Topics for Today

1.) Some Pictures (Bubbles?)

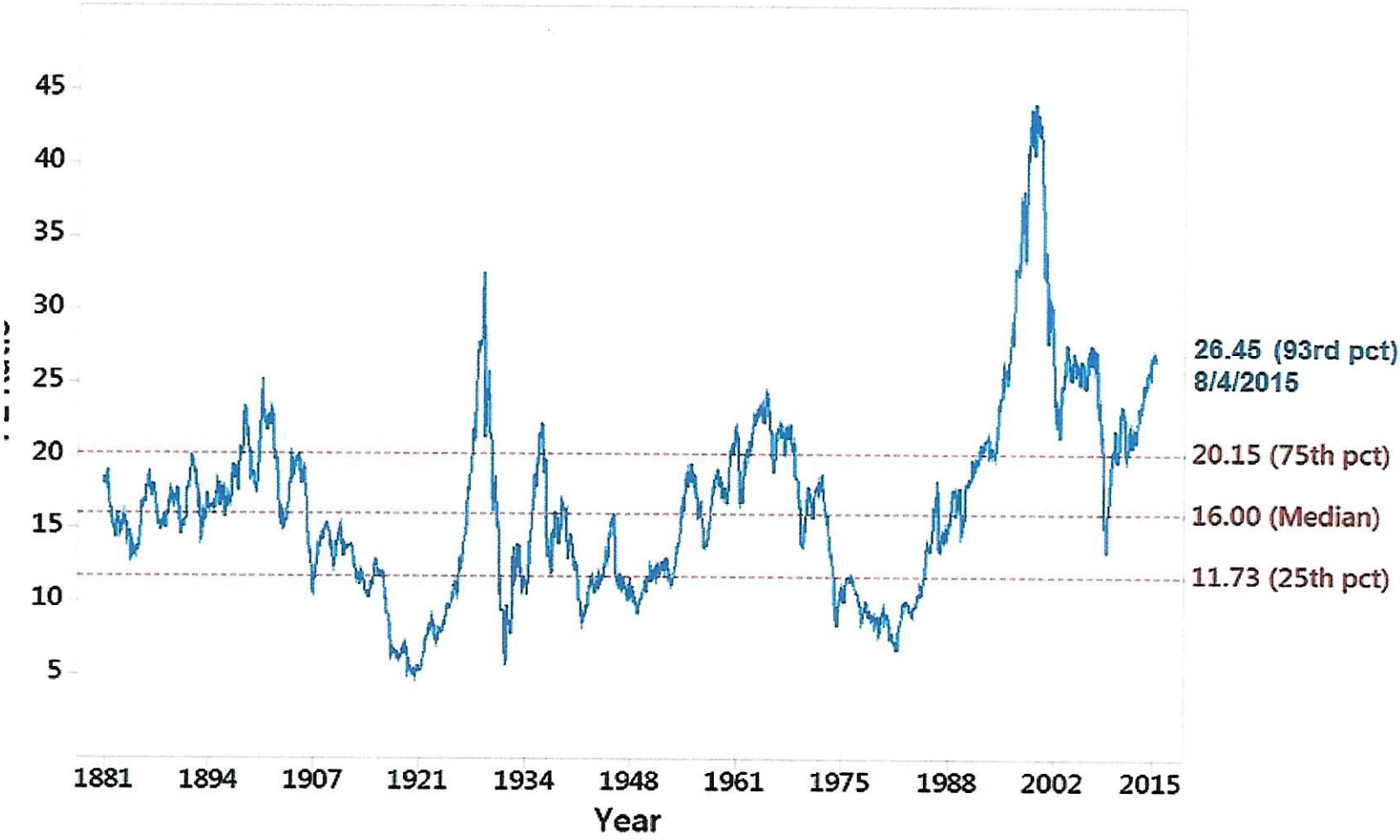
2.) Other Examples

3.) Rational Bubbles

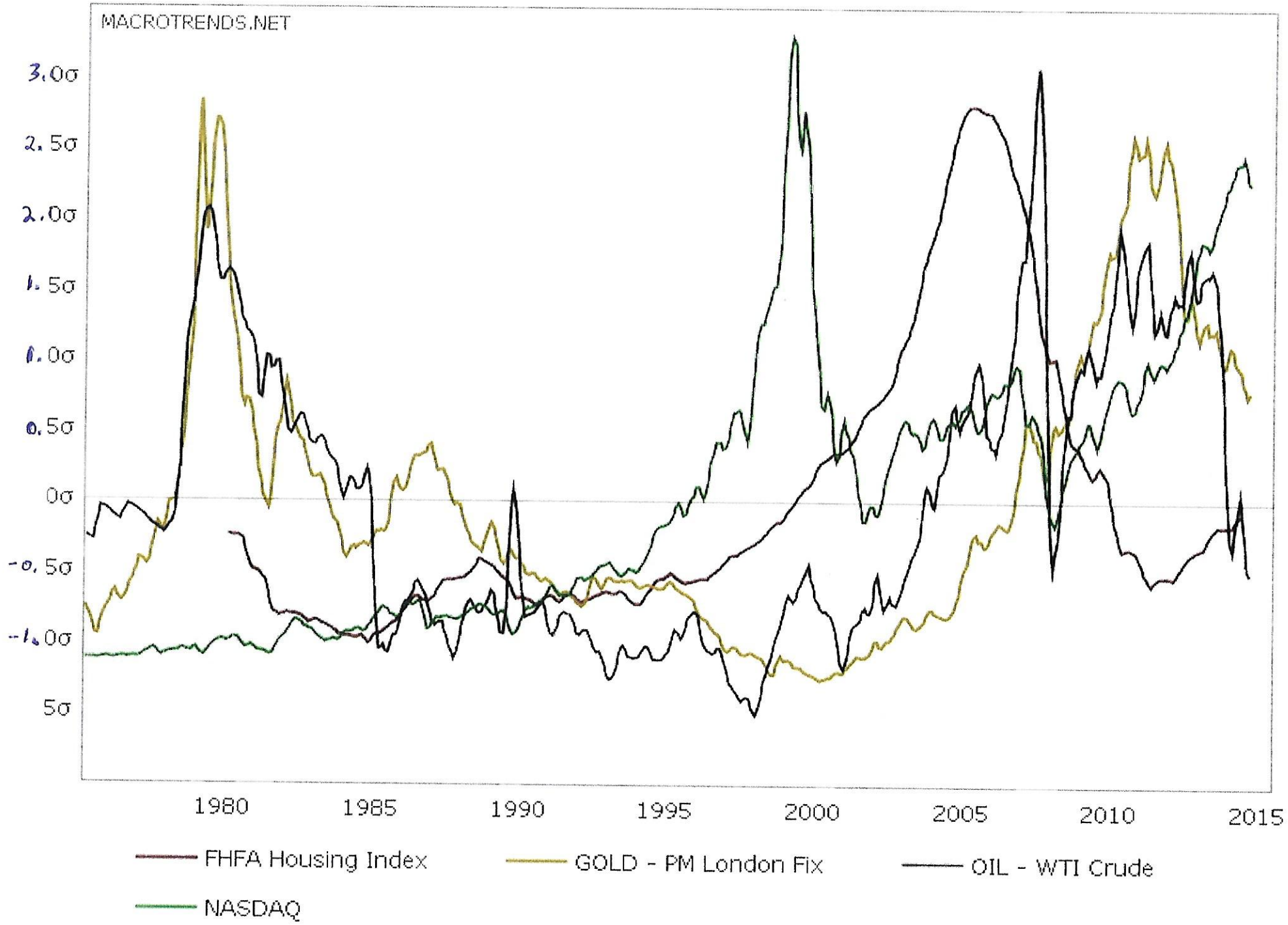
4.) Problems with Rational Bubble Theories

5.) Heterogeneous Beliefs + Speculative Trading
   - Harrison + Kreps (1978)

S&P 500 Price Earnings Ratio (CAPE)



urce Data: Robert Shiller (Cyclically Adjusted PE Ratio or CAPE).


MACROTRENDS.NET
3.0σ
2.5σ
2.0σ
1.5σ
1.0σ
0.5σ
0σ
-0.5σ
-1.0σ
5σ
1980
1985
1990
1995
2000
2005
2010
2015
FHFA Housing Index
GOLD - PM London Fix
OIL - WTI Crude
NASDAQ

SSE Composite Index (000001.SS) ★ Watchlist

3,414.02 +97.32(+2.93%) Shanghai - As of 12:11AM EST

Other Examples (?)

1.) Tulipmania (1637)

2.) Mississippi (France) + South Sea (Britain) Bubbles (1720)

3.) Railroads (1840's Britain, 1870's-90's USA)

4.) "Roaring '20's"

5.) Japan (1980's)

6.) Dotcom Boom (1990's)

- Note, most of these events coincided with the introduction of some new financial or technological innovation, or the opening of some new market.

Rational Bubbles

- Bubbles might well reflect "irrational exuberance" or they might be due to fraud and market manipulation. However, they might also be perfectly rational. Here's why,

- Consider the following (risk-neutral) asset-pricing equation,

$$P_t = \beta E_t (P_{t+1} + d_{t+1})$$

- What's the solution? As always (at least for linear functional equations)

General Solution = Particular Solution + Homogeneous Solution

- We can obtain the particular solution by a "guess & verify" strategy (i.e., "method of undetermined coefficients").

- Suppose $d_{t+1} = \alpha d_t + \varepsilon_{t+1}$. Note, this implies $E_t d_{t+1} = \alpha d_t$. Given this, let's guess

$$P_t = G d_t$$

where G is to be determined.

- With this guess, $E_t P_{t+1} = G \alpha d_t$. Sub this in gives,

$$G d_t = \beta(G\alpha + \alpha) d_t$$

$$\Rightarrow \quad G = \frac{\beta\alpha}{1 - \beta\alpha}$$

- The particular solution, $P_t = \frac{\beta\alpha}{1-\beta\alpha} d_t$ is often called the "fundamental solution", since it depends on economic fundamentals.

- Write the General Solution as,

$$P_t = f_t + B_t$$

where f_t is the fundamental solution, and B_t solves the following homogeneous equation,

$$P_t = \beta E_t P_{t+1} \quad \text{> Homogeneous Equation}$$

- Now consider the process,

$$B_t = \frac{1}{\beta} B_{t-1} + V_t$$

where V_t is any "martingale difference" sequence (i.e, $E_t V_{t+n} = 0$). Subbing this into the homogeneous eq.

$$B_t = \beta E_t B_{t+1} = \beta\left(\frac{1}{\beta}\right) B_t = B_t \; !$$

Hence, $\boxed{B_t = \frac{1}{\beta} B_{t-1} + V_t}$ solves the homogeneous equation. It is a "rational" solution to the asset pricing equation

- Note, $\beta < 1 \Rightarrow \frac{1}{\beta} > 1$, so the B_t solution is explosive. Therefore, it is often called a bubble.

- Although an explosive bubble that goes on forever seems empirically implausible, consider the following example of a <u>collapsing bubble</u> [Blanchard 1979]

$$B_{t+1} = \frac{1}{\rho\pi} B_t + V_{t+1} \quad \text{w.p. } \pi$$

$$= V_{t+1} \quad \text{w.p. } (1-\pi)$$

Note that $E_t B_{t+1} = \frac{1}{\rho} B_t$ just as before.

The more likely the bubble is to collapse, the faster it must rise before it collapses.

Problems with Rational Bubble Theories

1.) Sometimes Transversality Conditions rule them out, (e.g., ∞-horizon, optimizing models of real assets).

2.) By backward induction, rational bubbles cannot occur with finite maturity assets.

3.) Rational bubbles generate no trading volume. In practice, bubbles are always accompanied by lots of trading.

4.) By definition, rational bubbles are unrelated to fundamentals. In practice, bubbles seem to be related to fundamentals (e.g., tech./financial innovations).

5.) How do they start in the first place ?

Heterogeneous Beliefs + Speculative Trading - Harrison/Kreps (1978)

- It seems obvious that asset markets feature heterogeneous beliefs.
- However, their role in financial markets is subtle.
- Heterogeneous beliefs arise for two basic reasons:
  1.) Heterogeneous Information
  2.) Heterogeneous Priors
- There are 2 problems with the heterogeneous info. story
  1.) Often prices reveal the info of other traders } Grossman + Stiglitz (1980)
  2.) No Trade Theorems: If people are only trading to make a profit, so trade is a 0-sum game, then if someone wants to sell you something, why would you buy? } Tirole (1982)
- Harrison + Kreps instead assume that people have heterogeneous prior beliefs. People simply interpret the same data differently. In this case, both sides may expect to profit from trade (even though only one will, ex post).
- Problem with heterogeneous priors - Learning. Eventually, agents priors should merge together.
- Harrison + Kreps simply ignore learning.

Assumptions of Harrison + Kreps (1978)

1.) 2 risk-neutral (infinitely-lived) traders.

2.) Can trade shares (competitively) in a stock which yields a sequence of random dividends.

3.) They have different prior beliefs about the process generating dividends.

4.) Partial Equilibrium (Rednex Equilibrium)

5.) No Learning

6.) No budget constraints. [Agents have sufficient wealth to buy all outstanding shares].

* 7.) No short sales *

Key Assumption

Ruling out short sales is crucial. It means the beliefs of optimists are more fully reflected in the market. As a result, prices inherit an upward bias.

Key Result

The equilibrium price is higher than the expected Present Discounted Value of dividends of both traders. This is because the price embodies a resale option value.