



## Cap3c

# Market Efficiency and Behavioral Finance



## Financial Markets and Investments

...



## 1. Efficient Market Hypothesis (EMH)

- Why look at market efficiency?
- Do security prices reflect information ?

## 1. Efficient Market Hypothesis (EMH)

- In 1970, Eugene Fama published an important paper where he presented an appealing definition of efficient markets (Fama, 1970, pp. 383) :

*“a market in which prices always “fully reflect” available information”*

In mathematical notation

$$p_{j,t+1} - E(p_{j,t+1} | \Phi_t) = 0$$

or

$$r_{j,t+1} - E(r_{j,t+1} | \Phi_t) = 0$$



## 1. Efficient Market Hypothesis (EMH):

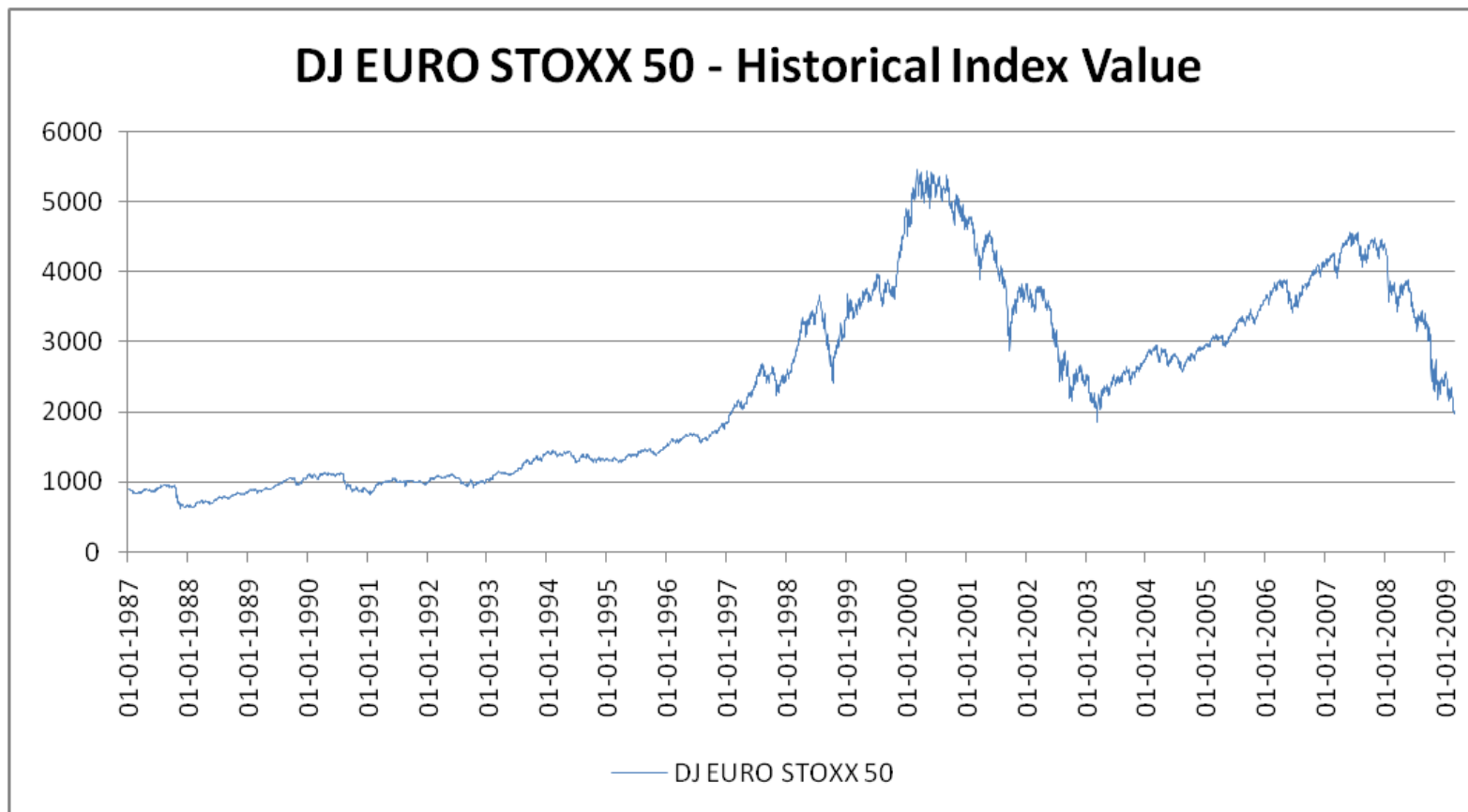
- Stock prices fully and accurately reflect publicly available information
- Once information becomes available, market participants analyze it
- Competition assures prices reflect information

## 1. Efficient Market Hypothesis (EMH)

- Efficiency Levels, 3 levels of Efficiency:
  - Weak-Form
    - Historical information is reflected in past price (or return) histories.
  - Semistrong-Form
    - Besides the historical price data,
      - The concern is the speed of price adjustment to other obviously publicly available information
  - Strong-Form
    - The concern is whether any investor or groups have monopolistic access to any information relevant for the formation of prices have recently appeared

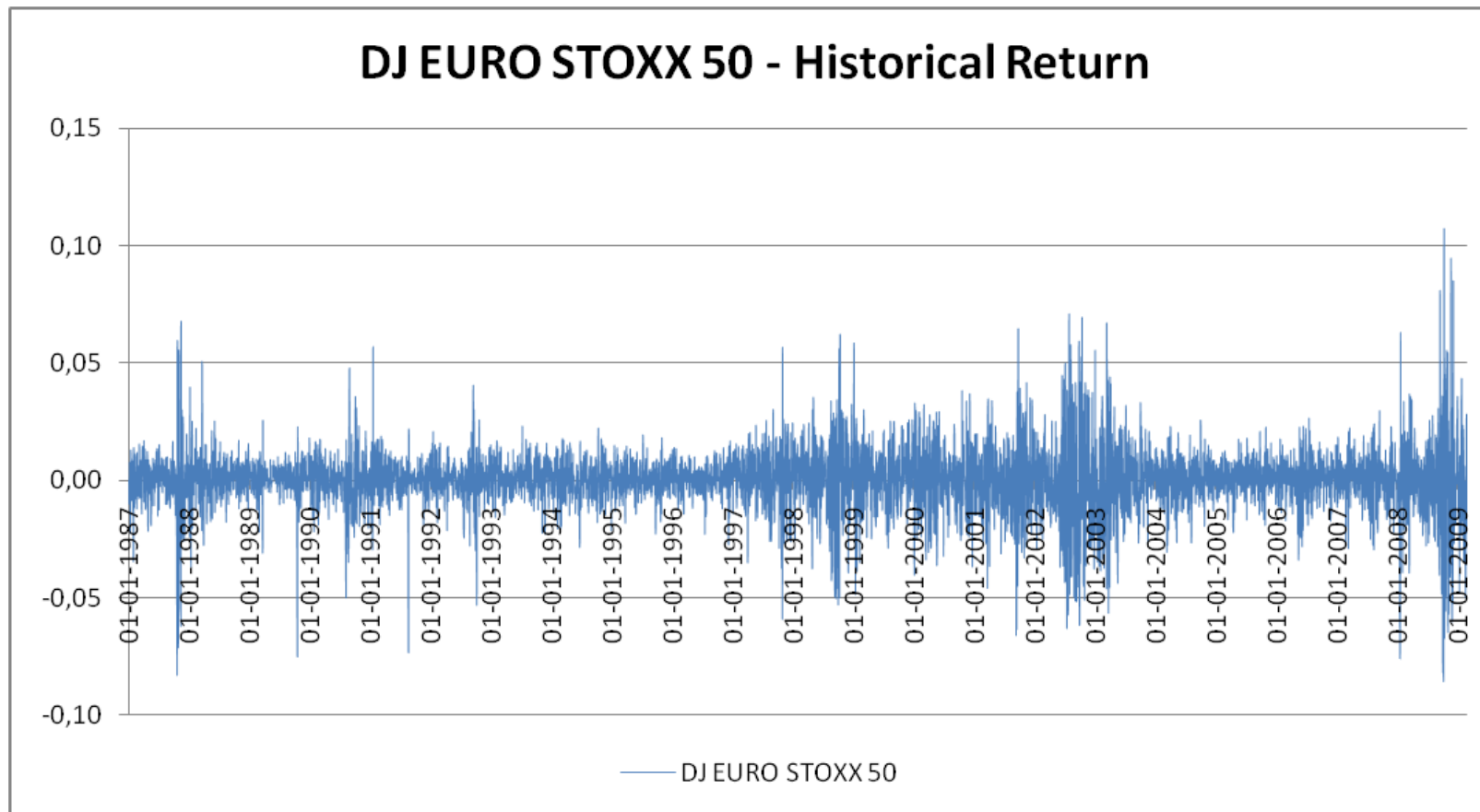
## 1. Efficient Market Hypothesis (EMH)

- Weak-Form



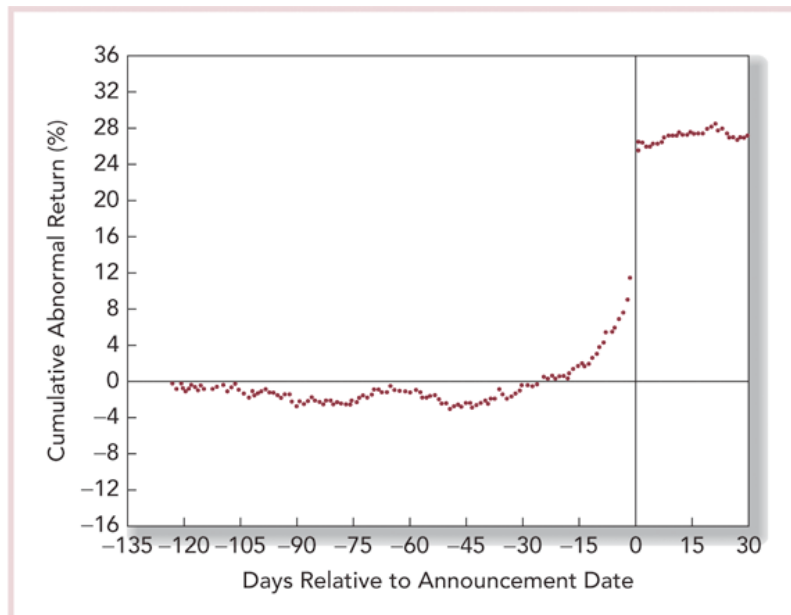
## 1. Efficient Market Hypothesis (EMH)

- Weak-Form



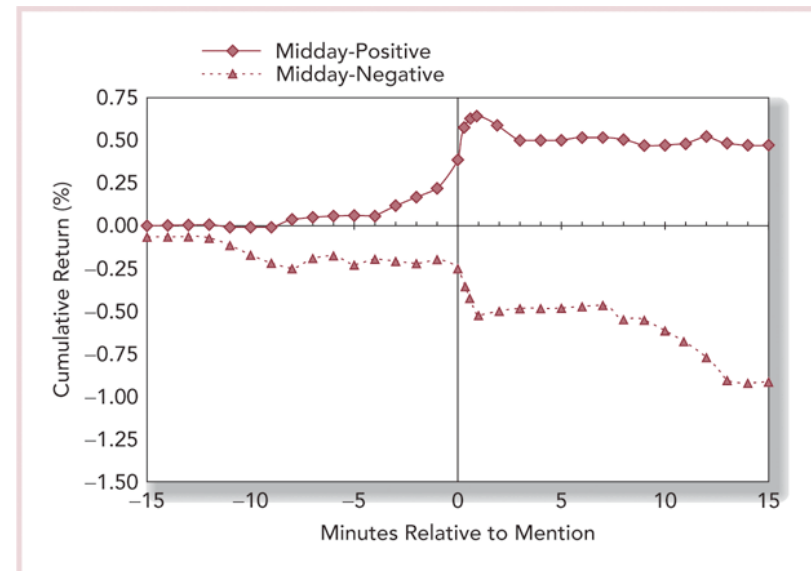
## 1. Efficient Market Hypothesis (EMH)

- Semistrong-Form



**FIGURE 11.1** Cumulative abnormal returns before take-over attempts: Target companies

Source: Arthur Keown and John Pinkerton, "Merger Announcements and Insider Trading Activity," *Journal of Finance* 36 (September 1981). Reprinted by permission of the publisher, Blackwell Publishing, Inc.



**FIGURE 11.2** Stock price reaction to CNBC reports. The figure shows the reaction of stock prices to on-air stock reports during the "Midday Call" segment on CNBC. The chart plots cumulative returns beginning 15 minutes before the stock report.

Source: Reprinted from J. A. Busse and T. C. Green, "Market Efficiency in Real Time," *Journal of Financial Economics* 65 (2002), p. 422. Copyright 2002 with permission from Elsevier Science.





## 2. Implications of the EMH

- Technical Analysis
  - Using prices and volume information to predict future prices
  - Weak form efficiency & technical analysis
- Fundamental Analysis
  - Using economic and accounting information to predict stock prices
  - Semi strong form efficiency & fundamental analysis



## 2. Implications of the EMH

- Active or Passive Management
  - Active Management
    - Security analysis
    - Timing
  - Passive Management
    - Buy and Hold
    - Index Funds



## 2. Implications of the EMH

- Active or Passive Management
  - Even if the market is efficient a role exists for portfolio management:
    - Appropriate risk level
    - Tax considerations
    - Other considerations



## 3. Are Markets Efficient? Tests...

- Weak-Form
  - Serial correlation
  - Returns over the Short Horizon
    - Momentum
  - Returns over Long Horizons
    - Reversal Effect



## 3. Are Markets Efficient?

- Weak-Form
  - Predictors of Broad Market Returns
    - Aggregate returns are higher with higher dividend ratios (Fama and French)
    - Earnings yield can predict market returns (Campbell and Shiller)
    - Bond spreads can predict market returns (Keim and Stambaugh)



## 3. Are Markets Efficient?

- Semistrong-Form

- Event studies

- Empirical financial research that enables an observer to assess the impact of a particular event on a firm's stock price
- Abnormal return due to the event is estimated as the difference between the stock's actual return and a proxy for the stock's return in the absence of the event

## 3. Are Markets Efficient?

- Semistrong-Form

- Event studies

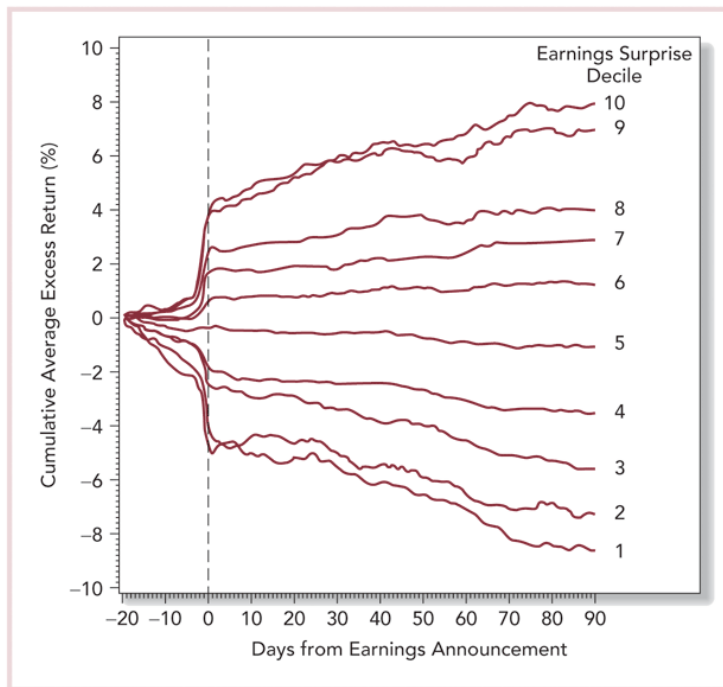
- Returns are adjusted to determine if they are abnormal
- Market Model approach

$$r_t = a_t + br_{Mt} + e_t$$
$$\underbrace{e_t}_{\text{Excess Return}} = \underbrace{r_t}_{\text{Actual Return}} - \underbrace{(a_t + br_{Mt})}_{\text{Expected Return}}$$

- Then we can compute CAR – Cumulative Abnormal Return

## 3. Are Markets Efficient?

- Semistrong-Form



**FIGURE 11.5** Cumulative abnormal returns in response to earnings announcements

Source: Reprinted from R.J. Rendleman Jr., C. P. Jones, and H. A. Latané, "Empirical Anomalies Based on Unexpected Earnings and the Importance of Risk Adjustments," *Journal of Financial Economics* 10 (1982), pp. 269–287. Copyright 1982 with permission from Elsevier Science.



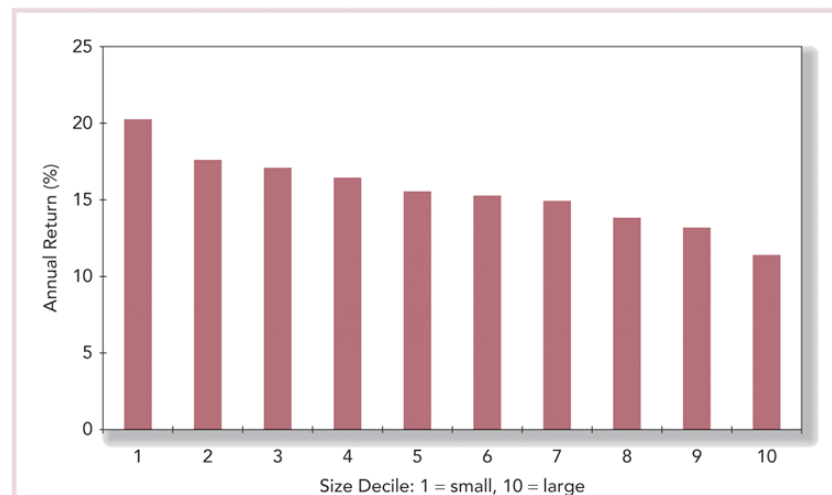


## 3. Are Markets Efficient?

- Semistrong-Form
  - Anomalies
    - P/E Effect
    - Small Firm Effect (January Effect)
    - Neglected Firm Effect and Liquidity Effects
    - Book-to-Market Ratios
    - Post-Earnings Announcement Price Drift

## 3. Are Markets Efficient?

- Semistrong-Form



**FIGURE 11.3** Average annual return for 10 size-based portfolios, 1926–2006

Source: Authors' calculations, using data obtained from Professor Ken French's data library at [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).



**FIGURE 11.4** Average return as a function of book-to-market ratio, 1926–2006

Source: Authors' calculations, using data obtained from Professor Ken French's data library at [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

## 3. Are Markets Efficient?

- Strong-Form
  - Inside Information
    - The ability of insiders to trade profitability in their own stock has been documented in studies by Jaffe, Seyhun, Givoly, and Palmon
  - Markets are not Strong-Form efficient, therefore trades based on inside information are regulated and limited

## 3. Are Markets Efficient?

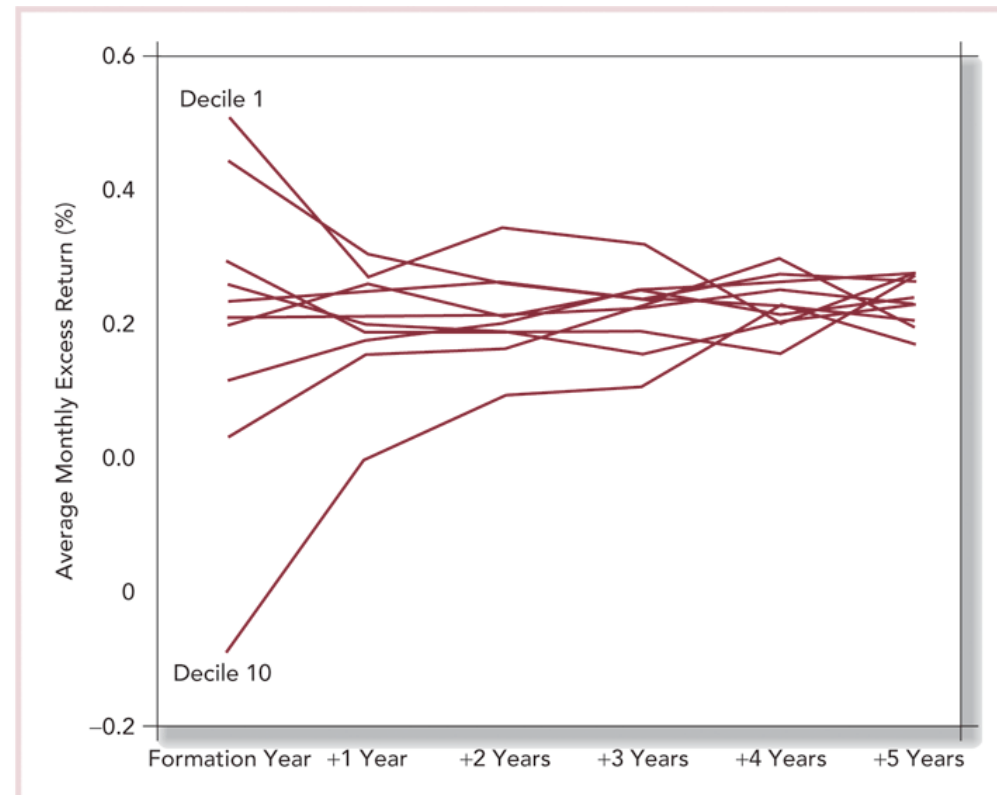
- Interpreting the Evidence
  - Risk Premiums or market inefficiencies
    - Fama and French argue that these effects can be explained as manifestations of risk stocks with higher betas
    - Lakonishok, Shleifer, and Vishney argue that these effects are evidence of inefficient markets
  - Anomalies or Data Mining



## 3. Are Markets Efficient?

- For investors, the issue of market efficiency boils down to whether skilled investors can make consistent abnormal trading profits
- The best test is to look at
  - Stock Market Analysts
    - Analysts seems to add value, but...it is not clear how
  - Mutual Fund Managers
    - Professional managers cannot consistently beat the market

## 3. Are Markets Efficient?



**FIGURE 11.8** Persistence of mutual fund performance. Performance over time of mutual fund groups ranked by initial year performance

Source: Mark M. Carhart, "On Persistence in Mutual Fund Performance," *Journal of Finance* 52 (March 1997), pp. 57–82. Reprinted by permission of the publisher, Blackwell Publishing, Inc.

## 4. The Behavioural Critique

- The EMH assumes that agents are rational, with rationality meaning two things (Barberis and Thaler, 2003)
  - When agents receive new information, they update their beliefs correctly
  - Given their beliefs, agents make choices that are normatively acceptable



The subjective distribution used by agents to forecast futures returns is indeed the distribution of that returns



# VI. Market Efficiency and Behavioural Finance



## 4. The Behavioural Critique

- Limited rationality
  - But...Are investors really rational?
  - If not, the mainstream finance theory is at risk because:
    - expected utility theory; and
    - non-arbitrage worldwill not hold!
  - To find an answer, we need the help of psychology, which is one of the building blocks of behavioural finance





## 4. The Behavioural Critique

- The truth is
  - Investors do not always process information correctly
  - Investors often make inconsistent or systematically suboptimal decisions

Information  
Processing

Behavioural  
Biases



## 4. The Behavioural Critique

- Information Processing
  - How do you classify your driving skills?
    - Above average
    - On average
    - Below average



## 4. The Behavioural Critique

- Information Processing
  - How much is  $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$ ?
  - And how much is  $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ ?



## 4. The Behavioural Critique

- Information Processing
  - How much is  $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$ ?
    - Average answer: 512
  - And how much is  $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ ?
    - Average answer: 2250
  - Correct answer: 40,320



## 4. The Behavioural Critique

- Information Processing
  - What is the percentage of African countries in the United Nations?
    - First guess: 10%





## 4. The Behavioural Critique

- Information Processing
  - What is the percentage of African countries in the United Nations?
    - Second guess: 60%

## 4. The Behavioural Critique

- Information Processing

- What is the percentage of African countries in the United Nations?

- First guess: 10%  Average answer: 25%
- Second guess: 60%  Average answer: 45%



Correct answer: 53 countries in 192 (27,6%)



## 4. The Behavioural Critique

- Information Processing
  - How many times the white team throw the ball among them?

<http://viscog.beckman.uiuc.edu/flashmovies/15.php>



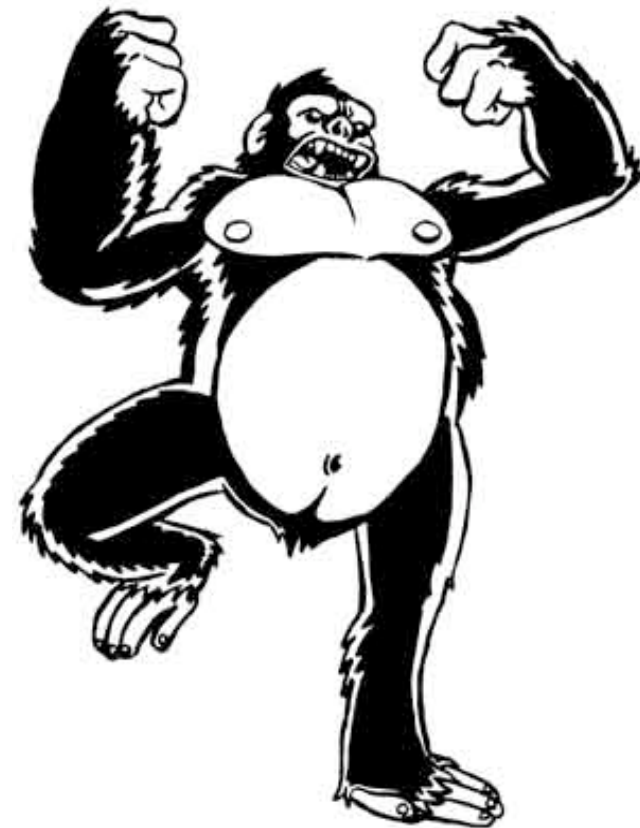


## 4. The Behavioural Critique

- Information Processing
  - Did you see any unexpected thing that were not suppose to be there?
  - Rewatch the filme e try to find anything unusual...

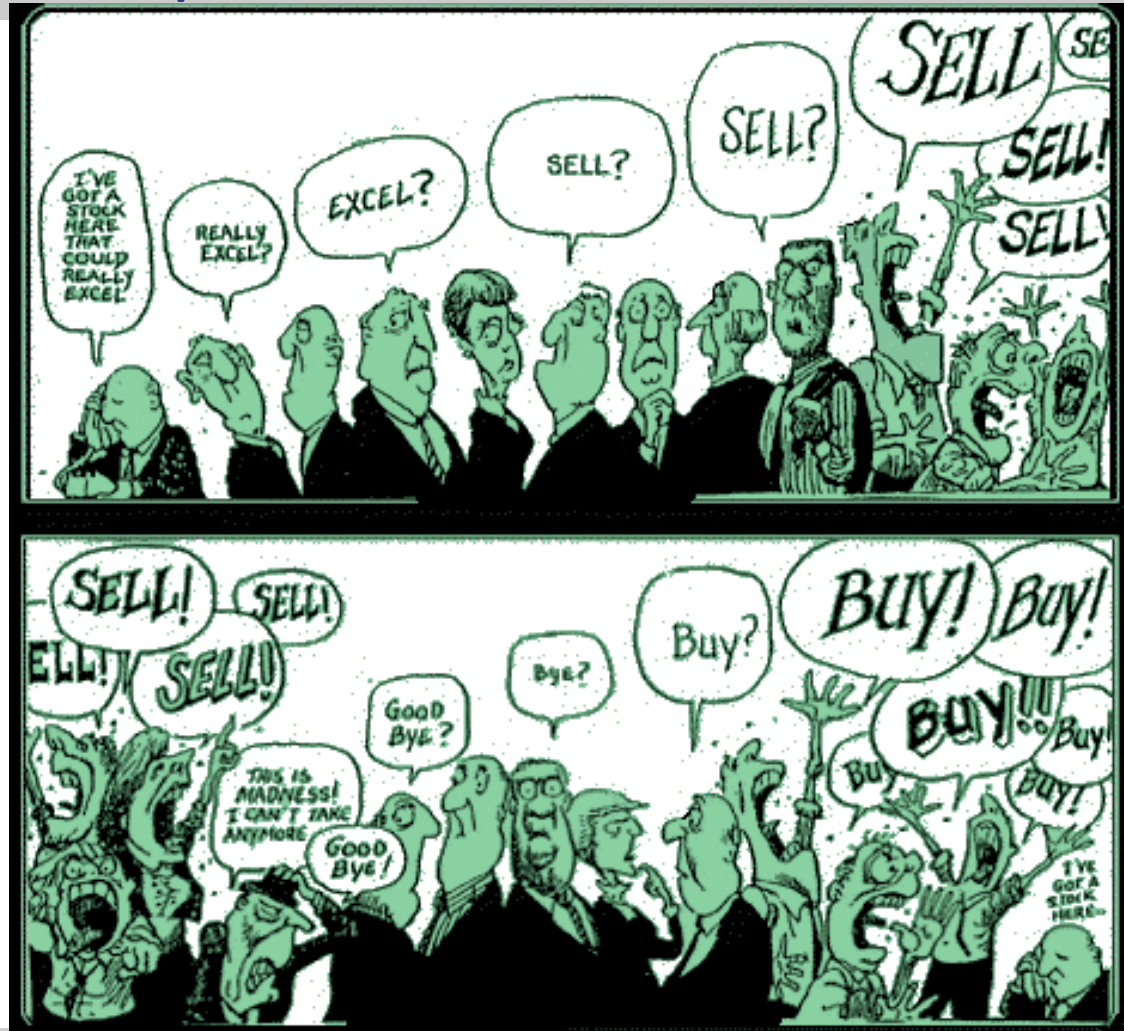
## 4. The Behavioural Critique

- Information Processing
  - Rewatch again the film and pay attention to the big monkey! 😊



## 4. The Behavioural Critique

- Information Processing





## 4. The Behavioural Critique

- Information Processing
  - Forecasting Errors
  - Overconfidence
  - Conservatism
  - Sample Size Neglect and Representativeness



## 4. The Behavioural Critique

- Behavioural Biases
  - Framing
  - Mental Accounting
  - Regret Avoidance
  - Prospect Theory

## 4. The Behavioural Critique

- Behavioural Biases
  - Suppose two games
    - First game
      - You have just won € 1.000
      - Now choose between
        - »  $A = (1000, 0,5)$
        - »  $B = (500, 1)$

## 4. The Behavioural Critique

- Behavioural Biases
  - Suppose two games
    - Second game
      - You have just won € 2.000
      - Now choose between
        - »  $A = (-1000, 0,5)$
        - »  $B = (-500, 1)$



## 4. The Behavioural Critique

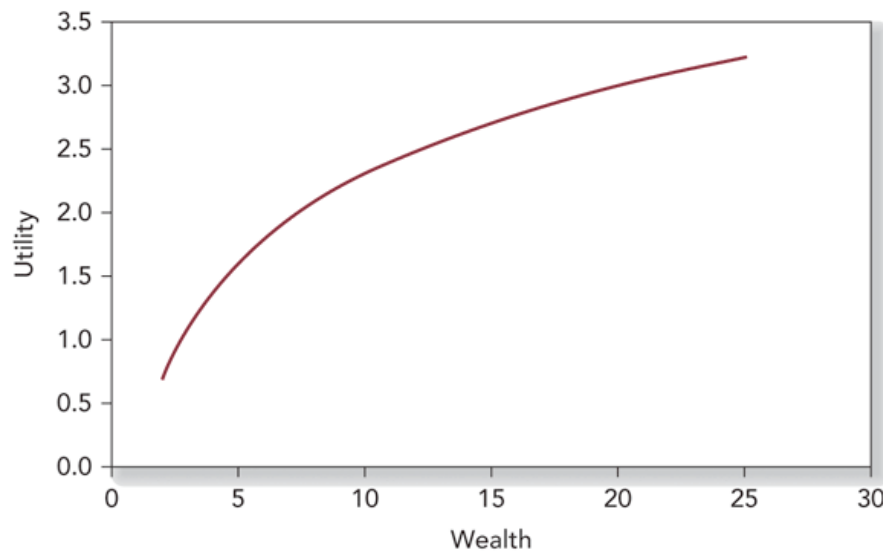
- Behavioural Biases
  - In each outcome the expected value of the final wealth is 1500, however people choose differently
    - In the first game 84% of people choose A
    - In the second game 69% of people choose B
  - It is the Allais Paradox



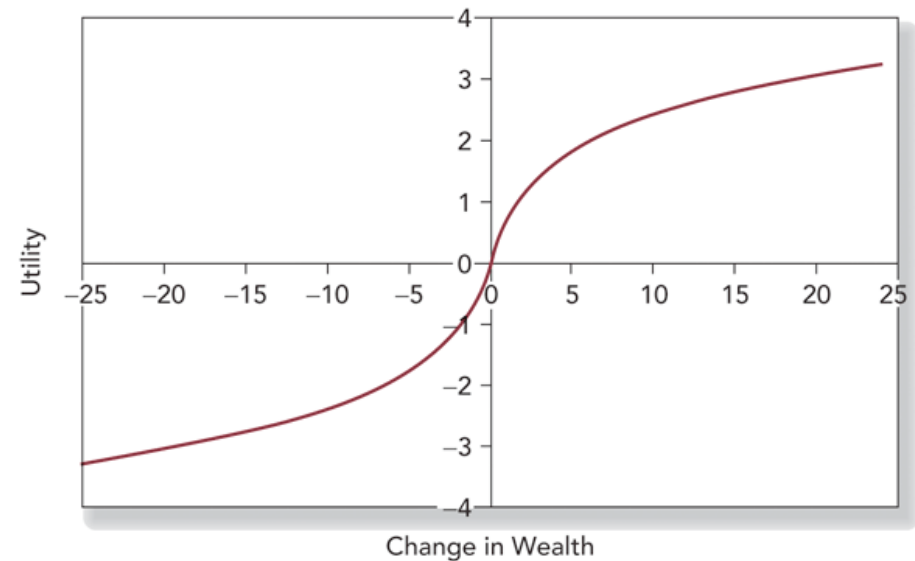
## 4. The Behavioural Critique

- Behavioural Biases
  - From similar results, Kahneman and Tversky has developed the Prospect Theory

A: Conventional Utility Function



B: Utility Function under Prospect Theory





## 4. The Behavioural Critique

- Neurobiology
  - Neurobiology tells us that human beings have two complementary ways of making decisions (Damásio)
    - Way A, the fully rational one, leads to some mental images being projected in our minds, such as options for action and their future consequences. Based on these images we come out with a decision through different reasoning strategies
    - However, at the same time, we recall ancient emotional memories lived in similar situations, which is way B. This recall, conscious or not, influences our decision making process conditioning our analysis of the situation



## 4. The Behavioural Critique

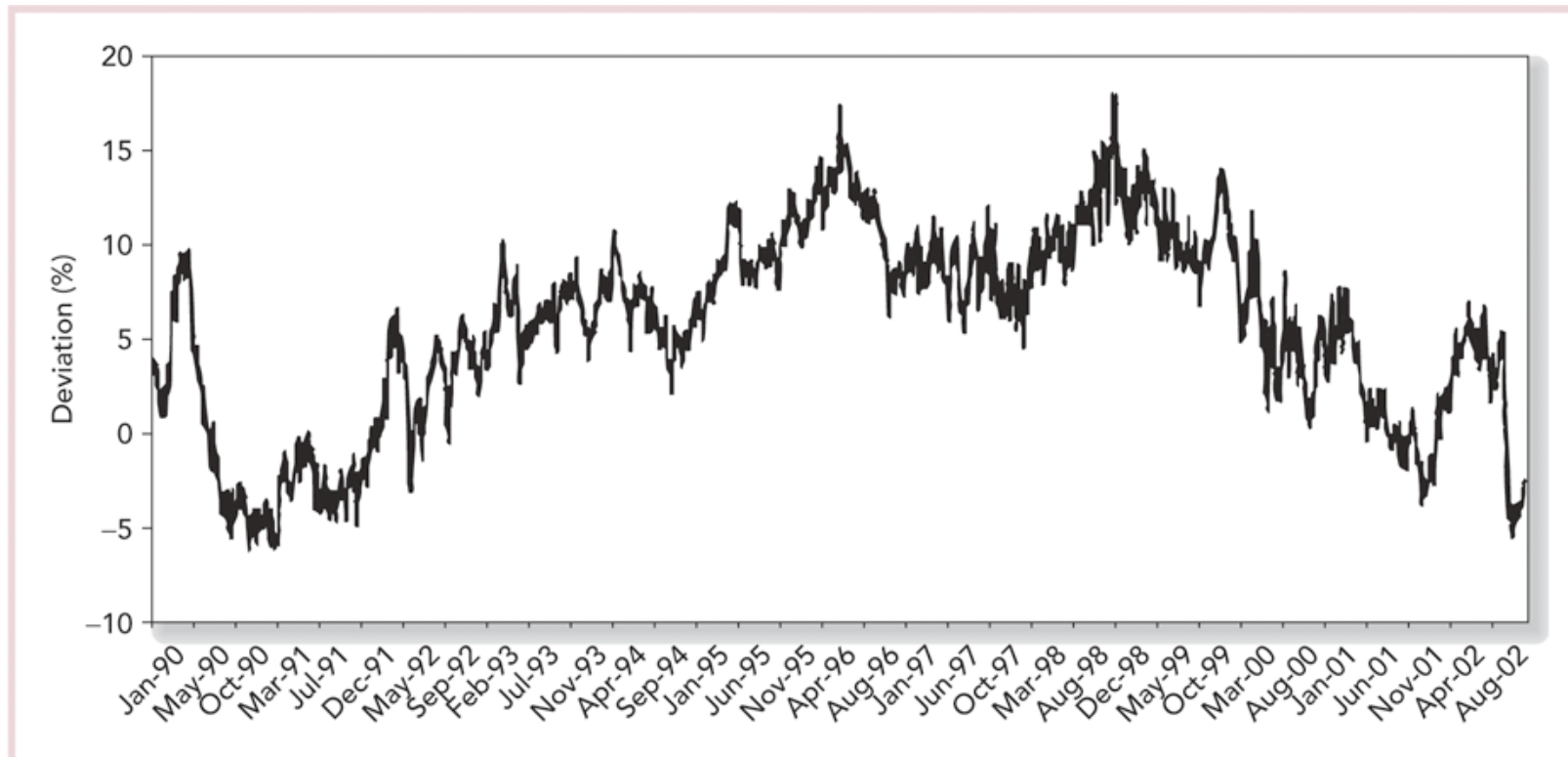
- Limits to Arbitrage
  - Fundamental Risk and Noise Trader Risk
  - Implementation Costs
  - Model Risk



## 4. The Behavioural Critique

- Limits to Arbitrage
  - Examples
    - Siamese Twin Companies
    - Equity Carve-outs
    - Closed-End Funds

## 4. The Behavioural Critique



**FIGURE 12.2** Pricing of Royal Dutch relative to Shell (*deviation from parity*)

Source: O. A. Lamont and R. H. Thaler, "Anomalies: The Law of One Price in Financial Markets," *Journal of Economic Perspectives* 17 (Fall 2003), pp. 191–202.



## 4. The Behavioural Critique

Price = Intrinsic Value  $\Rightarrow$  No Free Lunch

Price  $\neq$  Intrinsic Value  $\not\Rightarrow$  Free Lunch

## 4. The Behavioural Critique

- Evaluation of the Behavioral Critique
  - The critique is well taken, but...
    - Bubbles are not necessarily irrational
    - Behavioural Finance (BF) does not give guidance as to how exploit any irrationality or what alternative models should be used
    - An unified behavioural theory is needed
    - BF and EMH may lead to the same policy conclusions
      - Example: passive strategies are preferable