

A Macroprudential Approach to Financial Supervision and
Monetary Policy in Emerging Economies

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금융시장의 안정과 통화신용정책의 효율성을 위한
거시건전성 감독의 방향

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ABSTRACT

This paper attempts to define, construct a policy framework, and analyze interactions with monetary policy of macroprudential policy. The available pieces of evidence suggest that the effects of the LTV and DTI regulations for financial stability are rather unclear in Korea.

It also shows that when financial markets exhibit instability in a stable inflationary environment, macroprudential policy could run into conflict with monetary policy.

This paper proposes an appropriate modality of macroprudential policy to minimize the potential conflict with monetary policy.

본 연구는 거시건전성 감독의 정의·목적, 통화신용정책과의 보완, 상충 관계 및 효과를 분석하고 있다. 한국의 경험을 살펴보면 금융안정을 위한 LTV나 DTI의 감독효과는 분명히 나타나지 않는다.

더구나 물가가 안정되어 있는 여건에서 금융시장의 불안이 심화되는 경우, 거시건전성 감독과 통화신용정책은 서로 상충되는 결과를 초래할 수 있다. 이러한 불합리성을 최소화 하기 위해서는 중앙은행, 감독당국, 그리고 재정정책의 주체 간의 정책조정이 선행되어야 한다.

I . Introduction

A series of financial crises in the 1990s and the 2008-09 global economic crisis have brought to light a number of structural frailties of the financial system - both domestic and global - that have a bearing on managing financial crisis. They have certainly contributed to a better understanding of the causes and consequences of the build-up of financial imbalances. It is now widely accepted that contrary to the long held view, consumer price stability is not a sufficient condition for financial stability. Financial imbalances in the form of the boom and bust in asset markets, 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 pile up in a non-inflationary environment. The unwinding of these imbalances could destabilize the financial system and even trigger a financial crisis, which could in turn cause serious disruptions to the economy and interfere with real sector development.

There has also been a sharp increase in the volatility as well as the volume of cross-border capital movements with deepening of integration of financial markets of individual economies at both the regional and global level. In a globalized economy, financial turbulences in one country could easily spill over into neighboring economies including even those with strong and sound fundamentals, destabilizing their financial systems as well. Finally, experiences with managing financial crises in both advanced and emerging economies suggest that the conduct of monetary policy could exacerbate rather than prevent the build-up of systemic risk unless it is complemented by other policy measures.

These changes in the financial landscape have underlined the need to strengthen the foundation of the domestic financial system to improve its resilience to external shocks and to develop new policy instruments that could complement monetary and fiscal policy in safeguarding the economy against financial instability. The search for new policy tools has led to a reorientation of macroeconomic dimensions of microprudential supervision.

In the wake of the 1997-90 Asian financial crisis, Crockett (2000) proposed that microprudential supervision and regulation, which had been traditionally directed to protect depositors and investors, should be reoriented toward maintaining financial stability by "marrying the micro and macro-prudential dimensions of financial stability." This was followed by the construction of a macroprudential framework for financial supervision and regulation (Borio 2003), which had been further refined by a series of papers by the staff of the BIS.

Since the eruption of the 2008-09 global economic crisis, macroprudential policy has taken center stage of the discussion of the assessment of health and safety of the financial system and prevention of future financial crises. The IMF program for the assessment of systemic financial stability and the growing attention central banks and other policy authorities are paying to monitoring, analyzing, and formulating policy responses all bear witness to the growing importance of macroprudential

supervision as a new macroeconomic policy.

Although there has been a growing literature on macroprudential policy in recent years, there appears to be a considerable disagreement on its scope and effectiveness.¹ Indeed, there is neither a widely accepted definition of financial stability nor an appropriate operational framework for macroprudential policy. It is generally agreed that efficiency of monetary policy would improve, if it is complemented by macroprudential supervision: Yet, it is proved to be difficult to identify the contour of a new system of coordination of the two polices. This is because the new system needs to be designed in a way that will avoid the potential conflict in which the effects of the two polices cancel out each other because macroprudential policy has macroeconomic spillovers, whereas monetary policy affects risk-taking behavior of financial market participants.

In this paper, an attempt is made to clarify some of the analytical as well as operational issues related to the construction of a macroprudential policy framework for financial supervision and regulation, in particular interactions between monetary and macroprudential policy. To set the stage for the discussion, Section 2 examines the operational definition, the rationale behind, and the scope of macroprudential policy in the context of emerging economies. This is followed by a discussion of the role and effectiveness of macroprudential policy in Section 3. Section 4 analyzes Korea's experience with managing macroprudential policy. Section 5 is devoted to outlining an appropriate scope and modality of macroprudential supervision. Concluding remarks are in the final section.

II. Role and Scope of Macroprudential Policy

1. Definition and Rationale

Monetary policy should be an integral component of any policy framework for managing financial imbalances. As the monetary authority, the central bank does – and in fact has to – monitor and assess financial market developments as part of the process of adjusting the stance of monetary policy. Depending on the gravity of the situation, it may use its policy tools to alleviate financial disruptions threatening systemic risk. However, it would not do so unless they imperil price stability for which the central bank is primarily responsible. It would also be reluctant to intervene largely because it does not have effective instruments to lean against the financial cycle or to restrain excessive leverage and risk taking of financial market participants. 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 inflation is below the target rate (Blanchard et al. 2010).

If monetary policy is not an appropriate instrument – in scope and effectiveness – for addressing the buildup of systemic risk, then questions arise as to whether the financial regulatory authorities could shoulder much of the

¹ See Galati and Moessner (2011) for a literature survey.

responsibility for assessing and safeguarding financial stability. Indeed, if individual financial institutions are healthy, sound, and efficiently managed, the likelihood of financial distress is expected to decline.

Since the regulatory authorities are entrusted with enforcing prudential standards and codes of good behavior at these institutions, they could contain contagion of insolvency of a financial institution to fend off a run on the entire financial system. Prudential supervision of individual institutions or microprudential supervision is therefore a critical component of any tool kit for financial stability and strengthening it is no less essential than before: the regulatory authorities should assume a large part of the financial stability function.

While it is an essential component, as long as it is bound by safety of individual institutions, microprudential supervision will not be a suitable tool for financial stabilization. This focus may result in excessive protection to undermine the safety of individual institutions it supervises (Crockett 2000). Furthermore, the soundness of individual institutions is neither a necessary nor a sufficient condition for the stability of the financial system as a whole. As Goodhart (2004) points out, depending on the nature of the inter-linkages among financial institutions and markets, financial systems containing individually weak institutions may nevertheless be systemically robust and vice versa (p.9).²

The emphasis on individual institutions does not also leave much room for microprudential supervision to weigh up or deal with an increasing array of macroeconomic risk factors common to all financial institutions, such as a high degree of volatility of capital flows, the boom-bust cycle in asset markets, and sudden changes in market sentiment and expectations. This limitation is likely to cause a failure in monitoring the increase in systemic risk and taking appropriate remedial actions.

The above two constraints associated with the institution specific focus have led to reorienting and refining macroeconomic dimensions of microprudential supervision as a means of managing systemic risk. 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). It is intended to prevent the buildup of systemic risk, which could destabilize the financial system and, as a consequence, the whole economy.³

According to a BIS paper (CGFS 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." Borio (2009) and Hannoun (2010) identify two types of disruption that could cause the accumulation of financial imbalances. One type is the financial cycle – the procyclicality over the business cycle in lending at banks and other non-bank financial institutions. Another is a cross dimensional disruption arising from a 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 an indirect exposure through the

² Goodhart cites the Japanese experience in the 1980s as an example in which banks were strong individually, but they were systemically weak in the face of the bursting of the real estate bubble.

³ See Crockett 2000, Borio 2003, and White 2004 on the procyclicality of lending.

<Table 1> Micro and Macro Approach

	Macroprudential	Microprudential
Objective	Limiting systemic risk of the financial system: mitigating the failure of a large segment of the financial system.	Limiting idiosyncratic risk of individual institutions: protection of depositors and investors
Implementation of supervisory controls	Top-down: setting prudential control in terms of the probability and costs of systemic distress	Bottom-up: setting and aggregating prudential control in relation to the risk of each institution
Characteristics of risk	Endogenous: Originating in the collective behavior of and interactions between institutions	Exogenous: Given to individual institutions and the disregard of feedback of collective actions
Common exposure to systemic risk	Relevant and important: causes of the fallacy of composition	Irrelevant
Use of instruments	Standard prudential tools plus linking provisioning and pricing of risk to the volume of loan	Uniform solvency standards and codes of conduct
Focus of supervision	(i) A greater weight given to banks and larger and more complex institutions; (ii) Market monitoring; and (iii) Countercyclical orientation	Protection of individual institutions

Sources: Crockett (2000) and Borio (2003 and 2009).

network linkages as in the case of assuming counterparty risks.⁴

To be sure, these objectives are not mutually exclusive, as a greater resilience of the financial system would enable the system to adjust to financial cycles better (Crockett 2000 and Borio 2002). In contrast, the microprudential objective is to limit idiosyncratic risk individual financial institutions are exposed to. The macroprudential supervisory standard is derived from a top-down, whereas the microprudential standard from a bottom-up approach. The systemic risk the macroprudential approach deals with is endogenous as it is determined by the collective behavior of individual institutions whereas the idiosyncratic risk is exogenous. The differences between the two supervisory approaches are summarized in Table 1.

⁴ To put it differently, macroprudential policy is designed to lean against the wind when systemic risk is building up and to stem the risks originating in interconnections and spillovers in the financial system (CGFS 2010 and Hanoun 2010). See also Crockett (2000), Borio (2003), and White (2004) on the procyclicality of lending.

In recent years, the creation of a unified financial supervising system independent from the central bank has also brought to the fore the need to define the scope, tools, and division of labor in conducting macroprudential policy. If a central bank was engaged in some types of macroprudential supervision before the supervisory oversight was separated out and transferred to a new independent institution, it would certainly use microprudential tools to complement its monetary policy, tightening in the up-phase while relaxing them in the down-phase of the business cycle. With the creation of an independent supervising authority, then it stands to reason that the stability function needs to be shared by both the central bank and the supervisory authority and that the central bank has to coordinate its conduct of monetary policy with the financial supervisory agencies.

2. Tools of Macroprudential Policies

There is a growing literature on macroprudential policy, yet the precise contour of the macroprudential supervision in monitoring, analyzing, and participating in the designing of policy responses to an impending financial stress is yet to be defined. The advocates of macroprudential orientation of financial supervision do not necessarily propose either creating new prudential controls or adding new functional responsibilities to the supervisory authority, they are arguing for the adjustment of the traditional modality of supervision in a way that will contribute to mitigating systemic risks.

For analytical purposes, the tools for macroprudential supervision are divided into the two categories of time- and cross-sectoral-dimensions as shown in Table 2. In each category, the tools are also divided into those developed for mitigating systemic risk and recalibrated microprudential tools. Most of the instruments with a cross-sectoral dimension in Table 2 are microprudential tools recalibrated for macroeconomic objectives of sustaining financial stability.⁵ They take the form of restrictions or incentives related to financial firms' balance sheets designed and implemented to contain distress of individual financial institutions. As Hannoun (2010) argues, they could be utilized to mitigate systemic risk as they can complement the instruments of monetary policy. Some of the instruments such as capital and liquidity surcharges on SIFI, restrictions on leverage in particular types of lending, and currency mismatches may be used to strengthen resilience of the financial system. As in the case of SIFIs, the regulatory authorities may separate out vital institutions to reflect their potential threat to the stability of the financial system (Borio 2009).

A host of microprudential tools with a time dimension may also be reoriented to help tame the procyclicality of lending by banks and other non-bank financial institutions. As shown in Table 2, those developed specifically for lessening systemic risk include: countercyclical capital charges, forward-looking provisioning for loan losses, and levy on non-core deposits. Recalibrated tools include the loan-to-value

⁵ CGFS (2010) and Hannoun (2010) provide a list of these instruments categorized by the disruptions to the financial system they constrain.

<Table 2> Macroprudential Policy Tools

Tools	Risk Dimensions	
	Time-dimension	Cross-Sectoral Dimension
1. Instruments developed specifically to mitigate systemic risk		
	<ul style="list-style-type: none"> • Countercyclical capital buffers • Through-the-cycle valuation of margins or haircuts for repos • Levy on non-core liabilities • Countercyclical change in risk weights for exposure to certain sectors 	<ul style="list-style-type: none"> • Systemic capital surcharges on SIFIs • Systemic liquidity surcharges on SIFIs • Levy on non-core liabilities • Higher capital charges for trades not cleared through CCPs
2. Recalibrated instruments		
	<ul style="list-style-type: none"> • Time-varying LTV, Debt-To-Income (DTI) and Loan-To-Income(LTI) caps • Time-varying limits in currency mismatch or exposure(e.g. real estate) • Time-varying limits on loan-to-deposit ratio • Time-varying caps and limits on credit or credit growth • Dynamic provisioning • Stressed VaR to build additional capital buffer against market risk during a boom • Rescaling risk-weights by incorporating recessionary conditions in the probability of default assumptions(PDs) 	<ul style="list-style-type: none"> • Powers to break up financial firms on systemic risk concerns • Capital charge on derivative payables • Deposit insurance risk premiums sensitive to systemic risk • Restrictions on permissible activities (e.g. ban on proprietary trading for systemically important banks)

Source: IMF (2011).

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).⁶ These tools could be adjusted frequently and quantitatively.⁷

⁶ These instruments can be complemented by the 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 that 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, the dynamic provisioning may discriminate against small- and medium-sized firms, which are likely to be perceived as high-risk clients.

⁷ 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 LTV ratio, which can improve the resilience of the financial system, but also serve as an automatic stabilizer for the financial system (CGFS 2010).

III. Effectiveness of Macroprudential Policy in Leaning against Financial Cycle⁸

1. Fungibility of Money: Ineffectiveness of Selective Credit Control

In a situation where bubbles are in the making in the markets for real or financial assets, the financial supervisory authority may consider invoking macroprudential regulations to reduce mortgage lending at banks and other non-bank financial intermediaries by using two types of instruments. The first includes some of the recalibrated microprudential tools such as the LTV (Loan to Value) and DTI (Debt to Income) ratios, which are adjusted to control the supply of mortgage loans. If these two instruments proved to be inadequate, the supervisory authority may strengthen its control by employing the second type reserved for tempering procyclicality in bank lending such as countercyclical capital charges, dynamic loan-loss provisioning, and capital conservation rules for banks. Implementation of these two types of instruments entails quantitative – rather than price – control of the availability of sectoral as well as aggregate bank credit. This section argues that because of fungibility of money and potential conflict with monetary policy these tools lose much of their effectiveness in suppressing the bubbles.

In order to elaborate on this argument, suppose that the regulatory authority lowers the ceilings of the two ratios – LTV and DTI – to stave off a housing market boom, and that there is no change in the stance of monetary policy. The squeeze on mortgage lending is likely to discourage borrowing for consumption demand – the purchases of houses for their services – but not necessary for the investment demand by those investors 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 housing finance they curtail. 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 non-mortgage bank loans are likely to invest the bulk of their loan proceeds in housing.⁹ This results from the fungibility of money and imperfections in ex post loan use monitoring that may result in the diversion of non-mortgage loans.

Given the fungibility of money, it appears that in countries where housing has become good substitutes for financial assets and banks dominate financial intermediation, restrictions on mortgage lending alone may not be effective in preventing the housing market bubble. To be effective, they may need to be complemented by an overall cut back in aggregate bank credit through, for instance,

⁸ This section draws on Park (2010).

⁹ 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.

an increase in loan-loss provisioning to curtail further the availability of housing finance.

However, the overall cutback is likely to create two types of spillover problems. One problem is that once housing speculation gathers forces, as shown by the Korean experience discussed in Section 4, even the simultaneous squeeze on both the sectoral and aggregate supply of bank credit may not be enough to keep housing speculators at bay. 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. Another problem is that as discussed below, a tighter macroprudential policy runs into conflict with the conduct of monetary policy, which remains neutral, as it exerts contractionary effects on aggregate demand for goods and services.

2. Macroprudential and Monetary Policy: Are they Independent?

A growing number of countries—both advanced and emerging—have taken to using macroprudential tools in their efforts to stabilize their financial systems, but because of its short history, not much is known about its effectiveness in controlling systemic risk over and at a point in time, and in a cross sectional dimension in emerging economies.

Experiences of these countries suggest that faced with growing systemic risk, both monetary and supervisory authorities work well in unison to forestall a financial crisis when both consumer and asset prices are rising or falling together. In this case, the stance of the two policies would be the same and there are no spillover problems. When the build-up of inflationary pressure is accompanied by asset price bubbles, both policies will be tightened—for example, the policy rate is raised while the loan-loss provisioning will be increased—and they will reinforce each other. However, when the two prices move in the opposite directions, a serious problem of working at cross-purposes arises.

Citing the literature on the target-tool assignment, Yellen (2010) argues, “it is perfectly possible to attain good outcomes even if monetary policy and macroprudential policy are carried out separately and independently, and the goals of each are pursued using entirely separate tool kits.” Yellen claims that satisfactory results can be attained without policy coordination, even though fully optimal policy generally calls for coordination when spillovers occur, because situations may arise in which the central bank, in its conduct of monetary policy, might not be able to fully offset the macroeconomic effects of macroprudential interventions.¹⁰ In this

¹⁰ Yellen (2010) points out that higher supervisory standards for capital following the real estate-related loan losses of the early 1990s may have slowed the economy's recovery from the recession. More stringent bank capital and liquidity requirements to stem systemic risk—when many economies suffer from high unemployment—they may delay economic recovery unless implemented in gradual manner over time. The new Basel III agreement recognizes the desirability of a phase in period for these standards. The implementation of tighter standards over a multi-year period could mitigate the concern that the macroprudential policies designed to control systemic risk will unduly restrict the availability of credit.

section, it is argued that largely because many of the tools of macroprudential policy work through the channels of monetary policy, the independence of macroprudential policy as a macroeconomic policy instrument is not warranted.

To examine further this lack of independence, consider again a situation in which consumer prices are not expected to rise beyond a target range, but a surge in housing prices threatens a bubble. Under these circumstances, 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 has the danger of increasing inflationary pressure, whereas the regulatory authority would be called into action.¹¹ Suppose they lower the capping of the LTV and DTI together causing a squeeze on overall bank credit supply.

This tighter 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 the bank loan market and into money and capital markets for direct financing. This increase in the debt and equity financing will then increase market interest rates. If this happens, higher interest rates may dampen the aggregate demand for goods and services (with a possible exception of construction investment) as many borrowers without access to the capital market will be rationed 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 help enhance financial stability. It follows then, that if the policy rate is a poor tool to deal with financial market instability, so are macroprudential 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, whereas the 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 sectoral and aggregate credit and in this respect, they 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 for price stability are one and the same, although they have different objectives.

¹¹ The 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 to impair their efficiency.

IV. Korea's Experience with Macroprudential Policy: 2001-2011

During the 1997-98 financial crisis when interest rates were skyrocketing and bank lending evaporated, real properties markets had taken a severe beating with a collapse of their prices. However, it did not take long for these markets to thrive again. Beginning in 2002, Korea was gripped again with a haunting memory for the boom-bust cycles in real estate prices—that had plagued the economy periodically throughout the pre-crisis period—with a steep rise in prices of housing.¹² One of the main causes of this resurgence was the speedy recovery of the economy with a return of stability in the financial system, but easy monetary policy with bank lending deregulation was largely responsible for inflaming the housing market boom.

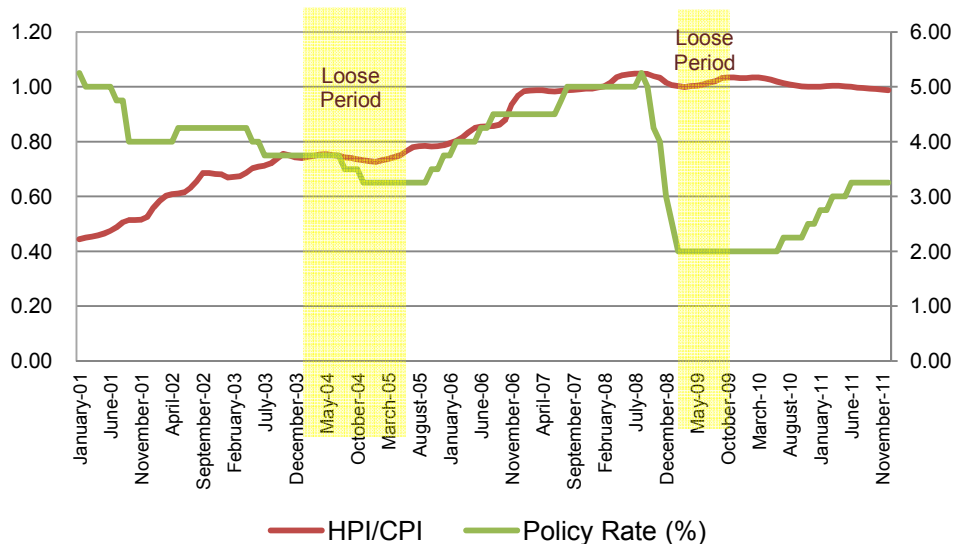
Korea suffered from the global IT bubble burst in 2001 with a dip in the growth rate. This set back in growth had led the Bank of Korea to cut the policy rate to 4 percent on September 2001 from a high of 5.25 a year earlier and kept it between 4.25 percent and 3.25 percent during the 2002 and 2005. The expansionary monetary policy then combined with the deregulation of mortgage lending at banks and non-bank financial institutions in the wake of the 1997-98 to rekindle real asset speculation.

For more than a decade thereafter, Korea's fiscal and financial regulatory authorities have battled for bringing real asset speculation under control by implementing various financial regulatory and tax policy measures. In contrast, however, the Bank of Korea has largely remained detached from the housing market boom by keeping an easy stance of monetary policy. As a result, the financial regulatory authority took the brunt of the responsibility of stabilizing real estate markets.¹³ The Financial Supervisory Service (FSS)—the watchdog of financial institutions and markets—has employed macroprudential tools to smooth out

¹² Ro (2007) shows that the investment demand with its potential for capital gains dominated the consumption demand for housing in the Seoul metropolitan area by comparing the sales price index with its rental price index from 1999 to 2007 period. The rental-to-sales price ratio, which measures the degree of the weight of the consumption demand in the market value of a house or apartment unit, declined after October 2001 when the sales price sharply climbed up.

¹³ The financial supervisory authority consists of the two organizations: the Financial Supervisory Commission (FSC) and Financial Supervisory Commission (FSS). The Financial Services Commission serves as a consolidated policy making body for the supervision of the financial industry as a whole. The Financial Supervisory Service was established on January 2, 1999, under the Act on the Establishment of Financial Supervisory Organizations by bringing together four supervisory bodies—Banking Supervisory Authority, Securities Supervisory Board, Insurance Supervisory Board, and Non-bank Supervisory Authority—into a single supervisory organization. The primary function of the FSS is examination and supervision of financial institutions but, it also conducts other oversight and enforcement functions as requested by the Financial Services Commission and the Securities and Futures Commission. The posts of the FSC Chairman and the FSS Governor were separated on March 2008 for clear distinction between policy-making and execution of financial market supervision.

[Figure 1] Changes in the Real House Price index (HPI/CPI) and the Policy rate



Note: HPI: Index for Seoul apartment prices
 CPI: Consumer Price Index
 Source: Bank of Korea and Kookmin Bank.

fluctuations in the prices of residential and commercial housing and land by controlling procyclicality in mortgage lending. Although the available evidence is rather sketchy, it appears that these regulatory measures have not inspired much confidence in controlling real asset speculation.¹⁴

As shown in Figure 1, over a six-year period beginning on January 2001, the real house price index—the nominal house price index divided by CPI—more than doubled.¹⁵ The housing boom ended early in 2007 to be followed by a persistent slump. Understandably, throughout the period, the FSS has directed much of its effort to remedying susceptibility to speculation and improving resilience of the housing market. To this end, it has selected to impose macroprudential restrictions on twelve occasions.¹⁶

Concerned about an incipient housing boom threatening an implosion of housing prices, the FSS introduced the LTV capping with a ceiling of 60 percent in 2002 to

¹⁴ A 2010 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 moderating financial cycles and that the evidence on the effectiveness of macroprudential measures is not conclusive (CGFS 2010).

¹⁵ The house price index used is based on prices of apartment units in the Seoul metropolitan area.

¹⁶ For the details of changes in the mortgage lending regulations, see Igan and Kang (2011) and Chang (2010).

curb mortgage lending. Since then it has adjusted the ratio eight times. On six occasions, the FSS has tightened it to squelch a housing market boom and loosened in 2004 and 2009 to stimulate housing demand. On August 2005, the regulatory authority fortified its arsenal of macroprudential tools by including the DTI regulation, which since then has been tightened five times and loosened up twice.

The boom in real asset markets, in particular housing, has been concentrated in many districts of the Seoul metropolitan area, while keeping most other regions uninfected. As a result, the FSS has concentrated on the Seoul metropolitan area as the target for its macroprudential policy. As shown in Tables 1 and 2 in Appendix, the FSS first lowered the LTV cap to 50 percent on June 2003 for mortgage loans with maturity less than 3 years extended by banks and insurance firms in the Seoul metropolitan districts infected by speculation. The LTV control turned out to be less than effective, because of the leakages: banks were able and in fact started lending for housing finance with maturity longer than 3 years to avoid the restriction while non-bank financial institutions were not subject to it. Six months later on October, to plug these leakages, the FSS extended and tightened the LTV regulation to cover mortgage loans with 10 years or less maturity by lowering the LTV cap to 40 percent for apartment purchases.¹⁷

After the LTV tightening, the rise of housing prices had begun decelerating, but it was not clear whether it was the right time to relax macroprudential policy. Unsure about whether the market lull could last, the FSS took a cautious step of relaxation by lifting up the LTV ratio to 70 percent for mortgage loans with maturity longer than 10 years on March 2004. However, within less than a year, housing prices reversed their downward trend to soar again. This resurgence prompted the FSS to cut the LTV cap on those mortgage loans with maturity longer than 10 years for the purchase of an apartment valued at more than 600 million won (or approximately 600 thousand US dollars) in the speculative zones on June 2005. On November 2006, this restriction became more extensive to include nonbank financial institutions at a higher ceiling of 50 percent to slowdown their mortgage lending.

After the Lehman Brothers' collapse, which triggered a liquidity crisis, a deeper recession, and contraction of housing demand, Korea's policy makers also realized the need to relieve household borrowers of the burden of servicing their mortgage debt. This debt relief led the FSS to removing most of the speculative areas from its list of control on November 2008. With the recovery from the liquidity crisis gaining speed in the early months of 2009, however, banks were increasing their mortgage lending and housing prices started rising again. In response, the FSS lowered the LTV ratio to 50 percent for loans at banks for financing apartment worth more than 600 million won in the metropolitan area on July 2009. Three months later, this regulation applied to all financial institutions.

To complement the LTV regulation, between August 2005 and August 2007, the FSS lowered the DTI ratios five times at banks and other non-bank financial institutions. At its inception in 2005, a relatively small segment of riskier borrowers

¹⁷ In Korea, there is a liquid market for apartments, which are standardized in terms of size and actively traded. In particular, smaller ones are easily marketable, making them tradable investment assets and good substitutes for financial assets.

buying apartments—those who were single and under the age of 30 or if married, those whose spouses had debt—was subject to the ceiling of 40 percent in several districts of the Seoul metropolitan area prone to speculation. Less than a year later, on March 26, the coverage of the restriction was broadened to include the borrowings for the purchases of smaller apartment units priced at 600 million won and more. A year later, apartment units worth 600 million won or less were also subjected to this regulation with the ratios set between 40 to 60 percent

As in the case of the LTV, the FSS removed most areas off its list of speculative zones on November 2008. The relaxation did not last long, however. On September 2009, the FSS saw the need to tighten the DTI regulation, only to loosen up again less than a year later when the housing market showed signs of contraction.

Observing the raw data on housing price developments since 2001, one may conclude that macroprudential policy of adjusting the LTV and DTI tools has been effective in taming the real estate market boom, but failed to prevent its stagnation. This is also the conclusion reached by Igan and Kang (2011). For a study on the effectiveness of macroprudential measures, the authors estimate an equation where a number of housing market variables are regressed against a vector of control variables and a dummy, which takes on the value of 1 in the six months following the implementation of the LTV and DTI changes.

The results of this estimation show that the rates of increase in housing prices dropped significantly for the six months following the tightening of the LTV. This deceleration is largely driven by developments in the metropolitan areas, most of which were designated as the speculative zones. Surprisingly, however, the results of the DTI tightening—which is known to be a more powerful tool—are not as robust as those of the LTV.

The authors also find that the rate of increase in the number of housing transactions fall significantly during the six months after the LTV and DTI ratios are lowered mostly in the metropolitan areas. They do not find, however, any effectiveness of these macroprudential tools on reviving the sagging demand or negative association between the growth of household borrowing and tightening of the two ratios.

In their study, Igan and Kang do not examine the effectiveness of changes in the two macroprudential tools six months after the policy implementation is announced. Another recent study by Kang (2011) finds that it tends to disappear. The estimation results of Igan and Kang are less convincing than otherwise as they do not discuss some of the structural characteristics of Korea's housing market and limitations of the LTV regulation that could affect their results. One problem with the empirical examinations such as the one conducted by Egan and Kang is the difficulty of isolating the effects of the LTV regulation when it is implemented with other policies such as monetary policy, tax, and other administrative measures. Kim et al. (2010), for instance, lists 29 housing policies introduced during the Roh Moo Hyun Administration (2003-07), which ranged from housing acquisition and registration tax to new town construction. Obviously all these variables cannot be controlled properly in a simple regression analysis.

On a closer inspection, it is clear that despite the implementation of these macroprudential measures, housing speculation did not subside until January 2007.

During the 2005-07 period, it became clear that stronger doses of anti-speculation measures were needed and the stronger measures implemented included direct controls on housing transactions such as the requirement for registration of and imposition of transfer and transaction taxes on trading in properties. In retrospect, it is questionable whether the real estate speculation could have been brought under control, if the government had refrained from resorting to the tax and other direct control measures¹⁸.

The LTV and DTI regulations for mortgage lending are managed in a highly complex system of supervision where different ratios are applied to different financial institutions and speculative areas.¹⁹ This complicated system has left a large room for loan leakages and loopholes for evasion. As noted earlier, housing speculators could easily divert their non-mortgage loan proceeds or cash in their holdings of other assets to finance their housing investments. They could choose to move to other areas that are not subject to the mortgage loan regulations to buy individual houses or apartments as long as they believe the prices of these real properties would continue to go up.

When housing prices are rising and expected to rise continuously, the tightening of the LTV regulation has a limited effect on moderating the growth of mortgage loans as banks and other non-bank financial institutions would lend more as the value of the housing collateral offered for mortgage loans also increases.

Korea's experience also suggests that the supervisory authority has consistently been reactive rather than preemptive in managing macroprudential policy—lowering or raising the ceilings of the LTV and DTI every time it sees noticeable changes in housing prices since 2002. This reactive response may help subdue the procyclicality in mortgage lending, which was shown to expand six months after the surge in housing prices, but it has allowed market participants to forecast with a fair degree of accuracy when and how the FSS would respond to changes in housing market developments.²⁰

Knowing from the past episodes that the boom could be persistent once it starts, market participants would rush to borrow as much as they could to beat the regulatory restrictions that may become more stringent as time passes in a boom period. In fact, they would take the restrictions as a signal for a housing market boom on the horizon that is likely to last for some time to come once realized. In the opposite case where the housing market is down with falling prices, they would stop borrowing. In fact, they would leave the market even before the regulatory authority reversed its macroprudential policy when they believe that the boom has reached a peak. This pattern of behavior on the part of the market participants may have increased the volatility of housing prices and frustrate the regulators in their efforts to anchor expectations on future housing prices.

In general, the effectiveness of macroprudential tools may vary depending on the

¹⁸ The control variables introduced in Egan and Kang's study do not include tax regulations, an administrative control.

¹⁹ It was unnecessary to impose the lending regulations nationwide because speculation did not permeate all housing markets that were disparate and regionally segmented.

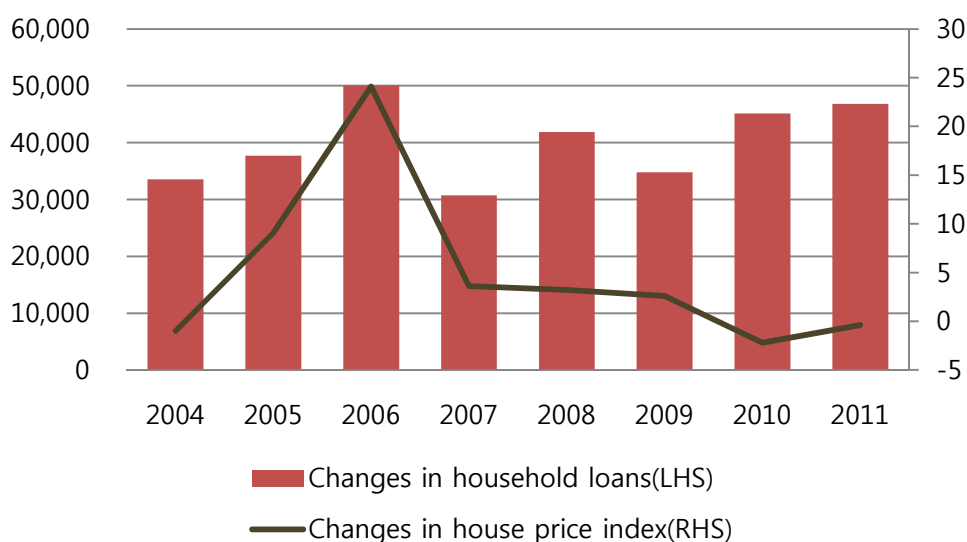
²⁰ On this lag, see Kang (2011).

circumstances in which they are implemented. In the preceding section, it is argued that the conflict between monetary and macroprudential policies is likely 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 which monetary and macroprudential policies took divergent paths.

In August 2010, the central bank raised the policy rate to be on guard against the signs of growing inflationary pressure, while the FSS went on to lift up the DTI ratio on specific mortgage loans to revive the weak demand for housing. The relaxation did little in the way of eliciting any positive housing market response, but the regulatory service could not tighten it any further because of a massive increase in household indebtedness, which has emerged as an element of systemic risk.²¹ As shown in Figure 2, after three years of slow growth, the availability of household loans, the bulk of which consists of mortgage loans, has been rising since 2009, whereas housing prices recovered only slightly in 2011 after four consecutive years of slowdown against the background of rising consumer prices. This divergence has made it difficult to determine an appropriate combination of monetary and macroprudential policy (See Figure 3).

In the meantime, household debt grew rapidly, rising to more than 155 percent of disposable income at the end of 2010 from 125 percent six years earlier. Between 2008

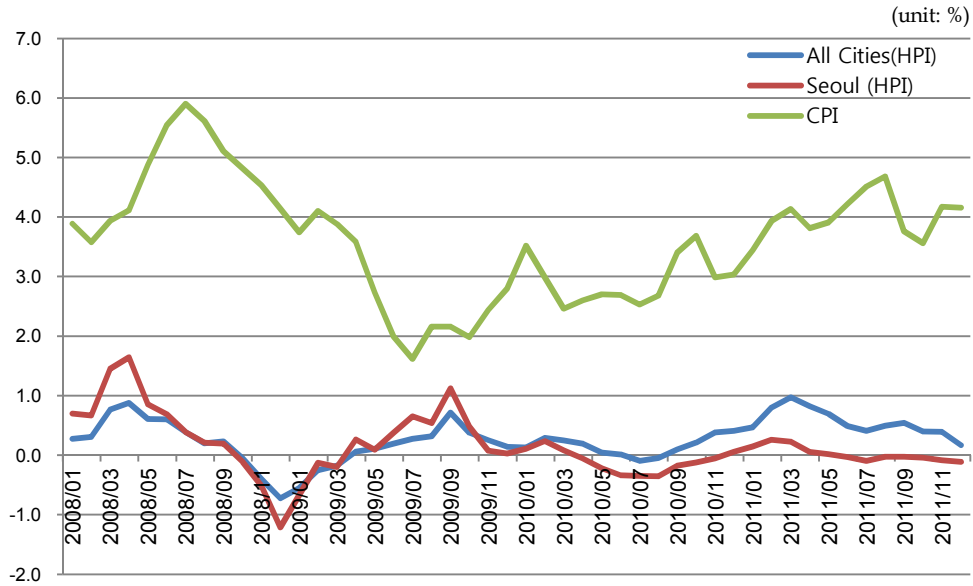
[Figure 2] Changes in Housing Loans and Prices



Note: Changes in household loans (billion Korean Won),
 Changes in house price (Seoul apartment prices) index (year on year %)
 Source: The Bank of Korea and Kookmin Bank.

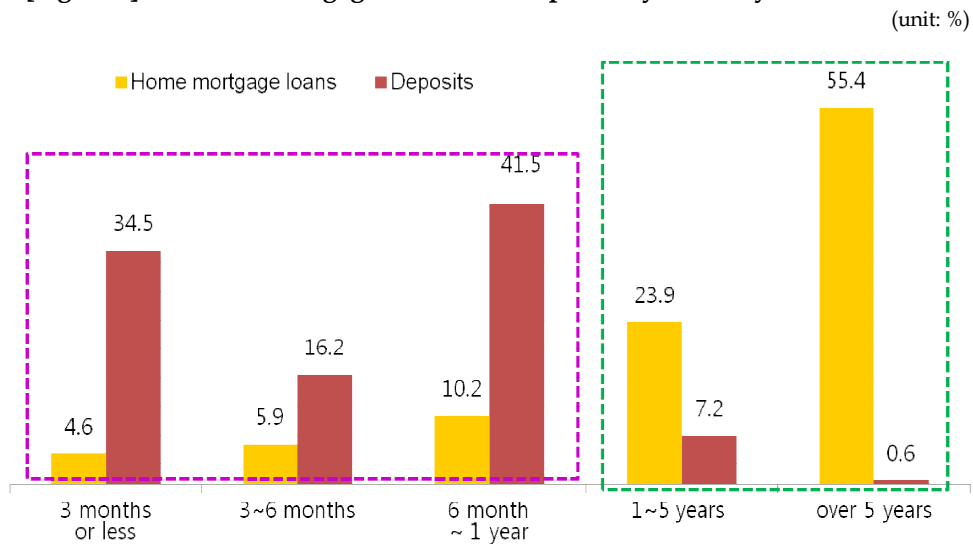
²¹ During the first seven months of 2010, consumer prices rose by about one percent, whereas housing prices in some parts of the Seoul metropolitan area began to fall beginning in the second quarter of 2010.

[Figure 3] Changes in CPI and Housing Prices



Note: HPI is an Apartment Price Index
 Source: Bank of Korea (ECOS) and Kookmin Bank.

[Figure 4] Shares of Mortgage Loans and Deposits by Maturity



Source: Bank of Korea

and 2010, mortgage loans accounted for 93 percent of the increase in household debt. More than 90 percent of these loans carried variable rates and 78.4 percent of mortgage loans outstanding were overdue, current only in interest payments. Figure 4 shows that the bulk of mortgage loans at banks have been financed by short-term deposits and borrowing from wholesale funding markets, creating a balance sheet maturity mismatch. Given this profile of systemic risk, it was clear that the regulatory authority could not relax mortgage loan restrictions, whereas the monetary authority had to maintain a tighter stance of monetary policy to keep the lid on inflationary expectations.

Macprudential tools such as the LTV and DTI 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. Macprudential policy for controlling the quantity of aggregate credit needs to be coordinated with the conduct of monetary policy, but given the different objectives and approaches coordination between the monetary and regulatory authorities would be difficult to institutionalize.²²

For effective management of macroprudential policy, the regulatory authority, FSC and FSS, should be able to detect signs of real asset speculation well before they get out of control and to identify the turning points in cyclical developments. Equipping the FSS, for example, with macroeconomic forecasting would mean duplication of some of the functions of the central bank. This possibility, which could result in competing macroeconomic forecasts, underscores further the need to construct a mechanism of coordination between the two institutions, which the following section turns to.

V. Making Operational a Macprudential Framework for Financial Supervision

1. Macprudential Framework

In addressing systemic risk, the financial supervisory authority, FSC and FSS, is responsible for providing information on the health and efficiency of financial institutions and developments in financial markets pertinent to the assessment of financial stability, including the monitoring of various financial indicators, interpretation of scenario analyses, and stress testing for both individual financial institutions and banking and other financial industries. While this responsibility of supplying information and data is of crucial importance, the major task of the supervisory authority is to construct and manage a macroprudential policy regime. Like in any other policy, this regime is structured around the goal, intermediate targets, and tools of financial supervision.

²² 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.

• The Objectives and Modality

Broadly speaking, the goal of the macroprudential approach to financial supervision is to sustain overall stability of the financial system in cooperation with other policy authorities. Given this objective, on the part of financial regulators, it would be instructive to identify some of the most likely sources from which financial distress originates. In emerging economies, as noted earlier, one of the most prevalent sources is speculation in asset markets, in particular in those markets for land, housing, and commercial real estate, which often leads to the boom-bust cycle of their prices.²³

Other sources are likely to be speculative capital outflows and inflows, an unsustainable current account deficit, and a high degree of volatility in the foreign exchange rate. Of these potential sources of financial instability, it appears that the supervisory authority has comparative advantage in controlling speculation in and stabilizing prices of real and financial assets as it has detailed information on and influence over the asset-liability management of banks and other financial institutions.

In stabilizing financial markets, the financial supervisors will find it necessary to analyze and monitor a large number of financial stability indicators such as those identified by the global financial stability report by the IMF. In many cases, this stability or macroprudential analysis is not backed by quantitative analyses using a coherent general equilibrium model that defines and quantifies financial fragility. As such, they are descriptive but lack the diagnosis and forecasting of financial stability: they are unable to indicate whether financial distress is in the making *ex ante* and explain the consequences of interactions of financial variables, which are mostly endogenous.

The macroprudential analysis needs to be supported by general equilibrium models of systemic stability that can analyze and quantify aggregate financial stability Goodhart (2004).²⁴ Despite its potential, the reliability and usefulness of the general equilibrium approach are not proven in emerging economies. Other less sophisticated and partial equilibrium approaches to defining and measuring financial distress may be more useful to the emerging economies. For example, Borio and Lowe (2004) propose a scheme in which the probability of financial distress is evaluated in terms of a small set of variables that include the ratio of private credit to GDP, real asset prices, and investment. They show that over a three-year horizon, close to 60 percent of the crises are predicted in a sample of 34 industrial and emerging economies over the 1960-1999 period during which there

²³ In the run-up to a financial crisis or during the upswing phase of the business cycle, financial imbalances are often manifested in sharp increases in the prices of real and financial assets, regardless of whether the causes of the imbalances are of domestic or foreign origin.

²⁴ Goodhart (2004 and 2006) shows that a general equilibrium model based on a microeconomic foundation can be constructed to measure and predict fragility of the banking sector, not the overall financial system. This model includes incomplete financial markets, heterogeneous banks, heterogeneous bank customers, endogenous default, and credit and deposit markets. An index of financial distress of the banking sector is defined in terms of the probability of default of the banking sector, which is chiefly related to bank profitability and the bank repayment rate.

were 38 crises. In a subsequent paper (2004), they find a similar pattern in emerging economies when an over-valued exchange rate is included as an additional variable.²⁵

• Intermediate Targets

Like the central bank's strategy of using operational and intermediate targets, the finance supervisory authority engaged in the macroprudential policy needs to choose and aim at a set of variables that lie between its tools and the goal of stabilizing financial markets. The strategy to work with the intermediate target is desirable for two reasons. One is the difficulty of assessing and forecasting impending financial market instability. The difficulty is often compounded by the fact that the regulatory authority is not likely to be confident about its ability to influence the goal directly. Another reason is that whatever operational mechanism instituted for macroprudential policy, it is not likely to be managed on a day-to-day basis, but to be activated only when threats to financial stability become visible. By then it may be too late to deflect the threats. By installing a system of monitoring and analyzing a set of intermediate targets, which may also serve as early warning indicators, the financial supervisory institutions may have a better chance of detecting the signs of impending financial distress early on.

The criteria for choosing the intermediate targets are rather straightforward: they should be measurable, they should have predictable effects on financial stability, and the supervisory authority should command a certain degree of control over the variables. Which variables would then qualify as intermediate targets? It is neither possible nor practical to consider all those indicators identified by the IMF's global financial stability report. A more realistic strategy would choose a manageable number of indicators that send clear signals of an impending asset market boom. In this regard, experiences with past financial crises would be helpful in identifying promising candidates. They are likely to vary from country to country, but some of the potential variables include the volume of lending, sectoral allocation of loans, risk spreads, and capital provisions at banks and other financial institutions.

• Management of Macroprudential Supervision

In conducting macroprudential policy, it would be instructive to think of it as a two-stage process of policy implementation. The first stage concentrates on an assessment of asset market stability. If potential threats to asset market stability are detected, financial regulators may respond to the growing imbalances by tightening microprudential tools at their disposal.²⁶ At this first stage, the macroprudential response would be tailored to treat all financial institutions the same, as if there were "n" number of identical financial institutions.

At the second stage of the policy response, microprudential policy would

²⁵ The performance of the three variables is measured in terms of the noise-to-signal ratio. In order to capture the buildup of financial distress, the authors use the deviations of the three variables from the levels of the time of assessment.

²⁶ The central bank will also be alerted to the disruption and called into action. On its part, the bank may raise its policy rate to discourage speculation and transaction.

dominate, which consists of (i) monitoring the extent to which financial institutions adjust their asset and liability management in response to the tightening of prudential controls, and (ii) enforcing these controls if they do not adapt to the change.

In executing prudential controls, microprudential policy should take into consideration different financial institutions including banks that behave in different ways and are heterogeneous. This means that the exposure level of risk financial institutions is likely to be different and idiosyncratic from institution to institution. Therefore, financial regulatory institutions may have to exercise considerable discretion in differentiating between financial institutions on the basis of their relative importance.

For example, macroprudential operations have to weigh up the knock-on effect of financial distress (Crockett 2000 and White 2004). Banks as the suppliers of liquidity to the system and large and more complex institutions, such as those engaged in universal banking, should be subject to scrutiny in monitoring their imprudent behavior than smaller financial firms whose failure may not necessarily pose serious systemic risks.

On implementing prudential tools, questions have been raised as to the extent to which the supervisory authorities should be allowed to exercise discretion as opposed to relying on a set of rules. In view of the fact that the supervisory authority will have difficulty in diagnosing the health and soundness of the financial system independently or in cooperation with other authorities, and the effect of the macroprudential supervision on the behavior of financial institutions and markets is uncertain, relying on discretion could be counter-productive. There is also the danger that the supervisory authority loses its credibility and influence on financial market participants if they cry wolf too often.²⁷

2. Need for Tripartite Policy Coordination

An effective policy response to macroprudential concerns of mitigating financial systemic imbalances with their attendant heavy costs in terms of output and employment may require a broader framework for macroeconomic policy, which encompasses not only the use of macroprudential instruments but also monetary and fiscal policy. Only such a broad policy regime can provide critical information needed for financial stability about the distribution of risks and various systemic vulnerabilities stemming from the transfer of one type of risk to another through the interplay among market participants (White 2004). The framework may also have

²⁷ Given these circumstances and risks together with the expediency of the rules, one can make a strong case for a rule-based, rather than a discretionary, macroprudential supervision. Goodhart (2004) is an advocate of linking not only provisioning but also the pricing of risks to the volume of the lending at banks. Borio (2002), however, argues that the rule-based supervision has its share of problems: it may not encourage financial institutions to improve their risk management, thereby exacerbating incentives to arbitrage it away, and it may not be consistent with promoting a better balance between market and policy-induced discipline

advantages as it could facilitate policy coordination and institutionalize an integrated role of the central bank, the supervisory agency and the fiscal authority.

In this broader framework, all policy authorities – the central bank, the supervisory institution, and the central government fiscal authority with a clear division of labor – are jointly responsible for steering the economy clear of financial disruptions. Before the supervisory function was separated out, the central banks were engaged in some type of macroprudential supervision. Now that many central banks do not have the authority of supervising individual financial institutions, the responsibilities for financial stability have to be shared among the three institutions in terms of policy tools at their disposal. In this regard, it may be desirable to create a tripartite committee consisting of all three policy authorities for monitoring and analyzing various financial stability indicators and making decisions on the activation of policy response to an impending financial crisis.

VI. Concluding Remarks

Macroprudential orientation of financial supervision and regulation is not necessarily a new idea. Most central banks with supervisory oversight have been and will continue to be engaged in some type of macroprudential supervision. In their supervisory role, they would rely on many of the microprudential tools as a means of controlling pro-cyclicality in lending and risk management at banks and other financial institutions.

Two relatively recent developments have garnered growing attention to macroprudential orientation of financial supervision both in domestic and international policy communities. One has been the realization that the best defense against financial instability begins with strengthening the foundations of the domestic financial system.

The other has been the creation of an independent supervisory institution in a number of countries. These supervisory institutions are still bound by tradition of giving priority to ensuring safety of individual financial institutions to protect consumers-depositors and other financial investors. At the same time, many central banks have chosen inflation targeting as the framework for their conduct of monetary policy. To be sure, central banks should have the mandate to maintain overall financial stability, as well. Nevertheless, the transfer of supervisory oversight and the focus of the central bank on inflation targeting appear to have created a vacuum of macroprudential supervision as a constituent part of an overall macroeconomic policy framework for financial stability. This is a highly undesirable and unsustainable state of policy management and will have to be rectified. This paper recommends the construction of an overall framework for macroprudential policy to be managed jointly by monetary, fiscal, and supervisory authorities.

As a newly established institution, the independent supervisory agency may not have had the time to develop either the culture or the expertise needed to incorporate macroprudential controls in its supervisory operations. This internal constraint has been compounded by the additional burden of conducting

macroprudential controls in the absence of a reliable macroeconomic framework for macroprudential policy that the authority can make use of in evaluating emergence of financial distress and charting appropriate policy responses. Despite the growing literature, the ongoing debate, it appears, has not settled on the scope and effectiveness of macroprudential policy. What is, therefore, needed at this stage of the debate is further research on the quantification and better assessment of systemic financial risk and the scope and effectiveness of prudential controls at the supervisory agencies.

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Appendix:

<Table 1A> Timeline of LTV Regulations

Date	Specification	Range of Application	Direction
Sept. 2002	- Introduced the LTV ceiling as 60 percent	Banks & Insurance Companies	Inception
June 2003	- Reduced the LTV from 60 to 50 percent for loans of 3 years and less maturity to buy houses in the speculative zones	Banks & Insurance Companies	Tighten
Oct. 2003	- Reduced the LTV from 50 to 40 percent for loans of 10 years and less maturity to buy houses in the speculative zones	Banks & Insurance Companies	Tighten
March 2004	- Raised the LTV from 60 to 70 percent for loans of 10 years or more maturity and less than one year of interest-only payments	All Financial Institutions	Loosen
June 2005	- Reduced the LTV from 60 to 40 percent for loans of 10 years and less maturity to buy houses worth 600 million won and more in the speculative zones	Banks & Insurance Companies	Tighten
Nov. 2006	- Set the LTV ceiling as 50 percent for loans of 10 years and less maturity to buy houses worth 600 million won and more in the speculative zones and originated by nonbank financial institutions such as mutual credits, mutual savings banks, and credit-specialized financial institutions	Extended to Nonbank Financial Institutions	Tighten
Nov. 2008	- Removed all areas except the three Gangnam districts off the list of speculative zones	All Financial Institutions	Loosen
July 2009	- Reduced the LTV from 60 to 50 percent for loans to buy houses worth 600 million won and more in the metropolitan area	Banks	Tighten
Oct. 2009	- Expand the LTV regulations to all financial institutions for the metropolitan area	Nonbank Financial Institutions	Tighten

<Table1B> Timeline of DTI Regulations

Date	Specification	Range of Application	Direction
Aug. 2005	- Introduced the DTI ceiling as 40 percent for loans used to buy houses in the speculative zones only if the borrower is single and under the age of 30 or if the borrower is married and the spouse has debt	All Financial Institutions	Inception
Mar. 2006	- Set the DTI ceiling as 40 percent for loans to buy houses worth 600 million won and more in the speculative zones	All Financial Institutions	Tighten
Nov. 2006	- Extended the range of application of DTI regulation to the overheated speculation zones in the metropolitan area	All Financial Institutions	Tighten
Feb. 2007	- Set the DTI ceiling as 40-60 percent for loans to buy houses worth 600 million won and less	Banks	Tighten
Aug. 2007	- Set the DTI ceiling as 40-70 percent for loans originated by nonbank financial institutions such as insurance companies, mutual savings banks, and credit-specialized financial institutions	Extended to Nonbanking Institutions	Tighten
Nov. 2008	- Removed all areas except the three Gangnam districts off the list of speculative zones (so, the DTI regulation does not apply to the metropolitan areas)	All Financial Institutions	Loosen
Sept. 2009	- Extended the range of application of DTI regulation to the non- speculative zones in Seoul and the metropolitan area (Gangnam Three 40 percent, non-speculative zones in Seoul 50 percent, the other metropolitan areas 60 percent)	Banks	Tighten
Aug. 2010	- Exempted the loans to buy houses in the non-speculative zones of the metropolitan area if the debtor owns less than two houses (set to expire by end-March 2011)	All Financial Institutions	Loosen

Source: Igan and Kang (2011).