Lecture 9

Mispricing and Efficient Market Hypothesis

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Lecture Outline

- Asset Mispricing
- Efficient Market Hypothesis
  - Are Markets Efficient?

The Capital Asset Pricing Model

- The **capital asset pricing model (CAPM)** defines the relationship between risk and return

$$E(R_i) = R_f + \beta_i \times (E(R_M) - R_f)$$

- If we know an asset's systematic risk, we can use the CAPM to determine its expected return

Factors Affecting Expected Return

CAPM: $E(R_i) = R_f + \beta_i \times (E(R_M) - R_f)$

- The *pure time value of money*: measured by the risk-free rate, R_f, this is the reward for merely waiting for your money, without taking any risk.

- The *reward for bearing systematic risk*: measured by the market risk premium, $E(R_M) - R_f$, this is the reward the market offers for bearing an average amount of systematic risk in addition to waiting.

- The *amount of systematic risk*: measured by β_i, this is the amount of systematic risk present in a particular asset or portfolio, relative to that in the market portfolio.

Example: Mispricing

Investment	Beta	A(R)
T-bills	0	0.08
Market	1	0.15
Security A	1.29	0.174
Security B	0.68	0.138
Security C	-0.86	0.017

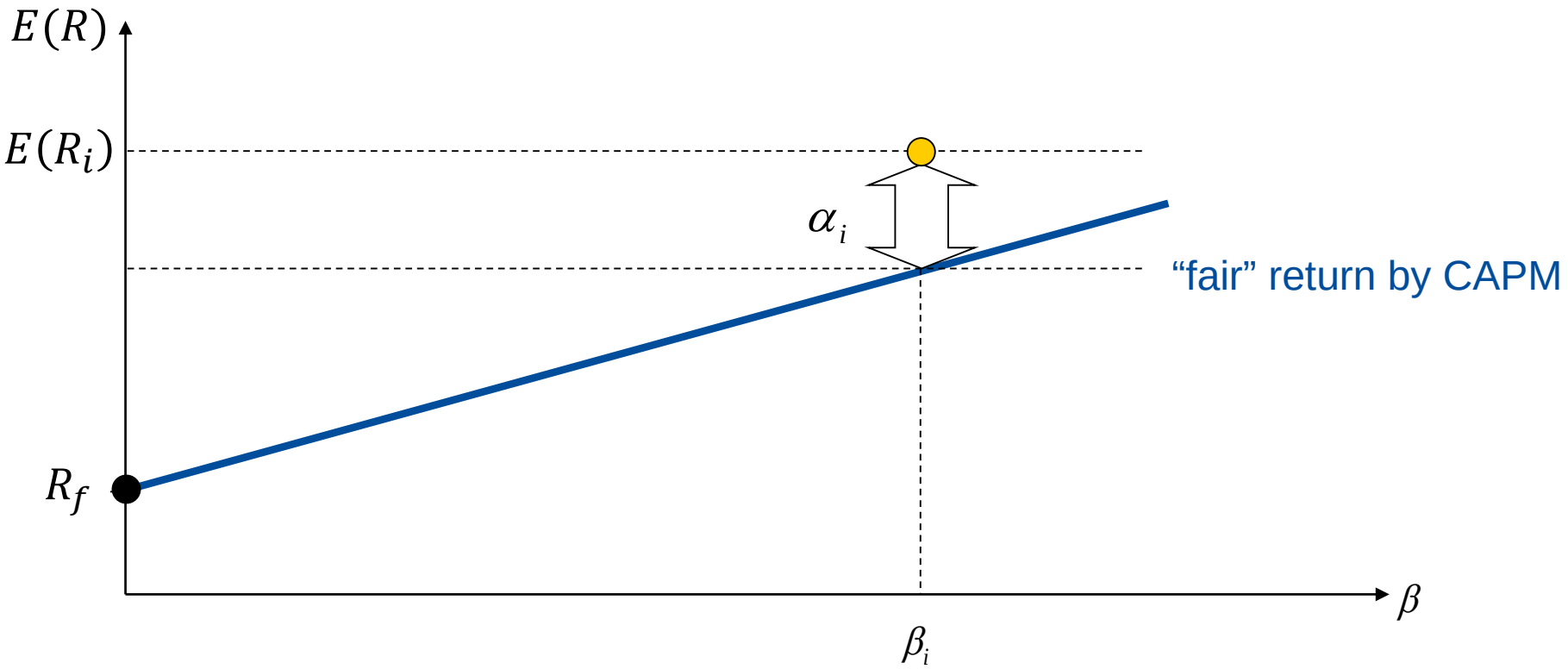
A(R) here refers to actual expected return as extracted from current stock prices. Based on the CAPM, what is the expected return on Securities A, B and C? Are they correctly priced?

Example: Mispricing

Investment	Beta	A(R)	CAPM E(R)	Attractive?
T-bills	0	0.08	0.08	Fairly Valued
Market	1	0.15	0.15	Fairly Valued
Security A	1.29	0.174	**0.1703**	**Underpriced**
Security B	0.68	0.138	**0.1276**	**Underpriced**
Security C	-0.86	0.017	**0.0198**	**Overpriced**

- $E(R_A) = R_f + [E(R_M) - R_f] \times \beta_A = 0.08 + (0.15 - 0.08) \times 1.29 = 17.03\% < 17.4\%$, Security A's return is higher than CAPM would suggest.
- $E(R_B) = R_f + [E(R_M) - R_f] \times \beta_B = 0.08 + (0.15 - 0.08) \times 0.68 = 12.76\% < 13.8\%$, Security B's return is higher than CAPM would suggest.
- $E(R_C) = R_f + [E(R_M) - R_f] \times \beta_C = 0.08 + (0.15 - 0.08) \times (-0.86) = 1.98\% > 1.7\%$, Security C's return is lower than CAPM would suggest.

CAPM “alpha” and the SML



- assets with positive alpha plot above the SML
- assets with negative alpha plot below the SML

Implication For Asset Management Industry

alpha measures mis-pricing relative to the CAPM:

- if asset i's $\alpha_i > 0$: the asset earns too much return given its systematic risk (beta)
  - i.e. the asset is under-priced
  - if we believe in the model, we should ***buy***

- if asset i's $\alpha_i < 0$: the asset earns too little return given its systematic risk (beta)
  - i.e. the asset is over-priced
  - if we believe in the model, we should ***sell***

Exercise

Economist believes that the following benchmarked model correctly estimates the fair return of Ford's stock price:

$$R_F = 0.10\% + 1.1R_M$$

where R_F denotes the Ford's stock monthly return. If the market index return is 8% and Ford's stock price return is 7%, what is the abnormal change in Ford's stock return?

Solution

- The return on the market is 8%. Therefore, the forecast monthly return based on the index model for Ford is:

$$0.10\% + (1.1 \times 8\%) = 8.9\%$$

- Ford's actual return was 7%, so the abnormal return was –1.9%.

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Challenger Crash

January 28, 1986. You hold a portfolio consisting of, among others, stocks of four companies of American space industry: Rockwell International, Lockheed, Martin Marietta and Morton Thiokol

All four companies were involved in manufacturing different parts for space shuttle Challenger

- **Rockwell International**: maker of the shuttle and its engines
- **Lockheed**: manager of shuttle ground support
- **Martin Marietta**: manufacturer of shuttle's external fuel tank
- **Morton Thiokol**: maker of shuttle's solid fuel booster rocket

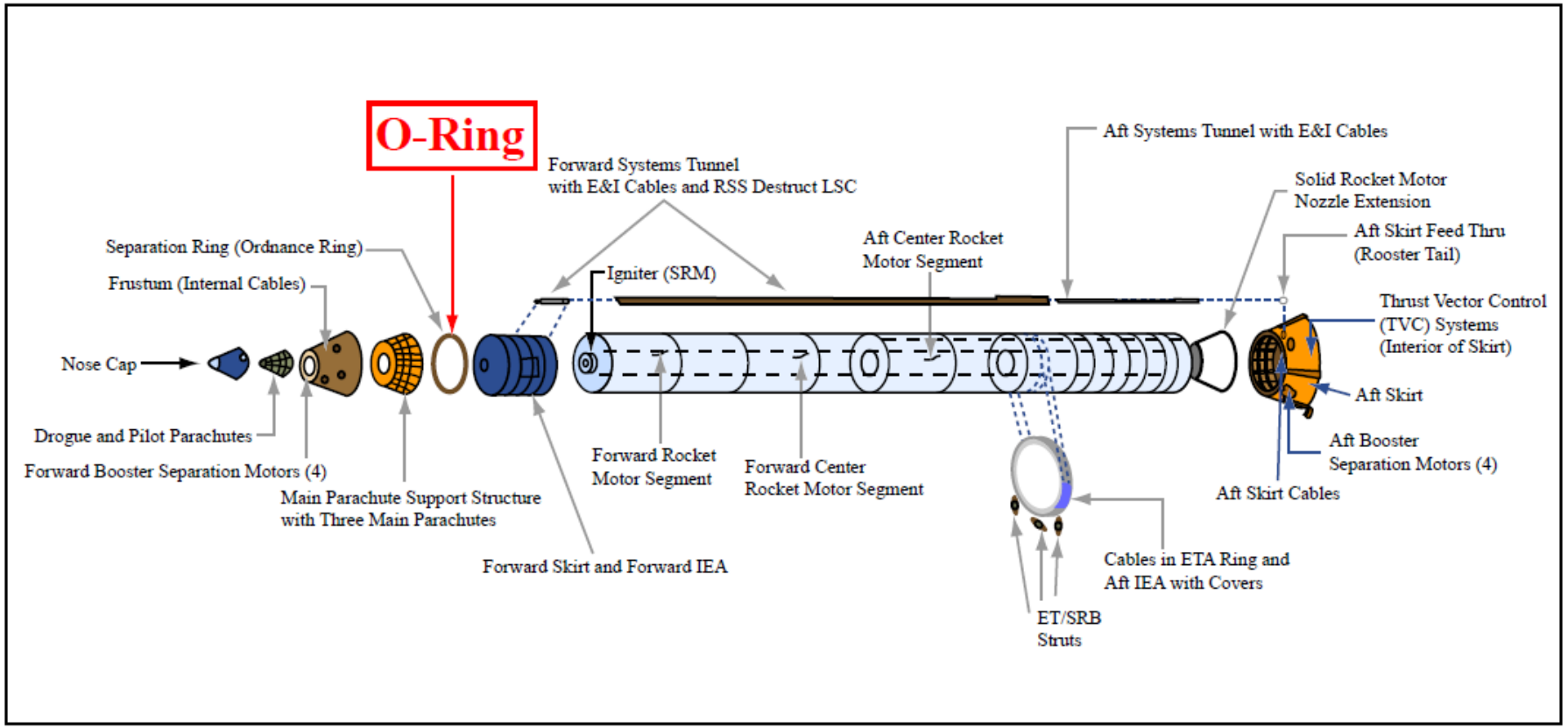
11:39 a.m.

Challenger Crash

- At 11:39 a.m. Shuttle explodes broadcasted on live TV
- The announcement of the crash came across the Dow Jones News Wire at 11:47 a.m.
- The crash caught nearly everyone by surprise. There was no prior information about any problems with any of the shuttle's components
- All officials were at "no comments" mode
- There was no leakage that induced run-up or run-down in the pre-event period
- Reagan establishes Presidential Commission to investigate

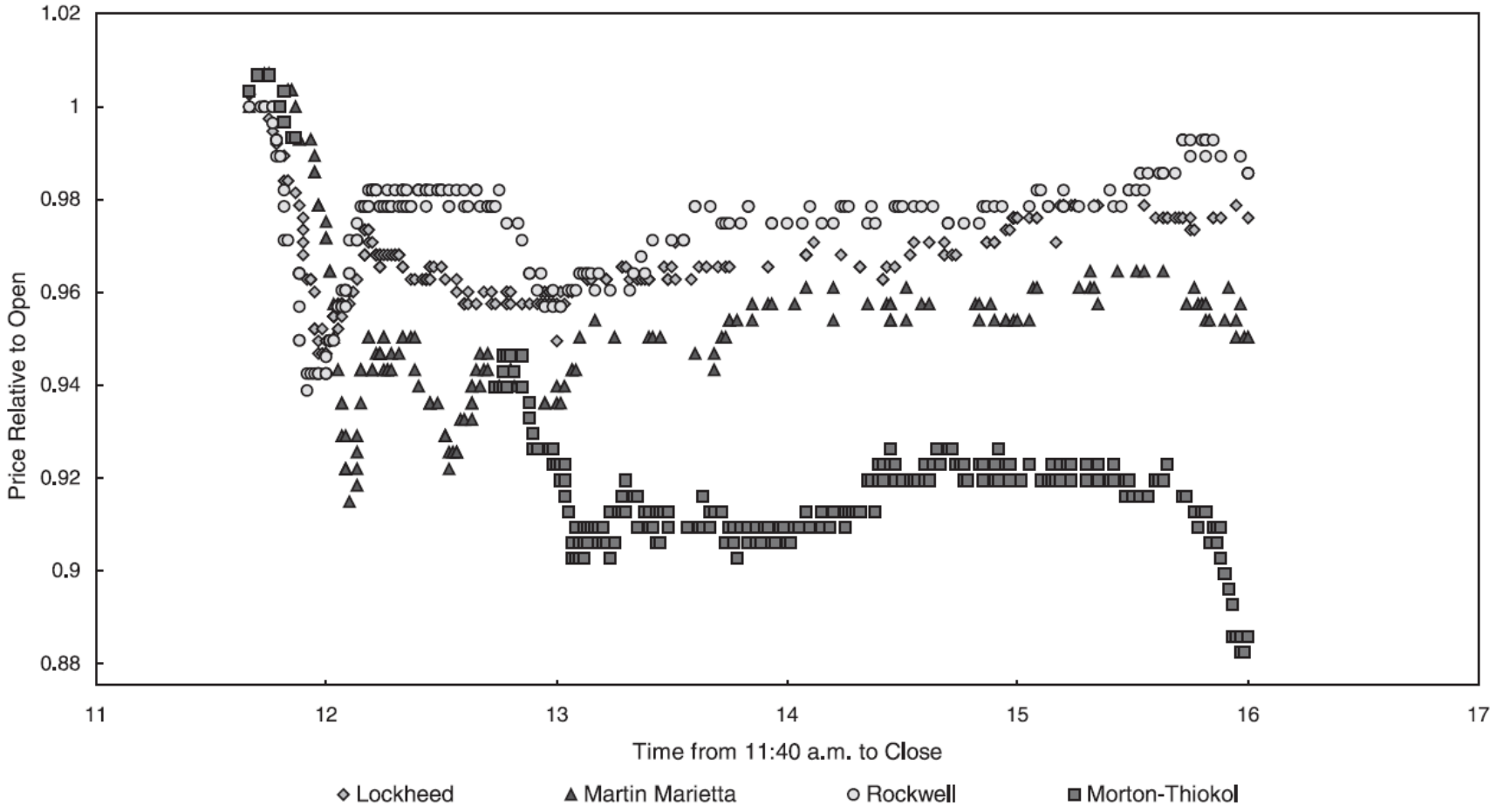
Commission Report (06/1986)

Morton Thiokol at fault:



Intraday Stock Market Behavior

Intraday stock market behavior around the crash on January 28, 1986



Efficient Markets

- An **efficient market** is a market in which security prices always fully reflect the available information

- The **efficient market hypothesis** (EMH) says that real-world markets are efficient

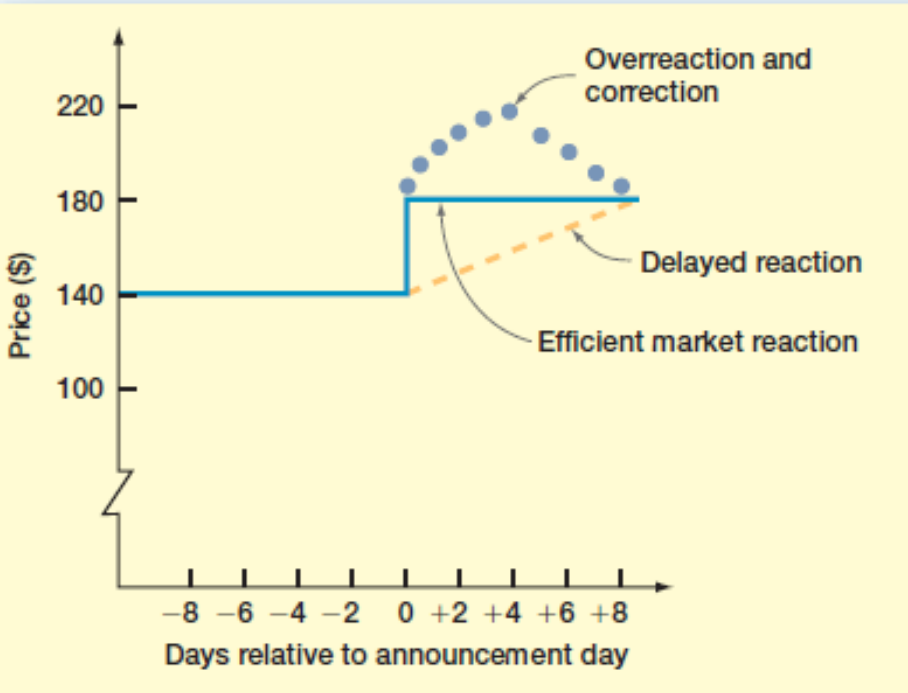
  – Prices react to new information quickly and to the right extent

  – New information is unpredictable; if it could be predicted, then the prediction would be part of today's information

  – Stock prices that change in response to new (unpredictable) information also must move unpredictably

  – Stock price **changes** follow a **random walk**

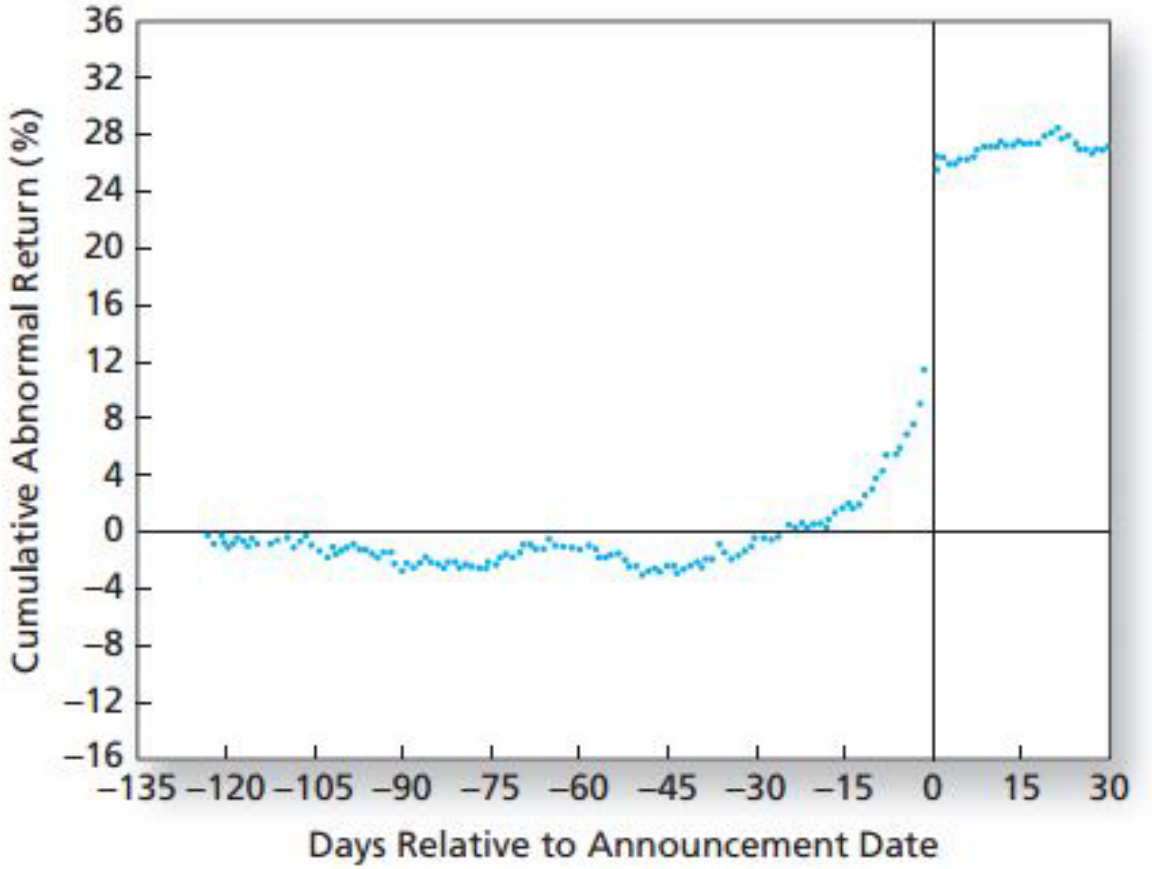
Stock Market Reaction to Good News



- Efficient market reaction: the price instantaneously adjusts to and fully reflect new information; there is no subsequent increase or decrease
- Under reaction (delayed adjustment): the price partially adjusts to the new information; it reflects the complete new information gradually
- Over reaction: the price overreacts to the new information; it overshoots and subsequently corrects

Price Jump on the Announcement Day

Cumulative Abnormal Returns Before Takeover Attempts: Target Companies



- Stock prices jump dramatically on the announcement day but there is no further drift.

Empirical Evidence

A few years ago, Gordon Brown, the Chancellor of the Exchequer, gave an interview to the BBC. The interview was held on the floor of the London Stock Exchange, in front of monitors displaying the ups and downs of stock prices.

As soon as Mr Brown mentioned some disappointing economic data, the screens behind him turned red before he could finish his sentence.

Is this compatible with EMH?

The example shows prices do indeed react quickly to the arrival of news

What Makes Markets Efficient?

- There are many investors out there doing research
  - As new information comes to market, this information is analyzed and trades are made based on this information
  - Therefore, prices should reflect all available information

- If investors stop researching stocks, then the market will not be efficient

Prices Reflect Even Private Information

Example:

Suppose you have accidentally overheard a conversation between the CEO of company A and one of his board members. You learn that company A will acquire company B in a few days.

Because of anticipated synergy effects, you predict that as a result of the takeover, the price of firm B's stock will rise significantly. Because one else knows about this yet, you conclude that B's stock is still under-priced. For the moment, let us ignore any legal issues.

What do you do?

- Buy lots of shares of B's stock
- This pushes the price up until it is not worth buying more
- At that point, B's price reflects the information you possess

Your increased trading activity may reveal your information to other market participants, so they also start buying

Common Misconception about EMH

- Efficient markets ***DO NOT*** imply that investors cannot earn a positive return in the stock market

- They mean that
  1. on average, investors earn a return that is appropriate for the risk undertaken
  2. there is not a bias in prices that can be exploited to earn positive abnormal returns
     - Abnormal return = Actual return – Expected return from a benchmark model
     - Actual returns will sometimes be above and sometimes below expected returns, but on average, unexpected returns are zero

Resource Allocation

- If markets were inefficient, resources would be systematically misallocated.
  - Firm with overvalued securities can raise capital too cheaply.
  - Firm with undervalued securities may have to pass up profitable opportunities because cost of capital is too high.

- Even if the market is efficient a role exists for portfolio management
  - Skilled portfolio managers can select stocks to construct well-diversified portfolios to eliminate unsystematic risks

Can Fund Managers Generate Alpha?

So, Are Market Efficient?

- We have to be careful in judging whether EMH holds or not: the most probably the truth is somewhere in the middle

- Performance of professional managers is consistent with EMH: most managers do not do better than the index fund that invests in the market portfolio

- There are, however, some notable superstars: Warren Buffet, George Soros
  - "*I'd be a bum on the street with a tin cup if the markets were efficient!*"

    -- Warren Buffet
  - In 1964, shares in Buffet's fund, Berkshire Hathaway, were trading at $19.46. As of 2018, the price is a staggering $330,000 per share!

Exercise

Respond to the following comments: “If stock price changes are random, then capital markets are little different from a casino.”

Though stock price changes do appear to be random, over the long run there is compensation for bearing risks and for the time value of money. Investing differs from a casino in that in the long-run, an investor is compensated for these risks, while a player at a casino faces less than fair-game odds.