

The foreign capital flow and domestic drivers of the US financial crisis and its spread globally

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Introduction

The collapse of subprime mortgages that began in the U.S. in mid-2007 developed into the biggest financial crisis in more than 75 years and made 2009 the first year since World War II in which global economic activity declined. The subsequent recovery was weak in the U.S., and Europe entered a prolonged period of crisis.

This paper focuses on the development of the conditions in which the crisis was triggered. It draws on the recollections of the author, who led a team charged with assessing the economic and political forces shaping the global business environment from within a financial institution at the center of the crisis as it unfolded. The objective is to sort through the multiple forces and actors that enabled such unstable conditions to develop.

In looking at what led up to the crisis, one must be careful not to fall into the post hoc ergo propter hoc (after this, therefore because of this) fallacy. Some sequences of events clearly reflect a causal relationship, but others do not. And causation must be looked at in two senses for an event like the crisis. There are factors that created a fragile environment that was vulnerable to collapse, and there was a trigger for the most acute phase of the crisis—the bankruptcy filing of Lehman Brothers—that brought about a collapse just as the removal of one more block from a Janga tower that had become increasingly unstable can send it toppling. But the last block is not important. It might have been the one before, and, in the absence of this one, it would have been the next block or the one after that brought down the tower. The increasingly unstable Janga structure created by weakening at many points is the important thing.

This paper focuses on the buildup to the crisis in the U.S. and then looks at how the collapse there affected the rest of the world.

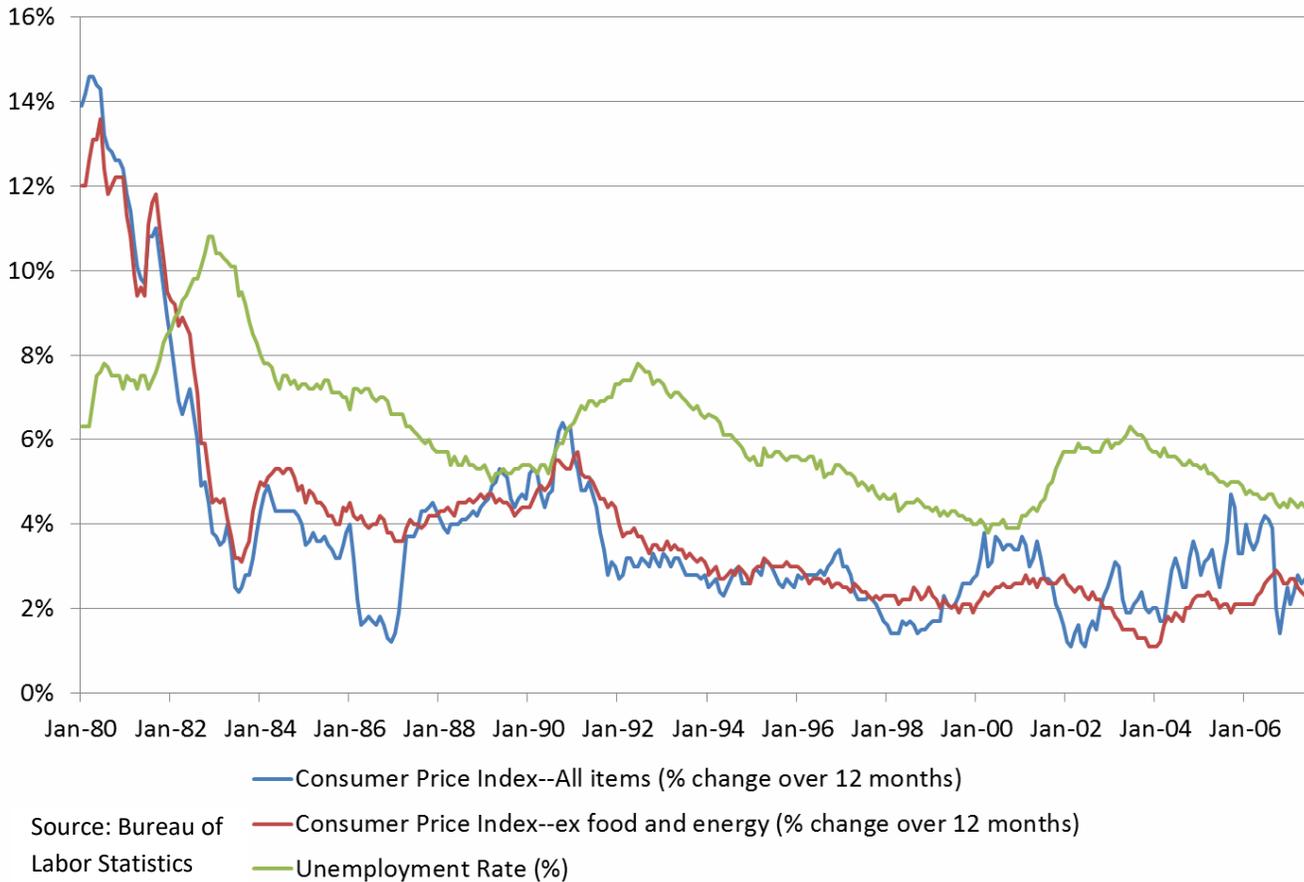
The Buildup

Monetary conditions were relatively easy

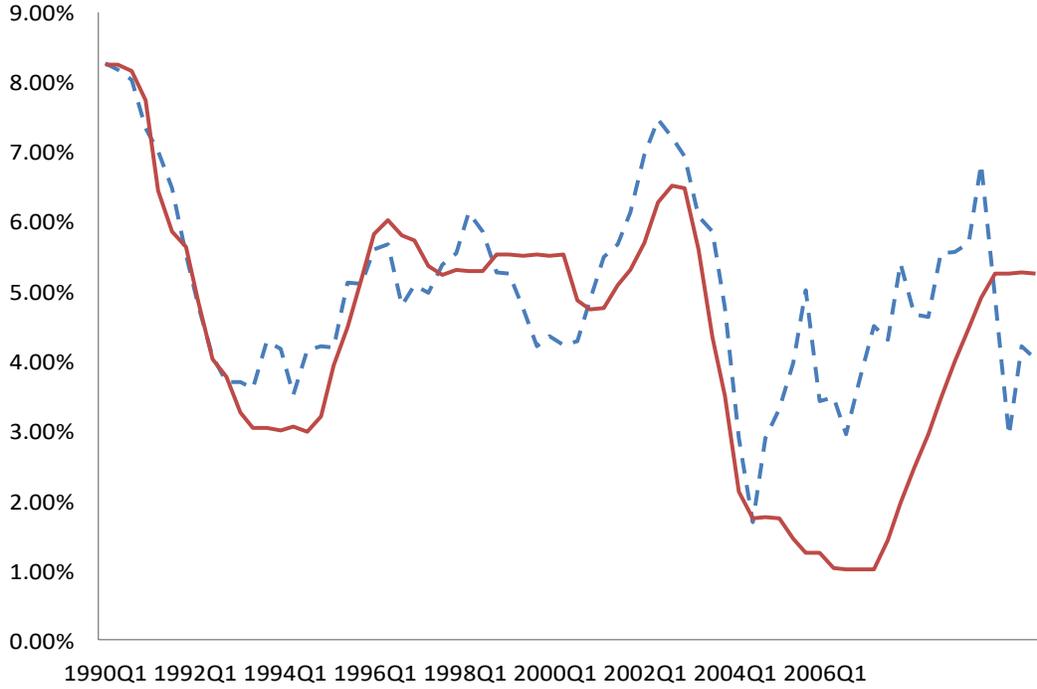
The conditions for the crisis built up as confidence grew over several decades that monetary policy had been mastered with respect to ensuring both stable low inflation and stable financial conditions. For 25 years following the painfully-won triumph over inflation by the Federal Reserve, led by Paul Volcker, in the early 1980s, the U.S. economy had enjoyed an unprecedented period of stability. Ben Bernanke, Chairman of the Federal Reserve Board at the time of the crisis, called this period “the great moderation.”¹ The rate of inflation measured by the annual rate of change of the core (excluding food and energy) personal consumption expenditure (PCE) deflator, favored as an indicator of inflation by the Federal Reserve, fell from more than 9% in 1980 to less than 2 ½% in 1993 and remained between 1 ½%-2 ½% thereafter. The “headline” (without exclusions) inflation rate was nearly as well behaved. The unemployment rate declined from more than 10% in 1982-1983 to less than 7% in 1993 and remained well below this level for 15 years until the crisis took it back to 10%. There had been financial disturbances, notably the black Monday stock market crash on October 19, 1987 and the collapse of the dot-com bubble beginning in March 2000. But economic and financial spillovers were contained in both cases.

The Federal Reserve became more activist following the mild inflation and deflation of the dot-com equity bubble and the shock of Sept. 11, 2001 as it sought to sustain the Great Moderation. It directed policy to provide greater assurance of sustained growth amid concern about the risk of deflation, which had become entrenched in Japan. This became a theme in the public statements of Federal Open Market Committee (FOMC) members.² Policy from 2002 into 2006 lagged on the easy monetary policy side of the Taylor rule.³ This rule stipulates the Federal funds interest rate that the Fed should set at each point in time, considering GDP and inflation, to stay close to or return to an inflation target. Analysts widely use it as an indicator of the extent to which monetary policy is on the easy or tight side, but it does not account for factors that may justify a bias on one side or the other. The focus of policy was on sustaining growth. This became known in the markets as the “Greenspan put”—an implicit option contract with the market that removed the risk of a steep decline in the economy or the markets. The expansionary thrust of Fed policy was reinforced by large Federal budget deficits produced by tax cuts in 2001 and the cost of the second Gulf War from 2003 on.

Inflation and Unemployment During the Great Moderation



Taylor Rule Rate vs. Fed Funds Rate



Source: Board of Governors of the Federal Reserve System

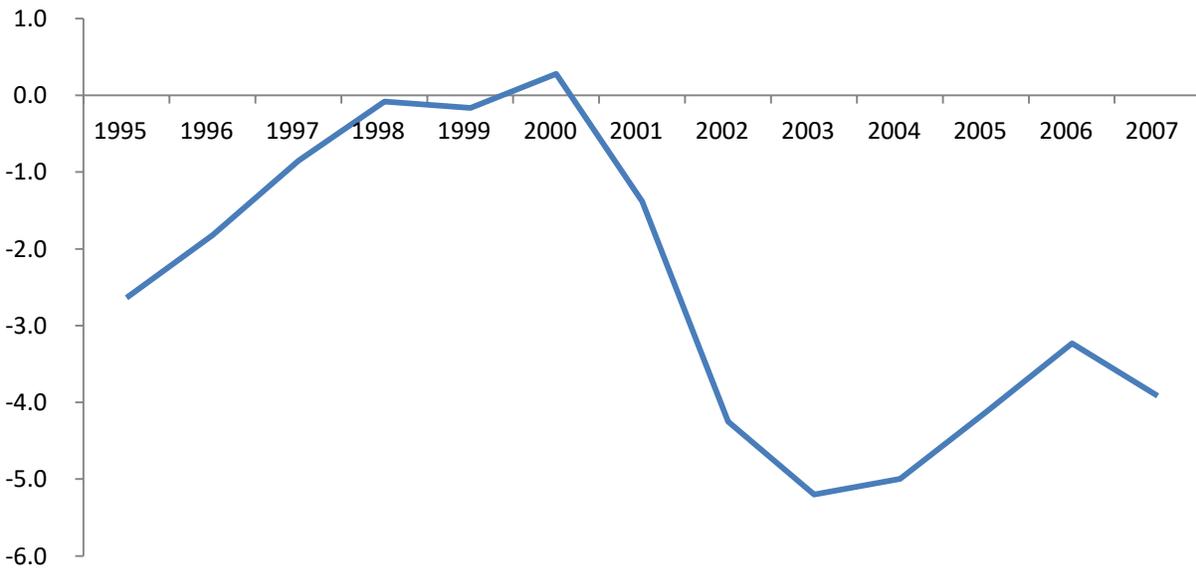
— Taylor Rule

— Federal Funds Rate

U.S. Cyclically Adjusted Budget Balance

Federal, State and Local Governments

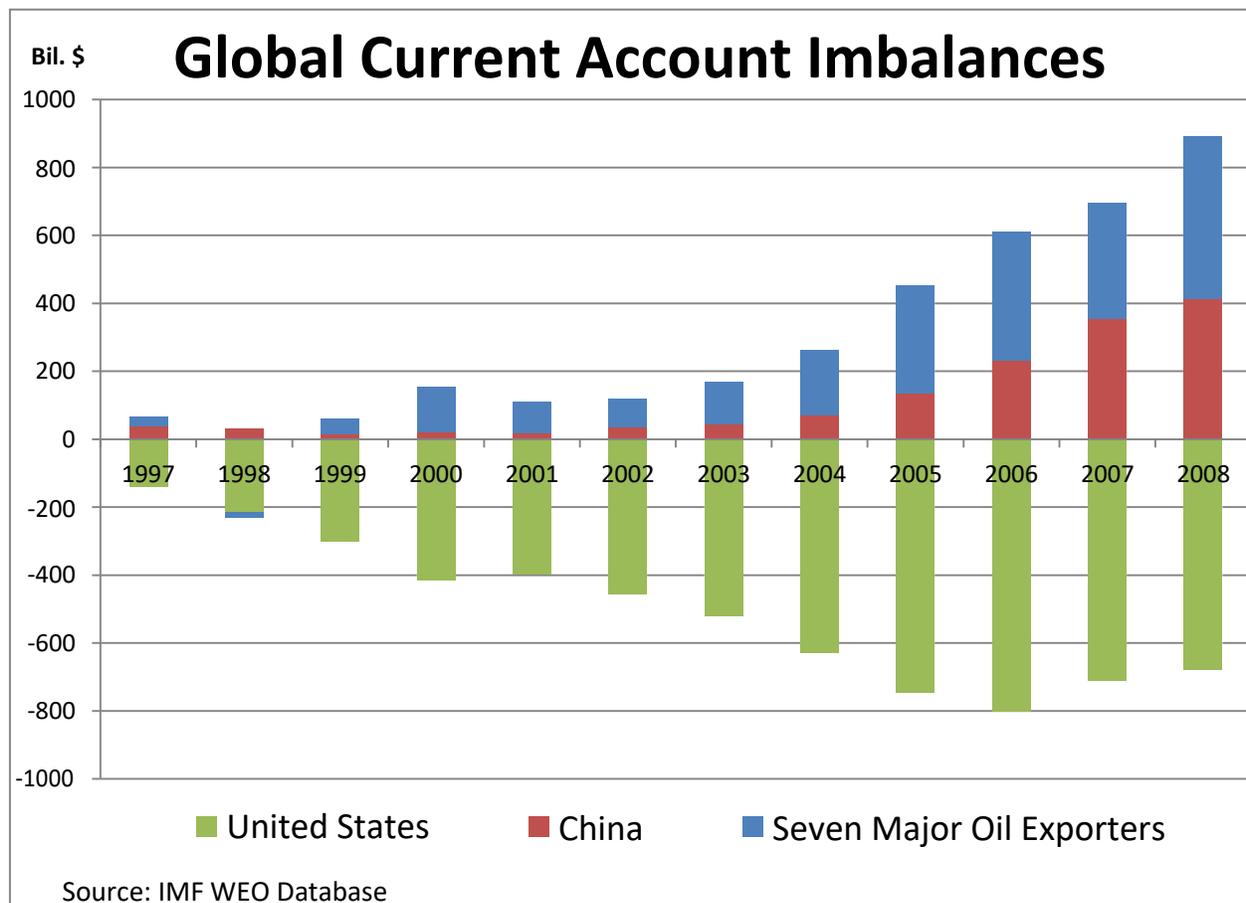
% of GDP

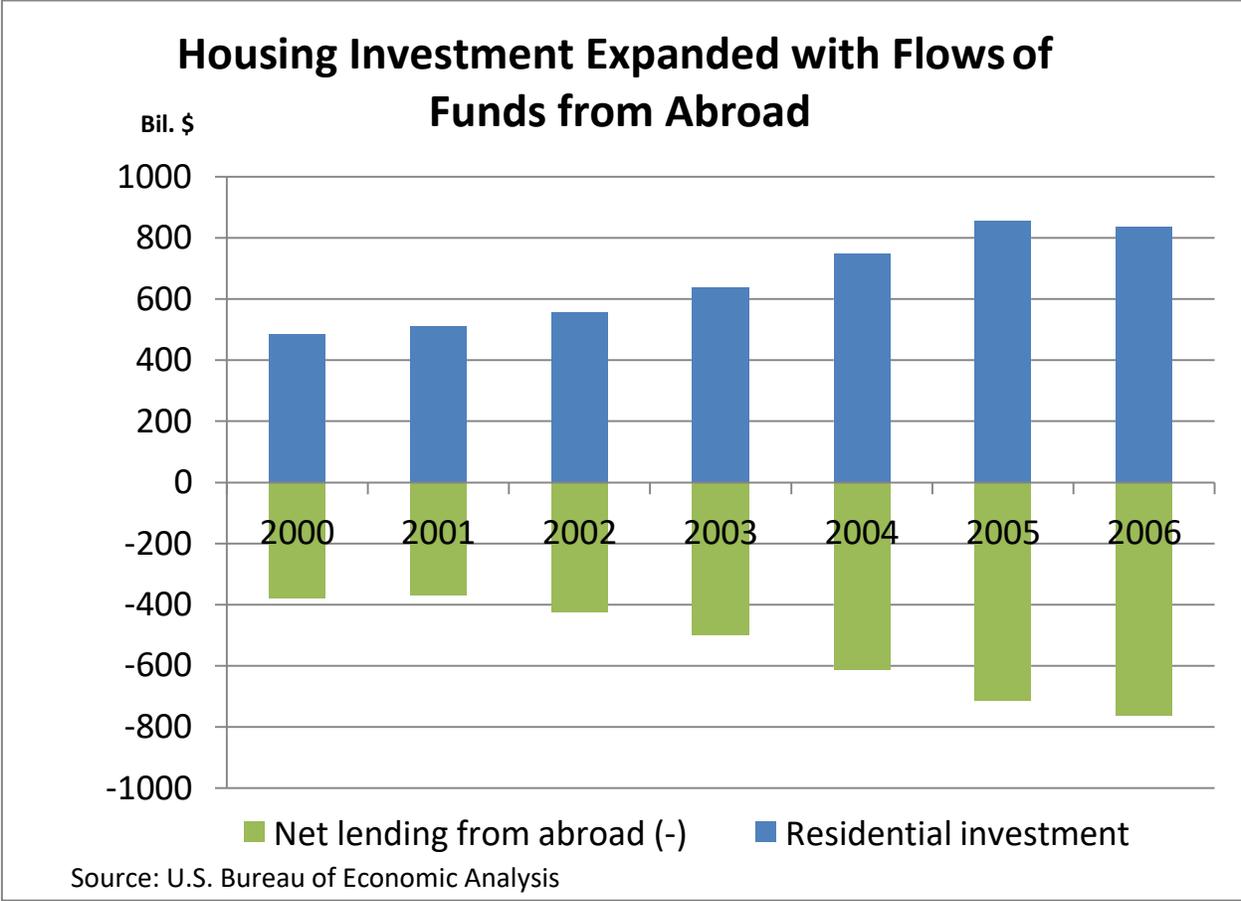


Source: OECD Economic Outlook, Volume 2012 Issues 2 No. 92. © OECD 2012

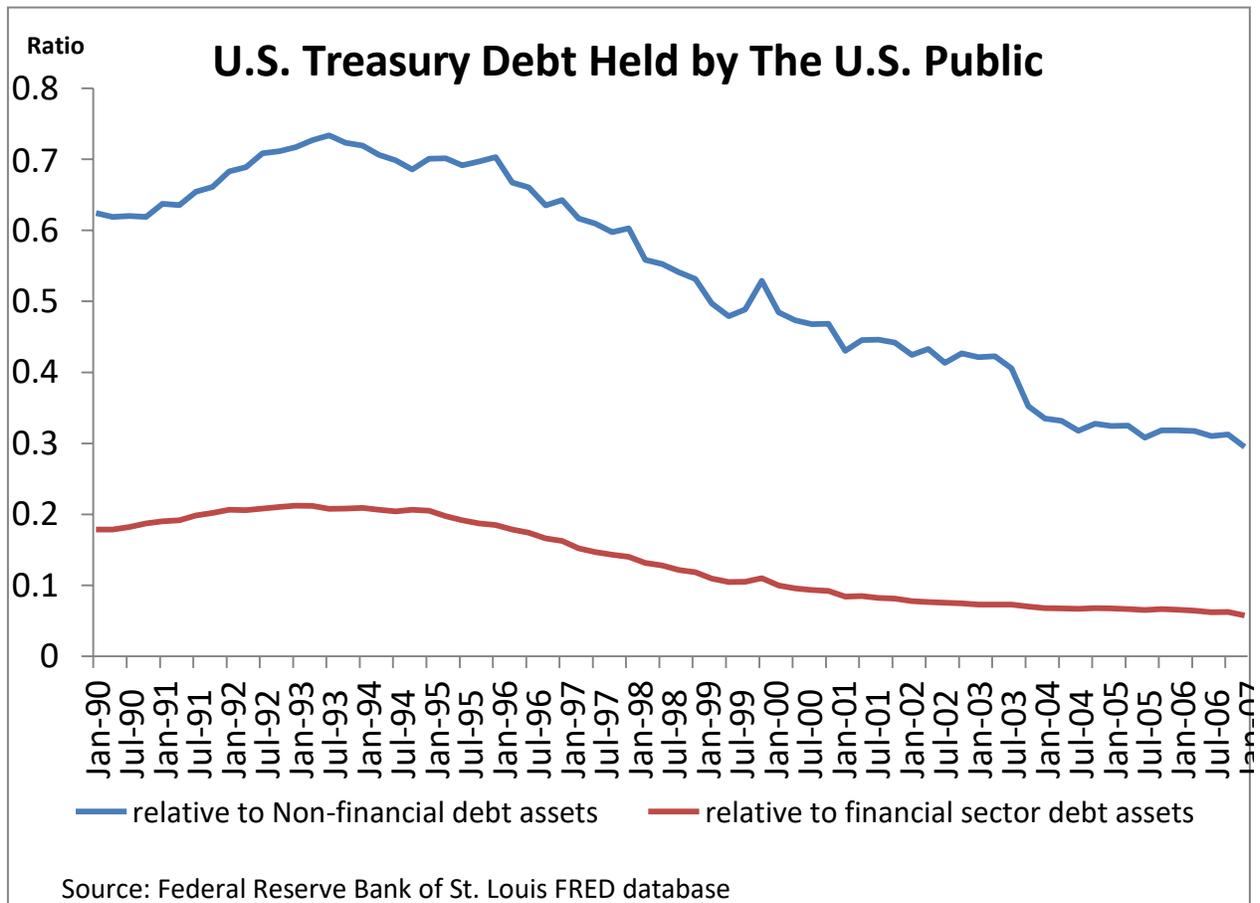
Global imbalances were part of a distorted pattern of economic activity

From the mid-1990s through 2006, the current account imbalance widened between the U.S. and the rest of the world, most significantly with China and oil-producing countries. The U.S. was buying a lot more than it was selling and was financing this by building up debt owed to foreigners. This led to calls for more rapid exchange rate adjustment by China and to Chinese criticism of U.S. budget deficits and low saving. But with steady growth in both countries, neither felt any urgency to address the imbalances. Such concern as there was focused on the sustainability of international capital flows and the demand for Treasury securities. The external imbalances did not point economists toward what would become the unsustainable piece of the global pattern: the financing of housing in the U.S. The connection was largely indirect. But foreign central banks directly supported the U.S. mortgage market by buying obligations of government-sponsored enterprises (Fannie Mae and Freddie Mac) that were major buyers and guarantors of home mortgages. Further support came from the purchase of AAA rated tranches of mortgage securitizations by a wide range of foreign investors, notably European financial institutions.

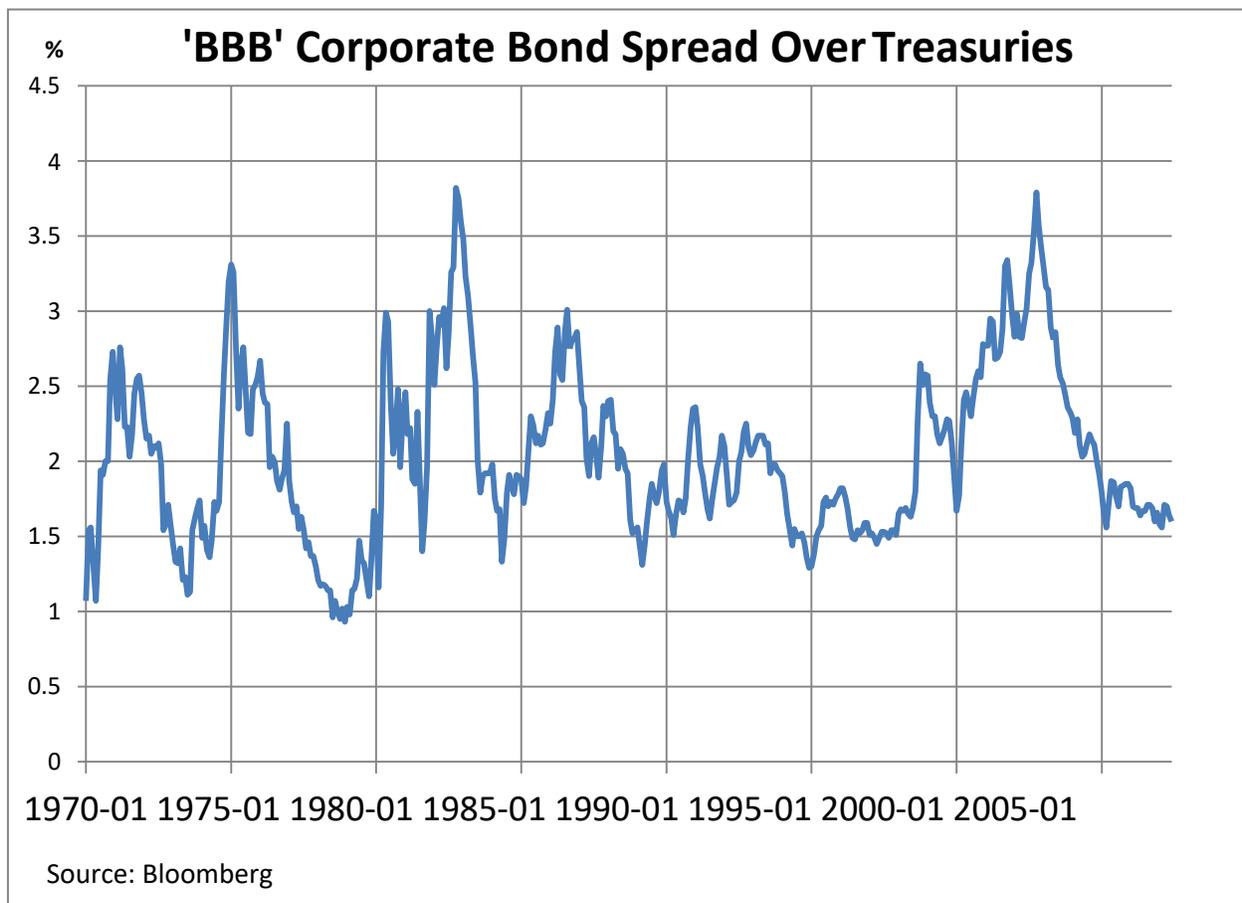




The global imbalance was seen to reflect a “global saving glut,” another description that Bernanke provided (2005), as strong saving from China and other East Asian countries flowed into the U.S. The inflows were invested overwhelmingly in U.S. Treasury and other “safe” securities, creating a supply shortage of highly rated paper despite U.S. budget deficits boosted by tax cuts and wars. Treasury securities held by the U.S. public declined by 3/5 relative to debt assets held in the financial system and by 3/4 relative to debt assets held by households and nonfinancial business between the spring of 1993 and the eve of the crisis. Clearly, there was demand for more safe assets than were available. Innovation in housing finance responded to this demand for safe assets. The rising imbalance between China and the U.S. also reflected a rising flow of low-priced imports to the U.S., which held inflation down while limiting growth in tradable goods. Consequently, the expansionary thrust of policy fell on sectors that did not compete with imports. Housing construction was a leading beneficiary.

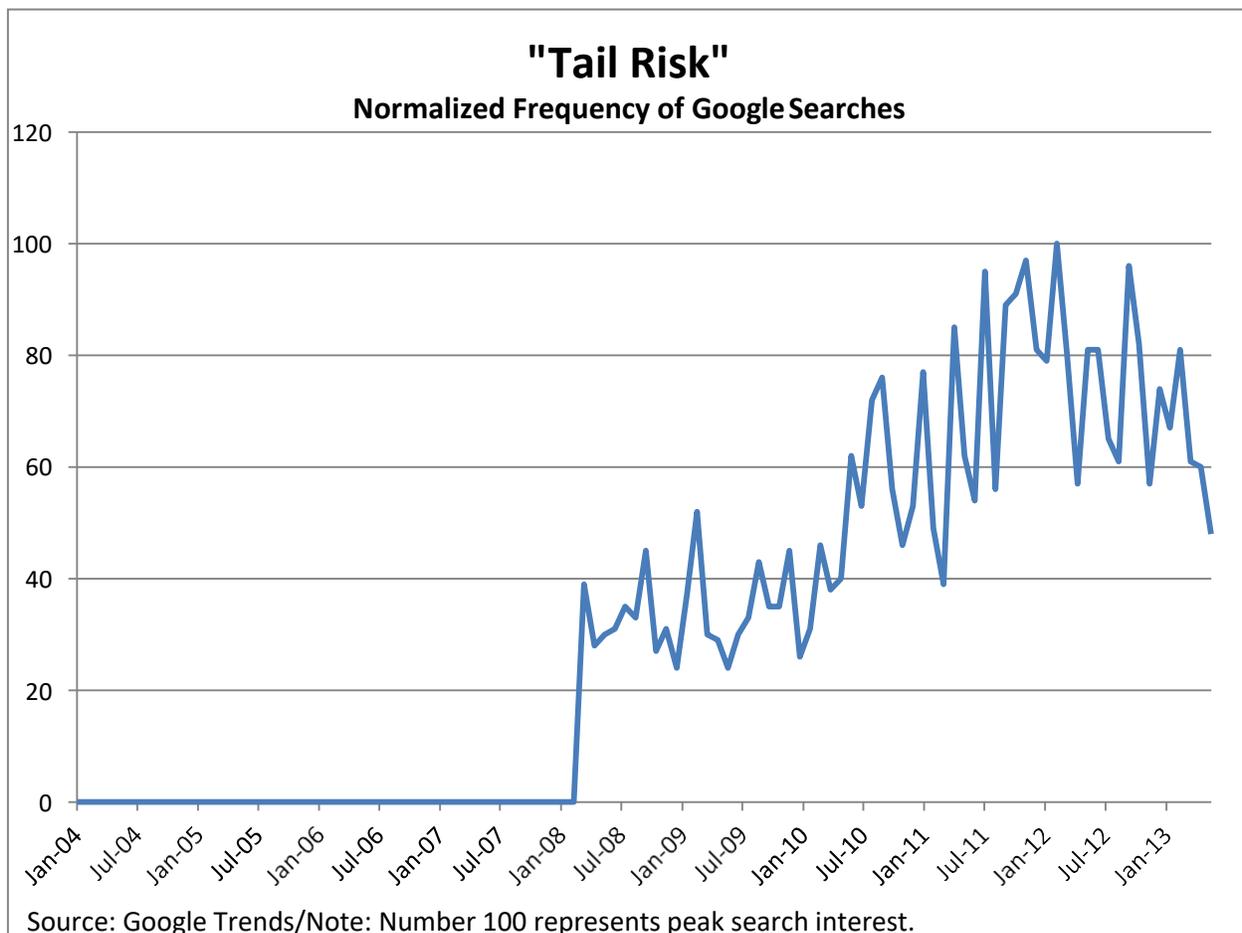


Contrary to some of what has been written, the appetite for risk in the market was not historically strong in the run-up to the crisis. Portfolios filled up with securitized mortgages thought to be safe. Interest rates on bonds with significant credit risk (rated 'BBB'—at the low end of investment-grade ratings) did not drop below past levels relative to U.S. Treasury bonds than had prevailed in reasonably good economic times. Spreads of risky bonds over Treasuries had narrowed substantially in the years immediately before the crisis, but this was a return to normal rather than an appetite for more risk than had been seen before. Spreads had been elevated earlier in the decade by high-profile bankruptcies such as Enron, WorldCom, 3Com, Global Crossing, and other telecom companies.



Complacency infected the markets and the regulators

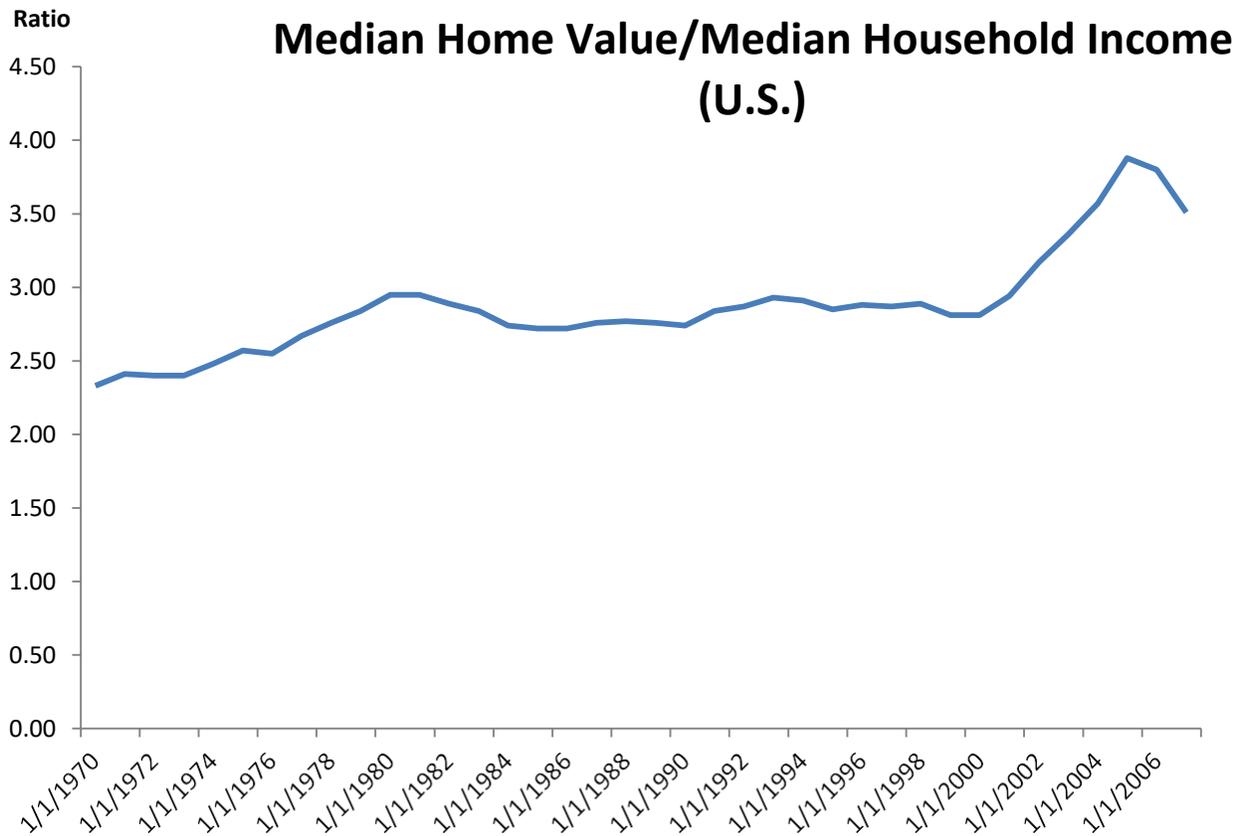
Although the price of risk was not abnormally low in 2006 and early 2007, complacency among financial market participants was high. The potential for large adverse events was neglected. Talk about the “Greenspan put” was one indicator. Another indicator was the very low incidence of Google searches for the term “tail risk,” a well-established concept in risk theory, in the years before the crisis. It was as though no one was thinking of it. Once the crisis began to unfold, “tail risk” became a term frequently used in Google searches. This occurred well before the Lehman Brothers bankruptcy.



The Great Moderation fed a growing confidence that markets could be counted on to efficiently and rationally respond to information and adjust to changing conditions relatively smoothly. Regulation focused on correcting recognized market failures and creating a level playing field by, for example, ensuring full disclosure by issuers of securities, eliminating conflicts of interest and prosecuting insider trading. But systemic stability was pretty much taken for granted, and the trend was to relax and rely more heavily on rating agencies' and banks' internal risk assessments in setting capital requirements as the international regulatory community moved from Basel I to Basel II.

A housing boom ensued

While no serious inflation threat emerged in response to the Fed's easy monetary policy, housing prices took off. The 12-month increase in the S&P/Case-Shiller 20 City Home Price Index rose at an average rate of nearly 16% in 2004 and 2005. The boom took the median price of a house in America, as measured by the National Association of Realtors, from 2.8x median household income at the beginning of the decade to 3.9x in 2005—an increase of more than one-third. In the previous three decades, the ratio had never risen as high as 3x.



Source: Bloomberg

One reason that stimulative monetary and fiscal policy conditions had a stronger impact on housing than on most other sectors is that intense competition from abroad curbed growth in America’s tradable goods and services sectors despite strong consumer demand. Resources flowed into activities that did not face competition from abroad (but workers in housing and other nontradable sectors did face competition from a record inflow of immigrants).

Other forces also contributed to a housing boom:

- Long-standing government policy support for housing and homeownership got new impetus from both the Clinton Administration and the Bush Administration that followed. This especially favored expansion of homeownership to those who would not have qualified for mortgages under earlier credit standards. The private sector responded to the demands for greater homeownership by developing mortgage products for those who did not meet the credit criteria for conventional mortgages—subprime and alt-A mortgages. Subprime mortgages swelled from only 6% of mortgage originations at the start of the 2000s to 25% by 2006.⁴

- Looser credit standards extended to the mainstream mortgage markets as down payments fell, refinancing to withdraw equity became common, and many homeowners drew on home equity lines of credit. Despite the increasing use of homes as piggy banks, homeowners' equity share in housing continued to increase as rising house prices outstripped rising mortgage debt.⁵ This led to complacency about household financial strength among economic analysts.
- Exploitation of earlier innovations in the retail mortgage-backed securities (RMBS) market enabled mortgages to be packaged in ways that facilitated management of interest rate and repayment risk while providing the market with a spectrum of credit ratings. The development of the RMBS market had played a critical role in filling the housing finance hole that the collapse of the savings and loan industry left at the end of the 1980s, and these securities had come to play a central role in housing finance. The highest-rated tranches (French for slices) of these securities would typically only suffer losses after lower tranches had been wiped out. This credit structuring helped fill the demand for safe assets created by the shrinking supply of Treasury securities. RMBS issuance, which had totaled about \$100 billion per year in the second half of the 1990s, surged to more than \$700 billion in 2005 and was close to that level again in 2006.⁶
- The packaging and distribution of RMBS was often accompanied by ratings from the credit rating agencies, many of which, in retrospect, appear to have been based on assumptions that failed to capture what eventually happened. Those assumptions were little questioned at the time, and indeed many were shared by those in the market and in the regulatory agencies, given the widespread view that housing prices were unlikely to decline steeply nationally. In addition, buyers and the rating agencies saw the structure of the securities as providing ample protection for the highly rated tranches. Analysts in both the private and public sectors began paying increasing attention to the risk of a housing price decline as the peak was approached in 2006, but an analysis of the effects of relatively large housing price declines did not point to large defaults on highly rated tranches of RMBS. For example, Standard & Poor's published in September 2005⁷ an analysis of the effects of a 20% national housing price decline with a 30% decline on the East and West coasts. This found no significant probability of downgrade, let alone loss, in the highly rated tranches of even subprime RMBS. The losses were expected to be absorbed by the speculative-grade tranches. An update in May 2006⁸, just at the top of the housing market, simulated the effect of the same housing price decline along with a recession and continued high interest rates. The analysis came to essentially the same conclusion—that highly rated tranches would withstand such a

shock. Looking back at what happened, the risk models that rating agencies and others in the industry used for the complex structured products were deficient, but the extent of the misrepresentation of mortgages' characteristics on the part of borrowers and originators stands out. The defaults through the fall of 2013 on the 'AAA' rated tranches of securities clearly labeled as subprime have been 5.4% of those outstanding on Jan. 1, 2007, while those categorized as having higher-quality mortgages suffered higher default rates since the senior tranches were given less protection. Their performance suggests that the mortgages in the securitizations were much lower quality than represented.⁹

- The attractiveness of the top-rated tranches of mortgage-backed securities as substitutes for Treasuries was enhanced by the use of credit ratings in setting capital requirements for banks. For example, the rules then in effect in the U.S. gave a 20% weight to mortgage-backed securities carrying a 'AAA' or 'AA' rating, a 50% risk weighting to those with a 'A' rating, and a 100% weight to those with a 'BB' rating. This meant that capital requirements rose in jumps as ratings fell. Rules in Europe and elsewhere were similar.
- Fannie Mae and Freddie Mac, privately owned but government-sponsored enterprises (GSEs that the market treated as government guaranteed), responded aggressively to loss of market share to private mortgage securitizations and expanded into lower-quality alt-A and subprime mortgages by issuing securities perceived to be close substitutes for sought-after Treasuries. This was done both by issuing 'AAA' rated liabilities and investing the proceeds in mortgages and by guaranteeing mortgages bundled into asset-backed securities assembled by others, thereby giving them the GSEs' valued 'AAA' rating. The GSEs also became active purchasers of private subprime RMBS. Issuance of GSE debt, already a major source of top-rated bonds, doubled from the beginning of the decade to the third quarter of 2008. The GSEs either held or guaranteed \$5.3 trillion in mortgages when these institutions became distressed and were put into conservatorship with government backing then.¹⁰
- As the housing boom gathered momentum and the demand for mortgages to put into securitized products swelled, underwriting standards deteriorated markedly. Mortgage originators—often newly hired and half-trained agents working in storefront offices and compensated on a commission basis—became casual about documentation, leading to “liar loans” and “NINJA” loans (no income, no job or assets). Questions about borrowers' debt-servicing capacity were swept aside by complacency that the value of the collateral (a house) would only go up. Originators also became increasingly aggressive in marketing products that were often not well suited to the borrower. The Federal Reserve Board, which had responsibility for consumer borrower protection, remained

passive in the face of reports of questionable practices. But not all borrowers were innocent victims; many took on debt to buy property that they intended to “flip” with the intention of walking away if markets turned down. The nonrecourse mortgage laws in many states, which allow a borrower to walk away from a mortgage by giving up the house and nothing else, encouraged this. Of the four states with the biggest housing booms and busts, two have nonrecourse laws (California and Arizona), and Florida has homestead exemptions from bankruptcy that limited the exposure of other assets in bankruptcy. Of the four, only in Nevada were the other assets of a defaulting borrower at significant risk.¹¹

What happened in the housing boom followed the pattern of credit booms and busts of the past: the opportunity for providing financing through a new channel is recognized, growth breeds optimism and a buildup of capacity in which market knowledge becomes diluted, regulators lag behind, and the market becomes overextended.

A Fragile Financial System

Over the period of the Great Moderation, four trends in financial markets led to the creation of an extraordinarily fragile system:

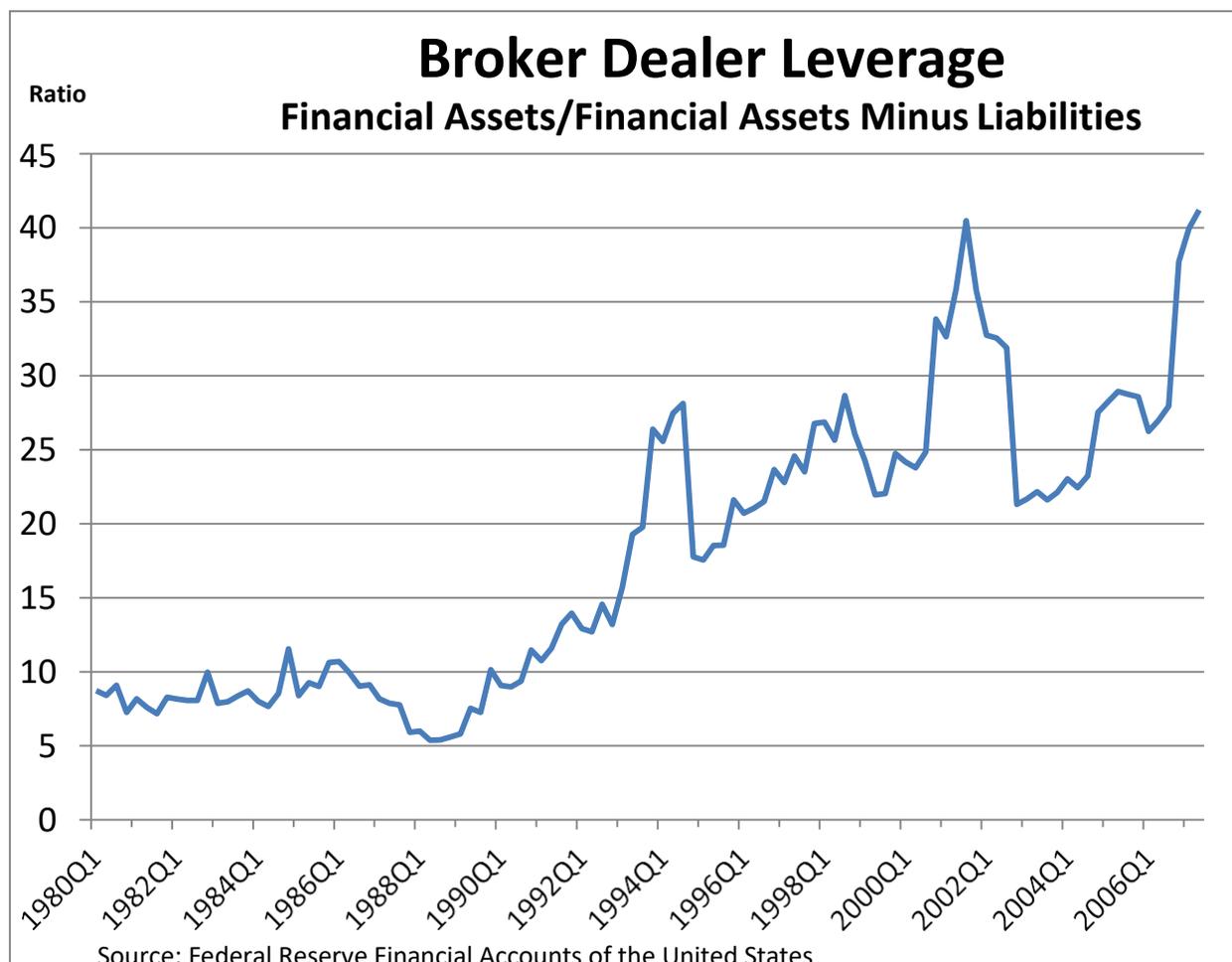
1. Rising leverage, which left the system much more sensitive to changes in the value of outside assets, such as housing.
2. Increasing maturity transformation—the financing of long-term assets with short term liabilities—in securities portfolios.
3. More opaque financial instruments and markets generated by financial innovation, which resulted in an increase in information asymmetries—one side of the market with knowledge that the other side lacks.
4. Increasing intensity of incentive-based compensation in financial institutions.

The first meant that when credit risk on mortgages increased, depositors and other creditors of the financial institutions and funds that held mortgages or mortgage-backed securities, including other financial institutions, had less of an equity buffer to protect their positions. They looked more quickly for an exit. The second meant that the exit could quickly become blocked as assets became unsellable except at fire-sale prices, leading to the inability of institutions or funds to meet their obligations. The third allowed a buildup of risk that was not recognized and intensified the flight to quality once events increased the uncertainty about the value of many assets. The fourth contributed to neglect among traders in financial institutions of small probability risks of large losses. Risk management systems failed to control for this.

Incomplete data and the use of off-balance-sheet transactions masked the full extent of the trends that created the fragility. Some saw pieces of the growing fragility, but few, if any, saw the extreme vulnerability that was building up and the intensity of the collapse that would follow when the system shattered. The result was a systemic liquidity crisis that the Federal Reserve System could not contain, even with the support from the \$700 billion TARP program administered by the Treasury (of which \$426 billion was disbursed) despite a series of actions as lender of last resort, which were extraordinary in their scale and unprecedented in their design.

The buildup of leverage in the financial system

The rise in leverage ratios within the financial system was not universal. Large U.S. commercial banks, constrained by capital requirements internationally coordinated in the Basel Committee, actually reduced their leverage modestly in the 1990s and the first half of the 2000s. But broker-dealers (both the independent investment banks like Bear Stearns, Lehman Brothers, Merrill Lynch, Morgan Stanley, and Goldman Sachs and the investment banking subsidiaries of bank holding companies like Citigroup) boosted their leverage from an average of less than \$10 of assets per dollar of capital in the 1980s to a ratio of 40 on the eve of the crisis.¹⁶ The SEC, whose principal mandate was investor protection and not safety and soundness, gave much less emphasis to capital adequacy than the banking regulators. It has been criticized for having loosened its Uniform Net Capital Rule in 2004, but the increase in leverage, including all affiliates of the broker-dealer which were not covered by the rule, had been climbing for 15 years before this.



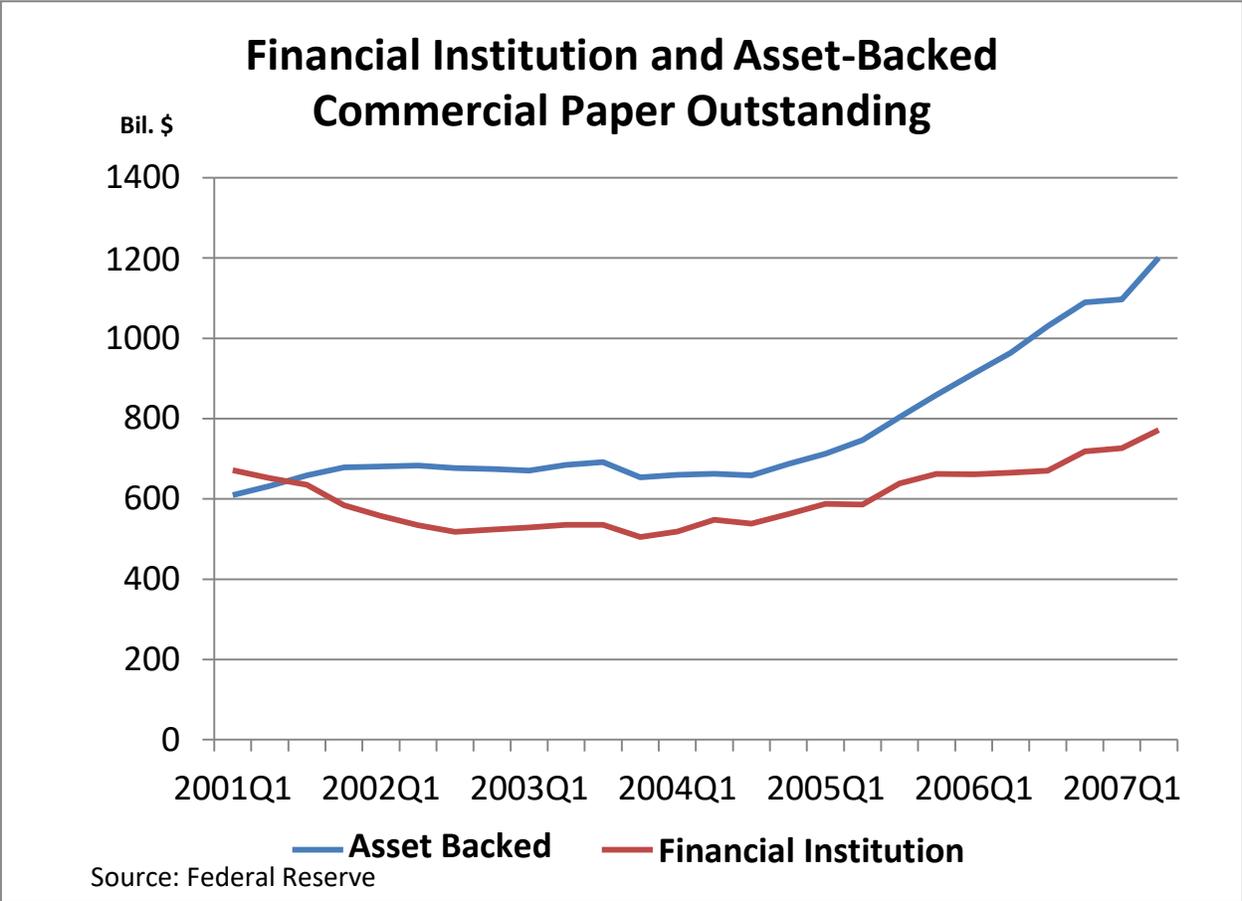
Leverage also increased in other ways that were hard to observe then and impossible to fully document now. One example that contributed to the distress that followed was the growth of off-balance-sheet structured investment vehicles (SIVs) and other conduits that banks were obliged to support when they lost funding. These were funds that had narrow equity cushions and were financed largely through issuance of short-term paper.

Another leverage magnifier was the explosion of derivatives. These increased exposure to market fluctuations to an unmeasured, but clearly huge, extent since their valuation on balance sheets bore no relationship to the risk that they entailed. The global market value of over-the-counter derivatives (surveyed by the Bank for International Settlements) increased 5.6 times from the end of 1999 to the end of 2007. It then doubled to \$15.8 trillion as the crisis unfolded and prices moved by huge amounts in unexpected ways. The associated gross credit exposure from these positions grew even more explosively, reaching \$3.9 trillion by the end of 2007, and rose further as prices in distressed markets became more and more distorted. The increasing exposure on derivatives was driving collateral calls, forcing asset sales when there were few, if any, buyers and pushing many institutions to the brink of failure, some over the brink.

behind its financial institutions was in doubt. But at times, when unexpected credit losses were followed by increased uncertainty about where there might be more losses and who might be exposed to them, institutions that would be considered sound in normal times could be subject to a run. When this happened, the losses could be many times the size of the initial shock.

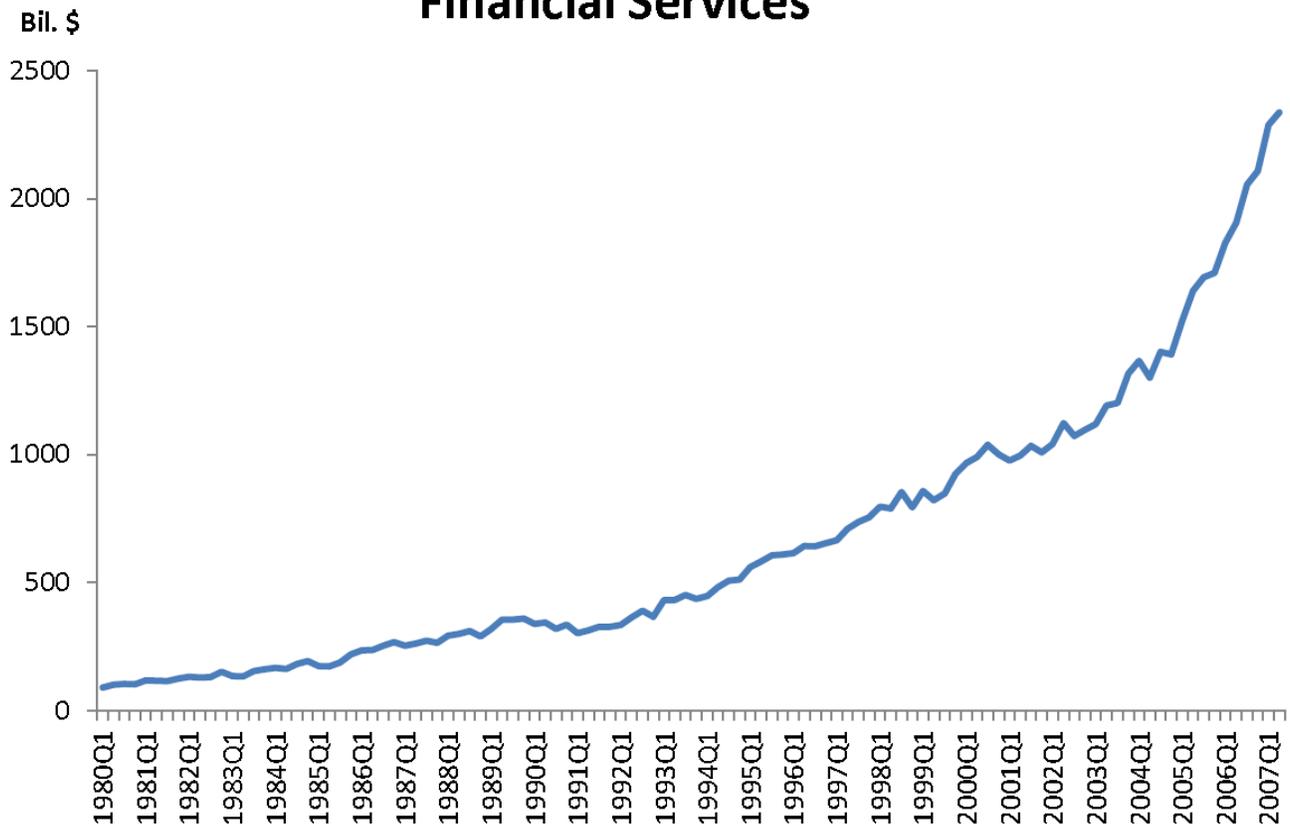
The financial crisis of 2007-2009 had some elements of previous liquidity crises, but its unimagined intensity was the result of the role that securities played on both sides of balance sheets—long term on the asset side and short term on the liabilities side. This led to a systemic liquidity crisis in a country with a very strong sovereign financial position, as evidenced by the flows into, not out of, dollars as the crisis escalated. The dollar appreciated, and U.S. Treasury bond yields fell.

The financing of securities portfolios did not receive close attention in the years before the crisis. It was becoming increasingly short term. Two instruments that were widely used as short-term financing vehicles were commercial paper and repurchase agreements (repos—overnight or other very short-term borrowing backed by securities). Neither was new, but the extent of their use was. Commercial paper that financial institutions issued directly grew only modestly from early 2001 (when the Federal Reserve data begin) to mid-2007, but asset-backed commercial paper (ABCP) issued by SIVs and other conduits more than doubled. Repos and Federal funds (usually overnight loans of funds on deposit with a Federal Reserve Bank by one commercial bank to another) exploded, increasing by more than 10 times from 1980 to 2000 and rising another 140% from then to mid-2007. On the eve of the crisis, \$4.3 trillion of these short-term instruments were funding the financial sector—much of this debt taken on by funds holding mortgage securitizations.

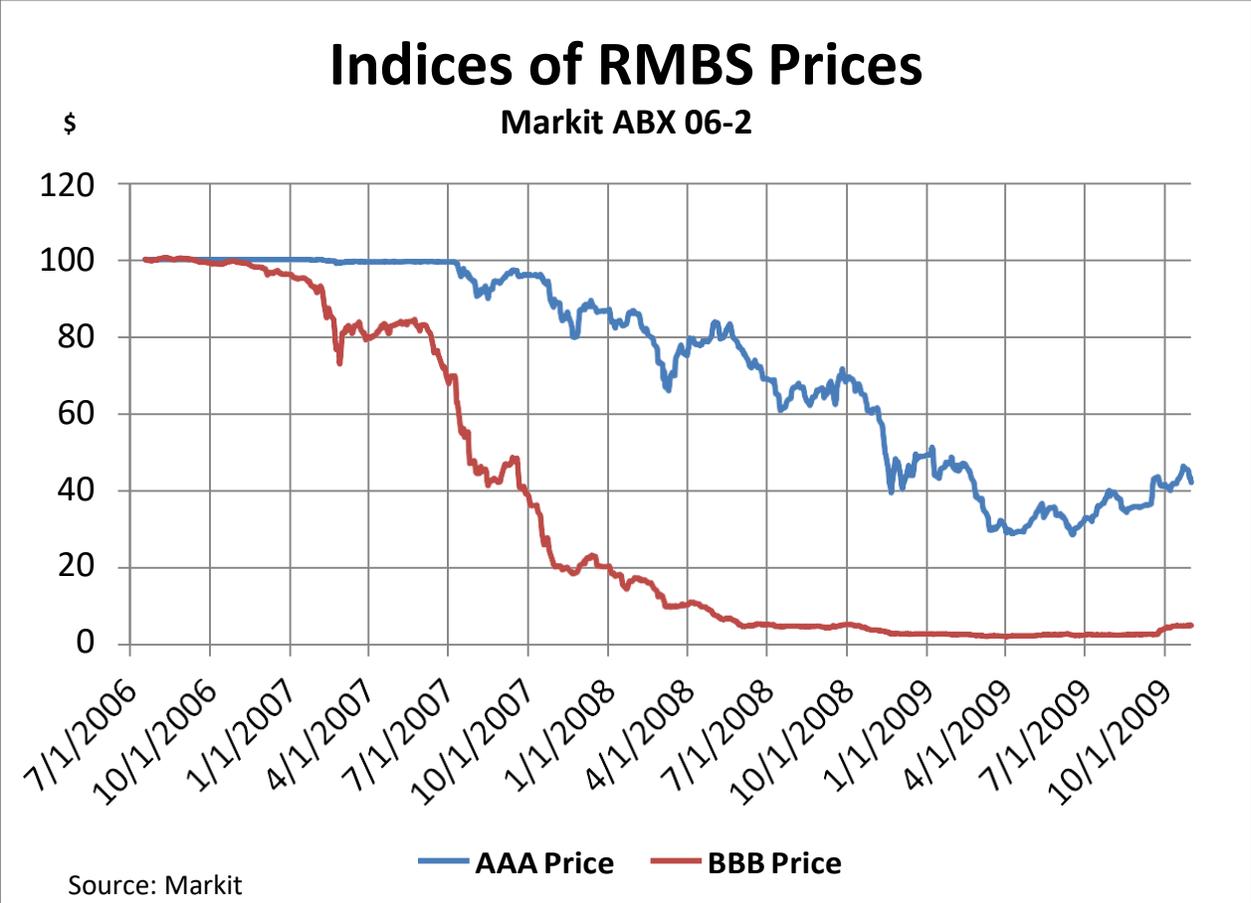


Few observers saw this short-term funding as a problem since the issuers held marketable assets that they could sell in case of need, unlike traditional banks which held loans that would be difficult to unload. But two developments proved this assumption wrong. One was that, as uncertainty grew about underlying values, potential buyers asked for larger and larger discounts on the value of the securities. The second was that, as the short-term funding dried up, everyone using these markets faced the need to raise cash. The number of sellers increased, and buyers disappeared. Even securities of unquestioned quality, except for U.S. Treasury obligations, could be sold only at a steep discount.

Net Repos And Federal Funds Borrowing Within Financial Services



Source: Federal Reserve



Increasing opacity of financial instruments and markets

Rapid financial innovation, beginning roughly in the early 1980s, stemmed largely from the development of powerful new tools for financial analysis and the emergence of IT as a means of obtaining and processing information. It was facilitated by regulations that reflected the positive view of innovation among policymakers. They avoided creating obstacles in the absence of clear policy concerns. (One area of concern that did receive close policy attention was the expanding capacity to launder money and move funds to support criminal and terrorist activities.)

Much of this innovation had a cumulative effect of reducing the transparency of markets, though the extent of this did not receive close attention until the crisis. Several forces were at work:

- More complex instruments were developed that may not have been fully understood by many who dealt with them, including those who designed them. Examples include exotic mortgages, structured RMBS, collateralized debt obligations (CDOs), and many derivatives. Buyers often lacked an understanding of what they were buying, and risk managers were poorly equipped to oversee activities within financial institutions in these instruments.
- Chains between ultimate obligor and ultimate risk bearer grew longer, resulting in a loss of information. For example, a mortgage banker in a storefront office would originate a mortgage. This would be passed to the firm's central office, where it would be sold to another institution. This institution would place the mortgage in a complex structured RMBS. This could then become a part of a CDO, which could then be sold to a SIV. The SIV could then issue ABCP, which a money market mutual fund would buy. The fund shares would be held by an individual more than half a dozen steps removed from the person with the mortgage. Market participants relied on statistical models to compensate for lack of information about the ultimate credits. But these proved to have been built on wrong assumptions (about how effectively risk was being diversified) and failed to take adequate account of how mortgage origination practice was changing (the increase in irregular practices such as "liar loans").
- New instruments and analytical techniques ended up having unanticipated consequences. This is an inescapable cost of innovation that is minimized by alertness and generally far outweighed by the benefits that innovation brings. Most often, an innovation does not reach a level where unanticipated consequences can be systemic before it is thoroughly tested by use. But the Great Moderation sustained conditions in which innovations in mortgage origination and distribution, risk management, and financial institution funding grew to have systemic consequences before they were well tested.

The increased opacity of financial instruments and markets had two adverse consequences. The first contributed to the inflation of the housing bubble, and the second helped multiply its collapse once the crisis began.

1. The loss of information in markets created an environment in which investment decisions had a weaker fundamental basis. Not only were poor decisions made, but the tendency to follow the herd also increased. Bad investment decisions cumulated and became systemic.

2. Once the correction process began, market participants lost confidence in what they thought they knew. They questioned fundamentally sound instruments as well as those that were troubled. This contagion reinforced the implosion of liquidity and resulted in loss of value far beyond the underlying losses that were unavoidable with a repricing of housing and consequent mortgage losses.

Increasing intensity of incentive-based compensation

Incentive-based compensation is as old as business—piecework payment to craftsmen and commission compensation for sales forces are the norms for these jobs. Extensive economic research shows that well-designed incentive-based compensation enhances productivity and efficiency. In recent decades, the breadth and intensity of incentive-based compensation has grown across the economy. In 1990, the equity-based share of senior executive compensation in U.S. corporations was 20%. By 2007, this form of incentive-based compensation had risen to 70%¹⁹ And incentive-based compensation has moved into areas far from finance and culture—public school teachers, for example.

The key to effective incentive-based compensation is that the incentives be tightly linked to the desired behavior. Thus, when the objective is to sell as much of a product as possible, a commission provides an incentive that is aligned with the objective. But when the incentive is not closely aligned with the objective, behavior will be different from what was sought. If the incentive is very intense, the result can be costly. For example, academic research shows that teachers have a greater tendency to organize cheating on standardized tests when their positions or compensation are at stake.²⁰

The shift toward incentive-based compensation was especially strong in finance where it had always played an important role. This was facilitated because the output of many finance professionals—sales people, traders, portfolio managers, loan officers, and investment bankers—can be measured in dollars. And rising competition for staff from alternative investment firms (private equity and hedge funds), which use very intense incentive compensation systems, pushed mainstream commercial and investment banks further in this direction. Concern about distorted incentives created by compensation systems in finance had been recognized: “The problem at Salomon Brothers has been a compensation plan that was irrational in certain crucial respects,” said Warren Buffett in 1991 about the investment bank in which he then owned a large stake.²¹ In the wake of the crisis, several incentive compensation issues have come to the fore.

One seems overdone: that CEOs were given incentives to take on too much risk. Academic research suggests that CEOs' risk-taking behavior was, if anything, restrained relative to the

wishes of shareholders, although they may have underweighted the interests of debtholders and of the government as a backstop.²² Moreover, it is difficult to believe that the CEOs of Bear Stearns, Lehman Brothers, Citigroup, and other damaged firms would not have followed very different strategies if they had any inkling in time to get off the track of the freight train that was headed straight at them. Their losses of jobs, prestige, and money were immense.

A systemic incentive distortion that may well have played more of a role in the crisis was the asymmetry of compensation structures within financial firms. Positive outcomes were rewarded in finance, and large positive outcomes were often rewarded very highly. But in the event of a loss, the worst one could experience is loss of a job and no compensation. The employee had a put option with the firm—the employee shared the gain and could put losses back to the firm. It could be no other way if rewards were going to be large. Few, if any, would have the financial capacity to sign up for a symmetrical compensation system that assessed employees for large losses as it gave high rewards. As a result, there was an incentive to take risk built into the compensation systems of financial institutions. Good luck as well as sound decision-making was rewarded. Bad luck carried a much smaller loss. Risk management functions in financial services firms were intended to play a compensating role, but they proved to be weak. The result was a buildup of risks, especially of tail risks of large losses that were expected to occur with small probability if they were recognized at all. Compensation structures have changed, but only on the margin, since the crisis.

Acharya, Cooley *et al*, in a thoughtful early *post mortem* on the financial crisis, place the manufacture of tail risk at the center of the crisis and attribute this to an important extent to incentive distortions faced by those within the business. But they give more weight than I would to institutional incentives created by the regulatory environment adding to the buildup of tail risk. I am inclined to give this less importance than the opacity of the structure that had developed, which left both senior managements and equity holders oblivious to risks that were being created under their noses. There may be more to be faulted in the knowledge and skills of CEOs and investors, which are very heavily weighted toward institutions with professional portfolio management, than in their intentions.

The U.S. Toll

The housing boom was followed by a bust

Booms have limits, and housing was no exception. Housing prices peaked in the summer of 2006. By the spring of 2007, one could reasonably expect, and many did, that a painful repricing of housing and housing debt lay ahead, and perhaps a recession, as home

construction declined, and households adjusted their spending to declining home values. But looking at housing alone would not have led one to see the force of what would come

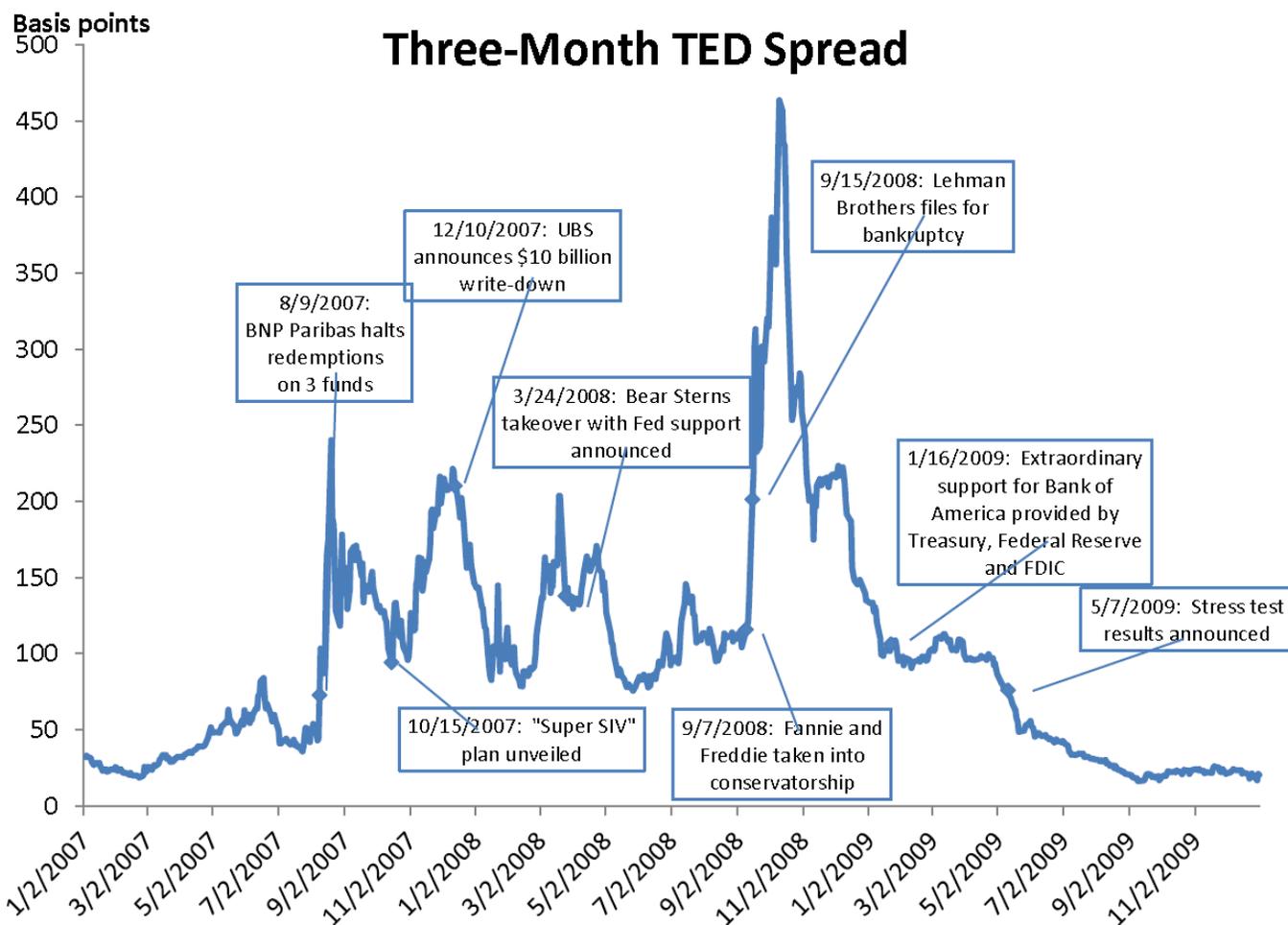
The financial and fallout from the end of the housing boom was amplified by the fragility of the financial system

Whatever the causes of the housing boom and its deflation, and however badly forecasters missed the housing price decline that was to come, the tremendous impact on the financial system and the U.S. and global economies cannot be ascribed to the scale of the loss of value in residential real estate and debt secured by it. The loss of value in American homes of \$5.8 trillion was large. But it was only two-thirds the size of the stock market decline in the early part of the decade when the IT bubble burst, and this was followed by 9/11. That led to a mild and brief recession, but no systemic financial distress. By contrast, the housing price adjustment triggered financial distress that spread across markets. Indeed, the eventual size of the U.S. stock market decline during the 2007-2009 crisis, at \$12.9 trillion, was more than twice as large as the home value decline.¹⁴ And a deep recession further magnified this decline. The result was the first global economic decline since World War II.

The relatively easy monetary conditions and complacency engendered by the Great Moderation had some impact on the nonfinancial corporate sector, which increased its leverage during the years leading up to the crisis. But except for leveraged loans to finance buyouts by private equity firms, the financial strength of corporate America continued to be viewed as strong, as the resiliency of corporate credit through the deep recession that followed the crisis demonstrated. By contrast, the financial system was becoming more fragile, and this amplified the housing downturn into a financial and economic calamity.

The scale of financial distress in the U.S.

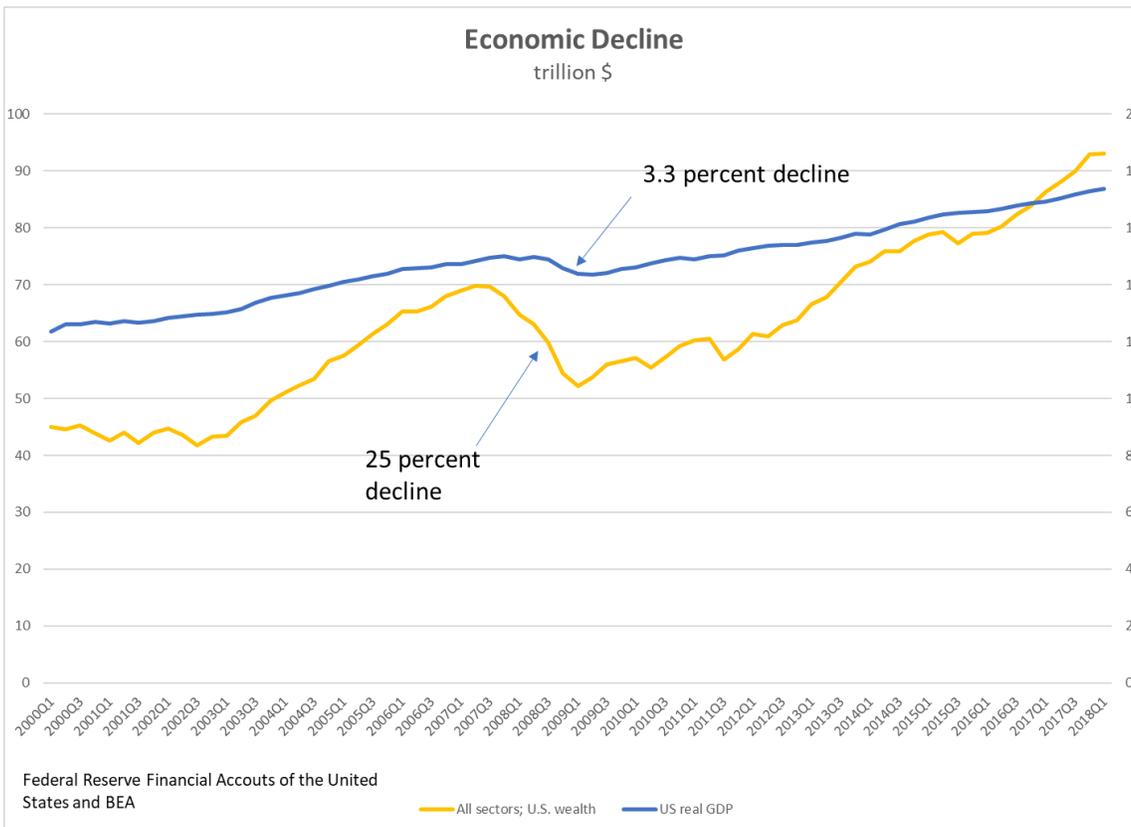
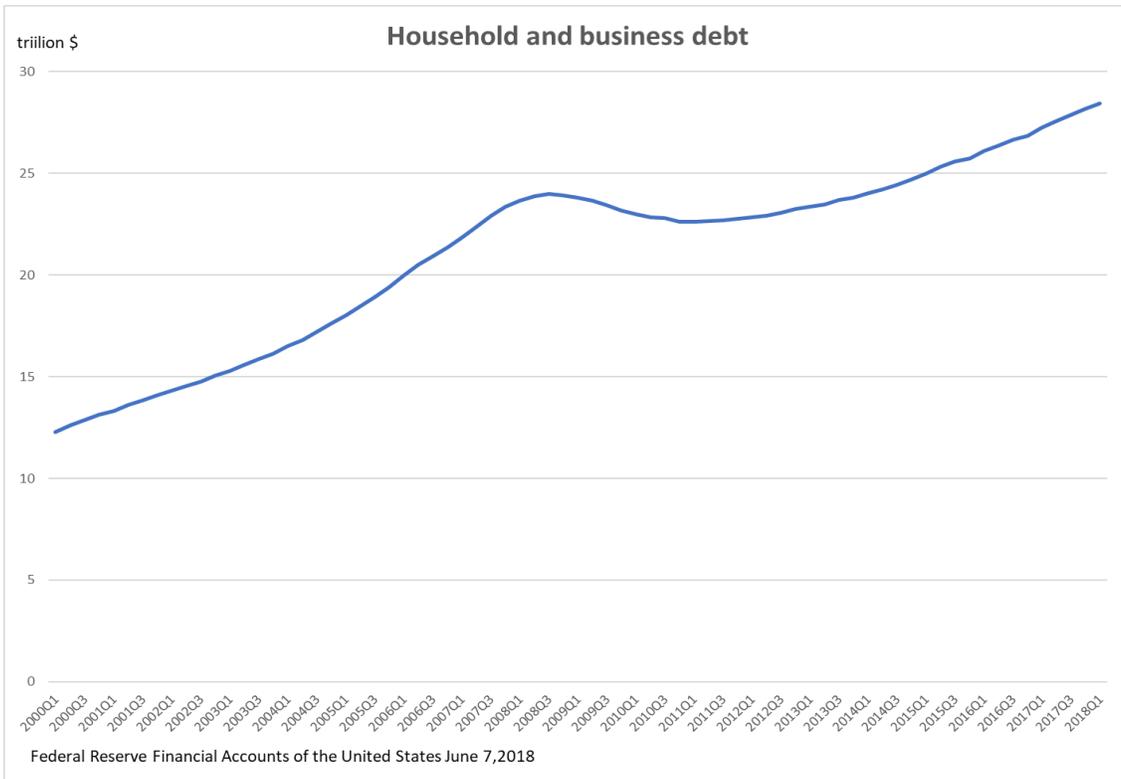
Two measures highlight the impact of the crisis which reached its critical phase following the bankruptcy of Lehman Brothers on September 15, 2008. First is the scale of liquidity distress as measured by the TED spread (differential between three-month LIBOR and US Treasury yields).



Source: Federal Reserve Bank of St. Louis FRED database

In normal times the TED spread had run well less than 50 basis points. It jumped to about 250 basis points at the first signs of systemic distress in August 2007, remained high and volatile for the ensuing year and then spiked to nearly 500 basis points after the Lehman bankruptcy. This was an indicator of the unavailability of funds in the interbank market and the need for them by banks and other financial institutions. This translated into a contraction of lending in the economy, but it was not huge—only a 6 percent decline in household and business debt over the following 3 years. But the liquidity distress led to fire sales that extended from debt markets to equity markets.

The impact on economic wealth of the private sector was immense—dropping by one-quarter. The impact on GDP was surprisingly moderate given this—a decline of 3.3 percent from peak to trough. Of course, automatic stabilizers and roughly \$ 1 trillion in fiscal stimulus over 2008 and 2009 mitigated the GDP impact. Trade contracted much more sharply than GDP—US goods imports fell by 22 percent in volume over two quarters. The value drop was 29 percent as commodity prices plummeted.





Global Spread

The US mortgage crisis spread rapidly abroad once liquidity dried up globally, as well as in the US and the US went into recession. The spread of financial and economic distress was quick and powerful for several reasons.

First, when dollar liquidity dried up it affected the world since the dollar was the key international currency. The TED spread is indicative of what banks with a dollar book faced globally if they had a dollar book, which any bank with international activities would have. Foreign banks did not have the large stable dollar deposit bases of US banks, and faced even more acute liquidity pressures. And their central banks did not have unlimited dollars to advance as a lender of last resort although some had substantial dollar reserves. The Federal Reserve moved to extend swap facilities to a widening circle of foreign central banks as the liquidity situation deteriorated. The first new swaps were arranged in December 2007 and were greatly expanded in September 2008.

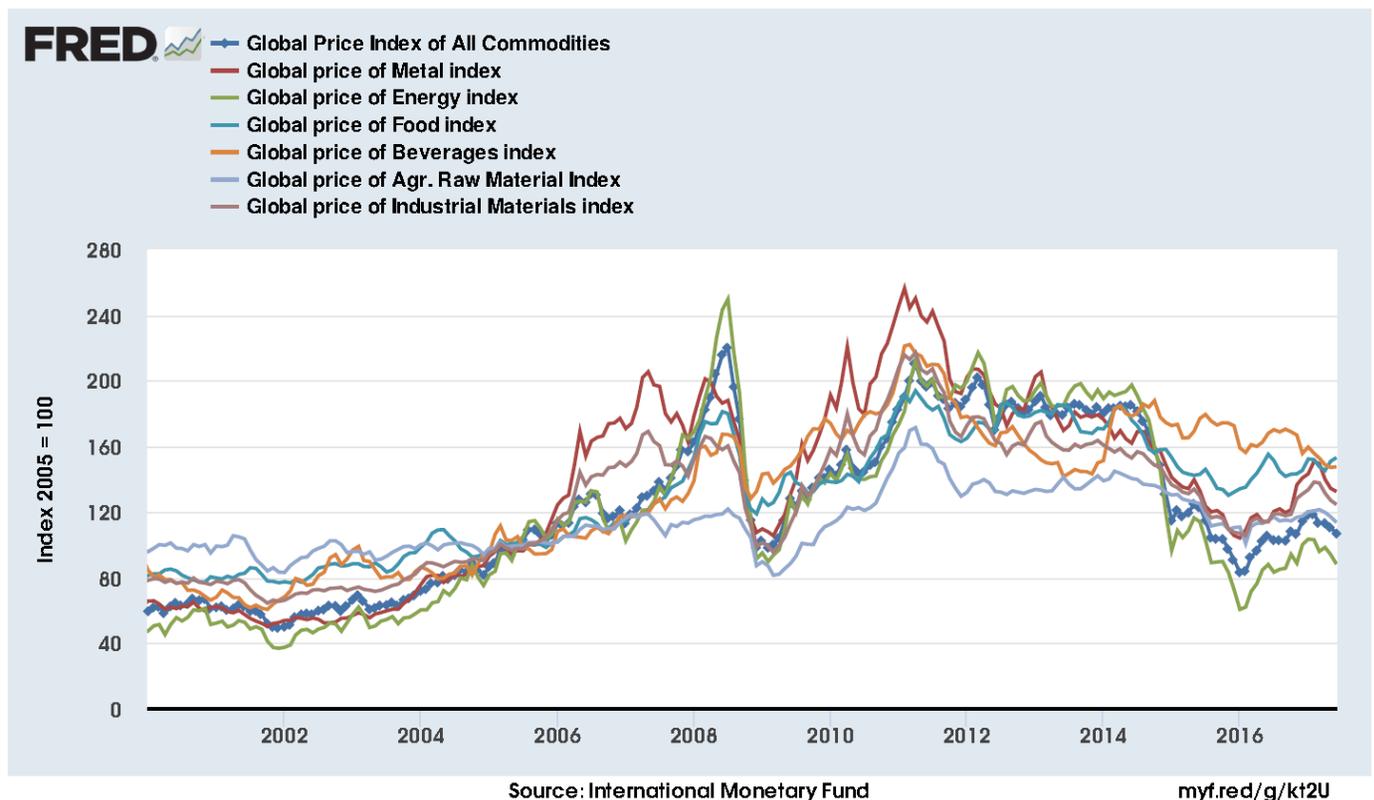
Second, for many European banks, the problem was more than a drying up of global liquidity. Losses on mortgage backed securities, which had been loaded onto balance sheets of banks with lean capital brought down some banks and threatened many others. As the economic decline spread to Europe, reinforced by sovereign debt problems, bad loans built up and further strained undercapitalized banks.

Europeans took a significant hit from the collapse of the US mortgage backed securities market. They had been significant investors. Other sources of US capital inflows, which enabled the US housing boom pretty much escaped. The Chinese, Japanese and other Asian reserve managers had extended

beyond Treasuries for their US investors, but they did not go far beyond agency securities. Neither had middle Eastern sovereign wealth funds although they did take fliers in some US banks that did not turn out well. They were fortunate that the US government bailed out FNMA and FHLMC (Fannie and Freddie). European had AAA investments too, but their senior tranches of mortgage backed securities were not bailed out.

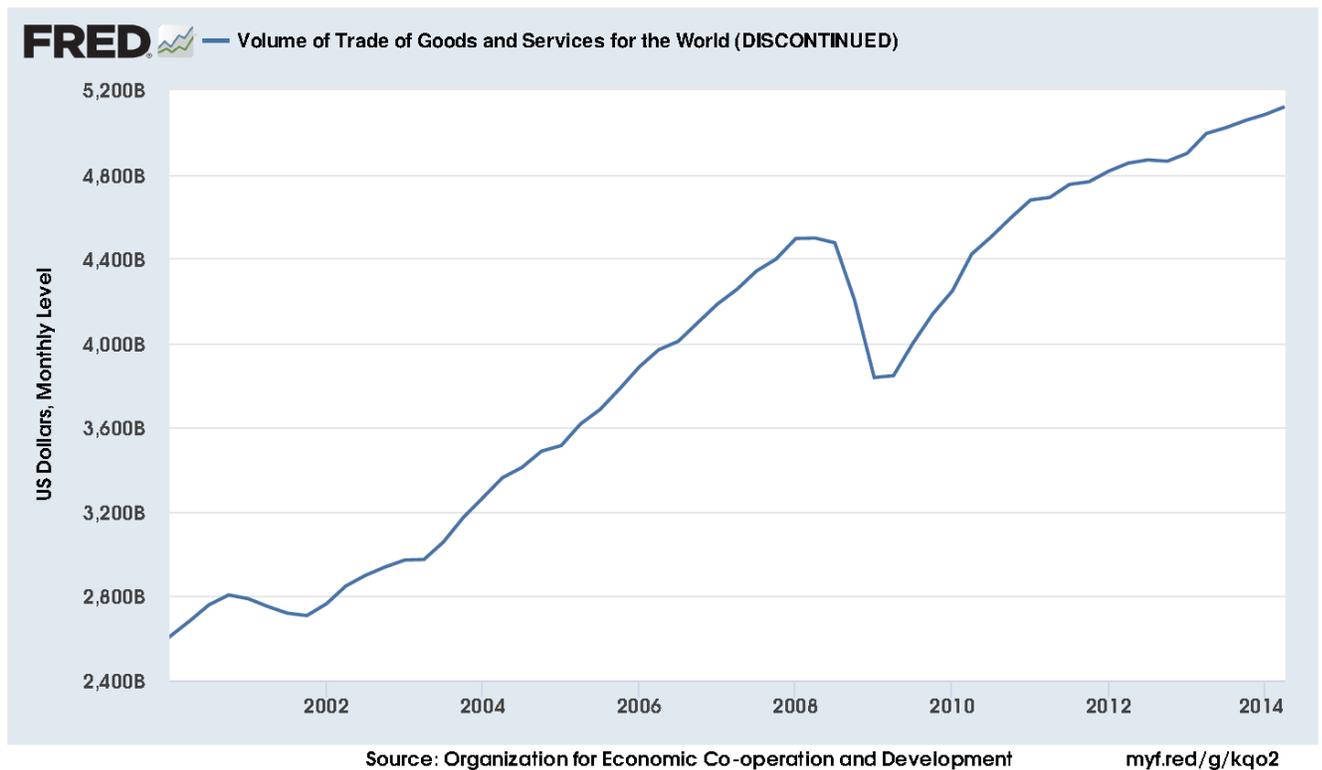
Third, the US as the world’s largest importer had a significant direct effect on aggregate demand globally. The peak to trough decline in US imports amounted to more than 5 percent of GDP for the rest of the world. That is a big aggregate demand shock.

Fourth, a commodities boom coincided with the housing boom. Commodity prices quadrupled from 2002 to the summer of 2008. Energy experienced the strongest bull market, but there were strong booms in everything but agricultural raw materials. Even these prices doubled in a period of low inflation. As with US housing, a commodity bust followed the boom as easy monetary conditions were replaced by crisis induced tight financial conditions. Commodities markets are, of course global, and the demand strength followed by collapse was a global phenomenon. The all commodities index dropped by 55 percent in 5 months. Energy prices fell most deeply—by 63%, but metals prices dropped nearly half.

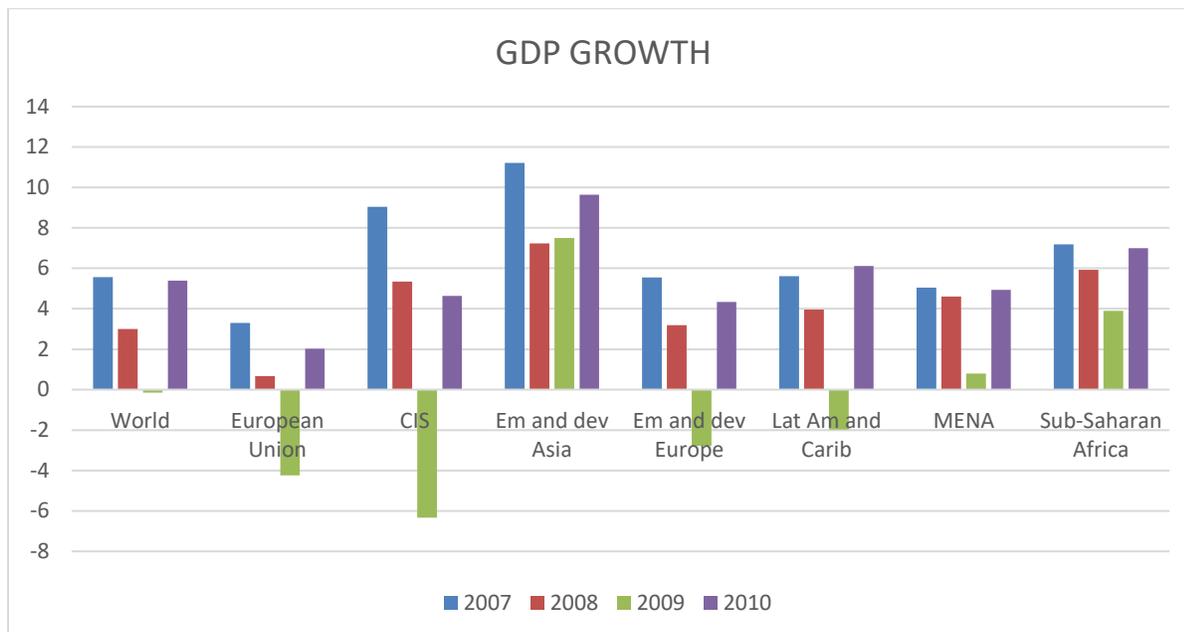


Finally, an unprecedented development stopped trade and constrained economic activity everywhere, but most strongly in emerging markets—trade finance dried up. I was told at the time

by colleagues in the trade finance business that banks would not extend even trade collateralized credit because they would not accept the name of other banks as guarantors. This had not happened through waves of sovereign debt crises, but it happened in 2009. I have been unable to find data for this specific credit item, but an indication that this was occurring on a large scale can be gleaned from BIS data. They show that cross border bank credit to all sectors shrunk by 22 percent in the winter of 2008-2009 and that extended to other banks fell by 31 percent. World trade volume shrunk by 4 percent in two quarters under the force of the during up of trade credit on top of the drop in US import demand. And for many countries the collapse of commodity prices added to the distress.



Economic growth was affected everywhere. The Biggest hit was in The CIS where oil price declines hit Russia and others with limited shock absorbing foreign assets. The EU with its banks at the capital impairment process was almost as badly hit. Emerging Europe was a bit less affected, as was Latin America. The middle East and North Africa did not experience a decline in GDP as global wealth allowed countries to smooth the impact of lower oil and gas prices. The relative strength of Asia reflects the successful effort of China to stimulate domestic demand when exports markets shrank. The strength of Sub Saharan Africa is surprising given the importance of commodity exports for the region. It must reflect positive domestic developments and relative financial insulation.



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² For example, Bernanke (2002).

³ Taylor (2007),

⁴ Federal Reserve Bank of San Francisco (2007), p. 8

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¹¹ Ghent and Kudlyak (2009)

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