



Do Our Financial Models Still Work?

Tuesday, April 27, 2010; 2:30 PM - 3:45 PM

Moderator:

Glenn Yago, Executive Director, Financial Research, Milken Institute

Speakers:

Aaron Brown, Risk Manager, AQR Capital Management; Author, *The Poker Face of Wall Street and A World of Chance*

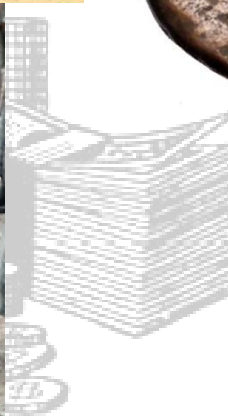
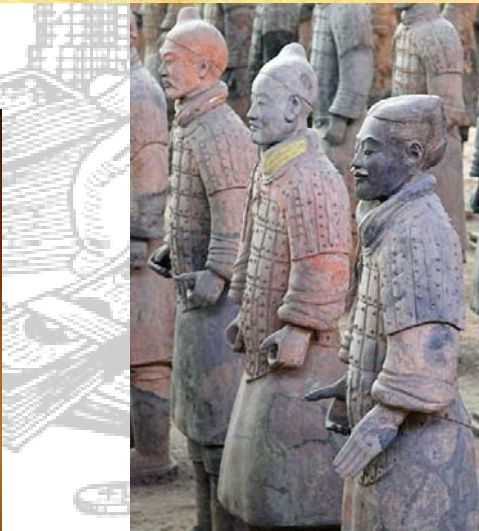
Colin Camerer, Robert Kirby Professor of Behavioral Finance and Economics, California Institute of Technology

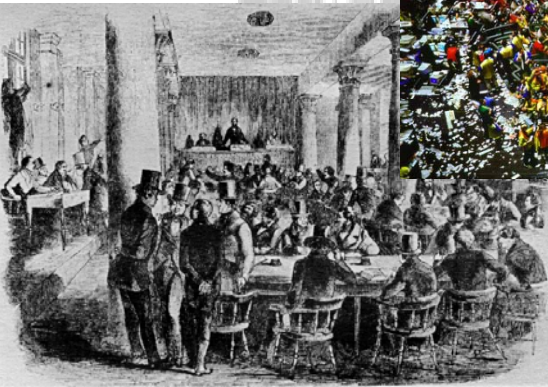
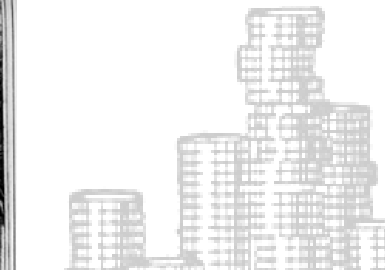
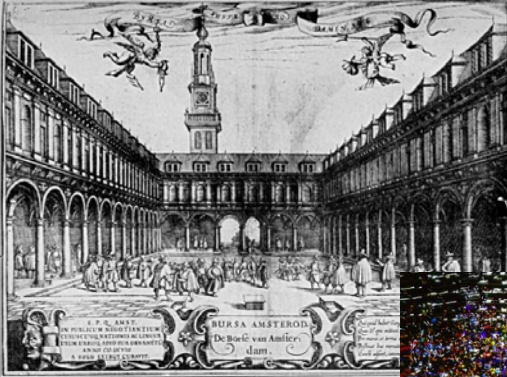
John Cassidy, Staff Writer, *The New Yorker*; Author, *How Markets Fail: The Logic of Economic Calamities*

Myron Scholes, Nobel Laureate, 1997; Chairman, Platinum Grove Asset Management

Bruce Tuckman, Director of Financial Markets Research, Center for Financial Stability

Aaron Brown's slides









Adventure COMICS

Featuring

"The GORILLA with X-RAY EYES!"

Our new model will melt down the financial system



AFTER CLARK APOLOGIZES TO THE BAFFLED DENTIST AND LEAVES...

NOW I KNOW WHY MY INVULNERABILITY DIDN'T PROTECT ME FROM THE GAS AND THE CANDY... THEY WERE PRODUCTS OF XADU'S ADVANCED KRYPTONIAN MEDICINE!

HE AND ZEDA MUST'VE GONE OFF AND LEFT ME ALONE IN THE CHAIR WHILE I WAS STILL HALLUCINATING!



WELL, AT LEAST THE TOOTHACHE THEY INFLICTED UPON ME HAS GONE AWAY!

BUT I WOULDN'T HAVE TIME TO THINK ABOUT IT ANYWAY... FROM NOW ON I MUST BE ON THE ALERT AT ALL TIMES...



...TO BE READY FOR WHATEVER DIABOLIC REVENGE THOSE TWO KRYPTONIAN CRIMINALS HAVE PLANNED FOR ME!

AND NOW THAT I THINK ABOUT IT, THERE'S SOMETHING ELSE I'M SUPPOSED TO START DOING IN THE MEANTIME...

NOW, WHAT WAS IT...?



OH YES, NOW I REMEMBER--

IT'S TIME FOR ME TO SAVE THE FINANCIAL SYSTEM!



In my models,
markets work

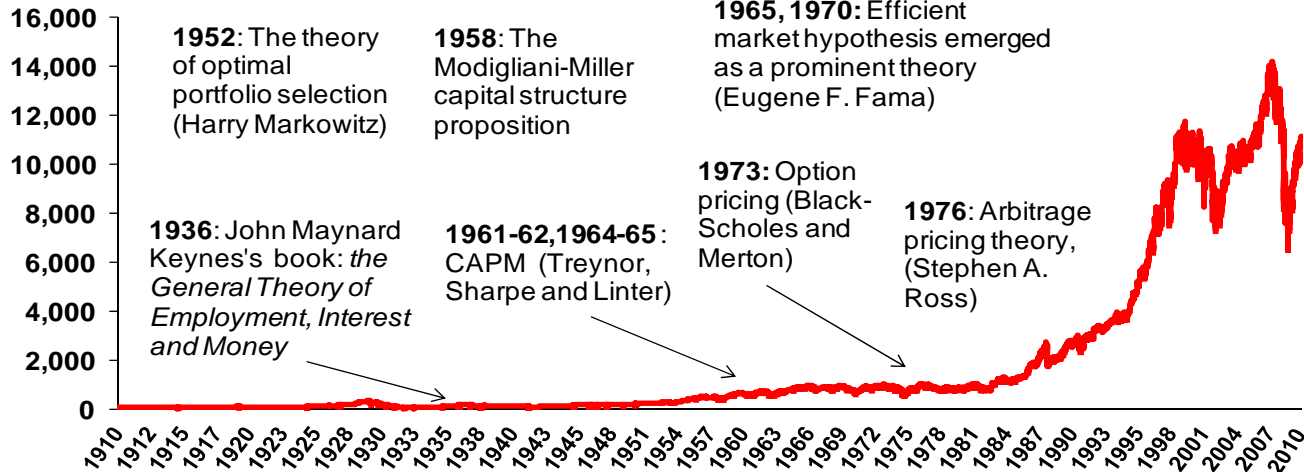


Additional slides



Development of finance theory

Dow Jones



Examples of mathematical financial models

- The Modigliani-Miller capital structure proposition
- The Capital Asset Pricing Model (CAPM)
- Arbitrage pricing theory
- The Black-Scholes option pricing formula
- Monte Carlo simulation techniques

The Capital Asset Pricing Model (CAPM)

$$E(R_i) = R_f + [E(R_M) - R_f]\beta_{iM}, i = 1, \dots, N.$$

The capital asset pricing model (CAPM) of William Sharpe (1964) and John Lintner (1965) marks the birth of asset pricing theory (resulting in a Nobel Prize for Sharpe in 1990). Four decades later, the CAPM is still widely used in applications, such as estimating the cost of capital for firms and evaluating the performance of managed portfolios. It is the centerpiece of MBA investment courses. Indeed, it is often the only asset pricing model taught in these courses.¹

Examples of mathematical financial models

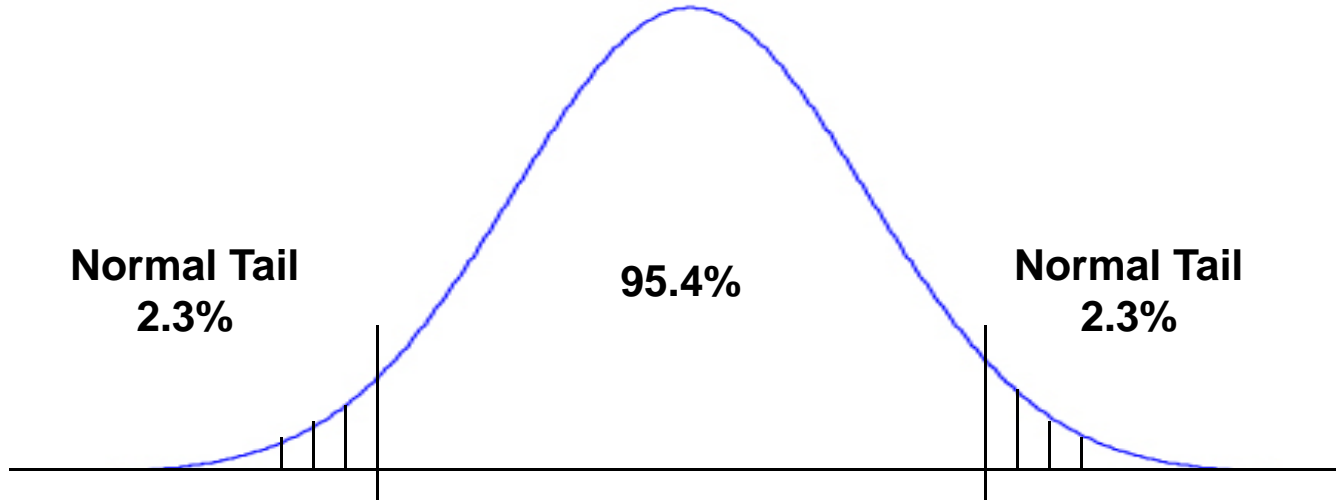
Black-Scholes option pricing formula

$$\frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS \frac{\partial V}{\partial S} - rV = 0.$$

A faculty member in the Sloan School of Management nominates the Black-Scholes option pricing formula, a mathematical model for equity pricing. Fischer Black, Myron Scholes, and Robert Merton began collaborating in the early 1970s when all were working at the Sloan School of Management. In 1977, Scholes and Merton received the Nobel Prize in Economics for their "new method to determine the value of derivatives" (Black had died in 1995; the Nobel prize is not awarded posthumously).

The tails on the distribution curve are fatter than you think

Normal distribution curve

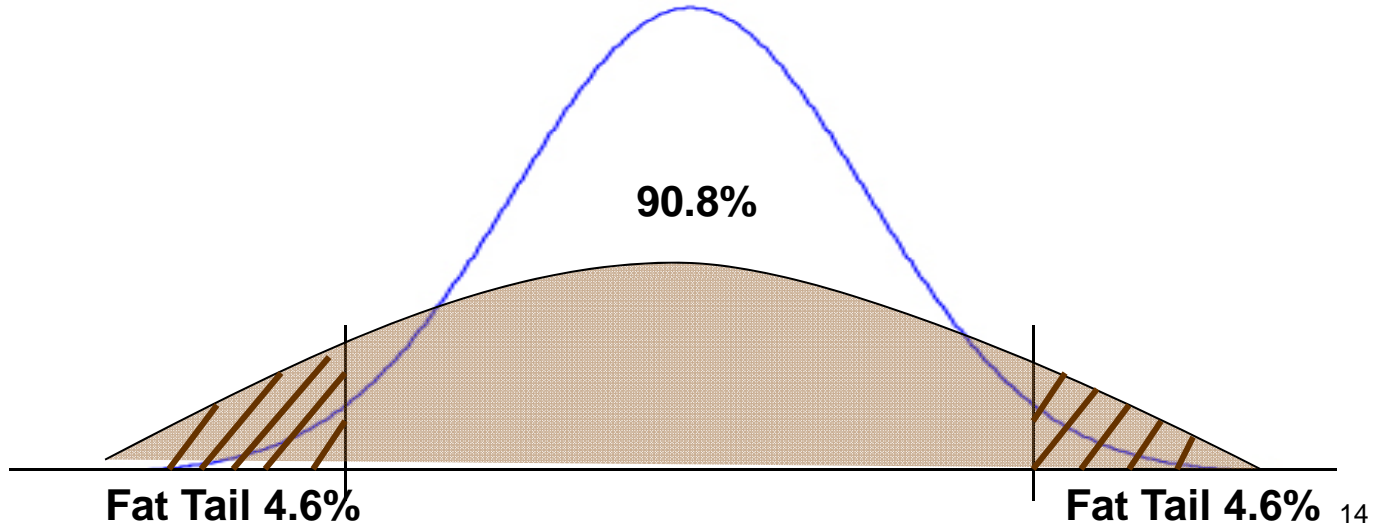


The tails on the distribution curve are fatter than you think (cont.)

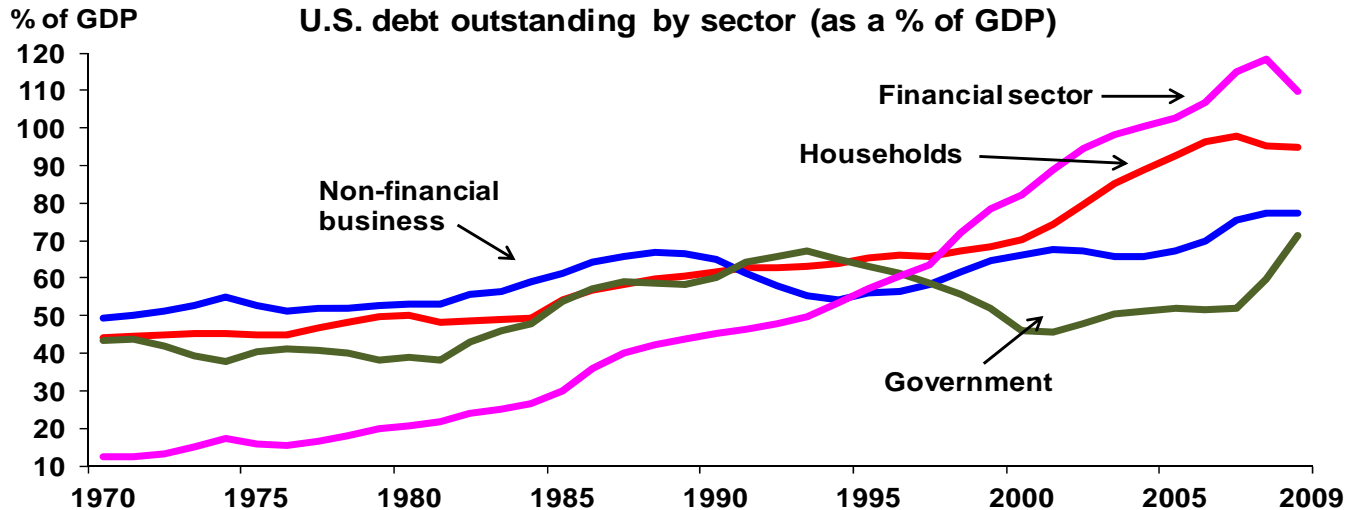


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Fat tails distribution curve



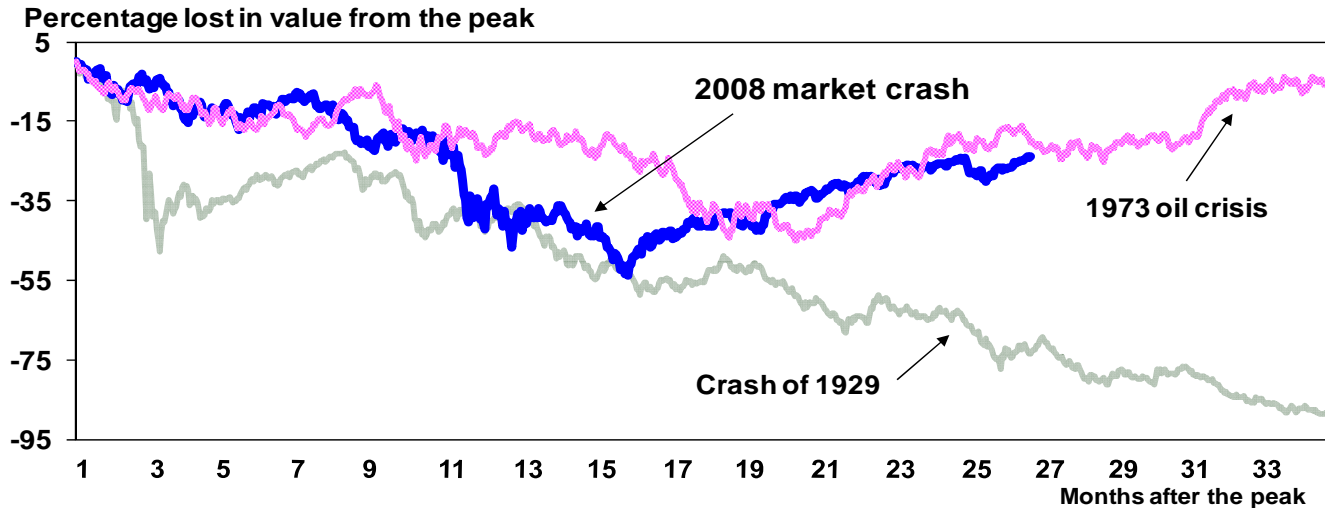
The build-up of excessive leverage



Source: Federal Reserve.

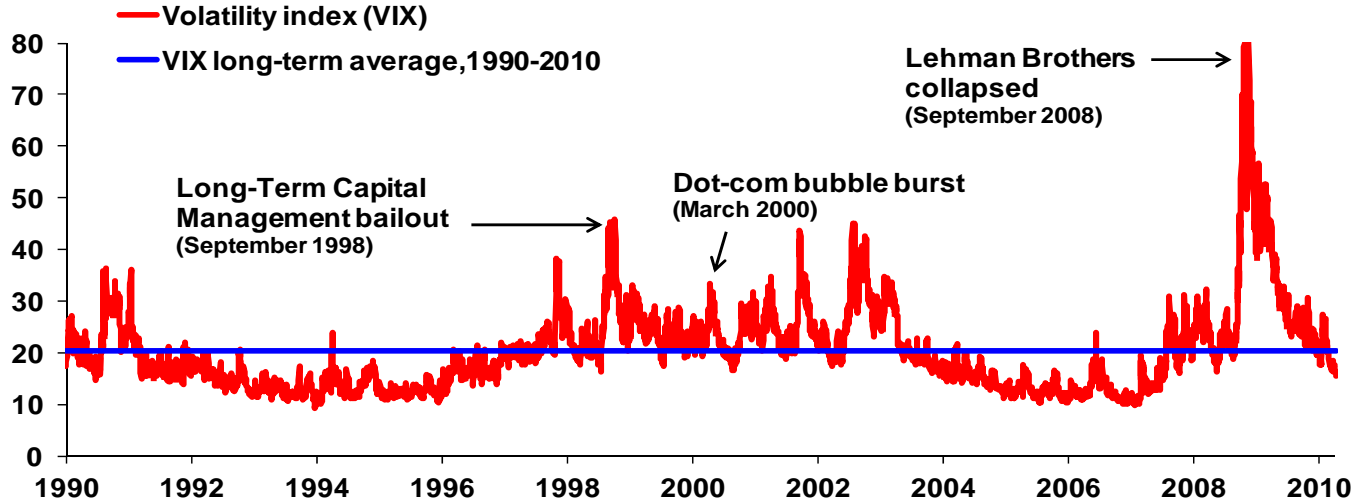
Stock market crashes

Dow Jones Industrial Average



Source: Bloomberg.

Unprecedented rise in market volatility during the 2008 market crash

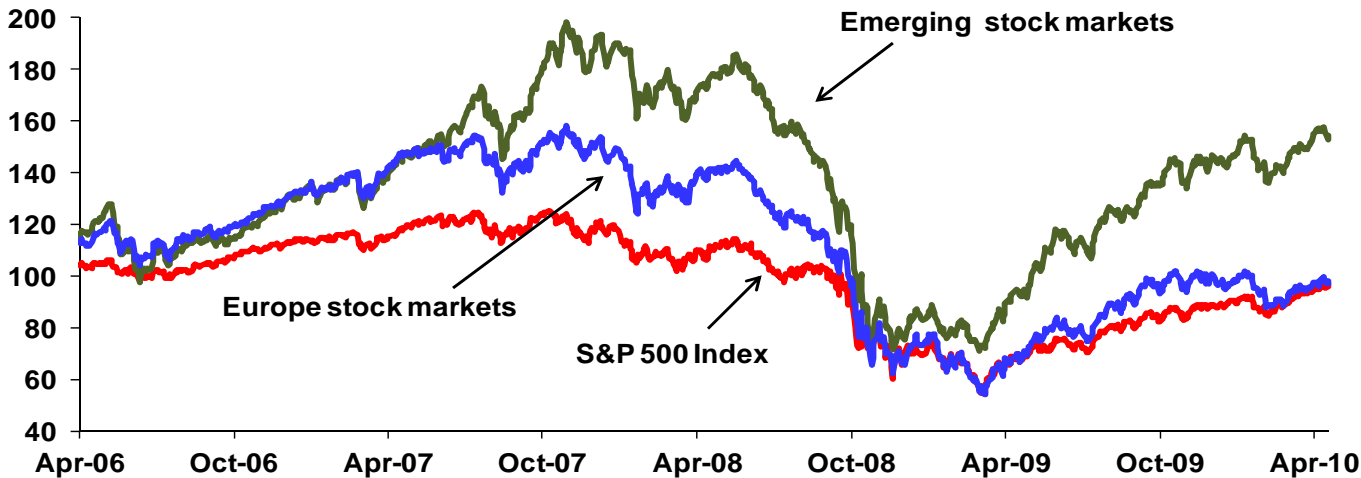


Note: VIX is the Chicago Board Options Exchange's volatility index.
Source: DataStream.



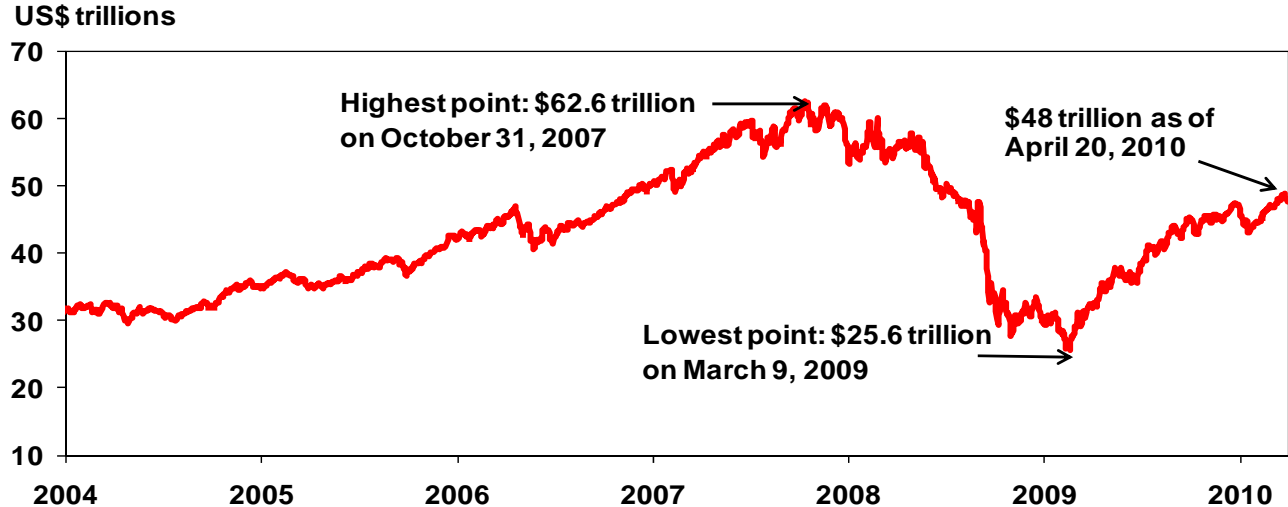
Global stock indexes

January 2006 = 100



Source: Datastream

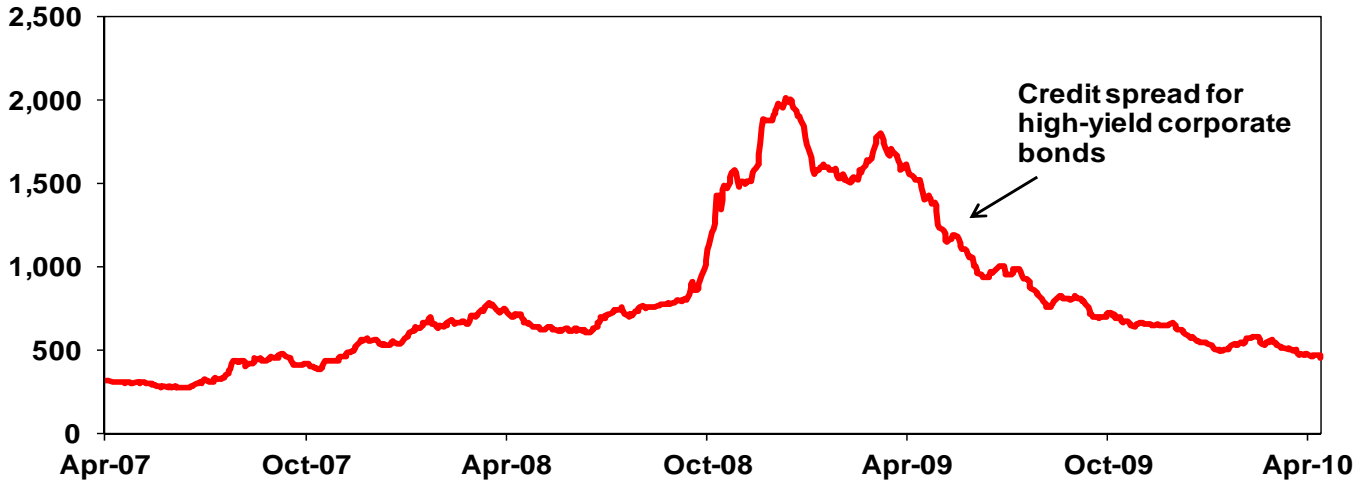
World stock market capitalization still 23% below its peak level (as of April 20, 2010)



Source: Bloomberg.

Narrowing risk spread for U.S. corporate high-yield bonds

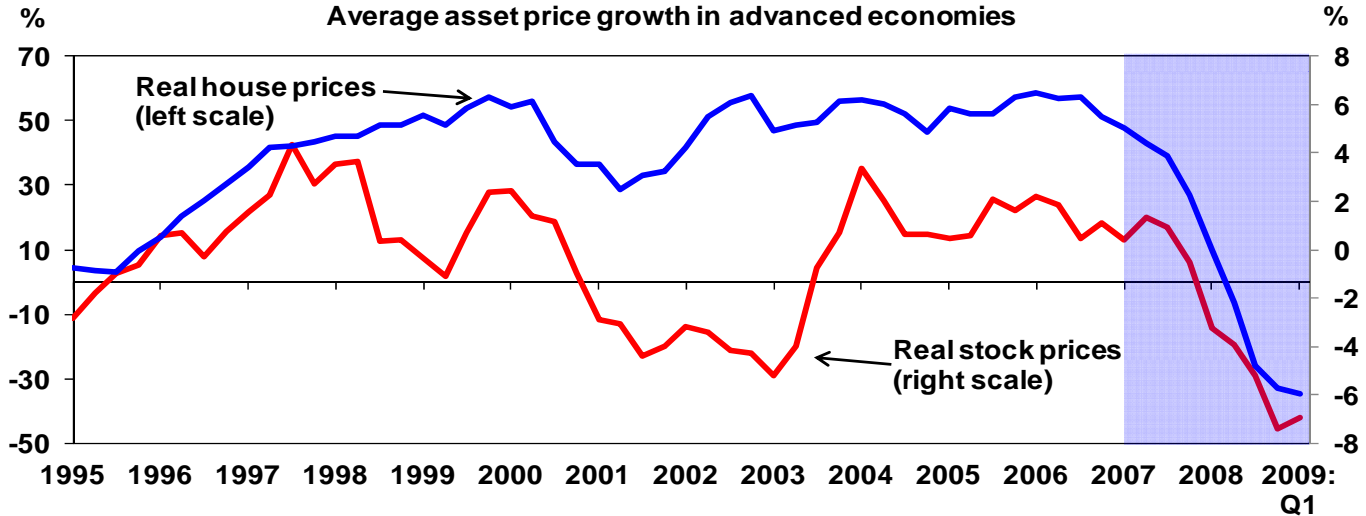
Basis points, spread over 10-year Treasury bonds



Note: the high yield rate is the yield on the Merrill Lynch high-yield index.

Source: Bloomberg.

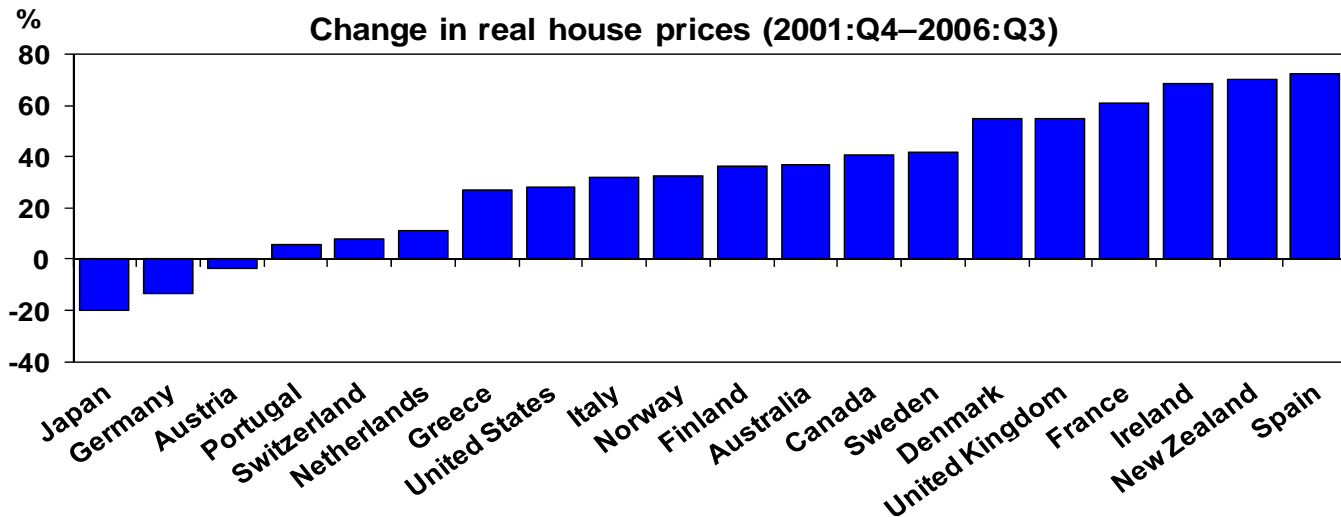
Developments in house and stock prices in advanced economies



Source: *World Economic Outlook*, International Monetary Fund, October 2009.

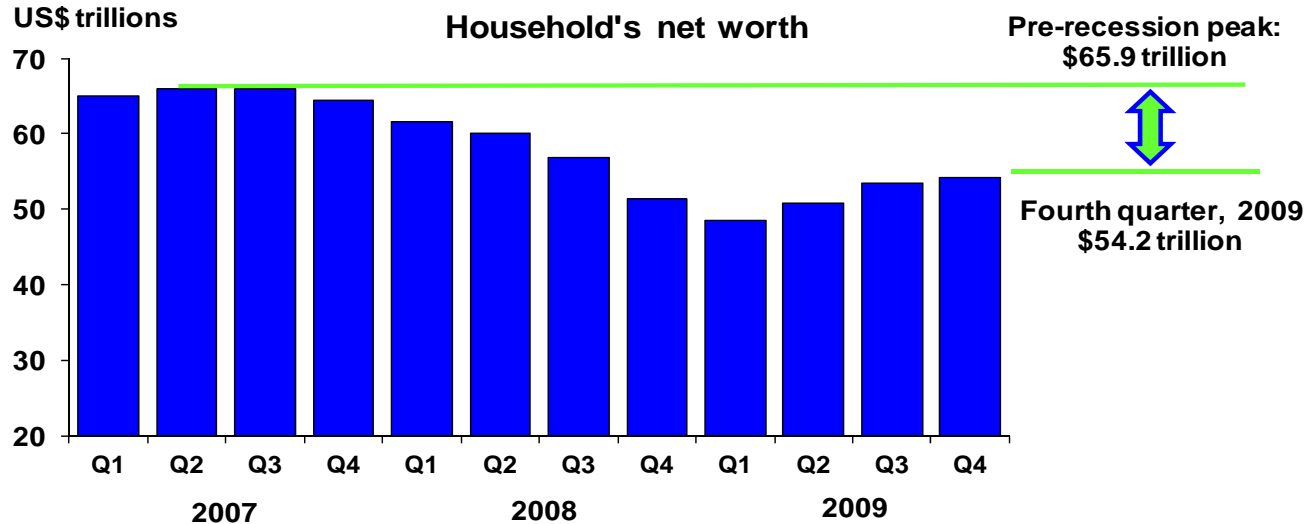
House prices rose strongly prior to the crisis

House price appreciated 68-72% in Ireland, New Zealand and Spain



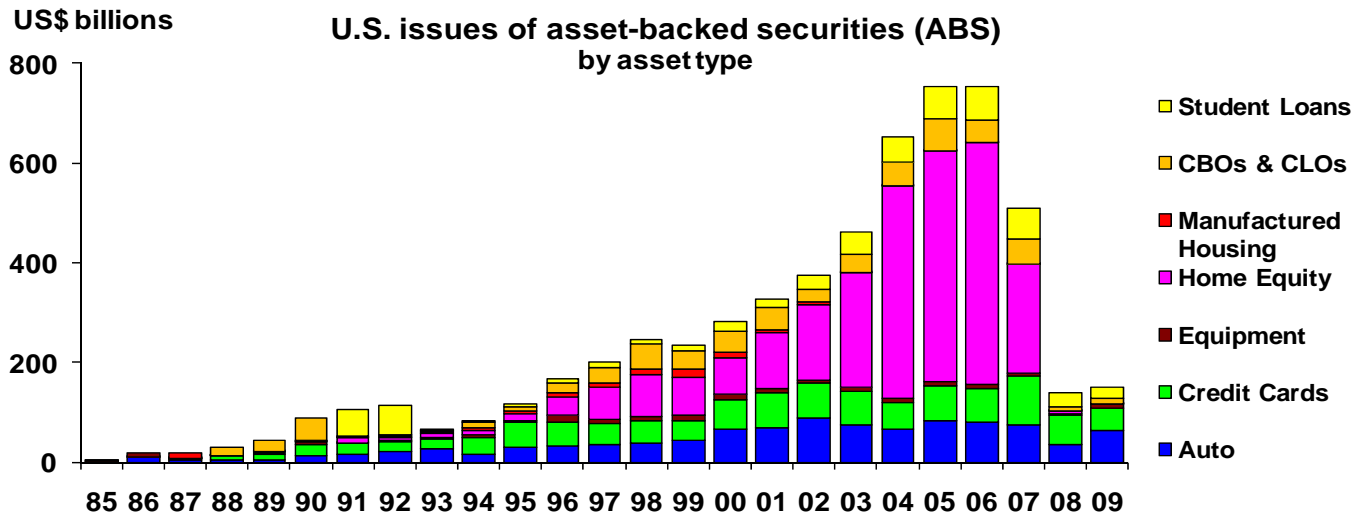
Source: *World Economic Outlook*, International Monetary Fund, October 2009.

Americans' net worth is down by 12 trillion from its 2007 peak



Source: Federal Reserve.

Fast growing asset-backed securities prior to the market's collapse in 2008



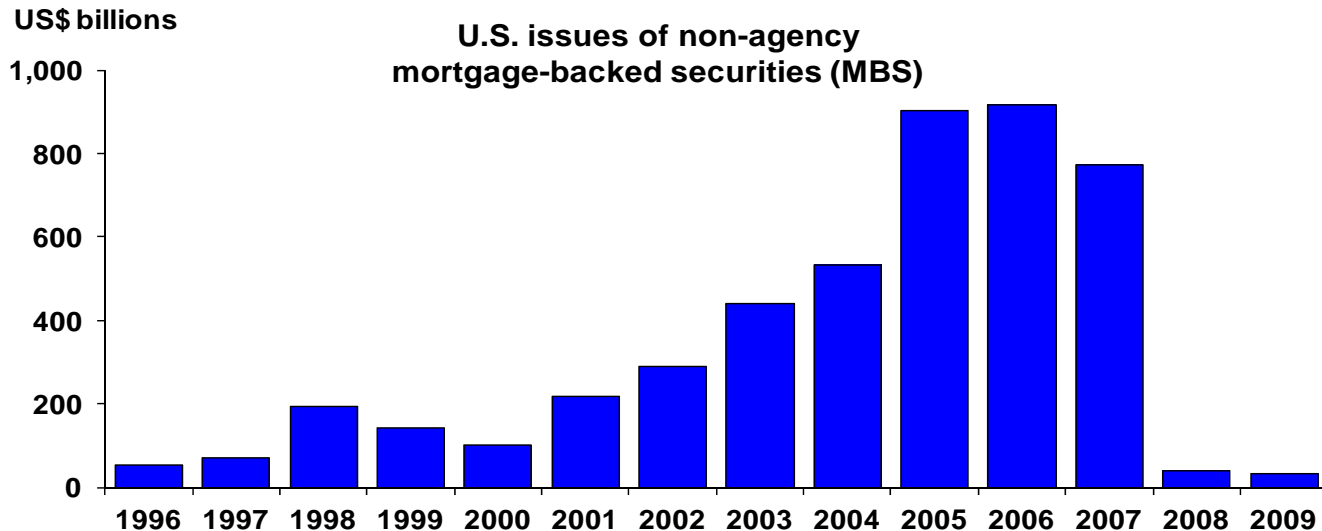
Note: CBOs = Collateralized bond obligations; CLOs = Collateralized loan obligations.

Source: Securities Industry and Financial Market Association, SIFMA.

Fast growing mortgage-backed securities prior to the market's collapse in 2008



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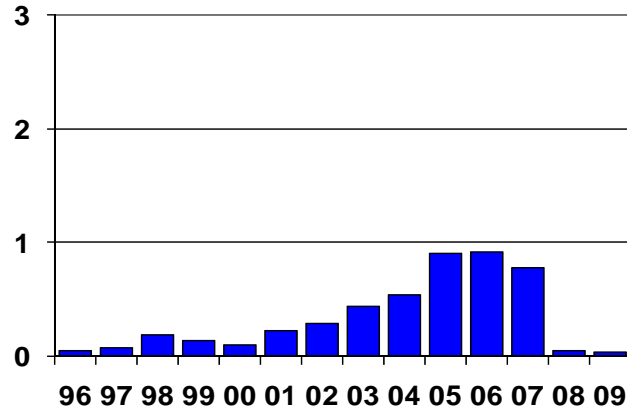


Source: Securities Industry and Financial Market Association, SIFMA.

The collapse in the MBS markets is from the private-sector side

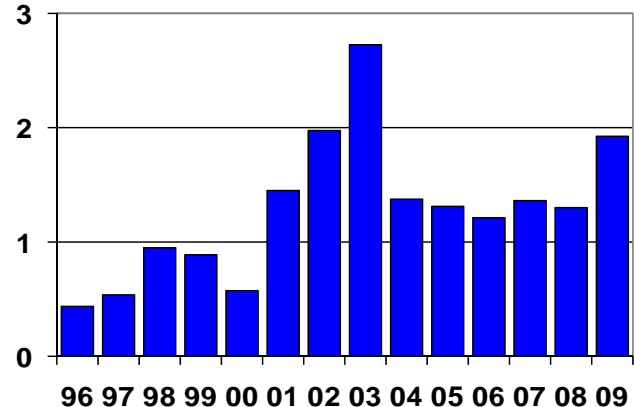
Private-label MBS

US\$ trillions



Ginnie Mae, Fannie Mae, Freddie Mac MBS

US\$ trillions



Source: Securities Industry and Financial Market Association, SIFMA.

Common credit default swap transaction

Protection seller

Does not usually own underlying bond

Selling bond protection

Credit default swap premium paid periodically

If credit event occurs, delivers the bond.

Payment if credit event occurs.

Protection buyer

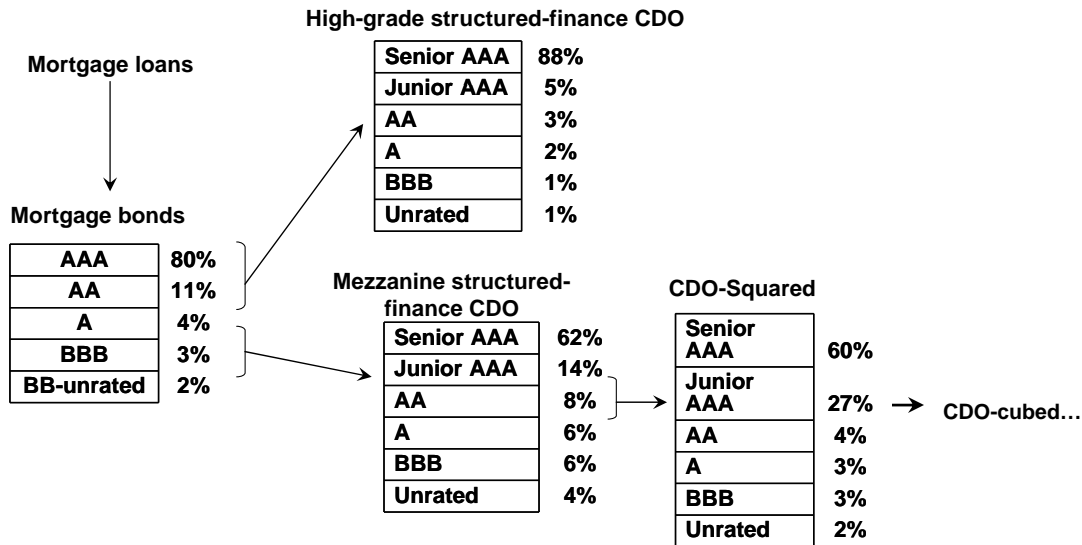
May not own underlying bond

Purchasing bond protection



When is a AAA not a AAA?

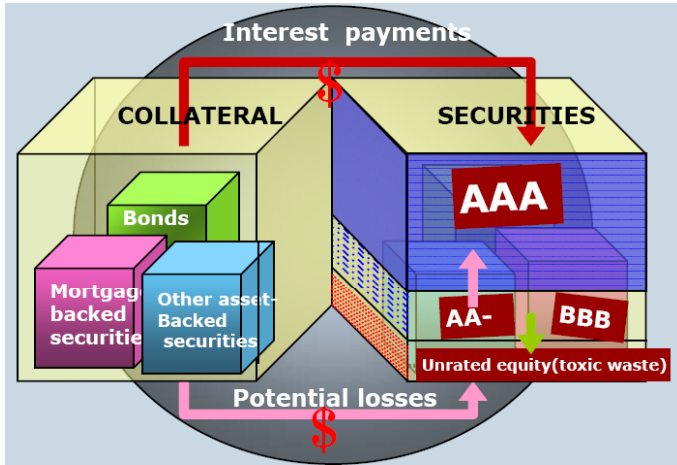
Multilayered mortgage products



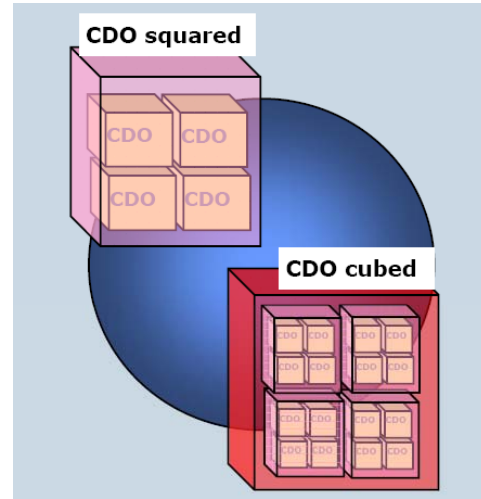
Sources: International Monetary Fund, Milken Institute.

Complexity is not innovation

The CDO



Multiply CDOs



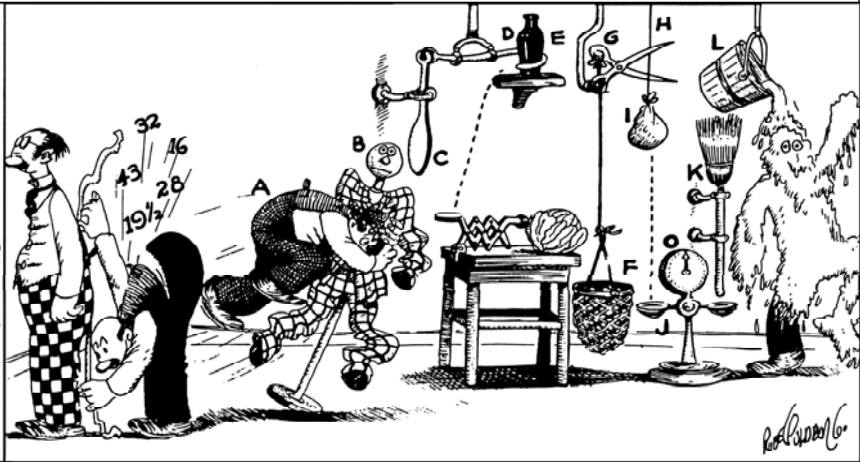
Source: Richard R. Lindsey (Callcott Group, LLC), Bloomberg Markets.

Rube Goldberg Dodging bill collectors (1914)

PROFESSOR BUTTS MISTAKES A LOT OF BROKEN GLASS FOR BATH SALTS AND WHEN THEY PULL HIM OUT OF THE TUB HE MUMBLES AN IDEA FOR DODGING BILL COLLECTORS.

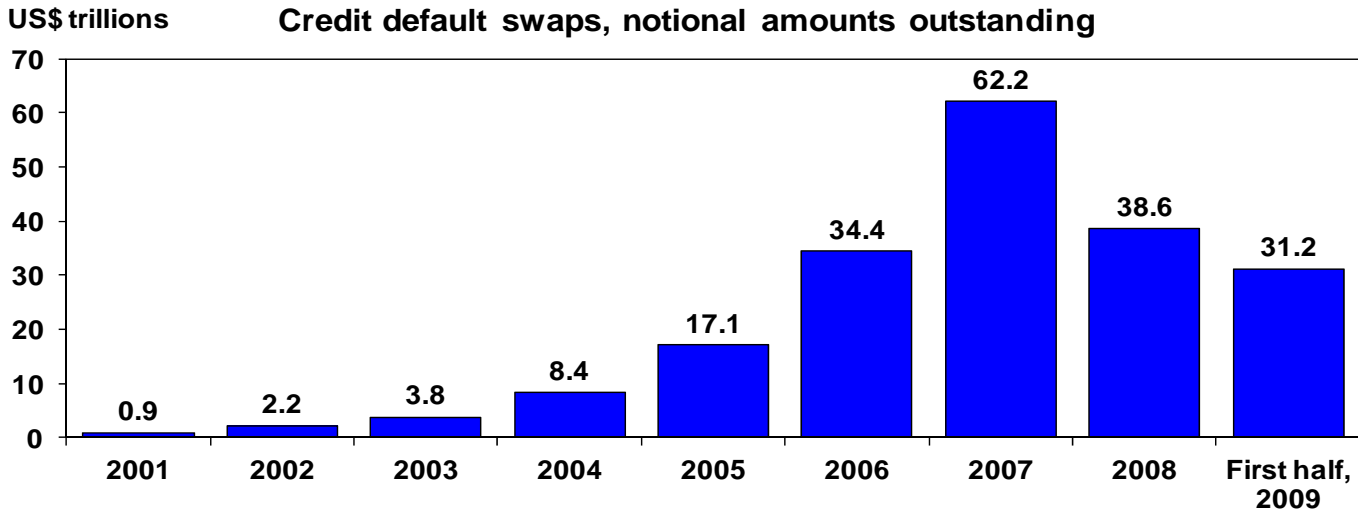
AS TAILOR (A) FITS CUSTOMER (B) AND CALLS OUT MEASUREMENTS, COLLEGE BOY (C) MISTAKES THEM FOR FOOTBALL SIGNALS AND MAKES A FLYING TACKLE AT CLOTHING DUMMY (D). DUMMY BUMPS HEAD AGAINST PADDLE (E) CAUSING IT TO PULL HOOK (F) AND THROW BOTTLE (G) ON END OF FOLDING WATRACK (H) WHICH SPREADS AND PUSHES HEAD OF CABBAGE (I) INTO NET (J). WEIGHT OF CABBAGE PULLS CORD (K) CAUSING SHEARS (L) TO CUT STRING (M). BAG OF SAND (N) DROPS ON SCALE (O) AND PUSHES BROOM (P) AGAINST PAIR OF WHITEWASH (Q) WHICH UPSETS ALL OVER YOU CAUSING YOU TO LOOK LIKE A MARBLE STATUE AND MAKING IT IMPOSSIBLE FOR YOU TO BE RECOGNIZED BY BILL COLLECTORS.

DON'T WORRY ABOUT POSING AS ANY PARTICULAR HISTORICAL STATUE BECAUSE BILL COLLECTORS DON'T KNOW MUCH ABOUT ART.



Credit default swaps

Notional amounts outstanding

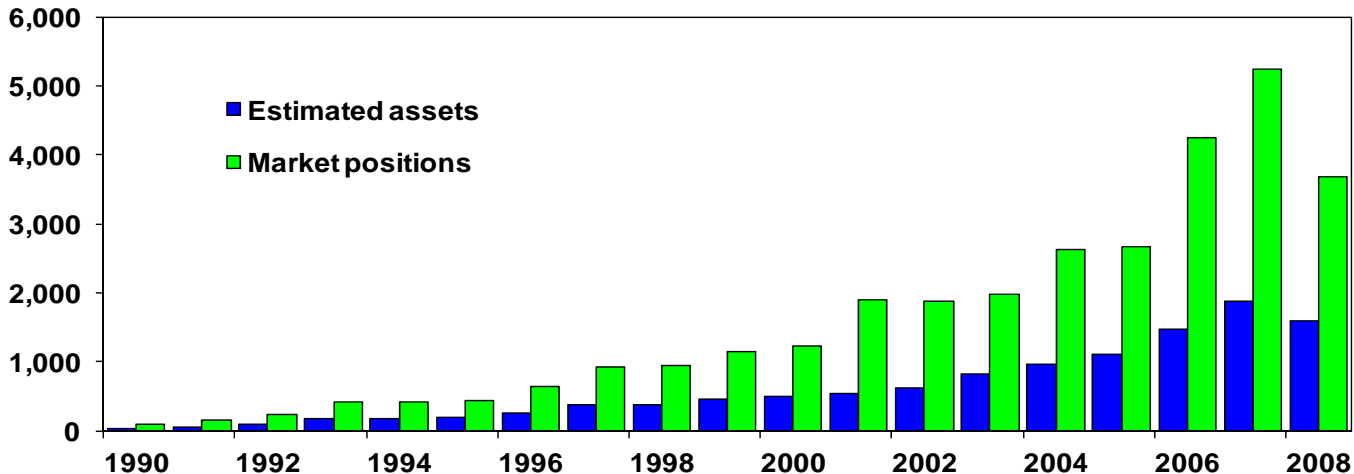


Source: International Swaps and Derivatives Association, 2009.

Hedge fund assets and market positions

1990-2008

Assets (US\$ billions)

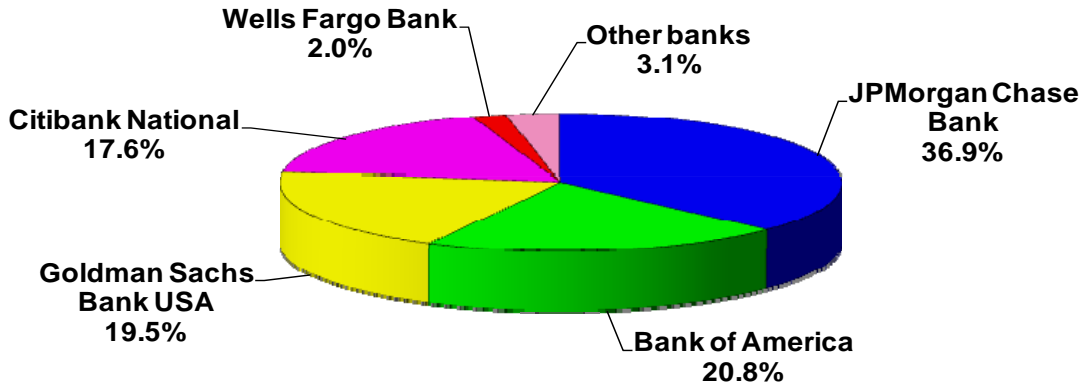


Source: Andrew Lo before U.S. House of Representatives Committee on Oversight and Government Reform, November 2008.

Derivatives activity is dominated in few large banks

The top five banks hold 97% of all derivatives

The notional amount of derivative contracts held by top five U.S. commercial banks, fourth quarter 2009 (% total)

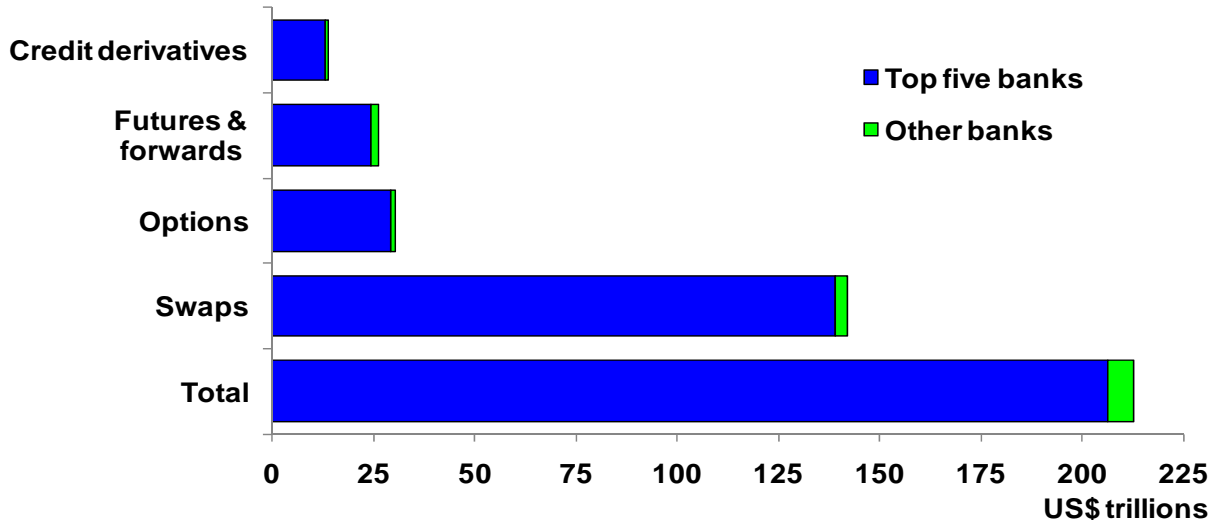


Note: Other banks include only U.S. commercial banks with derivatives activity.

Source: OCC's quarterly report on bank trading and derivative activities, Comptroller of the Currency, fourth quarter, 2009.



Concentration of derivative contracts



Note: Other banks include only U.S. commercial banks with derivatives activity.

Source: OCC's quarterly report on bank trading and derivative activities, Comptroller of the Currency, fourth quarter, 2009.

Five largest banks control almost half of the U.S. national banking assets (as of December 31, 2009)

	Consolidated assets (US\$ billions)	% of total assets of the U.S. banking system
JPMorgan Chase	1,627	13.7
Bank of America Corporation	1,465	12.4
Citigroup	1,161	9.8
Wells Fargo	608	5.1
Wachovia bank (Wells Fargo)	510	4.3
Total assets of the U.S. banking system	11,846	100
Top five banks		45.4
Top ten banks		54.1

Large banks become larger

Top U.S. banks ranked by total assets



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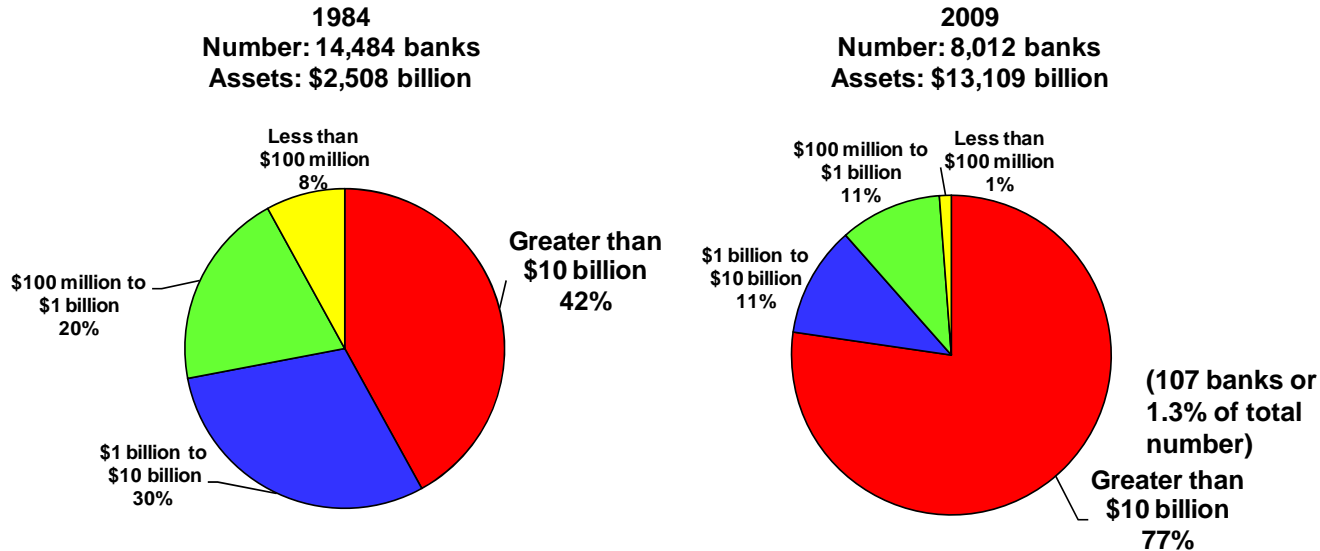
End of 1989	Consolidated assets (US\$ billions)
Citicorp	204
Chase Manhattan	96
Bank of America	93
JPMorgan	83
Security Pacific	78
Total banking assets	3,128
Top five banks (% of total banking assets)	17.7%

End of 2009	Consolidated assets (US\$ billions)
JPMorgan Chase	1,627
Bank of America	1,465
Citigroup	1,161
Wells Fargo	608
Wachovia (Wells Fargo)	510
Total banking assets	11,846
Top five banks (% of total banking assets)	45.3%

Big banks increasingly dominate the U.S. banking industry: *Asset shares by bank size*



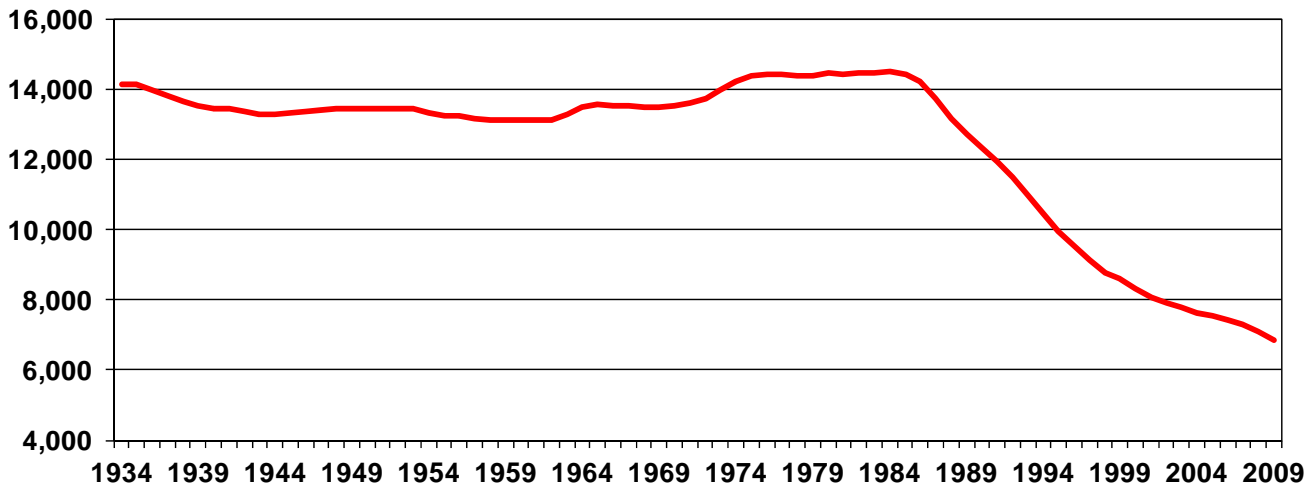
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Consolidation in the U.S. banking industry

1934 to 2009

Number of commercial banks



Source: FDIC.

Are the biggest banks in the world too big to fail?

Trillion dollar banks, ranked by assets, 2009

Bank	Country	Total Assets (US\$ trillions)	Market Cap (US\$ billions)
1 BNP Paribas	France	2.9	93
2 Royal Bank of Scotland	U.K.	2.7	38
3 HSBC Holdings	U.K.	2.4	178
4 Mitsubishi UFJ	Japan	2.3	73
5 Credit Agricole	France	2.2	40
6 Barclays	U.K.	2.2	66
7 Bank of America	U.S.	2.2	180
8 Deutsche Bank	Germany	2.2	48
9 JPMorgan Chase	U.S.	2.0	179
10 Citigroup	U.S.	1.9	123
11 Mizuho Financial	Japan	1.7	32
12 ICBC	China	1.7	241

Bank	Country	Total Assets (US\$ trillions)	Market Cap (US\$ billions)
13 ING	Netherlands	1.7	38
14 Lloyds Banking	U.K.	1.7	64
15 Banco Santander	Spain	1.6	111
16 Societe Generale	France	1.5	47
17 Unicredit	Italy	1.4	58
18 China Construction Bank	China	1.3	184
19 Sumitomo Mitsui	Japan	1.3	45
20 UBS	Switzerland	1.3	60
21 Bank of China	China	1.3	149
22 Wells Fargo	U.S.	1.2	162
23 Commerzbank	Germany	1.2	11
24 AXA	France	1.0	51

Sources: Bloomberg, Milken Institute.

Note: Market capitalization is from March 19, 2010.