

The Efficient Market Hypothesis

GOALS

- Discuss efficiency in financial markets
- Examine three versions of the efficient market hypothesis
- Discuss testing for efficiency
- Discuss 'rationality' in financial markets

WHAT IS EFFICIENCY IN MARKETS?

Three possible definitions apply

- Operational efficiency
 - trading is carried out quickly, reliably and at minimum cost.
- Bid-ask spreads
 - Are minimal
- Brokerage
 - A competitive business

WHAT IS EFFICIENCY IN MARKETS?

- Allocation efficiency
 - funds flow to most productive uses
 - Unproductive uses are starved
- Raising capital
 - Ignores long / short term time frames
 - Cost is the same

WHAT IS EFFICIENCY IN MARKETS?

- Firms with highest possible profits benefit
 - Reflected in share prices
 - New capital
 - Raised more easily
 - At cheaper cost
- Firms with lowest possible profits
 - Share price falls, might become take-over targets

WHAT IS EFFICIENCY IN MARKETS?

- Information efficiency
 - prices reflect all available information
- Markets allocate based on information
- Most allocation decisions are made in response to prices
- The information in prices must relate to fundamentals only

EFFICIENT MARKETS HYPOTHESIS

- IF capital is deployed efficiently
 - We require informational efficiency
PLUS rationality
- EMH states financial markets make efficient use of information
- But is this really true?

EFFICIENT MARKETS HYPOTHESIS

- There are forms of the EMH
 - weak form
 - semi-strong form
 - strong form
- Let's discuss each further

EFFICIENT MARKETS HYPOTHESIS

- Weak form
 - Suggests financial markets make full use of all information from past behaviour of financial instruments
- Semi-strong form
 - Financial markets make full use of all other publicly available information
- Strong form
 - Financial markets make full use of ALL information, public or private

EFFICIENT MARKETS HYPOTHESIS

- Can we can test share prices to see if they immediately reflect new information?
- Can we test if individuals can make excess profits from the use of information of any kind?
- We define excess as rates of return which are in excess of those expected from an asset with a given level of risk

EFFICIENT MARKETS HYPOTHESIS

Question

- On average, stock market investors are expected to earn a positive return this year
- Some will earn more than others

Does this undermine the EMH?

EFFICIENT MARKETS HYPOTHESIS

Answer – no

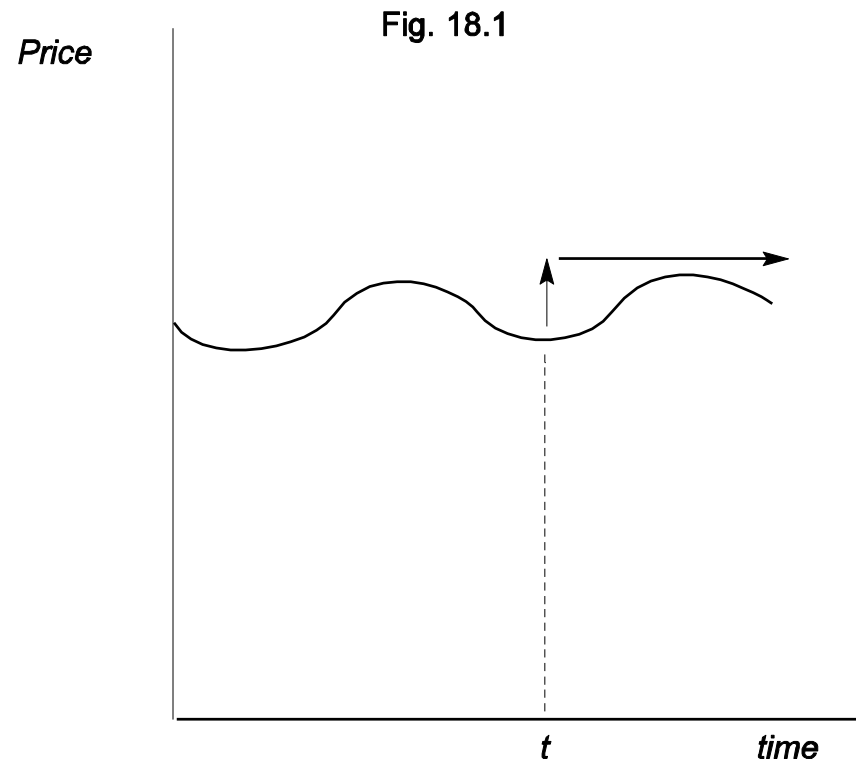
- Investors expect to earn a positive and risk-adjusted rate of return
- IF some earn more than others they
 - are holding shares with higher risk or
 - are lucky (the EMH only rules out consistent excess returns, not windfalls)

EFFICIENT MARKETS HYPOTHESIS

Weak form efficiency

In the figure market participants realise at time t there is a pattern the share price, shown by the wavy line

What will investors do and why?

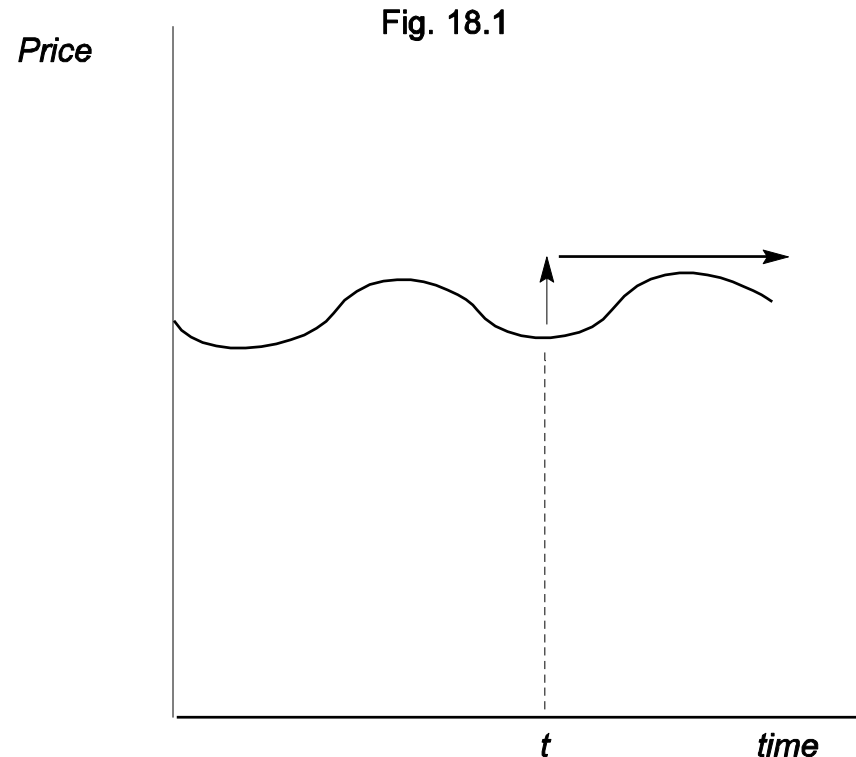


EFFICIENT MARKETS HYPOTHESIS

Weak form efficiency

There will be an
immediate upsurge in
demand for the share

The price increases



20 MINUTE BREAK

RANDOM WALK

- Only *new* information can influence the future course of share prices
- Any supposedly new information must be unpredictable
- Effects of new information on share prices must be *random*

RANDOM WALK

- Share prices must follow random walks
- In the absence of news
 - Future price changes are not predictable
- But share prices will still change – why?
- Can these changes be predicted?

TESTS OF WEAK FORM EFFICIENCY

- Do prices immediately reflect information?
- Do they follow a random walk?
- Recall, prices must be serially uncorrelated
 - This means correlation of neighbouring data points is low or even zero

TESTS OF WEAK FORM EFFICIENCY

- Test of serial correlation

$$P_t = a + bP_{t-1} + \varepsilon$$

- Where
 - P_t is today's price
 - P_{t-1} is yesterday's price
 - b is a coefficient to be determined

TESTS OF WEAK FORM EFFICIENCY

- Given

$$P_t = a + bP_{t-1} + \varepsilon$$

- IF today's price, P_t , is not dependent upon yesterday's price, P_{t-1}
 - THEN b must be different from zero

EMH & CHARTISM

Question: What does the EMH imply about Chartism?

Answer: If anything useful could be learned from a pattern, then it would already have affected the price and so could not be used for any profitable purpose

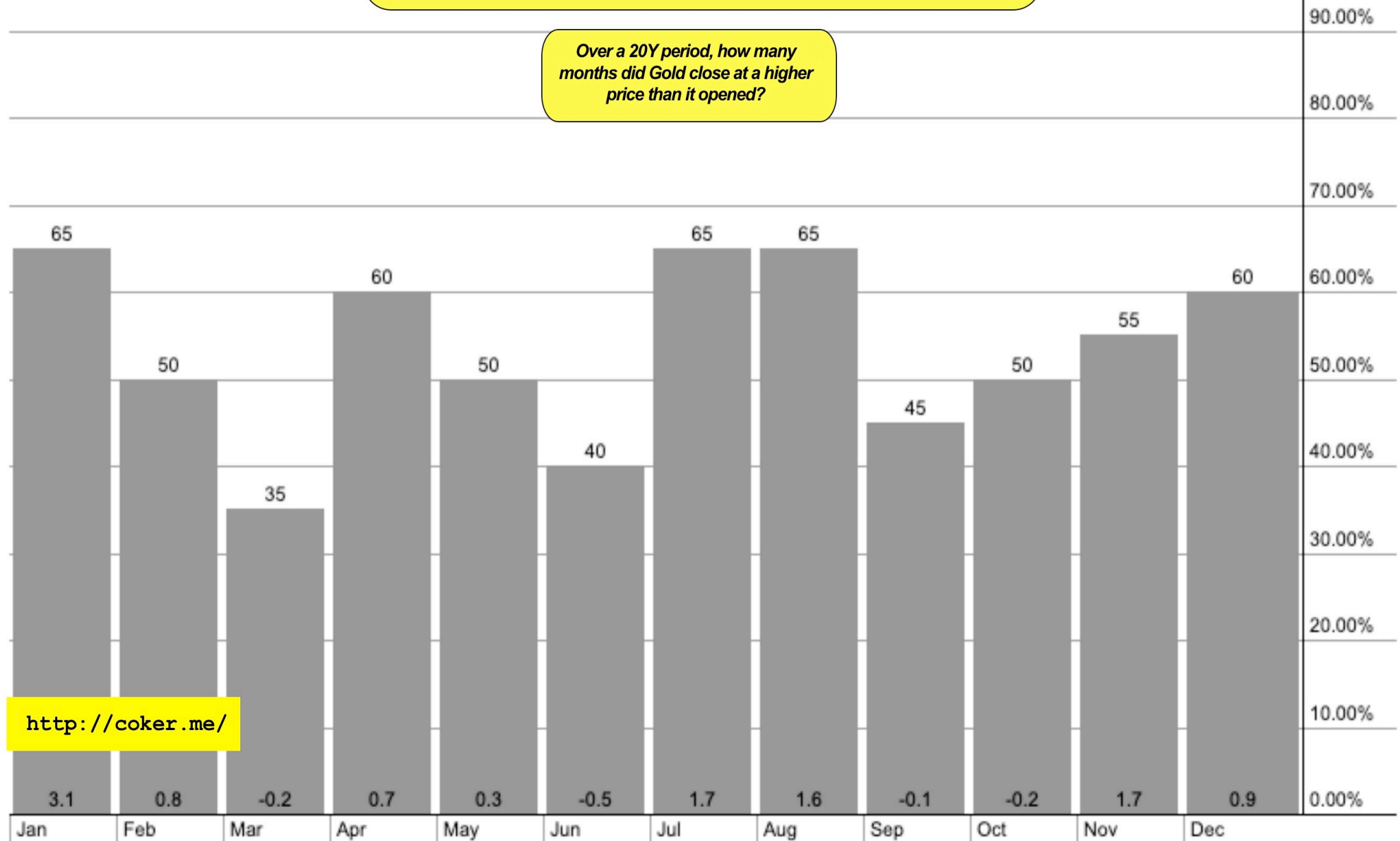
There is no evidence that investors can achieve consistently superior returns by appeal to visual patterns of past behaviour

EMH & CHARTISM

% of Months in Which \$GOLD Closed Higher Than It Opened From 2003 to 2022

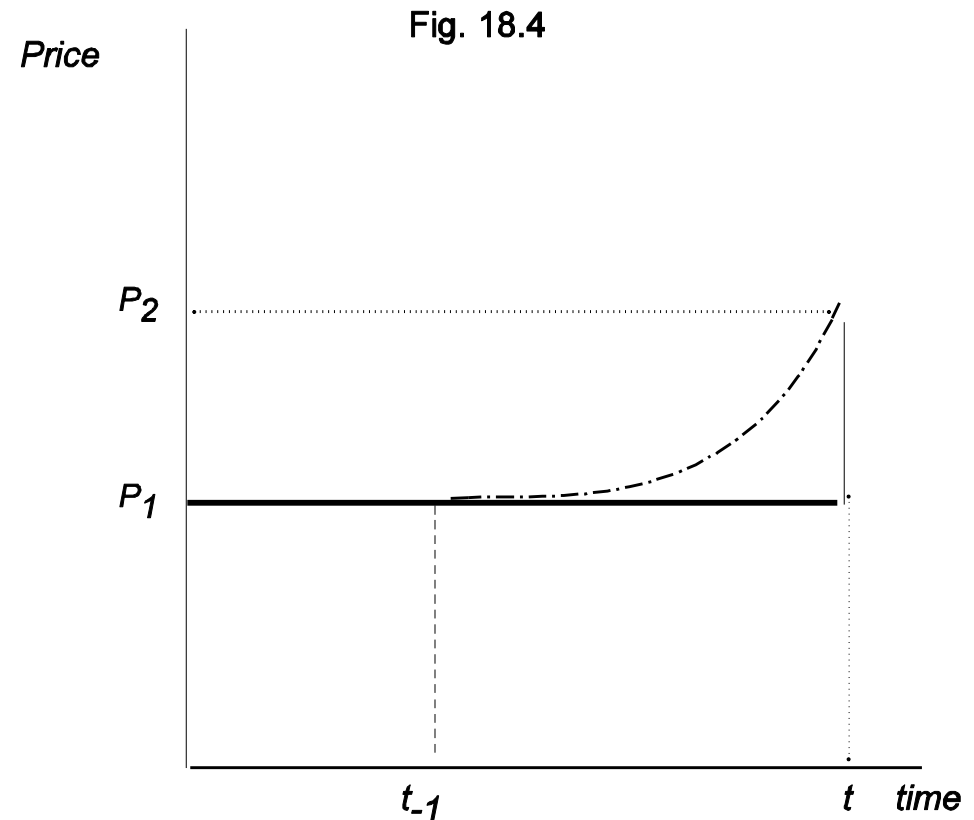
GOLD'S SEASONAL PRICES

Over a 20Y period, how many months did Gold close at a higher price than it opened?



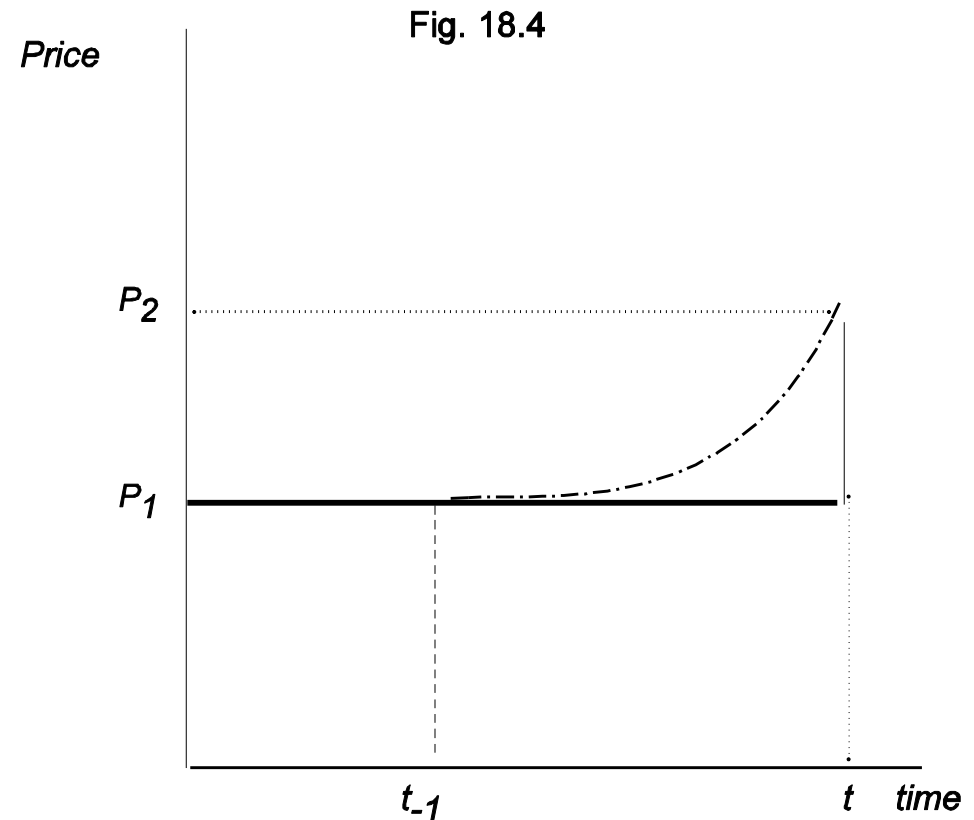
SEMI-STRONG FORM EFFICIENCY

- Assume a cost-reducing innovation by a particular firm becomes public knowledge at time t
- IF share price is initially P_1
- THEN $P_2 = P_1 + \text{NPV of cost savings}$



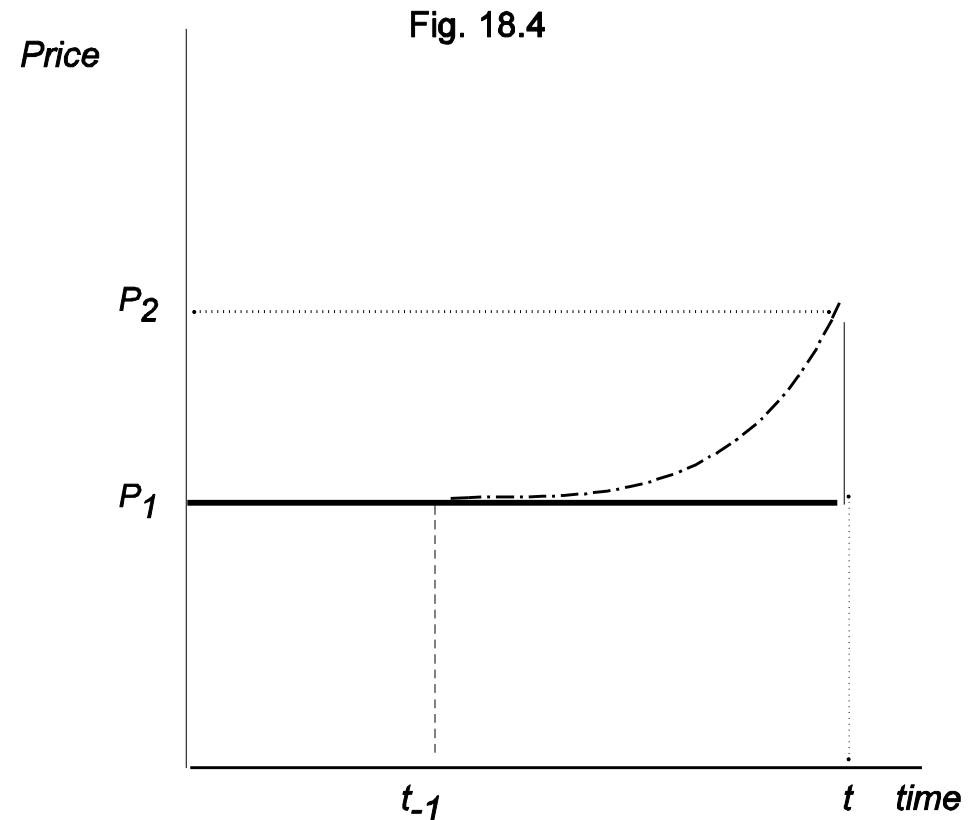
SEMI-STRONG FORM EFFICIENCY

- IF the share price rises to P_2 AFTER t
- THEN it is possible to make abnormal gains from publicly available information by buying the share at t



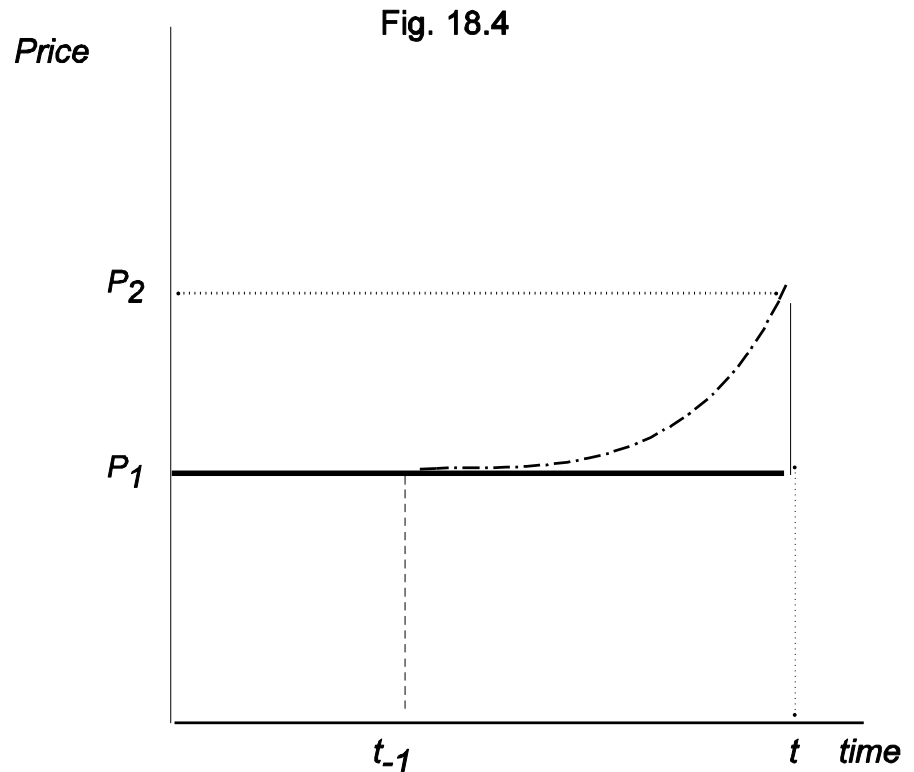
SEMI-STRONG FORM EFFICIENCY

- Semi-strong efficiency requires the share price to rise to P_2 as soon as the innovation becomes public knowledge
- This is shown by the solid line.



SEMI-STRONG FORM EFFICIENCY

- BUT the price may begin to rise in anticipation of the news, as early as t_{-1}
- This is shown by the dashed line



TESTS OF SEMI-STRONG FORM EFFICIENCY

Standard testing is called 'event studies'

- Sample of firms which experienced a major public announcement
- Defining a period either side of the announcement day
- Computing returns on each day, for each firm in the sample
- Comparing returns on firms in the sample with those of similar firms without an announcement

TESTS OF SEMI-STRONG FORM EFFICIENCY

- If the market is semi-strong form efficient
 - THEN abnormal returns
 - Driven by news news
 - will be earned in the days leading up to, or on the day of, the announcement
- After the day of announcement
 - it is impossible to earn excess returns

SEMI-STRONG FORM EFFICIENCY

- Most event studies find US securities markets semi-strong form efficient
- BUT does this mean that it is pointless paying for analysis, research and professional fund management?
- Not a simple answer

SEMI-STRONG FORM EFFICIENCY

- But the answer is probably ‘yes’
- If no one has an information advantage
 - THEN in the long-run only normal returns may be earned
- But what kind of investing strategy works in this situation?

SEMI-STRONG FORM EFFICIENCY

- buy and hold is solid
 - buying a diversified portfolio of assets and holding assets for a long period
- Frequent buying and selling is unlikely to improve performance
 - No one can consistently pick winners
 - Transaction costs must be paid

SEMI-STRONG FORM EFFICIENCY

- Tracker funds are popular and efficient
- Manager replicates shares in an index
- Minimises research and trading costs
 - Fund offers low annual charges
- Allows friction fee growth

BUT ACTIVE MANAGEMENT?

- Professional services
 - research,
 - Analysis
 - monitoring
 - of firms & shares make markets efficient
- Help ensuring prices respond efficiently to news

SEMI-STRONG FORM EFFICIENCY

- Even private information is incorporated in security prices
- But acting on inside information is illegal
- Inside information is defined as not being in the public domain
- Who can get this information?

SEMI-STRONG FORM EFFICIENCY

- Why is acting on inside information illegal?
- Unfair to other participants in the market
- Inside information can lead to excess returns

SEMI-STRONG FORM EFFICIENCY

- How about information held by analysts?
 - They study the firm on behalf of fund managers or stockbrokers and investment banks.
- They are not employed by the firm
 - So not insiders
- They find information BEFORE
 - it becomes public knowledge

20 MINUTE BREAK

SO WHAT ABOUT MARKETS?

- Some actively managed funds show higher returns than buy and hold
- This suggests markets are not strong form efficient
- Keep in mind funds charge
 - Management
 - Trading
 - Advertising

SO WHAT ABOUT MARKETS?

- Securities markets in the United States
 - are semi-strong form efficient
- There is little to no evidence regarding strong form
- It is very difficult to consistently generate excess returns

RATIONALITY IN MARKETS

- Why is the EMH is widely accepted?
 - Two key reasons
 -
 - Evidence
 - Centrality of maximisation in economics
- Let's look at Centrality

RATIONALITY IN MARKETS

- Market participants are rational
- Act in their own best interests
 - to maximise wealth
- IF we found EMH is not true
 - Then we know market participants are NOT using information to to maximise

RATIONALITY IN MARKETS

- If EMH is NOT true
 - investors do not maximise wealth
 - This is not possible

RATIONALITY IN MARKETS

- But are markets consistently rational?
- IF EMH is true
 - THEN then assets are priced efficiently
AND according to fundamentals
- OR according to their risk and return

RATIONALITY IN MARKETS

- SO all relevant information is incorporated
 - Specifically rational information about fundamentals
- We are assuming correct pricing models are used
- But the use of any model is an assumption
 - Possibly is not correct

RATIONALITY IN MARKETS

- EMH suggests agents make the best use of information
- Information is used to price assets
- IF pricing is efficient
 - Nobody can earn excess returns

RATIONALITY IN MARKETS

- Separation of EMH from pricing models is important
- We have doubts asset prices are determined only by fundamentals
- There could be a high degree of informational efficiency COMBINED with low level of rationality

SUMMARY

- EMH states markets make best use of all available information
- The weak form refers to information about the past behaviour of an asset's price
- The semi-strong form refers to all publicly available information
- The strong form refers to all information, even private

SUMMARY

- EMH implies information is incorporated into prices quickly
- Nobody can take advantage of information to earn 'excess returns' consistently
- Financial markets are at least semi-strong form efficient
- BUT asset prices may not be determined by fundamentals

The Efficient Market Hypothesis