



Lecture 7

Efficient Markets Hypothesis

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Jargons of the day

- Arbitrage
- Technical analysis
- Fundamental analysis
- Abnormal Return
- Cumulative Abnormal Return
- Random walk
- Insider trading



Expectations & EMH

- Expectations are very important in our financial system.
 - Expectations of returns, risk, and liquidity impact asset demand
 - Inflationary expectations impact bond prices
 - Expectations not only affect our understanding of markets, but also how financial institutions operate.
- To better understand expectations, we examine the *efficient markets hypothesis*.
 - Framework for understanding what information is useful and what is not
 - However, we need to validate the hypothesis with real market data. The results are mixed, but generally supportive of the idea.



Efficient Market Hypothesis

- Recall that the rate of return for any position is the sum of the capital gains ($P_{t+1} - P_t$) plus any cash payments (C):

$$R = \frac{P_{t+1} - P_t + C}{P_t}$$

- At the start of a period, the unknown element is the future price: P_{t+1} . But, investors do have some expectation of that price, thus giving us an *expected rate of return*.

$$R^e = \frac{P_{t+1}^e - P_t + C}{P_t}$$



Efficient Market Hypothesis

The Efficient Market Hypothesis views the expectations as equal to optimal forecasts using all available information. This implies:

$$P_{t+1}^e = P_{t+1}^{of} \rightarrow R^e = R^{of}$$

Assuming the market is in equilibrium:

$$R^e = R^*$$

Put these ideas together: ***efficient market hypothesis***

$$R^{of} = R^*$$



Efficient Market Hypothesis

$$R^{of} = R^*$$

- This equation tells us that current prices in a financial market will be set so that the optimal forecast of a security's return using all available information equals the security's equilibrium return.
- Financial economists state it more simply: **A security's price fully reflects all available information in an efficient market.**



Rationale Behind the EMH

- Why **efficient market hypothesis** makes sense

If $R^{of} > R^* \rightarrow P_t \uparrow \rightarrow R^{of} \downarrow$

If $R^{of} < R^* \rightarrow P_t \downarrow \rightarrow R^{of} \uparrow$

Until $R^{of} = R^*$

- All unexploited profit opportunities eliminated
- Efficient market condition holds even if there are uninformed, irrational participants in market



Assumptions of EMH

- According to the Efficient Market Hypothesis, an *efficient* capital market is one in which “asset prices always fully reflect available information” (Fama, 1970)
- As a consequence, markets “allocate society’s scarce capital almost perfectly by setting prices to fluctuate randomly around their ‘true’ fundamental values” (Frydman & Goldberg, 2011)
- EMH based on a set of three key assumptions
 - Investors are rational
 - Independence of events (no unforeseen change can be linked to known past or current events)
 - Arbitrage
- The EMH has key implications for the functioning of capital markets



Arbitrage in Financial Market

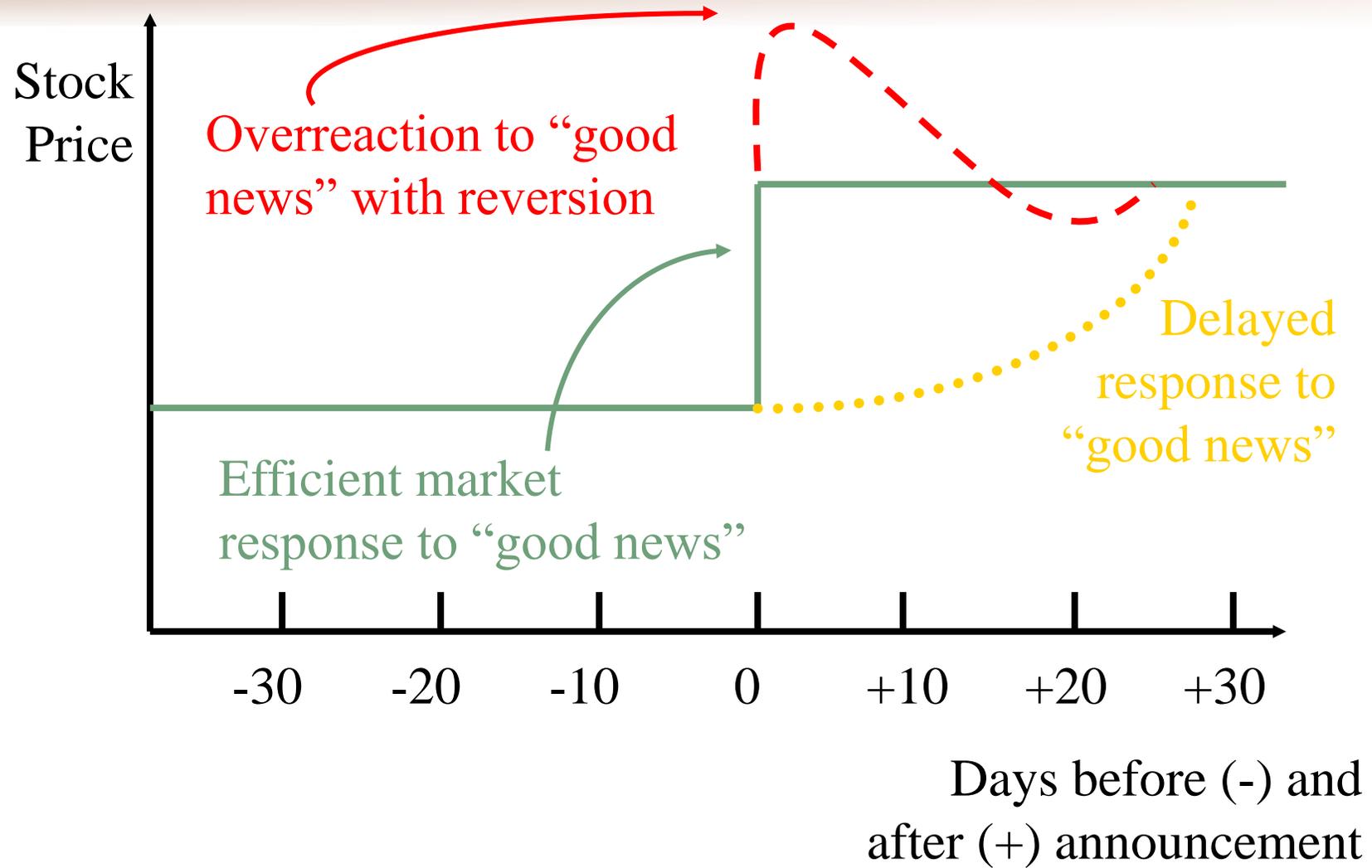


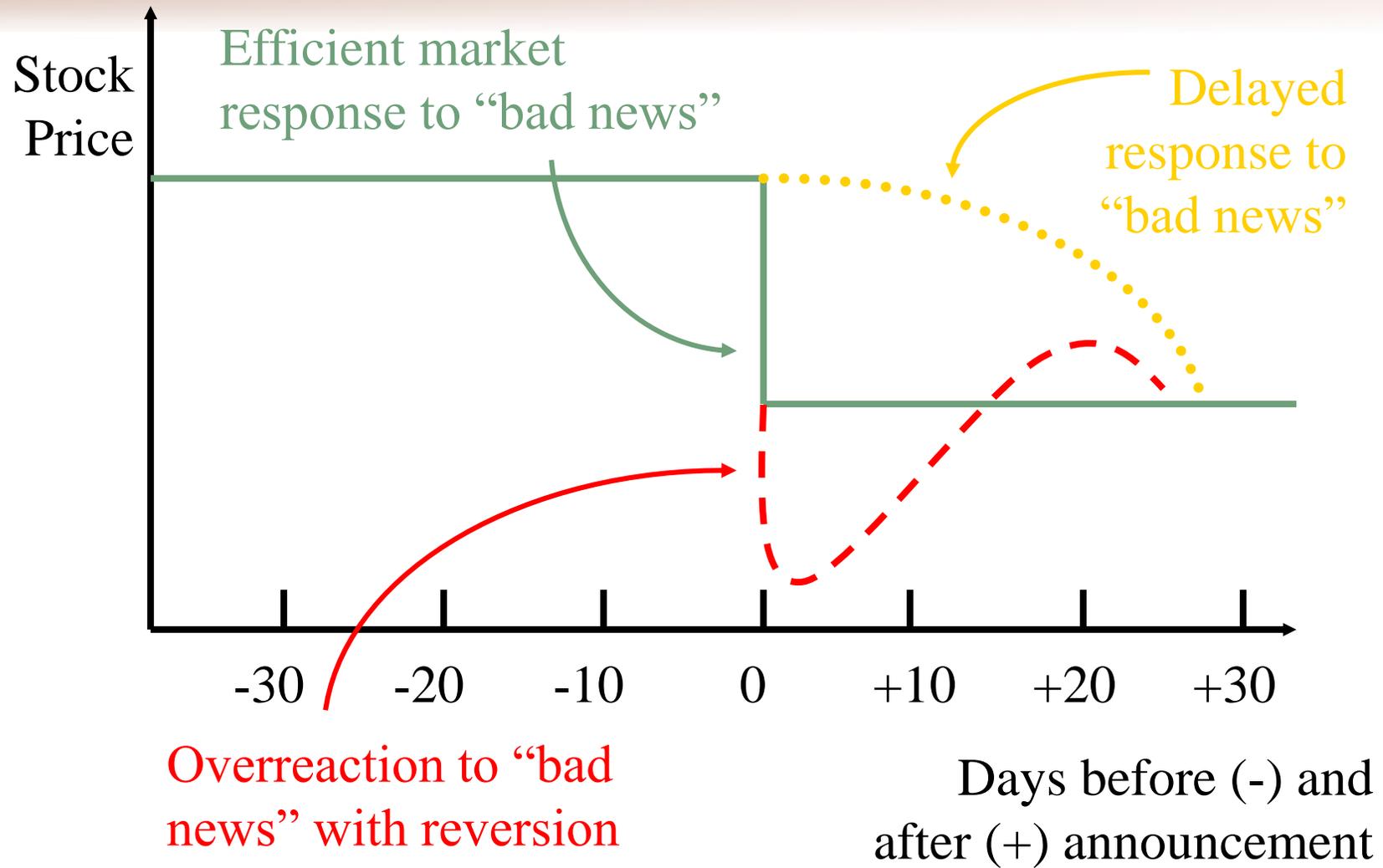
EMH implications for investors & firms

- For investors, any attempt to earn excess returns (after taking risk into account) is bound to fail
 - Knowing information *when it is released* does an investor little good; the price adjusts before investors have time to trade on it
- Firms should expect to receive the fair value for securities that they sell. *Fair* means that the price they receive from issuing securities is the present value
 - Firms cannot profit from fooling investors in an efficient market



Example: stock price reactions to good & bad news







2. Different types of efficiency

- Weak Form
 - Security prices reflect all historical information.
- Semi-strong Form
 - Security prices reflect all publicly available information.
- Strong Form
 - Security prices reflect all information—public and private.



Weak form market efficiency

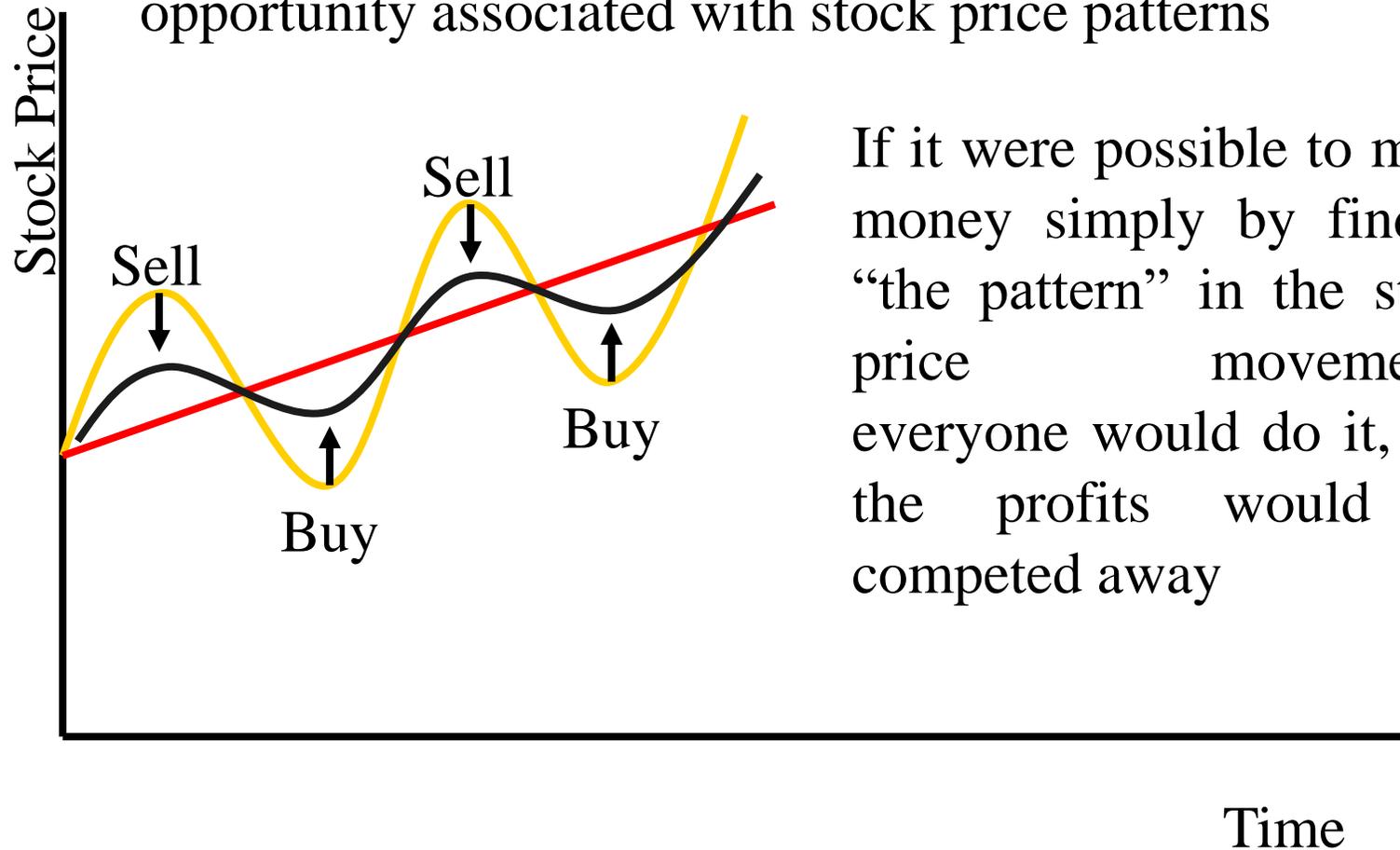
- Security prices reflect all information found in past prices and volume
- If the weak form of market efficiency holds, then technical analysis is of no value
- Since stock prices only respond to *new* information, which according to this theory arrives randomly, stock prices are said to follow a **random walk**

$$P_t = P_{t-1} + \text{Expected return} + \text{Random error}_t$$



Why technical analysis fails?

Investor behavior tends to eliminate any profit opportunity associated with stock price patterns



If it were possible to make money simply by finding “the pattern” in the stock price movements, everyone would do it, and the profits would be competed away



Semi-strong form market efficiency

- Security prices reflect all publicly available information
- Publicly available information includes:
 - Historical price and volume information
 - Published accounting statements
 - Information found in annual reports

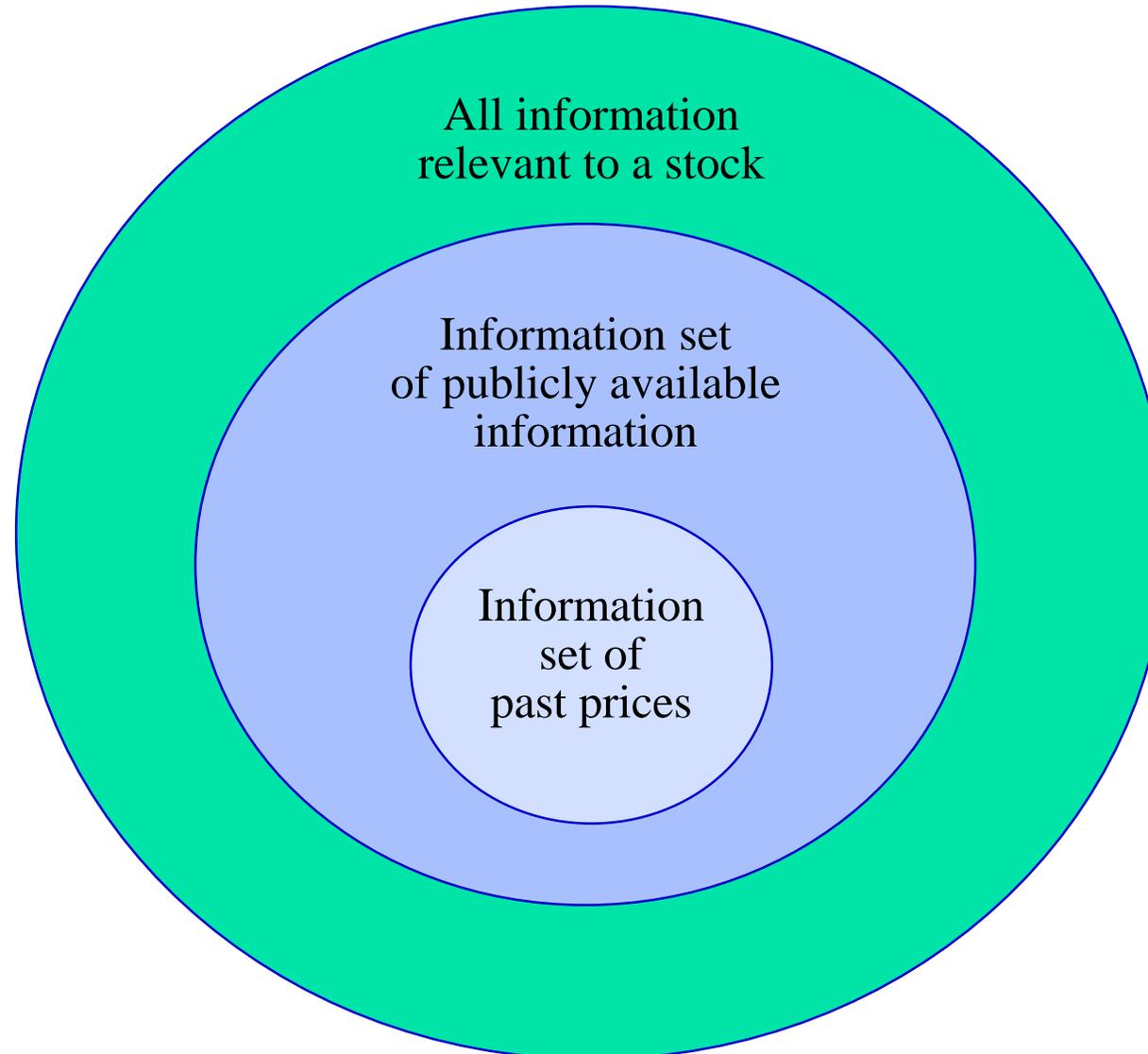


Strong form market efficiency

- Security prices reflect all information - public and private
- Strong form efficiency incorporates weak and semi-strong form efficiency
- Strong form efficiency says that *anything* pertinent to the stock and known to at least one investor is already incorporated into the security's price



Information sets





What the EMH does and does not say

- Investors can throw darts to select stocks
 - This is almost, but not quite, true
 - An investor must still decide how risky a portfolio he wants based on risk aversion and expected return
- Prices are random or uncaused
 - Prices reflect information
 - Changes in prices are driven by *new* information, which according to the theory arrives randomly
 - Therefore, financial managers cannot “time” stock and bond sales



3. The evidence

- The record on the EMH is extensive
- Some view it as reassuring to advocates of the efficiency of markets (pre-2007)
- Studies fall into three broad categories:
 1. Are changes in stock prices random? Are there profitable “trading rules?”
 2. Event studies: does the market quickly and accurately respond to new information?
 3. The record of professionally managed investment firms

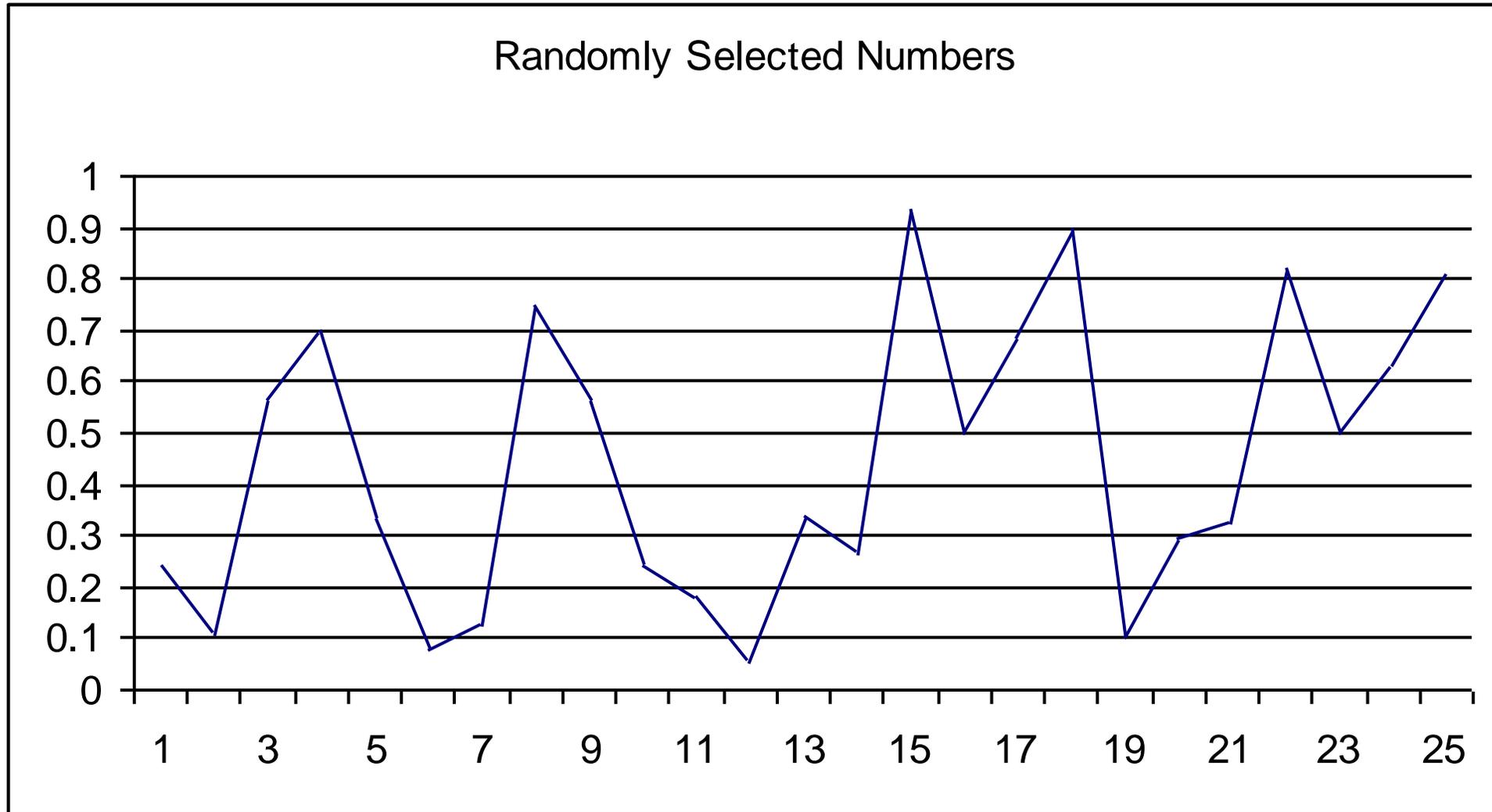


Are changes in stock prices random?

- Can we really tell?
 - Many psychologists and statisticians believe that most people want to see patterns even when faced with pure randomness
 - Are patterns mere optical illusions? See behaviorists' response
- A matter of degree
 - Even if we can spot patterns, we need to have returns that beat our transactions costs
- Random stock price changes would support weak form efficiency

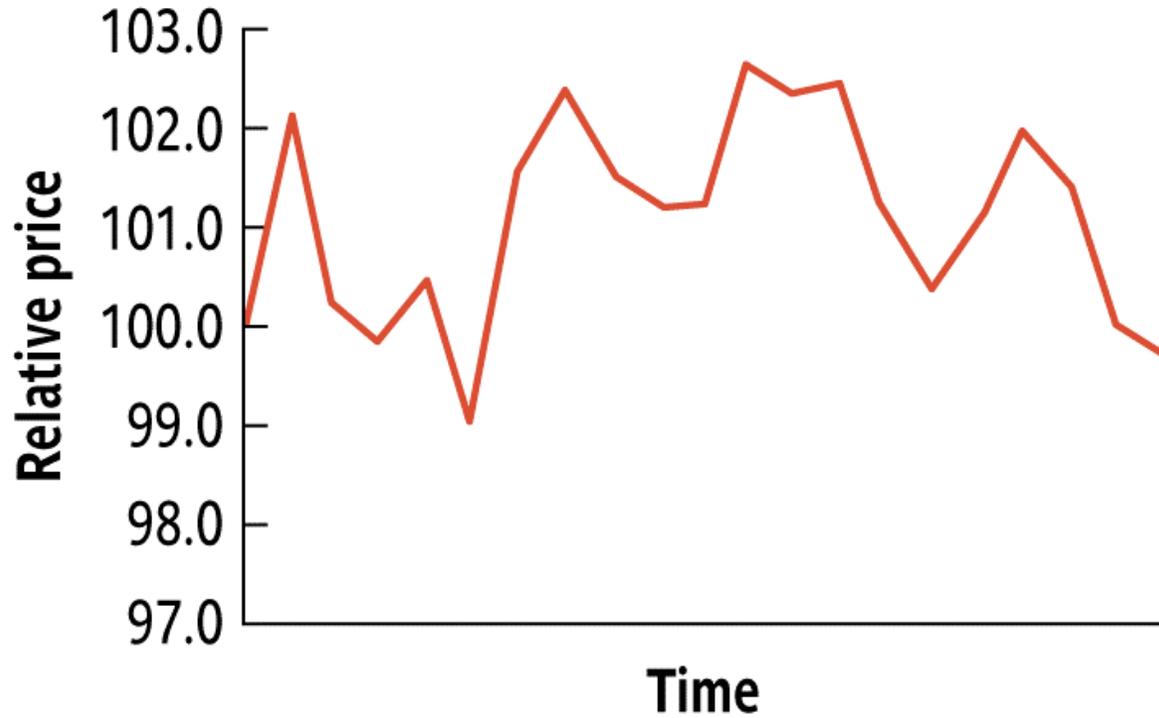


What pattern do you see?

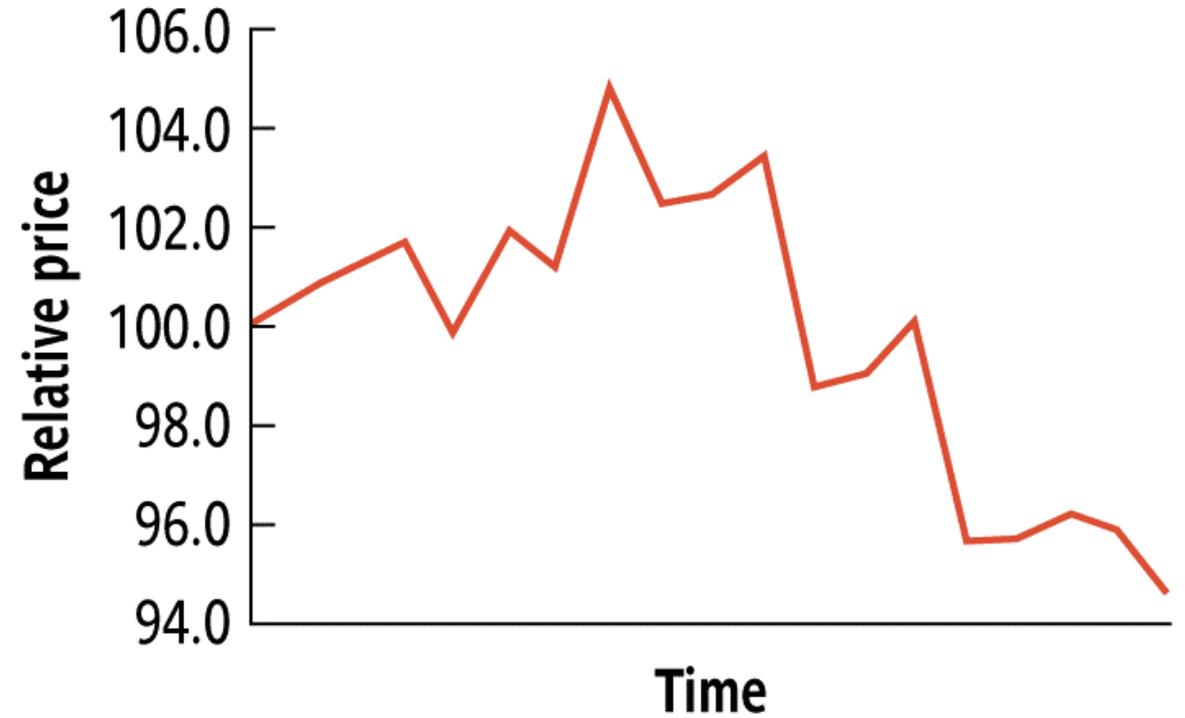




A. Price movements simulated from random-walk process



B. Actual price movements for the stock of The Gap





Event Studies

- Event Studies are one type of test of the semi-strong form of market efficiency
 - Remember, this form of the EMH implies that prices should reflect all publicly available information
- To test this, event studies examine prices and returns over time—particularly around the arrival of new information
- Test for evidence of under-reaction, overreaction, early reaction, or delayed reaction around the event

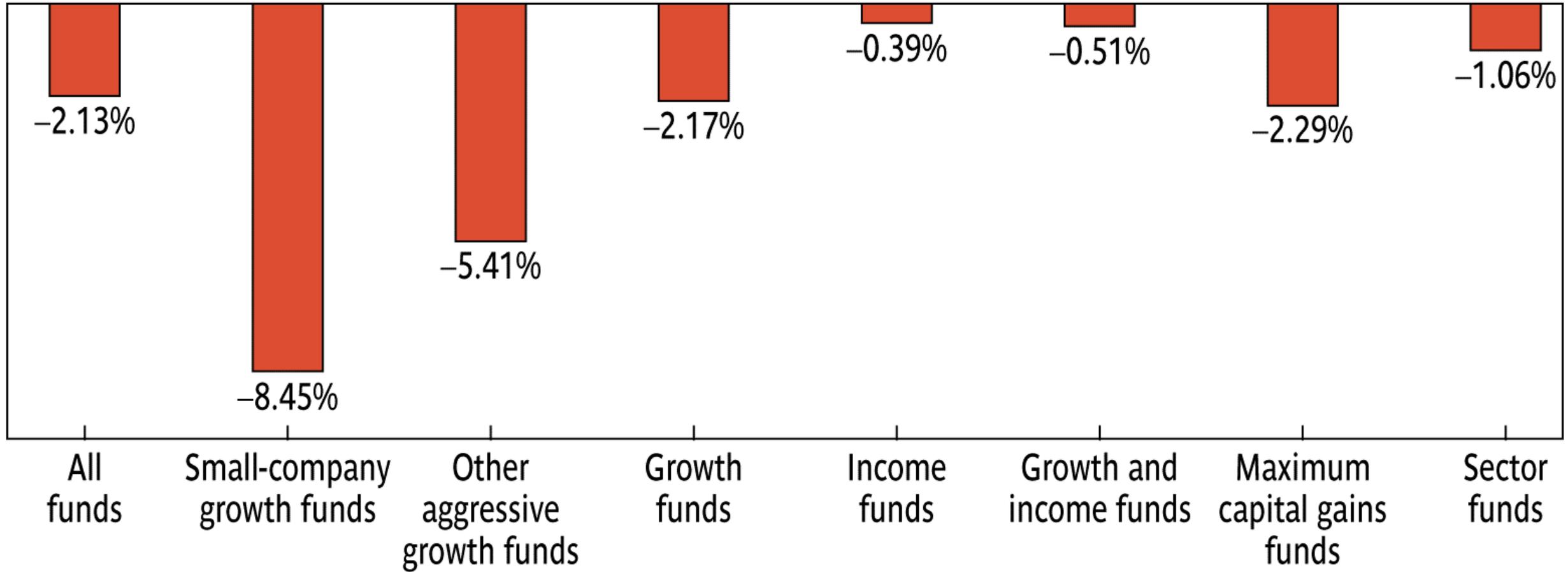


The record of mutual funds

- If the market is semi-strong form efficient, then no matter what publicly available information mutual fund managers rely on to pick stocks, their average returns should be the same as those of the average investor in the market as a whole.
- We can test efficiency by comparing the performance of professionally managed mutual funds with the performance of a market index.



The record of mutual funds



Source: Lubos Pastor and Robert F. Stambaugh, "Mutual Fund Performance and Seemingly Unrelated Assets," *Journal of Financial Economics*, 63 (2002).

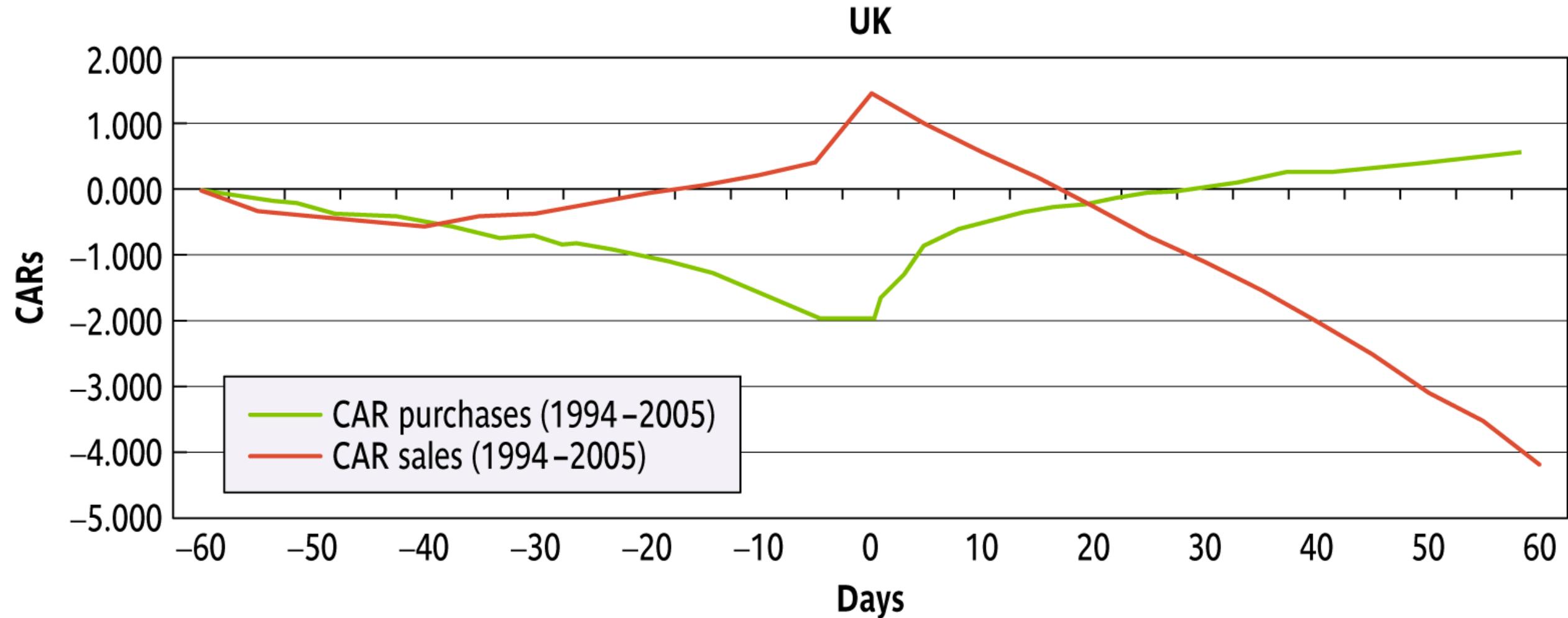


The strong form of the EMH

- One group of studies of strong form market efficiency investigates insider trading
- A number of studies support the view that insider trading is abnormally profitable
- Thus, strong form efficiency does not seem to be substantiated by the evidence



Cumulative Abnormal Returns from UK Director Trading





Abnormal Return and Cumulative Abnormal Return

- Returns are adjusted to determine if they are *abnormal* by taking into account what the rest of the market did that day.
- The ***Abnormal Return (AR)*** on a given stock for a particular day can be calculated by subtracting the market's return on the same day (R_M) from the actual return (R) on the stock for that day:

$$AR_{j,t} = R_{j,t} - R_{M,t}$$

- The **Cumulative Abnormal Return (CAR)** can be calculated as:

$$CAR_{j,t} = \sum_{-T}^t AR_{j,t}$$

(Aggregate abnormal returns from $-T$ to t)



Is Insider Trading a Victimless Crime?

<https://www.youtube.com/watch?v=2BtawLeS5f>





Summary: Evidence on 3 forms of EMH

- The evidence certainly does not support the strong form EMH
- There is some degree of support for the semi-strong form and the weak form
 - But this evidence is more and more questioned by non-mainstream financial economists
- There is anecdotal evidence against EMH (insider trading, corporate scandals...)
- More importantly, there have been serious theoretical and empirical challenges in recent years



Empirical Challenges to EMH

- 1) Irrational exuberance
- 2) Earnings Surprises
- 3) Firm Size
- 4) Value vs. Growth



1) Irrational exuberance

- A long-term view of financial markets shows long, persistent up swings in asset prices
- Bubbles occur when the price of an asset differs from its fundamental market value
 - Can bubbles be rational?
 - Tulip mania is a classical example
 - In recent decades, think of the Internet (dotcom) bubbles in late 1990s or the house price bubble in the 2000s



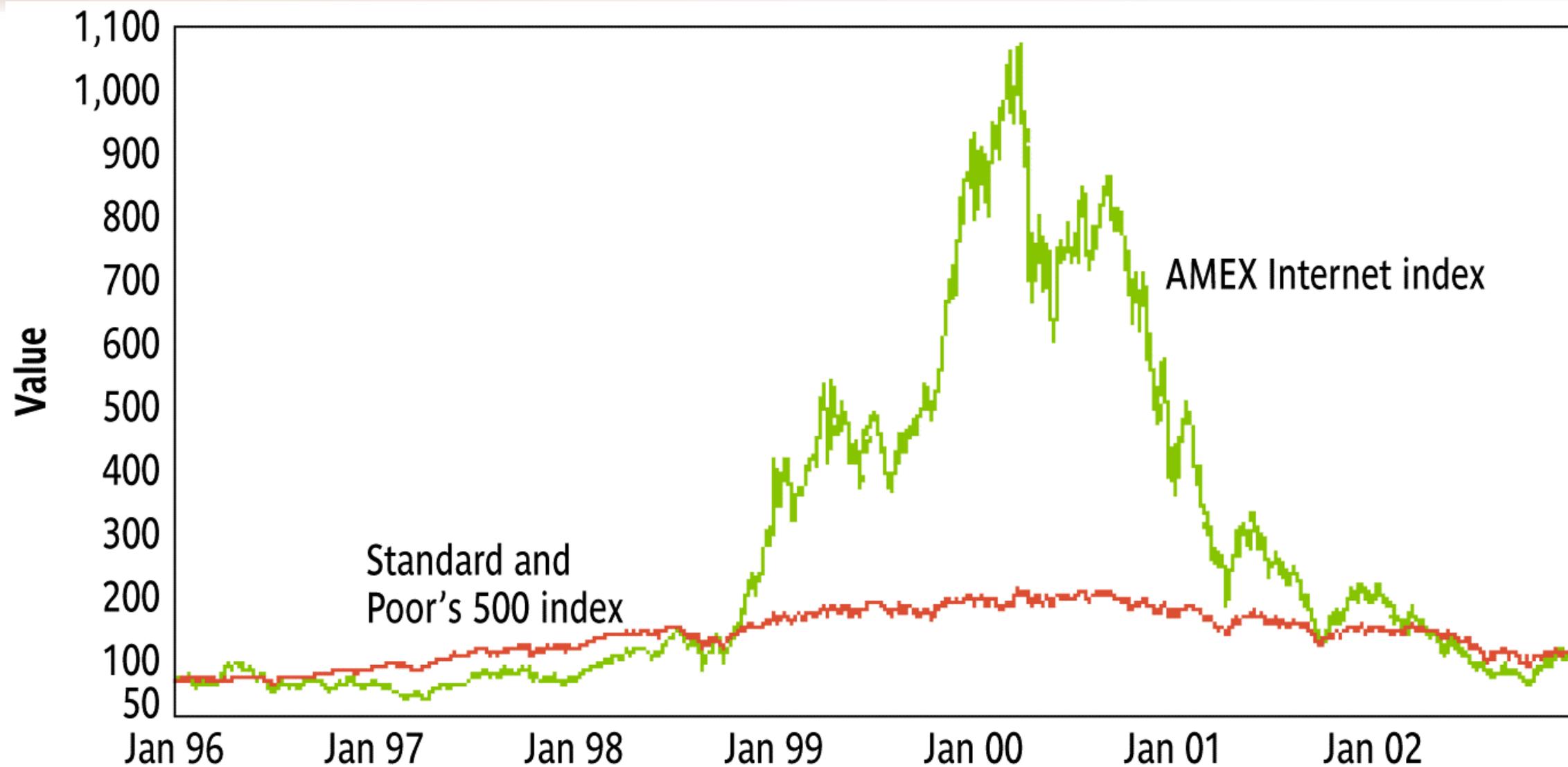
Tulip Mania

<https://www.youtube.com/watch?v=I5ZR0jMIxX0>





Internet Bubbles

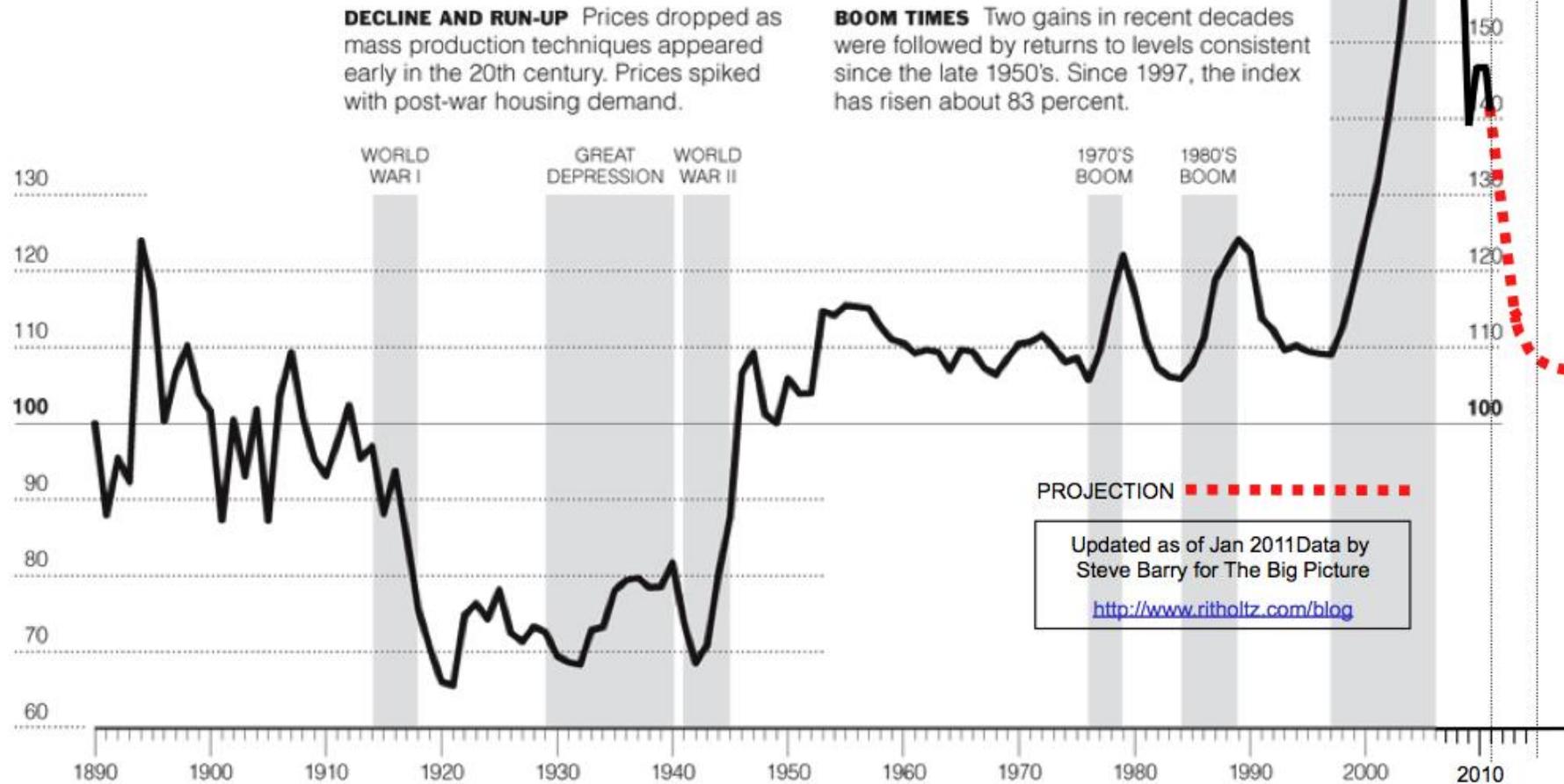




A History of Home Values

The Yale economist Robert J. Shiller created an index of American housing prices going back to 1890. It is based on sale prices of standard existing houses, not new construction, to track the value of housing as an investment over time. It presents housing values in consistent terms over 116 years, factoring out the effects of inflation.

The 1890 benchmark is 100 on the chart. If a standard house sold in 1890 for \$100,000 (inflation-adjusted to today's dollars), an equivalent standard house would have sold for \$66,000 in 1920 (66 on the index scale) and \$199,000 in 2006 (199 on the index scale, or 99 percent higher than 1890).





Manias, panics and crashes

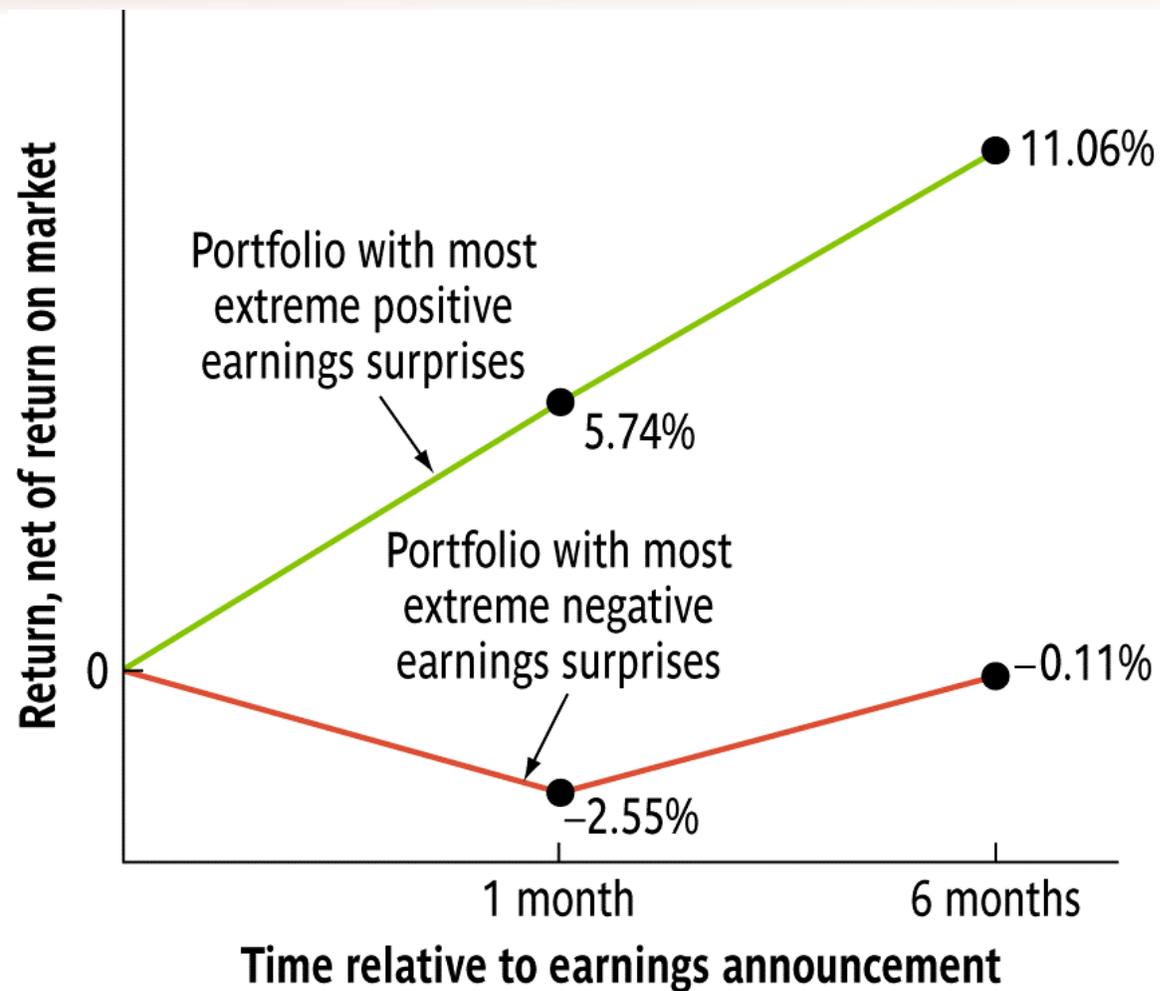
- Most bubbles ends with crashes
- Crashes are **unexpected**
 - On October 19, 1987, the stock market dropped between 20 and 25 percent on a Monday following a weekend during which little surprising news was released
 - A drop of this magnitude for no apparent reason is inconsistent with market efficiency



2). Earnings Surprises

Stock prices
adjust slowly to
earnings
announcements

Why?

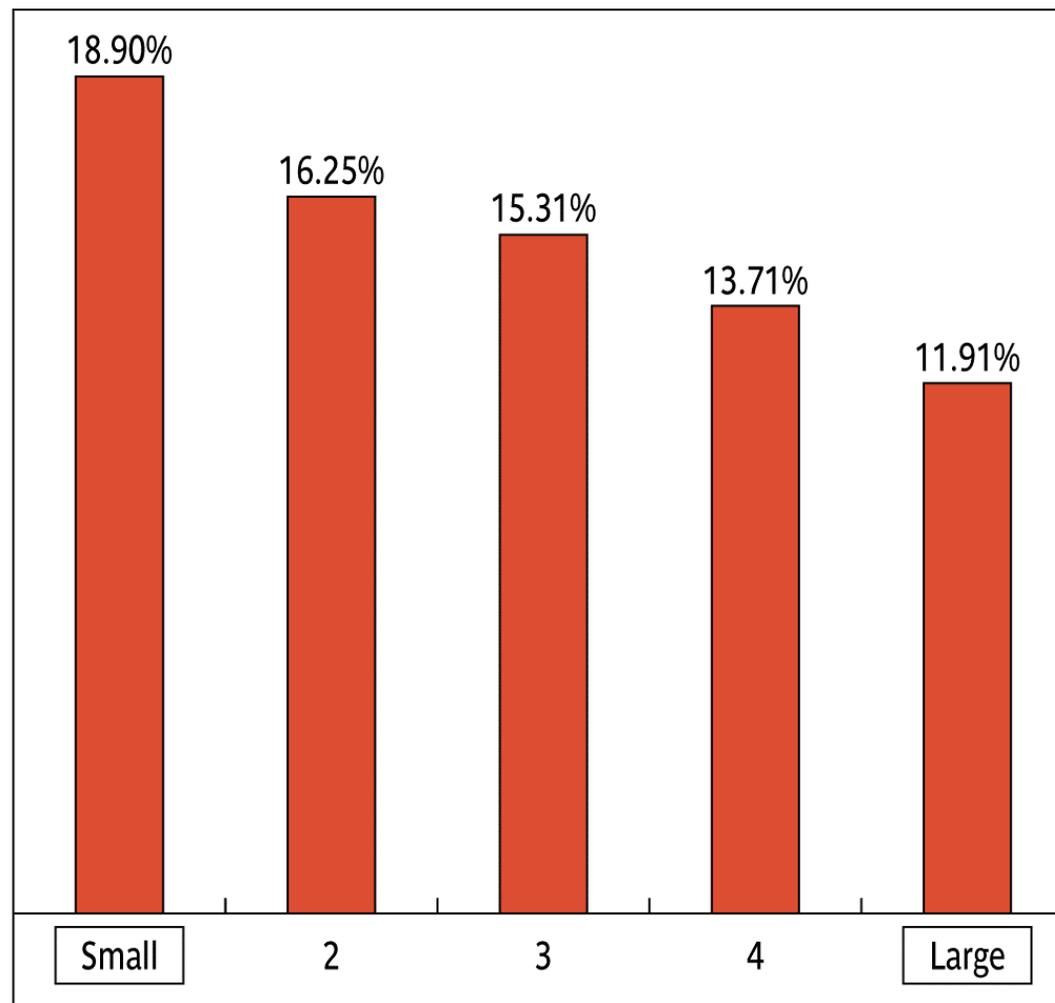


Source: Adapted from Table 1 of A. Kolasinski and X. Li, 'Are corporate managers savvy about their stock price? Evidence from insider trading after earnings announcements', *Journal of Accounting and Public Policy* (2009).



3). Firm Size

Small cap stocks seem to outperform large cap stocks

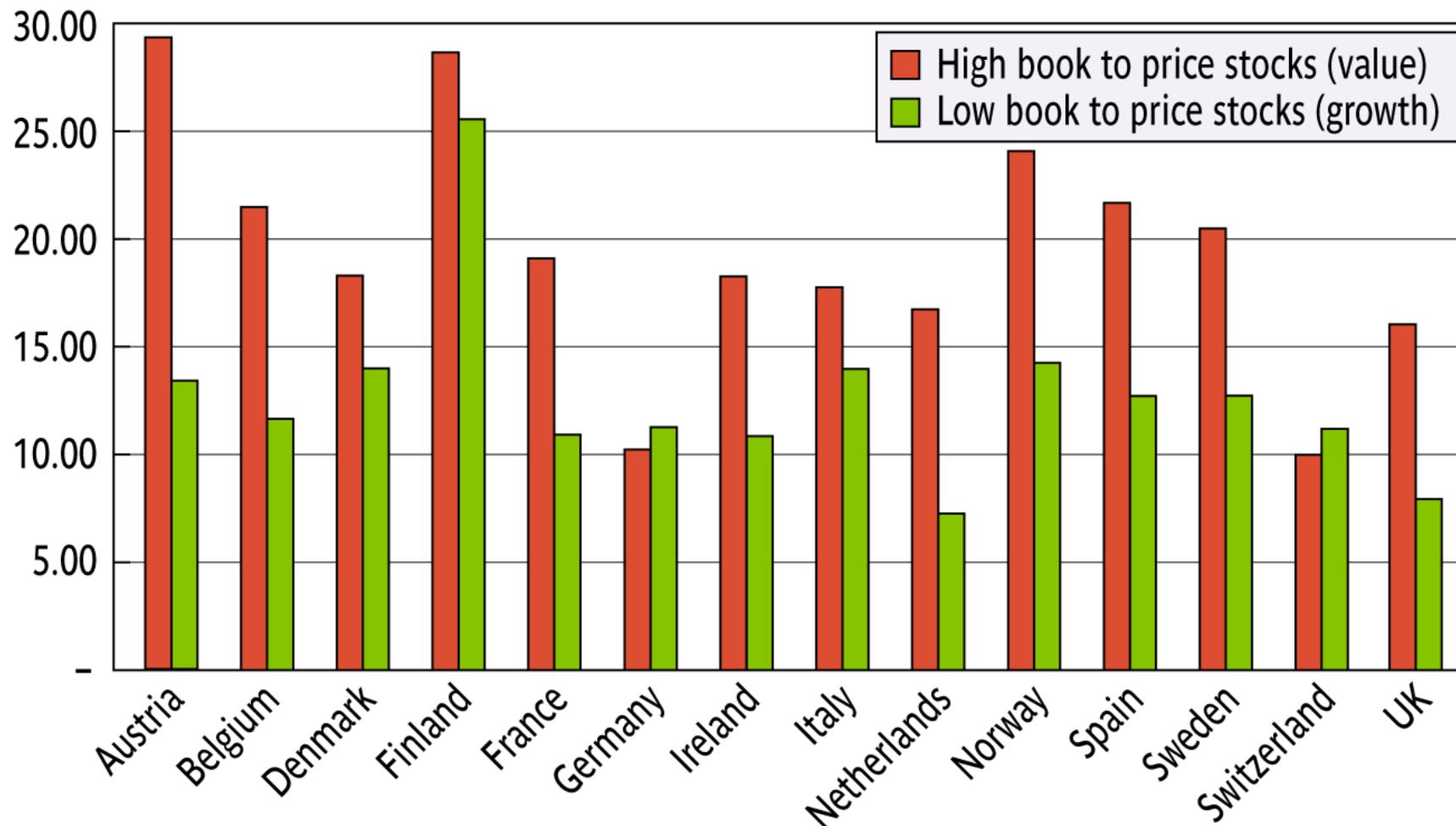


Source: T. Loughran, 'Book-to-market across firm size, exchange and seasonality', *Journal of Financial and Quantitative Analysis* 32 (1997).



4). Value vs. Growth

High book value-to-stock price stocks and/or high E/P stocks outperform growth stocks



Source: The figures are the authors' own calculations based on data taken from Kenneth French's website (<http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html>)



Agenda

1. Efficient Market Hypothesis
2. Different types of efficiency within EMH
3. Empirical evidence



Next Topic

- CAPM Model & Behaviour Issues in Financial Markets
- Some parts of Mishkin and Eakins (2015) relevant parts in Chapter 4 and Chapter 15