Discussion of

Explaining House Price Dynamics:
Isolating the Role of Nonfundamentals

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Discussion of “Explaining House Price Dynamics: Isolating the Role of Nonfundamentals” by D. Ling, J. Ooi, and T. Le

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Housing, Stability, and the Macroeconomy: International Perspectives
November 14, 2013

¹Any opinions expressed here do not necessarily reflect the views of the management of the Federal Reserve Bank of San Francisco or of the Board of Governors of the Federal Reserve System
Do house prices respond to non-fundamental variables?

- 3 measures of sentiment from surveys (buyer, lender, builder) are regressed on a typical set of fundamental variables. Residuals from these regressions represent the non-fundamental components of sentiment.
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  ⇒ Evidence of self-reinforcing feedback.
Some related findings in the literature.

**Bubble dynamics and extrapolative expectations:**

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**Self-reinforcing feedback:**

- House prices rose faster in areas where lending standards were weakest, as measured by the prevalence of subprime/exotic mortgages or LTV of first-time home buyers. (Tal 2006, Wheaton and Nechayov 2008, Mian & Sufi 2009, Pavlov & Wachter 2011, Duca, Muellbauer & Murphy 2012).
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- Past house price appreciation in a given area had a significant positive impact on subsequent loan approval rates in area. (Dell’Ariccia, Igan, & Laeven 2011, Goetzmann, Peng, & Yen 2012).
Co-movement of U.S. house prices & sentiment.

- U.S. Ratio of House Price to Annualized Rent
  Source: Lincoln Land Institute

- NAHB Sentiment Index

- Quarterly Real House Price Change
  Source: Lincoln Land Institute

- CST Survey: 1–Yr Expected House Price Change (Average of 4 Cities)
Comparing U.S. house price growth to rent growth.
Bubbles versus rationally low risk premiums. Are the two situations observationally equivalent?

John Cochrane (2009): “... Crying bubble is empty unless you have an operational procedure for distinguishing them from rationally low risk premiums...”
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\[
p_t = d_t + E_t \left( \frac{1}{1+r} \right) p_{t+1}, \quad r = rf + \text{risk premium}
\]

Discount rate = Expected Return

\[
= d_t + E_t \left[ \frac{d_{t+1}}{1+r} + \frac{d_{t+2}}{(1+r)^2} + \frac{d_{t+3}}{(1+r)^3} + \ldots, \quad \frac{d_{t+1}}{d_t} = 1 + g + \epsilon_{t+1} \right]
\]

\[
\frac{p_t}{d_t} = \frac{1}{r-g}, \quad \text{provided } r > g.
\]

A high p-d ratio can be justified by fundamentals if expected return (r) is low because risk premium is low.
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\[ p_t = d_t + E_t \left( \frac{1}{1+r} \right) p_{t+1}, \quad r = r^f + \text{risk premium} \]

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A high \( p/d \) ratio can be justified by fundamentals if expected return \( (r) \) is low because risk premium is low.

Problem with this story: Survey evidence reveals that expected returns are high when \( p/d \) ratios (or price-rent ratios) are high.
Did housing investors expect low future returns in 2005?
Rational model predicts low expected returns at market peaks.

“12-month expectations are fairly well described as attenuated versions of lagged actual 12-month price changes.”
"Our evidence rules out rational expectations models in which changes in market valuations are driven by the required returns of a representative investor."
A typical empirical model of house prices.

Are these fundamental explanatory variables?

Table B2.1. What Determines House Prices in Industrial Countries?
(Summary of empirical results, 1971–2003)

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged dependent variable</td>
<td>Real house price (growth)</td>
</tr>
<tr>
<td>Lagged real house price (growth)</td>
<td>0.521</td>
</tr>
<tr>
<td></td>
<td>[0.030]*</td>
</tr>
<tr>
<td>Reversion</td>
<td></td>
</tr>
<tr>
<td>Lagged housing affordability ratio</td>
<td>-0.144</td>
</tr>
<tr>
<td></td>
<td>[0.021]*</td>
</tr>
<tr>
<td>Fundamentals</td>
<td></td>
</tr>
<tr>
<td>Real disposable income</td>
<td>0.530</td>
</tr>
<tr>
<td>(per capita, growth)</td>
<td>[0.119]*</td>
</tr>
<tr>
<td>Short-term interest rate (percent)</td>
<td>-0.507</td>
</tr>
<tr>
<td></td>
<td>[0.109]*</td>
</tr>
<tr>
<td>Real credit (growth)</td>
<td>0.109</td>
</tr>
<tr>
<td></td>
<td>[0.036]*</td>
</tr>
<tr>
<td>Lagged real stock price (growth)</td>
<td>0.033</td>
</tr>
<tr>
<td></td>
<td>[0.009]*</td>
</tr>
<tr>
<td>Population growth</td>
<td>1.754</td>
</tr>
<tr>
<td></td>
<td>[0.623]*</td>
</tr>
<tr>
<td>Bank crisis</td>
<td>-2.426</td>
</tr>
<tr>
<td></td>
<td>[0.952]*</td>
</tr>
<tr>
<td>Memorandum</td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>524</td>
</tr>
</tbody>
</table>
Comment: bubbles can be driven purely by fundamentals.
References: Froot & Obstfeld (AER 1991) and Lansing (Economic Journal 2010).

\[ p_t = d_t + E_t \left( \frac{1}{1+r} \right) p_{t+1}, \quad \frac{d_{t+1}}{d_t} = 1 + g + \epsilon_{t+1} \]

\[ p_t = p_t^f + p_t^b \]

\[ p_t^f = \frac{d_t}{r - g} \quad \left\{ \begin{array}{c} \Rightarrow p_t = f(p_{t-1}) \\ \Rightarrow p_t = p_{t-1} \exp(\lambda \epsilon_{t+1}) \end{array} \right. \]

\[ \lambda = \pm \sqrt{\frac{2 \log(1+r)}{\Var(\epsilon_{t+1})}} \]

\Rightarrow Authors' methodology may not detect this type of bubble.
Comment: Map to Campbell-Shiller return identity.

\[
R_{t+1} = \frac{p_{t+1} + d_{t+1}}{p_t} = \frac{(p_{t+1} / d_{t+1} + 1) (1 + g_{t+1})}{p_t / d_t}
\]

\[
\log \left( \frac{p_t}{d_t} \right) \approx \kappa_0 + \kappa_1 \log \left( \frac{p_{t+1}}{d_{t+1}} \right) + g_{t+1} - \log \left( R_{t+1} \right)
\]

\[
\approx \kappa_0 + \sum_{j=1}^{\infty} (\kappa_1)^j \left[ g_{t+j} - \log \left( R_{t+j} \right) \right]
\]

\[
\text{Var} \left[ \log \left( \frac{p_t}{d_t} \right) \right] = \text{Cov} \left[ \log \left( \frac{p_t}{d_t} \right), \sum_{j=1}^{\infty} (\kappa_1)^j g_{t+j} \right] - \text{Cov} \left[ \log \left( \frac{p_t}{d_t} \right), \sum_{j=1}^{\infty} (\kappa_1)^j \log(R_{t+j}) \right]
\]

\[\Rightarrow \] Price-rent ratio must predict either future rent-growth or future returns. This motivates the form of forecasting regressions.
Forecasting U.S. housing returns with the price-rent ratio.
Authors use composite sentiment index to forecast future housing returns.

\[
\text{Return}_{t \rightarrow t+j} = \hat{b}_0 + \hat{b}_1 \log \left( \frac{\text{Price}_t}{\text{Rent}_t} \right) + u_{t+1}
\]

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>( j = 2 )</td>
<td>(-0.079^{***})</td>
<td>(-0.099^{**})</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.043)</td>
</tr>
<tr>
<td>( j = 4 )</td>
<td>(-0.180^{***})</td>
<td>(-0.258^{**})</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.043)</td>
</tr>
<tr>
<td>( j = 8 )</td>
<td>(-0.405^{***})</td>
<td>(-0.736^{***})</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.143)</td>
</tr>
</tbody>
</table>

⇒ Higher price-rent ratio predicts lower realized returns. But survey evidence shows that investors fail to take this relationship into account when forming their expectations.
Summary

**Lessons for research:**

- Models with rationally time-varying risk premiums are strongly rejected by empirical evidence from investor surveys.
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- To guard against costly housing bubbles, regulators should enforce prudent mortgage lending standards.
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- To guard against costly housing bubbles, regulators should enforce prudent mortgage lending standards.

- Debt-to-income limits represent a more prudent lending criteria than loan-to-value limits. (Lim et al 2011, Gelain, et al. 2013)