A Few Thoughts on
Asset Bubbles & Interest Rates

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Some Thoughts on Bubbles & Rates: Agenda

► Real Estate & Asset Bubbles:
  ▪ Long history of asset bubbles
  ▪ Rationalizing “bubbles”
  ▪ Impact on risk & return
  ▪ The volatility of land values
  ▪ Who cares & why?

► Interest Rates in a Historical Context:
  ▪ Near all-time lows
  ▪ Cap rates v. interest rates
  ▪ Spreads to Treasuries – varying with LTV & time

► Interest Rates in a Forward-Looking Context:
  ▪ Today’s yield curve → implications for tomorrow’s rates
  ▪ Consensus view on tomorrow’s interest rates
  ▪ Consensus view on tomorrow’s inflation rates
  ▪ Consensus is often wrong → cautionary note
Is CRE in “Bubble” Territory?

• How should we view the level of CRE prices?

Source: Green Street Advisors, Commercial Property Price Index, October 6, 2015.
“Bubbles” ← Easy to Spot, After They Bust

• Finance has a long history of asset bubbles, dating as far back as at least:
  – 1637: Dutch tulip mania
  – 1711: British South Sea bubble
  – 1763: Mississippi Land Company

• But, of course, bubbles are easily spotted after they burst!

• Before they burst, there are simply disagreements about the likely path of future prices.

• This is the essence of any debate about current prices:

  ⇒ Have prices strayed too far from some sense of “fundamental” value?
The Debate About Asset Prices

- In finance (real estate or otherwise), the debate about asset prices generally falls into three possible explanations:

1. **“This time is different”** – there has been a shift in some underlying structural factor(s) [e.g., globalization, legislation, socio-economic, political, *etc.*].

2. **“Noise”** – simply some random fluctuations (with the mistaken impression of trend).

3. **“Animal spirits”** – a pattern, driven by excessive optimism (a “bubble”) or pessimism, which is about to reverse itself.
More Recent Examples ← Where Were You?

• Let’s consider three more-recent examples:
  – Late 1990s: San Francisco office rents
  – Mid 2000s: Home prices
  – Late 2000s: Commercial real estate prices

• As you look at these examples, candidly ask yourself:
  ⇒ Did you recognize the bubble before it burst?

• If so, did you have the (financial) courage to act on it?

• Acting on the recognition of the bubble can take two forms:
  1. Avoidance of over-priced assets ← risk-averting strategy
  2. Exploit the over-priced assets ← risk-seeking strategy

Using volatility to your advantage. As one example, consider the brilliance and the guts displayed in *The Big Short* in which certain hedge-fund managers: a) recognized the bubble in home prices, b) understood the exposure in the junior tranches of sub-prime debt and c) invented credit-default swaps on these junior tranches. [CDS existed previously, but not on sub-prime debt.]
• Consider the predicament of office-building investors in the late 1990s:
  – The “dot.com” market is booming.
  – Northern California is the epicenter of the dot.com revolution.
  – San Francisco is particularly challenging from a supply/construction perspective (hilly peninsula jutting into the ocean, earthquakes, etc.).
  – “Sticky” supply v. variable demand
     ⇒ Particularly prone to boom-&-bust cycles
  – Effective rents increase:
     – by ~100% in 3 years and
     – increase by ~50% in 1.5 years:
     ⇒ How to underwrite?
San Francisco Office Rents → Values

Effective Rents in San Francisco's Financial District

Effective Rents per Square Foot

- Rents increase ~100% in 3 years
- Rents increase ~50% in 1.5 years

How would you have underwritten lease rental rates upon rollover?

dot.com mania is in full bloom!

Source: Torto Wheaton Research and Instructor's Calculations
Effective Rents in San Francisco's Financial District

In less than 1.5 years, rents fall to levels of 5.5 years earlier.

Clearly, this behavior plays HAVOC with your underwriting!

the bloom is off the bud!

Source: Torto Wheaton Research and Instructor's Calculations
U.S. Home Prices – Perhaps the Best-Known Example

Path of Real Home Prices and Building Costs as well as Population and Interest Rates from 1890

Source: Robert Shiller | *Irrational Exuberance* and Instructor's calculations.
U.S. Home Prices – Deviation from the Trend → Bubble?

Path of Real Home Prices and Building Costs as well as Population and Interest Rates from 1890

I’d suggest that one potential sign of increased risk, if not a bubble, is a significant deviation from the trend.

\[ y = 0.5078x - 884.71 \]

\[ R^2 = 0.5455 \]

Source: Robert Shiller | *Irrational Exuberance* and Instructor's calculations.
"Bubble" Growth and Subsequent Decline for Certain US Housing Markets for the Period 2000 through 2012

The "boom" ↑

The “bust” ↓

Net appreciation rate of 0% per annum

Net appreciation rate of 2.5% per annum

Net appreciation rate of 4% per annum

Of course, national averages conceal substantial variation by market

- U.S. Home Prices → Market-Level Booms & Busts
- "Bubble" Growth and Subsequent Decline for Certain US Housing Markets
- for the Period 2000 through 2012

Cities included:
- Atlanta
- Boston
- Chicago
- Cleveland
- Detroit
- Denver
- Miami
- Minneapolis
- New York
- Orlando
- Phoenix
- Portland
- San Diego
- San Francisco
- Seattle
- Tampa
- Washington
- Las Vegas

The "boom" ↑

The “bust” ↓
What About U.S. Commercial Real Estate Prices?

NCREIF Index: Market Values, Rescaled NOI and Capitalization Rates Based on a $100 Investment for the Period 1978 through 2014

Property values
fall by ~ 25%
over 3 years

Property values
fall by ~ 35%
over 2 years

Will property values fall precipitously again?
Greenspan’s Definition of a Bubble

“...I define a bubble as protracted period of falling risk aversion that translates into falling capitalization rates that decline measurably below their long term trendless averages. Falling capitalization rates propel one or more asset prices to unsustainable levels. All bubbles burst when risk aversion reaches its irreducible minimum, i.e., credit spreads approaching zero, though analysts’ ability to time the onset of deflation has proved illusive.” {emphasis added}

Land Values Are the Most “Bubblicious” of All

Path of Real Home Prices and Building Costs as well as Population and Interest Rates from 1890

Land values are essentially a call option on future development opportunities. As such, they are more volatile than the property values themselves.

For convenience, let’s use the earlier home-price data.

Consider the differences between home prices and building costs as a proxy for land values:

\[ \sigma_{\text{Homes}} = 7.3\% \quad \text{v.} \quad \sigma_{\text{Land}} = 18.8\% \]

\[ \rho_{\text{Homes, Land}} = 73.3\% \]

Source: Robert Shiller | *Irrational Exuberance* and Instructor's calculations.
Replacement-Cost Fallacy = \( f(\text{Land Value Volatility}) \)

- There is an optionality value embedded in land values.
- The value of this option is extremely volatile.
- Consider the typical replacement cost analysis:
  
  \[
  \begin{array}{c|c}
  \text{Property Value} & < \\
  \hline
  \text{Land Value} & + \\
  \text{Replacement Cost of the Improvements} & \\
  \end{array}
  \]

- Properties acquired (or developed) during the bubble (almost) always illustrate this inequality
- If you disagree, how many deals lost in investment (or loan) committee because:

  \[
  \text{Property Value} > \text{Land Value} + \text{Replacement Cost of the Improvements}
  \]
Replacement-Cost Fallacy → Deals Done before the Crash

- But, when the bubble bursts, land values crash and the inequality is reversed!

\[ \text{Property Value} > \text{Land Value} + \text{Replacement Cost of the Improvements} \]

In a crash, land values approach zero

- Consider the performance of various high-profile deals following the crash:

  - AMLI announces Morgan Stanley’s bid (8-05)
  - Carr America announces Blackstone’s bid (2-06)
  - EOP announces Blackstone’s bid (11-06)
  - Archstone announces Tishman’s bid (5-07)
Illustration of Changing Risk/Return Continuum as Bubble Concerns Mount

Increased apprehension over the magnitude of a potential bubble leads to a worsening risk/return continuum.

How far the continuum moves reflects your degree of apprehension.

If a sufficient number of market participants share your apprehension, prices will drop such that the initial risk/return continuum is restored.

You are, of course, free to “bet” against the market's consensus view.

Markets generally observe a “flight to quality” during / after a downturn.

Overheated markets generally observe a flattening of risk premium.
Commercial real estate differs from many other assets in that the “crash” generally does not push asset values to zero (v. dot.com stocks being vaporized). Instead, changing property values can be considered as deviations around a trend:

- This sort of analysis is not meant to be conclusive about future CRE pricing. Clearly, expected returns on other assets influence the pricing of CRE – as does the path of interest rates (see next section). Instead, this analysis is meant to simply illustrate CRE’s pricing volatility.
• If you are a long-term, low-levered CRE investor, these deviations matter little.

• So, these asset bubbles matter more to:
  
  ▪ Long-term, high-levered investors – particularly those with short-term debt maturities (e.g., Macklowe’s EOP | Manhattan*) and/or poorly laddered maturities (e.g., pre-crash GGP v. SPG).

  ▪ Short-term investors (e.g., value-add & opp funds, developers, etc.).

  ▪ High-leverage, high-yield lenders – particularly those with levered balance sheets (e.g., Blackstone mortgage REIT, Colony Capital debt funds, etc.).

  ▪ Government agencies (e.g., Fannie, Freddie, HUD, Fed, etc.):
    o with exposure to high-leverage borrowers, and
    o who become the “lenders of last resort” in a downturn.

* Aggravated by $1 billion recourse bridge loan.
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Some Historical Context

Historical Path of Treasury Bond Interest Rates
1-, 10- and 30-year Maturities for the Period 1954 to YTD 2015

Note: The 30-year bond series begins in 1977, but was discontinued for four years (2002-2006).

Source: Federal Reserve Bank of St. Louis | Board of Governors of the Federal Reserve System
Investors’ Concern: Fat Right-Side Tail

Stylized Comparison of Current Interest Rate to History of Long-Term Interest Rates

Current Long-Term Interest Rate

Stylized History of Long-Term Interest Rates
Valuations & Interest Rates

• Some investors naively assume:
  
  • Interest Rates ↑ ⇒ Asset Prices ↓

• However, a change in interest rates = f(●):
  
  • a change in inflation expectations, and/or

  • a change in the real return requirement.

• These two factors can have very different impacts on asset values:
  
  • Inflation ↑ ⇒ Interest Rates ↑ ⇒ Asset Prices ↑

  • Real Return ↑ ⇒ Interest Rates ↑ ⇒ Asset Prices ↓

**Inflationary increases may be favorable for real estate**

**Real return increases may be unfavorable for most all asset classes, including real estate**
A comparison of cap rates & cash-flow yields v. 5-year Treasury rates:

Comparison of 5-year US Treasury Rates to NCREIF Cap Rates & Cash-Flow Yields for the Quarterly Periods 1979-2014

A “noisy” relationship!
A comparison of cap rates & cash-flow yields v. 5-year Treasury rates:

Comparison of 5-year US Treasury Rates to NCREIF Cap Rates & Cash-Flow Yields for the Quarterly Periods 1979-2014

You can find instances of all four combinations!
History: Interest Rates v. Current Return

- The differential highlights that these are fundamentally different securities:

Comparison of 5-year U.S. Treasury Rates to NCREIF Cash-Flow Yields for the Quarterly Periods 1979-2014

Of course, we should be comparing cash to cash (i.e., Treasury yields v. CRE’s (unlevered) cash-flow yield).

The spread reflects:
1. the expected growth in CRE’s future cash flows, less
2. the difference in the expected real returns between CRE and Treasuries.

Note: Some investors like to invert this relationship – as it suggests positive or negative (cash-flow) leverage.
Conceptual: Interest Rates v. Current Return

• What does the difference ($\delta$) between bond rates ($i/P_0$) and real estate’s cash-flow yields ($CF_1/P_0$) imply?

• Fundamentally, this is a comparison between a fixed-rate, nominal-yield security with a variable-rate, real-yield security.

• More specifically, the difference equals:

\[ \delta = g - (r_{RE} - r_{TB}) \]

• expected RE’s growth ($g$) in cash flow less

• the difference in:
  - RE’s expected real return ($r_{RE}$), and
  - Treasury bonds’ expected real return ($r_{TB}$).
Illustration: Interest Rates v. Current Return

• As an illustration, assume:
  • bond rates \((i/P_0) = 2.0\%\)
  • real estate’s cash-flow yields \((CF_1/P_0) = 5.0\%\)

• \(\therefore\) the observed difference \((\delta) = 2.0\% - 5.0\% = <3.0\%\>

• Further assume:
  • real estate’s expected cash-flow growth \((g) = 1.5\%\)
  • real estate’s real return \((r_{RE}) = 5.0\%\),
  • Treasury bond’s real return \((r_{TB}) = 0.5\%\)

• \(\therefore\) the implied difference \((\delta) = 1.5\% - (5.0\% - 0.5\%) = <3.0\%\>

• Also assumes that RE’s growth rate equals the inflation rate \((g = \rho)\)
Illustration: Interest Rates v. Current Return

Illustration of Observed and Implied Spreads:
Interest Rate v. Cash-Flow Yields

Observed Spread: \( \delta = \frac{i}{P_0} - \frac{CF_1}{P_0} \)

Implied Spread: \( \delta = g - (r_{RE} - r_{TB}) \)

These are unobservable
An Aside: The Path of TIPS Rates

TIPS Yields of Varying Maturities
Quarterly Data from to 2003 to Present

Note: TIPS were first auctioned in 1997. In 2009, 20-year TIPS were discontinued in favor of 30-year TIPS. Treasury now offers 5-, 10-, and 30-year TIPS.
An Aside: The Path of TIPS Rates

TIPS Yields of 5-Year Maturities
Quarterly Data from to 2003 to Present

Given the 2007-08 financial crisis, the historical average may not be reflective of the equilibrium level.

Historical Average
The historical average 5-year TIPS yield is ~0.68%
Technical: Interest Rates v. Current Return

• Before considering the difference (δ) between bond rates (i/P₀) and real estate’s cash-flow yields (CF₁/P₀), we need two relationships:

• The nominal (k) and real (r) returns on any asset are linked by:

\[ k = (1 + r)(1 + \rho) - 1 \]

• where inflation (\(\rho\)) is the link between nominal and real returns.

• The total (nominal) return on real estate is given by:

\[ k_{RE} = \frac{CF_1}{P_0} + g \]

• This assumes constant cap rates.

• Let’s use these relationships to examine δ
Technical: Interest Rates \( \nu \). Current Return (continued)

• Consider:

\[
\delta = \frac{i}{P_0} - \frac{CF_1}{P_0}
\]

Recall: \( k_{RE} = \frac{CF_1}{P_0} + g \Rightarrow \frac{CF_1}{P_0} = k_{RE} - g \)

Rewrite such that \( k = (1+r)(1+\rho) - 1 \)

\[
= \left(1 + r_{TB}\right)(1+\rho) - 1 - \left[ \left(1 + r_{RE}\right)(1+\rho) - 1 - g \right]
\]

Eliminate & collect terms

\[
\approx g - \left( r_{RE} - r_{TB} \right)
\]
Mortgage Interest Rates

- Of course, mortgage interest rates are priced at a spread to Treasuries:

![Illustration of the Cost of Indebtedness as $f(LTV)$ for a Given Maturity Date](chart)

- We borrow at a spread to Treasuries
These Spreads Are Also Volatile

• Lending spreads: generally, a poor predictor of future asset return & volatility:

Estimates of the Annual Interest Rate at Various Leverage Ratios

- Interest Expense at 75% LTV
- Interest Expense at 50% LTV
- Interest Expense at 25% LTV

Structural Differences ($\gamma$)

Risk-free Rate
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• The “expectations theory” of future interest rates:

\[
(1 + 0.02) (1 + x) = (1 + 0.025)^2 \implies x \approx 0.03
\]

Then:
- The implied one-year interest rate in one year is expected to be ~ 3.0%

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>2.0%</td>
</tr>
<tr>
<td>2 years</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

• That is, bond investors are assumed to be indifferent between:

| Holding the 1-year security and “rolling over” to 1-year security in the second year | Holding the 2-year security to maturity |

• This approach can be extended to the entirety of today’s yield curve
Today’s Yield Curve

Estimated Yield Curve for U.S. Treasury Rates as of November 2, 2015

An upward-sloping yield curve implies a rise in future interest rates.

Sources: U.S. Department of the Treasury and Citadel Realty’s calculations.
Market’s View of Expected Future One-Year Rates

Current and Implied Forward One-Year Treasury Rates as of November 2, 2015

The consensus view suggests that the 1-year Treasury rate rises, by more than 245 bps, to ≈ 2.85%
Market’s View of Expected Future Five-Year Rates

Current and Implied Forward Five-Year Treasury Rates as of November 2, 2015

The consensus view suggests that the 5-year Treasury rate rises, by more than 130 bps, to ≈2.85%.
The consensus view suggests that the 10-year Treasury rate rises, by more than 75 bps, to ~2.95%
Today’s Yield Curve → Expected Inflation

Implied Inflation Rates Based Upon U.S. Treasury Rates and TIPS Yields as of November 2, 2015

The consensus view suggests that the inflation rates rise to ≈ 1.65%

Source: U.S. Department of the Treasury and Instructor's calculations.
Caveat: Market’s View Is Often Wrong

This “hairy” chart illustrates the divergence between actual and expected.
This chart also illustrates the divergence between actual and expected. Market-predicted LIBOR rate exceeded the actual by 73 bps, on average.
A Similar Perspective: Long-Term (10-Year) Treasuries

Cautionary Note

• If you are really good at forecasting future interest rates:
  – Get out of the real estate business
  – Get into the bond-trading business
    ⇒ Sit in your pajamas,
    ⇒ trade from home for < 1 hour/day, and
    ⇒ hit the beach (golf course, bike trails, *etc.*) the rest of your day!