Behavioural Economics and Housing Decisions

Lecture Six: Market Sentiment and Housing Bubbles

By Helen Bao

Outline

- Research questions
- Housing bubbles
- Herd behaviours and market sentiment
- Data and methods
- Findings and discussions
- Future research directions

Research Questions

- Can market sentiment help predict market turning points?
- Which type of sentiment index (survey- or search-volume-based) is more reliable

- Related questions:
  - Why is it important to understand cycles and bubbles in housing markets?
  - What is herding?
  - How to measure market sentiment?

Housing bubbles

- A term that has been widely used but rarely clearly defined or measured.
- It refers to a situation in which excessive public expectations of future price increases cause prices to be temporarily elevated. (Case, K. E. and R. J. Shiller. 2003. “Is there a bubble in the housing market?” *Brookings Papers on Economic Activity* 2: 299-362.)
- Locally originated and globally distributed: Martin, R. (2011). "The local geographies of the financial crisis: from the housing bubble to economic recession and beyond." *Journal of Economic Geography* 11(4): 587-618.

Housing bubbles

- Rational bubbles:
  - Intrinsic rational bubbles:
    - Caused by intrinsic fundamentals such as income or housing stock
    - Due to a nonlinear relationship between house prices and fundamental factors
    - Usually due to limited chance to arbitrage in the housing market
    - Self-correcting, eventually will return to fundamental values, and won't burst
    - Nothing 'behavioural'
    - Froot, K. A. and M. Obstfeld (1991). "Intrinsic Bubbles: The Case of Stock Prices." *American Economic Review* 81(5): 1189-1214.

Housing bubbles

- Glaeser, E. L., et al. (2008). "Housing supply and housing bubbles." *Journal of Urban Economics* 64(2): 198-217.
- Bubbles should be more common and longer in places where supply is inelastic.

Table 6
Distribution of real price growth in the 1996–2006 boom by degree of supply constraint

	$n = 26$ Most inelastic (%)	$n = 25$ Middle third (%)	$n = 28$ Most elastic (%)
Mean	93.9	53.8	28.2
Std. dev.	50.4	39.7	26.3
10th	13.5	15.3	6.2
25th	49.4	24.7	12.6
50th	98.6	36.2	18.4
75th	140.2	86.6	30.1
90th	146.5	115.1	67.0

Housing bubbles

- Rational bubbles:
  - Explosive rational bubbles:
    - Caused by factors other than fundamentals of housing price, such as high leverage
    - Example: LTV = 97%, interest rate = 2%, housing market return = 12%, return to own equity (i.e., 3% of the house price) is

$$\frac{97\%\times(12\% - 2\%) + 3\%\times12\%}{3\%} = 335\%$$

    - If market collapses, losses could be capped at 100% (i.e., losing the 3% own equity only)
    - Any rational person would jump on that opportunity
    - Primarily driven by institutional investors
    - Explosive bubbles are the primary reasons behind many of the financial crises in history. Without effective interventions by regulators and the government, these bubbles almost always burst.

Housing bubbles

- Irrational or speculative bubbles
  - Caused by investor sentiment
  - “Natural consequence of the principles of social psychology coupled with imperfect news media and information channels”, Shiller, R. J. (2014). "Speculative Asset Prices." *American Economic Review* 104(6): 1486-1517.
  - Primarily driven by individual investors
  - Stock market is dominated by institutional investors (e.g., pension funds, insurance companies, endowment funds, hedge funds, banks).
  - Housing market has a lot more individual investors (e.g., homeowners and buy-to-let investors) – a fertile ground for speculative bubbles!

Housing bubbles

- Brzezicka, J. (2021). "Towards a Typology of Housing Price Bubbles: A Literature Review." *Housing Theory & Society* 38(3): 320-342.

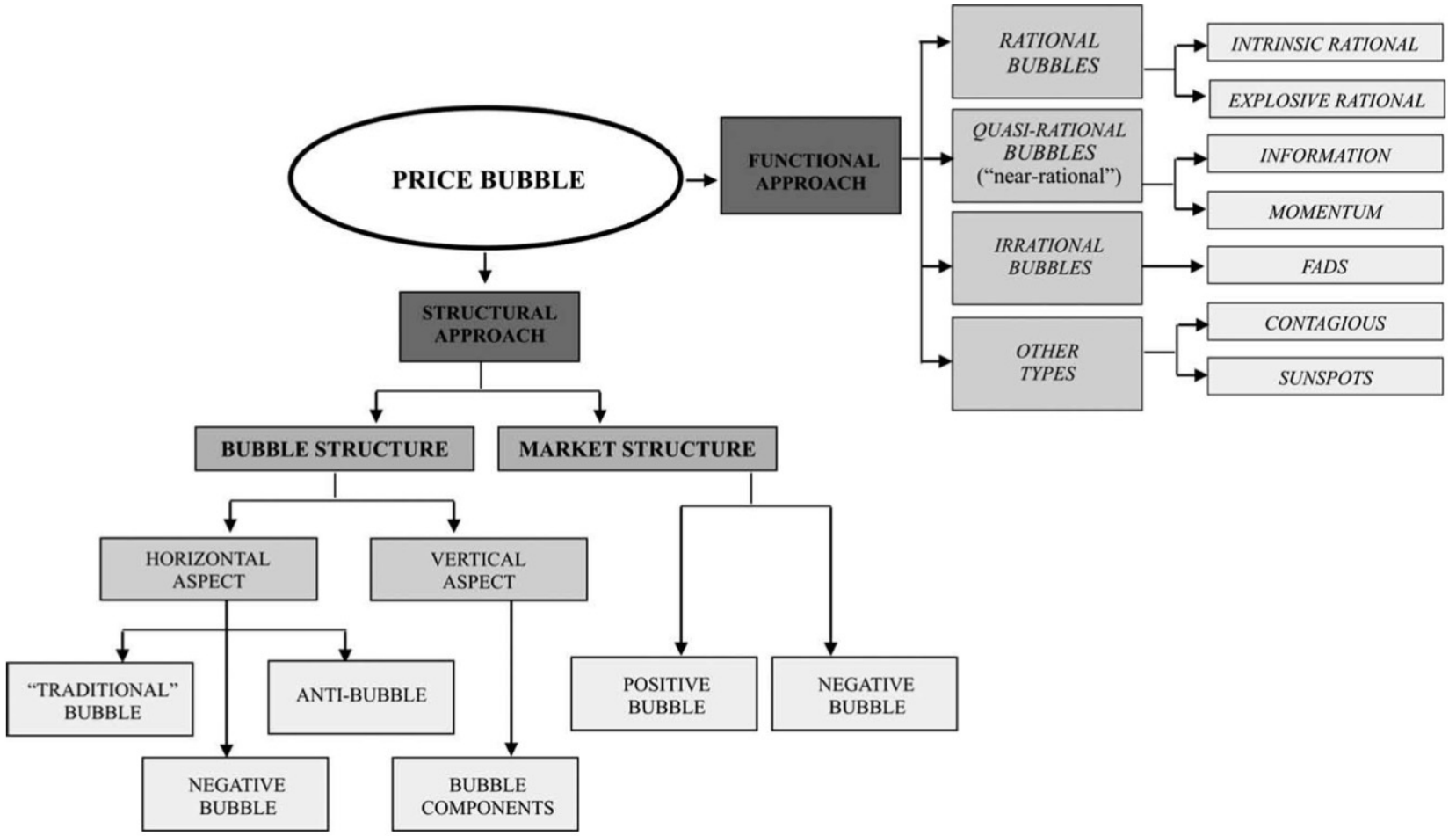


Figure 4. Typology of price bubbles.

Housing bubbles

- If defining bubbles is a tricky business, identifying them is even more challenging
- A ‘Hall of Fame’ or a ‘Hall of Shame’?
- Smith, M. H. and G. Smith (2006). "Bubble, bubble, where's the housing bubble?" *Brookings Papers on Economic Activity*(1): 1-67.
  - Estimated “fundamental values” : projected net rental savings discounted by a required rate of return
  - “there was no bubble in the prices of single-family homes in 2005” (page 47).
  - “the bubble is not, in fact, a bubble in most of these areas: … buying a home at current market prices still appears to be an attractive long-term investment.” (page 2).

Housing bubbles

- Shiller, R. J. (2015). *Irrational exuberance*. 3rd edition. New York, Currency/Doubleday.

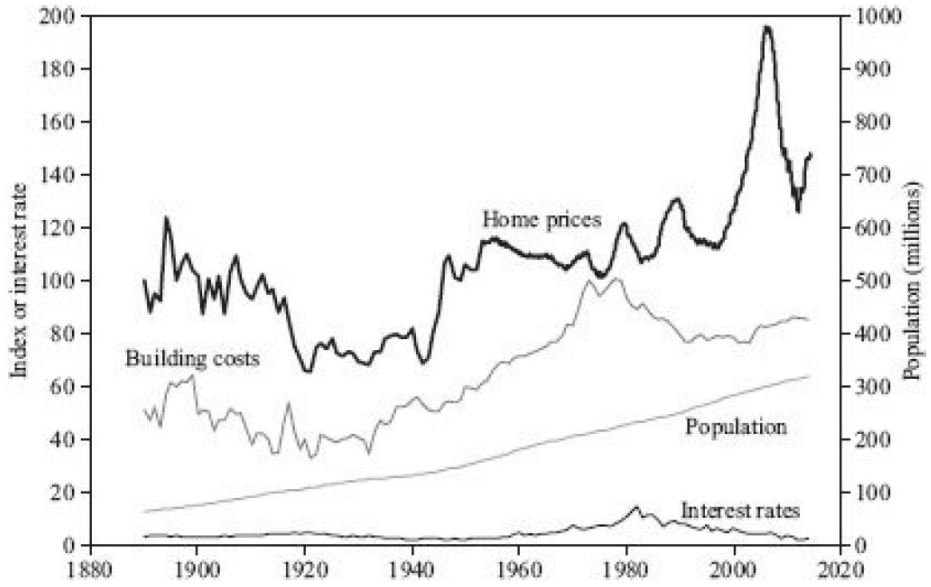


Figure 3.1

U.S. Home Prices, Building Costs, Population, and Interest Rates, 1890–2014

- "There is no hope of explaining home prices in the United States solely in terms of building costs, population, or interest rates"
- "The changing behaviour of home prices is a sign of changing public impressions of the value of property, a heightening of attention to speculative price movements"

Real S&P Composite Stock Price Index Real S&P Composite earnings

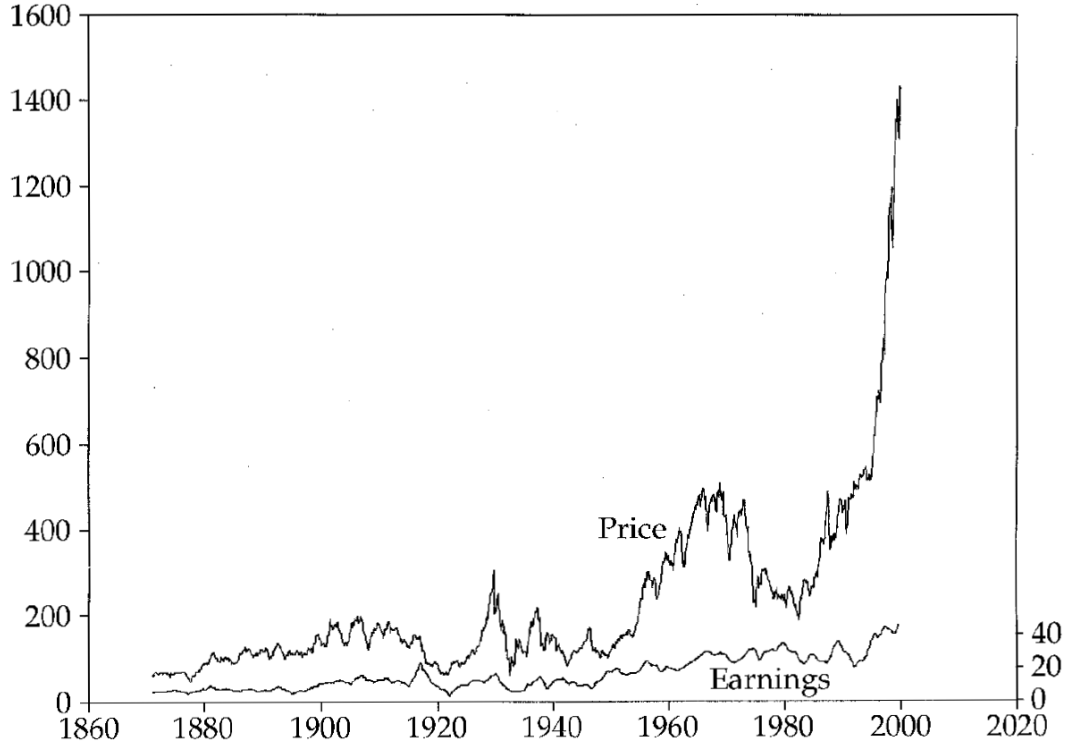


Figure 1.1

Stock Prices and Earnings, 1871–2000

Real (inflation-corrected) S&P Composite Stock Price Index, monthly, January 1871 through January 2000 (upper series), and real S&P Composite earnings (lower series), January 1871 to September 1999. *Source:* Author's calculations using data from S&P Statistical Service; U.S. Bureau of Labor Statistics; Cowles and associates, *Common Stock Indexes;* and Warren and Pearson, *Gold and Prices.* See also note 2.

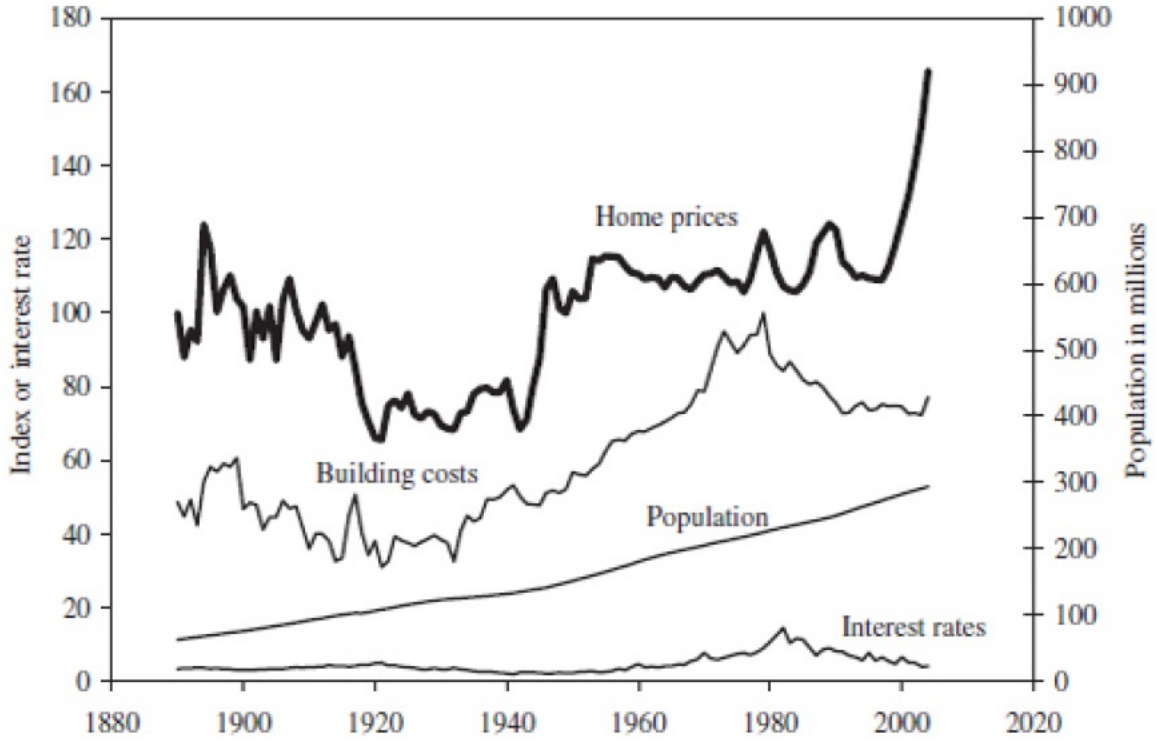


Figure 2.1

U.S. Home Prices, Building Costs, Population, and Interest Rates, 1890-2004

Heavy solid line (left scale): real (inflation-corrected) home price index, 1890 = 100, for the United States, constructed by the author from various existing indexes and raw data on home prices;[3] thin line (left scale): real building cost index, 1979 = 100, constructed by the author from two published construction cost indexes;[4] thin line (right scale): U.S. population in millions, from the U.S. Census; lowest line, thin line (left scale): long-term interest rate constructed by the author from two sources.[5]

Herding

- Herding: everyone doing what everyone else is doing, even when their private information suggests doing something quite different
  - Banerjee, A. V. (1992). "A Simple Model of Herd Behavior." *Quarterly Journal of Economics* 107(3): 797-817.
  - Example: choosing between two restaurants A and B
    - 100 customers to make a choice
    - Public information (e.g., restaurant rating from a magazine): A has a 51% chance of being better, and B has a 49% of chance of being better
    - Private information (e.g., advice from friends): Customer 1 received a signal that 'A is better', and all other customers received a signal that 'B is better'
    - Private information are of equal quality
    - Customer 1 arrived first, followed by the other 99 customers, one at a time

Herding

- No herding

Restaurant A	Restaurant B
Customer 1	Customer 2 Customer 3 . . . Customer 100

Herding

- With herding

Restaurant A	Restaurant B
Customer 1 Customer 2 (*private information canceled out, use public information*) Customer 3 . . . Customer 100	

Herding

- Banerjee, A. V. (1992). "A Simple Model of Herd Behavior." *Quarterly Journal of Economics* 107(3): 797-817.
  - Customer 2's choice provides no new information to the next person in line: the third person's situation is thus exactly the same as that of the second person, and she should make the same choice and so on.
  - Everyone ends up at restaurant A even if, given the aggregate private information, it is practically certain that B is better.
  - The very act of trying to use the information contained in the decisions made by others makes each person's decision less responsive to her own information and hence less informative to others

Herding

- Informational cascade
  - Bikhchandani, S., et al. (1998). "Learning from the behavior of others: Conformity, fads, and informational cascades." *Journal of Economic Perspectives* 12(3): 151-170.
  - Information cascade happens when optimal action does not depend on private information, and no further information accumulate
  - Assumptions:
    - All previous actions can be observed (not just the immediate predecessor)
    - Public information pool is updated by adding private information in each step
    - Signal is inferred from actions taken by all predecessors
    - When private information is absent or canceled out, flip a coin (instead of following the predecessor)

Informational cascade

- If signal = A then adopt, if signal = B reject

Decision maker	Private signal	Action	Public signal
Aaron	A	adopt	A
Barbara	B	Flip a coin and adopt	AA
Clarence	B	adopt	AAA
Donna	B	adopt	AAAA
…			

- An information cascade starts from Clarence when public information stops accumulating, or private information stops entering the public information pool

Herding

- Bikhchandani, S., et al. (1998). "Learning from the behavior of others: Conformity, fads, and informational cascades." *Journal of Economic Perspectives* 12(3): 151-170.
  - The ”Fashion Leaders” effect
  - If an expert (i.e., a fashion leader) is the first-decision maker, a cascade forms instantly
  - People imitate the actions of those who appear to have expertise
  - Ways to protect us: in U.S. Navy courts-martial, judges vote in inverse order of rank. In simultaneous balloting, voters decide without knowing how others have voted.

Herding

- The wisdom of crowds
  - Surowiecki, J. (2004). *The wisdom of crowds : why the many are smarter than the few and how collective wisdom shapes business, economies, societies, and nations*. New York, Doubleday.
  - Galton's Weight-judging competition in a country fair in Plymouth, UK
  - 787 people participated, many are non-experts
  - The average is 1197 pounds
  - The Ox was 1198 pounds after being slaughtered and dressed
  - The collective wisdom of the Plymouth crowd is essentially perfect

Herding

- The wisdom of crowds
  - Surowiecki, J. (2004). *The wisdom of crowds : why the many are smarter than the few and how collective wisdom shapes business, economies, societies, and nations*. New York, Doubleday.
  - "Under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them"
  - "diversity and independence are important because the best collective decisions are the product of disagreement and contest, not consensus or compromise"
  - The value of aggregating private information!

Herding

- The wisdom of crowds
  - Golub, B. and M. O. Jackson (2010). "Naive Learning in Social Networks and the Wisdom of Crowds." *American Economic Journal-Microeconomics* 2(1): 112-149.
  - A theoretical model of the wisdom of crowds
  - Assumption: people receive independent noisy signals about the true value of a variable and then communicate in a network. They naively update beliefs by repeatedly taking weighted averages of neighbors' opinions
  - Conclusions:
    1. A society is wise if and only if the influence of the most influential agent (e.g., experts or fashion leaders) is vanishing as the society grow
    2. Societies with balance (e.g., no experts or fashion leaders) and dispersion (e.g., all members pay attention to the rest of the network) in their communication structures will have accurate learning

Herding

- Herding in housing markets
  - A specialised market, and hence experts are important (and there are so many of them!)
  - Inattention is widespread: complex marketplace and products, stressful decision, information overload, …
  - Products are very social, and hence independent use of private information is difficult
  - As a result, housing market is probably not a good place to find the wisdom of crowds!

Measuring Market Sentiment

- Direct measurement through surveys
  - Confidence indices by the Organisation for Economic Co-operation and Development (OECD)
  - Economic Sentiment Index (ESI) by Eurostat
  - University of Michigan Consumer Sentiment Index (monthly): a broad measurement (50+ questions about business climate, personal finance, and spending); telephonic household interviews
  - American Association of Individual Investors (AAII) survey; based on weekly online survey among members; "Bull-Bear Spread Trend".
  - The U.S. Housing Confidence Survey: Based on an annual household survey by Case and Shiller; 2014 – 2019.

Measuring Market Sentiment

- Direct measurement through surveys
- Case, K. E., et al. (2012). "What Have They Been Thinking? Homebuyer Behavior in Hot and Cold Markets." *Brookings Papers on Economic Activity*: 265-315.
  - Homebuyers' expectations and reasons for buying
  - Stratified sampling: 500 random samples in each of the four cities selected, i.e., two hot (Los Angeles and San Francisco), one cold (Boston) and one stable market (Milwaukee)
  - The questionnaires were sent with a letter hand signed by both Case and Shiller, a postcard follow-up to non-respondents, a second mailing, and when response rates dropped off after 2005, they included a letter signed by a colleague in each state.

Measuring Market Sentiment

- Case, K. E., et al. (2012). "What Have They Been Thinking? Homebuyer Behavior in Hot and Cold Markets." *Brookings Papers on Economic Activity*: 265-315.

Table 1. Response Rates in the Homebuyers Survey, 1988–2012

Year	*Surveys returned*	*Response rate (percent)*
1988	886	43.6
2003	705	35.3
2004	456	22.8
2005	441	22.1
2006	271	13.6
2007	300	15.0
2008	545	27.3
2009	370	18.5
2010	375	18.8
2011	319	16.0
2012	328	16.4
All years	4,996	22.7

Table 3. Short- and Long-Term Home Price Expectations, by Survey Location and Year, 2003–12

Mean response (percent)[a]

Survey year	Survey location: Alameda County	Middlesex County	Milwaukee County	Orange County
	"How much of a change do you expect there to be in the value of your home over the next 12 months?"[b]			
2003	7.6	4.4	5.5	9.4
2004	9.3	7.6	6.4	13.1
2005	9.6	6.3	6.6	8.7
2006	7.4	1.9	5.9	6.0
2007	4.9	2.9	6.1	–0.1
2008	–1.6	–0.7	2.4	–2.6
2009	2.4	2.0	1.5	0.7
2010	4.4	2.2	3.7	3.8
2011	2.3	2.3	1.7	0.3
2012	4.4	2.3	2.3	3.6
	"On average over the next ten years how much do you expect the value of your property to change each year?"[c]			
2003	12.3	8.9	7.1	11.5
2004	14.1	10.6	10.4	17.4
2005	11.5	8.3	11.9	15.2
2006	9.4	7.5	9.9	9.5
2007	10.7	5.3	8.1	12.2
2008	7.9	6.4	7.2	9.4
2009	8.5	6.2	8.2	6.9
2010	9.8	5.0	7.3	5.7
2011	7.6	4.1	4.7	7.1
2012	5.4	3.1	3.1	5.0

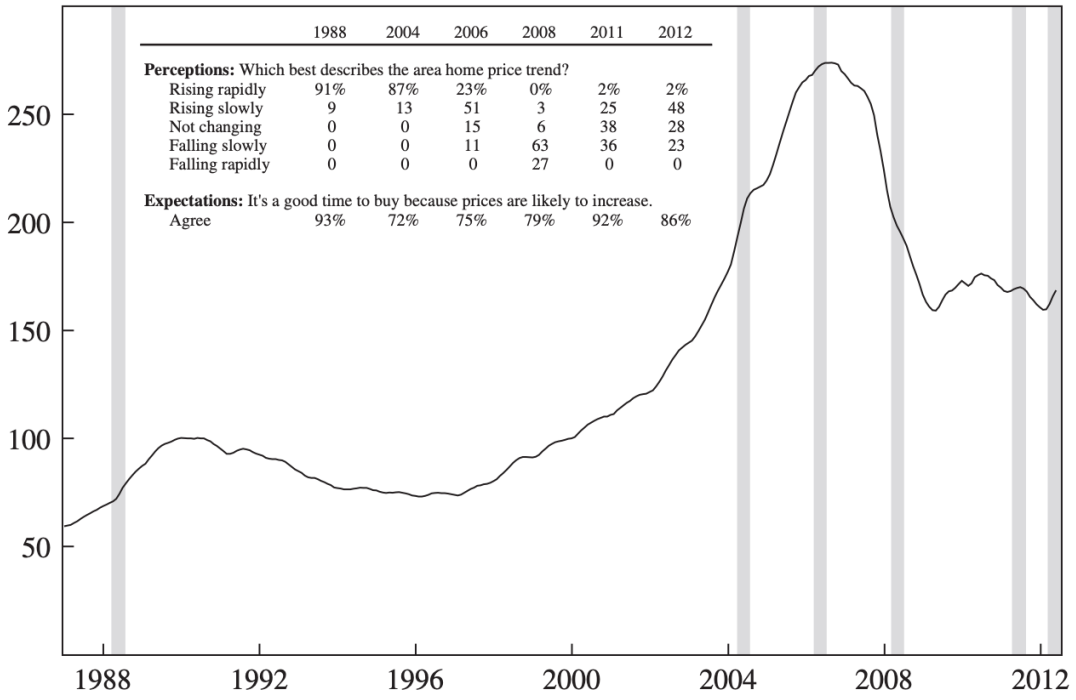
Table 2. Correlations between Actual and Perceived Home Price Trends, by Survey Location, 2003–12[a]

Correlation coefficients

Perceived price trend	Actual price trend: Alameda County	Middlesex County	Milwaukee County	Orange County	All
Rising rapidly	0.67	0.86	0.89	0.81	0.76
Falling rapidly	–0.88	–0.65	–0.80	–0.71	–0.76

Orange County, Calif. (Los Angeles metro area)

Index, Jan. 2000 = 100



Sources: S&P/Case-Shiller and Fiserv, Inc.

a. Vertical lines indicate quarters in which the homebuyers survey was conducted. The questions in each table are from survey questions 14 and 25; the full survey questionnaire is available on the *Brookings Papers* website at www.brookings.edu/about/projects/bpea/, under "Past Editions."

Measuring Market Sentiment

- Case, K. E., et al. (2012). "What Have They Been Thinking? Homebuyer Behavior in Hot and Cold Markets." *Brookings Papers on Economic Activity*: 265-315.
- Rationality test:

$$actual\_price\_change = \alpha + \beta \times expected\_price\_change + \varepsilon$$

- Rational: $\alpha = 0$ and $\beta = 1$
- Irrational: $\alpha \neq 0 \; and \; \beta < 1 \; (i.e., over \; react)$

$$actual\_price\_change = \alpha + \beta \times expected\_price\_change + \varepsilon$$

Table 5. Regressions Testing for Rational Expectations of the One-Year Change in Home Prices[a]

	Survey location				
	Alameda County	*Middlesex County*	*Milwaukee County*	*Orange County*	*All*
Using S&P/Case-Shiller Home Price Indexes, 2003–12					
Constant	–12.79	–4.75	–5.67	–9.48	–9.13
	(8.84)	(2.85)	(4.52)	(5.16)	(2.52)
Own-city expected 12-month price change[b]	2.57	1.50	1.43	2.71	2.34
	(1.42)	(0.71)	(0.94)	(0.78)	(0.46)
No. of observations	9	9	9	9	36
R^2	0.32	0.39	0.25	0.63	0.43
Using FHFA home price data					
Constant	–8.60	–4.82	–6.96	–8.75	–8.11
	(4.12)	(2.50)	(3.45)	(2.88)	(1.48)
Own-city expected 12-month price change[b]	2.03	1.73	1.86	2.81	2.32
	(0.66)	(0.62)	(0.72)	(0.44)	(0.27)
No. of observations	9	9	9	9	36
R^2	0.57	0.52	0.49	0.86	0.69

Measuring Market Sentiment

- Indirect measurement using stock market data
- Baker, M. and J. Wurgler (2007). "Investor sentiment in the stock market." *Journal of Economic Perspectives* 21(2): 129-151.
  - A summary of 'proxies' used as sentiment measurement in the literature
  - Employed a sentiment index of six proxies: trading volume as measured by NYSE turnover; the dividend premium; the closed-end fund discount; the number and first-day returns on IPOs; and the equity share in new issues
  - 1965 – 2018 index data are available at http://people.stern.nyu.edu/jwurgler/data/Investor_Sentiment_Data_20190327_POST.xlsx

Measuring Market Sentiment

- Baker, M. and J. Wurgler (2007). "Investor sentiment in the stock market." *Journal of Economic Perspectives* 21(2): 129-151.

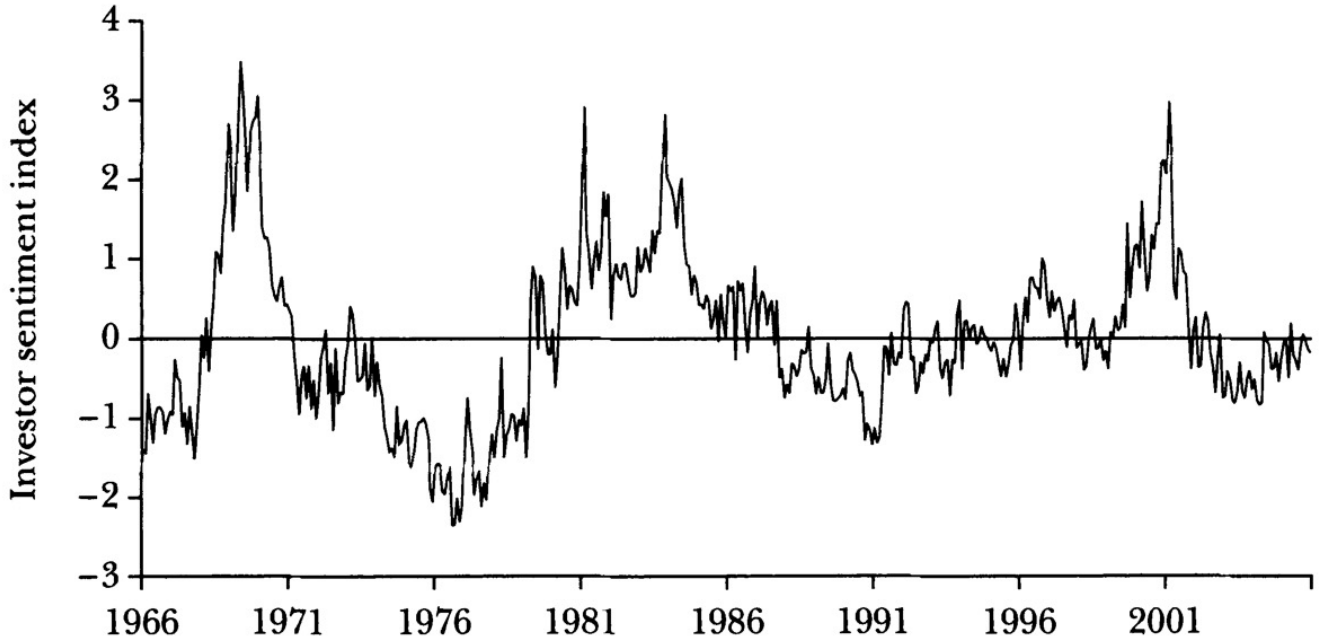
Indicators	Rational	Correlation with market sentiment
Closed-end fund discount (CEFD)	If closed-end funds are disproportionately held by retail investors, their bearish sentiment leads to higher discounts	-
Trading volume (TURN)	Irrational investors are more likely to trade when they are optimistic	+
IPO volume (NIPO)	Underlying demand for IPO is sensitive to investor sentiment	+
IPO first day return (RIPO)	A reflection of investor enthusiasm	+
Dividend premium (PDND)	Dividend-paying stocks resemble bonds in that their predictable income stream represents a salient characteristic of safety	-
Equity share in new issues (S)	Firms issue relatively more equity than debt just before periods of low market returns.	+

Measuring Market Sentiment

- Baker, M. and J. Wurgler (2007). "Investor sentiment in the stock market." *Journal of Economic Perspectives* 21(2): 129-151.

Panel A: Index of sentiment levels

$$SENT = -0.23\,CEFD + 0.23\,TURN + 0.24\,NIPO + 0.29\,RIPO - 0.32\,PDND + 0.23\,S$$



Measuring Market Sentiment

- Zheng, Y. and E. Osmer (2021). "Housing price dynamics: The impact of stock market sentiment and the spillover effect." *Quarterly Review of Economics and Finance* 80: 854-867.
  - Sentiment measurement: Baker & Wurgler sentiment index
  - House price returns: S&P/Case- Shiller Home Price Index in 19 major U.S. metropolitan areas
  - Monthly data between Jan 1991 and Dec 2014
  - Time series analysis: VAR-GARCH-M models, VAR models, GARCH, and DCC models
  - House price returns are negatively related to market sentiment: flight to quality (housing market is considered safer)
  - Spillover effect is slightly weaker between stock and housing markets (68% vs. 66.2%): potential for diversification

Measuring Market Sentiment

- Zheng, Y. and E. Osmer (2021). "Housing price dynamics: The impact of stock market sentiment and the spillover effect." *Quarterly Review of Economics and Finance* 80: 854-867.

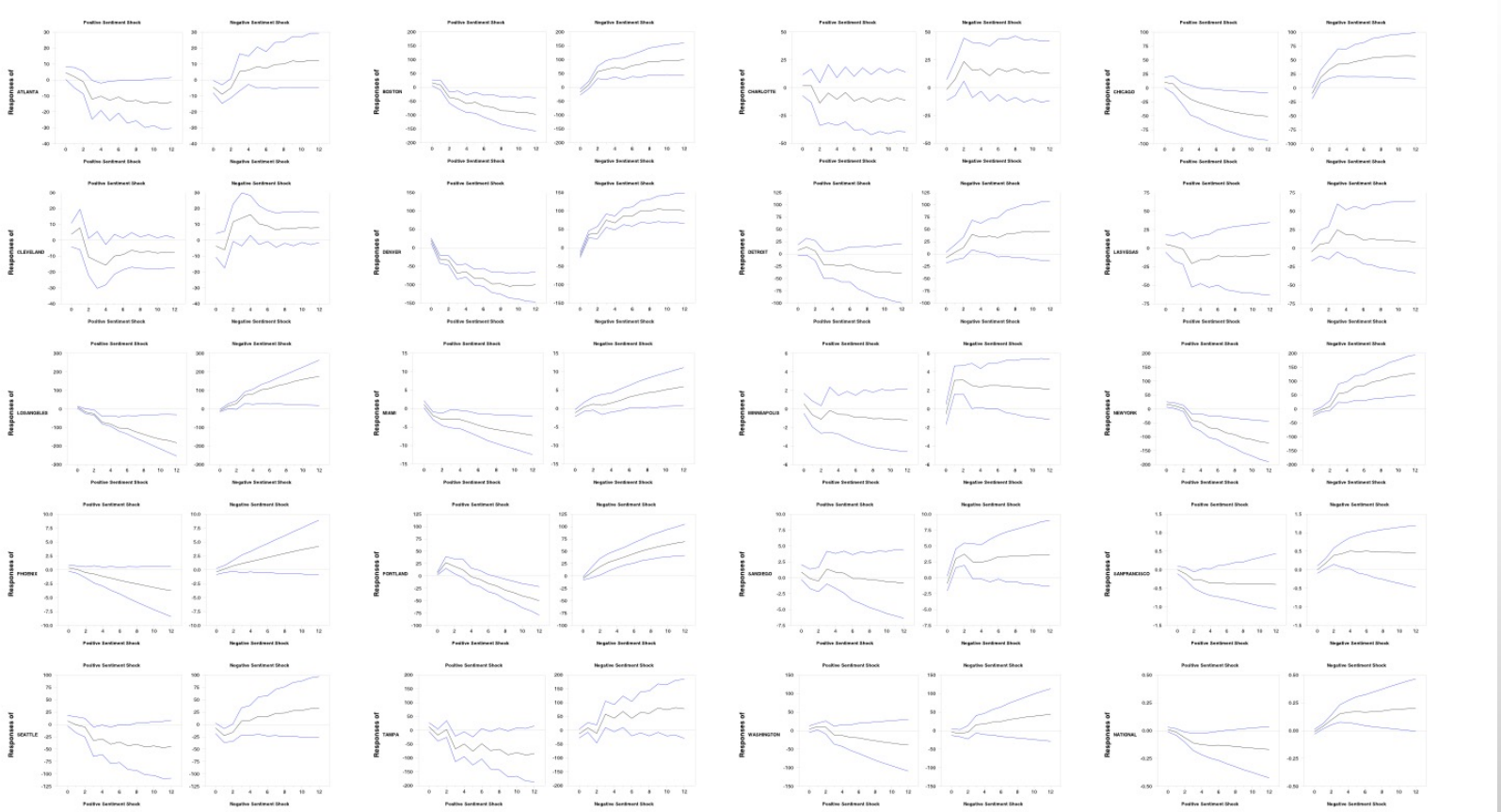


Fig. 2. Impulse response functions for bivariate VAR-GARCH-M.
The figure plots the impulse response functions simulated from the maximum likelihood estimates of the bivariate VAR-GARCH-M model's parameters (Eqs. (1)–(4).

Measuring Market Sentiment

- Zheng, Y. and E. Osmer (2021). "Housing price dynamics: The impact of stock market sentiment and the spillover effect." *Quarterly Review of Economics and Finance* 80: 854-867.

Table 3
Spillover Table, Housing Price Return Series.

	ATL	BOS	CLE	CHI	CLT	DTT	DEN	LAS	LAX	MIA	MSP	NYC	PHX	PDX	SAN	SEA	SFO	TPA	DCA	National	From Others
Atlanta	30.5	0.3	2.1	0.9	3.6	3.4	10.6	1.3	0.8	1.2	0.8	5.2	6.1	0.5	7.5	1.4	7.1	1.3	0.5	15.1	70
Boston	0.2	27.5	3.1	1.1	0.7	1.4	15.3	0.3	1	0.2	2.3	2.6	1.1	1.3	10.1	0.5	12.8	0.7	1.6	16.1	72
Cleveland	0.4	1.8	50.7	1.6	1.5	0.4	14.4	0.6	0.3	0.9	0.7	1.8	3.4	2.2	4.4	0.9	2.2	1	2	8.9	49
Chicago	1.8	0.8	2.6	22.7	3.9	4.7	9.1	0.3	0.4	2.4	2.7	0.9	5.8	2.2	5.6	1.7	4.7	3.9	2.3	21.6	77
Charlotte	3.2	3.3	1	0.2	46.1	0.4	2.6	0.9	0.8	1.7	1.4	2.2	8.7	2.9	1.8	5.9	2.3	2.4	0.7	11.6	54
Detroit	2.6	1.6	0.1	5.6	2.2	33.7	14	0.8	0.7	0.6	4.6	1.3	7.2	1.3	7.3	0.5	6.2	0.3	1.2	8.4	66
Denver	0.6	1.5	2.2	0.3	2.3	0.3	53.2	0.1	0.8	0.5	0.2	0.4	3.3	0.2	7.8	1.7	14.4	0.5	0.8	9.2	47
Las Vegas	0.1	0.5	0.2	0.1	3.1	0.6	4.6	33	19.8	0.9	0.1	1.4	5.1	0.4	16.3	1	1	1.2	0.6	10	67
Los Angeles	0.3	1.6	1.4	0.1	0.3	0.4	2.7	1.8	26.3	1.9	1.4	4.4	10	1.2	19.2	0.9	6.7	1.3	0.5	17.7	74
Miami	1.8	1	0.8	0.1	0.1	0.5	6.9	0.7	3.4	23.1	1	0.4	17.5	1.3	8.6	0.4	4.4	3.9	4.9	19.2	77
Minneapolis	0.5	1.3	3.6	1.7	0.7	1.9	17.1	0.3	0.7	1.9	22.3	1	6.2	1.5	8.3	1.6	9	2	1.8	16.8	78
New York	0.9	5.2	2.7	0.7	0.1	1.4	6.6	0.4	2.1	1.8	2.3	23.2	4.5	1.6	8.1	0.5	4.9	4.1	1.7	27.2	77
Phoenix	3.1	0.2	1.1	0.1	0.5	0.7	8.2	0.5	0.5	6.4	0.1	1.2	37.1	1.8	7	1.7	6.8	0.2	9.5	13.3	63
Portland	0.5	1.7	3	1.3	3.3	1.2	3.9	2.7	0.3	5.8	0.3	1.2	16.4	32.1	1.4	1	1.2	5.6	3.4	13.8	68
San Diego	0.4	2.4	1.5	0.1	0.3	0	7.5	1.6	16.9	0.7	0.9	2.4	3.4	0.8	31.8	0.9	11.9	1	1	14.4	68
Seattle	0.2	0	0.3	0.6	1.4	0.9	5.4	1.1	1.2	3.6	1	2	16	1.3	4.2	34.4	5.7	1.7	0.7	18.4	66
San Francisco	0.2	0.7	2.7	0.4	0.6	0.3	9.9	0.2	3.9	1.4	0.9	4.7	7	1.6	13.9	1.5	33.6	0.3	0.8	15.4	66
Tampa	2.3	1.1	0.9	0.2	0.2	0.9	7.3	0.7	1.9	8.1	1.2	0.2	17	1.9	6.3	0.8	3.9	23.5	3	18.6	76
Washington, D.C.	2.9	2.5	1.7	0.6	0.5	0.9	4.7	0.5	6.7	4.3	0.7	0.7	8.2	2.6	10.4	0.8	7	1.1	20.8	22.3	79
National	0.3	2.5	0.8	0.3	0.7	0.6	8.9	1	3.7	4	1.6	0.8	13.2	1.8	12.1	1.7	7.4	3.1	1.6	34	66
Contribution to others	22	30	32	16	26	21	160	16	66	48	24	35	160	28	160	26	119	36	39	298	1360
Contribution including own	53	57	82	38	72	54	213	49	92	71	46	58	197	61	192	60	153	59	60	332	68.00%

The underlying variance decomposition is based upon a monthly VAR of order 2, identified using a Cholesky factorization with the ordering as shown in the column heading. The i^{th}, j^{th} value is the estimated contribution to the variance of the 10-week-ahead real return forecast error of series *i* coming from innovations to stock returns of series *j* (Eqs. (5)–(9)). This table reports the spillover from housing return series for 19 metropolitan areas: Atlanta, Boston, Charlotte, Chicago, Cleveland, Denver, Detroit, Las Vegas, Los Angeles, Miami, Minneapolis, New York, Phoenix, Portland, San Diego, San Francisco, Seattle, Tampa, Washington, D.C. and the national level.

Measuring Market Sentiment

- Indirect measurement using internet-based sentiment indicators
- Google Trend search volume index (SVI), newspaper text analysis, social media posts, …
  - **Online articles**: Chen, H. L., et al. (2014). "Wisdom of Crowds: The Value of Stock Opinions Transmitted Through Social Media." *Review of Financial Studies* 27(5): 1367-1403.
  - **Microblog**: Renault, T. (2017). "Intraday online investor sentiment and return patterns in the US stock market." *Journal of Banking & Finance* 84: 25-40.
  - **Google Trend SVI**: Da, Z., et al. (2011). "In Search of Attention." *Journal of Finance* 66(5): 1461-1499.

Measuring Market Sentiment

- Google Trend SVI:
  - Aroul, R. R., et al. (2022). "FEAR Index, city characteristics, and housing returns." *Real Estate Economics* 50(1): 173-205.
  - Dietzel, M. A. (2016). "Sentiment-based predictions of housing market turning points with Google trends." *International Journal of Housing Markets and Analysis* 9(1): 108-136.
  - Hohenstatt, R. and M. Kaesbauer (2014). "GECO's Weather Forecast for the UK Housing Market: To What Extent Can We Rely on Google Econometrics?" *Journal of Real Estate Research* 36(2): 253-281.
  - Hohenstatt, R., et al. (2011). ""Geco" and its Potential for Real Estate Research: Evidence from the U.S. Housing Market." *Journal of Real Estate Research* 33(4): 471-506.
  - van Veldhuizen, S., et al. (2016). "Internet searches and transactions on the Dutch housing market." *Applied Economics Letters* 23(18): 1321-1324.
  - Venkataraman, M., et al. (2018). "Does internet search intensity predict house prices in emerging markets? A case of India." *Property Management* 36(1): 103-118.

Measuring Market Sentiment

- Zhu, E. W., et al. (2022). "A Sentiment Index of the Housing Market in China: Text Mining of Narratives on Social Media." *Journal of Real Estate Finance and Economics,* 66(1):77-118.
  - Data source: microblogs postings (Sina Weibo); based on the keyword “house price” (Fang Jia); excluding reposts.
  - Sampling period: January 2012 and December 2018
  - Sample size: 1.92 million microblogs posted by about 0.88 million users; 8.22 million sentences
  - Sentiment classification: Long Short-Term Memory (LSTM) model; machine learning; deep learning; neural network.
  - Results: 87.42% are classified as irrelevant, 1.55% as future-positive (FP), 1.14% as future-negative (FN), 7.79% as past-positive (PP), and 2.10% as past-negative (PN)
  - Index calculation:

$$FSI_t = \frac{NFP_t}{NFP_t + NFN_t}$$

$$PSI_t = \frac{NPP_t}{NPP_t + NPN_t}$$

Measuring Market Sentiment

- Zhu, E. W., et al. (2022). "A Sentiment Index of the Housing Market in China: Text Mining of Narratives on Social Media." *Journal of Real Estate Finance and Economics,* 66(1):77-118.

Table 1 Average out-of-sample prediction accuracies (in percentage)

Method	Structure	Sub-classifier				Average
		Relevance	Temporality	Past sentiment	Future sentiment	
Majority	N/A	57.35	63.94	81.67	54.83	64.45
naïve Bayes	Bag of words	78.67 (0.07)	84.44 (0.16)	88.00 (0.14)	78.59 (0.25)	82.43
	Bag of words and bigrams	80.20 (0.10)	84.96 (0.12)	87.50 (0.12)	79.36 (0.41)	84.76
SVM	Bag of words	83.12 (0.13)	85.05 (0.20)	93.68 (0.21)	77.17 (0.54)	83.01
	Bag of words and bigrams	83.51 (0.15)	86.02 (0.21)	93.91 (0.13)	77.53 (0.45)	85.24
LSTM	Word Sequence	87.17 (0.12)	89.39 (0.17)	95.22 (0.14)	81.80 (0.29)	88.40

Measuring Market Sentiment

- Zhu, E. W., et al. (2022). "A Sentiment Index of the Housing Market in China: Text Mining of Narratives on Social Media." *Journal of Real Estate Finance and Economics,* 66(1):77-118.

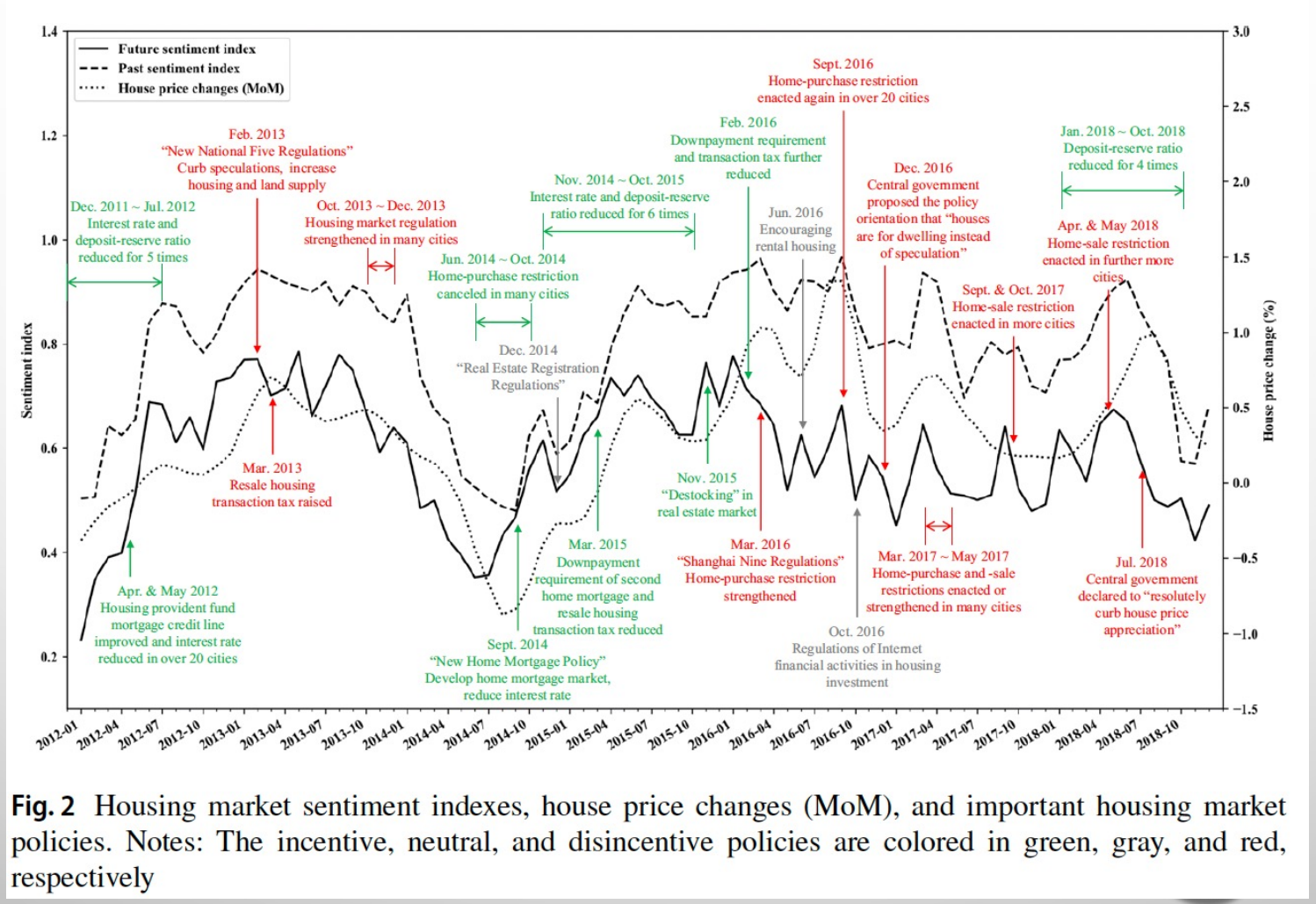


Fig. 2 Housing market sentiment indexes, house price changes (MoM), and important housing market policies. Notes: The incentive, neutral, and disincentive policies are colored in green, gray, and red, respectively

Measuring Market Sentiment

- Aroul, R. R., et al. (2022). "FEAR Index, city characteristics, and housing returns." *Real Estate Economics* 50(1): 173-205.
  - Financial, Economic, and Real Estate (FEAR) Index: Da, Z., et al. (2015). "The Sum of All FEARS Investor Sentiment and Asset Prices." *Review of Financial Studies* 28(1): 1-32.
  - January 2004 to December 2014; 20 cities in the US
  - Based on 2154 searches; the top 30 most significant search terms are identified on a 6-month rolling basis (based on t test statistics from regression models);
  - A negative sentiment index;

$$FEAR\ Index_{i,t} = \left(\frac{\sum_{j=1}^{30} \left(\Delta itASVI_{i,j,t-1} \right)}{30} + \frac{\sum_{j=1}^{30} \left(\Delta ASVI_{i,j,t-2} \right)}{30} + \frac{\sum_{j=1}^{30} \left(\Delta ASVI_{i,j,t-3} \right)}{30} \right) / 3$$

- Aroul, R. R., et al. (2022). "FEAR Index, city characteristics, and housing returns." *Real Estate Economics* 50(1): 173-205.
- Dependent variable: S&P/Case–Shiller Home Price Indices
- One standard deviation increase in FEAR Index corresponds with a decline of 37 basis points in Home Price Return in 1 month, 34 points in 2 months, and 18 points in 3 months

TABLE 3 *FEAR Index* and future returns in the housing market

Variable	(1)	(2)
$FEAR\ Index_{i,t-1}$	−0.37***	−0.37***
	(−3.03)	(−3.93)
$FEAR\ Index_{i,t-2}$	−0.34**	−0.34**
	(−2.49)	(−2.37)
$FEAR\ Index_{i,t-3}$	−0.18**	−0.18**
	(−2.54)	(−2.49)
$Lagged\ Housing\ Return_{i,\ t-1\ to\ t-12}$	0.59***	0.93***
	(15.92)	(54.38)
$\Delta Real\ GDP_t$	0.03	0.03
	(0.84)	(1.44)
ΔCPI_t	0.02	0.02
	(0.45)	(0.37)
$\Delta Unemployment\ Rate_t$	−0.02**	−0.02**
	(−2.23)	(−2.09)
ΔHMI_t	0.00	0.00
	(0.45)	(0.47)
$S\&P\ 500\ Return_t$	0.01*	0.01*
	(1.96)	(2.07)
Constant	−0.00	−0.00
	(−1.56)	(−1.61)
Fixed effects	No	Yes
Observations	2,240	2,240
Adjusted R^2	0.41	0.42

Note: This table assesses the impact of *FEAR Index* constructed for 20 markets using negatively related terms on next month's housing market return in those markets while controlling for several key variables. The index is built using 30 terms selected dynamically from a list of real-estate- and economy-related terms we compiled and related top searches suggested by Google Trends. *FEAR Index* gauges the negative sentiment of households in 20 markets toward the real estate market in those markets. Accordingly, an increase in *FEAR Index* implies an increase in negative sentiment or pessimism. All variables are included at a monthly frequency. The regressions are for January 2005 to December 2014. *FEAR Index* coefficients have been multiplied by 100 to reduce the number of decimals. The interpretation of these coefficients has been adjusted accordingly. Variable descriptions are in Table 1. *t*-Statistics computed using robust standard errors based on the Huber–White sandwich estimator are below the coefficient estimates in parentheses; and 1%, 5%, and 10% statistical significance are indicated with ***, **, and *, respectively.

Measuring Market Sentiment

- Composite sentiment indices
- Hui, E. C. M. and Z. Y. Wang (2014). "Market sentiment in private housing market." *Habitat International* 44: 375-385.
- Zhou, Z. Y. (2018). "Housing market sentiment and intervention effectiveness: Evidence from China." *Emerging Markets Review* 35: 91-110.
- Das, P., et al. (2020). "The cross-over effect of irrational sentiments in housing, commercial property, and stock markets." *Journal of Banking & Finance* 114.

Measuring Market Sentiment

- Hui, E. C. M. and Z. Y. Wang (2014). "Market sentiment in private housing market." *Habitat International* 44: 375-385.
  - A composition of proxies from the housing, capital, and stock market
  - Buyer-seller sentiment, and developer sentiment
  - Principle component analysis method to obtain the weighting, and Hodrick-Prescott Filter for detrending (i.e., separate the economic factors or market fundamentals)
  - Has been applied to study the impact of sentiment on various housing topics, such as homeownership and consumption
    - Dong, Z. Y. Z., et al. (2021). "Housing market sentiment and homeownership." *Journal of Housing and the Built Environment* 36(1): 29-46.
    - Hui, E. C. M., et al. (2018). "How do housing price and sentiment affect consumption distribution in China?" *Habitat International* 77: 99-109.

Measuring Market Sentiment

- Hui, E. C. M. and Z. Y. Wang (2014). "Market sentiment in private housing market." *Habitat International* 44: 375-385.

Table 1
Proxies for buyer-seller sentiment.

Category	Proxies for buyer-seller sentiment	CODE
Stock market	Shanghai composite index	STOCKINDEX
	Market Value of real estate industry/total Market Value	STOCKVALUE
	Price-earnings ratio of real estate industry	PERATIO
Housing Market	Transaction Volumes in real market	SALEAREA
	Transaction Amount in real market	SALEAMOUT
Capital Market	New bank loan	LOAN
	Fulfilled amount of investment of developer	INVEST

Table 2
Proxies for developer's sentiment.

Category	Proxies for developer's sentiment	CODE
Stock market	Shanghai composite index	STOCKINDEX
	Market Value of real estate industry/total Market Value	STOCKVALUE
	Price-earning ratio of real estate industry	PERATIO
Land market	Land cost	LANDCOST
	Land area	LANDAREA
Development situation	Area of Completed	COMPLETEAREA
	Area of construction	CONSTRUCTIONAREA
Capital Market	Fulfilled amount of investment of developer	INVEST
	New bank loan approved to developer	FUNDS

$$\begin{aligned} senti_{bs_t} &= 0.046871stockvalue_t + 0.258839peratio_t \\ &\quad + 0.320255stockindex_t + 0.139644loan_t \\ &\quad + 0.143351invest_t + 0.202302saleamount_t \\ &\quad + 0.143097salearea_t \end{aligned} \tag{3}$$

$$\begin{aligned} senti_{d_t} &= 0.11576897stockvalue_t + 0.24541591peratio_t \\ &\quad + 0.25120304stockindex + 0.02988877invest \\ &\quad + 0.09600568funds_t - 0.04039838landcost \\ &\quad + 0.01661984landarea \\ &\quad + 0.0270567constructionarea \\ &\quad + 0.15899061completearea \end{aligned} \tag{4}$$

Measuring Market Sentiment

- Das, P., et al. (2020). "The cross-over effect of irrational sentiments in housing, commercial property, and stock markets." *Journal of Banking & Finance* 114.

Table 1
Variable definitions and descriptive statistics.

Variable	Definition	Source	Min	Max	Mean	SD
Return Measures						
CRER	NCREIF Property Index (NPI)					
RRER	S&P/Case-Shiller U.S. National Home Price Index					
SMTR	S&P 500 Stock Market Index					
Sentiment Indicators						
CFSIres	Contributions to Cleveland Financial Stress Index: Residential Real Estate Spread					
CFSIcom	Contributions to Cleveland Financial Stress Index: Commercial Real Estate Spread					
CMBS	CMBS total return index in excess of the 3-month T-bills rate					
reitipo	Number of REIT Equity IPOs in a given quarter					
reiteqsh	Share of net REIT equity issues relative to total REIT capital raised					
mgtflw	Net commercial mortgage flows as percentage of GDP					
Mich_princ	Percentage of respondents expecting house prices to increase					
Mich_relinv	Difference between responses "good time to invest" versus "bad time"					
TED	Difference between 3-month interbank loans interest rates and the 3-month T-bills rate					
AAII	American Association of Individual Investors Index, ratio bullish to bearish responses					
VRSP	Difference between the expected variance captured by the implied volatility index (VIX) and the subsequent actual variance based on the SMTR, averaged per quarter					
IPO	Number of IPOs in a given month					
CEFD	Average difference between the NAV and of closed-end fund and market prices					
RERC	Investor ratings of investment conditions for commercial property					
SLOS	Senior Loan Officer Opinion Survey on Bank Lending Practice*					

$$RSIX_t = -0.202CSFIres^{\perp}_{t-1} + 0.689Mich\_princ^{\perp}_{t-1} + 0.695Mich\_relinv^{\perp}_{t-1}. \quad (6)$$

$$CSIX_t = -0.437CFSIcom^{\perp}_{t-1} + 0.267reiteqsh^{\perp}_{t-1} - 0.251reitipo^{\perp}_{t-1} + -0.319mgtflw^{\perp}_{t-1} - 0.509RERC^{\perp}_{t-1} + 0.420CMBS^{\perp}_{t-1} + 0.369SLOS^{\perp}_{t-1}. \quad (8)$$

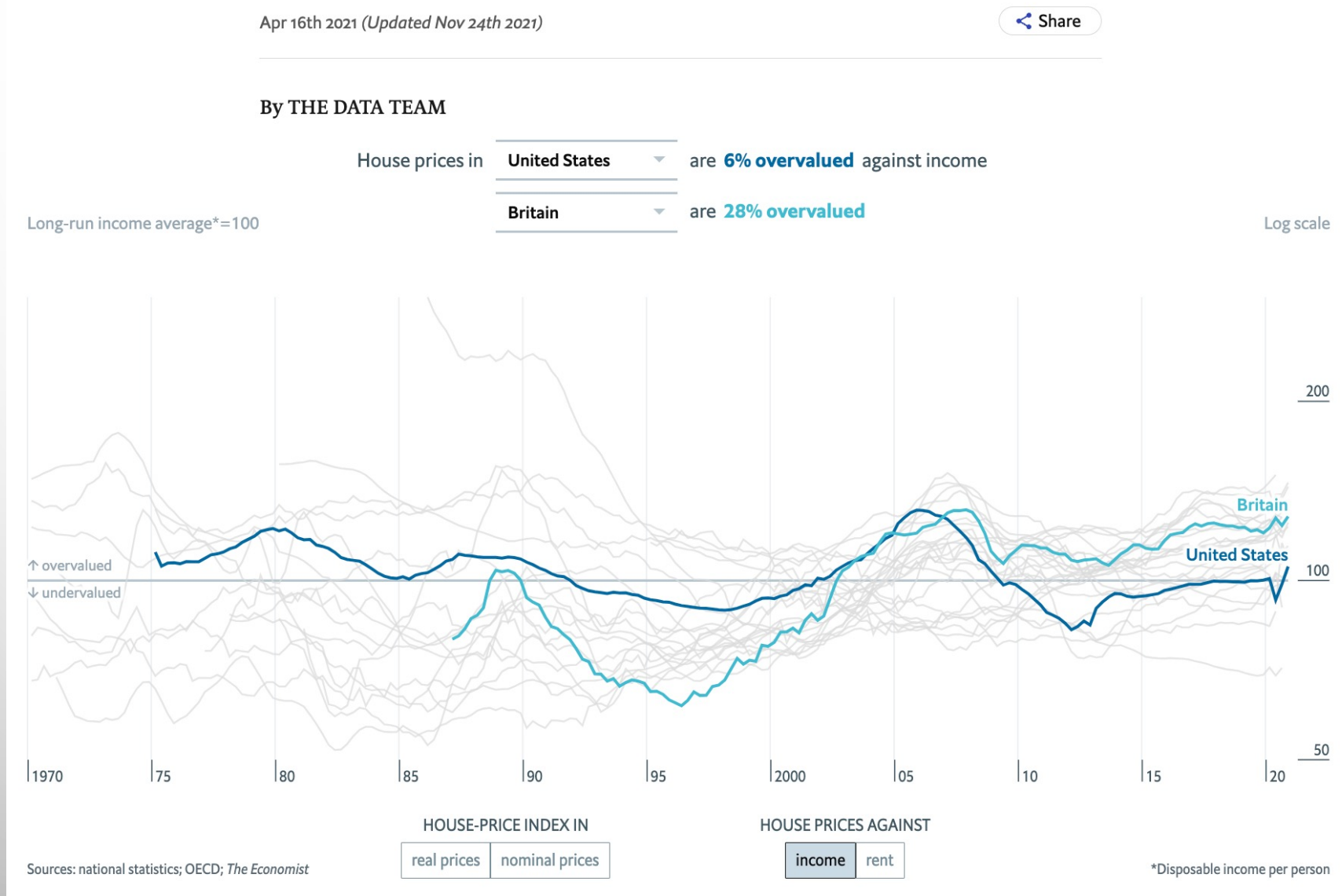
$$SSIXq_t = 0.57TED^{\perp}_{t-1} - 0.22AAII^{\perp}_{t} - 0.51reitipo^{\perp}_{t} + 0.57CEFD^{\perp}_{t} + 0.23VRSP^{\perp}_{t}. \quad (10)$$

$$ret_{t,j} = \mu_{1,j} + \sum_{i=1}^{p} \beta_{1i,j} ret_{t-i,j} + \sum_{i=1}^{p} \gamma_{1i,j} sent_{t-i,j} + \delta_{1,j} X_{t,j} + \varepsilon_{1t,j}$$

$$sent_{t,j} = \mu_{2,j} + \sum_{i=1}^{p} \beta_{2i,j} ret_{t-i,j} + \sum_{i=1}^{p} \gamma_{2i,j} sent_{t-i,j} + \delta_{2,j} X_{t,j} + \varepsilon_{2t,j}. \quad (11)$$

Data and methods

- Study areas: USA and UK (https://www.economist.com/graphic-detail/global-house-prices)



Data and methods

- Sentiment measures
  1. Business Confidence Index (BCI): based on business tendency surveys that seek enterprises' assessment of production, orders and stocks, as well as their current position and expectations for the immediate future. Values above 100 indicate that economic conditions are better than normal (or the long-term average)
  2. Consumer Confidence Index (CCI): based on responses in the consumer tendency surveys where households report their plans for major purchases and their economic situation, both currently and their expectations for the immediate future. Values above 100 indicate that economic conditions are better than normal (or the long-term average)
  3. Google Trend search index (SVI): keyword = mortgage loan, from 2004 to 2019.

Data and methods

Table 7.1: Variable definition and descriptive statistics

Variable	Description	Remark
PI	Index of real house price	2010 = 100
RI	Index of rental price	2010 = 100
GDPR	Growth rate of quarterly GDP	Unit: %
INC	Per Capita Real Disposable Personal Income	Seasonally Adjusted Annual Rate
DST	USA: Housing Starts (New Privately Owned Housing) UK: Permanent dwellings started	Thousands of Units, Seasonally Adjusted
IR	Long-term interest rates	Unit: %
BCI	The business confidence index (BCI)	Amplitude adjusted, Long-term average = 100
CCI	The consumer confidence index (CCI)	Amplitude adjusted, Long-term average = 100
DESVI	Google search volume index (SVI) by using 'mortgage loan' as the search word	Seasonally adjusted, Historical peak = 100

Note: All variables are obtained from OECD*, except for INC, DST, and DESVI. The data source for INC and DST is the National Statistics Office for the UK market, and the Federal Reserve Economic Database for the US market. DESVI is obtained from Google Trends website.*

Data and methods

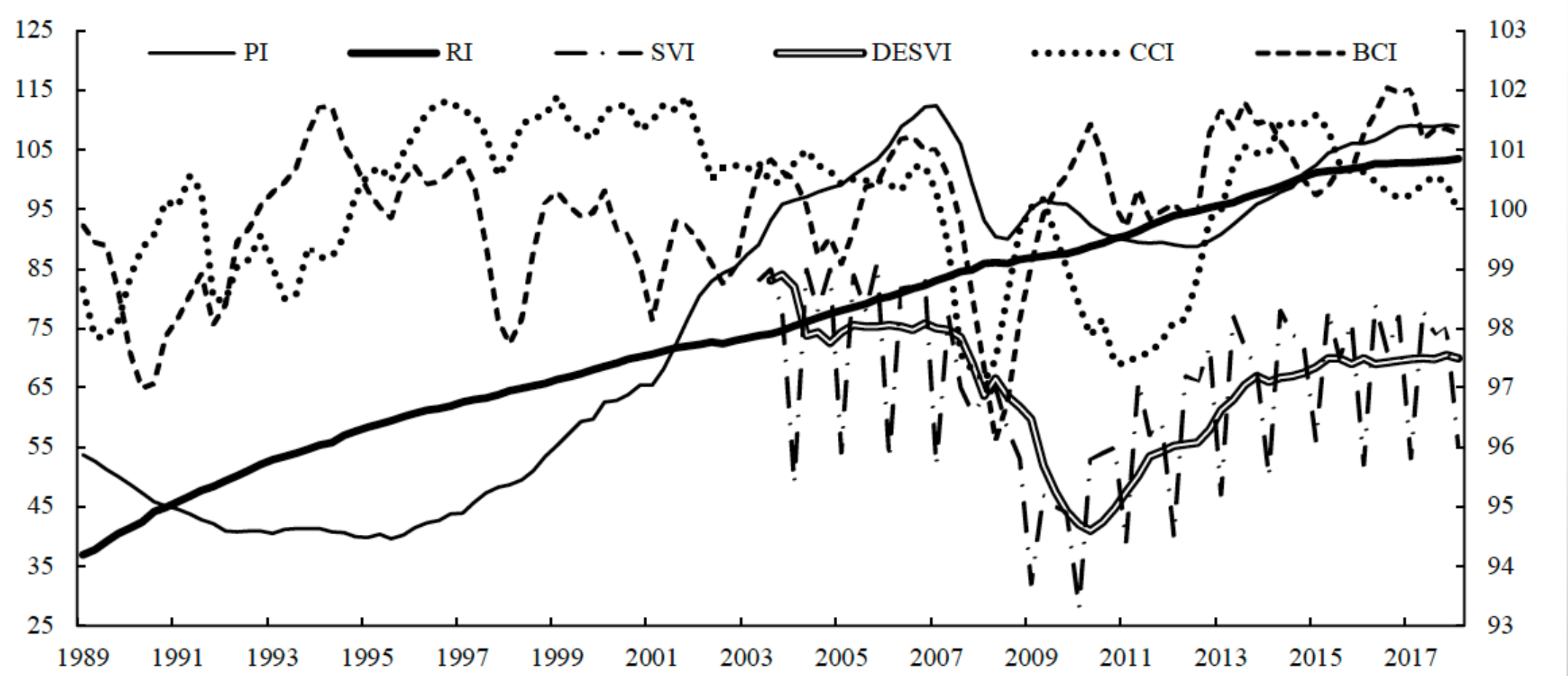


Figure 7.3: UK house pricing market and sentiment indices

Data and methods

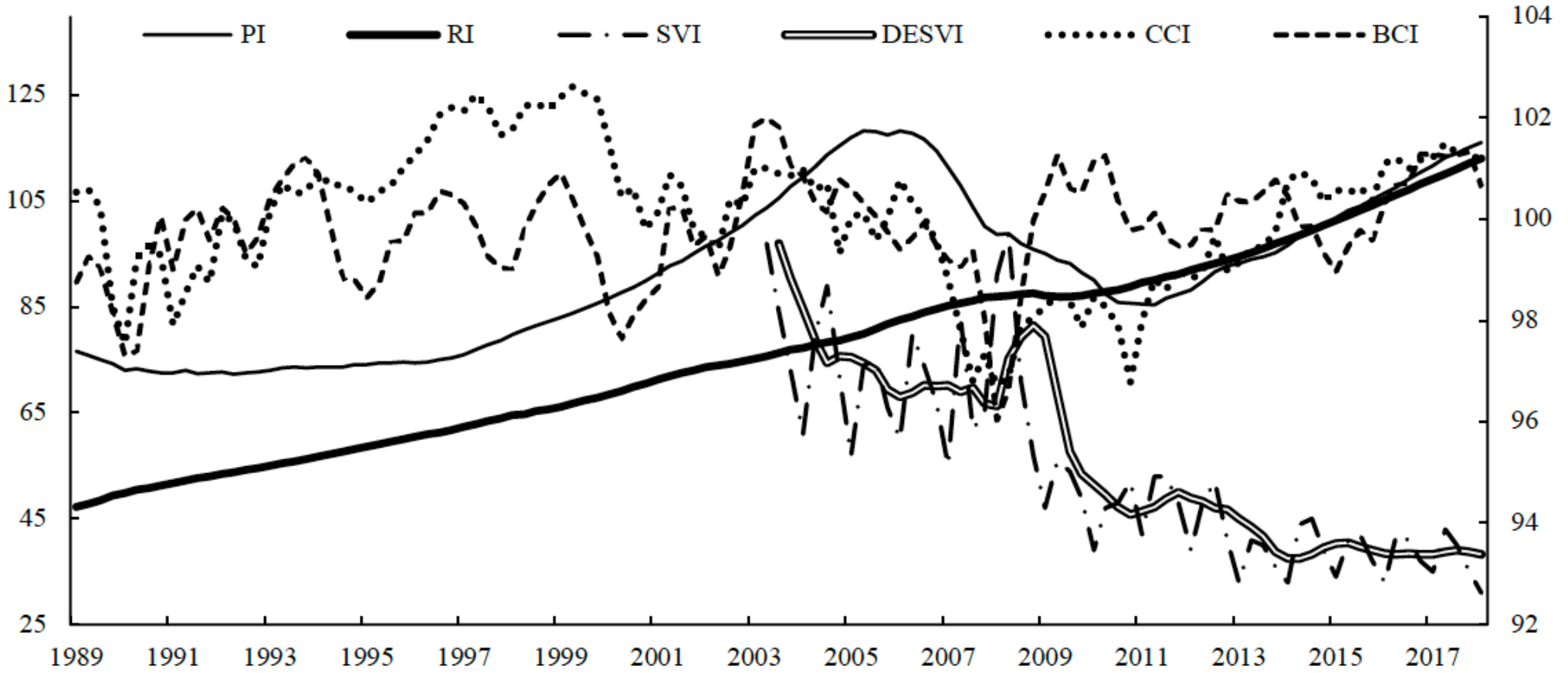


Figure 7.4: US house pricing market and sentiment indices

Data and methods

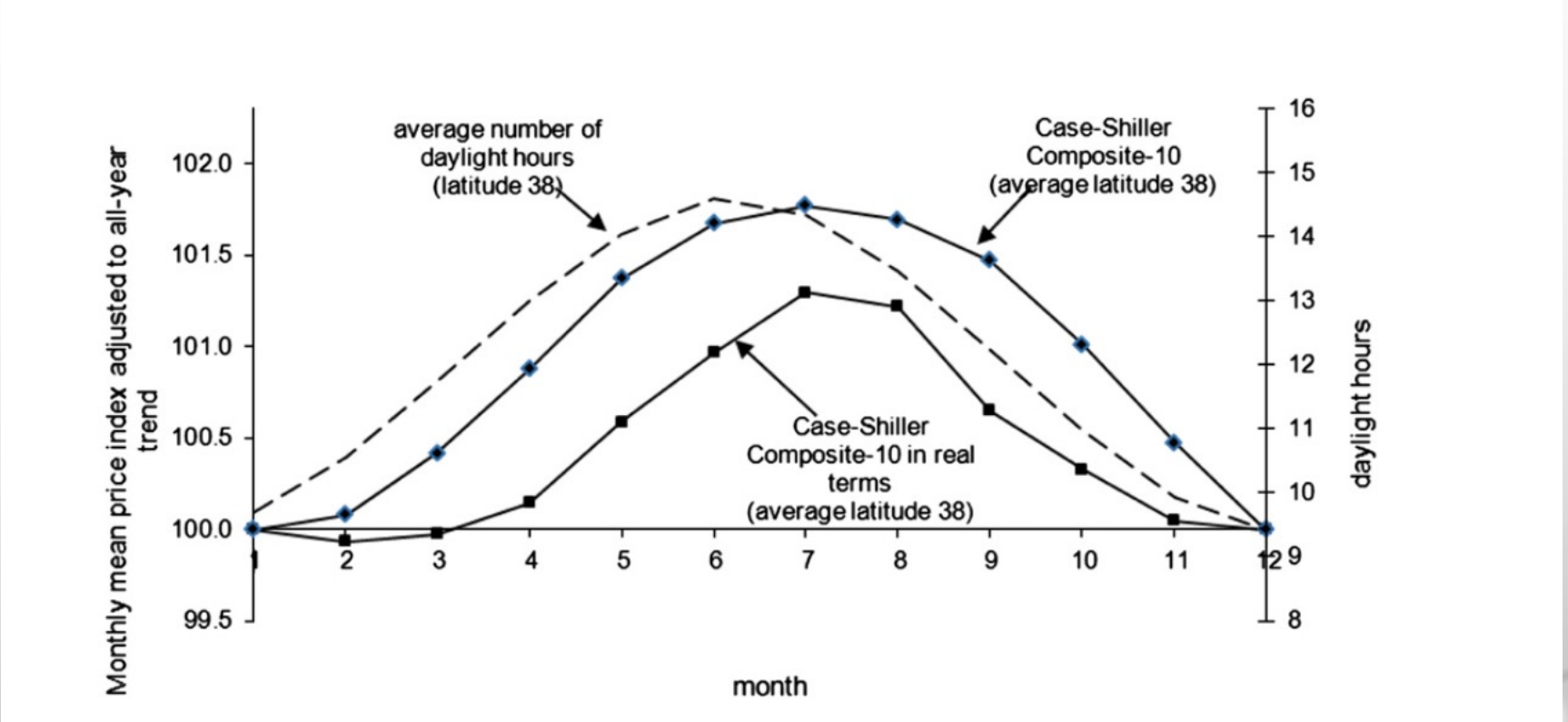
- Clear seasonal pattern is observed in the SVI series for both countries
- December is the holiday season. People avoid moving as much as possible. Hence the low search volume
- Seasonal Affective Disorder (SAD): winter blue!
  - Rosenthal, N. E., et al. (1984). "Seasonal Affective Disorder: A Description of the Syndrome and Preliminary Findings With Light Therapy." *Archives of General Psychiatry* 41(1): 72-80.
  - Goetzmann, W. N., et al. (2015). "Weather-Induced Mood, Institutional Investors, and Stock Returns." *Review of Financial Studies* 28(1): 73-111.
  - Kaplanski, G. and H. Levy (2012). "Real estate prices: An international study of seasonality's sentiment effect." *Journal of Empirical Finance* 19(1): 123-146.

The SAD effect

- Kaplanski, G. and H. Levy (2012). "Real estate prices: An international study of seasonality's sentiment effect." *Journal of Empirical Finance* 19(1): 123-146.
  - CDH: changes in daylight hours across the various months of the year
  - Also considered the latitude of the area zone under consideration
  - Alternative explanations:
    - Matching Theory (MT): strategic herding – larger group gives higher chance to sell and/or better prices, so join the group
    - Bargaining Power Hypothesis (BPH): summer buyers have less bargaining power (parents of school-age children and newlyweds)

The SAD effect

- Kaplanski, G. and H. Levy (2012). "Real estate prices: An international study of seasonality's sentiment effect." *Journal of Empirical Finance* 19(1): 123-146.



Data and methods

De-seasonalisation does not change the mean and the standard deviation of SVI.

Table 7.2: Descriptive Statistics

	UK				USA			
	Mean	**Std Dev**	**Min**	**Max**	**Mean**	**Std Dev**	**Min**	**Max**
PI	76.02	25.84	39.65	112.39	91.42	14.83	72.32	118.29
RI	74.93	18.62	36.94	103.47	76.71	17.94	47.25	113.07
GDPR	0.49	0.59	-2.17	1.93	0.61	0.59	-2.16	1.83
IR	5.10	2.74	0.84	12.32	4.62	1.92	1.56	8.70
INC	4,168	602	3,015	4,972	35,132	5,161	26,962	44,831
DST	45,590	8,721	22,270	64,710	1,297	406	505	2,151
CCI	100.08	1.29	97.11	101.90	100.06	1.40	96.73	102.61
BCI	99.99	1.22	96.11	102.04	99.84	1.04	96.02	101.99
SVI	64.92	14.74	28.00	86.00	54.37	17.93	31.00	99.00
DESVI	65.29	10.74	41.00	84.00	56.16	16.88	37.50	97.00

Data and methods

- We use the first difference of all variables in the VAR models
- The first differenced variables are all stationary, or I(1)
- The results should be interpreted as “the average one-period change in Y according to one-period change in X”. This is appropriate as we are trying to identify turning points (i.e., we are interested in short-term changes)
- VAR model is necessary because house prices and rents are likely to affect each other.

Table 7.3: VAR estimations (UK)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	PI	**RI**	**PI**	**RI**	**PI**	**RI**	**PI**	**RI**	**PI**	**RI**	**PI**	**RI**
PI(-1)	0.798***	0.053	0.760***	0.085	0.745***	0.077	0.764***	0.076	0.741***	0.090	0.724***	0.087
RI(-1)	-0.148**	0.028	-0.162**	-0.047	-0.115*	-0.014	-0.109*	0.064	-0.131**	-0.036	-0.085	-0.014
GDPR							0.665***	0.465	0.248	0.133	0.312*	0.157
INC							0.009***	0.002	0.006***	0.0004	0.008***	0.001
IR							0.294	-0.223	0.201	-0.113	-0.091	-0.018
DST							0.00003*	-0.00009**	0.00002	-0.00004**	0.00002	-0.00004*
DESVI	0.201***	0.092					0.170***	0.115				
DESVI(-1)	-0.045	-0.098					-0.041	-0.127				
CCI			0.415*	0.120					0.284	0.169		
CCI(-1)			0.752***	0.042					0.637***	0.069		
BCI					0.653***	-0.064					0.58***	-0.047
BCI(-1)					-0.025	-0.247					0.064	-0.199
CONSTANT	0.111	0.293	0.204**	0.508***	0.195*	0.503***	0.049	0.227	0.119	0.481***	0.058	0.485***

*Note: ***: p-value < 0.01. **: p-value < 0.05. *: p-value < 0.10.*

Table 7.4: VAR estimations (USA)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	PI	**RI**	**PI**	**RI**	**PI**	**RI**	**PI**	**RI**	**PI**	**RI**	**PI**	**RI**
PI(-1)	0.874***	-0.063	0.887***	-0.068	0.918***	-0.066	1.027***	-0.119	0.976***	-0.105	0.985***	-0.103
RI(-1)	-0.629***	0.026	-0.629***	0.046	-0.636***	0.050	-0.684***	0.18**	-0.663***	0.144**	-0.667***	0.142**
GDPR							-0.050	-0.192	0.007	-0.074	0.073	-0.069
INC							-0.001***	-0.002***	-0.001***	-0.002***	-0.001***	-0.002***
IR							-1.204***	-0.522	-0.65***	-0.101	-0.231	0.169
DST							0.00078	-0.00069	0.00029	-0.00009	0.00022	-0.00047
DESVI	0.079	0.021					0.063	0.038				
DESVI(-1)	-0.079	-0.002					-0.033	0.001				
CCI			0.205	0.017					0.066	-0.148		
CCI(-1)			-0.063	-0.221					0.222*	0.100		
BCI					0.181	0.067					0.107	0.071
BCI(-1)					-0.494***	-0.290					-0.371***	-0.246*
CONSTANT	0.260	0.473**	0.373***	0.525***	0.373***	0.525***	0.504***	0.860***	0.519***	0.817***	0.536***	0.825***

*Note: ***: p-value < 0.01. **: p-value < 0.05. *: p-value < 0.10.*

Findings and conclusions

- Can market sentiment help predict market turning points?
- UK results
  - All three sentiment index are helpful. CCI has leading effect
  - House price index moves in the same direction as market sentiment.

    Market sentiment is helpful in prediction of house price turning points
- US results
  - Much weaker result: smaller effect size, lower statistical significance.

    BCI is not a suitable sentiment index for housing market

Findings and conclusions

- Which type of sentiment index (survey- or search-volume-based) is more reliable?
- Google search volume index does a reasonably good job in the UK market, which is small and more centrally controlled
- The UK results show the potential of SVI, and the US results highlight the potential pitfalls of using it in certain types of housing studies
- CCI consistently outperformed DESVI and BCI in both countries. It is able to give earlier warnings for market turning points. This shows the benefit of measuring non-institutional agents directly

Practical session

- Do an online search for similar search volume indices in China. Have you heard of such indices before?
- Do you think SAD will affect house price or transaction volume in China? If yes, will the effect be the same across the country?
- If you want to study the effect of market sentiment in China's housing market, what data will you need to support the analysis?
- Are you familiar with the time series analysis techniques involved in this lecture? If not, conduct an online search to find out what software is suitable.
- Suggests ways to improve the research design and implementation in this case study

Summary

- Research questions
- Housing bubbles
- Herd behaviours and market sentiment
- Data and methods
- Findings and discussions
- Future research directions