THE U.S. HOUSING BUBBLE AND THE GLOBAL FINANCIAL CRISIS: VULNERABILITIES OF THE ALTERNATIVE FINANCIAL SYSTEM

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Executive Summary

An unprecedented bubble in U.S. housing prices began to inflate in the first quarter of 1998 and then popped in the second quarter of 2006. An overly accommodative U.S. monetary policy from the second quarter of 2002 through the third quarter of 2006 when compared with the Taylor rule encouraged financial institutions to expand credit aggressively by reducing their short-term funding costs. At the same time, stable inflationary expectations and the exchange rate policies in the People's Republic of China and other Asian economies restrained long-term U.S. interest rates. U.S. housing prices soared as low long-term interest rates further stimulated the already strong demand among households for housing, while financial institutions enthusiastically supplied the necessary residential mortgage credit.

This study identifies the microeconomic causes that contributed to this credit expansion and then explains how stress in U.S. housing and housing-related finance caused a global financial crisis. Essentially, an alternative financial system based on securitization and highly leveraged non-depository financial institutions now performs the same the economically vital, but inherently risky functions of intermediation and liquidity and maturity transformation that banks traditionally performed. However, this alternative financial system, which is largely outside of the regulatory and supervisory framework necessary to contain financial contagion, proved vulnerable to a modern version of 19th century bank runs. Three misaligned private incentives in this alternative financial system and two regulatory factors contributed to the inflation of housing bubble, while two regulatory factors aggravated the global financial crisis once the bubble popped.

On August 9, 2007, a global financial crisis triggered a general reassessment of credit and liquidity risks. Thereafter, interest rate spreads widen for most loans and debt and derivative securities. Tighter credit standards reduced the availability of credit and increased its cost to most borrowers. In response, the Federal Reserve eased U.S. monetary policy and taken extraordinary steps to provide liquidity in financial markets. President Bush signed legislation authorizing one-off tax rebates and approved regulatory steps providing liquidity for housing finance and helping distressed home owners to refinance or restructure their delinquent subprime residential mortgage loans.

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THE U.S. HOUSING BUBBLE AND THE GLOBAL FINANCIAL CRISIS: VULNERABILITIES OF THE ALTERNATIVE FINANCIAL SYSTEM

I. INTRODUCTION

A previous JEC study, *The U.S. Housing Bubble and the Global Financial Crisis: Housing and Housing-Related Finance*, identified the causes for the inflation of an unprecedented housing bubble in the United States beginning in the first quarter of 1998 and examined the economic consequences of the popping of this bubble in second quarter of 2006 for housing and housing-related finance. Using a seven-stage framework for understanding asset bubbles developed by Charles P. Kindleberger, the previous study explored stage one – displacement of existing expectations, stage two – credit expansion (monetary policy and other macroeconomic factors), stage three – proclamation of a new economy, stage four – swindles, and stage five – overtrading, revulsion, and discredit. Moving beyond a narrow focus on housing and housing-related finance, this study explains how weakness in the U.S. housing sector ignited a global financial crisis on August 9, 2007. Using the Kindleberger framework, part two examines stage two – credit expansion (microeconomic factors relating to financial services) and stage six – financial panic and crisis management. Stage seven – the aftermath will be discussed in a forthcoming study in this three-part series.

During the last three decades, an alternative financial system evolved to rival the traditional bank-centric system. This alternative financial system is based on **structured finance** and **highly leveraged non-depository financial institutions (HLNDFIs)**. In 2007, the $12.7 trillion of U.S. financial assets held by HLNDFIs almost equaled the $13.5 trillion held by depository institutions.[1]

The most common form of structured finance is the **securitization** of loan, leases, and receivables. **Originators** extended loans, leases, and receivables to households and non-financial firms that cannot access credit markets directly by issuing debt securities. **Issuers** buy these loans, leases, and receivables, place them as collateral into **special purpose vehicles (SPVs)** that are legally separate from the issuer, and sell **derivative securities** in the SPVs. This "securitizes" the collateral.

Highly leveraged non-depository financial institutions include **finance companies**, **financial government-sponsored enterprises (GSEs)**, **hedge funds**, **investment banks**, and **bank-sponsored off-balance sheet entities (OBSEs)**. In general, these institutions "borrow short" through lines of credit, commercial paper, repos, reserve repos, and other short-term debt securities to "lend long" by investing in medium- and long-term debt and derivative securities, many of which have limited market liquidity.

Highly leveraged non-depository financial institutions are now performing the same economically vital, but inherently risky functions of **intermediation** and **liquidity and maturity transformation** that banks and other depository institutions have historically performed. During the 19th and early 20th centuries, largely unregulated and unsupervised banks and other depository institutions were frequently subject to runs (i.e., the simultaneous demand from a large number of depositors to convert their deposits into cash). Runs often become contagious, triggering financial panics that were characterized by asset price declines, credit contractions, bank failures, and growing financial stress among households and non-financial firms. Financial panics usually caused recessions or even depressions. Bitter experience taught policymakers in the United States and other developed economies that the banking system requires an appropriate regulatory and supervisory framework, including:

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[1] Federal Reserve Flow of Funds statistics for September 30, 2007, and IMF estimates for financial assets in hedge funds and OBSEs.

- **Capital adequacy regulation** (i.e., a minimum capital ratio, which is defined equity plus certain reserves, to assets) that caps the leverage in banks and other depository institutions;
- **Central banks** that serve as "lenders of the last resort" to illiquid, but solvent banks and other depository institutions in order to check contagious bank runs and to prevent widespread financial panics and resulting damage to the economy;
- **Deposit insurance** that prevents runs by guaranteeing depositors against losses if their bank or other depository institution should fail; and
- **Prudential supervision** that detect fraud and other misconduct in banks and other depository institutions, monitors their financial condition, and provides an early warning system for institution-specific or systemic financial problems so that central banks, national regulators, and finance ministries can take corrective actions before financial crises develop.

In this alternative financial system, largely unregulated and unsupervised highly leveraged non-depository financial institutions are vulnerable to a modern version of runs and financial contagion. This has increased the risk for financial panics in the United States and other developed economies during stressful market conditions.

Several microeconomic factors relating to financial services contributed to the credit expansion. Misaligned private incentives that helped to inflate the U.S. housing bubble and cause a global financial crisis once the bubble popped include:

- "Originate to securitize" business model of mortgage banks;
- "Issuer pays" business model of credit rating agencies; and
- "Up front" incentive compensation plans in investment banks.

Two regulatory and supervisory factors contributed to the credit expansion that helped to inflate the U.S. housing bubble:

- Inherent limitations in the **value-at-risk models** that banks, other depository institutions, highly leveraged non-depository financial institutions, and their regulators use to estimate credit, market, and operational risk caused these financial institutions to underestimate their risk exposure; and
- Failure to incorporate off-balance sheet entities within the regulatory perimeter allowed sponsoring banks to disguise their actual leverage and risk exposure;

Two regulatory and supervisory factors aggravated the global financial crisis after the housing bubble popped:

- Lack of supervision of highly leveraged non-depository financial institutions; and
- Fair value accounting (also known as mark-to-market accounting) for illiquid financial assets (referred to as level 3 assets).

After the housing bubble burst in the second quarter of 2006, soaring delinquency and foreclosure rates for subprime residential mortgage loans reduced the market value of subprime-related residential mortgage-backed securities (RMBS) and tranches of subprime-related collateralized mortgage obligations (CMOs). On August 9, 2007, BNP-Paribas ignited a severe global financial crisis when BNP-Paribas suspended cash redemptions from three of its hedge funds because of uncertainty about the value of subprime-related RMBS and tranches of subprime-related CMOs in these funds. Over the next nine months:

- Credit losses in highly rated RMBS and CMOs caused investors to lose confidence in the accuracy of credit ratings. This triggered a general reassessment of risk that boosted credit and market liquidity risk premiums across the board.
- The performance of real estate loans has deteriorated significantly. Since these loans comprise 60.2 percent of all loans and leases in U.S. banks and savings institutions, this deterioration boosted the average seasonally adjusted delinquency rate and the average seasonally adjusted annualized chare-off rate and reduced the average risk-weighted regulatory capital ratios at U.S. banks and saving institutions.
- Banks became uncertain about the credit risk in lending to other banks, boosting the spread of the London Interbank Offer Rate (LIBOR) over the effective federal funds rate.
- Many bank-sponsored off-balance sheet entities could not rollover their **asset-backed commercial paper (ABCP)**. These OBSEs drew upon their back-up lines of credit with their sponsoring banks, or these sponsoring banks absorbed OBSE assets.
- The combination of involuntary increases in bank assets, rapidly escalating charge-offs on subprime mortgage loans, mark-to-market write-downs on subprime-related RMBS and tranches of subprime-related CDOs reduced the regulatory capital ratios in many banks.[2]
- In response, banks and other depository institutions have:
  - Tightened their credit standards and increased their interest rate margins on most loans to households and non-financial firms;
  - Increased their "haircuts" and made margin calls on lines of credit to highly leveraged non-depository financial institutions.
- Deleveraging by highly leveraged non-depository financial institutions has decreased the market liquidity for many debt and derivative securities and increased their interest rate spreads over Treasuries with comparable maturities.

Federal policymakers have taken a number of steps to ease the global financial crisis:

- The Federal Reserve lowered:
  - The discount rate by 400 basis points from 6.25 percent on August 17, 2007 to 2.25 percent on April 30, 2008, and
  - The target federal funds rate by 325 basis points from 5.25 percent on September 17, 2007 to 2.00 percent on April 30, 2008.
- The Federal Reserve created:
  - Term lending facilities for banks and other depository institutions, and

[2] Under the Basel II capital standards, the bank regulatory capital ratio refers to the ratio of either Tier I or Tier II capital to risk-weighted assets. Tier I capital includes common stock, perpetual, non-cumulative preferred stock, and retained earnings. Tier II capital include all items in Tier I capital plus undisclosed reserves, revaluation reserves, general and specific credit loss reserves, hybrid debt-capital instruments and subordinated term debt with a term of five years or more. Under Basel II, risk-weighted assets may be calculated through a standard formula (for small banks) or through an internal rating approach at either a foundation or an advanced level (for large banks).

- Parallel overnight and term lending facilities for primary dealers.[3]

- President Bush signed legislation on February 12, 2008 authorizing:
  - One-off tax rebates, bonus depreciation, and an increase in the expensing limit for business during 2008;
  - Higher conforming mortgage loan limits for Fannie Mae and Freddie Mac in high cost areas up to $729,750 for residential mortgage loans originated between July 1, 2007 and December 31, 2008; and
  - Higher limits for FHA insured residential mortgage loans in high-cost areas up to $729,750 (up from a maximum of $362,790) through December 31, 2008.
- The Bush administration initiated the HOPE Now Alliance and FHA Secure programs to help qualifying subprime borrowers to refinance their subprime residential mortgage loans or renegotiated their terms.
- The Bush administration loosened the capital requirements on Fannie Mae and Freddie Mac to enable them to purchase up to $200 billion of RMBS and tranches of CMOs.

In April 2008, the IMF forecast that the global credit losses from this financial crisis will be $945 billion (which is equivalent to 6.83 percent of U.S. GDP in 2007).[4] These losses have triggered a severe credit crunch as banks and other depository institutions rehabilitate their balance sheets. Despite the extraordinary measures taken by the Federal Reserve, the IMF estimates that this credit crunch will reduce U.S. real GDP by 1.4 percentage points below what it would have otherwise been for up to three quarters.[5]

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[3] Primary dealers are banks or securities broker-dealers that may trade directly with the Federal Reserve. A primary dealer is required to make bids or offers when the Federal Reserve conducts open market operations, provide information to the Federal Reserve's trading desk, and to participate actively in Treasury auctions. The current primary dealers are:

1. BNP Paribas Securities Corp.
2. Banc of America Securities LLC
3. Barclays Capital Inc.
4. Bear, Stearns & Co., Inc.
5. Cantor Fitzgerald & Co.
6. Citigroup Global Markets Inc.
7. Countrywide Securities Corporation
8. Credit Suisse Securities (USA) LLC
9. Daiwa Securities America Inc.
10. Deutsche Bank Securities Inc.
11. Dresdner Kleinwort Wasserstein Securities LLC.
12. Goldman, Sachs & Co.
13. Greenwich Capital Markets, Inc.
14. HSBC Securities (USA) Inc.
15. J. P. Morgan Securities Inc.
16. Lehman Brothers Inc.
17. Merrill Lynch Government Securities Inc.
18. Mizuho Securities USA Inc.
19. Morgan Stanley & Co. Incorporated
20. UBS Securities LLC.

[4] *World Economic and Financial Surveys, Global Financial Stability Report: Containing Systemic Risk and Restoring Financial Soundness* (Washington, D.C.: International Monetary Fund, April 2008), pg. 10.

[5] Ibid., pg. 35.

Since March 2008, timely actions by the Federal Reserve and other central banks ameliorated the extreme stress that had characterized financial markets earlier in the year. However, interest-rate spreads remain elevated, and a general tightening of credit standards continues.

Significant downside risks to economic growth remain. These risks include the possibilities that (1) U.S. housing prices will decline more than is currently forecast, and (2) the default rates on non-investment-grade corporate debt securities and loans to highly leveraged non-financial firms will increase more than is currently anticipated. If either were to occur, global credit losses would mount, and the risk for a deep and long recession would increase.

II. APPLYING THE KINDLEBERGER FRAMEWORK TO THE GLOBAL FINANCIAL CRISIS

II.A. CREDIT EXPANSION

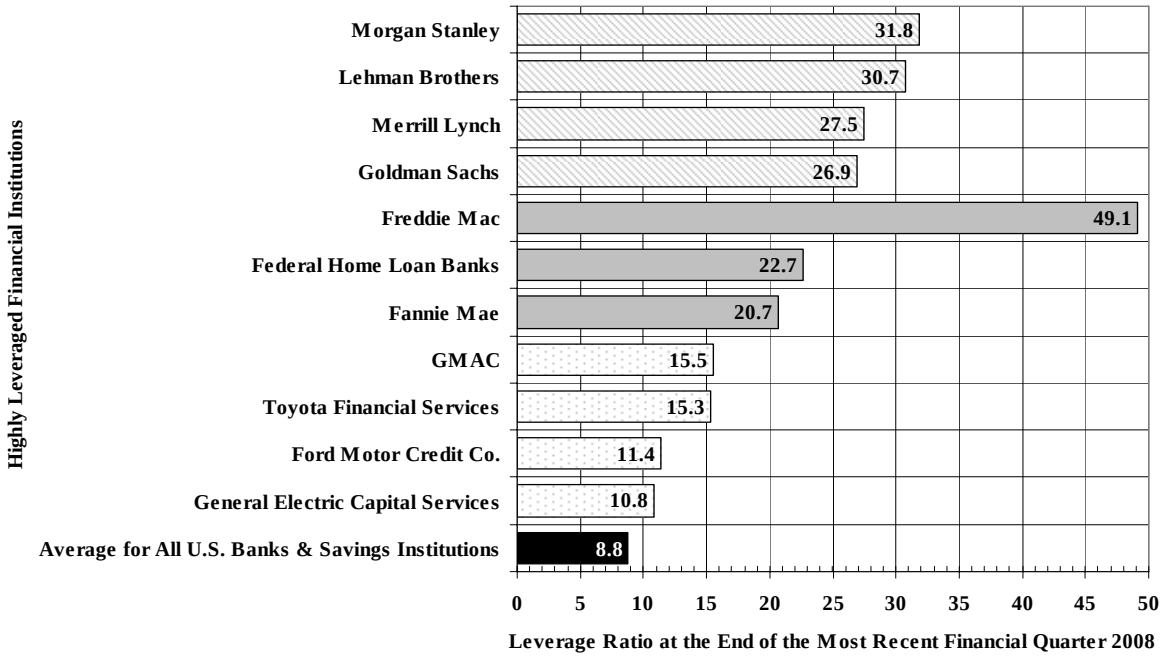
During the last decade, the credit available to U.S. households and non-financial firms grew much faster than GDP. Total credit outstanding including total debt securities outstanding in U.S. credit markets and total loans and leases at U.S. depository institutions grew from $17.087 trillion (equal to 205.8 percent of GDP) on December 31, 1997 to $38.324 trillion (equal to 276.8 percent of GDP) on December 31, 2007. While this credit expansion was mainly attributable to the Federal Reserve's overly accommodative monetary policy from the second quarter of 2002 and the third quarter of 2006 when compared with the Taylor rule and macroeconomic supply factors in U.S. credit markets that restrained long-term U.S. interest rates (see Subsection III.B in a previous JEC study, *The U.S. Housing Bubble and the Global Financial Crisis: Housing and Housing-Related Finance*, for additional details), microeconomic factors related to financial services also contributed to this credit expansion.

II.A.1. Emergence of Alternative Financial System

II.A.1.a. Bank-Centric Financial System

Banks emerged during the Renaissance to serve as intermediaries between borrowers and savers. Banks and other depository institutions accept deposits from savers. Relying on the low probability that depositors will demand all of their deposits back simultaneously, banks and other depository institutions use deposits to fund loans and investments in debt and derivative securities. In the United States and other developed economies, banks and other depository institutions specialize in extending loans to households and non-financial firms that cannot access credit markets directly by issuing debt securities. Banks and other depository institutions "borrow short and lend long" because deposits are generally payable on demand, while most loans are repayable over months or years. This conversion of illiquid financial assets (e.g. medium- and long-term loans) into highly liquid financial assets (e.g., deposits payable on demand) is known as **liquidity and maturity transformation**.

Graph 2.1 - Leverage Ratios at Major Highly Leveraged Financial Institutions at the End of the Most Recent Financial Quarter 2008



Banks and other depository institutions are highly leveraged. On March 31, 2008, the average leverage ratio (i.e., total liabilities to total equity) was 8.8:1 for all banks and saving institutions in the United States (see Graph 2.1).[6] Similarly, the average Tier I risk-weighted capital ratio for all banks and savings institutions in the United States was 10.1 percent, while the average total (i.e., Tier I plus Tier II) risk-weighted capital ratio was 12.8 percent.[7] Bank and other depository institutions earn profits from the interest-rate spreads between the interest earned on loans and debt and derivative securities and the interest paid to depositors less other expenses.

Banks and other depository institutions are exposed to four major risks:

- **Credit risk** refers to a loss in the fair market value of loans, debt securities, and derivative securities because the borrower does not perform (i.e., pay interest and principal as contractually agreed).
- **Funding liquidity risk** refers to a sudden and unexpected loss of deposits or other funding sources.

[6] Federal Deposit Insurance Corporation, *Quarterly Banking Profile (First Quarter 2008)*. Found at http://www4.fdic.gov/qbp/2008mar/qbp.pdf.

[7] Ibid. Tier I capital includes common stock, non-redeemable, non-cumulative preferred stock, and retained earnings. Tier II capital includes all of Tier I capital plus undisclosed reserves, revaluation reserves, general provisions for loss reserves that are not allocated to specific financial assets or classes of assets, hybrid debt-equity instruments, and subordinated long-term debt. Tier II capital is limited to 100 percent of Tier I capital. Assets are weighted from 0 percent to more than 100 percent based on complex risk factors.

- **Market risk** refers to a loss in the fair market value of loans, debt securities, and derivative securities because of general economic factors (e.g., a general increase in interest rates will reduce the market value of a bank's fixed-rate debt securities).
- **Operational risk** refers to a bank's vulnerability to fraud and theft.

Historically, funding liquidity risk was manifested in **runs** (i.e., the simultaneous demand of depositors to convert all of their deposits into cash). In the absence of a central bank and deposit insurance, banks and other depository institutions are vulnerable to runs because cash on hand is a very small percent of any bank's assets. Runs occur when depositors fear that their bank or other depository institution may become highly illiquid or even insolvent and thus unable to pay depositors on demand in cash. Consequently, depositors will run to their bank to try to convert their deposits into cash before the bank's cash on hand is exhausted.

A bank or other depository institution that experiences a run must immediately secure alternative sources of funding. At first, a besieged bank may seek short-term loans from unaffected banks. If these loans do not quell a run, a besieged bank or other depository institution may seek to generate cash by demanding immediate repayment from borrowers with loans that are payable on demand and by selling financial assets. Without adequate time to find able buyers willing to pay the fair market value, a besieged bank or other depository institution may receive significantly less than fair market value for its infrequently traded debt securities and loans. This is known as a **fire sale**.

Runs often became **contagious** with grave economic consequences. A run on one bank or other depository institution may cause depositors in other banks or depository institutions to doubt their ability to convert deposits into cash on demand, triggering more runs. As the contagion spreads, unaffected banks or other depository institutions may stop extending loans to besieged banks, households, and non-financial firms and may start to hoard cash.

Now the contagion can morph into a financial panic. The scarcity of credit spikes interest rates, while concurrent fire sales drive asset prices far below their fair market values. Falling asset prices trigger margin calls on loans collateralized with such assets. Non-financial firms may incur extreme difficulties in securing sufficient credit at affordable interest rates to maintain normal operations. If the financial panic is not quickly reversed, waves of bank and other depository institution failures may occur. Households may slash purchases, while non-financial firms may cut output and dismiss employees. Thus, contagious runs can ignite a recession or even a depression.

Bitter experiences of repeated contagious runs, financial panics, and associated recessions and depressions during the 19th century convinced policymakers in the United States and other developed economies that banking requires an appropriate regulatory and supervisory framework, which includes:

- **Capital adequacy regulation** that require banks and other depository institutions to maintain a minimum ratio of capital, which includes shareholder equity plus certain reserves, to assets to prevent excessive leverage;
- **Central banks** that serve as the "lender of the last resort" to illiquid, but solvent banks and other depository institutions in order to check contagious runs and prevent financial panics;
- **Deposit insurance** that prevents runs by guaranteeing depositors against losses if their bank or other depository institution should fail; and
- **Prudential supervision** that detects fraud and other misconduct in banks or other depository institutions, monitors their financial condition, and provides an early warning system for institution-specific or systemic financial problems so that central banks, regulators, and finance ministries can take corrective actions before financial crises develop.

Regulation and prudential supervision are different and quite distinct concepts that are frequently confused. On the one hand, prudential supervision involves gathering financial intelligence and taking necessary regulatory actions to correct deficiencies that are found in banks or other depository institutions. For example, a central bank or regulator might require an undercapitalized bank to seek additional equity investment to bring its capital level back into a safe zone.

On the other hand, regulation involves promulgating and enforcing detailed mandates and prohibitions about products and pricing, branch locations, and affiliations with other financial firms. Some regulations may have more to do with special interest rent-seeking than safety and soundness. For example, detailed regulations about products, prices, markets, and affiliations that once existed include: *Regulation Q* limits for interest rates on non-checkable deposits, interest prohibitions on checkable deposits under the *Banking Act of 1933*, state laws prohibiting interstate branch banking and limiting intrastate branching to a single county within a state, the separation of commercial and investment banking under the *Banking Act of 1933*, and prohibitions on savings institutions from extending residential mortgage loans beyond a narrowly defined area near the headquarters of such institutions. Actually, the need for strong prudential supervision is greater in unregulated market for financial services than in a highly regulated market.

II.A.1.b. Alternative Financial System

A largely unregulated and unsupervised alternative financial system emerged during the last three decades to challenge the dominance of the bank-centric system. At the heart of this alternative financial system, are:

- **Structured finance**, which refers to the pooling of financial assets (including loans, leases, receivables, and debt securities) into different credit products that are legally separate from their issuers and the subsequent sale of these structured credit products by their issuers to investors; and
- **Highly leverage non-depository financial institutions (HLNDFIs)**, which include finance companies, hedge funds, financial government-sponsored enterprises (GSEs), investment banks, and bank-sponsored off-balance sheet entities (OBSEs) such as asset-backed commercial paper (ABCP) conduits and special investment vehicles (SIVs) that invest in structured finance products. In 2007, the $12.7 trillion of financial assets held by HLNDFIs almost equaled the $13.5 trillion of financial assets held by banks and other depository institutions.

II.A.1.b.i. Securitization

The most common form of structured finance is **securitization**, which emerged during the 1970s. Under securitization, **originators** extended loans, leases, and receivables to households and non-financial firms that cannot access credit market directly by issuing debt securities. **Issuers** buy these loans, leases, and receivables from their originators, place these loans, leases, and receivables as collateral into **special purpose vehicles (SPVs)** that are legally separate from the issuers, and sell **derivative securities** in these SPVs to investors.

When the derivative securities in SPVs have *equal and undifferentiated* interests in the cash flow from the underlying collateral, such securities are known as **asset-backed securities (ABS)**. When the residential mortgage loans comprise the collateral of ABS, they are referred to as **residential mortgage-backed securities (RMBS)**. Similarly, when commercial mortgage loans comprise the collateral of ABS, they are referred to as **commercial mortgage-backed securities (CMBS)**.

When SPVs are divided into tranches of derivative securities that have *unequal and differentiated* interests in the cash flow from the underlying collateral, such securities are known as **collateralized debt obligations** (**CDOs**). When mortgage loans comprise the collateral in CDOs, they are referred to as

collateralized mortgage obligations (**CMOs**). In both CDOs and CMOs, the tranches are typically ranked in descending order of seniority from AAA (highest) to equity (lowest). Senior tranches have a priority claim on the cash flow from the underlying collateral and must be paid before junior tranches.

Often CDOs and CMO were restructured into multi-layered structured credit products. For example, a CMO with AAA-rated (80 percent), AA-rated (11 percent), A-rated (4 percent), BBB-rated (3 percent) and equity (2 percent) tranches can be repackaged into a **high-grade structured finance CMO** and a mezzanine **structured finance CMO**. The AAA-rated, AA-rated, and A-rated tranches can be placed into a high-grade structured finance CMO, while the BBB-rated and equity tranches can be placed into a mezzanine structured finance CMO. Thus, 62 percent of the bottom 5 percent of the original CMO can be transformed into a Senior AAA-rated tranche of the mezzanine structured finance CMO. Moreover, the middle tranches of a mezzanine structured finance CMO could be repackaged again into a **CMO-squared**.[8]

Securitization frequently involves credit enhancements. Internal credit enhancements include: excess spreads (i.e., the interest rate on the derivative securities is less than the interest rate on the underlying collateral), overcollateralization (i.e., the face value of the collateral exceeds the aggregate face value of the securities), and reserve funds. External credit enhancements include: wrapping (i.e., a guaranty from a third party, usually a credit guaranty insurer), or a cash collateral account (i.e., the issuer deposits borrowed funds into an escrow account that will pay the derivative security owners if the underlying collateral does not perform).

In February 1970, the U.S. Department of Housing and Urban Development began to collateralize FHA- and VA-mortgage loans into Government National Mortgage Association (Ginnie Mae) RMBS. During the next two years, two financial GSEs – the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac) – began securitizing conforming conventional residential mortgage loans to creditworthy households (known as prime mortgages) into RMBS. Fannie Mae issued the first CMO in 1983. Banks began securitizing motor vehicle installment loans into ABS in 1985. During the following year, the securitization of credit card receivables commenced.

Exploiting the funding advantage that the implicit federal guaranty gave to their debt securities, Fannie Mae and Freddie Mac established an effective duopoly over the securitization of prime residential mortgage loans and accumulated large portfolios of RMBS and CMOs. During 1990s, investment banks entered two segments of the residential mortgage market that Fannie Mae and Freddie Mac could not legally securitize: jumbo residential mortgage loans (i.e., residential mortgage loans above the maximum amount for conforming residential mortgage loans) and subprime residential mortgage loans to less creditworthy households.

II.A.1.b.ii. Credit Derivatives

Another feature of the alternative financial system is the widespread use of credit derivatives. A credit derivative is a financial contract under which the seller receives a periodic fee in exchange for making contingent payments to the buyer if a specific reference entity fails to meet its agreed obligations. Credit derivatives may be funded or unfunded.

Credit default swap (CDS) is the most common form of unfunded credit derivatives. In a physical CDS, the seller agrees to purchase a defaulted reference asset at its face value from the protection buyer. In a cash CDS, the seller agrees to pay the difference between the face value of the defaulted asset and its current market value. CDS is functionally equivalent to financial guaranty insurance.

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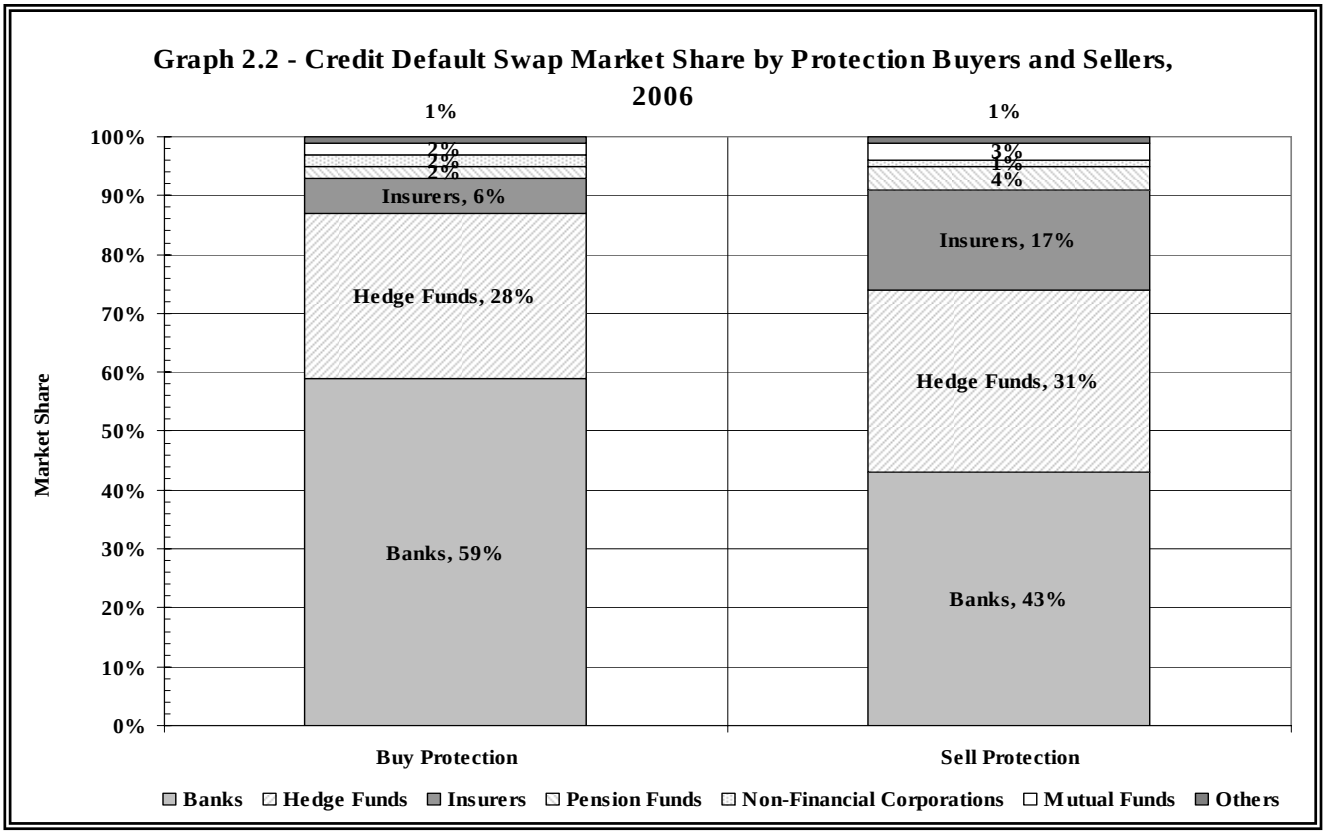
[8] *Global Financial Stability Report* (April 2008), pp. 59-60.



The Bank of International Settlements (BIS) reports that credit default swaps (CDS), which had a notional value of $42.6 trillion, had a market value of $721 billion as of June 30, 2007. In 2006, banks were collectively the largest net buyers of CDS protection, while insurers were collectively the largest net sellers of CDS protection. Banks had the largest positions in both the buy CDS protection and sell CDS protection markets, hedge funds were second in both markets, and insurers were third in both markets (see Graph 2.2). All major financial institutions are connected to each other as counterparties through CDSs.

In the United States, banks and saving institutions that were sellers of CDS protection had a notional exposure of $12.917 trillion as of June 30, 2007. The fair value of these protection contracts to the guarantors was a negative $23.0 billion. By March 31, 2008, this notional exposure had increased to $16.441 trillion, while the fair value of these protection contracts to the guarantors had declined to a negative $474.0 billion.[9]

[9] FDIC (First Quarter 2008), Table VI-A.

Table 2.1 – Financial Assets in Major Financial Institutions (in Trillions of U.S. Dollars as September 30, 2007)			
Highly Leveraged Financial Institutions			
Financial Institution	**Sub-Subtotal**	**Subtotal**	**Total**
Depository Institutions			**$13.5**
Banks		$10.9	
Savings Institutions		$1.9	
Credit Unions		$0.7	
Highly Leveraged Non-Depository Financial Institutions (HLNDFIs)			**$12.7**
Finance Companies		$1.9	
Financial GSEs		$3.1	
Hedge Funds		$2.7	
Investment Banks		$3.2	
Off-Balance Sheet Entities (OBSEs)		$1.8	
Asset-Backed Commercial Paper (ABCP) Conduits	$1.4		
Structured Investment Vehicles (SIVs)	$0.4		
Less Leveraged Financial Institutions			
Financial Institution		**Subtotal**	**Total**
Agency & GSE Mortgage Pools			**$4.2**
Closed-End and Exchange-Traded Funds			**$0.9**
Insurers			**$7.4**
Life		$5.0	
Property and Other		$1.4	
Mutual Funds			**$10.8**
Money Market		$2.8	
Other		$8.0	
Pension Funds			**$10.1**
Private		$6.0	
State and Local Govt.		$3.2	
Federal Govt.		$1.1	
Real Estate Investment Trusts (REITs)			**$0.4**
Sources: Federal Reserve flow of funds data, IMF estimates for hedge funds and OBSEs			

II.A.1.b.iii. Highly Leveraged Non-Depository Financial Institutions

The most buyers of structured credit products in the alternative financial system are highly leveraged non-depository financial institutions (HLNDFIs). Four of these HLNDFIs became major investors in derivative securities: financial GSEs (especially Fannie Mae and Freddie Mac), hedge funds, investment banks, and bank-sponsored off-balance sheet entities.

Collectively, this alternative financial system is performing the same economically vital, but inherently risky liquidity and maturity transformation through HLNDFIs as the traditional bank-centric system has performed through banks and other depository institutions, but largely outside of the regulatory and supervisory framework developed for banking. HLNDFIs invest primarily in medium- and long-term debt and derivative securities. Through the securitization process, HLNDFIs become the ultimate creditors for the households and non-financial firms whose loans, leases, and receivables are collateralized in these derivative securities. HLNDFIs fund their investments largely through short-term financial instruments, including commercial paper, lines of credit, repos, and reverse repos. In turn, money market mutual funds purchase commercial paper from HLNDFIs, creating deposit-like financial assets for households and non-financial firms.

Despite these functional similarities to depository institutions, HLNDFIs did not have direct access to the discount window of the Federal Reserve to obtain credit prior to March 14, 2008. Thus, HLNDFIs were vulnerable to runs (albeit in a different form) that could trigger a panic as depository

institutions were during the 19th century and early 20th before the creation of the Federal Reserve and federal deposit insurance.

II.A.1.b.iii.1. Finance Companies

Finance companies extend loans and leases to households and non-financial firms. For households, finance companies provide motor vehicle loans and leases, personal loans, and loans to purchase durable consumer goods. For non-financial firms, finance companies provide floor plan loans to motor vehicle dealers to finance their inventory of motor vehicles for sale, loans and leases for business equipment, and loans against business receivables. Finance companies are generally funded through commercial paper and other debt securities.

Some finance companies are captive; others are non-captive. Captive finance companies are wholly owned subsidiaries of parent firms. Captive finance companies mainly extend loans, leases, and receivables to finance the distribution and purchase of products made by their parents. In captive finance companies, advances from parent firms are often an important source of funding. Examples of major captive finance companies include Ford Motor Credit Company and Toyota Financial Services, which had financial assets of $165 billion and $77 billion, respectively, on March 31, 2008.

Non-captive finance companies extend loans, leases, and receivables for many purposes, not simply to finance the distribution and purchase of products made by their parent firm. Examples of major non-captive finance companies include General Electric Capital Services[10] and GMAC LLC,[11] which had financial assets of $504 billion and $208 billion, respectively, on March 31, 2008. Together, these four finance companies account for 49 percent of all financial assets held by finance companies in the United States.[12]

Finance companies are highly leveraged. On March 31, 2008, General Electric Capital Services, GMAC LLC, Toyota Financial Services, and Ford Motor Credit Company had leverage ratios of 10.8:1, 15.5:1, 15.3:1, and 11.4:1, respectively (see Graph 2.1).

II.A.1.b.iii.2. Financial GSEs

Financial government-sponsored enterprises (GSEs) provide credit to specific economic sectors or borrowers. Financial GSEs include the Federal Home Loan Banks (FHLBs), Fannie Mae, Freddie Mac, Sallie Mae (Student Loan Marketing Association, since 1997 a subsidiary of SLM Holding Corporation, a private company), the Farm Credit System, Financing Corporation (FICO), and Resolution Funding Corporation (REFCORP). Financial GSEs issue debt securities (collectively known as U.S. Agency debt securities) to fund themselves. Despite explicit denials, investors generally regard U.S.

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[10] Although General Electric Capital Services is a wholly owned subsidiary of General Electric, GE Capital Services provides a wide variety of loans and leasing services that are not related to the sale of other GE products. Therefore, GE Capital Services is not considered a captive financial company. GE Capital Services includes GE Commercial Finance, GE Consumer Finance (e.g., private label credit cards), and GE Equipment Services (e.g., Penske Truck Leasing).

[11] Founded in 1919 as a wholly owned subsidiary of General Motors Corporation, GMAC was originally established to provide GM dealers with the automotive financing necessary to acquire and maintain vehicle inventories and to provide retail customers the means by which to finance vehicle purchases through GM dealers. On November 30, 2006, GM sold a 51 percent interest in GMAC for approximately $7.4 billion to FIM Holdings LLC (FIM Holdings), an investment consortium led by Cerberus FIM Investors, LLC, Citigroup Inc., Aozora Bank Ltd., and a subsidiary of The PNC Financial Services Group, Inc. Today, GMAC LLC includes GMAC for financing GM dealer new and certified used motor vehicle sales, Nuvell Financial Services for subprime motor vehicle loans, ResCap Holdings for residential mortgage finance subsidiaries GMAC Mortgage, GMAC-RFC, GMAC Bank, Ditech.com, and Homecomings Financial.

[12] Flow of funds statistics/Federal Reserve/Haver. Percentage calculation by author.

Agencies as having an implicit guaranty from the U.S. government. Thus, U.S. Agencies typically have yields only slightly above Treasuries with comparable maturities.

Fannie Mae and Freddie Mac were established to reduce the interest-rate risk that banks and other depository institutions were taking by funding their portfolios of long-term fixed-rate residential mortgage loans with variable-rate, payable-on-demand deposits through securitization. During the 1970s and 1980s, Fannie Mae and Freddie Mac were primarily issuers of RMBS and CMOs that were sold to other investors. Prior to 1988, the RMBS and the CMOs held by all financial GSEs were less than $1 billion, or less than 0.1 percent of all financial assets in all financial GSEs.[13]

Since then, Fannie Mae and Freddie Mac have exploited the funding cost advantage associated with their implicit federal guaranty by issuing debt securities to accumulate large investment portfolios of RMBS and CMOs. As of March 31, 2008, Fannie Mae and Freddie Mac had investment portfolios of $722.7 billion and $712.4 billion, respectively, of which Fannie Mae and Freddie Mac invested $247.6 billion and $346.9 billion, respectively, in their own RMBS (see Table 2.2). In addition, Fannie Mae and Freddie Mac have guaranteed the performance of $2.457 trillion and $1.437 trillion, respectively, of their own RMBS that are owned by other investors.

Table 2.2 - Composition of Fannie Mae and Freddie Mac Investment Portfolios in billions of U.S. dollars as of March 31, 2008

GSE	Own RMBS	Agency RMBS	Private RMBS	Mortgages	Total
Fannie Mae	$247.6	$32.7	$109.2	$333.2	$722.7
Freddie Mac	$346.9	$54.3	$222.9	$88.3	$712.4

Fannie Mae and Freddie Mac are highly leveraged. On March 31, 2008, the leverage ratios at Fannie Mae and Freddie Mac were 20.7:1 and 49.1:1, respectively (see Graph 2.1). Put another way, the risk-weighted core regulatory capital ratios (equivalent to the Tier I risk-weighted capital ratio for banks and other depository institutions) for Fannie Mae and Freddie Mac were 5.06 percent and 4.77 percent respectively.

Congress established the Federal Home Loan Banks in 1932. The twelve regional Federal Home Loan Banks are owned by more than 8,000 U.S. banks, other depository institutions, and insurers that are active in residential mortgage finance. The Federal Home Loan Banks extend loans (known as advances) to these financial institutions to help them extend residential mortgage loans to U.S. households. In turn, these residential mortgage loans comprise the collateral for FHLB advances to financial institutions. As of March 31, 2008, the Federal Home Loan Banks advanced $913 billion (or 69.0 percent of assets) to financial institutions and invested $155 billion (or 11.7 percent of assets) in Fannie Mae and Freddie Mac debt securities and RMBS, state and local housing authority debt securities, and private RMBS.

The Federal Home Loan Banks are also highly leveraged. As of March 31, 2008, the Federal Home Loan Banks had a leverage ratio of 22.7:1 (see Graph 2.1), or equivalently a capital ratio of 4.22 percent.

II.A.1.b.iii.3. Hedge Funds

Hedge funds are private companies that invest in U.S. credit and equity markets, but generally maintain their legal residence outside of the United States. To escape the regulations that apply to mutual funds under the *Investment Company Act of 1940*, hedge funds are open only to large qualified investors such as other financial institutions and sophisticated individual investors with a net worth of at least $1 million. Hedge funds follow a variety of investment strategies. The five major elements of investment strategy are:

[13] Flow of funds statistics/Federal Reserve/Haver. Percentage calculation by author.

1. Style – Global macro hedge funds invest in all instruments and markets and seek profits by anticipating global macroeconomic trends. Directional hedge funds make niche investments in specific markets, instruments, or situations (e.g., hedge funds that invest only in securities from emerging markets or from high tech industries; hedge funds that follow a value or a growth investment strategy; hedge funds that take short portions in overvalued stocks). Event-driven hedge funds seek profits by finding and exploiting price inefficiencies arising from specific events (e.g., hedge funds that invest in securities from corporations filing for bankruptcy or from corporations involved with mergers). Relative value hedge funds seek profits by finding and exploiting price inefficiencies between related financial assets (e.g., hedge funds that arbitrage price differentials in equity, debt, or derivative securities markets).
2. Markets – Hedge funds may invest in one or more of the following markets: equity securities, debt securities, derivative securities, commodities, and currencies.
3. Instruments – Hedge funds may take long or short positions in securities, buy or sell options, or trade in futures.
4. Method – Investment decisions may be discretionary (made by hedge fund managers) or quantitative (selected by a computer program).
5. Diversification – Some hedge funds seek diversification through investments by different managers or in different markets, instruments, or sectors. Other hedge funds do not seek diversification.

Hedge funds grew rapidly during the last decade and had an estimated $2.7 trillion of financial assets under management in 2007.[14] According to *Institutional Investor*, JPMorgan Asset Management was the largest hedge fund in the world with financial assets under management of $44.7 billion as of December 31, 2007. Moreover, the top ten hedge funds had aggregate financial assets under management of $324 billion as of December 31, 2007.[15]

To increase returns, hedge funds are often highly leveraged. Hedge funds borrow through lines of credit and reserve repurchase agreements (repos) with banks. As of December 31, 2007, the **prime brokers**, which the OECD identifies as the ten banks or independent investment banks with the largest investment banking functions in the world (i.e., Bear Stearns, Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, JPMorgan-Chase, Lehman Brothers, Merrill Lynch, Morgan Stanley, and UBS), extended $1.36 trillion in credit to hedge funds through lines of credit, repos,[16] and reverse repos.[17]

Leverage ratios vary widely among hedge funds. Typically, leverage ratios range from 2:1 to 10:1. However, the leverage ratios in some hedge funds exceed 30:1.

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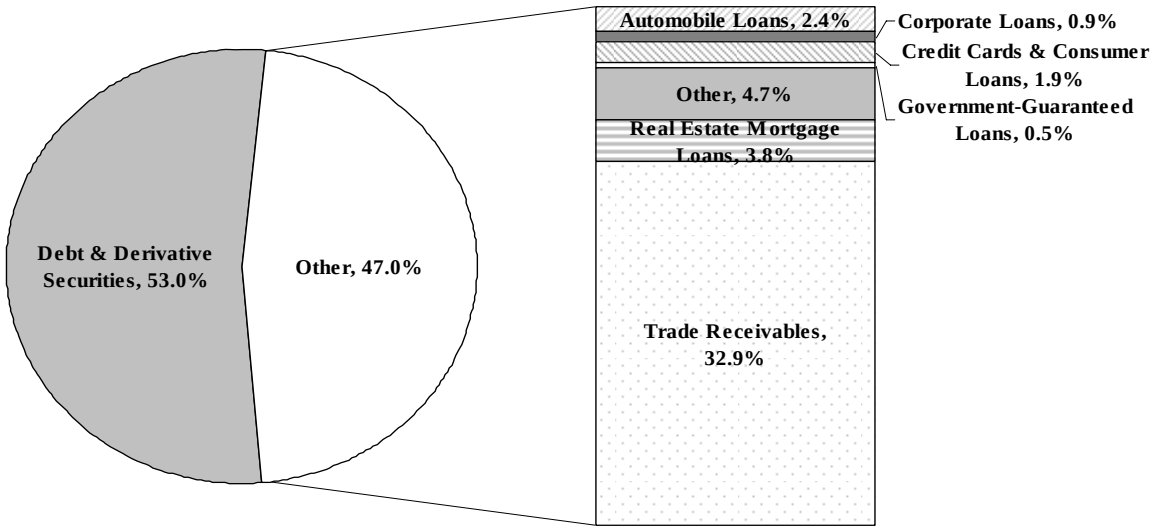
[14] IMF estimate.

[15] Found at http://www.iimagazine.com/Rankings/rankingsHeFu100RGlobal08.aspx?src=http://www.iimagazinerankings.com/rankingsHeFu100RGlobal08/index.asp.

[16] A "repo" is a repurchase agreement in which one party sells securities to a second party with an agreement to repurchase these securities at a fixed higher price on a specified future date (usually overnight). This is essentially a loan with the interest rate implied by the difference between the sale price and the higher repurchase price. A "reserve repo" is a reserve repurchase agreement in which one party purchases specific securities from a second party with an agreement to resell these securities at a fixed higher price at a specific future date (usually overnight). This is essentially a security loan with the interest rate implied by the difference between the purchase price and the higher sale price.

[17] Adrian Blundell-Wignall, "The Subprime Crisis: Size, Deleveraging and Some Policy Options" in *Financial Market Trends* (Paris: Organization for Economic Cooperation and Development, April 2008), pg. 20. Found at: http://www.oecd.org/dataoecd/36/27/40451721.pdf.

Graph 2.3 - Asset-Backed Commerical Paper Conduit Assets by Type, October 2007



II.A.1.b.iii.4. Investment Banks

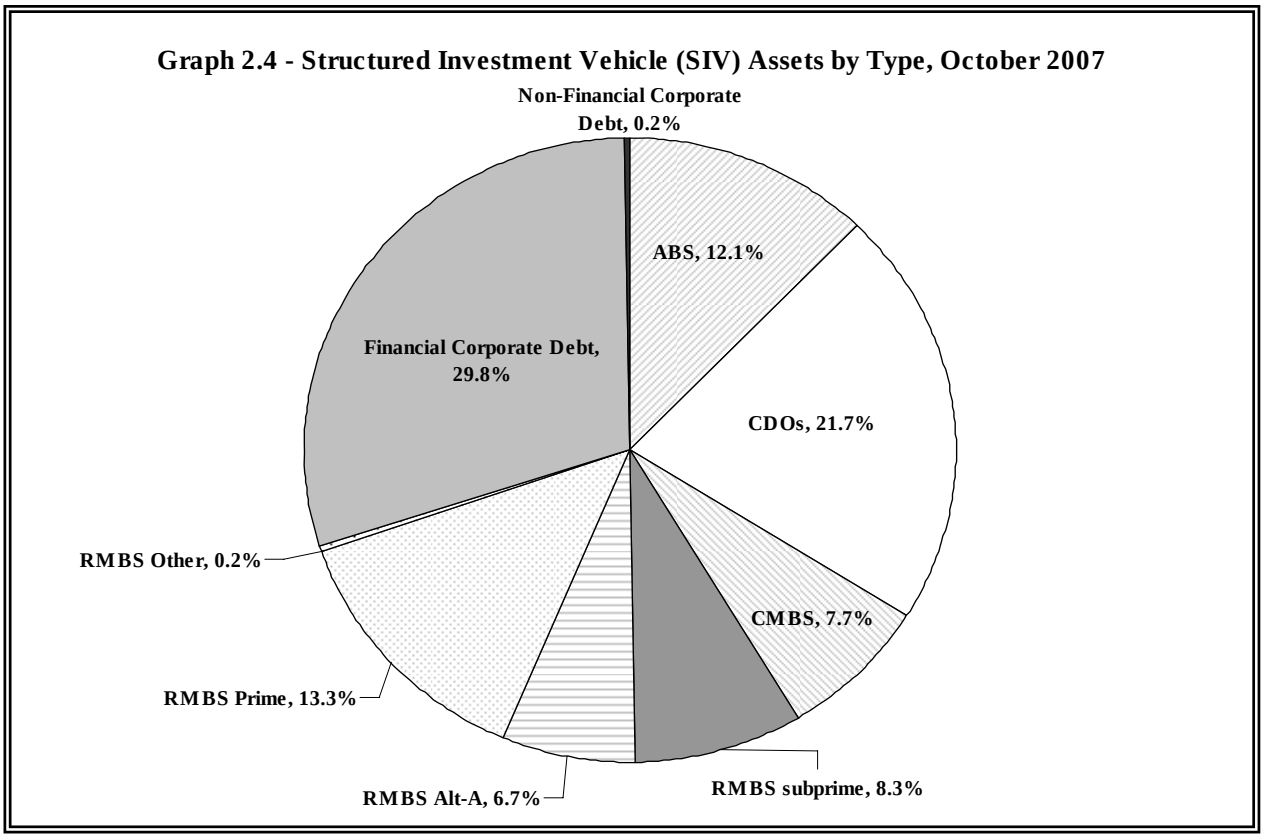
Investment banks (also known as broker/dealers) are firms that trade securities for a fee and hold an inventory of securities for resale. Investment banks help to distribute both new securities and securities being resold on the secondary market. The financial assets of investment banks include collateral repayable from borrowed securities, securities held for distribution, and loans provided to customers. Investment banks are funded largely through repos (37.8 percent of total liabilities of all investment banks at year-end 2007) customer deposits (28.0 percent), and lines of credit from banks (11.0 percent).[18]

Because of their expertise in the distribution of securities, investment banks became the major issuers of ABS and CDOs in second of half of the 1980s and the 1990s. In recent years, investment banks have also become major issuers of RMBS and CMOs in the subprime and jumbo segments of the market not dominated by Fannie Mae and Freddie Mac.

In addition to their role as issuers, investment banks have also become major investors in debt and derivative securities through their proprietary accounts. At year-end 1987, debt and derivative securities in the proprietary accounts of investment banks were $39.8 billion. At year-end 2007, debt and derivative securities in the proprietary accounts of investment banks skyrocketed to $815.2 billion. Over these twenty years, the proprietary portfolio of debt and derivative securities had expanded by an average of 21.2 percent a year.[19]

Independent investment banks that are not affiliated with a bank or other depository institution are highly leveraged. At the end of the most recent quarter, the leverage ratios at the four largest

[18] Flow of funds statistics/Federal Reserve/Haver. Percent calculation by author.
[19] Ibid.



independent investment banks in the United States were 26.9:1 at Goldman-Sachs, 30.7:1 at Lehman Bros., 27.5:1 at Merrill Lynch, and 31.8:1 at Morgan-Stanley (see Graph 2.2).[20]

II.A.1.b.iii.5. Off-Balance Sheet Entities

Off-balance sheet entities are a highly leveraged special purpose vehicles sponsored by banks, but legally separate from their sponsors. OBSEs pay substantial management fees to their sponsors. To exclude OBSE assets and liabilities from a sponsoring bank's consolidated financial statement, sponsors retain only a small percent of the equity in their OBSEs. The majority of the equity in an OBSE is usually sold to hedge funds.

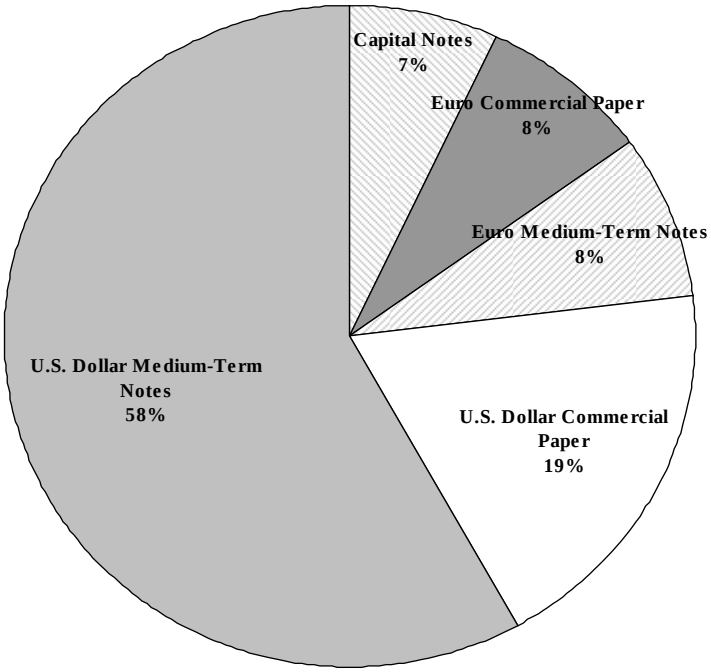
During the last decade, banks sponsored OBSEs to circumvent regulatory capital standards. Because OBSEs were outside of the regulatory perimeter under Basel I (which is discussed further in II.A.2.), the minimum capital ratio (or equivalently the maximum leverage ratio) that applies to bank assets did not apply to OBSE assets. Thus, OBSEs allowed sponsoring banks to reduce their capital costs and to increase their return on equity by increasing overall leverage.

There are two major types of OBSEs:

- **ABCP Conduits**. Asset-backed commercial paper (ABCP) conduit profit from exploiting the difference between short- and long-term interest rates. ABCP conduit assets include loans, leases, and receivables (47 percent of total assets in all conduits); and debt and derivative securities (53 percent of total assets in all conduits) (see Graph 2.3). Sponsoring banks use various forms of credit enhancements. ABCP conduits are

[20] Fiscal quarter-end data are from February 29, 2008 for Goldman Sachs, Lehman Brothers Holdings, Inc., and Morgan Stanley and from March 28, 2008 for Merrill Lynch.

Graph 2.5 - Structured Investment Vehicle (SIV) Liabilities by Type, October 2007



funded through asset-back commercial paper supported with back-up lines of credit with sponsoring banks. Before the financial crisis in the second half of 2007, ABCP conduits had an estimated $1.4 trillion in assets.[21] As of March 31, 2008, banks and savings institutions in the United States had extended $22.3 billion through lines of credit and had unused commitments of $346.0 billion in lines of credit to ABCP conduits.[22]

- **Structured investment vehicles (SIVs)**. SIVs are similar to ABCP conduits except they are funded through a mixture of including asset-backed commercial paper with a back-up line of credit (27 percent of total liabilities in all SIVs), medium-term debt securities often sold to hedge funds (66 percent of total liabilities in all SIVs), and capital notes again often sold to hedge funds (7 percent of total liabilities in all SIVs) (see Graph 2.4). Unlike ABCP conduit assets, almost all SIV assets are tradable, including CMBS, RMBS, and ABS (48 percent of total assets in all SIVs); financial firm debt securities (28 percent of total assets in all SIVs); and CDOs and CMOs (22 percent of total assets in all SIVs) (see Graph 2.5). At their peak in July 2007 before the financial crisis, SIVs had an estimated $400 billion of assets under management.[23]

[21] *Global Financial Stability Report* (April 2008), pg. 70-72.
[22] FDIC (First Quarter 2008), Table VII-A.
[23] *Global Financial Stability Report* (April 2008), pg. 70-72. Additional aggregation of SIV asset classes by author.

II.A.1.b.iv. Role of Banks and Other Depository Institutions in the Alternative Financial System

The bank-centric financial system and the alternative financial system are not totally separate. Instead, these two systems interact with each other. For example, banks and other depository institutions participate in the alternative financial system in a number of ways:

- Banks and other depository institutions frequently originate loans, leases, and receivables that are securitized by highly leveraged non-depository financial institutions.
- Banks and other depository institutions issue their own derivative securities. In the United States, 135 banks and saving institutions securitized and sold $1.724 trillion of financial assets with servicing retained or with recourse or other seller-provided credit enhancements during the first quarter of 2008.[24] Banks and savings institutions retained $76 billion of seller's interest in their own securitizations carried on their books as loans or securities on March 31, 2008.[25]
- Banks and other depository institutions service derivative securities issued by highly leveraged non-depository financial institutions. In the United States, banks and savings institutions serviced derivative securities worth $3.801 trillion issued by highly leveraged non-depository financial institutions.[26]
- Banks and other depository institutions are also investors in derivative securities. In the United States, banks and savings institutions held $1.281 trillion of RMBS or tranches of CMOs on their books as March 31, 2008.[27]
- Banks and other depository institutions also provide credit to highly leveraged non-depository financial institutions especially hedge funds, investment banks, and bank-sponsored off-balance sheet entities.

II.A.2. Regulatory Changes

After the messy liquidation of Bank Herstatt in 1974, the Federal Reserve and central banks in the other major developed countries founded the Basel Committee on Banking Supervision (BCBS) within the Bank for International Settlements (BIS), an organization of central banks, to coordinate the regulation and supervision of multinational banks. In the same year, the International Organization of Securities Commissions (IOSCO) was formed to coordinate the regulation and supervision of issuance and trading of securities. Twenty years later in 1994, the International Association of Insurance Supervisors (IAIS) was formed to coordinate the regulation and supervision of multinational insurance firms. The BIS, IOSCO, and IAIS have increasingly worked together in the Financial Stability Forum as the traditional distinctions among financial services providers and products have blurred during the last decade.

In 1988, the BCBS developed a set of uniform capital standards for banks and other depository institutions, known as Basel I, that were subsequently implemented by Belgium, Canada, France, Germany, Italy, Japan, Luxemburg, Netherlands, Spain, Sweden, Switzerland, United Kingdom and the United States. While Basel I was a significant improvement over differing national capital standards, Basel I had certain weaknesses. The fixed risk-weights given to broad classes of financial assets for determining required capital under Basel I may encouraged some banks to seek riskier assets within each

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[24] FDIC (First Quarter 2008), Table VII-A.
[25] Ibid., Table VII-A.
[26] Ibid., Table VII-A.
[27] Ibid., Table II-A.

class to maximize returns. Under Basel I, for example, all performing commercial and industrial (C & I) loans to private firms bore a risk-weight of 100 percent regardless of whether the borrowers were start-up businesses or major corporations with the highest credit ratings. This lack of risk differentiation within broad categories of financial assets tempted some banks and other depository institutions to increase their profits by extending more C & I loans to riskier firms that paid higher interest rates and less to financially strong firms that paid lower interest rates. Because off-balance sheet entities were generally outside of the regulatory perimeter for determining capital standards under Basel I, banks and other depository institutions established OBSEs to reduce their capital costs and increase their leverage.

II.A.2.a. Inherent Limitations in Value-at-Risk Models

Around the turn of the century, the BCBS began to review and revise the Basel I capital standards to address these deficiencies. In 2006, the Committee issued the final version of Basel II capital standards that had been proposed in 2004. Basel II is based on three pillars: (1) minimum capital requirements, (2) supervisory review, and (3) market discipline.

Basel II encourages large banks to develop and use **value-at-risk (VaR) models** to assess their exposure to credit, market, and operational risks. Regulators use these value-at-risk models to determine capital adequacy at large banks. These value-at-risk models convinced some bankers and their regulators that some debt and derivative securities were less risky than previously believed. The widespread implementation of value-at-risk modeling convinced these bankers and their regulators that banks could operate safely and soundly with less capital for a given amount of assets. In other words, bank leverage ratios could be higher.

However, this conclusion ignored some inherent limitations of value-at-risk models:

- Value-at-risk models are necessarily based on historical relationships between economic and financial data. Because of the lengthening of the business cycle and the shallowness of recessions since 1982, value-at-risk models often lack sufficient historical data to draw statistically valid inferences about the likely performance of financial products under stressful market conditions. This is especially true for new financial products that have not been through at least one complete business cycle. Thus, value-at-risk underestimate credit and market risk for new financial products generally and for all financial products during stressful market conditions.
- Value-at-risk models do not account for liquidity risk exposure because:
    1. Bid-ask spread data in over-the-counter markets are not generally available;
    2. Even when data are available, there is no widely agreed methodology to calculate liquidity risk; and
    3. Systemic liquidity crises are rare, but extreme events that increase counterparty risks, putting the gross rather than hedged net position at risk.

Value-at-risk modeling also became a standard tool for evaluating risk at all highly leveraged non-depository financial institutions. These models unwittingly encouraged riskier investment behavior in HLNDFIs. In written testimony before the Joint Economic Committee, former Federal Reserve Chairman Paul A. Volcker observed:

> *One broad lesson, it seems to me, is the limitations of financial engineering, involving presumably sophisticated modeling of past market behavior and probabilities of default. It's not simply a matter of inexperience or technical failures in data selection or the choice of relevant time periods for analysis. The underlying problem, I believe, is that mathematic modeling, imbued with the concept of normal frequency distributions found in physical phenomena, cannot*

easily take account of the human element of markets – the episodes of contagious "irrational exuberance" or conversely "unreasoned despair" that characterize extreme financial disturbance.[28]

II.A.2.b. Mark-to-Market Accounting for Level Three Financial Assets

For decades, banks kept performing loans and debt securities (i.e., loans and debt securities in which the borrowers were paying interest and principal in full and on time) on their books at their face value unless management had reasonable grounds to suspect that borrowers might have difficulties in meeting their obligations in the future. Because of this accounting convention, outside investors could not easily determine the market value of banks. To improve financial transparency and increase the ability of market participants to monitor and discipline banks and other depository institutions, accounting standards boards (i.e., the Financial Accounting Standards Board (FASB) in the United States and the International Accounting Standard Board (IASB) in the European Union) and regulators have required banks to use fair value accounting (which is often referred to as mark-to-market accounting).[29]

Under Generally Accepted Account Principles (GAAP), financial instruments are classified into three levels for determining fair value. Level one uses observable prices on the same day for the same instrument in liquid markets. Level two uses (1) observable prices for the same instrument on a nearby date or (2) arbitrage models based on observable prices of similar instruments. Level three uses theoretical models based on price inputs for illiquid instruments (which is often referred to as mark-to-model).[30]

Market-to-market accounting has reduced the opacity about the financial condition of banks and other depository institutions. However, mark-to-market accounting has the unintended consequence of being pro-cyclical. Mark-to-market accounting forces highly leveraged financial institutions to recognize paper losses on their portfolios of debt and derivative securities immediately and therefore reduces their capital.

While the write-downs for level one and level two assets under mark-to-market accounting generally reflect actual changes in the fair value of these assets, the theoretical models used to value level three assets tend to exaggerate actual losses in fair value under stressful market conditions. These theoretical models suffer from many of the same limitations as value-at-risk models – insufficient historical data for financial assets that have not been through at least one business cycle and too few instances of extreme conditions – to draw statistically valid inferences about the fair value of many level three assets, especially during stressful market conditions. Thus, these models have caused financial institutions to write down the value of some level three assets by more than their actual loss in fair value.

In a new type of run, banks, money market mutual funds, and other creditors may refuse to roll-over their repos with hedge funds and investment banks, while banks may reduce their lines of credit. To remain solvent, these hedge funds and investment banks try to sell some of these deeply written-down level three debt and derivative securities in fire sales. In turn, the fire sales drive down the market prices for these debt and derivative securities and force further liquidations. In essence, mark-to-market accounting can help to fuel a modern version of a 19th century financial panic.

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[28] Paul A. Volcker, Written Testimony before the Joint Economic Committee Hearing (May 14, 2008), pg. 2.
[29] Fair value is defined as "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date." Financial Accounting Standard 157.
[30] Ibid.

II.A.3. Misaligned Private Incentives

II.A.3.a. "Skin in the Game"

Securitization relies on the competence and integrity of the originators to screen potential borrowers, to extend loans only to borrowers that meet or exceed appropriate credit standards, and to sell only such loans to the issuers. While issuers check all loans offered for sale contain the necessary financial and legal documentation, it would be cost prohibitive for issuers to verify the accuracy of the information contained in the documentation. At most, issuers can spot check a random sample of the loans to verify the accuracy of the documentation.

Three decades ago, when banks and other depository institutions kept the residential mortgage loans that they extended on their books to maturity, banks and other depository institutions had a strong incentive to enforce good credit standards when extending loans because any credit losses from defaults and foreclosures would reduce the institution's earnings. Today, originators own residential mortgage loans for a very short time before they are sold to issuers. Since originators are paid fees for each loan sold, originators may be tempted to weaken credit standards for extending residential mortgage loans to increase the volume of loans sold, knowing that someone else will incur the credit losses if a large number of these loans do not perform because of the neglect of good credit standards.

Issuers have tried to protect themselves from this risk by requiring originators to repurchase residential mortgage loans that default within a short time. However, these recourse provisions proved inadequate. Indeed, many mortgage banks lacked sufficient capital to make these repurchases when issuers sought recourse. Instead, some of these mortgage banks filed for bankruptcy.

Unlike the issuers of RMBS, the issuers of ABS typically require the originators of motor vehicle loans and credit card receivables to retain a small percentage ownership in all loans sold to issuers. This residual ownership is known as "skin in the game." Requiring mortgage bankers as well as banks and other depository institutions to retain "skin in the game" might have counteracted this misaligned private incentive to weaken credit standards for extending residential mortgage loans.

II.A.3.b. "Issuer Pays"

A nationally recognized statistical rating agency (NRSRO) is a credit rating agency that issues credit ratings that the SEC permits other financial services firms to use for various regulatory purposes. Currently, there are three major NRSROs – Fitch, Moody's, and Standard and Poor's – and six minor ones.

Investors, financial institutions, and even governments use credit ratings to assess the credit risk associated with debt and derivative securities. Many private agreements incorporate credit ratings as a means of determining acceptable investments in pension funds and trust funds. Moreover, governments employ credit ratings as a regulatory tool. For example, central banks and regulators use credit ratings to determining the risk-weights given to assets when calculating capital standards for banks and other depository institutions. Even though credit ratings merely express the informed opinions of the credit rating agencies, the widespread use of these ratings in legal agreements and regulations has given awarded a quasi-official status to these ratings.

Because of this quasi-official status, systemic biases and methodological errors at credit rating agencies distort investment decisions and may have profound negative effects on financial markets, financial institutions, and the broader economy. When credit rating agencies award overly high ratings to any class of debt or derivative securities, financial institutions and other investors purchase more of these securities for their investment portfolios. At the same, systemic biases and errors in credit ratings encourage issuers to supply more of these overly rated securities to financial markets. Thus, systemic biases and errors in credit ratings erroneously stimulate the flow of credit to economic sectors that are receiving funds through these overly rated securities.

Although credit rating agencies are thought to work on behalf of the buyers of debt securities and structured credit products, information leakage creates a free rider problem. Once a buyer and an issuer learn about a credit rating, it is virtually impossible to prevent an issuer from advertising a favorable rating to attract other buyers. This makes it unprofitable for credit rating agencies to operate on a voluntary "buyer pays" business model. Consequently, the credit rating agencies developed an "issuer pays" business model, in which issuers paid the agencies for their ratings. This "issuer pays" business model created a conflict of interest.

For many years, this problem was more theoretical than real. The size of any issue of debt securities for any non-financial corporation, state, or locality was so small relative to the total volume of debt securities issued in any year that neither corporate nor governmental officials could influence the ratings of their debt securities at any credit rating agency by threatening to move their business to other agencies. As securitization blossomed, however, investment banks became very large and frequent issuers so that a threat of going elsewhere might influence the ratings of their ABS, MBS, or tranches of CDOs or CMOs.

On April 11, 2008, *The Wall Street Journal* reported that Moody's "was known as a place where analysts often didn't even promptly pick up their phones, much less talk extensively to companies whose bonds they were rating." In 1996, Brian Clarkson took over the Moody's division responsible for rating mortgage-related debt securities and began making it "more client friendly and focused on market gain" from the other rating agencies. In 1999, Clarkson assumed the responsible for rating many structured finance products as well. Before Clarkson took over this department, Moody's had rated just 15 percent of the "prime" products compared with 51 percent for Fitch and 89 percent for Standard and Poor's. Clarkson fired or reassigned two dozen analysts and hired new ones who started giving higher grades under a new methodology. By 2001, Moody's coverage increased to 65 percent.

The *Journal* also reported that in 2001 Moody's analysts had voted to require that the Bank of America place 4.25 percent of the residential mortgage loans in lower tranches of a CMO that the Bank was planning to issue in order to receive an AAA rating on the highest tranche. When Bank executives protested and threatened to "go with a different rating firm," Moody's reduced the size of the lower-rated tranches. A former Moody's analyst told the *Journal*, "There was … a palpable erosion of institutional support for rating analysts that threatened market share."[31]

II.A.3.c. "Up Front" Incentive Compensation Plans for Investment Bankers

Investment banks have compensated their leading investment bankers primarily through year-end incentive plans tied to the volume and profitability of their transactions for their business unit (i.e., securities underwriting, structuring financial derivatives, mergers and acquisitions, trading, and investment management for others and for the firm's proprietary accounts) during one year. These incentive compensation plans bias investment bankers toward transaction volume (i.e., doing deals now) rather than the long-term profitability of their transactions for their customers. In other words, this structure encourages investment bankers to underwrite and market riskier securities, to structure and market riskier derivatives, and to pursue riskier acquisitions and mergers than they would if part of their incentive compensation was deferred and tied to the long-term profitability of their deals.

Chief executive officers and risk managers at investment banks have recognized this problem for many years. However, investment banks face a prisoner's dilemma. Unless all investment banks were to change their incentive compensation plans simultaneously, the first investment bank that deferred a substantial portion of its incentive compensation plan and tied it to the long-term deal performance would

[31] Aaron Lucchetti, "Ratings Game: As Housing Boomed, Moody's Opened Up," *The Wall Street Journal* (April 11, 2008), pg. A1.

likely lose its best investment bankers to other investment banks that did not make such changes. Recently, a number of investment bank executives voiced their support for an internationally coordinated regulatory change through the Basel Committee on Banking Supervision that would require all investment banks to restructure their incentive compensation packages simultaneously to account for long-term deal profitability.

II.A.4. Methodological Failures at Credit Rating Agencies

A report of the Financial Stability Forum found that credit rating agencies had made three major methodological errors in rating derivative securities that caused many ABS, RMBS, and tranches of CDOs and CMOs to receive unjustifiably high credit ratings. First, credit rating agencies did not have sufficient historical data to rate many derivative securities. In particular, the subprime-related RMBS and the tranches of subprime-related CMOs that credit agencies rated had only existed in a benign economic environment of general prosperity, low long-term interest rates, and rising housing prices. Credit rating agencies lacked the historical data to assess accurately how these derivative securities would perform in an adverse economic environment.[32]

Second, both the Financial Stability Forum and the IMF found that credit rating agencies systematically underestimated the likelihood of default in ABS, RMBS, CDOs, and CMOs because credit rating agencies ignored the correlation (i.e., simultaneous occurrence) of defaults among the underlying collateral. Because ABS, RMBS, CDOs, and CMOs contain similar loans, leases, or receivables as collateral, the performance of the collateral is likely to be highly correlated since similar financial assets are likely to be affect in the same way from general economic trends. Thus, the collateral in an ABS, a RMBS, a CDO, or CMO are more likely to default simultaneously than in a diversified portfolio of debt securities. Because of this correlation, an ABS, a RMBS, a CDO, or CMO will usually have a higher probability of incurring credit losses than the probability of a credit loss on any single collateralized loan, lease, or receivable. [33]

Third, the Financial Stability Forum found that credit rating agencies did not generally confirm the validity of the financial information that issuers provided them. Nor did credit rating agencies review or conduct spot checks of both issuers and originators to determine whether they exercised due diligence when extending and buying loans, leases, and receivables that would be securitized.[34]

Households and institutional investors rely on the ratings of credit rating agencies in choosing financial assets for their portfolios. Given the opacity of ABS, RMBS, CDOs, and CMOs compared to other debt securities, credit ratings probably had greater influence over investor decision-making about these derivative securities than other debt securities. Methodological errors caused both households and institutional investors around the world unknowingly to invest in far riskier portfolio of derivative securities than such investors would have if the credit ratings had been more accurate.

II.B. PANIC AND CRISIS MANAGEMENT

In 2006 and the first half of 2007, the effects of the popping of the housing bubble were largely contained within the housing sector in the United States. After August 9, 2007, the decline in U.S. housing prices, the drop in the demand for new and existing homes, the slump in housing construction, and bankruptcies of major mortgage bankers undermined investor confidence in debt and derivative securities and in banks more generally. These contagion effects ignited a global loss of confidence and an economic slowdown in the United States and much of the rest of the world.

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[32] *Report of the Financial Stability Forum on Enhancing Market and Institutional Resilience* (April 7, 2008), pp. 32-33.
[33] *Report of the Financial Stability Forum* (April 7, 2008), pp. 33-35, and *Global Financial Stability Report* (April 2008), pp. 59-64.
[34] *Report of the Financial Stability Forum* (April 7, 2008), pp. 36-37.

II.B.1. Collapsing Hedge Funds, a German Bank Rescue, and a Run on a British Saving Bank

During the summer of 2007, Bear Stearns was forced to shutter sponsored hedge funds because of credit losses in their subprime-related financial assets. On June 22, 2007, Bear Stearns pledged funds from a collateralized loan of $3.2 billion to assist one of its hedge funds, the Bear Stearns High-Grade Structured Credit Fund, that had invested in subprime-related RMBS and tranches of subprime-related CMOs, and sought to secure credit for another fund, the Bear Stearns High-Grade Structured Credit Enhanced Leveraged Fund, that had made similar investments. The subprime assets in these funds proved to be worth far less than Bear Stearns' mark-to-market model suggested. Merrill Lynch seized $850 million of the underlying collateral, putting these funds out of business. However, Merrill Lynch was only able to recover $100 million.

In late July 2007, the German federal government organized a rescue package for IKB Deutsche Industriebank. IKB incurred huge losses because it and its off-balance sheet entity, Rhinebridge SIV, had invested heavily in subprime-related RMBS and tranches of subprime-related CMOs that lost much of their value after the U.S. housing bubble popped. Since the rescue began, the German federal government, KfW Bankengruppe (owned 80 percent by the German federal government and 20 percent by German state governments), and private banks in Germany have infused IKB with a total of $11.9 billion to keep its doors open. So far, the German federal government has been unsuccessful in arranging a sale of IKB.[35]

On August 9, 2007, BNP Paribas announced that it was suspending redemptions in three of its sponsored hedge funds because it could not value the subprime-related RMBS and tranches of subprime-related CMOs in these funds. This announcement triggered a global financial crisis.

Northern Rock is a British saving bank that had two factors that made it particularly vulnerable to a housing-related panic. First, Northern Rock invested primarily in residential mortgage loans. Second, about three quarters of its liabilities were short-term debt securities, while the remaining quarter was deposits. After the BNP Paribas shock, institutional investors refused to rollover their short-term debt securities. Northern Rock was then forced to borrow from the Bank of England on September 12, 2007. When knowledge of this emergency borrowing became public two days later, this process accelerated into a full-scale run on Northern Rock. To quell the run, the Chancellor of the Exchequer Alistair Darling announced on September 17, 2007, that the British government would guarantee all deposits at Northern Rock. Its management failed at a number of attempts to raise additional capital or arrange a merger. On February 17, 2008, Chancellor Darling announced the nationalization of Northern Rock. Taking over Northern Rock's liabilities effectively added an amount to Britain's government debt equal to approximately 7 percent of its GDP.

II.B.2. Widening Interest-Rate Spreads

The revulsion toward new subprime-related RMBS and tranches of subprime-related CMOs caused investors to reassess the credit and liquidity risk associated with all debt securities and credit derivatives. Collectively, investors concluded that they had underestimated the credit and liquidity risk with most debt securities, structured credit products, and credit derivatives. As a result, the credit markets began to increase the credit and liquidity risk premiums built into interest rates. Since credit markets assume that U.S. Treasury debt securities do not have credit or liquidity risk, one may observe this repricing of credit and liquidity risk premiums by comparing the interest-rate spreads between Treasuries and other comparable-maturity debt securities Treasuries over time. Widening interest-rate spreads increase the cost of borrowing for corporations and state and local governments.

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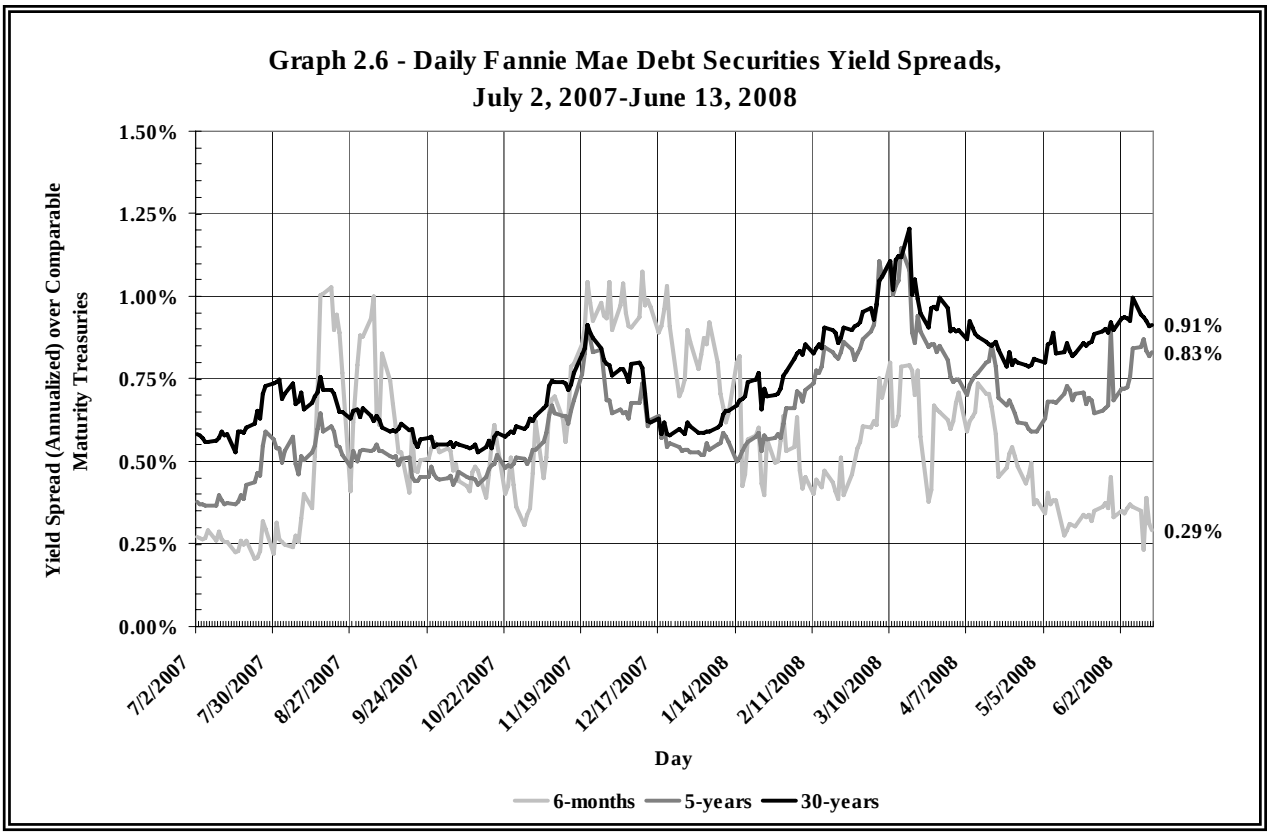
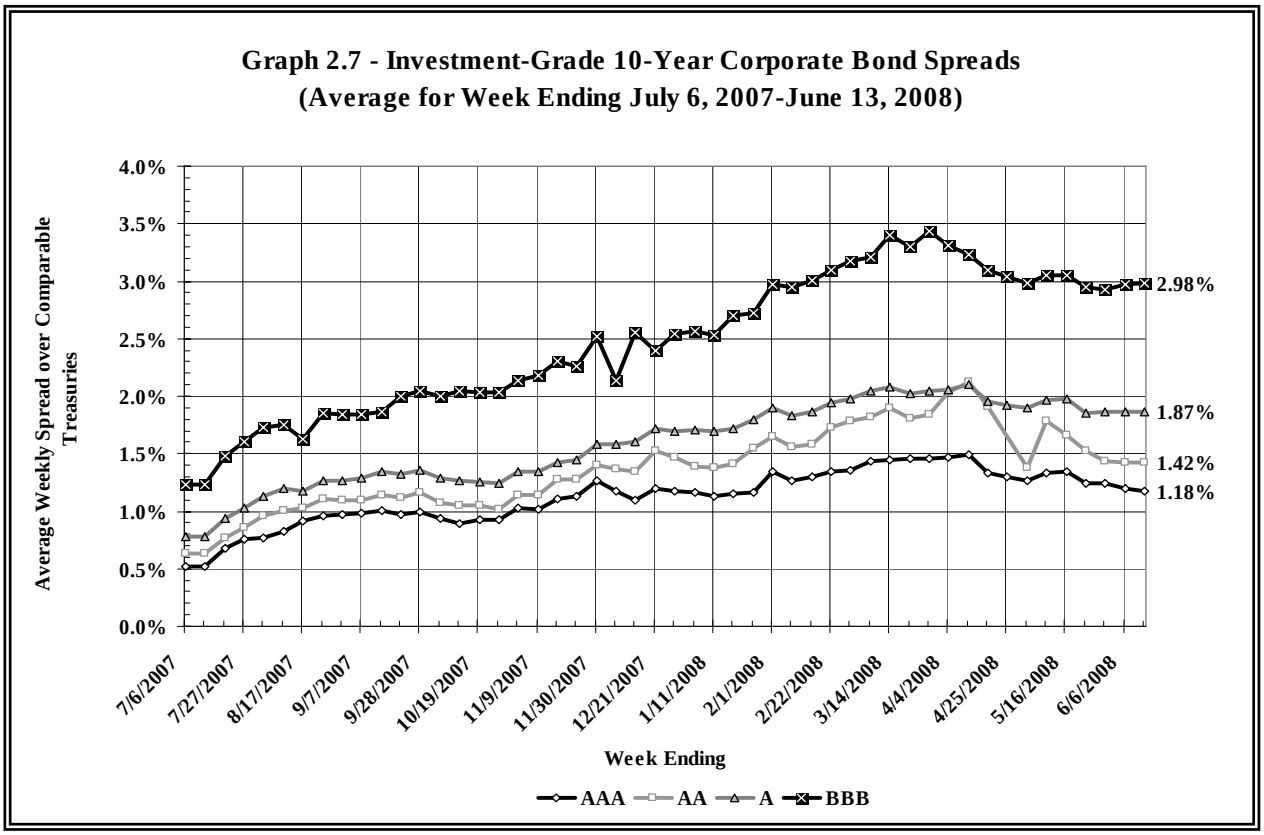
[35] "German Government No Longer Expects to Get 800 million Euros for IKB," *Forbes* (June 18, 2008). Found at: http://www.forbes.com/afxnewslimited/feeds/afx/2008/06/18/afx5127459.html.

In general, interest-rate spreads rose from August 9, 2007 through March 2008. Since then, some easing in the elevated level of spreads has occurred. Most of this improvement is concentrated in the short end of the yield curve for low credit risk debt securities. Spreads for long-term debt securities and for debt securities involving average to high credit risk still remain relatively high. For example:

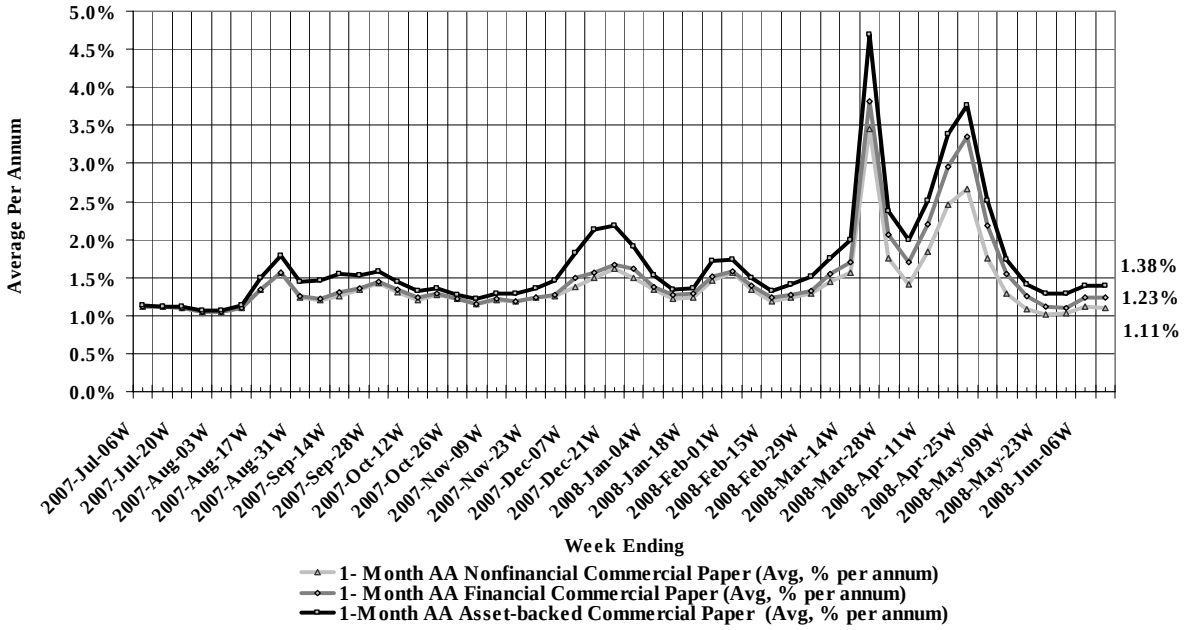
- **Fannie Mae debt securities**. The spreads on Fannie Mae debt securities with a six-month constant maturity increased from 27 basis points[36] on July 2, 2007, to 29 basis points on June 13, 2008. For five-year constant maturity, the spread expanded from 38 basis points to 83 basis points. For a thirty-year constant maturity, the spread rose from 58 basis points to 91 basis points (see Graph 2.6).[37]
- **Investment-grade corporate bonds**. The average spread on Standard and Poor's AAA-rated 10-year corporate bonds increased from 52 basis points for the week ending on July 6, 2007 to 118 basis points for the week ending on June 13, 2008. The average spread on AA-rated 10-year corporate bonds increased from 63 basis points to 142 basis points. The average spread on A-rated 10-year corporate bonds increased from 78 basis points to 187 basis points. The average spread on BBB-rated 10-year corporate bonds increased from 123 basis points to 298 basis points (see Graph 2.7).[38]
- **Commercial paper**. In contrast with investment-grade corporate bonds, the spreads on investment-grade commercial paper have nearly returned to their pre-crisis levels. For non-financial firms, the average spread on one-month AA-rated commercial paper was unchanged at 111 basis points for the week ending on July 6, 2007 and the week ending on June 13, 2008. For financial firms, the average spread on one-month AA-rated commercial paper increased from 112 basis points to 123 basis points. The average spread on one-month AA-rated ABCP increased from 113 basis points to 138 basis points (see Graph 2.8).[39]
- **Municipal bonds**. The spread on five-year AAA-rated municipal bonds increased from a minus 102 basis points on July 2, 2007 to a minus 55 basis points on June 6, 2008. The spread on thirty-year AAA-rated municipal bonds increased from a minus 40 basis points to a positive 18 basis points. Even though the interest paid on municipal bonds is exempt from federal income taxes while the interest paid on Treasuries is taxable, some AAA-rated municipal bonds are now yielding more than comparable Treasuries (see Graph 2.9).[40]
- **Non-investment grade or "junk" grade corporate bonds**. The most dramatic widening of spreads occurred in non-investment grade or "junk" bonds. The average spread on Standard and Poor's BB+-rated 10-year corporate bonds increased from 225 basis points for the week ending on July 6, 2007 to 395 basis points for the week ending on June 13, 2008 (see Graph 2.10).

[36] A basis point (bp) equals 1/100 of 1 percent.
[37] Federal Reserve and Fannie Mae/Haver. Author calculated the spreads.
[38] Federal Reserve/Haver. Author calculated the spreads.
[39] Federal Reserve/Haver. Author calculated the spreads.
[40] Federal Reserve and *Wall Street Journal*/Haver. Author calculated the spreads.

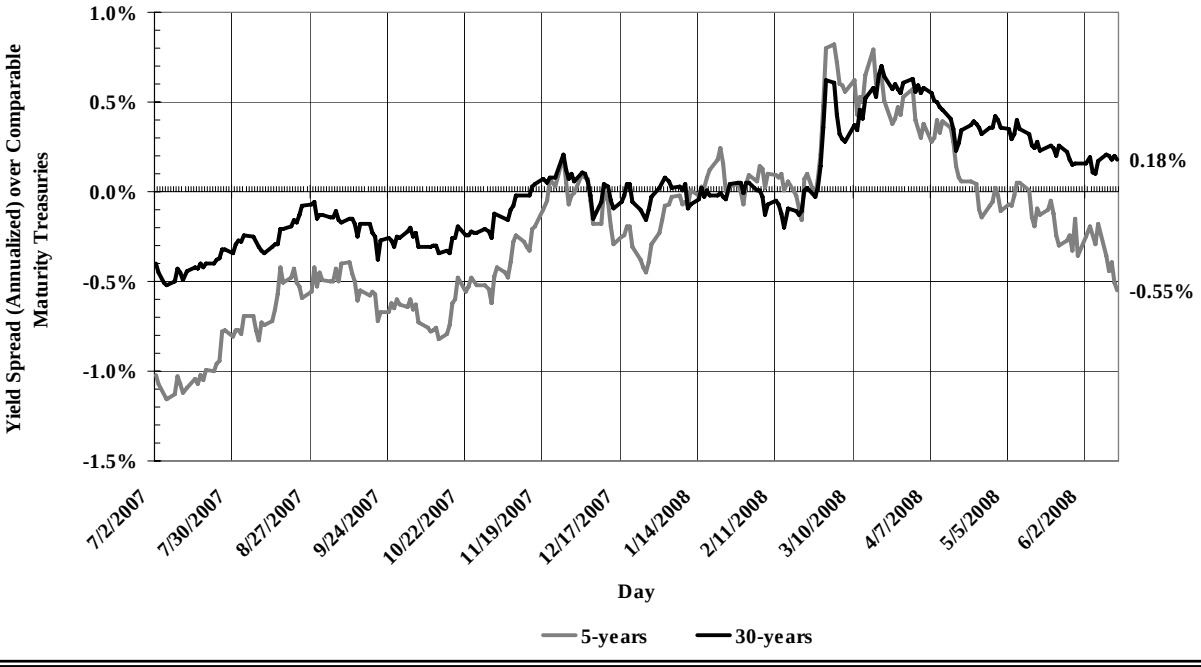

Graph 2.6 - Daily Fannie Mae Debt Securities Yield Spreads,
July 2, 2007-June 13, 2008
Yield Spread (Annualized) over Comparable Maturity Treasuries
1.50%
1.25%
1.00%
0.75%
0.50%
0.25%
0.00%
0.91%
0.83%
0.29%
7/2/2007
7/30/2007
8/27/2007
9/24/2007
10/22/2007
11/19/2007
12/17/2007
1/14/2008
2/11/2008
3/10/2008
4/7/2008
5/5/2008
6/2/2008
Day
6-months
5-years
30-years

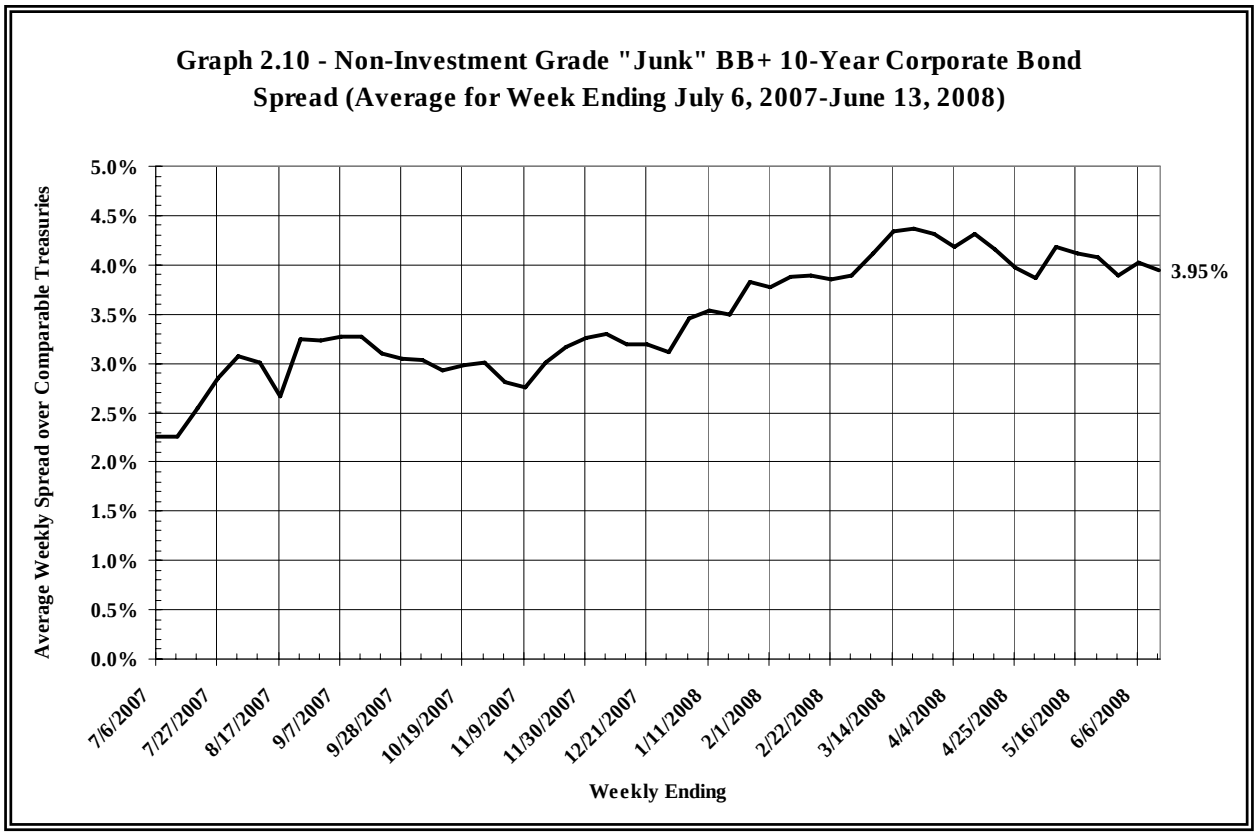

Graph 2.7 - Investment-Grade 10-Year Corporate Bond Spreads
(Average for Week Ending July 6, 2007-June 13, 2008)
Average Weekly Spread over Comparable Treasuries
4.0%
3.5%
3.0%
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
2.98%
1.87%
1.42%
1.18%
7/6/2007
7/27/2007
8/17/2007
9/7/2007
9/28/2007
10/19/2007
11/9/2007
11/30/2007
12/21/2007
1/11/2008
2/1/2008
2/22/2008
3/14/2008
4/4/2008
4/25/2008
5/16/2008
6/6/2008
Week Ending
AAA
AA
A
BBB

Graph 2.8 - One-Month AA Commercial Paper Spreads
(Average for Week Ending July 6, 2007 - June 13, 2008)



Graph 2.9 - Daily AAA Municipal Bonds Yield Spreads
(July 2, 2007-June 13, 2008)





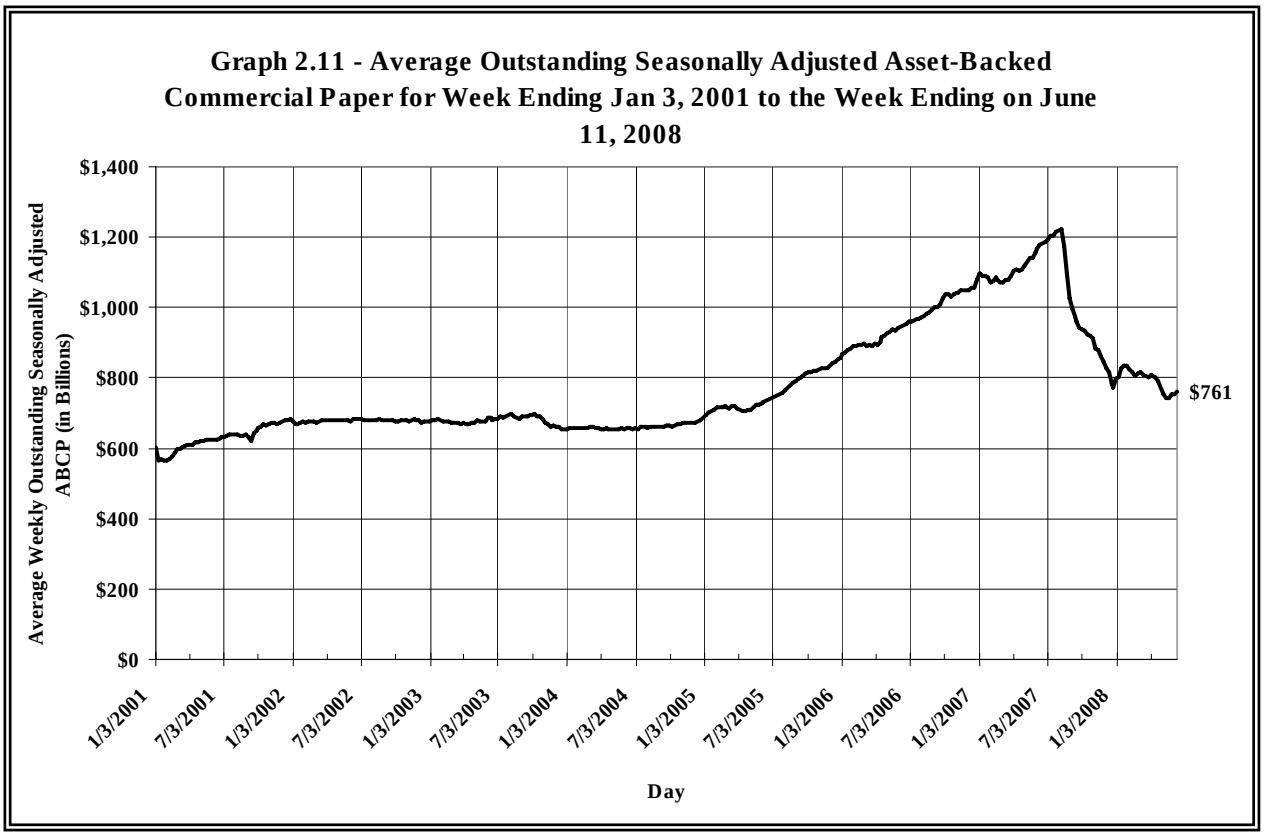
II.B.3. Asset-Backed Commercial Paper Conduits and Structured Investment Vehicles

During the fall of 2007, asset-backed commercial paper conduits and structured investment vehicles that had invested heavily in subprime-related RMBS and tranches of subprime-related CMOs were unable to rollover their asset-backed commercial paper or to find counterparties for their repos. Because of these funding liquidity problems, many ABCP conduits and SIVs drew upon their back-up lines of credit with sponsoring banks.

The growing possibility that some ABCP conduits and SIVs might be placed into receivership threatened the reputation of their sponsoring banks. To protect their reputation, some sponsoring banks repaid the creditors of the sponsored ABCP conduits and SIVs and then absorbed the assets of sponsored ABCP conduits and SIVs onto the balance sheets of the sponsoring banks. Thus, the sponsoring banks implicitly acknowledged that these sponsored ABCP conduits and SIVs should have never been considered as separate entities from either an accounting or a regulatory perspective. On December 14, 2008, for example, Citigroup announced that it was absorbing $58 billion of assets from seven troubled SIVs that it had sponsored.[41] Previously, HSBC Holdings Plc, Société Générale SA and WestLB AG had absorbed the assets from their troubled SIVs.[42]

These absorptions of ABCP conduits and SIVs may be seen indirectly through the 37.8 percent decline in seasonally adjusted outstanding ABCP from a peak of an average of $1.195 trillion for the

[41] Shannon D. Harrington and Elizabeth Hester, "Citigroup Rescues SIVs With $58 Billion Debt Bailout (Update 5)," *Bloomberg* (December 14, 2007). Found at: http://www.bloomberg.com/apps/news?pid=20601087&sid=apiI216v.OAI&refer=home.
[42] Ibid.



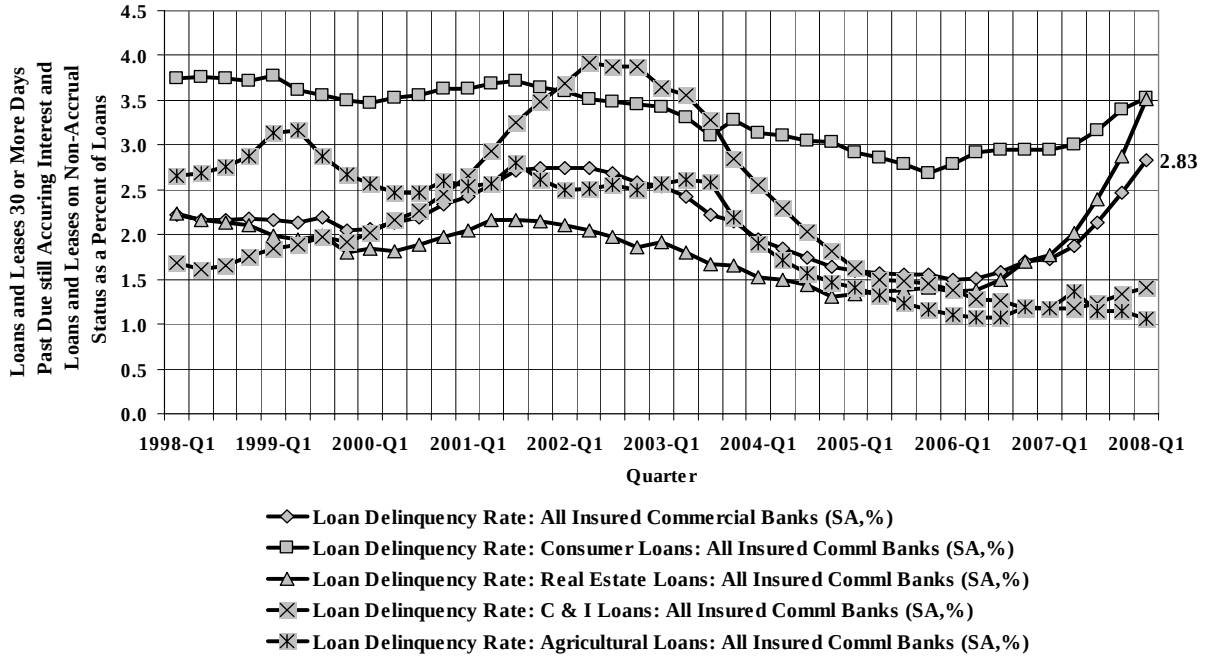
week ending on August 8, 2007 to an average of $761 billion the week ending on June 11, 2008 (see Graph 2.11).[43] These absorptions represent an involuntary increase in the assets on bank balance sheets and decrease of regulatory capital ratios. For example, Citigroup's assumption reduced its risk-weighted Tier I capital ratio by 0.16 percentage points to 7.32 percent.[44] As a result of these absorptions, banks have less capacity than they would otherwise have to extend loans to creditworthy households and firms.

Other banks, investment banks, and hedge funds "orphaned" their SIVs. These orphaned SIVs defaulted on their debt obligations and were placed into receivership. Consequently, total SIV assets under management fell by about one-quarter from an estimated peak of $400 billion in July 2007 to an estimated $300 billion in May 2007.[45]

On June 17, 2008, Goldman Sachs announced a plan, known as the "Cheyne model," for restructuring the $6.6 billion of debt owed by Cheyne Finance to its senior creditors. This SIV was orphaned by its sponsor, Cheyne Capital Management Ltd., on October 17, 2007 and then placed into receivership. Under the Cheyne model, the receiver will auction Cheyne Finance's assets among seven investment banks. Once market prices for these assets are established through this auction, Goldman Sachs will purchase these assets at their market prices. On the next day, Goldman Sachs will offer the senior creditors in the Cheyne Finance four options: (1) accept a cash payment based on these market prices (possibly for less than the amount due from the Cheyne Finance), (2) take a pro-rata share of Cheyne Finance's assets, (3) buy zero-coupon notes issued by Goldman Sachs, or (4) buy pass-through

[43] Federal Reserve/Haver. Author calculated percent change. Delinquent loans and leases include loans and leases past due thirty days or more still accruing interest and all loans and leases with non-accrual status.
[44] Harrington and Hester (December 14, 2007).
[45] Anousha Sakoui and Gillian Tett, "SIV Restructuring: A Ray of Light for Shadow Banking," *Financial Times* (June 18, 2008), pg. 23.

Graph 2.12 - Deliquency Rates (Seasonally Adjusted) as a Percent of Loans and Leases in U.S. Banks Q1-1998 to Q1-2008



notes in a new SIV that will manage Cheyne Finance's remaining assets. The junior creditors in Cheyne Finance will be wiped-out.

Goldman Sachs plans to use this Cheyne model to restructure the senior debts of four other orphaned SIVs:

1. $8.7 billion in Whistlejacket (sponsored by Standard Chartered Bank),
2. $1.7 billion in Mainsail II (sponsored by Solent Capital Ltd),
3. $1.2 billion in Golden Key (sponsored by Barclays Capital), and
4. $0.9 billion in Rhinebridge (sponsored by IKB).[46]

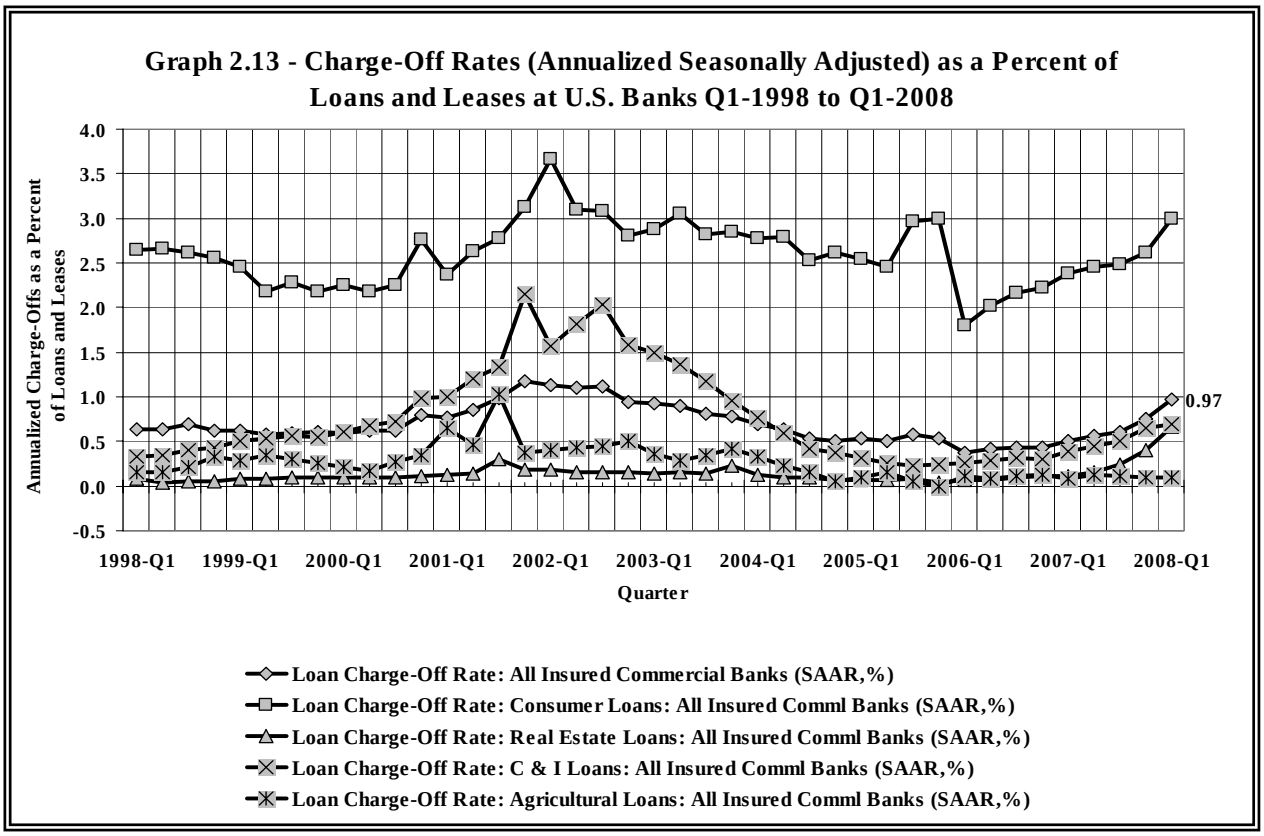
If these restructurings of senior debt in orphaned SIVs prove successful, it may signal that a bottoming has begun in financial markets.

II.B.4. Deteriorating Credit Quality

There has been a widespread deterioration in the credit quality of financial assets in all highly leveraged financial institutions. For example, Graph 2.12 shows a rapid increase in the seasonally adjusted delinquency rate for loans and leases in U.S. banks from 1.51 percent in the second quarter of 2006 when the housing bubble popped to 2.83 percent in the first quarter of 2008.[47] This increase was driven primarily by a sharp rise in the seasonally adjusted delinquency rate on real estate loans in U.S. banks from 1.38 percent in the second quarter of 2006 to 3.52 percent in the first quarter of 2008. This

[46] Ibid.

[47] The delinquency rate is the sum of all loans and leases thirty days or more past due and still accruing interest and all loans and leases on non-accrual status divided by total loans and leases.

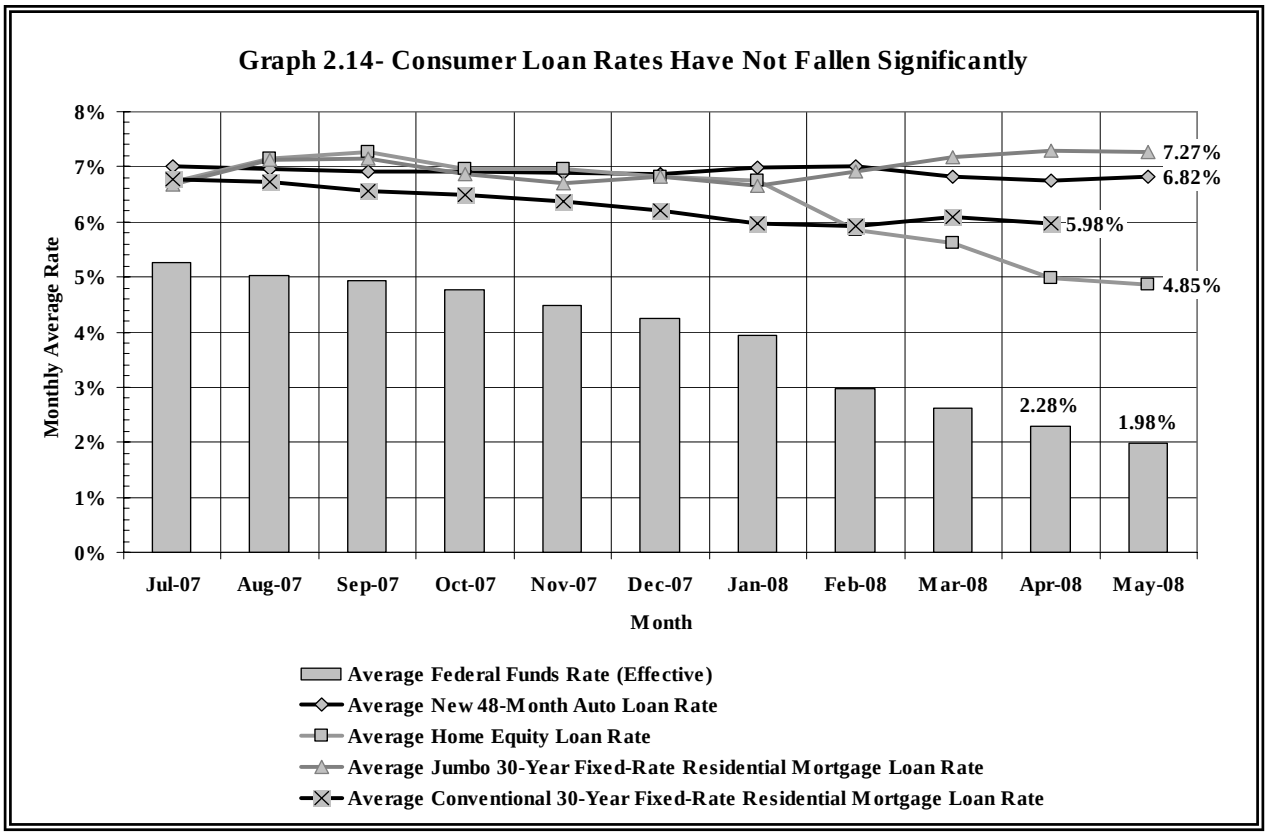


deterioration in the performance of real estate loans can significantly impair the ability of banks and savings institutions to lend since real estate loans comprised 60.2 percent of all loans and leases in all banks and savings institutions in the United States on March 31, 2008.[48] In contrast to the performance of real estate loans, the seasonally adjusted delinquency rate increased modestly on consumer loans. Delinquency rates on both commercial and industrial (C&I) loans and agricultural loans remained near their recent lows.[49]

Likewise, Graph 2.13 displays a significant increase in the annualized seasonally adjusted charge-off rate on loans and leases in U.S. banks from 0.42 percent in the second quarter of 2006 to 0.97 percent in the first quarter of 2008. Again, this increase was due to steep rise in the annualized seasonally adjusted delinquency rate on real estate loans in U.S. banks from 0.07 percent in second quarter of 2006 to 0.66 percent in the first quarter of 2008.[50]

To date, the increases in the delinquency and charge-offs rates for real estate loans have been concentrated in residential mortgage loans. On June 6, 2008, the *Wall Street Journal* reported independent analysts expect these credit quality problems to spread to commercial mortgage loans used to fund residential development and construction.[51] On March 31, 2008, U.S. banks and savings institutions had extended $632 billion in real estate construction and development loans.[52] Zelman & Associates

[48] FDIC (First Quarter 2008), Table V-A.
[49] Federal Reserve/Haver.
[50] Ibid.
[51] Michael Corkery, Jonathan Kapp, and Damian Paletta, "Real-Estate Woes of Banks Mount: Lenders Dumping Bad Loans at Discount; Regulators See Losses Continuing," *Wall Street Journal* (June 6, 2008), pg. A-1.
[52] FDIC (First Quarter 2008), Table V-A.



recently predicted that banks will charge-off between 10 percent and 26 percent of these commercial mortgage loans over the next five years, which would amount to between $65 billion and $165 billion.[53]

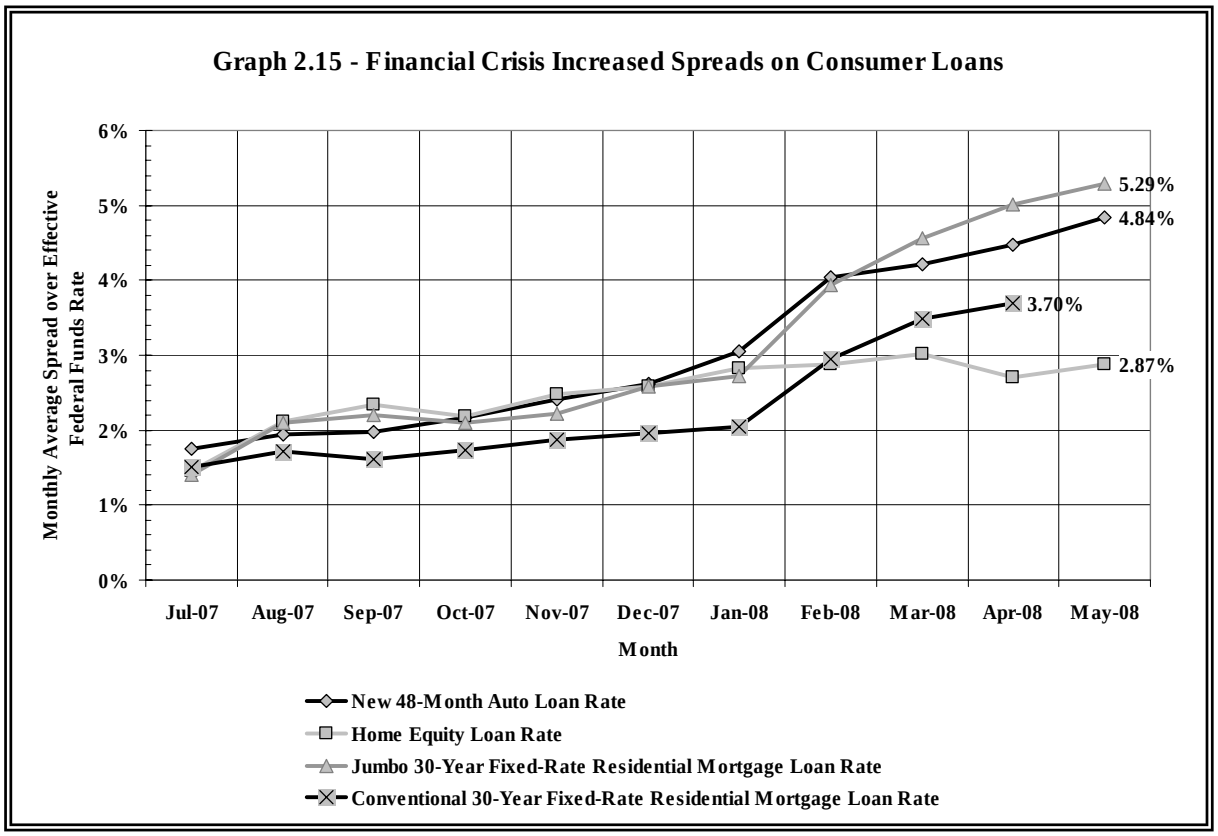
Another sign of the deterioration of credit quality of assets in financial institutions was the downgrading of three of the four remaining major independent investment banks in the United States by Standard and Poor's on June 2, 2008. Morgan Stanley fell from AA- to A+, while Lehman Brothers and Merrill dropped from A+ to A. This caused the price credit default swaps for Lehman Brothers bonds to rise by 10 bps to 248 bps (by $10,000 per year to $248,000 per year for a $10 million five-year bond). Similarly, the CDS price for Merrill Lynch bonds rose by 1 bps to 190 bps, while the CDS price for Morgan Stanley bonds jumped by 10 bps to 155 bps. Even though Goldman Sachs was not downgraded, the CDS price for its bonds also increased by 5 bps to 100 bps.

II.B.5. Tightening Credit Standards at Banks Raises Borrowing Costs and Reduces Credit Availability to Non-Financial Firms and Households

Higher funding costs, fears of a liquidity squeeze, and losses on subprime-related RMBS and tranches of subprime-related CMOs have caused many banks and other depository institutions to tighten their credit standards across a wide variety of loan products that are not related to residential mortgage loans. In the quarterly *Survey of Terms of Business Lending*, the average interest-rate spread for all commercial and industrial (C&I) loans rose from 178 basis points over the intended federal funds rate during the first quarter of 2007 to 222 basis points in the first quarter of 2008.[54]

Since August 9, 2007, the interest-rate spreads on most consumer loans have widened. The monthly average spread for a 48-month installment loan for purchasing a new motor vehicle increased

[53] Corkery, Kapp, and Paletta, (June 6, 2008), pg. A-1.
[54] Ibid.



from 175 basis points in July 2007 before the financial crisis began to 448 basis points in May 2008.[55] The average monthly spread for a home equity loan increased from 146 basis points in July 2008 to 278 basis points in May 2008.[56] The average monthly spread for a jumbo 30-year fixed-rate residential mortgage loan jumped from 141 basis points in July 2007 to 529 basis points in May 2008.[57] The average monthly spread for a conforming conventional 30-year fixed-rated residential mortgage loan increased from 151 basis points in July 2007 to 370 basis points in April 2008 (see Graph 2.15).[58] Consequently, the interest rates on most consumer loans have not declined as normally happens when the Federal Reserve lowers short-term interest rates (see Graph 2.14).

The most recent *Senior Loan Officer Survey on Bank Lending Practices at Selected Large Banks in the United States* in April 2008 found that over the past three months 55.4 percent of all reporting banks had tightened their credit standards for commercial and industrial loans and lines of credit to large non-financial firms ($50 million or more in annual sales), while 51.8 percent had tightened their credit standards for small non-financial firms (less than $50 million in annual sales) (see Table 2.3).[59] Among the banks that had tightened their credit standards for C&I loans and lines of credit, 93.5 percent attributed their tightening to worsening economic conditions, 78.2 percent to a reduced tolerance for risk, 72.0 to worsening industry-specific conditions, 54.3 percent to decreased liquidity in the secondary market for these loans, 45.3 percent to less aggressive competition from other lenders, 32.6 percent to a

[55] Federal Reserve and Wall Street Journal/Haver. Calculation by author.
[56] Ibid.
[57] Ibid.
[58] Federal Reserve and Federal Housing Finance Board/Haver. Calculation by author.
[59] Federal Reserve, Senior Loan Officer Survey on Bank Lending Practices, Table 1, Question 1a and 1b (January 2008). Found at: http://www.federalreserve.gov/boarddocs/SnLoanSurvey/200801/table1.htm.

deterioration in the bank's capital condition, 32.6 percent to increased defaults by borrowers in credit markets, and 22.7 percent to a concern about funding liquidity at their bank.[60]

Table 2.3 - Changes in Credit Standards for C&I Loans during the Three Months Ending April 2008			
Question 2	**Action**	**Percent of Banks Taking Action for Large Firms (A)**	**Percent of Banks Taking Action for Small Firms (B)**
a	Reduced maximum size for lines of credit	34.5%	21.8%
b	Reduced maximum maturity of loans	34.5%	23.6%
c	Increased cost of lines of credit	61.8%	54.5%
d	Increased spread over cost of funds	74.6%	65.4%
e	Increased risk premium on riskier loans	66.3%	54.5%
f	Tightened loan covenants	45.4%	27.3%
g	Tightened collateral requirements	29.1%	21.8%

For commercial real estate loans, 78.6 percent of all reporting banks had tightened their credit standards for commercial real estate loans during the past three months.[61] For residential mortgage loans, 62.3 percent and 77.7 percent of banks reported tightening their credit standards on prime residential mortgage loans and subprime residential mortgage loans, respectively, during the last three months.[62] For revolving home equity lines of credit, 70.3 percent of banks reported tightening credit standards during the last three months.[63] Moreover, 44.4 percent and 32.4 percent of banks reported tightening credit standards for consumer installment loans and credit cards, respectively, during the last three months.[64]

II.B.6. Credit Guaranty Insurance

Credit guaranty insurers (also known as mono-line insurers) guarantee the timely payment of interest and principal to the owners of corporate and municipal bonds if their issuers were to default. Issuers pay premiums to credit guaranty insurers for their guaranty. Upon receiving a guaranty, credit rating agencies assign the credit rating of the credit guaranty insurer (which historically had Aaa or AAA credit ratings) rather than that of the issuer. Because of this substitution, issuers that did not have an Aaa or AAA credit rating could reduce their interest expense. Over the last few decades, bond insurance proved a profitable low-risk business. Credit guarantee insurers covered about one-half of all municipal bonds issued since 1971 with $1.348 trillion bond insurance in force at year-end 2006 (see Graph 2.16).[65]

During the last decade, credit guaranty insurers expanded into structured finance insurance by guaranteeing the timely payment of interest and principal on ABS, RMBS, and tranches of CDOs and CMOs. At year-end 2006, credit guaranty insurers had guaranteed $824 billion of structured credit products (see Graph 2.17).[66]

Unfortunately, structured finance insurance proved far more risky than bond insurance. The growing possibility that credit guaranty insurers would suffer large losses because of widespread defaults of subprime-related RMBS and subprime-related tranches of CMOs caused precipitous declines in their share prices. During the winter of 2007-08, credit rating agencies threatened to downgrade their Aaa or AAA credit ratings, which would effectively prevent them issuing new guaranties, unless these credit guaranty insurers quickly secured substantial equity infusions from investors.

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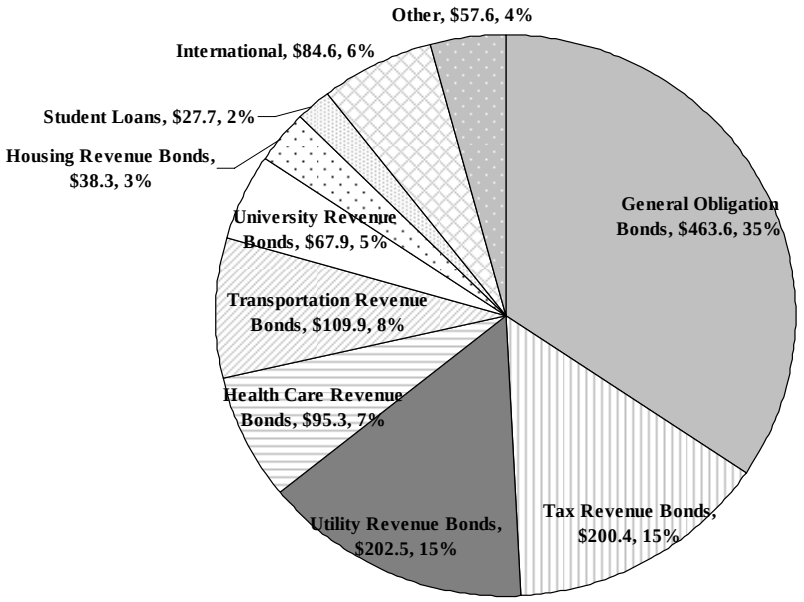
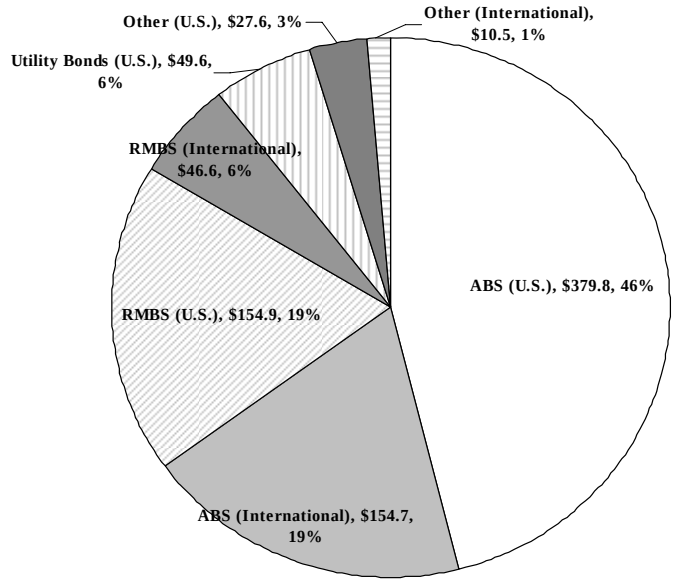
[60] Ibid. Questions 3A b, c, e, and f.
[61] Ibid. Question 7.
[62] Ibid. Questions 11a and 11c.
[63] Ibid. Question 13.
[64] Ibid. Questions 16 and 17.
[65] Association of Financial Guaranty Insurers. Found at: http://www.afgi.org/pdfs/2006financialcharts.pdf.
[66] Ibid.

Graph 2.16 - Net Financial Guarantees in Force from Credit Guaranty Insurers at Year-End 2006
Public Finance (Total $1,347.8 Billion)



Graph 2.17 - Net Financial Guarantees in Force from Credit Guaranty Insurers Year-End 2006
Structured Finance (Total $823.7 Billion)



During March 2008, one of the three major credit rating agencies, Fitch, downgraded Ambac Assurance Group and MBIA Group, the largest and second largest credit guaranty insurers, respectively, from AAA to AA, while the other two major credit rating agencies, Moody's and Standard and Poor's,

have retained their Aaa and AAA ratings, respectively, with negative outlooks. The third major credit guaranty insurer, Financial Security Assurance (FSA), retains its Aaa and AAA ratings because it had less exposure to structured finance insurance than its two main competitors. Billionaire Warren Buffett recently initiated the regulatory process to enter credit guaranty insurance by establishing a new firm, Berkshire Hathaway Assurance.

In early 2008, MBIA raised $2.7 billion in new equity, while investor Wilbur Ross agreed to buy $250 million of shares in Ambac with an option to buy another $750 million. However, these capital infusions proved inadequate to protect the Aaa and AAA ratings of Ambac and MBIA. On June 4, 2008, Moody's announced that it would "most likely" downgrade Ambac and MBIA from Aaa. After Moody's announcement, the price of credit default swaps for MBIA debt spiked 18.5 percent upfront plus 5 percent per year for five years to 23.5 percent upfront plus 5 percent per year for five years on June 2, 2008. Similarly, the upfront cost of insuring Ambac debt jumped from 21.5 percent to 25.5 percent.[67] On June 10, 2008, Standard and Poor's reduced the credit ratings on both Ambac and MBIA from AAA to AA. Ten days later, Moody's cut its credit ratings on Ambac from Aaa to Aa and slashed its credit rating on MBIA from Aaa to A.[68]

The loss of Aaa and AAA ratings for both Ambac and MBIA has forced financial institutions to downgrade the previous Aaa or AAA credit ratings on more than $1 trillion of debt and derivative securities that Ambac and MBIA have insured to the higher of either (1) the credit rating of the insurer or (2) the credit rating of the security without the insurance. As a result, the *Financial Times* expects that Citigroup, Merrill Lynch, and UBS alone will make additional write-downs of $10 billion.[69]

Moreover, *Bloomberg* reported:

> *The ability of MBIA and Ambac to continue as viable ongoing companies is highly in doubt," according to a note from Rob Haines and Craig Guttenplan, analysts at debt research firm CreditSights Inc. in New York* [70]

II.B.7. Funding Liquidity Problems for Financial Institutions

II.B.7.a. LIBOR

Since August 9, 2007, the interbank market displayed great liquidity stress. As banks became increasingly suspicious about the funding liquidity of other banks, the cost of funds in the interbank market increased sharply. The spread between the three-month London Interbank Offer Rate (LIBOR) and the daily effective federal funds rate, which had averaged 10 basis point between January 1, 2007 and August 8, 2007, widened abruptly to 89.5 basis points on August 9, 2007, as perceived counterparty risk increased after BNP Paribas suspended redemptions in three of its hedge funds that had invested heavily in subprime-related RMBS and tranches of subprime-related CMOs. While this spread fluctuated widely, it remained at an elevated average of 54.4 points for the remainder of 2007. From January 2, 2008 to March 14, 2008, market liquidity seemed to improve as perceived counterparty risk diminished. The spread averaged 2.7 basis points. Following the collapse of Bear Stearns and its acquisition by JPMorgan-Chase, perceived counterparty risk has increased once again. After March 17, 2008, the average spread rose once again, reaching 68.6 basis points on June 6, 2006 (see Graph 2.18).

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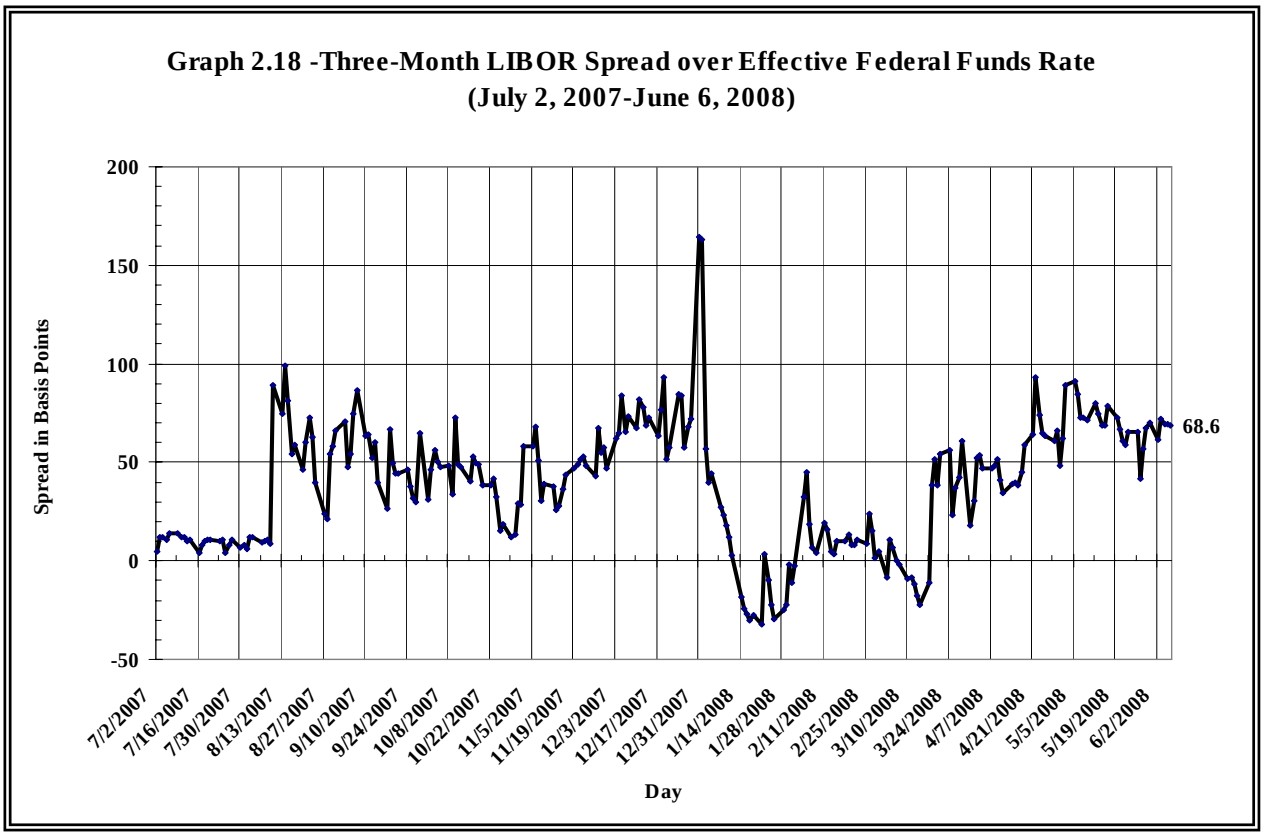
[67] Christine Richard and Jody Shenn, "MBIA, Ambac May Quit Aaa Battle on Moody's Likely Cut (Update3)" *Bloomberg.com* (June 5, 2008). Found at: http://www.bloomberg.com/apps/news?pid=20601087&sid=aOQpu7f9_R3s&refer=home.

[68] Aline van Duyn and Nicole Bullock, "Gloom Follow MBIA Rating Cut," Financial Times (June 20, 2008). Found at: http://www.ft.com/cms/s/0/3a08826e-3eff-11dd-8fd9-0000779fd2ac.html.

[69] Ibid.

[70] Richard and Shenn (June 5, 2008).



An April 16, 2008 article in the *Wall Street Journal* alleged that some banks were not reporting their actual cost of funds to the British Bankers Association that set the LIBOR rate every morning based on reports from banks around the world. The minutes of a recent meeting in the Bank of England recorded, "Several group members thought that LIBOR fixings had been lower than actually traded interbank rates through period of stress." Citigroup interest-rate strategist Scott Peng thought the three-month LIBOR should be up to 30 basis points higher than it was reported. Peng speculated that some banks were understating the interbank rate that they were paying to conceal the full extent of the problems that these banks were encountering with funding liquidity.[71] This suggests that the low LIBOR spreads on Graph 2.18 during the first four months of 2008 did not accurately reflect market conditions and that funding liquidity for banks was actually tighter during this period.

On the same day that this article was published, the British Bankers' Association launched an investigation into whether banks had been underreporting their cost of funds. On April 18, 2008, the *Wall Street Journal* reported a large and unusual one-day jump in LIBOR of 8.375 basis points during the previous day. This was the biggest one-day increase since the 12 basis point increase on August 9, 2007, when the financial crisis began.[72]

A study published by the *Wall Street Journal* on May 29, 2008 suggested that five of the sixteen banks whose reports are used to calculate LIBOR appeared to have underreported their cost of funds significantly from January 2008 until the publication of the article alleging underreporting appeared on

[71] Carrick Mollenkamp, "Libor Fog: Bankers Cast Doubt on Key Rate Amid Crisis," *Wall Street Journal* (April 16, 2008), pg. A-1.
[72] Carrick Mollenkamp, "Libor Surges After Scrutiny Does, Too: Banks May Be Reacting as BBA Speeds Probe; Impact on Business," *Wall Street Journal* (April 18, 2008), pg. C-1.

April 16, 2008. These banks are Citigroup, JPMorgan-Chase, WestLB (Germany), HBOS PLC (United Kingdom), and UBS AG (Switzerland).

II.B.7.b. Hedge Fund Haircuts

Prior to August 9, 2008, banks, other depository institutions, and investment banks provided substantial funding to hedge funds. At year-end 2007, the prime brokers, which the OECD defines as the ten banks and investment banks with the largest investment banking functions in the world, advanced $1.36 trillion to hedge funds.[73] These advances are based on the value of the securities in hedge fund portfolios after taking a percentage "haircut" to account for the risk inherent with each type of security. The IMF found that the size of typical haircuts had increased significantly between January-May 2007 and April 2008 (see Table 2.4). For example, the amount that hedge funds could borrow under lines of credit by pledging Treasuries as collateral fell from 99.75 percent of their value in early 2007 to 97 percent of their market value in April 2008.

Table 2.4 – Typical "Haircut" on Collateral for Lines of Credit to Hedge Funds (in percent)

Security	January-May 2007	April 2008
U.S. Treasuries	0.25	3
Investment-grade Bonds	0-3	8-12
Non-investment-grade Bonds	10-15	25-40
Equities	15	20
Investment-grade CDS	1	5
Synthetic-super-senior	1	2
Senior Leveraged Loans	10-12	15-20
Second-lien Leveraged Loans	15-20	25-35
Mezzanine Level Loans	18-25	35+
AAA ABS CDOs	2-4	15
AA ABS CDOs	8-15	30-50
A ABS CDOs	8-15	30-50
BBB ABS CDOs	10-20	40-70
Equity ABS CDOs	50	100
AAA CLO	4	10-20
AAA RMBS	2-4	10-20
Alt-a RMBS	3-5	20-50
Sources: Citigroup and IMF Staff Estimates		

Increasing haircuts have prevented many hedge funds from obtaining the leverage that they need to meet their profitability targets on low-yielding financial assets. Because of this reduction in their funding liquidity, some hedge funds have begun to sell their debt and derivative securities. If this trend continues, hedge funds that had been a major supplier of market liquidity in credit markets may instead become a major drain. A hedge fund sell-off would disrupt credit markets.

II.B.8. Recapitalization of Banks, Other Depository Institutions, and Investment Banks

Large write-downs (i.e., reductions in the book value of debt or derivative securities in a bank's asset portfolio because of losses in the market value of such securities matched by equal reductions in a bank's equity) and charge-offs (i.e., the removal of loans, leases, receivables, and debt or derivative securities from a bank's asset portfolio due to credit losses matched by equal reductions in a bank's reserves or a bank's equity if such reserves are inadequate) reduce the regulatory capital at banks and other depository institutions. Without additional capital from equity infusions or retained earnings, banks and other depository institutions may curtain lending to improve their capital position. This would worsen the credit crunch.

[73] OECD (April 2008), pg. 20.

Based on the OECD forecast of subprime-related credit losses of $422 billion, the OECD estimated that bank assets would collectively fall by 5.4 percent from June 30, 2007 to December 31, 2009 without equity infusions. Equity infusions of $60 billion would be required to maintain bank assets at their level on June 30 2007, while equity infusions of $137 billion would be required for banks to maintain a normal asset growth rate of 7 percent a year.[74] These estimates reflect only subprime-related credit losses. When other credit losses are considered, the amount of additional equity that banks, other depository institutions, and investments banks may need is likely to be significantly higher.

From July 1, 2007 to June 24, 2008, banks, other depository institutions, and investment banks around the world raised $236 billion of additional equity to replenish their regulatory capital (see Table A-2.2 in Appendix). Despite these equity infusions, however, the average risk-weighted Tier I capital ratio for all U.S. banks and savings institutions fell from 10.4 percent on June 30, 2007 before the global financial crisis ignited to 10.1 percent on March 31, 2008. Likewise, the average risk-weighted total capital ratio for all U.S. banks and savings institutions declined from 12.9 percent on June 30, 2007 to 12.8 percent on March 31, 2008.[75]

In the recent weeks, however, many investors have grown increasingly reluctant to make additional equity investments in banks, other depository institutions, and investment banks in the United States. This is particularly true for smaller banks and other depository institutions with assets of less than $1 billion because of their heavy concentration in real estate loans.[76] As of March 31, 2008, the FDIC reported that 69.0 percent of all loans and leases in U.S. banks and savings institutions with assets of less than $1 billion were real estate loans.[77]

The shares that large investors bought in major financial institutions have lost much of their value so far in 2008. For example, investors infused new equity totaling $22.1 billion into Citigroup and $12.2 billion into Merrill Lynch between November 2007 and January 2008. However, Citigroup shares fell by 30.6 percent from an adjusted closing price of $27.81 on February 1, 2008 to $19.30 on June 20, 2008, while Merrill Lynch shares dropped by 37.6 percent from an adjusted closing price of $57.61 on February 1, 2008 to $35.95 on June 20, 2008.[78]

Several uncertainties are weighing down financial share prices. Investors are unsure about the ultimate size of the credit and market losses in specific financial institutions. The earnings that major banks, other depository institutions, and investment banks enjoyed from their structured finance activities related to housing and their merger and acquisition activities related to highly leveraged non-financial firms are likely to be much smaller over the medium term. Moreover, the regulatory environment for investment banks may change. If investment banks were to become subject to the capital standards that now apply to banks and other depository institutions, investment banks would not be permitted to employ as much leverage as they have done during recent years to boost their return on equity.

Until these uncertainties about credit losses, earnings, and the regulatory environment are resolved, investors may refrain from "catching a falling knife." A shunning of new equity issues may force many banks, other depository institutions, and investment to shed assets to improve their capital

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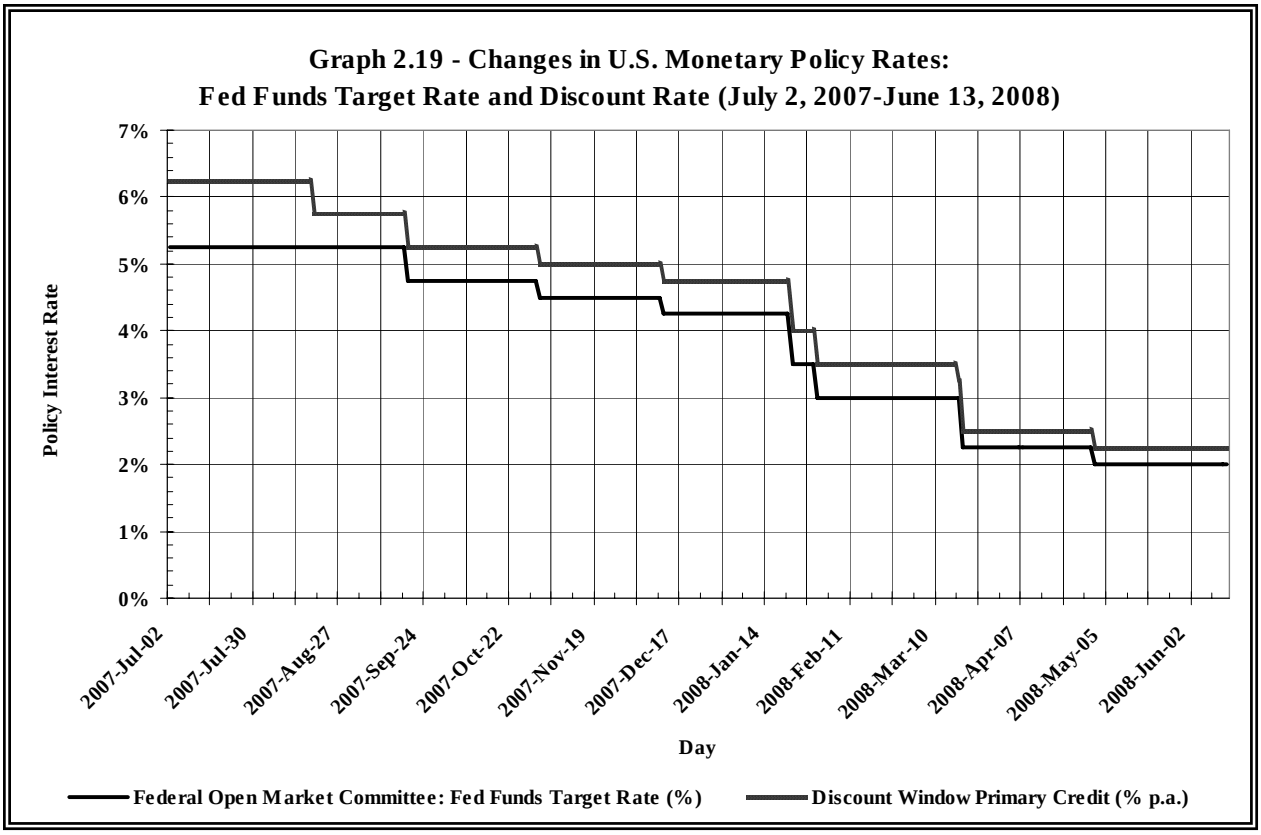
[74] OECD (April 2008).
[75] Federal Deposit Insurance Corporate, *Quarterly Banking Profile* (Second Quarter 2007), Table IV-A. Found at http://www4.fdic.gov/qbp/2007jun/qbp.pdf; and FDIC (First Quarter 2008) Table III-A.
[76] Robin Sidel, "Deals and Deal Makers: Investors Hide as Banks Come Knocking: Financial Firms Struggle to Get Capital from Bid Players Burned Once Already," Wall Street Journal (June 23, 2008), pg. C1
[77] FDIC (First Quarter 2008), Table V-A.
[78] Historical closing prices are adjusted for dividends and splits.



positions by severely restricting new loans and investments. This would seriously aggravate the credit crunch.[79]

II.B.9. Federal Reserve Response

II.B.9.a. Monetary Policy

The Federal Reserve responded to this financial crisis by aggressively easing monetary policy. Since August 16, 2007, the Federal Reserve reduced its discount rate by 400 basis points from 6.25 percent to 2.25 percent, and its target federal funds rate by 325 basis points from 5.25 percent to 2.00 percent (see Graph 2.19). Specifically, the Federal Reserve:

- Cut its discount rate by 50 basis points to 5.75 percent on August 17, 2007, reducing its spread over the target federal funds rate to 50 basis points after an emergency meeting of the Federal Open Market Committee (FOMC);
- Trimmed both its discount rate and its target federal funds rate by 50 basis points to 5.25 percent and 4.75 percent, respectively, on September 18, 2007 after the regular FOMC meeting;
- Reduced both its discount rate and its target federal funds target rate by 25 basis points to 5.00 percent and 4.50 percent, respectively, on October 31, 2007 after a regular FOMC meeting;

[79] Sidel (June 23, 2008), pg. C1.

- Reduced both its discount rate and its target federal funds rate by 25 basis points to 4.75 percent and 4.25 percent, respectively, on December 11, 2007 after a regular FOMC meeting;
- Slashed both its discount rate and its target federal funds rate by 75 basis points to 4.00 percent and 3.50 percent, respectively, on January 22, 2008 after an emergency FOMC meeting;
- Trimmed both its discount rate and its target federal funds rate by 50 basis points to 3.50 percent and 3.00 percent, respectively, on January 30, 2008 after a regular FOMC meeting;
- Cut its discount rate by 25 basis points to 3.25 percent on March 17, 2008, reducing its spread over the target federal funds rate to 25 basis points; and
- Slashed both its discount rate and its target federal funds rate by 75 basis points to 2.50 percent and 2.00 percent, respectively, on March 18, 2008 after a regular FOMC meeting.
- Cut both its discount rate and its federal funds target rate by 25 basis points to 2.25 percent and 2.00 percent, respectively, on April 30, 2008 after a regular FOMC meeting.

II.B.9.b. Funding Liquidity Measures

The Federal Reserve undertook extraordinary steps to alleviate the funding liquidity crisis confronting banks, other depository institutions, and highly leveraged non-depository financial institutions. Traditionally, the Federal Reserve extended credit to banks and other depository institutions encountering funding liquidity problems through overnight loans at the discount window collateralized with a wide range of financial assets. However, banks and other depository institutions do not like to borrow from the discount window because of a perceived "stigma." In the very uncertain environment after August 9, 2007, banks and other depository institutions began to doubt the funding liquidity or even the solvency of each other. Executives feared that borrowing from the discount window might trigger a run in the interbank and repo markets.

To provide banks and other depository institutions with more than overnight funding, the Federal Reserve established the **Term Discount Window Program** on August 17, 2007. Similar to the discount window, banks and other depository institutions could borrow from the Federal Reserve for up to ninety days instead of overnight. However, the stigma persisted, and funding liquidity conditions continued to worsen during the fall. On December 12, 2007, the Federal Reserve established a **Term Action Facility** for banks and other depository institutions. Under this facility, banks and other depository institutions bid every two weeks for a predetermined amount of funding that is repayable in 28 days. Banks and other depository institutions may use any type of collateral that is acceptable at the discount window as collateral for this facility.

On March 16, 2008, the Federal Reserve created a term auction funding facility, known as the **Term Securities Lending Facility**, for primary dealers. Five days later, the Federal Reserve created an overnight funding facility, known as **Primary Dealer Credit Facility**, for primary dealers.

Banks, other depository institutions and primary dealers have readily used these new facilities as other sources of funding liquidity became more costly and difficult to secure. This has greatly changed the composition of the Federal Reserve's balance sheet (see Table 2.5). On June 27, 2007, 93.7 percent of the Federal Reserve's assets consisted of U.S. Treasuries. By June 18, 2008, unencumbered Treasuries fell to 51.0 percent of assets. The new term auction credit facilities for banks and other depository institutions and a discount facility for primary dealers now accounted for 16.0 percent of assets and 1.5 percent of Federal Reserve assets, respectively. Repos with primary dealers ballooned from 2.2 percent of assets to 14.2 percent of assets. Other assets also grew due to the liquidation of Bear Stearns from 4.5 percent of assets to 11.1 percent of assets.

Table 2.5 – Federal Reserve Bank Assets (in $ Millions)				
	6-27-07	**Percent**	**6-18-08**	**Percent**
U.S. Treasuries	$790,497	87.6%	$478,734	51.0%
Repurchase Agreements	$20,000	2.2%	$133,500	14.2%
Term Auction Credit	$0	0.0%	$150,000	16.0%
Discounts to Depository Institutions	$187	0.0%	$13,744	1.5%
Discounts to Primary Dealers	$0	0.0%	$8,145	0.9%
Float	-$152	0.0%	-$1,781	-0.2%
Other Assets	$40,233	4.5%	$103,820	11.1%
Gold Stock	$11,041	1.2%	$11,041	1.2%
SDR	$2,200	0.2%	$2,200	0.2%
Treasury Currency	$38,526	4.3%	$38,833	4.1%
Off-Balance Sheet – Like Securities Lent to Primary Dealers				
Overnight Facility	*0*	*0.0%*	*$4,361*	*0.5%*
Term Facility	*0*	*0.0%*	*$114,457*	*12.2%*

II.B.9.c. Bear Stearns

On Thursday March 13, 2008, Bear Stearns executives informed the Federal Reserve and the Securities and Exchange Commission that Bear Stearns' funding liquidity position had deteriorated during the week from $18 billion on Monday to $2 billion on Thursday and that Bear Stearns would have to file for Chapter 11 bankruptcy the next day unless alternative funding could be arranged. Federal Reserve Chairman Ben Bernanke concluded:

> *With financial conditions fragile, the sudden failure of Bear Stearns likely would have led to a chaotic unwinding of positions in those markets and could have severely shaken confidence. The company's failure could also have cast doubt on the financial positions of some of Bear Stearns' thousands of counterparties and perhaps of companies with similar businesses. Given the current exceptional pressures on the global economy and financial system, the damage caused by a default by Bear Stearns could have been severe and extremely difficult to contain. Moreover, the adverse effects would not have been confined to the financial system but would have been felt broadly in the real economy through its effects on asset values and credit availability. To prevent a disorderly failure of Bear Stearns and the unpredictable but likely severe consequences of such a failure for market functioning and the broader economy, the Federal Reserve, in close consultation with the Treasury Department, agreed to provide funding to Bear Stearns through JPMorgan-Chase*.[80]

On Friday March 14, 2008, the Federal Reserve arranged a 28-day line of credit through JPMorgan-Chase. Over the weekend, JPMorgan-Chase agreed to acquire Bear Stearns for $2 per share, a small fraction of what its shares were valued early that week. The Federal Reserve agreed to take up to $30 billion of securities owned by Bear Stearns onto its books. To avoid threatened litigation by Bear Stearns shareholders, JPMorgan-Chase subsequently agreed to increase its offer to $10 per share. JPMorgan-Chase also agreed to compensate the Federal Reserve for any losses on its portfolio of former Bear Stearns assets up to $1 billion dollars.

[80] Ben S. Bernanke, Statement before the Joint Economic Committee (April 2, 2008), pp. 6-7.

II.B.10. Fiscal Policy Response

On January 18, 2008, President George W. Bush asked Congress to enact an economic stimulus package. Congress responded quickly. On February 13, 2008, Bush signed the *Recovery Rebates and Economic Stimulus for the American People Act of 2008* into law as P.L. 110-185. The Congressional Budget Office expects this stimulus act to cost $151.7 billion in fiscal year 2008 and $16.3 billion in fiscal year 2009. The act:

- Provides a refundable 10 percent rebate on the first $6,000 of taxable income ($12,000 for couples) that is phased out at a 5 percent rate for incomes over $75,000 ($150,000 for couples) plus an additional $300 per qualifying child if eligible for a rebate;
- Allows 50 percent bonus depreciation for business purchases of qualifying equipment in 2008;
- Increases the amount of eligible investment (generally equipment) expensing from $128,000 to $250,000; and the phase-out threshold from $510,000 to $800,000 for 2008;
- Increases the conforming mortgage loan limits for Fannie Mae and Freddie Mac in high cost areas up to $729,750 for loans originated between July 1, 2007 and December 31, 2008; and
- Allow the FHA to insure mortgages in high-cost areas up to $729,750 (up from a maximum of $362,790) through December 31, 2008.

II.B.11. Regulatory Policy Response

To date, the major regulatory thrust has been to assist subprime borrowers that are delinquent to refinance or restructure their subprime residential mortgage loans on more favorable terms and to provide more liquidity to the RMBS market through Fannie Mae and Freddie Mac.

On October 10, 2007, Secretary of the Treasury Henry Paulson announced the Bush administration had brokered an alliance, known as HOPE Now, among mortgage bankers, RMBS issuers, servicers, counselors, and investors. This Alliance issued a *Statement of Principles, Recommendations, and Guidelines for a Streamlined Foreclosure and Loss Avoidance Framework for Securitized Subprime Adjustable Rate Mortgage Loans*. This statement identifies subprime borrowers that are in danger of defaulting and outlines refinancing, loan modifications, and loss mitigation steps that are consistent with the governing Pooling and Service Agreements (PSAs) for the RMBS or CMOs into which these loans were placed.

Previously, servicers could only modify loans if default was reasonably foreseeable and such action increased the net present value (NPV) of the mortgage pool. Many servicers had interpreted this NPV rule as requiring a case-by-case approach. This statement establishes a standardized approach for loan modifications and loss mitigation steps that is more efficient than a case-by-case approach. A standardized approach also protects servicers from possible litigation by investors when the servicers modify loans in accordance with the standard.

The statement benefits certain subprime borrowers.[81] Subprime borrowers are divided into three segments. Members of the first segment are current and can qualify for refinancing through FHA or

[81] The statement applies to: (1) first-lien subprime mortgages that (2) were originated in the one and one-half year period between January 1, 2005 and July 31, 2007 with (3) adjustable interest rates, which have an introductory fixed-rate period of less than 36 months, where (4) the first interest rate resets are scheduled to occur between January 1, 2008 and July 31, 2010, and that (5) have been securitized on the secondary market.

private lenders. Members of the second segment meet four conditions[82] but cannot qualify for refinancing. Under the statement, servicers must "fast track" members of the second segment for loan modifications that may freeze their interest rates for up to 5 years. The third segment includes all other subprime borrowers. The statement directs servicers to apply an individualized approach to these cases.

Between July 2007 and April 2008, servicers have agreed to 1,558,854 workout plans to help borrowers avoid foreclosure through payment rescheduling and loan modifications (see Table 2.6).

Table 2.6 – Loan Workout Plans under HOPE Now (July 2007-April 2008)

	Subtotal	***Total***
Workout Plans		**1,558,854**
Prime	599,795	
Subprime	959,059	
Repayment Plans		**1,084,820**
Prime	464,782	
Subprime	620,038	
Modifications		**474,034**
Prime	135,013	
Subprime	339,021	

Source: Hope NOW

The Bush administration has also created the FHA Secure program to help households refinance their adjustable-rate subprime mortgage loans if the mortgagers fall behind in payments after an adjustment. Subprime borrowers that qualify can refinance through a fixed rate FHA-insured mortgage loan up to 97.5 percent of the current market value of their residence. This program does not benefit subprime borrowers that are **underwater** (i.e., their mortgage loan balance exceeds the current market value of their residence). The Department of Housing and Urban Development asserts that over 100,000 home owners have benefited from the FHA Secure program.[83]

The Bush administration reversed its previous policy of requiring Fannie Mae and Freddie Mac to limit their asset growth and to increase their capital ratios. On March 19, 2008, Office of Housing Finance Enterprise Oversight (OHFEO) Director James Lockhart announced that OHFEO was lowering its capital surplus requirement for Fannie Mae and Freddie Mac from 30 percent to 20 percent. This change allows Fannie Mae and Freddie Mac to purchase up to $200 billion of RMBS and tranches of CMOs.

II.B.12. Global Credit Losses and Likely Effects on the Broader Economy

In the *Global Financial Stability Report: Containing Systemic Risks and Restoring Financial Soundness*, the International Monetary Fund estimated that the eventual credit losses to the global financial sector from the U.S. housing bubble and resulting global financial crisis will be $945 billion (equivalent to 6.8 percent of U.S. GDP in 2007).[84] Globally, banks (including other depository institutions and investment banks) will incur losses of $440 billion to $510 billion; insurers, $105 billion to $130 billion; pension funds, $90 billion to $160 billion; financial government-sponsored enterprises and governments, $40 billion to $140 billion; and hedge funds and other investors, $110 billion to $200

[82] To qualify for segment two, subprime mortgagers must (1) be current, (2) be owner-occupiers; (3) meet the "FICO test," i.e., have credit scores below 660 and less than 10 percent higher than their scores at the time of origination, (4) have payments that would increase by more than 10 percent after the scheduled reset.

[83] Found at: http://www.hud.gov/news/release.cfm?content=pr08-024.cfm.

[84] *World Economic and Financial Surveys, Global Financial Stability Report: Containing Systemic Risk and Restoring Financial Soundness* (Washington, D.C.: International Monetary Fund, April 2008), pg. 10.

billion.[85] About one-half of these credit losses will ultimately accrue to U.S. financial institutions and other U.S. investors.

From January 1, 2007 through May 19, 2008, major banks, other depository institutions, and investments banks around the world have recorded aggregate credit losses (including write-downs and charge-offs) of $379.2 billion (see Table A-2.1 in the appendix).[86] This suggests the ultimate credit losses to banks and other depository institutions will as least as large the IMF forecast of $440 billion to $510 billion.

In comparison to the U.S. saving and loan crisis, the Japanese banking crisis, and the Asian financial crisis, the nominal losses from the U.S. housing bubble and resulting global financial crisis will be greater than any of these previous crises. However, the losses as a percentage of GDP will be larger than the S&L crisis, but smaller than the Japanese banking crisis or the Asian financial crisis.[87]

Moreover, battered bank balance sheets, deleveraging, and the repricing of credit and liquidity risk are likely to cause a severe slowdown in the growth rate of the bank credit-to-GDP ratio compared with other business cycle downturns.[88] This credit crunch will reduce real GDP growth in the United States by up to 1.4 percentage points below what it would otherwise have been for at least three quarters.[89]

In the *World Economic Outlook: Housing and the Business Cycle*, the IMF forecasts that U.S. housing prices as measured by the Standard & Poor's/Case-Shiller U.S. National Home Price Index[90] will fall another 12 percent in 2008.[91] Residential investment will continue to fall. Consumption will decline throughout 2008 and remain sluggish in 2009 as households increase their saving from income after a long period when capital gains on assets boosted household wealth.[92] Despite higher oil prices, the rapid growth of U.S. exports will cause the U.S. current account deficit to fall from 5.3 percent of GDP in 2007 to 4.2 percent in 2009, alleviating international imbalances.[93]

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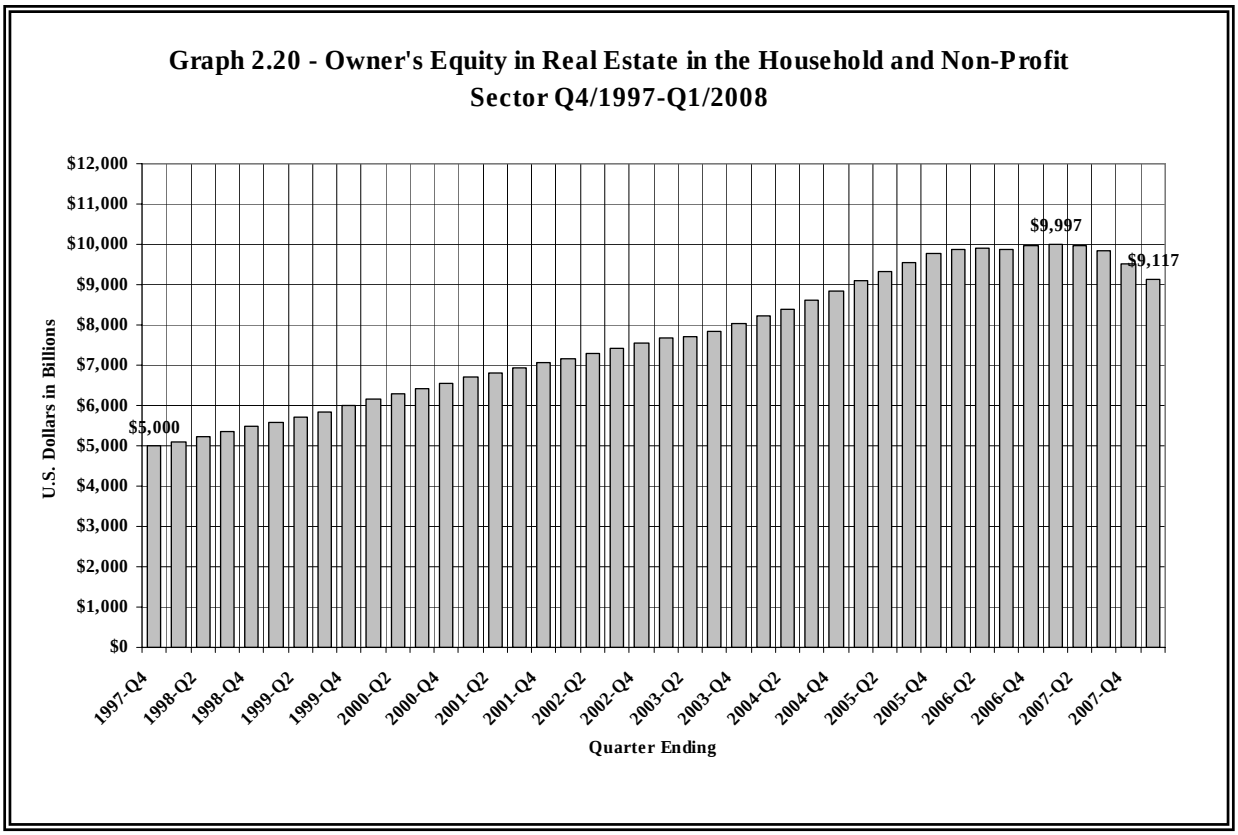
[85] Ibid., pg. 12.
[86] Yalman Onaran, "Subprime Losses Top $379 Billion," Bloomberg (May 19, 2008). Found at www.bloomberg.com/apps/news?pid=20670001&refer=&aK4Z6C2kXs3A.
[87] Ibid. pg. 13.
[88] *World Economic and Financial Surveys*, *World Economic Outlook: Housing and the Business Cycle* (Washington, D.C.: International Monetary Fund, April 2008), pp. 10-16.
[89] *Global Financial Stability Report* (April 2008), pg. 35.
[90] The S&P/Case-Shiller U.S. National Home Price Index is an aggregate of the nine Census Divisions: New England: CT, ME, MA, NH, RI, VT; Middle Atlantic: NJ, NY, PA; East North Central: IL, IN, MI, OH, WI; West North Central: IA, KS, MN, MO, NE, ND, SD; South Atlantic: DE, DC, FL, GA, MD, NC, SC, VA, WV; and East South Central: AL, KY, MS, TN.
[91] *World Economic Outlook* (April 2008), pg. 68. Author subtracted the decline in the S&P/Case-Shiller Index in 2006 and 2007 from the IMF forecast for the peak in 2006 to end of 2008 decline in this index to isolate the forecast decline in 2008.
[92] Ibid., pg. 68.
[93] Table 2.2, Ibid., pg. 67.



Some experts believe the credit losses from the global financial crisis are likely to be higher than the IMF currently forecasts. For example, John Paulson, a hedge fund manager that profited by anticipating the U.S. housing bubble and the resulting global financial crisis, predicted that global credit losses will be $1.3 trillion, which is about 37 percent higher than the IMF forecast. "The housing market shows no signs of stabilizing and the problems will spread to other areas such as non-residential construction and consumer spending."[94] If such pessimistic forecasts on global credit losses prove accurate, the credit crunch may intensify, and its adverse effects on the broader economy may be larger.

The Federal Reserve reported that declining U.S. housing prices reduced owners' equity in residential real estate in the household and non-profit sector by 8.8 percent from its peak of $9.997 trillion on March 31, 2007 to $9.117 trillion on March 31, 2008 (see Graph 2.20).[95] This loss contributed to a 3.8 percent reduction in the net worth of the household and non-profit sector from its peak of $58.2 trillion on September 30, 2007 to $56.0 trillion on March 31, 2008.[96] The negative wealth effect on consumption expenditures by households due to declining net worth is likely to remain a drag on economic growth for several quarters so long as housing prices continue to decline.

II.B.13. Additional Downside Risks

There are three major downside risks that could aggravate the current global financial crisis and increase the risk for a long and deep recession in the United States and other developed economies: a steeper decline in U.S. housing prices than the IMF forecasts, sharply higher default rates among non-

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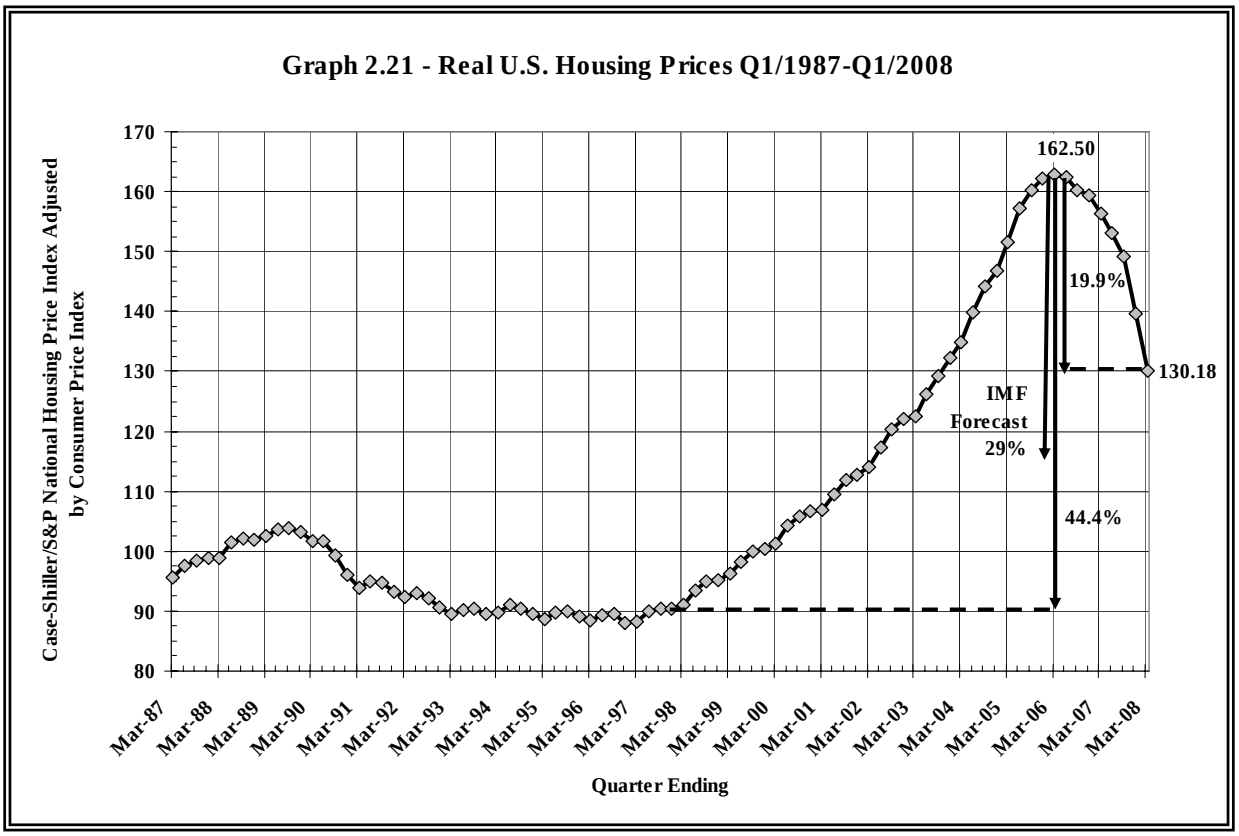
[94] Ben White, Francesco Guerrera, and Henry Sender, "Hedge Fund Chief Warns of Worse to Come," *Financial Times* (June 19, 2008), pg. 1.
[95] Federal Reserve/Haver. Percent calculation by author.
[96] Ibid.



investment-grade bonds and loans to highly leveraged non-financial firms, and a rash of counterparty defaults in the credit default swap market.

II.B.13.a. U.S. Housing Prices Decline More than Forecast

First, the IMF projects a 22 percent nominal decline in U.S. housing prices as measured by the Standard & Poor's/Case-Shiller Index from its peak in the second quarter of 2006 to the fourth quarter of 2009.[97] Using the IMF forecast for U.S. inflation of 2.0 percent in 2008 and 1.8 percent in 2009, a 22 percent fall in nominal housing prices equates to a 29 percent drop in real housing prices from the second quarter 2006 to the fourth quarter of 2009 (see Graph 2.21).[98]

From the second quarter of 2006 through the first quarter of 2008, nominal U.S. housing prices fell by 16.2 percent as measured by the Standard & Poor's/Case-Shiller Index.[99] Thus, real housing prices dropped by 19.9 percent (see Graph 2.21).[100] If the IMF forecasts are correct, nominal housing prices must fall by another 6.9 percent before the end of 2009, while real housing must decline by another 9.9 percent.[101]

However, real housing prices would have to decline by 44.6 percent from their peak in the second quarter of 2006 to equal their pre-bubble level in the fourth quarter of 1997 (see Graph 2.21).[102]

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[97] Ibid., pg. 68.
[98] Calculation by author.
[99] Standard & Poor's/Case-Shiller Index/Haver.
[100] Calculation by author.
[101] Calculation by author.
[102] Calculation by author.

Therefore, there is a significant downside risk that U.S. housing prices may decline by more than the IMF has forecast.

Housing prices must stabilize before normal economic growth can resume. If U.S. housing prices fall more than the IMF currently forecasts, the large credit losses that are currently concentrated in subprime residential mortgage loans, subprime-related RMBS, and tranches of subprime-related CMOs may spread to the prime residential mortgage loan market, the jumbo residential mortgage loan market, and home equity loan market. One-third of all home owners with residential mortgage loans could go underwater. Moreover, many commercial mortgage loans used to finance residential development and construction would become delinquent and eventually be charged-off.

While most "underwater" home owners would not default on their residential mortgage loans, some would. Higher than anticipated credit losses on residential mortgage loans, home equity loans, RMBS, and CMOs would increase the likelihood of other failures at banks, other depository institutions, and highly leveraged non-depository financial institutions. The credit crunch would intensify as these institutions contract their balance sheets. In turn, the risk for a long and severe recession in the United States and other developed economies would increase.

Underwater residential mortgage loans may restrict the ability of affected home owners to move to other communities to secure new, better, or higher-paying jobs. This could reduce the high degree of labor mobility within the United States that has boosted productivity and helped to keep the U.S. economy internationally competitive.

II.B.13.b. Higher than Forecast Default Rates on Non-Investment Grade "Junk" Corporate Bonds and C&I Loans to Highly Leveraged Non-Financial Corporations

Default rates on non-investment grade "junk" corporate bonds and loans to highly leveraged non-financial corporations are likely to increase substantially during the next two years. Default rates on junk bonds and loans to highly leveraged non-financial firms were at all-time lows of about 2 percent during 2006 and 2007. Historically, default rates on these bonds and loans move inversely with real GDP growth and industrial production. An increase in the volatility of corporate earnings could cause spikes in these default rates. The IMF estimates that a recession would cause these default rates to increase to 12 percent.[103] Given unprecedented issuance of new non-investment grade "junk" corporate bonds since 2000 and the large number of short-term bridge loans to highly leveraged non-financial firms that were recently stranded on bank balance sheet when permanent financing did not materialize, credit losses associated with junk bonds and loans to highly leveraged non-financial firms may be larger than forecast. This development would intensify the credit crunch.

II.B.13.c. Chain Defaults on Credit Default Swaps

Credit default swaps are a major unregulated mechanism through which a bankruptcy or default by one major bank, other depository institution, or highly leveraged non-depository financial institution could trigger a cascade of defaults and pose significant systemic risk. Almost every financial institution is now linked through CDSs. If a bank, other depository institution, or a highly leveraged non-depository financial institution that sold protection is under stress from significant credit losses and funding liquidity problems, the seller might not be able to settle with the buyer. The protection seller would likely fail, and all of its financial obligations would become doubtful.

Financial institutions would be required to reduce the credit ratings on any loan or debt or derivative security, whose credit rating had been upgraded to the previously higher rating of the protection seller, to the lower rating of the borrower. Such downgrades would increase the risk-weighting

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[103] *Global Financial Stability Report* (April 2008), pp. 14-16.

for these financial assets and therefore would reduce the risk-weighted capital ratios at banks and other depository institutions. All types of financial institutions would incur significant write-downs and charge-offs on downgraded financial assets. Banks, other depository institutions, and other highly leveraged non-depository financial institutions may be forced to contract their loans and investments in debt and derivative securities to strengthen their balance sheets. Some financially weakened banks, other depository institutions, and highly leveraged non-depository institutions could fail. If central banks do not intervene promptly and vigorously, a chain reaction of failures could intensify the credit crunch, increasing the risk for a long and deep recession in the United States and other developed economies.

III. CONCLUSION

An alternative financial system based on structured finance and highly leveraged non-depository financial institutions has emerged to challenge the bank-centric financial system during the last three decades. Collectively, this alternative financial system is performing the same economically vital, but inherently risky functions of intermediation and liquidity and maturity transformation largely outside of the regulatory and supervisory framework that governs banking. This alternative financial system is vulnerable to a modern version of runs and financial contagion as recent events have demonstrated.

This study identified several microeconomic factors relating to financial services that combined with monetary and other macroeconomic factors identified in a previous study to create a significant credit expansion during the last decade. This credit expansion inflated an unprecedented bubble in U.S. housing prices. Moving beyond housing and housing-related finance, this study documented how the popping of the U.S. housing bubble morphed into a global financial crisis that began on August 9, 2007. The study then detailed the response of federal policymakers to the global financial crisis.

Since the assisted acquisition of Bear Stearns by JPMorgan-Chase in March 2008, funding liquidity for most banks, other depository institutions, and highly leveraged non-depository financial institutions has improved, and the elevated spreads in credit markets have eased somewhat. Given the uncertainty over the eventual global credit losses associated with the U.S. housing bubble, it is not yet clear that the worst of the global financial crisis has passed.

The global financial crisis has caused U.S. economic growth to slow down dramatically. It is likely to be weak for several quarters. Moreover, there are significant downside risks present.

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Senior Economist

APPENDIX

Table A-2.1 – Credit Losses (Including Write-Downs & Charge-Offs) at Major Banks, Other Depository Institutions and Investment Banks (January 1, 2007 through May 19, 2008)

Rank	Company	Credit Losses (in billions of U.S. dollars)
1	Citigroup	$42.8
2	UBS	$38.2
3	Merrill Lynch	$37.0
4	HSBC	$19.5
5	IKB Deutsche	$16.0
6	Royal Bank of Scotland	$15.2
7	Bank of America	$14.9
8	Morgan Stanley	$12.6
9	JPMorgan-Chase	$9.7
10	Credit Suisse	$9.5
11	Washington Mutual	$9.1
12	Crédit Agricole	$8.3
13	Deutsche Bank	$7.7
14	Wachovia	$7.0
15	HBOS	$6.9
16	Bayerische Landesbank	$6.7
17	Fortis	$6.6
18	Société Générale	$6.3
19	Mizuho Financial Group	$6.2
20	ING	$6.0
21	Barclays	$5.2
22	WestLB	$4.8
23	Canadian Imperial (CIBC)	$4.2
24	LB Baden-Wuerttemberg	$4.0
25	E*Trade	$3.4
26	Dresdner	$3.4
27	Natixis	$3.4
28	Wells Fargo	$3.3
29	Lehman Brothers	$3.3
30	Bear Stearns	$3.2
31	National City	$3.1
32	Goldman Sachs	$3.0
33	BNP-Paribas	$2.7
34	Lloyds TSB	$2.7
35	Nomura Holdings	$2.5
36	HSH Nordbank	$2.5
37	ABN Amro	$2.4
38	Bank of China	$2.0
39	Commerzbank	$1.9
40	Royal Bank of Canada	$1.7
41	UniCredit	$1.6
42	DZ Bank	$1.5
43	Alliance & Leicester	$1.4

Table A-2.1 – Credit Losses (Including Write-Downs & Charge-Offs) at Major Banks, Other Depository Institutions and Investment Banks (January 1, 2007 through May 19, 2008)		
44	Dexia	$1.3
45	Caisse d'Épargne	$1.2
46	Hypo Real Estate	$1.0
47	Gulf International	$1.0
	Other European banks: 1. Allied Irish Banks 2. Bradford & Bingley 3. Aareal Bank 4. Deutsche Postbank 5. Standard-Chartered 6. Northern Rock 7. NordLB 8. Radobank 9. HVB Group 10. Sachsen LB 11. Intesa Sanpaolo 12. Landersbank Hessen-Thueringen 13. SEB AB 14. Erste Bank 15. NdB NOR 16. Anglo-Irish 17. KBC Group 18. LB Berlin 19. NIBC Holding	$9.2
	Other Asian banks: 1. Mitsubishi UFJ 2. Shinsei 3. Sumitomo Trust 4. Aozora Bank 5. DBS Group 6. Australia & New Zealand Banking Group 7. Abu Dhabi Commercial 8. Bank Hapoalim 9. Arab Banking Corp. 10. Industrial & Commercial Bank of China 11. Citic International 12. BOC Hong Kong 13. Bank of East Asia 14. China Construction Bank 15. Sumitomo Mitsui 16. ICICI Bank 17. State Bank of India 18. United Overseas 19. Wing Lung	$7.8
	Other North American banks: 1. Bank of Montreal 2. National Bank of Canada 3. Bank of Nova Scotia 4. BB&T Corp. 5. PNC Financial Services Group 6. SunTrust Banks 7. South Financial Group 8. Sovereign Bancorp 9. First Horizon	$4.1
TOTAL		**$379.2**

Table A-2.2 Major Equity Investments in Banks, Other Depository Institutions, and Investment Banks Worldwide since July 1, 2007

Target Company[1]	Nationality	Investor	Nationality	Type of Investor	Stake	Value ($ millions)	Date	Comments
Australia and New Zealand Bank	Australia	SAFE Inv. Co.	China	Sovereign Wealth Fund (SWF)	<1%	175	Q4/07	
Banco Santander	Spain	Banca Monte Dei Paschi di Siena	Italy	Bank		12,500	11/07	Purchase of Banca Antonveneta
Barclays	UK	China Development Bank	China	SWF	3.1%	3,000	7/07	Barclays is buying back shares to neutralize stake sale.
Barclays	UK	Temasek Holdings	Singapore	SWF	2.1%	2,000	7/07	Barclays is buying back shares to neutralize stake sale.
Barclays	UK	Qatar Investment Authority, Challenger (Qatar), China Development Bank, Sumitomo Mitsui Financial Group, and Temasek	China, Japan, Qatar, and Singapore	SWFs and Bank		8,860	6/08	
Bear Stearns (investment bank)	US	JPMorgan-Chase	US	Bank	100%	1,200	3/08	
Bear Stearns (investment bank)	US	Citic Securities	China	Brokerage		1,000	10/07	The two firms each invested $1 bn. in the other and formed a joint venture
Canadian Imperial	Canada	Li Ka-Shing; Manulife Financial; Caisse de Depot et Placement du Quebec; OMERS[2]	China and Canada	see footnote	6.1%	1,500	1/08	
Canadian Imperial	Canada	Public Investors	n/a	Public Investors	5%	1,200	1/08	
Citigroup	US	Kuwait Investment Authority	Kuwait	SWF	4.1%	7,700	1/08	
Citigroup	US	Abu Dhabi Investment Authority	UAE	SWF	4.9%	7,500	11/07	
Citigroup	US	Government of Singapore Investment Corp.	Singapore	SWF	4%	6,880	1/08	
Commonwealth Bank of Australia	Australia	SAFE Inv. Co.	China	SWF	<1%	175	Q4/07	
Compass Bank	US	BBVA SA	Spain	Bank	100%	9,870	9/07	Acquisition

Table A-2.2 Major Equity Investments in Banks, Other Depository Institutions, and Investment Banks Worldwide since July 1, 2007

Target Company[1]	Nationality	Investor	Nationality	Type of Investor	Stake	Value ($ millions)	Date	Comments
Countrywide (bank, investment bank, and mortgage lender)	US	Bank of America	US	Bank		2,000	8/07	Preferred stock
Credit Suisse	Switzerland	Qatar Investment Authority	Qatar	SWF	1-2%	500	2/08	
Fifth Third	US					1,000	6/08	
Fortis	Belgium	Public offering				19,200	10/07	Equity rights issue to finance ABN Amro bid
Fremont Investment & Loan (bank and mortgage lender)	US	Capital Source	US	Nonbank commercial lender	all bank opera-tions	170	4/08	Cash
Great Western Bancorporation	US	National Australia Bank	Australian	Bank	100%	798	11/07	Cash purchase
IKB	Germany	KFW, and a group of private banks	Germany	State-owned development bank	52%	12,000	7/07	
Jefferies Group (investment bank)	US	Leucadia Group	US	Fin. Servs.	13.7%	434	4/08	
Key Corp	US					1,650		
Landsbanki	Iceland	Institutional investors	US		5%	400	10/07	
Lehman Brothers (investment bank)	US	Unnamed institutional investors	US			4,000	3/08	$4.0 billion offering of 4,000,000 shares of 7.25% Non-Cumulative Perpetual Convertible Preferred Stock
Lehman Brothers (investment bank)	US	Unnamed investors	US	Public offering		6,000	6/08	$4.0 billion of 143 million shares of common stock at $28.00 per share and 2.0 million shares of 8.75% Non-Cumulative Mandatory Convertible Preferred Stock
Marfin Popular Bank	Greece	Dubai Financial Group	UAE	SWF	19.9%	2,500	10/07	
Marfin Popular Bank	Greece	Dubai Financial Group	UAE	SWF	10.1%	1,250	2/08	
Merrill Lynch (investment bank)	US	Davis Selected Advisors	US	Mutual fund manager	2.6%	1,200	1/08	

Table A-2.2 Major Equity Investments in Banks, Other Depository Institutions, and Investment Banks Worldwide since July 1, 2007

Target Company[1]	Nationality	Investor	Nationality	Type of Investor	Stake	Value ($ millions)	Date	Comments
Merrill Lynch (investment bank)	US	Kuwait Investment Authority, Mizuho Financial Group, and Korean Investment Corp.	Kuwait, Japan, and Korea	SWF (Kuwait and Korea); bank (Japan)	10-11%	6,600	1/08	
Merrill Lynch (investment bank)	US	Temasek Holdings	Singapore	SWF	9.9%	5,600	12/07	
Morgan Stanley (investment bank)	US	China Investment Corp.	China	SWF	9.9%	5,000	12/07	
National Australia Bank	Australia	SAFE Inv. Co.	China	SWF	0.3%	175	Q4/07	
National City	US	Consortium of funds led by Corsair Capital, a private equity firm	US			7,500	4/08	
Piraeus Bank	Greece	Abu Dhabi State Investment Fund	UAE	SWF	3%	370	10/07	
Royal Bank of Scotland	UK	Sale of new shares to current shareholders			61%	24,000	4/08	Cash call (Holders were entitled to buy 11 shares for each 18 they owned.)
Societé General	France	Existing shareholders and public offering			15-20%	8,520	3/08	Convertible stock rights
Syndicate Bank	India	Indian institutional investors	India	n/a	9%	160	2/08	follow-on equity offering
UBS	Switzerland	Rights offering to current holders at discount to market value			20%	15,360	6/08	
UBS	Switzerland	Government of Singapore Investment Corp.	Singapore	SWF	8-11%	9,740	12/07	
UBS	Switzerland	Undisclosed Middle East investor	N/A	SWF	2%	1,800	12/07	
Visa (Bank-owned credit card assn.)	US	IPO		Public sale	51%	19,500	3/08	
Wachovia	US	Sale of common and preferred stock to unidentified investors			13%	8,050	4/08	
Washington Mutual	US	TPG and a group of institutional investors	US	Private equity		7,000	4/08	Stock, warrants, and convertible securities

Table A-2.2 Major Equity Investments in Banks, Other Depository Institutions, and Investment Banks Worldwide since July 1, 2007

Target Company[1]	Nationality	Investor	Nationality	Type of Investor	Stake	Value ($ millions)	Date	Comments
TOTAL						**$236,037**		

Sources: Morgan Stanley, Bloomberg, and various periodical accounts.

[1] Target companies are banks unless otherwise noted.
[2] Li Ka-Shing is Asia's richest resident with net worth of $23 billion, and is a citizen and resident of Hong Kong. Manulife Financial is the largest life insurance company in Canada, the second largest in North America, and sixth largest in the world based on market capitalization. Caisse de Depot et Placement du Quebec was established in 1965 by an Act of the National Assembly to manage the funds contributed to a newly created universal pension plan, the Quebec Pension Plan. OMERS was established in 1962 and is one of Canada's leading pension funds with over $48 billion in assets.