Chapters 8-9

The Efficient Market Hypothesis & Behavioral Finance

Efficient Market Hypothesis (EMH)

- **Do security prices accurately reflect information?**
  - **Informational Efficiency**
    - Are price changes consistently predictable?
  - **Allocational Efficiency**
    - Are prices correct in that they accurately reflect the cash flows associated with the security?
    - **Gold and the greater fool theory.**

- **Huge implications concerning the answers to these questions.**

Implications of efficiency

- Informational efficiency
  - If markets are not informationally efficient
    - Investors may not be able to trust that market prices are up to date and investors should then conduct their own research (or hire a researcher) to validate the price.
      - Privileged groups of investors will be able to consistently take advantage of the general public.
  - Active strategies should outperform passive strategies.

EMH and Competition

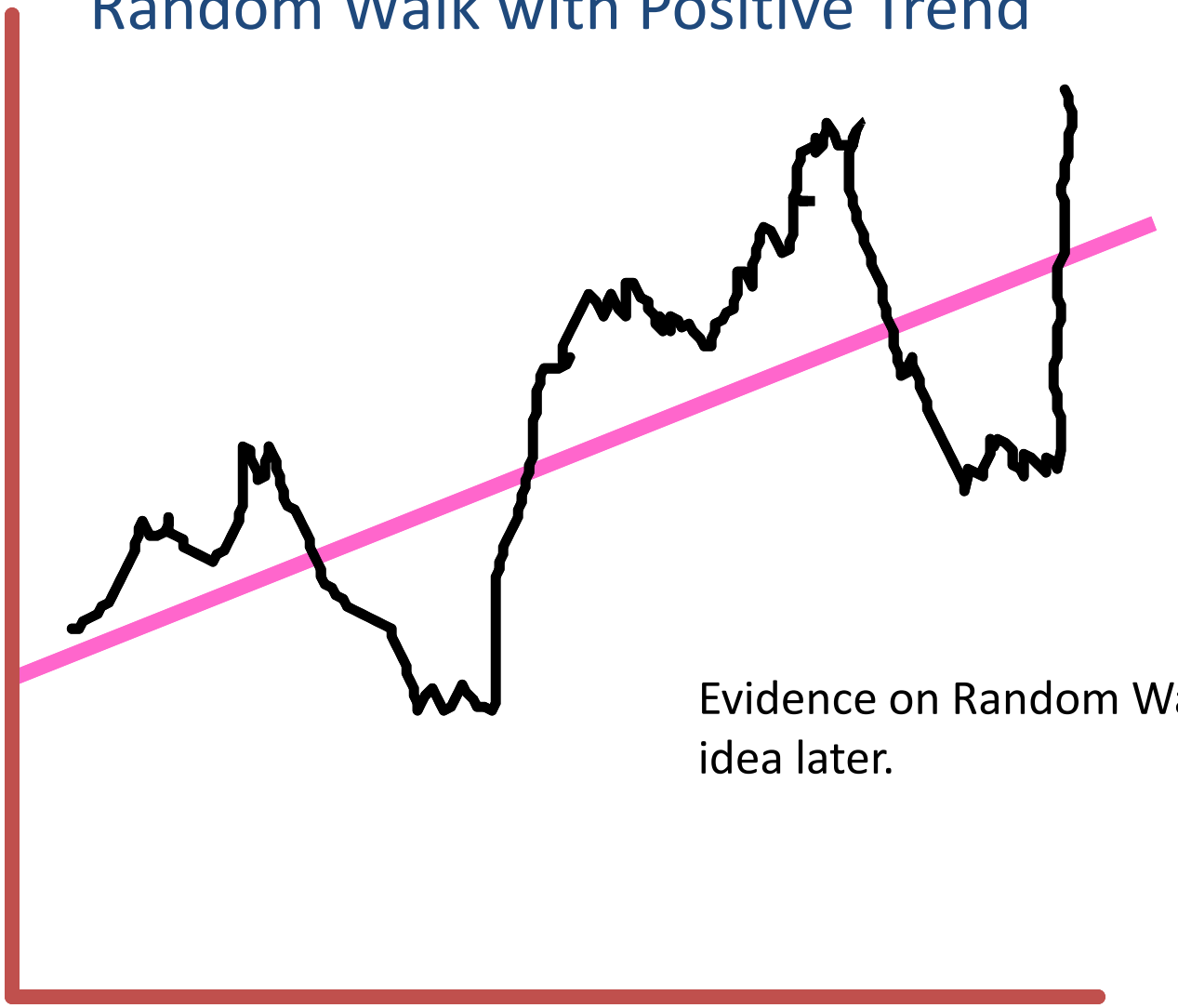
- Competition implies that stock prices fully and accurately reflect publicly available information very quickly. Else there are unexploited profit opportunities.
  .

Random Price Changes

- Why are price changes random?
  - In very competitive markets prices should react to only NEW information
    Flow of NEW information is random
    Therefore, price changes are random

Idea that stock prices follow a "Random Walk"

Random Walk with Positive Trend



Evidence on Random Walk idea later.

Forms of the EMH

- **Prices reflect all relevant information**
- **Vary the** information set
  - **Weak**

The relevant information is historical prices and other trading data such as trading volume.

If the markets are weak form efficient, use of such information provides no benefit “at the margin.”

Forms of the EMH

- **Prices reflect all relevant information**
- **Vary the information set:**
  - **Semi-strong**

    The relevant information is "all publicly available information, including past price and volume data."

    If the markets are semi-strong form efficient, then studying past price and volume data & studying earnings and growth forecasts provides no net benefit in predicting price changes at the margin.

Forms of the EMH

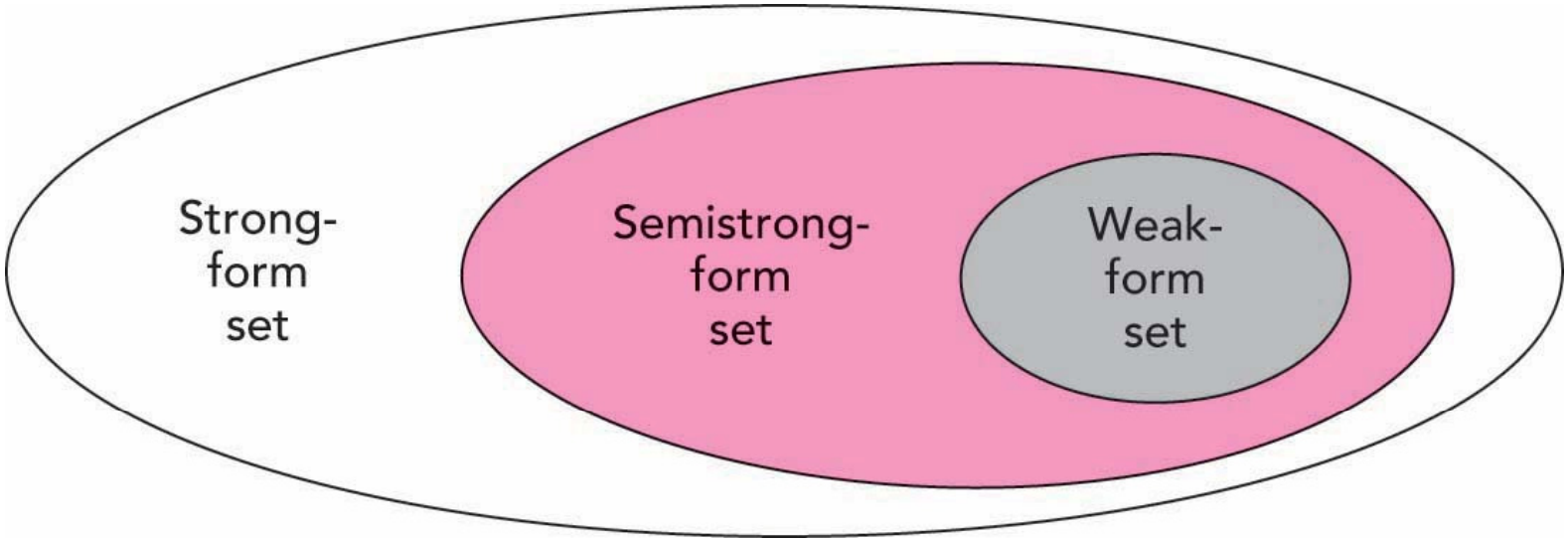
- **Prices reflect all relevant information**
- **Vary the information set:**
  - **Strong**

The relevant information is “all information” both public and private or “inside” information.

If the markets are strong form efficient, use of any information (public or private) provides no benefit at the margin.

SEC Rule 10b-5 limits trading by corporate insiders, (officers, directors and major shareholders). Inside trading must be reported.

Relationships between forms of the EMH



Implications of Efficiency for Active or Passive Management

- **Active Management**
  - Security analysis
  - Timing strategies
  - Investment Newsletters
  -

Assumes inefficiency, use technical and/or fundamental analysis to pick securities

- **Passive Management**
  -
  - Buy and Hold portfolios
  - Index Funds

Consistent with semi-strong efficiency

Types of Stock Analysis & Relationship to the EMH

- ***Technical Analysis:***
  Technical Analysis or TA is using prices and volume information to predict future price changes

  TA assumes prices follow predictable trends

  – **If the markets are weak form efficient or semi-strong form efficient or strong form efficient will technical analysis be able to consistently predict price changes?**

Basic Types of Technical Analysis

Support and resistance levels

- **Support level:**
  - **A price level below which it is supposedly unlikely for a stock or stock index to fall.**
- **Resistance level:**
  - **A price level above which it is supposedly unlikely for a stock or stock index to rise.**

A stock price above “resistance level” would then indicate a 'breakout' which would be a bullish signal.

“Behold! A golden cross emerges.” WSJ, Oct. 25

Types of Stock Analysis & Relationship to the EMH

- ***Fundamental Analysis:***

  using economic and accounting information to predict stock price changes

  - **If the markets are weak form efficient or semi-strong form efficient or strong form efficient will fundamental analysis be able to consistently predict price changes?**

If the markets are only weak form efficient?

Fundamental Analysis CAN predict price changes

If the markets are semi-strong or strong form efficient?

Fundamental Analysis CANNOT predict price changes

Fundamental Analysis

- **Fundamental analysis assumes that stock prices should be equal to**

  the discounted value of the expected *future* cash flows the stock is expected to provide to investors.

- **Fundamental analysis is thus the**

  "art" of identifying over- and undervalued securities based on an analysis of the firm's financial statements and future prospects.

Fundamental Analysis

- **Fundamental analysis varies in technique but generally focuses on**
  - forecasting the firm's future dividends or earnings,
  - discounting those future cash flows by the required rate of return (usually obtained from the CAPM),
  - and comparing the resulting estimated price with the current stock price.

Empirical Tests of Informational Efficiency

Do investors systematically misinterpret information?

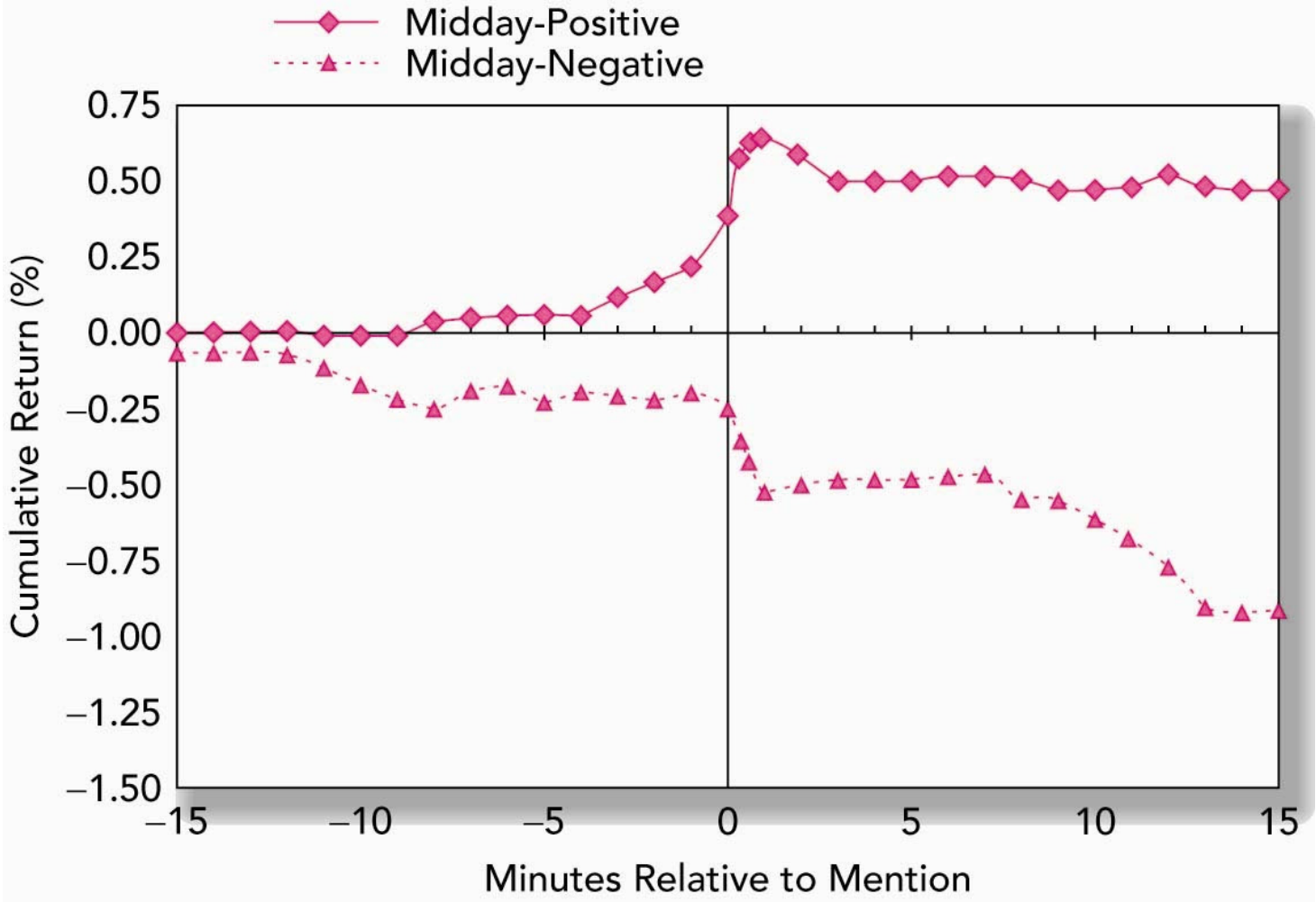
This says that investors do not repeat the same mistakes over and over in an irrational fashion.

For example, sometimes they may overestimate the impact on earnings of some event and sometimes they underestimate the impact on earnings but on average the estimates are unbiased.

How Tests Are Structured

Examine prices and returns around some material announcement

Stock Price Reaction to CNBC Midday Reports



Issues in Examining the Results

- **Possible Model Misspecification**
- Results have to be adjusted for the risk of the given stock or strategy.

  This means that tests of efficiency are necessarily joint tests of the model used to measure risk and market efficiency.
- Results counter to efficiency may just be saying researchers aren't using the right model to measure risk and hence the expected return.

Counter Evidence: Some Apparent Predictors of Broad Market Returns

- **Fama and French**
  - Aggregate returns tend to be higher for firms with higher dividend yields
- **Campbell and Shiller**
  - Aggregate returns tend to be higher for firms with higher earnings yields
- **Keim and Stambaugh**
  - Changes in bond credit spreads can predict market returns

Each of these may also be consistent with changing risk premiums and may have nothing to say about market efficiency.

Bubbles and Market Efficiency

Periodically stock prices appear to undergo a 'speculative bubble.'

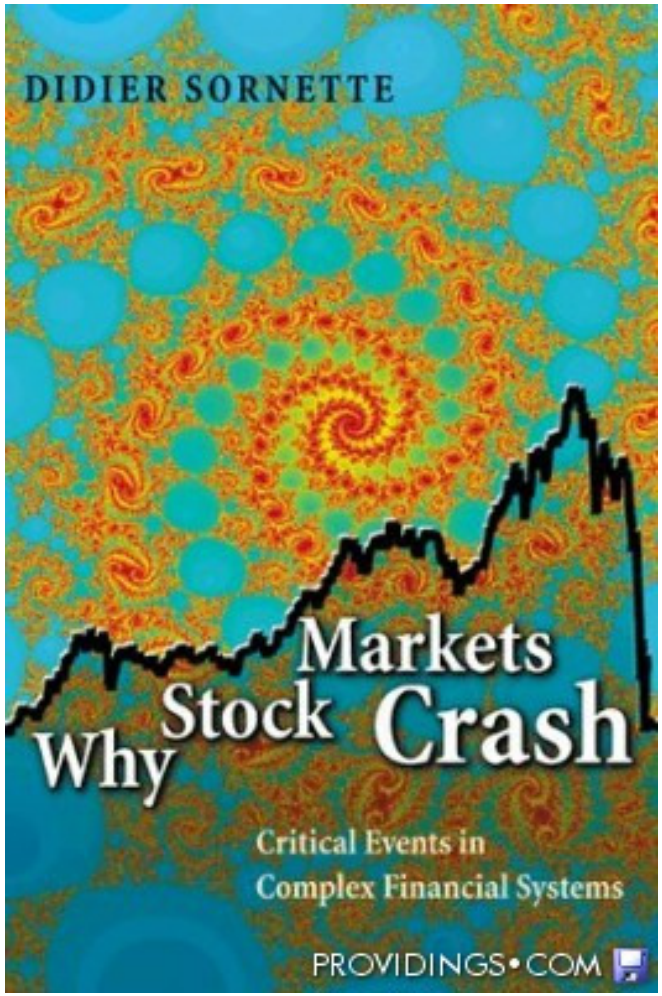
A speculative bubble is said to occur if prices do not equal the intrinsic value of the security.

Does this imply that markets are not efficient?

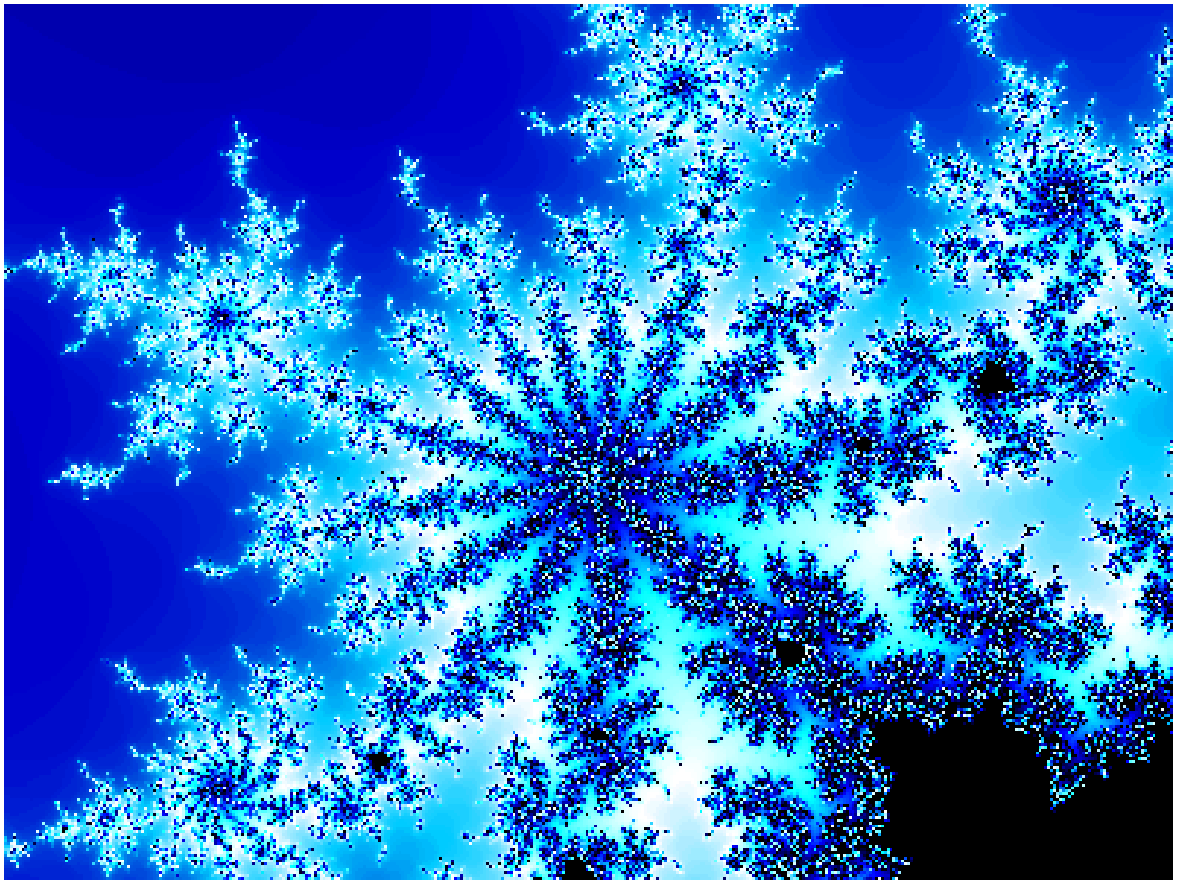
- **Very difficult to predict if you are in a bubble and when the bubble will burst.**

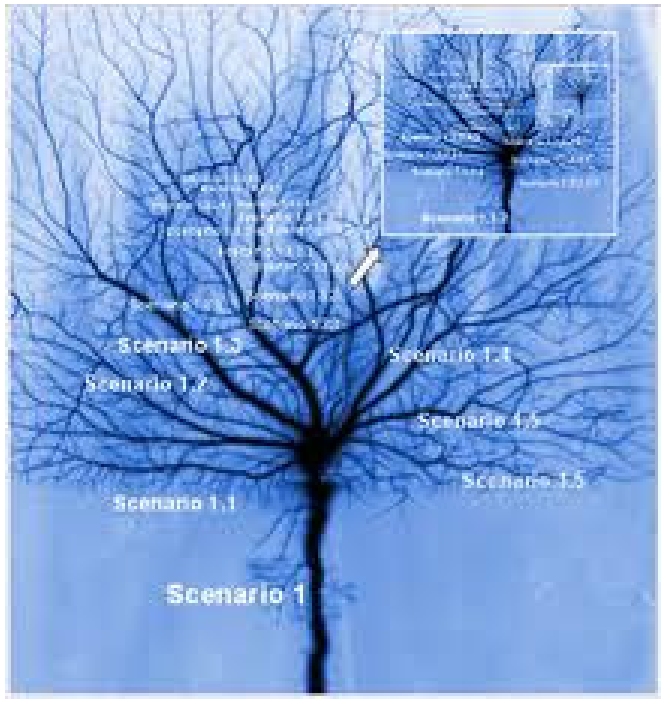
Crashes as Critical Points

"The Professor Who Chases Financial Bubbles"
, WSJ 03/13/2010



People self-organize in same way as nature





People self-organize in same way as nature

maximum number of interactions within a cluster
is $s \times (s-1)/2$, which becomes proportional to s^2 for large s.

crash hazard rate $h(t)$ as the conditional probability per unit of
crash will happen:

$$h(t) = \frac{q(t)}{1 - Q(t)}$$

where $Q(t)$ and $q(t)$ are cumulative and probability distribution
respectively of the time of crash. Since the decision to sell off by a
belonging to a cluster depends on the decisions of all other inve
probability of this happening per unti of time, $h(t)dt$, must be gro
cluster size faster than s but slower than s^2. Hense, $h(t)dt$ is pr
to s^α, where $\alpha \in (1, 2)$. Assuming that average cluster size, s, co
grow until the time of crash, t_c, the self-similar pattern of imitati
that relative variations of $h(t)$ with respect to relative variation of
to-crash, $(t_c - t)$, are independent of t, i.e. constant:

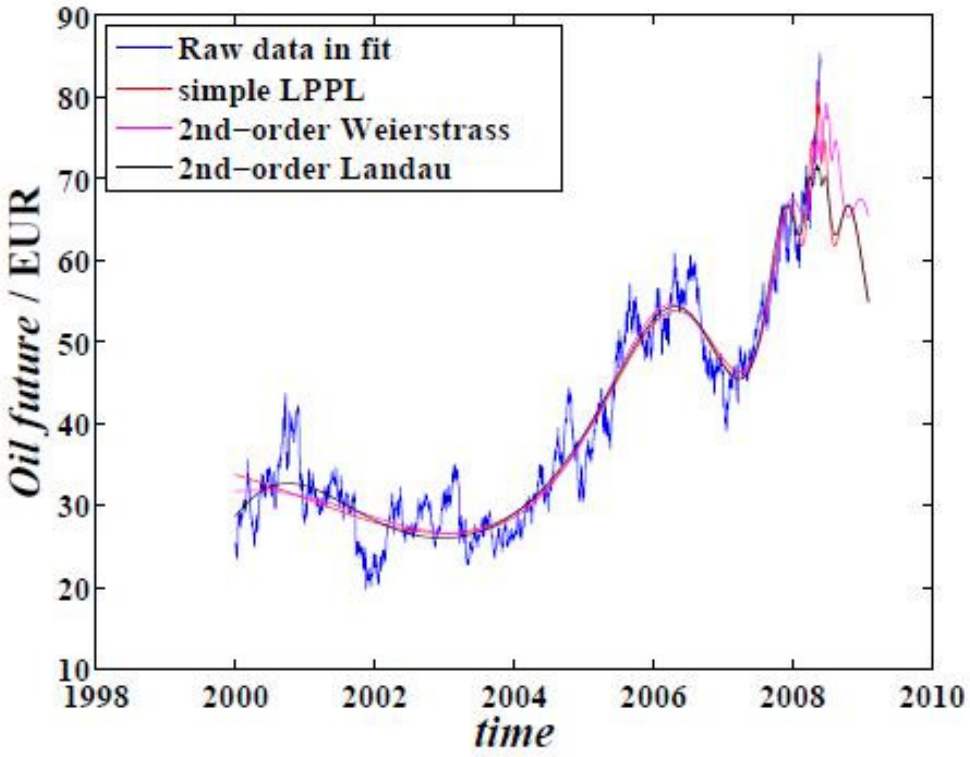
$$\frac{dlnh(t)}{dln(t_c - t)} = -\alpha$$

the solution to $h(t)$ is a power-law:

$$h(t) \approx B(t_c - t)^{-\alpha} \quad (6)$$

the following second order approximation for $h(t)$ which exhibits ascillations around the main exponential trend that increase in frequency until t_c is reached.

$$h(t) \approx B(t_c - t)^{-\alpha} + C(t_c - t)^{-\alpha} cos(\omega log(t_c - t)) \quad (7)$$



Econophysics Focus

Evidence from the 2007 Burst of the Real Estate Bubble

Figure 1: P/E Ratios of Real Estate Stocks Ralative to Market

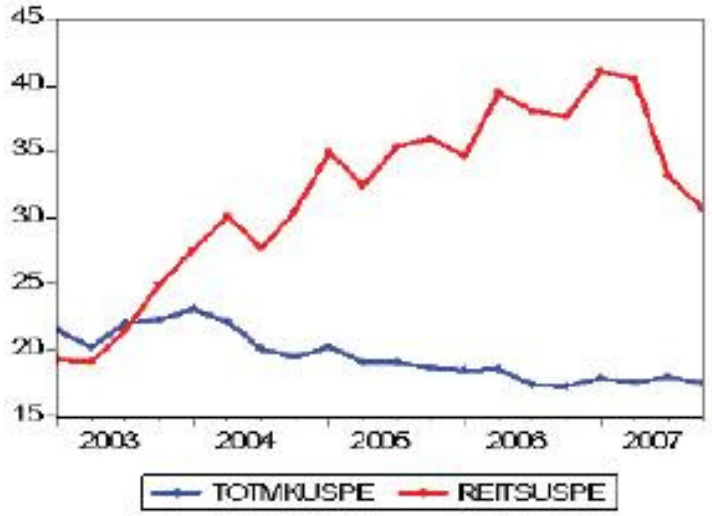


Figure 1 shows P/E ratios of the 121 Real Estate Stocks (REITS) and the S&P500 Index (TOTMK). It suggests that REITS stocks were overvalued for the period 2003 to 2007 as their P/E ratio more than doubled during that period. In addition to analyzing the behavior of investors with positions

Figure 2: Log ACC Share Price and LPPL Extrapolation

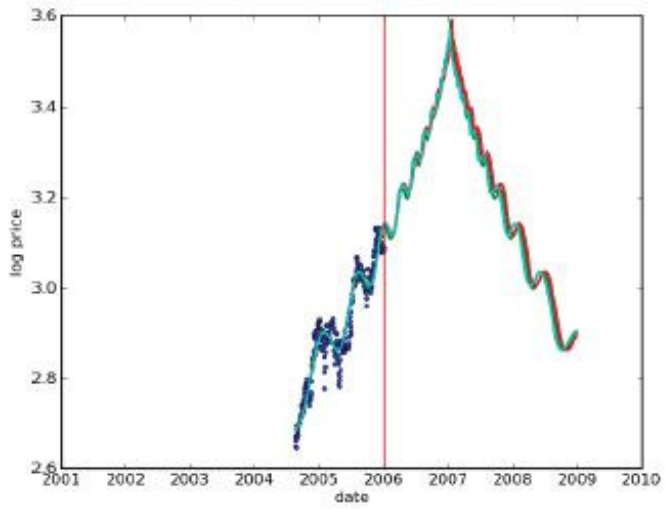
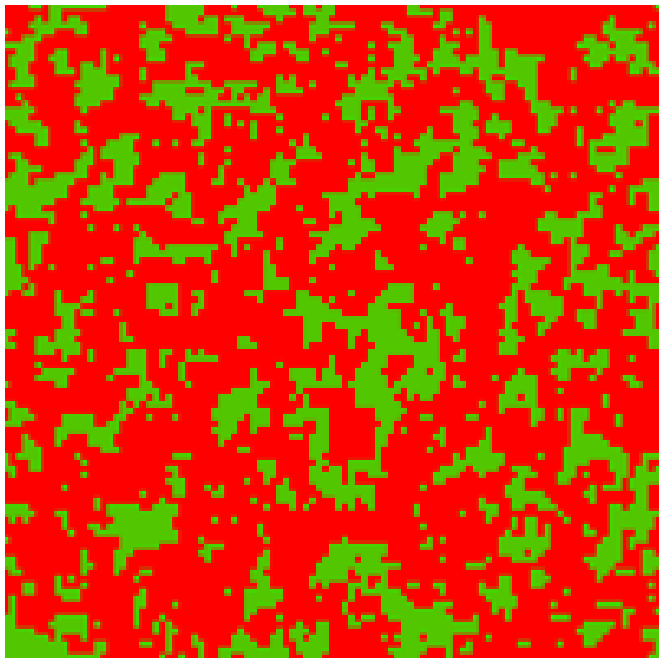


Figure 2 shows the plot of log share prices of American Campus Communities, Inc.(ACC), an equity real estate investment trust, one of 121 closed end funds in our sample. The solid lines fit Log-Periodic Power Law to the data and predict the time of price collapse with suprising accuracy. As mentioned before ACC is just one of over two dozen stocks in our sample that exhibit strong bubble characteristics and focusing on these stocks should reinforce our resutlts.

Artificial Financial Market



1) Individuals are boundedly rational.
2) Individuals are heterogeneous.
3) Individuals are open to the sentiments of their closest colleagues

A qualitative meaning is given to the information, as either being good (+1) or bad (-1):

(1): I(t)~N(0,1)
(2): Q(t)=1 if I(t)>0, Q(t)=-1 otherwise
I(t) - New Information (news for short)
Q(t) - Qualitative meaning

Artificial Financial Market

Si(t)=f(Ki,NSi(t),ns,Q(t),ei(t)): trader i's sentiment regarding the information, if it is good (bullish) the trader buys if it is bad (bearish) the trader sells.

Ki - Propensity of the trader i to be contagiated with the friends sentiment.

NSi(t) - The sum of the trader i's friends sentiments.

nsi - the sensitivity of the trader i to the news qualitative meaning.

ei(t) - a random term

Artificial Financial Market

http://ccl.northwestern.edu/netlogo/models/community/Artificial%20Financial%20Market