience of the financial system but also serve as an automatic stabilizer for the system (CGFS 2010).

In controlling systemic risk over, and at a point in time in, a cross-sectional dimension, how does macroprudential policy work? How effective is it? Is it independent or

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<sup>5</sup> CGFS (2010) and Hannoun (2010) provide a list of these instruments categorized by the disruptions to the financial system they constrain. CGFS (2010) discusses how to design macroprudential frameworks and reviews experience in a range of countries.

<sup>6</sup> Borio (2009) proposed a top-down approach in employing prudential tools in which the contribution of each institution to systemwide risk is calculated. On the basis of this information, higher standards are imposed on institutions with a larger contribution.

<sup>7</sup> These instruments can be complemented by dynamic provisioning, but with caution. This is because the dynamic provisioning scheme may have an inherent bias against small and medium-sized firms and households, which have increasingly accounted for a large share of customers at banks. Large firms have access to international as well as domestic capital markets for the financing of their investment. Denied credit at banks, they could issue commercial paper, bonds, and equities to raise funds they need. These financing alternatives are often not available to small and medium-sized firms. During an economic boom, dynamic provisioning may discriminate against small and medium-sized firms, which are likely to be perceived as high-risk clients.

complementary to monetary policy? To answer these questions, in the following two sections this paper first identifies two sources of financial instability in East Asia. One is the real asset market boom–bust cycle, and the other is the currency and maturity mismatches in the balance sheets of banks and other financial institutions. The causes of these two sources of instability will then be examined to evaluate the scope and effectiveness of macroprudential policy in controlling the risks they present. Section 3 analyzes the structural characteristics of the housing market, and the dynamics of bubbles in it.<sup>8</sup> The twin mismatches are taken up in section 4.

### **3. BOOM–BUST CYCLE IN REAL PROPERTY MARKETS AND EFFECTIVENESS OF MACROPRUDENTIAL POLICY**

The two episodes of financial crisis in the past decade and a half have presented growing evidence that the markets for real properties and equities are prone to speculation and bubbles and that this susceptibility has been one of the most damaging frailties of East Asia’s financial system.<sup>9</sup> In the run-up to the 1997–1998 Asian financial crisis, excessive investment exceeding the average in housing and other types of real estate, much of which was financed by foreign capital inflows, set off real asset speculation. The subsequent boom fed into bubbles, which eventually burst, deepening and exacerbating the management of the crisis. In the past few years, the People’s Republic of China, Singapore, and Hong Kong, China have witnessed soaring prices of housing, which is seen as a sign of new speculative bubbles in the making. These past and current developments in the housing market provide an interesting case for examining the causes and consequences of, and the effectiveness of, macroprudential policy in safeguarding against financial instability in emerging East Asia.

#### **3.1 Characteristics of the Real Estate Market**

Real estate includes land, residential housing, and a variety of commercial real estate. Although housing and other types of real estate have traditionally served as investment vehicles for wealth accumulation, many households and firms hold them for their services rather than for portfolio investment.<sup>10</sup> The absence of a standard unit of real estate hampers market transactions, and largely for these reasons the markets for land, housing, and commercial real estate are heterogeneous, illiquid, and segmented.

The heterogeneity and market segmentation suggest that different classes of real estate are likely to be poor substitutes for one another and for financial assets. As a result, the price of each class of real estate is largely determined by its supply and demand and is mostly unaffected by changes in the prices of other types of real and financial assets.

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<sup>8</sup> For a more rigorous analysis of the procyclicality in Korea’s real estate market, see Park and Wyplosz (2008).

<sup>9</sup> According to Glindro, Subhanji, Szeto, and Zhu (2008), speculation in the housing market is considered to be one of the major sources of financial imbalance that pose systemic risks to these economies. Zhu (2006) also points to booms and busts in the real estate market as having played a crucial role in triggering and worsening the 1997–1998 Asian financial crisis.

<sup>10</sup> In many East Asian emerging economies that have suffered from high and unpredictable inflation, housing has been one of the most sought-after assets for wealth accumulation. In Korea, for example, the total market value of housing was estimated to be three times larger than gross domestic product (GDP) in 2006.

These features may provide rationale for the policy authorities to intervene in these markets when they see signs of speculation. They could do this by invoking microprudential regulations to curtail bank financing for real estate investment and taxation on property transactions rather than changing the stance of macroeconomic policies such as monetary policy.

### 3.2 Substituting Housing for Financial Assets

Before the onset of financial liberalization that began in the early 1980s and which has spurred the expansion and diversification of housing finance, there was no unified national housing market in East Asia's emerging economies. In fact, there were many heterogeneous housing markets segmented by region and differentiated by housing type. With the continuing expansion and diversification of the housing financial system, however, these segmented markets have increasingly been integrated into a unified national housing market that is large and liquid in many East Asian emerging economies. This market integration has been instrumental in lowering transaction costs and increasing market liquidity, which have in turn made housing a tradable asset and good substitute for financial assets.

As a result, housing demand has become more sensitive to changes in macroeconomic variables, such as the prices of bonds and equities and the exchange rate. Zhu (2006) finds a strong positive relationship between prices of real estate and those of equities, suggesting that in countries with a well-developed and efficient mortgage market the two assets are likely to be good substitutes for each other.<sup>11</sup> The same study also provides evidence that changes in the exchange rate have a significant impact on housing prices in countries that adopt flexible exchange rate systems where currency appreciation is associated with a housing boom and depreciation with a market contraction. It is also seen that during the boom period foreign investors move heavily into East Asian property markets and retreat en masse when a downturn begins, as they did during the 1997–1998 Asian financial crisis.

For an analysis of the dynamics of housing market speculation, it is convenient to divide buyers of housing into two different types. The first type includes those buyers coming into the market for consumption of housing services, and the second are speculative investors. Buyers in the first category rent the houses they purchase to themselves; many of them do not speculate on housing prices. Buyers in the second group are those investing in housing as an asset for capital gains; they are mostly speculators.

On the supply side, the availability of housing consists of existing houses on the market for sale and inventory of newly built houses. Since it takes time to build new houses and most house owners are not likely to put up their houses for sale in response to a housing market boom, the supply of housing tends to be insensitive to changes in house prices in the short run. An exogenous increase in demand therefore does not elicit much of a supply response and is therefore likely to raise prices in the housing market more than it would in other financial markets, suggesting that much of the market clearing takes place through price changes.

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<sup>11</sup> See also Borio and McGuire (2004) for strong links between equity price and house price movements.

### **3.3 Financial Accelerator and Extrapolative Expectations in the Housing Market**

When there exists a well-developed housing finance system, investments in housing are mostly financed by loans originated by banks and other mortgage lenders for which real estate properties are pledged as collateral. Therefore, larger availability and diversification of housing finance would result in an increase in the positive correlation between housing prices and the supply of bank credit. This correlation establishes a strong link between the housing price and bank credit cycles.<sup>12</sup> This link then activates the financial accelerator mechanism that could put the housing price on an implosive path to create a bubble.<sup>13</sup>

The collateral value of houses increases with the higher prices of housing. This increase allows housing investors to secure more mortgage loans with more favorable terms than before. That is, the rise in house prices lowers the cost and increases the availability of mortgage credit to house buyers as their financial positions measured by their house collateral values improve. The borrowers in the first category may then be able to extract additional equity to finance their next house, and for the same reason speculative buyers will be able to purchase more houses. Because of these secondary and cumulative effects of the increase in housing finance and demand, housing prices continue to soar in a housing boom.

When the financial accelerator mechanism is set in motion, changes in current housing prices are likely to be determined by their previous changes in addition to the deviations from the fundamental housing values and the contemporaneous adjustment to changes in the fundamentals. That is, an initial price increase induces an additional demand for housing for investment purposes as it generates an expectation of a continuous increase in housing prices to attract speculative buyers, pushing up the house prices further and thereby setting off a price dynamics that could build a bubble. The financial accelerator mechanism may then explain why investors in the housing market are likely to be guided by an extrapolative expectation.

## **4. THE ROLE AND EFFECTIVENESS OF MACROPRUDENTIAL POLICY IN STABILIZING THE HOUSING MARKET**

To discuss the scope and effectiveness of macroprudential policy in leaning against financial cycles, this section considers a situation in which consumer prices are not expected to rise beyond a target range but there are signs of incipient speculation that may create a bubble in the housing market. Faced with growing instability in the housing market, the central bank could increase the policy rate to suppress unwarranted high expectations of capital gains, but would be reluctant to do so unless the speculation was likely to increase inflationary pressure. Fiscal authorities may raise the property tax rate and impose additional taxes on the transactions in, and transfer of, properties but these types of taxation may not be desirable as they distort property markets and impair their efficiency.

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<sup>12</sup> Zhu (2006) finds that bank credit is positively related to house prices in all countries he examines.

<sup>13</sup> On the financial accelerator, see Bernanke (2007).

As a third alternative policy measure, financial regulatory authorities may consider imposing microprudential regulations on mortgage lending at banks and other nonbank financial intermediaries for the macroeconomic purpose of stabilizing the housing market. In this regard, regulatory authorities could employ two types of macroprudential instruments. The first includes some of the microprudential instruments—such as the loan-to-value and debt-to-income ratios, which are adjusted to control the supply of credit to a particular sector such as housing. The second type comprises those tools for controlling the supply of aggregate bank credit such as countercyclical capital charges, dynamic loan-loss provisioning, and capital conservation rules for banks. These tools are mostly implemented to moderate procyclicality in bank lending. Implementation of these two types of instruments entails quantitative—rather than price—control of the availability of sector as well as aggregate bank credit.

#### **4.1 Fungibility of Money: Ineffectiveness of Selective Credit Control**

In an effort to stave off a housing market boom, suppose that the regulatory authorities lower the two microprudential ratios—the loan-to-value and debt-to-income ratios—and that there is no change in monetary policy. The squeeze on mortgage lending is likely to discourage borrowing for consumption demand (the purchases of houses for their services) but not necessarily borrowing for investment demand by those seeking higher capital gains if housing prices are expected to rise continuously. Under these circumstances, as long as the level of total bank lending is left unchanged, banks will be able to extend more of other types of business and consumer loans with the funds released from curtailed housing finance. But if the expected real return on housing investment is perceived to be higher than the returns on other assets, many of the borrowers taking out other nonmortgage bank loans are likely to invest the bulk of their loan proceeds in housing.<sup>14</sup> This results from the fungibility of money and imperfections in ex-post loan use monitoring that may not be able to prevent the loan diversion.

Given the fungibility of money, it appears that, in countries where housing has become a good substitute for financial assets and banks dominate financial intermediation and the financial system as a whole, restrictions on mortgage lending alone may not be effective in preventing a housing market bubble; they need to be complemented by an overall cutback of aggregate bank credit through, for instance, an increase in loan-loss provisioning. But once housing speculation gathers force (as shown by the Korean experience discussed in section 4.3), even the simultaneous squeeze on both the sector and aggregate supply of bank credit may not be effective. This is because, despite the overall tightening of bank credit, some of the loans extended to non-housing borrowers could be drawn away to be invested in housing as long as real property speculation picks up speed.

#### **4.2 Macroprudential and Monetary Policy: Are They Independent?**

In the preceding discussion, tightening of macroprudential policy is likely to move banks to raise interest rates on their loans. It will also drive many of their loan customers out of

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<sup>14</sup> A housing market boom often coincides with land speculation. Business borrowers may decide to use a fixed investment loan to build a plant on a larger site of land than otherwise.

the bank loan market and into money and capital markets for direct financing at a higher cost. This increase in debt and equity financing will then increase market interest rates. If this happens, contractionary macroprudential policy will dampen the aggregate demand for goods and services (with a possible exception of construction investment) as many potential borrowers without access to the capital market will drop out of the bank loan market, while it has limited effects on suppressing housing market speculation. The tighter stance of macroprudential policy may therefore widen the output gap, depending on the extent to which bank loans are shifted to housing finance. Macroprudential measures may strengthen the financial system but do not necessarily enhance financial macroeconomic stability. It follows then that if the policy rate is a poor tool to deal with financial market instability so are macroprudential measures poor tools for moderating financial cycles.

The preceding discussion raises an important question as to whether the division of labor in policy management, in which the central bank follows an interest rate rule in conducting monetary policy for price stability while regulatory authorities are engaged in quantitative control in managing macroprudential policy for financial stability, is a viable institutional arrangement.

This question arises because most of the macroprudential instruments leaning against financial cycles work through changes in the availability of sector and aggregate credit and in this respect are similar to reserve requirements. That is, macroprudential tools operate through effects on bank lending—changes in bank loans cause investment and consumer spending to change. Since this bank lending channel is one of many channels of monetary policy, it follows that, in emerging economies where the banking system dominates financial intermediation, as far as the channel of transmission is concerned, macroprudential policy geared to controlling procyclicality in bank lending and monetary policy targeted on price stability are one and the same, although they have different objectives.

### 4.3 Korea's Experience with Macroprudential Policy

A recent survey by the BIS on the use of macroprudential instruments in 33 countries shows that in most cases the objective was to enhance the resilience of the financial system rather than moderate financial cycles and that the evidence on the effectiveness of macroprudential measures is not conclusive (CGFS 2010). In part these findings are supported by the recent experience with managing the real estate boom in Korea. Over a 7-year period beginning in 2001, the Government of Korea tightened monetary policy and imposed various macroprudential and tax measures on 12 occasions to break off an impending period of real estate speculation.

In October 2003, the government not only increased the policy rate but also lowered the loan-to-value ratio to 40% from 60% on mortgage loans with maturities of less than ten years for apartment purchases.<sup>15</sup> But the loan-to-value ratio control turned out to be less than effective because of leakage—banks were able, and in fact started, to extend mortgage loans with maturities longer than ten years to avoid the restriction. To plug this loophole, two years later mortgage lending was tightened further by lowering the loan-value ratio on those loans with maturities longer than ten years for the purchase of an

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<sup>15</sup> In Korea there is a liquid market for apartments, which are standardized in terms of size and are actively traded. In particular, smaller apartments are easily marketable, making them a tradable investment asset and a good substitute for financial assets.

apartment valued at more than W600 million (approximately US\$600,000). At the same time the debt-to-income ratio was lowered to below 40% for apartment financing in some of the districts of the Seoul metropolitan area where there were signs of real estate speculation, and in 2009 this restriction was extended to the entire Seoul metropolitan area.

Despite the implementation of these macroprudential measures, housing speculation did not subside. It was clear that stronger doses of antispeculation measures were needed. These measures included the requirement for registration of and imposition of transfer and transaction taxes on properties, which eventually ended the boom in the housing market. In retrospect it is unclear whether the real estate speculation would have been brought under control if the government had not resorted to the tax and other direct control measures. It is difficult to examine empirically the extent to which the 20 percentage point reduction in the loan-to-value ratio contributed to slowing down if not stopping the speculation. In retrospect it was more of a symbolic move on the part of the regulatory agency—the Financial Supervisory Service (FSS)—to signal that it was serious about stabilizing expectations on future prices of apartments, although it is unclear as to how successful the signaling was.

In general, the effectiveness of macroprudential tools may vary depending on the circumstances in which they are implemented. When the consumer price index (CPI) and asset prices move in the same direction, it is likely that the stance of both monetary and macroprudential policy would be the same—they reinforce each other to restore both price and asset market stability.<sup>16</sup> On the other hand, when movements of consumer and asset prices diverge, the two policies run into conflict with each other, as in the case of stable CPI and rising asset prices in section 4.

In particular, the conflict between the two policies appears to be more severe if rising consumer prices are accompanied by stagnation in the housing market, as shown by the recent experience in Korea. In August 2010 the central bank raised the policy rate as it was concerned about the buildup of inflationary pressure. At the same time, regulatory authorities lifted the debt-to-income ratio on specific mortgage loans to revive the sagging demand for housing loans. Although it is too early to judge, the higher debt-to-income ratio did not seem to have elicited any positive housing market response.<sup>17</sup>

Macroprudential tools such as the loan-to-value and debt-to-income ratios are rather inflexible instruments that cannot be fine-tuned frequently to alter price expectations in real property markets. Fungibility of money makes their effectiveness at best ambiguous. Macroprudential policy for controlling the quantity of aggregate credit needs to be coordinated with the conduct of monetary policy but, given the different policy objectives and approaches to policy management of the monetary and regulatory authorities, such coordination would be difficult to institutionalize.<sup>18</sup> Financial regulatory authorities would find it difficult to decide on timing and the extent of adjustment of tools. For effective management of macroprudential policy, regulatory authorities should be able to detect signs of real asset speculation well before it gets out of control, and identify the turning

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<sup>16</sup> A recent BIS report (CGFS 2010) argues that the use of macroprudential policies targeting the real estate sector in Asian countries helped make banking systems more resilient to real estate downturns but did not make much difference to either the strength of the boom or the depth of the bust.

<sup>17</sup> During the first 7 months of 2010, consumer prices rose by about 1% whereas housing prices in some parts of the Seoul metropolitan area began to fall, beginning in the second quarter of 2010.

<sup>18</sup> The regulatory authorities may have not developed the expertise or culture of macroprudential policy, while the central bank cannot exercise supervisory control at the level of individual institutions. These institutional constraints could hamper coordination between the two policy authorities.

points in cyclical developments in the economy. Equipping regulatory authorities with this macroeconomic forecasting function would mean entrusting them with a role in the conduct of monetary policy. It is not clear what that role should be.

## 5. CURRENCY AND MATURITY MISMATCHES AS A SOURCE OF FINANCIAL INSTABILITY<sup>19</sup>

A second source of financial instability that has caused much anguish to many East Asian emerging economies has been the propensity of financial institutions to hold assets and liabilities that are mismatched in terms of maturity and currency. The twin mismatches are a typical example of systemic risk in a cross-sectional dimension that many emerging economies are exposed to (please put footnote 19 here). When banks and other nonbank financial institutions hold long-term and low-liquidity assets, such as long-term loans (denominated in both domestic and foreign currency) funded by borrowing from both domestic and external wholesale funding markets, they expose themselves to a liquidity and solvency crisis when market liquidity in both domestic and reserve currencies suddenly evaporates. If banks commit similar mismatches across the board, an external shock such as a sudden reversal in capital flows could endanger the safety of the entire financial system.

During the 1997 Asian financial crisis, currency mismatches between foreign currency assets and liabilities in bank balance sheets were at the top of the list of financial vulnerabilities of Asian banks that exacerbated, if not triggered, the financial meltdown. A number of studies attribute their causes to the market failures associated with asymmetric information and moral hazard.<sup>20</sup> This paper argues that there were more mundane causes.

In the run-up to the 2008–2009 global economic crisis, it appears the currency mismatch of East Asian financial institutions was moderate compared to the massive deterioration that had taken place prior to the 1997–1998 crisis, although this may not be the case for the maturity mismatch. The 2008 global economic crisis has highlighted the gravity of the maturity mismatch as a major cause of the crisis, not only in emerging but also advanced economies.<sup>21</sup> As shown in the following sub-section, in emerging economies with foreign currency liabilities, maturity mismatches create a more serious systemic risk as they are invariably accompanied by currency mismatches. The section discusses how the financial imbalances stemming from the twin mismatches arise and whether they could be mitigated through macroprudential policy.

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<sup>19</sup> This section draws on Park (2009).

<sup>20</sup> Goldstein and Turner (2004) argue that all prominent financial crises in emerging economies in the 1990s and the early 2000s share one striking characteristic—a large currency mismatch. See also Chang and Velasco (2000); Corsetti, Pesenti, and Roubini (1999); and Rodrik and Velasco (1999).

<sup>21</sup> Brunnermeier et al. (2009) point out that one of the most critical lessons of the 2008–2009 crisis is that the maturity mismatch of short-term funding of long-term assets with potentially low market liquidity has been the main source of financial instability.

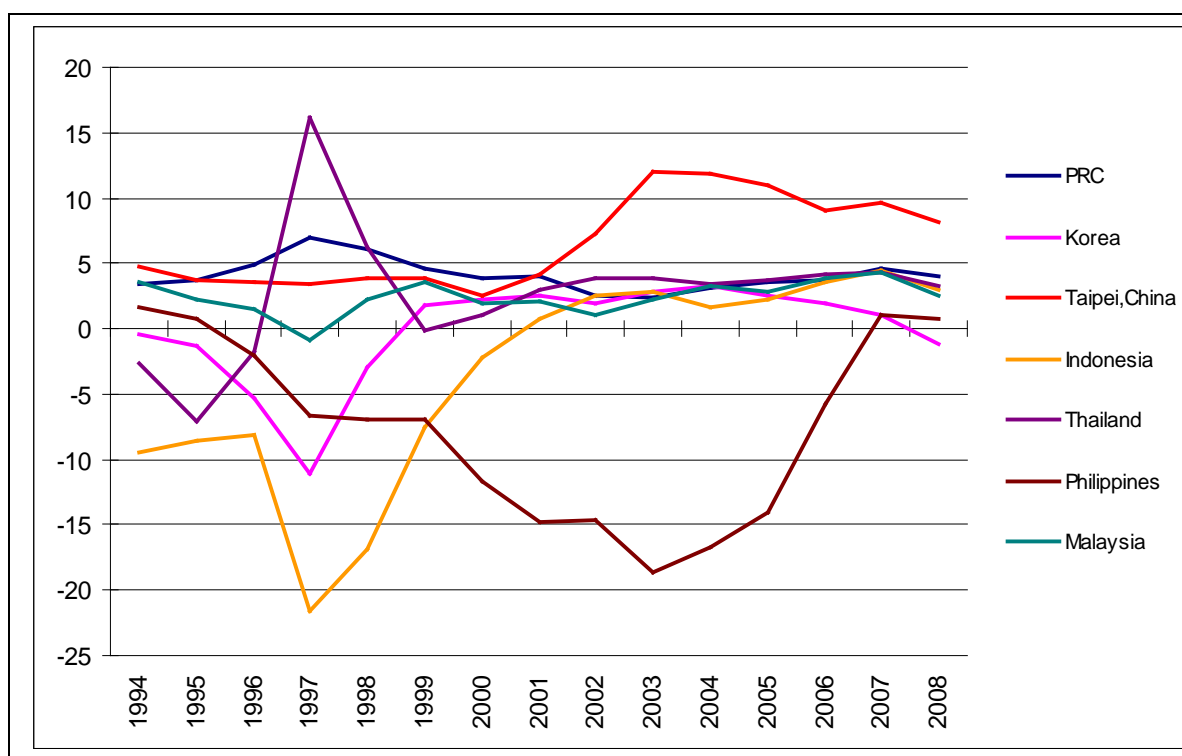


## 5.1 The Scale and Pervasiveness of Maturity and Currency Mismatches

Goldstein and Turner (2004) constructed a measure of currency mismatch known as the aggregate effective currency mismatch (AECM).<sup>22</sup> Figure 1 presents AECMs of Asia's emerging economies. A negative number for the AECM, which results from a negative position on net foreign currency assets, indicates a high degree of mismatching. The estimates show that Indonesia, Korea, the Philippines, and Thailand had all erred on letting the currency mismatch deteriorate to a negative level before the 1997–1998 crisis.

Since then the situation has eased as the AECM has remained in positive territory in most countries, although, reflecting the decline in net foreign assets caused by the 2008 global economic crisis, it slipped in all sample East Asian countries in 2008. The deterioration has been most pronounced in Korea—its AECM slid from 2005, turning into a negative figure in 2008 due to a sharp decline in capital inflows.

**Figure 1: Currency Mismatches of Asia's Emerging Economies, 1994–2008**  
(%)



Notes: Recent figures provided by Phillip Turner at the BIS; PRC refers to People's Republic of China

Source: Goldstein and Turner (2004)

<sup>22</sup> Goldstein and Turner (2004) define an aggregate effective currency mismatch (AECM) as follows:

$AECM = NFCA/XGS (FC/TD)$ , where

NFCA = net foreign currency assets (+) or liabilities (-);

XGS = exports of goods and services (national income account), when NFCA is negative;

MGS = imports of goods and services (national income account), when NFCA is positive; and

FC/TD = foreign currency share of total debt.

Even when the AECM is positive, as noted earlier a country could run into a financial crisis if reserve currency liquidity vanishes when it is exposed to a large maturity mismatch between foreign currency assets and liabilities. To be a useful predictor or an early warning indicator for a financial crisis, therefore, the AECM may need to be adjusted for the maturity mismatch. In the absence of the banking data needed for the construction of a measure of the maturity mismatch, Park (2010) examines as proxies changes in the loan–deposit ratio and short-term foreign liabilities relative to foreign exchange reserves for a qualitative assessment of the extent of the mismatch. In general, a rise in the loan–deposit ratio indicates that banks rely more on both domestic and foreign wholesale market funding than on core deposits. This will cause an increase in the maturity mismatch.

Similarly, an increase in short-term foreign liabilities relative to foreign exchange reserves is likely to aggravate the maturity mismatch since it means that banks secure more external funding from the short end of global financial markets. Here one could use the volume of total foreign liabilities rather than the level of foreign exchange reserves as a scale variable. However, the level of foreign exchange reserves provides additional information on a country's vulnerability to liquidity crisis as the ratio of short-term foreign liabilities to foreign exchange reserves is often regarded as a barometer for an adequate amount of foreign exchange reserves to be held in emerging economies.

Park (2010) shows that between 2000 and 2008 the loan–deposit ratios were stable and stayed well below 100% in most countries except for Korea and Thailand, where the ratios climbed up to 135% (Korea) and 105% (Thailand) in 2008. On the external liability side, short-term foreign liabilities as a proportion of foreign exchange reserves in some of the East Asian countries where data are available were well below the maximum level allowed for by the Greenspan–Guidotti–Fischer rule, which prescribes an amount of reserves equal to the country's short-term foreign currency liabilities.

The two ratios together with changes in the AECM suggest that all East Asian economies under review appeared to have been in a much stronger financial position than in 1997 to withstand and remain outside the danger zone of a currency crisis. During the fourth quarter of 2008, after the collapse of Lehman Brothers, however, Korea came close to facing insolvency of many of its financial institutions.

## 5.2 Causes of Twin Mismatches

Regardless of their nationality, banks are open to maturity mismatching due to a number of inherent characteristics of bank intermediation. One such characteristic is the debt maturity transformation they are engaged in. Another is procyclicality in their lending and borrowing, and a third is relationship banking where banks establish long-term relationships with their loan customers.

All banks, whether they are operating from advanced or emerging economies, earn a substantial share of their profits by borrowing from the short end of the financial market (as in the case of accepting short term deposits and issuing certificates of deposits CDs) and lending long (as in the case of financing long-term business investment in addition to short-term working capital).<sup>23</sup> The maturity mismatch “reflects the underlying structure

<sup>23</sup> Brunnermeier et al. (2009) argue that there are many caveats to this generalization and that the mismatch is a matter of degree.

of the economy in which individuals have a preference for liquidity but the most profitable investment opportunities take a long time to pay off. Banks are an efficient way of bridging the gap between the maturity structure embedded in the technology and liquidity preference". (Allen and Gale 2007: 59)

From the perspective of an individual bank, it would be reasonable to assume that, under normal circumstances, it would have an adequate deposit base and access to wholesale funding markets to finance its long-term loans and investments in securities. In fact, most banks would make the same assumption. Any temporary difficulties in short-term funding markets in domestic currency could easily be dealt with by the central bank. But dependence on foreign currency funding is quite different. When reserve currency liquidity dries up, the central bank can meet only a limited amount of the increase in the demand for reserve currency liquidity.

To be sure, some of the individual banks may be able to avoid a liquidity crisis but the financial system as a whole cannot when it is faced with a sharp decrease in net capital inflows. Even when banks in emerging economies relend in reserve currencies, they may not be able to avoid a currency mismatch, because local borrowers include not only exporters with cash flows in dollars and euros but also borrowers from the nontradable sector for imports without them.

As Turner (2010) points out, the massive aggregate dependence of non-US financial firms on wholesale short-term dollar funding markets created a major systemic risk in 2008. When depositors left the banks en masse and liquidity in short-term funding markets disappeared rather suddenly, the entire banking sector of emerging economies suffered from severe US dollar liquidity shortages. In some countries, the liquidity crisis threatened the solvency of their banking industry. It should be noted that, unlike their counterparts from emerging economies, financial firms from reserve currency countries (the US and members of the European Monetary Union) engaged in cross-border financial intermediation are largely immune to such a liquidity shortage.

In general, banks are relationship lenders. They nurture close long-term relationships with their loan customers, which helps overcome the asymmetry in information to improve the screening and monitoring process. Banks routinely roll over short- as well as long-term loans to those loan customers with a good credit standing. The banks also know that most of their loan customers are so accustomed to the loan rollover that they would not be prepared to repay their loans even when they are due, not to mention paying the loans back before they mature. Therefore, even when they are faced with liquidity shortages, banks would not consider refusing renewal of most of their household and business loans for fear of losing the loan customers with long-standing relationships until they exhaust all other options.

Procyclicality over the business cycle is another characteristic of banking that exacerbates the twin mismatches. During the cyclical upturn, the yield curve gets steeper to create incentives for banks to rely more on short-term funding for the growing demand for their loans. In particular, banks may borrow more in volume and from the short end of international money markets if domestic interest rates are higher. As a result, both the maturity and currency mismatches deteriorate.

When a cyclical downturn sets in, foreign investors unload their holdings of domestic securities and foreign banks refuse to renew their short-term loans at a time when domestic banks and other financial institutions find it increasingly difficult to recall their foreign currency loans extended to local customers or liquidate foreign currency assets they hold. A subsequent decline in net capital inflows exacerbates currency mismatching

and, depending upon the magnitude, the currency mismatch could provoke a reserve currency liquidity crisis.<sup>24</sup>

During the downturn, the central bank is expected to loosen up monetary policy to prevent credit contraction. Although an expansionary monetary policy of cutting the policy rate is called for to forestall deflation, it could deepen the liquidity crisis as it weakens the currency and hence induces further capital outflows. Over the business cycle, there is a limit to which monetary policy can mitigate the increase in the twin mismatches. This limitation may provide the rationale for strengthening macroprudential policy in cooperation with monetary authorities but, as argued in the following section, its effectiveness remains unclear.

## 6. TWIN MISMATCHES AND MACROPRUDENTIAL POLICY

### 6.1 Could Mismatches be Mitigated by Prudential Regulations?

Goldstein and Turner (2004) propose restrictions such as imposing limits on net foreign exchange positions, foreign exchange liabilities, and bank holdings of securities denominated in foreign currencies. They also recommend introducing more restrictive rules for liquidity risk management and a higher reserve requirement on foreign currency deposits. Requirements on the ratio of foreign currency loans to deposits may be added to this list (Hannoun 2010).<sup>25</sup> In this section it is argued that these regulations could distort resource allocation and, in a crisis situation, they are likely to be ineffective, as the Korean experience shows.

A strict regulatory restriction designed to prevent currency mismatches would dictate that bank lending and debt contracts be made in the currencies in which deposits and foreign funding are denominated and in which borrowing customers earn revenues. In an extreme case, loans to local customers who earn only in a local currency should be excluded from banks' foreign currency lending. Would such a regulatory restriction be efficient or, more importantly, enforceable?

Such a regulation is not efficient because banks are likely to discriminate in foreign currency lending against those borrowers from the nontradable sector without foreign currency revenues. Compliance with the currency mismatch regulation would mean that banks would lend in foreign currency mostly to the borrowers from the tradable sector. If banks lend to firms in the nontradable sector they may charge a higher premium. Therefore, the regulation is likely to distort resource allocation and even retard the development of the nontradable sector.

Is the regulation enforceable? To alleviate the twin mismatch problems, Korea's financial supervisory service imposes a foreign currency liquidity regulation in which banks are

<sup>24</sup> Capital flows in emerging markets tend to be procyclical, as shown by Kaminsky, Reinhart, and Vegh (2004); Contessi, DePace, and Francis (2008); and Cardarelli, Elekdag, and Aythan Rose (2009).

<sup>25</sup> In addition, these regulatory restrictions may be complemented by other measures limiting maturity mismatching, such as (i) linking the class of assets for which short-term funding is secured to the maturity of the funding, e.g., restricting banks to holding only short-term safe and liquid assets for short-term funding; and (ii) imposing a higher capital charge on financial institutions with funding liquidity risk stemming from holding long-term assets with low market liquidity funded by short-term liabilities (Brunnermeier et al. 2009).

required to relend in foreign currencies to local borrowers at least 85% of their foreign currency funds maturing within three months (15% for domestic currency loans). The maturity of the local foreign currency loans must also be less than three months. The financial supervisory service also enforces another liquidity restriction in which banks are required to keep the ratio of net short-term foreign currency assets maturing within 7 days to total foreign currency assets at a positive level, and at more than –10% for assets maturing within less than 30 days. On their balance sheets banks do comply with these regulatory measures, but in reality they do not. Indeed, if these prudential measures had been observed to the letter, one might argue that Korea should have avoided the run on the central bank reserves during the fourth quarter of 2008, but it did not.

In reality it appears that bank compliance has not prevented, or even moderated, the pervasiveness of the two balance sheet mismatches. This is largely because the banks kept on renewing their domestic and foreign currency loans, regardless of their maturities, with the expectation that they would have continuing access to global wholesale funding markets.

This laxity in contingency planning for lining up liquidity in a crisis does not necessarily reflect a serious moral hazard on the part of Korean banks, because the past experience with the 1997–1998 Asian financial crisis must have taught them that the government could not come to their aid in a crisis caused by low reserve currency liquidity. Instead, the laxity may have more to do with relationship banking and reflect the fact that compliance means the loss of competitiveness with regard to foreign competitors in global financial intermediation.

If the regulatory restrictions prove to be ineffective, governments of emerging economies may invoke measures that are more direct such as providing government guarantees on foreign loans and imposing capital control. To restore foreign investor confidence, on 12 October 2008 the Government of Korea issued sovereign guarantees on new foreign loans up to \$100 billion maturing before the end of June 2009. Similar guarantees had failed to allay fears of financial meltdown at the beginning of the Asian financial crisis in 1997, and they failed again; as in 1997, market participants simply ignored the guarantees. Foreign creditors simply do not believe in government promises when official reserves are inadequate to meet foreign debts coming due for repayment.

As for direct control measures, there is an emerging consensus on the need to conduct reserve intervention and impose taxes and other restrictions on short-term capital inflows. Even the International Monetary Fund has softened its opposition to intervention in the foreign exchange market and imposing capital control (Blanchard, Dell’Ariccia, and Mauro 2010; Ostry et al. 2011). Whatever the benefits and costs of capital control and foreign exchange market intervention, national policy authorities would not refrain from invoking these measures if the volatility of the exchange rate rises to an excessive level and endangers stability of the domestic financial system as a result of volatile capital movements.<sup>26</sup>

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<sup>26</sup> Only when Korea secured a swap line of \$30 billion from the US Federal Reserve on 30 October 2008 did the foreign exchange market settle down somewhat, although it was not for very long—the won-dollar exchange rate depreciated by more than 15% 3 weeks after the swap had been announced. The Federal Reserve’s liquidity support was apparently not enough to remove uncertainties surrounding Korea’s ability to service its foreign debt. Korea also secured local swap lines with the central banks of the People’s Republic of China and Japan, each amounting to an equivalent of \$30 billion, on 13 December 2008. This additional support, together with the indication that the Federal Reserve would renew the swap

## 6.2 A Global Liquidity Safety Net

The US is largely free from currency mismatches because its currency—the dollar—is used for a high proportion of international banking business. Its central bank can always print more money to thwart any impending liquidity crisis caused by deterioration of maturity mismatches. As Shafer (1982) points out, the rise of international banking created a need for a lender of last resort in the euro currency markets. But central banks from the Group of 10 (G-10) countries could not agree on how to create such an institution in the 1970s, leading them to decide not to establish any rules and procedures for the provisioning of short-term liquidity (Turner 2009). During the 2008 economic crisis it was the four foreign central banks of Canada, Japan, Switzerland, and the United Kingdom, together with the European Central Bank, that had unlimited dollar swap lines with the Federal Reserve.

Most central banks of emerging economies were given no such access. All this gives banks in advanced countries a competitive advantage in international financial intermediation. This means that, even during tranquil periods, the international monetary and financial systems do not provide a level playing field for emerging market economies in global finance. From their point of view, this bias, which is equivalent to a non-reserve currency discount, raises the issue of fairness and even questions the rationale of them integrating into the global financial system to the extent that it weakens their competitiveness.

As argued in the preceding section, there are few effective measures emerging economies can take to prevent, and alleviate the consequences of, the currency mismatch. This limitation calls for multinational efforts at institutionalizing a global system of reserve currency liquidity support at both regional and global levels to be activated in a crisis situation when participating members suffer from short-term reserve currency liquidity shortages. The US dollar has been a *de facto* global currency and, as a distant second candidate, the euro has emerged as another reserve currency, although the recent euro crisis has cast doubt on its future in this role.

As the providers of global media of exchange and stores of value, the reserve currency countries need to bear responsibility for controlling and stabilizing the global supply of liquidity. In assuming their global role, the Federal Reserve and European Central Bank may consider constructing a global currency swap network to supply liquidity in a crisis when banks and other financial institutions retreat from the market.

The network membership could be enlarged to include, in addition to the current members, some of the emerging economies active in international financial markets to support them in case they need short-term US dollar or euro liquidity to prevent contagion of a liquidity crisis.<sup>27</sup> At the same time, the swap network could be complemented by new and additional credit facilities at the International Monetary Fund such as the flexible credit line (FCL) and expanding and consolidating regional liquidity

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agreement, saw the confidence of foreign investors in the Korean economy improve, and stability in the foreign exchange market returned towards the end of the first quarter of 2009.

<sup>27</sup> There is concern that the expansion of the swap network could create moral hazard problems in emerging economies, but it is difficult to believe that emerging economies would be disposed to laxity in managing their macroeconomic policy simply because they have access to the swap lines.

support arrangements such as the Chiang Mai Initiative Multilateralization among ASEAN+3<sup>28</sup> member states.

## 7. CONCLUDING REMARKS

In the wake of the 2008–2009 global financial crisis, there has been growing concern about the destabilization of the financial system in a low-inflation environment. One of the lessons of the great moderation is that price stability is not a sufficient condition for financial stability, although it remains true that sustained inflation encourages speculation, and abrupt decline in the rate of inflation could cause an increase in financial institution failures and significant financial stress throughout the economy.

Monetary policy, as it is targeted to price stability, may not be an effective means to prevent a financial crisis or manage it better when it occurs. Fiscal policy is traditionally reserved for aggregate demand management.

Harnessing financial stability therefore requires an additional instrument, and reorientation of microprudential regulations has been promoted as such a measure. This paper has examined the extent to which the regulatory tools, which are basically designed to safeguard soundness of individual financial institutions, could be implemented to moderate the boom–bust cycle in the real estate market by changing sector and aggregate volumes of bank credit. This paper argues that macroprudential policy operates through the bank credit channel, as does monetary policy, and its effectiveness is ambiguous. As far as the transmission mechanism is concerned, the two policies are one and the same.

Traditionally, banks are specialized in asset transformation. As such they are exposed to maturity mismatches in their balance sheets and hence potentially to a liquidity crisis, which often provokes a bank run. In emerging economies, banks active in international financial intermediation are open to another risk that could undermine their soundness—i.e., currency mismatch as they finance their local currency lending by borrowing in foreign currencies. Various regulatory restrictions may not be effective in preventing banks from committing the mismatch, because as long as banks are entrenched in long-term relationship banking that systemizes the rollover of loans as a routine practice they find it difficult to comply with regulatory supervision. If these regulations are strictly enforced there is the danger that they could limit the scope of asset–liability management of banks and hence undermine their competitiveness in international financial intermediation with regard to their counterparts from advanced or reserve currency countries which are not subject to a similar constraint.

When a sudden reversal in capital flows occurs, even well-regulated and sound banks in emerging economies are likely to be faced with solvency risk as they are denied access to external wholesale funding markets. This risk is one of the main reasons why many emerging economies hold excessive amounts of foreign exchange reserves and may need to intervene in the foreign exchange market and impose capital control. Since holding large amounts of reserves is costly and could exacerbate global trade imbalances, constructing a global liquidity safety net that could meet the short-term reserve currency liquidity needs would serve as a more effective means of safeguarding against preventing reserve currency liquidity crises in emerging economies.

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<sup>28</sup> ASEAN+3 is the member countries of the Association of Southeast Asian Nations plus the People's Republic of China, Japan, and Korea.

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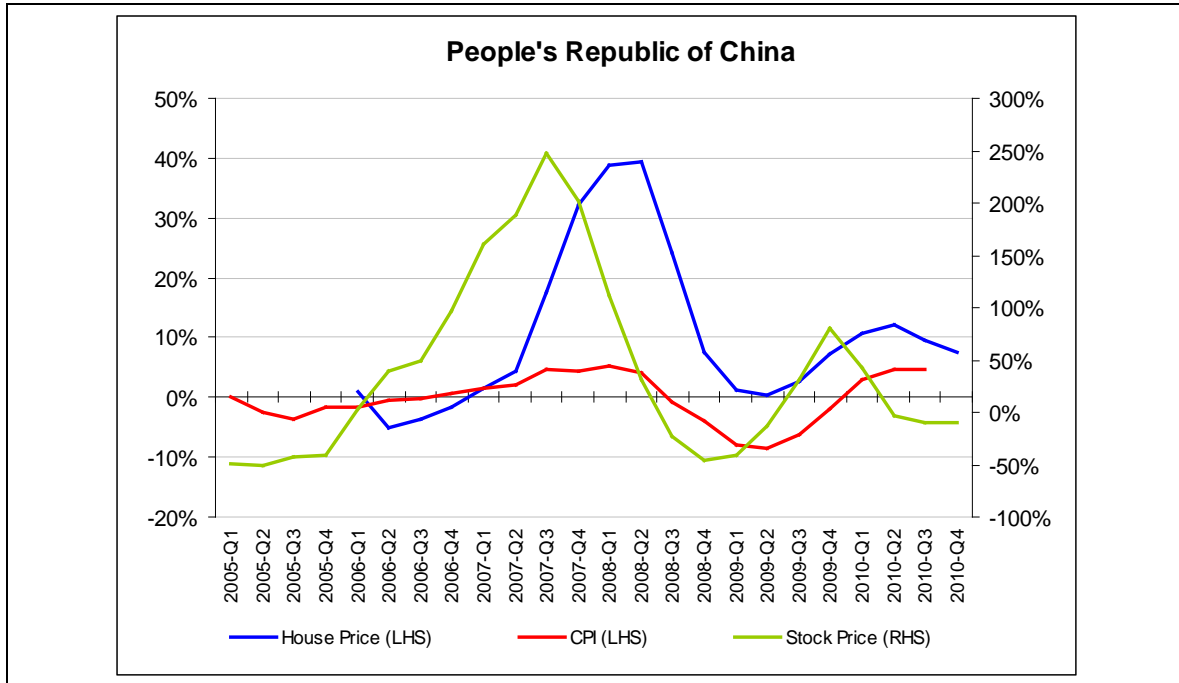


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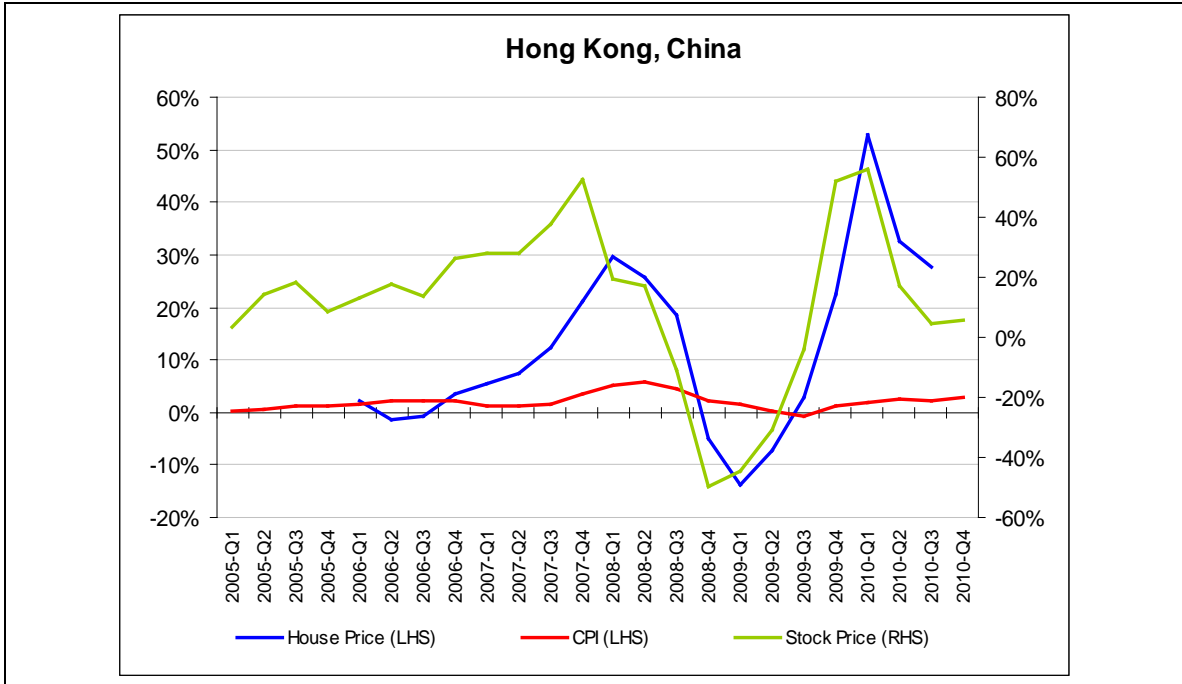
## APPENDIX

**Changes in the Consumer Price Index and Prices of Housing and Equities in Selected Asian Countries**

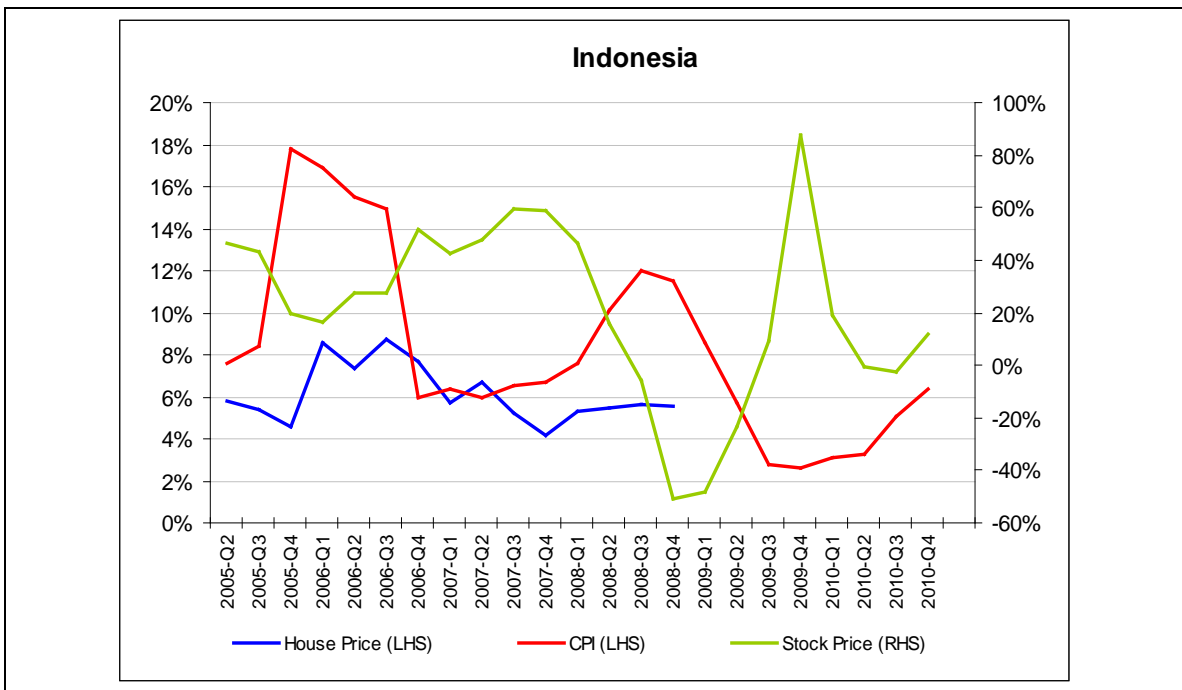


Note: Consumer price index and house prices are measured on the left hand axis and stock price on the right.

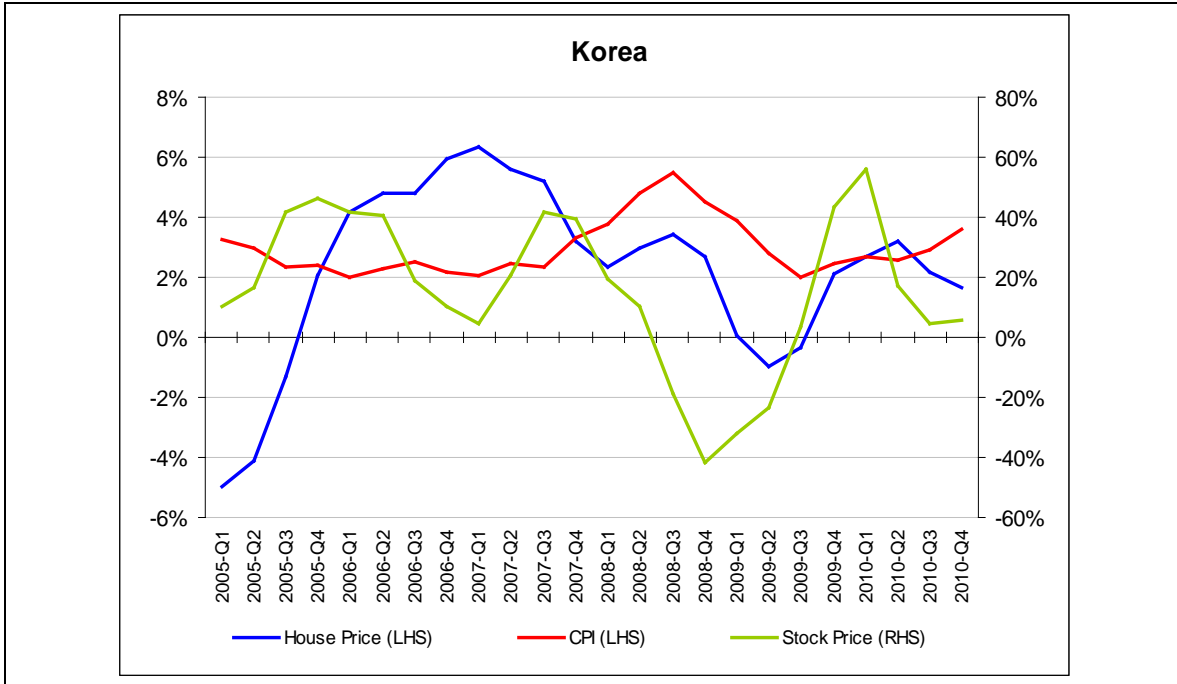
Source: National Bureau of Statistics of China, Shanghai Stock Exchange



Source: Census and Statistics Department, Government of the Hong Kong Special Administrative Region of the People's Republic of China, Hang Seng Stock Exchange

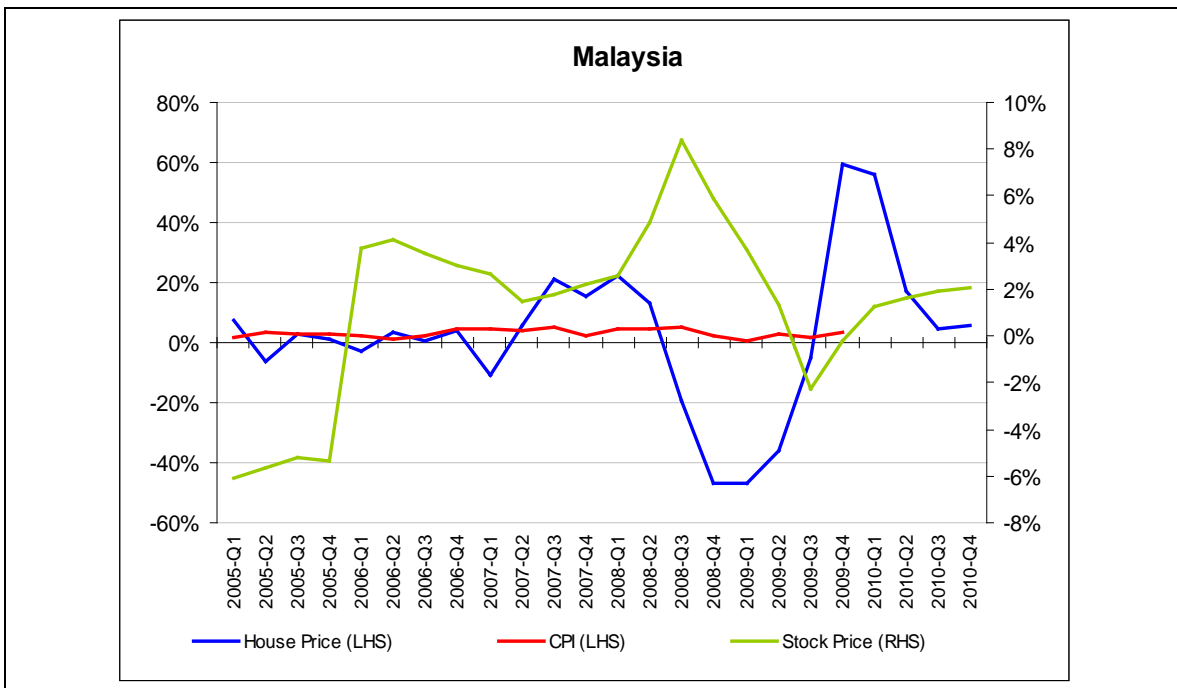


Source: Bank Indonesia, Statistics Indonesia, Indonesia Stock Exchange

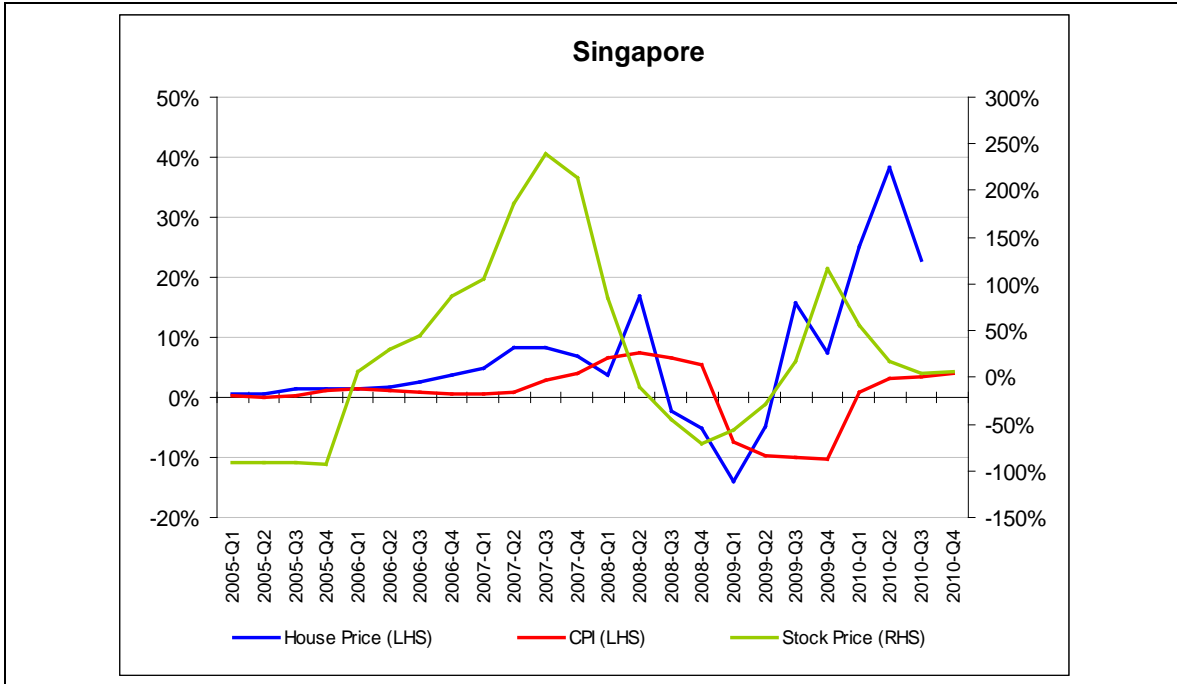


Note: Republic of Korea is here referred to by 'Korea'

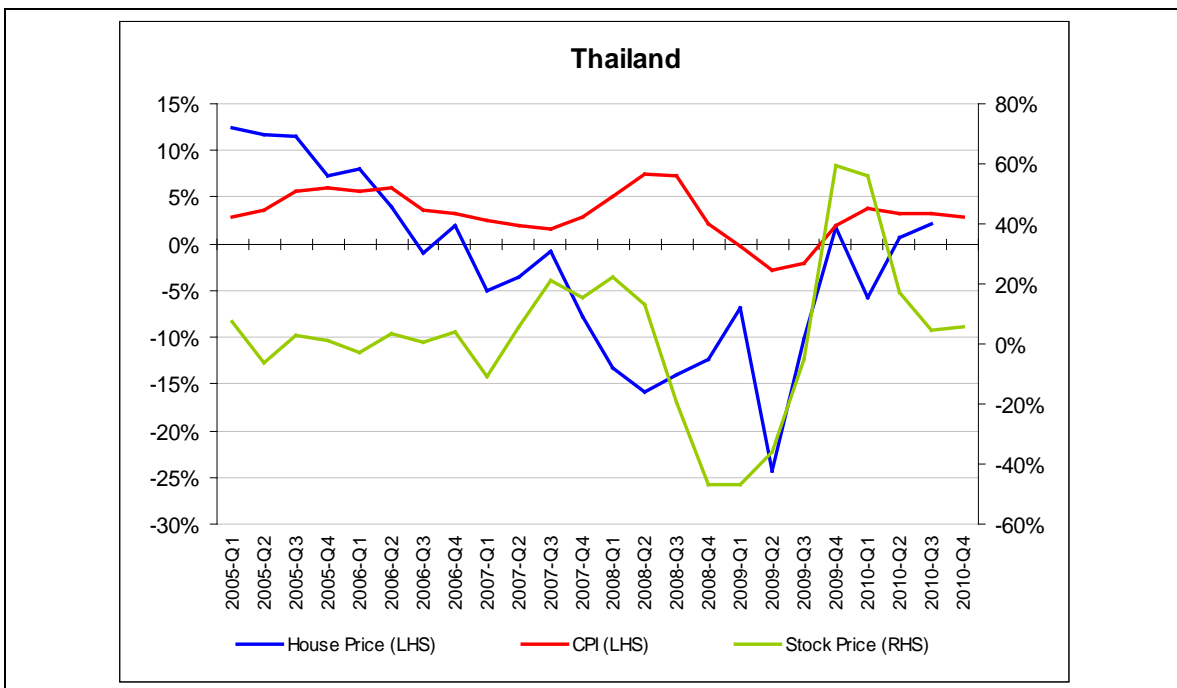
Source: Korea National Statistical Office, Koomin Bank Korea, Korea Composite Stock Price Index



Source: Bank Negara Malaysia, Kuala Lumpur Stock Exchange



Source: Singapore Department of Statistics, Urban Redevelopment Authority Singapore, Singapore Exchange



Source: Bank of Thailand, Stock Exchange of Thailand