

ADAPTING MACROPRUDENTIAL POLICIES TO GLOBAL LIQUIDITY CONDITIONS

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The global financial crisis that erupted in 2007 has had intellectual repercussions as well as large economic costs. Recent events in the advanced economies, especially the capital flow reversals and the looming banking sector crises in Europe, have shaken the conviction that traditional yardsticks of financial development such as the ratio of commercial bank assets to GDP, or of financial integration such as cross-border claims and liabilities as a proportion of GDP. And yet, those same measures of financial integration and financial development that were held up as the yardsticks of progress have, instead, turned out to be the engines of financial distress as capital flow reversals have gathered pace in Europe. In contrast, it has been the emerging economies with what were presumed to be “weak institutions” that have managed to weather the storm best.

For emerging economy policy makers, recent experience gives an opportunity to revisit some of the principles underpinning policies toward financial stability.

The traditional approach to prudential regulation has been to focus on the solvency of individual financial institutions, with the primary tool being the minimum capital requirement imposed on banks. The state of the art on prudential policy before the global financial crisis of 2007-2009 could have been summarized in terms of the following set of propositions.

- Minimum capital requirements serve as a buffer against loss on the assets of the bank, thereby protecting depositors from loss. If the government insures deposits, then the bank capital requirement also serves as a buffer against loss by taxpayers.

I thank the editors for their insight and comments on an earlier version of this paper.

Capital Mobility and Monetary Policy, edited by Miguel Fuentes D., Claudio E. Raddatz, and Carmen M. Reinhart, Santiago, Chile. © 2014 Central Bank of Chile.

- Minimum capital requirements ensure that the bank’s owners have a stake in the value of the bank’s assets, thereby ensuring that owners have sufficient “skin in the game,” deterring moral hazard on their part toward excessive risk-taking.
- Having ensured financial stability through bank capital requirements, and in the presence of well-functioning international capital markets, monetary policy can focus on the task of macroeconomic stabilization by setting interest rates to stabilize components of aggregate demand, such as consumption and investment.

Recent experience has raised questions on the adequacy of a policy framework based on these propositions alone, and has spurred a reassessment of the purpose and effectiveness of prudential regulations.

Consider the traditional approach to banking regulation, and its focus on the soundness of individual institutions. To shield the creditors of the banks—especially the depositors—from the risk of loss on assets of the bank, requirements are set on minimum capital for banks as a proportion of their risk-weighted assets.

The basic philosophy of setting buffers against loss has been central in the international standards for banking regulation as led by the Basel Committee on Banking Supervision, which has coordinated the international discussion on the harmonization of international standards on banking regulation. The Basel III framework has continued the tradition of basing banking regulation on building buffers against loss. The centerpiece of the framework agreed on in 2010 was a strengthened common equity buffer of 7%, together with newly introduced liquidity requirements and a leverage cap to be phased in over an extended timetable running to 2019 (BCBS, 2010).

Basel III also incorporates a countercyclical capital surcharge that can be introduced at the discretion of national regulators, and foresees additional requirements on global SIFIs (systemically important financial institutions, the “G-SIFIs”) in the form of capital surcharges. However, G-SIFIs discussions have revolved around the difficulties of cross-border resolution and the moral hazard of banks being “too-big-to-fail”. Issues of excessive asset growth or cross-border banking flows that are of most interest to emerging economy policy makers have received less attention. In this respect, Basel III is *micro*-prudential in its focus, concerned with the solvency of individual banks; rather than being *macro*-prudential, concerned

with the resilience of the financial system as a whole. The language of Basel III is revealing in this regard, with repeated references to greater “loss absorbency” of bank capital. However, achieving greater loss absorbency by itself is almost certainly inadequate in achieving a stable financial system, for two reasons.

- Loss absorbency does not directly address the procyclicality of the financial system and the *excessive asset growth* during booms.
- Preoccupation with loss absorbency diverts attention from the *liabilities side* of banks’ balance sheets, and vulnerabilities from the reliance on unstable short-term funding and short-term foreign currency funding.

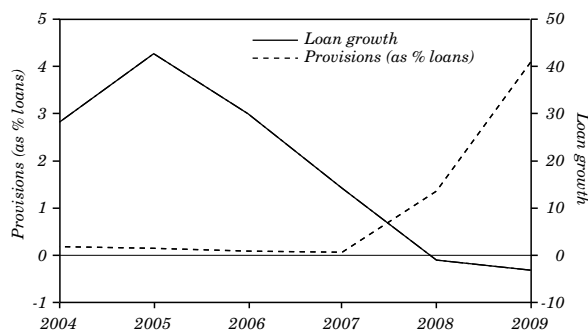
These two shortcomings have special importance for developing and emerging economies given their susceptibility to the fluctuations in global liquidity conditions. Indeed, the Basel process has focused almost exclusively on the imperatives of advanced country financial systems, rather than the needs of emerging and developing economies.

Consider now the issue of procyclicality and excessively rapid asset growth. During a lending boom, temporarily depressed risk measures, combined with high bank profitability, tend to bolster bank capital ratios. However, experience has shown repeatedly that rapid loan growth is only achieved at the cost of the build-up of systemic vulnerabilities. As the former BIS head Andrew Crockett (2000) has put it,

“The received wisdom is that risk increases in recessions and falls in booms. In contrast, it may be more helpful to think of risk as increasing during upswings, as financial imbalances build up, and materializing in recessions.” (Crockett, 2000).

As an illustration, take the example of Allied Irish Banks (AIB); although we could have chosen one of many other examples from the recent global financial crisis.

Figure 1 plots AIB’s loan growth and loan loss provisions from 2004 to 2009. AIB’s loan book increased 43% in 2005 and 30% in 2006, but loan growth came to a sudden halt with the onset of the global financial crisis. Loan loss provisions were low and falling throughout the lending boom, but the low measured risks were only masking the underlying vulnerability of the loan book, and provisions jumped above 4% by the end of 2009. AIB’s capital ratios were highest at the peak of the boom in 2006 and did not issue timely warnings, as seen in table 1. The severity of the subsequent bust calls into question the

Figure 1. Loan Growth and Provisions for Allied Irish Banks

Source: Shin (2011), data from AIB Annual Reports.

Table 1. Capital Ratios for Allied Irish Banks
Percent

	2004	2005	2006	2007	2008	2009
Tier 1 capital ratio	7.9	7.2	8.2	7.5	7.4	7.2
Total capital ratio	10.7	10.7	11.1	10.1	10.5	10.2

Source: AIB Annual Reports.

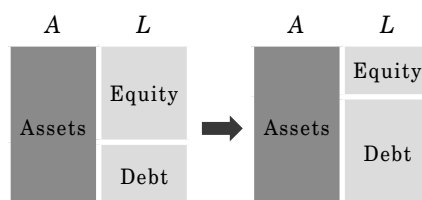
philosophy of relying on capital ratios while neglecting asset growth itself. The problem of excessive asset growth is not addressed easily within the framework of traditional banking regulation that focuses on capital as a buffer against loss, and points to the necessity of more active restraint on asset growth in order to curtail the build-up of vulnerabilities.

Procyclicality in asset growth is inherent to banking. In textbook discussions of corporate financing decisions, the set of positive net present value (NPV) projects is often taken as being exogenously given with the implication that the size of the balance sheet is fixed. Leverage increases by substituting equity for debt, such as through an equity buy-back financed by a debt issue, as depicted by the left hand panel in figure 2.

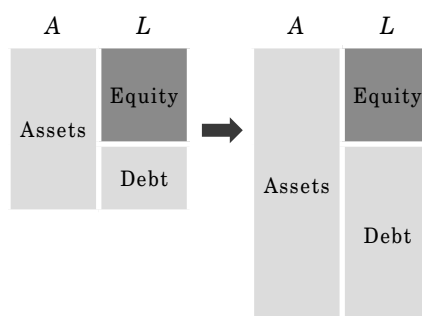
However, the left hand panel in figure 2 turns out to not be a good description of the way that the banking sector leverage varies over

Figure 2. Two Modes of Leveraging Up

A. Mode 1: Increased leverage with assets fixed



B. Mode 2: Increased leverage via asset growth



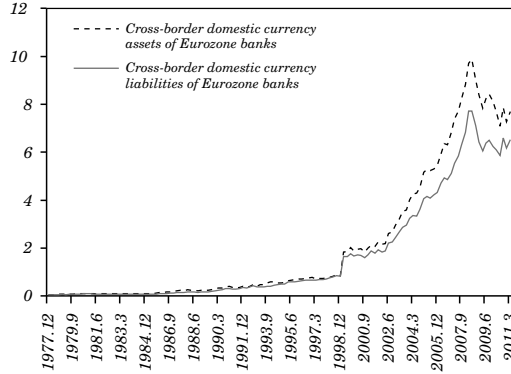
Source: Author's elaboration.

the financial cycle. The distinguishing feature of the banking sector leverage cycle is that leverage fluctuates through fluctuations in the total size of the balance sheet with equity being the pre-determined variable. Hence, leverage and total assets tend to move in lockstep, as depicted in the right hand panel of figure 2. Part of the increase in bank assets in boom times may be due to new positive net present value (NPV) projects that become available with improvements in economic fundamentals. However, the accumulated empirical evidence suggests that the procyclicality of the banking sector cannot be accounted for by the fundamentals alone, but instead points to shifting capacity to bear risk on the part of the banks themselves.¹

The aggregate consequences of bank balance sheet management can be gleaned from the banking statistics of the Bank for International

1. Adrian and Shin (2008, 2010) discuss the evidence from US investment banks, while Bruno and Shin (2011) find in their empirical investigation of capital flows to emerging economies that non-US global banks behave similarly.

Figure 3. Cross-Border Domestic Currency Assets of Eurozone Banks
US\$ trillion



Source: BIS Locational Banking Statistics, Table 5A.

Settlements (BIS). Since we will be appealing to the BIS statistics in some detail in what follows, some preliminary remarks are in order on how to read the numbers.

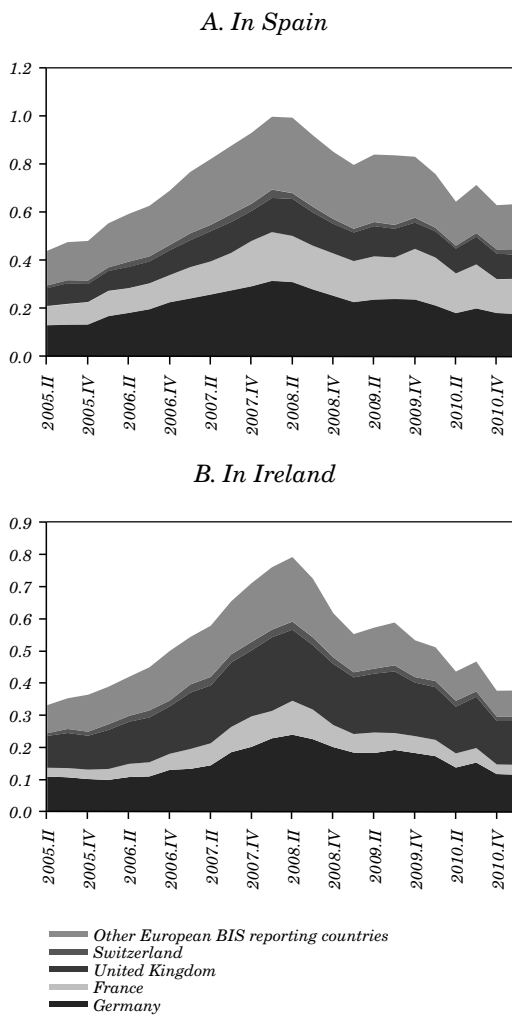
The BIS data comes in two forms. First is the locational banking statistics, which are based on the principle of residence, and which are consistent with the residency principle underlying balance of payments and national income statistics. Under the locational statistics, the branches and subsidiaries of the global banks are classified together with the host country banks. Second is the consolidated statistics, based on the nationality of the parent bank. Within the consolidated banking statistics, *foreign claims* include the local claims of branches and subsidiaries, while the *international claims* exclude local claims in local (that is host country) currency.²

Figure 3 is from the BIS locational banking statistics, plotting the cross-border assets and liabilities of Eurozone banks in domestic currency. Thus, after 1999, the series denotes the cross-border euro-denominated lending and borrowing by the Eurozone banks. Figure 3 shows that cross-border banking within the Eurozone experienced

2. See BIS (2009) for details on the BIS banking statistics. See McGuire and von Peter (2009) for an example of how the BIS statistics can be used in combination to reconstruct aggregate cross-border banking positions.

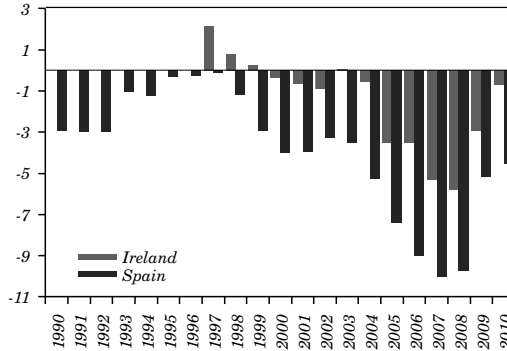
explosive growth, especially after around 2003. The consequences for Spain and Ireland were that they were borrowing in increasing amounts from other European banks, as shown in figure 4.

Figure 4. International Claims of European BIS-reporting Banks on Counterparties in Spain and Ireland
US\$ trillion



Source: BIS Consolidated Banking Statistics, Table 9D.

Figure 5. Current Accounts of Ireland and Spain
Current account balance as % of GDP



Source: IMF International Financial Statistics.

The banking flows were mirrored in the ballooning current account deficits of Spain and Ireland, as shown in figure 5. Spain and Ireland underwent residential property booms that were financed through the banking system by the credit supplied by banks, in other Eurozone economies, to the banking sectors of Spain and Ireland. The current account deficits of Spain and Ireland were, therefore, closely aligned to the gross banking sector flows. The “banking glut” in Europe represented by these charts sheds much light on current conjuncture and the European financial crisis of 2011. The European crisis carries the hallmarks of a classic “twin crisis” that combines a banking crisis with an asset market decline that amplifies banking distress. In the emerging market twin crises of the 1990s, the banking crisis was intertwined with a currency crisis. In the European crisis of 2011, the twin crisis combined a banking crisis with a sovereign debt crisis, where the mark-to-market amplification of financial distress interacted to worsen the banking crisis.

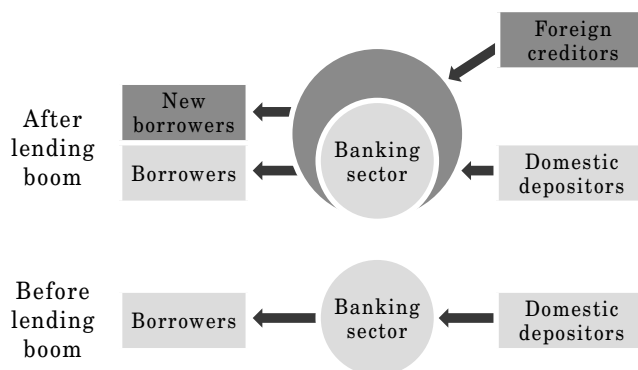
The vulnerability of the banking sector to run by its wholesale creditors, highlighted by the crisis in Europe, is equally relevant for emerging and developing economy financial systems. For open emerging economies, the wholesale funding obtained by the banking sector is often in foreign currency. Deleveraging episodes that materialize as a twin crisis are particularly harmful due to the ballooning of bank liabilities in domestic currency terms as the value of the domestic currency falls relative to the US dollar,

even while the asset value of the bank suffers collapse in a crisis. In other words, during a twin crisis, bank equity gets squeezed from both directions—liabilities increase while asset values fall (Shin, 2010, Ch. 1).

Being members of the Eurozone prevented both Ireland and Spain from having autonomous monetary policy rein in domestic bank lending. However, the loss of autonomy over monetary policy is a more general theme that affects many more countries than just those of the Eurozone. For emerging and developing economies with open capital accounts whose domestic financial system is heavily influenced by the external environment, the degree of autonomy in monetary policy can be severely curtailed due to capital inflows un-doing the effects of tighter monetary policy. Faced with low interest rates in advanced economies and permissive funding conditions carried by the global banks, raising domestic interest rates may backfire by inducing greater carry trade inflows resulting in looser domestic financial conditions. For this reason, the policy maker may face a dilemma in meeting financial stability concerns through the use of monetary policy.

When the external environment curtails the effectiveness of monetary policy and funding conditions in global capital markets, additional policy tools may be required to lean against the build-up of financial vulnerabilities. Macroprudential policies are one way to fill the gap in the policy toolkit under such circumstances, although as we will discuss below, they are rarely a panacea. Macroprudential policies are aimed, in the first instance, at dampening the procyclicality of the financial system. They lean against excessive growth of lending in booms. At the same time, they are aimed at mitigating the emergence of vulnerabilities on the liabilities side that may result in sharp reversals in funding when global liquidity conditions deteriorate.

In what follows, we will consider in more detail the rationale for macroprudential policies, and how such policies may be designed and implemented. In particular, we will highlight the role played by the “non-core” liabilities of the banking sector as an indicator of the vulnerability of the financial system to shocks. Non-core liabilities serve as a measure of the risk appetite of financial intermediaries, both for domestic institutions and their foreign creditors, and hence the potential for a rapid curtailment of funding as global funding conditions deteriorate. Moreover, non-core liabilities can serve as an indicator of the “supply push” factor of global liquidity resulting from expansive monetary policies pursued by advanced economy central banks.

Figure 6. Lending Boom Financed by Non-Core Liabilities

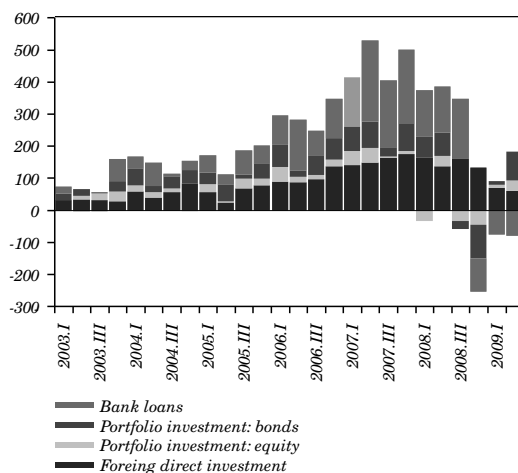
Source: Author's elaboration.

Figure 6 is a schematic illustration of the build-up of vulnerabilities associated with the growth of non-core liabilities. The bottom panel is the banking sector before a credit boom, while the top panel illustrates the system after the boom. As traditional deposit funding does not keep up with the credit growth, the banking sector's expansion is funded by non-core liabilities (in this case, from foreign creditors) building up vulnerabilities to deleveraging by foreign creditors.

Figure 7 is a chart from the IMF's Global Financial Stability Report of April 2010 showing the capital inflows into a group of 41 countries, including many emerging economies. The flows are disaggregated into the four main categories of capital flows. We see that aggregate FDI flows are steady and portfolio equity flows are small in net terms. However, banking sector flows display the signature procyclical pattern of surging during the boom, only to change abruptly and surge out with the deleveraging of the banking sector. The downward-facing Bank loans in 2008.IV is particularly striking.

Some macroprudential tools have close affinities with existing *micro*-prudential tools, except that the motivation is to ensure stability of the system as a whole, rather than individual bank solvency. In addition, there are more specialized macroprudential tools. An example is the levy on the non-core liabilities of banks introduced by Korea at the end of 2010 that counteracts the

Figure 7. Components of Capital Flows
US\$ billion



Source: IMF Global Financial Stability Report, April 2010 p. 123.

distortions to global funding conditions and the “supply push” of funding by the global banks. We return to this example below.

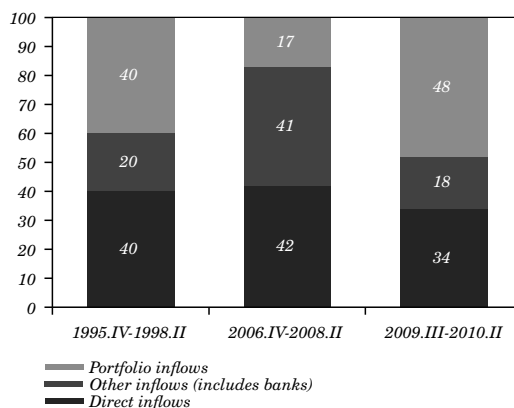
Macroprudential policies have important interactions with monetary policy and with other macro stabilization policies, such as capital flow management (CFM) policies (that is capital controls). A neat division between monetary policy and policies toward financial stability are difficult in theory and unlikely to be useful in practice. Short-term interest rates influence capital flows and the balance sheet composition of domestic and global banks, so that monetary policy has financial stability implications. By the same token, curtailing loan growth will have an impact on real economic activity, and hence will have a direct impact on the stabilization of macroeconomic activity.

The outline of the rest of the paper is as follows. We begin by reviewing the importance of external financing conditions for influencing domestic financial conditions through banking sector capital flows. We do so by drawing on the BIS cross-border banking statistics. We then review the range of macroprudential tools at the disposal of policy makers and compare the respective advantages and disadvantages, depending on the policy environment.

1. EXTERNAL ENVIRONMENT AND GLOBAL LIQUIDITY

The low interest rates maintained by advanced economy central banks in the aftermath of the 2007-9 financial crisis have ignited a lively debate about capital flows to emerging economies. A recent policy document on capital flows from the IMF (2011) has drawn attention to changes in the composition of capital flows between the most recent post-crisis episode; and the credit boom that immediately preceded the global financial crisis.

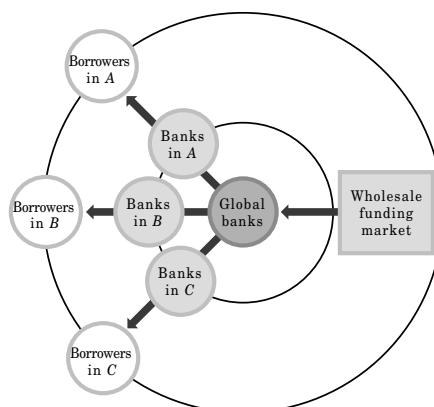
Figure 8. Components of Capital Inflows to Emerging Economies ex China



Source: IMF (2011, p. 14).

The IMF document (IMF, 2011) identifies three periods of rapid capital inflows in recent decades, the first being 1995. IV–1998. II associated with the subsequent Asian crisis, the period 2006. IV–2008. II associated with the 2008 financial crisis, and the most recent period in the aftermath of the crisis (2009. III–2010. II). The distinguishing feature of the boom that preceded the 2008 financial crisis is the role played by banking sector flows. Understanding the external environment and the role of cross-border banking is important in putting the recent crisis in context. The US dollar bank funding market has special significance in this debate.

As well as being the world's most important reserve currency and an invoicing currency for international trade, the US dollar is

Figure 9. Structure of Cross-Border Banking and Capital Flows

Source: Author's elaboration.

also the currency that underpins the global banking system. It is the funding currency of choice for global banks. One manifestation of the dollar's role as the currency for the global banking system is through the role of foreign banks in the US. The US hosts branches of approximately 160 foreign banks whose main function is to raise wholesale dollar funding in capital markets and then ship it to the head office. Some of the borrowed dollars will find their way back to the US to finance purchases of mortgage backed securities (MBS) and other assets.³ But some of them will flow to Europe, Asia and Latin America where global banks are active local lenders. In this way, global banks become the carriers for the transmission of liquidity spillovers across borders. At the margin, the shadow value of bank funding will be equalized across regions through the portfolio decisions of the global banks, so that global banks become carriers of dollar liquidity across borders. In this way, permissive US liquidity conditions will be transmitted globally, and US monetary policy becomes, in some respects, *global* monetary policy.

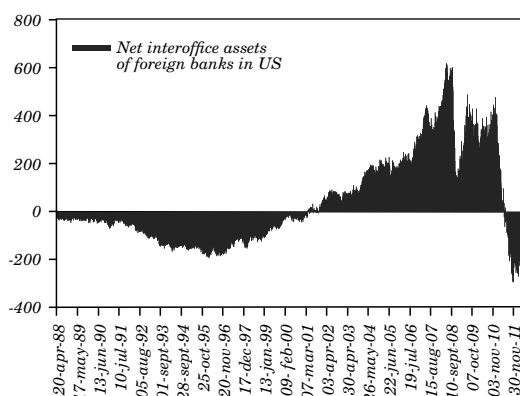
Foreign bank branches in the US collectively raise over one trillion dollars of funding, of which over 600 billion dollars is

3. See Shin (2011) for discussion of the "global banking glut" associated with European banks.

channeled to headquarters.⁴ A key quantity is the *net interoffice assets* of foreign bank branches in the US—the lending by branches and subsidiaries to headquarters—as given in figure 10. Interoffice assets increased steeply in the last two decades, saw a sharp decline in 2008, but bounced back in 2009, only to turn negative again in 2011 as the European crisis gathered pace.

Figure 10. Net Interoffice Assets of Foreign-Related Institutions in the United States

US\$ billion



Source: Federal Reserve H8 series.

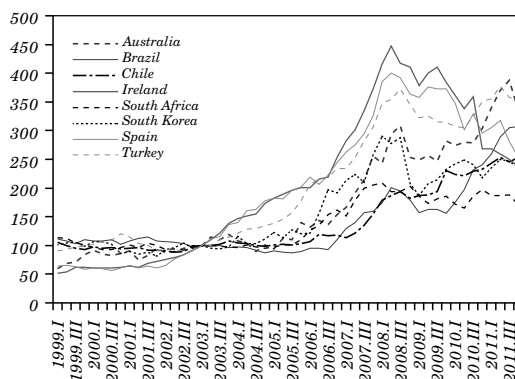
The large net positive interoffice accounts of foreign banks in the US highlights the potential for cross-border spillovers in monetary policy. Dollar funding that is shipped abroad to headquarters will be deployed globally according to portfolio allocation decisions that seek out the most profitable use of such funds. Thus, permissive liquidity conditions in the US dollar wholesale market will be transmitted via the global banking system to other parts of the world.

We can pick up the trail once the dollars are on lent to local borrowers in Europe, Asia and Latin America. The BIS locational banking statistics can provide more detailed information through

4. BIS (2010) "Funding Patterns and Liquidity Management of Internationally Active Banks" CGFS paper 39, May 2010, Bank for International Settlements. <http://www.bis.org/publ/cgfs39.htm>.

Figure 11. External Claims (Loans and Deposits) of BIS Reporting Banks

March 2003=100



Source: BIS Locational Banking Statistics, table 7A.

the external claims (loans and deposits) of the banks from the BIS reporting countries vis-à-vis many emerging economies.

Figure 11 plots the normalized series (with the values at March 2003 set to 100) of the cross-border claims against counterparties listed on the right of the figure. What is notable is the degree of synchronization of banking sector flows across disparate geographical regions of the recipient countries, especially in the period immediately leading up to 2008. However, it is notable that economies in Latin America, notably Brazil and Chile, saw relatively late surges in banking sector inflows, and did not see the rapid banking sector inflows that most other emerging economies experienced in the 2006–2008 period prior to the recent global financial crisis.

Bruno and Shin (2011) build a theoretical model of global banking where the assets of the global banks are the liabilities of the emerging economy banks and derive empirical predictions on the size of capital flows as a function of the leverage cycle of the banking sector, and verify that the theoretical predictions are confirmed in the data. In particular, the VIX index of the implied volatility of equity index options which is known to be a key explanatory variable for bank leverage (Adrian and Shin, 2010) is also highly significant in explaining both banking sector capital flows and domestic credit growth in the recipient economies.

2. NON-CORE LIABILITIES AS MACROPRUDENTIAL INDICATORS

Banks are the most important financial intermediaries in emerging and developing economies. To the extent that banking sector risks are mirrored in the size and composition of bank balance sheets, a useful set of signals may be those derived from the *liabilities side* of banking sector balance sheets. The liabilities side of the banking sector balance sheet will shed light on how much of the financing is being channeled through the banking system, and hence give insights on the risk attitude of the banking sector.

Even in a closed economy, the relative size of the banking sector vis-à-vis the rest of the financial sector is likely to reveal useful information on risk attitudes. When bank liabilities are increasing rapidly, this suggests households are supplying more credit *indirectly* through the banking sector rather than *directly* through some other means (for example, through the corporate bond market). If the “as if” preferences of banks were identical to the household sector, then it would not make a difference to the projects being financed in the economy whether the funding is directly or indirectly provided. However, as explained at the outset, procyclical behavior characterizes the banking sector where the lending standards vary more over the cycle than would be justified by the economic fundamentals alone (see Shin, 2011, for a formal model). Thus, an increase in the relative size of the banking sector during a boom is likely to entail lower lending standards and greater “risk appetite” in overall lending decisions.

The shifts in effective risk aversion entailed by such fluctuations in the relative size of the banking sector is key to resolving the apparent paradox where larger bank liabilities (short-term “safe” claims of households) are associated with greater risk taking in the economy. The paradox is only apparent because the apparently “safe” claims against the banks are being recycled in the form of loans to ultimate borrowers in the economy. When short-term “safe” claims on the banks increase, this is the mirror image of the greater quantity of lending that is being channeled through the banking sector. The model of the “Global Banking Glut” in Shin (2011) has further details of the precise mechanism.

Traditional monetary aggregates give a window on the size and composition of bank liabilities. Monetary aggregates such as M2 track the size of the deposit base of the domestic banking system,

and hence can serve as a proxy for the claim of the household sector on the banking sector. However, traditional classifications of monetary aggregates focus on the transactions role of money as a medium of exchange. As such, the criterion is based on how close to cash—how “money-like”—a particular financial claim is. The classic study by Gurley and Shaw (1960) emphasized the distinction between “inside money,” which is a liability of a private sector agent and “outside money,” which is not (such as fiat currency). The traditional focus of monetary analysis has been on money as a medium of exchange.

Demand deposits are the archetypal money measure because such liabilities of the banking sector can be quickly transferred from one person to another. Savings deposits are less money-like, and hence figure in broader notions of money, such as M2, but even here they fall outside the M2 measure if the depositor faces restrictions on easy access to the funds. In this way, the traditional hierarchy of monetary aggregates goes from cash to the very liquid claims, such as demand deposits going out to more illiquid claims on the banking sector, such as term savings deposits. The criterion is how easily such claims can be used to settle transactions.

For financial stability purposes however, an alternative classification system for liability aggregates may be better suited, which is conceptually a better fit for the vulnerability to financial shocks and their propagation. The key task would be to draw on existing knowledge of the behavior of financial intermediaries, and to find the counterparts in banking sector liability aggregates that have implications on the procyclicality of the financial system. Traditional transactions-motivated monetary aggregates may not be the most useful measure in this respect.

A distinction made in Shin and Shin (2010) is between the *core* and *non-core* liabilities of the banking sector. Core liabilities are the funding that the bank draws on during normal times. What constitutes core funding will depend on the context and the economy in question, but retail deposits of the household sector would be a good example of core liabilities. When banking sector assets are growing rapidly, the core funding available to the banking sector is likely to be insufficient to finance the rapid growth in new lending. This is because retail deposits grow in line with the aggregate wealth of the household sector. Other sources of funding must then be tapped to fund rapidly increasing bank lending. The state of the financial cycle is thus reflected in the composition of bank liabilities.

Consider the following accounting framework, taken from Shin and Shin (2010). Suppose there are n banks in the domestic banking system, indexed by $\{1, \dots, n\}$. The domestic household sector is given the index $n + 1$. The foreign creditor sector is given the index $n + 2$.

Bank i has two types of assets. First, there are loans to end-users such as non-financial companies or households. Denote the total loans by bank i to such end users of credit as y_i . Next, there are the claims against other financial intermediaries. Call these the “interbank” assets, although the term covers all claims on other intermediaries. The total interbank assets held by bank i are

$$\sum_{j=1}^n x_j \pi_{ji}$$

where x_j is the total debt of bank j and π_{ji} is the share of bank j 's debt held by bank i .

Note that $\pi_{i,n+1}$ is the proportion of the bank's liabilities held by the domestic creditor sector (for example, in the form of deposits), while $\pi_{i,n+2}$ is the proportion of the bank's liabilities held by foreign creditors (for example, in the form of short-term foreign currency-denominated debt). Since sectors $n + 1$ and $n + 2$ are not leveraged, we have $x_{n+1} = x_{n+2} = 0$. The balance sheet identity of bank i is

$$y_i + \sum_{j=1}^n x_j \pi_{ji} = e_i + x_i$$

The left-hand side is the total assets of the bank. The right-hand side is the sum of equity and debt. Letting $x = [x_1 \dots x_n]$ and $y = [y_1 \dots y_n]$, we can write in vector notation the balance sheet identities of all banks as

$$y + x\Pi = e + x$$

where Π is the matrix whose (i,j) th entry is π_{ij} . Solving for y ,

$$y = e + x(I - \Pi).$$

Define leverage λ_i as the ratio of total assets to equity and let Λ be the diagonal matrix with λ_i along the diagonal. Then,

$$y = e + e(\Lambda - I)(I - \Pi)$$

where Π is the matrix of interbank liabilities. By post-multiplying the above equation by the unit column vector u , we can sum up the rows of the vector equation above, and we have the following balance sheet identity

$$\sum_i y_i = \sum_i e_i + \sum_i e_i z_i (\lambda_i - 1)$$

where z_i is given by the i^{th} row of $(I - \Pi)u$. Here, z_i has the interpretation of the proportion of the bank's liabilities that come from outside the banking sector—that is the proportion of funding that comes either from the ultimate domestic creditors (for example, deposits) or the foreign sector (for example, foreign-currency denominated banking sector liabilities). In this way, we can re-write the aggregate balance sheet identity in the following way

$$\begin{aligned} \text{Total Credit} &= \text{Total Equity of Banking Sector} \\ &+ \text{Liabilities to Non-bank Domestic Creditors} \\ &+ \text{Liabilities to Foreign Creditors} \end{aligned}$$

The accounting framework above helps us to understand the connection between (i) the procyclicality of the banking system, (ii) systemic risk spillovers, and (iii) the stock of non-core liabilities of the banking system. Within this accounting framework, the *core liabilities* of a bank can be defined as its liabilities to the non-bank domestic creditors (such as through retail deposits). Then, the *non-core liabilities* of a bank are either (i) a liability to another bank, or (ii) a liability to a foreign creditor.

Two features distinguish non-core liabilities. First, non-core liabilities include claims held by intermediaries on other intermediaries. Second, they include liabilities to foreign creditors, who are typically the *global* banks, and hence also intermediaries, albeit foreign ones. Even for liabilities to domestic creditors, if the creditor is another intermediary, the claim tends to be short-term. The distinction between core and non-core liabilities becomes meaningful once there are differences in the empirical properties of the two types of liabilities.

Table 2 is a two-way classification of banking sector liabilities that distinguishes the traditional concern with the liquidity of monetary aggregates for transactions' purposes together with the question of whether the liabilities are core or non-core.

Table 2. Classification of Core versus Non-Core Liabilities

	<i>Core liability</i>	<i>Intermediate</i>	<i>Non-core liability</i>
<i>Highly liquid</i>	Cash Demand deposits (households)	Demand deposits (non-financial corporate)	Repos Call loans Short-term FX bank debt
<i>Intermediate</i>	Time deposit and CDs (households)	Time deposit and CDs (non-financial corporate)	Time deposit and CDs (banks & securities firms)
<i>Illiquid</i>	Trust accounts (households) Covered bonds (households)	Trust accounts (non-financial corporate)	Long-term bank debt securities (banks & securities firms) ABS & MBS

Source: Shin and Shin (2010).

Hahm and others (2010) examine the components of Korean banks' liabilities, sub-divided into the two-dimensional categorization illustrated in table 1, that is, by classifying liabilities into how liquid they are, and who holds them. They exhibit evidence of a clear hierarchy within each liquidity category of the relative "stickiness" of the liability, depending on whether the liability is due to the household sector, non-financial corporate sector or financial corporate sector. In this way, core liabilities are more stable (or "sticky") than non-core liabilities. For instance, retail deposits of household savers would be more stable than corporate deposits, which in turn could be sub-divided into non-financial company deposits and financial institution deposits.

In an open emerging economy where the banking system is open to funding from global banks, rapid increases in the non-core liabilities of the banking system would show up as capital inflows

through increased foreign exchange-denominated liabilities of the banking system. For this reason, foreign exchange denominated liabilities of the banking sector can be expected to play a key role in diagnosing the potential for financial instability.

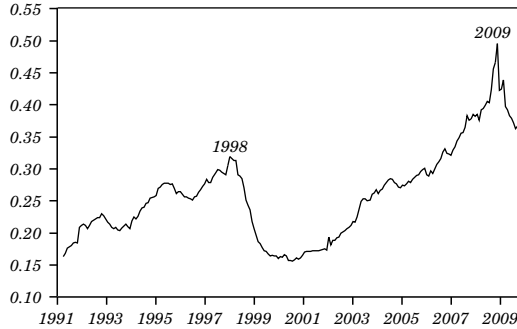
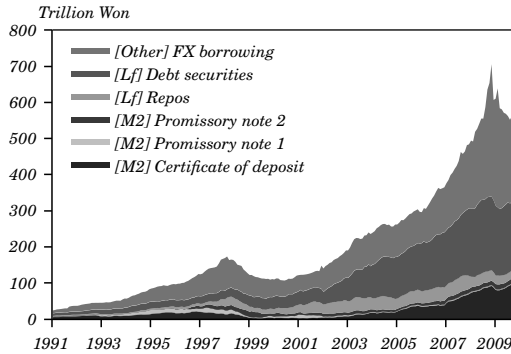
For the case of Korea, Shin and Shin (2010) proposed a definition of non-core liabilities as the sum of (i) foreign exchange denominated bank liabilities (ii) bank debt securities, (iii) promissory notes (iv) repos and (v) certificates of deposit.⁵ Note that this measure of non-core liabilities is an approximation of “true” non-core liabilities defined in our accounting framework above, as the classification is still based upon financial instruments rather than actual claim holders. For instance, households can hold bank debt securities such as debentures and CDs, and those must be excluded from the non-core liabilities.

The right hand panel in figure 1 charts the non-core liabilities of the Korean banking sector, taken from Shin and Shin (2010) with the FX liabilities shown in red. It is noticeable how the first peak in non-core liabilities coincides with the 1997 crisis. After a lull in the early 2000s, non-core liabilities increase rapidly in the run-up to the 2008 crisis.

Note also that the peak in these series occurs some weeks after the outbreak of the crisis. This is because the total amounts are measured in Korean won, and the outbreak of the crisis coincides with a rapid depreciation of the won, which implies an increase in the won value of the foreign currency denominated bank liabilities.

The left hand panel of figure 12 is the plot of the non-core liabilities as a fraction of M2. We see that the relative size of non-core liabilities to M2 is highly procyclical. There is substantial variation in the ratio of non-core liabilities to M2, ranging from around 15% of M2 to a peak of 50% at the height of the 2008 crisis following the bankruptcy of Lehman Brothers. The pronounced procyclicality of the non-core liability series for Korea should not come as a surprise given our earlier discussion of the balance sheet management practices of banks and the perverse nature of the demand and supply responses to asset price changes and shifts in measured risks. During a credit boom when measured risks are low and funding from global banks is easy to come by, we would expect to see strong credit growth fueled by capital inflows into the banking sector, often in foreign exchange.

5. The peaks in the series occur some weeks after the start of the crisis, as the non-core series are measured in Korean won and the won depreciated sharply during the 1997 and 2008 crises, increasing the won value of foreign exchange-denominated liabilities.

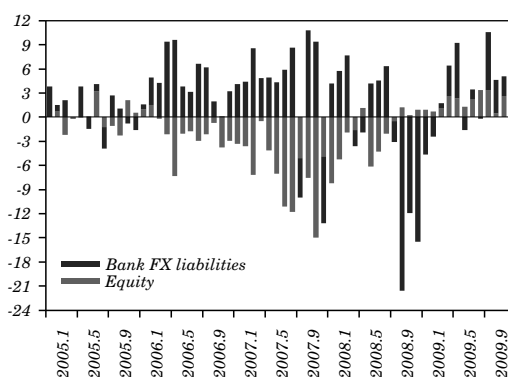
Figure 12. Non-Core Banking Sector Liabilities of Korea*A. Non-core liabilities as fraction of M2**B. Non-core liabilities of Korean banks*

Source: Shin and Shin (2010), data from Bank of Korea.

Figure 13, taken from Shin and Shin (2010), shows how capital flows associated with foreign currency liabilities of the banking sector played a key role in the foreign exchange liquidity crisis of 2008 in Korea. Figure 13 plots and compares the capital inflows and outflows for two sectors—the equity sector and the banking sector.

The equity sector (in light bars) actually saw *net inflows* during the crisis in the autumn of 2008. Contrary to the common misperception (perpetuated by television broadcasts from the stock exchange after turbulent trading) that the exit of foreign investors from the Korean stock market is the main reason for capital outflows,

Figure 13. Net Capital Flows of Equity and Banking Sector
US\$ billion



Source: Shin and Shin (2010), data from Bank of Korea.

we can see that the flows in the equity sector were *net positive* immediately after the crisis.

There are good reasons for why the equity sector should see net positive flows during a crisis. Equity outflows have two mitigating factors. During a crisis, not only do stock prices fall sharply, but there is also a steep depreciation of the local currency relative to dollar terms. For both reasons, foreign investors suffer a “double whammy” if they withdraw from the local stock market. Provided that the exchange rate is allowed to adjust, equity outflows will not be the main culprit in draining foreign currency reserves. When Korean investors have equity investments abroad, the repatriation flows back to Korea will outweigh the outflows from foreign investors.

However, the banking sector is different for three reasons. First, foreign currency liabilities of the banks have a face value that must be met in full. Second, the face value is in foreign currency. Third, the dynamics of deleveraging, sets off amplifying effects through price changes and shifts in measured risks.

For all three reasons, the deleveraging of the banking sector is associated with precipitous capital outflows. Unlike long-term investors—such as pension fund, mutual fund and life insurance companies—leveraged institutions are vulnerable to erosion of their capital, and hence engage in substantial adjustments of their assets, even to small shocks. The feedback loop generated by such reactions to price changes amplifies shocks.

As seen in figure 13, the banking sector in Korea saw very substantial capital outflows in the aftermath of the Lehman crisis. In the three months following the Lehman bankruptcy, the outflow from the banking sector was 49 billion dollars, which more than accounts for the decrease in Korea's foreign exchange reserves from over 240 billion dollars before the Lehman crisis to 200 billion at the end of 2008. Deleveraging by banks and the associated amplification effects have figured prominently in emerging economy financial crises.

As a practical matter, the classification into core and non-core is not so clear-cut. For a small and medium-sized enterprise with an owner-manager, the bank deposits of that firm could be seen as household deposits. However, the firm could be a major firm with access to market finance, which can issue bonds and then deposit the proceeds of the bond sale in the banking system. Nevertheless, the distinction between core and non-core bank liabilities provides a better window on the actual exposure of the banking sector to financial risk and their willingness to increase exposures. As such, the relative size of non-core liabilities can be used as a monitoring tool to reflect the stage of the financial cycle and the degree of vulnerability to potential setbacks.

Hahm, Shin and Shin (2011) test the hypothesis that the greater incidence of non-core liabilities is associated with greater vulnerability to crises by conducting a cross-country panel probit study of financial crises. The study is conducted using the IMF's International Financial Statistics (IFS) where the liability of the banking sector to foreign creditors is used as one of several non-core liability measures. They find that, non-core liabilities indeed figure prominently in explaining financial crises, even in the presence of other predictive variables such as the credit to GDP ratio that has received much attention in the policy community.

3. MACROPRUDENTIAL TOOLS

Macroprudential policy aims to secure financial stability by leaning against the excessively rapid loan growth in the banking sector. One useful taxonomy is to distinguish between *asset side tools* that limit bank loan growth directly, *liabilities side tools* that limit vulnerability to liquidity and currency mismatches, and *bank capital-oriented tools* that limit loan growth through altering incentives of banks. Table 3 summarizes the macroprudential tools and their main advantages and drawbacks. The rest of this section will be devoted to a more detailed examination of their properties.

Table 3 Taxonomy of Macroprudential Tools

	<i>Policy tool</i>	<i>Advantages</i>	<i>Drawbacks</i>
Asset side tools	<p>Loan-to-Value (LTV) cap</p> <p>Debt service-to-Income (DTI) cap</p> <p>Loan-to-Deposit caps</p> <p>Reserve Requirement</p>	<p>Low administrative burden</p> <p>Ties loan growth to wage growth</p> <p>Low administrative burden</p> <p>Low administrative burden</p>	<p>Ineffective during rapid housing boom</p> <p>High administrative capacity needed for data on income</p> <p>Distorts bank funding Not applicable to foreign banks</p> <p>Ineffective with low interest rates, burdens central bank</p>
Liabilities side tools	<p>Levy on wholesale bank liabilities</p> <p>Levy on FX-denominated bank liabilities</p>	<p>Price based measure Acts on broad liability aggregates</p> <p>Price-based measure Enhances monetary policy Counters FX risk</p>	<p>Needs legislation Cannot narrowly target FX vulnerability</p> <p>Needs legislation Narrow base of levy</p>
Bank capital-oriented tools	<p>Countercyclical capital requirements</p> <p>Forward-looking provisioning</p> <p>Leverage cap</p>	<p>Conforms to Basel III</p> <p>Modifies bank incentives</p> <p>Modifies bank incentives</p>	<p>Difficulty in calibration level playing field issues</p> <p>Objections from accounting standard setters</p> <p>Not price based Open to circumvention Vulnerable to bank FDI</p>

Source: Author's elaboration.

3.1. Bank Capital-Oriented Tools

3.1.1 Capital requirements that adjust over the cycle

The balance sheet management of banks is inherently procyclical. The rise in asset values that accompanies a boom results in higher capital buffers at financial institutions, supporting further lending in the context of an unchanging benchmark for capital adequacy. In the bust, the value of this capital can drop precipitously, possibly even necessitating a cut in lending.⁶

Capital requirements that lean against the credit or business cycle can mitigate the lending cycle. The framework for countercyclical capital buffers as envisaged in the Basel III framework has focused on the ratio of credit to GDP. This ratio has been proven to be useful as an indicator of the stage of the financial cycle, as demonstrated by the work of BIS economists, notably by Borio and Lowe (2002, 2004). Under the Basel III framework, the ratio of credit to GDP has been given a central role. The initial consultation document (BCBS, 2009) issued by the Basel Committee first proposed a countercyclical capital surcharge. The idea that the required capital buffer should vary over the financial cycle had been discussed for some time, and had been argued in the Geneva Report on bank regulation (Brunnermeier and others, 2009). The Basel Committee's approach can be seen as the concrete implementation of the concept by selecting the credit to GDP ratio as the appropriate cyclical indicator.

Conceptually, it is natural that credit growth should be scaled by normalizing it relative to some underlying fundamental measure. Normalizing credit growth by GDP has many advantages. GDP is an aggregate flow measure of economic activity that reflects current economic conditions, and one which is readily available under the basic national income calculations. Moreover, it is a measure that has a high degree of standardization across countries, which helps in competition and level playing field disputes in the consistent implementation of international banking regulations.

However, there are measurement challenges even for the concept of credit growth. To serve as a signal of procyclicality, credit growth should mirror the risk taking attitudes or market risk premiums, where they are relevant. The need for judgment is important in

6. For example, see Kashyap and Stein (2004) and Adrian and Shin (2010).

emerging and developing economies where long-term structural change through financial development may render credit growth statistics less useful as a gauge of risk appetite.

For instance, if the ratio of private credit to GDP shows rapid increases due to informal credit arrangements moving on to the formalized banking sector, then such a development has benign consequences for financial stability. In contrast, if the ratio of private credit to GDP increases due to a housing boom that is fed by cheap credit and the recycling of funding by non-financial companies, then the financial stability implications are more worrying.

The simple credit to GDP ratio may suffer from the fact that the aggregate measures of credit growth may mask some subtleties that cannot be summarized in one simple aggregate. It is also conceivable that there may be endogenous changes in the economic relationships between variables if the reduced-form economic relationships that underpin credit and GDP are used for policy purposes.

One possible counterargument to the accusation that the credit to GDP ratio may be too blunt could be that any policy maker will be exercising judgment when interpreting the figures. Also, it could be argued that there is an asymmetry between the upswing part of the financial cycle and the downswing part, and that most of the asynchronicity of financial cycles show up during the downswing. During the upswing, it may be argued that the policy of “leaning against the wind” can use the information contained in the rapid growth of the credit to GDP ratio.

Assenmacher-Wesche and Gerlach (2010) present an opposing viewpoint to the emphasis placed by Borio and Lowe (2002, 2004) on the credit to GDP ratio as an informative signal of the build-up of vulnerabilities in the economy. Assenmacher-Wesche and Gerlach (2010) take a skeptical line on the link between credit growth and property price increases. Although they find that credit shocks are associated with increases in real GDP and equity prices, the authors do not find evidence that credit growth has a large impact on property prices. The authors take this result as evidence that the bulk of the variation in credit growth is related to expected future changes in real economic activity, and they conclude that the widely accepted view that fluctuations in credit growth have been a major driver of property price shocks, seems to not be supported by the data.

Assenmacher-Wesche and Gerlach’s (2010) study uses data from the OECD countries covering the period 1986–2008. Hence, their

study applies to advanced economies rather than for developing and emerging economies. However, the difficulty of finding conclusive evidence for the link between credit and property prices may be more widely applicable. The fundamental difficulty is that a simple credit to GDP ratio does not have a conceptual framework that can easily link the measurement to measures of financial vulnerability. The skeptic could always argue that a surge in credit could either be due to a structural change in the economy, the increase in positive net present value projects, and hence, the *demand* for credit that is fully justified by the fundamentals, or simply the migration of lending relationships to the formal banking sector that were previously taking place in the informal sector.

Further research will be necessary to determine to what extent the simple credit to GDP ratio can serve as a finely calibrated signal that can support the use of automatic tightening of bank capital standards, as envisaged in the Basel III framework.

It would be uncontroversial to say that the less unanimity there is on the interpretation of the signal, the greater will be the political economy challenges faced by policy makers in acting decisively and in a timely fashion in heading off financial booms that build up vulnerabilities.

If the triggering of the countercyclical capital requirements is predicated on the exercise of discretion and judgment by the authorities, then political economy problems associated with the exercise of such discretion put the authorities under pressure from powerful interest groups. The political economy problem is similar to that of central banks that tighten monetary policy to head off property booms. Since there are private sector participants (such as construction companies or property developers) who are the beneficiaries of the short-term boom, they can be expected to exert pressure on policy makers or engage in general lobbying. The political economy problems will be more acute if there are controversies on the exact stage of the financial cycle or the degree of conclusiveness of the empirical evidence invoked by the policy authorities. A potential disadvantage of the countercyclical capital buffer is that it relies on the triggering of additional capital requirements in response to quantitative signals. Although such quantitative measures are relatively straightforward in simple theoretical models, there may be considerable challenges in the smooth and decisive implementation in practice.

3.1.2 Forward-looking provisioning

Forward-looking provisioning requires the build-up of a loss-absorbing buffer in the form of provisions at the time of making the loan, and shares similarities with the countercyclical capital buffer. However, there is a key difference between provisioning and equity in its accounting treatment. In the case of forward-looking provisioning, the provision is not counted as bank capital, and hence is less likely to influence bank management that targets a specific return on equity (ROE) level. To the extent that the bank uses its capital as the base on which to build its total balance sheet, the larger size of the equity base will result in a larger balance sheet, and hence the greater use of debt to finance the assets. During the credit boom, the build-up of greater assets using debt financing will contribute to the build-up of vulnerabilities.

The accounting treatment of the loss buffer as a provision, rather than as equity thus has a potentially crucial effect on bank behavior. By insisting on forward-looking provisioning, the bank's equity is reduced by the amount of the provision. During a boom, such a reduction of bank capital can play an important role in "letting off steam" in the pressure to build up the bank's balance sheet by removing some of the capital base of the bank. An early reference to the specific rules and procedures as well as the empirical studies that underpin the specific quantitative features of the scheme is given in Fernández, Pagés and Saurina (2000). A more recent update is provided by Saurina (2009) in a World Bank note.

Although forward-looking provisioning has been important in cushioning the Spanish banking system from the initial stages of the global financial crisis, there is a question mark as to whether building up loss absorbing buffers, on their own, can be sufficient to cushion the economy from the bursting of a major property bubble, as Spain has discovered in the recent financial crisis in Europe.

3.1.3 Leverage caps

Caps on bank leverage may be used as a way to limit asset growth by tying total assets to bank equity (Morris and Shin, 2008). The rationale for a leverage cap rests on the role of bank capital as a constraint on new lending rather than the Basel approach of bank capital as a buffer against loss.

The main mechanism is the cost of bank equity, which is regarded by the bank as being a more expensive funding source than short-term debt. By requiring a larger equity base to fund the total size of the balance sheet, the regulator can slow down asset growth.

The experience of Korea teaches some lessons in the use of leverage caps. In June 2010, the Korean regulatory authorities introduced a new set of macroprudential regulations to mitigate excessive volatility of foreign capital flows. Specific policy measures included explicit ceilings on foreign exchange derivatives positions of banks, regulations on foreign currency bank loans, and prudential regulations for improving foreign exchange risk management of financial institutions. These policy measures were intended to limit short-term foreign currency denominated borrowings of banks, and did so by requiring banks to put up more equity capital if they chose to increase volatile debt. Korea's leverage cap on bank FX derivative positions introduced in June 2010 saw some success in limiting the practice of banks hedging forward dollar positions with carry trade positions in the Korean won funded with short-term US dollar debt.

3.2 Asset Side Tools

Asset side tools act as brakes on bank asset growth directly, counteracting the superficial and temporary strength of individual bank capital ratios that are inflated due to temporarily depressed measures of risk, or higher profitability during booms. Inevitably, there are tools that straddle alternative categories. For instance, the reserve requirement imposed by central banks is an asset side tool, but is more naturally discussed in connection with the non-core liabilities levy below. Here, we begin with LTV and DTI.

3.2.1 Loan-to-value and debt-service-to-income caps

When monetary policy is constrained, administrative rules that limit bank lending, such as caps on loan-to-value (LTV) ratios and debt-service-to-income (DTI) ratios may be a useful complement to traditional tools in banking supervision. LTV regulation restricts the amount of the loan to not exceed some percentage of the value of the collateral asset. DTI caps operate by limiting the debt service costs of the borrower to not exceed some fixed percentage of verified income.

Conceptually, it is useful to distinguish two motivations for the use of LTV and DTI rules. The first is the consumer protection

motive, where the intention is to protect household borrowers who may take on excessively burdensome debt relative to the reasonable means to repay it from wage income. Under this motivation, LTV and DTI rules would be similar to the rules against predatory lending to uninformed households. Although this is an important topic in consumer protection policy, this is not the motivation that is relevant for macroprudential policy, and is not discussed in this report.

Instead, the macroprudential rationale for imposing LTV and DTI caps is to limit bank lending to prevent both the build-up of non-core liabilities to fund such loans, and also to lean against the erosion of lending standards that are associated with rapid asset growth.

It is important to reiterate why conventional microprudential tools such as minimum capital requirements are insufficient to stem excessive asset growth. As illustrated by the example of AIB in the earlier analytical background section, minimum capital requirements rarely bite during a lending boom when bank profitability is high, and when measured risks are low. Recall that AIB's capital ratios were at their highest immediately before the onset of the global financial crisis.

Although LTV ratio caps are familiar tools, the use of DTI caps is less widespread. For Korea and some Asian economies, such as Hong Kong, the use of DTI ratios has been an important supplementary tool for macroprudential purposes. DTI rules have the advantage that bank loan growth can be tied (at least loosely) to wage growth in the economy. Without this fundamental anchor, an LTV rule by itself will be susceptible to the amplifying dynamics of a credit boom, which interacts with an increase in the value of collateral assets during a housing boom. Even though the LTV rule is in place, if house prices are rising fast enough, the collateral value will rise simultaneously, making the constraint bind less hard.

In the case of Hong Kong, the use of DTI rules takes on added significance due to the fact that Hong Kong has a currency board based on the US dollar, and hence does not have an autonomous monetary policy. As such, monetary policy shocks are transmitted directly to Hong Kong.

3.2.2 Loan-to-deposit caps

A cap on the loan to deposit ratio limits credit growth by tying it to the growth in deposits. The Korean supervisory authority announced in December 2009 that it would reintroduce the loan-to-deposit ratio

regulation that had been scrapped in November 1998 as a part of the government deregulation efforts. According to the regulation, the ratio of Korean won denominated loans to won-denominated deposits should fall below 100% by 2013. The rationale for this policy was to restrict loan growth, by tying the growth of lending to the deposit base.

Since the deposit base constitutes the baseline, the definition of what qualifies as deposits has strict guidelines. For instance, negotiable certificates of deposit (CDs) are not included in the measure of deposits in the denominator in computing the ratio. The requirement to meet the 100% ceiling was set for the end of 2013, but the banks anticipated the eventual cap and began reducing their loan-to-value ratios in anticipation of the implementation of the cap.

However, one potential weakness of the regulation is that the rule does not apply to the Korean branches of foreign banks. Since foreign bank branches supply a substantial amount of foreign exchange denominated lending to Korean banks and firms, the exemption of foreign bank branches leaves a gap in the regulation. However, this gap would not have been easily filled within the framework of a loan-to-deposit cap, since foreign bank branches, by their nature, rely mostly on funding from headquarters or from wholesale funding, rather than local deposit funding.

For domestic banks, the loan to deposit ratio cap has two effects. First, it restrains excessive asset growth by tying loan growth to the growth in deposit funding. Second, there is also the direct effect on the growth of non-core liabilities, and hence on the build-up of vulnerabilities that come from the liabilities side of the balance sheet. In this respect, there are similarities between the loan to deposit cap and the levy on non-core liabilities, to be discussed below.

Indeed, at the theoretical level, the loan-to-deposit cap can be seen as a special case of a non-core liabilities levy (to be discussed below) where the tax rate is kinked, changing from zero to infinity at the threshold point. However, the comparison with the non-core liabilities levy is more difficult due to the fact that the loan to deposit cap only applies to loans, not total assets or total exposures (including off balance sheet exposures).

3.3 Liabilities Side Tools

Liabilities side tools address the build-up of vulnerabilities to liquidity and currency mismatches and the underpricing of risk on global capital markets. A levy on the non-core liabilities of banks

acts to mitigate the build-up of systemic risks through currency or maturity mismatches. The levy works by counteracting the distortions to global funding conditions and the “supply push” of funding by the global banks.

3.3.1 Levy on non-core liabilities

As already discussed in earlier sections of this report, the stock of non-core liabilities reflects the stage of the financial cycle and the extent of the underpricing of risk in the financial system. A levy or tax on the non-core liabilities can serve to mitigate pricing distortions that lead to excessive asset growth. The Financial Stability Contribution (FSC) recommended by the IMF in its report (IMF, 2010) on the bank levy to the G20 leaders in June 2010, is an example of such a corrective tax.

The levy on non-core liabilities has several features that impact overall financial stability. First, the base of the levy itself varies over the financial cycle. The levy bites hardest during the boom when non-core liabilities are large, so that the levy has the properties of an automatic stabilizer even if the tax rate itself remains constant over time. Given the well-known political economy challenges to the exercise of discretion by regulators, the automatic stabilizer feature of the levy may have important advantages.

Second, the levy on non-core liabilities addresses financial vulnerability while leaving the essential functioning of the financial system in channeling core funding from savers to borrowers unaffected. By targeting only non-core liabilities, the levy addresses externalities associated with excessive asset growth and systemic risk arising from interconnectedness of banks. In other words, the levy addresses the “bubbly” element of banking sector liabilities, rather than the core liabilities of the banking system.

Third, the targeting of non-core liabilities can be expected to address the vulnerability of emerging economies with open capital accounts to sudden reversals in capital flows due to deleveraging by banks. Indeed, for many emerging economies, the levy on non-core liabilities could be aimed more narrowly at the foreign currency denominated liabilities only. Shin (2011) discusses some of the potential advantages of a levy on non-core liabilities of this sort.

The revenue raised by the levy is a secondary issue. The main purpose of the levy is to align incentives. A good analogy is with the Congestion Charge used to control car traffic into central

London. Under this charge, car drivers pay a daily fee of 8 pounds to drive into central London. The main purpose of the charge is to discourage drivers from bringing their cars into central London, thereby alleviating the externalities associated with traffic congestion. In the same way, the non-core liabilities bank levy should be seen primarily as a tool for aligning the incentives of banks closer to the social optimum. The revenue raised by the levy would also be of benefit, perhaps for a market stabilization fund, but the revenue is a secondary issue.

In December 2010, Korea announced that it would introduce a *Macroprudential Levy* aimed at the foreign exchange-denominated liabilities of banks—both domestic banks and the branches of foreign banks. The proposal passed the legislative process in April 2011, and came into effect in August 2011.

The rate for the Korean levy has been set at 20 basis points for short-term FX denominated liabilities of up to one year, falling to 5 basis points for long-term liabilities exceeding five years. The proceeds from the levy will be held in a special account of the pre-existing Exchange Stabilization Account, managed by the finance ministry. The proceeds may be used as part of the official foreign exchange reserves.

There is a key difference between Korea's macroprudential levy and the outwardly similar levy introduced by the UK. In the UK's case, the revenue goes into the general fiscal account of the government, and hence can be regarded as a revenue raising measure. In contrast, the Korean levy has its revenue ring-fenced for specific use in financial stabilization.

3.3.2 Unremunerated reserve requirements

Perhaps the best-known traditional form of capital control has been unremunerated reserve requirements (URR), where the central bank requires importers of capital to deposit a certain fraction at the central bank. The prevalence of the URR is owed, in large part, to the fact that the central bank has been in charge both of prudential policy and also of macroeconomic management, and the central bank normally has had discretion to use URR policies without going through the legislative procedures associated with other forms of capital controls, such as levies and taxes.

The recent IMF staff discussion note (Ostry and others, 2011) has a comprehensive discussion of the experience of countries in

their use of URRs. Most central banks impose some type of reserve requirement for deposits, especially when the deposits are under government sponsored deposit insurance. The rationale in such cases for the reserve requirement is as an implicit insurance premium to be paid by the bank in return for the deposit insurance.

The macroprudential motivation for URR is to impose an implicit tax on those components of financial intermediary liabilities other than insured deposits that are likely to impose negative spillover effects. The introduction of a reserve requirement for the non-deposit liabilities of banks would raise the cost of non-deposit funding for banks, and thereby restrain the rapid growth of such liabilities during booms. In this respect, the reserve requirement on non-deposit liabilities would have a similar effect on a tax or levy on such liabilities, to be discussed below.

Some recent examples of the use of URR are discussed in Ostry and others (2011, p. 28). Chile set up a URR in 1991 at a 20% rate, with varying length depending on the maturity of the balance sheet item. The rate was subsequently increased to 30% and the deposit was set at one year, regardless of the maturity. However, the URR rate was reduced to zero in 1998.

Colombia set up a 40% URR in 2007, where withdrawals within six months were met with a heavy penalty. The rate was increased to 50% in May 2008. Also, to prevent circumvention via the classification of some flows as FDI, a two-year minimum stay requirement was implemented for inward FDI.

Although the URR is an implicit tax on a balance sheet item, the implied tax rate itself will vary with the opportunity cost of funds, and hence on the prevailing interest rate. The variability of the implicit tax rate necessitates some adjustment of the reserve rates, and the requirements will need to be raised to a high level when interest rates are low. This is potentially one disadvantage of the URR relative to other measures.

Another issue is the challenges of managing the central bank's balance sheet as a consequence of URRs. The reserves would have to be held on the central bank's balance sheet as a liability, with implications for the fluctuations in the money supply in line with the private sector's use of non-deposit liabilities, and the selection of counterpart assets on the central bank's balance sheet.

Although not central, there are also differences in the revenue implications between the reserve requirement, and a levy or tax. The reserve requirement would raise revenue to the extent that the

net income on the assets held by the central bank that is funded by the reserves would be positive. Hence, the bigger the interest spread between the asset and liability, the larger would be the income.

There is one advantage of the reserve requirement that is not shared by the levy, which is that the banks would have access to a liquid asset in case there is liquidity shortage or a run in the financial market. In this respect, the reserve requirement would have some of the features of the Basel III liquidity requirement on banks (BCBS, 2010).

However, a disadvantage of the reserve requirement is that it only applies to banks, rather than the wider group of financial institutions that use non-core liabilities. When faced with the possibility of arbitrage, or with structural changes that shift intermediation activity from banks to the market-based financial intermediaries, the reserve requirement would be less effective.

3.3.3 Relative merits of URR versus levies/taxes

The long preparation period needed for the macroprudential levy in Korea offers useful lessons on the relative merits of unremunerated reserve requirements, and levies or taxes. The legislative process required to implement a levy could entail considerable delays in the introduction and effectiveness of the policy. In the case of Korea, the initial discussions concerning the levy began in February 2010, but the eventual announcement of the implementation followed in December 2010. The legislative hurdles were cleared in April 2011, for implementation in August 2011. The whole process took 18 months, illustrating the challenges of setting up a new system.

When the external environment is changing rapidly, such long delays make the new introduction of a levy cumbersome and impractical as the first line of defense. Nevertheless, as in Korea's case, alternative measures that rely on existing legislation or other temporary measures can be used in the interim until the longer-term policy measures come into force.

In practice, the choice between URR, and levies or taxes is driven by practicality or reasons of administrative expediency, rather than on matters of principle. Typically, the central bank is the best-established policy institution that has direct contact with the financial markets and institutions. The long established status of the central banks in most countries explains why URRs have been more prevalent than levies or taxes.

There are, however, exceptions to this rule. In the case of Brazil, the *inflow tax* (IOF) was introduced some time ago (in 1993), and the legislation has been in effect since. Although the tax rate has been set a zero during times when the tax was not implemented, the infrastructure has been available for “dusting off” as circumstances have demanded.

Unlike a tax, a URR can usually be removed (or set to zero) more easily because the budget is not directly reliant on its revenues. For a similar reason, the macroprudential levy set by Korea has been designed so that the revenue does not have any budgetary implications, precisely in order to forestall potential political economy concerns.

3.4. Capital Controls

We conclude the paper by examining the relationship between macroprudential policies and other macro stabilization policies, including capital controls.

To the extent that the external environment in the global banking system is a key determinant of the vulnerability of the economy to financial excesses, considerations of macroprudential policies cannot easily be separated from the currently active debate on the merits of capital controls. The IMF has recently suggested the more neutral term “capital flow management” (CFM) policies (IMF, 2011), rather than the more emotive term “capital controls,” reflecting the more receptive attitude by the IMF to the imposition of capital controls.

Indeed, some macroprudential tools have many similar attributes to the tools used in capital controls. For this reason, the IMF has suggested a classification of policies along the capital flow management (IMF, 2011, p. 41). The suggested three-part taxonomy is as follows.

- **Prudential tools.** These encompass existing or new tools of prudential regulation that have, primarily, a domestic focus, and are not aimed primarily at correcting capital flow distortions. Examples include LTV rules, caps on the loan to deposit ratio, leverage caps, etc.
- **Currency-based tools.** These tools are prudential measures that address vulnerabilities that originate from distortions in the external environment such as global liquidity conditions, but which restrict activity or impose costs based on currency distinctions rather than on the residency of the investor. Examples include the levy on short-term foreign exchange

denominated liabilities of the banking sector implemented by Korea (the “macroprudential levy”).

- **Residency-based tools.** These are the traditional capital control (or “CFM”) tools that restrict activity or impose costs based on the residence of the investor. Examples include administrative restrictions on ownership, and taxes on portfolio inflows (IOF) currently being imposed by Brazil.

Capital controls raise a complex set of issues concerning their ultimate objectives—that is whether the objective is to hold down the exchange rate, or to limit the total volume of inflows in order to slow down the appreciation of the exchange rate. These issues merit a separate discussion, and will not concern us here. In this report, we will focus exclusively on the financial stability impact of macroprudential policies.

Capital controls have two broad rationales. The first as a macroeconomic policy tool aimed at leaning against the appreciation of the exchange rate. The second as a prudential tool, used for financial stability objectives. This report will not have much to say about the first objective. The IMF’s paper from its Strategy, Policy and Review Department discusses the variety of capital control tools and their rationale (IMF, 2011).

The distinguishing feature of capital control tools is that they discriminate on the basis of residence of the investor—that is whether the investor is domestic or foreign. The tools include inflow taxes such as Brazil’s IOF, as well as administrative measures that restrict banning certain activities, or investments that foreign investors can hold.

Although capital controls have been employed in order to affect the pace of exchange rate appreciation, the evidence on their effectiveness remains controversial. However, there is much better evidence on the financial stability implications of capital controls.

Regarding the financial stability objective, Ostry and others (2011) note that there is a strong empirical association between capital controls on one hand and less severe forms of credit booms and FX borrowing on the other (Ostry and others, 2011, p. 21). In reference to the recent global financial crisis, the authors regard this as a natural experiment for the effectiveness of capital controls, and note that the evidence is “suggestive of greater growth resilience in countries that had either capital controls (especially on debt liabilities) or prudential measures in place in the years prior to the crisis” (Ostry and others, 2011, p. 23). There are also important

implications for monetary policy autonomy. De Gregorio, Edwards and Valdés (2000) find that capital controls allowed Chile's Central Bank to target a higher domestic interest rate over a period of 6 to 12 months.

The likely channel, through which capital controls have their financial stability effects, is through their effect on the *composition* of capital flows, rather than the total amount. De Gregorio, Edwards and Valdés (2000) and Cárdenas and Barrera (1997) show that capital controls are likely to have tilted the composition of inflows away from short-term claims and debt claims, toward longer-term claims that have more benign financial stability implications. The survey paper by Magud, Reinhart and Rogoff (2011) conducts a "meta-analysis" of the existing survey literature on the effects of capital controls. Their results are based on a meta-analysis of 37 empirical studies and the main findings are four-fold concerning the effectiveness of capital controls on inflows. They (i) make monetary policy more independent, (ii) alter the composition of capital flows, and (iii) reduce real exchange rate pressures (although the evidence on the latter is more controversial). However, they (iv) do not reduce the volume of net flows (and hence the current-account balance).

To the extent that capital controls have an effect on the composition of capital flows and the likely pace of currency appreciation that give some additional autonomy to monetary policy, both features appear to point to some role of capital controls within the broader macroprudential policy framework.

4. CONCLUDING REMARKS

In this paper, we have given an overview of the policy options that can complement traditional tools of bank regulation and monetary policy in reining in the excesses in the financial system. Macroprudential policies aim to lean against excessive asset growth during booms, and thereby achieve more sustainable long-term loan growth. The mirror image of moderating asset growth is the mitigation of vulnerabilities on the liabilities side.

The policy debate on macroprudential policies in the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) has taken place with the focus largely on the developed financial systems that were at the eye of the storm in the recent financial crisis of 2007-9. To the extent that the current global

conjuncture with permissive global liquidity conditions is driven by expansive monetary policies pursued by advanced economy central banks, macroprudential policies that are aimed at achieving financial stability have many points of contact with capital control tools, or using the more neutral terminology currently in fashion, the capital flow management (CFM) tools.

Capital flow management tools often have broader macro objectives, such as leaning against the overly-rapid appreciation of the domestic currency; the exact dividing line between tools for financial stability and tools for macroeconomic management can be somewhat fuzzy. Although the study of macroprudential policy frameworks is in its infancy, there is a quickly accumulating body of work on the subject. Based on the existing literature and recent insights, this paper has provided an analytical framework regarding the motivations for, and effects of, macroprudential rules on financial institutions to consider a range of policy proposals as to their applicability in general.

REFERENCES

- Adrian, T. and H.S. Shin. 2008. "Procyclical Leverage and Value-at-Risk." *Federal Reserve Bank of New York Staff Reports 338* http://www.newyorkfed.org/research/staff_reports/sr338.html.
- . 2010. "Liquidity and Leverage." *Journal of Financial Intermediation* 19(3): 418–437.
- Assenmacher-Wesche, K. and S. Gerlach. 2010. "Financial Structure and the Impact of Monetary Policy on Property Prices." Working Paper, Goethe University, Frankfurt, [http://www.stefangerlach.com/Asset%20prices%20\(21%20Apr%202010\).pdf](http://www.stefangerlach.com/Asset%20prices%20(21%20Apr%202010).pdf).
- Bank for International Settlements. 2009. "Guide to the International Financial Statistics." <http://www.bis.org/statistics/intfinstatsguide.pdf>.
- . 2010. "Funding Patterns and Liquidity Management of Internationally Active Banks." CGFS Paper 39, May 2010, <http://www.bis.org/publ/cgfs39.htm>.
- Bank of England. 2009. "The Role of Macroprudential Policy: A Discussion Paper." <http://www.bankofengland.co.uk/publications/other/financialstability/roleofmacroprudentialpolicy091121.pdf>.
- Basel Committee on Banking Supervision. (BCBS) 2009. "Strengthening the Resilience of the Banking Sector." December 2009 <http://www.bis.org/publ/bcbs164.pdf>.
- . 2010. "International Regulatory Framework for Banks (Basel III)." *Bank for International Settlements*, <http://www.bis.org/bcbs/basel3.htm>.
- Borio, C. and P. Lowe. 2002. "Asset Prices, Financial and Monetary Stability: Exploring the Nexus." BIS Working Paper 114 (Basel: Bank for International Settlements, July).
- . 2004. "Securing Sustainable Price Stability: Should Credit Come Back from the Wilderness?" BIS Working Paper 157.
- Brunnermeier, M., A. Crockett, C. Goodhart, A. Persaud, and H.S. Shin. 2009. "Geneva Report on the World Economy 11: The Fundamental Principles of Financial Regulation."
- Bruno, V. and H.S. Shin. 2011. "Capital Flows, Cross-Border Banking and Global Liquidity." Working Paper http://www.princeton.edu/~hsshin/www/capital_flows_global_liquidity.pdf.
- Cárdenas, M. and F. Barrera. 1997. "On the Effectiveness of Capital Controls: The Experience of Colombia During the 1990s." *Journal of Development Economics* 54(1): 27–57.

- Crockett, A. 2000. "Marrying the Micro- and Macro-Prudential Dimensions of Financial Stability." Remarks before the Eleventh International Conference of Banking Supervisors, Basel, 20–21 September. <http://www.bis.org/speeches/sp000921.htm>.
- De Gregorio, J., S. Edwards, and R. Valdés. 2000. "Controls on Capital Inflows: Do They Work?" *Journal of Development Economics* 63(1): 59–83.
- Fernández, S., J. Pagés, and J. Saurina. 2000. "Credit Growth, Problem Loans and Credit Risk Provisioning in Spain." Bank of Spain Working Paper 18, <http://www.bde.es/informes/be/docs/dt0018e.pdf>.
- Gurley, J.G. and E.S. Shaw. *Money in a Theory of Finance*. Brookings Institution, Washington, D.C., 1960.
- Hahm, J., F.S. Mishkin, H.S. Shin, and K. Shin. 2010. "Macroprudential Policies and the Role of the Central Bank." Study commissioned by the Bank of Korea.
- Hahm, J., H.S. Shin, and K. Shin. 2011. "Non-Core Bank Liabilities and Financial Vulnerability." Working Paper <http://www.princeton.edu/~hsshin/www/noncore.pdf>.
- International Monetary Fund. 2010. "A Fair and Substantial Contribution by the Financial Sector." Report by the IMF to the G20, June 2010 <http://www.imf.org/external/np/g20/pdf/062710b.pdf>.
- . 2011. "Recent Experiences in Managing Capital Inflows – Cross-Cutting Themes and Possible Policy Frameworks." Strategy, Policy and Review Department, February 2011.
- Kashyap, A. and J. Stein. 2004. "Cyclical implications of the Basel II Capital Standards." *Federal Reserve Bank of Chicago Economic Perspectives* 28(1).
- Magud, N., C.M. Reinhart, and K.S. Rogoff. 2011. "Capital Controls: Myth and Reality—A Portfolio Balance Approach." NBER Working Paper 16805, National Bureau of Economic Research.
- McGuire, P. and G. von Peter. 2009. "The US Dollar Shortage in Global Banking." *BIS Quarterly Review*, March 2009, Bank for International Settlements.
- Morris, S. and H. S. Shin. 2008. "Financial Regulation in a System Context." *Brookings Papers on Economic Activity*, Fall 2008, 229–274.
- Ostry, J. D., A. Ghosh, K. Habermeier, L. Laeven, M. Chamon, M.S. Qureshi, and A. Kokenyne. 2011. "Capital Inflows: The Role of Controls." IMF Staff Discussion Note 10/06.

- Saurina, J. 2009. "Dynamic Provisioning: Experience of Spain." *World Bank Policy Brief* 7, 2009, <http://rru.worldbank.org/documents/CrisisResponse/Note7.pdf>.
- Shin, H.S. 2010a. *Risk and Liquidity*, 2008 Clarendon Lectures in Finance, Oxford University Press.
- . 2010b. "Macroprudential Policies Beyond Basel III." Policy Memo, <http://www.princeton.edu/~hsshin/www/MacroprudentialMemo.pdf>.
- . 2011. "Global Banking Glut and Loan Risk Premium." 2011 Mundell-Fleming Lecture, http://www.princeton.edu/~hsshin/www/mundell_fleming_lecture.pdf.
- Shin, H.S. and K. Shin. 2010. "Procyclicality and Monetary Aggregates." NBER Discussion Paper 16836, <http://www.nber.org/papers/w16836>.