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A sound banker, alas! Is not one who foresees danger and avoids it, but one who, when he is ruined, is ruined in a conventional and orthodox way along with his fellows, so that no one can really blame him.

John Maynard Keynes, "The Consequences to the Banks of the Collapse in Money Values," 1931

Introduction and Executive Summary

We are currently experiencing a major shock to the financial system, initiated by problems in the subprime mortgage market, which spread to securitization products and credit markets more generally. Banks are being asked to increase the amount of risk that they absorb (by moving off-balance sheet assets onto their balance sheets), but losses that the banks have suffered limit their capacity to absorb those risky assets. The result is a reduction in aggregate risk capacity in the financial system – a bank credit crunch caused by a scarcity of equity capital in banks – as losses force those who are used to absorbing risk to have to limit those exposures.

This essay considers the origins of the subprime turmoil, and the way the financial system has responded to it. There are both old and new components in both the origins and the propagation of the subprime shock.

With respect to origins, the primary novelty is the central role of agency problems in asset management. In the current debacle, as in previous real estate-related financial shocks, government financial subsidies for bearing risk seem to have been key triggering factors, along with accommodative monetary policy. While government encouragement of risky borrowing and loose money played a major role in the current U.S. housing cycle, investors in subprime-related financial claims must share the blame for making ex ante unwise investments, which seem to be best understood as the result of a conflict of

interest between asset managers and their clients. In that sense, sponsors of subprime securitizations and the rating agencies – whose unrealistic assumptions about subprime risk were known to investors prior to the runup in subprime investments – were providing the market with investments that asset managers demanded in spite of the obvious understatements of risk in those investments.

With respect to the propagation of the shock, much is familiar – the central role of asymmetric information is apparent in adverse selection premia that have affected credit spreads, and in the quantity rationing of money market instruments – but there is an important novelty, namely the ability of financial institutions to have raised more than $434 billion (as of the end of the third quarter of 2008) in new capital to mitigate the consequences of subprime losses for bank credit supply. The ability and willingness to raise capital is especially interesting in light of the fact that the subprime shock (in comparison to previous financial shocks) is both large in magnitude and uncertain in both magnitude and incidence. In the past, shocks of this kind have not been mitigated by the raising of capital by financial institutions in the wake of losses. This unique response of the financial system reflects the improvements in U.S. financial system diversification that resulted from deregulation, consolidation, and globalization.

Another unique element of the response to the shock has been the activist role of the Fed and the Treasury, via discount window operations and other assistance programs that have targeted assistance to particular financial institutions. Although there is room for improving the methods through which some of that assistance was delivered, the use of directly targeted assistance is appropriate, and allows monetary policy to be “surgical”

and more flexible (that is, to retain its focus on maintaining price stability, even while responding to a large financial shock).

In light of these new and old elements of the origins and propagation of the subprime turmoil, the essay concludes by considering the near term future of financial and macroeconomic performance, and the implications for monetary policy, regulatory policy, and the future of the structure of the financial services industry.

Downside risks associated with the credit crunch increased in the wake of the financial upheaval of September 2008. At this writing, a comprehensive plan to recapitalize the financial system is being considered by Congress. An intervention based on preferred stock injections into banks would be preferable to the Fed-Treasury TARP proposal of government purchases of bank assets.

Although credit conditions are a major concern, dire forecasts of the outlook for house prices reflect an exaggerated view of effects of foreclosures on home prices.

Inflation and inflation expectations have risen and pose an immediate threat. Monetary policy should maintain a credible commitment to contain inflation, which would also facilitate US financial and nonfinancial firms' access to capital markets.

Regulatory policy changes that should result from the subprime turmoil are numerous, and include reforms of prudential regulation for banks, an end to the longstanding abuse of taxpayer resources by Fannie Mae and Freddie Mac, the reform of the regulatory use of rating agencies' opinions, and the reform of the regulation of asset managers' fee structures to improve managers' incentives. It would also be desirable to restructure government programs to encourage homeownership in a more systemically

stable way, in the form of downpayment matching assistance for new homeowners, rather than the myriad policies that subsidize housing by encouraging high mortgage leverage.

What long-term structural changes in financial intermediation will result from the subprime turmoil? The conversion of Morgan Stanley and Goldman Sachs from standalone investment banks to commercial (depository) banks under Gramm-Leach-Bliley is one important outcome. The perceived advantages of remaining as a standalone investment bank – the avoidance of safety net regulation, and access to a ready substitute for deposit funding in the form of repos – diminished as the result of the turmoil. Long-term consequences for securitization will likely be mixed. For products with long histories of favorable experiences – like credit cards – securitization is likely to persist and may even thrive from the demise of subprime securitization, which is a competing consumer finance mechanism. In less time-tested areas, particularly those related to real estate, simpler structures, including on-balance sheet funding through covered bonds, will substitute for discredited securitization in the near term, and perhaps for years to come.

I. What's Old and What's New about the **Origins** *of theTurmoil?*

The financial turmoil that began in the summer of 2007 continues, and likely will continue, through the end of 2008, and perhaps beyond. The turmoil has many dimensions in addition to the obvious statistics of falling asset prices, increased foreclosures, and widening default spreads – the "financial revulsion" (a wonderfully descriptive term that unfortunately has fallen out of use in recent decades) marks the end of a boom in housing prices, the collapse of the young subprime mortgage market, and the demise of a recent wave of complex securitization structures engineered by Wall

Street to share risk and conserve on financial intermediaries' capital (the so-called originate-and-distribute model of financial intermediation). It also marks the end of one the longest periods of high profitability, ample equity capital, and abundant credit supply in U.S. banking (1993-2006). For these reasons, the turmoil is much more than a cyclical readjustment in prices, risk appraisal, risk tolerance, or credit supply; it represents an end to important secular trends in asset prices, financial innovation, and financial intermediation, which persisted for more than a decade.

From the perspective of a longer-term view of financial shocks, such reversals are not new. The Great Depression saw similar long-term trend reversals. Asset prices that had boomed in the 1920s collapsed in the 1930s. The stock issues boom and the tendency of retail investors to become stockholders on a large scale (both of which can be regarded as financial structural changes of the 1920s), were brought to an end in the 1930s (for roughly thirty years). And much like the securitized mortgage finance sector today, the high-fliers of the 1920s, the utilities companies, went from a booming sector that thrived on the new funding sources of the 1920s to struggling enterprises and wards of the state.

The Great Depression is not the only example of an historical financial crisis that witnessed a long-term reversal in financial structure trends. Indeed, the Depression was quite different from the current turmoil in its origins; there are many better historical parallels to choose from.[1] When searching history for precedents and lessons it is important to recognize distinctions among financial crises (exemplified in Table 1). Some entail severe losses (losses from the Dot.com collapse were greater than the large losses

[1] Although agricultural problems continued from the 1920s into the 1930s, the Depression was not caused by shocks relating to a real estate bust. The Great Depression was caused primarily by shocks relating to worldwide monetary and exchange rate policy, which were propagated, in part, through their effects on the financial system. For a recent review of the contributing factors to the Depression, see Parker (2007).

from the current subprime turmoil), others do not (e.g., the Penn Central crisis, or the panics of the national banking era). In some cases, the incidence of losses across the economy is easy to discern (e.g., in the Dot.com collapse), in others (like the current subprime debacle, the Penn Central crisis, or the national banking era panics) losses are not easy to measure or locate within the financial system. Some revolve around bank lending behavior (like today's problems), others are located mainly in stock and bond markets (e.g., the Dot.com collapse). Some are closely related to real estate (the agricultural problems of the 1920s and the 1980s), others are not.

What are the typical historical ingredients of crises that are most similar to the current turmoil? What has caused severe credit collapses linked to real estate booms and busts in the past? Accommodative monetary policy has been a key factor in historical credit and asset pricing cycles of all types historically (Bordo and Wheelock 2007a, 2007b, Bordo 2007). This has long been recognized by commentators on financial crises. In reviewing White's (1996) edited compendium of prominent articles on financial crises, Calomiris (1998) noted an overarching theme of the collection: the most severe financial crises typically arise when rapid growth in untested financial innovations coincided with very loose financial market conditions (that is, an abundance of the supply of credit).

In historical and contemporary real estate-related financial crises, a third factor has also been key to causing the most severe losses: the presence of government subsidies encouraging widespread underpricing of risk, which makes the costs of financial collapses particularly large (see Calomiris 1989, 1990, 1992, 2008, Caprio and Klingebiel 1996a, 1996b, Dermirguc-Kunt, Kane, and Laeven 2008).

In exploring the roots of the subprime debacle it is reasonable to begin the search for causes in this familiar territory. Can one conclude that the current turmoil offers simply another illustration of familiar broad themes that are well known to financial historians? Is the current mess just another example of what happens when one mixes loose monetary policy (magnified by the so-called global savings glut of the past several years),[2] distortionary policies that subsidize risk taking (like various government subsidies for leveraging real estate, discussed below), and financial innovations that complicate risk assessment (an innovative, fast-growing market for securitized assets)?

Real estate debacles are common historically. A little more than one hundred years ago, five of the financial collapses of that era (Argentina 1890, Australia 1893, Italy 1893, the Western United States 1893, and Norway 1900) all displayed similar trend reversals in real estate markets, albeit to different degrees.[3] Four of these crises (Australia, Argentina, Italy, and Norway) constitute the most severe banking crises of the 1875-1913 period worldwide where severity is measured in terms of the negative net worth of failed banks as a proportion of annual GDP.[4] All four of these cases have been linked in the economic history literature to government subsidies in real estate finance that gave rise to booms in real estate investment. The most severe ones (Australia and Argentina, both of which resulted in nearly unprecedented resolution costs of roughly 10

[2] By some measures, monetary policy was unusually accommodative during the subprime boom. The real fed funds rate, measured less the core PCE, or less the University of Michigan five-year expected inflation measure, was persistently negative from 2002-2005 to a degree only seen once before in the post-World War II era, in 1975-1978. The effects of loose monetary policy (which is generally confined to lowering only short-term interest rates) was magnified by global factors that promoted correspondingly low long-term rates (the so-called "conundrum"). Caballero et al. (2008) argue that special circumstances relating to the comparative advantage of financial intermediation in the United States can explain the conundrum.

[3] These episodes are discussed in detail in Calomiris (2008).

[4] Brazil is excluded from the list due to lack of available data.

percent of GDP) clearly were cases in which particularly large government subsidies financing land development drove extraordinary booms in land markets that ended badly.

The Argentine financial collapse of 1890 was at its core the end of an experiment in the subsidization of real estate risk in the pampas. Argentina's banks were permitted to originate mortgages (cedulas) that were guaranteed to be paid by the state if the borrower was unable to do so. These mortgages traded at par with Argentine government securities in the London money market. This arrangement was designed to expand credit supply for land (the political brainchild, of course, of the recipients of the subsidy). In the process, it also encouraged extreme risk taking by lenders (the incentive consequences of guaranteeing mortgage repayment are essentially the same as guaranteeing deposit repayment or GSE liabilities in our modern financial system).

The Australian case was a bit different; financial market policies toward the private sector were not the primary means through which the government promoted the land boom that preceded the bust of 1893. The pre-1890 Australian economic expansion was largely an investment boom in which the government played a direct role in investing in land and financing farmers' investments. Government investments in railroads, telegraphs, irrigation, and farms were financed by government debt floated in the British capital market and by government-owned savings banks and postal savings banks (M. Butlin 1987, N. Butlin 1964, S. Butlin 1961, Davis and Gallman 2001).

The smaller losses during the Norwegian and Italian land busts reflected less aggressive, more regionally-focused government policies that promoted land development. In Norway, that was achieved through a government-sponsored lender and an accommodative central bank; in Italy, through liability protection for the Banca di

Roma, which famously financed a Roman land boom at the behest of the Pope, who had lobbied for national government insurance of the bank's liabilities (Canovai 1911). The Norwegian banks' losses amounted to roughly three percent of GDP, and the Italian banks' losses (which largely reflected exposures to the Roman land market) were roughly one percent of GDP (Calomiris 2008).

The agricultural finance collapse of the 1890s in the Western U.S. (concentrated in Kansas and Nebraska) was a different matter; it had little to do with government policy. Here, mortgage brokers and local bankers mistook the quality and riskiness of the newly settled lands of the so-called "middle border," and in retrospect, invested far too much in lands that failed to meet those expectations; those overly optimistic initial assessments were brought to light during the drought-stricken years after 1887 (Bogue 1955, Calomiris and Gorton 1991). It is noteworthy that bank failures during the U.S. crisis of 1893 were highly concentrated in the states whose lands had produced surprising losses; the losses of failed banks for the U.S. as a whole were small as a fraction of GDP (less than one-tenth of one percent) – in sharp contrast to the other four cases – reflecting the region-specific nature of that crisis, and the absence of an active role of government subsidization of real estate risk, which was present in the other four cases.

In the 20th century, boom-and-bust cycles in agricultural land prices, sometimes with dramatic consequences for farm and bank failures, were also apparent, and the most severe of these episodes (the farm land price collapses of the 1920s and the early 1980s) – like the land booms and busts of Australia, Argentina, Italy, and Norway in the 1890s – were traceable to government policies that subsidized real estate financing.

Following a typical wartime pattern, agricultural prices were bid up substantially during World War I. Some optimistic, risk-loving farmers in some states in the United States substantially expanded their land under cultivation in response to that short-term change (wrongly inferring a permanent change had occurred), while others did not. Interestingly, not all states empowered optimistic farmers to the same degree. In North Dakota, South Dakota, and Nebraska, the losses from overly optimistic agricultural lending that came home to roost in the 1920s were much larger than in adjoining states. Those three states empowered land value optimists by establishing large land financing subsidies in the form of mandatory deposit insurance systems for state-chartered banks. Optimistic farm land speculators could organize small new banks and attract funds easily in the presence of deposit insurance. All state banks shared (via mutual liability for each other's deposits) any losses that occurred. The result was that these three states' state-chartered banks expanded their agricultural lending at a much faster pace than other states, and did so through the establishment of new, small (very undiversified) rural banks with very low equity capital (Calomiris 1990, 1992).[5]

A similar pattern repeated itself at the national level during the agricultural boom of the 1970s. Carey (1994) constructed a theoretical and empirical model of how credit subsidies administered through the Farm Credit System "fed the optimists" during the 1970s. As land prices escalated, non-Farm Credit System lenders withdrew from financing loans collateralized by obviously overbought land, while government lenders did not (and eventually constituted 100% of the marginal loan supply for agricultural

[5] Wheelock and Wilson (1994) show similar patterns, cross-sectionally, within Kansas. Banks in Kansas that voluntarily entered the Kansas deposit insurance system operated less prudently and suffered larger losses than other Kansas banks. The compulsory systems of Nebraska and the Dakotas, however, offered greater subsidization of risk, and resulted in greater loss.

loans). Carey's empirical evidence of the existence of a land bubble in the 1970s is unusually convincing; unlike in residential real estate (where projections of fundamentals relating to permanent income and demographic trends make it difficult to establish the existence of a bubble) by focusing on agricultural land, whose value can be clearly linked to soil productivity and crop price trends (which are observable characteristics), one can measure the extent to which land values deviate from reasonable projections of the net present value of income earned from the land.

In summary, real estate-related financial crises with the most disastrous loss consequences have typically been the result of government financial policies that subsidized the taking of real estate risk.[6] How relevant are these historical cases – Australia and Argentina in the 1890s, the Dakotas and Nebraska in the 1920s, or the U.S. farm boom and bust of the 1970-1985 period – for understanding the current turmoil? Did government investment and credit subsidies drive the current boom and bust in the same manner as it drove these most severe trend-reversing real estate busts of the past, which resulted in huge macroeconomic declines and enormous taxpayer-borne resolution costs?

Clearly, U.S. financial policy subsidizes the bearing of risk in financing residential real estate. The U.S. government subsidizes homeownership in several ways, but each of those subsidies is delivered in a way that promotes financial fragility in the

[6] Obviously, the cases discussed above are not a complete list. Including other examples would confirm the central conclusion of this discussion. For example, the U.S. Panic of 1837 and Panic of 1857 also were significant financial crises with real estate aspects, particularly related to infrastructure expansion. The 1830s saw overbuilding of canals by state and local governments, through a combination of government expenditures, state government bond flotations, and loans from state-chartered banks whose charters specifically envisioned financing these projects. The series of events that triggered the Panic of 1837 is controversial (Temin 1969, Schweikart 1987, Rousseau 2002), but whatever the trigger, the Panic brought huge losses related to prior infrastructure investment. The westward expansion of the 1850s resulted primarily from private investments in railroads, which was undermined by adverse political news relating to the brewing conflict over western expansion between the North and the South (Calomiris and Schweikart 1991). Compared to the Panic of 1857, the Panic of 1837 resulted in far more severe losses for banks and securities investors who financed the government-promoted real estate investments of the 1830s.

real estate market. The primary subsidies are: (1) the deductibility of mortgage interest on one's home,[7] (2) FHA programs to provide credit to buyers (which permit 97% leverage at origination, and permit cash out refinancing that leave leverage as high as 95%.), (3) government funding subsidies via Federal Home Loan Bank lending (which played a large role in financing IndyMac and Countrywide) and liability protection for Fannie Mae and Freddie Mac (formerly implicit, now explicit) along with political pressures on those institutions to increase their "affordable housing" programs, which increased demand for subprime mortgages by Fannie and Freddie, (4) government initiatives (including the Community Reinvestment Act, or CRA) that have pressured banks to increase the access of low-income and minority individuals to bank credit, and (5) default mitigation protocols, developed during the 1990s and early 2000s, which have required banks that originate loans held by Fannie, Freddie, and FHA to adopt standardized practices for renegotiating delinquent loans to avoid foreclosure.

These five categories of initiatives either encourage creditworthy borrowers to increase their mortgage leverage (by establishing benefits of maintaining high leverage) or expand access to borrowing for people who would not otherwise be able to secure or retain mortgage loans. Over the last several decades, the government and private lenders have both expanded the maximum allowable leverage on a home, and reduced the minimum creditworthiness of individuals with access to mortgage finance, which has magnified the subsidies from these various credit programs. The most important of these influences in recent years seems to have been the role of Congressional politics in

[7] Because owners of rented residential properties are permitted to deduct their mortgage interest expenses, the benefit of which presumably is passed on to renters, it is wrong to say that permitting homeowners to deduct their mortgage interest subsidizes homeownership; rather, it is perhaps better to say that allowing homeowners to deduct interest avoids taxing homeownership.

encouraging Fannie and Freddie to grow their subprime portfolios. Accounting scandals at Fannie and Freddie in 2003 and 2004 galvanized the GSE reform movement. Critics, including Alan Greenspan, worried increasingly about the systemic risks posed by the growing size and portfolio risks of these institutions, and undertook a concerted effort to rein in the housing GSEs, which culminated in proposed legislation by Senate Republicans in 2005 (Calomiris and Wallison 2008). Apparently, this drove the GSEs to redouble their efforts to appeal to Congressional Democrats by substantially expanding their exposures to subprime mortgages from 2005 through 2007. As of 2008, Fannie and Freddie had a combined exposure to subprime and Alt-A mortgages of more than one trillion dollars.

Alternative means for subsidizing homeownership do exist in other countries. In particular, one alternative is a program of government matching of downpayments by new homebuyers. This offers an alternative, risk-reducing means of promoting homeownership (Calomiris 2001). But governments typically prefer promoting homeownership by subsidizing lending. The primary explanation for Congress' and other governments' preference for credit subsidies, historically and currently, revolves around the differing electoral politics of on- and off-budget subsidies. Downpayment matching by the government is a budgeted transfer payment, while the costs of subsidizing housing via the five categories of credit intervention listed above are hidden (until a financial collapse makes them apparent). The desire of legislators to avoid visible budgeted costs in favor of hidden guarantee costs seems to be a consistent theme of political history. That has an important consequence: the powerful political interests that favor real estate subsidies receive their government largesse in a form that promotes financial instability.

Undoubtedly, subsidies for mortgage leverage and government policies that have expanded access to credit were key drivers of the current U.S. turmoil. This is not just a U.S. problem; in Germany, for example, the government-supported Landesbanken are the locus of some of the most severe losses. Clearly, it is desirable to reduce government subsidization of mortgage risk.

But loose monetary policy and government encouragement of subprime investments by Fannie Mae, Freddie Mac, and other government interventions to promote affordable housing do not offer a complete explanation of the current mortgage mess in the United States. Subprime loan securitizations were bought by private sector players, not just by Fannie Mae or Freddie Mac. And the purchasers and originators of claims on these mortgages were not just regulated commercial banks (who had to meet CRA or other similar regulatory pressures), but included all classes of institutional investors. I will argue that another influence, namely an investment agency problem, was also important for understanding the timing and severity of the subprime shock. Before making that case, it is useful to review more comprehensively the frameworks used by economists to explain financial crises, and how well or poorly those competing frameworks perform in explaining the facts of the current subprime turmoil.

Different frameworks for explaining booms and busts

There are several non-mutually exclusive frameworks in economics that are capable of delivering what are variously termed "credit cycles," "cycles of mania and panic," "booms and busts," and the like. I would characterize the literature as divided into four broad frameworks: (1) variation in fundamentals over time, (2) irrational myopia, (3)

government subsidies that distort risk pricing, and (4) agency in asset management.[8] I have already described the way government subsidies that distort risk pricing can produce booms and busts. I briefly review the other three frameworks to explain why asset management agency problems, in combination with loose monetary policy and a preexisting set of government policies that encouraged high leverage, played the dominant role in the origins of the current turmoil.

The first framework, the "fundamentalist" model, posits that credit cycles reflect exogenous events, which alter rational perceptions of future cash flows and lead to endogenous changes in tolerances for risk, reflected in leverage limits, risk pricing, and asset prices. Recent examples of such models include Von Peter (2008) and Geanakoplos (2008). According to these models, which build on prior theoretical work on credit cycles and business cycles by Bernanke and Gertler (1989, 1990) and others, agents behave rationally and respond to evolving news. Responses to news become especially pronounced in environments of asymmetric information, and can deliver large changes in leverage and asset pricing. One strength of this class of models is that it is capable of explaining why some credit cycles are much more severe than others – the severity of the cycle should depend on the size of the exogenous shock, and on the financial condition (state variables such as leverage, liquidity, etc.) of financial intermediaries, firms, and consumers at the time news shocks arrive.

This framework implies many testable implications (identifying shocks, and measuring differences in responses that vary according to the state variables of the

[8] There is another category of theoretical models (which have fallen out of fashion in the past decade) that posit financial crises resulting from knife-edge phenomena relating to multiple equilibria and endogenous liquidity scarcity. I discuss this class of models elsewhere (Calomiris 2008), where I show that these models are of little use for understanding the likelihood, timing and varying severity of financial crises.

agents). There is a large literature measuring responses over the credit cycle and linking them to identifiable shocks and propagators. Importantly, this literature shows that severe credit events do not happen in every cycle. For example, Calomiris and Gorton (1991) show that the timing of the nationwide banking panics during the period 1870-1913 can be fully explained with a dual threshold criterion: if and only if the quarterly liabilities of failing businesses rose sufficiently (by 50%) while stock prices were falling sufficiently (by more than 9%), a banking panic ensued. Calomiris, Orphanides and Sharp (1997) find that firms' investment contractions during recessions do depend on their preexisting leverage, but that dependence is complex and reflects the fundamental circumstances of individual firms; the combination of firms' sales growth fundamentals and leverage is what matters, not just leverage, per se, when considering how severely firms are punished by contracting credit markets. Similarly, Calomiris and Mason (2003a) show that bank depositors varied their withdrawal responses to the shocks buffeting banks during the Great Depression according to the fundamental positions of their respective banks. Calomiris and Mason (2003b) show that regional variation in the extent of the credit crunch during the Great Depression was related to characteristics of the banking systems in different states.

Variation over time in the pricing of risk (as described by Bordo 2007, and Bordo and Wheelock 2007a, 2007b) arises in a fundamentals-based model of credit cycles. Asymmetric information problems in financial intermediation cause variation over time in the effective supply of credit available to borrowers, and the pricing of risk will vary with the supply of credit. For example, if reductions in the riskless interest rate are associated with increases in the value of bank equity capital, and if increases in equity

capital in turn increase the supply of loanable funds, then credit spreads may fall with riskless interest rates. Indeed, this particular transmission mechanism of monetary policy was a key insight in Bernanke's (1983) fundamentalist model of financial markets during the Great Depression, which found further microeconomic empirical support in Calomiris and Mason (2003b) and Calomiris and Wilson (2004).

A limitation of the fundamentalist approach is that it explains variation in risk pricing, but not under- or over-pricing of risk. Several empirical studies have argued that risk pricing not only varies over time, but becomes excessively favorable during booms, implying a failure of markets to adequately protect against loss and to price underlying risk fully (Dell'Ariccia, Igan, and Laeven 2008, Jimenez, Ongena, Peydro-Alcalde, and Saurina 2007, and Mendoza and Terrones 2008). Indeed, I will argue below that there is strong evidence of the underpricing of risk in subprime lending from 2004 to 2007.

How can mispricing of risk be explained? Hyman Minsky (1975) and Charles Kindleberger (1978) advocate a behavioral theory of manias (during booms) and panics (during crashes), which is rooted in the tendency of human nature to overreact. Myopia and herd-like behavior cause endogenous cycles of greed and fear to dominate investment behavior rather than rational long-term calculations of forecasted fundamentals. This theory posits the perpetual under- and over-pricing of risk as the result of human nature's purported tendency to engage in cycles of euphoric greed, followed by fear and panic.

Despite its appeal for explaining risk mispricing, the Minsky-Kindleberger approach suffers from an important empirical defect: as a theory about human nature, it should have nearly universal application. At least within the context of roughly similarly organized financial markets and economies, boom and bust cycles should be pretty

similar in their length and severity. That implication is a problem for the theory; some financial crises, as even the brief review of cases above illustrates, have much more severe consequences than others. This variation, of course, is precisely what fundamentalist models of financial cycles are capable of explaining. If one wants to know why *this particular turmoil of 2007-2008* is so much worse than others in the past, the Minsky-Kindleberger view is going to be hard pressed to explain it.

Neither the Minsky-Kindleberger view nor the "fundamentalist" model can explain the origins and peculiar severity of the current turmoil. The fundamentalist view cannot explain the private sector's under-pricing of subprime risk. Furthermore, unlike the Russian/Long-Term Capital crisis of 1998, or 9/11, there was no identifiable exogenous shock driving the current turmoil; the problem came from within the financial system. The Minsky-Kindleberger view, while capable of explaining under-pricing of risk, does not explain the relative severity of shocks like the current one. Furthermore, as discussed at length below, there is evidence that subprime risk under-pricing was intentional, not the result of euphoria or ignorance.

In my view, the three specific, key influences that worked together to produce the massive ex ante underpricing of risk in the two years prior to mid-2007 were: (1) the global savings glut (a surge in the supply of investable funds resulting from loose monetary policy, and other global influences, including the exchange rate/reserve accumulation policy of China), (2) the massive increase in demand for subprime instruments by Fannie Mae and Freddie Mac, and (3) agency problems that led asset managers to purposefully deploy an increasing proportion of funds in bad investments.

The three influences fed on each other. Fannie and Freddie bid up the prices of subprime instruments and seemed to offer a reliable source of growing, taxpayer-supported demand in support of subprime mortgage-backed securities' prices. The global savings glut encouraged excessive risk taking by providing a vast pool of resources available for investment; this factor, by itself, would tend to encourage excessive risk taking by non-hedge fund money managers who are compensated on the basis of the volume of risky assets that they manage. Indeed, the fact that LBO financing and other asset classes, not just subprime mortgages, seem to have been overpriced in 2006 and 2007, provides evidence of a general environment of excessive risk taking. But the agency problem was especially pronounced for subprime investments because of the behavior of the GSEs, as well as the novelty of subprime lending and the *particular loss experience on subprime foreclosures in 2001-2003*, which created a unique moral-hazard opportunity for asset managers to enjoy "plausible deniability" in the pricing of risk.

Asset managers invested too much in risky assets because of an incentive conflict. If they had informed their clients of the truth – that the supply of good investments in risky assets has been outstripped by the flood of financial savings, and that consequently, the risk-reward tradeoff does not warrant further investment in risky assets – then asset managers would have been required to return money to clients rather than invest in risky assets. Presumably the money would then have ended up in bank deposit accounts or other investments. Returning the money to investors under these circumstances makes investors better off (given the poor return to bearing risk), but it can make asset managers worse off (if their compensation depends primarily on the size of the funds they manage),

since the management fees earned grow in proportion of the amount of funds invested in risky assets.[9]

Agency in Asset Management: "Plausible Deniability" and the 6% Solution

What is the evidence that asset managers who bought or retained securitization claims or other liabilities relating to subprime mortgages willingly over-invested their clients' money in risky assets that did not adequately compensate investors for risk? Others (e.g., Mason and Rosner 2007a, 2007b, IMF 2008, Ellis 2008) describe in detail the faulty assumptions that underlay the securitization of subprime mortgages and related CDOs. Of course, it is always difficult to establish the ex ante unreasonableness of any assumptions. Nevertheless, some facts known to investors in advance of the subprime collapse are hard to explain without appealing to an asset management agency problem.

Ratings agencies and sponsors, who engineered the financing structure of subprime MBS through their chosen assumptions regarding the probability of default (PD) and loss given default (LGD) on portfolio pools (and other assumptions), assumed unrealistically low expected losses on subprime MBS pools prior to the crisis, and failed to timely revise them upward, despite the high growth of subprime and changes in the population of originators and borrowers that should have been cause for concern. Indeed, ratings agencies and sponsors maintained highly optimistic assumptions about the market until the middle of 2007, long after clear signs of serious problems had emerged. The expected loss assumptions were unreasonably low, and independent observers drew

[9] If this account is correct, it implies a testable hypothesis for future empirical work: institutional investors who were investing their own money, or who are properly incentivized to focus on the long-run performance of their portfolios (i.e., many hedge fund managers), should have been more choosey about their investments in subprime mortgages and related CDOs. Casual empiricism is consistent with this prediction, although I am not aware of any formal analysis that supports it.

attention to that fact far in advance of the summer of 2007. The low expected loss assumptions were fundamental to the growth of subprime MBS in the four years leading up to the crisis. A low assumed expected loss is crucial for explaining how subprime mortgages were able to finance themselves more than 80% in the form of AAA debts, and more than 95% in the form of A, AA, or AAA debts, issued by subprime MBS conduits.

The low assumed expected loss had two parts: a low assumption of the probability of default (PD), and a low assumption of the loss given default (LGD), which is also called the "severity" of loss. It is hard to document the pre-2007 PD and LGD assumptions used by ratings agencies or sponsors. [10] Data on expected losses for subprime pools, however, do exist (the product of LGD and PD). Assumed expected losses were roughly 4.5% circa 2004, and rose to roughly 6% in 2006. Realized losses on these cohorts are now projected to be several times these numbers.[11]

Where did the low loss assumptions come from, and how could institutional investors have accepted these as reasonable forward-looking estimates? Subprime was a relatively new product, which grew from humble beginnings in the early 1990s, and remained small even as recently as several years ago (Table 2); not until the last three years did subprime originations take off. Given the recent origins of the subprime market, which postdates the last housing cycle downturn in the U.S. (1989-1991), how were ratings agencies able to ascertain what the LGD would be on a subprime mortgage pool?

[10] The modeling assumptions used in rating subprime pools have become much more transparent since the middle of 2007, and it is now possible to know LGD assumptions by type of product and by cohort, but this sort of information seems to be unavailable retrospectively.

[11] The original collateral pool loss expectations for the 2006 subprime vintage were in a range between 5.5% and 6%, according to Moody's (2007e). In 2004, some industry sources indicate that Moody's expected loss assumption for subprime pools was 4.5%.

A significant proportion of subprime mortgages defaulted in the wake of the 2001 recession, although the volume of outstanding subprime mortgages was small at that time (Figure 1). In fact, only in the last quarter has the default rate on subprime mortgages exceeded its 2002 level. The existence of defaults from 2001-2003 created a default loss record, which provided a basis for low expected loss projections. Subsequent experience was even better; the 2003 cohort of subprime mortgages realized cumulative losses of only 3% prior to July 2007 (Merrill Lynch 2007, p. 9, note 11).

There were two major problems with using the 2001-2003 experience as a basis for a forward-looking forecast of future losses from subprime foreclosures. First, and most importantly, the loss experience of 2001-2003 occurred in the wake of a very unusual (almost unique) macroeconomic event, namely a recession (in 2001) during which the housing market continued to boom. Low realized losses reflected the fact that housing prices grew dramatically from 2000 to 2003 (see Figure 11). In a flat or declining housing market – the more reasonable forward-looking assumption for a high-foreclosure, recessionary state of the world – both the probability of default (PD) and the LGD would be much greater (as today's experience demonstrates). The PD would be greater in a declining housing market because borrowers would be less willing to make payments when they have little equity at stake in their homes.[12] The LGD would be greater in a declining housing market because of the effect of home price appreciation on lenders' losses.[13]

[12] Foreclosure is a strategic decision on the part of borrowers and lenders, and thus reflects changes in house values. Calomiris, Longhofer and Miles (2008) show that negative shocks to house prices produce increases in foreclosures.

[13] According to Fitch (2006b, p. 6), the 2004, 2005, and 2006 cohorts of subprime mortgages had average loan-to-value ratios of 81.5% and average loan sizes of roughly $163,000. On average, foreclosures costs on a home in the U.S. average roughly $59,000, which is a large fraction of the size of subprime mortgages (Getter 2007). Foreclosures, on average, are completed eighteen months after the first missed payment –

This error was forecastable. For the most part, the housing cycle and the business cycle coincide very closely. Most of the time in the past (and presumably, in the future) when recession-induced defaults would be occurring on subprime mortgages, house prices would be not be appreciating. Thus, it is reasonable to assume that times of high foreclosure are also times of high LGD. This implies that the loss experience of 2001-2003 (when house prices rose) was not a good indicator either of the probability of foreclosure or of the LGD for subprime mortgage pools on a forward-looking basis. Anyone estimating future losses sensibly should have arrived at a much higher expected loss number than the 4.5%-6% numbers used during the period 2003-2006.

Another reason that the expected losses were unrealistically low relates to the changing composition of loans. Even if 6% had been reasonable as a forward-looking assumption for the performance of the pre-2005 cohorts of subprime borrowers, the growth in subprime originations from 2004 to 2007 was meteoric, and was accompanied

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Getter 2007). Costs consist of lost loan principal, real estate taxes and insurance payments, maintenance, real estate commissions, legal fees, and other physical collection costs. When house prices rise, some of the costs lenders bear in foreclosure are recoverable, although not all foreclosure costs can be recovered, even when home prices of foreclosed homes rise dramatically (Mason 2007). In essence, the LGD is kinked as a function of home price change: home price declines have a one-for-one dollar effect on realized losses (since they reduce the ability to recover principal, accrued interest, and other recoverable costs one-for-one), but home price appreciation only has a fractional effect on foregone losses, since some expenses cannot be recovered from the proceeds of the sale of the house. For example, under an assumption of a 15% prospective decline in house prices, as of January 2008, JPMorgan projected that the LGD for a sample of Prime Alt-A Hybrid ARM portfolios that were originated in 2003 was 12.8%, but the LGD for the 2006 cohort of similar mortgages, under the same price change assumption, was 44.6%. That difference reflected the fact that on average the 2003 cohort had substantial equity (25.5% equity at origination plus 27.3% estimated appreciation from origination to January 2008), while the 2006 portfolio had 24.3% equity at origination and house prices were estimated to have declined 17.0% from origination to January 2008. Thus, the huge 31.8% estimated difference in LGD was attributable to a 44.3% difference in price change (less than a one-for-one effect). A reasonable forward-looking average LGD assumption for subprime mortgages prior to 2007 would probably have been upwards of 40%, consistent with realistic foreclosure cost estimates and a zero-price change housing outlook (Merrill Lynch 2007, p. 9), not the lower LGD numbers actually assumed prior to 2007. The low LGD assumptions employed reflected unrealistic assumptions of continuing home price appreciation, which persisted into the middle of 2007.

by a significant deterioration in borrower quality (Ellis 2008).[14] Was it reasonable to assume that these changes would have no effect on the expected loss of the mortgage pool? The average characteristics of borrowers changed dramatically (resulting in substantial increases in the PD, which were clearly visible by 2006 even for the 2005 cohort, as is apparent in Figure 2).

Mason and Rosner (2007a, 2007b) raised these and many other criticisms of subprime underwriting standards before August 2007. As early as the summer of 2006, critics pointed to the implausible loss assumptions of subprime mortgage pools, and the need to stress test them with a housing downturn. This was not rocket science.

Even more remarkably, subprime and Alt-A originations for 2006 and early 2007 continued despite mounting evidence of performance problems in existing portfolios, which were discussed openly by the ratings agencies. Gary Gorton, in his oral comments at the 2008 Kansas City Federal Reserve Bank's Jackson Hole Conference described the originations in 2006 and 2007 by Merrill, UBS, and Citibank as "shocking." As Gorton's (2008) paper emphasizes, the core assumption on which subprime lending had been based was the permanent appreciation of home prices. By the middle of 2006, that assumption came into question. Gorton (2008) shows that the ABX market had become concerned about subprime performance by the middle of 2006. According to Fitch's (2006a, p. 21) extremely negative discussion of subprime prospects, the environment became increasingly negative after the first quarter of 2006, as reflected in the fact that

[14] Low LGD assumptions also help to explain the rise of "no-docs" or "low-docs" subprime mortgages (less graciously called "liar" mortgages) that produced the uniquely loss-creating loan cohorts of 2005, 2006, and 2007 (Ellis 2008). The probability of default (PD) – which increases when screening is relaxed – matters less when the LGD is low. Cutting processing costs and time delays by adopting a no-docs process and charging a few extra percentage points of interest may be a more profitable way to run a subprime origination business, despite the adverse selection consequences for the pool of adopting this practice, if you believe that the LGD is low.

"the number of sub-prime downgrades in the period between July and October 2006 was the greatest of any four-month period in Fitch's history for that sector" (up to that point). Fitch (2006a, p. 21) correctly predicted that "the sensitivity of sub-prime performance to the rate of HPA [home price appreciation] and the large number of borrowers facing scheduled payment increases in 2007 should continue to put negative pressure on the sector. Fitch expects delinquencies to rise by at least an additional 50% from current levels throughout the next year and for the general ratings environment to be negative, as the number of downgrades is expected to outnumber the number of upgrades." Nevertheless, in the midst of all this negative news, the originations continued at a feverish pace (Table 2), and not until the middle of 2007 did serious problems become reflected in significant changes in modeling assumptions by the ratings agencies.[15]

Institutional investors managing the portfolios of pensions, mutuals, insurance companies and banks continued to buy subprime-related securitization debt instruments, and banks that sponsored these instruments continued to retain large amounts of the risk associated with the subprime MBS and CDO securitizations they packaged, through purchases of their own subprime-related debts and credit enhancements for subprime conduits. Were the bankers who created these securitizations and retained large exposures for their banks related to them, and other sophisticated institutional investors who bought subprime-related securities, aware of the flawed assumptions regarding PD and LGD that underlay the financial engineering of subprime MBS by ratings agencies? These assumptions were widely publicized as part of the process of selling the securities. Did they object? Apparently not.

[15] In July 2007, as problems in subprime started to appear, loss assumptions increased substantially to roughly 8-11% (Merrill Lynch 2007, Moody's 2007a, 2007b, 2007c, 2007d). By the end of 2007, loss estimates had grown much more; in some subprime portfolios, estimated pool losses could exceed 50%.

There is also evidence that bankers who securitized subprime mortgages put the worst of the subprime mortgages into their securitization portfolios (retaining the better subprime mortgages on their balance sheets). Keys, Mukherjee, Seru, and Vig (2008) examine a dataset on securitized subprime mortgage loans and find that lenders purposely placed inferior subprime mortgages into securitization portfolios. Specifically, although the mortgages in the pools appeared to be similar to non-securitized mortgages, based on prima facie credit indicators (such as FICO scores), those that were securitized ultimately had substantially higher default rates. These results suggest that securitization was associated with the purposeful adverse selection of risk. In other words, securitizations purposely created hidden risks for buyers, including the sponsoring institutions that retained much of the risk created by their own securitizations.

Why did bankers create these risks for their own and other institutions, and why did other sophisticated institutional investors buy these overpriced securities? One answer is that asset managers were placing someone else's money at risk, and earning huge salaries, bonuses and management fees for being willing to pretend that these were reasonable investments. And furthermore, they may have reasoned that other competing banks and asset managers were behaving similarly, and that they would be able to blame the collapse (when it inevitably came) on a surprising shock. The script would be clear, and would give "plausible deniability" to all involved. "Who knew? We all thought that 6% was the right loss assumption! That was what experience suggested, and what the rating agencies used." Plausible deniability may have been a coordinating device for allowing asset managers to participate in the feeding frenzy at little risk of losing customers (precisely because so many participated). Because asset managers could point

to market-based data, and ratings at the time as confirming the prudence of their actions on a forward looking basis, they were likely to bear little cost from investor losses.

If the understatement of subprime risk was so clear, then why didn't hedge funds sell these investments short? As Gorton (2008) discusses, individual subprime MBS and CDO debt instruments were not traded widely. The ABX market, which traded in aggregate subprime-related indexes, developed only in January 2006; before that time, it was not possible for informed investors to express opinions about the level of risk in this market by buying or selling the various subprime indexes.

This account does not place the primary blame for the mispricing of risk on sponsors or rating agencies. After all, sponsors were only supplying what asset managers of their own institutions or outside buyers were demanding. And the rating agencies were also doing what the investors wanted – going through the mechanical process of engineering conduit debt structures, and rating them, based on transparently rosy assumptions. I doubt that rating agencies were deceiving sophisticated institutional investors about the risks of the products they were rating; rather they were transparently understating risk and inflating the grading scale of their debt ratings for securitized products so that institutional investors (who are constrained by various regulations to invest in debts rated highly by NRSROs) would be able to invest as they liked without being bound by the constraints of regulation or the best interests of their clients. Many observers wrongly attribute rating agencies' behavior to the fact that sponsors, rather than investors, paid for the ratings. But that fact seems irrelevant; sponsors and investors alike knew what was going on, and if the investors had not wanted the ratings to be inflated,

then the ratings agencies would not have inflated them. Ratings grade inflation was demand-driven.

Another fact confirms that conclusion. Collateralized debt obligations (CDOs), which increasingly repackaged subprime mortgages, grew dramatically alongside the subprime mortgage boom. From 2000 to 2005, the percentage of non-conforming mortgages that became securitized as MBS increased from 35% to 60%, while the percentage of conforming mortgages securitized rose from 60% to 82%. In 2005, 81% of new CDO pools consisted of MBS, and as of October 2006, 39.5% of existing CDO pools covered by Moody's consisted of MBS, of which 70% were subprime or second-lien mortgages (Mason and Rosner 2007a, p. 28). CDO issuance roughly doubled in 2006 (Figure 3). Were institutional investors aware that rating agencies were rating CDOs using a different scale from the normal corporate bond ratings? Yes. Moody's published restrospective data on the probability of default (as of the end of 2005) for Baa CDO tranches and for Baa corporate debts. As of 2005, the Baa CDO offerings had a roughly 20% five-year default probability, compared to a roughly 2% five-year default probability for corporate Baa bonds.[16] Despite the rhetoric rating agencies publish claiming to maintain uniformity in their ratings scale, it was common knowledge before and during the subprime boom that investment grade debt issues of subprime MBS and

[16] According to *Bloomberg Markets* (July 2007, p. 56) "Corporate bonds rated Baa, the lowest Moody's investment grade rating, had an average 2.2 percent default rate over five-year periods from 1983 to 2005, according to Moody's. From 1993 to 2005, CDOs with the same Baa grade suffered five-year default rates of 24 percent, Moody's found." Long before the recent turmoil, Moody's was aware that its Baa CDO securities were about 10 times as risky as its Baa corporate bonds. There was improvement in default experience on CDOs in 2006, and the default rate fell to 17%, reflecting that some previous impairments were cured in 2006. Nevertheless, the gap between corporate bonds and CDOs remained large. Based on additional data, through 2006, the comparable numbers are 2.1% and 17.0%. Moody's refers to missed payments in CDOs as "impairments," which are curable prior to maturity. Despite ratings' agencies statements that letter grade ratings should represent consistent portrayals of risk across different debt instruments (e.g., corporate debt and debts from securitizations), in fact, this has not been the case. For statements by ratings agencies affirming that ratings should have a consistent meaning "without regard to the bond market sector" see Mason and Rosner (2007b, pp. 7-8, 19).

CDO conduits were much riskier than their corporate counterparts. Indeed, this fact had been known about securitization debt issues since the early 1990s, and was the topic of a high-profile article published by two New York Fed economists (Cantor and Packer 1994).

An anecdote conveyed to me by a rating agency executive supports the view that asset managers, not sponsors and rating agencies, were driving the market's decision to overpay for risky debts. It is well known that sponsors of CDOs engage in an activity called ratings shopping. Sponsors ask rating agencies to tell them, hypothetically, how much AAA debt they would allow to be issued against a given pool of securities being put into the CDO portfolio. If a rating agency gives too conservative an answer relative to its competitors, the sponsor just uses another rating agency. On one occasion, when one agency was uninvited by a sponsor from providing a rating (because the rating agency did not offer to approve as high a percentage limit for AAA debt as the other agencies), the agency warned a prominent institutional investor not to participate as a buyer, but was rebuffed with the statement: "we have to put our money to work." Clearly, the institutional investors understood and controlled the rating process. They were sophisticated and informed buyers, and because they controlled the cash, they determined what constituted acceptable risk measurement by sponsors and rating agencies.

To what extent is it plausible to argue that the novelty of securitization products (subprime MBS, CDOs, etc.) made investors and rating agencies unable to gauge risk properly? As I have already noted, data were available prior to the turmoil that showed (1) that assumptions regarding subprime losses were unrealistically low, and (2) that the ratings given to debts issued by securitization conduits exaggerated the quality of those

debts. Furthermore, the novelty of a securitization product, in and of itself, was an indicator of a need to adjust estimates of risk upward. Experience suggests that rating agencies frequently underestimate the risks of new products and learn from major credit or fraud events that their risk measures and controls are inadequate. Experience prior to the subprime collapse (in credit card securitization, in delinquent consumer account receivable securitization, and in other areas) has shown that the learning curve related to underestimation of risk can be steep. Decades of experience with steep learning curves in new securitization products indicates yet another reason that properly incentivized institutional investors should have been cautious about the new, fast growing markets in subprime mortgages and CDOs.

Indeed, it is particularly strange to look at the measurement of subprime risk in contrast to the measurement of risk in the much older credit card securitization business. In credit card securitization, market participants paid close attention to the identities of originators, to their performance in the past, to the composition of portfolios, and to how compositions changed over time, and originators were rewarded with greater leverage tolerances for "seasoned" receivables with good track records (Calomiris and Mason 2004a). In contrast, until the middle of 2007, the ratings of subprime portfolios (based largely on the 6% or below expected loss assumption) seem to have been extremely insensitive to changes in borrower quality, product type (which is correlated with unobservable aspects of borrower quality), or the state of the housing market. And there was dramatic new entry into subprime origination in 2004-2006, yet these new entrants offering new, riskier products to new customers seem to have been able to raise funds under more or less the same low loss assumptions as old originators who offered older,

lower-risk products.[17] The principles learned over twenty years in the credit card securitization business were thrown out the window.

Various regulatory policies unwittingly encouraged the "plausible deniability" equilibrium. Regulation contributed in at least four ways. First, insurance companies, pension funds, mutual funds, and banks all face regulations that limit their ability to hold low-rated debts, and the Basel I and II capital requirements for banks also place a great deal of weight on rating agency ratings. By granting enormous regulatory power to rating agencies, the government encouraged rating agencies to compete in relaxing the cost of regulation (through lax standards). Rating agencies that (in absence of regulatory reliance on ratings) saw their job as providing conservative and consistent opinions for investors changed their behavior as the result of the regulatory use of ratings, and realized huge profits from the fees that they could earn from underestimating risk (and in the process provided institutional investors with plausible deniability).

Second, unbelievably, Congress and the SEC were sending strong signals to the rating agencies in 2005 and 2006 to encourage greater ratings inflation in subprime-related CDOs! In a little known subplot to the ratings-inflation story, the SEC proposed "anti-notching" regulations to implement Congress's mandate to avoid anti-competitive behavior in the ratings industry (Calomiris 2007a). The proposed prohibitions of notching were directed primarily at the rating of CDOs, and reflected lobbying pressure from ratings agencies that catered most to ratings shoppers.

Notching arose when CDO sponsors brought a pool of securities to a rating agency to be rated that included debts not previously rated by that rating agency. For

[17] Interestingly, Moody's (2007a) found that performance varied greatly across different subprime portfolios in ways that had not been foreseen; the identify of the originator was a very important determinant of differences in loss experience.

example, suppose that ratings shopping in the first generation of subprime securitization had resulted in some MBS securities that were rated by Fitch but not Moody's (i.e., perhaps Fitch had been willing to bless a higher proportion of AAA debt relative to subprime mortgages than Moody's). When asked to rate the CDO that contained those debts issued by that subprime MBS conduit, Moody's would offer either to rate the underlying MBS from scratch, or to notch (adjust by a ratings downgrade) the ratings of those securities that had been given by Fitch.

Rating agencies that offered more favorable subprime MBS ratings reportedly lobbied Congress to prohibit notching, complaining that this constituted an anti-competitive practice, and arguing that the dominant players (Moody's and S&P) should instead accept ratings of other agencies without adjustment when rating CDO pools. This effectively would have further emboldened the most lenient rating agencies to be even more lenient to ratings shoppers, since it effectively would have required the relatively conservative agencies (e.g., Moody's) to accept the ratings of other agencies in repackaging securities rated by others. Unbelievably, the SEC agreed that notching was anti-competitive and proposed to prohibit notching. In light of the CDO debacle, and a flood of criticism from academics (including myself), the SEC quietly withdrew this proposed anti-notching regulation (at least for the time being). But it still contributed to the subprime rating problem. In the face of the threatened anti-notching rule, the likely response by the relatively conservative rating agencies was to loosen their ratings standards on subprime MBS and CDOs. This policy constituted an attack on any remaining voices of conservatism within the ratings industry that argued for the importance of preserving long-run reputational capital: trying to swim against the tide of

grade inflation would put conservative rating agencies at risk of running afoul of their regulator.

Third, changes in prudential bank capital regulation introduced several years ago relating to securitization discouraged banks from retaining junior tranches in securitizations that they originated, and gave them an excuse for doing so. This exacerbated agency problems by reducing sponsors' loss exposures. The regulatory changes relating to securitization raised minimum capital requirements for originators retaining junior stakes in securitizations. Sponsors switched from retaining junior stakes to supporting conduits through external credit enhancement (typically lines of credit of less than one year), which implied much lower capital requirements.[18] Sponsors that used to retain large junior positions (which in theory should have helped to align origination incentives) no longer had to worry about losses from following the earlier practice of retaining junior stakes. Indeed, one can imagine sponsors explaining to potential buyers of those junior claims that the desire to sell them was driven not by any change in credit

[18] There were two important regulatory changes that took place in the last several years. In 2001, regulatory capital requirements were increased on junior stakes retained by sponsors; effectively, retaining a first-loss position in a securitization conduit required the sponsoring institution to maintain an equal amount of capital to the size of the retained position (http://www.occ.treas.gov/ftp/bulletin/2001-49a.pdf). In contrast, holding AAA debts issued by the sponsor's conduit required a 1.6% capital position against those AAA securities held (8% of a 20% risk weight). In 2004, regulators exempted conduit sponsors from the newly enacted GAAP consolidation rules for securitization (which in some cases would have otherwise required securitized assets to be treated as on-balance sheet assets for purposes of calculating capital requirements). Those 2004 regulations also established new rules for capital requirements on liquidity and credit enhancements from sponsors for their conduits (http://www.occ.treas.gov/fr/fedregister/69fr44908.pdf). For example, an asset-backed commercial paper conduit with $100 million in securities as assets, issuing $90 million in commercial paper, with liquidity enhancement from the sponsor in the form of a line of credit of less than one year had to maintain $720,000 in capital against that credit line (8% x 10% "credit conversion factor" x $90 million). These regulations seem to have encouraged banks to use external enhancements and to hold AAA issues from their conduits, rather than hold first loss positions in their conduits.

standards or higher prospective losses, but rather by a change in regulatory practice – a change that offered sponsors a plausible explanation for reducing their pool exposures.[19]

More fundamentally, the prudential regulatory regime lacked any device for ensuring that bank risk would be adequately measured or that capital would be commensurate with risk. As Adrian and Shin (2008) show, both risk and leverage increased during the subprime boom, which provides prima facie evidence of the regulatory failure to measure risk and budget capital accordingly. Interestingly, Calomiris and Wilson (2004) show that in the 1920s this was not the case. During that lending boom, as banks' risks increased, market discipline forced banks to reduce their leverage in order to limit the riskiness of their deposits. In the presence of deposit insurance and anticipated too-big-to-fail protection, however, debt market discipline is now lacking. If prudential regulation fails to limit risks, banks may fail to maintain adequate capital cushions. The recent failure of banks to maintain adequate capital in the face of rising risk suggests a need for fundamental reform of prudential regulation, which is explored in detail in Section III.

Fourth, the regulation of compensation practices in asset management likely played an important role in the willingness of institutional investors to invest their clients' money so imprudently in subprime mortgage-related securities. Casual empiricism suggests that hedge funds (where bonus compensation helps to align incentives and mitigate agency) have fared relatively well during the turmoil, compared to other institutional investors, and this likely reflects differences in incentives of hedge fund managers, whose incentives are much more closely aligned with their clients.

[19] Of course, either through external enhancement or voluntary provision of support to their conduits, sponsors may still be taking a position that could result in large losses, and of course, many did so by absorbing losses that otherwise would have been born by other investors.

The standard hedge fund fee arrangement balances two considerations: the importance of incentive alignment (which encourages long-term profit sharing by managers), and the risk aversion of asset managers (which encourages limiting the downside risk exposure for managers). The result is that hedge fund managers share the upside of long-term portfolio gains but have limited losses on the downside. Because hedge fund compensation structure is not regulated, and because both investors and managers are typically highly sophisticated people, it is reasonable to expect that the hedge fund financing structure has evolved as an "efficient" financial contract, which may explain the superior performance of hedge funds.

The typical hedge fund compensation structure is not permissible for some other, regulated, asset managers. Mutual fund managers must share symmetrically in portfolio gains and losses; if they were to keep 20% of the upside, they would have to also absorb 20% of the downside. Since risk-averse fund managers would not be willing to expose themselves to such loss, mutual fund managers typically charge fees as a proportion of assets managed and do not share in profits. This is a direct consequence of the regulation of compensation, and arguably has been a source of great harm to investors, since it encourages asset managers to maximize the size of the funds that they manage, rather than the value of those funds. Managers who gain from the size of their portfolios rather than the profitability of their investments will face strong incentives not to inform investors of deteriorating opportunities in the marketplace, and not to return funds to investors when the return relative to risk of their asset class deteriorates.

To summarize, the subprime debacle is best understood as the result of a particular confluence of circumstances in which incentive problems combined with

unusual historical circumstances. The longstanding problems of asset management agency problems and government distortions in real estate finance got much worse in 2003-2006. The specific historical circumstances that drove this included (1) loose monetary policy, which generated a global savings glut, (2) GSE politics in Congress that drove Fannie Mae and Freddie Mac to expand their purchases of subprime assets, (3) prudential regulatory policies that increasingly encouraged lax risk management, and (4) the historical accident of a very low loss rate during the early history of subprime mortgage foreclosures in 2001-2002. Monetary, regulatory, and GSE policies combined with the historically low loss rates to give incentive-conflicted asset managers, rating agencies, and securitization sponsors a basis of "plausible deniability" on which to base unreasonably low projections of default risk.

Government actions must bear a significant share of the blame for this outcome, and not just because regulators failed to prevent bank sponsors from behaving more prudently. GSE purchases of subprime assets, increased regulatory reliance on ratings, regulatory actions that encouraged grade inflation, ineffective bank capital regulations including rules that discouraged sponsors from retaining junior risk exposures, proposed SEC anti-notching rules, and regulatory limits on profit sharing by asset managers, all contributed to the "plausible deniability" equilibrium.

II. What's Old and What's New about the **Propagation** *of the Turmoil?*

What aspects of the reactions of financial markets to the subprime shock have been similar to, or different from, the propagation of financial shocks in the past? As in the case of the origins of the subprime shock, the propagation of the subprime shock in

the financial system shares many features with previous responses to financial shocks. The role of uncertainty about the size and incidence of the shock across different financial institutions ("asymmetric information" about losses) has produced a wide variety of familiar market responses, which I review (widening credit spreads, ebbs and flows of optimism and pessimism, quantity rationing in money markets, a contraction in the supply of credit, and lender of last resort interventions by the central bank).

Nevertheless, there are three elements to the current turmoil that are quite new, and surprisingly so, when considered together. The first novelty is that the shock is unusually severe, as it combines the worst features of previous historical shocks (namely, on the one hand, a large realization of loss, and on the other hand, large uncertainty about the precise size and location in the financial system of that loss). The second novelty is that financial institutions have been unusually willing to raise capital and successful in doing so, and have thereby mitigated the consequences of the subprime shock. This second feature is even more remarkable when considered in combination with the first. A third novelty has been the aggressive use of coordinated Fed and Treasury assistance to particular financial institutions through the discount window and special programs.

This section first reviews aspects of the current turmoil that are qualitatively familiar from the history of financial system responses to similar financial shocks, then discusses the three novel aspects of the adjustment to the shock. With respect to the second novelty, the special role of the evolution of the structure of the banking system in the past two decades is described (through a combination of deregulation, consolidation and globalization), which helps to explain the unprecedented ability and willingness of banks to issue new equity in the wake of losses.

What's Old About the Financial System's Responses to the Shock

Subprime mortgages either served as backing for MBS, or were held on balance sheet. Subprime MBS was sometimes repackaged into CDOs, increasingly so leading up to the 2007 collapse of the subprime market. Subprime MBS and CDO conduits issued debts of various ratings which were sold to institutional investors (AAA debts constituted the vast majority – roughly 80% of subprime MBS pools and an even larger percentage of CDO pools). Sponsors of MBS and CDOs did not sell all the securities issued by their conduits. Banks, in particular, purchased substantial amounts of their own conduits' AAA debts (which enjoyed favored risk weights as assets from the standpoint of bank capital regulation), and many of those debt purchases ended up being parked in ABCP conduits or SIVs run by the sponsoring bank.[20] These conduits financed themselves primarily or largely by asset-backed commercial paper, which was sold to MMMFs and other money market investors (Fitch 2005). Additional exposures to these pools also took the form of so called "external credit enhancements," by sponsors and other intermediaries (especially monoline insurance companies), who provided various types of liquidity or credit guarantees to the MBS, CDO, and ABCP conduits.

The sequence of events relating to the subprime shock and its spread is described in several papers (IMF 2008, Brunnermeier 2008, Buiter 2008, Greenlaw, Hatzius, Kashyap, and Shin 2008, Herring 2008), and in numerous press accounts, and will not be reviewed in detail here. The important elements of the story are that it became clear very

[20] Arteta, Carey, Correa and Kotter (2008) analyze the risk choices of banks that established commercial paper issuing conduits. European banks were particularly heavy users of this means of finance. The authors argue that the relative reliance on this form of financing reflected several influences, including moral-hazard problems in risk management for heavy users.

quickly in the late summer and early fall of 2007 that losses were growing rapidly on the large amount of subprime mortgages that had been originated in the previous three years, and that the models that had quantified the risks on those mortgages had grossly underestimated prospective losses. The precise size of the future loss was (and remains) hard to gauge, since the structures of the securities are so complex (Gorton 2008) and these new products have such limited track records, particularly in a declining house price envirnoment. The problem was not just the novelty of the product itself, but the fact that its early years of growth had occurred in a booming housing market; there was no way to predict accurately how defaults would evolve in a soft housing market. Furthermore, underwriting standards had deteriorated, as "no-docs" and "low-docs" subprime mortgages proliferated. That meant that the experience of prior cohorts of subprime borrowers offered little reliable evidence on future defaults even if housing conditions did not soften materially.

Not only was the aggregate size of loss related to subprime exposures hard to gauge, the incidence of those losses was also hard to measure. Some subprime MBS had been repackaged into complex CDOs and CDO-squareds. And sponsors of CDO conduits, including some of the largest banks, had placed significant amounts of the debts issued by those CDO conduits into their own ABCP and SIV conduits, which in turn financed themselves with commercial paper and various notes. External credit enhancements for the various conduits issuing all these securities were complex, and exposures of guarantors were not easy to quantify. The precise size of portfolios held by different intermediaries, and the proliferation of external credit enhancements that

entailed uncertain loss exposures made loss estimation difficult. Markets in the debt instruments were virtually nonexistent, so there was little hope of marking to market.

Estimates of the total loss from subprime and other relatively risky (Alt-A) mortgages within the first several months of the turmoil were in the neighborhood of $100-400 billion, which reflected widely disparate views of the probability of default and the loss given default. These losses remain uncertain. At the moment, reasonable estimates fall at the high end of that range. Additional losses related to other consumer, corporate, and commercial real estate lending will, in aggregate, likely reach a similar magnitude. Confusion about the size of loss and its incidence led to a flight to quality, as investors sought liquidity. Thus, in addition to the initial (uncertain) shocks to net worth of financial institutions, liquidity risk became a major factor.

As emphasized by Mishkin (1991) and Calomiris and Gorton (1991), in historical financial crises the incidence of shocks was hard to gauge (e.g., 1893 or 1907). Asymmetric information about the true financial positions of borrowers and banks led to a contraction in the willingness of parties to lend to each other, which resulted in a flight to quality. In the 2007-2008 turmoil, rising default risk, market illiquidity and the flight to quality were visible in rising long-term debt default risk spreads, and falling Treasury bond yields, as shown in Figures 4 and 5, which plot the CDS spread, the 10-year Treasury yield, and the spread between the Baa corporate rate and Treasuries. Figure 6 shows that the spread between jumbo mortgage interest rates and conforming mortgage interest rates widened, and both mortgage rates rose, despite the aggressive Fed rate cuts that drove money market rates lower. The widening jumbo-conforming spread reflects, in part, the relative liquidity of conforming mortgages, and in part, the fact that relatively

expensive homes are more dependent on the private (non-GSE) securitization market, which saw a rise in its relative cost of funding.

Widening of spreads is also visible between different money market instruments. The flight to quality was apparent in a widening spread between LIBOR and Treasury bill yields (Figure 7), the rising relative cost of longer-term LIBOR (Figure 7), and the rising cost of financial commercial paper relative to nonfinancial (Figure 6).

The spread between overnight LIBOR and overnight fed funds (Figure 8) also rose. Both of these are costs of unsecured interbank borrowing for one day. Loans of fed funds, however, typically entail credit from small banks, while LIBOR loans are from large banks. The widening spread between overnight LIBOR and fed funds (which had generally remained within 5 basis point prior to the turmoil)[21] reached almost 180 basis points toward the end of 2007 and over 400 basis points in September 2008. Large banks

[21] Bartolini, Hilton, and Prati (2005) examine the LIBOR-fed funds spread prior to the turmoil, and find that, since 1990 (which marked an important regulatory change, eliminating reserve requirements on interbank borrowing in the Libor market) the two markets have been closely integrated. They find that during the 660 days of trading from February 11, 2002 to September 24, 2004, using actual transactions data from the two markets to compute hourly and daily spreads between the two markets, the two rates were always very similar. Using hourly data, the two rates never diverge by more than 15 basis points, and reveal temporally scattered observations of gaps of 10-15 basis points only for 20 hours of trading during the 660-day period. Daily differences between the two rates are even smaller; spreads only exceed 5 basis points on 5 out of the 660 days, and never exceed 8 basis points. Figure 13, therefore, marks an unprecedented departure from the previously observed behavior of these two interest rates. The spread peaks August 10 at 128 basis points, and averages 49 basis points in the period August 9 to September 11. Bartolini, Hilton and Prati (2005) point out that "the Eurodollar market may draw a greater share of larger, more internationally-oriented institutions, which are more likely to operate foreign branches or International Banking Facilities through which they can borrow Eurodollars." Bartolini, Hilton and Prati (2005) emphasize, therefore, that the counterparty risks in the two markets may not be identical. That observation suggests that the widening spread during the turmoil of August and September reflects adverse-selection problems that increased the counterparty risks for large-size transactions involving large, international banks (possibly the European banks with the large ABCP exposures discussed above), or rising liquidity demands by large banks that reflected their exposure to the subprime shock. The fed funds market, which often entails smaller transactions between small bank lenders and large bank borrowers should have been less affected by the liquidity demands of large banks or their adverse-selection problems, and apparently it was less affected.

were unwilling to lend during the turmoil, either because they were scrambling for liquidity or because they doubted each other's credit quality.

Interestingly, although there is one primary underlying source of loss affecting the year-long period of July 2007-September 2008 being graphed in the various figures (namely, subprime and other losses on existing loans), the figures display large movements up and down in spreads, reflecting variation in estimated losses, adverse selection costs and market illiquidity as uncertainty about the size and consequences of the losses rose and receded in various waves, clearly visible in CDS spreads in Figure 4. This is a familiar pattern in the history of asymmetric information crises, including the national banking era crises and some of the regional banking crises during the Great Depression, which saw similar ups and downs in the perception of risk, and concerns about concentrations of risk in particular financial institutions, which arose in response to particular news events over time (see Sprague 1910, Wicker 1996, Calomiris and Mason 1997, and Bruner and Carr 2007). During historical banking panics, when confusion about the incidence of shocks produced large adverse selection costs in banking, actions by banks, clearing houses, and regulators that resolved uncertainties about the incidence of shocks helped to restore confidence, reduce adverse selection costs, restore liquidity and eventually brought the panics to an end.[22] Similarly, during the past year, news that helped reassure market participants that the turmoil was being contained (e.g., Fed intervention to prevent a meltdown of Bear Stearns) produced reductions in spreads.

It is difficult to decompose the various contributing factors that affect spreads during an asymmetric-information crisis. Four separate factors are at work: (1) increased

[22] See Sprague (1910), Gorton (1985), Calomiris and Gorton (1991), Calomiris and Schweikart (1991), Calomiris and Mason (1997), and Bruner and Carr (2007).

expected loss for risky debts, (2) changes in the pricing of any risk of loss reflecting the reduced net worth of asset buyers (i.e., diminishing marginal utility of consumption), (3) changes in the pricing of risk relating to adverse-selection costs (reflecting the difficulty of observing risk), and (4) changes in the pricing of liquidity reflecting an increased desire for liquidity on the part of buyers. Recent research by Schwarz (2008) suggests that during the past year changes in the pricing of liquidity have been more important than credit risk in explaining widening spreads (see also Allen and Carletti's 2008 view of the central role of systemic liquidity problems in the current turmoil). LIBOR spread widening, in particular, largely has reflected the heightened liquidity demand of borrowers.[23] Despite the progress made in disentangling the various influences on spreads, some aspects of the recent experience remain puzzling. Why, for example, did the spreads on Fannie Mae and Freddie Mac debts (over comparable-maturity Treasuries) not fall more as the result of government commitments to protect Fannie's and Freddie's debtholders from the risk of default in July 2008, which should have caused Fannie and Freddie debts to be viewed as close substitutes for U.S. Treasuries?

An important aspect of financial system adjustment to severe shocks is the tendency for quantity rationing in money market instruments, which is a source of liquidity risk during financial crises. Short-term near money market instruments with a risk of loss – uninsured deposits, commercial paper, and repos – respond to increases in risk primarily through quantity rather than price adjustment. Thus, in addition to rising spreads in bond, CDS, and money markets, a major part of the adjustment process to the subprime turmoil was a contraction in money market instruments.

[23] Schwarz (2008) is able to isolate default risk and liquidity effects on LIBOR spreads by comparing synthetic spreads (in which no financial instrument is held, and only default risk should affect pricing) with actual deposit transactions (in which both default risk and liquidity affect pricing).

LIBOR deposits of maturities greater than a few days virtually disappeared from the banking system in the first months of the turmoil. This is consistent with the theoretical framework of Calomiris and Kahn (1991). Very short-term (demandable) debt becomes more necessary during difficult times owing to its superior ability to discipline bank risk taking (through the threat of funding withdrawal) in an environment of highly asymmetric information; any bank that would attempt to borrow at longer term under difficult circumstances would both be avoiding discipline of short-term debt (giving rise to a moral-hazard cost) and revealing a desire to avoid that discipline (giving rise to an adverse-selection cost), and would thus pay a higher interest rate. Only banks with risky intentions or unobservably weak banks would try to lock in long-term credit. This explains why longer term, one-month or three-month LIBOR lending was virtually nonexistent in the immediate aftermath of the shock.

Asset-backed commercial paper issues, which were strongly connected to CDOs, were withdrawn rapidly from the market, while other commercial paper remained relatively unaffected (only in September and October of 2008 did nonfinancial paper rollover become a potential problem, as the liquidity crisis deepened). As Figure 9 shows, ABCP grew rapidly in 2006 and the first half of 2007, reflecting the close link between ABCP and CDO originations. ABCP fell even faster; most of the decline in outstanding commercial paper occurred in the immediate aftermath of the August-September 2007 shock, and reflected mainly the contraction of ABCP; while other financial commercial paper contributed somewhat to the decline, nonfinancial commercial paper has remained virtually unchanged (at least through mid-September 2008). This shows that the initial fallout from the shock has mainly to do with the loss in confidence in the architecture of

securitization per se, and secondarily with rising adverse-selection costs for financial institutions. It is interesting to note that even within ABCP, it appears that a significant share of ABCP was being rolled over even during the period of sharp ABCP contraction. That is, the decline of ABCP appears to be substantially less than the decline that would have occurred if all maturing ABCP had been withdrawn from the market. Apparently, there was not a categorical refusal to roll over ABCP.[24] Some of the apparent "rollover" of ABCP also likely reflects banks purchasing their own paper.[25]

Bear Stearns' heavy reliance on overnight repos and high leverage to fund itself led to its collapse in March 2008 as counterparties became concerned about its increasing risk, and as mortgage-backed securities ceased to be acceptable in the market as collateral for overnight repos (a shock that would have been extremely difficult to anticipate even a few months before). Liquidity risk was an important part of that story, since by any reasonable estimate (Bernstein Research 2008a) Bear Stearns was not insolvent. But Bear's heavy reliance on the risk-intolerant overnight repo market for its funding

[24] Even at the height of the ABCP "run," the aggregate liquidity risk for U.S. banks from the contraction of ABCP appears to not have been very large, although Citigroup stands out as the U.S. bank with more than its share of liquidity risk exposure (including its so-called structured investment vehicles, or SIVs, which issue a variety of debts, including ABCP). Much of U.S. ABCP consists of paper issued by so-called "multiseller issuers," which tends to be maturity-matched so that liquidity risk is minimal. Most of the remaining ABCP can suffer from significant liquidity risk due to the mismatch between longer maturing assets (which include a wide variety of securities, loans, receivables, swaps, and repos) and short-term commercial paper liabilities. Most of that paper, however, was issued by foreign institutions. According to data from Moody's, on average during the first quarter of 2007, of the $1.3 trillion in average ABCP outstanding administered (and, to a first approximation, issued by) the top 20 ABCP administrators, Citibank accounted for $98 billion, Bank of America accounted for $49 billion, and JPMorgan Chase accounted for $45 billion. Given the shrinkage in ABCP that has occurred over the past weeks, the total remaining liquidity risk exposure to U.S. banks from ABCP issues, including any ABCP issued from SIVs, is roughly $100 billion, with Citigroup accounting for about half of that. This is a very small liquidity risk for the three American banks, given the sizes of their balance sheets and their liquid asset holdings. This discussion draws on data from Moody's ABCP Program Index, March 31, 2007, and descriptions in JPMorgan Securities Inc. (2007).

[25] From a regulatory capital standpoint, under Basel I rules, banks may have an incentive to purchase ABCP rather than fund its retirement via a line of credit, since a loan has a full risk weight, but commercial paper does not. Banks may also wish to purchase ABCP to resell it, once market liquidity improves. It is unclear the extent to which ABCP that remains outstanding according to these data is being effectively retired by being purchased by banks that run the ABCP conduits.

(Bernstein Research 2008b) meant that it could not continue to rollover its liabilities. Historical evidence from the Panics of 1893 and 1907 confirm that quantity rationing in money markets can take the form of sudden runs (on deposits and repos) in response to an increase in risk even when the underlying risk of insolvency remains quite low.[26]

The risk intolerance of money market instruments has been visible historically and in recent times, both in response to idiosyncratic events at particular banks and firms, and in response to aggregate shocks. Calomiris, Himmelberg, and Wachtel (1995) analyze the exit of contemporary commercial paper issuers, which occurs reliably and quickly in response to deterioration in earnings and sales growth. Calomiris (2007b) shows that, in response to sudden adverse news affecting a commercial paper issuer, orderly exit from the commercial paper market often occurs even before commercial paper matures; issuers remove their paper from the market, sometimes at a price equal to accrued par (to prevent investors from suffering any loss as the result of the adverse news event) as a means of preserving their reputations with the investor community, in hope of reentering the market subsequently. Uninsured bank deposits, historically and currently, also display patterns of rationing in response to adverse shocks. This can occur as a sudden run on one bank or on many banks (Calomiris and Schweikart 1991, Calomiris and Gorton 1991, Calomiris and Kahn 1991), or as a more gradual response by depositors to reduce certain classes of deposits that are particularly risk-intolerant (Calomiris and Mason 1997, 2003a, Calomiris and Wilson 2004, Calomiris and Powell 2001).

[26] In 1873, 1893 and 1907, suspension of convertibility stopped runs on New York City banks from continuing. Discount rates on cashier drafts on New York banks immediately after suspension show that market perceptions of risk of deposit loss were quite small even at times of extreme withdrawal pressure (just before suspensions), according to data reported in Sprague (1910).

A final familiar theme from previous financial disturbances is that financial failures typically reflect fundamental weakness, not random market behavior. Bear Stearns was not insolvent in March 2008, and the same may be said of Lehman Brothers and AIG in September 2008; nevertheless, the unwillingness of creditors to permit Bear to continue in its weak state reflected its unusually large exposure to subprime risk, and its unusually high leverage. The market properly singled out the investment bank with the weakest fundamentals. Similarly, Northern Rock was an observably weak institution with large asset side risk and very high leverage. This non-random pattern of failure is important because it reminds us that financial market discipline is often well-informed, selective, and helpful in containing systemic loss by preventing weak institutions from continuing to operate. Similar patterns of informed, selective, and helpful market discipline have been apparent in historical banking crises, as well. That is not to say that market discipline is perfect; asymmetric information implies that not all financial institutions that lose the confidence of their creditors are as weak as their creditors fear. Furthermore, as the events of September 2008 illustrate, once a liquidity crisis becomes systemic, even institutions with little fundamental risk exposure (like Goldman Sachs and Morgan Stanley) find themselves at risk of being taken down. Still, market discipline has a fair record in identifying doubtful risks even in the midst of severe financial crises (Calomiris and Mason 1997, 2003a, Bruner and Carr 2007).

What's New about the Response to the Shock: Unprecedented Recapitalizations

The greatest concern about the subprime turmoil and the collapse of the securitization markets that came with it, from the perspective of potential macroeconomic

implications, is the possibility that the failures of financial institutions and the large subprime-related losses within surviving financial institutions would substantially reduce equity capital available to support lending. Although many financial institutions have suffered substantial losses, the primary systemic concern for the macroeconomy is the health and lending capacity of commercial banks, given their central role in providing consumer and business credit.

The losses in bank equity were occurring at a time when banks needed capital more than ever to absorb erstwhile securitized assets back onto their balance sheets and support new lending. From the beginning, policy makers worried that the combination of lost capital and reintermediation of securitized assets in the wake of the subprime shock could lead to a huge bank credit-supply contraction, similar perhaps in effect to the credit crunch of the Great Depression (Bernanke 1983, Calomiris and Mason 2003b, Calomiris and Wilson 2004), or the credit crunch of 1989-1991 (Bernanke and Lown 1991, Baer and McElravey 1993, Boyd and Gertler 1994).

In the bank capital crunches of the 1930s and 1989-1991, despite the scarcity of bank equity capital, and consequent scarcity of credit, financial institutions suffering from large losses raised virtually no new equity capital (Calomiris and Wilson 2004). Financial economists attribute the lack of new equity offerings by banks in response to large losses to adverse selection problems that result from asymmetric information. Any bank trying to issue equity at a time where potentially large hidden losses remain unidentified will experience a large decline in its stock price, as the market infers that the offering institution may have unusually high losses that it wants to share with new shareholders. That price reaction would make a stock offering highly dilutive, and thus

value-destroying, for existing shareholders. During the subprime turmoil, asymmetric information was high, and adverse selection costs were visible in money market spreads and bond spreads, and in money market quantity rationing. Those same information problems should be all the more costly to a bank trying to raise equity capital, since adverse selection problems are much greater for (junior) equity offerings than for (senior) short-term debts (Myers and Majluf 1984).

From the standpoint of the ability of banks to raise equity in response to losses, both the size of the shock and the ability to ascertain who will bear its costs are highly relevant. Adverse selection costs of raising equity are higher when shocks are large and uncertain in their incidence. From that perspective, one might have expected little equity to be raised in the wake of the subprime shock. Compared to other financial shocks, this one was both large and highly uncertain in its incidence.

In financial history, for the most part, the largest financial shocks affecting banks (measured in units of loss as a percentage of GDP) have generally not been "asymmetric-information" shocks. The losses from the U.S. agricultural bust of 1920-1930, for example, were large, but for the most part, these shocks – which were visible in agricultural commodity price declines, and consequent land value declines with clear consequences for local banks – were not shocks in which asymmetric information was very important. The classic asymmetric-information shocks of the national banking era panics of 1873, 1884, 1890, 1893, 1896, and 1907, in contrast, were not associated with large financial system losses, but rather with confusion about the incidence of those losses, which created problems for banks because of the risk intolerance of depositors. In that sense, the current shock is unusually severe in that it is both large (losses on

subprime and Alt-A mortgages and related instruments could be as high as 4% of GDP) and markets have been quite uncertain about the incidence of those losses (Greenlaw, Hatzius, Kashyap, and Shin 2008).

The large size and uncertain incidence of the subprime shock explains the protracted process of financial system adjustment to the shock. What it does not explain, however, is the remarkable fact that financial institutions have recapitalized themselves with over $434 billion of new capital over the year ending September 2008 (Figure 10). Banks showed an unprecedented capacity to mitigate the consequences of the subprime shock by raising new equity. In September 2008 alone, as Goldman Sachs and Morgan Stanley sought to insulate themselves from the liquidity crisis, and as Merrill, Wachovia, and Washington Mutual were acquired, the financial system raised capital in excess of $40 billion.

That is not to say that new capital has prevented a credit crunch. The last year has seen a dramatic reduction in some securitization flows. For example, according to Bear Stearns (2007), commercial mortgage backed securities issues that had averaged $18 billion per month for January through August 2007, fell to only $4 billion in September 2007. As Figure 11 shows, however, commercial and industrial lending expanded rapidly during the August and September upheaval, and continued to grow at a reasonably fast pace throughout the past year, an achievement that stands in sharp contrast the huge contractions in lending that occurred in the 1930s and in 1989-1991.

This unprecedented achievement was not a random event, but was rather a predictable consequence of two sets of factors: (1) the favorable condition of banks balance sheets at the time the subprime shock hit, and (2) major structural changes in the

financial system that made this unprecedented recapitalization occur. Those structural changes were a consequence of the consolidation, deregulation, and globalization of banking and finance that occurred in the past two decades. With these exceptional historical circumstances in mind, some observers foresaw that the unprecedented bank recapitalization would likely occur in response to the capital losses, and argued that it could prevent the subprime turmoil from triggering a major recession, a forecast that at least thus far has proved to be accurate.

First, with respect to the preexisting condition of U.S. banks at the time of the subprime shock, as Fed Chairman Ben Bernanke noted from the outset, commercial banks were otherwise doing reasonably well and had substantial equity capital. Although the capital position of U.S. banks as of 2007 was inadequate in light of the risks that they had taken, banks were in better shape than they had been in the 1980s. In the late 1980s, bank balance sheets were extremely weak, owing to the series of shocks banks had faced. Banks had suffered losses due to interest rate rises in the early 1980s, LDC loan problems, agriculture land value collapses in the mid-1980s, commercial real estate collapse in the late 1980s, and southwestern oil and real estate distress in the mid-to-late 1980s. Moreover, the overall economic environment was one of anemic macroeconomic performance. Banks were not well diversified regionally, and had limited sources of income. By the end of the 1980s some money center banks were barely solvent. In contrast, U.S. banks enjoyed profitable and diverse operations and ample equity capital at the time the subprime shock hit. Their wide range of profitable ventures included nontraditional and traditional banking products, within and outside the United States.

According to the Federal Reserve Board Statistical Release H8, large, domestically chartered U.S. commercial banks (the primary point of vulnerability in the financial system to the current securitization shock) maintained a seasonally adjusted capital account of $702.5 billion, as of September 12, 2007, which was 12.1% of seasonally adjusted assets. Their assets included $1,346.9 billion in securities, most of which were U.S. Treasury and Agency securities. These banks had significant capacity for absorbing additional loans and mortgage backed securities while remaining in compliance with minimum regulatory capital requirements.[27] As of December 2006, total equity for the largest 50 U.S. bank holding companies (which is distinct from the data on the chartered banks of those holding companies, cited above) was $819 billion, and tier 1 capital for these holding companies was $570 billion of that amount, while total holding company assets were $9.6 trillion. Thus, the tier 1 leverage ratio, on average, was 6.17% for this group, implying that banks could accommodate substantial new mortgage originations and other lending on balance sheet in an orderly fashion.

The diversification of banks' portfolios, operations, and sources of income – especially those of large, global banks – were also significantly better circa 2007 than in 1989 or 1930. Banks hold much more diversified portfolios today than they used to, they are less exposed to real estate risk than they were in the 1980s, and much less exposed to local real estate risk, although U.S. banks' exposure to residential real estate has risen since 2000 (Wheelock 2006). In prior episodes of real estate decline (the 1920s, 1930s,

[27] Regulatory requirements include a 4% tier 1 risk-based capital requirement (as a fraction of risk-weighted assets), an 8% tier 1 plus tier 2 risk-based capital requirement (as a fraction of risk-weighted assets), and a leverage requirement ("adequately-capitalized" banks generally must maintain 4% of tier 1 capital relative to total assets; "well-capitalized" banks must maintain a ratio of 5% of tier 1 capital relative to total assets). It is highly desirable for banks to be considered "well-capitalized," and banks maintain a buffer above their minimum requirements. The leverage requirement is probably the most binding of these constraints going forward, especially since banks will be re-intermediating mortgage assets, which have less than a full risk weight, and likely will continue to maintain less than a full risk weight under Basel II.

and 1980s) much banking distress resulted from exposures to regional shocks, because of the absence of nationwide branch banking. In the 1980s, shocks associated with commercial real estate investments in the northeast, and oil-related real estate problems in the southwest, were particularly significant sources of banking distress.[28] During the last two decades, however, banks have become much more diversified regionally, owing to state-level and federal reforms of branching laws, and internationally, as the result of the globalization of banking and finance.

Although banks are likely to absorb roughly half of the losses from the subprime fallout according to most estimates, as Figure 10 shows, those bank losses have been distributed globally, not just within the United States. Banks also have a more diverse income stream due to the expansion of bank powers, which culminated in the 1999 Gramm-Leach-Bliley Act. Diversified banks should be able to weather the subprime shock much better than in the 1930s or late 1980s, when variation in regional circumstances led to significant shocks to regionally isolated banks and to the supply of bank credit. That the industrial organization of banking is crucial for facilitating banking systems' abilities to adjust to shocks without experiencing major disruptions has been a consistent theme of banking history. Bordo (1985) emphasized the peculiar fragility of American banking in the late nineteenth and early twentieth centuries, which reflected the geographical fragmentation of U.S. banks historically, and this theme has been echoed in many other studies.[29]

[28] Wheelock (2006) finds that, in the 1980s, substantial declines in real estate prices translated into significant deterioration in local banking condition.

[29] For a review of branching deregulation and its positive effects on banking sector performance, see Calomiris (2000) and Jayaratne and Strahan (1996). Evidence on the role of regional shocks in banking distress and credit contraction during the 1980s is provided in Wheelock (2006); for the 1920s and 1930s, see Alston, Grove, and Wheelock (1994), Alston (1984), Calomiris (1992), Calomiris and Mason (1997, 2003a, and 2003b), and Calomiris and Wilson (2004).

The superior condition and prospects of banks (relative to the 1980s), owing to their diversification and the highly profitable environment of the last 15 years, reflected the favorable influences of deregulation, consolidation, and globalization, which reshaped the U.S. banking system. Those influences not only helped mitigate the effects of the subprime shock by making the initial condition of banks stronger; they also helped banks raise new capital. The keys to raising capital are convincing the market that the downside of loss can be bounded reasonably, and that favorable future prospects exist (in pursuit of which new capital will be deployed). Banks that are stronger, larger, and more diverse are much better able to bound losses and credibly argue for favorable prospects.

Deregulation also helped facilitate the orderly restructuring of large distressed investment banks in 2008. The acquisitions of Bear Stearns and Merrill Lynch by JP Morgan Chase and Bank of America would not have been possible without the repeal of Glass-Steagall. Clearly, the claim that "deregulation" produced the subprime crisis is a false diagnosis. Regulatory failure (especially with respect to the GSEs and prudential banking regulation) was a major contributor to the crisis. But deregulation of branching and bank powers over the past two decades has helped to mitigate the fallout from the crisis in many ways.

Several other factors also favored bank recapitalization. First, despite what may seem a slow process of recognizing loss, in comparison with the loss recognition practices of banks and S&Ls in the 1980s, loss recognition has been fast. This reflects a substantially improved regulatory environment in which it is much harder for banks to disguise losses or delay their recognition.[30] Second, many hedge funds and sovereign

[30] It seems unlikely that fair value accounting has been of great use during the recent turmoil. Many market observers believe that fair value accounting has exaggerated losses (given the absence of useful transacting

wealth funds were relatively unaffected by the subprime shock, and had ample funds to invest. Thus, there were sophisticated investors with adequate resources available to recapitalize banks, if adverse-selection concerns could be overcome. Here again, globalization of finance has helped to cushion the subprime shock considerably. In addition to assisting in recapitalizing banks, nonblank investors (hedge funds and private equity firms) with ample resources to invest are also taking pressure off of bank balance sheets by purchasing assets.

What's New about the Policy Response to the Shock: Unprecedented Activism

Another new feature of the response to the current turmoil is the level of activism of the Fed and the Treasury. The number and boldness of their actions has been striking, even prior to the September 2008 campaign to implement the comprehensive TARP plan for massive purchases of financial assets. The terms of lending, and collateral requirements, were quite flexible. Primary dealers and Fannie and Freddie were granted access to the discount window, not just depository banks. A major Wall Street investment bank and the world's largest insurance company were been bailed out by the combined efforts of the Fed and Treasury. And Fannie Mae and Freddie Mac were rescued, as well, and they were subsequently placed in conservatorship, as the initial effort to keep them afloat proved inadequate.

Not surprisingly, many people find all this a bit worrying. Government loans, guarantees and investments in troubled financial institutions (which even include potential capital infusions into the GSEs), not to mention government purchases of assets

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data, and the illiquidity of markets) and produced unreliable statements of earnings (Wallison 2008). More significant, to my mind, is the credibility of the regulatory environment, which allows investors to have some confidence that disclosures of bank exposures are reasonably accurate.

(as contemplated under the TARP plan) not only put taxpayers' resources at risk today, they also change the risk-taking behavior of financial institutions going forward. If financial institutions know that the government is there to share losses, that makes risk taking a one-sided bet, and so more risk is preferred to less. There is substantial evidence from financial history – some of it very recent – that this "moral-hazard" problem can give rise to hugely loss-making, high-risk investments that are both socially wasteful and an unfair burden on taxpayers.[31]

Of course, the presence of moral-hazard cost does not mean that all government assistance is ill-advised. If assistance is provided only when the systemic consequences of not providing assistance are truly large, that will limit moral-hazard costs, and if assistance is structured to limit abuse, then assistance can be particularly worthwhile. Were these two conditions met? Were the interventions by the Fed, the Treasury and the Congress justified by the systemic risks of failing to intervene, and did they structure assistance in a cost-minimizing manner?

To address these questions, and to place the recent assistance decisions in context, it is useful to review the debate on the role of the lender of last resort as it has evolved in recent years. The debate about the potential gross benefits of assistance has revolved around the question of how important asymmetric information and adverse selection are during episodes of financial shocks. In the 1980s and early 1990s, several prominent economists argued that it might be desirable to abolish the discount window, on the

[31] There is a large literature measuring the moral-hazard costs of protection. These costs take various forms. For example, Alston (1984) shows that the foreclosure relief measures instituted to combat the agricultural distress of the 1920s and 1930s raised credit market costs for non-defaulting borrowers. Additionally, there is the cost of wasteful resource allocation from increased risk taking. The academic literature looking at the adverse consequences for risk management of protecting banks is large. See, for example, Calomiris (1990), Barth, Caprio and Levine (2006), and Demirguc-Kunt, Kane, and Laeven (2008), among many others.

theory that central banks should only manage the aggregate amount of liquidity in the system (via open market operations), and leave it to the financial system to (efficiently) determine the proper allocation of credit (Goodfriend and King 1988, Bordo 1990, Kaufman 1991, 1992, and Schwartz 1992). Proponents of abolishing the discount window recognized that in days of yore it served a purpose, but argued that in the modern era of an efficiently operating fed funds market, and other efficient private markets for lending among financial institutions, there was no point in Fed lending to banks.

Calomiris (1994) challenged that view, and referred to the Fed's use of the discount window during the Penn Central crisis as an example of how asymmetric information costs can cause erstwhile efficient markets to shut down, giving a role to the Fed in preserving market liquidity through specifically targeted assistance. During the Penn Central episode, which was in some ways similar to the recent turmoil, albeit on a much smaller scale, the market lost confidence in the screening apparatus of the rating agencies for determining access to the commercial paper market. The commercial paper market essentially shut down, and many borrowers faced significantly increased liquidity risk as they were unable to rollover their outstanding commercial paper. By targeting assistance to commercial paper issuers, via pass through discount window lending channeled through banks, the Fed targeted a temporarily dysfunctional part of the financial system for assistance, and prevented commercial paper borrowers from having to cut their investments and engage in a counterproductive scramble for liquidity. As the recent turmoil illustrates, despite the ongoing technological improvements and sophistication of our financial system, asymmetric information problems that disrupt the

operation of normally efficient markets remain an important ingredient of market reality. The discount window, therefore, remains an important component of the Fed's toolkit.

How should assistance be structured? Specifically, on what terms (how long a maturity, and at what interest rate?), and against what kind of collateral should loans be made? Should nonbanks be permitted access to the window? Are loans good enough, or are other investments sometimes warranted? An exploration of the full range of possible policy interventions to deal with financial shocks is beyond our scope here; the following is a selective review.[32]

Bagehot (1873) famously argued that the lender of last resort should lend freely at a penalty rate on good (but not perfect) collateral.[33] This prescription still holds validity today, but the devil is in the details. The lender of last resort should lend at a penalty rate to avoid abuse of access to the window. The term of the loan should be long enough to relieve pressure in the market; too short a term forces borrowers to bear imminent rollover risk, which does little to assuage the flight to liquidity. It makes little sense for the lender of last resort to exclude systemically important financial institutions from receiving assistance, although once it is clear that nonbanks are eligible for assistance, they should be subjected to prudential regulations (analogous to those that apply to banks) to limit potential abuse of safety net access.

An effective lender of last resort should not be too picky about collateral. Lending against collateral assets that are of higher average quality (lower risk) than the borrower's overall asset portfolio may do harm rather than good. If a lender of last resort lends against very high-quality collateral, that effectively subordinates depositors of the bank,

[32] For a broader treatment of alternative mechanisms, see Calomiris, Klingebiel, and Laeven (2005).
[33] For many interesting discussions of the application of this principle historically, see Meltzer (2003) and Capie and Wood (2007).

and thereby increases the risk of depositor loss, which could counterproductively prompt deposit withdrawals. Indeed, Mason (2001) shows that this was precisely the problem with the first attempts of the Reconstruction Finance Corporation to provide assistance to banks during the Depression. The 1933 switch to preferred stock investments (which were junior claims relative to deposits) made RFC assistance much more effective.

As Meltzer (2003) shows, the Fed has never clearly enunciated a policy rule for its lender of last resort interventions. It prefers instead to make ad hoc interventions, and has behaved inconsistently over time. Nevertheless, in theory, it is possible to justify a consistent rule that would contain most if not all of the assistance innovations of the Fed and Treasury – longer term discount window lending, to banks and nonbanks, on collateral of average quality (including mortgage-backed securities today), and even the proposed use of preferred stock injections into Fannie and Freddie as a substitute for lending. But in granting access to its resources the lender of last resort still must adhere to two principles: (1) potential adverse systemic consequences with large social costs must be a real possibility (not just a chimerical convenience), and (2) the structure of assistance should minimize moral-hazard costs. Our financial leaders owe us a detailed explanation and justification of the various financial assistance packages that they have orchestrated, and a coherent vision and set of rules to guide policy going forward that is consistent with these two principles, lest wasteful and risk-increasing rescues become a habit. Neither the Fed nor the Treasury provided such a coherent vision in justifying their decisions regarding whether and how to assist Bear Stearns, Fannie Mae, Freddie Mac, Lehman or AIG. Neither did the Fed or the Treasury explain why the new comprehensive TARP approach was appropriate after September 18, 2008, but not before, or why this

asset purchasing approach was superior to other means to stabilizing markets (notably, preferred stock purchases in banks, which have been favored as a superior alternative by most economists).

Was intervention necessary and pursued in a least-cost manner in the three most controversial (pre-September 18, 2008) actions by the Fed and the Treasury, namely the assistance given to Bear Stearns, the GSEs, and AIG?

The assistance provided to Bear Stearns seems defensible as an action to limit the risk of adverse systemic consequences of Bear Stearns' failure. Bear was a counterparty to many derivatives transactions, and a major repo issuer. A failure of Bear Stearns would have created substantial confusion regarding the net positions of derivatives market participants, and would have produced a major shock to the repo market and to money markets more generally. Assistance provided a means of orderly exit (the acquisition of Bear Stearns by JP Morgan Chase), and avoided what could have been substantial disruption in the repo market, derivative markets, and financial markets generally.

Was the structure of assistance appropriate? In particular, was the $30 billion loss exposure accepted by the Fed and Treasury really necessary?[34] It is not clear (and hard to second-guess in retrospect) whether the Fed and the Treasury could have gotten a better deal in their negotiations with JP Morgan Chase. By all accounts, JP Morgan Chase enjoyed a windfall from the transaction, even after the renegotiation of the Bear Stearns stock price by Bear shareholders, which raised the acquisition price from $2 a share to $10, after the bailout. On the other hand, there were few if any alternative qualified bidders, so the Fed's (or Treasury's) ability to bargain was limited. Most importantly,

[34] Although the exposure to loss was on the Fed's balance sheet, it was indemnified by the Treasury, so it may be best to think of this arrangement as a Treasury action, facilitated by the Fed, rather than a Fed lending decision.

Bear Stearns' stockholders suffered huge loss (compared to their pre-acquisition stock price), and thus moral hazard should not be much encouraged by this episode.

The promise of assistance to Fannie Mae and Freddie Mac that was given in July 2008 also seems to have been warranted in the sense that their role in the mortgage market was too important to ignore, and their ability to continue accessing the bond market had become questionable. The market wanted to know whether the long-anticipated implicit government backstop would, in fact, be forthcoming. Upon the announcement of the Fed and Treasury plan, the GSEs access to debt markets was initially restored, even before key aspects of the plan for assistance had been approved by Congress. After the July intervention, however, concerns about the GSEs mounted and ultimately creditors demanded concrete injection of resources by the government, which was undertaken by placing the GSEs into conservatorships in September 2008. The government now have pledged to support the GSEs through preferred stock injections, as needed, to maintain the flow of mortgage credit and to support GSE obligations. These preferred stock injections may be desirable as a short-term measure, but there are several aspects of the proposal that are problematic.

First, GSE fragility reflected longstanding incentive problems and excessive risk taking in anticipation of safety net protection. The GSEs made moral hazard a cornerstone of their business plan for decades. Critics of the GSEs argued that the government's implicit protection warranted greater regulation, or privatization, or winding down, of GSE operations (Calomiris and Wallison 2008). The GSEs and their defenders responded that there was no implicit protection, and therefore, no need to

prevent abuse. In the meantime, they built up subprime mortgage exposures of more than $1 trillion on a paper thin capital base.

The short-term assistance program for the GSEs, even if legitimately motivated by systemic concerns, should have been accompanied by a clearly enunciated, long-term proposal to wind down the GSEs, or fully and credibly privatize them (and make them subject to a clearly specified receivership or conservatorship regime). Nationalization of the enterprises would have been another reasonable option. The July assistance legislation and the September creation of the conservatorships does neither, and simply leaves the long-term future of the GSEs open – a surefire method to maximize campaign contributions for influential members of Congress perhaps, but not a very helpful means either of stabilizing markets or providing a transition to proper market discipline.

What about the government's September 2008 decision not to intervene to rescue Lehman Brothers, and its opposite decision to rescue AIG? The decision not to rescue Lehman has been criticized as causing much of the late-September 2008 liquidity strains in the market. That decision reflected the view by policy makers that the markets had been given ample time (six months) to adjust to the possibility of a Lehman failure, and that therefore Lehman's failure would not have grave systemic consequences. In the case of AIG, the larger size, global ramifications, and suddenness of the increased risk of failure on the heels of AIG's ratings downgrade may explain the government's different course. Here the government provided assistance, albeit at the price of requiring 80% of the firm's equity.

The government changed course dramatically on September 18, 2008. Up to that point, ad hoc decisions whether and on what terms to intervene had been the means of

dealing with problems. On September 18, the Treasury and Fed propose a comprehensive asset purchase (TARP) plan (alongside new prohibitions on short sales of financial stocks and insurance of money market mutual funds, which were experiencing large withdrawals after one prominent fund "broke the buck" of contributors' principal in the fund)? The best explanation for the change in course revolves around the "bear run" on the stock of Morgan Stanley and Goldman Sachs that occurred on the 17th and 18th of September. The previous policies of the government indicated that the government's intervention to rescue an ailing firm was uncertain, but that when it did intervene, stockholders suffered large losses. That "punitive intervention" policy made sense from the perspective of limiting moral-hazard consequences of providing assistance, but it had one bad consequence: short sellers could be confident that they would very likely profit from shorting the stock of any financial firm experiencing liquidity trouble; if the insititution did not receive assistance, then short sellers would profit as the firm scrambled to raise cash, and if it did receive assistance, shares would plummet as the result of the policy of punitive intervention. The vulnerability of Morgan Stanley and Goldman Sachs despite the fact that neither of them had significant exposures to subprime problems may have convinced policy makers that the liquidity crisis had reached a new level of severity.

III. What's Next?

In the first year since the subprime turmoil erupted, economic growth has been sluggish and the employment situation has worsened, but the ability of banks to reintermediate off-balance sheet positions without sharply curtailing credit supply (which

was the consequence of banks' preexisting regulatory capital cushion, their continuing earnings from other sources, as well as substantial capital flotations and dividend cuts) prevented the credit crunch from causing the sort of severe recession that otherwise would have accompanied a financial sector shock of this magnitude.

The near-term outlook for the economy and the financial sector has deteriorated recently, as the financial sector was buffeted in September by one of the most dramatic months in its history. Fannie Mae and Freddie Mac went into conservatorship. AIG was rescued by the government, Lehman Brothers failed, Merrill Lynch became part of Bank of America, Washington Mutual and Wachovia were acquired in FDIC-assisted transactions, and Morgan Stanley and Goldman Sachs became bank holding companies. By the end of September, the risk of further significant financial failures within the United States had been substantially reduced, if only by the fact that the fates of virtually all significant financial institutions had already been resolved. But European banks were beginning to experience severe strains and credit spreads were extremely elevated in the U.S. and abroad as equity and debt markets seized up, and the risk of a much more severe credit crunch loomed.

At the same time, the inflation picture worsened. Many observers commented that the Fed's aggressive fed funds rate cuts may have gone too far. There has been a substantial acceleration in inflation, and a rise in at least one (controversial) measure of long-term inflation expectations (the Cleveland Fed measure shown in based on the spread between indexed and nominal 10-year Treasuries, shown in Figure 12). Many market participants commented that the failure by the Fed to convince the market that it would ensure price stability has been a significant drag on the stock market.

Low U.S. stock prices, especially for banks, are a major cause for concern. Low stock prices discourage banks from raising new equity. Despite the enormous amount of equity raised thus far, unless stock prices rise to encourage banks to continue to raise equity capital, credit supply decline likely will accelerate. The Treasury and Fed have offered the TARP asset purchase plan as a means of staving off the risk of a severe decline in credit and economic activity.

The remainder of this section (1) evaluates the TARP proposal, (2) evaluates the risks in the housing market related to the growing wave of foreclosures, (3) offers a few monetary and long-term regulatory policy recommendations, and (3) provides an assessment of how the subprime turmoil will reshape the structure of the financial system.

TARP and a Preferred Alternative

The TARP proposal, which was pending before Congress at this writing, would have the U.S. government spend up to $700 billion acquiring distressed assets from financial institutions. The proposal has significant shortcomings.

First, it places taxpayers in a first-loss position with respect to the assets they buy. To mitigate that problem, Congress added several proposed items, including the awarding of stock warrants to the government by asset-selling institutions, ex post assessments to be paid by all surviving financial institutions (to be designed subsequently) to recoup any ultimate taxpayer losses, limits on executive pay, and a variety of other features. These features reflect the desire to insulate taxpayers from the large potential risks associated with the acquisition of subprime-related assets and other assets, and entail significant

uncertainties for taxpayers and participating institutions from their implementation. The asset purchases and the various risk-mitigating measures also provide extraordinary discretion to the Secretary of the Treasury.

Second, the plan is to purchase assets at above "fire-sale" prices but below "hold-to-maturity" value (to use Chairman Bernanke's terms). This aspect of the plan reflects the recognition that purchasing assets at the lowest possible price in the midst of a liquidity crisis would do little to help banks, since it would not add to the capital of sellers and could force all banks to mark their portfolios to extremely low values. Given that most of these instruments do not trade in a secondary market, are highly heterogeneous and complex, and are not going to be purchased at the lowest (i.e., current market) price, it is hard to see how their prices will be determined. Discretionary authority combined with an ill-defined objective is a recipe for mischief, unaccountability, and even corruption.

Third, the plan entails moving a huge amount of the financial system's assets out of the private sector and into the public sector. This may be good news for the price of Northern Virginia's real estate, but it will produce inefficient disposition of assets and reduce employment in New York's financial center at a time when job losses there are already quite high.

There is a better way. The Reconstruction Finance Corporation's (RFC) preferred stock program, which began in 1933, was quite successful at giving banks needed capital and liquidity in the 1930s, and it did so at minimal risk to taxpayers. Infusing banks with preferred stock protects taxpayers against loss by making recipient bank stockholders bear the first tier of losses on their assets (thus avoiding the need for complex contracting

schemes involving warrants, assessments and compensation limits), avoids the near-impossible task of pricing subprime-related securities, and keeps the workout of distressed assets in private hands (and in New York). The U.S. experience in the 1930s and Finland's in the 1990s show that preferred stock injections can boost systemic stability with little risk to taxpayers (Mason 2001, Englund and Vihriala 2003, Calomiris and Mason 2004b). The RFC was successful in limiting the abuse of its preferred stock investments because it codified and followed clear practices specifically designed to limit abuse. Those included limiting common stock dividend payments, requiring recipients to devise a plan to increase capital, and retaining significant corporate governance authority to limit abuse of protection. A properly designed RFC approach is head-and-shoulders better than the TARP approach being advocated by Messrs. Paulson and Bernanke.

Will U.S. House Prices Collapse?

If the above account of the origins of the turmoil is correct in placing significant blame on agency problems in asset management, then that implies an important corollary: agency problems are also likely causing an overreaction to the subprime shock. Over-selling on the downside is a standard theoretical and empirical result in the literature on agency in asset management. It results from the desire of portfolio managers to avoid stocks that are seen by the public as obvious poor performers.

The most dire predictions of financial sector loss begin with forecasts of a large decline in house prices. Using flawed measures of prices, many commentators believe that U.S. house prices have already fallen by more than 15% and may decline by substantially more in the near term. Such a decline implies that prime mortgages, not just

subprime and Alt-A loans, could suffer substantial losses. The main worry is that a massive wave of subprime foreclosures and resulting distress sales of subprime borrowers' houses will produce a steep house price decline for all houses, fueling further foreclosures (by "walkaway" prime borrowers) and leading to further price declines.

Calomiris, Longhofer and Miles (2008) show that the empirical basis for this view is highly suspect.[35] Roughly three quarters of the U.S. mortgage market (measured in numbers of homes) is prime and conventional (non-subprime, and non-jumbo). The value of these homes is accurately measured by the OFHEO indexes (there are two quarterly index numbers, one based on purchases of homes, the other based on both purchases and appraisals during refinancings – see Leventis 2007 for details). Regardless of which of the OFHEO indexes one employs, these price measures for the typical American home have not fallen much since the 2007 peak (Figure 13). Furthermore, even if dire foreclosure forecasts come true, Calomiris, Longhofer and Miles (2008) estimate that home prices as measured by the OFHEO index likely will not fall by very much (a peak-to-trough decline of more than 5% would be a reasonable upper bound of average decline, even if foreclosures substantially exceed estimates for 2008 and 2009), although in roughly a dozen states declines will be (and already have been) severe (Figure 14).

The OFHEO index is an accurate measure of the prices of houses financed in the prime mortgage market, and thus provides a clear indication of whether foreclosure activity is likely to produce significant price decline in that market. Other price indexes (the median sales price index, and the Case-Shiller national index – plotted in Figure 13)

[35] The study develops a quarterly Panel Vector Autoregressive model, using quarterly data at the state level since 1980 on employment, house sales, house permits, house prices, and foreclosures. We simulated house price declines for each of the states through 2009 by combining the model's parameter estimates with state-level foreclosure estimates for 2008 and 2009 from economy.com.

are biased measures of the overall housing market. Case-Shiller, in particular, gives great weight currently to distressed subprime sales, and to jumbo sales, particularly in a few states (due to its uneven coverage of the national market). The OFHEO indexes, in contrast, mainly measure the value of houses in the prime market. Thus, there is little reason to believe that prime mortgages will suffer large losses from subprime foreclosures.

If this upbeat assessment is correct, it is very good news for the recovery, since it indicates that the housing market is nearing its bottom. Recovery will not begin in earnest until markets become convinced that housing prices, which underlie so much of the uncertainty in the financial sector, have reached bottom.

Calomiris, Longhofer, and Miles (2008) also argue that, the OFHEO index is superior to Case-Shiller for measuring the consumption wealth effect of house price changes, since it is more representative of households whose consumption behavior is most likely to respond to house value decline. That argument reflects theoretical perspectives on the housing wealth effect (see Sinai and Souleles 2005, and Buiter 2008). Central banks' macroeconomic models typically gauge the wealth effect using the OFHEO index as their measure of housing wealth, perhaps for similar reasons. The fact that the typical American home is unlikely to decline much in value over the period 2007-2010 due to the foreclosure wave buffeting the housing market, therefore, provides an optimistic perspective on consumption. The combination of a 5% OFHEO peak-to-trough price decline and a reasonable estimate of the housing wealth effect (a 3% elasticity) produces a very small decline in consumption.

Perspectives on Monetary Policy

I have argued that the Fed's aggressive actions with respect to the expansion in access to the discount window, the Fed-Treasury actions to prevent the collapse of Bear Stearns, and intervention to prevent the collapse of the GSEs, were appropriate responses to financial turmoil, although as many other commentators have correctly noted, in the case of the assistance to GSEs, government protection should have been delivered in a way that also committed to the right long-term resolution of the GSE problem.

During an asymmetric-information shock, the central bank needs to be able to deliver targeted assistance. The discount window is a "surgical" tool used to combat localized problems (like the current securitization shock) without changing fed funds rates, and through them, interest rates throughout the financial system. Discount window lending inevitably entails some acceptance of risk by the central bank; to be useful, the collateral taken on loans should be good, but not riskless. At the same time, the discount window should not be used as a hidden means of transferring resources to insolvent borrowers (as the Fed did, and was roundly criticized for doing, during the 1980s).

Being able to grant access to the discount window not only allows policy makers to target microeconomic assistance to put out fires with systemic consequences in the financial system, it also frees the monetary authority to be keep the money supply and fed funds rate on an even keel, even during times of high stress. A bold use of the discount window, in other words, empowers the Fed to maintain a strong commitment to price stability even as it delivers assistance quickly where it is needed.

Unfortunately, the Fed has not pursued a combination of bold lender-of-last-resort support alongside conservative policies to promote price stability. Aggressive fed funds

cuts have permitted inflation to accelerate. During the turmoil, some voices within the Fed argued that core inflation provided a better indicator of long-term inflation, despite the fact that food and energy price inflation was obviously accelerating in a secular trend, rising alongside long-term inflation expectations and partly as a direct result of a weakening dollar. This was unwise at best and disingenuous at worst. And Fed officials' promises that rate cuts would be taken back in 2008 if inflation accelerated have proven hollow.

To avoid a worsening economic contraction, banks and nonfinancial firms must be able to continue to access the stock and bond markets. U.S. corporations (whose debt capacity has improved over the past four years markedly, in response to the corporate leverage reduction wrought by the Bush dividend tax cuts – Figure 15) should be able to raise substantial funds in the bond market. But worries about inflation can limit buyers' interest in new debt offerings. Ensuring price stability should be a priority for Fed policy, even from the standpoint of supporting the expansion of credit supply.

Until the Fed raises the fed funds rate to demonstrate its concern about the acceleration of inflation, Fed pronouncements on price stability will be seen as cheap talk. Starting sooner rather than later, the Fed needs to raise the fed funds rate, slowly and predictably, to restore confidence in its continued commitment to price stability.

Regulatory Policies

With respect to regulatory policy, an important historical lesson is that bad regulations are often wrought in the wake of large financial shocks. Post-Depression regulatory changes (the separation of commercial and investment banks, the

establishment of deposit insurance, the entrenchment of entry barriers across regions) are almost universally viewed by financial historians as mistaken reactions to the Depression which remained a source of major economic costs in the decades that followed (Calomiris 2000). It is important to emphasize that knee-jerk criticisms that blame the banking deregulation of recent decades for the subprime turmoil are dead wrong. As discussed above, bank deregulation and globalization over the past decades substantially reduced the costs of the subprime turmoil. But there have been regulatory mistakes, and they need fixing.

This regulatory discussion focuses on six regulatory policy issues raised by the subprime turmoil:[36] (1) prudential regulation of banks and other intermediaries, (2) policy toward the GSEs, (3) government policies designed to increase the rate of homeownership, (4) changes in the regulation of asset management, (5) the regulatory use of ratings for various purposes, and (6) foreclosure relief.

Prudential regulation of banks has been shown to be inadequate, not just in retrospect, but in prospect. Critics of the status quo prior to the turmoil noted that the magic 8% number for total risk-based capital, and the lower limits on overall leverage enforced in the U.S., have long questioned whether these levels are adequate. Other longstanding criticisms have been that the chief pillars of Basel II – reliance on rating agencies opinions and reliance on internal models – have both been roundly discredited by the collapse of subprime. Many economists (see Repullo and Suarez 2008, for a

[36] Many other topics also warrant discussion, but not all can be treated here. The future of derivatives trading is of particular interest. Many observers are arguing that counterparty risk could be reduced by simplifying and homogenizing derivative contracts and encouraging their trading on exchanges, and by creating more efficient management of clearing and netting of positions. The allocation of regulatory and supervisory authority is another complex area of increasing debate. In particular, there are reasons to favor removing the Federal Reserve from the day-to-day business of supervision and regulation, as suggested by Secretary Paulson (see Calomiris 2006).

review) have also noted the desirability of allowing minimum capital requirements to decline during downturns – to mitigate the credit supply contractions that accompany bank losses during downturns – but allowing such variation while also preserving sufficient equity buffers requires a substantial increase in the average minimum capital ratio. This could be done at low cost to the economy if it were phased in over a long period of time (say over a decade or so). Once the economic recovery is underway, policy makers should begin the process of raising minimum capital requirements.

The subprime debacle brings a deeper lesson, too. Banks used securitization to avoid prudential regulatory policies that tried to limit bank asset risk per unit of capital. If prudential regulation is going to be effective it has to do more than make a new set of rules that clever bankers will innovate around. Regulation must take incentives into account and build rules that will be immune to creative accounting for risk. To accomplish that objective, capital requirements should also be made more dependent on debt market discipline, rather than just rating agency opinions or internal models. Many academics, within and outside the United States, have long favored the imposition of a minimum subordinated debt requirement as part of bank capital requirements (Shadow Financial Regulatory Committee 2000). While it is true that agency problems in asset management, like those revealed during the subprime turmoil, can weaken the accuracy of market opinions as expressed in the pricing of subordinated debts, the answer to that problem is to find ways to encourage better incentives by asset managers, not to give up on market discipline. Bankers who know that they will be subject to the risk judgments of sophisticated creditors, who place their own money at risk, will have strong incentives to limit the true underlying risk borne by those creditors. A minimum subordinated debt

standard (which was supported by academic and Federal Reserve Board (1999) research, but killed by the political lobbying of the big banks in 1999), is the sine qua non of a credible approach to defeating regulatory arbitrage in banks' risk management practices.

Largely in reaction to the disorderly LIBOR market over the past year, regulators are moving to require banks to meet minimum liquidity standards. It is likely that banks will be required to maintain adequate liquidity, not just adequate capital, as part of a reformed set of Basel requirements. Such a requirement would also reduce the dependency of banks on the Fed discount window during future financial shocks.

Another potential change in prudential regulation resulting from the subprime turmoil could be the imposition of **prudential regulations on investment banks**. Now that investment banks that are primary dealers have accessed the discount window and been the targets of other special Fed and Treasury intervention, is it possible to return to the status quo ex ante (where investment banks operate with neither the benefits of government protection nor the costs of adhering to strict guidelines for prudential regulation)? Much of the urgency of resolving that question was removed by the decisions of Morgan Stanley and Goldman Sachs to become bank holding companies under the regulation of the Federal Reserve Board. Still, the status of other investment banks, and of prospective entrants, remains unclear.

The key unresolved issue is the extent of protection going forward. Unless the government can find a way to credibly avoid providing blanket protection to primary dealers that become troubled, prudential regulation of primary dealers would be necessary. On an optimistic note, reforms in over-the-counter markets are underway that would establish a central clearing house for some derivatives trading. This could

substantially reduce and render more transparent the counterparty risks in derivatives trading. Doing so would reduce the potential costs of allowing a primary dealer to fail, and could thereby help limit the expansion of the safety net and the need to extend prudential regulation to the primary dealers.

The genie is clearly out of the bottle with respect to GSE protection, which implies a pressing need to **reform the GSEs**. For over a decade, critics of the GSEs have been pointing out that the implicit protection afforded to them by the government invited abuse of taxpayers' funds (Wallison 2001, Calomiris and Wallison 2008), and that there was no justification for preserving their unique mix of private ownership with government protection. Now that the government has bailed out the GSEs, taxpayers' exposure is no longer implicit, it is explicit. The status quo ex ante is no longer acceptable. In the long term, the GSEs either should be divided into smaller institutions and credibly privatized, or should be wound down after being nationalized. There are many acceptable ways to achieve one or the other of these options.

The government has made a point of using **credit subsidies as the primary means of encouraging homeownership** – via tax deductibility of mortgage interest, FHA guarantees, support for GSEs and Federal Home Loan Banks, and pressures on lenders to expand access to credit for would-be homeowners. This has significantly contributed to unwise risk taking and excessive leveraging in the real estate market, which promoted instability in the housing and financial markets. The argument typically made for subsidizing homeownership is that it increases people's stake in their communities, and makes them better citizens. A better way to achieve that objective is downpayment assistance for new homeowners (employed in Australia), which could

deliver the same homeownership outcome in a way that stabilizes real estate markets and ensures that homeowners maintain a real stake in their homes. After all, how can homeownership significantly increase an individual's stake in the community if the individual retains only a trivial stake in his or her home?

Although it has received scant attention in the press, given the central importance of agency problems in asset management in triggering the recent turmoil, policy makers should be considering ways to **reform the regulation of asset management** to encourage better performance, greater competition, and more accountability. A good start would be the elimination of the symmetry requirement for profit sharing, which would permit asset managers to adopt compensation arrangements that would reward performance (along the lines of the arrangements employed by hedge funds). One can imagine other potential regulatory changes that might encourage greater competition and accountability on the part of institutional investors. This topic warrants more attention.

The regulatory use of ratings, as discussed in Section 1, has contributed to ratings grade inflation, and given "plausible deniability" to value-destroying asset managers who made poor investments in subprime mortgage-related instruments.[37] Unlike typical market actors, rating agencies are more likely to be insulated from the standard market penalty for being wrong, namely the loss of business. Issuers must have ratings, even if investors don't find them accurate. That fact reflects the unique power that the government confers on rating agencies to act as *regulators*, not just opinion providers. Portfolio regulations for banks, insurers, and pension funds set minimum ratings on debts these intermediaries are permitted to purchase. Thus, government has

[37] The discussion here relies heavily on Calomiris and Mason (2007).

transferred substantial regulatory power to ratings agencies, since they now effectively decide which securities are safe enough for regulated intermediaries to hold.

Ironically, giving rating agencies regulatory power reduces the value of ratings by creating an incentive for grade inflation, and makes the meaning of ratings harder to discern. Regulated investors encourage grade inflation to make the menu of high-yielding securities available to them to purchase larger. The regulatory use of ratings changed the constituency demanding a rating from free-market investors interested in a conservative opinion to regulated investors looking for an inflated one.

Grade inflation has been concentrated particularly in securitized products, where the demand is especially driven by regulated intermediaries. Even in the early 1990s, it was apparent how regulation was skewing the ratings industry. Cantor and Packer (1994) pointed out that grade inflation was occurring, and that it was driven initially by ratings agencies other than Moody's and S&P: "Rating-dependent financial regulators assume that the same letter ratings from different agencies imply the same levels of default risk. Most 'third' agencies, however, assign significantly higher ratings on average than Moody's and Standard & Poor's." In fact, those "third" agencies were already pushing more heavily into structured finance than Moody's and Standard & Poor's, rating deals that the two main agencies did not. Moody's and Standard & Poor's eventually chose to join the others in what turned out to be an incredibly lucrative fast-growing product area, which accounted for roughly half of rating agencies' fees.

It is no use blaming the rating agencies, who are simply responding to the incentives inherent in the regulatory use of ratings. The right solution is for regulators to reclaim the regulatory power that has been transferred to rating agencies to both award

ratings *and* determine the meanings attached to ratings. Such reform becomes even more important in light of soon-to-be-adopted Basel II capital rules, which allow bond ratings to be used to measure default risk in regulating the portfolios of banks that do not develop their own models under Basel II's Internal Risk-Based (IRB) Capital Rules.

How can regulatory power be reclaimed? Regulating how rating agencies set standards is one possibility, but that would compromise rating agencies' ability to use independent discretionary judgment. A better solution is to reform regulations to avoid the use of letter grades in setting standards for permissible investments by regulated institutions. In the absence of regulatory use of letter grades, banks and their regulators would look at the underlying risks of investments (their default probabilities and the expected losses given default), not letter grades. Indeed, rating agencies sell tools to investors that permit exactly this sort of analysis, and the IRB framework under Basel II presumes such data, which would render letter grades superfluous. Full disclosure of these new measures of portfolio risks, and a greater reliance on market discipline to discourage excessive risk taking would further improve the regulatory process.

An even better reform would be to eliminate the regulatory use of ratings altogether. Regulation could substitute true market discipline through mandatory subordinated debt requirements, as discussed above.[38] Not only would requiring banks to issue sub debt provide discipline from debtholders placing their funds at risk, the opinions of these market participants are publicly observable in bond prices and thus provide useful information to other investors and regulators.

[38] For evidence of the desirability and feasibility of employing greater market discipline, see Board of Governors (1999), Mishkin (2001), and Barth, Caprio and Levine (2006).

Congress and many states are considering various ideas for **helping homeowners to avoid foreclosure**. Many homeowners, particularly highly levered subprime borrowers who are facing rising interest rates as the result of teaser rate contracts, are facing a high risk of foreclosure. Compassion, and the desire to remove downward pressure on home prices from distress sales, motivate various aid proposals. The costs of such aid could be large, and the benefits in the form of higher home prices have been exaggerated (again, see Calomiris, Longhofer and Miles 2008). Costs include the moral hazard consequences of encouraging high-risk borrowing in the future. To the extent that aid is provided, it should be targeted (e.g., to limit foreclosures on primary residences of low-income homeowners), and should depend on renegotiation by creditors and lenders, not government intervention into the foreclosure process. Any aid should require lenders to make significant concessions to reduce borrowers' leverage and reduce the risk of default going forward, and post-assistance cash out refinancing should be strictly prohibited for borrowers participating in assistance programs.

Long-Term Structural Consequences of the Subprime Turmoil

Will securitization remain an important feature of financial intermediation or has it been discredited too much by the subprime debacle? Over the last two decades securitization transformed financial intermediation. Advocates of efficiency gains from securitization point to the flexibility of securitization structures in carving up and distributing risk to meet different investors' preferences for duration, default risk, interest rate risk, and prepayment risk. Securitization also can efficiently reduce the equity capital needed to absorb the risk of the assets being intermediated. Securitization mechanisms

can perform that function by promoting learning about securitized assets over time (which reduces adverse selection costs), or by employing subtle contractual devices that improve the incentives of sponsors to manage risk (Calomiris and Mason 2004a).

Critics see securitization as a means of promoting too much systemic risk by allowing banks to maintain inadequate minimum capital requirements, while retaining most or all of the risk of the assets being securitized. The absorption of much of the loss by sponsors of conduits has left many observers questioning whether securitization really does reallocate risk, and whether it does so in a transparent fashion. The lack of reliability of the risk modeling for subprime MBS and CDOs has undermined confidence in the apparatus for engineering conduits and measuring the risks of their debt issues.

Securitization of subprime and CDO conduits have given securitization a bad name and the long-term future of securitization remains uncertain. But already we are seeing that the negative impact on securitization depends on the product line. For example, on the one hand, credit card securitizations seem to holding their own. They have been around for decades, have operated through several business cycles, and have a well-understood track record. The master trusts under which debts are issued have evolved over time, and their complex structures (including early amortization structures that protect issuers and debtholders) have stood the test of time well. Deal flow in credit card securitizations remains high, and one could even argue that credit card securitization will benefit from the demise of subprime and other housing related products. On the other hand, more recent and exotic products, especially related to the residential or commercial mortgage sector, have been severely affected over the past year. Commercial MBS debt

tranches with low loan-to-value ratios (e.g., 70% LTV tranches that are rated A) have seen yields in the high teens or even higher, and deal flow has been substantially reduced.

Financial institutions are seeking to find a substitute mechanism in product areas where the market is less receptive to securitization. Covered bonds provide one possible solution. Indeed, one could argue that covered bonds are a more transparent version of the financial arrangements that previously characterized securitized assets. They similarly allow sponsors to carve up and redistribute risk, and permit separate categories of assets to serve as the bases for funding financial intermediation (rather than lumping everything together on the bank's balance sheet and raising funds for the bank as a whole).

Covered bonds are obligations of the issuing bank that issues them, but they are also linked directly to a set of assets that provide the first line of defense for repaying the cash flows promised to bondholders. This permits covered bond issuers to be rewarded for the performance of the asset pools on which the bonds are issued, as in a securitization, and it allows complex carving up of risks and targeting of risks to different (relatively junior and senior) bondholders. But debt service on covered bonds is a claim on the cash flows of the financial institution that issues them, not just the cash flows from the assets earmarked to support them, and covered bonds also are backed by the net worth of the issuing financial institution. While securitized assets enjoy the implicit backing of the sponsor's holding company, this was conditional in the sense that there was no legal requirement by the sponsor to provide backing. Covered bonds entail a greater, more explicit and unconditional commitment for protection, and thus are quite different from securitization (Calomiris and Mason 2004a, Higgins and Mason 2004).

That difference raises a concern for prudential regulation, namely cash flow and asset "stripping" – the possibility that the a bank's commitment to its covered bond holders could cause a depletion of cash flow and assets that would otherwise support the institution as a whole (Eisenbeis 2008). So long as prudential regulation is effective, bank capital will be sufficient to provide protection against losses to other bank liabilities notwithstanding the use of covered bonds, but given the concerns noted above about the effectiveness of prudential regulation, it is worth recognizing that the use of covered bonds further reinforces the need for deep reforms of prudential regulation.

Will Stand-Alone Investment Banks Disappear?

Deregulation, culminating in the Gramm-Leach-Bliley Act of 1999, allowed commercial banks (i.e., those issuing deposits) to engage in a wide range of financial services. Why would a wholesale bank choose to remain as an investment bank after the deregulation of commercial banks' powers? The primary advantage was avoiding the prudential regulations that applied to commercial banks. Although investment banks could not issue deposits, they could fund themselves with repurchase agreements (largely overnight), which substituted for short-term, low-interest rate deposits.

The subprime crisis dramatically changed the perceived costs and benefits of remaining a stand-alone investment bank, as indicated by the disappearance of Lehman, the decisions by Morgan Stanley and Goldman Sachs to become bank holding companies, and the acquisitions of Bear Stearns and Merrill Lynch by JP Morgan Chase and Bank of America, respectively. It now seems likely that stand-alone investment banking will become the domain of small, niche players in the financial system.

Obviously, the giant stand-alone investment banks didn't want it to come to this. Why did they resist it for some long, and what does this tell us about the downside of their capitulation for the structure and efficiency of the American financial system going forward?

The investment banks' resistance until now largely reflected the regulatory costs and risk "culture" changes that come with regulated depository banking. Virtually all of the franchise value of Goldman and Morgan is human capital. These folk are the most innovative product developers, and the most skilled risk managers, that the world has ever seen. Depository bank regulation, supervision, and examination prizes stability and predictability over innovativeness, and banks bear a great compliance burden associated not only with their financial condition, but also their "processes" related to both prudential regulatory compliance and consumer protection. None of that is conducive to innovation and nimble risk taking.

Goldman's and Morgan's moves, therefore, could have a big cost in trimming their upside potential and reducing the value of their human capital for developing new products and proprietary trading strategies. What about the benefits? First and foremost, they will be able to use reliable, low-cost deposit financing as a substitute for the shrinking collateralized repo market and other high-priced market-based debt instruments. Second, they will be able to preserve their client advisory business, and perhaps even compete better in underwriting activities. Stand-alone investment banks have lost market share in underwriting to universal banks over the past two decades because underwriting and lending businesses are linked, and non-depository institutions

suffer a comparative disadvantage in funding their lending (see Calomiris and Pornrojnangkool 2008).

In this sense, the capitulation of the stand-alones marks the final stage in the victory of the relationship banking/universal banking model. Those of us who argued in the 1980s that nationwide branching would allow commercial banks to serve as platforms for universal banks with large relationship economies of scope can now say that we told you so. Bank of America, JP Morgan Chase, and Citibank have all weathered the financial storm and are not under immediate threat of failure precisely because their geographical and product diversification has kept them resilient, and even permitted them to engage in acquisitions and new stock offerings during the worst shock in postwar financial history.

But it is not progress, in my mind, to move toward a one-size-fits-all financial system based entirely on behemoth universal depository banks. Just as community banks still play an important role in small business finance (owing to their local knowledge and flat organizational structures), we need nimble, innovative risk takers like Goldman and Morgan in the system.

Still, I am not too worried about the lost long-run innovative capacity of American and global finance, for a simple reason: Ultimately, people are the innovators, not institutions; smart, innovative people can (and many will) find homes elsewhere. The financial landscape will shift, giving rise to new franchises and new structures (perhaps even spinoffs from the current investment banks) that combine the features of the old franchises that don't fit comfortably under the Fed's umbrella. Global competition, as always, will be a reliable driver of financial efficiency.

The structure of U.S. financial intermediation will probably undergo significant changes over the next few years, many of which are hard to predict. History does not give a precise guide to those changes, but one pattern is likely to repeat: Financial sector problems breed new opportunities alongside losses. The American financial system, if it remains true to its history, will adapt and innovate its way back to profitability and high stock prices sooner than is suggested by the dire predictions that fill today's newspapers.

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Table 1
Illustrating the Diversity of U.S. Financial Shocks

Financial Shock	Banking Problem?	Real Estate Related?	Importance of Asymmetric Information in Relevant Market	Severity of Financial Shock (relative to size of overall economy)
Panic of 1893	Yes	Partly	High	Low
Panic of 1907	Yes	No	High	Low
Agriculture Distress 1920-1930	Yes	Yes	Low	High
Crash of 1929	No	No	Low	High
Banking Distress 1931-1933	Yes	Partly	Occasional, mainly regional	High
Penn Central 1970	No	No	High	Low
Agricultural Distress Early 1980s	Yes	Yes	Low	Moderate
Bank and S&L Distress 1980-1991	Yes	Yes	Varied	High
Crash of 1987	No	No	Low	High
Dot Com Crash of 2001	No	No	Low	High
Subprime Shock	Yes	Yes	High	High

Table 2

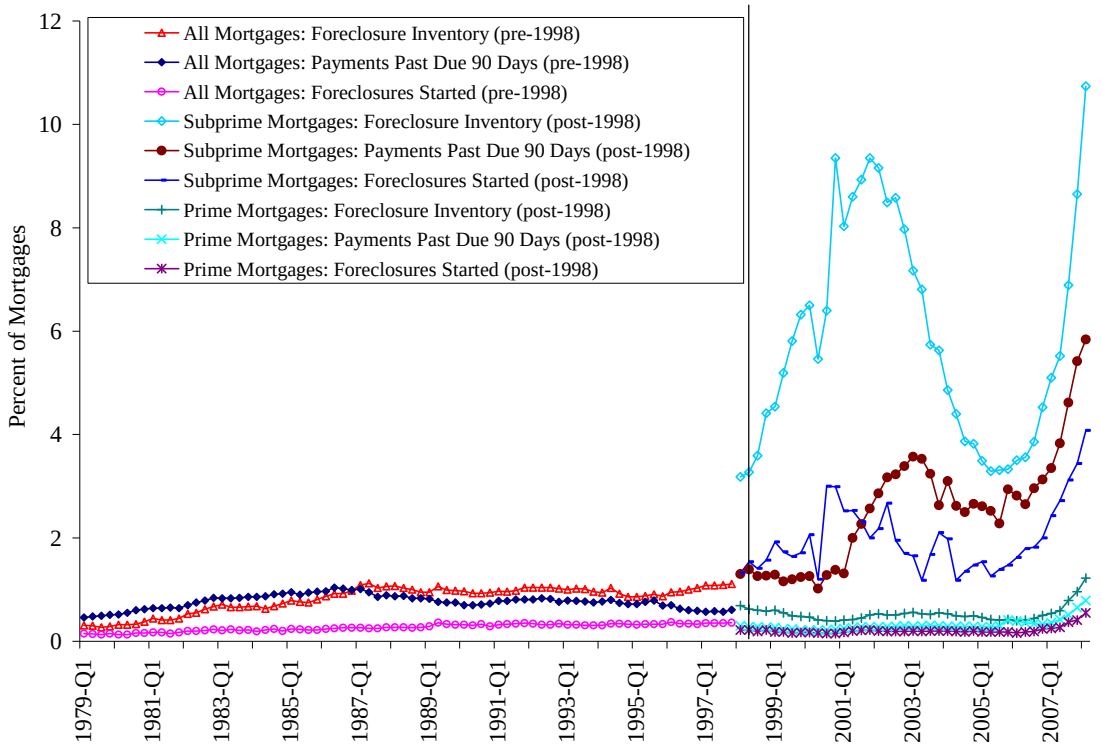
Mortgage Originations
By Product and By Originator
(Billions of Dollars)

	2007 (6 mo)	2006	2005	2004	2003	2002	2001
FHA/VA	42	80	90	130	220	176	175
Conv/Conf	570	990	1090	1210	2460	1706	1265
Jumbo	242	480	570	510	650	571	445
Subprime	**151**	**600**	**625**	**530**	**310**	**200**	**160**
AltA	**205**	**400**	**380**	**185**	**85**	**67**	**55**
HELOC	200	430	365	355	220	165	115
TOTAL	1410	2980	3120	2920	3945	2885	2215
ARMs	460	1340	1490	1464	1034	679	355
Refis	765	1460	1572	1510	2839	1821	1298

Top 10 Originators	
Countrywide (CA)	245
Wells Fargo (IA)	148
Citi (MO)	116
Chase (NJ)	109
B of A (NC)	96
WaMu (WA)	83
Resid. Cap. (NY)	58
Wachovia (NC)	55
IndyMac (CA)	48
Am Home Mort (NY)	35
TOTAL for Top 10	993
TOTAL for Market	1410

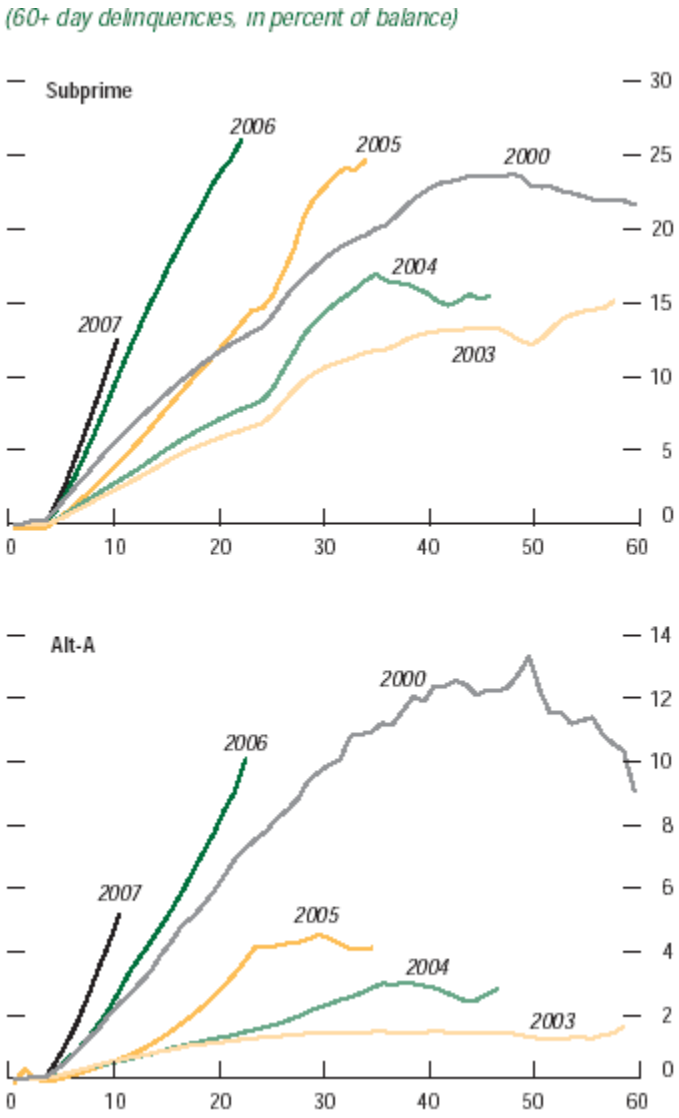
Source: Originations data are from "Current Mortgage Market Conditions," Housing Data Users Group, September 26, 2007.

Figure 1: Foreclosure and Delinquency Rates



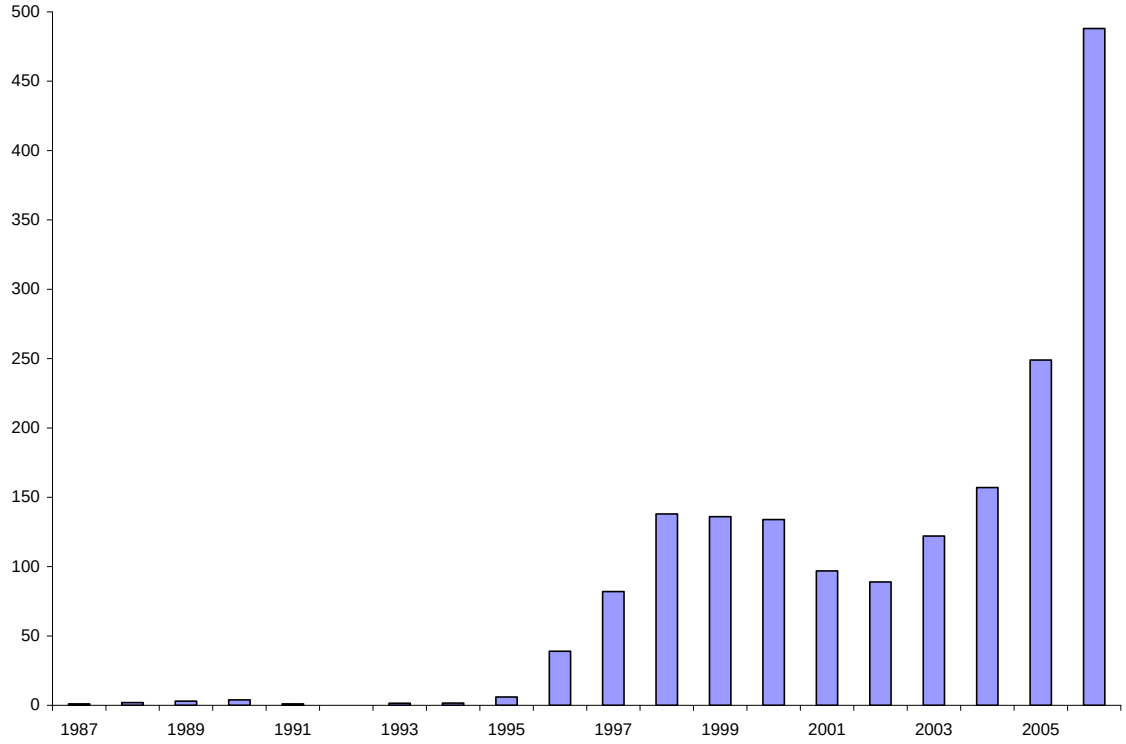
Source: Mortgage Bankers Association, National Delinquency Survey. FHA and VA mortgages, and jumbo mortgages, are included in the pre-1998 aggregate data, but VA and FHA mortgages are not included in the post-1998 samples of prime and subprime mortgages; jumbo mortgages are included in those samples.

Figure 2: Default Paths of Different Mortgage Cohorts



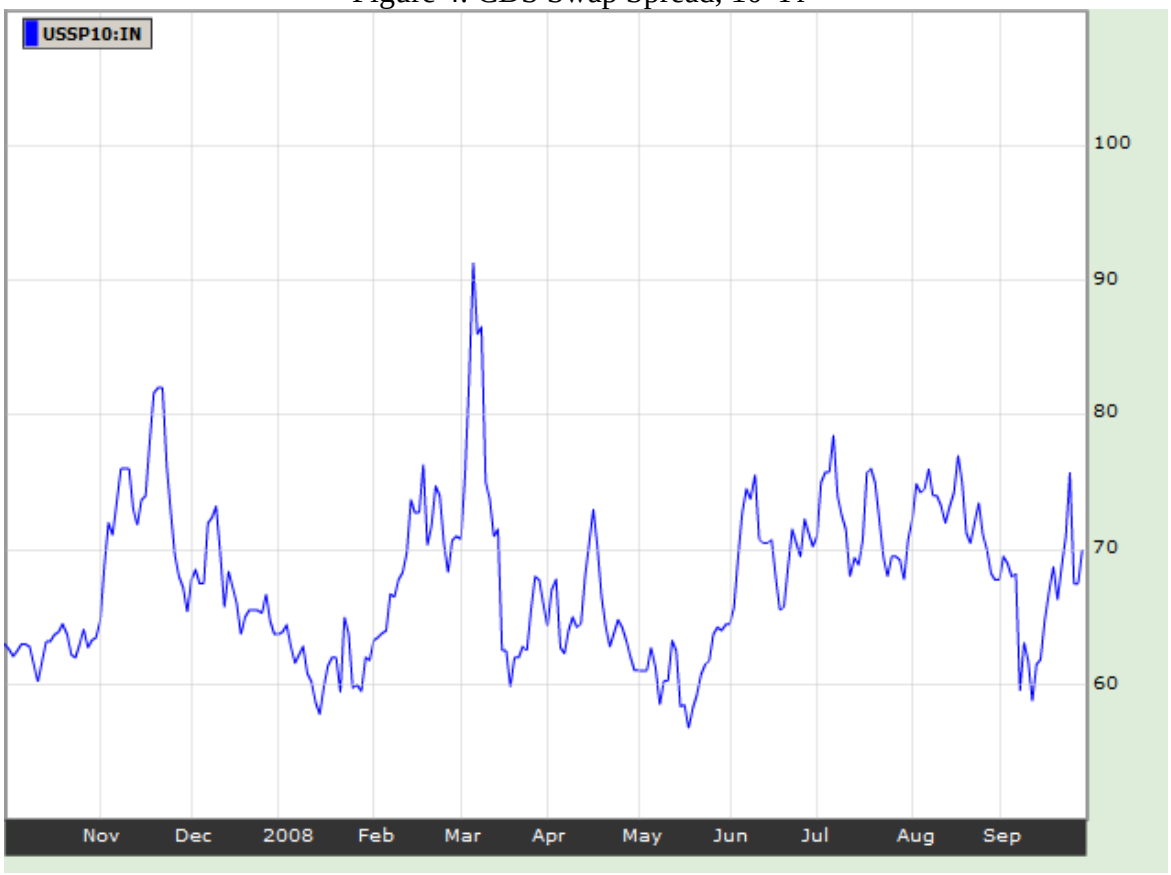
Source: IMF Global Financial Stability Report, April 2008, p. 6.

Figure 3: Annual Cash CDO Issuance



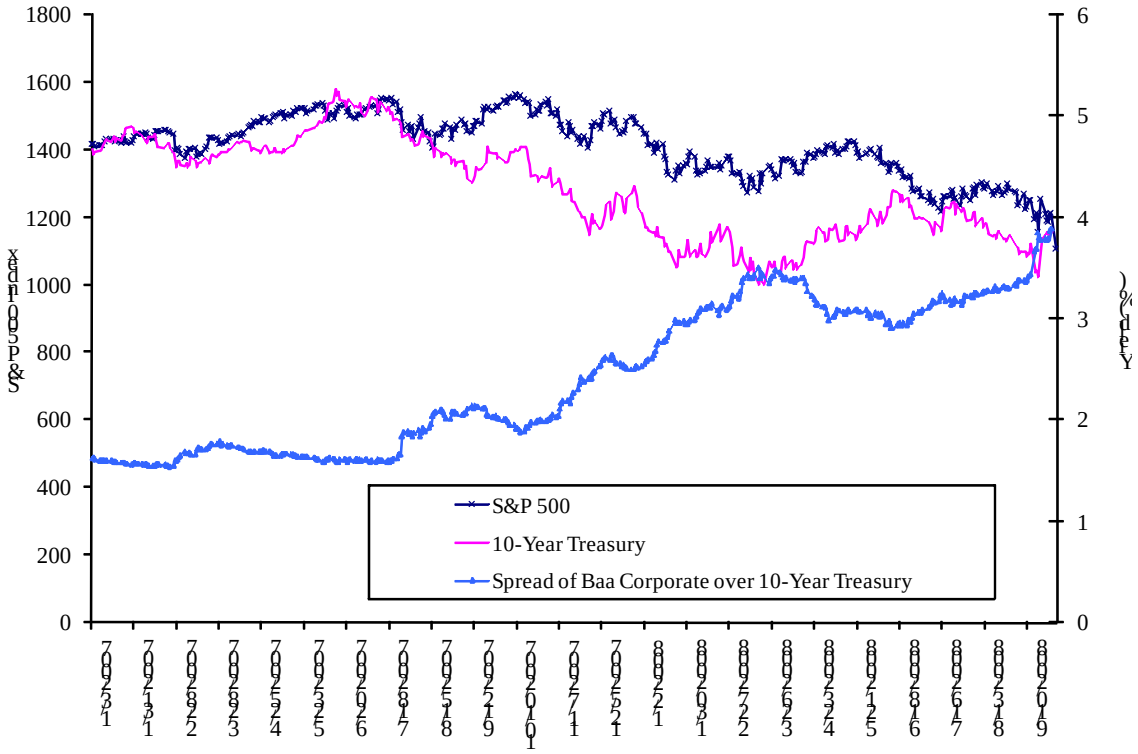
Sources: Mason and Rosner (2007), derived from Lucas, Goodman and Fabozzi (2006).

Figure 4: CDS Swap Spread, 10-Yr



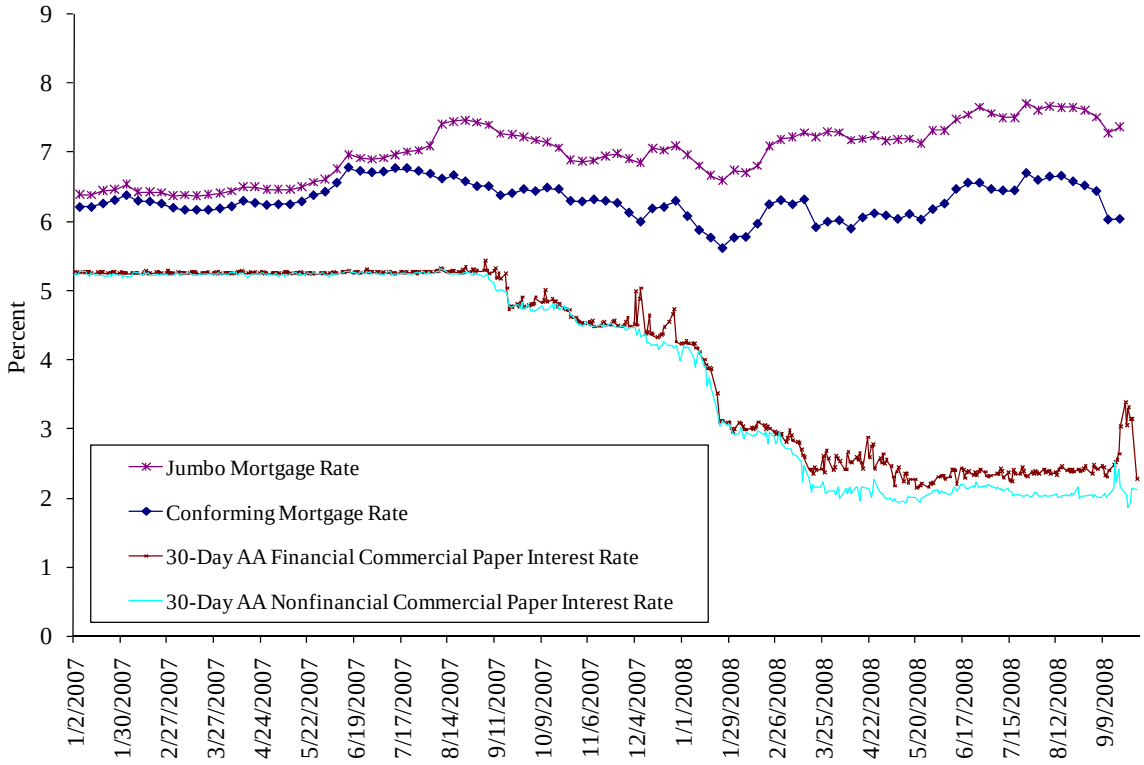
Source: Bloomberg.

Figure 5: S&P 500 vs. 10-Year Treasury Yields vs. Spread Between Moody's Seasoned Baa Corporate Bonds and 10-Year Treasury Yields



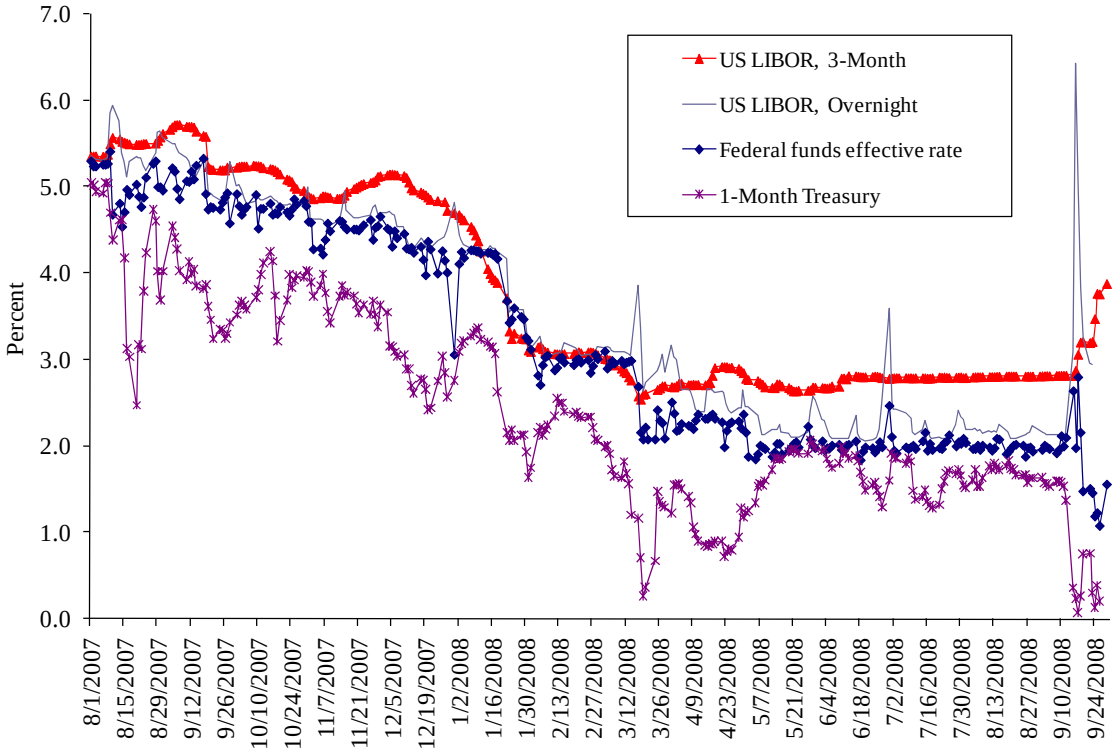
Sources: Yahoo! Finance (http://finance.yahoo.com); Federal Reserve Statistical Release H.15.

Figure 6: Commercial Paper Rates, LIBOR, and Mortgage Rates



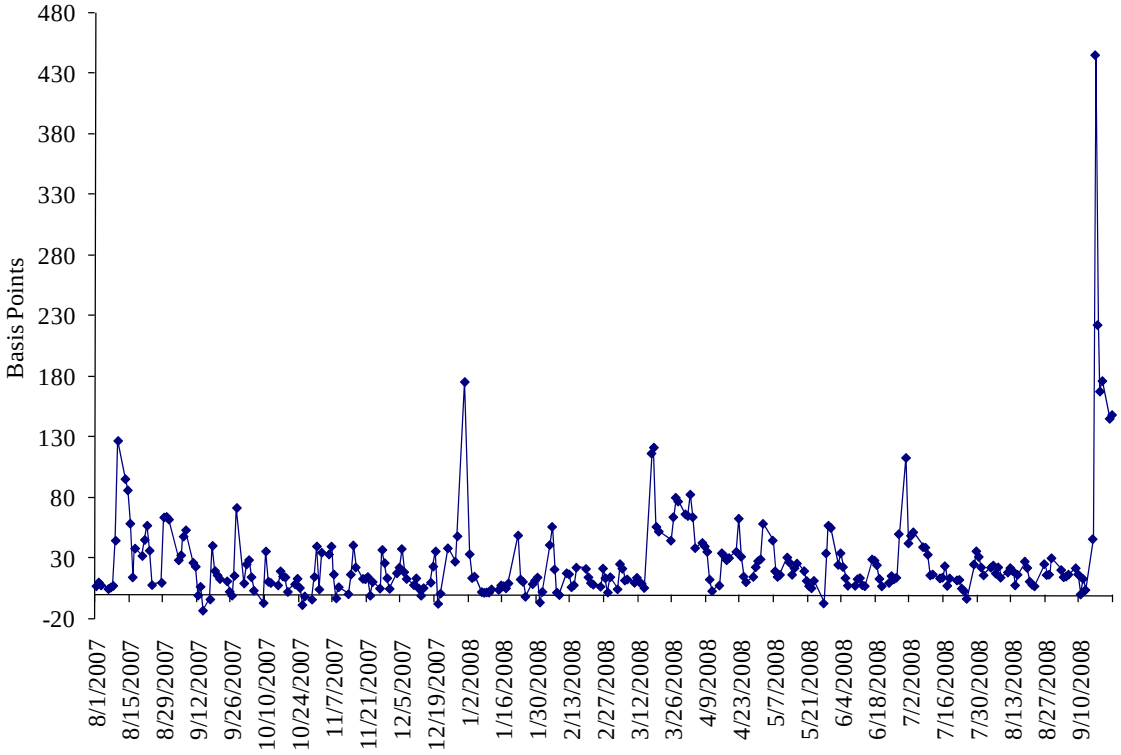
Sources: Federal Reserve (http://www.federalreserve.gov/DataDownload/Choose.aspx?rel=CP); HSH Associates, www.hsh.com.

Figure 7: LIBOR, Treasury Bill, and Fed Funds Rates



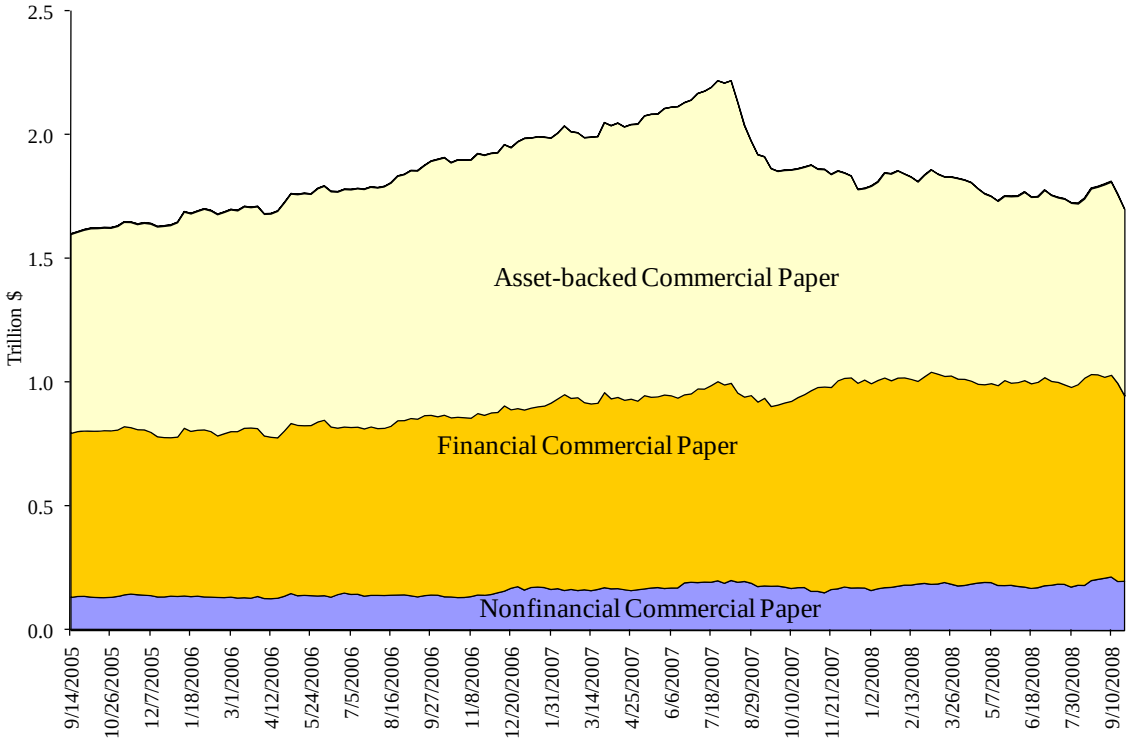
Sources: Federal Reserve Statistical Release H.15; British Bankers Association, Historic BBA LIBOR Rates (http://www.bba.org.uk/bba/jsp/polopoly.jsp?d=141&a=627).

Figure 8: Overnight Libor-Fed Funds Spread



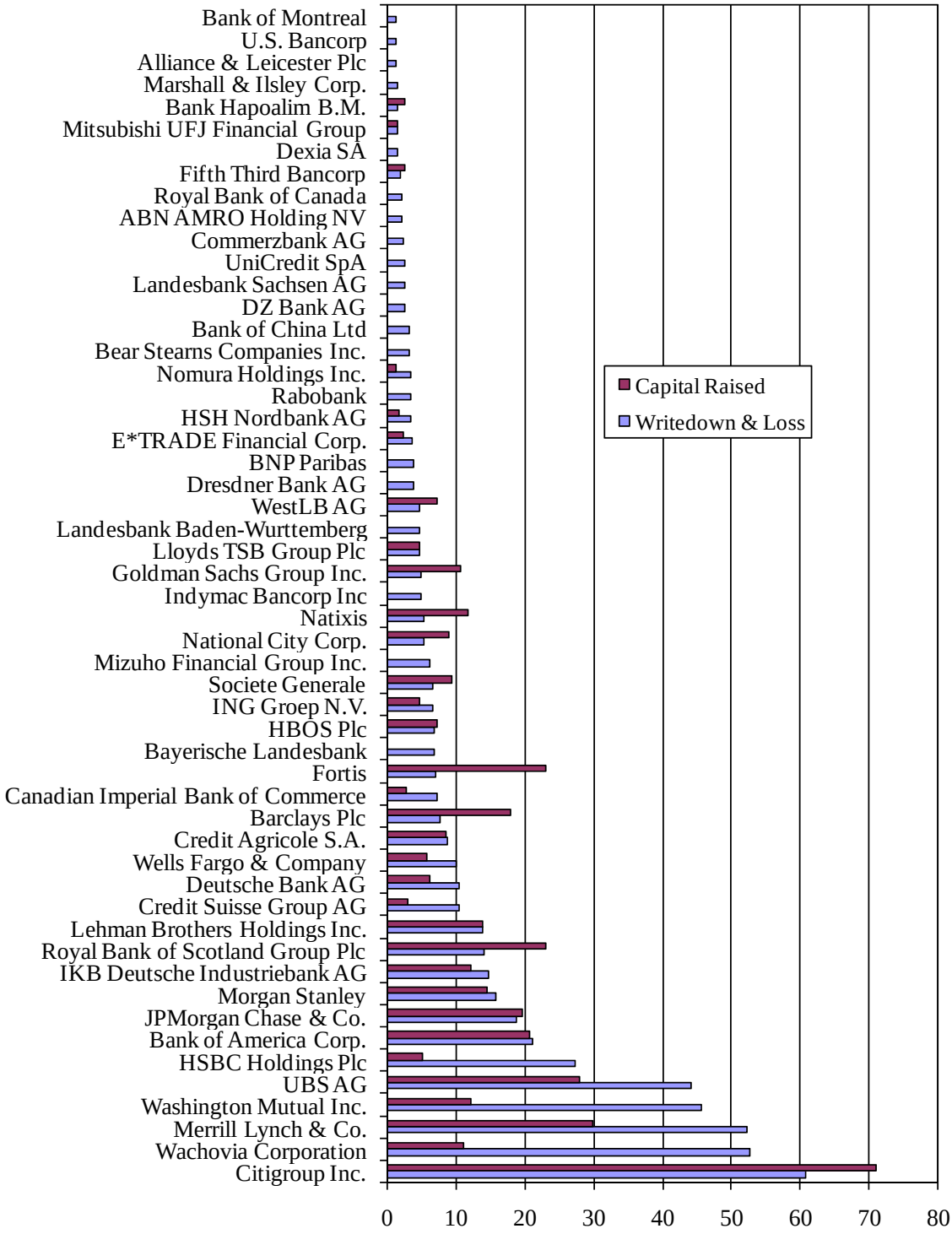
Sources: Federal Reserve Statistical Release H.15; British Bankers Association, Historic BBA LIBOR Rates (http://www.bba.org.uk/bba/jsp/polopoly.jsp?d=141&a=627).

Figure 9: Commercial Paper Outstanding (Weekly, Seasonally Adjusted)



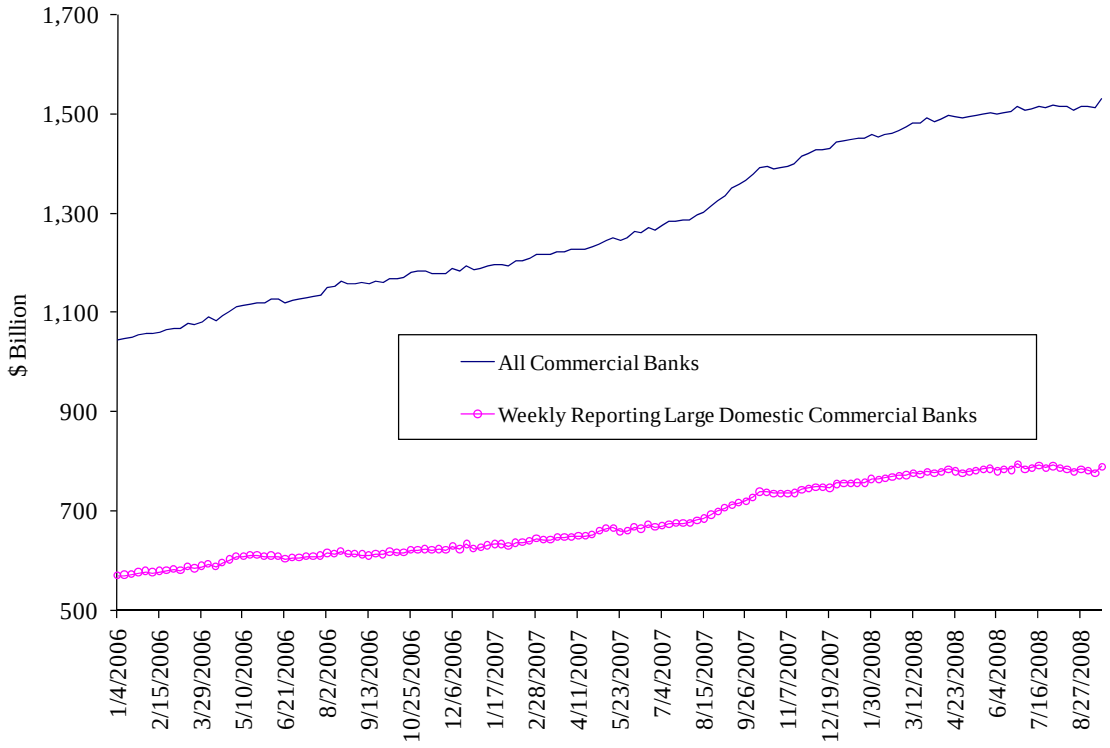
Source: Federal Reserve (http://www.federalreserve.gov/DataDownload/Choose.aspx?rel=CP)

Figure 10: The Distribution of Total Writedowns ($590.8 billion)
and Capital Raising ($434.2 billion) by Institution
($ Billions)



Source: Yalman Onaran & Dave Pierson, *Banks' Subprime-Related Losses Surge to $591 Billion: Table*, BLOOMBERG, Sep. 29, 2008.

Figure 11: Commercial and Industrial Loans

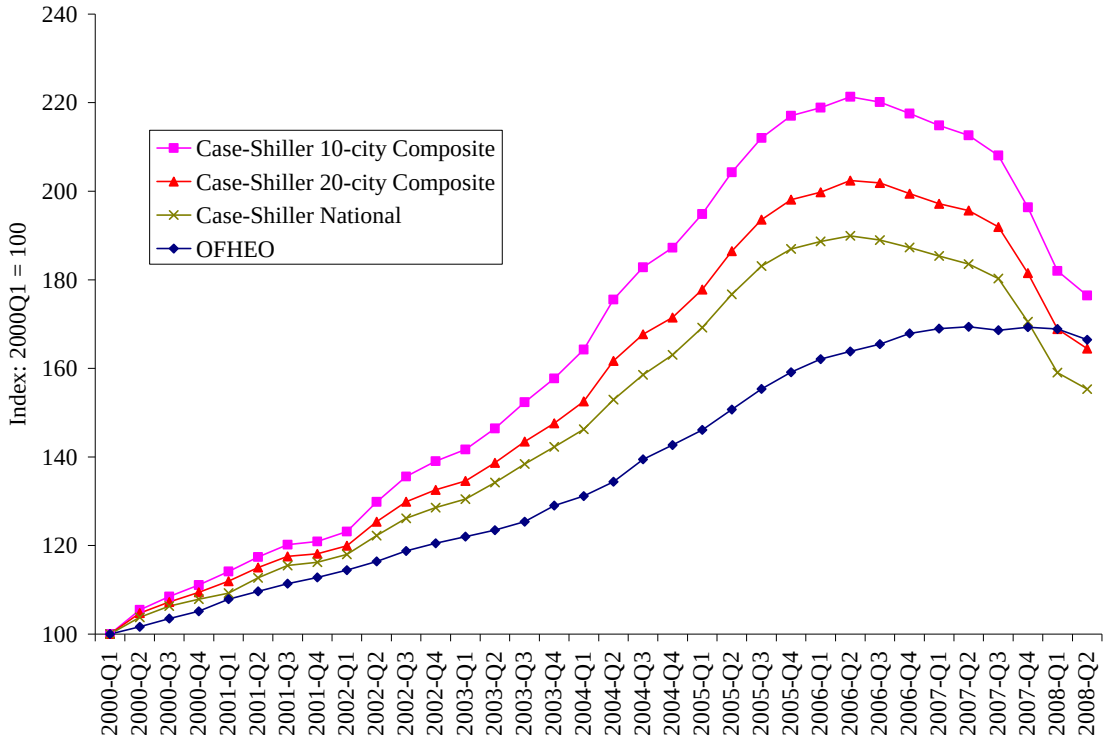


Note: Data are seasonally adjusted.
Source: Federal Reserve Statistical Release H.8 (http://www.federalreserve.gov/releases/h8/data.htm).

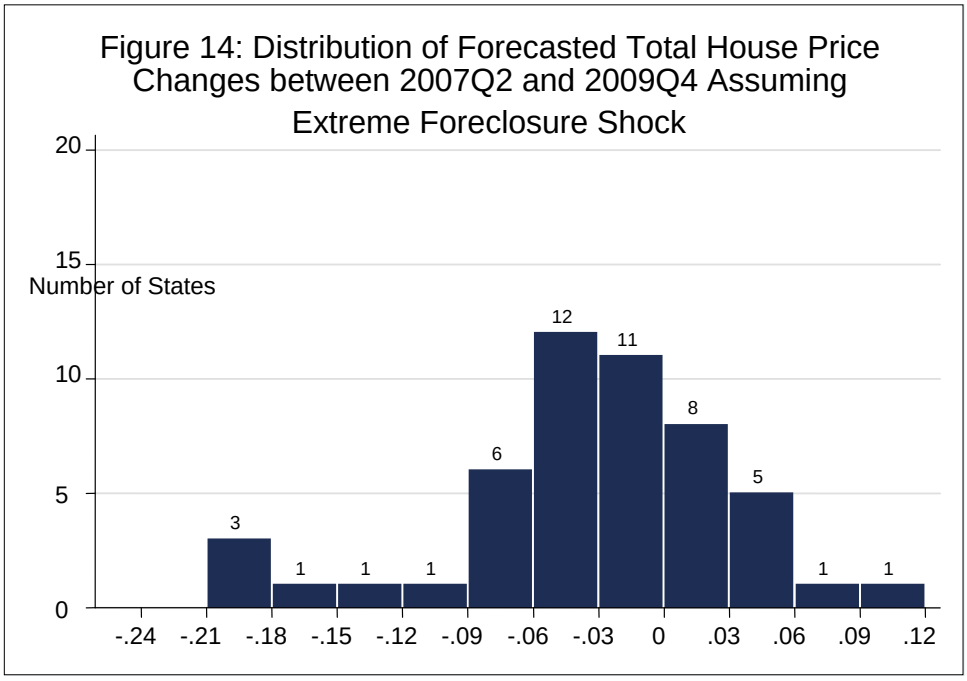
Figure 12: Cleveland Fed 10-Year TIPS-Derived Expected Inflation

Source: Federal Reserve Bank of Cleveland, TIPS Expected Inflation Estimates (http://www.clevelandfed.org/research/data/tips/index.cfm).

Figure 13: U.S. Home Price Appreciation



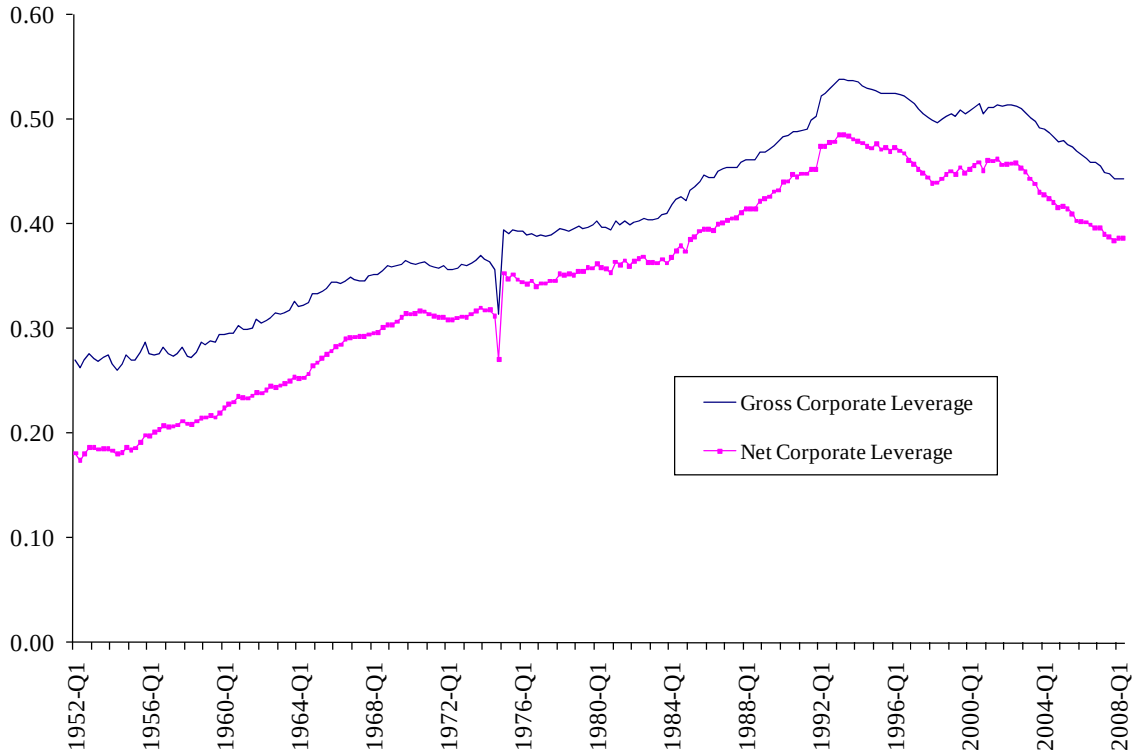
Sources: S&P/Case-Shiller Home Price Indices (http://www2.standardandpoors.com/portal/site/sp/en/us/page.topic/indices_csmahp/0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0.html); OFHEO, House Price Index (http://www.ofheo.gov/hpi_download.aspx).



Note: Alaska and New Hampshire are not included because of data limitations; the District of Columbia is included.

Source: Calomiris, Longhofer and Miles (2008)

Figure 15: Corporate Leverage



Note: Gross corporate leverage is defined as liabilities divided by assets. Net corporate leverage is defined as liabilities, less cash, divided by assets. Cash is defined as total financial assets, less trade receivables, consumer credit, and miscellaneous assets.
Sources: Federal Reserve Statistical Release Z.1, Table B.102
(http://www.federalreserve.gov/releases/z1/Current/data.htm)