

JOHNSON
Cornell University

NBA 5420: Investment and Portfolio Management

Class 4: Efficient Markets versus Behavioral Finance

Professor Matt Baron
February 22, 2016





Efficient Markets vs. Behavioral Finance

1. We can all agree there are stupid investors out there
2. The question is whether behavioral biases, sentiment, and irrationality affect asset prices. Two requirements:
 - Enough irrational investors to misprice the asset
 - Limits of arbitrage to keep the ‘smart money’ from pushing prices back to fundamentals
3. The even bigger question is whether these mispricings affect the macroeconomy (investment, recessions, & financial crises)
 - Stock markets may be a sideshow
 - Bubbles in credit and housing markets may be a bigger issue



Efficient Markets Hypothesis

Definition by Fama (1976):

“An efficient capital market is a market that is efficient in processing information. The prices of securities observed at any time are based on ‘correct’ evaluations of all information available at that time. In an efficient market, prices ‘fully reflect’ available information.”



Efficient Markets Hypothesis

Three Forms of Market Efficiency (from strongest to weakest):

1. All investors are rational
 - Standard utility functions
 - Rational expectations in beliefs
2. Prices always reflect fundamental values
 - Price = discounted value of expected future cash flow
 - Hard to prove / disprove because you can't observe the true discount rate
3. Law of One Price holds
 - No arbitrage, because arbitrageurs quickly correct mispricings



Efficient Markets Hypothesis

Another Three Forms of Market Efficiency (from Fama):

1. Weak form
 - You can't beat the market using only past prices
 - So prices are a random walk along a long-term trend
2. Semi-strong form
 - Can't beat the market using all publicly available information
3. Strong form
 - Can't beat the market using all information, including private information



Why the Efficient Markets view is influential

1. Stock prices appear to move randomly over short time intervals
 - New information appears to be quickly incorporated into prices
 - Studies on stock price reactions to corporate announcements (earnings releases, takeover bids, etc.) show that markets react to such information very quickly
2. Most money managers (i.e. actively managed mutual funds) do not appear to be able to beat the market consistently
 - So don't give them your money
3. Rational models, overall, prove to be a good starting framework for understanding securities pricing



Behavioral Finance

Behavioral finance says:

1. Prices are sometimes wrong
 - Due to behavioral biases, sentiment, or investor irrationality
 - Investors do not always process information correctly
 - Investors often make inconsistent or systematically suboptimal decisions
2. There are limits to arbitrage
 - Arbitrageurs do not or cannot correct these mispricings



Why this debate is important

- Markets may not properly guard against fraud and mismanagement
 - Due to investor inattention or misguided beliefs
- Markets may create bubbles, which can lead to severe crashes and recessions
 - Due to excessive optimism or failure of investors to properly price risky assets
 - Which in turn can lead to the collapse of the financial system and severe recessions
- Creates need for regulation to control market excesses and crack down on fraud and mismanagement
 - Though regulators can have behavioral biases too



Evidence for Behavioral Finance

1. Violations of the Law of One Price
2. Investors' systematic errors of judgment
3. Limits of Arbitrage



VIOLATIONS OF THE LAW OF ONE PRICE



Violations of the Law of One Price

A more direct approach to testing market efficiency:

- Look for special cases or quasi-/natural experiments where you can apply Law of One Price (LOP).
 - Two assets with identical cash flows should sell for same price in an efficient market.
- Some examples:
 1. Closed-end funds
 2. Siamese twin companies
 3. Equity carve-outs
 4. Index inclusions



Closed-end Funds

- Price of fund often differ substantially from NAV (net asset value of underlying stocks).
- Stable discount would not be too weird. But price/NAV differential can gyrate wildly.
 - e.g., **Germany Fund on NYSE** goes from 9% discount in early 1989 to **100% premium in early 1990 back down to parity** in mid 1990.
- This violation of LOP raises two questions:
 1. Where are the arbs: why is this any different than the pricing of short-term options and forwards, where LOP usually works well?
 2. Why would anybody pay a 100% premium for assets they could buy directly at half price?



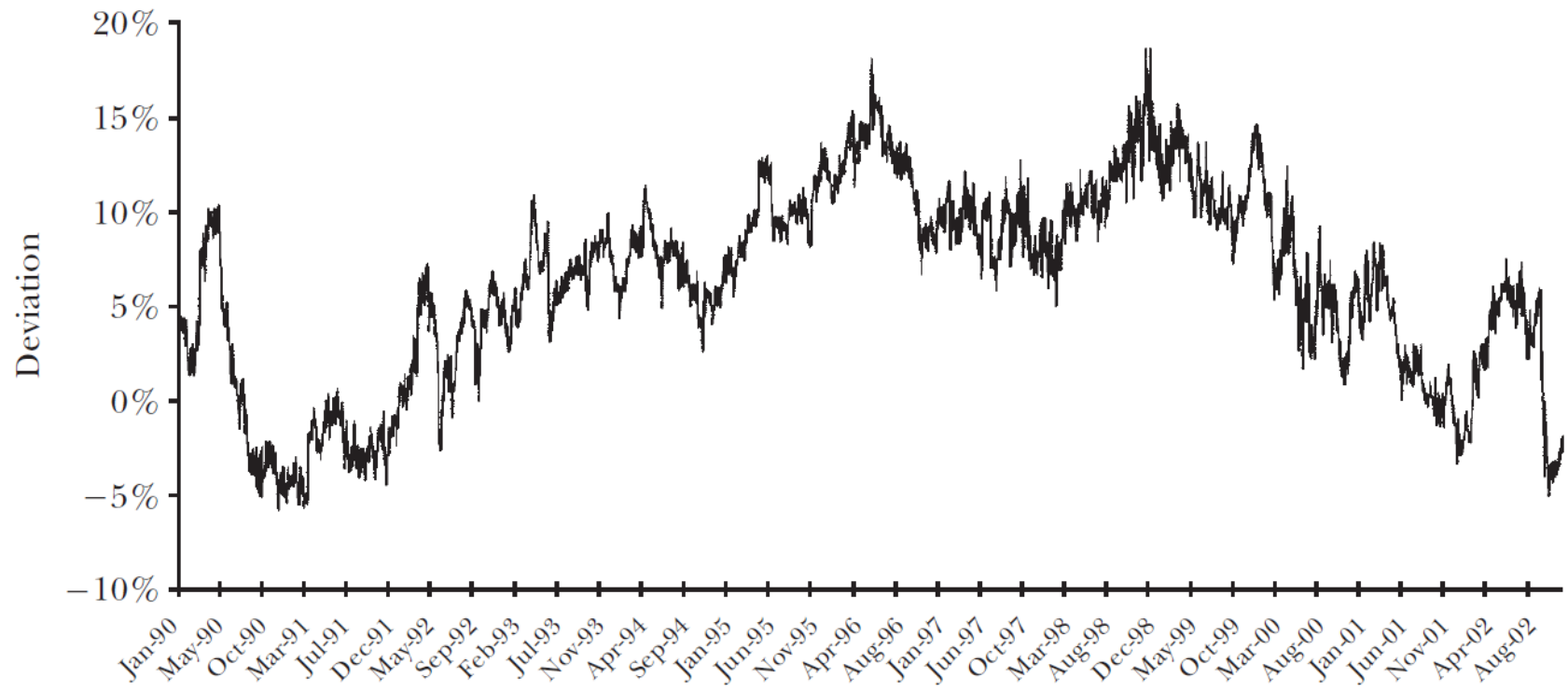
Siamese Twin Companies

Classic example is Royal Dutch/Shell:

1. Royal Dutch shares trade primarily in Amsterdam
 2. Shell shares trade mostly in London.
 - Can get ADRs on both in US.
- 1907 merger agreement formula: all cash flows are split, 60% to Royal Dutch; 40% to Shell.
 - If LOP holds, market values should always be 60-40.
 - In reality, ratio of prices fluctuates widely
 - From theoretical parity to 30% too high or too low.
 - Mispricing is persistent, half-life on order of 6-12 months.



Royal Dutch / Shell





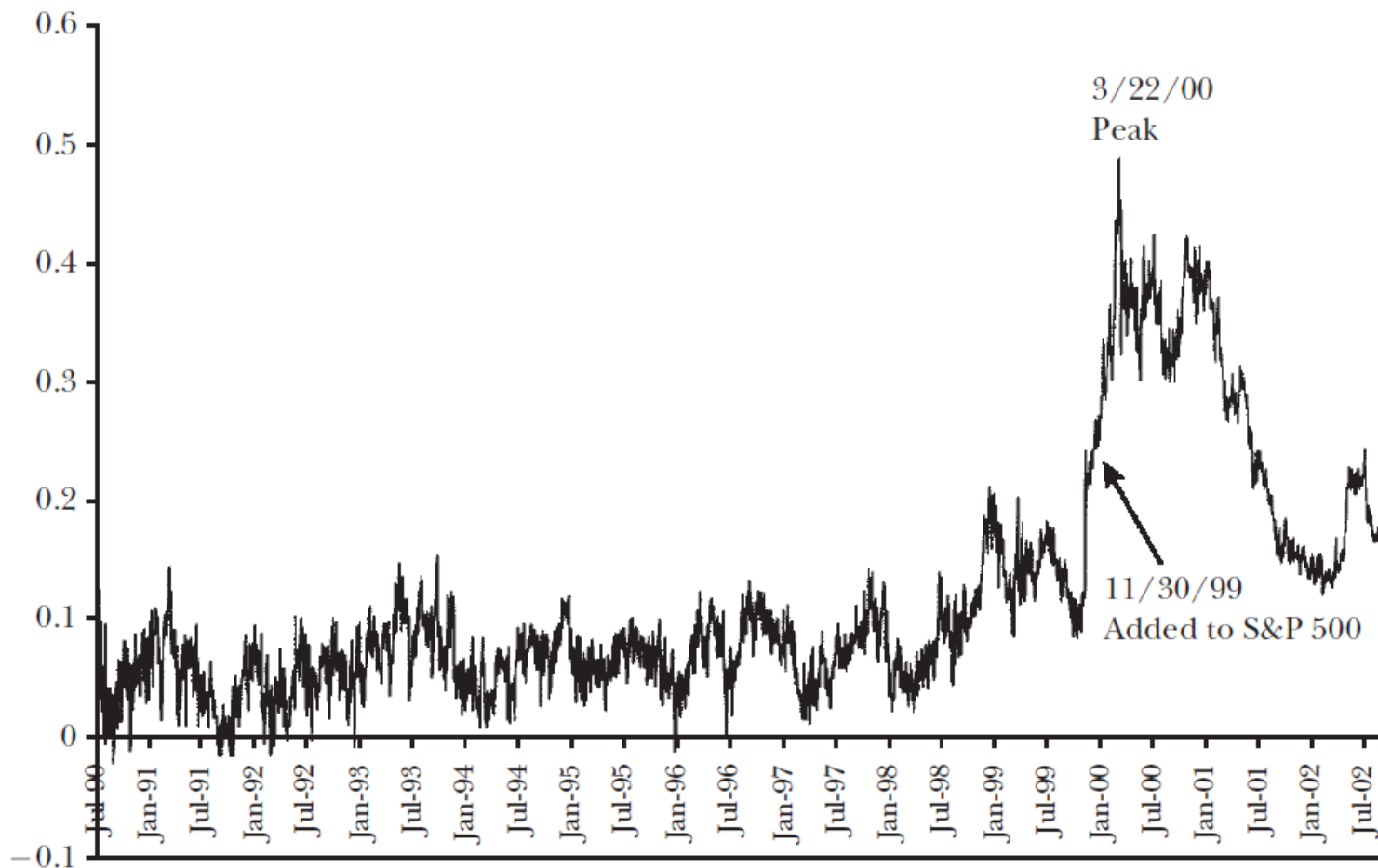
Siamese Twin Companies

- Other examples from readings:
 - ADRs (American Depositary Receipts)
 - Infosys traded at a 136% premium in the US relative to Bombay exchange in March 2000
 - Dual-share classes
 - Molex voting shares traded at a 15% premium
 - Which increased to 49% in March 2000
 - After it was included in the S&P 500 index



Dual-share classes

Premium of Mox common over Mox Class A, 1990–2002





Equity Carve Outs

- March 2000: 3Com sells 5% of Palm subsidiary to public, retains 95%.
 - Each 3Com shareholder thus indirectly owns 1.5 shares of Palm.
- However, $(3\text{Com} + \text{Palm}) < (\text{Palm})$
 $\$82/\text{share}$ $\$145/\text{share}$
- So 3Com alone was worth $-\$63/\text{share}???$



Index Inclusions

- When a stock is included in S&P 500, there is no news about fundamental value
- But price goes up several percent right away, due to increased demand from index funds.



INVESTORS' SYSTEMATIC ERRORS OF JUDGMENT



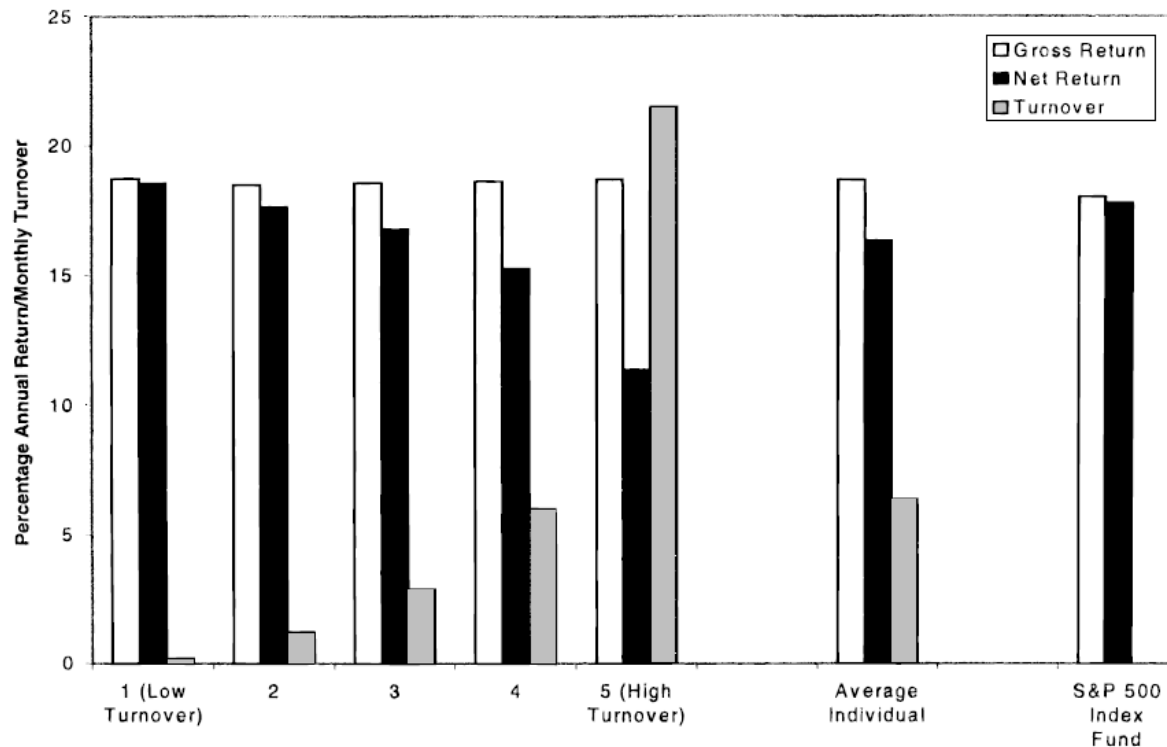
Systematic Errors of Judgment

1. Over-confidence & over-optimism
 - Leads to over-trading
2. Loss aversion
 - Leads investors to hold onto losers, sell winner
3. Extrapolation from the past
 - Leads to momentum and bubbles
4. Limited attention
 - Under-reaction to news
 - Home-country bias

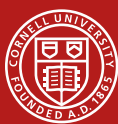


Over-confidence

- Over-confidence leads to excessive trading
 - But the more retail investors trade, the more money they lose (Odean, 1999)



Individual Investors Quintiles based on Monthly Turnover



Loss Aversion

- People are reluctant to sell securities at a loss relative to purchase price
 - Investors also risk averse over gains, risk seeking over losses
 - Also called the “disposition effect” or “prospect theory”
- Empirical test:

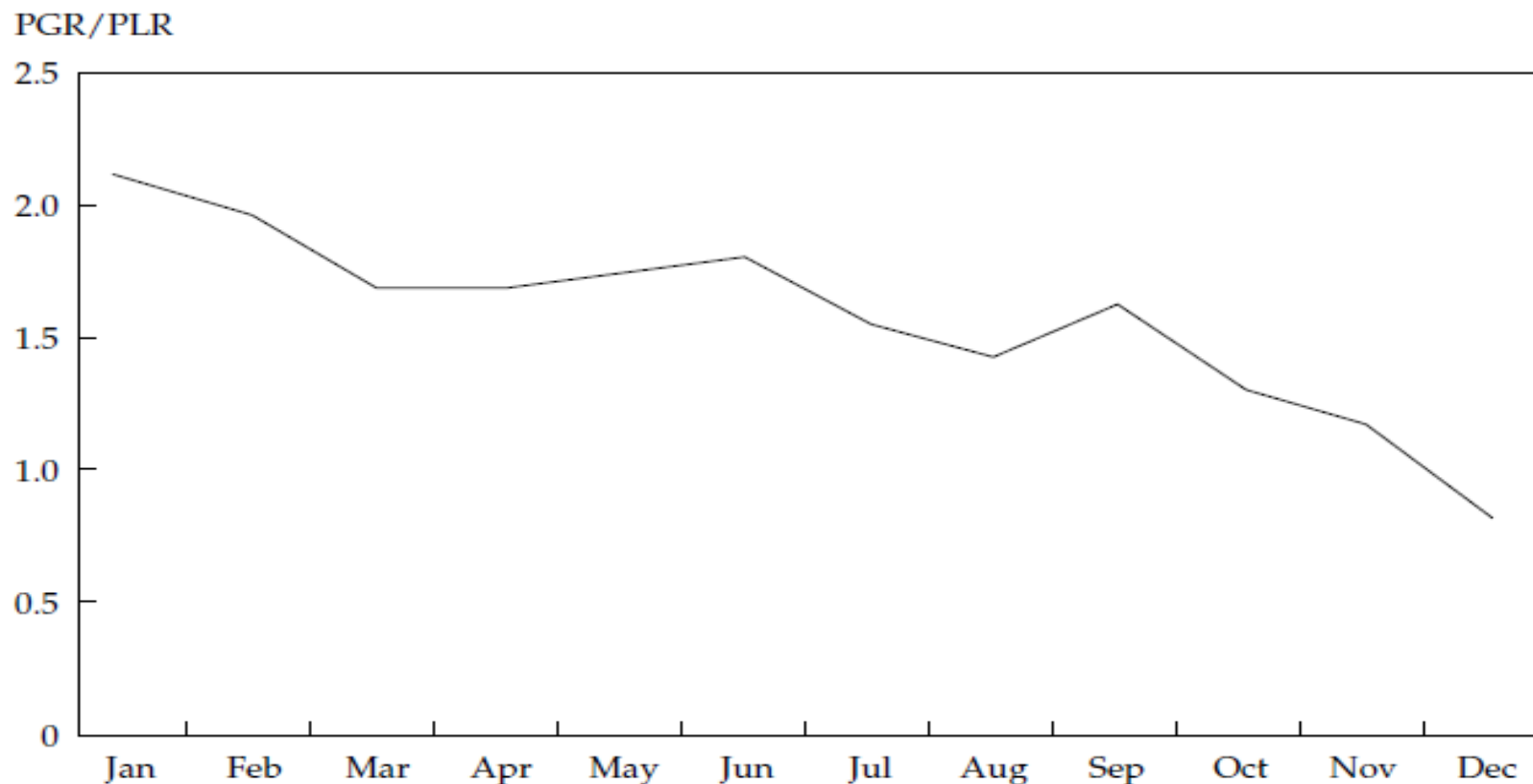
$$\frac{\textit{Realized Gains}}{\textit{Realized} + \textit{Unrealized Gains}} > \frac{\textit{Realized Losses}}{\textit{Realized} + \textit{Unrealized Losses}}$$

- Also holds in housing market
 - Genesove and Mayer (2001, QJE)



Loss aversion

Ratio of: Percent Gains Realized / Percent Losses Realized
= (Left-hand Side) / (Right-hand Side) from previous slide



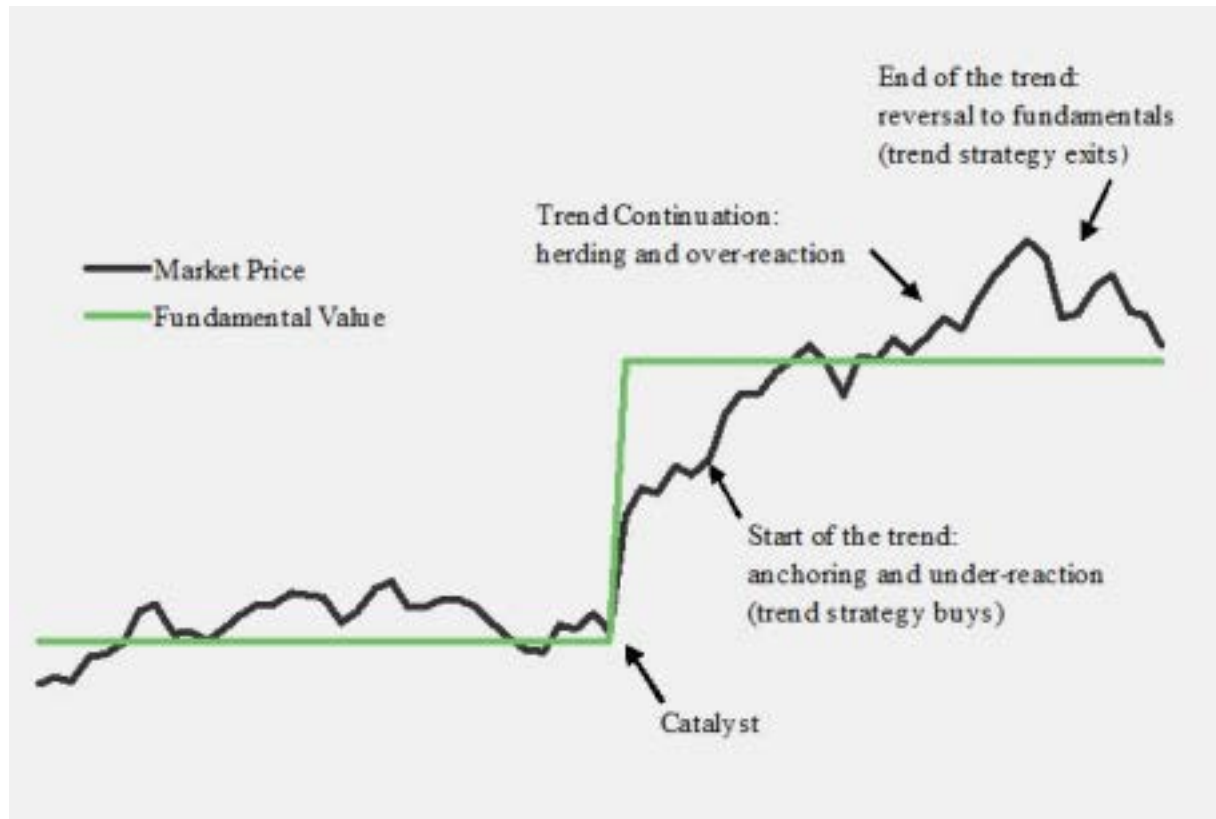


Extrapolation

- Can you predict future returns from past returns?
 - Efficient Markets Hypothesis says should NOT be possible
- Some terminology:
 - “Momentum”
 - Stocks that went up in the past will continue to go up
 - “Reversion”
 - Stocks that went up in the past will go down in the future
 - These stocks “over-reacted” and return to fundamentals
 - “Contrarian” strategies try to trade on this idea
 - Both can be true (though at different time horizons)



Over- & Under-reaction to News





Extrapolation

- Excessive extrapolation of past fundamentals and past returns
 - Can induce “momentum” and bubbles in stock returns
 - Will talk more about extrapolation in future class on bubbles



Limited Attention

- Can potentially explain insufficient market reaction to public information:
 1. Momentum
 2. Post-earnings-announcement drift
- Insufficient market reaction can also potentially be explained by conservatism & belief perseverance
- Case of EntreMed (ENMD)
 - Large price reaction to NYT Sunday May 4, 1998 report of breakthrough in cancer research
 - EntreMed had licensing right to the breakthrough
 - But *Nature* and the *Times* itself published the story 5 months earlier



Limited Attention

Home-Country Bias (French and Poterba, 1991, AER)

- In 1989, domestic equity as percentage of overall equity held was:
 - 94% for U.S.
 - 82% for U.K.
 - 98% for Japan
- Taking labor income risk into account only worsens the puzzle (because international stocks should help more with diversification)



Limited Attention

Home Bias within Countries

- Grinblatt and Keloharju (2001, JF) showed that Finnish investors allocate heavily to stocks whose companies:
 - are headquartered close to them geographically
 - use their native tongue in annual reports
 - have a chief executive that shares their cultural background
 - effects are stronger for individuals than for institutions
- Investors also hold too much of their employer's stock:
 - Over 30% of defined contribution plan assets in U.S. companies are invested in own company stock
 - Bad for diversification!
 - If company goes bankrupt, you lose both your job and your savings!



LIMITS OF ARBITRAGE



Limits of Arbitrage

George Soros on U.S. Market in 2000
(*The Economist*, 5/6/2000)

“It is too dangerous and crazy to short. You could have shorted the market in March of 1929 and lost everything.”



Limits of Arbitrage

1. Arbitrage Risk

- You don't have unlimited capital
- The market move against you before things get better, forcing you to liquidate your positions at worse prices

2. Short-sale constraints

3. Incentives of money managers

4. Other reasons

- Transaction costs
- Model risk



Arbitrage Risk

“Markets can remain irrational a lot longer than you can remain solvent.”

– John Maynard Keynes



Arbitrage Risk

- Whatever irrational opinion caused noise traders to get excited and create a mispricing, **it could get worse before it gets better**
- Widening spread can cause the arb to approach bankruptcy or to be forced to liquidate positions, if he **runs out of capital** or collateral to hold positions, or if **his investors/creditors panic and withdraw**
 - Fundamental risk: you short Amazon.com at \$80/share in late 1999. They release better earnings numbers than anyone could have reasonably expected, price goes to \$100.
 - Note that fundamental risk cannot explain Royal Dutch/Shell, Palm/3Com, closed-end funds.
 - Noise trader risk: Short Amazon.com at \$80. Fundamentals don't improve, but irrational investors become even more optimistic, price goes to \$100.



Limits of Arbitrage

1. Arbitrage Risk

- You don't have unlimited capital
- The market move against you before things get better, forcing you to liquidate your positions at worse prices

2. Short-sale constraints

3. Incentives of money managers

4. Other reasons

- Transaction costs
- Model risk



Short-sale constraints

- Regulatory and legal constraints
- Institutional constraints:
 - Most mutual funds can take long positions only
 - Many institutions are set up to encourage long positions only
 - Growth of hedge funds is a welcome correction to this imbalance
- Securities to lend for shorting might be in limited supply



Mechanics of Shorting

Suppose an investor wants to short sell a stock trading at \$100

1. The investor (short-seller) borrows a stock from a broker
 - typically one-day loan, renewed many times, but callable
2. The investor sells the stock in the market for \$100
 - But the \$100 (plus margin capital) stays with the broker
 - The investor needs to post more margin if the stock goes up
3. At a later point in time, the investor exits the short by buying the stock back
 - The investor returns a share to the broker and gets back the \$100 + margin capital



Short-sale constraints

- Need to find a lender for the stock
 - Typically borrow from institutional investors through brokers
 - Small, illiquid stocks, which are not widely held by institutions are typically difficult to borrow
 - Can be difficult, especially when you need it the most
- **Short sale constraints matter:** stocks that are difficult to short experience lower subsequent returns
 - i.e. they're over-priced to begin with
 - Jones and Lamont (2002); Ofek-Richardson-Whitelaw (2004)



SHORTING AND PRICE DISCOVERY



Shorting and Price Discovery

- Short positions and derivatives, used properly, can ensure that prices don't get overly inflated
- Example:
 - Suppose there are 100 shares of stock
 - 50 'optimistic' investors each with demand function $D_1 = 120 - P$
 - 50 'pessimistic' investors each with demand function $D_2 = 100 - P$



Shorting and Price Discovery

- Example:
 - Suppose there are 100 shares of stock
 - 50 'optimistic' investors each with demand function $D_1 = 120 - P$
 - 50 'pessimistic' investors each with demand function $D_2 = 100 - P$
- **Suppose there is NO futures market and NO shorting**
 - **Pessimists will stay out of the market** (since they think the price is too high)

$$\begin{aligned}\text{Supply} &= \text{demand} \\ 100 &= 50(120 - P) \\ \text{Solve for: } P &= 118\end{aligned}$$

- Therefore:
 - 'Optimists' will hold: $D_1 = 50(120 - P) = 100$ shares
 - 'Pessimists' will hold: $D_2 = 0$ shares
- Price is 'too high' at \$118 because no downward pressure from pessimists



Shorting and Price Discovery

- Example:
 - Suppose there are 100 shares of stock
 - 50 'optimistic' investors each with demand function $D_1 = 120 - P$
 - 50 'pessimistic' investors each with demand function $D_2 = 100 - P$
- **Now, suppose shorting is allowed. Or, alternatively, there is a futures market** to make side bets. Then equilibrium is:

$$\begin{aligned}\text{Supply} &= \text{demand} \\ 100 &= 50(120 - P) + 50(100 - P) \\ \text{Solve for: } P &= 109\end{aligned}$$

- Therefore:
 - 'Optimists' will hold: $D_1 = 50(120 - P) = 550$ shares
 - 'Pessimists' will hold: $D_2 = 50(100 - P) = -450$ shares
- **So, now prices don't get inflated** (i.e. they incorporate more diverse beliefs)



Limits of Arbitrage

1. Arbitrage Risk

- You don't have unlimited capital
- The market move against you before things get better, forcing you to liquidate your positions at worse prices

2. Short-sale constraints

3. Incentives of money managers

4. Other reasons

- Transaction costs
- Model risk



Incentives of Money Managers

- Can we count on professionals to drive prices to fundamental values?
- Some classic career issues
 - Herding/benchmarking: fund managers worry about performance relative to peers.
 - Not enough to be good; have to convince investors and/or bosses that you are.
 - Otherwise, investors may withdraw (or you might be fire) before you can capture the arbitrage opportunity
 - Fund managers may be unwilling to take bold positions even if expected returns are high
 - Hard to go against popular beliefs
 - e.g., shorting the housing market in 2006