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The Shadow Banking System:  
Implications for Financial Regulation

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## **The Shadow Banking System: Implications for Financial Regulation**

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### **Abstract**

The current financial crisis has highlighted the growing importance of the “shadow banking system,” which grew out of the securitization of assets and the integration of banking with capital market developments. This trend has been most pronounced in the United States, but it has had a profound influence on the global financial system. In a market-based financial system, banking and capital market developments are inseparable: Funding conditions are closely tied to fluctuations in the leverage of market-based financial intermediaries. Growth in the balance sheets of these intermediaries provides a sense of the availability of credit, while contractions of their balance sheets have tended to precede the onset of financial crises. Securitization was intended as a way to transfer credit risk to those better able to absorb losses, but instead it increased the fragility of the entire financial system by allowing banks and other intermediaries to “leverage up” by buying one another’s securities. In the new, post-crisis financial system, the role of securitization will likely be held in check by more stringent financial regulation and by the recognition that it is important to prevent excessive leverage and maturity mismatch, both of which can undermine financial stability.

Key words: financial architecture, regulatory reform

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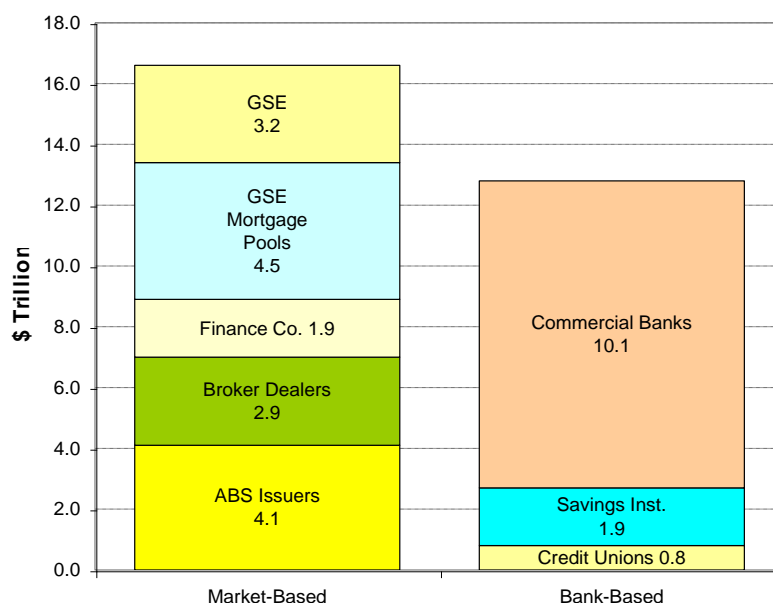
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## Introduction

The distinguishing mark of a modern financial system is the increasingly intimate ties between banking and the capital markets. The success of macroprudential regulation will depend on being able to internalize the externalities that are generated in the shadow banking system. Before the current financial crisis, the global economy was often described as being “awash with liquidity”, meaning that the supply of credit was plentiful. The financial crisis has led to a drying up of this particular metaphor. Understanding the nature of liquidity in this sense leads us to the importance of financial intermediaries in a financial system built around capital markets, and the critical role played by monetary policy in regulating credit supply.

An important background is the growing importance of the capital market in the supply of credit, especially in the United States. Traditionally, banks were the dominant suppliers of credit, but their role has increasingly been supplanted by market-based institutions – especially those involved in the securitization process.

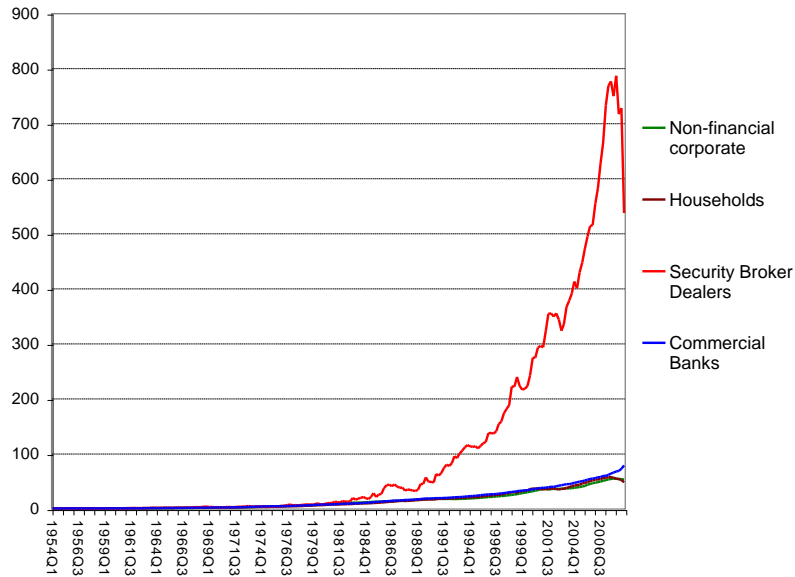
**Figure 1. Total Assets at 2007Q2 (Source: US Flow of Funds, Federal Reserve)**



For the United States, Figure 1 compares total assets held by banks with the assets of securitization pools or at institutions that fund themselves mainly by issuing securities. By the end of the second quarter of 2007 (just before the current crisis), the assets of this latter group, the “market-based assets,” were substantially larger than bank assets.

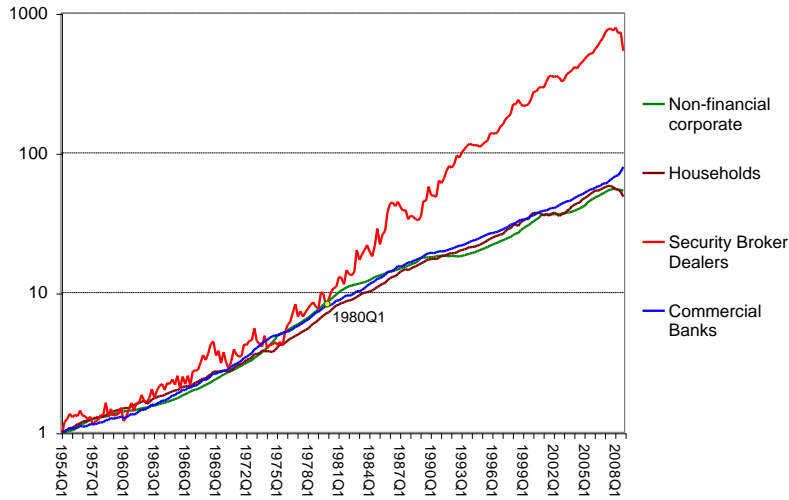
The growing importance of the market-based system can be seen from Figure 2, which charts the growth of four sectors in the United States – the household sector, non-financial corporate sector, commercial banking sector and the security broker dealer sector. All series have been normalized to 1 for March, 1954.

**Figure 2: Growth of Assets of Four Sectors in the United States (March 1954 = 1)**  
 (Source: Federal Reserve, Flow of Funds)



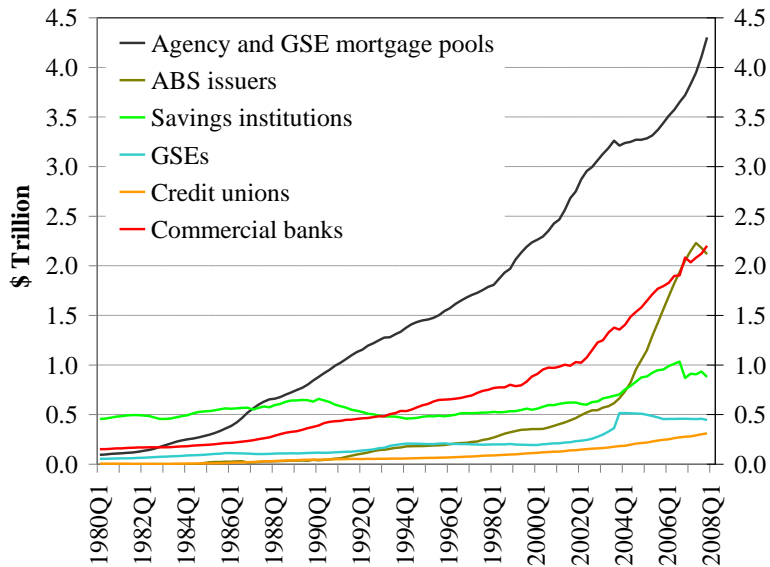
We see the astonishingly rapid growth of the securities sector relative to the other sectors in the economy. Figure 3 contains the same series as in Figure 2, except that the vertical axis is in log scale. We see from Figure 3 that the rapid increase in the securities sector began around 1980.

**Figure 3: Growth of Assets of Four Sectors in the United States (March 1954 = 1)**  
**(Log scale) (Source: Federal Reserve, Flow of Funds)**

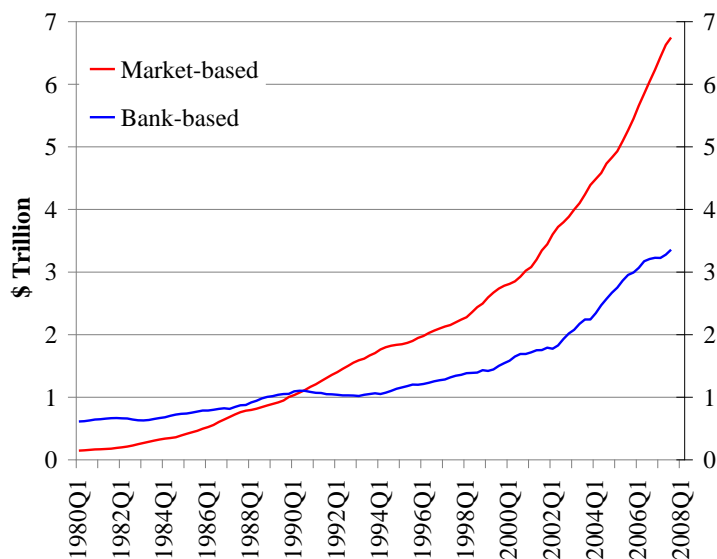


This take-off of the securities sector can be explained by the changing structure of the US financial system, and in particular by the changing nature of the residential mortgage market and the growing importance of securitization.

**Figure 4. Total Holdings of US Home Mortgages by Type of Financial Institution**  
**(Source: US Flow of Funds, Federal Reserve)**



**Figure 5. Market Based and Bank Based Holding of Home Mortgages**  
 (Source: US Flow of Funds, Federal Reserve)

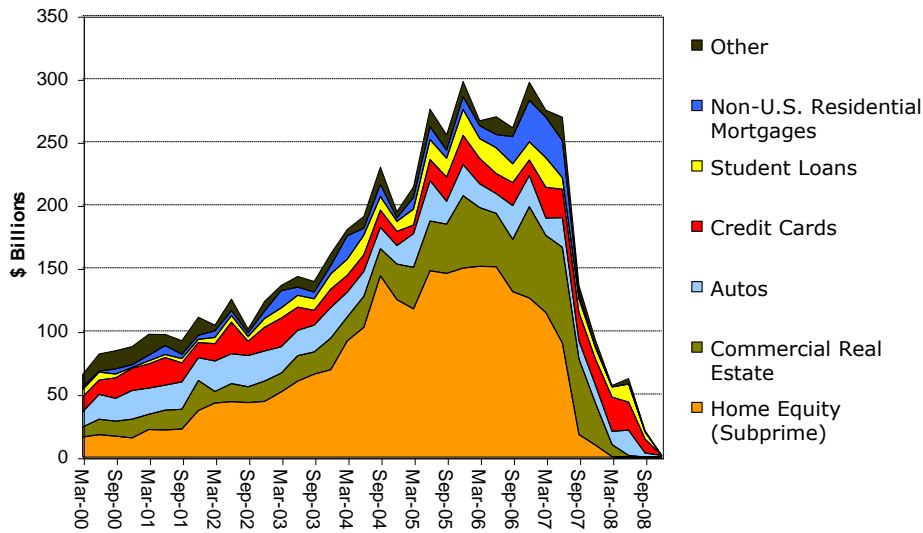


Until the early 1980s, banks were the dominant holders of home mortgages, but bank-based holdings were overtaken by market-based holders (Figure 4). In Figure 5, “bank-based holdings” add up the holdings of commercial banks, savings institutions and credit unions. Market-based holdings are the remainder – the GSE mortgage pools, private label mortgage pools and the GSE holdings themselves. Market-based holdings now constitute two thirds of the 11 trillion dollar total of home mortgages.

### **Credit Crunch**

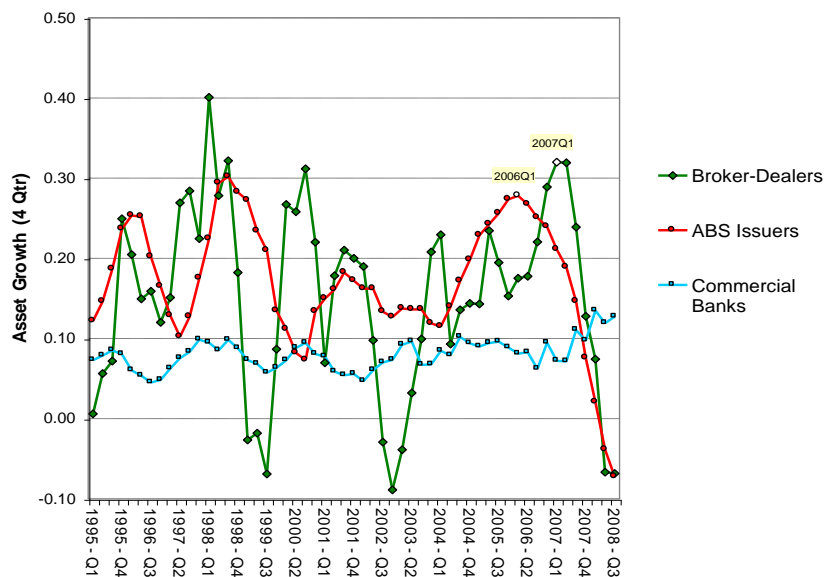
In the current crisis, it is the market-based supply of credit has seen the most dramatic contraction. Figure 6 plots the flow of new credit from the issuance of new asset-backed securities. The most dramatic fall is in the subprime category, but credit supply of all categories has collapsed, ranging from auto loans, credit card loans and student loans.

**Figure 6. New Issuance of Asset Backed Securities in Previous Three Months**  
 (Source: JP Morgan Chase and Adrian and Shin (2009))



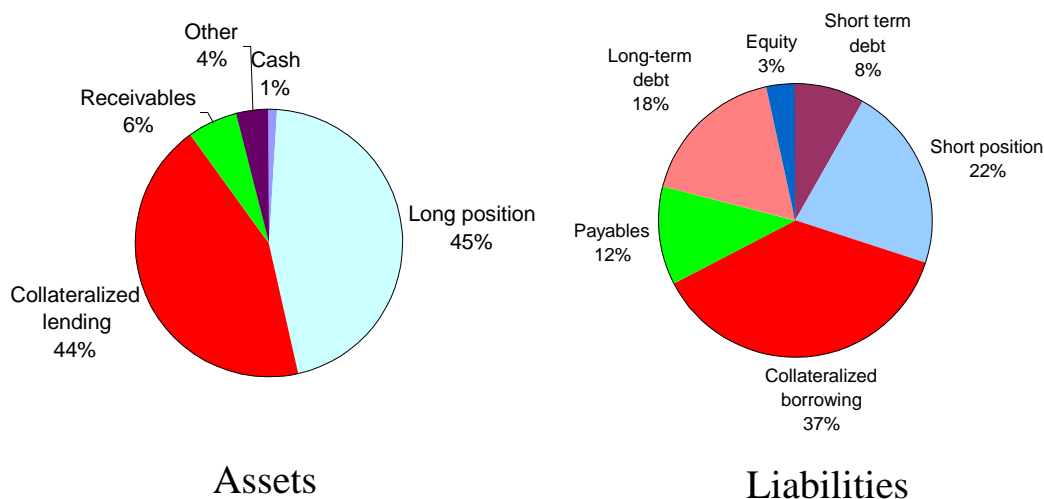
However, the drying up of credit in the capital markets would have been missed if one paid attention to bank-based lending only. As can be seen from Figure 7, commercial bank lending has picked up pace after the start of the financial crisis, even as market-based providers of credit have contracted rapidly. Banks have traditionally played the role of a buffer for their borrowers in the face of deteriorating market conditions (as during the 1998 crisis) and appear to be playing a similar role in the current crisis.

**Figure 7. Annual Growth Rates of Assets**  
 (Source: US Flow of Funds, Federal Reserve)



## Market-Based Intermediaries

The long-term development of the US financial system and its vulnerability to the current crisis raises several questions. At the margin, all financial intermediaries (including commercial banks) have to borrow in capital markets, since deposits are insufficiently responsive to funding needs. But for a commercial bank, its large balance sheet masks the effects operating at the margin. In contrast, securities firms have balance sheets that reflect much more sensitively the effects operating in the capital markets. Below, we summarize the balance sheet of Lehman Brothers, as at the end of the 2007 financial year, when total assets were \$691 billion.



The two largest classes of assets are (i) long positions in trading assets and other financial inventories and (ii) collateralized lending. The collateralized lending reflected Lehman's role as prime broker to hedge funds, and consisted of reverse repos and other types of collateralized lending. Much of the collateralized lending was short term, often overnight. The other feature of the asset side of the balance sheet is how small the holding of cash is. The cash holding is \$7.29 billion out of a total balance sheet size of \$691 billion.

The liabilities of Lehman Brothers reflected the short-term nature of much of its liabilities. The largest component is collateralized borrowing, including repos. Short positions ("financial instruments and other inventory positions sold but not yet purchased") is the next largest component. Long-term debt is only 18% of total liabilities. One notable item is the

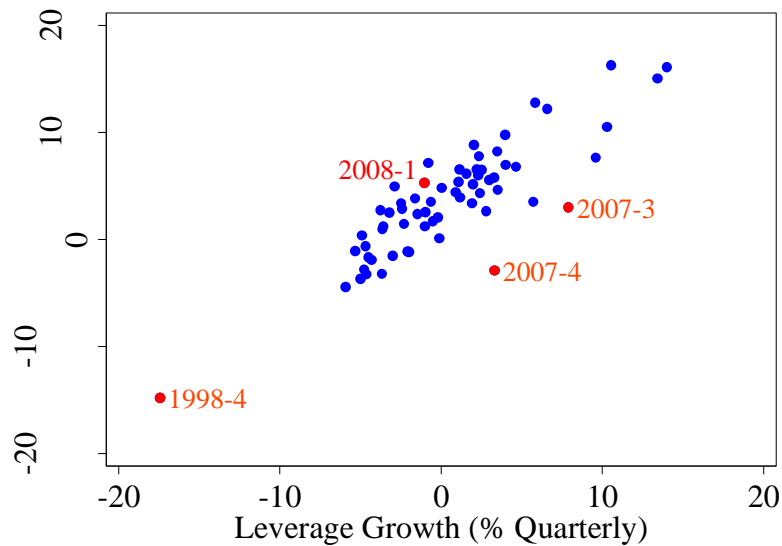


“payables” category, which is 12% of total balance sheet size. Payables include the cash deposits of Lehman’s customers, especially its hedge fund clientele. It is for this reason that “payables” are much larger than “receivables” on the asset side of the balance sheet (only 6%). Hedge fund customers’ deposits are subject to withdrawal on demand, and proved to be an important source of funding instability.

In this way, broker-dealers (securities firms) have balance sheets that are in stark contrast to conventional deposit funded banks. Broker-dealers have traditionally played market-making and underwriting roles in securities markets, but their importance in the supply of credit has increased in step with securitization. For this reason, broker dealers may be seen as a barometer of overall funding conditions in a market-based financial system.

Figure 8 is taken from Adrian and Shin (2007) and shows the scatter chart of the weighted average of the quarterly change in assets against the quarterly change in leverage of the (then) five stand-alone US investment banks (Bear Stearns, Goldman Sachs, Lehman Brothers, Merrill Lynch and Morgan Stanley). The striking feature is that leverage is procyclical in the sense that leverage is high when balance sheets are large, while leverage is low when balance sheets are small. This is exactly the opposite finding compared to households, whose leverage is high when balance sheets are *small*. For instance, if a household owns a house that is financed by a mortgage, leverage falls when the house price increases, since the equity of the household is increasing at a faster rate than assets.

**Figure 8. Leverage Growth and Asset Growth of US Investment Banks**  
 (Source SEC; Adrian and Shin (2007))



Procyclical leverage offers a window on financial system liquidity. The horizontal axis measures the (quarterly) growth in leverage, as measured by the change in log assets minus the change in log equity. The vertical axis measures the change in log assets. Hence, the 45-degree line indicates the set of points where (log) equity is unchanged. Above the 45-degree line equity is increasing, while below the 45-degree line, equity is decreasing. Any straight line with slope equal to 1 indicates constant growth of equity, with the intercept giving the growth rate of equity.

In Figure 8 the slope of the scatter chart is close to 1, implying that equity is increasing at a constant rate on average. Thus, equity plays the role of the forcing variable, and the adjustment in leverage primarily takes place through expansions and contractions of the balance sheet rather than through the raising or paying out of equity. We can understand the fluctuations in leverage in terms of the implicit maximum leverage permitted by creditors in collateralized borrowing transactions such as repurchase agreements (repos). In a repo, the borrower sells a security today for a price below the current market price on the understanding that it will buy it back in the future at a pre-agreed price. The difference between the current market price of the security and the price at which it is sold is called the “haircut” in the repo. The fluctuations in the haircut largely determine the degree of funding available to a leveraged institution, since the haircut determines the maximum permissible leverage achieved by the borrower. If the haircut is 2%, the borrower can borrow 98 dollars for 100 dollars worth of securities pledged. Then, to hold

100 dollars worth of securities, the borrower must come up with 2 dollars of equity. Thus, if the repo haircut is 2%, the maximum permissible leverage (ratio of assets to equity) is 50.

Suppose the borrower leverages up the maximum permitted level, consistent with maximizing the return on equity. The borrower then has leverage of 50. If a shock raises the haircut, then the borrower must either sell assets, or raise equity. Suppose that the haircut rises to 4%. Then, permitted leverage halves from 50 to 25. Either the borrower must double equity or sell half its assets, or some combination of both. Times of financial stress are associated with sharply higher haircuts, necessitating substantial reductions in leverage through asset disposals or raising of new equity. Table 9 is taken from IMF (2008), and shows the haircuts in secured lending transactions at two dates - in April 2007 before the financial crisis and in August 2008 in the midst of the crisis. Haircuts are substantially higher during the crises than before.

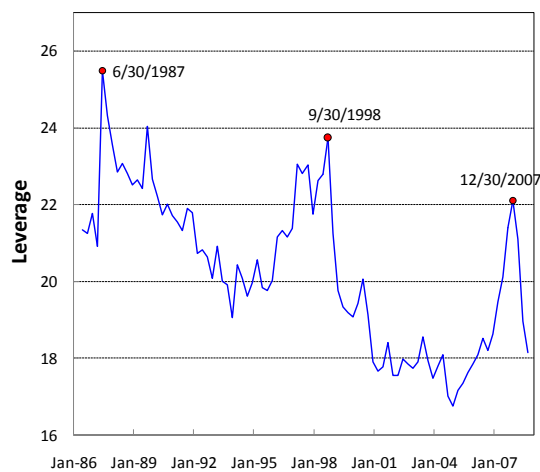
**Table 9. Haircuts on Repo Agreements (percent)**

**(Source: IMF Global Financial Stability Report, October 2008)**

Securities	April-07	August-08
U.S. treasuries	0.25	3
Investment-grade bonds	0–3	8–12
High-yield bonds	10–15	25–40
Equities	15	20
Senior leveraged loans	10–12	15–20
Mezzanine leveraged loans	18–25	35+
Prime MBS	2–4	10–20
ABS	3–5	50–60

The fluctuations in leverage resulting from shifts in funding conditions are closely associated with epochs of financial booms and busts. Figure 10 plots the leverage US primary dealers – the set of 18 banks that has a daily trading relationship with the Fed. They consist of US investment banks and US bank holding companies with large broker subsidiaries (such as Citigroup and JP Morgan Chase).

**Figure 10. Mean Leverage of US Primary Dealers**  
(June 86 to Sept 08. Source: SEC 10-K and 10-Q filings and Adrian and Shin (2009))



The plot shows two main features. First, leverage has tended to decrease since 1986. This decline in leverage is due to the bank holding companies in the sample—a sample consisting only of investment banks shows no such declining trend in leverage (see Adrian and Shin, 2007). Secondly, each of the peaks in leverage is associated with the onset of a financial crisis (the peaks are 1987Q2, 1998Q3, 2008Q3). Financial crises tend to be preceded by marked increases of leverage.

The fluctuations of credit in the context of secured lending expose the fallacy of the “lump of liquidity” in the financial system. The language of “liquidity” suggests a stock of available funding in the financial system which is redistributed as needed. However, when liquidity dries up, it disappears altogether rather than being re-allocated elsewhere. When haircuts rise, all balance sheets shrink in unison, resulting in a generalized decline in the willingness to lend. In this sense, liquidity should be understood in terms of the growth of balance sheets (i.e. as a flow), rather than as a stock.

### **Role of Securitization**

The fluctuations of market funding conditions have important implications for financial stability and international capital flows. Indeed, there is an intimate connection between the

emergence of subprime mortgages and the large US external deficits in the middle years of this decade. The chain that ties the two is securitization.

Securitization refers to the practice of parcelling and selling of loans to investors. It was intended as a way to disperse risks associated with bank lending so that deep-pocketed investors who were better able to absorb losses would share the risks. But in reality, securitization worked to concentrate risks in the banking sector. There was a simple reason for this. Banks and other intermediaries wanted to increase their leverage – to become more indebted – so as to spice up their short-term profit. So, rather than dispersing risks evenly throughout the economy, banks and other intermediaries bought each other's securities with borrowed money. As a result, far from dispersing risks, securitization had the perverse effect of concentrating all the risks in the banking system itself.


In the process, increased leverage fuelled by securitization exacerbated global imbalances. To understand the role of securitization, it is important to take a system-wide perspective on financial intermediation. In a traditional banking system that intermediates between retail depositors and ultimate borrowers, the total quantity of deposits represents the obligation of the banking system to creditors outside the banking system. However, securitization opens up potentially new sources of funding for the banking system by tapping new creditors. The new creditors who buy the securitized claims include pension funds, mutual funds and insurance companies, as well as foreign investors such as foreign central banks. Foreign central banks have been a particularly important funding source for residential mortgage lending in the United States.

When the claims and obligations between leveraged entities have been netted out, the lending to ultimate borrowers must be funded either from the equity of the intermediary sector or by borrowing from creditors outside the intermediary sector. To see this, consider a simplified balance sheet of an individual bank, as follows

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

### Individual bank

By "bank" we mean any leveraged institution. In the US context, this includes securities firms, hedge funds and the government sponsored enterprises (GSEs) such as Fannie Mae and Freddie Mac. When balance sheets are aggregated across banks, all the claims and obligations between banks cancel out. So, the aggregate balance sheet for the banking sector as a whole looks as follows.

Assets	Liabilities
 Total lending to Firms and households	<div style="border: 1px solid cyan; padding: 5px; display: inline-block;">           Liabilities to non-banks  <b>(deposits + securitized debt)</b> </div> Total equity

### Banking Sector

Aggregate lending to end-user borrowers by the banking system must be financed either by the equity in the banking system or by borrowing from creditors outside the banking system. For any fixed profile of equity and leverage across individual banks, the total supply of credit to ultimate borrowers is larger when the banks borrow more from creditors outside the banking system. Put differently, the leverage of the financial sector as a whole is increasing as banks resort to greater securitization.

The supply of credit is the outcome of increased leverage of the banking sector as a whole. As balance sheets expand, new borrowers must be found. In other words, new assets must be generated that will fill expanding balance sheets. When all prime borrowers have a mortgage, but still balance sheets need to expand, then banks have to lower their lending standards in order

to lend to subprime borrowers. The seeds of the subsequent downturn in the credit cycle are thus sown.

When the downturn arrives, the bad loans are either sitting on the balance sheets of the large financial intermediaries, or they are in special purpose vehicles (SPVs) that are sponsored by them. This is so, since the bad loans were taken on precisely in order to expand total assets and raise leverage. Although final investors such as pension funds and insurance companies will suffer losses, too, the large financial intermediaries are more exposed in the sense that they face the danger of seeing their capital wiped out. The severity of the current credit crisis lies precisely in the fact that the bad loans were not all passed on to final investors.

In this way, the subprime crisis has its origin in the increased supply of loans - or equivalently, in the imperative to find new assets to fill the expanding balance sheets. This explains two features of the subprime crisis - first, why apparently sophisticated financial intermediaries continued to lend to borrowers of dubious creditworthiness, and second, why such sophisticated financial intermediaries held the bad loans on their own balance sheets, rather than passing them on to other unsuspecting investors. Both facts are explained by the imperative to use up slack in balance sheet capacity during an upturn in the credit cycle.

**Figure 11: Total exposure to losses from subprime mortgages**

(Source: Greenlaw, Hatzius, Kashyap and Shin (2008))

	Total reported sub-prime exposure (US\$tn)	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%

Figure 11 shows that of the approximately \$1.4 trillion 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.

### **Financial Regulation**

Having identified the problem as the excessive growth of leverage during the boom, the remedy that has gained recent support by policy makers is the imposition of tighter regulation, especially regulation that targets the procyclical nature of the current system of capital regulation under the Basel II system. Many ideas have been advanced, of which we will discuss four.<sup>1</sup> The first is an explicit leverage ratio bound that restrains growth of leverage at the peak of cycles. Switzerland has recently implemented such a system, Canada has had explicit leverage ratios as part of their regulatory framework for some time, and the Financial Stability Forum (2009) recommends a broader review of such a leverage ratio. The second is the forward-looking provisioning scheme used by Spain, where a provision is created at the time that a bank makes a loan, and the provision goes through the income statement of the bank. This system of forward-looking provisioning has been credited with maintaining a more robust banking system thus far in Spain relative to other European countries, in spite of the Spanish housing boom. Third, several recent policy reports have advocated explicit countercyclical capital rules (see, for instance, the Geneva Report (2009) and the Joint FSF-CGFS Working Group (2009) on the role of valuation and leverage in procyclicality). Fourth, Adrian and Brunnermeier (2009) propose to base capital adequacy rules explicitly on measures of systemic risk of particular institutions.

Whether the binding regulatory constraints come through leverage bounds, forward-looking provisioning, explicit countercyclical capital rules, or systemic capital rules is a matter of implementation. The underlying spirit of these different approaches is that financial system instability caused by market failures that provide rationales for public policy. Regulation with the aim of mitigating financial system risk must aim at reducing the adverse effects of the market failures that are the root cause of the crisis. Policy that is guided by the right economic theory

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<sup>1</sup> The consensus that emerged at the G20 summit in London on April 2<sup>nd</sup> is that capital requirements should be designed so that regulations restrain excesses when market-determined capital ratios fail to do so.



gives rise to a philosophy of regulation with the best chance of living up to the task. Only a regulatory system that has the system-wide perspective can meet the challenges ahead.

Currently, financial regulation combines two distinct activities. One is the monitoring of individual institutions for their impact on system stability; another is the investor and consumer protection regulation. As important as business and consumer protection roles are, their purpose is very different from that of a systemic regulator, and need a different set of skills as well as a different mindset. Consumer advocacy and prosecuting market abuse involve setting and then enforcing the appropriate rules under a transparent legal framework. Such work is best done by lawyers and accountants who specialize in rule-making and enforcement. The Securities and Exchange Commission in the United States is a good example of such a regulator. However a conduct of business regulator is ill-equipped to cope with a systemic crisis where the problem is not one of enforcing rules.

One element of improved regulation will be a macroprudential systemic regulator who could take on two important tasks. First, the systemic regulator should gather, analyze, and report systemic information. This will require reporting from a broader range of financial institutions, such as hedge funds, and the shadow banking system. Second, the systemic regulator will operate capital rules with a systemic focus. The G20 meeting in London has affirmed both principles, and the reform of the regulatory framework is likely to incorporate both. Given the central bank's intimate connections with the financial market through its monetary policy role, it is likely to have the best market intelligence in performing the role of the macroprudential regulator. Furthermore, the fact that the central bank is the lender of last resort (LOLR) gives it the capacity to intervene in the market when necessary. In any event, if the central bank is likely to be called upon during times of crisis to play its role in the resolution of problem institutions, it should be in a position to assess the true conditions of the problem institution. The best way that such information can be gained is through on-site examinations, perhaps together with the main regulatory agency.

In the new, post-crisis financial system, many familiar features of the system before the crisis will cease to be in place. The role of securitization is likely to be held in check by more stringent financial regulation and the recognition of the importance of preventing excessive leverage and maturity mismatch in undermining financial stability. Institutional changes and the conduct of monetary policy will flow from the recognition of the role of the financial system as

the servant of the real economy, rather than an end in itself. In particular, we might see the return of a more staid “utilities” version of banking based on the model of banking as a support to the real economy.

In retrospect, the boom in the securities sector seen in Figures 2 and 3 earlier could be seen as the emergence of a thirty-year bubble that began in 1980, and which burst with the first outbreak of the subprime in the summer of 2007. We are still feeling the after effects of that bursting.

## References

Adrian, Tobias and Markus K. Brunnermeier (2008) “CoVaR,” Federal Reserve Bank of New York Staff Reports 348.

[http://newyorkfed.org/research/staff\\_reports/sr348.html](http://newyorkfed.org/research/staff_reports/sr348.html)

Adrian, Tobias and Hyun Song Shin (2007) “Liquidity and Leverage,” *Journal of Financial Intermediation*, forthcoming.

[http://www.newyorkfed.org/research/staff\\_reports/sr328.html](http://www.newyorkfed.org/research/staff_reports/sr328.html)

Adrian, Tobias and Hyun Song Shin (2009) “Money, Liquidity and Monetary Policy” forthcoming in *American Economic Review, papers and proceedings*.

[http://www.newyorkfed.org/research/staff\\_reports/sr360.html](http://www.newyorkfed.org/research/staff_reports/sr360.html)

FSF-CGFS Working Group (2009) “The Role of Valuation and Leverage in Procyclicality”.

[http://www.fsforum.org/publications/r\\_0904h.pdf](http://www.fsforum.org/publications/r_0904h.pdf)

Geneva Report 11 (2009) “The Fundamental Principles of Financial Regulation”.

<http://www.voxeu.org/reports/Geneva11.pdf>

Greenlaw, David, Jan Hatzius, Anil Kashyap and Hyun Song Shin (2008) “Leveraged Losses: Lessons from the Mortgage Market Meltdown” US Monetary Policy Forum Report No. 2.

<http://research.chicagogsb.edu/igm/events/docs/USMPF-final.pdf>

International Monetary Fund (2008) *Global Financial Stability Report*.