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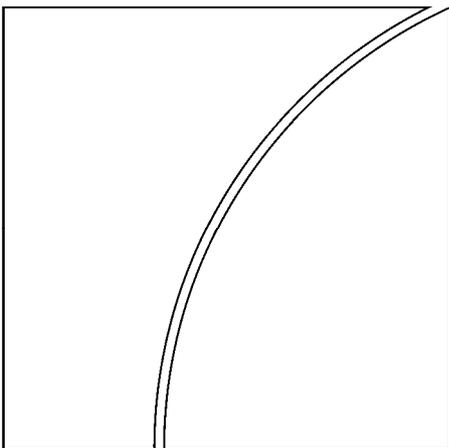
No 304

# Financial intermediation and the post-crisis financial system

by Hyun Song Shin

Monetary and Economic Department

March 2010



JEL classification: E51; G20; G21

Keywords: leverage; financial intermediation chains, financial stability

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CH-4002 Basel, Switzerland

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ISSN 1020-0959 (print)

ISBN 1682-7678 (online)

## Foreword

On 25–26 June 2009, the BIS held its Eighth Annual Conference on “Financial system and macroeconomic resilience: revisited” in Basel, Switzerland. The event brought together senior representatives of central banks and academic institutions who exchanged views on this topic. The forthcoming BIS Paper contains the opening address of Stephen Cecchetti (Economic Adviser, BIS) and the contributions of the policy panel on “Lessons learned from the financial crisis”. The participants in the policy panel discussion, chaired by Jaime Caruana (General Manager, BIS), were William Dudley (Federal Reserve Bank of New York), Masaaki Shirakawa (Bank of Japan) and Nout Wellink (The Netherlands Bank). The papers presented at the conference and the discussants’ comments are released as BIS Working Papers 301 to 306.



# Conference programme

## Thursday 25 June

- 09.00            Opening remarks            Stephen Cecchetti (BIS)
- 09.15            **Session 1: Towards market completeness?**  
Paper title:            The Failure Mechanics of Dealer Banks  
Chair:                 Muhammad Al-Jasser (Saudi Arabian Monetary Agency)  
Author:                Darrell Duffie (Graduate School of Business, Stanford University)  
Discussants:        Martin Hellwig (Max Planck Institute for Research on Collective Goods)  
                              Philipp Hildebrand (Swiss National Bank)
- 10.30            Coffee Break
- 10.45            **Session 2: Accounting and financial system behaviour**  
Paper title:            Accounting Alchemy  
Chair:                 Miguel Fernández Ordóñez (Bank of Spain)  
Author:                Robert Verrecchia (Wharton School, University of Pennsylvania)  
Discussants:        Mary Barth (Graduate School of Business, Stanford University)  
                              Jean-Pierre Landau (Banque de France)
- 12.00            Lunch
- 13.30            **Session 3: Liquidity**  
Paper title:            Illiquidity and All Its Friends  
Chair:                 Stanley Fischer (Bank of Israel)  
Author:                Jean Tirole (Institut d'Economie Industrielle)  
Discussant:          Franklin Allen (Wharton School, University of Pennsylvania)
- 14.45            Coffee Break
- 15.00            **Session 4: The future of regulation**  
Paper title:            Financial Intermediation and the Post-Crisis Financial System  
Chair:                 Lucas Papademos (European Central Bank)  
Author:                Hyun Shin (Princeton University)  
Discussants:        Donald Kohn (Federal Reserve Board)  
                              José Viñals (International Monetary Fund)

- 16.15 Coffee Break
- 16.30 **Session 5: Role of government in crisis management**  
 Paper title: Fear of fire sales and the credit freeze  
 Chair: Guillermo Ortiz (Bank of Mexico)  
 Presenting author: Raghuram Rajan (Graduate School of Business, University of Chicago)  
 Discussants: Bengt Holmstrom (Massachusetts Institute of Technology)  
 Jacob A Frenkel (Group of Thirty (G30))
- 19.00 Dinner

## Friday 26 June

- 09.00 **Session 6: Panel discussion: Lessons learned from the financial crisis**  
 Chair: Jaime Caruana (BIS)  
 Panellists: William Dudley (Federal Reserve Bank of New York)  
 Masaaki Shirakawa (Bank of Japan)  
 Nout Wellink (De Nederlandsche Bank)
- 10.30 Coffee Break
- 10.45 **Session 7: Household decisions, financial sector and the macroeconomy**  
 Paper title: Household Decisions, Credit Markets and the Macroeconomy: Implications for the Design of Central Bank Models  
 Chair: Duvvuri Subbarao (Reserve Bank of India)  
 Author: John Muellbauer (Nuffield College, Oxford University)  
 Discussant: Alan Bollard (Reserve Bank of New Zealand)

# Financial intermediation and the post-crisis financial system<sup>1</sup>

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## Abstract

Securitization was meant to disperse credit risk to those who were better able to bear it. In practice, securitization appears to have concentrated the risks in the financial intermediary sector itself. This paper outlines an accounting framework for the financial system for assessing the impact of securitization on financial stability. If securitization leads to the lengthening of intermediation chains, then risks becomes concentrated in the intermediary sector with damaging consequences for financial stability. Covered bonds are one form of securitization that do not fall foul of this principle. I discuss the role of countercyclical capital requirements and the Spanish-style statistical provisioning in mitigating the harmful effects of lengthening intermediation chains.

JEL: E51; G20; G21

Keywords: leverage; financial intermediation chains, financial stability

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<sup>1</sup> This paper was presented at the 8th BIS Annual Conference, June 25-26, 2009. I am grateful to Tobias Adrian, Markus Brunnermeier, Martin Hellwig and Stephen Morris for discussions during the preparation of this paper, and to the discussants Don Kohn and José Viñals.



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Figure 1  
**Subprime exposures by type of institution**

	Total reported sub-prime exposure (US\$bn)	Percent of reported exposure
Investment Banks	75	5%
Commercial Banks	418	31%
GSEs	112	8%
Hedge Funds	291	21%
Insurance Companies	319	23%
Finance Companies	95	7%
Mutual and Pension Funds	57	4%
Leveraged Sector	896	66%
Unleveraged Sector	472	34%
Total	1,368	100%

Source: Greenlaw et al (2008).

## 1. Introduction

The current financial crisis has the distinction of being the first post-securitization crisis in which banking and capital market developments have been closely intertwined. Historically, banks have always reacted to changes in the external environment, expanding and contracting lending in reaction to shifts in economic conditions. However, in a market-based financial system built on securitization, banking and capital market developments are inseparable, and the current crisis is a live illustration of the potency of the interaction between the two.

Securitization was meant to disperse credit risk to those who were better able to bear it, but in the financial crisis the risks appear to have been concentrated in the financial intermediary sector itself, rather than with the final investors. To understand the true role played by securitization in the financial crisis, we need to dispose of two pieces of received wisdom concerning securitization - one old and one new. The old view, now discredited, emphasized the positive role played by securitization in dispersing credit risk, thereby enhancing the resilience of the financial system to defaults by borrowers.

But having disposed of this old conventional wisdom, the fashion now is to replace it with a new one that emphasizes the chain of unscrupulous operators who passed on bad loans to the greater fool next in the chain. We could dub this new fashionable view the “hot potato” hypothesis, since the bad loan is like a hot potato passed down the chain. The idea is attractively simple, and there is a convenient villain to blame, and so has figured in countless speeches given by central bankers and politicians on the causes of the subprime crisis.

But the new conventional wisdom is just as flawed as the old one. Not only does it fall foul of the fact that securitization worked well for thirty years before the subprime crisis, it fails to distinguish between *selling* a bad loan down the chain and *issuing liabilities* backed by bad loans. By selling a bad loan, you get rid of the bad loan and it's someone else's problem. In this sense, the hot potato is passed down the chain to the greater fool next in the chain. However, the second action has a different consequence. By issuing liabilities against bad loans, you do not get rid of the bad loan. The hot potato is sitting on your balance sheet or on the books of the special purpose vehicles that you are sponsoring. Thus, far from passing the hot potato down the chain to the greater fool next in the chain, you end up keeping the hot potato. In effect, the large financial intermediaries are the last in the chain. While the investors who buy your

Figure 2  
Short intermediation chain



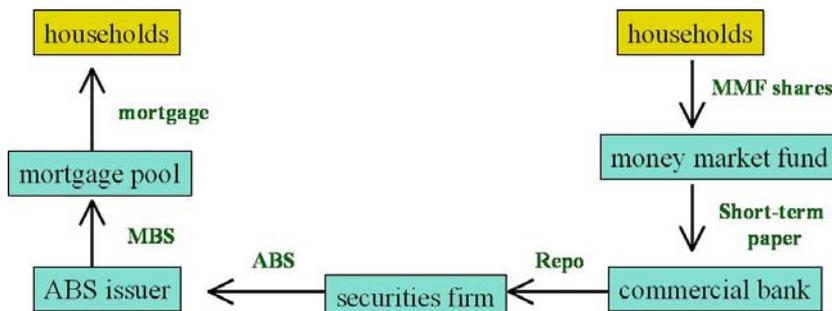
securities will end up losing money, the financial intermediaries that have issued the securities are in danger of larger losses. Since the intermediaries are leveraged, they are in danger of having their equity wiped out, as some have found to their cost.

Indeed, Greenlaw et al (2008) report that of the approximately 1.4 trillion dollar total exposure to subprime mortgages, around half of the potential losses were borne by US leveraged financial institutions, such as commercial banks, securities firms and hedge funds. When foreign leveraged institutions are included, the total exposure of leveraged financial institutions rises to two thirds (see Figure 1). Far from passing on the bad loans to the greater fool next in the chain, the most sophisticated financial institutions amassed the largest exposures to the bad assets.

A characteristic feature of financial intermediation based on the US-style securitization system is the long chains financial intermediaries involved in channeling funds from the ultimate creditors to the ultimate borrowers. The difference can be illustrated in figures 2 and 3. Figure 2, depicts a traditional deposit-taking bank that collects deposits and holds mortgage assets against household borrowers. Until around 1990, the bulk of home mortgage assets in the United States were held by savings institutions and commercial banks (see Adrian and Shin (2008)).

In recent years, however, the proportion of home mortgages held in government sponsored enterprise (GSE) mortgage pools have become the dominant holders. The chain of financial intermediation has become correspondingly much longer and more heavily dependent on overall capital market conditions. Figure 3 illustrates one possible chain of lending relationships whereby credit flows from the ultimate creditors (household savers) to the ultimate debtors (households who obtain a mortgage to buy a house). In this illustration, the mortgage asset is held in a mortgage pool - a passive firm whose sole role is to hold mortgage assets and issue liabilities (mortgage-backed securities, MBSs) against those assets. The mortgage-backed securities might then be owned by an asset-backed security (ABS) issuer who pools and tranches the MBSs into another layer of claims, such as collateralized debt obligations (CDOs). Then, a securities firm (a Wall Street investment bank, say) might hold CDOs on their own books for their yield, but finances such assets by collateralized borrowing through repurchase agreements (repos) with a larger commercial bank. In turn, the commercial bank would fund its lending to the securities firm by issuing short term liabilities, such as financial commercial paper. Money market mutual funds would be natural buyers of such short-term paper, and ultimately

Figure 3  
Long intermediation chain



the money market fund would complete the circle, since household savers would own shares to these funds. Martin Hellwig (1994, 1995) has been one of the early voices to comment on the trend of lengthening intermediation chains and the possible consequences of such lengthening chains for financial stability.

Of course, the illustration in Figure 3 is a simple example of potentially much more complex and intertwined relationships. For instance, the same security could be used several times in repo lending as the lender turns round and pledges the same security as collateral to another lender (the practice known as “re-hypothecation”). In that case, the chain would be much longer and more involved. Nor does the illustration take account of off-balance sheet vehicles such as structured investment vehicles (SIVs) or ABCP conduits that the commercial bank might set up in order to finance the direct holding of CDOs and other asset-backed securities.

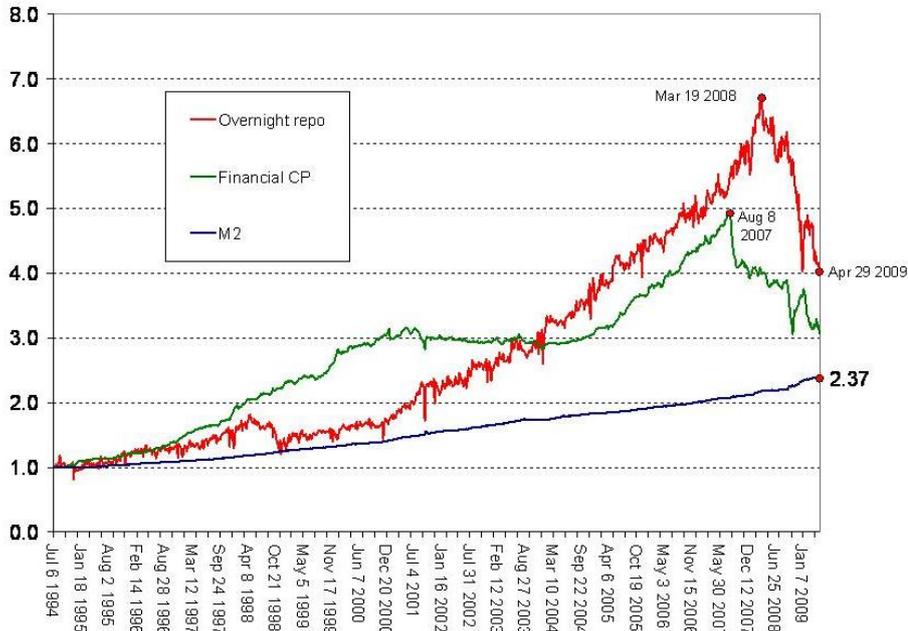
What is noticeable from the institutions involved in Figure 3 is that they were precisely those institutions that were at the sharp end of the financial crisis of 2007 and 2008. Subprime mortgages cropped up in this chain, and the failure of Bear Stearns and Lehman Brothers owed to problems in the smooth functioning of this chain. This realization begs the question of what advantages can be gained by such long intermediation chains.

One possible argument might be that securitization enables the dispersion of credit risk to those who can best bear losses. We have already commented on the apparent failure of this particular mechanism, but we will return to examine it more closely below. Leaving that to one side, another possible justification for long intermediation chains is that there is an inherent need for maturity transformation in the financial system because ultimate creditors demand short-term claims, and that the process of stringing together long lending relationships make it easier to perform the overall maturity transformation role.

There are well known arguments for the desirability of short-term debt for incentive reasons - in particular in disciplining managers. Calomiris and Kahn (1991) have argued that demand deposits for banking arose naturally as a response by the bank's owners and managers to commit not to engage in actions that dissipate the value of the assets, on pain of triggering a depositor run. Diamond and Rajan (2001) have developed this argument further, and have argued that the coordination problem inherent in a depositor run serves as a commitment device on the part of the depositors not to renegotiate in the face of opportunistic actions by the managers. When the bank has the right quantity of deposits outstanding, any attempt by the banker to extract a rent from depositors will be met by a run, which drives the banker's rents to zero. Foreseeing this, the banker will not attempt to extract rents. In a world of certainty, the bank maximizes the amount of credit it can offer by financing with a rigid and fragile deposit-only capital structure.

However, in both Calomiris and Kahn (1991) and Diamond and Rajan (2001), the focus is on traditional bank deposits, where the creditors are not financial intermediaries themselves. However, what is notable about the financial boom and bust cycle witnessed recently is that the largest fluctuations in ultra short-term debt has not been associated with the liabilities to retail depositors, but rather with the liabilities to other financial intermediaries. Adrian and Shin (2009) compare the stock of repurchase agreements of US primary dealers plus the stock of financial commercial paper expressed as a proportion of the M2 stock. M2 includes the bulk of retail deposits and holdings in money market mutual funds, and so is a good proxy for the total stock of liquid claims held by ultimate creditors against the financial intermediary sector as a whole. As recently as the early 1990s, repos and financial CP were only a quarter of the size of M2. However, the total rose rapidly reaching over 80% of M2 by the eve of the financial crisis in August 2007, only to collapse with the onset of the crisis.

**Figure 4**  
**Overnight repos, financial commercial paper and M2**  
(normalized to 1 on 6 July 1994)



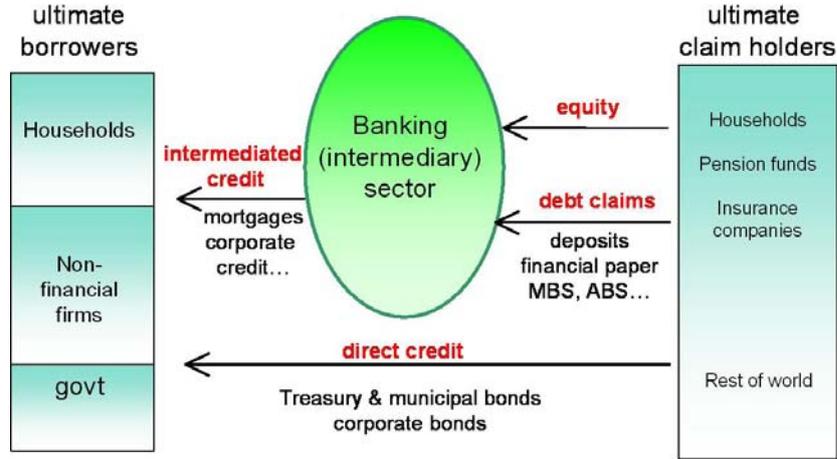
The ultra-short nature of the financial intermediary obligations to each other can be better seen when plotting the overnight repos component of the overall repo series. Figure 4 plots the size of the overnight repo stock, financial commercial paper and M2, normalized to be equal to 1 on July 6th, 1994 (the data on overnight repos are not available before that date). The stock of M2 has grown by a factor of around 2.4 since 1994, but the stock of overnight repos grew almost seven-fold up to March 2008. Brunnermeier (2009) has noted that the use of overnight repos became so prevalent that, at its peak, the Wall Street investment banks were rolling over a quarter of their balance sheets every night. What is evident from Figure 4 is that the rapid growth and subsequent collapse of the overnight repos cannot be easily explained by the demand for short-term liquid claims of retail depositors.

## 2. An accounting framework

Consider a stylized financial system for the allocation of credit in the economy depicted in Figure 5. The financial system channels savings from the lenders to ultimate borrowers. The ultimate lenders are households, either directly or indirectly through institutions such as pension funds, mutual funds and life insurance companies.

Some credit will be directly provided from the lender to the borrower. Treasury bonds or municipal bonds are a good example of such direct credit where the lender holds a direct claim on the borrower. However, the sizeable borrowing of the household sector - either mortgages or consumer debt - is almost always intermediated through the banking system, broadly defined. At the end of 2008, US household sector mortgage liabilities amounted to around \$10.6 trillion, and consumer debt accounts for another \$2.5 trillion.

Figure 5  
Stylized financial system for credit



The accounting framework presented here is based on the picture of credit flow given in Figure 5, and is drawn from Shin (2009). There are  $n$  financial intermediaries standing between the ultimate borrowers and the ultimate creditors. For convenience, we denote these intermediaries simply as “banks”.

Denote by  $y_i$  the claim held by bank  $i$  on the ultimate borrowers, such as household mortgages or consumer loans. For our purposes in this paper, it does not matter much whether  $y_i$  is in face values or market values, since the purpose of this paper is to outline the underlying accounting relationships within the financial system. However, in what follows, it is useful to interpret all quantities as being in market values, since the comparative statics take on additional richness due to valuation effects.<sup>2</sup>

As well as claims on the ultimate borrowers, the banks hold claims on each other. Denote by  $x_i$  the total value of the liabilities (other than its equity) of bank  $i$ , by  $x_{ij}$  the value of bank  $i$ 's liabilities held by bank  $j$  and by  $\pi_{ij}$  the share of bank  $i$ 's liabilities that are held by bank  $j$ . Denoting by  $e_i$  the value of equity of bank  $i$ , the balance sheet of bank  $i$  is

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

(1)

The balance sheet identity of bank  $i$  is:

$$y_i + \sum_j x_j \pi_{ji} = e_i + x_i \quad (2)$$

The left hand side is the value of assets and the right hand side is the sum of debt ( $x_i$ ) and equity ( $e_i$ ). The matrix of claims and obligations between banks can then be depicted as below.

<sup>2</sup> See Shin (2009) for more details on the relationship between book values and market values in an interconnected balance sheet network.

The  $(i, j)$ th entry in the table is the debt owed by bank  $i$  to bank  $j$ . Then, the  $i$ th row of the matrix can be summed to give the total value of debt of bank  $i$ , while the  $i$ th column of the matrix can be summed to give the total assets of bank  $i$ . We can give the index  $i + 1$  to the outside creditor sector (households, pension funds, mutual funds etc.), so that  $x_{i,n+1}$  denotes bank  $i$ 's liabilities to the outside claimholders. Deposits would be the prime example of a liability that a bank has directly to outside creditors.

	bank 1	bank 2	...	bank $n$	outside	debt
bank 1	0	$x_{12}$	...	$x_{1n}$	$x_{1,n+1}$	$x_1$
bank 2	$x_{21}$	0		$x_{2n}$	$x_{2,n+1}$	$x_2$
...	...	...	...	...	...	
bank $n$	$x_{n1}$	$x_{n2}$	...	0	$x_{n,n+1}$	$x_n$
end-user loans	$y_1$	$y_2$	...	$y_n$		
total assets	$a_1$	$a_2$		$a_n$		

From balance sheet identity (2), we can express the vector of debt values across the banks as follows, where  $\Pi$  is the  $n \times n$  matrix where the  $(i, j)$ th entry is  $\pi_{ij}$ .

$$[x_1, \dots, x_n] = [x_1, \dots, x_n] \begin{bmatrix} & & & \\ & \Pi & & \\ & & & \\ & & & \end{bmatrix} + [y_1, \dots, y_n] - [e_1, \dots, e_n] \quad (3)$$

or more succinctly as

$$x = x\Pi + y - e \quad (4)$$

Solving for  $y$ ,

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

Define the leverage of bank  $i$  as the ratio of the total value of assets to the value of its equity. Denote leverage by  $\lambda_i$ . That is,

$$\lambda_i \equiv \frac{a_i}{e_i} \quad (5)$$

Since  $x_i/e_i = \lambda_i - 1$ , we have  $x = e(\Lambda - I)$ , where  $\Lambda$  is the diagonal matrix whose  $i$ th diagonal entry is  $\lambda_i$ . Thus

$$y = e + e(\Lambda - I)(I - \Pi) \quad (6)$$

Thus, the profile of total lending by the  $n$  banks to the end-user borrowers depends on the interaction of three features of the financial system - the distribution of equity  $e$  in the banking

system, the profile of leverage  $\Lambda$  and the structure of the financial system given by  $\Pi$ . Total lending to end users is increasing in equity and in leverage, as one would expect. More subtle is the role of the financial system, as given by the matrix  $\Pi$ . Define the vector  $z$  as

$$z \equiv (I - \Pi) u \tag{7}$$

where

$$u \equiv \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix}$$

so that  $z_i = 1 - \sum_{j=1}^n \pi_{ij}$ . In other words,  $z_i$  is the proportion of bank  $i$ 's debt held by the outside claimholders - the sector  $n+1$ . Then, total lending to end-user borrowers  $\sum_i y_i$  can be obtained by post-multiplying equation (6) by  $u$  so that

$$\sum_{i=1}^n y_i = \sum_{i=1}^n e_i z_i (\lambda_i - 1) + \sum_{i=1}^n e_i \tag{8}$$

Equation (8) is the key balance sheet identity for the financial sector as a whole, where all the claims and obligations between banks have been netted out. The left hand side is the total lending to the end-user borrowers. The second term on the right hand side of (8) is the total equity of the banking system, and the first term is the total funding to the banking sector provided by the *outside* claimholders (note that the second term can be written as  $\sum_{i=1}^n x_i z_i$ ). Thus, from equation (8) we see the importance of the structure of the financial system for the supply of credit. Ultimately, credit supply to end-users must come either from the equity of the banking system, or the funding provided by non-banks. Greenlaw et al (2008) uses this framework to calibrate the aggregate consequences of banking sector lending contraction that results from the combination of capital losses and deleveraging from subprime losses.

The aggregate balance sheet identity of the financial intermediary sector given by (8) can be explained more informally as follows. Take the balance sheet of an individual bank, given by Figure 6. The bank has claims on ultimate borrowers (loans to firms and households), but it also has assets that are claims against other banks. On the liabilities side, the bank has obligations to outside creditors (such as retail depositors), but it also has obligations to other banks.

Figure 6  
Balance sheet of individual bank

Assets	Liabilities
Loans to firms, households	Liabilities to non-banks (e.g. deposits)
Claims on other banks	Liabilities to other banks
	Equity

**Individual bank**

Now, consider the aggregate balance sheet of the banking sector as a whole, where the assets are summed across individual banks and the liabilities are summed across the banks, also. Every liability that a bank has to another bank is an asset when viewed from the point of view of the lending bank. One asset cancels out another equal and opposite liability. In aggregate, all the claims and obligations across banks cancel out. Thus, in aggregate, the assets of the banking sector as a whole against other sectors of the economy consists of the lending to non-bank borrowers. This lending must be met by two sources - the total equity of the banking system, and the liabilities that banks have to lenders *outside* the banking system. Figure 7 illustrates.

Figure 7  
**Aggregate Balance Sheet of Banking Sector**

Assets	Liabilities
Total lending to ultimate borrowers (firms, households govt)	<div style="border: 1px solid green; padding: 5px; display: inline-block;"> <b>Total debt liabilities to non-banks</b> </div> Total equity

**Banking sector**

Equation 8 is a statement of the aggregate balance sheet identity. What is useful is the fact that equation 8 tells us how the leverage of the financial intermediary sector as a whole depends on the leverage of the individual institutions.

$$\sum_{i=1}^n y_i = \sum_{i=1}^n e_i z_i (\lambda_i - 1) + \sum_{i=1}^n e_i$$

The total debt liabilities of the banking sector to the household creditors can be expected to be sticky, and would be related to total household assets. Thus, the first term on the right hand side of equation (8) will be slow-moving, in line with shifts in the total household holding of debt claims on the banking sector. For the purposes of short-term comparative statics, we could treat it as a constant. If we treat the first term on the right hand side of equation (8) as a constant, we learn much about the impact of various shifts in the parameters on the configuration of the financial system. We now examine two scenarios.

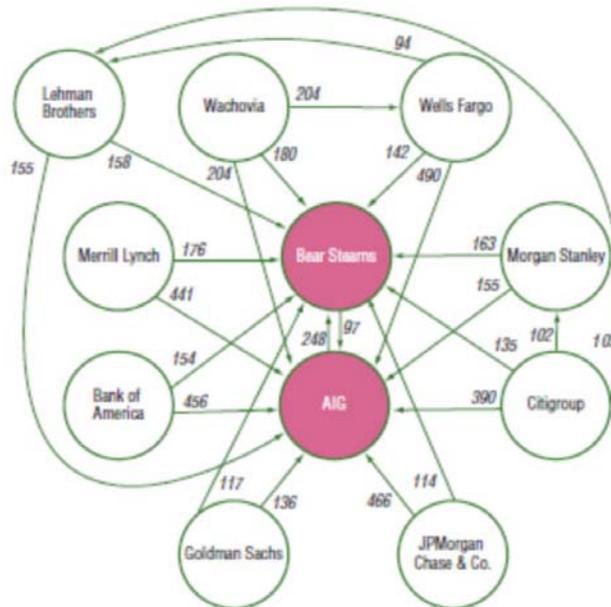
## 2.1 Boom scenario

Consider a boom scenario where the marked-to-market equity of the banks is healthy (that the profile of equity  $\{e_i\}$  is strong) and the decline in measured risks leads to an increase in leverage,  $\{\lambda_i\}$ . In order for the first term on the right hand side of equation (8) to remain constant, there must be an overall decline in  $\{z_i\}$ , the proportion of funding coming from outside claimholders. In other words, banks must lend more to each other in order to achieve their

desired risk-taking profile and leverage, given their strong capital position. In such a scenario, banks take on more of each others' debts and the intertwining of claims and liabilities become more far-reaching. The image is of an increasingly elaborate edifice built on the same narrow foundation, so that the structure becomes more and more precarious. The systemic risks therefore increase during the boom scenario.

Figure 8 is the map of CoVaR measures for the conditional Value at Risk for US financial institutions (conditional on distress of another institution) (Adrian and Brunnermeier (2009), IMF (2009)). Andy Haldane (2009) has recently highlighted the highly interconnected nature of financial institutions in the run-up to the financial crisis.

Figure 8  
US financial institutions' co-risk measure



Source: IMF global financial stability report, April 2009

Our accounting identity above shows why such closely interconnected balance sheets is a necessary feature of a boom scenario when banks have strong capital positions and measured risks are low. For any fixed pool of funding to be drawn from the household sector, any substantial increase in balance sheet size of the financial intermediaries can be achieved only by *borrowing and lending from each other*. The key variables are the  $\{z_i\}$ , which gives the proportion of funding obtained from outside the intermediary sector. In order to increase the profile of leverage  $\{\lambda_i\}$  within the intermediary sector, banks must lower the funding profile  $\{z_i\}$ , since they are competing for the same limited pool of outside funding. Banks can raise their risk exposure to their desired level only by borrowing and lending between themselves, since outside funding is inadequate to meet their growing needs.

An architectural analogy is appropriate. In order to build additional rooms into a house whose footprint is limited by shortage of land, the only way is to build upward - like a skyscraper in Manhattan. The lower is the funding profile  $\{z_i\}$ , the taller is the skyscraper. However, even this analogy is somewhat misleading in that the Manhattan skyscraper would be planned in advance and built as a coherent whole. An interconnected financial system that builds upward is much less coordinated, and hence is liable to result in greater unintended spillover effects. It would be as if additional floors are built on top of existing ones, where the architects of lower floors did not anticipate further building on top.<sup>3</sup>

Shortening of maturities would be a natural counterpart to the lengthening intermediation chains. In order for each link in the chain to be a profitable leveraged transaction, the funding leg of the transaction must be at a lower interest rate. When the yield curve is upward-sloping, this would entail funding with shorter and shorter maturities at each step in the chain. The prevalence of the overnight repo as the dominant funding choice for securities firms before the current crisis can be understood in this context. The use of ultra-short term debt is part and parcel of long intermediation chains.

The importance of the short-term interest rate in determining the size and fragility of the financial system can be seen from the above line of reasoning. A period of sustained short-term interest rates (with the assurance of continued low short rates by the central bank) is a highly favorable environment for the taking on of such short-term bets. Adrian and Shin (2008) shows that the Fed Funds rate is an important determinant of the growth of securities firms' balance sheets, which in turn has significant effects on the real economy. Thus, there is a monetary policy angle to the increasing length of intermediation chains.

## 2.2 Bust scenario

Now consider the reversal of the boom scenario whereby perceptions of heightened risk raise Value at Risk and induce deleveraging of the financial system, leading to lower  $\{\lambda_i\}$ . In addition, falls in asset prices and possible credit losses eat into the marked-to-market equity levels  $\{e_i\}$ . This is a double whammy for the financial system as a whole, since in order for the first term on the right hand side of equation (8) to stay roughly constant, there has to be substantial *increases* in  $\{z_i\}$ . The increase in  $z_i$  means that a greater proportion of the funding comes from outside claimholders - that is, the funding that banks had granted to each other must now be withdrawn. This is a classic run scenario where banks run on other banks. The runs on Northern Rock, Bear Stearns and Lehman Brothers are all instances of such a run.

The direct manifestation of a run of this type can be given a simpler depiction in the following two bank example, taken from Morris and Shin (2008). Bank 1 has borrowed from Bank 2. Bank 2 has other assets, as well as its loans to Bank 1. Suppose that Bank 2 suffers credit losses on these other loans, but that the creditworthiness of Bank 1 remains unchanged. The loss suffered by Bank 2 depletes its equity capital. In the face of such a shock, a prudent course of action by Bank 2 is to reduce its overall exposure, so that its asset book is trimmed to a size that can be carried comfortably with the smaller equity capital.

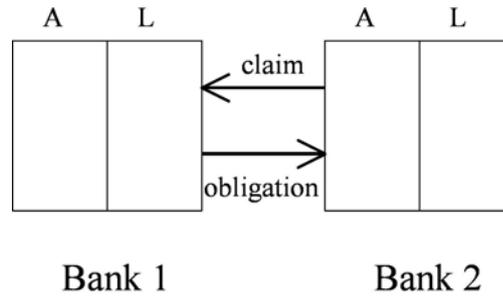
From the point of view of Bank 2, the imperative is to reduce its overall lending, including its lending to Bank 1. By reducing its lending, Bank 2 achieves its micro-prudential objective of reducing its risk exposure. However, from Bank 1's perspective, the reduction of lending by Bank 2 is a withdrawal of funding. Unless Bank 1 can find alternative sources of funding, it will have to reduce its own asset holdings, either by curtailing its lending, or by selling marketable assets.

In the case where we have the combination of (i) Bank 1 not having alternative sources of funding, (ii) the reduction in Bank 2's lending being severe, and (iii) Bank 1's assets being so illiquid that they can only be sold at fire sale prices, then the withdrawal of lending by Bank 2 will feel like a run from the point of view of Bank 1. In other words, a prudent shedding of exposures

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<sup>3</sup> Architecturally, the closest example would be the Sutyagin house in Archangel, Russia, reported in the Daily Telegraph of March 7th, 2007. The 13 floor 144 feet wooden structure is described as "a jumble of planking" and the "eighth wonder of the world". A Google image search for "Sutyagin House" yields dozens of photos of the structure.

Figure 9  
Financial Intermediary Run in the Bust Scenario



from the point of view of Bank 2 is a run from the point of view of Bank 1. Arguably, this type of run is one element of what happened to Northern Rock, Bear Stearns and Lehman Brothers.

### 3. Prescriptions

The prescriptions for moderating the fluctuations associated with the boom and busts scenarios can also be understood in terms of the aggregate balance sheet identity (8). We discuss three in particular - regulatory interventions, various forms of forward-looking provisioning, and the reform of the institutions involved in financial intermediation.

#### Approach 1: regulatory intervention

The first approach is to moderate the fluctuations in leverage and balance sheet size through capital regulation with an explicit countercyclical element, such as the countercyclical capital targets advocated in the recent Geneva Report (Brunnermeier et al. (2009)) and the Squam Lake Working Group's memo on capital requirements (Squam Lake Working Group (2009)). The leverage cap introduced in Switzerland recently (Hildebrand (2008)) can also be understood in this connection.

$$\sum_{i=1}^n y_i = \sum_{i=1}^n e_i z_i (\lambda_i - 1) + \sum_{i=1}^n e_i$$

Leverage caps or countercyclical capital targets aim at restraining the growth of leverage  $\{\lambda_i\}$  in boom times so that the corresponding bust phase of the financial cycle is less damaging, or can be avoided altogether. In the above expression, moderating the fluctuations in  $\{\lambda_i\}$  implies that the marked-to-market equity values  $\{e_i\}$  and the outside financing proportions  $\{z_i\}$  can also be kept within moderate bounds, so as to prevent the rapid build-up of cross-exposures which are then subsequently unwound in a disorderly way as runs against other banks.

A closely related set of proposals are those that address the *composition* of assets, rather than the capital ratio. The idea is to impose liquidity requirements on the banks so as to limit the externalities in the bust phase of the cycle. Cifuentes, Ferrucci and Shin (2004) is an early statement of the proposal, subsequently incorporated in the Bank of England's RAMSI framework for systemic risk.<sup>4</sup>

Morris and Shin (2008, 2009) describe the rationale for liquidity requirements and provides an analysis of the mechanisms invoked. The idea is to take those elements that are responsible for the vicious circle of distress and self-reinforcing runs and then harness them to create a *virtuous circle* of beliefs leading to a stable outcome. Liquidity requirements mandate a cushion of cash assets over some interval of time, such as requiring banks to maintain reserves at the central bank over some fixed maintenance period. Such liquidity requirements can moderate the externalities involved in a run by influencing the risks of spillovers across financial intermediaries. When a borrower bank has a high level of liquidity, then the withdrawal of funding by its creditor banks can be met (at least partly) by its liquid resources, which makes the debtor bank less likely to run on other banks. For creditor banks, there are two effects. First, knowing that the debtor bank is less vulnerable to runs reduces the incentive to run that arises purely from a coordination motive. In addition, when each creditor bank realizes that other creditor banks have higher liquidity levels, the coordination problem among the creditor banks becomes less sensitive to strategic risk - making them less jittery when faced with a run scenario. The more relaxed attitude of creditors and debtors are mutually reinforcing, just in the same way that distress and concerns about others' viability can be self-reinforcing. In this way, the same forces that lead to the vicious circle of run psychology can be harnessed and channeled to generate a *virtuous circle* of stability.

## Approach 2: Forward-looking provisioning

A second way to moderate fluctuations of the boom bust cycle is to operate directly on the equity  $\{e_i\}$  of the banks. The forward-looking statistical provisioning scheme that has operated in Spain is a good example of such a method. By imposing a provisioning charge when new loans are made, there is a corresponding diminution of the equity level of the bank making the loan. For any given desired leverage of the bank, a lower equity level means lower total assets, hence restraining the rapid growth of balance sheets.

$$\sum_{i=1}^n y_i = \sum_{i=1}^n e_i z_i (\lambda_i - 1) + \sum_{i=1}^n e_i$$

The Spanish pre-provisioning scheme highlights one of the important lessons in a boom<sup>5</sup>. Under a boom scenario, the problem is that there is *too much equity* in the banking system. There is overcapacity in the sense that the level of aggregate capital is too high. Capital is higher than is consistent with only prudent loans being made. Overcapacity leads to the chasing of yields and the lowering of credit standards. Elsewhere (Shin (2009)), I have sketched a mechanism for the emergence of subprime lending based on this mechanism. Expanding balance sheets are like an expanding balloon. Just as an expanding balloon needs air to fill the balloon, expanding balance sheets need new asset creation. But when all prime mortgage borrowers are already catered for, lending standards must be lowered in order to generate new assets. Hence, subprime lending emerges as a result of the urge to expand balance sheets.

In the Geneva Report, we discuss the merits of a variant of the Spanish pre-provisioning scheme called the Pigovian Tax. The idea is that rather than reducing equity through a provision, equity

<sup>4</sup> The Bank of England's RAMSI framework is described in the recent issue of the IMF's Global Financial Stability Report (2009, chapter 2).

<sup>5</sup> For a description of the Spanish pre-provisioning system, see the Bank of Spain working paper by Fernandez et al (2000).

can also be lowered in a boom through an explicit centralized tax. The tax has the potential to enhance efficiency of the overall financial system in the same way that a congestion charge would improve traffic in a city. By counteracting an existing inefficiency through a tax, one can counteract the harmful externality. Just as with a traffic congestion charge, the revenue raised in the tax is not an essential component of the scheme. However, if the revenue raised through the Pigovian Tax could be put into a separate bank resolution fund, then the scheme would not imply a net transfer away from the banking sector.

### Approach 3: Structural reform of intermediation

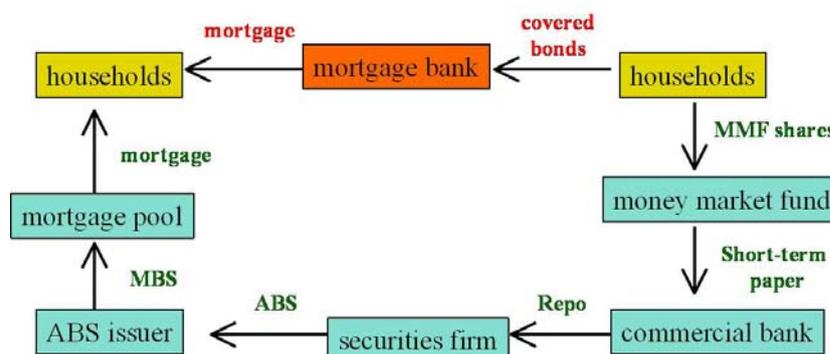
A third approach is more long term, and is aimed at influencing the market structure of the financial intermediary sector as a whole. The idea is to restrain the lengthening of intermediation chains, and encourage the formation of shorter intermediation chains.

$$\sum_{i=1}^n y_i = \sum_{i=1}^n e_i z_i (\lambda_i - 1) + \sum_{i=1}^n e_i$$

In terms of the aggregate balance sheet identity, the objective is to operate directly on the mode of financial intermediation so that the funding profile  $\{z_i\}$  is maintained at high levels, thereby limiting the number of intermediaries  $n$  and moderating the fluctuations in leverage and total assets. The idea is to induce a shortening of the financial intermediation chain by linking ultimate borrowers and ultimate lenders more directly.

One potential way to induce such shortening of the intermediation chain would be through the encouragement of the issuance of covered bonds – bonds issued against segregated assets on a bank’s balance sheet, with recourse against the issuing bank itself.

Figure 10  
Shortening the intermediation chain through covered bonds



The intermediation chain associated with a covered bond is short, since the bank holds mortgage claims against ultimate borrowers, and issues covered bonds that could be sold directly to households or to long-only institutions such as mutual funds or pension funds. The bonds offer longer duration that match the duration of the assets. The longer duration of the liabilities have two advantages. First, the duration matching between assets and liabilities means that the issuing bank does not engage in maturity transformation in funding. Rigorous application of marking to market makes less sense when loans are segregated to back such liabilities. In the Geneva Report, we have argued that the accounting treatment of such assets can take account

of what the banks are capable of holding, rather than simply appealing to their intentions, as is the rule under the current mark-to-market regime .

Second, the fact that liabilities have long duration means that the short-term funding that is prevalent in the long intermediation chains will be less likely to be employed provided that the covered bonds are held directly by households or by long-only institutions such as pension funds and mutual funds. The long duration of such securities would be a natural source of sought-after duration for pension funds who wish to match the long duration of their pension liabilities. Household savers would also find such products a good substitute for government bond funds. The shortening of the intermediation chain in this way will have important benefits in terms of mitigating the fluctuations in leverage and balance sheet size in the financial boom bust cycle.

Covered bonds have been a familiar feature of many European countries, especially in Denmark (with its mortgage bonds) and Germany (with its Pfandbriefe). But to date, over twenty countries in Europe have some form of covered bonds backed by laws that underpin their role in the financial system. Packer et al (2007) is a recent overview of the covered bond system, who report that as of mid-2007 the outstanding amount of covered bonds reached € 1.7 trillion.

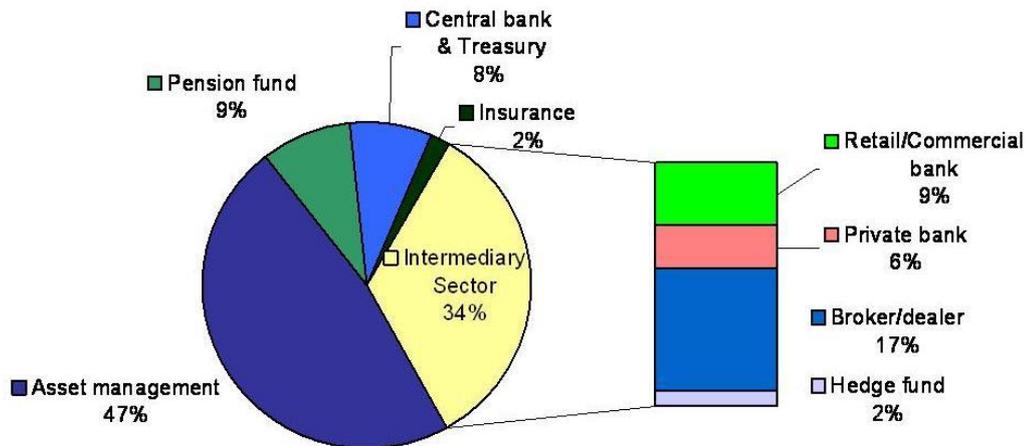
As already discussed, covered bonds are securities issued by a bank and backed by a dedicated, segregated group of loans known as a “cover pool”. The bondholders have two safeguards in their holding of covered bonds. First, the bonds are backed by the cover pool over which the bondholders have senior claims in case of bankruptcy. Second, because the covered bonds are the obligations of the issuing bank, the bondholders have recourse to the bank if the cover pool is insufficient to meet the bond obligations. In this second sense, covered bonds differ from the U.S.-style mortgage backed security, which are obligations of the special purpose vehicle - a passive company whose sole purpose is to hold assets and issue liabilities against those assets. The loans backing the covered bonds stay on the balance sheet of the bank, eliminating one step in the intermediation chain, and also guarding against potential incentive problems in the “originate to distribute” model of securitization in which the originating bank can sell the loan and take it off its balance sheet altogether.

The double protection offered by covered bonds distinguishes them both from senior unsecured debt and asset-backed securities (ABSs). In contrast to ABSs, the cover pool serves mainly as credit enhancement and not as a means to obtain exposure to the underlying assets. Furthermore, cover pools tend to be dynamic in the sense that issuers are allowed to replace assets that have either lost some quality or have been repaid early. These features imply that covered bonds are seen not so much as an instrument to obtain exposure to credit risk, but rather as a higher-yielding alternative to government securities.

These payoff attributes of covered bonds are reflected in the identity of the investors who hold them. The identity of the investors are critical in determining the funding profile  $\{z_i\}$  of the intermediation sector. The objective of achieving a higher funding profile is achieved if the investors are either household savers or non-bank institutions such as pension funds and mutual funds. A survey of the investors in covered bonds was released in May 2009 by the European Covered Bond Dealers Association (SIFMA (2009)), and is reproduced in Figure 11. We see that the bulk of the investors in covered bonds are non-banks, with the largest category being asset management firms. Leveraged institutions and intermediaries constitute only around one third of the total. Even within the intermediary sector, institutions such as private banks are closer to asset management firms in character than intermediaries such as broker dealers who lengthen the intermediation chain.

Even among covered bonds, the Danish system of mortgage bonds has attracted considerable attention recently as a resilient institutional framework for household mortgage finance due to

Figure 11  
Investors in covered bonds



Source: SIFMA (2009)

the added feature that household mortgage borrowers can redeem their debt by purchasing the relevant issue of the mortgage bonds at the prevailing market price (see Boyce (2008)). By being able to extinguish debt obligations at market prices, household borrowers participate as purchasers in the market for mortgage debt, and prevent the type of collapse in mortgage-backed securities seen in the United States in the financial crisis of 2007 and 2008.

The legislation required to underpin the operation of a covered bond system is more developed in some regions than others. Europe leads the world in this respect. In the European Union, covered bonds are defined by the Capital Requirements Directive (CRD), which limits the range of accepted collateral maximum loan-to-value ratios. While the CRD only recognizes securities issued under special legislation as covered bonds, market participants tend to work with a more general definition that also includes bonds issued under private contractual arrangements using elements from structured finance. There have been a number of such “structured covered bonds”, primarily in countries without covered bond legislation (eg the United Kingdom, the Netherlands and the United States) (see Packer et al (2007)).

Indeed, one of the main hurdles against the widespread introduction of a covered bond system has been the legal hurdle of introducing a class of claimholders for the cover pool that are senior to the deposit insurance agency, and hence the general depositors of the bank. The larger is the cover pool for covered bonds, the smaller is the general pool of assets that are accessible to the deposit insurance agency. In the United States, the FDIC has issued a statement on the treatment of covered bonds, limiting the size of covered bonds to 4% of total liabilities after issuance.<sup>6</sup> Given the benefits associated with the shortening of the intermediation chain, there are legitimate questions on how much political will can be mustered in order to amend the relevant laws to allow the operation of the covered bond system.

A possible alternative legal approach would be to permit specialist “narrow” banks whose liabilities are restricted to covered bonds only, and hence whose liabilities are not insured by the deposit insurance agency. Such narrow banks would be akin to Danish mortgage banks whose liabilities match the duration of the assets perfectly and whose equity provides a cushion for bond holders.

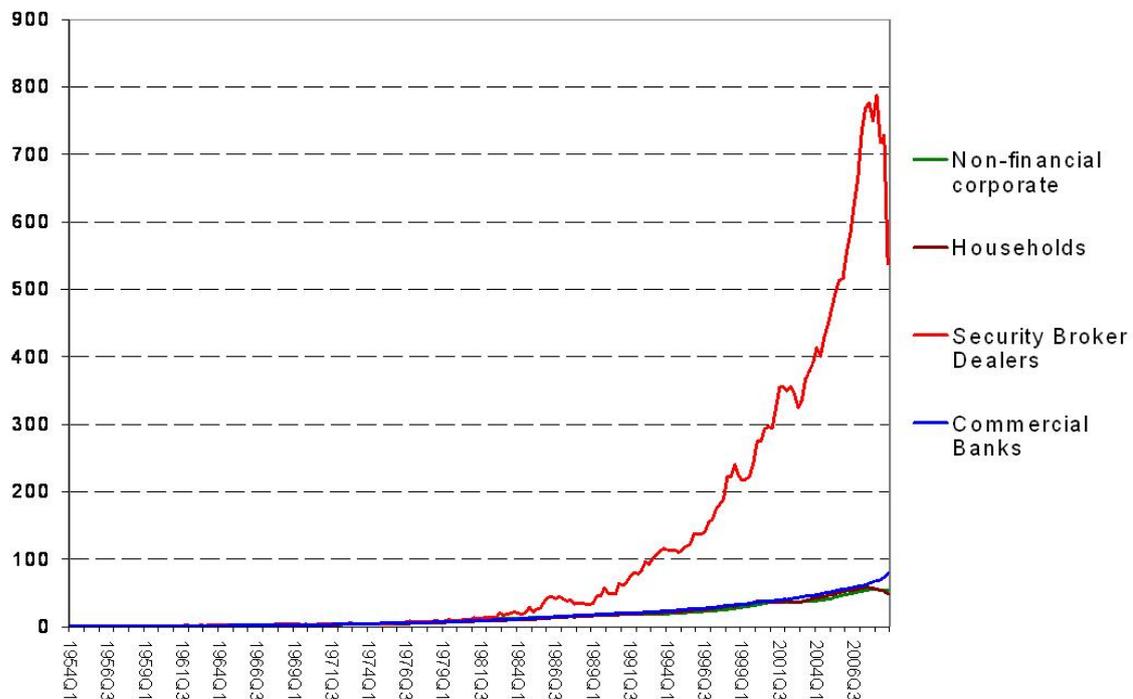
<sup>6</sup> The FDIC’s statement on covered bonds is at <http://www.fdic.gov/news/news/financial/2008/fil08073.html>

#### 4. Concluding remarks

The organizing theme of this paper has been the overall systemic impact of long versus short intermediation chains. Long intermediation chains have been associated with the rapid development of the securitized, market-based financial system in the United States. I have argued that long intermediation chains carry costs in terms of greater amplitude of fluctuations in the boom bust cycle of leverage and balance sheet size. Shorter intermediation chains carry benefits for stability of the financial system.

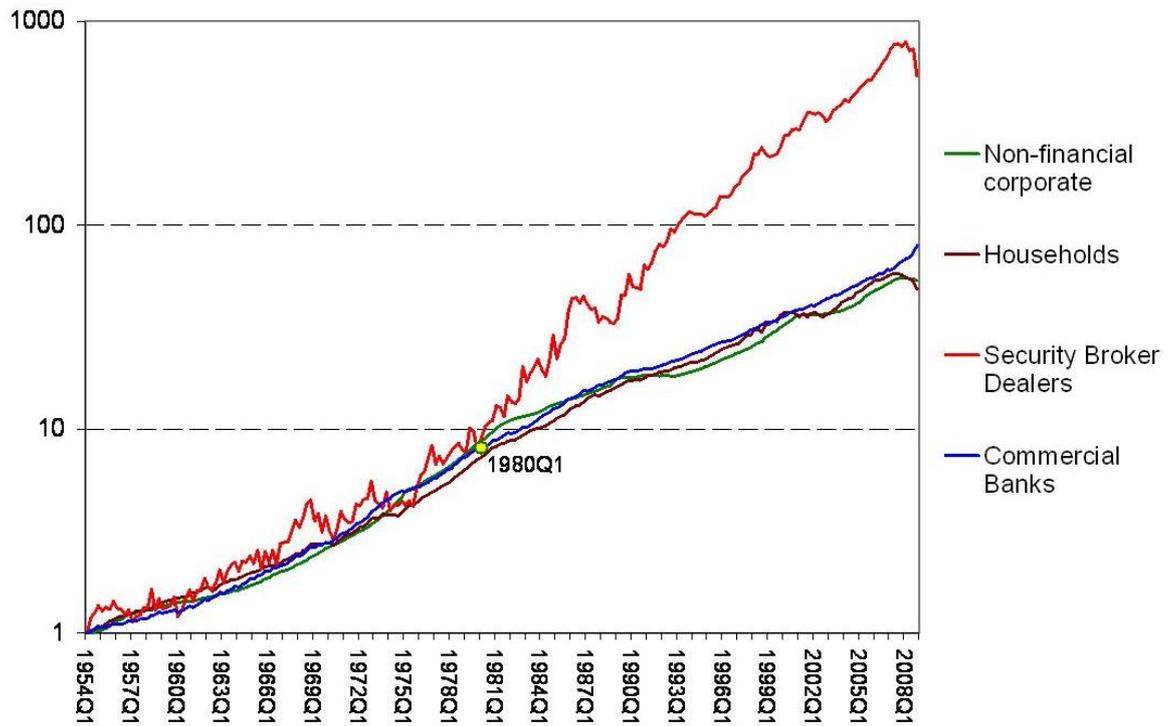
For the financial industry, the key question is to what extent the rapid development of securitization and the market-based system can be regarded as the norm, or a long, but ultimately temporary stage in the development of a more sustainable financial system. Figures 12 and 13 show the growth of four sectors in the United States (non-financial corporate sector, household sector, commercial banking sector and the security broker-dealer sector) taken from the Federal Reserve's Flow of Funds accounts. The series are normalized so that the size in Q1 1954 is set equal to 1. Most sectors grew to roughly 80 times its size in 1954, but the broker dealer sector grew to around 800 times its 1954 level, before collapsing in the current crisis. Figure 13 is the same chart, but in log scale. The greater detail afforded by the chart in log scale reveals that the securities sector kept pace with the rest of the economy until around 1980, but then started a growth spurt that outstripped the other sectors. On the eve of the crisis, the securities sector had grown to around ten times its size relative to the other sectors in the economy. Clearly, such a pace of growth could not go on forever. Even under an optimistic scenario, the growth of the securities sector would have tapered off to a more sustainable pace to keep in step with the rest of the economy.

Figure 12  
Growth of four US sectors (1954Q1 =1)



Source: Flow of Funds, Federal Reserve

Figure 13  
**Growth of four US sectors (1954Q1 = 1) (in log scale)**



The relative size of the securities sector can be seen as a mirror of the lengthening intermediation chains in the market-based system of financial intermediation. One could reasonably conclude that some of the baroque flourishes that appeared in the Indian summer of the expansion of the securities sector (such as the growth of exotic asset-backed securities such as CDO-squared) have gone for good, and are unlikely to feature in a steady state of the securities sector.

Overall, it would be reasonable to speculate that the securities sector that emerges from the current crisis in sustainable form will be smaller, with shorter intermediation chains, perhaps less profitable in aggregate, and with less maturity transformation. The backdrop to this development will be the regulatory checks and balances that are aimed at moderating the fluctuations in leverage and balance sheet size that were instrumental in making the current financial crisis the most severe since the Great Depression.

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## Comments on “Financial Intermediation and the Post-Crisis Financial System” by Hyun Song Shin

Donald L. Kohn<sup>1</sup>

Hyun Shin and his various coauthors have emphasized in a series of papers that practices within the financial system were hugely consequential for the buildup in risk-taking that preceded the current crisis and for the virulence of the subsequent pullback. In particular, the increase in leverage within the sector, the lengthening of intermediation chains, and the reliance on short-term financing that was subject to runs contributed to the vulnerability of the system and the severe aftereffects of its ensuing collapse. His analysis shows that we cannot look through the veil of finance, as was so common in our models and, to a lesser extent, in our thinking. His suggested reforms flow naturally from that diagnosis: Constrain leverage, especially in good times, and shorten intermediation chains.

I agree that the nature of the chains of interactions within the financial sector and the leverage and maturity mismatches were important factors in the buildup of imbalances and the difficult correction. And addressing these should contribute to a more robust financial system.

But, to an extent, leverage was a symptom rather than a cause of the underlying crisis. And I am not sure the accounting identity Shin uses, while a useful pedagogic device, illuminates the interactions within the financial sector and between that sector and the economy that led to the crisis. Treating symptoms helps, especially when the disease is complex and difficult to diagnose, but we also need to look for and treat the underlying causes, as I am sure Hyun agrees.

In my opinion, the root cause of the problems was the underpricing of risk as the financial sector interacted with nonfinancial sectors. On the lending side of the financial sector balance sheet, underpricing of loans relative to true risk resulted in a buildup of leverage in the household sector that left lenders vulnerable to declines in collateral values and debt servicing capacity. On the borrowing side, households ended up with some assets – like shares in money market mutual funds – that were not as liquid as they were thought to be; when money funds began to worry about the liquidity of their assets, like asset-backed commercial paper, and when households and businesses tried to use their perceived liquidity, the resulting fire sales accentuated asset price declines and transmitted problems from one sector to another.

The initial problems from the excessive risk buildup were exacerbated by the deleveraging that followed, including in the financial sector. Although there are many reasons that the deleveraging process has been so painful, one of the defining characteristics has been a sharp increase in uncertainty. Uncertainty is an aspect of every crisis, but it escalated to such an extreme degree in the summer of 2007 in response to an unexpected decline in housing prices that the financial system, which had been unusually stable and resilient, was pushed into a zone of increasing instability that in turn triggered an adverse feedback loop between the financial sector and the economy.

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<sup>1</sup> Vice Chairman, Board of Governors of the Federal Reserve System

The views expressed are my own and do not necessarily reflect the views of the other members of the Board of Governors. Matthew Pritsker of the Board's staff contributed to these remarks.

Risk had been mispriced, but by how much? Who was vulnerable? Would the markets and the economy overshoot or return to a more sustainable relationship? Financial market participants did not know the value of assets, the financial health of counterparties, or the likelihood that they themselves would be subject to unexpected hits to their capital or liquidity, for example, from ostensibly off-balance-sheet entities. The result was a hoarding of capital and liquidity, a sharp increase in risk premiums, and a generalized flight to liquidity and safety that only gathered momentum as instabilities in the economy and financial markets fed off each other.

The characteristics of the networks and the instruments accentuated the uncertainty. The instruments and the relationships among the institutions had become much more complex and opaque. The complexity of the instruments meant that investors did not understand the risk characteristics of the assets they were buying; among other problems, they relied on credit rating agencies for due diligence. The complexity of the networks meant that participants did not understand how reliant they had become on a few large core institutions and how those institutions were entwined with each other in very complex ways; when vulnerabilities started to become evident, market participants became worried about who their counterparties were exposed to. In sum, financiers were taking on more risks than they would like to, and in many respects they did not understand or were unaware that they were doing so.

This reasoning suggests that policy actions to treat underlying causes should address the causes of risk mispricing and should attempt to reduce uncertainty. One approach to attend to both is through greater transparency of

- *Instruments*--for example, by creating simpler structures that are easier to look through to evaluate, and by making the underlying credit extensions more visible; and, as a complement, by having clearer and more robust credit ratings.
- *Institutions*--by enhancing financial disclosures to report more detail on financial institutions' asset holdings and their value. Defining "value" is very difficult, and the appropriate value of any given asset may depend on the use of the information. But the publication of the results of the capital assessments of US banks last month showed how additional information about the risks and vulnerabilities of financial institutions--however imprecisely measured--can reduce uncertainty and promote financial stability.
- *Markets*--by reporting market aggregates on position-taking that would help market participants and policymakers alike monitor the buildup of risk exposures within the financial system.
- *Networks and interrelationships*--for example, by using central counterparties (CCPs). The presence of such counterparties solves an information problem, since market participants would only have to worry about the solvency of the CCP and not each other. CCPs may make it easier for market participants to more willingly absorb the other's sales during a period of deleveraging. But CCPs do concentrate risk, so they need especially robust risk-management systems.

In addition, to reduce uncertainty in response to a shock, we need to strengthen those increasingly critical institutions at the core of the system. Because of their systemic importance, they must be held to higher capital, liquidity, and risk-management standards. Moreover, resolution authority for systemically important institutions needs to be clearly delineated ahead of time, so their failure will be orderly and the authorities can choose who will bear the cost without the uncertainty and delay involved in bankruptcy.

The mispricing of risk and the resulting uncertainty also reflected skewed incentives. Attempting to encourage appropriate pricing of risk at the level of the bank through capital standards may be too blunt an instrument on its own to restrain bank risk-taking, since those standards can never be tuned so finely that traders will not find positions for which risk is

underpriced--and then load up on those risks. The solution, in addition, lies with more closely tying traders' compensation to the long-run performance of their portfolios. This internalization of the costs of risk-taking toward those most capable of understanding and measuring the risks should help blunt the buildup of excessive risk and leverage.

Long and complex chains present problems, importantly because of the incentive problems along the chain. Nevertheless, there may be sound economic reasons why long chains are desirable. For example, long chains of lending allow for some financial intermediaries to specialize in screening borrowers, others to specialize in arranging initial short-term financing, and others to focus on securitizing the assets and selling them to investors. Specialization lends itself to long chains, but such specialization comes with incentive problems at every step of the chain. These incentive problems need to be recognized and dealt with. Proposals that require intermediaries along the chain to maintain "more skin in the game" are worth considering, but that approach is not a panacea. Many institutions that had skin in the game got into trouble anyway--perhaps because it is hard to judge how much skin is enough to maintain proper incentives. In addition, it may be impossible to police whether an institution has chosen to keep its own skin in the game or whether its risk has been mitigated through hedging. In the end, no one can police the market better than the final investors, provided the instruments are simpler and more transparent.

Finally, our efforts to stabilize the system by guaranteeing much of the liabilities of systemically important institutions have further distorted the incentives of their counterparties. Offsetting the effects of this moral hazard is another reason to hold these institutions to higher standards and find better resolution mechanisms for them.

I want to close by reiterating the importance of Hyun's contributions. He has led the way in showing that the organization of financial structures is critical to the resiliency of the financial system. Going forward, we need to address not just the unstable structures that have become so evident in the recent crisis, but we also need to better understand why these sorts of structures emerge and take steps to prevent their reoccurrence in whatever forms they may take.



# Financial intermediation and the post-crisis financial system

Discussant comments by José Viñals<sup>1</sup>

## Taxonomy of Views on Securitization

Let me begin by laying out a taxonomy of views on securitization, because I think it helps to place Professor Shin's paper in context. The first view of securitization, which I would characterize as the "benign" view, was predominant among policymakers prior to the current crisis. Many policymakers were praising the "originate-to-distribute" lending model as a financial system stabilizer. In theory, through securitization markets, it was supposed to smooth credit allocation and disperse credit risk to a broader and more diverse group of investors, rather than concentrating it on bank balance sheets. It was supposed to make the banking and overall financial system more resilient. Mass bank failures would be a thing of the past, and credit cycles would be smoother.

However, the crisis has shown that banks themselves became among the biggest holders of these risks. In some cases, they retained what they thought were the least risky slices – the senior instruments based on the performance of highly-diversified loan pools. These were supposed to be vulnerable only to most improbable economic catastrophes. In other cases, they bought economic "catastrophe" instruments originated by other banks. These purchases were largely based on what has turned out to be a number of faulty assumptions, which I will get to in a minute.

At the same time, this new model facilitated the funding of long-term claims with short-term liabilities, such as ABCP through SIVs. Tranquil market conditions and low interest rates made it seem easy and safe for financial institutions to lever up using short-term funding. Of course, there is nothing new about banks funding long-term assets with short-term liabilities – banks have been doing it for centuries. The difference this time around was the dependence on wholesale lending, which is far less dependable than traditional retail deposits.

As a result of all this, instead of dispersing risk, the originate-to-distribute model concentrated risk in the financial sector, and increased the potential for disruptions to spread swiftly across markets and borders. As Andy Haldane from the Bank of England pointed out in a recent paper, these connected networks "exhibit a knife-edge, or tipping point, property." Up to a point they serve as a "shock absorber" but beyond that point they can become "shock amplifiers", as we now know all too well! This is the second view of securitization, and what Shin characterizes as the "hot potato" view of securitization.

Professor Shin's paper provides a third characterization of the process of securitization. It characterizes the originate-to-distribute model as a lengthening of intermediation chains that has increased complexity across the financial system. As a result of this chain lengthening, financial market disruptions were able to spread swiftly across markets and national borders, and in a highly procyclical way. Also, bank balance sheets became more vulnerable to market shutdowns. Indeed, we are witnessing the first "post-securitization" crisis. Professor

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Shin notes that the dynamics of boom bust cycles are fundamentally different because of longer intermediation chains. Long intermediation chains increase lending and borrowing to non-banks. What is interesting to ask is what is the role of the policy interest rate in this process.

## Policy recommendations

The paper goes on to make three broad policy recommendations, which are high on many of the authorities' "to do" lists. These include changes in capital and liquidity requirements, leverage caps (such as those already used in Canada and recently introduced in Switzerland), forward-looking statistical provisioning schemes (such as that used in Spain), and encouraging/requiring securitizers to keep more "skin in the game" (such as by issuing covered bonds).<sup>2</sup>

However, although intermediation chain lengthening undoubtedly played an important role in creating the conditions for a financial crisis, the financial system's inherent procyclicality also played an important role. Professor Shin's paper takes credit cycles as a natural and recurring phenomenon, but there were additional amplifying factors that played a role in the present crisis, and so we need to add them to the list of reforms that need to be considered. On provisioning, I tend to agree with Professor Shin that forward looking provisions help with both leaning against the wind and cleaning up afterward. Valuation reserves can also be another way of mitigating some of the hazards of securitization, particularly for the trading book which may be inherently complex when valuing the more complex securities. But I would go beyond the measures that Professor Shin calls for or alludes to in his paper. Here I would list six additional changes that can help to alleviate some of the risks of lengthened intermediation chains.

The first step that can be taken is to enhance current risk management frameworks. At present, risk management structures tend to encourage firms to increase the risk they take in benign low-volatility environments, and crank it down when volatility increases. Furthermore, margin requirements and haircuts tend to vary with cycles. To offset potential procyclicality, risk management systems and margin requirements should be based on through-the-cycle measures. They should be forward looking over sufficiently long time horizons, and smoothing techniques applied to risk capital allocations. Stress testing should also play a more prominent role. Firms also tend to underestimate liquidity risk in market upswings and vice versa. Market liquidity tends to be procyclical – volumes rise and bid-ask spreads narrow during upswings and reverse in downturns. Marketability tends to be overestimated during good times, particularly for assets that are customized or complex. Also, banks may anticipate the provision of public sector liquidity support under extreme conditions, underinsuring themselves for such cases. Funding risk procyclicality can be alleviated with more rigorous stress testing, plus making cash flow and funding cost scenarios more sensitive to credit ratings and collateral triggers, correlated credit risk events and funding

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<sup>2</sup> Regulations could alternatively require securitizers to retain prescribed amounts of risk exposure, as will become the case in Europe and the United States. The European implementation of Basel 2 (the Capital Requirements Directive) will require securitizers to retain a material economic interest in any assets they securitize. In the United States, the Mortgage Reform and Anti-Predatory Lending Act, currently being debated in the Senate, requires securitizers to retain an economic interest in some mortgages. In a recent Washington Post editorial, Timothy Geithner and Lawrence Summers said that soon-to-be announced regulatory reforms would *require the originator, sponsor or broker of a securitization to retain a financial interest in its performance.*

market breakdowns. Lastly, the authorities could encourage better pricing and public disclosure of contingent liquidity risk.

A second key area where progress should be made is compensation systems. Systems based on immediately measurable results also reinforce procyclicality, and encourage excessive risk taking in pursuit of high returns, often with insufficient attention to risk. Financial institutions should be encouraged to better align compensation with longer-term objectives – eg by delinking bonuses from annual results through deferrals and clawbacks. Also performance metrics should be better aligned with firm risk management systems. Compensation schemes and results should also be made more transparent, to bring more market discipline to bear.

A third area for improvement is information. Many investors in securitization products did not exercise appropriate due diligence, and relied too heavily on rating agencies for their risk assessments. In many cases, this was because sufficient information was not available, or because there was too much information to process and synthesize. Hence, securitizers should improve the availability and the usefulness of the information and tools that investors need to do their own risk assessments. Authorities should press the credit rating agencies to continue to improve their internal governance practices to reduce their special incentive conflicts. Also, given that, by design, structured credit products can suffer more severe, multiple-notch downgrades relative to corporate or sovereign bonds, a differentiated rating scale would help make these differences more explicit.<sup>3</sup>

A fourth area for improvement is the securitization process itself. Products should be simplified and standardized to increase transparency as well as market participants' understanding of the risks, thus facilitating the development of liquid secondary markets. Although there will always likely be types of investors that will demand bespoke complex products, securitization trade associations and securities regulators could encourage that these be structured, at least partially, from standardized building blocks.

A fifth area for improvement is an expansion of the regulatory perimeter, to ensure that the supervisors and regulators are capturing all systemically important institutions with their regulatory tools and framework, to avoid arbitrage. This will help to ensure that the distortion of incentives from longer intermediation chains no longer fall outside the regulatory net, and hence the radar screen of supervisors.

And finally, I would suggest that we need to change or update the crisis management frameworks that we have in place to deal with the risks from securitization. This topic covers a host of different issues, including how we structure the lender of last resort function and access to emergency liquidity, eligible collateral, what sort of haircuts to apply, but also more complex topics such as the deposit insurance arrangements in place in the presence of securitization – do we need to reconsider coverage limits, the types of institutions covered and how the schemes are funded? And what about resolution frameworks for financial institutions – do we need to broaden the powers of regulators, and what legal complications do lengthened intermediation chains pose for the prompt resolution of failing institutions?

To conclude, I would like to close with reference to the implications of the paper for monetary policy. What has become clear from the present crisis is that the short-term policy rate is important for financial stability, and regulation should take this into account. But monetary policy may also amplify procyclical risk taking. For example, interest rates that are too low for too long may encourage excessive leverage and over-indebtedness. Perhaps central banks should consider applying policy tools more symmetrically over the cycle and, in particular,

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<sup>3</sup> Meanwhile, it is a promising development that rating agencies are now providing investors with more analytical information regarding potential rating volatility. This additional analytic information, typically in the form of a score or index, provides investors with a useful quantification of the increased downgrade risk.

more fully taking into account financial imbalances when setting policy interest rates to achieve price stability over the medium term. This will provide for more “leaning” in good times so that there is less need for “cleaning” in bad times.