From story in LA Times on December 3, 2006, concerning flattening in real estate bubble. Caption: Forial Zaken celebrates the sale of her Granada Hills home. The 2,100-square-foot house fetched $810,000. The fall realty market calls for realism.
Today’s Market

Year-over-year percentage change in the median price of all homes in Southern California

- Dec. 1989: 10.6%
- Aug. 1990: 0%
- March: 10.7%
- August: 2.7%

Source: DataQuick Information Systems

Los Angeles Times
Median Price as an Index

- Depends on characteristics of houses on market
- Better index based on repeat sales of same houses
- Himmelberg, Mayer, and Sinai, “Assessing High House Prices”
Figure 1
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., BFA, BLS CPI Index-All Urban Consumers.
Rapid Rise in Last Decade

Increase in real housing prices:
Early 1990s trough to 2004

<table>
<thead>
<tr>
<th>City</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nation</td>
<td>40%</td>
</tr>
<tr>
<td>Boston</td>
<td>92%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>90%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>92%</td>
</tr>
<tr>
<td>Chicago</td>
<td>37%</td>
</tr>
<tr>
<td>Washington</td>
<td>63%</td>
</tr>
</tbody>
</table>
Cooling or Decline in Last 4 years

Change in real housing prices:
December 2004 to March 2008

Nation       -13%
Boston       -19%
San Francisco  -20%
Los Angeles   -16%
Chicago       -11%
Washington   -13%
### Other changes in Last 4 years

**Change in real housing prices:**

**December 2004 to March 2008**

<table>
<thead>
<tr>
<th>City</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seattle</td>
<td>+14%</td>
</tr>
<tr>
<td>Portland</td>
<td>+14%</td>
</tr>
<tr>
<td>San Diego</td>
<td>-30%</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>-28%</td>
</tr>
<tr>
<td>Phoenix</td>
<td>-3%</td>
</tr>
</tbody>
</table>
Were Prices Too High?

- **Price-rent ratio**
  - Index of housing prices: constant quality
  - Index of housing rents: constant quality
  - Look at ratio

- **Price-to-income ratio**
  - Index of housing prices: constant quality
  - Index of real income per capita
  - Ratio
Figure 1
Real U.S. House Price Index, Price-to-Rent and Price-to-Income Ratios
(ratios normalized to their 25-year average)

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### Price-to-Rent Ratio

**Increase in price-to-rent ratio:**
Trough to 2004

<table>
<thead>
<tr>
<th>Location</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nation</td>
<td>27%</td>
</tr>
<tr>
<td>Boston</td>
<td>51%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>76%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>44%</td>
</tr>
<tr>
<td>Chicago</td>
<td>32%</td>
</tr>
<tr>
<td>Washington</td>
<td>36%</td>
</tr>
</tbody>
</table>
Were Prices Too High?

- Price-to-income ratio
  - Index of housing prices: constant quality
  - Index of real income per capita
  - Ratio
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Price-to-Income Ratio

Increase in price-to-rent ratio:
Trough to 2004

<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nation</td>
<td>21%</td>
</tr>
<tr>
<td>Boston</td>
<td>60%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>57%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>76%</td>
</tr>
<tr>
<td>Chicago</td>
<td>31%</td>
</tr>
<tr>
<td>Washington</td>
<td>49%</td>
</tr>
</tbody>
</table>
Was It a Bubble?

- Do fundamental economic forces explain high housing prices?
- Or, is it a bubble?
  - Expect high appreciation
  - Willing to pay more now as consequence
  - I expect high appreciation because you do, and vice versa.
  - Mutual self-delusion?
Incorporating Expectations of Capital Gains

- Value of house today is $V_1$
- Mortgage is $\lambda V_1$
- Annual interest payment $i \lambda V_1$
- Maintenance is $M$
- Property tax is $\tau V_1$
- Expected price next year is $V_2$
Homeowner’s Cost-No Taxes

- Out of pocket
  \[i\lambda V_1 + \tau V_1 + M\]
- Opportunity cost of equity
  \[i(1-\lambda)V_1\]
- Capital gains
  \[V_2 - V_1\]
- Cost of owning
  \[i\lambda V_1 + \tau V_1 + M + i(1-\lambda)V_1 - (V_2 - V_1)\]

\[= iV_1 + \tau V_1 + M - (V_2 - V_1)\]
Homeowner’s Cost-No Taxes

- Cost of owning:
  \[ iv_1 + \tau v_1 + M - (v_2 - v_1) \]

- Rate of capital gains:
  \[ g = \frac{(v_2 - v_1)}{v_1} \quad \{v_2 - v_1 = g v_1\} \]

- Maintenance rate
  \[ M = \delta V \]

- Cost of owning
  \[ (i + \tau + \delta - g) v_1 \]
Taxes

- Property tax and interest deductible.
- Opportunity cost net of taxes
- Capital gains not taxed
- Cost of owning

\[((1-t)(i+\tau)+\delta-g)V_1\]
Some Numbers

\( i = 5\%\), \( \tau = 1\%\), \( \delta = 2.5\%\),
\( t = 30\%\), \( V_1 = $500,000 \)

g \hspace{1cm} \text{cost}
0\% \hspace{1cm} $33,500
2\% \hspace{1cm} 23,500
4\% \hspace{1cm} 13,500
6\% \hspace{1cm} 3,500

Note how expectations of appreciation can have a very large effect on cost of owning
Is $500,000 too much?

- Not if expect real capital gains of more than 4%
- Critical role of low interest rates

\[ ((1-t)(i+\tau)+\delta-g)V_1 \]

if \( g > (1-t)(i+\tau)+\delta \), cost is negative
Are Unrealistic Expectations of Capital Gains the Explanation?

- Assume expected capital gain is average growth rate in housing prices from 1940 to 2000
- Calculate cost of homeownership—imputed rent
- Express as ratio of actual rent
- Imputed rent to rent instead of price to rent
### Imputed Rent to Rent

<table>
<thead>
<tr>
<th>City</th>
<th>Peak</th>
<th>Trough</th>
<th>2004</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>1.37</td>
<td>0.67</td>
<td>1.02</td>
<td>60%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>1.52</td>
<td>0.71</td>
<td>0.97</td>
<td>56%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>1.42</td>
<td>0.68</td>
<td>1.03</td>
<td>56%</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.31</td>
<td>0.81</td>
<td>1.01</td>
<td>56%</td>
</tr>
<tr>
<td>Washington</td>
<td>1.24</td>
<td>0.76</td>
<td>1.02</td>
<td>56%</td>
</tr>
<tr>
<td>City</td>
<td>Peak</td>
<td>Trough</td>
<td>2004</td>
<td>2004</td>
</tr>
<tr>
<td>-----------------</td>
<td>------</td>
<td>--------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Boston</td>
<td>1.40</td>
<td>0.72</td>
<td>1.03</td>
<td>60%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>1.45</td>
<td>0.72</td>
<td>0.92</td>
<td>44%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>1.43</td>
<td>0.74</td>
<td>1.07</td>
<td>60%</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.27</td>
<td>0.83</td>
<td>0.96</td>
<td>48%</td>
</tr>
<tr>
<td>Washington</td>
<td>1.32</td>
<td>0.72</td>
<td>1.03</td>
<td>60%</td>
</tr>
</tbody>
</table>
Why Is Price-to-Rent High, But Imputed Rent-to-Rent is not?

- Imputed Rent:
  \[ R = (1-t)(i+\tau + \delta - g)V \]
  This part must be low.
  
  H-M-S call this the user cost.
## User Cost

<table>
<thead>
<tr>
<th>City</th>
<th>Average 2004</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>5.3%</td>
<td>4.0%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>3.7%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>4.4%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Chicago</td>
<td>6.3%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Washington</td>
<td>5.6%</td>
<td>4.4%</td>
</tr>
</tbody>
</table>
Why Is User Cost Low?

- User Cost
  
  \[(1-t)(i+\tau)+\delta-g\]

Lower interest rates?
Figure 3
Real 10-Year Interest Rates

Putting It Together

- Housing prices were high
- Cost of owning is not out of line with rent
- Low real interest rates
The Bigger Lesson

- Housing price is not the cost of owning
- Housing prices can be high, but cost of owning not
- High appreciation is one possibility—is it realistic or fantasy?
- Low interest rates are also a possibility
Explaining the Decline

- As interest rates declined, housing prices rose
- Lenders require less security
  - lower down payments
  - teaser loans
  - subprime loans
- When decline in interest rates halted, decline in prices halted
- Loans no longer so secure
- Defaults. Further decline
Next Time

- Edward Glaeser, “Are Cities Dying?”
- Daily question: A special treat for you!
- Our last class