The Real Estate Housing Bubble

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Brunnermeier (2009)

"Deciphering the Liquidity and Credit Crunch 2007–2008"

- Part 1: The "Originate and Distribute" Model
- Part 2: Series of Events
- Part 3: Amplifying Mechanisms and Recurring Themes

The "Originate and Distribute" Model

Basic CDO Process

- commercial banks get various mortgage payments from households taking out mortgages*
- mortgages are pooled together and sold to investment bank or SPV
- investment bank or SPV slices off mortgages into tranches by credit quality
  - Senior tranche gets paid first--safest tranche
  - junior tranche gets paid last--riskiest tranche
- investors buy these tranches of debt

*CDO's initially created from a diversified portfolio of loans (i.e. bonds, credit card receivables, mortgages, etc.)


Image from Investopedia: http://www.investopedia.com/terms/c/cdo.asp

Rise in Popularity of Securitized Products

- higher returns than bonds with seemingly less risk
- before the bubble burst, CDO's were well-diversified with many types of debt
- lower grade tranches (BBB) were more risky, but provided higher returns
- especially popular among fund managers because hard to value
  - could manipulate how they value their portfolio to smooth monthly returns

Global CDO Issuance

Billions of dollars
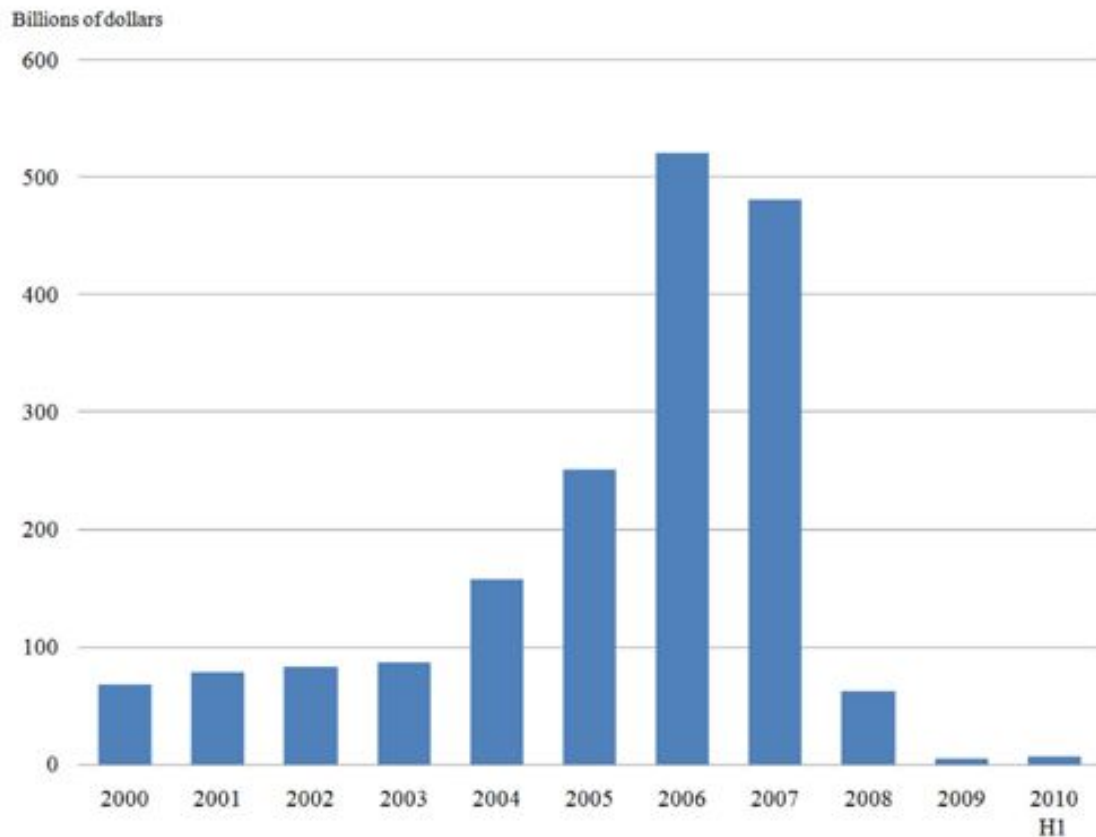
2003: $87 B

2006: $521 B

Source: Securities Industry and Financial Markets Association (SIFMA).

Irrational exuberance?

- diversification via pooling raised ratings
- most statistical models provided overly optimistic forecasts on securitized products (i.e. CDO's)
  - models based on historically low default rates
  - past downturns had only been regional
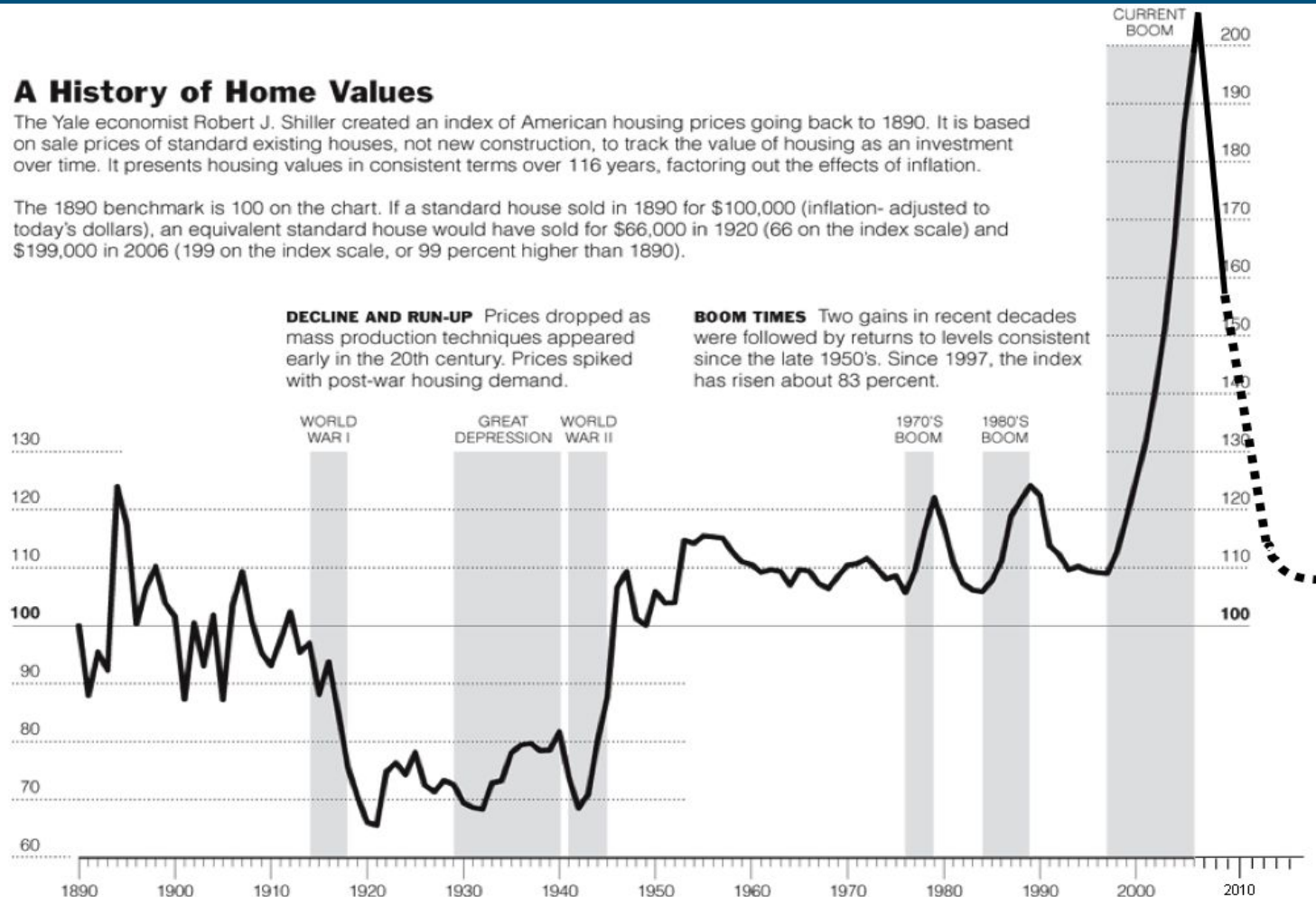 - not a single nationwide housing market decline post WWII

A History of Home Values

The Yale economist Robert J. Shiller created an index of American housing prices going back to 1890. It is based on sale prices of standard existing houses, not new construction, to track the value of housing as an investment over time. It presents housing values in consistent terms over 116 years, factoring out the effects of inflation.

The 1890 benchmark is 100 on the chart. If a standard house sold in 1890 for $100,000 (inflation- adjusted to today's dollars), an equivalent standard house would have sold for $66,000 in 1920 (66 on the index scale) and $199,000 in 2006 (199 on the index scale, or 99 percent higher than 1890).

DECLINE AND RUN-UP Prices dropped as mass production techniques appeared early in the 20th century. Prices spiked with post-war housing demand.

BOOM TIMES Two gains in recent decades were followed by returns to levels consistent since the late 1950's. Since 1997, the index has risen about 83 percent.

WORLD WAR I

GREAT DEPRESSION

WORLD WAR II

1970'S BOOM

1980'S BOOM

CURRENT BOOM

Source: "Irrational Exuberance," 2nd Edition, 2006, by Robert J. Shiller

Bill Marsh/The New York Times

Delinquency Rate On Single-Family Residential Mortgages, Booked In Domestic Offices, All Commercial Banks (DRSFRMACBS)
Source: Board of Governors of the Federal Reserve System

Shaded areas indicate US recessions.
2013 research.stlouisfed.org

Consequences: Cheap Lending

- Who bore most of the risk?
  - The investor that bought the CDO
- banks only faced "pipeline risk"
  - holding a loan for a few months until they could pass on the risk in the form of a CDO
  - banks had no incentive to be selective in approving loan applications
- increase in securitization → decrease in credit quality
- but more profitable to ride the wave than to lean against it...

Chuck Prince, Former CEO of Citigroup

"When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you've got to get up and dance. We're still dancing."

(July 2007)

Asked to clarify comment in 2010

"If you are not engaged in business, people leave the institution, so it is impossible to say in my view to your bankers we are just not going to participate in the business in the next year or so until things become a little more rational," he said. "You can't do that and expect to have any people left to conduct business in the future."

The Unfolding of the Crisis: Event Logbook

Key Dates

- May 4, 2007: UBS shuts down its internal hedge fund, Dillon Read, after suffering about $125 million of subprime-related losses
- Moody's begins downgrading dozens of tranches
- July 26, 2007: National Association of Home Builders revealed that new home sales had declined 6.6 percent year-on-year
- August 9, 2007: $24 B injection into interbank market
- From November 2007-January 2008: various sovereign wealth funds invest a total of more than $38 B in major US banks
- March 16, 2008: Bear Sterns agrees to be bought by JP Morgan for $2/share
  - overleveraged in CDO's
  - classic bank run scenario:short-term creditors refused to lend the firm more money and at the same time demanded repayment of their outstanding debt
  - $172/share in January 2007 → 98.4% wipeout

Federal Funds Rate
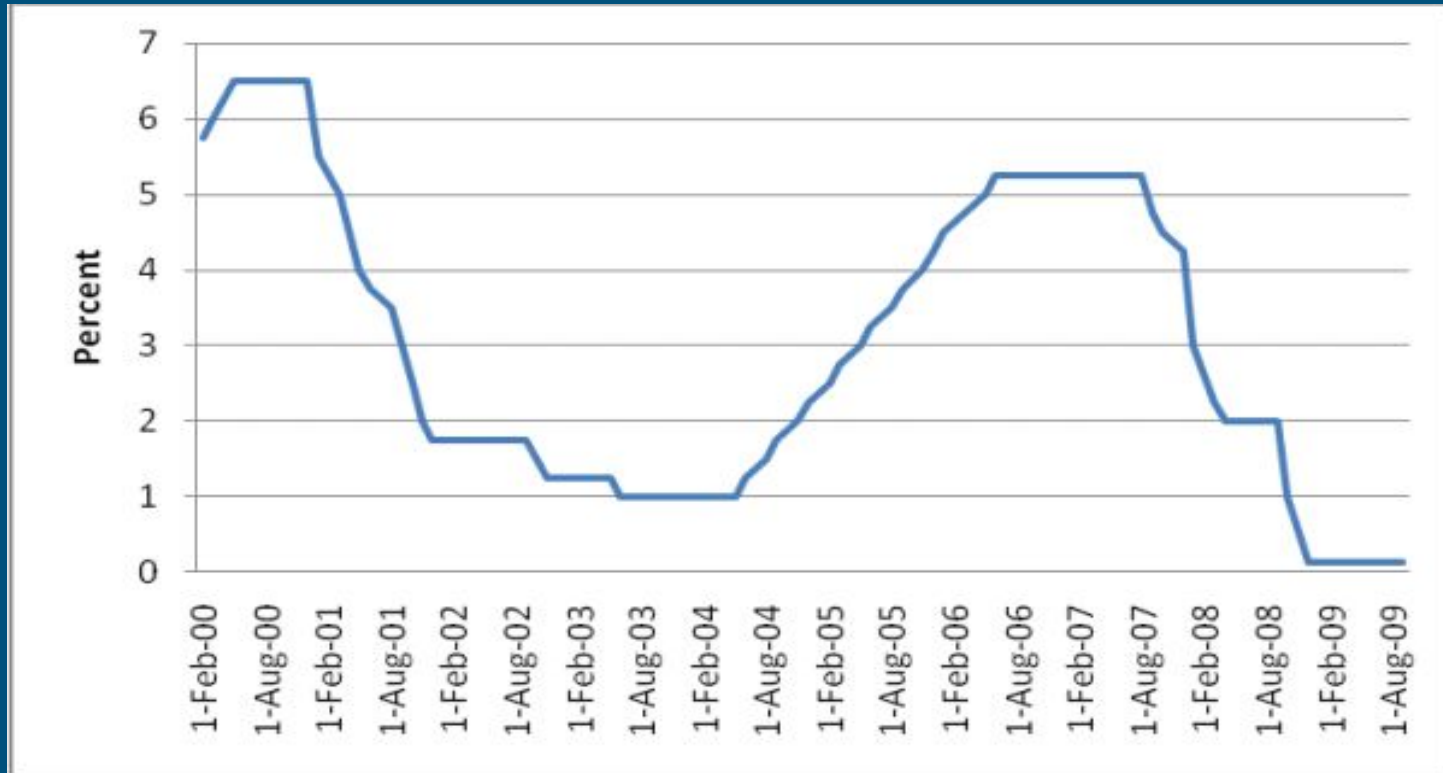
Source: Federal Reserve Board

Key Dates (cont.)

- September 19, 2008: Treasury Secretary announces $700 billion bailout plan
- December 16, 2008: Fed sets it target interest rate between 0 and .25%
- Fed begins buying debt and mortgage backed securities
- Fed Balance sheet
    - November 2007: $1.2 trillion
    - December 2008: $2.3 trillion

Amplifying Mechanisms and Recurring Themes

Two Types of Liquidity

- funding liquidity
  - the ease with which expert investors and arbitrageurs can obtain funding from (possibly less informed) financiers
  - funding liquidity is high when it is easy to raise money
- market liquidity
  - the relative ease of finding somebody who takes on the other side of the trade
  - market liquidity is low when selling the asset depresses the sale price

Two Spirals

- Loss Spiral
    - Negative shock to the financial system lowers asset prices
    - Institutions sells assets to **maintain** leverage ratio (precisely when prices are low)
    - These sales depress the price even lower, perpetuating the cycle

Loss Spiral Dynamics

- Investor buys $100 in assets
  - $10 own capital
  - $90 in borrowed money
  - Leverage Ratio = $100/$10 = 10
- Value declines to $95
  - Now only $5 own capital
  - To hold leverage ratio constant, must reduce position to $50
 - Investor sells $45
- This cycle perpetuates

Two Spirals

- Loss Spiral
  - Negative shock to the financial system lowers asset prices
  - Institutions sells assets to **maintain** leverage ratio (precisely when prices are low)
  - These sales depress the price even lower, perpetuating the cycle
- Margin Spiral
  - Negative shocks to the financial system leads to stricter lending standards
  - Institutions sells assets to **lower** leverage ratio

Figure 4
The Two Liquidity Spirals: Loss Spiral and Margin Spiral
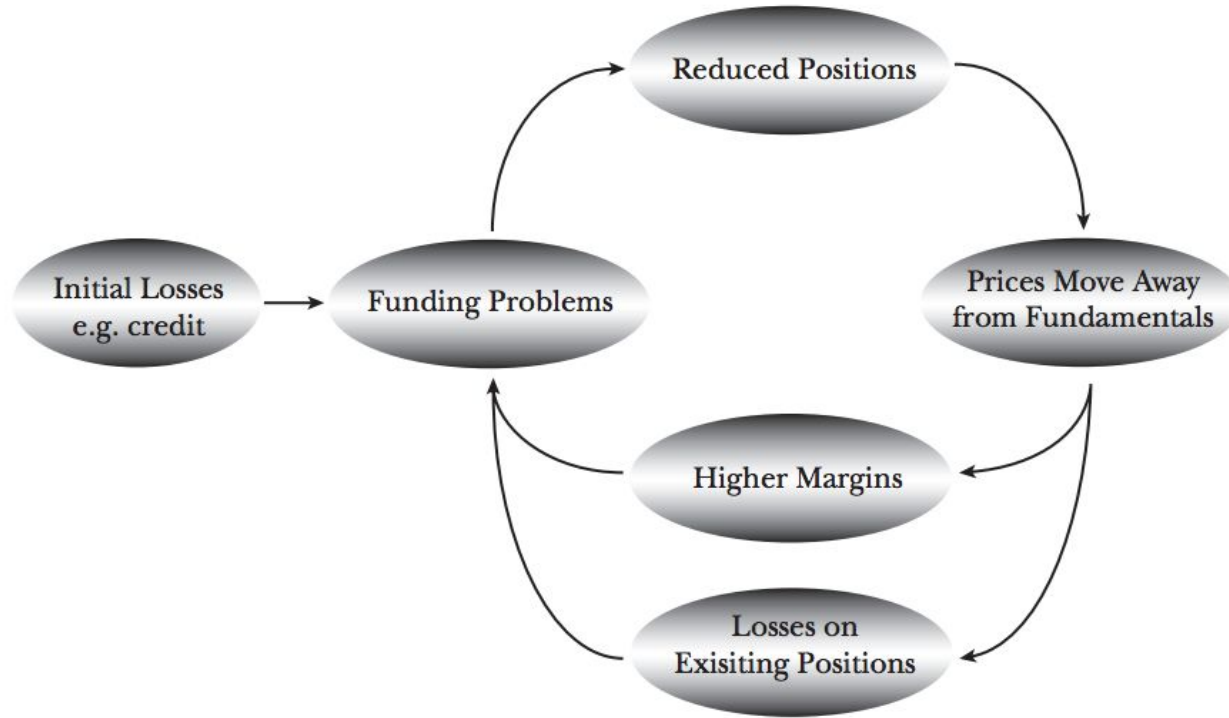
Source: Brunnermeier and Pedersen (forthcoming).
Note: Funding problems force leveraged investors to unwind their positions causing 1) more losses and 2) higher margins and haircuts, which in turn exacerbate the funding problems and so on.

Brunnermeier Conclusion

- **What's the same?**
  - speculation (CDO's)
  - bubble formation (housing prices)
  - bank run situation (hedge funds drawing out of Bear Stearns)
- **What's new?**
  - the extent of securitization
  - "an opaque web of interconnected obligations"

Finding the Real Estate Bubble

Paper 1: Assessing High House Prices: Bubbles, Fundamentals and Misperceptions

Written by : Charles Himmelberg, Christopher Mayer, and Todd Sinai

Goal: 2005 paper that attempts to determine if there is a housing bubble.

Method: They look at existing price measures and then introduced a new metric to track bubbles.

Findings: The paper concludes that there is no housing bubble in 2005

Traditional Metric 1: Real Price Metric

- Based on Office of Federal Housing Enterprise and Oversight (OFHEO)
- Uses a multiple observation price index to partially control for changes in house quality sold over time.
- Uses
  - calculate national price growth rates
- Downside is that it is subject to bias:
  - can't truly track changes in house quality
  - only includes traditional mortgages
  - Can't be used to compare prices across cities

Traditional Metric 2: Price to Rent Ratio

- Used to measure relative price of relative cost of owning versus renting.
- similar to price-to-earnings ratio
- Assumed to be reached by a supply/demand model
- Use: Find housing bubbles, as high ratio signals unrealistic expectations about housing price increases
- Drawbacks: a ratio, so it only captures relative movements

Traditional Metric 3: Price to Income Ratio

- Compares housing prices with consumer ability to pay.
- Uses OFHEO data divided by US Bureau of Economic analysis per capita income data.
- Uses: Determine there is a bubble by seeing if consumers are overpaying for housing
- Downside: A ratio, so only captures relative movement

Real U.S. House Price Index, Price-to-Rent and Price-to-Income Ratios
(ratios normalized to their 25-year average)
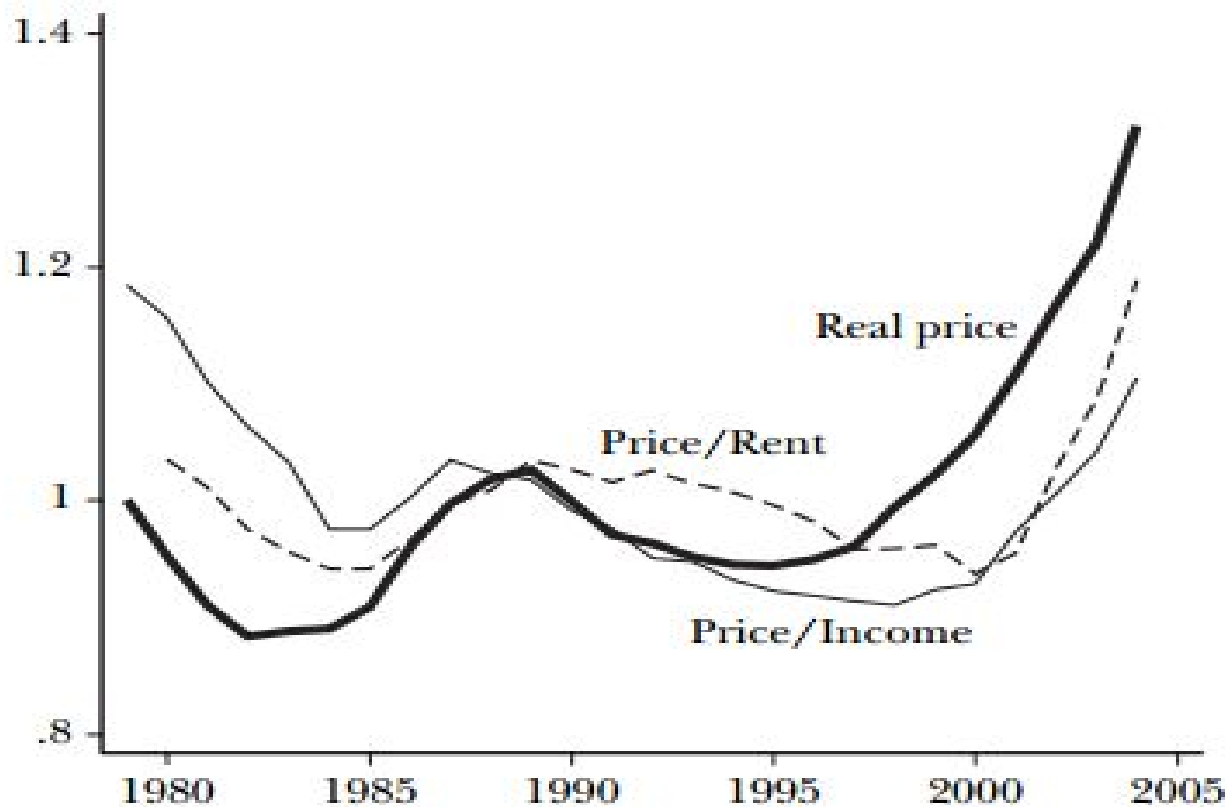
Source: OFHEO Price Index, REIS Inc., BEA, BLS CPI Index-All Urban Consumers.

Academics Conclude No Bubble…

"If high growth rates of house prices, price-to-rent ratios and price-to-income ratios were reliable indicators of a rising cost of obtaining housing, then these recent trends would indeed provide reasons to suspect overvaluation in many housing markets. However, as this paper will explain, these measures are inadequate to assess whether the housing market is the grip of a speculative bubble" (pg. 73)

Deriving Annual Cost of Ownership Model

Annual Cost of Ownership: $P_t r_t^{rf} + P_t \omega_t - P_t \tau_t (r_t^m + \omega_t) + P_t \delta_t - P_t g_{t+1} + P_t \gamma_t$

P_t= Price of Housing in year t

r_t^{rf} = risk free interest rate

ω_t= property tax rate

r_t^m= mortgage interest rate

τ_t= Tax return rate

δ_t= maintenance cost

g_{t+1}= expected future capital

γ_t=risk premium to compensate for ownership risk

Housing Market Equilibrium

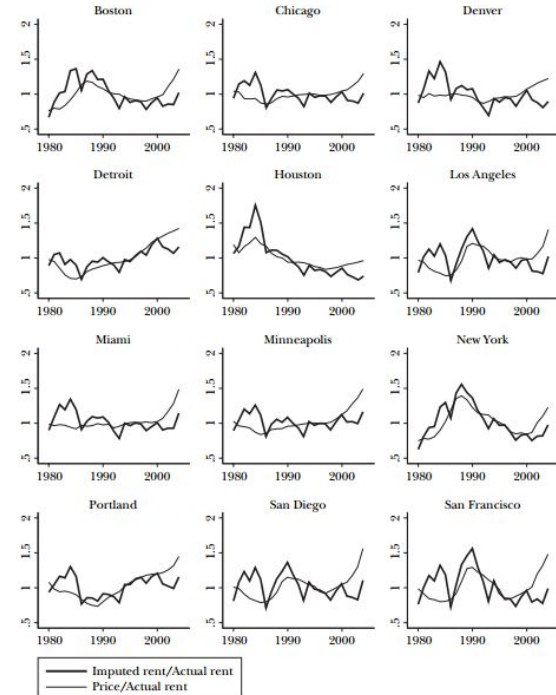$R_t = P_t u_t$ Equilibrium no arbitrage condition in the housing market

$\frac{P_t}{R_t} = \frac{1}{u_t}$ Equilibrium price-to-rent ratio should equal the inverse of the user costs

This equation allows us to retroactively estimate housing and rent prices given a set of market conditions and consumer expectations. We can determine if housing is mispriced given an "imputed rent" value based on housing market price.
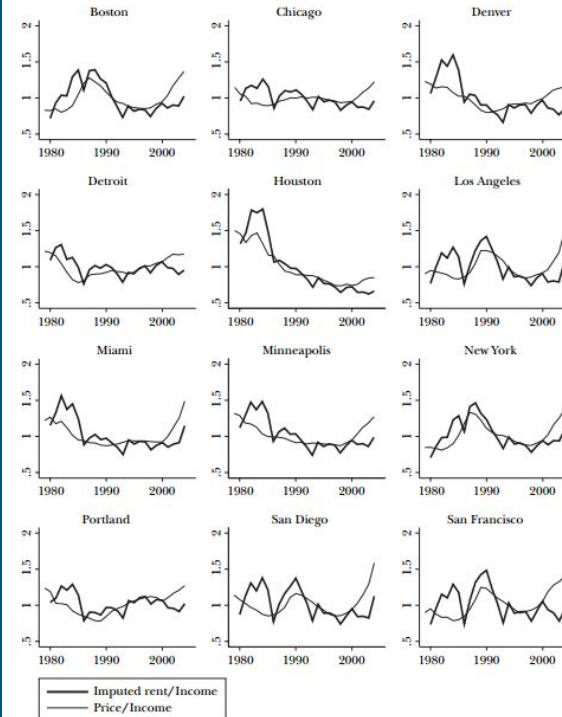
User Cost vs. Traditional Metrics

Figure 2
Imputed-to-Actual-Rent Ratio versus Price-to-Rent Ratio
(ratios normalized to their 25-year average)

Boston, Chicago, Denver, Detroit, Houston, Los Angeles, Miami, Minneapolis, New York, Portland, San Diego, San Francisco

Imputed rent/Actual rent
Price/Actual rent

Source: Authors' calculations.

Figure 4
Imputed-Rent-to-Income Ratio versus Price-to-Income Ratio
(ratios normalized to their 24-year average)

Boston, Chicago, Denver, Detroit, Houston, Los Angeles, Miami, Minneapolis, New York, Portland, San Diego, San Francisco

Imputed rent/Income
Price/Income

Conclusion

"it is impossible to state definitively whether or not a housing bubble exists. However, we can say that most housing markets did not look much more expensive in 2004 than they looked over the past 10 years, and in most major cities our valuation measures are nowhere near their historic highs" (89-90)

Challenges:

- Model assumed that consumers had a low appreciation rate (3.8%)
- Individual choice driven by much more than the expected cost

Paper 2: Wall Street and the Housing Bubble

Written by : Ing-Haw Cheng, Sahil Raina, and Wei Xiong

Goal: To determine if financial professionals expected the crisis based on their personal real estate purchases.

Method: Compare real estate finance professionals with other groups to determine if their individual purchases

Findings: The paper concludes that financial services professionals did not expect the housing bubble, and that they were oftentimes more aggressive in real estate investment than other groups.

Methodology

Treatment: Mid-level professionals at "major" firms who attended the 2006 American Securitization Forum, the largest industry conference.

Controls:

1. A random sample of S&P 500 equity analysts who do not cover homebuilding companies
2. A random sample of lawyers who did not specialize in real estate law

Personal Investment information pulled from LexisNexis public records database

Four Testing Methods

Hypothesis (Full Awareness): Securitization agents exhibited more awareness of a broad-based housing bubble relative to equity analysts and lawyers in four possible forms:

1. (Market timing form) Securitization agents were more likely to divest homes and downsize homes in 2004–2006.
2. (Cautious form) Securitization agents were less likely to acquire second homes or move into more expensive homes in 2004–2006.
3. (Performance) Overall, securitization agents had better performance after controlling for their initial holdings of homes at the beginning of 2000.
4. (Conservative consumption) Relative to their current income, any purchases made by securitization agents during the boom were more conservative.
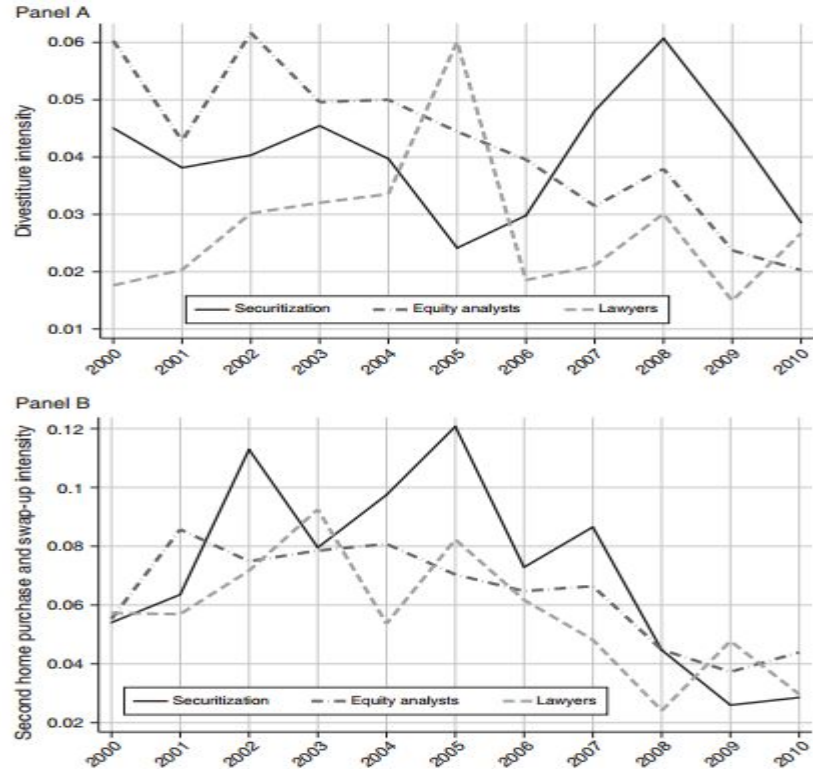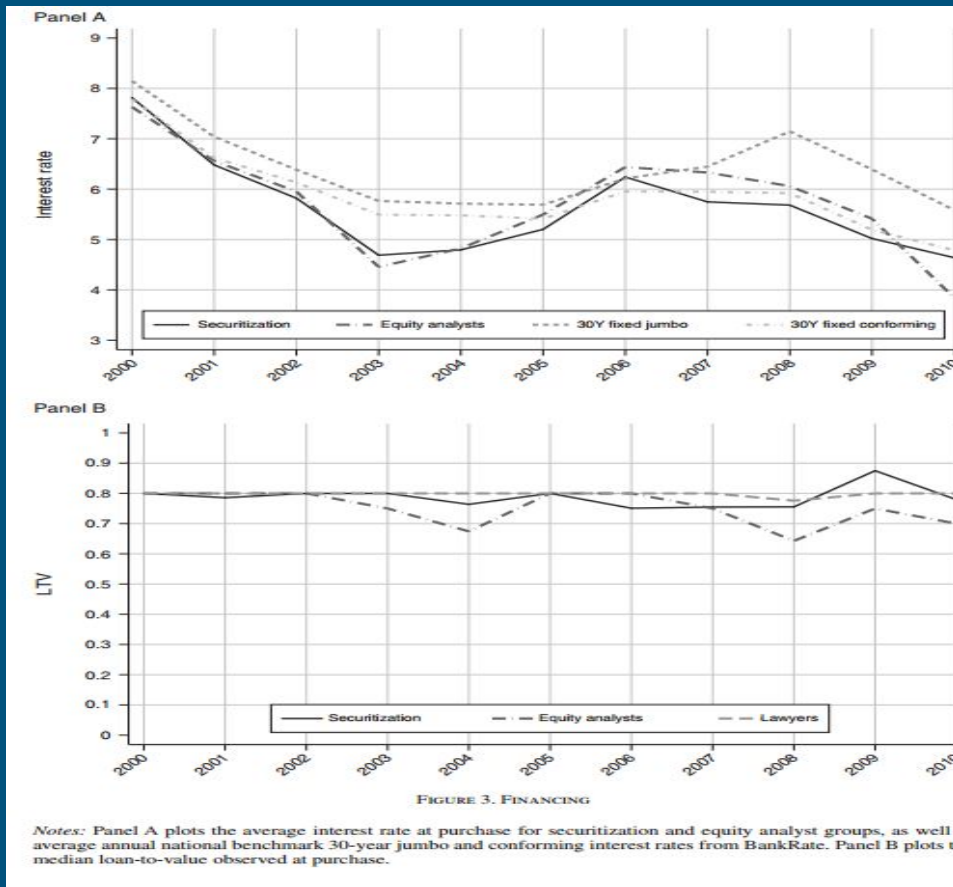
1. Real Estate Purchases

FIGURE 2. TRANSACTION INTENSITIES

Notes: Panel A plots the intensity of divestitures through time, defined as the number of divestitures per adjusted homeowner each year, for each group. Panel B plots the intensity of second home purchases and swap-ups.

2. Real Estate Leverage

FIGURE 3. FINANCING

Notes: Panel A plots the average interest rate at purchase for securitization and equity analyst groups, as well as average annual national benchmark 30-year jumbo and conforming interest rates from BankRate. Panel B plots the median loan-to-value observed at purchase.

3. Portfolio Performance

FIGURE 4. TRADING PERFORMANCE INDICES
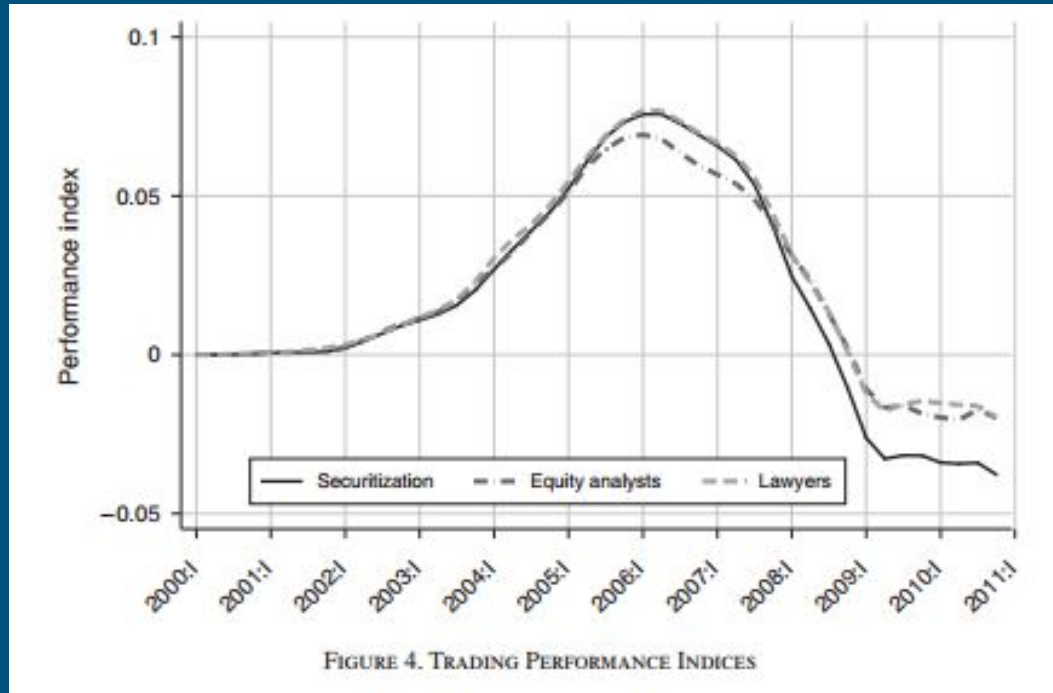
4. Consumption Patterns

TABLE 9—VALUE-TO-INCOME

		Sctzn.	Equity analysts	Lawyers
Preboom period	Mean	3.2	2.9	2.9
(2000–2003)	Median	3.1	2.7	2.5
	SD	1.3	1.5	1.2
	People	65	60	49
Boom period	Mean	3.4	3.1	3.3
(2004–2006)	Median	3.0	2.8	3.2
	SD	2.0	1.7	1.7
	People	73	45	46
Bust period	Mean	3.1	3.1	2.8
(2007–2010)	Median	3.0	3.1	2.8
	SD	1.2	1.4	1.3
	People	55	51	40
1. Boom − preboom	Point estimate	0.268	0.175	0.400
	t-stat	[0.94]	[0.57]	[1.37]
	Observations	138	105	95
	R^2	0.006	0.003	0.019
2. DID	Point estimate		0.093	−0.132
Sctzn. minus	t-stat		[0.22]	[−0.32]
Control	Observations		243	233
	R^2		0.015	0.015

Notes: This table presents average value-to-income (VTI) at purchase in three periods for each group. We first average VTI from purchases observed within each person-period before averaging across people to obtain an average VTI per purchaser for each period. Row 1 tests whether the boom minus preboom difference in averages was zero by projecting person-level income onto an indicator for the boom period in a two-period panel of person-level income. Row 2 tests whether the difference in difference is significant across groups. Standard errors are clustered at the person level.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Conclusion

There is no empirical evidence of securitization professionals suspecting a real estate crisis. There is evidence that they were more aggressive than other actors, giving an indication that they were more confident in the housing market than others.

Questions:

What are the implications? Was this unpredictable or was there systemic illusion on the part of the securitization professionals?

Paper 3: Speculative Fever: Investor Contagion in the Housing Bubble

Written by : Patrick Bayer, Christopher Geissler, Kyle Mangum, and James W. Roberts

Goal: Investigate speculative home buying behavior in the Los Angeles

Method: Test for speculative behavior of different purchasing groups to determine who drove the bubble.

Findings: Inexperienced investors made speculative bets and heavily influenced the housing bubble.

Determining Types of House Purchases

Non-residential real estate buying broken into two types:

1. Investment Property- If investor holds property for greater than 2 years
2. Quick Sale- investor sells property when held for less than 2 years

A "flipper" is an individual who has 2 instances of purchasing a second home for a period of less than 2 years. We want to understand flipper's role in the bubble. Flippers are characterized as either:

1. Middlemen- increase market efficiency
2. Speculative- non-positive effect on market efficiency

Experienced and Inexperienced Flipper Behavior

- Flippers typically purchase at 16% discount and sell at 7.5% above market price, with much higher returns than traditional real estate investors
  - Experienced flippers- purchase at 29% discount, sell at 12% above market
  - Inexperienced flippers- purchase at no significant discount, 3.5% profits primarily driven by market growth
  - Experienced flippers hold properties for half the time
- Houses that sell multiple times typically sell at an increasing premium relative to market prices on later sales.
- All houses likely to be of similar size and value
- This shows that experienced flippers are more likely serving as middle men and inexperienced flippers serving as speculative actors.

Flipper Purchasing Behavior
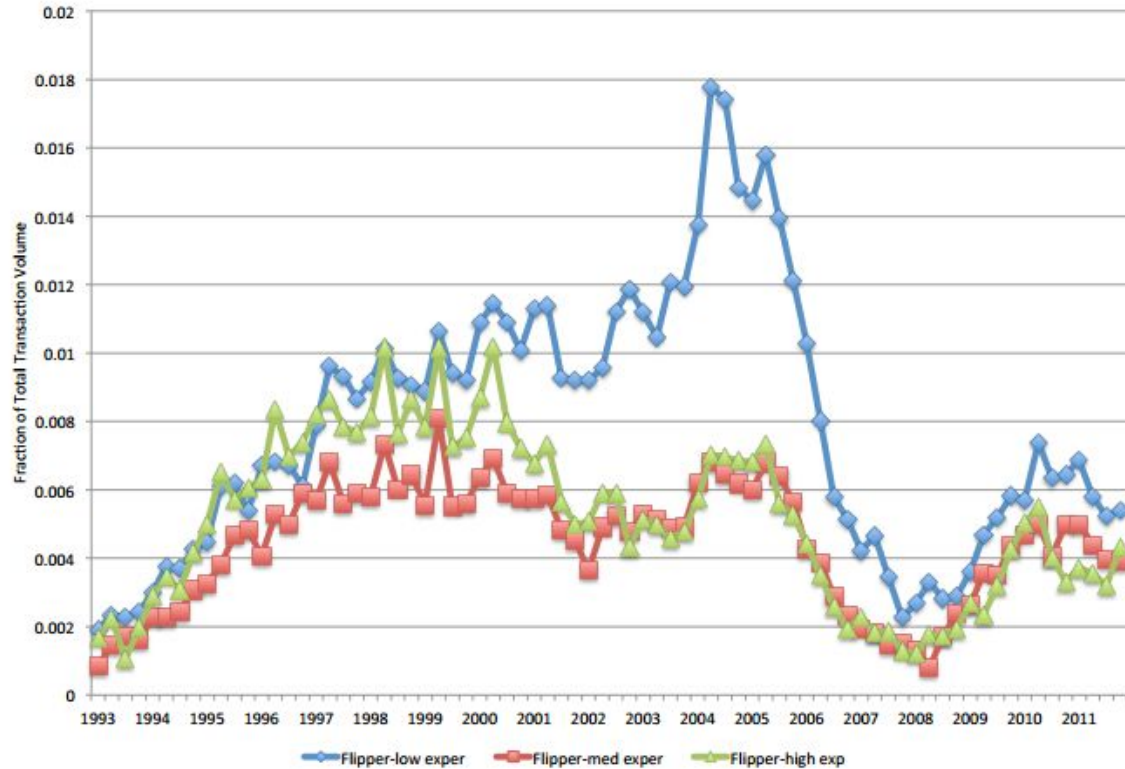
Investor Contagion

- Having a flipped property in one's immediate neighborhood increases the propensity to enter in a given month by 17 percent
- Having an investor neighbor increases the propensity by nearly 12 percent.
- This behavior shows explains the increased purchasing by inexperienced flippers in 2001-2006
- Shows how irrational exuberance spreads throughout a market.

Conclusion

The study concludes that speculative investing by inexperienced investors greatly increased the size of the housing bubble. Speculative investing was done by those not informed of market fundamentals, and drove prices up as a result.

Question:

If this data was available pre-crash, why was there not a greater realization of a bubble?

General Conclusions

- None of these parties could determine that there was a housing bubble, despite rising prices and transaction volume.
- It is difficult to control for hindsight bias in researchers.
- This shows the self-fulfilling nature of bubble boom and bust cycles.

Supply Side Theories

"Explaining the Housing Bubble"

- In their article, Adam Levitin and Susan Wachter argue that the housing bubble was not the result of factors such as the Federal Reserve's maintaining low interest rates, affordable housing policies or demand side factors such as irrational exuberance or population growth, which would put pressure on housing markets with inelastic supply.
- While monetary policy played a role, they attribute the bubble primarily to an excess supply of housing finance driven by a shift from regulated to unregulated securitization.

- The housing bubble can be broken into two periods: 1997-2003 and 2003-2006.
- Between 1997 and 2003, housing prices could be explained by fundamental values such as interest rates and the cost of purchasing vs. renting.
- Before 2003-2004, most MBS were issued by Fannie Mae and Freddie Mac, government sponsored entities and Ginnie Mae, a government agency.
- From 2003-2004, the market shifted to MBS issued by investment banks, which employed lower underwriting standards and new products that the GSEs would not issue.

- The new MBS were heterogeneous and complex. This prevented a sufficient number of investors from understanding the securities in a reasonable time frame. It was thus not possible to discover the price of the security through market trades.
- This process caused the dramatic increase in housing prices. Once the market for new borrowers was exhausted, the housing bubble burst like the collapse of a ponzi scheme.
- One proposal to prevent these conditions from occurring again is to require standardization of MBS that are sold in capital markets so that markets can focus on limited parameters and observe credit risks.

Regulated Securitization

- Until the beginning of the bubble in the late 90's, the GSEs would buy only prime amortizing mortgages and were limited by statute to buying loans with a LTV ratio of less than 80%, absent private mortgage insurance.
- Investors in agency MBS were exposed to the interest rate risk of the mortgages while the GSE assumed the credit risk. Since the GSEs were perceived to have government guarantees, investors were unconcerned with the credit risk of agency MBS and thus the default risk of the underlying mortgages.
- Regulatory standards prevented GSEs from lowering underwriting standards.

Private Label Securitization

- Sponsors of Private Label MBS did not guarantee payout of interest and principal on the MBS, exposing investors to both credit risk and interest rate risk.
- Investor demand was highest for investment-grade products, so the success of Private Label MBS relied on achieving good credit rating.

ARMs

- PLS increased from 22% of MBS issued in 2003, to 46% in 2004.
- This coincided with a massive increase in the amount of adjustable rate mortgages issued.
- ARMs were attractive to home buyers because of their low initial payments.
- Buyers were willing to speculate on houses because the cost of walking away was low.
- ARMS were also initially more affordable to borrowers, which enabled market expansion.
- The increase in the number of potential home buyers due to low lending standards drove up home prices, making ARMs even more attractive.

- As Private Label MBS issuance and mortgage risk increased, the spread between PLS and treasuries of the same maturity decreased.
- This represents a decrease in the risk premium that the market placed on PLS.
- One would have expected the nominal spread to increase due to the increased default risk of the underlying mortgages. This was not the case.

- This decrease in spreads was not a market wide phenomenon, but was unique to MBS.
- While the spread on AAA-rated corporate bonds remained constant, the spread on AAA-rated PLS declined.
- Such a pattern points to a supply side explanation for the housing bubble.
- An increase in volume(quantity) and a decrease in spreads(price) indicates a rightward shift in the supply curve.
- Irrational exuberance might have also caused borrowers to seek more financing accommodate higher prices. This would have caused an increase in supply and price and is represented by an outward shift in the demand curve.
- The price decline indicates that increases in supply dominated increases in demand.

Bubble Timing

- Inflation adjusted housing prices did not pass their previous peak levels until 2000.
- Furthermore, the rate of increase pre-2000 was identical to the rate of increase in rental prices.
- While housing prices did increase faster than rental prices from 2000-2003, this period was marked by historically low interest rates. The cost of financing for fully amortized fixed rate mortgages depends on interest rates.
- If there was a bubble in this period, it was driven by monetary policy. However, it was much smaller than the bubble of 2004-2006.

- The rate of housing price increases was constant between 1997 and 2001 at 6% and increased only slightly by 2003.
- The rate of increase then increased dramatically, reaching 12% in 2005.
- Furthermore, as seen in the graph, housing prices fell only to 2003 levels and not all the way to 1997 levels. This suggests that prices up until 2003 reflect fundamental values.

GSEs

- In response to increases in affordable housing goals in 1997, 2001 and 2005, the GSEs did expand their underwriting criteria to purchase riskier loans. However, this largely took the form of crowding out Federal Housing Administration (FHA) affordable lending. Thus, compliance with affordable housing goals had no measurable increase on total mortgage credit.
- GSEs did however accumulate large holdings of subprime PLS adding to the demand for PLS.
- Their purchases of Private Label MBS likely had more to do with maximizing executive compensation and short term performance than meeting federal housing goals.
- Furthermore, the failure of creditors to monitor GSEs because of the implicit government guarantee led them to take increased risk.

Conclusion

- The evidence suggests that the housing bubble can be attributed to supply side factors, which after 2003-2004 caused a substantial increase in housing prices.
- These factors include the expansion of the borrowing base through ARMs and relaxed underwriting standards.
- The shift from agency backed MBS to PLS fostered the conditions for the expansion of mortgage credit. The market could not properly price the opaque and heterogeneous securities created leading to rising prices. Once the borrowing base was exhausted, the bubble burst, sowing the seeds of the financial crisis.