Economics Report

2008 International Banking Conference
Sponsored by the FRB of Chicago and the ECB

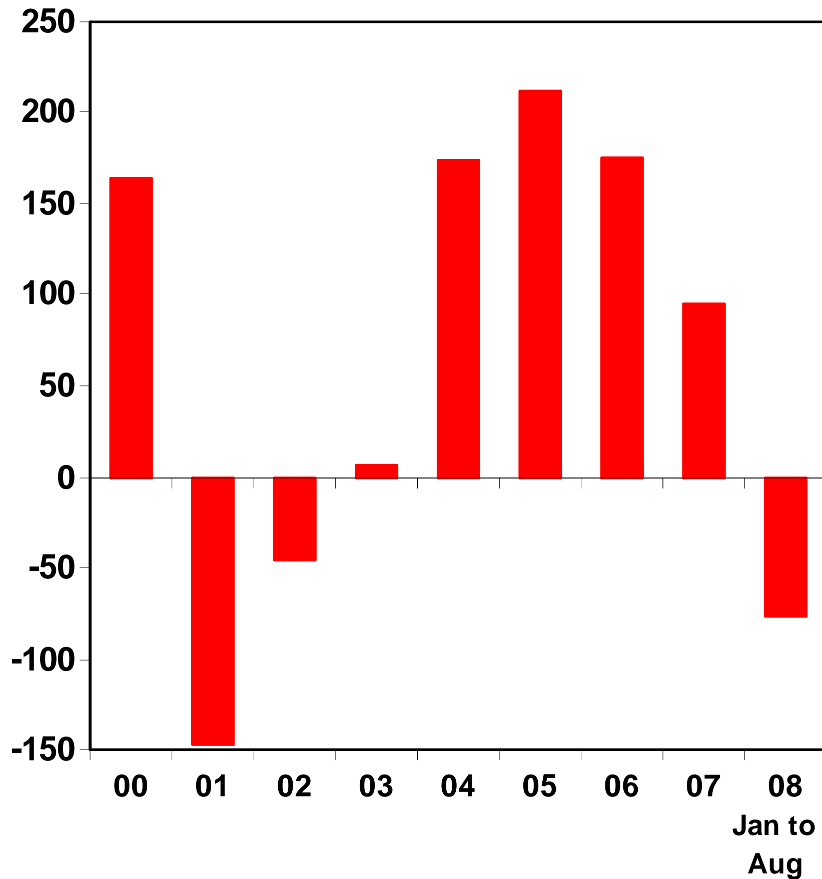
Impact of the Recent Credit Market Turmoil on the US Economy

David Greenlaw, Chief U.S. Fixed Income Economist

Morgan Stanley

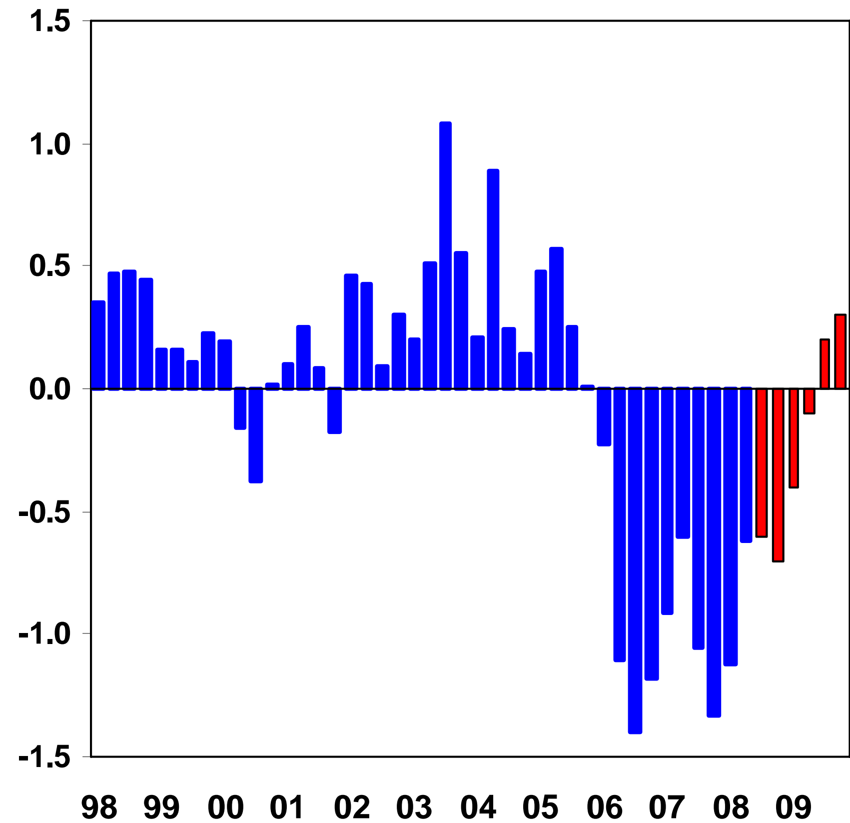
From Goldilocks to Recession …

Job Growth
(Average Monthly Payroll Change, Thousands)



Source: BLS

Residential Investment
(Percentage Point Contribution to Quarterly GDP Growth)



Source: BEA w/ Morgan Stanley forecast represented by red bars.

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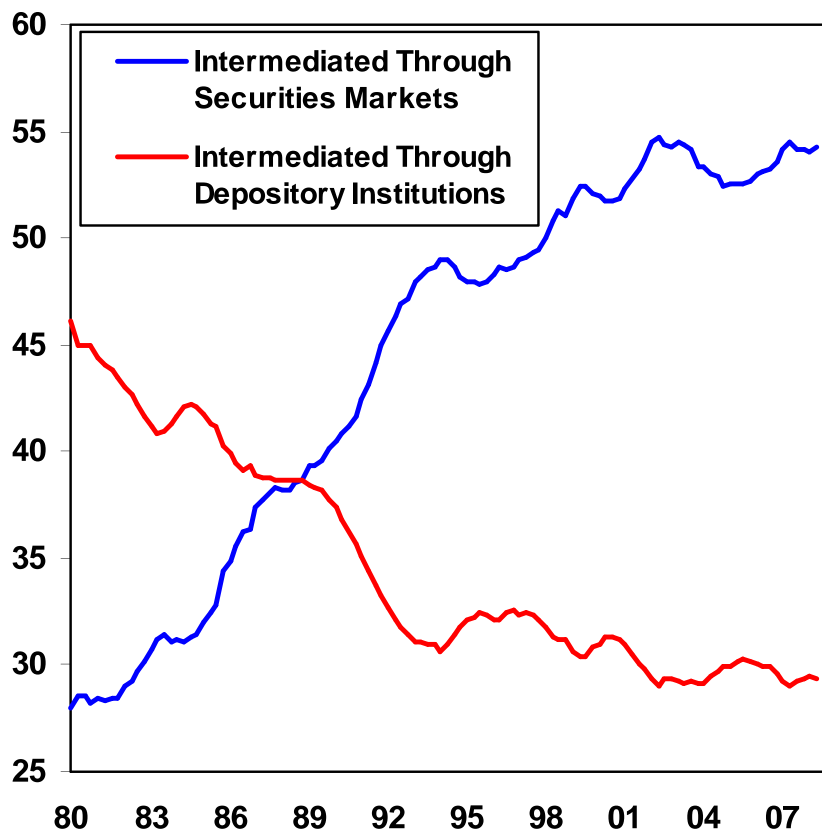
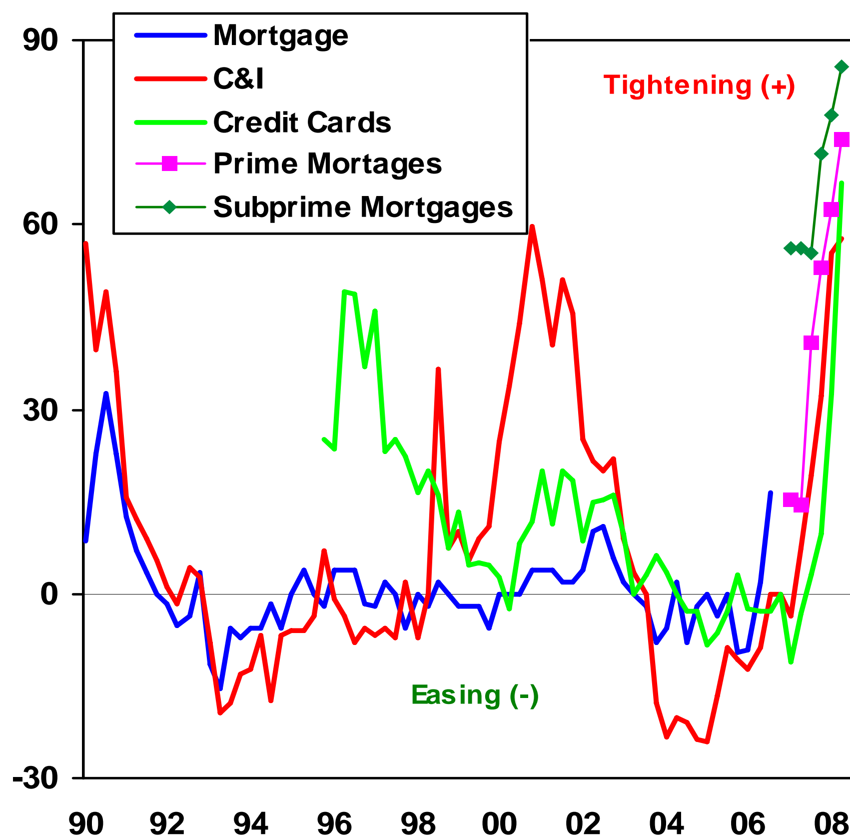
The First Broad Based Credit Crunch in the Securitization Era

Trends in Credit Intermediation
(Share of Private Nonfinancial Debt Outstanding, Percent)



Source: Morgan Stanley calculations based on Federal Reserve Flow of Funds Accounts.

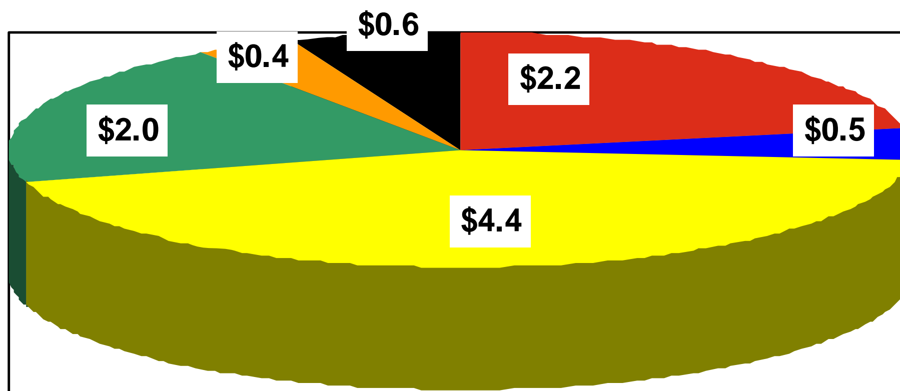
Lending Standards
(Net Percentage of Institutions Reporting a Tightening)

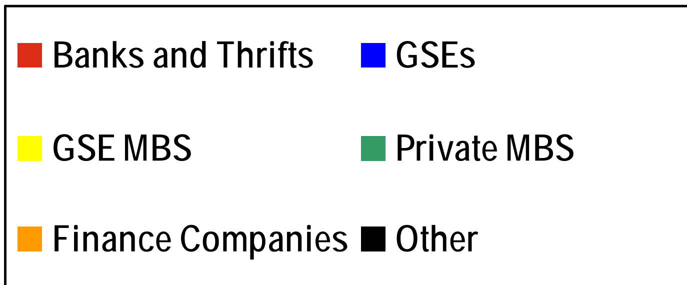


Source: Federal Reserve, Senior Loan Officer Survey. Latest data point is from the July 2008 survey.

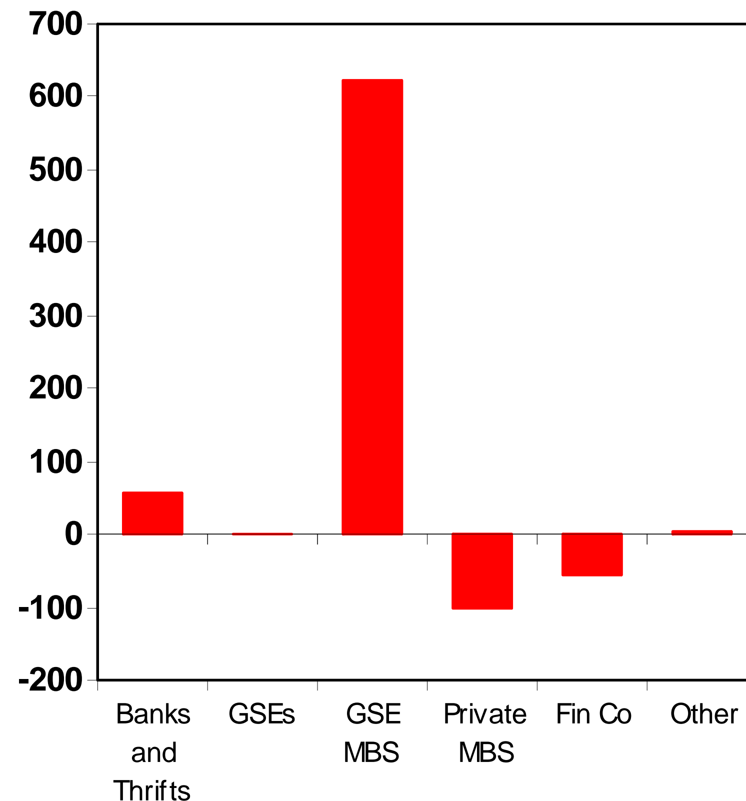
Spotlight on the Mortgage Market

Distribution of Home Mortgages Holdings
(Trillions of Dollars)





Change Over the Past Year
(Billions of Dollars)



Source: Federal Reserve Flow of Funds. Data are as of 2008 Q1.

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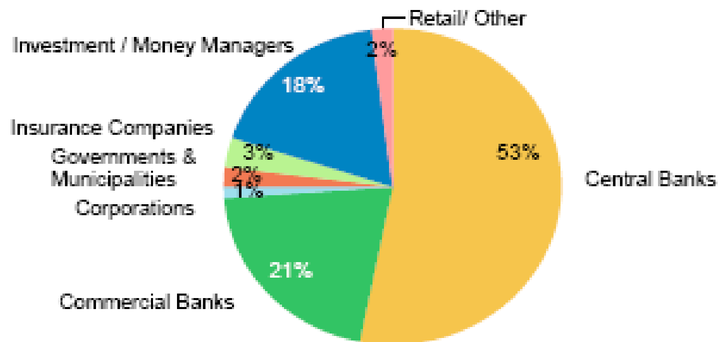
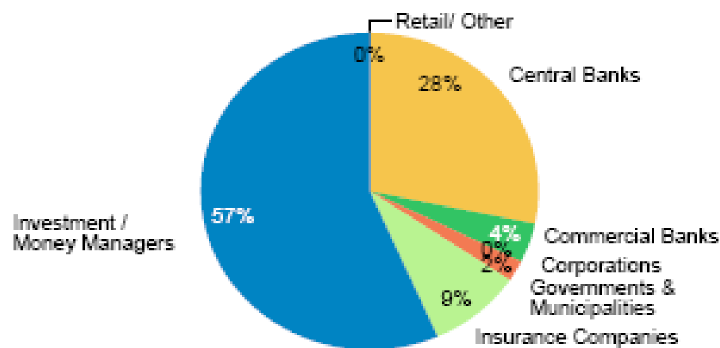
Ownership of U.S. Agency and MBS Debt

Distribution of Recent Agency Deals

April 2008: FRE 2.75 April 2011



August 2008: FRE 4.125 September 2013



Source: Freddie Mac

Foreign Central Bank Holdings of Agency Debt and MBS

	(As of 6/30/08)		
	Agency Debt ($Bn)	Agency MBS ($Bn)	Total Agency Holdings ($Bn)
China	202.4	245.4	447.8
Japan	142.5	116.3	258.9
United Kingdom	52.0	96.9	148.9
Mexico	90.7	0.8	91.6
Russia	91.6	0.0	91.6
South Korea	52.0	10.7	62.7
Hong Kong	34.5	21.9	56.4
Taiwan	26.5	24.1	50.6
Cayman Islands	5.6	44.7	50.3
Australia	31.8	3.3	35.1
Belgium	28.5	1.7	30.2
Ireland	6.6	23.0	29.6
Middle East Oil-Exporters	14.3	9.1	23.4
France	19.7	1.8	21.5
Int'l and Regional Organizations	15.0	5.7	20.7
Malaysia	10.6	7.6	18.1
Luxembourg	7.3	10.6	17.9
Netherlands	2.6	15.2	17.8
Switzerland	9.6	5.9	15.5
Germany	5.8	7.1	13.0
Canada	9.7	3.3	12.9
Poland	7.6	0.1	7.7
Sweden	6.1	0.7	6.9
British Virgin Islands	4.2	0.9	5.1
Brazil	4.0	0.0	4.0
Kazakhstan	3.6	0.2	3.8

Source: Federal Reserve, Morgan Stanley

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GSE Rescue Plan: A Four-Part Solution

FHFA Actions	Treasury Actions		
Conservatorship	**Preferred Stock Purchase Agreement**	**Liquidity Facility – GSECF**	**MBS Purchase Program**
• FHFA Director James Lockhart appointed FHFA as conservator for both FNM and FRE • Both companies' boards consented to the appointment of FHFA as conservator • Conservatorship represents an opportunity to assess future options for the companies and does not require a liquidation of assets (in contrast to receivership) • FHFA also announced it will replace senior management of both GSEs	• Treasury agreed to purchase Senior Preferred Stock if needed to maintain zero or positive net worth in the GSEs, up to a maximum of $100Bn per company • As consideration, Treasury will receive warrants to purchase 79.9% of common stock of each company • In addition, Treasury will receive an initial commitment fee of $1Bn as well as a periodic commitment fee	• Treasury established GSECF as a lender of last resort for GSEs (Fannie Mae, Freddie Mac and FHLB) to ensure continued access to funding and ensure market stability • Allows GSEs to repo agency MBS and certain other collateral to Treasury to ensure access to funding if all other liquidity sources become unavailable • Improves systemic stability by eliminating liquidity risk • Expires 12/31/09	• Treasury announced its intention to commence open market purchases of agency MBS to provide further support for the mortgage market and enhance mortgage affordability • This will supplement any purchasing activity conducted by the GSEs through their retained portfolios • Expires 12/31/09

Source: Morgan Stanley and U.S. Treasury

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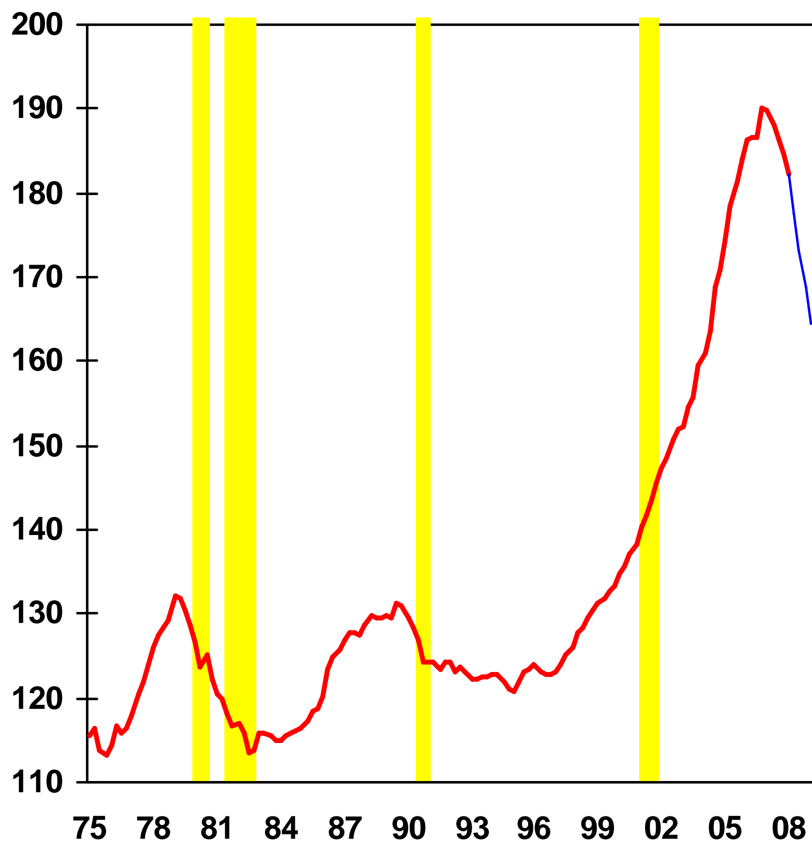
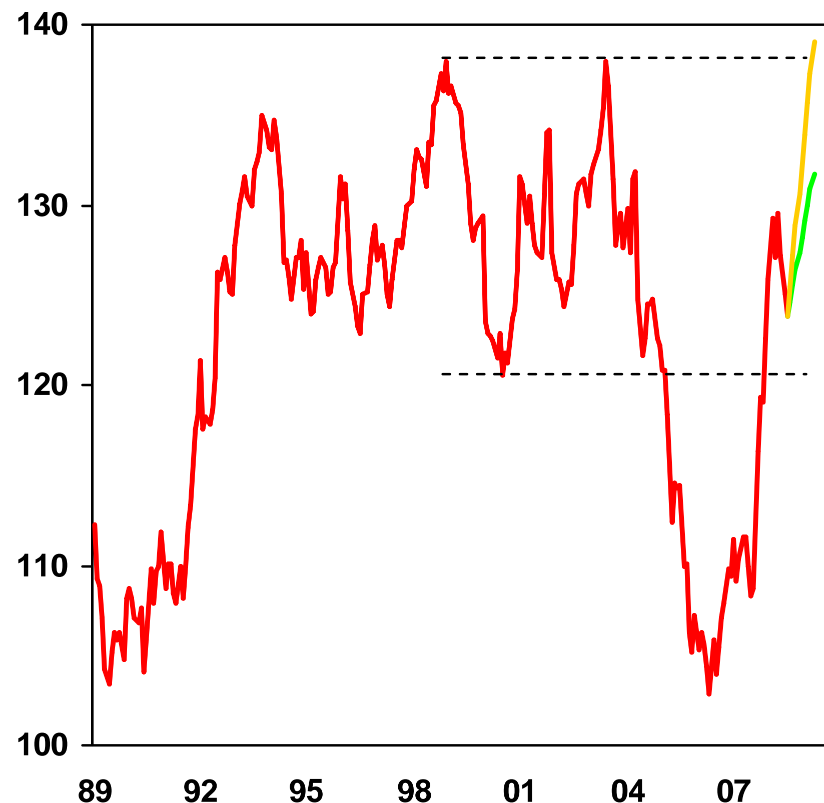
The Housing Market Adjustment Continues

Home Prices and the Business Cycle
(OFHEO Index Adjusted for CPI Inflation)



Source: OFHEO and BLS. Shaded Areas indicate recession. Blue line represents a 10% decline in real home prices through early-2009.

Housing Affordability Index
(Index, Base=100)



Source: National Association of Realtors w/ MS calculations
Note: Actual series plotted through July with estimates over the next nine months assuming further 5% and 10% declines in home prices. Data adjusted using MS calculations of seasonally adjusted home prices.

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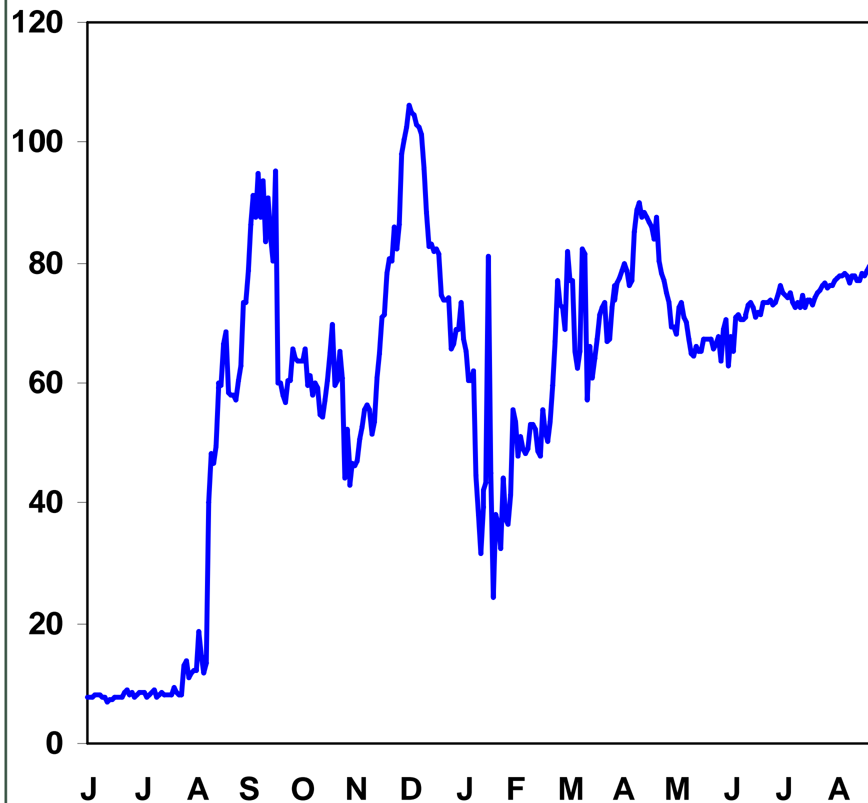
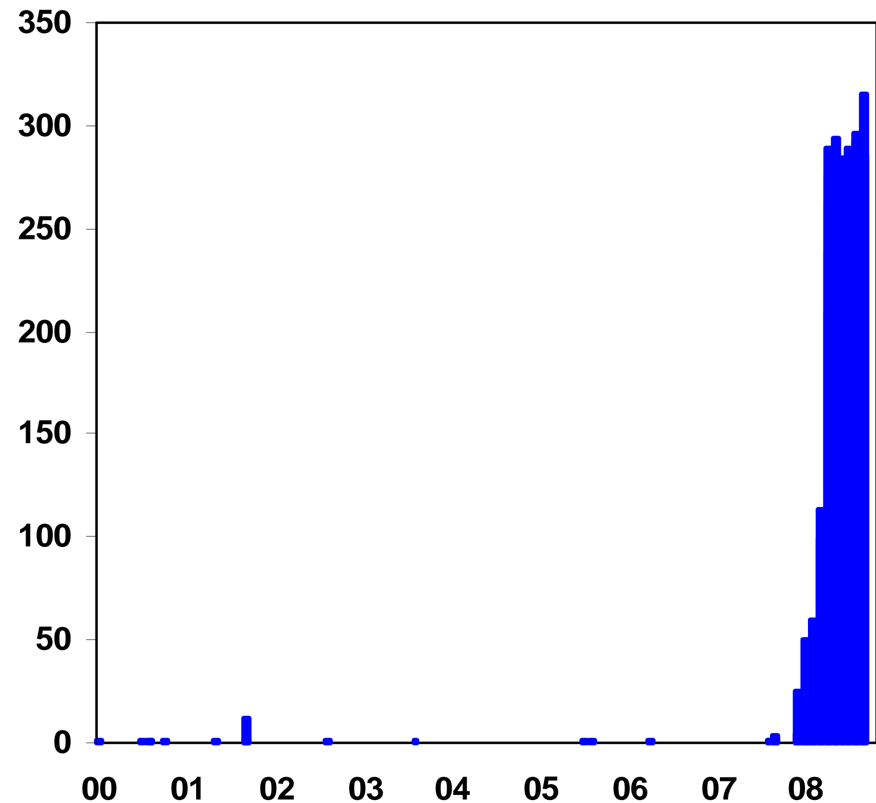
The Fed to the Rescue

3-Mo LIBOR vs Expected Fed Funds (OIS)
(Basis Points)



Source: Bloomberg

Fed Discount Window+TAF+PDCF+TSLF
(Bil $)



Source: Federal Reserve weekly H.4.1 report (data through Sept 17, 2008)

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Our Story

- Mortgage losses are substantial, yet modest relative to routine swings in the capital markets.
- The key is to compare losses to the capital base of levered financial intermediaries.
- The markets that show the greatest disruptions are the ones in which these institutions play a pivotal role (e.g., mortgages and commercial paper).
- Restoring equilibrium requires a rebuilding of the capital base of these institutions.
- In the interim, there will be further deleveraging as the intermediaries cut back on their risk exposure.
- Credit contractions can impact the aggregate economy.
- Policy options should take this factor into account.

[/] "Leveraged Losses: Lessons from the Mortgage Market Meltdown" by David Greenlaw, Jan Hatzius, Anil Kashyap and Hyun Song Shin. Originally presented at the Second Annual Monetary Policy Forum held in New York City on February 29, 2008.*

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Allocation of the Losses: Top Down Approach

Home Mortgage Exposure of US Leveraged Institutions (2007 Q4)	Billion ($)
Total	**11,136**
US Leveraged Institutions	**6,134**
Commercial banks	**2,984**
Direct	2,012
RMBS	971
Savings Institutions	**1,105**
Direct	840
RMBS	265
Credit Unions	**351**
Direct	311
RMBS (estimate)	40
Finance Companies	**474**
Direct	474
RMBS	0
Brokers and Dealers	**257**
Direct	0
RMBS (estimate)	257
Government-Sponsored Enterprises	**963**
Direct	445
RMBS (estimate)	519

Source: Federal Reserve, FDIC, and Authors' calculations

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Allocation of Losses: Bottom Up Approach

	Total reported sub-prime exposure (US$bn)	Percent of reported exposure
US Investment Banks	75	5%
US Commercial Banks	250	18%
US GSEs	112	8%
US Hedge Funds	233	17%
Foreign Banks	167	12%
Foreign Hedge Funds	58	4%
Insurance Companies	319	23%
Finance Companies	95	7%
Mutual and Pension Funds	57	4%
US Leveraged Sector	671	49%
Other	697	51%
Total	1,368	100%

Note: The total for U.S. commercial banks includes $95 billion of mortgage exposures by Household Finance, the U.S. subprime subsidiary of HSBC. Moreover, the calculation assumes that U.S. hedge funds account for four-fifths of all hedge fund exposures to subprime mortgages.
Source: Goldman Sachs Equity Research and Authors' calculations

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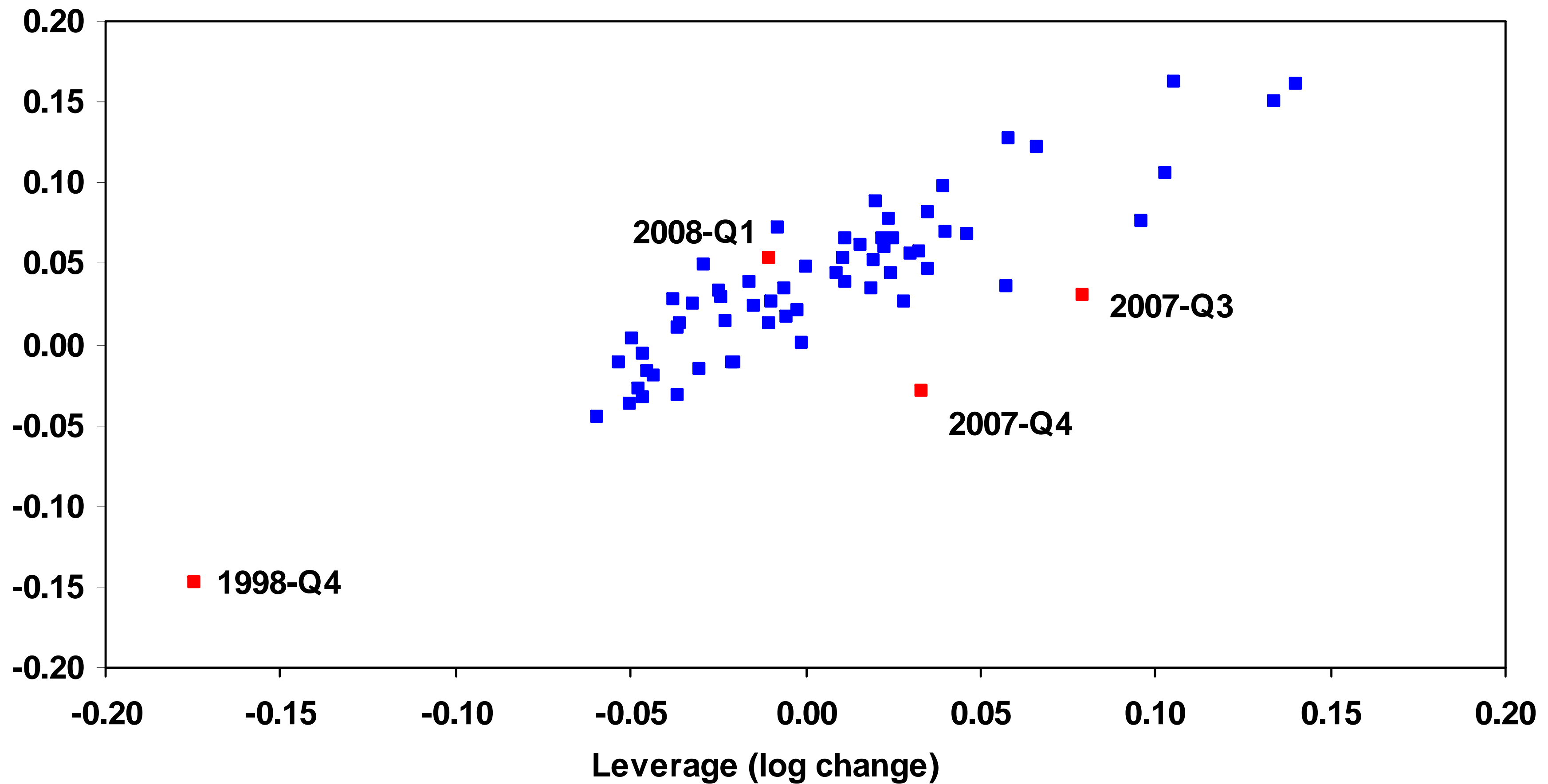
Leverage and Asset Growth for Large US Investment Banks



Source: Authors' calculations based on SEC's Edgar database

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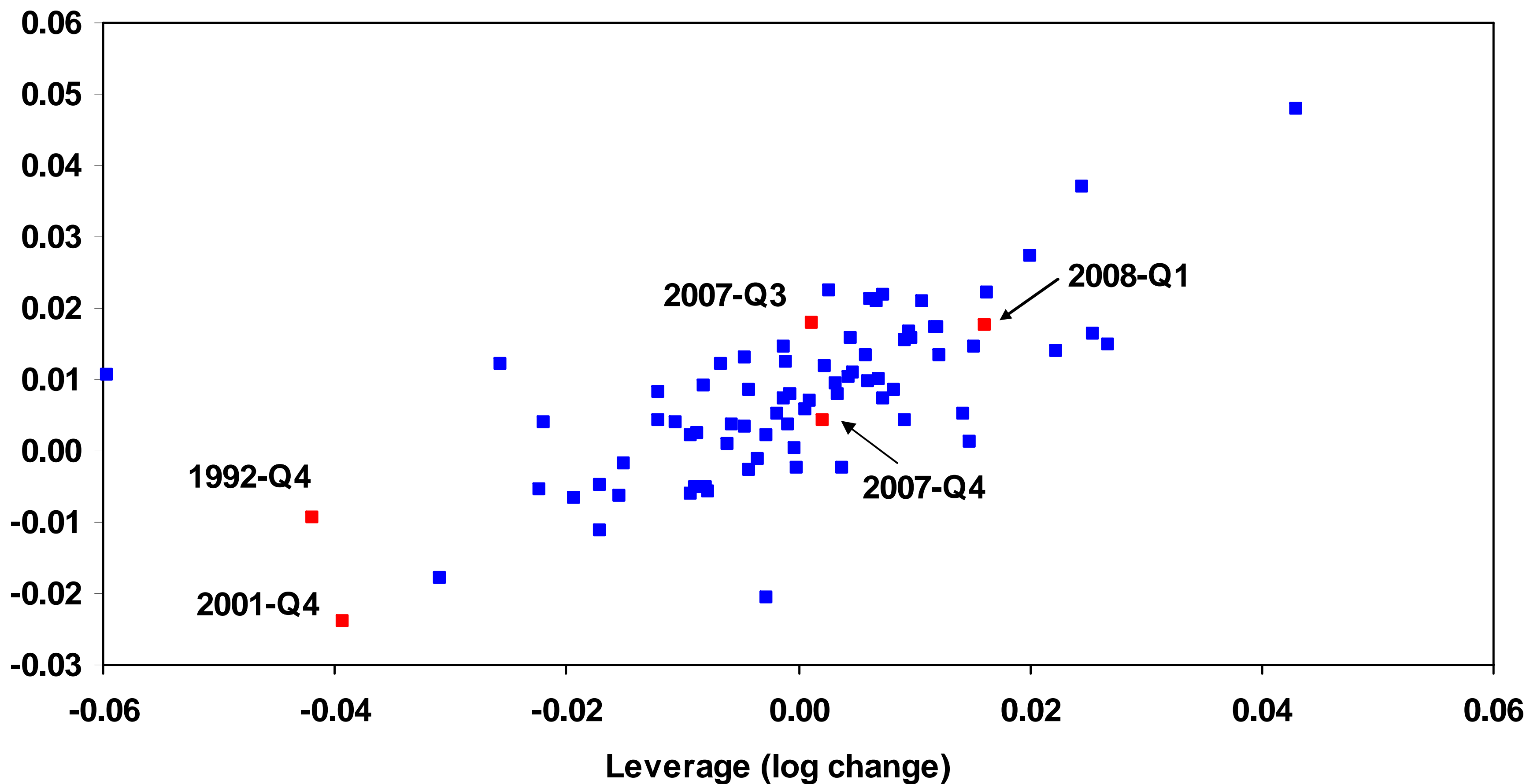
Leverage and Asset Growth for Large US Commercial Banks



Source: Authors' calculations based on SEC's Edgar database

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Leverage of Various Financial Institutions

	Assets ($bn)	Liabilities ($bn)	Capital ($bn)	Leverage
Commercial banks	11194	10050	1144	9.8
Savings Inst	1815	1607	208	8.7
Credit Unions	759	672	87	8.7
Finance Companies	1911	1720	191	10.0
Brokers/hedge funds	5597	5390	207	27.1
GSEs	1669	1598	71	23.5
Total - Leveraged Sector	**22945**	**21037**	**1908**	**12.0**

Source: Authors' calculations based on 2007 Q4 Flow of Funds, FDIC Statistics on Banking, Adrian and Shin (2007), and balance sheet data for Fannie Mae, Freddie Mac, and broker-dealers under Goldman Sachs equity analyst coverage.

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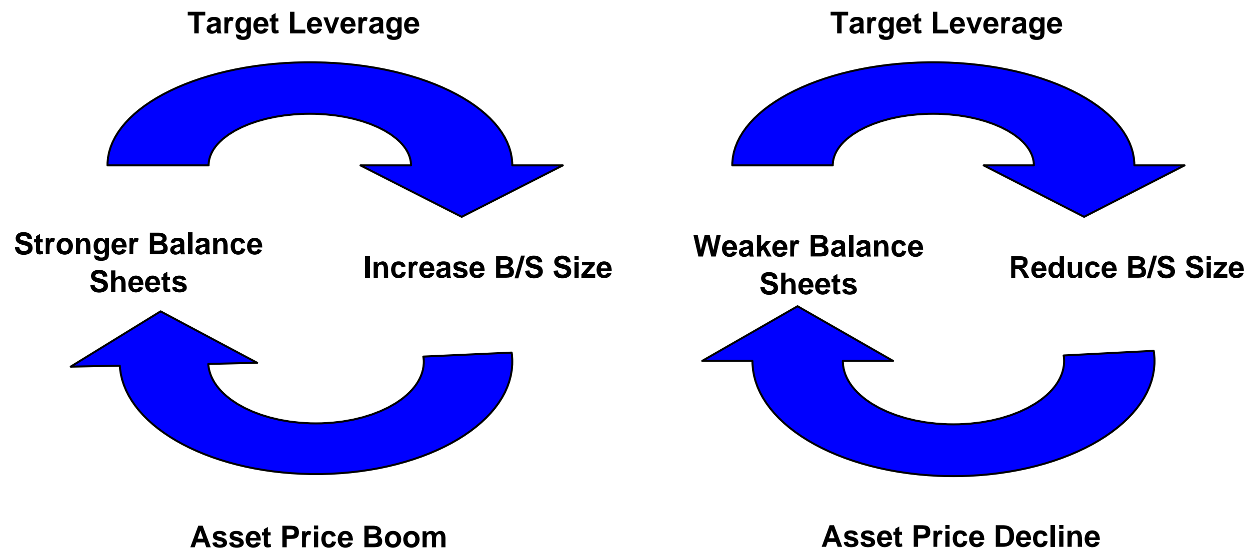
The Role of Risk Management

- **Mark-to-Market Accounting + Risk Management (or VAR) = Pro-cyclical Leverage at Financial Institutions**

- **Measured risk is low in booms, high in busts**
- **E = equity capital = VAR per dollar x assets**
- **Leverage = A/E = 1/(VAR per dollar)**

- **Suppose New Leverage: A*/E* = u x A/E**
- **So, A*/A = u x E*/E = u x (1 – ((L(1-k))/E))**
- **Where L = losses and k = % of recapitalization**

Another Way to View the Deleveraging Process



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Global Writedowns vs. Capital Injections: Where Do We Stand?

Company	Writedowns (Billions of dollars)
Citigroup	$55.1
Merrill Lynch	$52.2
UBS	$44.2
HSBC	$27.4
Wachovia	$22.7
Bank of America	$21.2
Morgan Stanley	$15.7
Washington Mutual	$14.8
IKB Deutsche	$14.7
JPMorgan Chase	$14.3
RBS	$14.2
Lehman Brothers	$13.8
Credit Suisse	$10.4
Deutsche Bank	$10.4
Wells Fargo	$10.0
Overall Total	**$518.2**

Company	Capital Infusion (Billions of dollars)
Citigroup	$49.1
Merrill Lynch	$29.9
UBS	$28.0
RBS	$23.2
Bank of America	$20.7
Barclays	$18.0
Lehman Brothers	$13.9
Washington Mutual	$12.1
IKB Deutsche	$12.2
Natixis	$11.8
Wachovia	$11.0
JPMorgan Chase	$9.5
Societe Generale	$9.4
National City	$8.9
Credit Agricole	$8.5
Overall Total	**$364.2**

Source: Bloomberg, page WDCI<GO>
Note: Announced writedowns and recapitalizations are as of September 18. Overall totals include institutions that are not listed separately.

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Impact of $250 Billion Equity Loss

Aggregate Asset Contraction as a Fraction of Initial Assets (%)

Decline in Leverage

k	0%	5%	10%
100%	1.00	0.95	0.90
75%	0.97	0.92	0.88
50%	0.95	0.90	0.85
25%	0.92	0.87	0.83
0%	0.89	0.85	0.80

Total Asset Contraction Associated with Deleveraging (Trillions of $)

Decline in Leverage

k	0%	5%	10%
100%	0.00	1.15	2.30
75%	0.63	1.74	2.86
50%	1.25	2.34	3.43
25%	1.88	2.93	3.99
0%	2.50	3.53	4.55

where k = % of recapitalization

Source: Authors' calculations

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Lending Reduction to the Rest of the Economy

Let Y = H+E, z = H/A and v = A/E

then, $Y/A = (Y/E)/(A/E) = A(1+zv)/v \rightarrow Y = A((1+10(7.5/23))/10) = 0.43A$

Decline in Credit to Non-Levered Entities (Trillions of $)

Decline in Leverage

k		0%	5%	10%
	100%	0.00	0.49	0.98
	75%	0.27	0.74	1.22
	50%	0.53	1.00	1.46
	25%	0.80	1.25	1.70
	0%	1.07	1.51	1.94

where k = % of recapitalization

Thus, assuming a 50% recapitalization rate, a $250 billion loss for leveraged financial intermediaries translates into a $1 trillion contraction in credit availability for the rest of the economy.

Source: Authors' calculations

Translation to the Real Economy

Treat decline in credit as a "supply-induced" decline in domestic nonfinancial debt (DNFD)

Dependent Variable Quarterly GDP Growth (at an annual rate)

Independent Variable	Coefficient	Standard Error	T-Statistic
Constant	1.470	0.475	3.080
GDP Growth$_{t-1}$	0.290	0.112	2.590
GDP Growth$_{t-2}$	0.284	0.102	2.800
GDP Growth$_{t-3}$	-0.224	0.107	-2.100
4 quarter DNFD Growth$_{t-1}$	0.140	0.072	1.950

Source: Authors' calculations

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Isolating the "Supply-Induced Variation"

Instrumental Variable Estimates of GDP Growth and DNFD*

Dependent Variable Quarterly GDP Growth (at an annual rate)

Independent Variable	Coefficient	Standard Error	T-Statistic
Constant	0.904	0.590	1.530
GDP Growth$_{t-1}$	0.247	0.118	2.100
GDP Growth$_{t-2}$	0.242	0.111	2.190
GDP Growth$_{t-3}$	-0.264	0.110	-2.410
4 quarter DNFD Growth$_{t-1}$	0.338	0.176	1.920

* Using the TED spread and senior loan officer opinion survey on the willingness to make installment loans as instruments for DNFD growth.

A $1 trillion contraction in credit availability is equivalent to a 3.2 percentage point decline in DNFD growth, which (using the equation above) corresponds to a 1.5 percentage point hit to real GDP growth over the following year.

Source: Authors' calculations

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Leveraged Losses: Where Do We Go From Here?

- **The key to restoring a market equilibrium is reducing credit exposure and rebuilding capital. The US economy will suffer until such an equilibrium is achieved.**

- **Capital can be rebuilt in a number of different ways, such as:**

  1) Retain more internally generated cash flow (i.e., cut dividends)

  2) Obtain an external infusion (perhaps from SWF's and PE)

  3) Write-ups of the underlying assets

- **An aggressive policy response from Washington lawmakers could have an important impact on the valuation of mortgage-related assets.**

- **The TARP, recently announced by the Treasury, represents a potentially viable solution since it could represent a source for both write-ups and capital injections.**

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