Financial Market Stability, Liquidity, and Systemic Risk

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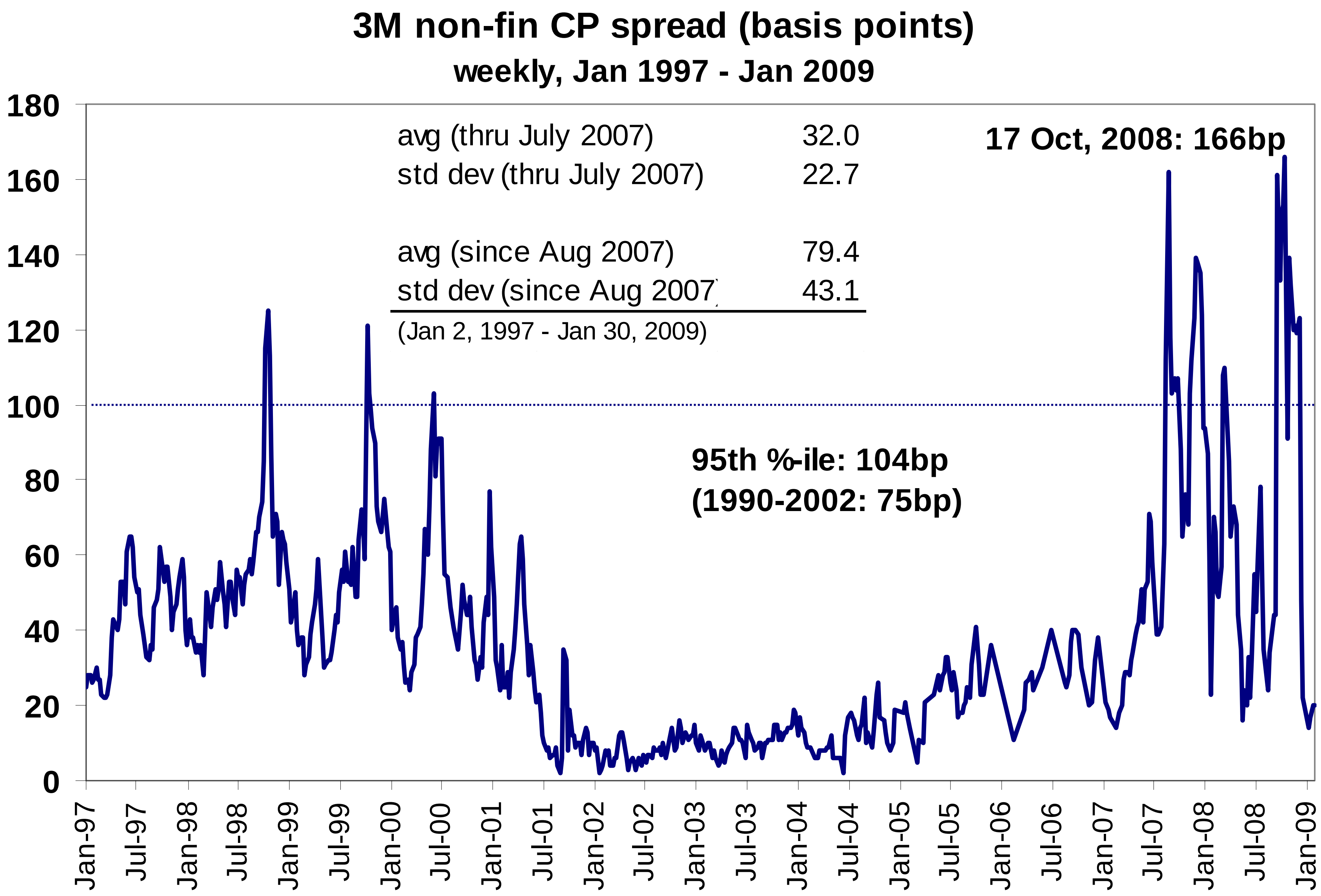
* Any views expressed represent those of the author only and not necessarily those of the Federal Reserve Bank of New York or the Federal Reserve System.

Words I thought I'd never hear . . . .

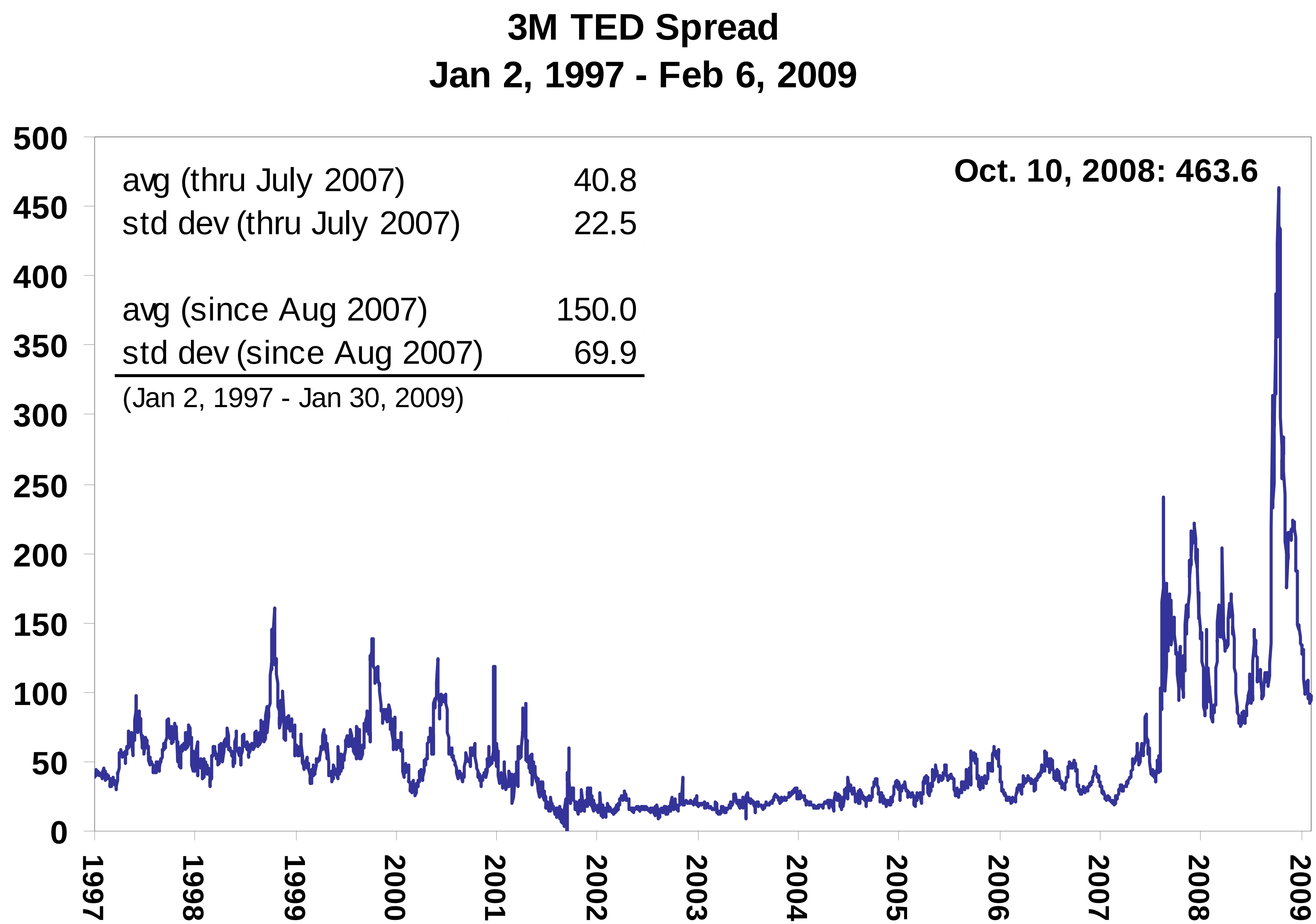
- Oh sh*$, Lehman won't file for bankruptcy before Asia opens
- The interbank market is completely shut down
- An insurance company is systemically important
- $2 trillion rescue plan ….. and the market drops 5%
- WSJ uses the N word ….. Nationalization

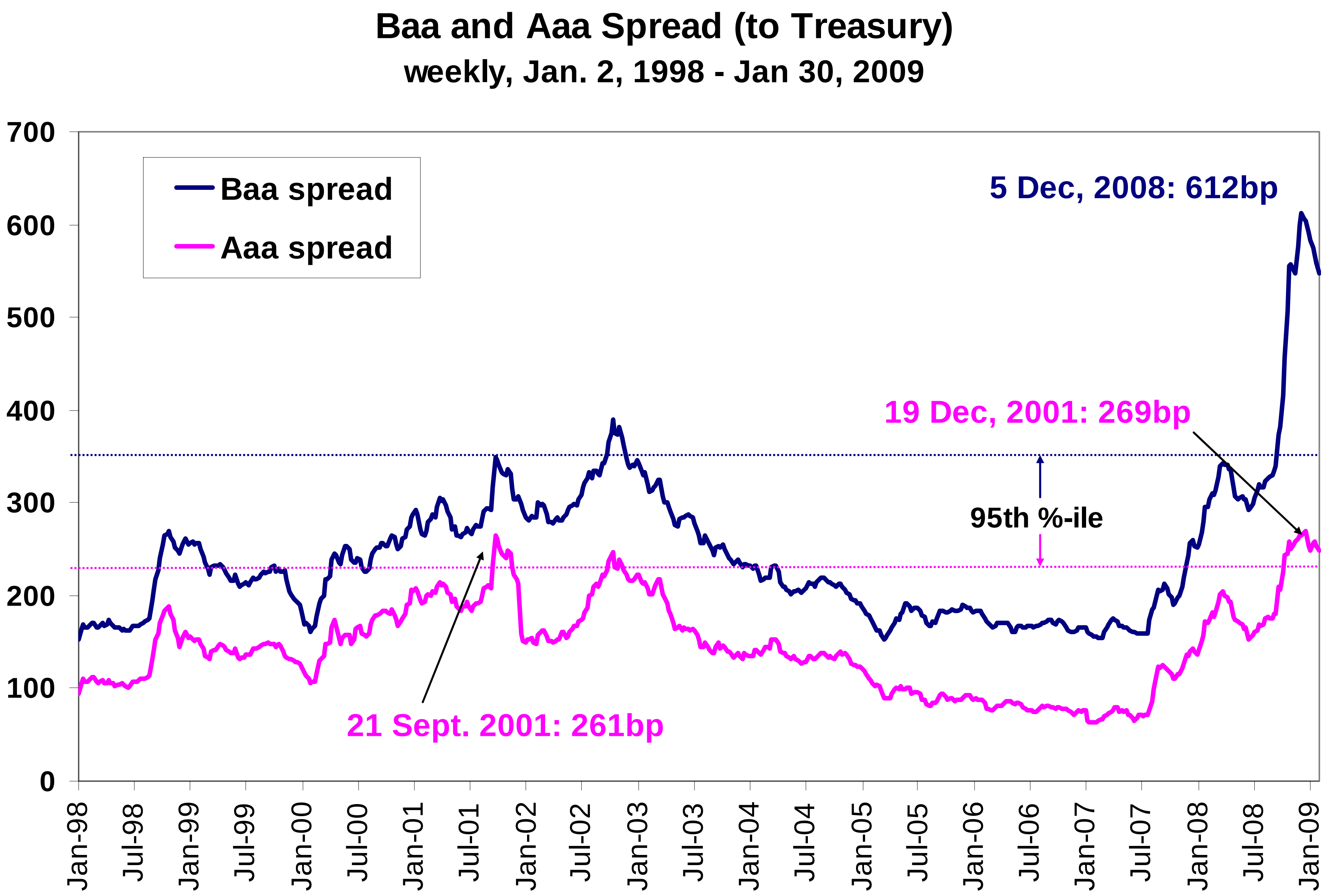
“Europe simulates financial meltdown”

(Headline in FT, April 10, ***2006****, p.2)*



3M non-fin CP spread (basis points)
weekly, Jan 1997 - Jan 2009
avg (thru July 2007) 32.0
std dev (thru July 2007) 22.7
avg (since Aug 2007) 79.4
std dev (since Aug 2007) 43.1
(Jan 2, 1997 - Jan 30, 2009)
17 Oct, 2008: 166bp
95th %-ile: 104bp
(1990-2002: 75bp)
180
160
140
120
100
80
60
40
20
0
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09


3M TED Spread
Jan 2, 1997 - Feb 6, 2009
avg (thru July 2007) 40.8
std dev (thru July 2007) 22.5
avg (since Aug 2007) 150.0
std dev (since Aug 2007) 69.9
(Jan 2, 1997 - Jan 30, 2009)
Oct. 10, 2008: 463.6
500
450
400
350
300
250
200
150
100
50
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009



Baa and Aaa Spread (to Treasury)
weekly, Jan. 2, 1998 - Jan 30, 2009
700
600
500
400
300
200
100
0
Baa spread
Aaa spread
5 Dec, 2008: 612bp
19 Dec, 2001: 269bp
95th %-ile
21 Sept. 2001: 261bp
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
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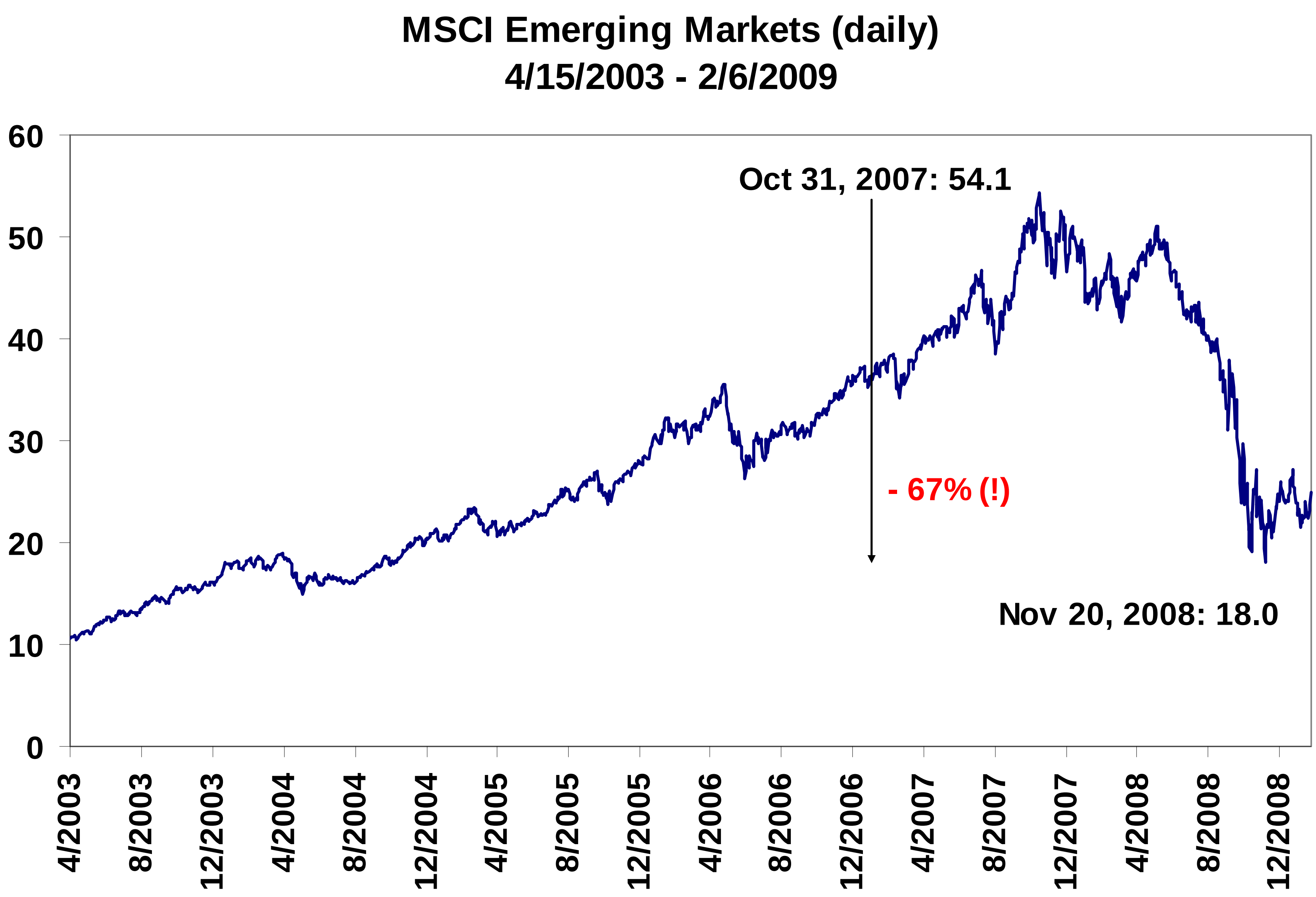
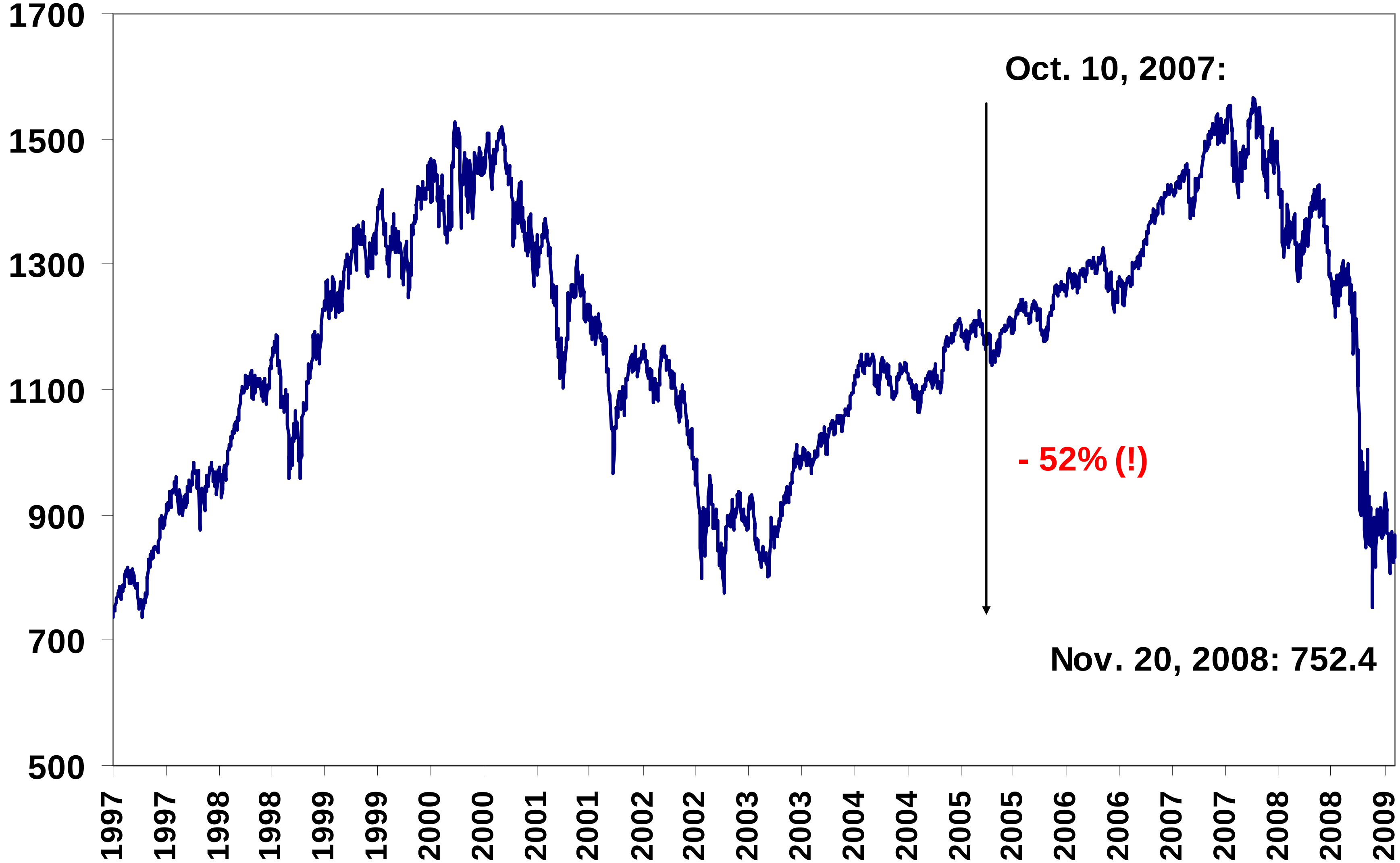
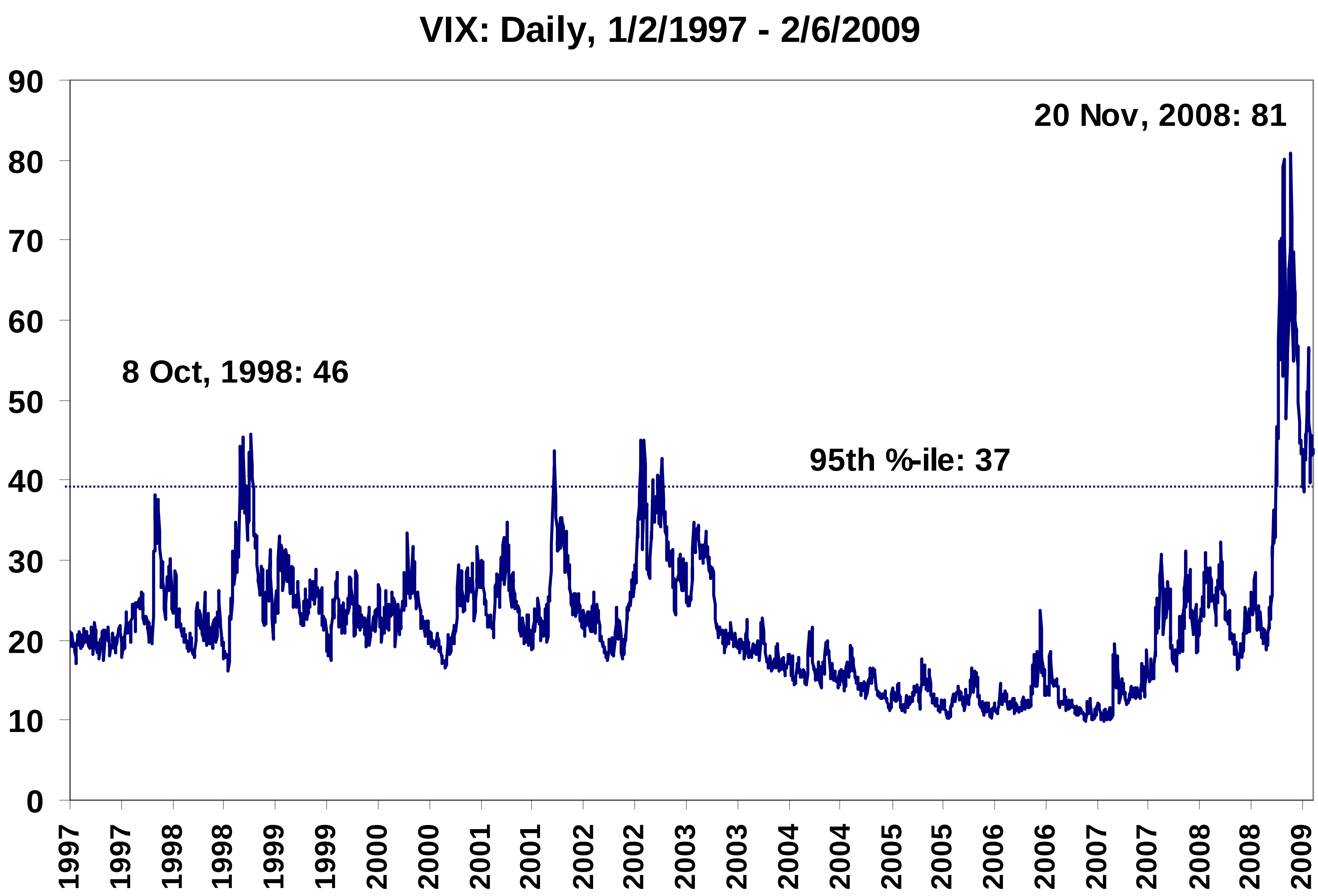
Jan-08
Jul-08
Jan-09



MSCI Emerging Markets (daily)
4/15/2003 - 2/6/2009
60
50
40
30
20
10
0
Oct 31, 2007: 54.1
- 67% (!)
Nov 20, 2008: 18.0
4/2003
8/2003
12/2003
4/2004
8/2004
12/2004
4/2005
8/2005
12/2005
4/2006
8/2006
12/2006
4/2007
8/2007
12/2007
4/2008
8/2008
12/2008

S&P500: Daily, 1/2/1997 - 2/6/2009





VIX: Daily, 1/2/1997 - 2/6/2009
90
80
70
60
50
40
30
20
10
0
20 Nov, 2008: 81
8 Oct, 1998: 46
95th %-ile: 37
1997
1997
1998
1998
1999
1999
2000
2000
2001
2001
2002
2002
2003
2003
2004
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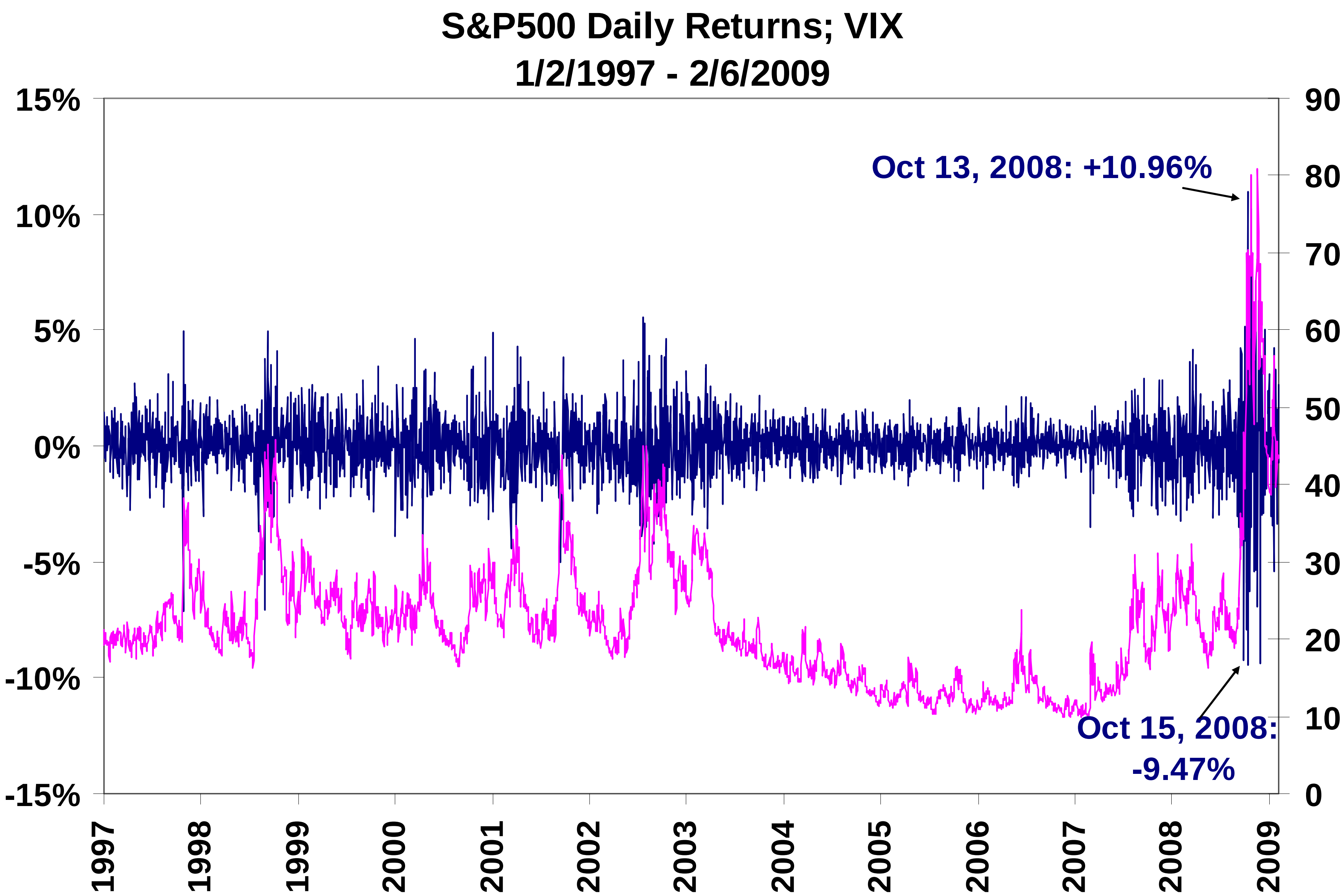
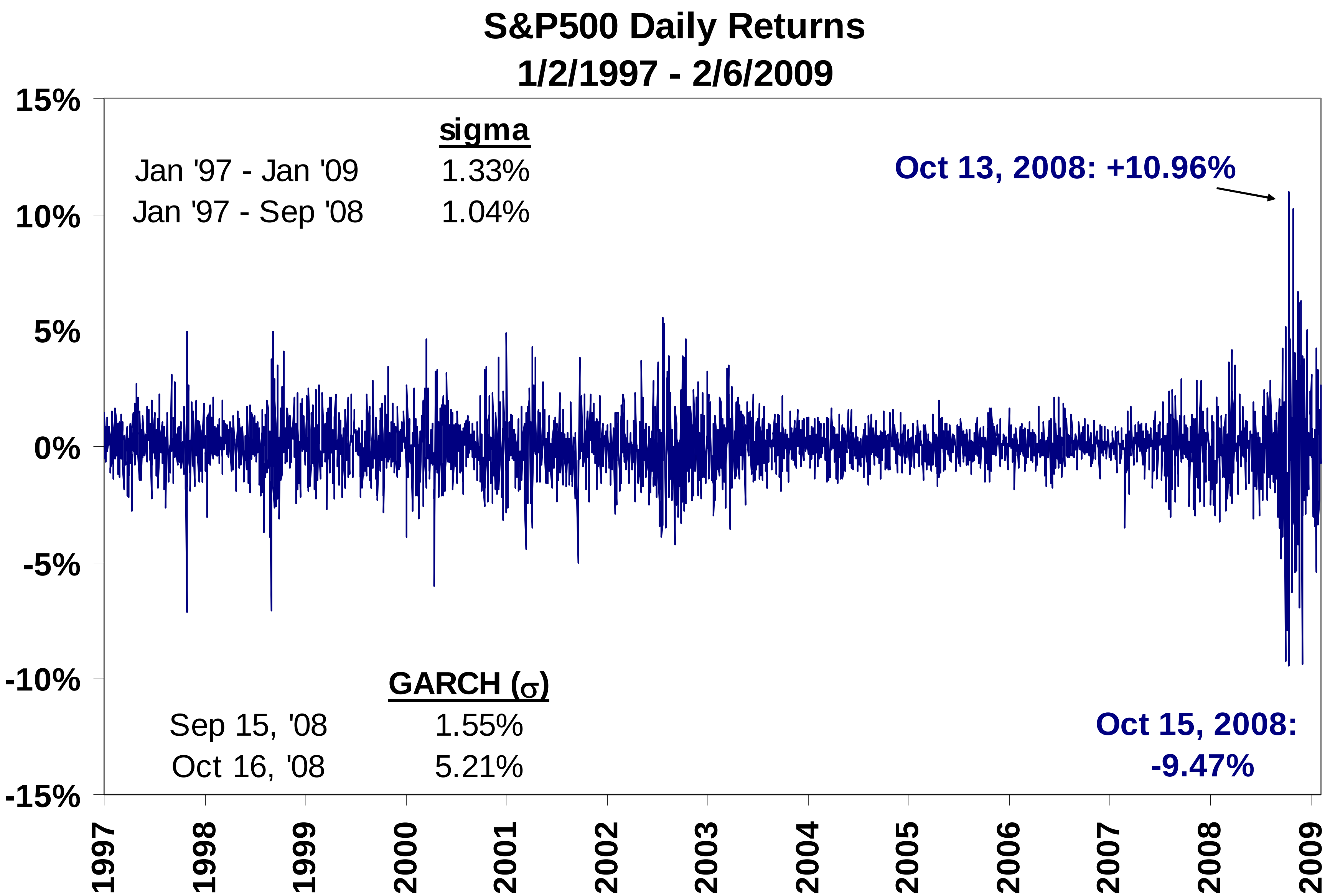
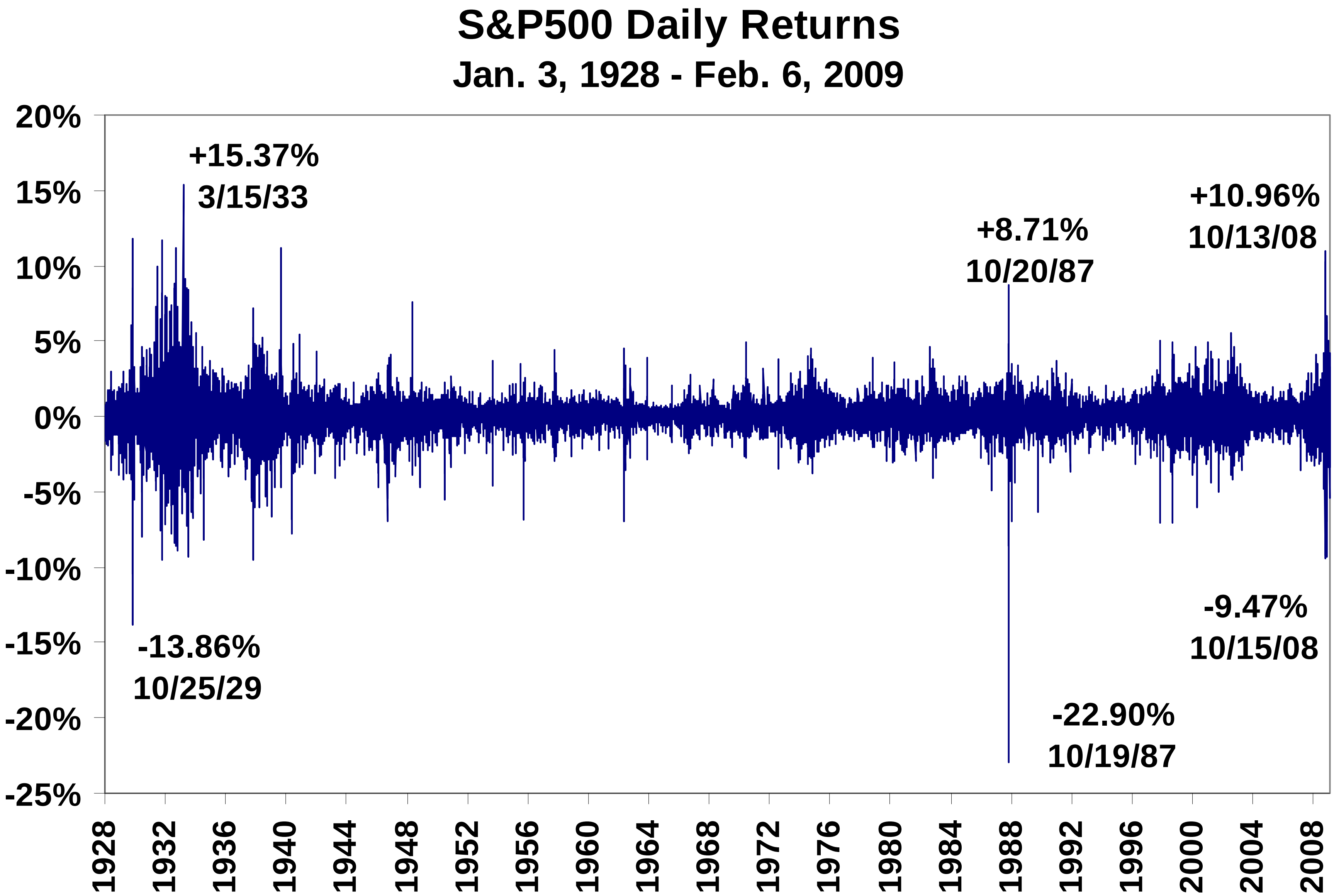
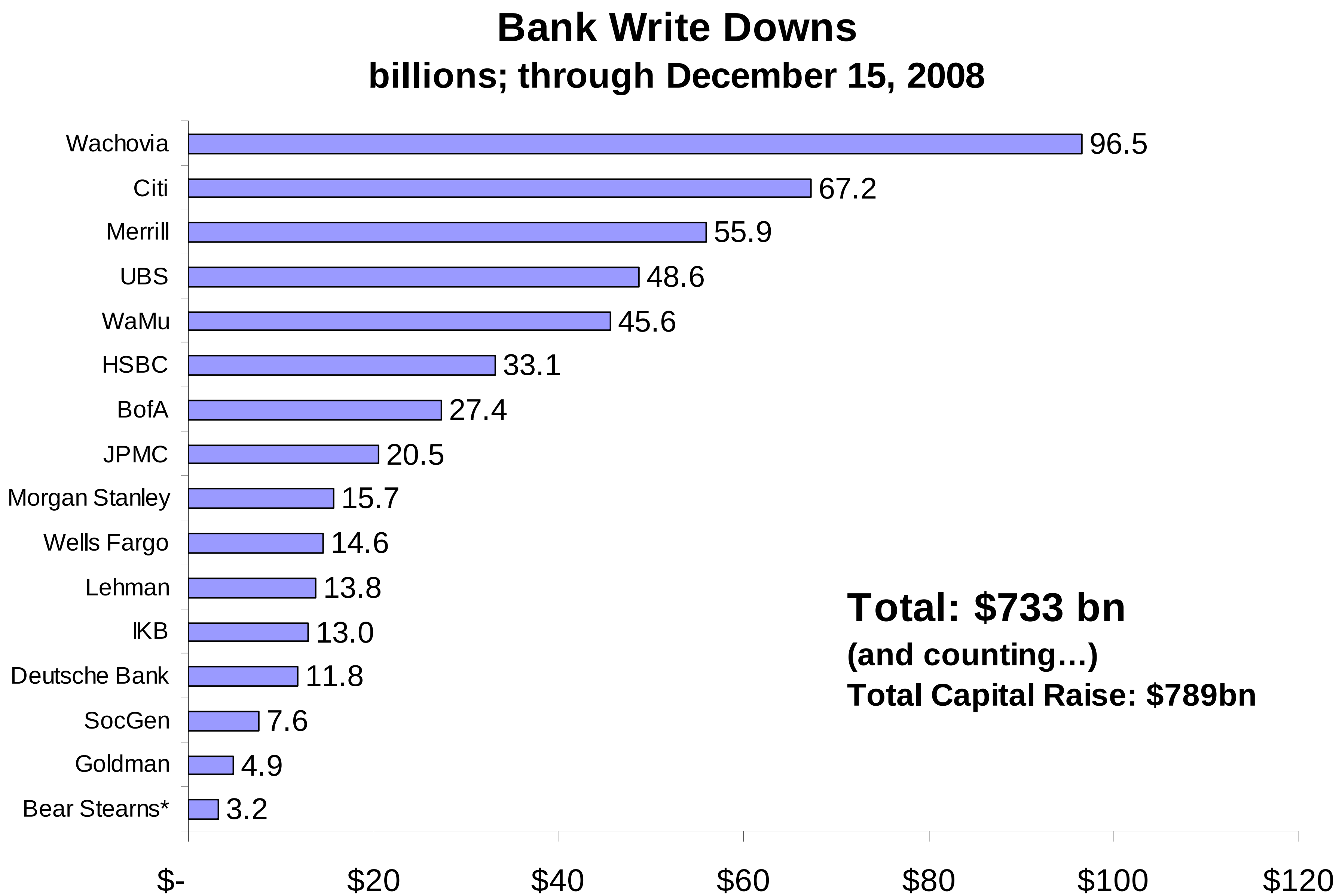
2007
2007
2008
2008
2009


S&P500 Daily Returns; VIX
1/2/1997 - 2/6/2009
15%
10%
5%
0%
-5%
-10%
-15%
90
80
70
60
50
40
30
20
10
0
Oct 13, 2008: +10.96%
Oct 15, 2008: -9.47%
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009


S&P500 Daily Returns
1/2/1997 - 2/6/2009
15%
10%
5%
0%
-5%
-10%
-15%
sigma
Jan '97 - Jan '09 1.33%
Jan '97 - Sep '08 1.04%
Oct 13, 2008: +10.96%
GARCH (σ)
Sep 15, '08 1.55%
Oct 16, '08 5.21%
Oct 15, 2008:
-9.47%
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009


S&P500 Daily Returns
Jan. 3, 1928 - Feb. 6, 2009
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
-25%
+15.37%
3/15/33
+8.71%
10/20/87
+10.96%
10/13/08
-13.86%
10/25/29
-9.47%
10/15/08
-22.90%
10/19/87
1928
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008



Source: Bloomberg

The shadow and "actual" banking system

- Early 2007:
  - ABCP + SIV + ARS + TOB + VRDN ≈ $2.2 trn
  - O/N tri-party repo: $2.5 trn
  - Hedge funds AUM: $1.8 trn
  - Assets of 5 i-banks: $4 trn

  - Assets of 5 U.S. BHCs: $6 trn
  - Assets of all U.S. banks: $10 trn

- Typically about 40% of consumer debt is securitized
  - No more; now it has to go back on to banks' BSs

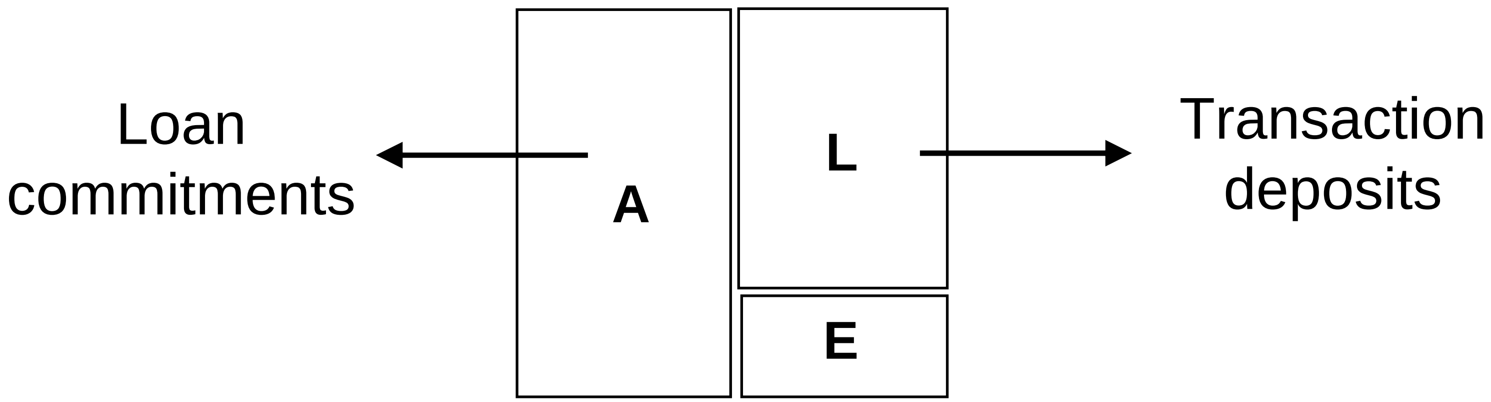
- Meanwhile, sum of write-offs to date (> $700bn) exceeds cost of S&L crisis (~ $250bn in current $)

Banks as liquidity providers and maturity transformers

- ALM is a dominant, hard to measure (manage?) risk
  - It is central to what banks do
- Banks (commercial and investment) are naturally longer assets than liabilities
  - In intermediating they conduct maturity transformation for the economy
  - They bear risk – and are compensated
    - And subsidized (through the existence of safety net)
- And banks are liquidity providers of second to last resort

Bank liquidity management

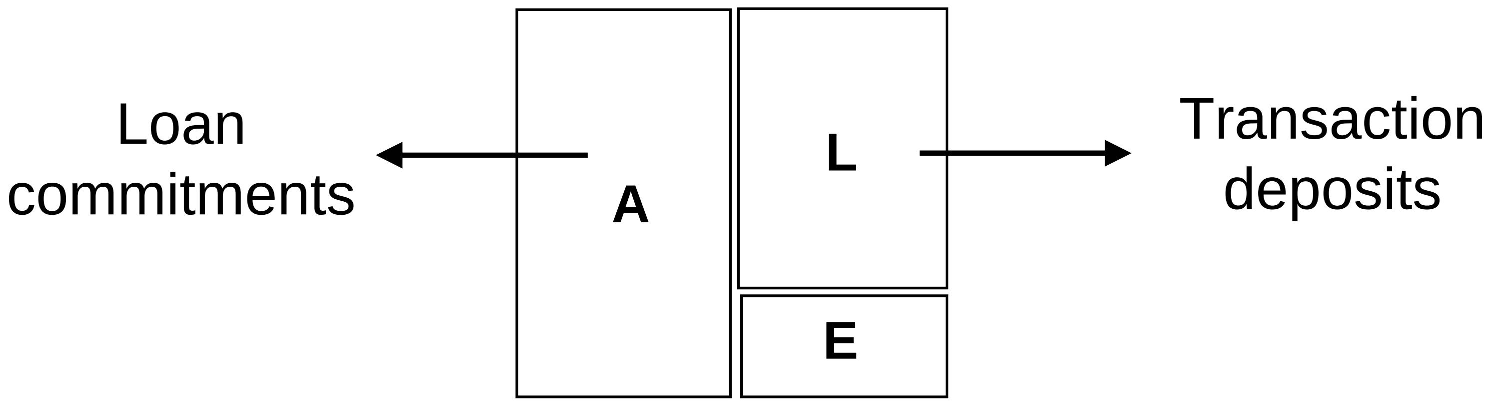
- A bank offers two short-term liquidity contracts



- Seems very unstable
  – What if demand spikes for both at the same time?
  – And what if that happens systematically (affecting *all* banks)
  – Worry about bank runs

Bank liquidity management

- A bank offers two short-term liquidity contracts



- Other sources of bank liquidity
  - Hold cash and liquid assets
  - Access to the inter-bank market
  - Borrow from the central bank

But maybe combining the 2 contracts reduces risk . . .

- Diversification synergy
  - Combining transactions deposits and loan commitments reduces *idiosyncratic* risk (Kashyap, Rajan & Stein, JF 2002)
  - Transaction deposits *hedge* the systematic liquidity risk exposure of loan commitments

- Flight to quality
  - Banks can bear *systematic* shocks to liquidity demand due to funding inflows (Gatev and Strahan, JF 2006)
  - Deposit-lending synergy is *stronger* in a liquidity crisis (e.g. Fall 1998) Gatev, Schuermann & Strahan, NBER 2005, RFS 2009

- Seems related to government safety net
  - Funding flows not related to bank solvency or size
  - Effects absent prior to FDIC (Pennacchi JME 2006)

What’s going on now?

- Banks have been hoarding liquidity
- Deposit flows
  – Foreign/domestic ….
- Bank balance sheets are growing
  – “Voluntarily”?
  – Banks are clearly re-intermediating as the “shadow banking system” is shrinking
  – But are they extending enough new credit?
- New Fed facilities
  – To help with liquidity (TAF, TSLF, PDCF)
  – To also help with credit provision (CPFF, TALF)

Problems addressed by new lending facilities

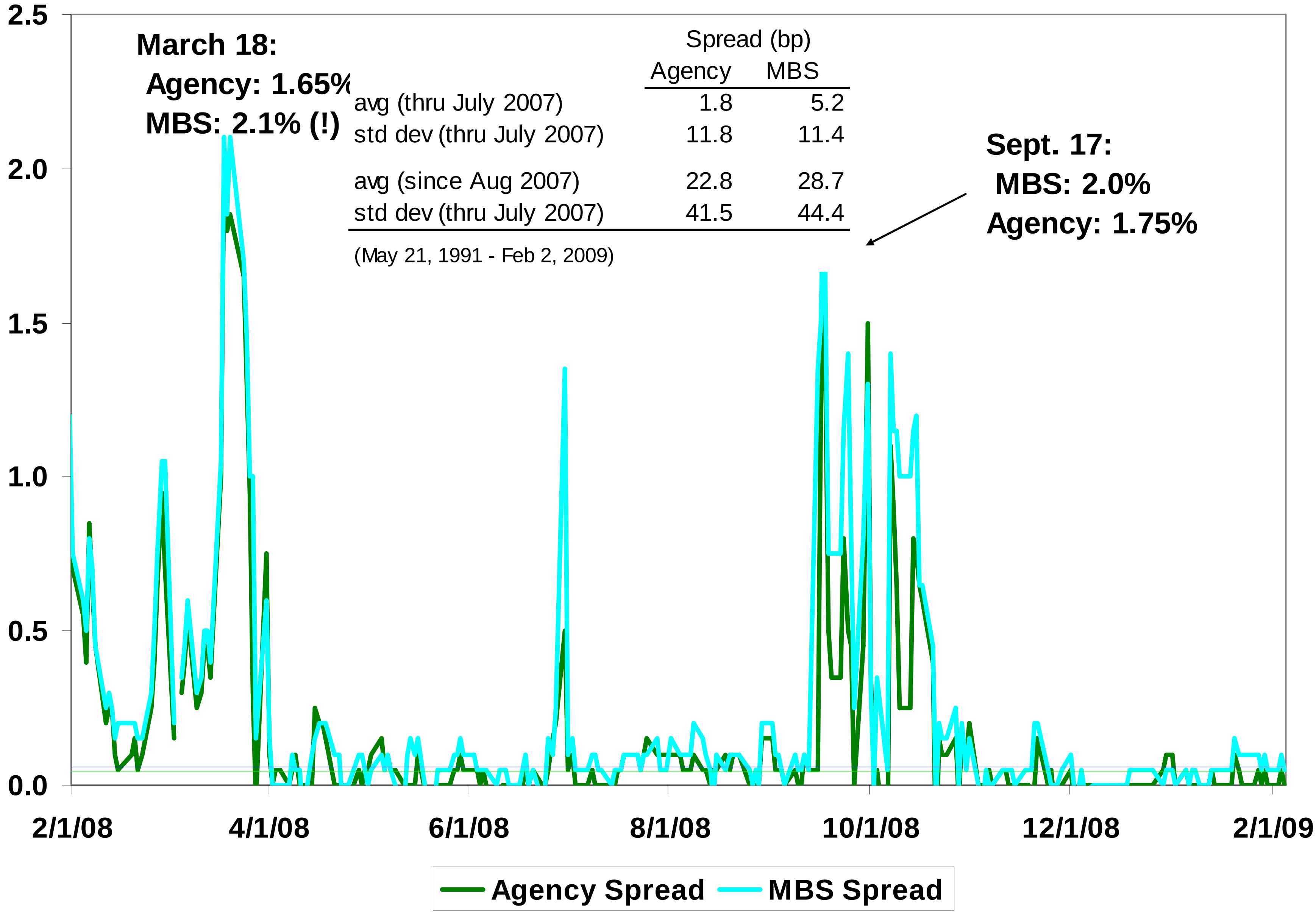
	Depository Institutions	Primary Dealers
Backstop Standing Facilities	Discount Window	Primary Dealer Credit Facility (PDCF)
Auction Facilities	Term Auction Facility (TAF)	Term Securities Lending Facility (TSLF)

- TAF: illiquid term markets and the stigma that accompanies discount window borrowing.
- TSLF: illiquid functioning in repo funding markets—illustrated by abnormal rates and high haircuts.
- PDCF: the lack of market-based back-stop credit in repo markets.

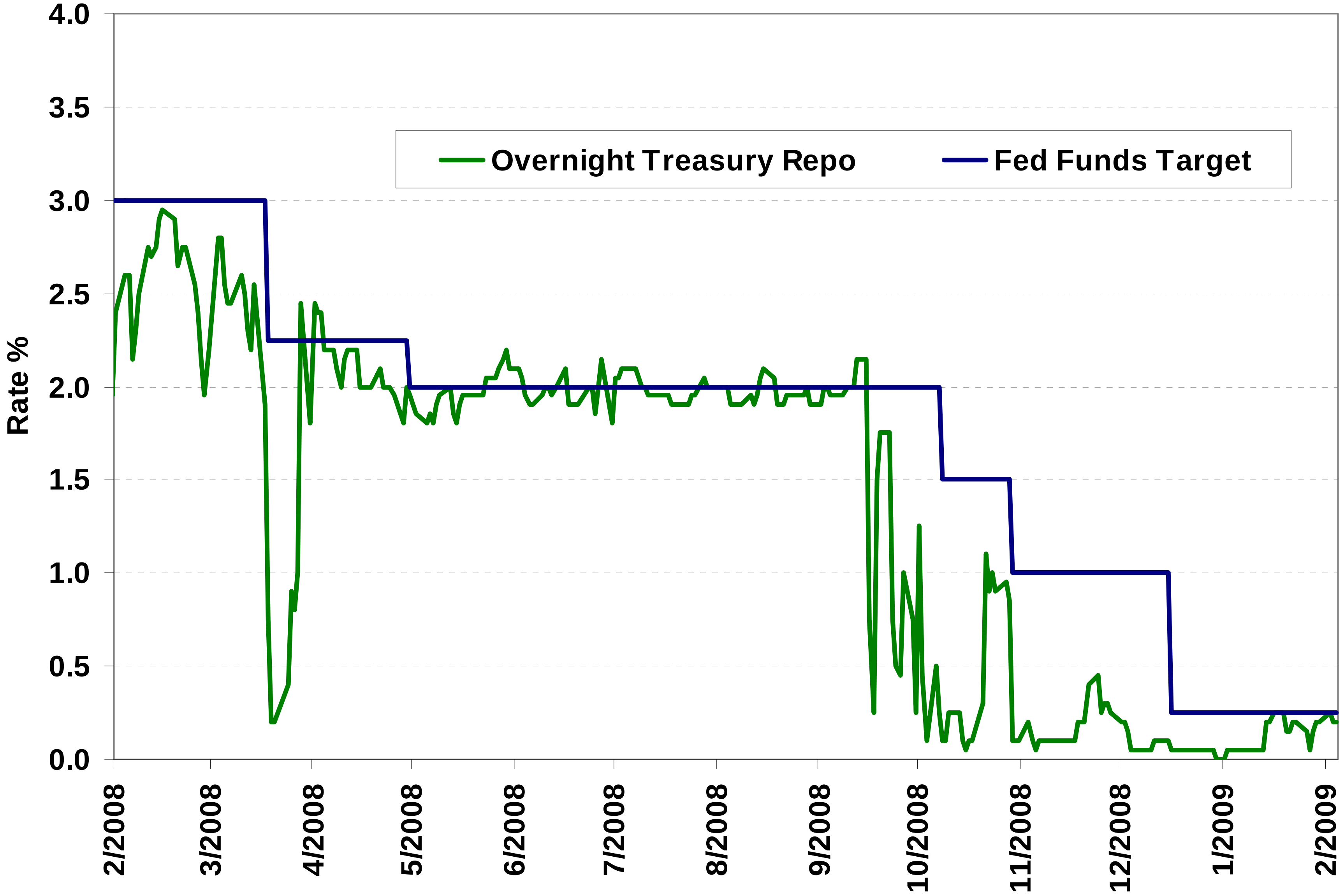
What can you pledge at the TSLF & PDCF?

- TSLF: OMO collateral plus investment grade securities: private label RMBS, CMBS, Agency CMOs, ABS such as CDOs, CLOs, corporates, munis, MBS (R and C), ABS
  - So long as it can be priced by the clearing banks
- PDCF: above plus sub-investment grade securities plus equities
- Importantly, previously repo-able securitized instruments are no longer “stuck” on firms’ balance sheets
  - Facilities designed as liquidity vehicles
- TALF: re-ignite consumer debt securitization

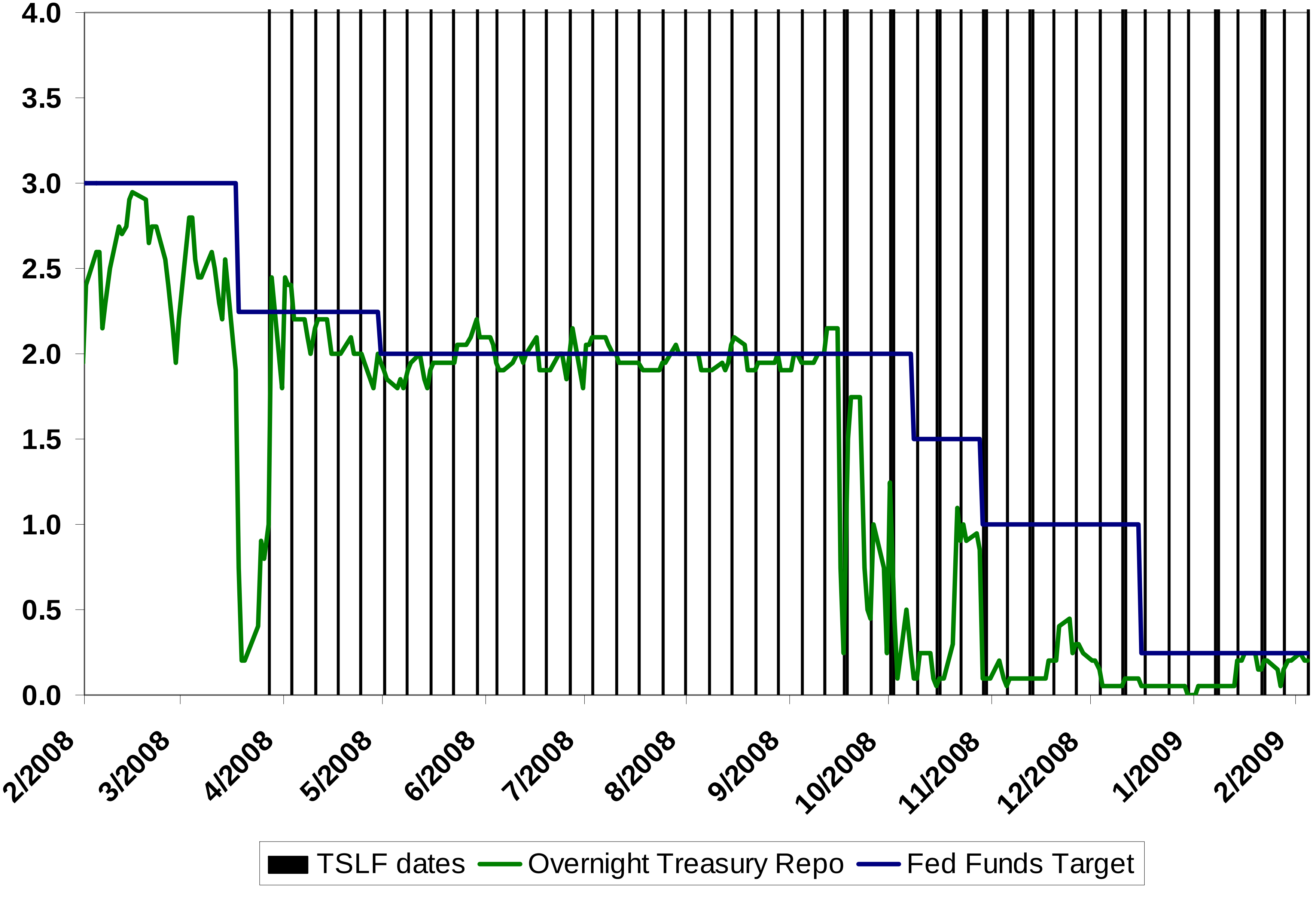
Spread to Agencies: flight to quality



Flight to quality



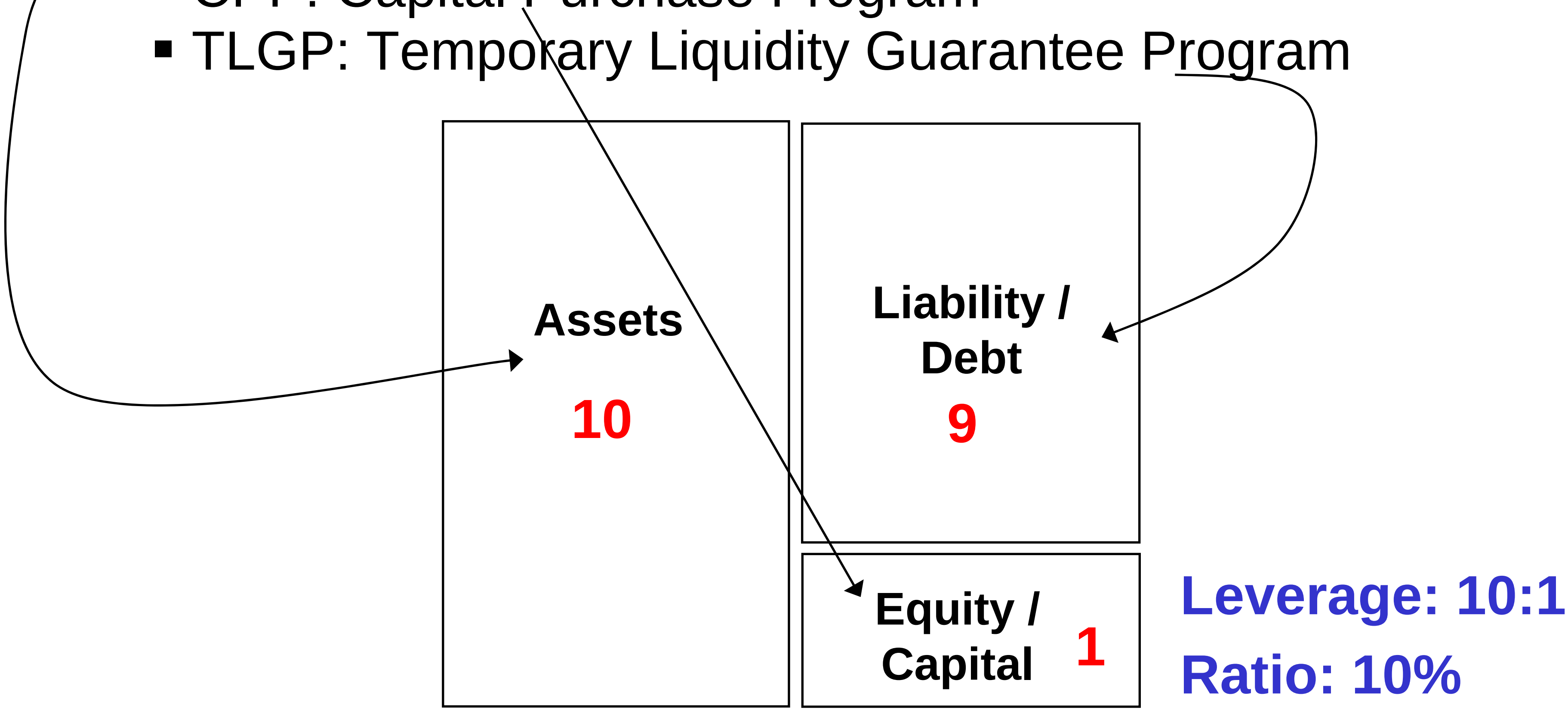
Impact of TSLF



A suite of policy tools

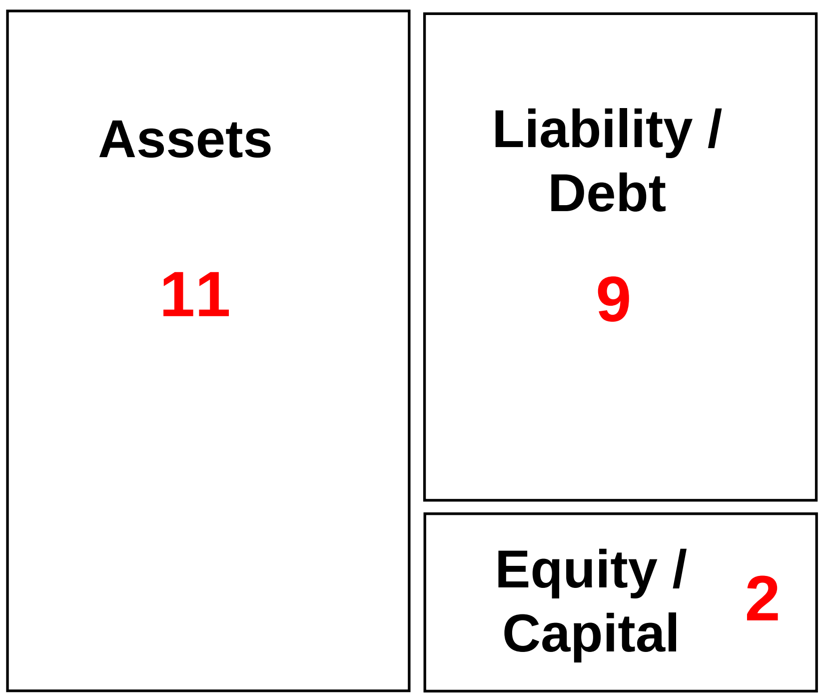
EESA: Emergency Economic Stabilization Act

- TARP: Troubled Asset Purchase Program
- CPP: Capital Purchase Program
- TLGP: Temporary Liquidity Guarantee Program



Asset purchase: Price > Mark

- Treasury buys troubled assets:
  - Spends $2 (cash) to buy assets “marked” $1

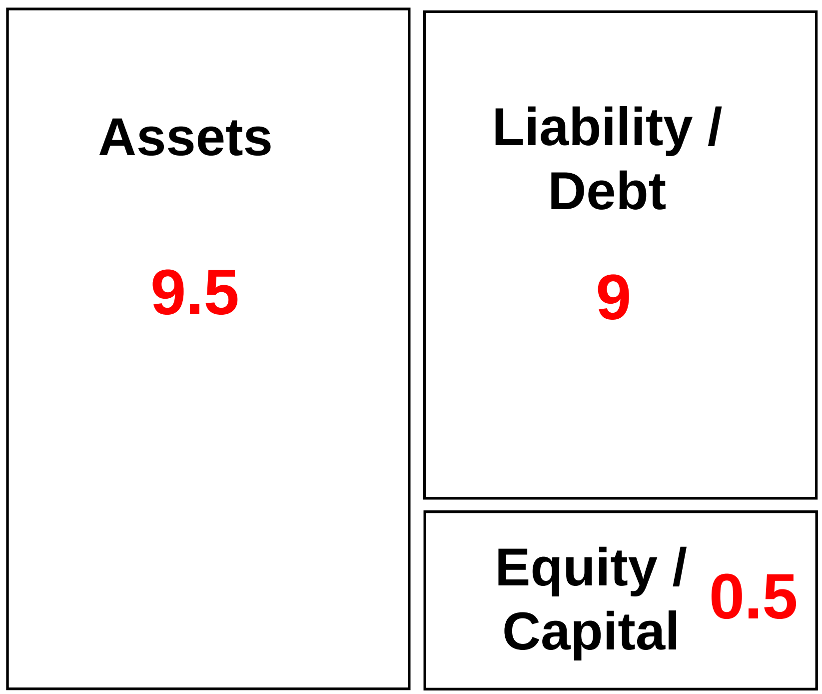


Leverage: 11:2 (5.5:1)

Ratio: 18.2%

Asset purchase: Price < Mark

- Treasury buys troubled assets:
  - Spends $0.5 (cash) to buy assets “marked” $1



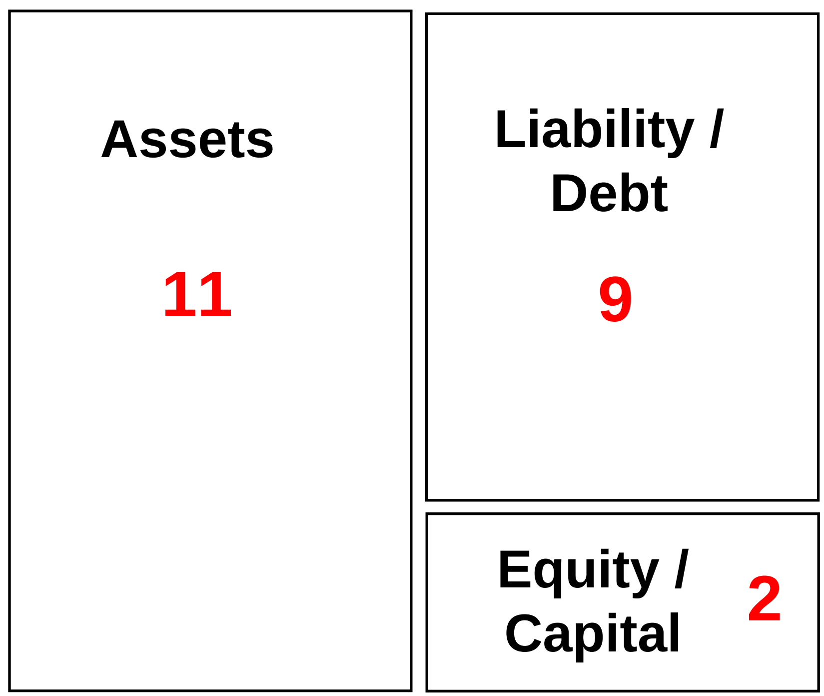
Leverage: 9½:½

(19:1)

Ratio: 5.3%

Capital injection

- Treasury buys preferred shares (capital injection:
  – Spends $1 to buy $1 of preferred shares
  – Proceeds used to buy safe(r) assets

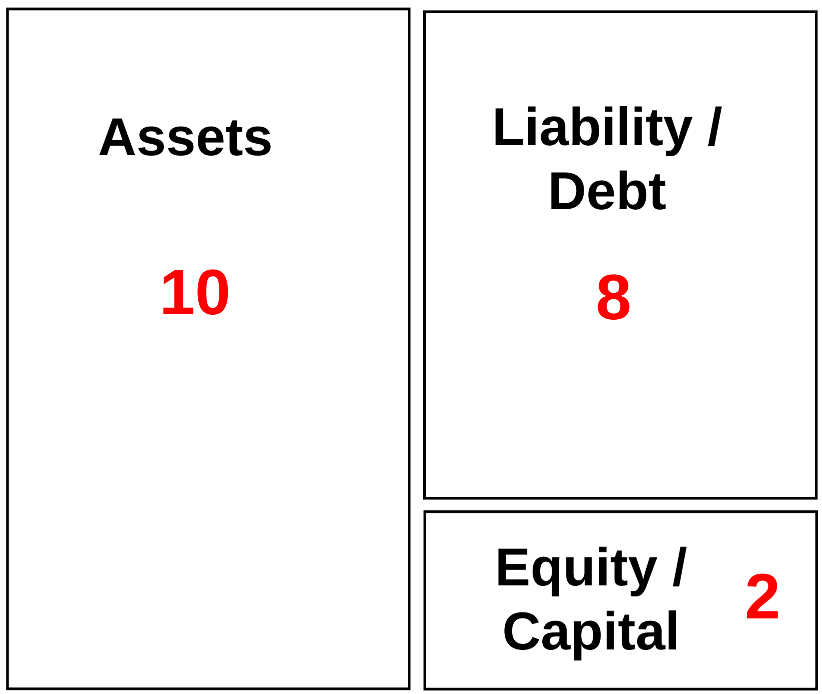


Leverage: 11:2 (5.5:1)

Ratio: 18.2%

Capital injection for debt retirement

- Treasury buys preferred shares (capital injection:
  - Spends $1 to buy $1 of preferred shares
  - Firm retires $1 of debt

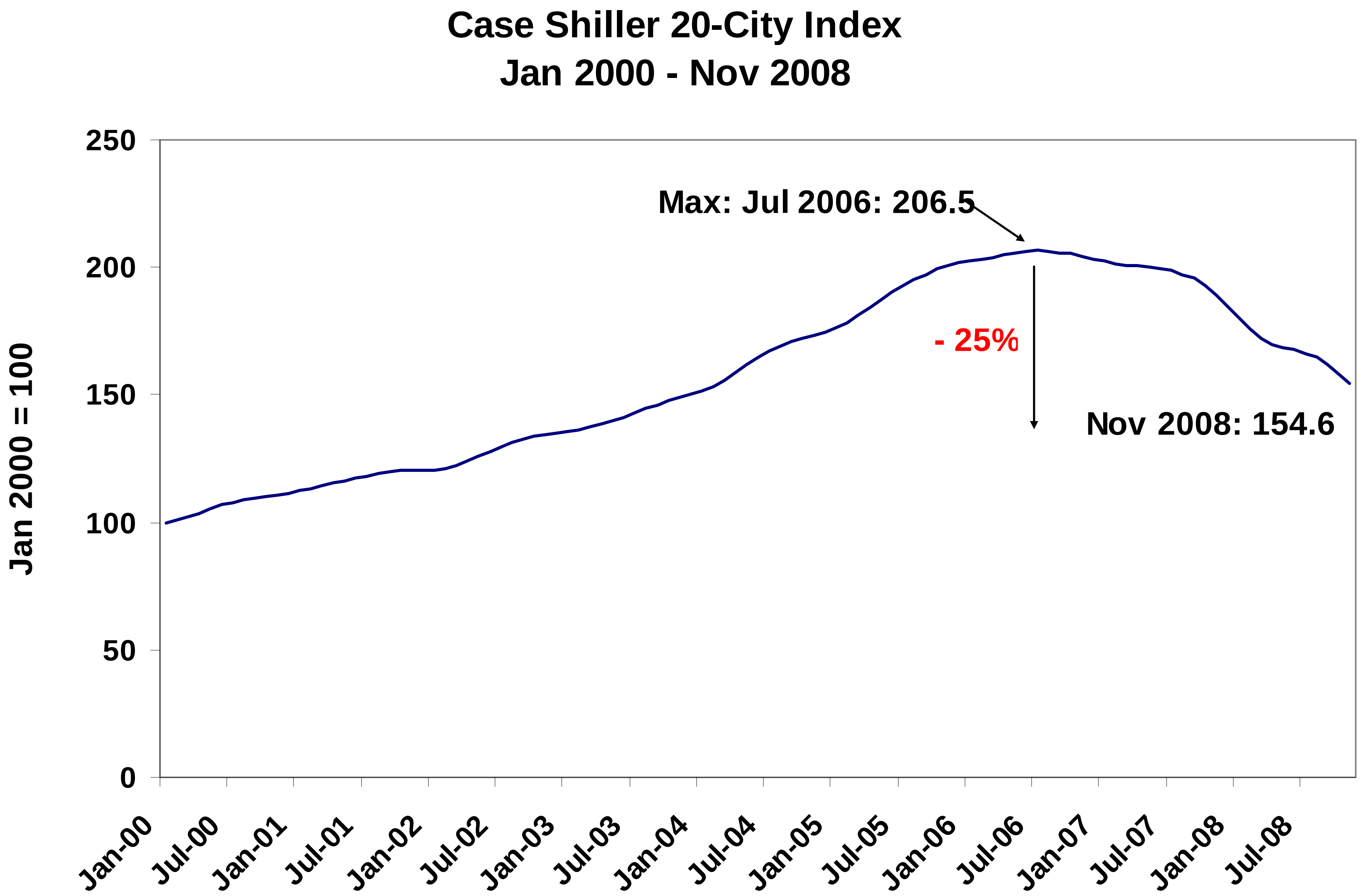


Leverage: 10:2

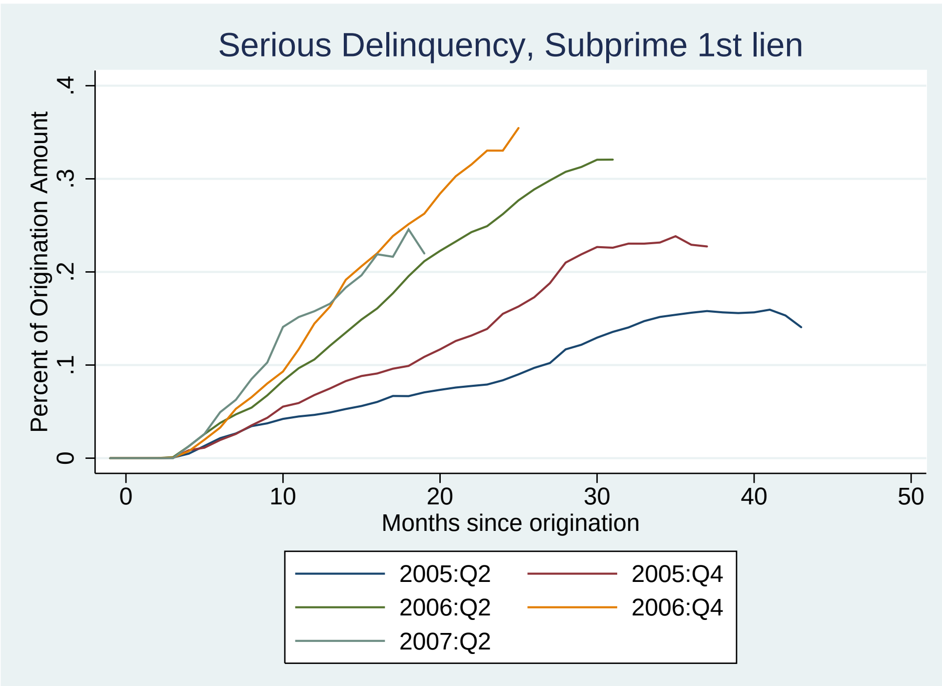
(5:1)

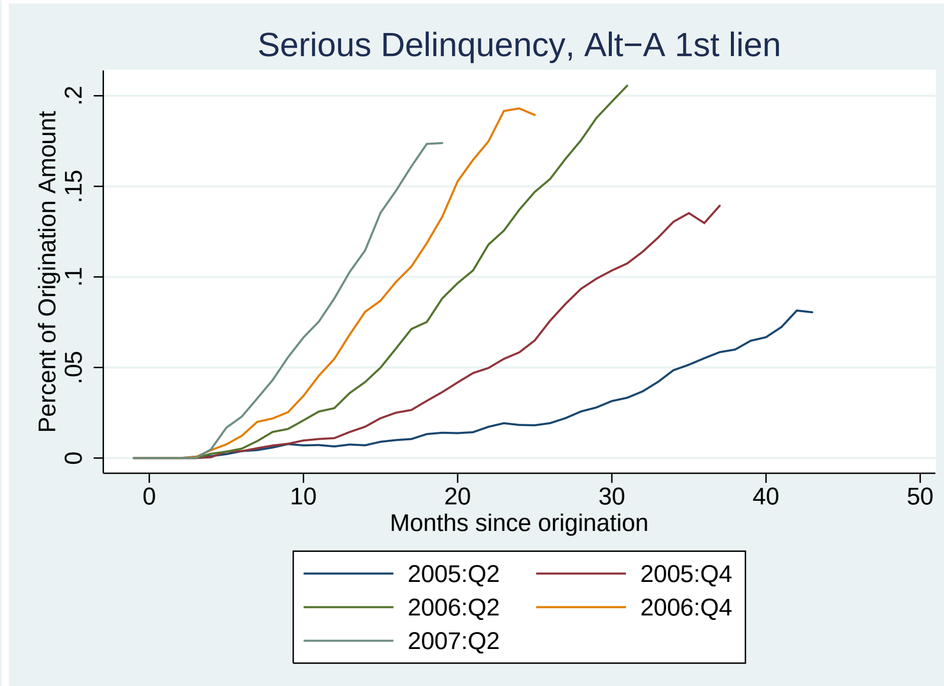
Ratio: 20%

What about housing?



Subprime: Serious delinquencies by class and vintage

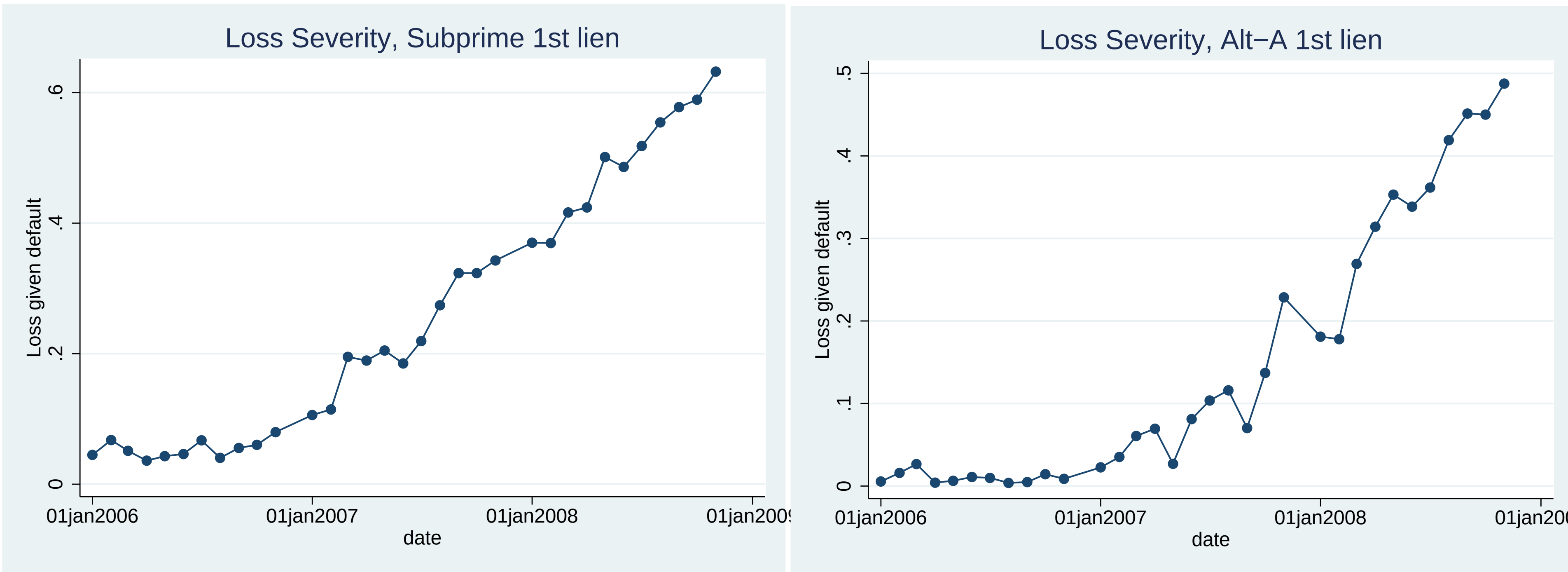




Data Source: Loan Performance

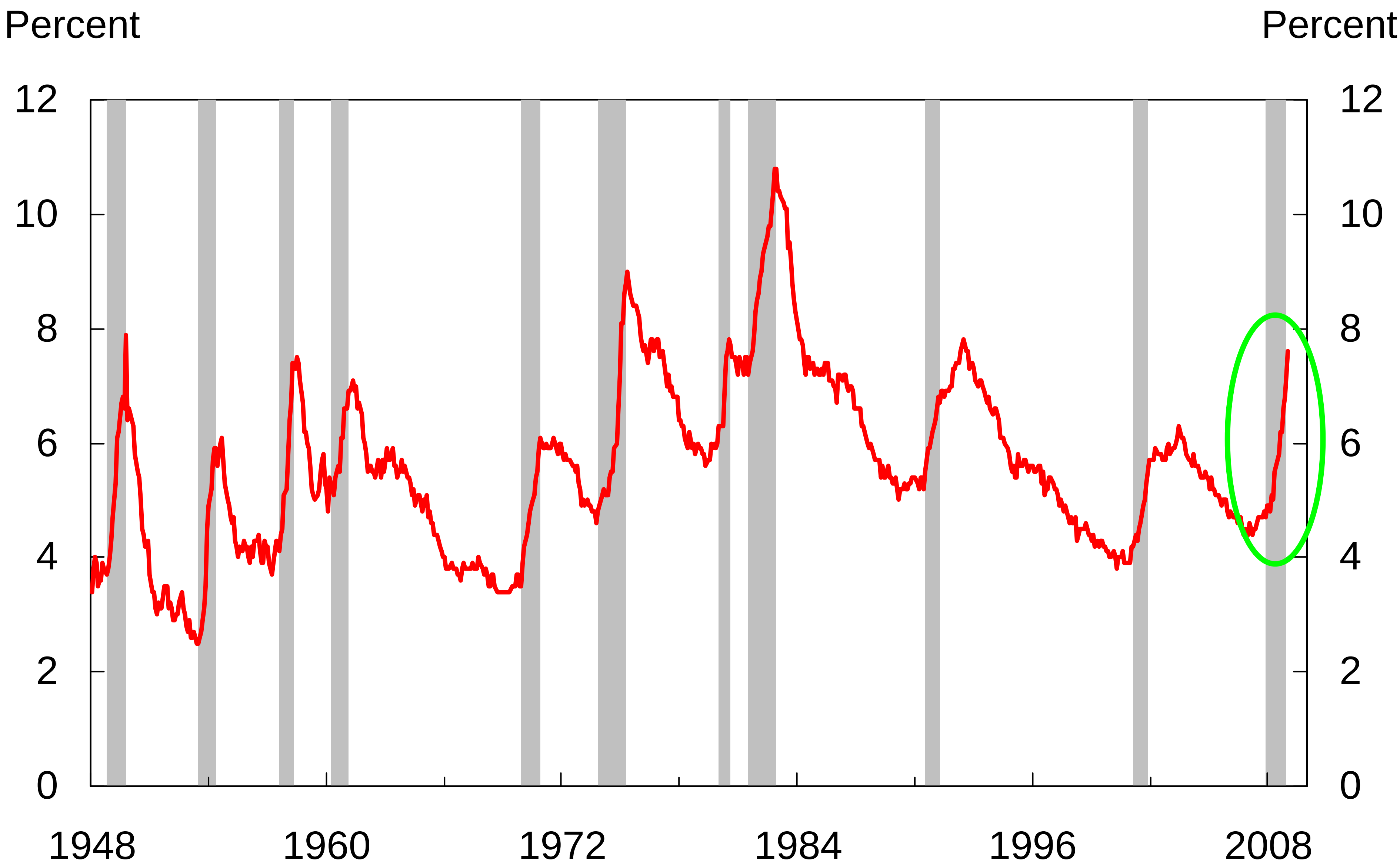
Subprime: Loss severity by class

- Starting to see LGD > 60%!



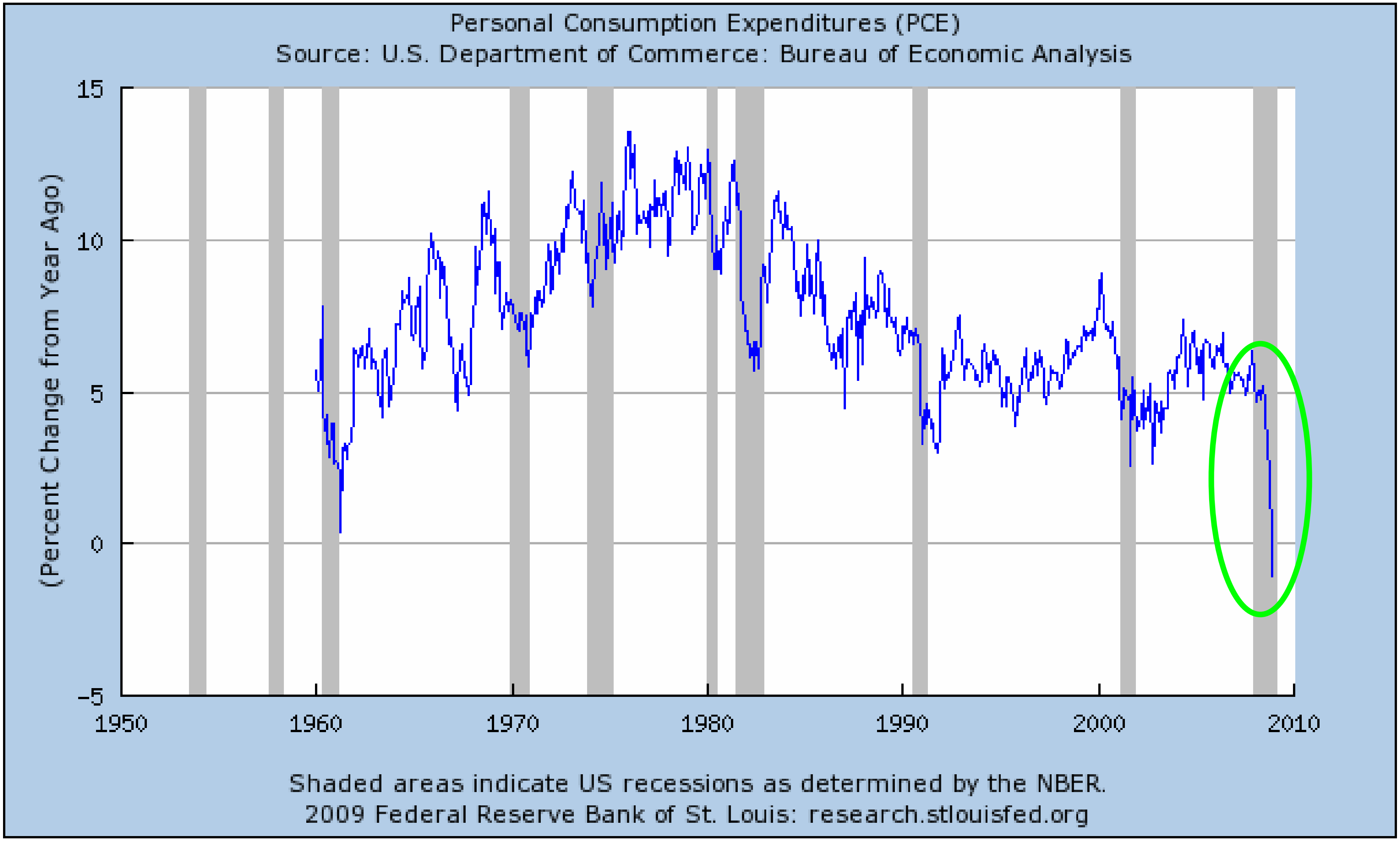
Data Source: Loan Performance; thru Nov 2008

Unemployment Rate



Source: Bureau of Labor Statistics

Note: Shading represents NBER recessions.


Personal Consumption Expenditures (PCE)
Source: U.S. Department of Commerce: Bureau of Economic Analysis
(Percent Change from Year Ago)
15
10
5
0
-5
1950
1960
1970
1980
1990
2000
2010
Shaded areas indicate US recessions as determined by the NBER.
2009 Federal Reserve Bank of St. Louis: research.stlouisfed.org

Really Unpredictable? Extreme Tail Estimation

(joint work with Ben Iverson, HBS)

- Use Extreme Value Theory (EVT) to model extreme events in financial markets

- Method: fit exceedances over chosen threshold to Generalized Pareto Distribution to model extreme quantiles
  - Returns, de-clustered with volatility from GARCH-family

- Perform this estimation for 47 global financial series including stock market indices, foreign exchange rates, commodities prices, and interest rates
  - Average of 25yrs of daily data; min = 5 yrs (Dubai EQ), max = 80 yrs (S&P500)

Extreme Tail Estimation: Results

- Three main results:
  - Magnitude of extreme quantiles (even 0.05% and 99.95%) homogeneous across geographic regions and asset classes
  - Tail shape estimated using data through the end of 2006 is very similar to shape estimated from data through 2008
  - Exception: Short-term interest rates have fatter and less stable tails than other series

Of 10 most extreme (negative/positive) daily returns, how many in 2008? Equities

	Raw Returns		Standardized Returns		
	Negative	Positive	Negative	Positive	# of Yrs
S&P 500	***2***	***2***	***0***	***0***	***80.7***
Mexico Bolsa	2	2	0	1	19.9
Brazil Bovespa	1	2	0	1	16.7
Chile IPSA	***4***	***2***	***2***	***0***	***19.8***
Toronto S&P/TSX Composite	***5***	***7***	***0***	***1***	***32.0***
FTSE 100	5	7	2	1	25.1
CAC 40	4	5	2	1	21.5
DAX	***4***	***4***	***1***	***1***	***37.9***
FTSE Eurotop 100	7	5	1	2	19.4
Russia RTS Index $	3	2	2	0	13.2
Turkey ISE National 100	0	1	0	1	18.7
Tel Aviv 100	4	2	1	1	16.6
Dubai DFM General Index	7	5	4	2	5.4
Nikkei 225	***6***	***4***	***0***	***0***	***37.2***
Hang Seng	1	3	0	0	34.0
Shanghai Stock Exchange Composite	1	2	1	0	13.4
Sydney All ordinaries	3	4	0	0	29.1
SET Index (Stock Exch of Thai)	2	0	1	0	20.9
Bombay BSE SENSEX 30	2	1	1	0	26.4
Singapore All	0	0	0	0	26.8

Of 10 most extreme (negative/positive) daily returns, how many in 2008? Other…

	Raw Returns		Standardized Returns		
	Negative	Positive	Negative	Positive	# of Yrs
$/Euro	6	8	2	1	10.4
yen/$	1	1	0	0	39.3
$/pound	2	1	0	0	39.3
Swiss Franc/$	1	0	0	0	39.3
$/Deutsche Mark	0	0	0	0	39.3
West Texas Crude	***0***	***3***	***0***	***1***	***25.3***
Gold 100 Oz. future	1	0	0	0	33.8
Silver $/Oz.	4	3	0	0	25.5
Copper $/metric ton	4	4	0	0	22.8
Wheat 3mo future contract	7	7	4	2	17.2
Goldman Sachs Commodities Index	***8***	***9***	***3***	***1***	***8.6***
US Gov't 3 mo.	***10***	***10***	***3***	***0***	***26.1***
Germany Gov't 3 mo.	***4***	***1***	***3***	***0***	***15.7***
JPY 3 mo. LIBOR	0	0	0	0	19.0
GBP 3 mo. LIBOR	2	0	1	0	22.0
US Gov't 10 yr.	***8***	***7***	***1***	***0***	***47.2***
Germany Gov't 10 yr.	***7***	***2***	***0***	***0***	***20.3***
Japan Gov't 10 yr.	0	0	1	0	21.2
UK Gov't 10 yr.	6	3	0	0	20.5
JPM EMBI+	8	9	3	1	5.5
Moody's Corp. Aaa Index	6	5	0	0	25.9
Moody's Corp. Baa Index	***5***	***0***	***2***	***1***	***22.9***

Final thoughts

- Biggest financial market disruption in my lifetime
- Policy makers – central banks, fiscal authorities – working to prevent the biggest real economic disruption in my lifetime
- "Unprecedented" …. "never in my career"….
  - But un-forecastable?
- Everything is endogenous . . . for a central banker

Thank You!

http://nyfedeconomists.org/schuermann/