Module 4: Market Efficiency

(BUSFIN 4221 - Investments)

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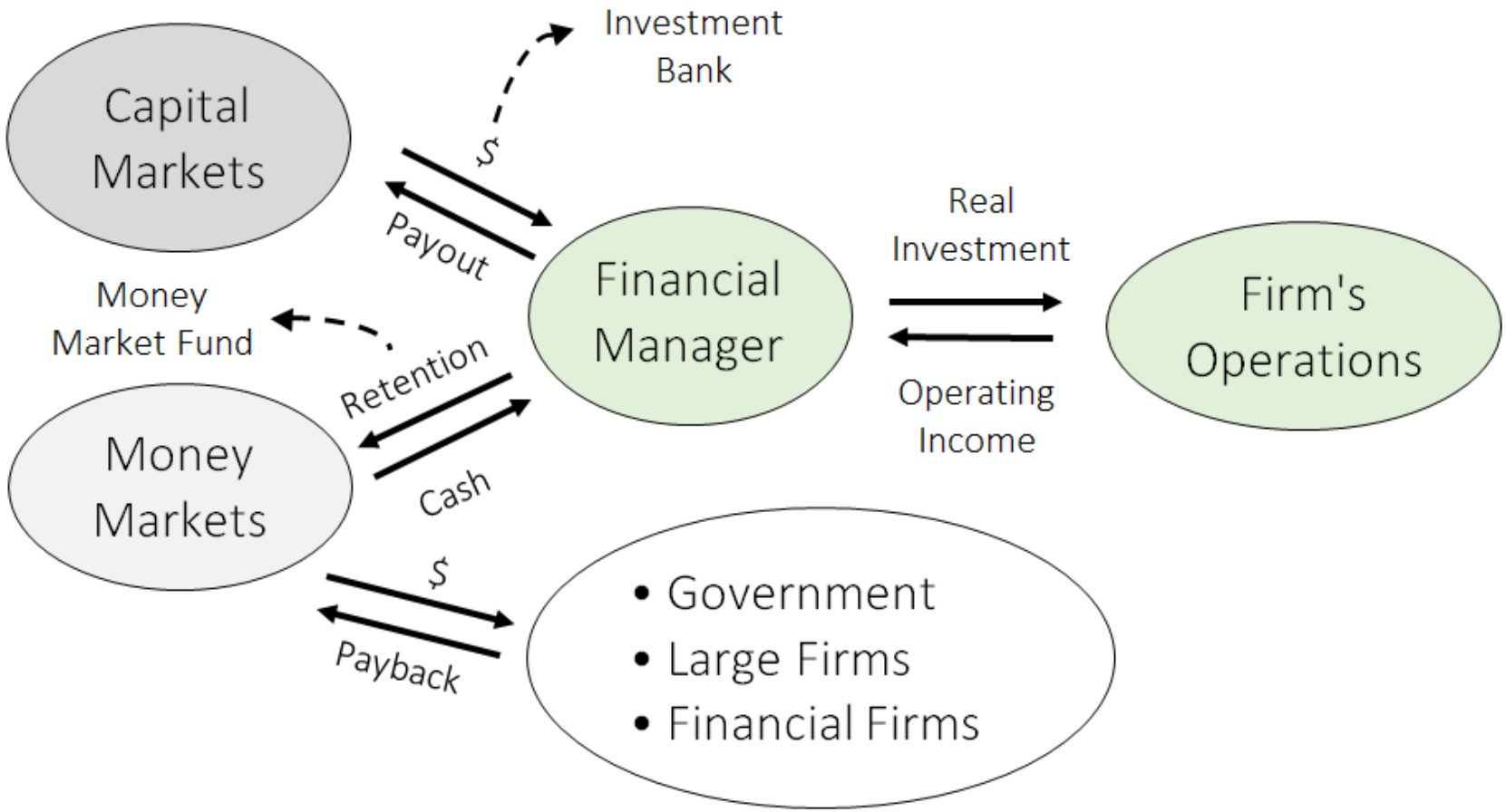
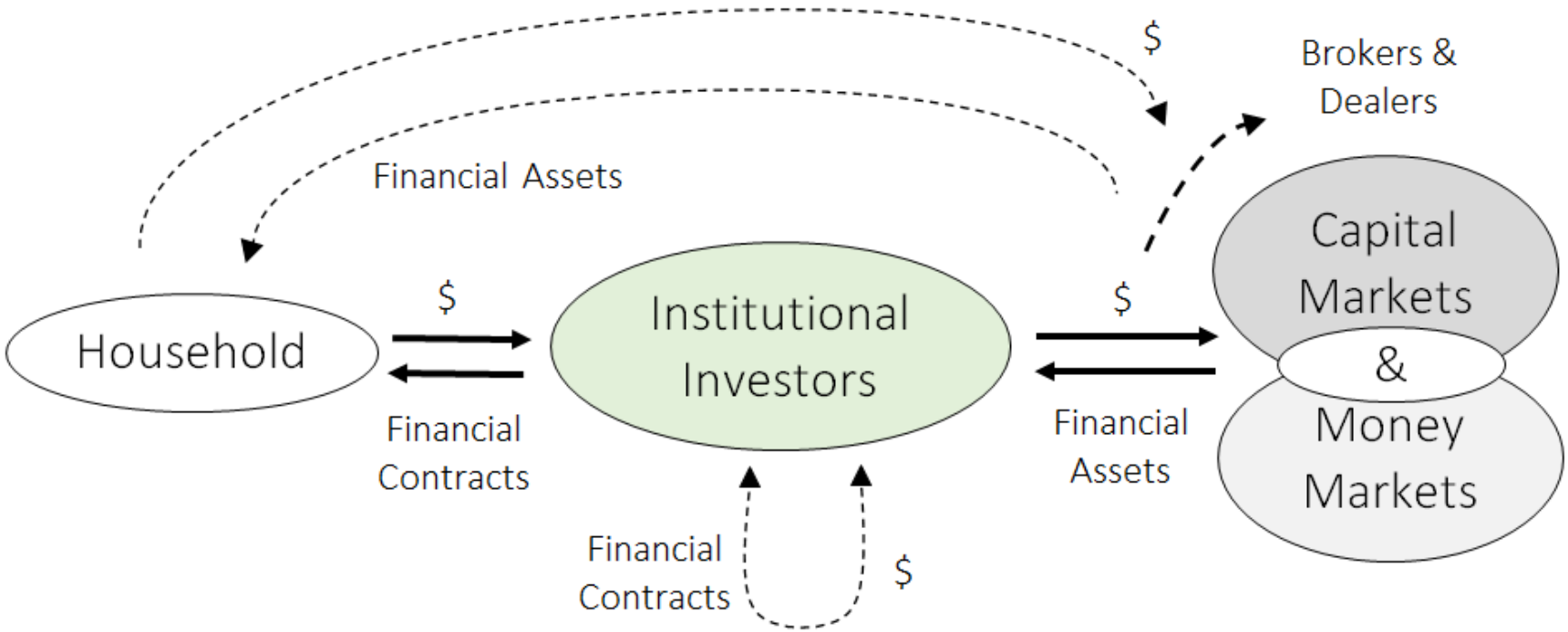
Fall 2016

Module 1 - The Demand for Capital



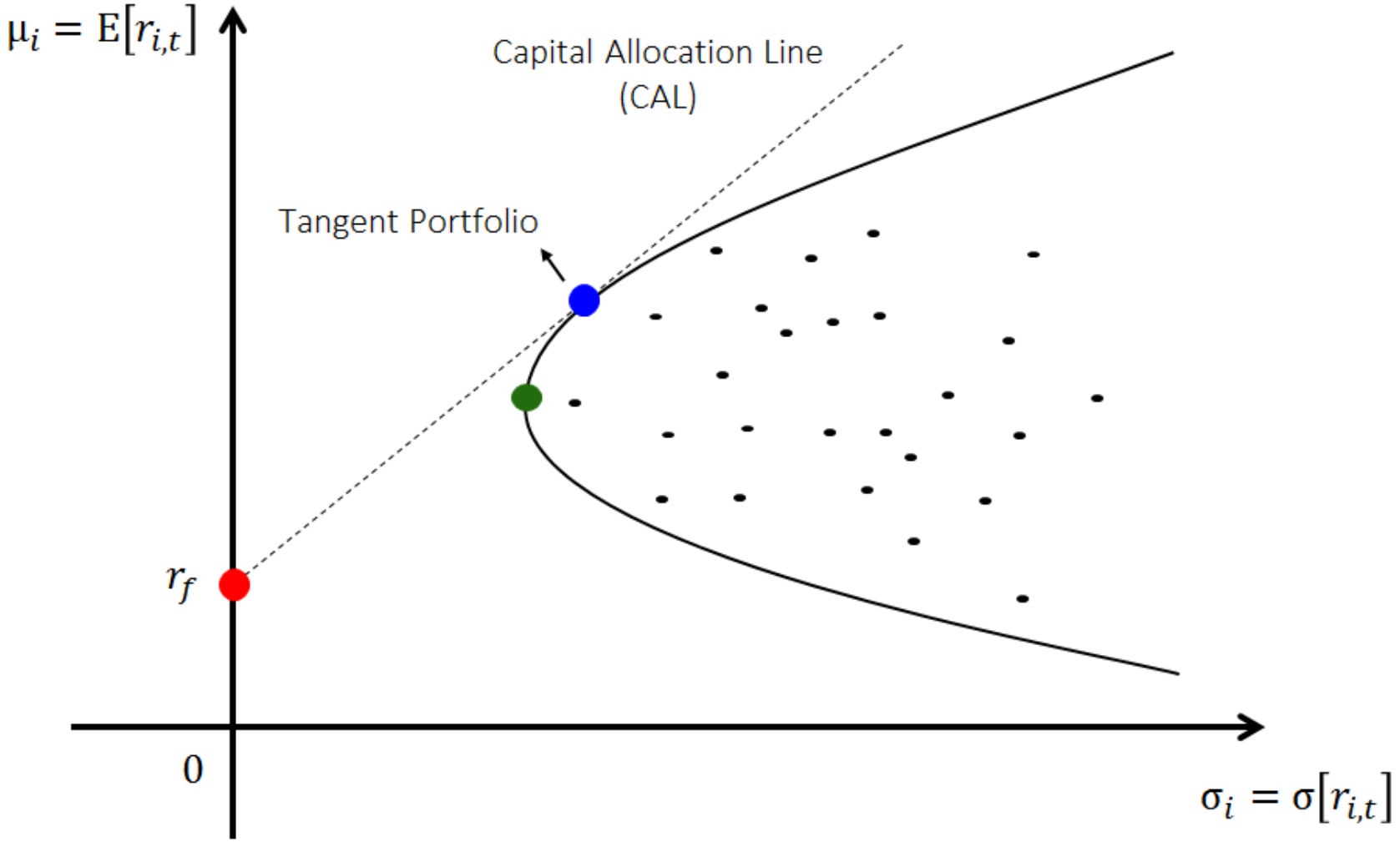
Module 1 - The Supply of Capital



Module 1 - Investment Principle

$$PV_t = \sum_{h=1}^{\infty} \frac{\mathbb{E}_t \left[CF_{t+h} \right]}{\left(1 + dr_{t,h} \right)^h}$$

Module 2 - Portfolio Theory



Module 3 - Factor Models

$$\mathbb{E}[r_i] = r_f + \beta_i \cdot (\mathbb{E}[r_M] - r_f)$$

$$+ \beta_{i,A} \cdot \mathbb{E}[r_A - r_a]$$

$$+ \beta_{i,B} \cdot \mathbb{E}[r_B - r_b]$$

$$+ \ldots$$

This Module: Market Efficiency

This Section: Efficient Market Hypothesis (EMH)

Prices correctly incorporate all relevant information available up to time t

Prices correctly incorporate all relevant information available up to time T

Prices are Intrinsically Linked to Information*

$$P_t = f\left(\text{Information available at time } t\right)$$

- Example: After the recent presidential debate, the peso (Mexican currency) appreciated by 2% relative to the dollar
- What is the $f(\cdot)$ function?
- What does it mean for $f(\cdot)$ to "correctly incorporate" all information?
- What information is relevant for prices?

Correctly Incorporating Information: Valuation Identity*

- In your "introduction to finance" class you used the definition of an interest rate to find:

$$PV = \frac{CF}{1+r} + \frac{CF}{(1+r)^2} + \frac{CF}{(1+r)^3} + \ldots$$

- From the definition of a "financial return", $r_t = \frac{(CF_t + P_t) - P_{t-1}}{P_{t-1}}$, we can isolate P_t and use recursive substitutions to show that (proof is in the appendix):

$$P_t = \frac{\mathbb{E}_t[CF_{t+1}]}{1+\mathbb{E}_t[r]} + \frac{\mathbb{E}_t[CF_{t+2}]}{(1+\mathbb{E}_t[r])^2} + \frac{\mathbb{E}_t[CF_{t+3}]}{(1+\mathbb{E}_t[r])^3} + \ldots$$

$$= \sum_{h=1}^{\infty} \frac{\mathbb{E}_t[CF_{t+h}]}{(1+\mathbb{E}_t[r])^h} = f(\text{Information at time } t)$$

Explaining the Previous two Slides

Key message: The valuation identity, $P_t = \sum_{h=1}^{\infty} \frac{\mathbb{E}_t[CF_{t+h}]}{(1+\mathbb{E}_t[r])^h}$, is always valid. This links current prices to current information.

Details:

The last slide provides a crucial result for understanding prices of financial assets. It says that there is one "valuation identity" that is always valid: $P_t = \sum_{h=1}^{\infty} \frac{\mathbb{E}_t[CF_{t+h}]}{(1+\mathbb{E}_t[r])^h}$.

Why is this equation always valid? Well, it can be proved by using the definition of a return and following algebraic steps (the proof is not required for the class, but it is available in the appendix of these class notes). No economic assumption needs to be made: no equilibrium or "smart investor" condition is needed.

So...there is a valuation identity that links current prices to current information embedded into expected cash flows, $\mathbb{E}_t[CF_{t+h}]$, and expected returns, $\mathbb{E}_t[r]$. This valuation identity replaces the f function in $P_t = f(\text{Information at time } t)$.

Now, the question is: does this valuation identity correctly incorporates the information? The next slide addresses this question.

Correctly Incorporating Information: What does it Mean?*

$$P_t = \sum_{h=1}^{\infty} \frac{\mathbb{E}_t\left[CF_{t+h}\right]}{\left(1+\mathbb{E}_t\left[r\right]\right)^h} \quad \times \quad P_t = \sum_{h=1}^{\infty} \frac{\widehat{CF}_{t+h}}{\left(1+dr_t\right)^h}$$

- dr_t is the discount rate or "required rate of return". It is determined by investors aversion to the given security
- EMH Holds: $\widehat{CF}_{t+h} = \mathbb{E}_t\left[CF_{t+h}\right] \implies \mathbb{E}_t\left[r\right] = dr_t$
- Prices are too high: $\widehat{CF}_{t+h} > \mathbb{E}_t\left[CF_{t+h}\right] \implies \mathbb{E}_t\left[r\right] < dr_t$
- Prices are too low: $\widehat{CF}_{t+h} < \mathbb{E}_t\left[CF_{t+h}\right] \implies \mathbb{E}_t\left[r\right] > dr_t$
- Here is a Shark Tank episode showing how this principle works

Explaining the Previous Slide

Key message: If markets are efficient, then $\mathbb{E}_t[r] = dr_t$. That is, investors can expect to receive a return identical to what they require in order to invest in any security

Details:

Investors value any given financial asset (google stock for example) by estimating the future cash flows they will receive and discounting these estimated cash flows, $\widehat{CF}_{t+h}$, by the rate they require in order to invest in such asset, dr_t. That is, $P_t = \sum_{h=1}^{\infty} \frac{\widehat{CF}_{t+h}}{(1+dr_t)^h}$.

If new information is correctly incorporated, then $\widehat{CF}_{t+h} = \mathbb{E}_t[CF_{t+h}]$. In other words, investor's estimates are as good as they can be given the information investors currently have. This is the key "hypothesis" behind efficient markets.

However, it is easier to understand the EMH from the perspective of the reward investors get relative to what they required. Hence, the previous slide compares the valuation identity (derived a few slides back) with this "fundamental valuation equation" to derive an important implication of the EMH: $\mathbb{E}_t[r] = dr_t$. From this there is a simple way to understand what happens when prices are "too high" or "too low":

If prices are too high, then buyers can expect a return below their required rate of return and sellers are able to sell the future cash flows at a price above their true value. Similarly, if prices are too low, buyers can expect a return above their required rate of return and sellers end up selling the future cash flows at a price below their true value.

Correctly Incorporating Information: Summary

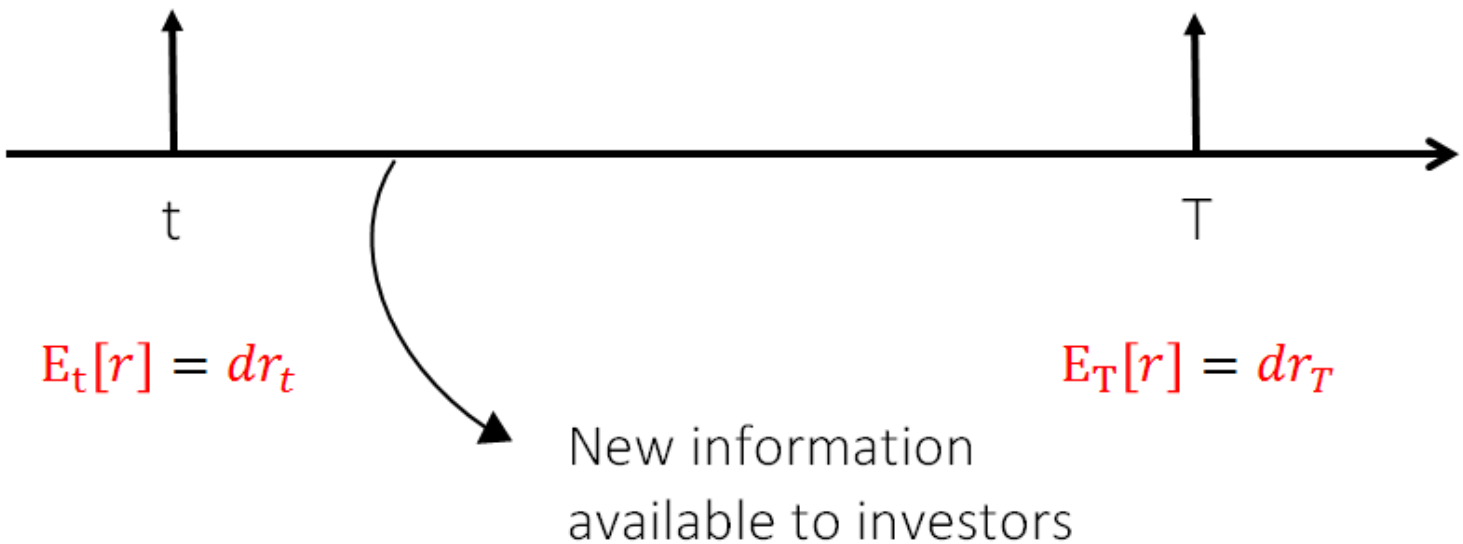
Prices correctly incorporate all relevant information available up to time t

Prices correctly incorporate all relevant information available up to time T

Correctly Incorporating Information: Summary

$$P_t = \sum_{h=1}^{\infty} \frac{E_t[CF_{t+h}]}{(1 + E_t[r])^h}$$

$$P_T = \sum_{h=1}^{\infty} \frac{E_T[CF_{T+h}]}{(1 + E_T[r])^h}$$



Suppose investors forecast stock market dividend growth to be 6% per year. However, there is a new technology being introduced in the world and it will allow people to teleport from one place to another. This will make firms much more productive, which you know will induce a growth much higher than the 6% assumed by the market. What should you do?

a) Nothing, EMH must hold in this scenario and, thus, the best action is to be passive

b) You should increase your allocation to equities since they currently pay expected returns above market required rate of return

c) You should decrease your allocation to equities since they currently pay expected returns above market required rate of return

d) You should increase your allocation to equities since they currently pay expected returns below market required rate of return

e) You should decrease your allocation to equities since they currently pay expected returns below market required rate of return

Correctly Incorporating Information: Why should you care?

- If markets are efficient, then you can (correctly) expect to get the return you require when investing
- There is no way to "beat the market" consistently! If you find a security that is paying a great expected return, that is because markets dislike this security and, as such, require a high rate of return for holding it
- You should ask yourself what are the characteristics of a security that induce markets to dislike it (risk, illiquidity, ...??)
- Key implication for the practical world: you should not invest in active management
- Active managers cannot deliver returns above what you would require from them, but they charge high fees. Index funds provide a better alternative (low costs!)

Correctly Incorporating Information: The Paradox

- Market efficiency requires smart investors to incorporate information into prices all the time
- But if markets are efficient, there is no benefit in doing so (you cannot beat the market)
- As such, if you are smart you should be a passive investor
- But if smart investors become passive, there is nobody incorporating information into prices! This implies markets cannot be efficient!
- It must be the case that markets have at least some degree of inefficiency (at least to justify the existence of smart investors incorporating information into prices)

Relevant Information: the three versions of the EMH

$$P_t = \sum_{h=1}^{\infty} \frac{\mathbb{E}_t\left[CF_{t+h}\right]}{\left(1+\mathbb{E}_t\left[r\right]\right)^h} \qquad \textit{and} \qquad \mathbb{E}_t\left[r\right] = dr_t$$

- Weak-form EMH:

relevant information = trading data

- Semistrong-form EMH:

relevant information = all publicly available information

- Strong-form EMH:

relevant information = all information (even private information)

Which of the following is a prediction of the Weak-form EMH?

a) Analyzing the financial information of firms and investing accordingly cannot deliver expected returns above required rates of return

b) If you work for Google and know that it will acquire Yahoo over the next year (which is a piece of information not released to the public yet), then there is no point in trading on this information (even if it was legal to do so)

c) Observing prices going down over the last month should not give you any information on how to trade

d) Cash flow estimates are identical to future realized cash flows, which rules out, for example, any possibility for surprises in earnings announcements

e) Prices are always right in the sense that no matter which information one uses (of any source), he/she cannot reach a different price for any given security

EMH $\Rightarrow$ Returns are Unpredictable

- Some tests of the EMH assume that the required rate of return is time invariant: $dr_t = dr$. Under this assumption:

$$P_t = \sum_{h=1}^{\infty} \frac{\mathbb{E}_t\left[CF_{t+h}\right]}{\left(1 + \mathbb{E}\left[r\right]\right)^h} \qquad \textit{and} \qquad \mathbb{E}\left[r\right] = dr$$

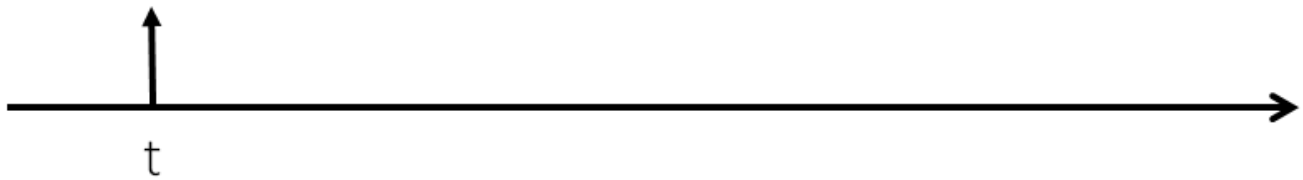
- If this is true, the EMH is equivalent to returns being unpredictable. Hence, prices follow a "Random Walk"
- EMH test $\Rightarrow$ check whether returns are truly unpredictable
- Alternative versions of the EMH $\Rightarrow$ No predictability by alternative sets of information

Event Studies: Logic

We can study returns after the event to see if there is any systematic pattern.

If the answer is yes, then prices did not incorporate all information at time t

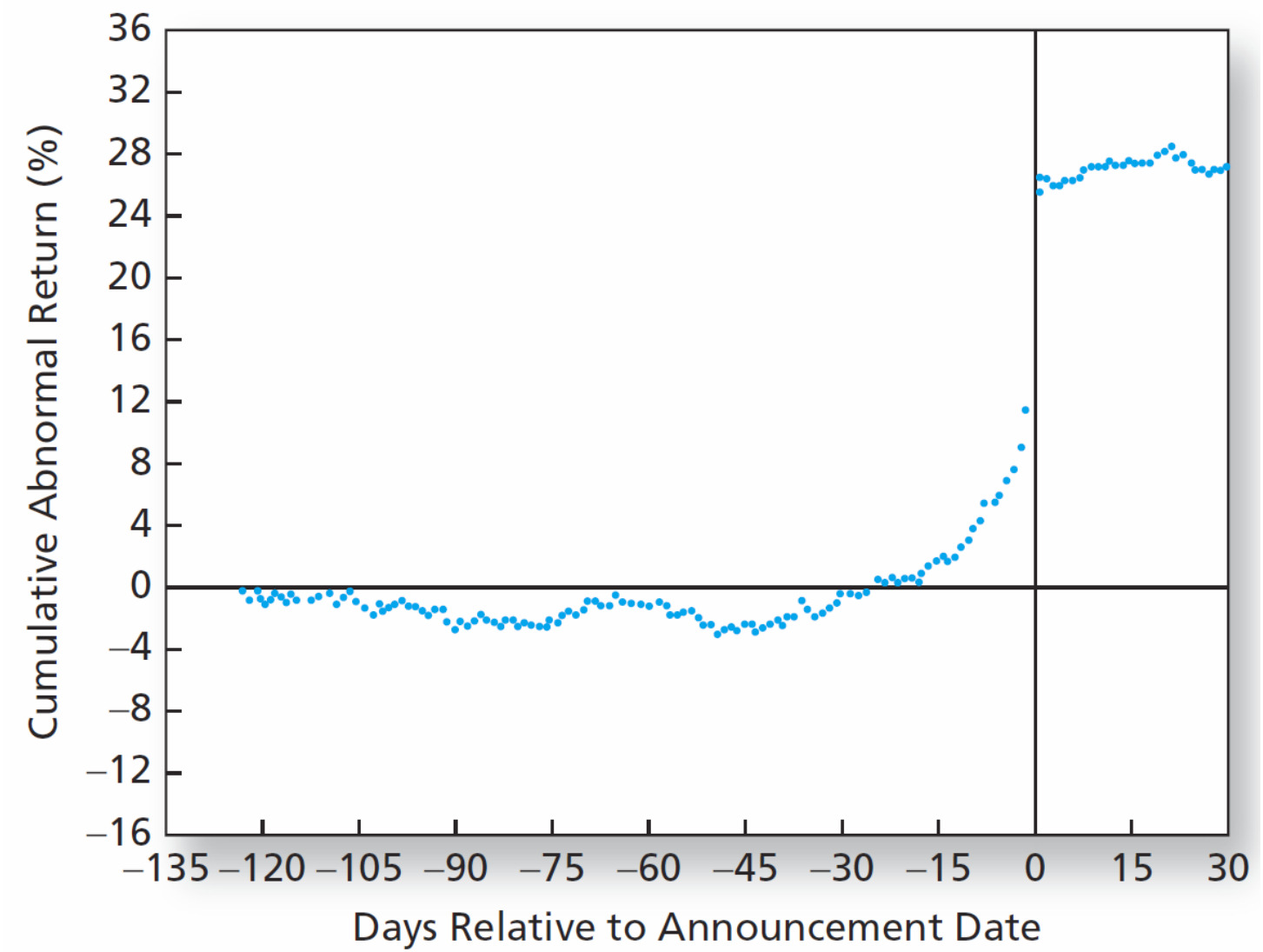
Event that is known to affect $E_t[CF_{t+h}]$



Q: How long does it take for prices to incorporate the change?

EMH ➡ It incorporates instantaneously: no predictability left

Event Studies: Takeover Attempts*



Source: Keown and Pinkerton (1981) - *Merger Announcements and Insider Trading Activity*

Explaining the Previous Slide

Key message: Information about takeover attempts is incorporated extremely fast into prices. Moreover, there is some leakage of information before the public announcement.

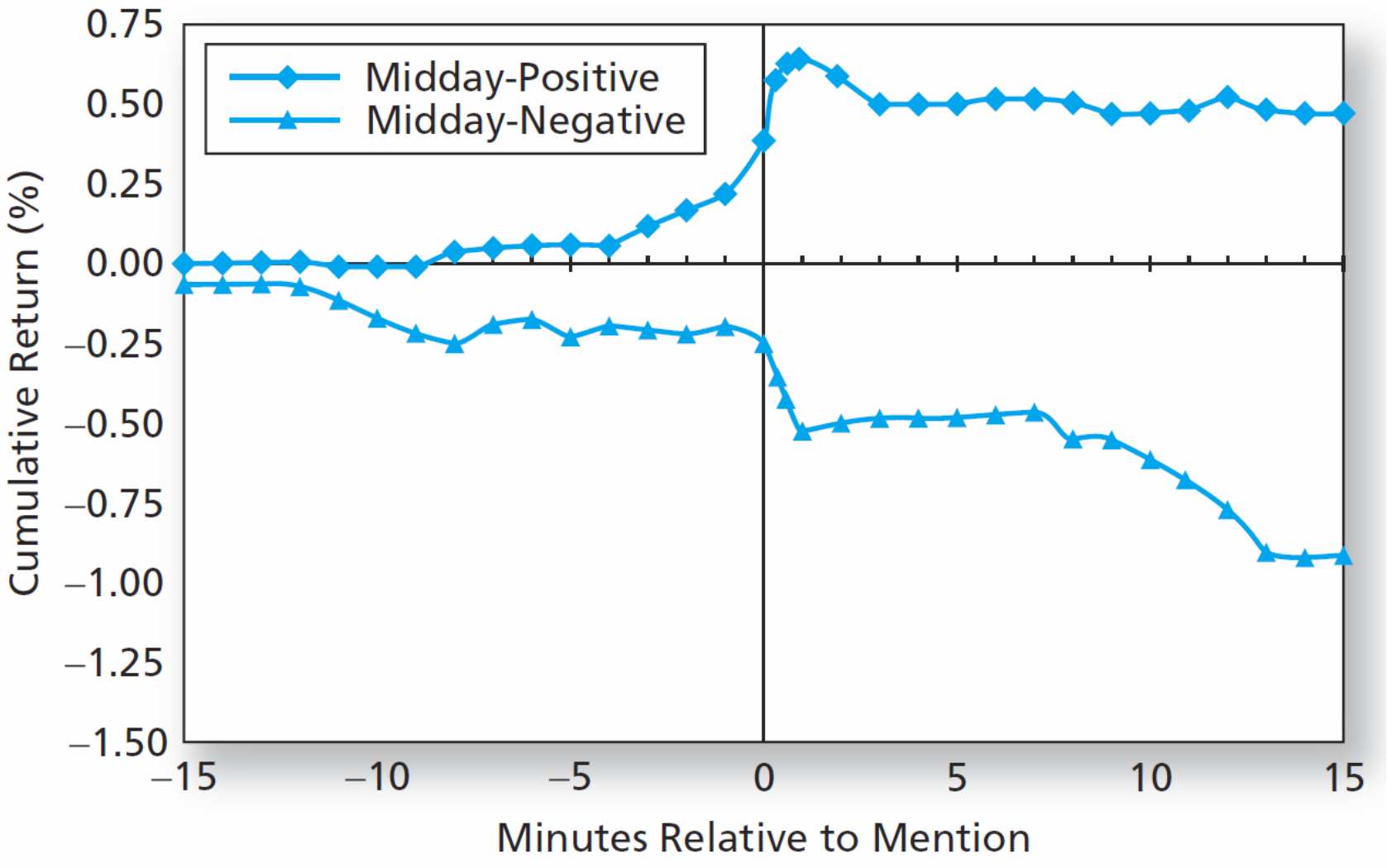
Details:

A takeover attempt is a situation in which an investor (typically an aggressive institutional investor like a Hedge Fund) decides that the management team of a given firm is not taking value maximizing decisions. As such, they attempt to buy enough shares (or convince current shareholders to given them their votes) so that they "control the company". Once they do it, they tend to replace the management team and set strict goals for the firm. If they were right, the new corporate actions will increase firm fundamental value and, as such, its stock price.

This graph plots cumulative (risk-adjusted) returns around the time of takeover attempts and asks how long it takes for the market to incorporate the information about the takeover attempt into prices (averaging across many takeover attempts). The answer seems to be that prices incorporate the information quite fast. As you see, after day 0 (the day of the takeover attempt) prices no longer increase (the evidence has been updated and same results remain true in more recent data) .

Another interesting observation from this graph is that prices start to increase before the public announcement. This means that there is some leakage of information, which is already moving prices before the information becomes public.

Event Studies: CNBC (Mentioned on "Midday Call")*



Source: Busse and Green (2002) - *Market Efficiency in Real Time*

Explaining the Previous Slide

Key message: Information reported by the media (in this study, the CNBC "Midday Call") is incorporated into prices in (at most) 15 minutes. You can decide for yourself if you consider that "efficient enough" (I do)

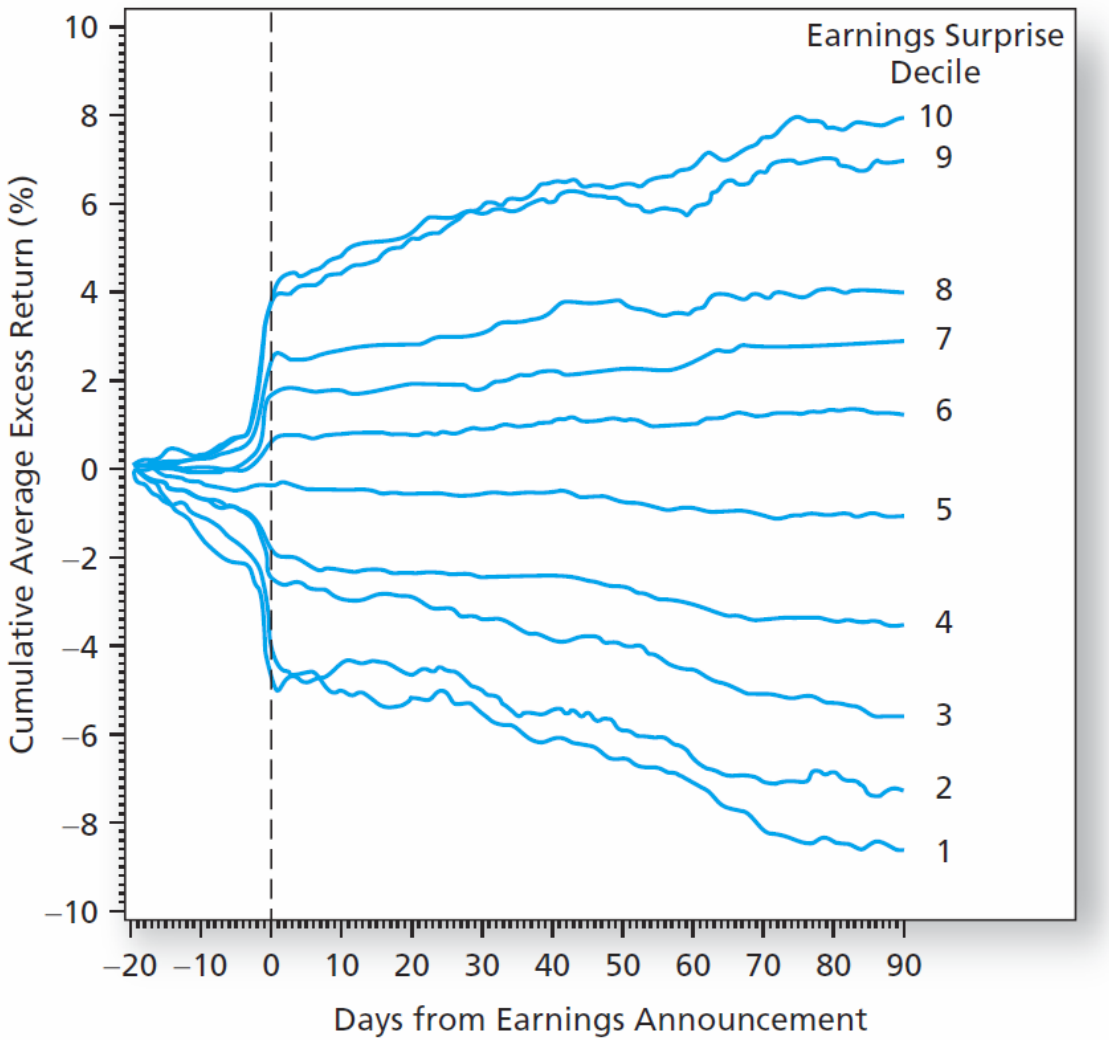
Details:

The graph considers CNBC Midday call reports (positive and negative) on several companies and looks at cumulative returns around the time of the report.

After information is reported in the CNBC Midday Call, it is incorporated into prices quite fast. Positive information tend to be incorporated even before, but there is still some reaction one minute after the report. Negative information takes a bit longer with prices reacting up to 15 minutes after the report.

Overall this demonstrates that prices react to information quite quickly (and in the right direction).

Event Studies: Earnings Announcement*



Source: Rendleman, Jones and Latané (1982) - *Empirical Anomalies Based on Unexpected Earnings and the*

Explaining the Previous Slide

Key message: After companies publicly announce their earnings, markets takes more than 3 months to fully incorporate the information into prices. This is typically regarded as evidence against the efficient market hypothesis

Details:

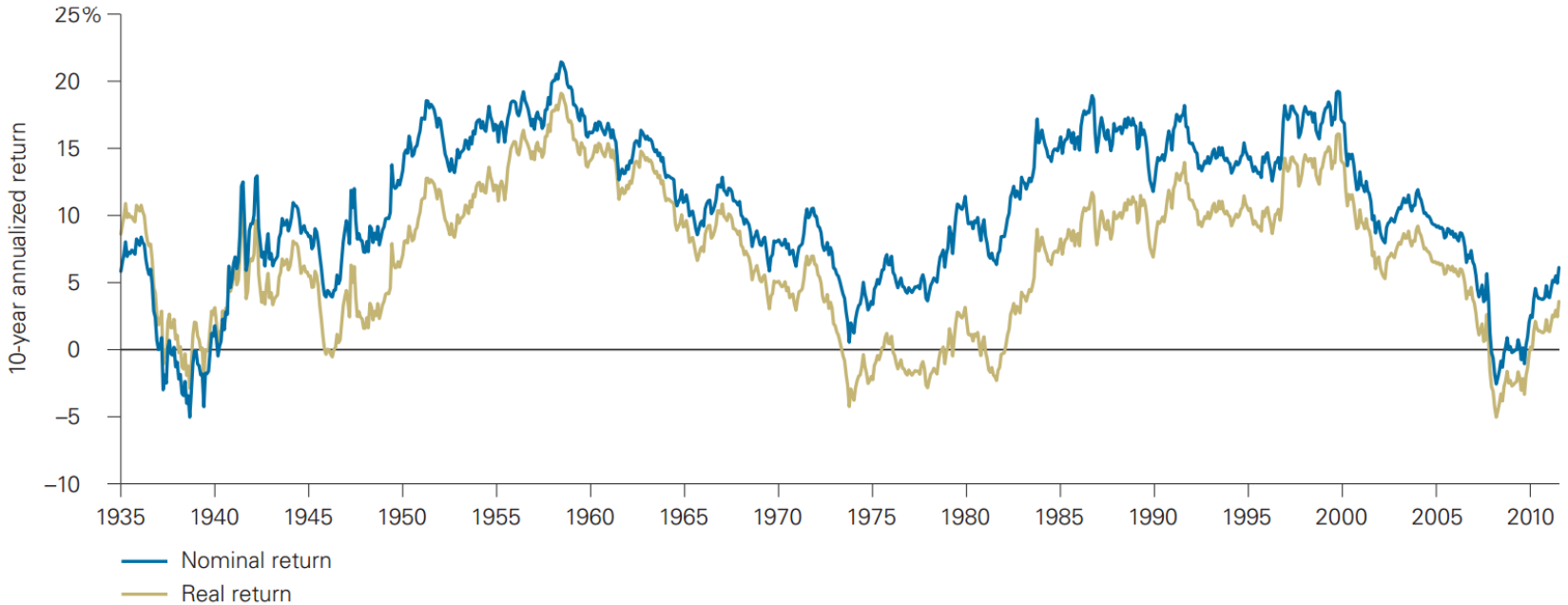
The graph considers earnings announcement days for several companies and looks at the days around the announcement day. In order to demonstrate the results, researchers separated stocks into 10 groups from the "most negative surprise in the earnings announcement" to the "most positive surprise in the earnings announcement".

The results are striking: firms that released good new earnings information have prices increasing over the next three months while the opposite is true for firms releasing bad new earnings information (this evidence remains true in the more recent data).

You can see that there is a large reaction on the day of the announcement. However, the magnitude of the reaction in the following three months is comparable to the reaction in the announcement day.

This is regarded as evidence against the efficient market hypothesis by many researchers. From the perspective of practitioners, this provides you with a trading strategy: buy stocks that announced earnings higher than contemporaneous market expectation and sell stocks that announced earnings below market expectation.

Systematic Return Forecast: Motivation

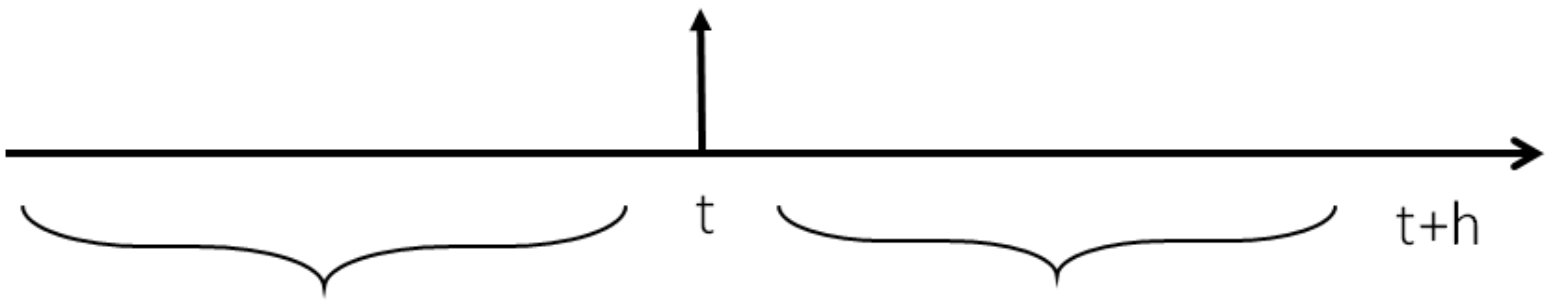


Source: Vanguard Group (2012) - *Forecasting Stock Returns: what Signals Matters and what do they say now?*

- This graph shows (at each point in time) the equity market average return over the previous 10 years
- It is clear that there is substantial variation in average returns
- This motivates us to check whether long-run returns are predictable by variables known ahead of time

Systematic Return Forecast: Logic

$$\hat{r}_{t+h} = \hat{r}(x_t)$$

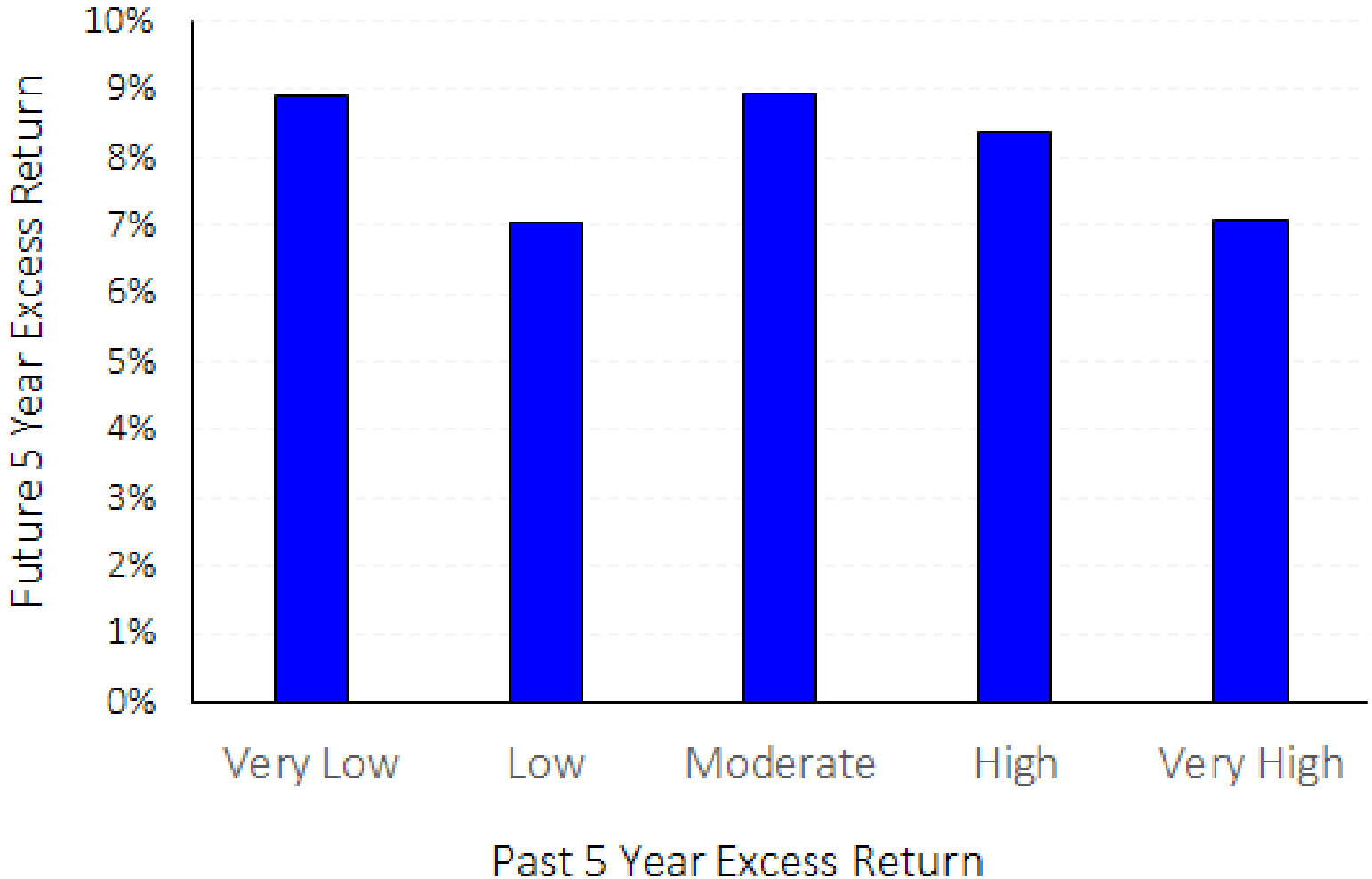


Use data to find best function to predict returns:

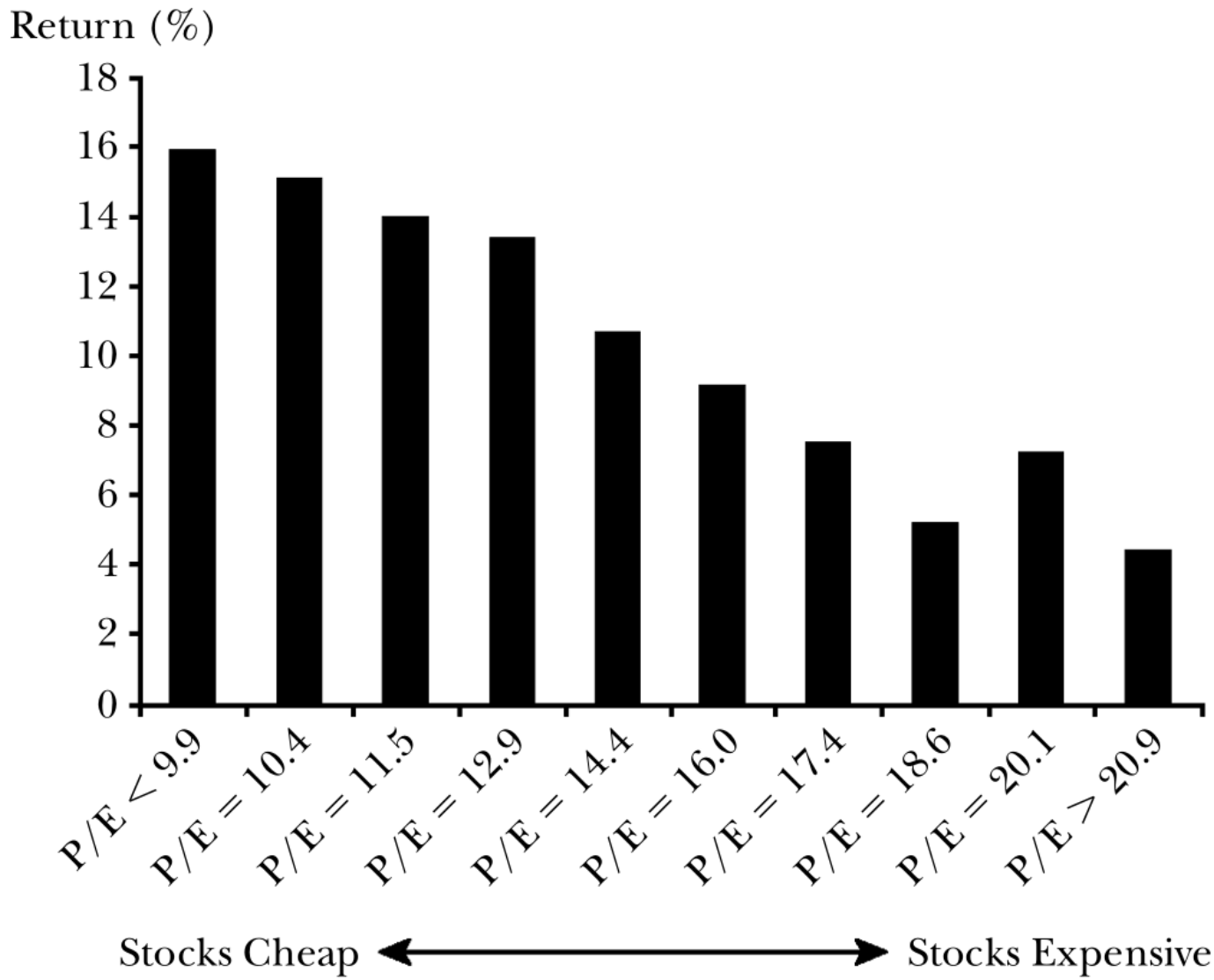
$\hat{r}(x_t)$

Check if $\hat{r}_{t+h}$ is a good predictor for r_{t+h}

Systematic Return Forecast: Past Returns*



Systematic Return Forecast: Price-to-Earnings (P/E)*



Source: Malkiel (2003) - *The Efficient Market Hypothesis and its Critics*

Explaining the Previous two Slides

Key message: While aggregate future returns are not predictable using past returns, there is strong return predictability when using information on firm fundamentals (e.g., Price-to-Earnings ratio). However, it is not clear whether this evidence is in favor or against the efficient market hypothesis.

Details:

Suppose today you decided to invest in an equity market index and to hold that position for the next 10 years. What return should you expect to receive?

It turns out that whether the market has gone up or down over the last years does not influence the answer to this question. In other words, past returns do not predict future returns (the bar graph two slides back demonstrates this point).

However, the current price-to-earnings ratio matters a lot when you try to figure out your average return over the next 10 years (check the bar graph in the previous slide). If prices are low (relative to earnings), then future returns are very high and vice versa.

Why does that happen? When prices are low relative to current cash flows they tend to also be low relative to future cash flows and you get a great return. The opposite is true when prices are high (this is the logic of the valuation identity we derived).

Is that evidence against the efficient market hypothesis? It turns out that it is not obvious. This could reflect systematic mistakes made by investors, but it could also reflect variation in required rates of return (in this case the EMH would be valid).

Which of the following is valid?

a) All event studies presented provide evidence in support of the EMH

b) There is substantial evidence of return predictability, which contradicts the EMH

c) Returns do not vary over time and, thus, there is no point in looking for predictability in returns

d) If the EMH is true, then prices must follow a "Random Walk" and returns must be unpredictable

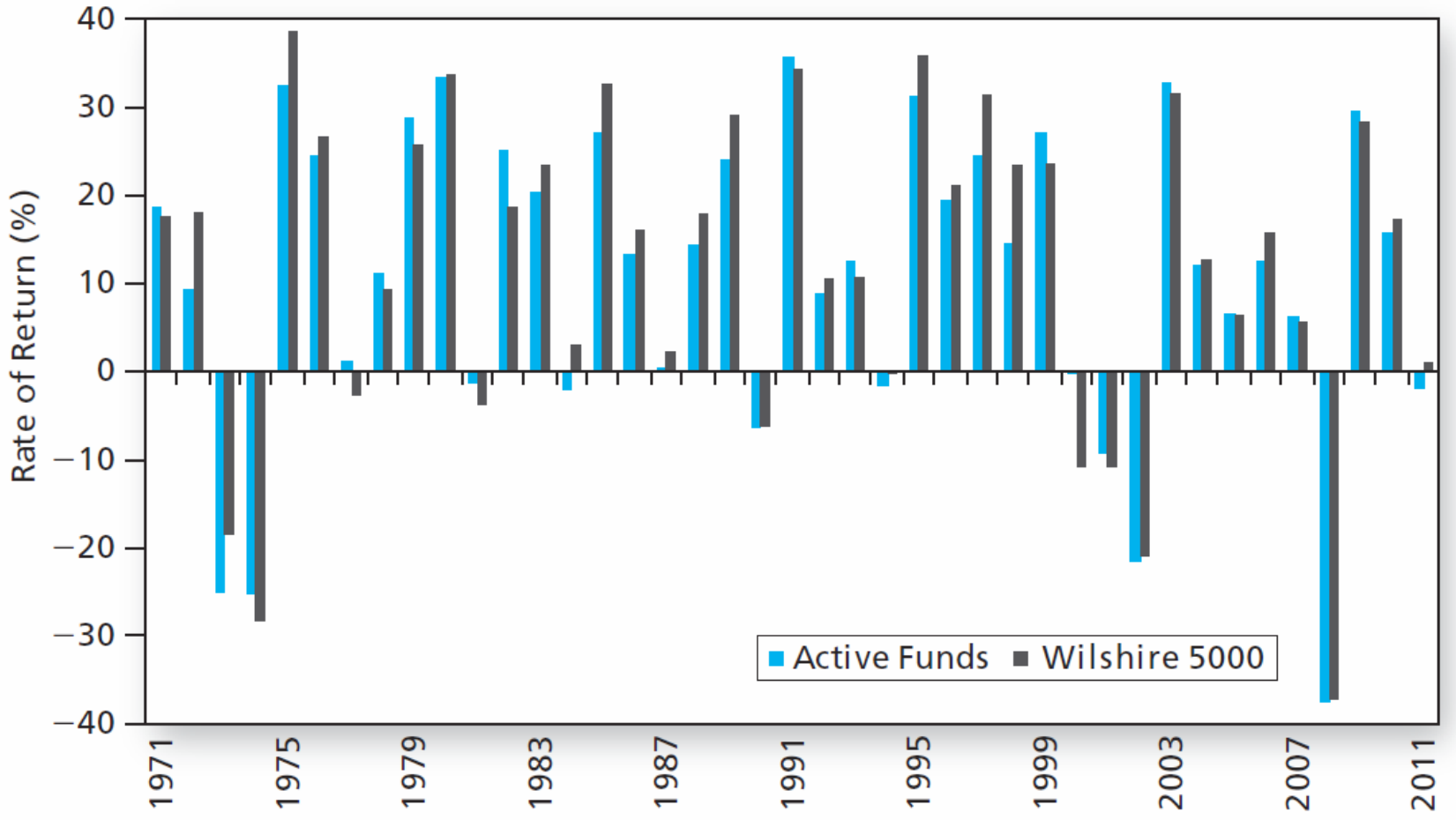
e) One way to interpret the evidence on return predictability is to think of time-varying required rates of return

EMH $\Rightarrow$ Active Investing Cannot Generate α

$$P_t = \sum_{h=1}^{\infty} \frac{\mathbb{E}_t\left[CF_{t+h}\right]}{\left(1+\mathbb{E}_t\left[r\right]\right)^h} \qquad \textit{and} \qquad \mathbb{E}_t\left[r\right] = dr_t$$

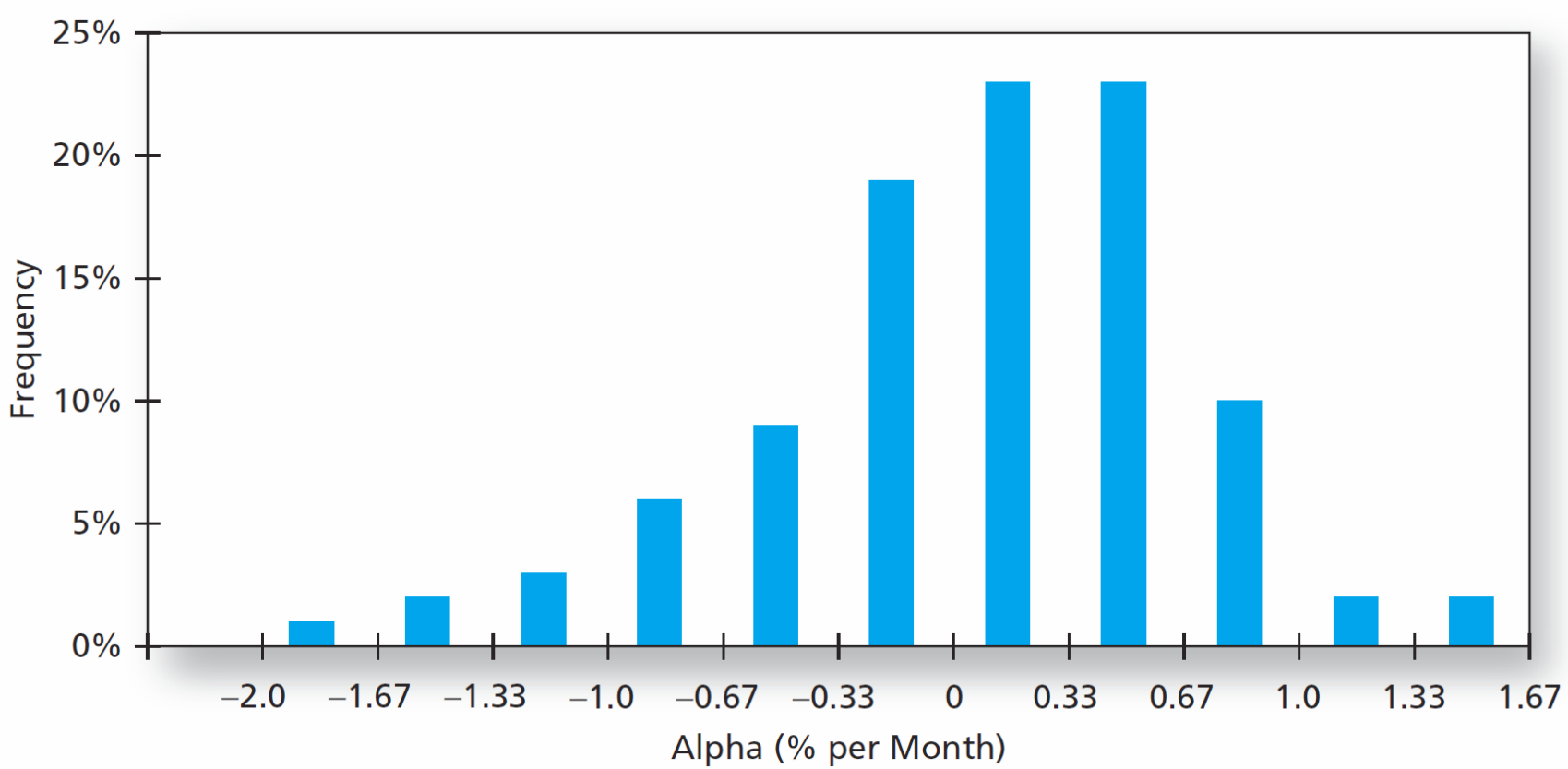
- Weak-form EMH:
  - Active investing based on trading data cannot generate α
- Semistrong-form EMH:
  - Active investing based on public information cannot generate α
- Strong-form EMH:
  - Active investing does not generate α no matter what information is used
  - This is rejected in the data (insider trading generates α). However, investing based on private information is illegal

Mutual Funds: Returns*



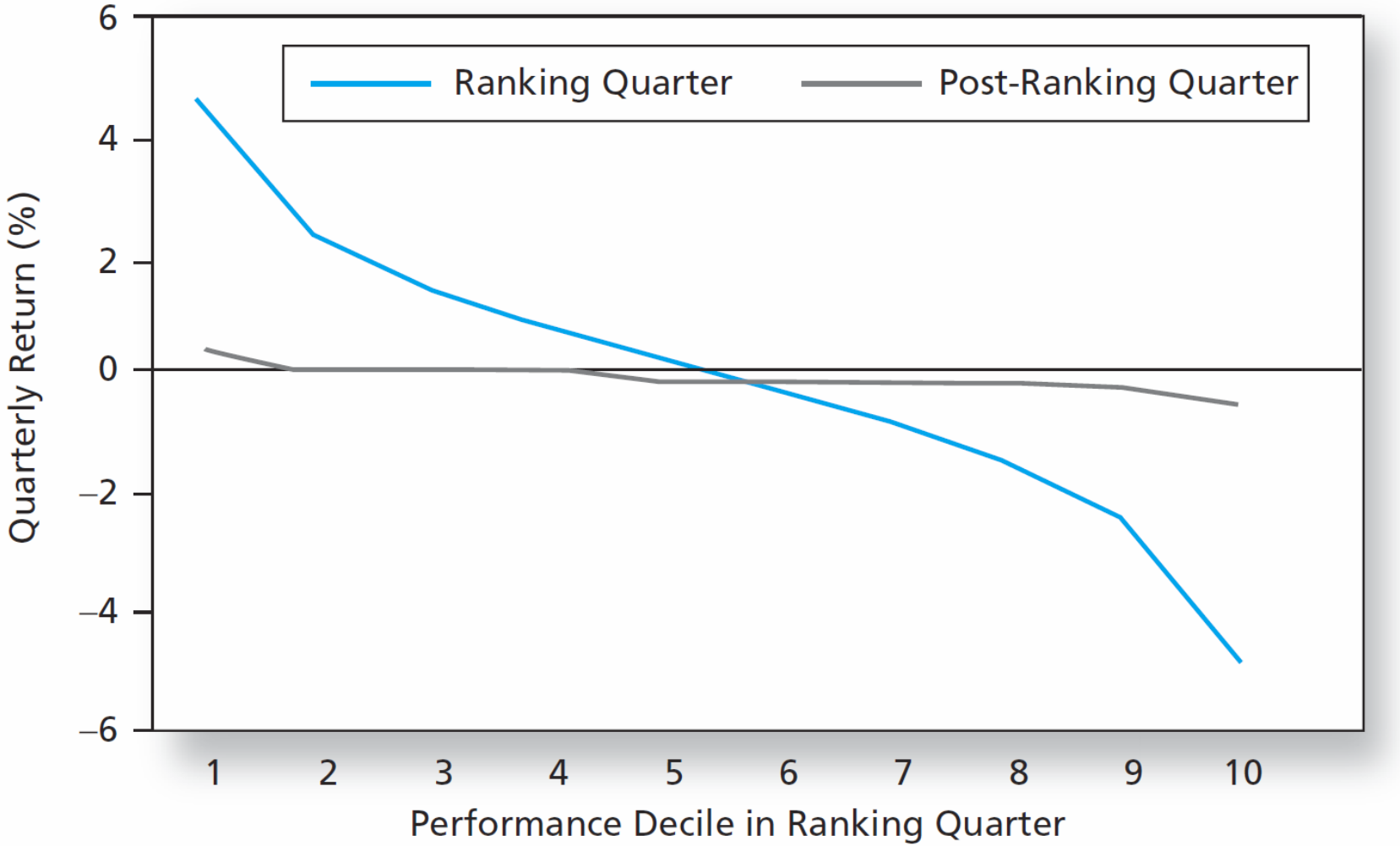
Source: Bodie, Kane and Marcus (10th ed) - *Investments*

Mutual Funds: α*



Source: Bodie, Kane and Marcus (10th ed) - *Investments*

Mutual Funds: α Persistence*



Source: Bollen and Busse (2004) - *Short-Term Persistence in Mutual Fund Performance*

Explaining the Previous three Slides

Key message: Mutual fund managers do not tend to consistently generate α.

Details:

The first figure shows that aggregate returns on the mutual fund industry are very close to market returns. You can formally calculate β and α, but if you do you get a β close to one and an α close to zero.

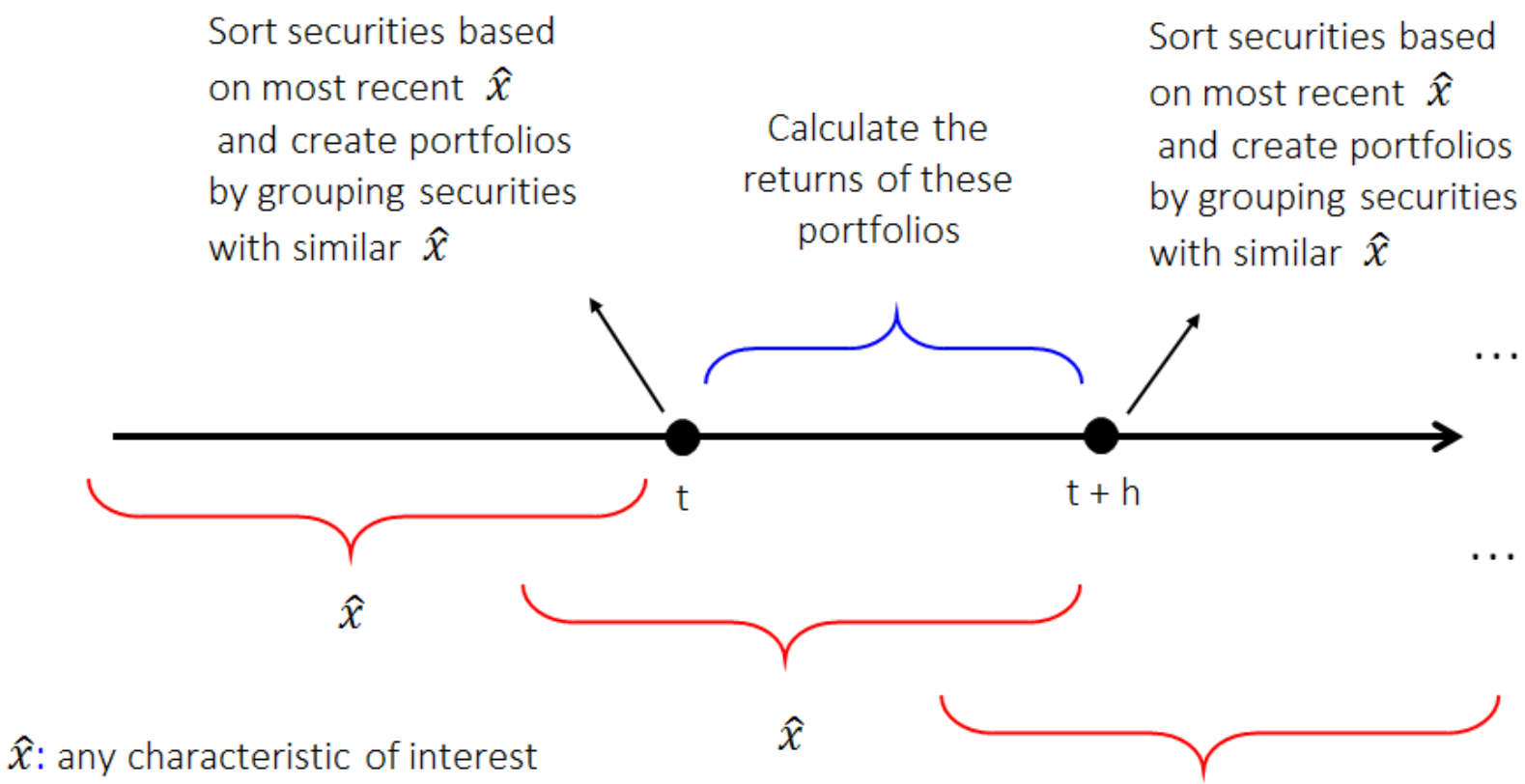
The second graph demonstrates that even though aggregate α is close to zero, there is substantial variation across managers, with some managers displaying a large α. Is this an indication that managers can in fact generate α or is this caused by chance?

To answer this, we look at whether past α of a given manager can predict his future α. In other words, if a manager performed well in the past is it because he/she is skilled or because he/she got lucky? This is done by calculating α for many managers, separating them into 10 groups and checking the future α of each group later on.

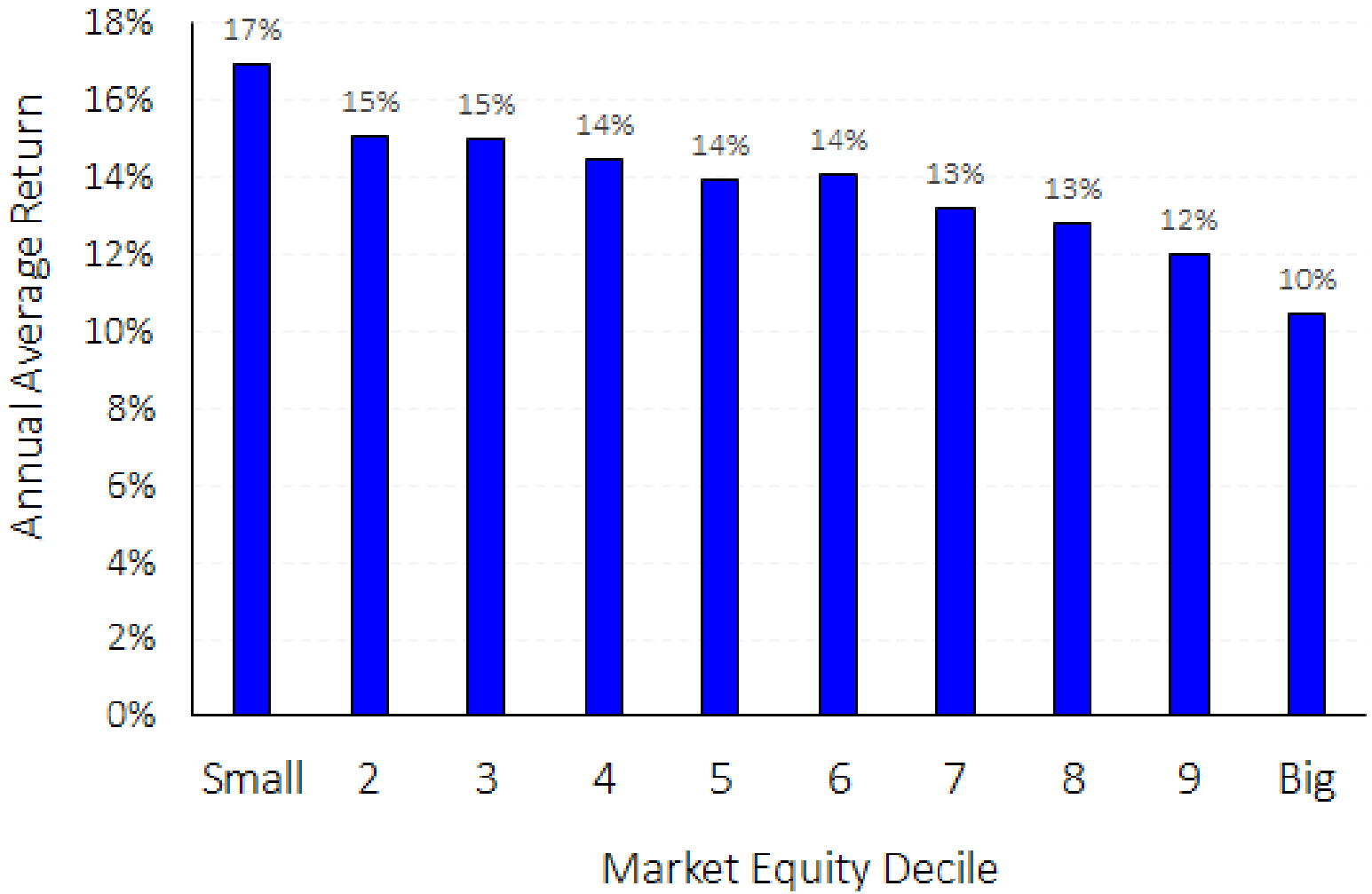
The last graph displays the results of this approach. The blue line represents the past α and there is a lot of variation across groups. The gray line shows the future α. There is basically no variation! In other words, if you pick a manager with a great α in the past he will probably generate an α close to zero in the future. This evidence shows this process done every quarter. If you do it every year (most investors do not change mutual fund positions every quarter) it shows even less predictability.

Conclusion: active managers do not tend to generate α (markets seem efficient).

Dynamic Strategies ("Anomalies"): Logic

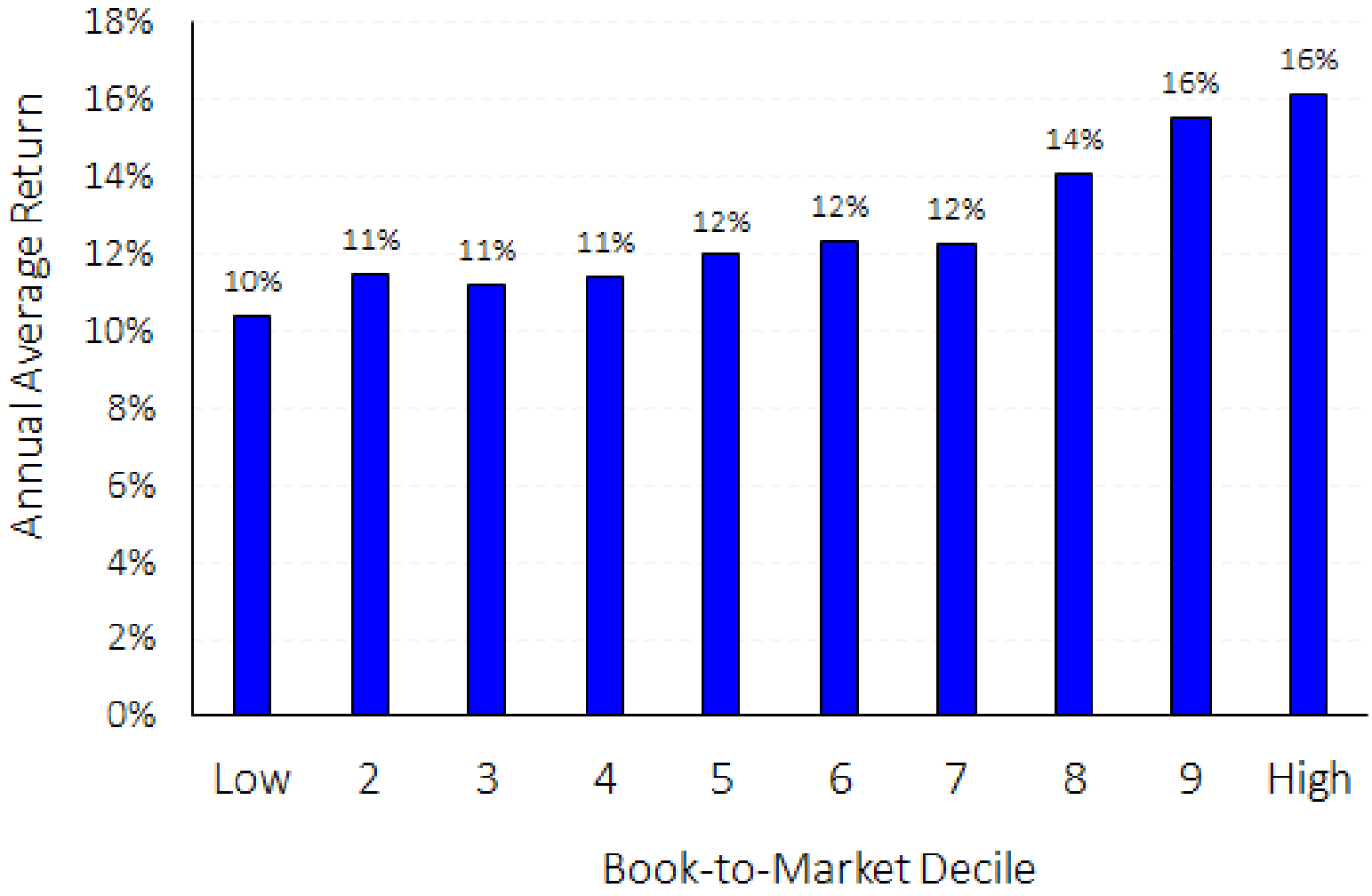


Dynamic Strategies ("Anomalies"): Size Effect*



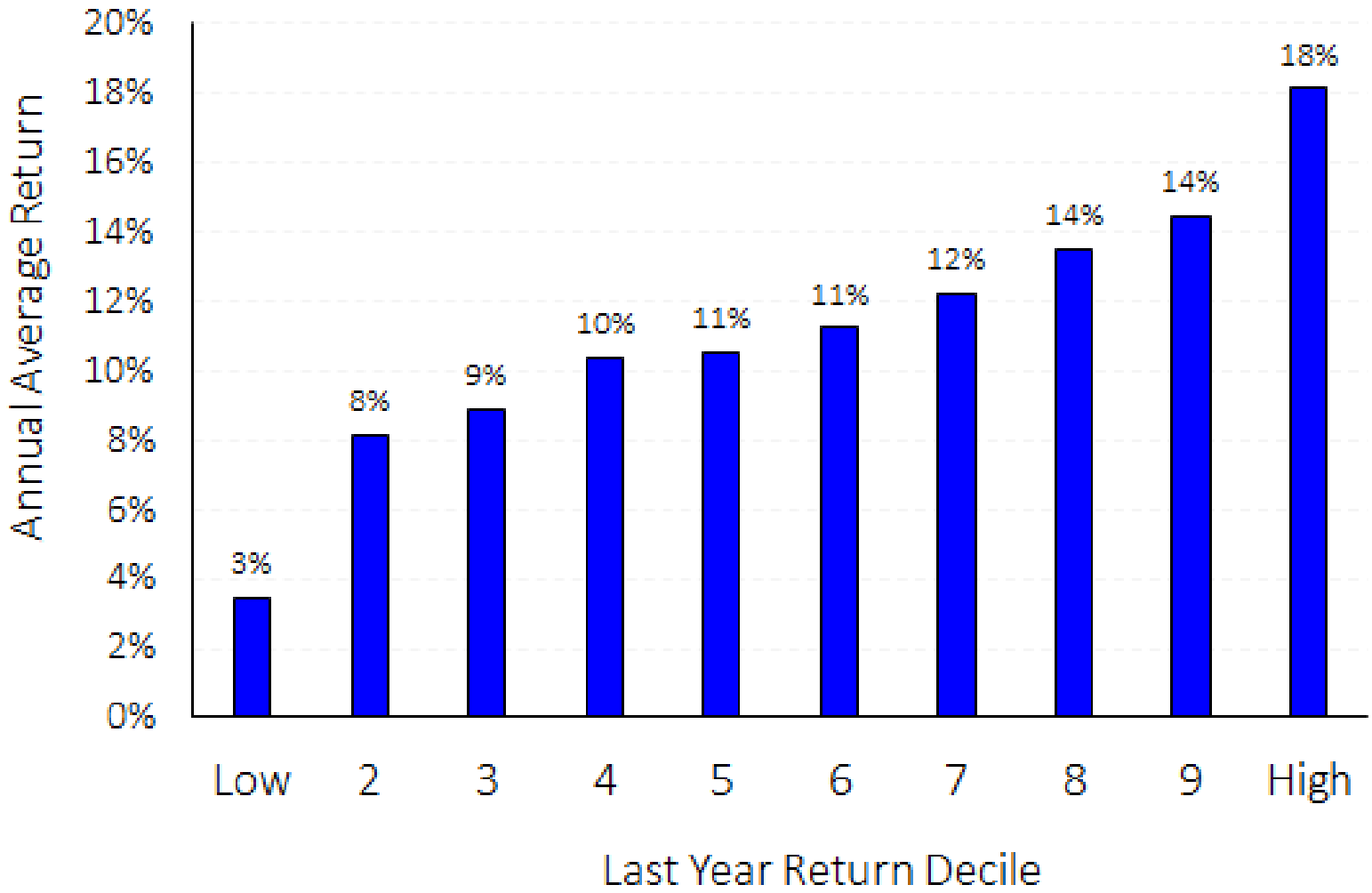
Ken French's data library at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Dynamic Strategies ("Anomalies"): Value Effect*



Ken French's data library at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Dynamic Strategies ("Anomalies"): Momentum*



Ken French's data library at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Explaining the Previous three Slides

Key message: Many dynamic trading strategies based on simple rules generate substantial average returns over time. However, it is not clear whether this is evidence for α or not since these strategies also generate systematic risk patterns.

Details:

The three previous graphs share the same principle. Choose a characteristic that might be related to future returns, separate stocks into groups with different values of such characteristic and check if these portfolios indeed had different future performance. The characteristics I choose to display were the Market Equity (the "Size Effect"), the Book-to-Market (the "Value Effect") and the past 1 year return excluding last month (the "Momentum Effect").

Small stocks, value stocks and "winners" (high Momentum stocks) deliver substantially higher average returns in the future relative to large stocks, growth stocks and "losers" (low Momentum stocks). There is a lot of research demonstrating that value and small stocks seem to be riskier than growth and large stocks (although there is still a debate going on on the research world). However, there is less evidence that the Momentum effect is due to risk.

Overall, I would say that the performance of dynamic trading strategies raises the possibility of generating α in financial markets. However, one needs to be skeptical since there is evidence indicating that investors trying to benefit from these strategies are potentially exposed to risks we are still trying to fully understand.

Which of the following is valid?

a) If the Semistrong EMH is true, then any two strategies based on public information should have identical expected return

b) All versions of the EMH imply that nobody can generate α in financial markets no matter what information they use

c) Insider trading does not generate α, which is evidence in favor of the Strong-form EMH

d) Most actively managed mutual funds do not consistently generate α and this goes in favor of the EMH

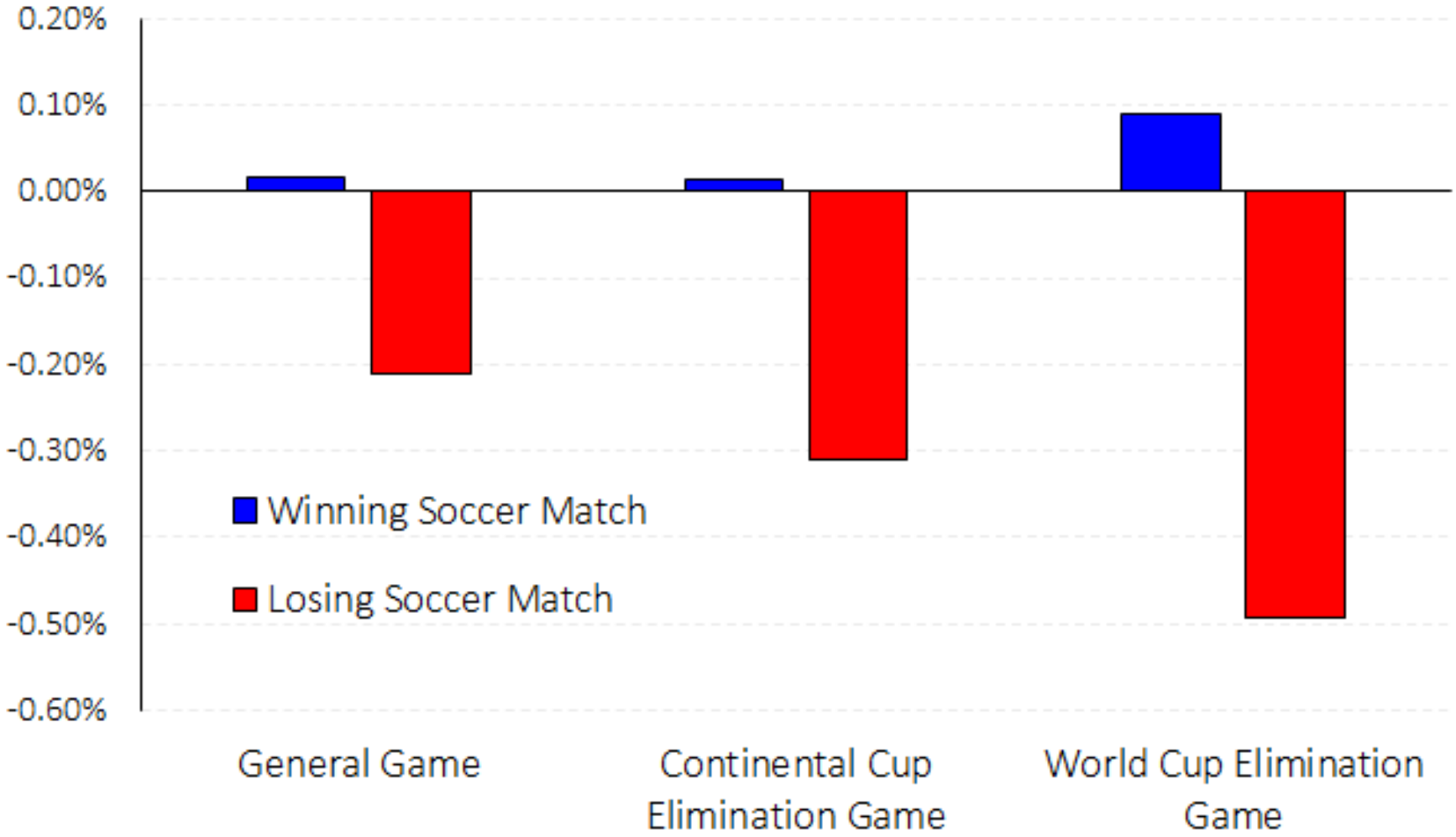
e) There is substantial variation in expected returns across stocks and part of this variation can be captured with dynamic trading strategies. This is strong evidence against the EMH

Systematic Mistakes + Limits to Arbitrage $\Rightarrow$ EMH fails

- EMH hypothesis says that investors compete until $\mathbb{E}_t[r] = dr_t$
- The EMH fails whenever $\mathbb{E}_t[r] \neq dr_t$
- For this to happen, investors need to make similar mistakes (if each investor makes a different mistake, they average to zero and prices are not affected)
- Moreover, smart investors must be unable to profit from the mistakes of other investors without taking a lot of risk (otherwise they would adjust prices)
- Behavioral Finance argues that both aspects are true in reality:

  Systematic Mistakes + Limits to Arbitrage $\Rightarrow$ EMH fails

Evidence: Abnormal Return one Day after Soccer Match*



Source: Edmans, García and Norli (2007) - *Sports Sentiment and Stock Returns*

Explaining the Previous Slide

Key message: After the national team plays a soccer match, the equity markets respond to that by going up the next day if the team wins the soccer match and going down if the team loses the soccer match. This is typically interpreted as evidence for investors' mood influencing financial markets.

Details:

These researchers looked at the equity market return the day following a soccer match of the national team of several countries. Then, they separated the soccer matches by two dimensions: (i) the importance of the soccer match and (ii) whether the national team won of lost the game.

It turns out that when the national team loses the game the equity market tends to go down (on average) the next day and this effect is stronger for more important games. The opposite effect is true when the national team wins the game, but the effect is mush weaker

While it is hard to profit from this type of strategy (soccer matches do not happen every day), this demonstrates that investors' mood can affect prices.

Evidence: Adding ".com" on Company Name*

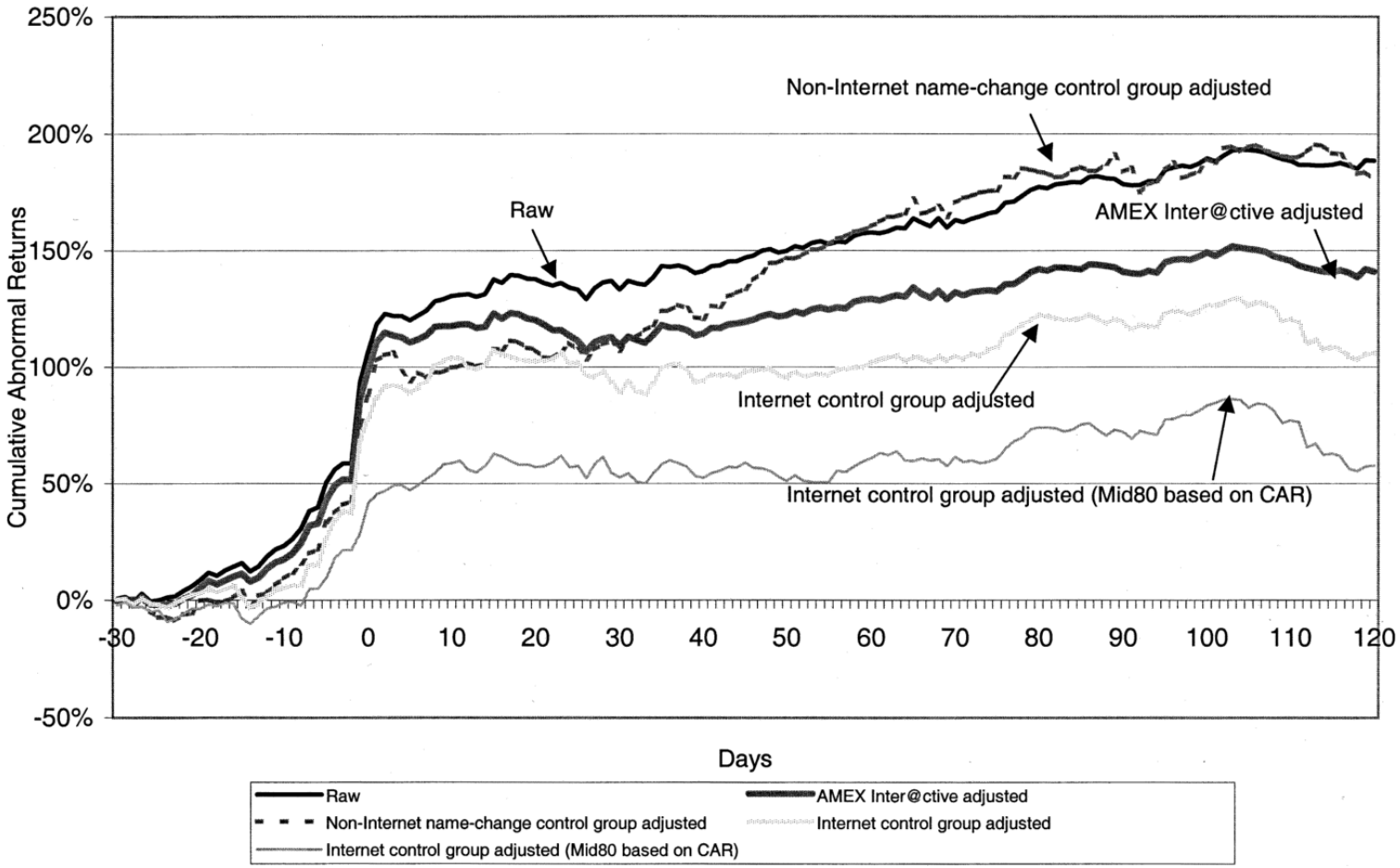


Figure 1. Cumulative abnormal returns earned around the announcement date by firms changing their names to dotcom names.

Source: Cooper, Dimitrov and Rau (2001) - *A Rose.com by any other Name*

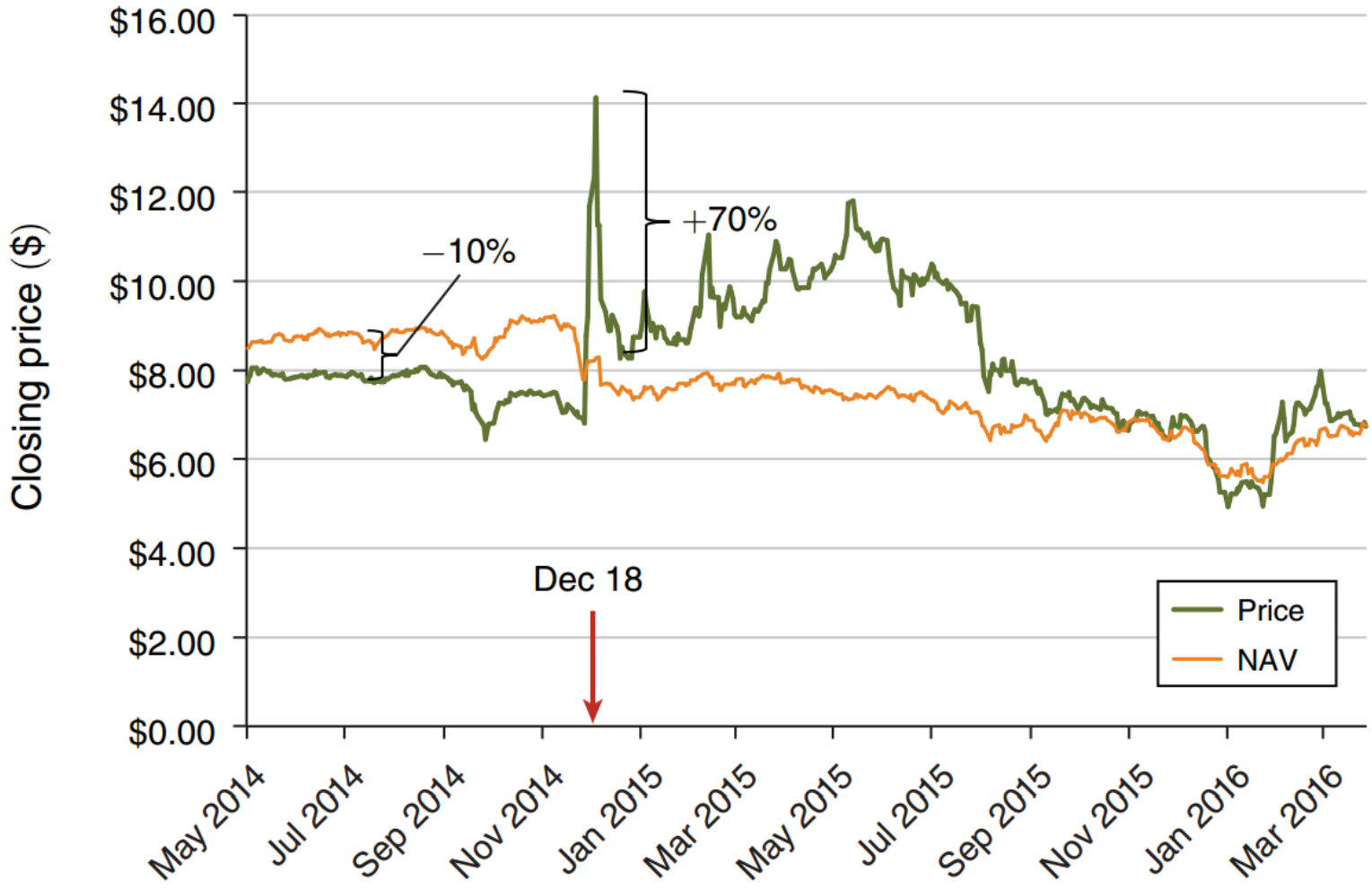
Explaining the Previous Slide

Key message: During the “tech bubble", companies that added “.com" to their names (and were in not technology or internet-related companies in any way) observed a very large increase in their price. This is typically interpreted as evidence against the EMH since a company’s relevant characteristics and/or future cash flows should not change just because the company changed its name

Details:

There is not much else to add here. I just want to point out that the graph in the previous slide has many lines. They all the pass the same message, but represent different ways to adjust returns to see if the evidence remains valid under different approaches

Evidence: "CUBA" Fund*



Source: Thaler (2016) - *Behavioral Economics: Past, Present, and Future*

Explaining the Previous Slide

Key message: There is one closed-end mutual fund with a ticker given by "CUBA" (ticker is the trading code of the fund). It does not have any type of exposure to the Cuban economy (it simply turn out to have this ticker). Around the time the U.S. restored full relations with Cuba, the price of this fund jumped to around 70% above Net Asset Value. Presumably, investors mistakenly assumed this fund was exposed to the Cuban economy and ended it bidding up the price. The market corrected the price later, but this is an anecdote evidence for an extreme version of inefficiency in financial markets.

Systematic Mistakes: Mental Accounting

- Did your parents create a "College Fund" for you?
- Mental Accounting bias:

  "Tendency for people to separate their money into separate accounts based on a variety of subjective criteria, like the source of the money and intent for each account"

- Application to Investments:
  - Investors are more likely to sell stocks with gains than the ones with loss ("disposition effect")
  - This goes against the tax minimization strategy

Systematic Mistakes: Availability

- Which is more likely:

  being killed by (i) a Shark or (ii) a falling vending machine?

- The availability bias:

  "Probability is estimated by the ease with which similar instances or associations can be brought to mind"

- Application to Investments:
  - Malmendier and Nagel (2001) find that individuals experiences affect risk taking
  - Individuals are less willing to participate in stock market if they lived through the Great Depression

Systematic Mistakes: Representativeness

- Choose 6 numbers from 1 to 60 to play in the lottery:

  (i) 1, 2, 3, 4, 5, 6 or (ii) 20, 32, 7, 43, 59, 12?

- The representativeness bias:

  "The probability that event X belongs to set Y is judged on the basis of how similar X is to the stereotype of Y"

- Application to Investments:

  - If a given firm has characteristics similar to typical risky firms, then investors might believe the firm is very risky regardless of whether it really is. This can lead to $\mathbb{E}_t[r]$ being related to firm characteristics as oppose to firm risk

Systematic Mistakes: Local Representativeness

- "Hot hand" fallacy in Basketball:
- The local representativeness bias:

  "Exaggerate how likely it is that a small sample resembles the parent population from which it is drawn"

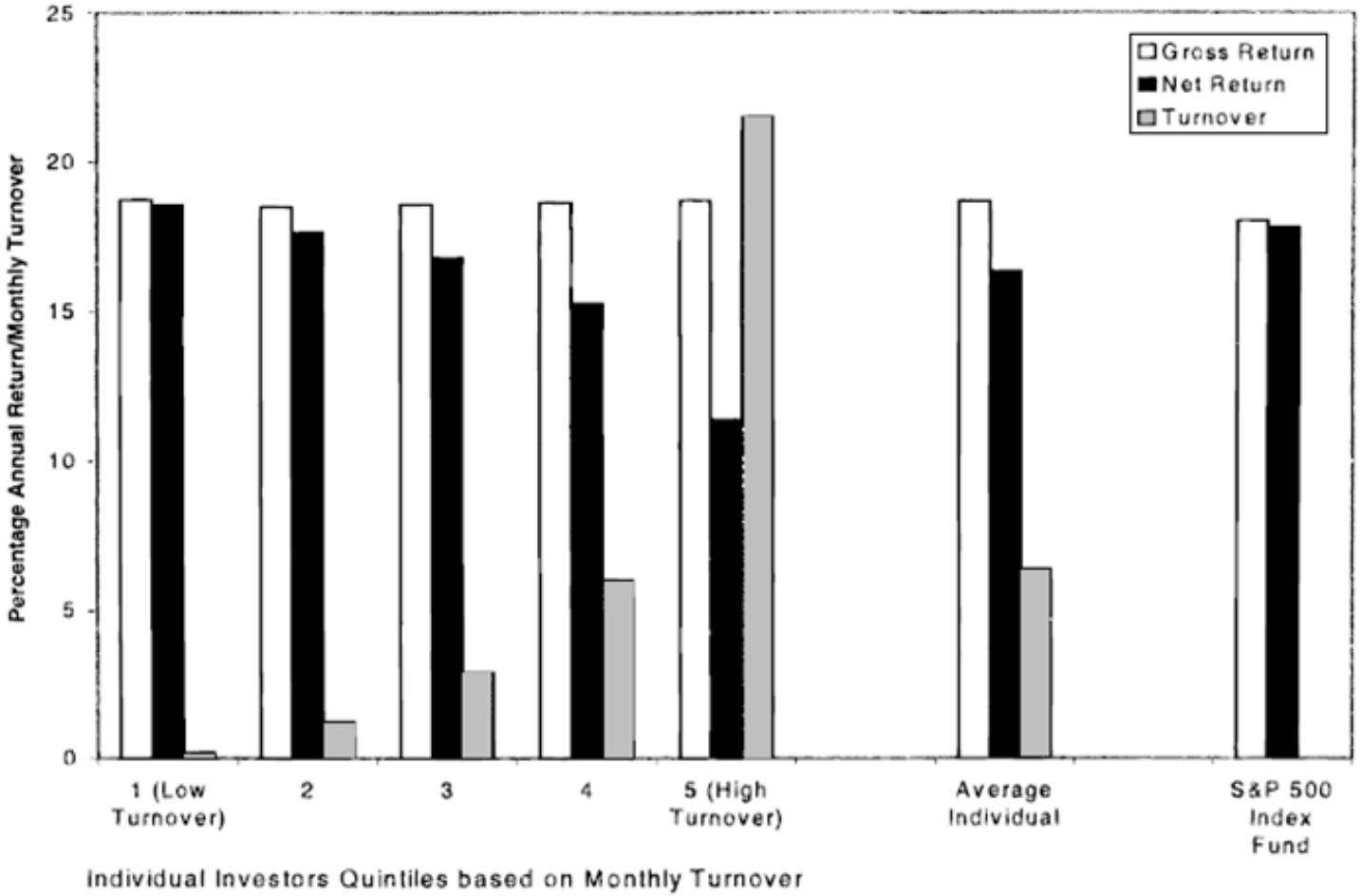
- Application to Investments:
  - Money chasing Mutual Funds past performance
  - Potential explanation for Momentum

Systematic Mistakes: Overconfidence

- Is your driving ability above median?
  - 50% should be below and 50% above
  - 93% of U.S. students estimate they are above median
- The overconfidence bias:

  "People overestimate the precision of their beliefs or forecasts. They are 'surprised' too often"
- Application to Investments:
  - Men trade much more often than women (45% more) and have much lower net returns as a result (0.93% lower per year)

Systematic Mistakes: Trading Activity x Returns*



Source: Barber and Odean (2001) - *Boys will be boys: gender, overconfidence, and common stock investment*

Explaining the Previous Slide

Key message: Retail investors who trade more often end up with the same returns before trading costs, but with much lower returns after trading costs (relative to retail investors who trade less often)

Details:

Turnover measures how much of a portfolio is changed over a given period. This graph shows that investors who change their portfolio more often (i.e., trade more) end up with similar returns (before fees) as investors who trade less often. However, since they trade more, they pay higher fees and end up with lower returns after fees.

One implication is that some investors are not behaving very rationally. In fact, they are being overconfident. You typically trade if you believe that your price estimate is better than the market price. You could be right and in this case you are not being overconfident. However, if you are right you should also generate extra returns. The evidence shows that retail investors who trade more were not right since they generated the same return as others, but lost money on trading costs. Hence, they are overconfident and get lower returns after trading costs because of that.

Another implication from this graph is that it is hard to beat the market and when you trade too much all you are doing is losing money on trading costs. To me, the practical message is that you should not trade often unless you have substantial amount of evidence that you are right and markets are wrong. In other words: you should behave as if markets are efficient.

Limits to Arbitrage

- Grinblatt et al (2011): High IQ investors are not as biased
- If "arbitrageurs" can easily take advantage of other investor's mistakes, then cognitive biases cannot have an effect on prices
- They can create very profitable strategies taking little risk: as they do it, prices adjust
- Three aspects of financial markets limit their actions:
  - Fundamental Risk (trading horizon matters!)
  - Implementation Costs/Restrictions
  - Model Risk (is this really a mispriced security?)

The Critics: EMH vs Behavioral Finance

- EMH is clearly not a complete description of reality. The question is: how good is it?
- Proponents of behavioral finance argue that EMH completely ignores the way people act in reality and, thus, fails miserably
- EMH supporters indicate that most investors are better off if they act "as if" EMH were true (even though EMH is not literally true). Moreover, the "clear evidence" for mispricing is not systematic (they are more like anecdotes)
- Finally, they argue that behavioral finance does not provide a reasonable alternative way to think about investments since it is "unstructured" (each bias is used to "explain" a different piece of evidence and they often contradict each other)

Regarding systematic biases inherent in human psychology and their influence in investment decisions:

a) Mental accounting can induce investors to have biased probability estimates

b) Overconfidence can induce prices to be above fundamental value, but not below fundamental value

c) Availability can make investors to behave as if they are too risk averse even when there is no plausible justification for it. However, it cannot make investors to behave as less risk averse than they really are

d) Local representativeness can lead investors to believe that prices will continue to rise if they have been rising in the recent past (it is a potential explanation for the Momentum effect)

e) Representativeness can make investors to rely too much on new information and to disregard important information previously known

Appendix: Proof of Valuation Identity (Not Required)

$$1 + \mathbb{E}_t\left[r_{t+1}\right] = \mathbb{E}_t\left[\frac{P_{t+1} + CF_{t+1}}{P_t}\right]$$

$$\Downarrow$$

$$P_t = \mathbb{E}_t\left[\frac{CF_{t+1}}{1 + \mathbb{E}_t\left[r_{t+1}\right]} + \frac{P_{t+1}}{1 + \mathbb{E}_t\left[r_{t+1}\right]}\right]$$

$$= \mathbb{E}_t\left[\frac{CF_{t+1}}{1 + \mathbb{E}_t\left[r_{t+1}\right]} + \frac{1}{1 + \mathbb{E}_t\left[r_{t+1}\right]} \cdot \left(\frac{CF_{t+2}}{1 + \mathbb{E}_{t+1}\left[r_{t+2}\right]} + \frac{P_{t+2}}{1 + \mathbb{E}_{t+1}\left[r_{t+2}\right]}\right)\right]$$

$$= \mathbb{E}_t\left[\frac{CF_{t+1}}{1 + \mathbb{E}_t\left[r_{t+1}\right]} + \frac{CF_{t+2}}{\left(1 + \mathbb{E}_t\left[r_{t+1}\right]\right) \cdot \left(1 + \mathbb{E}_{t+1}\left[r_{t+2}\right]\right)} + \frac{P_{t+2}}{\left(1 + \mathbb{E}_t\left[r_{t+1}\right]\right) \cdot \left(1 + \mathbb{E}_{t+1}\left[r_{t+2}\right]\right)}\right]$$

$$\vdots$$

$$= \mathbb{E}_t\left[\frac{CF_{t+1}}{1 + \mathbb{E}_t\left[r_{t+1}\right]} + \frac{CF_{t+2}}{\left(1 + \mathbb{E}_t\left[r_{t+1}\right]\right) \cdot \left(1 + \mathbb{E}_{t+1}\left[r_{t+2}\right]\right)} + \ldots\right] + \mathbb{E}_t\left[\frac{P_{t+\infty}}{\prod_{k=t}^{\infty}\left(1 + \mathbb{E}_k\left[r_{k+1}\right]\right)}\right]$$

$$= \mathbb{E}_t\left[\frac{CF_{t+1}}{1 + \mathbb{E}_t\left[r_{t+1}\right]} + \frac{CF_{t+2}}{\left(1 + \mathbb{E}_t\left[r_{t+1}\right]\right) \cdot \left(1 + \mathbb{E}_{t+1}\left[r_{t+2}\right]\right)} + \ldots\right]$$

$$P_t = \sum_{h=1}^{\infty} \mathbb{E}_t\left[\frac{CF_{t+h}}{\prod_{k=t}^{t+h-1}\left(1 + \mathbb{E}_k\left[r_{k+1}\right]\right)}\right]$$

Appendix: Proof of Valuation Identity (Not Required)

$$P_t = \sum_{h=1}^{\infty} \mathbb{E}_t \left[\frac{CF_{t+h}}{\prod_{k=t}^{t+h-1} \left(1 + \mathbb{E}_k \left[r_{k+1}\right]\right)} \right]$$

- If we assume that (i) $\mathbb{E}_t \left[r_{t+1}\right] = \mathbb{E}_t \left[r_{t+2}\right] \equiv \mathbb{E}_t \left[r\right]$ and (ii) shocks to cash flows are independent of shocks to expected returns, then we have:

$$P_t = \sum_{h=1}^{\infty} \frac{\mathbb{E}_t \left[CF_{t+h}\right]}{\left(1 + \mathbb{E}_t \left[r\right]\right)^h}$$

References