Real Estate Derivatives

May 18, 2007
“Derivatives 2007” NYU Stern School

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U.S. Housing: An Incomplete Market

Until very recently...

Direct investment/hedging limited to buying/selling houses

- Transaction friction & constraints
  - Limited Liquidity
  - Costly and Slow
  - Impossible to short
  - Difficult to diversify
Sizing-Up Housing as a Financial Market

- Scale
- Conditions
- Reliable Price Measurement
- Emerging Products
- Stakeholders
Market Scale
The United States at night

$22.8 Trillion
## Unique Performance: US Housing vs. Other Assets

*(Quarterly, 2006)*

<table>
<thead>
<tr>
<th></th>
<th>1 YEAR</th>
<th>10 YEAR</th>
<th>20 YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correlation</td>
<td>Return</td>
<td>Volatility</td>
</tr>
<tr>
<td>S&amp;P/CSI</td>
<td>N/A</td>
<td>-0.54%</td>
<td>0.59%</td>
</tr>
<tr>
<td>JP Morgan Gov't Bond Index</td>
<td>N/A</td>
<td>6.01%</td>
<td>1.69%</td>
</tr>
<tr>
<td>GSCI Total Return Index</td>
<td>N/A</td>
<td>-15.10%</td>
<td>7.79%</td>
</tr>
<tr>
<td>NARIET Price Index</td>
<td>N/A</td>
<td>22.73%</td>
<td>4.80%</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>N/A</td>
<td>11.09%</td>
<td>3.61%</td>
</tr>
</tbody>
</table>
S&P/Case-Shiller Composite (10-City) Home Price Index Jan 1987-Feb 2007
S&P/Case-Shiller 12-Mo. Growth Rate of Home Prices Jan 1988 to Feb 2007

Peak July 2004: 20.5%
NAHB Traffic of Prospective Buyers and S&P CSI Composite Home Price Increase
Boston: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence Index
Chicago: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence

Date

Real Index


Price
Rent
Denver: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence Index

Denver Homes

Date


Real Index

0 20 40 60 80 100 120 140 160

Price
Rent

innovative products for investment and risk management

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Las Vegas: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence

Las Vegas Homes

Date

Real Index


Price
Rent
Los Angeles: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence

Los Angeles Homes

Date


Real Index

0 50 100 150 200 250 300

Price Rent
Miami: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence Index
New York: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence Index

New York Homes

<table>
<thead>
<tr>
<th>Date</th>
<th>Real Index</th>
<th>Price</th>
<th>Rent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>350</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
San Diego: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence Index

San Diego Homes

Date

Real Index

0 50 100 150 200 250 300


Price
Rent
San Francisco: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence Index
Washington DC: S&P/Case-Shiller Home Price Index And BLS Rent of Primary Residence Index
Residential Investment/GDP (%) 1929-2006
Real Home Price Index 1929-2006
Compare OFHEO Indices – Short Sample Ending 2006-IV
Recent NAR Median Home Price (Ending Feb 2007)
Market Conditions

- Mounting Supply, Cancellation Rates
- Diminishing Sales
- Tightening Loan Underwriting
- Subsiding Speculation
- Uncertain Price Appreciation
- Changing Psychology

"The adverse publicity surrounding the sub-prime market has further damaged home buyers' psychology"

- Hovnanian Enterprises, May 4, 2007
Reliable Price Measurement

S&P / Case-Shiller® Home Price Indices
Emerging Products: CME Housing Futures & Options

CME Alternative Investment Products

CME Housing Futures and Options

OVERVIEW: CME Housing futures and options are the first comprehensive financial tools that make it possible to trade U.S. real estate values. These products provide opportunities for protection or profit in up or down markets, and extend to the housing industry the same tools for risk management and investment that previous CME innovations have brought to agriculture and finance.

CONTRACTS
Based on the S&P/Case-Shiller Home Price Index, CME housing futures and options are cash settled to a weighted composite index of U.S. real estate prices, as well as to specific markets in large U.S. cities.

<table>
<thead>
<tr>
<th>City</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>Boston</td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
</tr>
<tr>
<td>Denver</td>
<td>Denver</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>Las Vegas</td>
</tr>
<tr>
<td>San Diego</td>
<td>San Diego</td>
</tr>
<tr>
<td>San Francisco</td>
<td>San Francisco</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>Los Angeles</td>
</tr>
<tr>
<td>Washington D.C.</td>
<td>Washington D.C.</td>
</tr>
</tbody>
</table>

BENEFITS OF TRADING CME HOUSING

- A new means of risk transfer to a broad range of investors
- Loss or gain exposure to real estate values without direct ownership of properties
- Access to a unique asset class
- Opportunity to profit from a movement in housing prices
- A way to make trading in real estate a short-term and liquid investment

HOME PRICES VS. MORTGAGE RATES

CME housing futures and options have the potential for fostering stability in the housing industry.

MARKET PARTICIPANTS

- Businesses whose profits or losses are related to any area of the housing industry
  - property and real estate developers
  - banks
  - mortgage lenders
  - home suppliers

- Businesses seeking exposure to an unrelated asset class
  - hedge funds
  - commodity trading advisors (CTAs)
  - pension funds
  - foreign investors

“Financial Engineering comes to real estate at last, and the housing market will never be the same.” - Barron’s 5.15.06
# Emerging Products: CME Housing Futures & Options

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>168.28</td>
<td>-0.62%</td>
<td>-1.81%</td>
<td>-3.83%</td>
<td>-4.90%</td>
</tr>
<tr>
<td>Chicago</td>
<td>167.54</td>
<td>-0.54%</td>
<td>-1.25%</td>
<td>-2.09%</td>
<td>-3.16%</td>
</tr>
<tr>
<td>Denver</td>
<td>135.86</td>
<td>-1.08%</td>
<td>-2.71%</td>
<td>-3.60%</td>
<td>-4.64%</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>230.52</td>
<td>-0.63%</td>
<td>-2.28%</td>
<td>-3.85%</td>
<td>-5.50%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>268.67</td>
<td>-0.54%</td>
<td>-2.11%</td>
<td>-3.09%</td>
<td>-4.29%</td>
</tr>
<tr>
<td>Miami</td>
<td>279.42</td>
<td>-0.51%</td>
<td>-1.59%</td>
<td>-3.73%</td>
<td>-4.66%</td>
</tr>
<tr>
<td>New York</td>
<td>211.50</td>
<td>-0.04%</td>
<td>-1.08%</td>
<td>-3.27%</td>
<td>-4.12%</td>
</tr>
<tr>
<td>San Diego</td>
<td>237.16</td>
<td>-0.74%</td>
<td>-2.10%</td>
<td>-3.88%</td>
<td>-5.32%</td>
</tr>
<tr>
<td>San Francisco</td>
<td>211.77</td>
<td>-0.46%</td>
<td>-1.32%</td>
<td>-3.12%</td>
<td>-4.17%</td>
</tr>
<tr>
<td>Washington, DC</td>
<td>238.05</td>
<td>-0.61%</td>
<td>-1.95%</td>
<td>-3.97%</td>
<td>-5.15%</td>
</tr>
<tr>
<td>Composite-10</td>
<td>220.90</td>
<td>-0.70%</td>
<td>-2.06%</td>
<td>-3.61%</td>
<td>-4.79%</td>
</tr>
</tbody>
</table>

* Released April 24, 2007

** Futures Prices as of May 4, 2007

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** Implied Premium/Discount in Futures Market**

- **Emerging Products:** CME Housing Futures & Options
CME Futures Discounts

July 2006-Feb 2007

S&P/Case-Shiller Indexes - February 2007 Futures Prices v. Index Levels

-6%  -5%  -4%  -3%  -2%  -1%  0%  1%  2%  3%


Boston  Chicago  Denver  Las Vegas  Los Angeles  Miami  New York  San Diego  San Fran  Wash DC  Comp-10
Emerging Products: CME Housing Futures & Options

S&P/Case-Shiller Composite-10: Expected Change Within One Year, by Trading Day: Through May 4, 2007

*Data derived from the asking price of the long-dated CME futures contract and prevailing S&P/Case-Shiller Home Price Index level on each trading day.*
Emerging Products

OTC Swaps

<table>
<thead>
<tr>
<th>Party</th>
<th>Counterparty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay: S&amp;P/CSI Return</td>
<td>Receive: S&amp;P/CSI Return</td>
</tr>
<tr>
<td>Receive: Negotiated Interest Rate</td>
<td>Pay: Negotiated Interest Rate</td>
</tr>
</tbody>
</table>

- Hedge Housing Exposure / **Bearish Housing** View
- Gain Housing Exposure / **Bullish Housing** View

innovative products for investment and risk management
Emerging Products

- Futures & Options
- Forwards
- Swaps
- Index-Linked Notes
- Exchange-Traded Securities
- New Mortgage Contracts
- New Insurance Contracts
## Stakeholders

<table>
<thead>
<tr>
<th>Longs</th>
<th>Shorts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks</td>
<td>Banks</td>
</tr>
<tr>
<td>Dealers</td>
<td>Dealers</td>
</tr>
<tr>
<td>Developers and Home Builders</td>
<td>Developers and Home Builders</td>
</tr>
<tr>
<td>Pension Funds</td>
<td>GSFs</td>
</tr>
<tr>
<td>Hedge Funds</td>
<td>Hedge Funds</td>
</tr>
<tr>
<td>Individual Investors</td>
<td>Individual Investors</td>
</tr>
<tr>
<td>Insurance Companies</td>
<td>Mortgage Insurance Companies</td>
</tr>
<tr>
<td>Mutual Funds</td>
<td>Mortgage Lenders / Originators</td>
</tr>
<tr>
<td>REITs</td>
<td>REITs</td>
</tr>
</tbody>
</table>
Stakeholders will more closely monitor, re-evaluate housing stakes based upon the “news of the day”

• Building permits
• Consumer confidence
• Federal Reserve Board policy
• Home Sales - new and existing
• Housing starts
• Inflation
• Interest rates
• Job creation/unemployment

• Mortgage applications
• NAHB Housing Market Index
• NAR Pending Sales
• Housing-related company news
  (home builders, raw materials, construction equipment, etc.)
• Regional economic differences
• Sales/inventory ratios
• Tax laws
Stakeholders

March 27 (Bloomberg) -- The U.S. currency weakened as a private survey showed the price of homes in 20 U.S. metropolitan areas fell in January for the first time in at least six years and a Federal Reserve report showed a regional decline in manufacturing this month.

March 28 (Bloomberg) -- Asian stocks dropped for a second day, led by companies that sell to the U.S. after consumer confidence and home prices declined in the region's largest export market.

“Automakers and technology companies rely on sales in North America so the current uncertainty over the U.S. economy is pushing the shares lower,” said Junichi Misawa, who oversees $655 million at STB Asset Management Co. in Tokyo. In Japan, the Nikkei 225 Stock Average fell 0.6 percent, erasing gains of as much as 0.5 percent, while the broader Topix index slid 0.7 percent. All other markets fell, apart from in China. India's Sensitive Index slid 1.8 percent, the most in the region.

U.S. stocks posted their steepest losses in two weeks as economic reports added to concern a housing crisis will dent growth.
Concluding Thoughts

Creating Efficiency

- Price discovery in derivatives markets will have a positive effect on the cash market
- Greater efficiency in the cash market will reduce the impact of the real estate cycle on the overall business cycle
- Property derivatives will broaden investor base and add significant liquidity to the asset class