

# Asset prices and economic fluctuations

David Laibson

Robert I. Goldman Professor of Economics

Harvard University

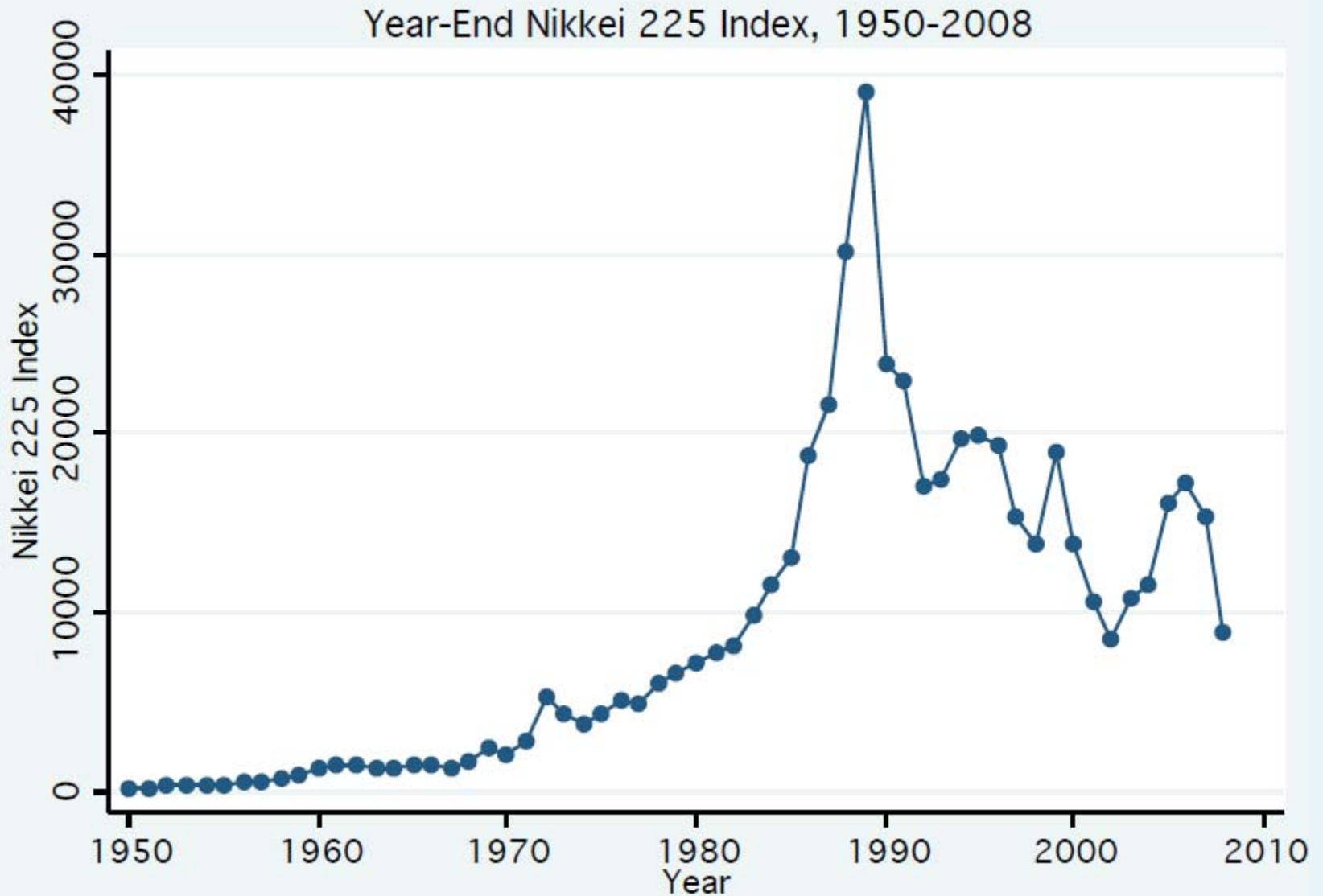
June 2011

# Bubble

## Definition

- An asset **bubble** exists when the expected discounted value of cash flow (and other benefits) is less than the asset price
- A negative bubble occurs in the reverse case

# The Japanese Bubble



# Outline

1. “Bubbles” in the last cycle
2. Leverage
3. Real consequences of asset price fluctuations
4. Identifying bubbles before they burst

# Bubbles form: 1995-2007

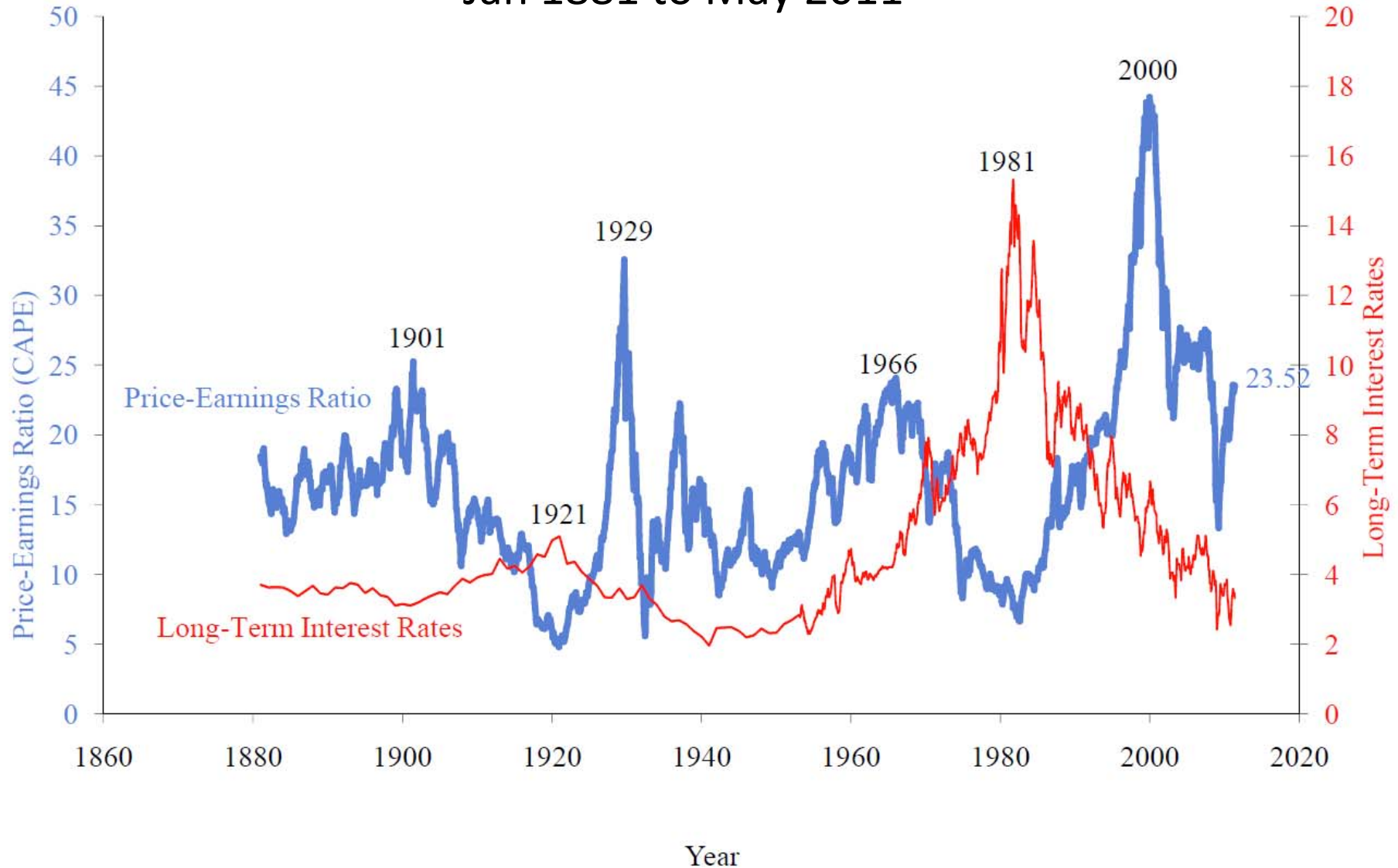
- Focus on the US, since this was the epicenter
- Related bubbles existed in many other countries
- The US bubble had two main components:
  - Prices of publicly traded companies
  - Prices of residential real estate
- And many minor contributors:
  - Prices of private equity
  - Commercial real estate
  - Farmland

# Fundamental Catalysts: 1990's

- End of the cold war
- Deregulation
- High productivity growth
- Weak labor unions
- Low energy prices (\$11 per barrel avg. in 1998)
- Information technology “revolution”
- Low nominal and real interest rates
- Congestion and supply restrictions in coastal cities

# P/E ratio: Cambell and Shiller (1998a,b)

Index divided by 10-year average of inflation-adjusted earnings  
Jan 1881 to May 2011



# Dot com bubble

Lamont and Thaler (2003)

- March 2000
- 3Com owns 95% of Palm and lots of other net assets, but...
- Palm has higher market capitalization than 3Com

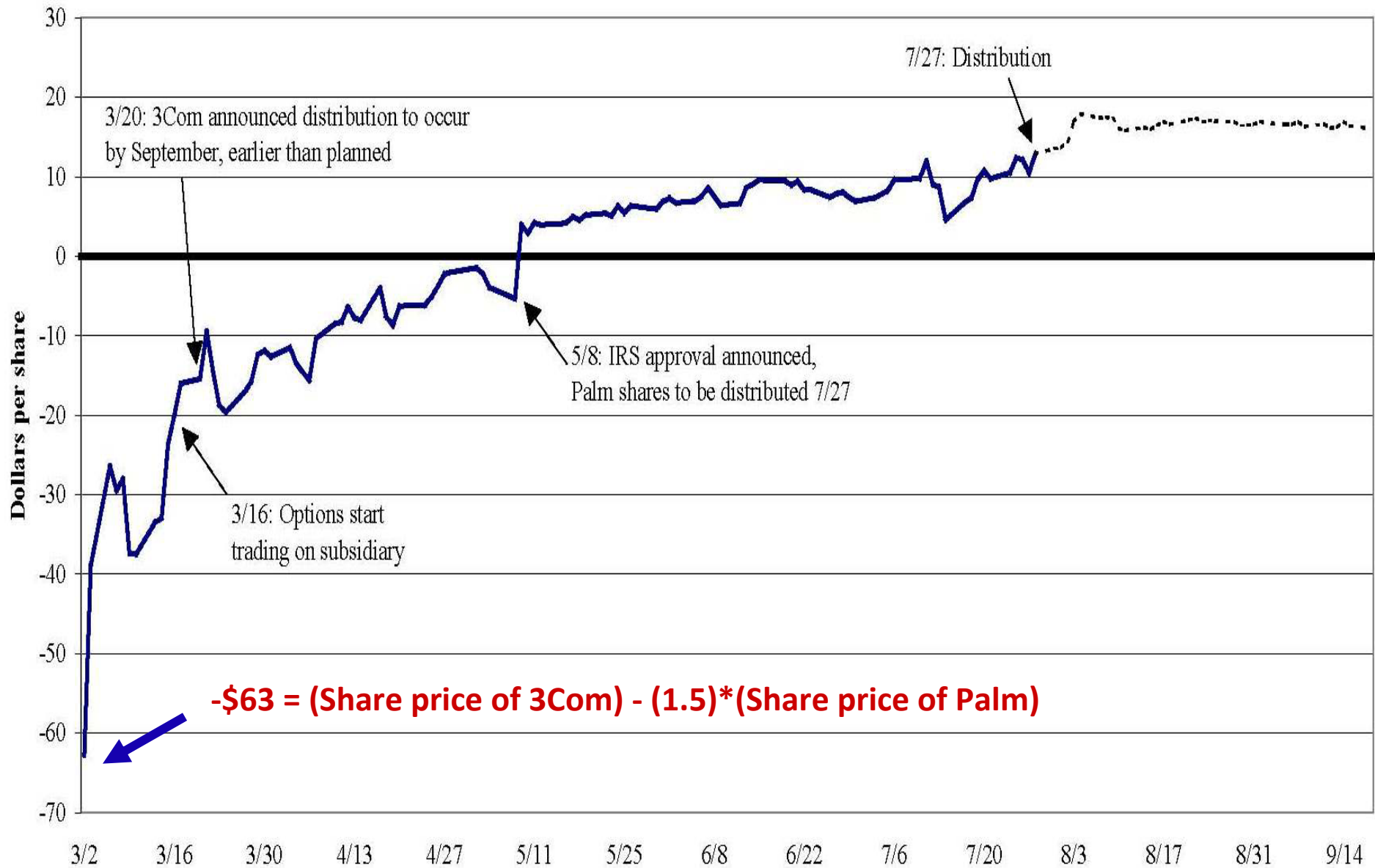
$$\$Palm > \$3Com$$

$$= \$Palm + \$Other\ Net\ Assets$$



# 3Com/Palm Stub

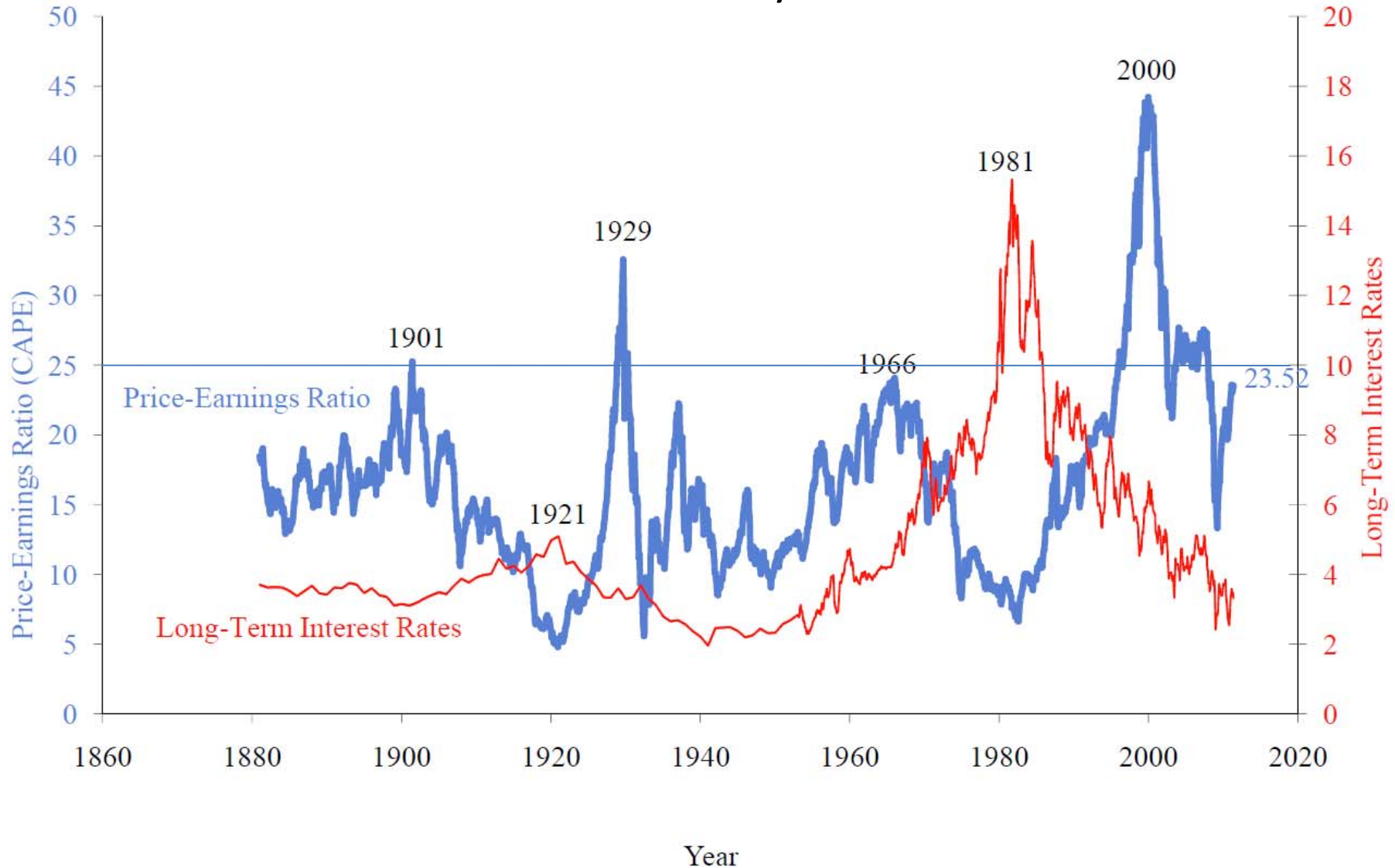
3/2/00 - 9/18/00



# P/E ratio: Cambell and Shiller (1998a,b)

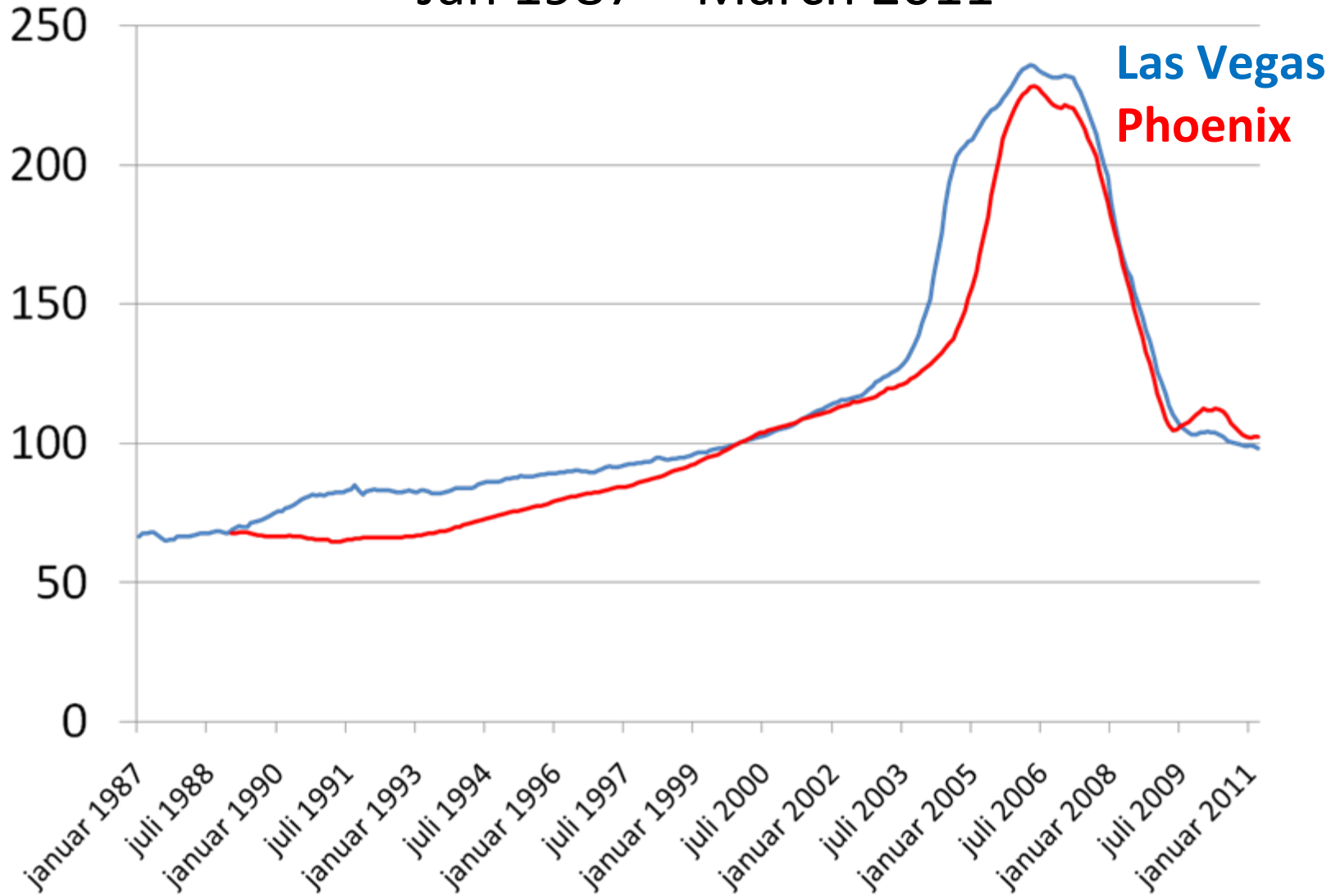
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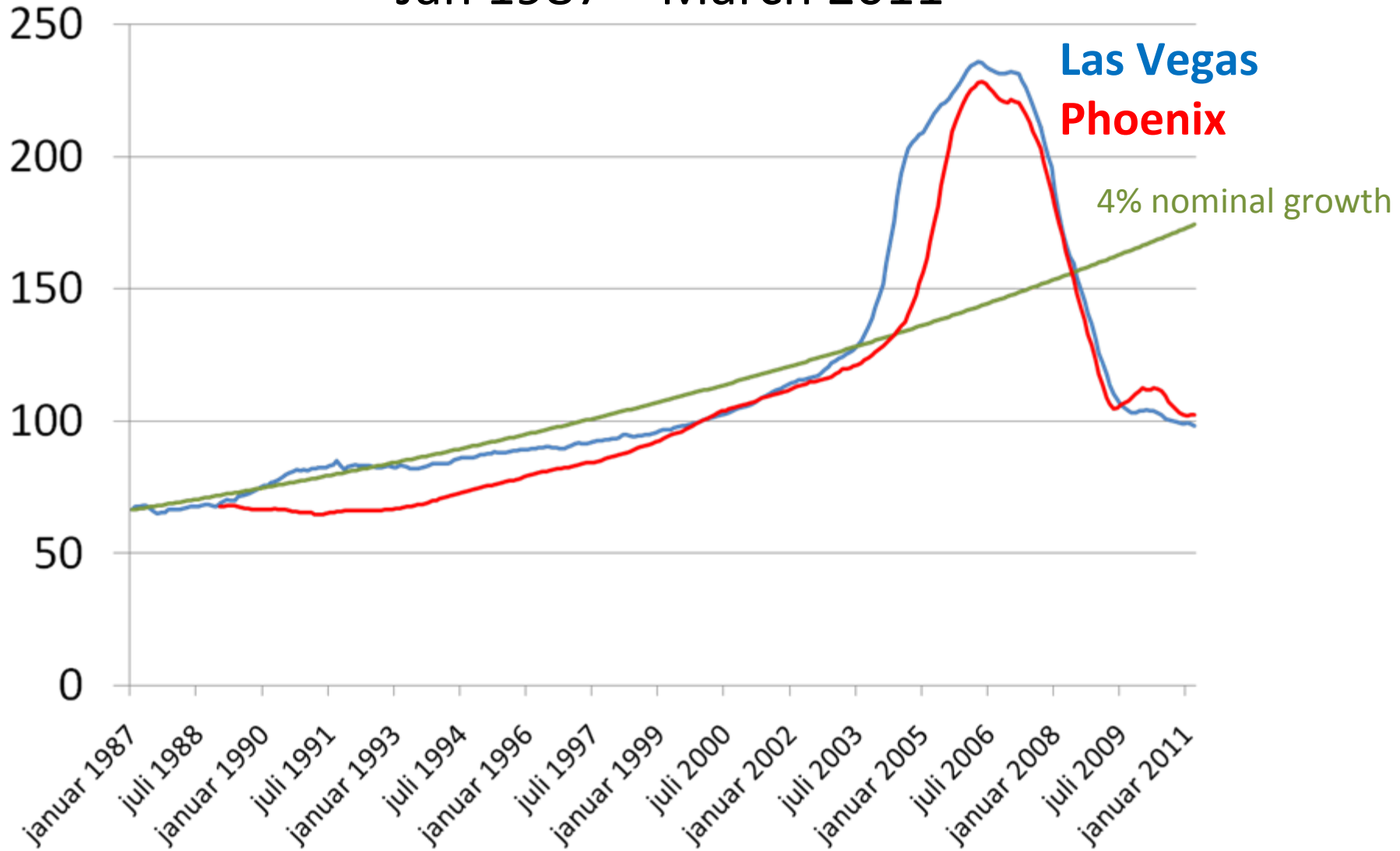
# Real Estate in Las Vegas and Phoenix

Jan 1987 – March 2011



# Real Estate in Las Vegas and Phoenix

Jan 1987 – March 2011



# Long-run horizontal supply curve



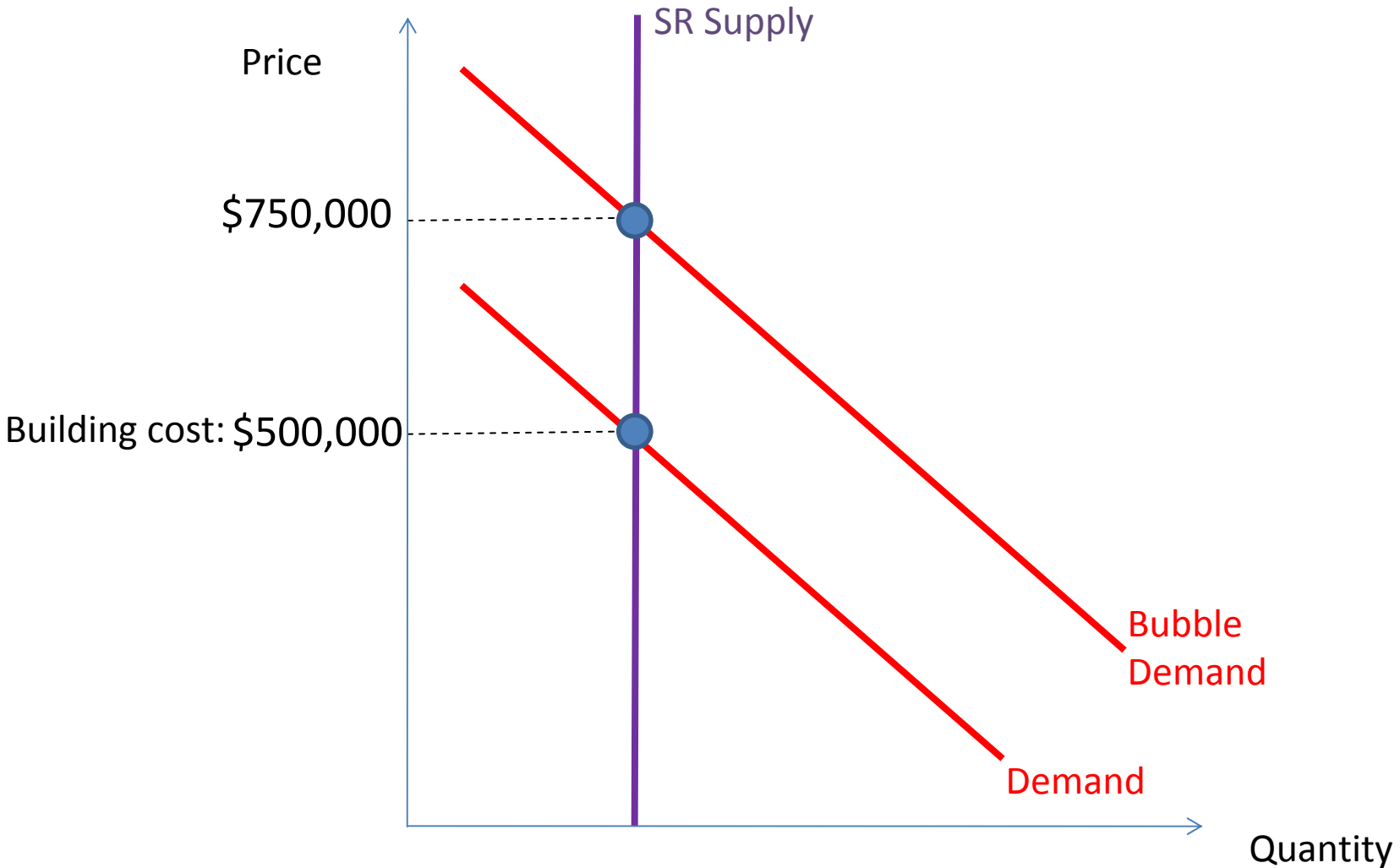
# Long-run horizontal supply curve



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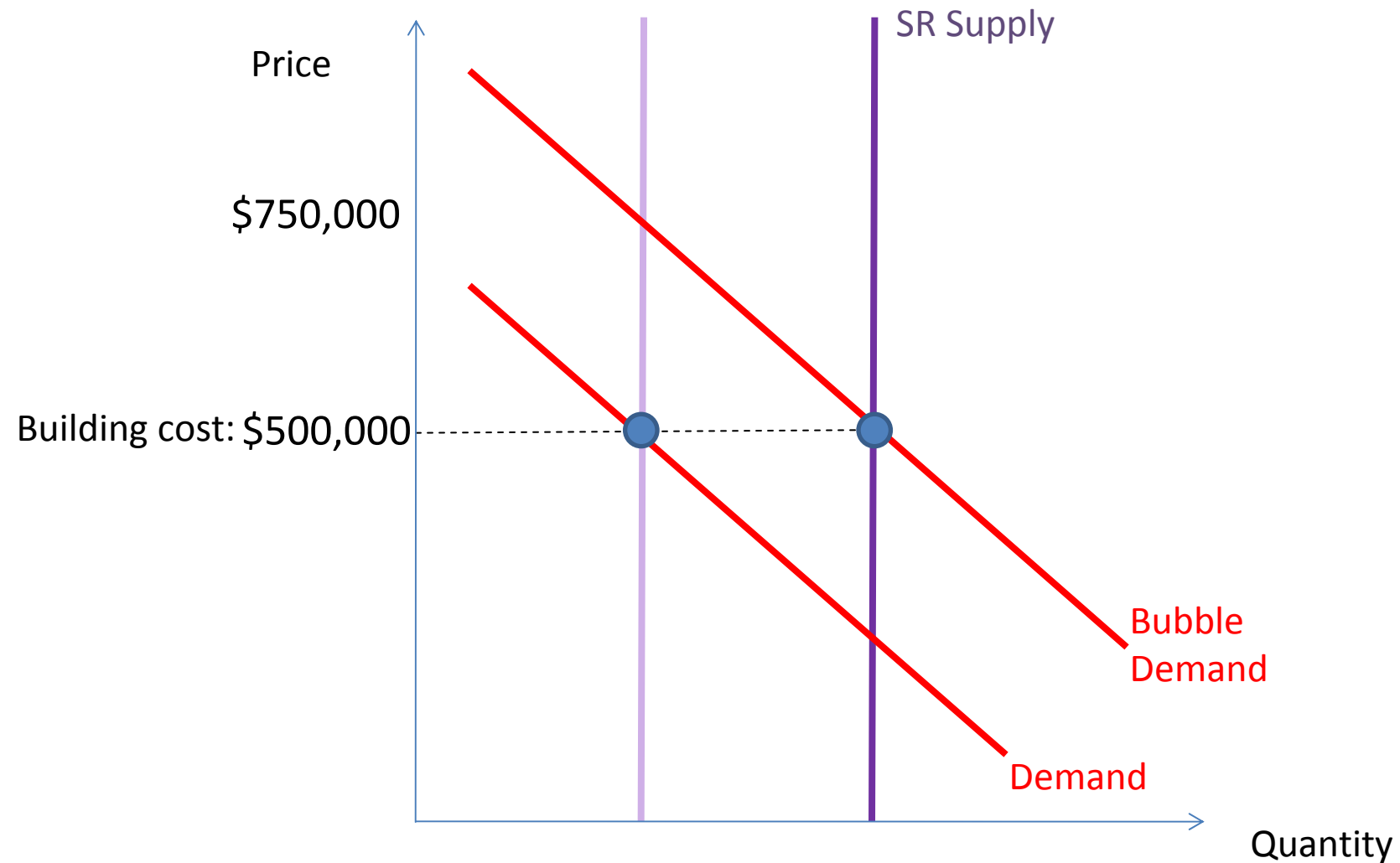


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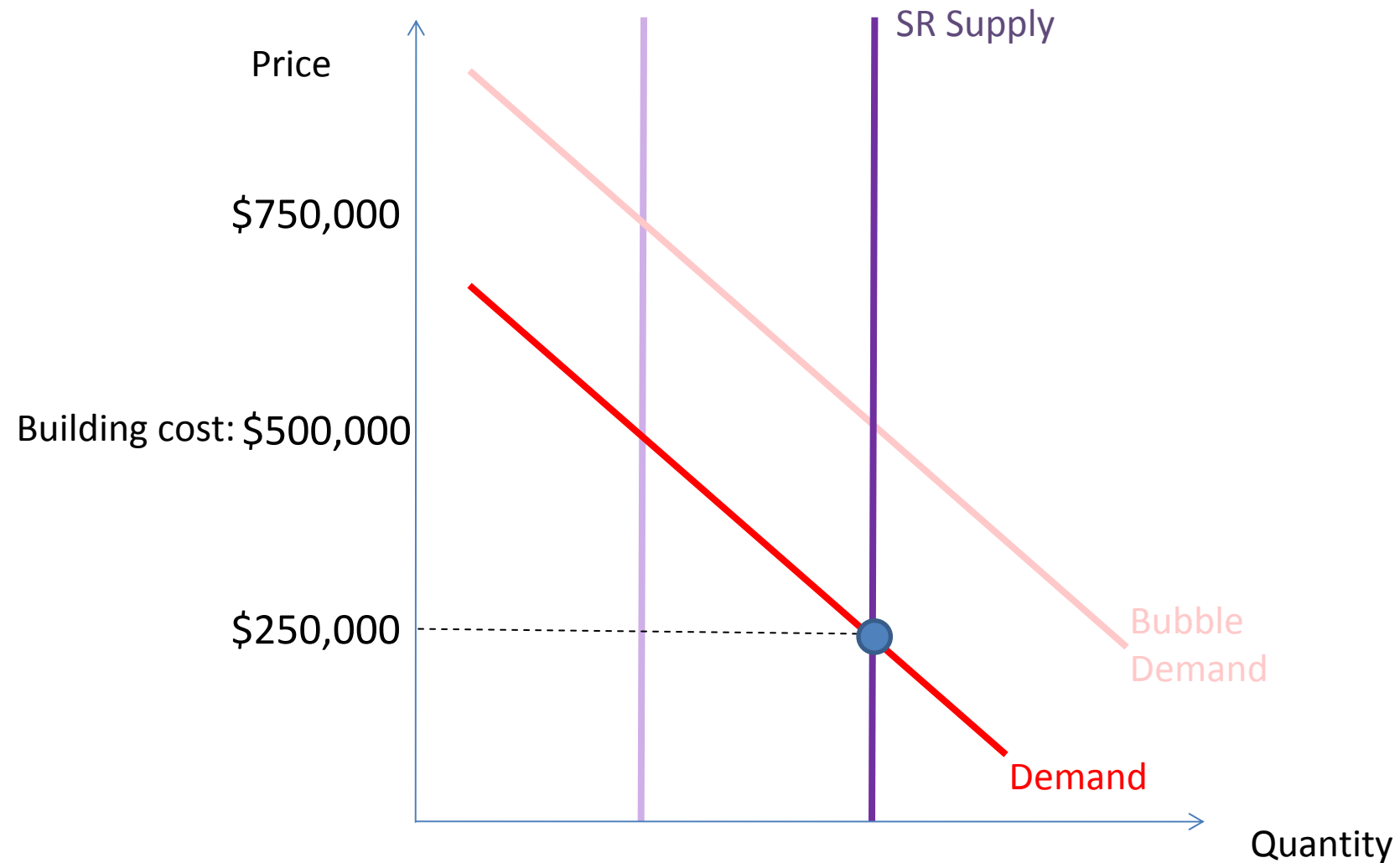




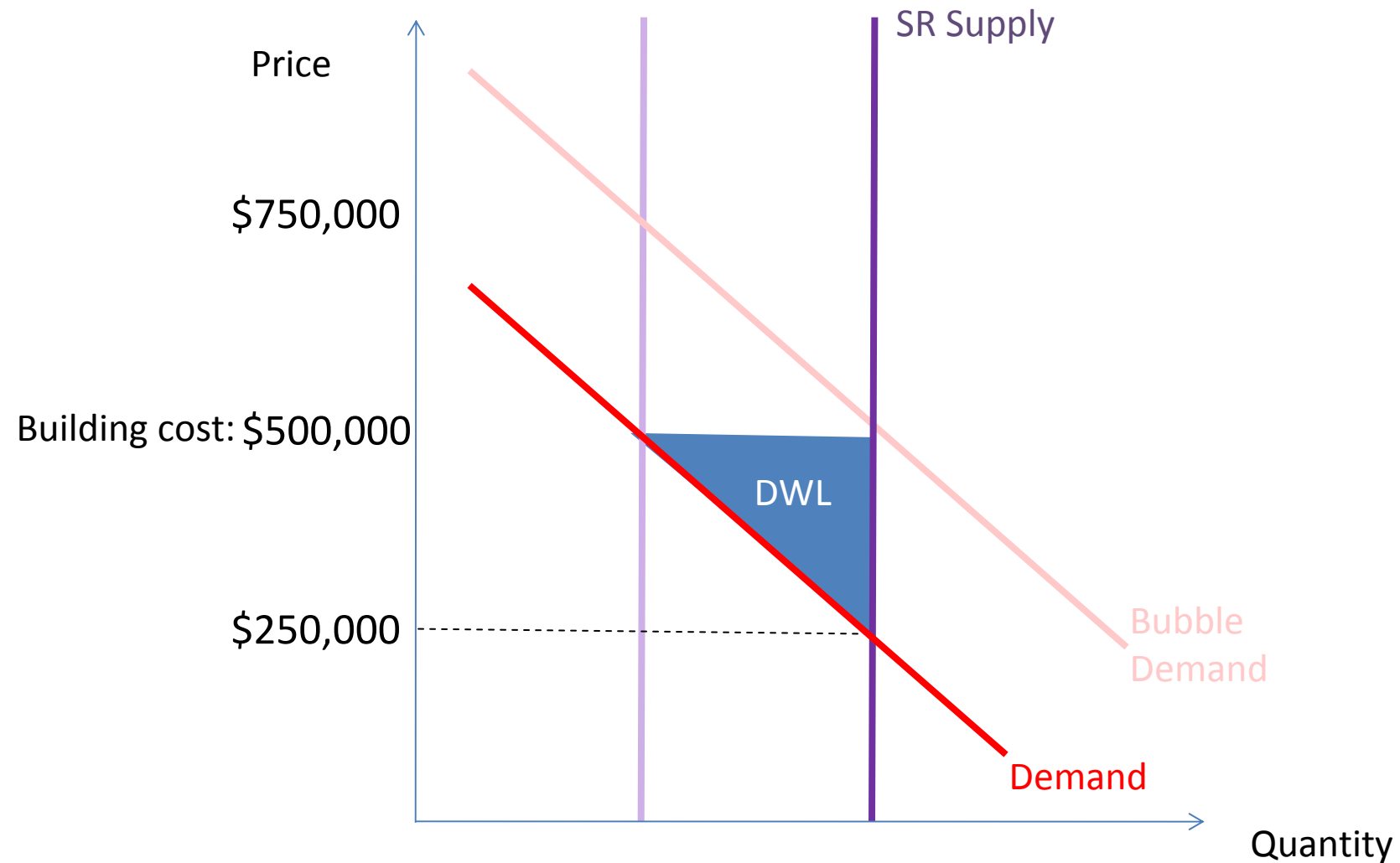
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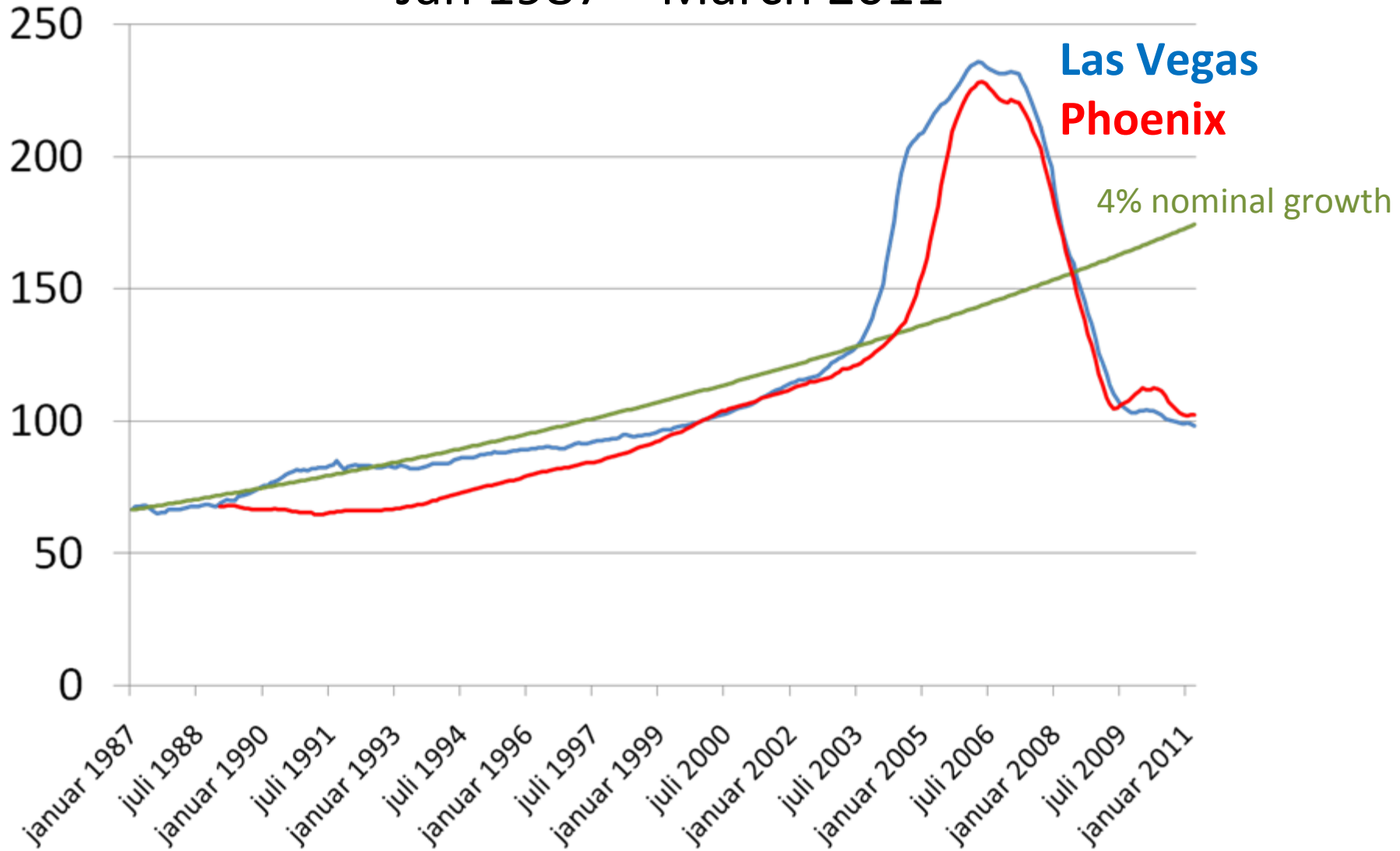


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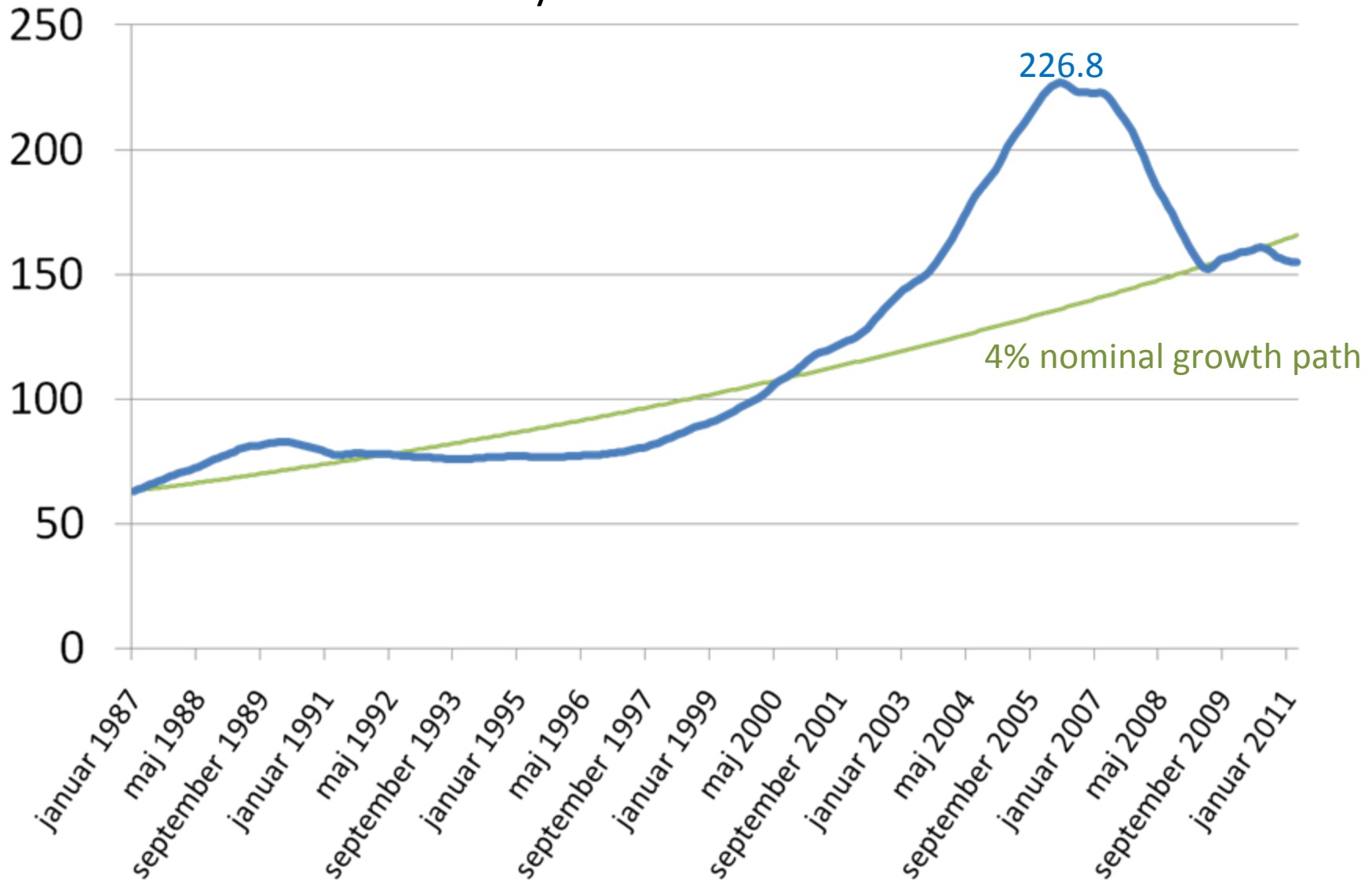
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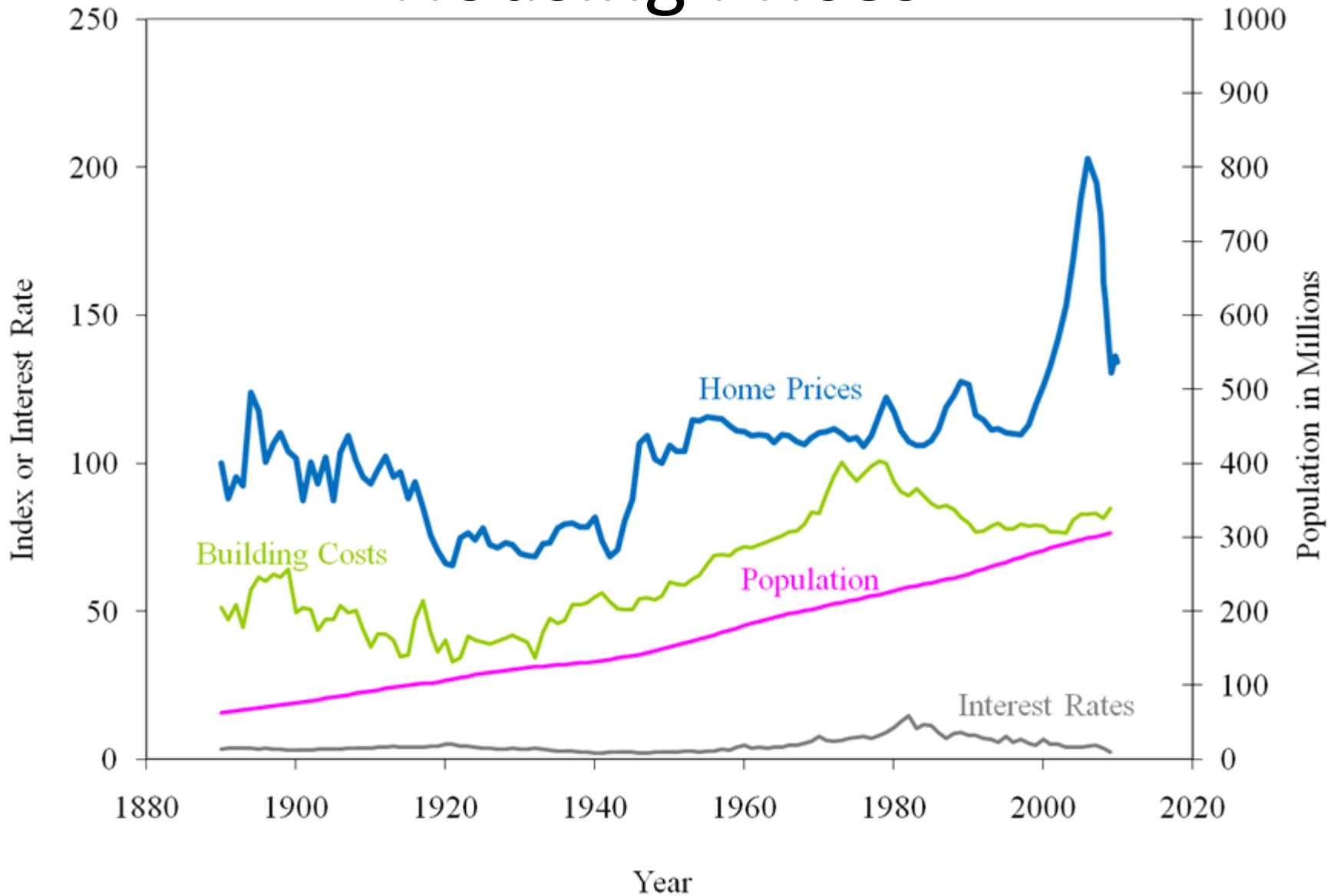


# S&P 500 Case-Shiller Index

January 1987-March 2011



# Housing Prices



Source: Robert Shiller web data

# Lehman's forecasts in 2005

## HPA = House Price Appreciation

Name	Scenario	Probability
(1) Aggressive	11% HPA over the life of the pool	15%
(2)	8% HPA for life	15%
(3) Base	HPA slows to 5% by end-2005	50%
(4) Pessimistic	0% HPA for the next 3 years 5% thereafter	15%
(5) Meltdown	-5% for the next 3 years, 5% thereafter	5%

Source: Gerardi et al (BPEA, 2008)

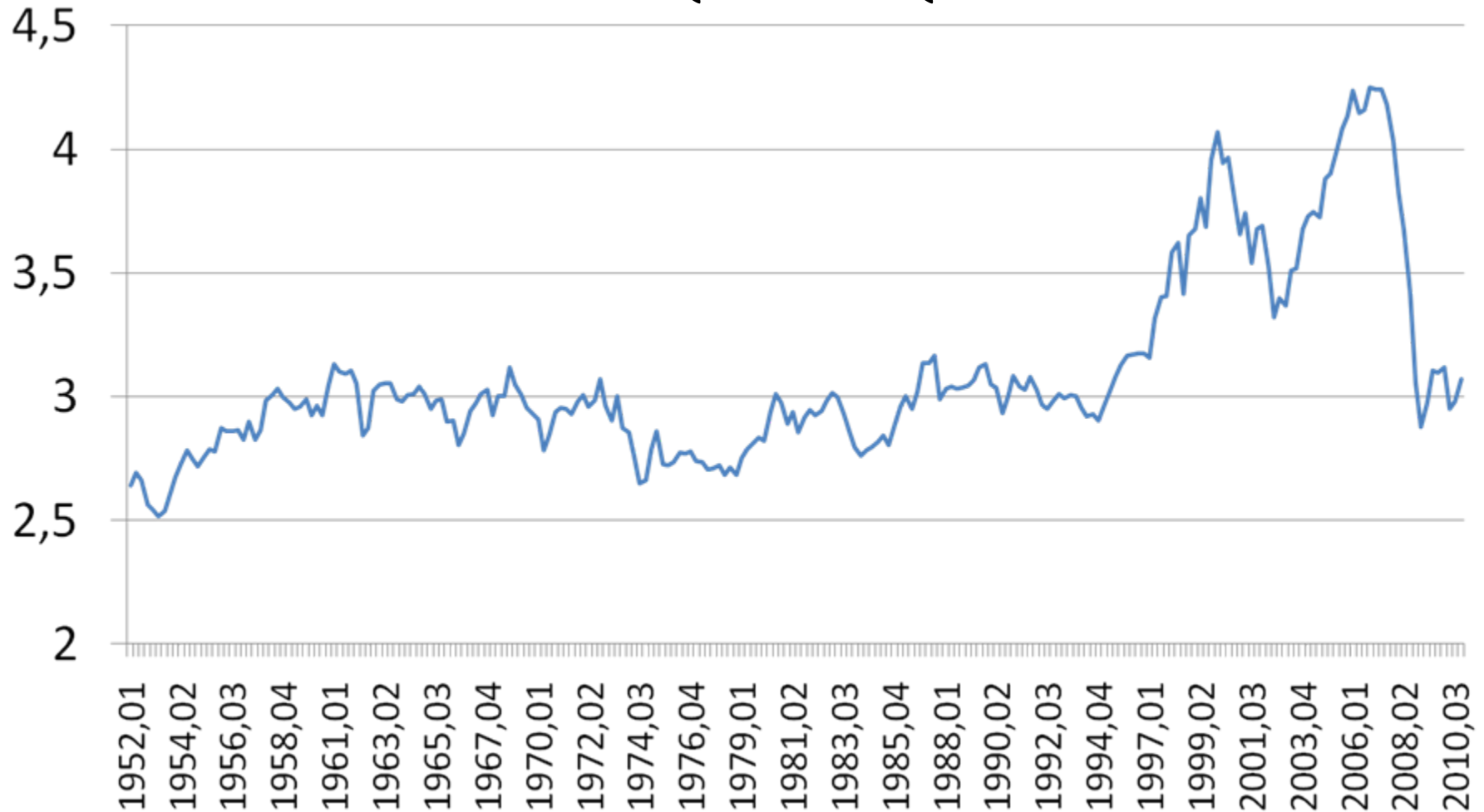
# Alan Greenspan

- “While local economies may experience significant speculative price imbalances, a national severe price distortion seems most unlikely in the United States, given its size and diversity.” (October, 2004)
- If home prices do decline, that “likely would not have substantial macroeconomic implications.” (June, 2005)
- Though housing prices are likely to be lower than the year before, “I think the worst of this may well be over.” (October, 2006)



# Household net worth (less federal gov't liabilities) divided by GDP

1952 Q1 – 2010 Q4



Source: Flow of Funds, Federal Reserve Board ; GDP, BEA ; and author's calculations

# Estimates of magnitude

- Balance sheets for households and non-profits record a decrement in value of \$14 trillion from 2007 q3 to 2009 q1.
- But this is an underestimate, since net worth would have been even higher at the start if households hadn't started spending their bubble wealth
- This spending effect amounts to \$5 trillion
- Total magnitude of the bubble: **\$19 trillion**

# Estimates of magnitude

(using decomposition)

- Stock market 2007 P/E was 27.3 and long-run historical average is 16.4. A 1/3 decline in the value of the (2007) stock market is \$5 trillion.
- Housing price index fell from 226.8 to 150. A 1/3 decline in the value of the (2006) housing stock is \$7 trillion.
- Total magnitude of the bubble: **\$12 trillion**
- This is a lower bound, since we are neglecting other asset classes (commercial real estate, privately held businesses, etc.)

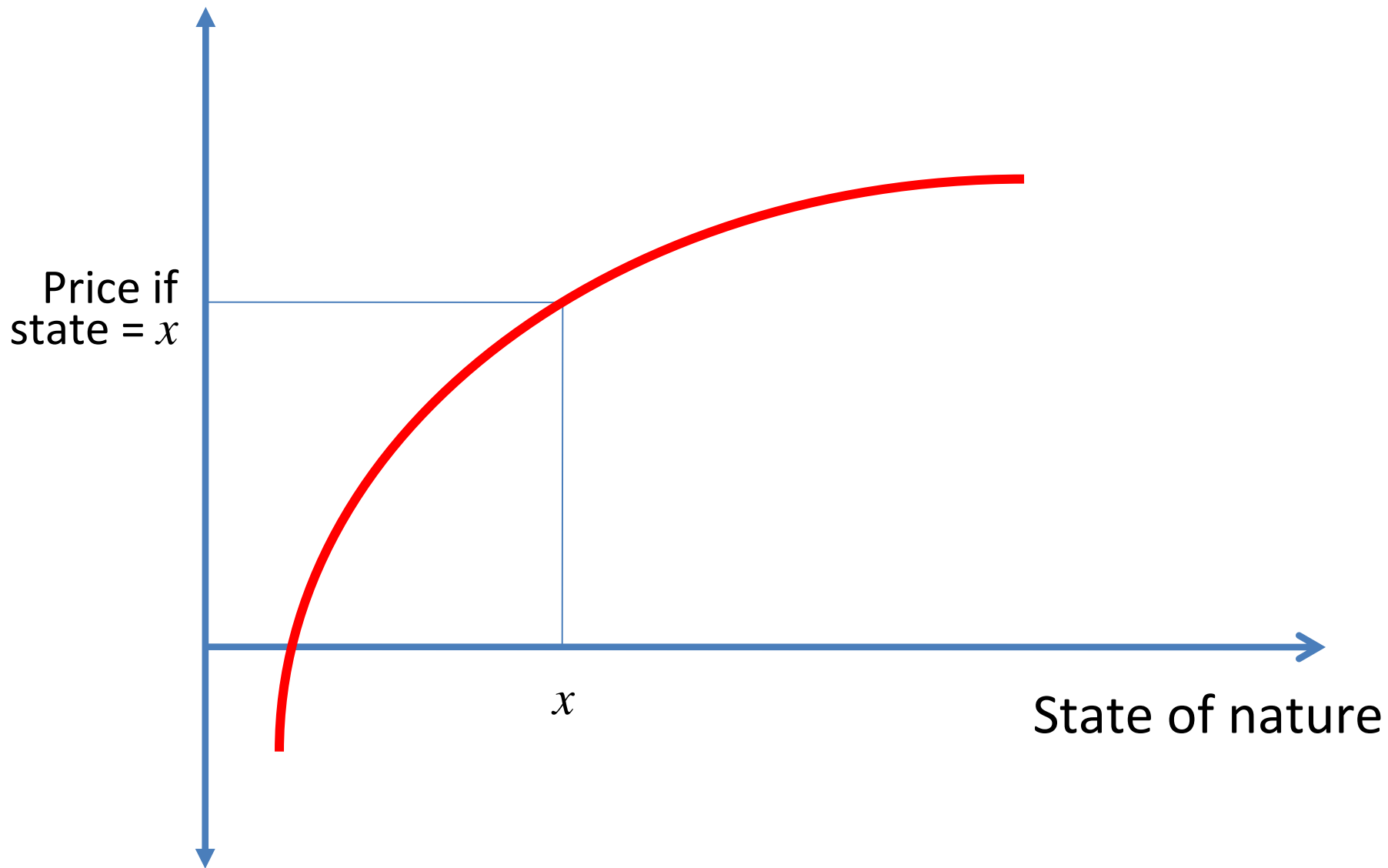
# Summary of bubble magnitude for US

- \$12 to \$19 trillion
- About one year of output

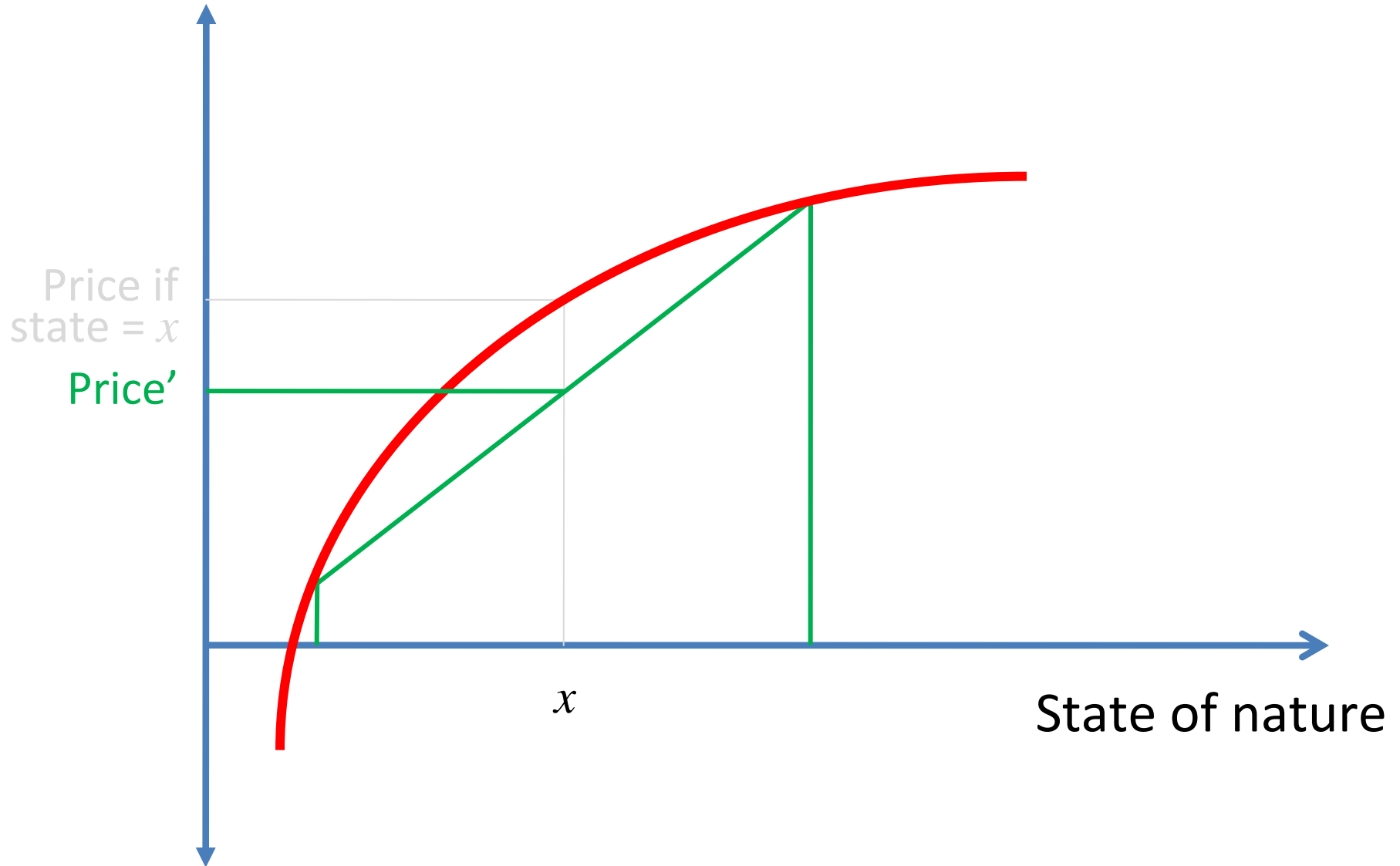
# Psychological foundations of bubbles

- Return chasing
  - E.g. Malmendier and Nagel (2009)
- Herding (social contagion)
  - E.g. Burnside, Eichenbaum, and Rebelo (2011)
- Over-optimism
  - E.g. Weinstein (1980)
- Overconfidence (plus concavity)
  - E.g. Alpert and Raiffa (1982)

# Overconfidence



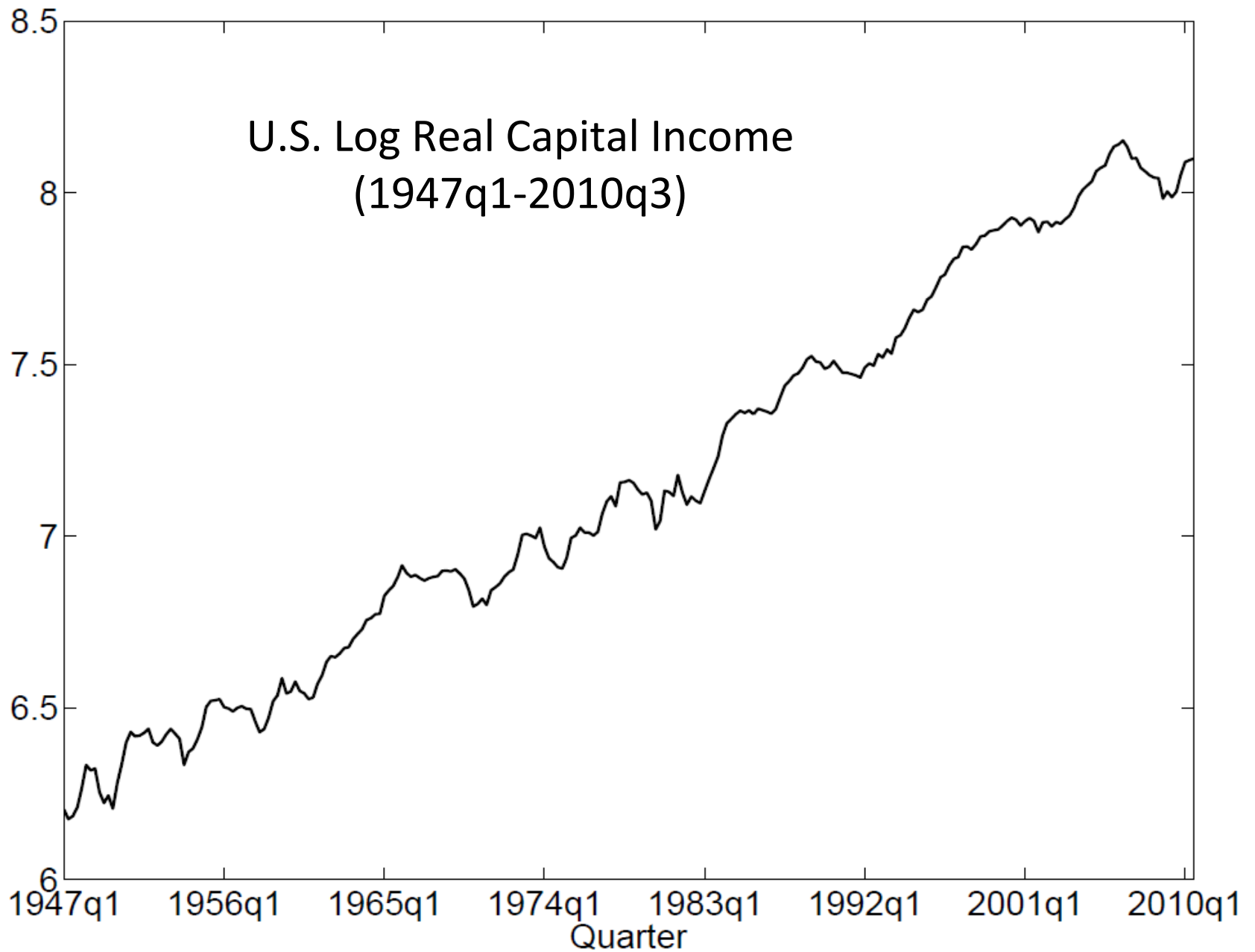
Price falls since payoff function is concave (financial frictions)



# Psychological foundations of bubbles

- Return chasing
- Herding (rational and irrational)
- Over-optimism
- Overconfidence (plus concavity)
- **Extrapolation vs. Mean reversion**
  - People perceive that events in the economy are more persistent than they actually are
  - In the short-run growth is positively correlated between periods.
  - But in the long-run, growth is negatively correlated





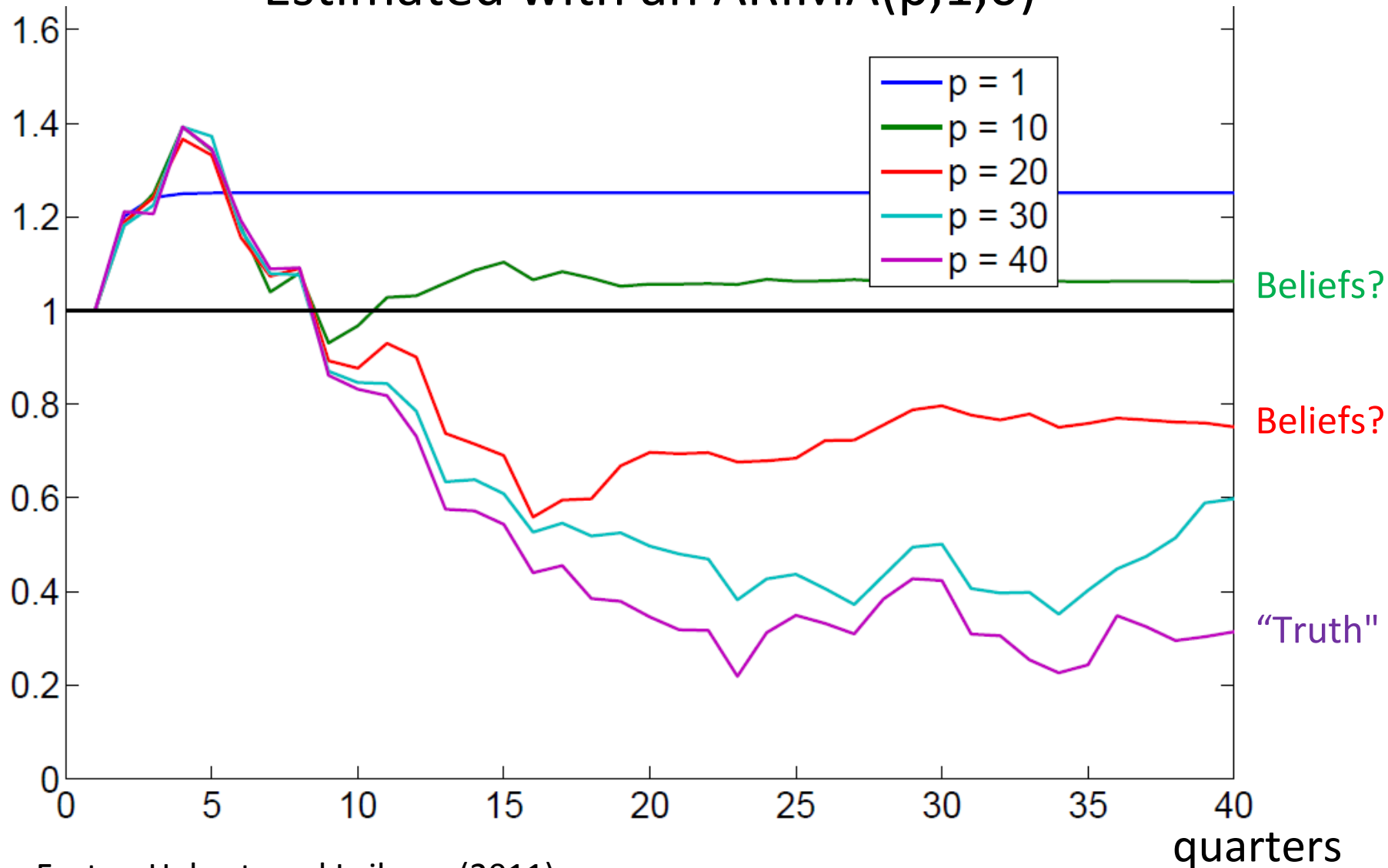
*U.S. NIPA (BEA): net operating surplus of private enterprises.*

Fit the real earnings data with an auto-regressive integrated moving average processes :

ARIMA( $p, 1, 0$ )

$$\Delta x_t = \mu + \alpha_1 \Delta x_{t-1} + \alpha_2 \Delta x_{t-2} + \dots + \alpha_P \Delta x_{t-P} + \varepsilon_t$$

# Impulse response functions for real capital income Estimated with an ARIMA(p,1,0)



# Mechanism

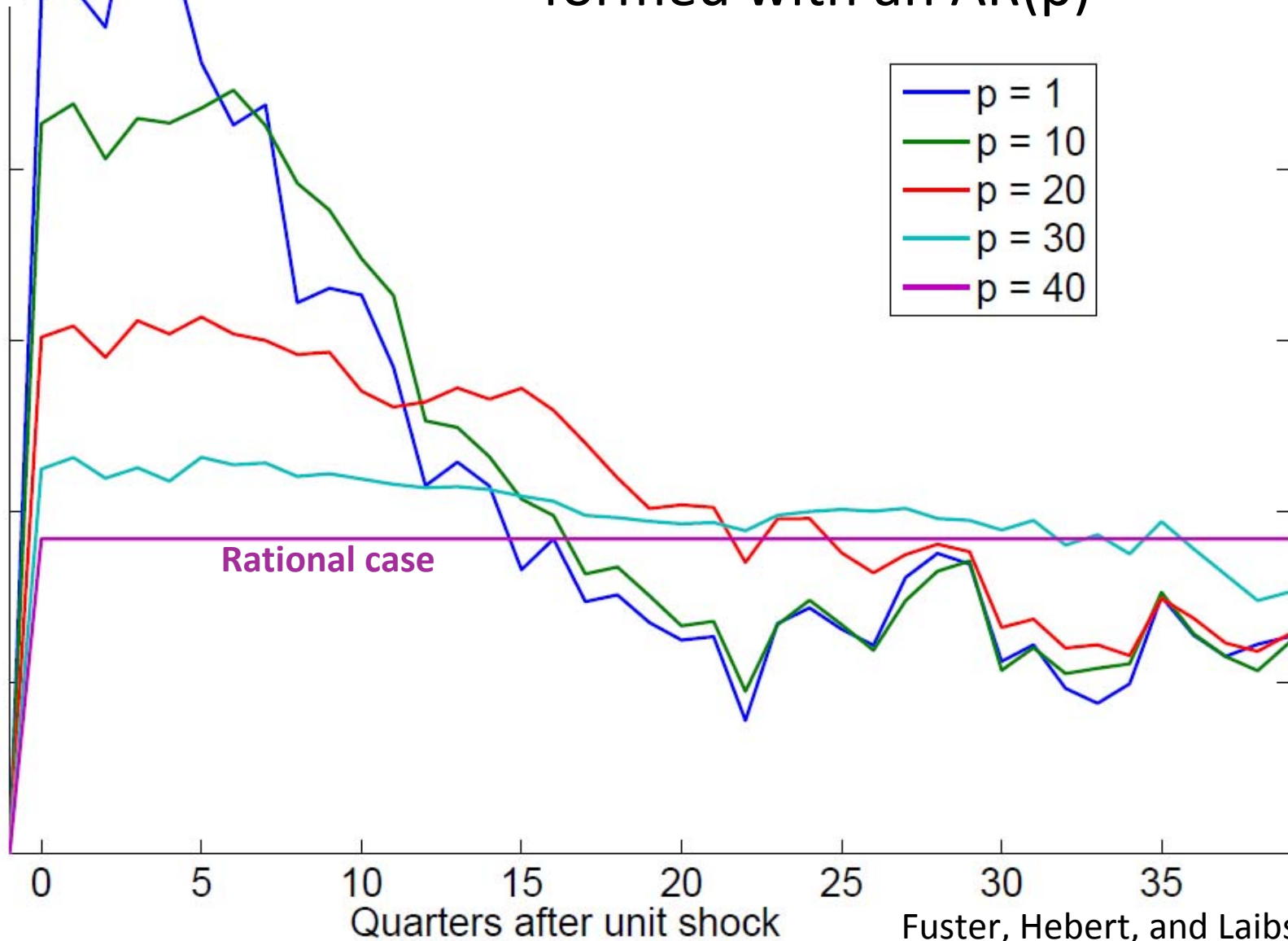
Fuster, Laibson, and Hebert (2011)

- Investors perceive that good events have momentum
- After good news, asset prices rise (too much)
- Economic fundamentals have more long-run mean reversion than investors realize

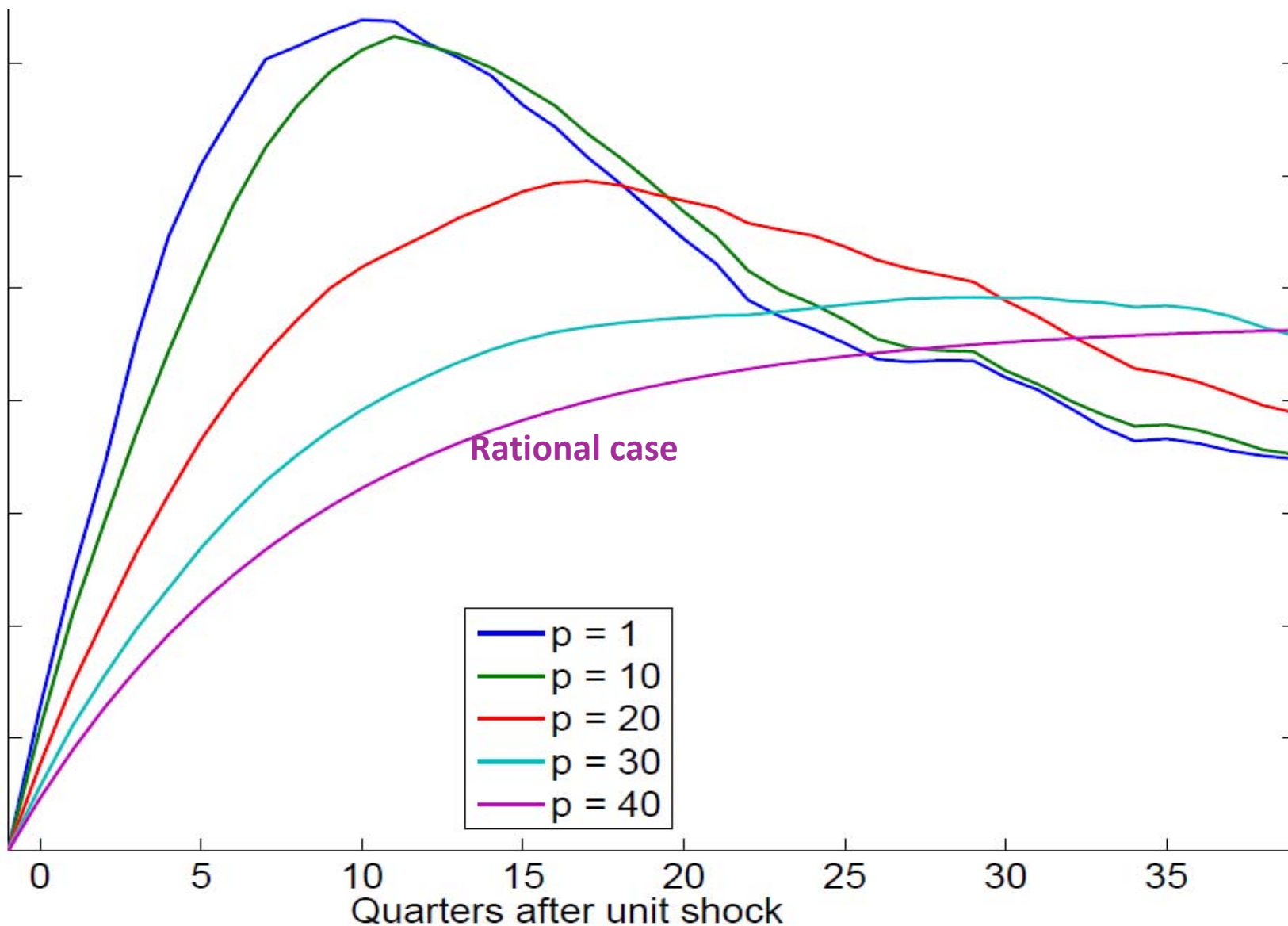
# Long-run cycle

1. Good news
2. Asset prices rise
3. Consumption slowly rises (habit formation)
4. Short run events confirm beliefs
5. Long run unanticipated reversals in fundamentals
6. Asset prices fall
7. Consumption falls

# IRF's for cumulative excess returns when beliefs about fundamentals are formed with an AR(p)



# IRF's for consumption when beliefs about fundamentals are formed with an AR(p)



# Supporting empirical evidence

Fuster, Hebert, and Laibson (2011)

- Current excess (equity) return negatively forecasts cumulative excess returns from year  $t+2$  to  $t+5$ 
  - Correlation is -0.22
- Campbell-Shiller P/E ratio negatively forecasts cumulative excess returns from year  $t+2$  to  $t+5$ 
  - Correlation is -0.38
- Current consumption growth negatively forecasts cumulative excess returns from year  $t+2$  to  $t+5$ 
  - Correlation is -0.30



# Evidence that economic agents do not fully anticipate the mean reversion

Fuster, Hebert, and Laibson (2011)

- P/E ratio negatively forecasts consumption growth between year  $t+2$  and  $t+6$ 
  - Correlation is  $-0.17$ .
- Current consumption growth negatively forecasts consumption growth between year  $t+2$  and  $t+6$ 
  - Correlation is  $-0.25$ .

# Outline

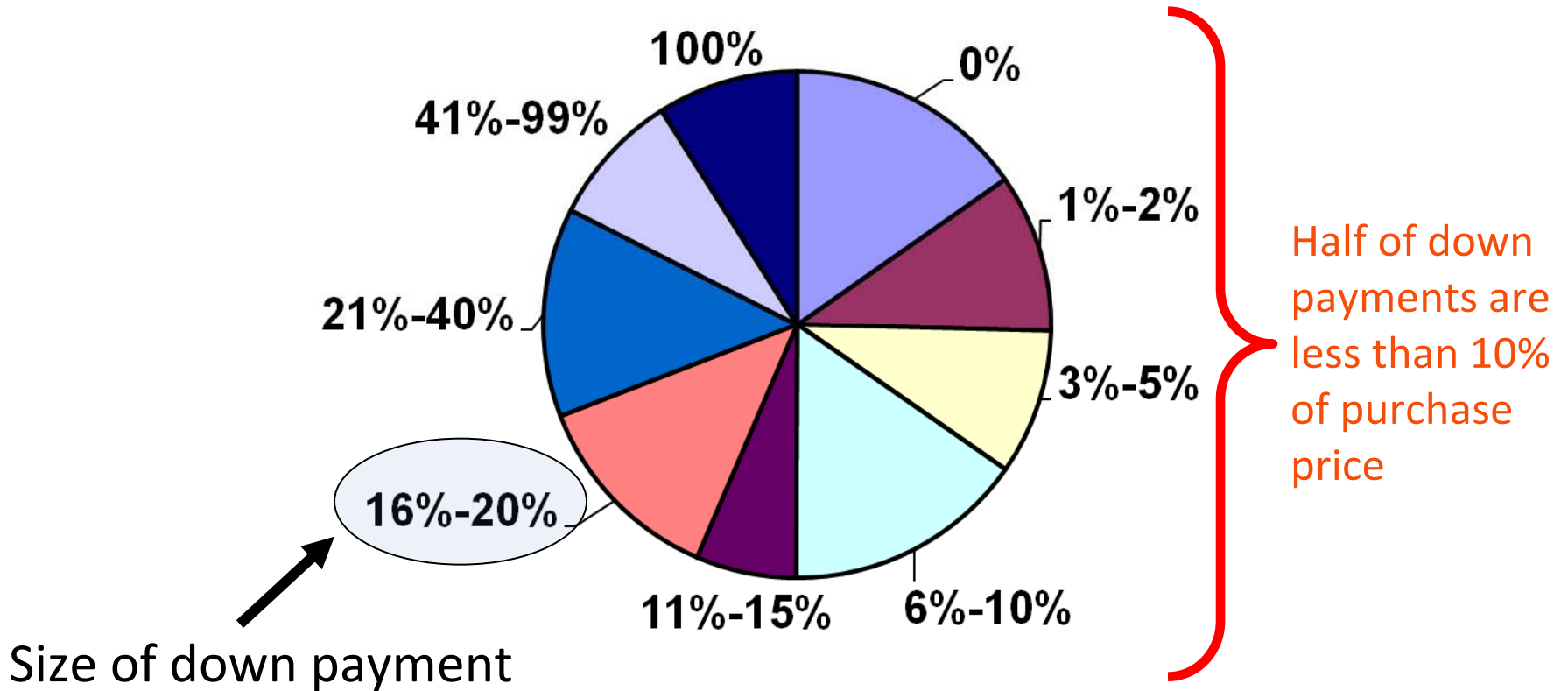
1. “Bubbles” in the last cycle
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# Leverage

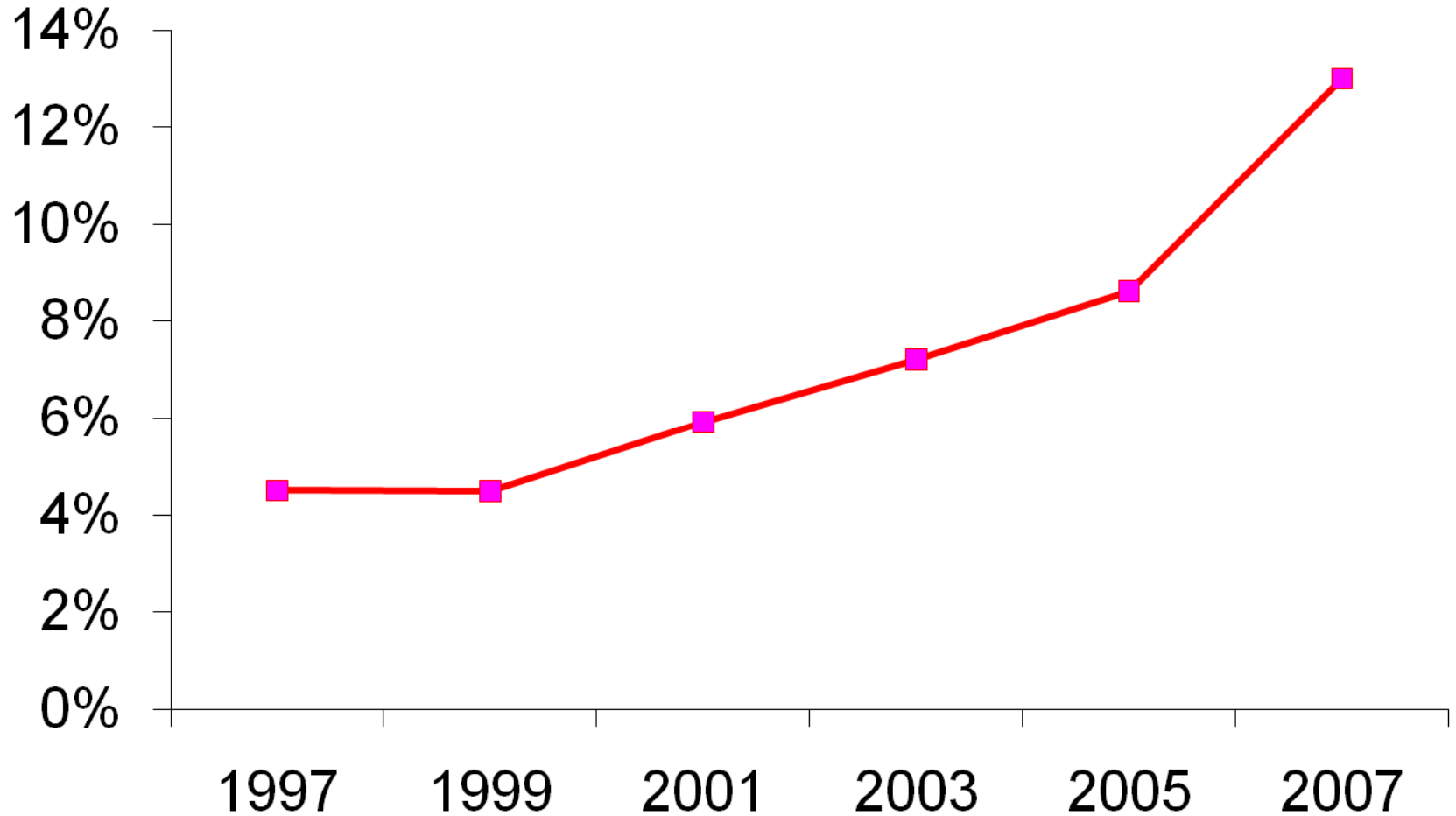
- Household leverage
- Leverage in financial sector

# Down payments

(New construction; 2004-2007)



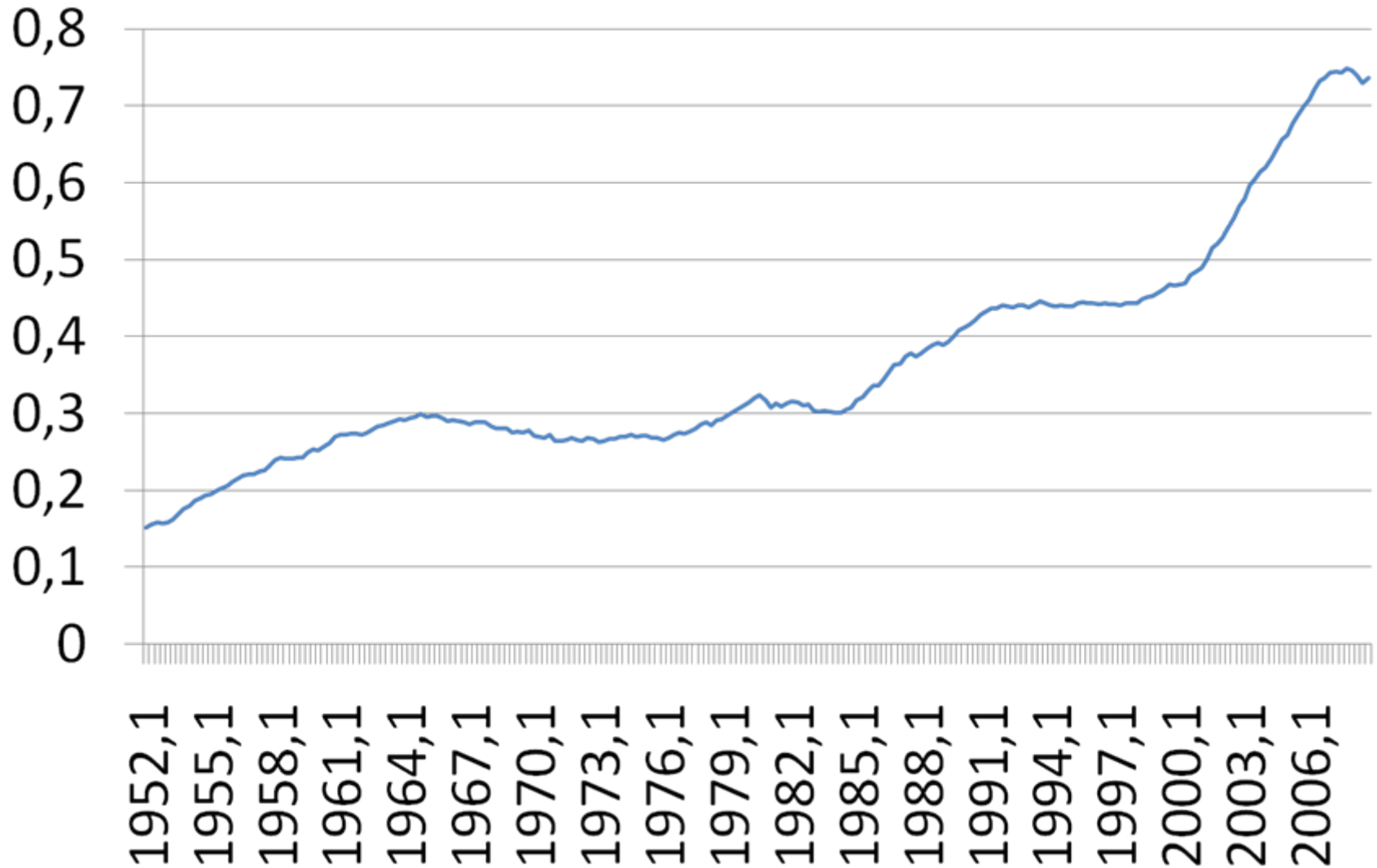
# Household leverage: Fraction of home buyers with no downpayment (New construction in last 4 years)



Source: American Housing Survey

# Household mortgages divided by GDP

1952 Q1 – 2008 Q4



# Financial sector leverage

Gross Leverage Ratios exceeded 30:1 at

- Merrill Lynch
- Lehman Brothers
- Morgan Stanley
- Bear Sterns

Only Goldman Sachs has stayed below this threshold with a maximum leverage ratio of 24.

# Lehman at the start of the financial crisis

<b>Assets (billions \$)</b>		<b>Liabilities and stockholders' equity (billions \$)</b>	
Cash	20	Short-term borrowing	546
Securities and other assets	671	Long-term debt	123
		Total Liabilities	669
		Stockholders' equity	22
<b>Total assets</b>	<b>691</b>	<b>Total Liabilities + Stockholders' equity</b>	<b>691</b>

Lehman Brothers, November 30, 2007



# Consequences for banking sector

- Bear Sterns sold in a fire sale to JP Morgan Chase (3/2008)
- **Lehman Brothers goes bankrupt (9/2008)**
- WaMu enters receivership and sold to JP Morgan Chase (9/2008)
- Wachovia sold in a fire sale to Wells Fargo (9/2008)
- Merrill Lynch sold in a fire sale to Bank of America (9/2008)
- Citigroup, Bank of America, and Morgan Stanley on the brink of failure/bankruptcy (12/2008)
- All together about 400 US banks fail (2007-2012)

# Why so much leverage?

- Why were households so leveraged?
  - Belief that housing would appreciate
  - Natural channel to fund consumption boom
- Why were banks so leveraged?
  - Belief that tranching asset-backed securities were really AAA (e.g., CDO's)
  - Implicit belief that national housing prices would appreciate (or at least stabilize)

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# Consumption Cycle

A simple model of consumption.

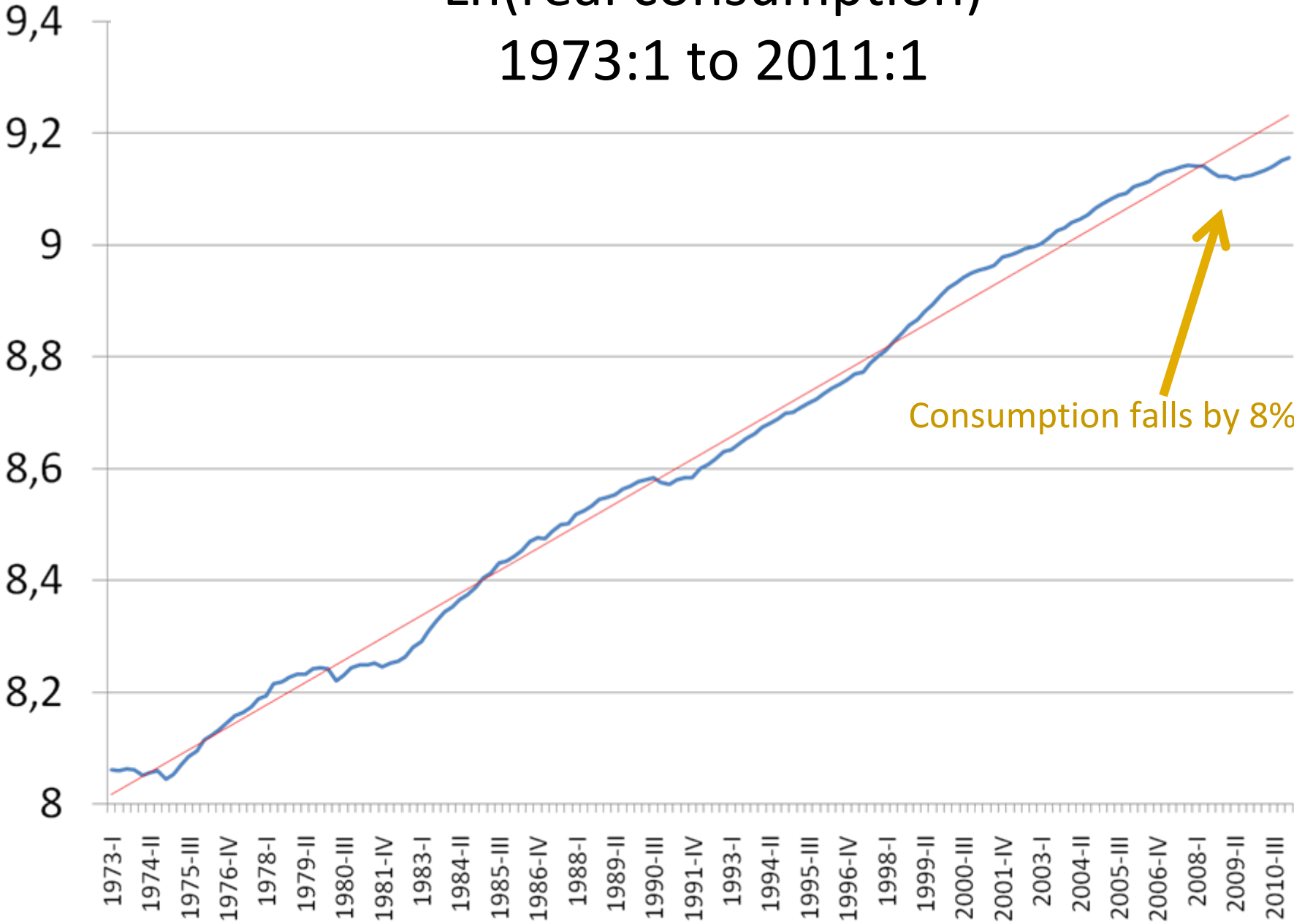
Consumption equals annuity value of wealth.

$$C = 0.05 * \text{wealth}$$

# Consequences for consumption

- Bubble reaches a peak of about \$15 trillion
- With an MPC of 0.05, consumption should fall by \$750 billion when bubble bursts
- Which is 7.5% of consumption.

# Ln(real consumption) 1973:1 to 2011:1

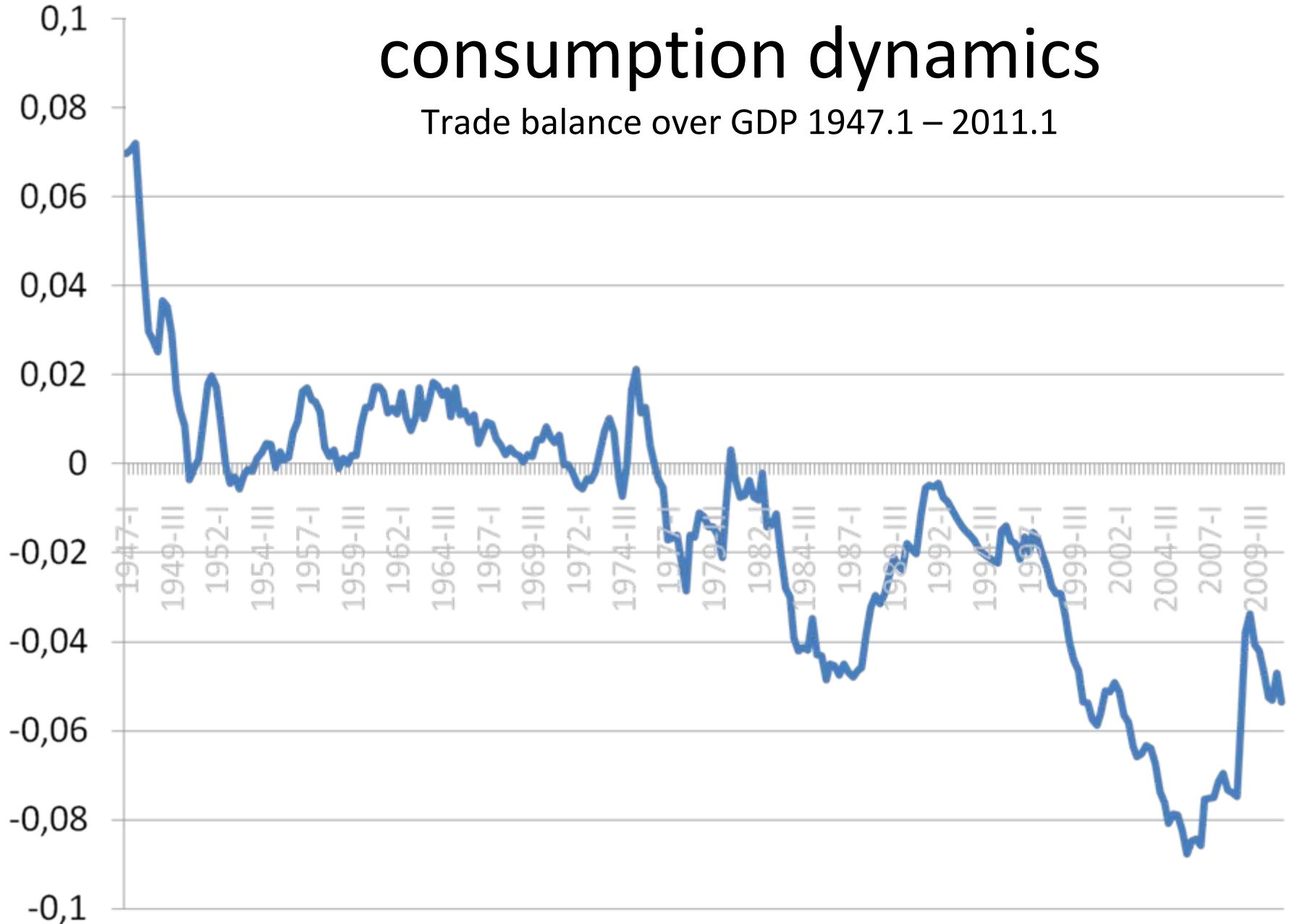


# Welfare costs

- Bubbles have very large welfare costs (even if they generate only small fluctuations in aggregate consumption) because exposure to bubble assets is highly heterogeneous
- Chauvin, Laibson, Mollerstrom (forthcoming)

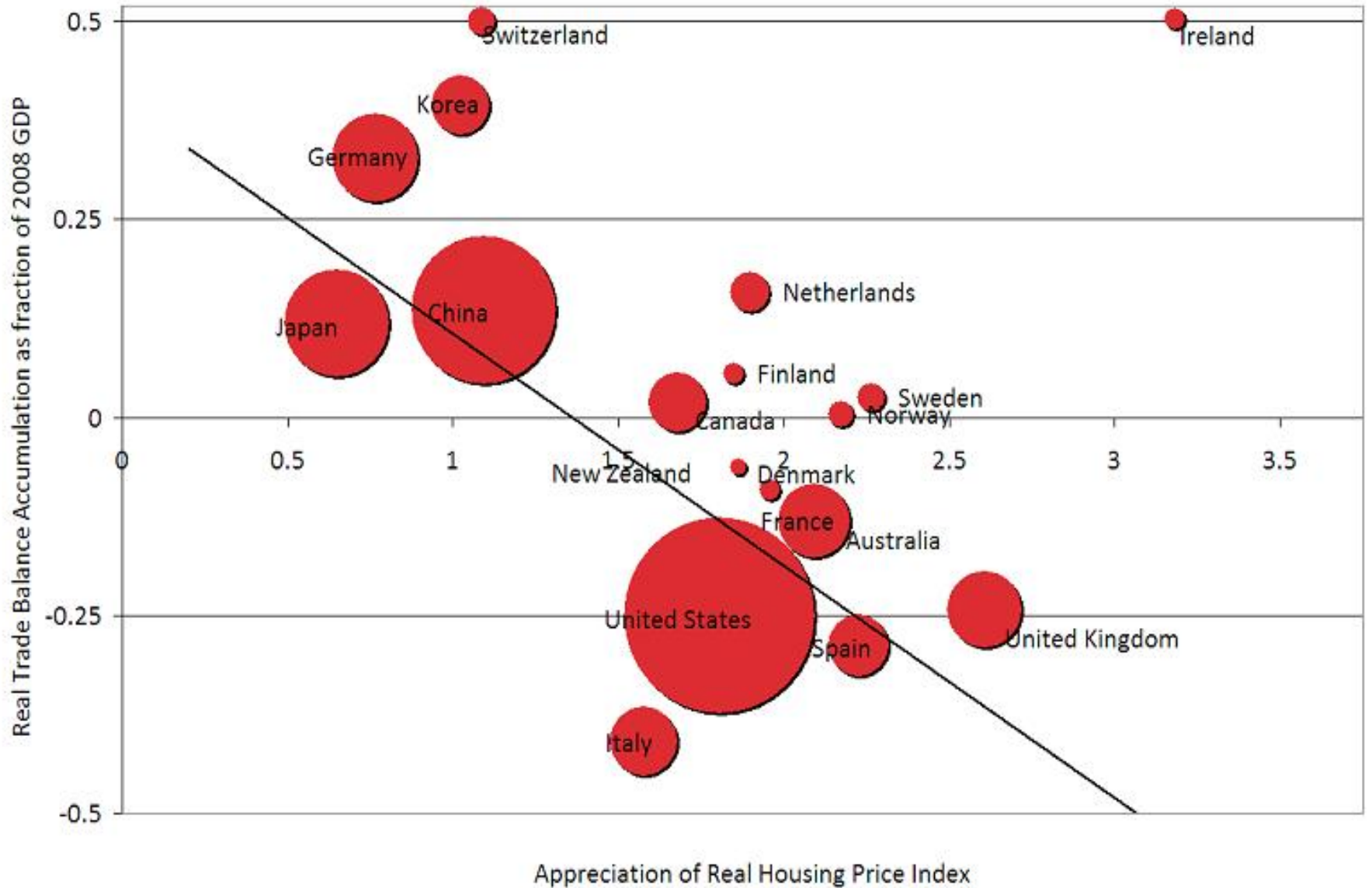
# US trade deficit absorbs consumption dynamics

Trade balance over GDP 1947.1 – 2011.1





# Housing prices and trade deficits

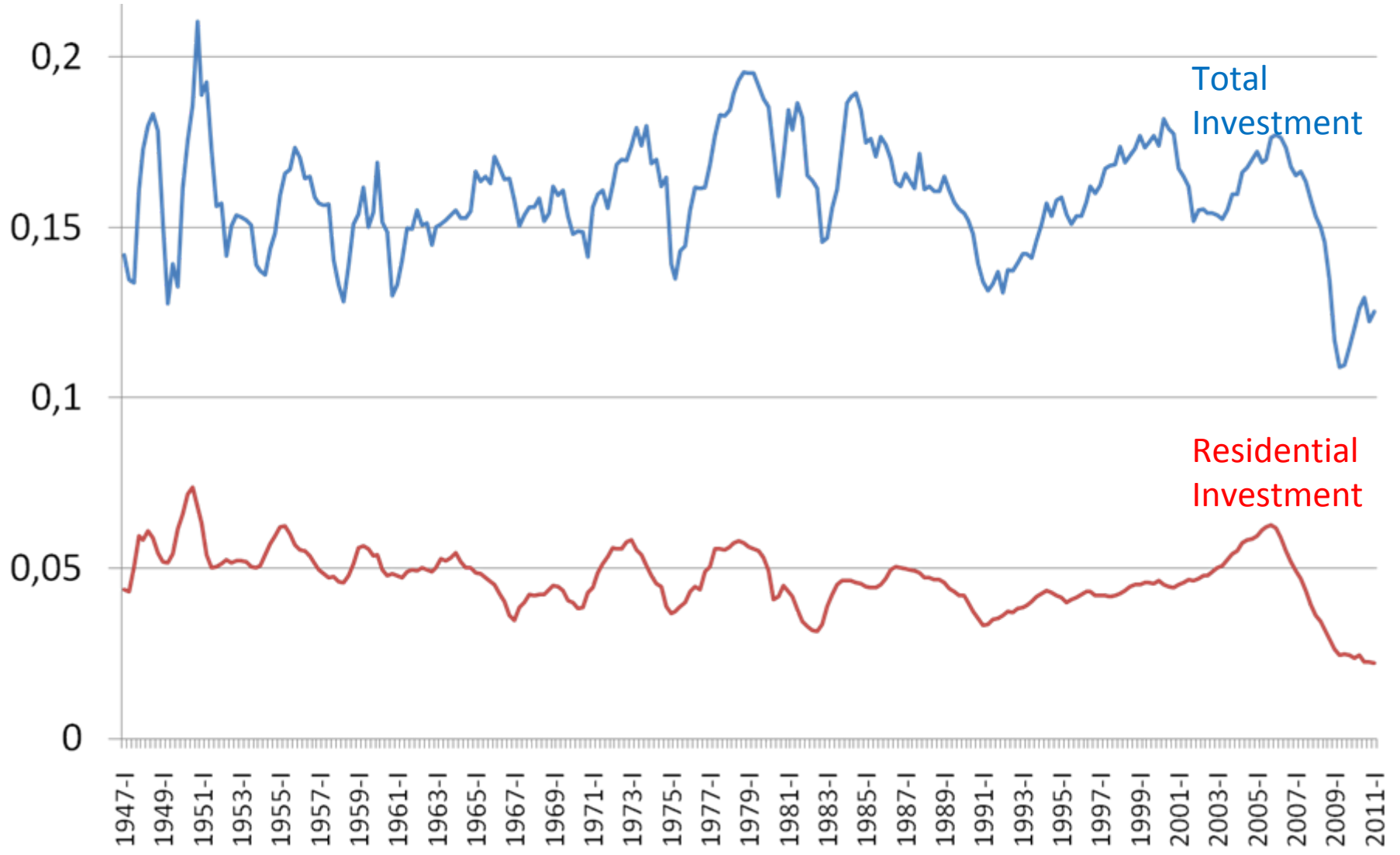


# Investment dynamics

- Rising housing prices drove a boom in residential housing construction

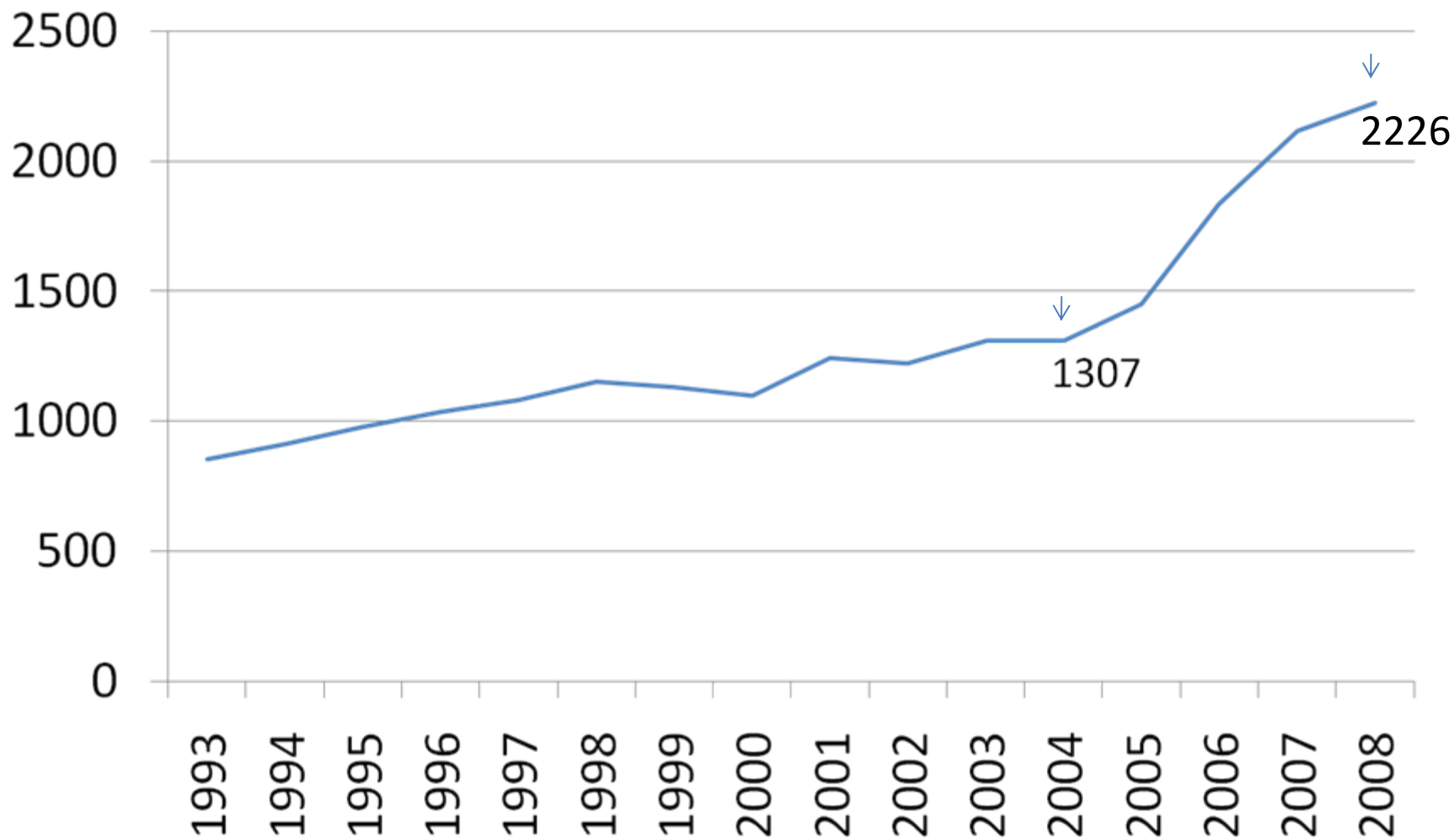
# Investment ratios

Investment divided by GDP 1947:1 to 2011:1



# Homes for Sale

(thousands of units)



# Alternative explanation: Bernanke's (2005) global savings glut?

- A large increase in desired savings in the developing world was the cause of the trade imbalances and the consumption boom.
- Three critiques (Laibson and Mollerstrom 2010)

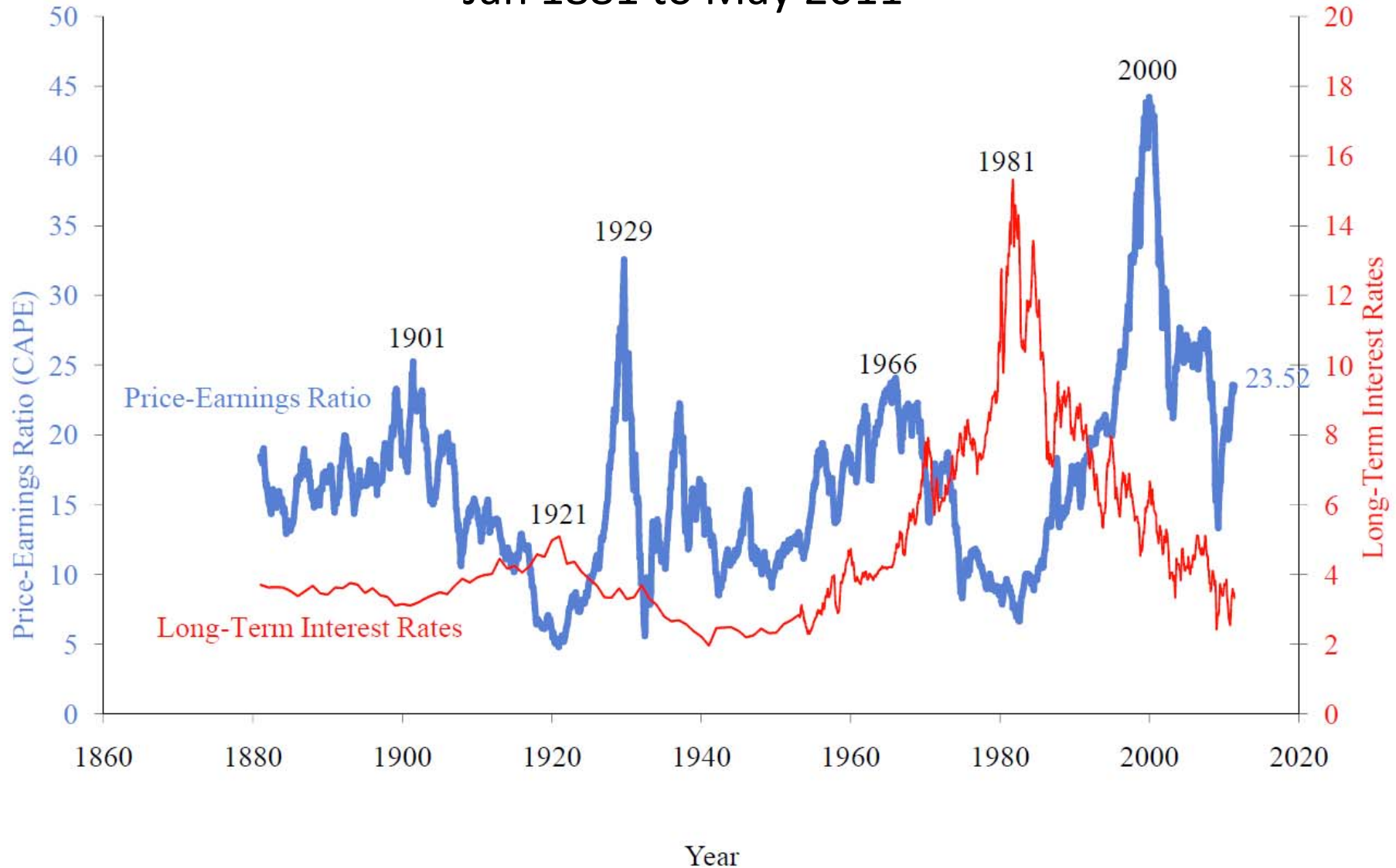
1. There was no worldwide boom in savings.
2. A worldwide savings boom (if it had occurred) should have produced a general investment boom in the US. You don't borrow a trillion dollars without investing most of it.
3. Trade imbalances seem to be closely linked to housing bubbles, which would be predicted by a bubble model but not by a savings glut model. Bubbles drove trade imbalances.

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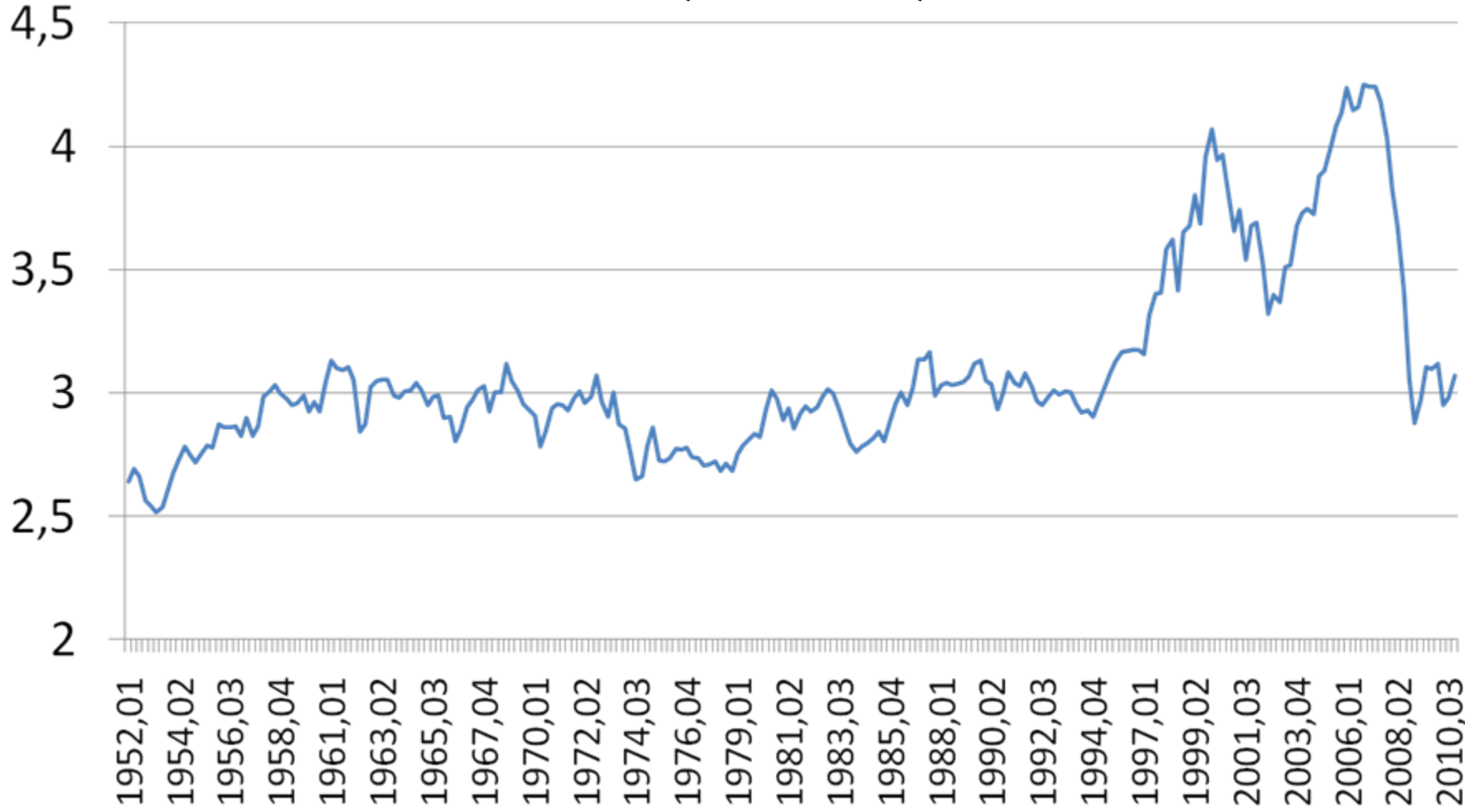
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# Household net worth (- federal gov't liabilities) divided by GDP 1952 Q1 – 2010 Q4



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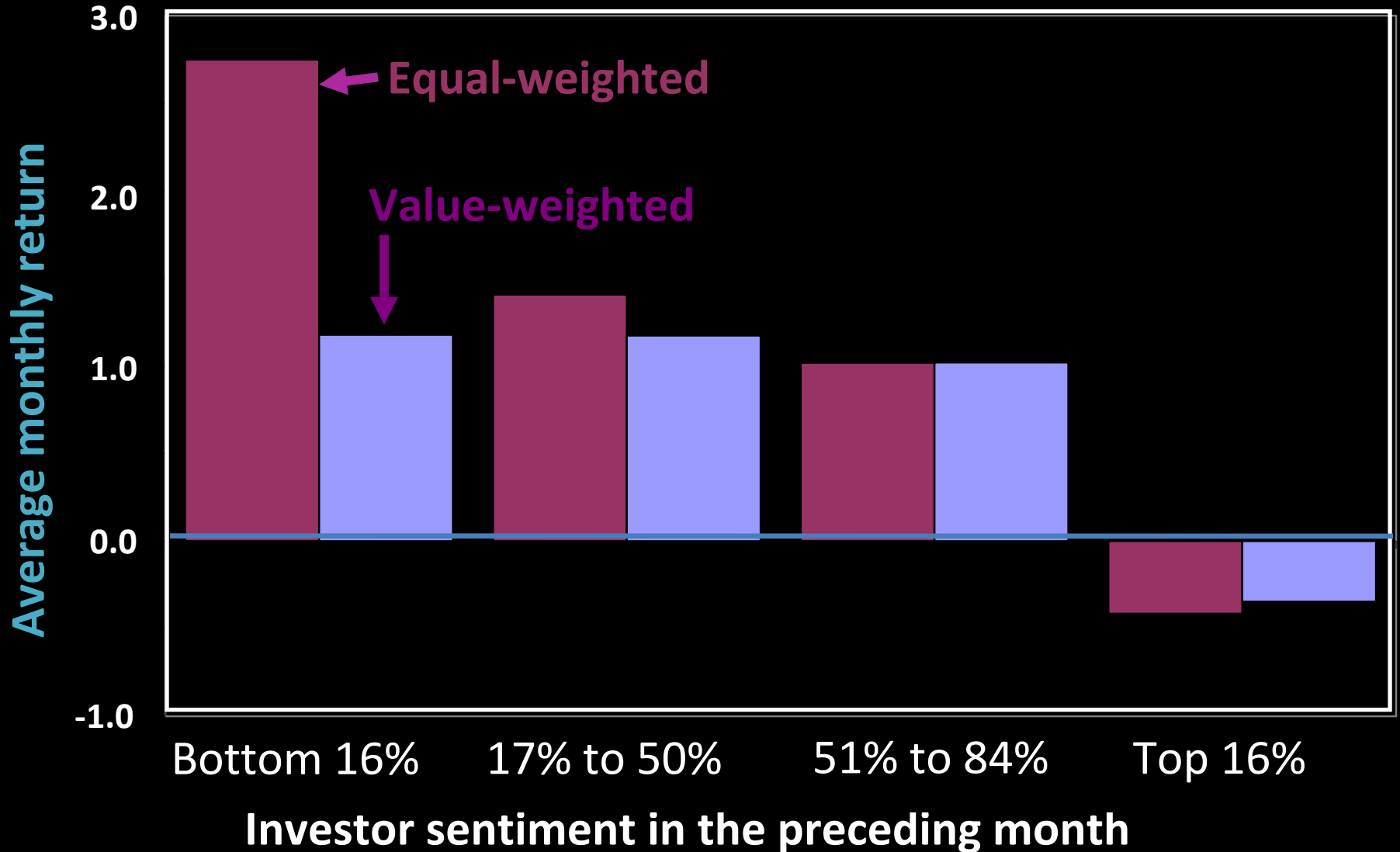
# Forecasting the future: The role of investor sentiment

Baker and Wurgler (2007)

Form an index using:

- Closed End Fund Discount (CEFD)
- Detrended Log Turnover (TURN)
- Number of IPO's (NIPO)
- First Day Return on IPO's (RIPO)
- Dividend Premium (PDND)
- Equity Share in New Issues (S)

# Last month's sentiment predicts this month's market returns



# Special role of leverage

When unlevered assets are over-valued, a bursting bubble has modest consequences.

- 2001 recession

When highly levered assets are over-valued, a bursting bubble has drastic consequences

- 2007-2009 recession
- These are the assets that you want to hedge

# Research frontiers

- Use models to formalize bubble dynamics. E.g.,
  - Burnside, Eichenbaum, and Rebelo (2011)
  - Fuster, Laibson, and Mendel (2010)
  - Fuster, Hebert, and Laibson (2011)
- Study how people form forecasts
- Directly gather beliefs in surveys. E.g.,
  - Piazzesi and Schneider (2009, 2011)
- Develop predictive tools that can probabilistically distinguish bubbles from fundamental-justified price movements
- Develop regulations that safeguard the financial system from rare collapsing bubbles (including cost-benefit analysis)