CHAPTER 24

NOISE TRADING AND BEHAVIOURAL FINANCE

The objective of this chapter is to provide knowledge of the implications of noise trading and behavioural finance for market efficiency, particularly in regard to:

1. The role of rumours in financial markets.
2. Under-reaction to news.
3. Over-reaction to news.
4. Inaccurate perceptions of risk.
5. Moods and emotions.
6. The adaptive markets hypothesis.

One of the assumptions of the Efficient Market Hypothesis is that, in aggregate, market participants behave in a rational manner. There are lines of reasoning that suggest that irrational behaviour can have significant impacts on financial markets. The concepts of noise trading and behavioural finance suggest that individual market participants do not consistently behave rationally.

Noise Trading and Rumours

Fisher and Statman (2004) distinguish between information traders and noise traders. Information trading is driven by the fundamental values of stocks (and other securities) whereas noise trading is driven by sentiment (Shefrin and Statman 1994). In an efficient market there are only information traders and value alone determines prices. Noise traders can move prices away from fundamental value and render markets inefficient. According to Fisher and Statman stock markets are in a bubble when bullish sentiment moves prices above fundamental value and in a negative bubble when bearish sentiment pushes prices below fundamental value.

Roll (1988a) found that value-related news explained only 35% of the variation in monthly stock returns and Fair (2002) found that many large price changes occurred in the absence of value-related news. Noise traders appear to have a substantial impact on price movements. Bullish noise trading can drive prices higher as fundamental value falls, and bearish noise trading can push prices down even when fundamental value rises. When a market movement occurs in the absence of value-related news,
the market movement becomes the news. Investors may react to such price changes on the grounds that they reveal how other investors are thinking. In particular it may be assumed that other investors know something, or understand something, that justifies the market movement and an informational cascade ensues with investors copying each other. Fama and French (2004a) showed that unless noise traders (stupid or misinformed investors) exactly cancel each other out there would be a noise trader effect on prices. Unless there is a mistaken overpricing to offset every mistaken under-pricing, the mistakes affect prices.

A noise trader uses irrelevant, or inaccurate, information when making investment decisions. One type of unreliable information, on which noise traders may base their trades, is rumour. However rumours may even affect professional traders. If trading on rumour is regarded as noise trading, then even market professionals are sometimes noise traders. Even respected financial newspapers and magazines participate in the spreading of rumours, and websites are an abundant source of rumours.

For financial market traders to profit from new information, they must act on the news before other traders. There is pressure to respond quickly. There may not be time to check on the accuracy of a rumour before acting on it. As a result even competent professionals may engage in noise trading. Pressure to act quickly is likely to engender anxiety and stress, which renders people more susceptible to accepting rumours. It is not always possible to know whether a piece of information is good or bad. One of the behavioural finance heuristics is the dilution heuristic according to which use of poor information can dilute the use of good information, and hence noise trades can crowd out information trades.

Kimmel (2004) points out that rumours emerge in conditions of uncertainty, which are frequent in financial markets. Rumours are particularly prone to emerge when emotions, especially feelings of fear, are high. In a situation of change people may be unable to understand the changes. The resulting uncertainty generates fear and the need for information relevant to the future. Uncertainty about the future creates stress, and interacts with stress, to produce a need for information which can be used to guide actions.
Rumours are more likely to circulate if they are credible. Rumours received from trusted sources are more likely to be believed. In addition to the plausibility, and source, of a rumour its frequency of repetition affects its acceptability. The more often a rumour is heard, the more likely it is to be believed. Repetition fosters belief. Olsen (2008a) pointed out that information which is disputed is less likely to be accepted.

It appears that in financial markets the most prevalent rumours concern short-term events; it is the immediate future that is of greatest concern. Kimmel and Audrain (2002) found that the number of rumours was related to the importance of their content, to the accuracy of previous rumours, and to levels of anxiety. They also found that rumours, which subsequently turned out to be true, became more precise over time. In contrast, false rumours became increasingly distorted.

Rumours, true or false, have an impact on market prices. For example DiFonzo and Bordia (1997) showed that rumours affect investment decisions, even when the rumours come from sources that lack credibility. They found that price changes resulting from rumours tend to follow trends that exhibit persistence. There is evidence that people make decisions based on stories constructed around information, rather than on the information itself (Mulligan and Hastie, 2005). If a rumour is consistent with such a story, or provides a story (an explanation of events), it may be more readily believed. People are prone to accept information from unreliable sources if such information is believable and consistent with their existing perceptions of events (Evans and Curtis-Holmes, 2005). Apart from their specific ‘information’ content rumours can have a further effect on markets by influencing market sentiment. Rumours can generate feelings of optimism or pessimism.

Some researchers have considered the role of the media in the provision of stock market information, and in particular whether the media provides good information or noise. Tetlock (2007) found that media optimism/pessimism could influence market prices but that the effects were subsequently eliminated, which was interpreted as suggesting that the information conveyed was noise. Noise was seen as having a merely temporary effect on prices. Media pessimism was followed by price falls, which were subsequently reversed. The falls were larger, and lasted longer, in the case of the stocks of smaller companies. This latter point was interpreted as indicating that small investors were most
strongly affected by the media. This view was based on the grounds that the stocks of smaller companies tend to be held by private individuals.

Liden (2006) investigated the value of stock recommendations from newspapers and magazines. It was found that, although the overall value of the information was about zero, there was a difference between buy and sell recommendations. Sell recommendations tended to be useful indicators; they contained good information. Buy recommendations were actually misleading in the sense that recommended stocks tended to fall in price.

Another source of noise appears to be advertising of the products of the company whose shares are being considered. Fehle, Tsyplakov and Zdorovtsov (2005) found that when a company advertises its products, it simultaneously advertises its shares. When a company advertises its products its stock price tends to rise. From the perspective of stock trading, the advertising could be seen as noise. It was observed that the increase in share purchases took the form of small purchases, which indicates that small investors are the ones influenced by the product advertising when making their investment decisions.

Barber and Odean (2008) point out that for individual investors the buying process is much more complicated than the selling process. When buying there are thousands of stocks from which to choose; when selling there is the small number of stocks held in the investor’s portfolio. It is impossible for an individual to analyse every possible stock when considering a purchase. Barber and Odean suggested that individuals consider only those stocks that have caught their attention, such as stocks in the news. Not every stock that catches an investor’s attention is bought, but stocks that do not attract attention are unlikely to be bought. The effect of attention applies only to purchase decisions, since sales tend to be restricted to stocks already held. An implication is that prices of stocks in the news are likely to rise relative to those of stocks not receiving publicity. The attention effect applies much more to individuals than to institutional investors because institutions have the resources to research a large number of potential purchases.
Rational investors might be expected to correct the errant price movements caused by noise traders. Unjustified falls would be countered by purchases on the part of rational investors, conversely unwarranted rises would tend to cause rational investors to sell and thereby eliminate the inappropriate price movement. Trading that tends to maintain prices at stable, equilibrium, levels is referred to as negative feedback trading. The Efficient Market Hypothesis assumes that negative feedback trading dominates financial markets.

Shleifer and Summers (1990) suggested that rational investors face two forms of uncertainty that could result in them not correcting the effects of noise traders. First, their rational valuations may be wrong. This possibility could make them reluctant to pursue the more modest profit opportunities, so that small deviations from fair value may remain uncorrected. Second, rational investors face uncertainty as to how long the stock prices will stay away from their fundamental values. The effects of uncertainty on the trading behaviour of rational investors allow noise traders to move prices away from the values that would accurately reflect the available information.

Schleifer and Vishny (1997) also pointed out limits to the correction of mispricing including the particular difficulty of exploiting overpricing. To profit from overpricing an investor needs to short-sell; that is, borrow shares and then sell them. The resulting short position provides a profit from a fall in the share price since the shares could be bought at a price lower than the selling price when being returned to the lender. The extent of such trades is limited by the fact that many investors are not allowed to short-sell. The possibility that the return of the shares to the lender could be demanded at any time renders the time-horizon of the short sale uncertain, and thereby causes the short sale to be riskier and less desirable.

A constraint on the rationality of investment behaviour is the limit to the amount of information that investors can process. Bounded rationality is the limited rationality that arises when, in the face of a deluge of information, investors fail to analyse it all and as a result do not behave in a totally rational manner. In addition, behavioural finance suggests that there are systematic psychological biases that distort decision-making and prevent rational behaviour. The limitations on the price-correcting trades
of rational investors makes it less likely that they would correct mispricing arising from the psychological biases identified by behavioural finance.

Noise traders are sometimes referred to as uninformed traders. Jordan and Kaas (2002) found that, whilst both informed and uninformed investors are subject to behavioural finance biases, uninformed investors are more strongly affected by the biases. In other words, noise traders are particularly prone to psychological biases in their trading behaviour.

**Behavioural Finance**

Behavioural finance has emerged as a challenge to the efficient market hypothesis. In particular it challenges the assumptions about investor behaviour made by the efficient market hypothesis (and by other theories that reflect a similar way of thinking such as the Markowitz diversification model, the capital asset pricing model, the dividend discount model and the Black-Scholes option pricing model). The view of decision making processes, based on those assumptions, has been referred to as classical decision theory (Ricciardi 2008).

Classical decision theory treats investors as having complete information and as making rational decisions with a view to maximising their wealth (or utility). The investor of classical decision theory knows all possible alternatives and has the best possible knowledge of the consequences of those alternatives. On the basis of this knowledge the optimum solution is chosen. The optimum solution relates solely to the financial dimension and to the individual’s (or household’s) self interest (Ricciardi 2008). The investor engages in a comprehensive search for all information and a full analysis of every alternative decision. For this an investor needs, and is assumed to possess, infinite computational ability.

According to the proponents of behavioural finance (behavioural decision making) investors have limited knowledge of possible outcomes and their consequences, and choose a satisfactory (rather than optimum) outcome. Rather than indulging in an exhaustive search for alternatives investors may decide on an acceptable outcome and end the search for alternatives as soon as one is found that achieves the acceptable outcome. In other words, investors satisfice rather than optimise.
The idea of bounded rationality (Simon 1956) sees investors as using a restricted form of rational choice that is restricted by limitations of mental capacity, limitations of time available for decision-making, limitations of information and the influence of emotion. Full rationality requires a choice among all alternatives, whereas an investor would not usually be aware of all alternatives. It also requires full knowledge of the consequences of each alternative, but knowledge of consequences is always partial. In addition to the limitations indicated by the notion of bounded rationality Olsen (2001) has pointed out that investors’ preferences tend to be multi-dimensional, are subject to change and are often formed during the process of decision making. Bernstein (1997) added the view that emotion can destroy the self-control, which is required for rational decision-making.

Behavioural finance applies the findings of psychological research on decision-making to investment decisions. Apparent irrationalities in decision-making are seen as arising from two sources. First, there are errors in the processing of information. This partly arises from self-deception. Second, there are biases and errors in the decision-making based on the processed information. This is partly due to heuristic simplification. In other words people perceive situations inaccurately, and then make decisions that are inconsistent with perceptions. There are two layers of errors.

There is evidence from psychological studies that there are systematic biases in the way people think. Research has found a number of systematic biases that affect investors. These include Overconfidence, Illusion of Control, Hindsight Bias, Confirmation Bias, Cognitive Dissonance, Representativeness, Retrievability, Narrow Framing, Mental Accounting, Conservatism, Status Quo Bias, Anchoring, Ambiguity Aversion, Loss Aversion, Regret, Emotion, Group-Think, and Herding (see the chapter on the psychology of personal investment decisions). All of these biases interfere with the process of rational decision-making that is assumed by the Efficient Market Hypothesis.

However Ko and Huang (2007) have suggested that overconfidence could be beneficial, rather than detrimental, to market efficiency. There is a view that, since it is costly to acquire information in terms of time and money, it is rational to limit the amount of information acquired. This is referred to as rational inattention (Huang and Liu 2007). According to Ko and Huang overconfident investors would
devote more resources to the acquisition of information than more rational investors. Since overconfident investors believe that they can use information profitably, they will seek relatively large amounts of information. An effect of this behaviour of overconfident investors is that more information is put into the market. In consequence stock prices reflect a larger amount of information and hence get closer to their fundamental, or true, values. In other words overconfident investors make markets more efficient.

**Under-Reaction**

Figure 24.1 illustrates the share price movements when there is over-reaction or under-reaction. At time T there is an item of news to which the share price should move, from $P_1$ to $P_2$, as indicated by the unbroken line. If the market over-reacts, the price rises to $P_3$ before moving to $P_2$. If there is under-reaction, the initial price movement is insufficient. Initially the share price moves only to $P_4$, the remaining price movement occurring subsequently.

![Figure 24.1](image)

If there were a consistent tendency to under- or over-reaction to new information, investors could profit from the information. Under-reaction would imply that investors could profit from buying subsequent
to the news. Over-reaction would provide profits from selling after the news. The opportunity to make such profits is inconsistent with the Efficient Market Hypothesis.

The concept of Conservatism suggests that investors are slow to change their views following the receipt of new information. This is consistent with the research findings that, following unexpected earnings announcements, it can take several weeks for the resulting stock price movements to be completed. Investors take time to change their views about a stock, following news of unexpectedly high or low company profits.

The idea of cognitive dissonance relates to the desire to avoid dissonance. Dissonance occurs when new information contradicts existing beliefs. Conservatism may arise in consequence of slow acceptance of new information. The slow acceptance could be an attempt to reduce cognitive dissonance. The extent of the conservatism would depend upon the strength of commitment to existing beliefs. The extent of the dissonance depends on the level of commitment to the beliefs. Commitment develops when the individual has a choice to make. The level of commitment to that choice (and the commitment to the beliefs associated with it) increases with the amount of money, time, and effort invested in that choice or set of beliefs. The level of commitment is stronger where the choice or belief deviates from the norm. Group-think is a name given to the tendency for members of a group to share beliefs and to mutually reinforce those beliefs (Hilton, 2001). If an individual takes a view that deviates from the group-think norm, the degree of commitment to that view will be high.

Zhang (2006) found that the extent of under-reaction was related to the amount of uncertainty relating to the new information. Adjustment to new information was slower when there was uncertainty concerning the accuracy of the new information. Uncertainty about new information would make it easier to maintain existing beliefs, and would hence slow the reaction to the new information.

A phenomenon similar to conservatism is anchoring. People often start from a particular value, the anchor, and then adjust their evaluation from this point. The anchor might, for example, be the purchase price of a share or the highest price that it has reached. It has been suggested that most people adjust too conservatively and hence give too much weight to the anchor value when evaluating the
appropriate value for an investment. This can cause investors to underestimate possible deviations from their original estimates (Shefrin, 2000; Tversky and Kahneman, 1982, 1982c).

In an experiment Tversky and Kahneman (1974) asked people to answer questions such as “What is the percentage of African nations in the UN?” A wheel of fortune was spun in front of the subjects who were then asked whether their answer was above or below the number provided by the wheel. They were then asked to give their answers. The subjects were found to be heavily influenced by the wheel of fortune. For example the average estimate was 25 and 45 for groups that received 10 and 65 respectively from the wheel.

Professional analysts, such as stockbrokers, appear to be subject to Anchoring. It might be thought that if an analyst suggests an appropriate price for a share and the share price subsequently moves away from that level, an investor would see a trading opportunity. For example, a fall in the share price below the analyst’s forecast should indicate a buying opportunity. Unfortunately for the private investor, the effect of the share price move seems to be that the analyst moves the forecast in the same direction as the share price. Cornell (2000) demonstrated this effect in relation to Intel. Those results were consistent with studies by Womack (1996), and Brav and Lehavy (2001) whose findings showed that adjustments subsequent to analysts’ forecasts took the form of the forecasts being changed towards actual prices rather than actual share prices moving towards the forecasts. This throws doubt on the idea that investment analysts move share prices towards the levels consistent with relevant information, and hence throws doubt on the idea that markets are efficient.

The appropriate prices of shares are uncertain and past prices are likely to be anchors for current prices. Stock markets tend to under-react to information such as earnings reports (e.g. Liu, Strong and Xu 2001); and investors may expect a company’s earnings to be in line with an apparent historical trend (and under-react to a deviation from that apparent trend). This is consistent with past prices acting as anchors for future prices. Anchoring may also explain the expectation, held by many investors including technical analysts, of a share price trading within a range of values for a period of time. All of these effects of anchoring can hinder the process of incorporating new information into a share price, with the effect that it takes time for the price to reflect all relevant information.
The fear of regret is another explanation for under-reaction. If an investment decision proves to be incorrect there would be the pain of regret at having made a bad decision. One defence against the risk of regret is the avoidance of decisions. Fear of regret could slow the process of incorporating new information into share prices through transactions in the shares.

Ambiguity Aversion (alternatively known as Familiarity Bias) suggests that investors prefer to invest in companies that they feel that they understand. Over 90 per cent of the equity investments of investors in the US, UK and Japan is in companies in their own countries. This home bias exists despite the demonstrated benefits of international diversification. Likewise there are biases towards the investor’s local region and the firm that employs them. This preference for the familiar results in the holding of portfolios that are insufficiently diversified. In consequence investors bear more risk than is necessary. The bias also hinders the flow of money to some areas or sectors. In consequence asset prices are slow to adjust to new information. The unfamiliar remains under-priced and the familiar remains overpriced.

**Over-Reaction**

Overconfidence causes people to overestimate their abilities and to overestimate the accuracy of their forecasts. Overconfidence arises partly from self-attribution bias. This is a tendency on the part of investors to regard successes as arising from their expertise whilst failures are due to bad luck or the actions of others. This leads to excessive confidence in one’s own powers of forecasting. Overconfidence appears to be greater when feedback on decisions is deferred or ambiguous (Fischhoff, Slovic and Lichtenstein 1977). Financial markets are characterised by delayed feedback, since anticipated price adjustments can take a considerable amount of time. The feedback is also ambiguous (are outcomes to be judged in absolute terms, or relative to a benchmark - and what benchmark is appropriate?). Noise trading in financial markets can cause feedback to be inconclusive (might apparently successful forecasting merely be the accidental result of noise?).

Overconfidence is capable of explaining a number of types of apparently irrational behaviour. For example it can explain why some investors hold undiversified portfolios. If investors are highly confident about their stock selection abilities, they will not feel the need to reduce risk by means of
diversification. It could also explain why some investors trade very frequently, to the point where transaction costs cause their investment behaviour to be loss making (Barber and Odean 2000, 2001).

To the extent that some investors attribute their profits from rising markets to their own talents, rising markets could be self-perpetuating. Overconfident investors may be encouraged to invest further and thereby reinforce an upward movement in stock prices. Conversely a falling market reduces confidence and investing. This is consistent with the view that markets exhibit over-reaction.

In one study of Overconfidence Lichenstein and Fischoff (1977) gave people market reports on 12 stocks and asked them to forecast the direction in which their prices would move. Whereas only 47% of the predictions were correct, on average people were 65% confident that their forecasts would be correct.

Odean (1998a) has shown that one of the effects of Overconfidence is that turnover of investments tends to be high, that is people trade shares more as a result of overconfidence. Barber and Odean (2000) have shown that as turnover rises net profits tend to fall. Psychological research has found that men tend to be more overconfident than women. Barber and Odean (2001a) found that single men trade 67% more than single women. Correspondingly single men on average experienced investment returns 3.5% per year lower than single women.

Some other biases tend to reinforce Overconfidence. According to the Confirmation Bias, investors pay more attention to evidence that supports their opinions than to evidence that contradicts them. This can cause investors to persist with unsuccessful investment strategies. Another cognitive bias is the Illusion of Control. In some circumstances people behave as if they were able to exert control, or able to forecast events, where this is impossible or unlikely. The Illusion of Control is associated with the under-estimation of risk. Also related to the concept of Overconfidence is Optimism Bias. Optimism Bias is the tendency for people to regard themselves as better than average (Hilton, 2001).

The Hindsight Bias is the inability to correctly remember one’s prior expectations after observing new information. The hindsight bias prevents people learning from their own mistakes, since they are
unable to remember those mistakes. People are unable to recognise their own errors. There is self-
denial about past errors. If someone has a self-image of being a clever investor, past errors in
forecasting may be subject to distortions of memory aimed at maintaining the self-image. Memory is
never a faithful recollection of the past; it is amended by the human mind.

Good decision-making in financial markets relies on learning from the past. Learning may entail the
comparison of new information with previous expectations. This requires an accurate recall of previous
expectations. The hindsight bias involves the contamination of recollections of expectations by new
information. The recalled expectations of an outcome are biased towards information about the
outcome. The person remembers forming an expectation that is close to what subsequently happened.

The hindsight bias can lead to overreaction by investors. People may form expectations by averaging
outcomes with their previous expectations of those outcomes. For example, expectations of future
returns could be formed by averaging realised investment returns with previously expected returns.
Hindsight-biased investors, when forming such averages, incorrectly remember their prior
expectations. They amend their memories in the light of realised returns. New information about
returns thus becomes over-weighted, and hence has excessive influence on the formation of
expectations. Expectations change too much. The result is overreaction to the new information.
Hindsight bias is not limited to naïve investors; Biais and Weber (2006) found that market
professionals were prone to hindsight bias.

Representativeness helps to explain why many investors seem to extrapolate price movements. Many
investors appear to believe that if prices have been rising in the past then they will continue to rise, and
conversely with falling prices. The concept of representativeness suggests that this is because those
investors see an investment with recent price increases as representative of longer-term successful
investments, conversely with price falls. DeBondt and Thaler (1985) argued that because investors are
subject to the representativeness bias, they could become too optimistic about past winners and too
pessimistic about past losers. Trading that is influenced by the representativeness bias can move share
prices away from the levels that accurately reflect all relevant information.
Everyone uses heuristics. Heuristics are rules-of-thumb that help people to make sense of the deluge of information with which they are bombarded. Social psychology has established that we tend to judge people by appearances. If someone, who is newly encountered, resembles a person one has known then it is assumed that the new acquaintance has a similar personality to the older acquaintance.

Representativeness refers to the tendency to evaluate something with reference to something else, which it resembles. A share price pattern that was followed by a price rise in the past may be seen as indicating a price rise in the future.

One aspect of representativeness is often referred to as the law of small numbers. It is a belief that random samples will resemble each other more closely than the principles of statistical sampling theory would predict. People tend to have an image of what a random sample should look like, and take the view that samples that differ from the image are not random. Consider the following two sequences of coin tossing:

THTHHT

and

TTTHHH

Both sequences are equally likely but when asked which is more likely most people will say the first. The first series fits the image of a random sequence whereas the second does not.

This may help to explain the popularity of chartism; people do not always see random sequences as being random, and tend to attribute patterns to the sequences. People are biased towards believing that a causal factor is the reason for a sequence of events and find it difficult to accept that events can occur by chance; they are reluctant to accept that an apparent pattern can emerge purely by chance. Investors tend to over-interpret patterns that arise from coincidence. A pattern arising from coincidence may be interpreted as indicative, or representative, of a genuine pattern of events. A result could be overreaction to a random sequence of events even when the number of events is small or the length of the sequence is short (Kahneman and Riepe, 1998).

Cooper, Dimitrov and Rau (2001) provided an interesting example of representativeness. They studied firms that changed their names to incorporate some mention of dot.com between June 1998 and July
1999, a period which coincided with the dot.com share price bubble. Some of the firms that made the change did not significantly operate in the internet business. It was found that those non-internet firms, on average, experienced a 140% increase in share price during the sixty days following the name change. The name changes conveyed no information about the operations of the firms. Some investors appear to have seen the letters ‘dot.com’ in a name as representative of potential strong performers.

Retrievability bias causes too much attention to be given to the most easily recalled information (it is alternatively known as the availability or memory bias). In consequence there is a tendency to give too much emphasis to the most recent information. Retrievability is consistent with the over-reaction hypothesis, one dimension of which is the over-emphasis on recent information and recent events when making investment decisions. According to the over-reaction hypothesis share prices are prone to rise too high and fall too low. Experiments by Kahneman and Tversky (1972, 1973) indicated that people not only give too much weight to recent experience when making forecasts but also make forecasts that are too extreme. Another aspect of the retrievability bias is the over-emphasis on one’s own experience. Some people appear to learn only from their own mistakes, rather than being able to learn from the experiences of others. The retrievability bias limits the amount of information used in investment decision-making, and hence limits the amount of information reflected in asset prices as a result of trading.

It has been observed that the shares of companies with low price-earnings ratios tend to outperform those of companies with high price-earnings ratios. This has been called the price-earnings ratio effect. DeBondt and Thaler (1990) argued that this price-earnings ratio effect could be explained in terms of extreme expectations of future earnings growth. The extreme forecasts of earnings growth lead to excessively high share prices and hence price-earnings ratios that are too high, and which subsequently fall when the error is realised. Thus the shares of firms with high price-earnings ratios tend to perform less well than the shares of firms with low price-earnings ratios, since some price decline is required in order to correct the exaggerated price-earnings ratio.

Francis, Chen, Philbrick and Willis (2004) cited evidence that professional investment analysts’ earnings forecasts tend to be over-optimistic with the degree of exaggeration increasing as the forecast
horizon becomes longer. Cornell (2001), when examining the case of Intel, concluded that many analysts’ recommendations were based on factors other than divergences between market price and fundamental value. Possible factors mentioned were rating the company, as well as the stock, and reacting to the recent price movement of the stock (the momentum effect of extrapolation). Francis, Chen, Philbrick and Willis cited evidence that professional investment analysts exhibited herding behaviour such that they were influenced by each other’s forecasts and hence produced similar forecasts. Any of these possible factors could exaggerate market swings in response to announcements of changes in company performance, and hence generate over-reaction.

Guedj and Bouchaud (2005) presented evidence confirming the tendency for financial analysts to be over-optimistic and prone to herding. Analysts tended to agree with each other five to ten times more than with actual outcomes. The quality of forecasting was no better than using current prices as forecasts of future prices. The researchers suggested that information was scarce and difficult to interpret with the consequence that it was questionable as to whether it was possible to establish a true (fundamental) value of a stock. Prices are determined by trading within broad ranges of possibilities. Considerable volatility can result. Over-reaction is not constrained by rational investors taking advantage of mis-pricing since no-one has a clear idea of what prices should be. Excessive price increases may not be moderated by sales and downward over-reaction may not be constrained by purchases. The efficient market hypothesis expects that investors trade independently of one another so that, even though none may have complete information, the result is a consensus that comes close to true value. If there is herding in the market, investors do not trade independently and prices can exhibit considerable bias.

It is interesting to reflect on some views expressed by Fisher Black (1986). He argued that traders could be divided into information traders, who are rational traders using relevant information, and noise traders. Noise is irrelevant or meaningless information. Noise trading puts noise into market prices, causing them to depart from their true values. The deviations caused by noise trading can be cumulative. As a stock price diverges further from its true value, the scope for profits from information trading becomes greater. Although information trading tends to pull prices towards their true values, it can be difficult to distinguish noise from relevant and accurate information. There can be uncertainty
about the reliability and relevance of information. A market may be efficient in that it fully reflects all information that is unambiguously reliable and relevant. However the scarcity of such solid information could mean that the dispersion of possible fundamental values is very wide. Black argued that a market could be efficient even if a stock price differs from its fundamental value by a factor of as much as two.

**Inaccurate Perceptions of Risk**

Risk could be regarded as uncertainty that can be measured and which has significance for a person. The dimensions of risk might be seen as (Sitkin and Weingart 1995; Loewenstein, Hsee, Weber and Welch 2001):

1. The expected variance of the probability distribution of possible future outcomes. A high variance indicates high risk. More sophisticated expectations might encompass skewness and kurtosis.
2. The significance of the outcomes (including emotional significance). Low significance is associated with low perceived risk.
3. The perceived controllability of the outcomes. Perceived controllability reduces risk.
4. The person’s confidence in their estimates of the previous three dimensions. Low confidence entails high risk. Low confidence is also reflected in a high expected variance of the probability distribution.

What one person sees as a major risk another person may perceive as a minor risk (Ricciardi 2008). People vary considerably in terms of all four of the dimensions. Sjöberg (2000) found variations in general risk sensitivity; some people show considerable concern about a wide range of potential hazards whereas others appear oblivious to all risks. Cultural theory (Douglas and Wildavsky 1982; Dake 1991) suggests that people vary in terms of the type of risk that concerns them most. This theory classifies people into four categories: individualists, egalitarians, hierarchists and fatalists. The individualists are the group most likely to be concerned with stock market risk whereas egalitarians tend to be primarily concerned with environmental risk, hierarchists with the risk of crime and fatalists are relatively indifferent to risk. Bouyer and Bagdassaian (2001) and Slovic (1993) found that people
with egalitarian or individualistic worldviews tended to perceive risks as greater than those with hierarchical or fatalistic worldviews.

People are constantly bombarded with information about situations and events around them. Perception is not an exact recording of information relating to an object, event or situation. Perception is an interpretation that is unique to an individual and may differ substantially from objective reality (Luthans 1998). It is the selection and organisation of information to provide an experience with meaning for a person. The individual searches for the best explanation of information based on that individual’s knowledge, experience, values, motivations and feelings. A perception may be based on the person’s past experience of a similar event, situation, activity or object (Ricciardi 2008). There is a tendency to make new information match what is already known and understood. The mind interprets information with the result that different people can perceive very different things on the basis of the same objective information.

Litterer developed a model of perception in which external information is subject to three internal processes (Litterer 1965; Kast and Rosenzweig 1970). The three internal processes of perception formation are selectivity, interpretation and closure. Selectivity is the means of dealing with information overload. The individual selects only part of the information available from the objective environment. Olsen (2008a) made the point that selectivity may not even be a conscious process. The person might not be aware of some selectivity. Processes outside of awareness can direct attention to particular aspects of a situation. The person could then think about the situation without even being aware that there has been an information selection process, which has excluded some information. The person would make a decision on the basis of incomplete information without being aware that the information is incomplete.

Olsen pointed out that an implication of risk perception studies is that risk perceptions contain both cognitive and affective dimensions. Affective elements are the risk attributes that reflect the investor’s feelings of goodness or badness in relation to an investment; feelings that are not necessarily conscious. Positive affect (feelings of goodness) causes perceived risk to be lower. Affect has its greatest influence when the decision is complex and requires effort. Other circumstances that increase the
influence of affect are incomplete information, unreliable information, the decision maker lacks confidence, and the decision time is short. One common outcome of the influence of affect is the perception that high return is associated with low risk; that is, positive affect causes both attributes of an investment to be perceived as favourable (conversely for negative affect).

The second process, interpretation, depends on a person’s past experience and the person’s system of values. The same objective information can be interpreted and perceived in different ways by different people. The third mechanism, closure, concerns the tendency of individuals to create a complete picture or story in relation to a situation. The individual may perceive more than the objective information provides. When external information is being processed additional information is attached in order to achieve completeness and significance. The interpretation and closure stages feed back to selectivity and affect the subsequent functioning of selectivity.

One consequence of these processes is that what an individual perceives may not actually exist, or may be a distortion of what exists. This is important since behaviour is based on the perception of reality; not on reality itself.

In chapter 27 on stock market bubbles and crashes evidence is cited to indicate that a person’s attitude to risk (risk aversion/risk tolerance) is not constant. A number of studies indicated that attitude to stock market risk depends upon the recent behaviour of the stock market (Clarke and Statman 1998; Shefrin 2000; MacKillop 2003; Grable, Lytton and O’Neill 2004; Yao, Hanna and Lindamood 2004). An alternative perspective on that evidence can be derived from research by Weber and Milliman (1997) who suggested that risk preference may be stable and that the effect of situational factors, such as stock market performance, may be caused by changes in perceptions of risk. They found that influences on investment choices simultaneously affected risk perceptions. It could be the case that attitude to perceived risk is constant, and that what changes is the perception of risk. From the perspective of providing financial advice this implies that by correcting misperceptions about the risks of investments a financial adviser can have a positive influence on investment decisions.
Sociologists have suggested that financial perception has a social dimension. Muniesa (2000) stressed the impossibility of separating information and cognition. Turning numbers and observations into meaningful information entails financial cognition. Financial cognition requires perception and analysis, and may be a group process. Perception and cognition could be team processes since team effort may be required to turn raw data into meaningful information. Financial perception, including perception of risk, may be a group perception. Information is not independent of perception frames; in other words information is not independent of how it is classified, analysed and interpreted. Different groups (e.g. fund management teams, investment analyst teams) have different analytical frameworks for interpreting raw data and hence have different perceptions of information. An individual’s perception of the financial world is influenced by the social group within which that individual operates. For example it has been observed that traders rely on interaction with and feedback from other traders in their observation and interpretation of price data (Zaloom 2003; Beunza and Stark 2005). Scherer and Cho (2003) found that people with stronger social linkages had more similar perceptions of risk; individual perceptions of risk become more similar as group interaction increases.

**Heuristic Biases**

Narrow framing refers to the tendency of investors to focus too narrowly. One aspect is focus on the constituents of a portfolio rather than the portfolio as a whole. Another dimension of narrow framing is the focus on the short term even when the investment horizon is long term. It is not rational for an investor accumulating assets for retirement 25 years hence to be concerned about the week-by-week performance of the portfolio. Yet long-term investors do focus on short-term volatility. Studies have shown that when, in experimental situations, people have been presented with monthly distributions of returns they are less likely to invest than when they are shown annual distributions (with the annualised volatility being the same in both cases). The implication is that focus on short-term volatility deters investment. It appears that people do not appreciate the effects of time diversification. By time diversification is meant the tendency for good periods to offset bad periods with the effect that the dispersion of investment returns does not increase proportionately with the period of the investment. Investors who focus too much on short-term fluctuations overestimate stock market risk and allocate too little of their money to investment in shares.
This has been suggested as a possible explanation of what is called ‘The Equity Premium Puzzle’. The puzzle is why the excess of equity returns over returns on bonds and deposits is so high (when averaged over long periods of time). Although additional return is appropriate in order to compensate for the extra risk, it is generally thought that the additional return actually received is much more than is justified by the extra risk. However if investors focus too strongly on the short term they may overestimate equity risk and hence require an excessive premium on the expected rate of return in order to induce them to invest in shares. Focus on individual stocks, rather than the portfolio as a whole, would also cause investors to overestimate stock market risk since the risk of individual shares exceeds the risk of portfolios. In terms of explaining the equity premium puzzle, these factors may be reinforced by loss aversion. The idea of loss aversion comes from prospect theory and suggests that people are much more sensitive to losses than to gains. Investors may not only overestimate the likelihood of losses, they also feel a disproportionate amount of pain as a result of losses (Benartzi and Thaler 1995).

Garmaise (2006) pointed out that most people have an evaluation period that is much shorter than their investment horizon. The evaluation period is the frequency of evaluating portfolio performance and the investment horizon is the period for which the investment is to be held. Benartzi and Thaler (1995) suggested that the equity risk premium indicated an evaluation period of about one year. Since the chance of loss over one year is much greater than the chance of loss over the investment horizon (e.g. twenty years) people overestimate the risk of loss, and prospect theory indicates that investors are very sensitive to losses. Benartzi and Thaler referred to the effect as ‘myopic loss aversion’. The tendency for the evaluation period to be much shorter than the investment horizon causes the perception of risk to be exaggerated. In consequence people are deterred from stock market investment. Garmaise, based on survey evidence in the US, suggested that the evaluation period averaged around two years. The survey indicated that a market fall tended to shorten the evaluation period, and hence increased the perception of risk. People with short evaluation periods were found to have relatively low-risk investment strategies. The evaluation period was shorter for older investors.

The idea of mental accounts has similarities with narrow framing. The principle of mental accounts sees people as separating aspects of their finances into separate accounts rather than seeing their
financial situation as an integrated whole. For example income and wealth may be segregated such that only current income is used for current spending, and wealth is treated as something to be preserved. In consequence changes in the level of wealth have little effect on spending.

The concept of mental accounts has been proposed as an explanation of the apparent preference, on the part of many investors, for stocks that pay high dividends (Statman 1997). Such investors may be prepared to use dividends to finance spending since dividends are seen as income, whereas they would not sell some of their shares to fund expenditure even when the real value of the shares has increased. Dividends are treated as available for spending but capital gains are not.

Mental accounting can cause investors to overestimate risk by failing to take the risk reduction effects of diversification into consideration. The chapter on portfolio diversification shows how combining assets into a portfolio reduces risk since poor performances from some investments may be offset by good performances from others. If an investor separates investments into different mental accounts, the potential risk reduction of such offsetting is ignored. In consequence total risk is overestimated.

Hindsight-biased investors may underestimate volatility. This is because they amend their recollected expectations into line with observed outcomes. A rational investor, upon observing a return that is substantially different from the previously expected return, would raise the expectation of volatility. A hindsight-biased investor would not be aware of the substantial discrepancy, and would therefore under-estimate volatility. Hindsight-biased investors form distorted expectations of future returns and risk, and as a result construct inefficient investment portfolios. Hindsight bias, by distorting expectations of return and risk, can prevent share prices from reflecting relevant information.

The illusion of control is the tendency to believe that chance events are amenable to personal control (Langer, 1975). This may take the form of investors believing that they can forecast price movements, which are unpredictable. The illusion of control can cause an underestimation of risk. If events are seen as controllable, they will be seen as less risky (Gollwitzer and Kinney, 1989). De Bondt (1998) suggested that one manifestation of the illusion of control was the belief of many investors that they would be sufficiently astute to sell before a large fall in prices. This belief that they would be able to
avoid losses by selling in time causes such investors to underestimate the risks of their investments. The degree of illusion of control can be affected by the individual’s environment (Taylor and Armor, 1996). Competitive and stressful environments can produce illusion of control (Friedland, Keinan, and Regev, 1992). Fenton O’Creevy, Nicholson, Soane and Willman (2005) found that traders in financial markets were subject to the illusion of control. They also found that the illusion of control was associated with poorer performance.

The illusion of knowledge is the tendency for people to believe that additional information always increases the accuracy of their forecasts. It is the belief that more information increases the person’s knowledge and hence improves decisions (Peterson and Pitz, 1988). For example people often believe that knowledge of previous drawings of lottery numbers improves their ability to predict future lottery numbers. Some information is irrelevant, or may be beyond a person’s ability to interpret, but the person may still regard the information as improving their ability to forecast. Tumarkin and Whitelaw (2001) found that, despite providing no useful information, website message board postings increased trading volume in the respective shares. Despite the absence of useful information from the messages, as indicated by subsequent price movements, it appeared that some investors believed that it added to their knowledge and expertise (and traded as a result). The illusion of knowledge can cause investors to be overconfident and to underestimate the amount of risk from an investment. Investors, who overestimate the accuracy of their forecasts, underestimate the risks taken.

The illusion of knowledge can be used by financial advisors as a means of encouraging clients to invest. King (2009) found that that client trust was enhanced if an advisor provided educational materials, market information, and information about financial products. There was increased client satisfaction, increased likelihood of the client recommending the advisor, and greater loyalty as measured by the time that the client remained with the advisor. Higher trust is associated with lower perceived risk.

Fenton-O’Creevy, Nicholson, Soane and Willman (2005) found that professional traders failed to appreciate the significance of sample size for risk. In the case of an illiquid stock there would be few trades, in other words a small sample size. In the case of liquid stocks there would be a high volume of
trading, and hence a large sample of trades. A particular percentage deviation from a previous price is more likely to be a chance event when trades are infrequent than when they are frequent. A 10% price change in an infrequently traded share is more likely to be the result of random variation than the same percentage change in the price of a heavily traded share.

According to the representativeness bias people are inclined to develop detailed generalisations about an event or situation based on a very few characteristics of the event or situation (Tversky and Kahneman 1971, Busenitz 1999). The mind assumes that events or situations (or objects or people) with some similar characteristics are identical, even though they may be different with respect to other characteristics (Eaton 2000). The representativeness heuristic proposes that people have an inclination to make judgments based on the similarity of items, or make forecasts on the basis of a small amount of information (Ricciardi 2008). In the process of forming opinions of events (or situations, or objects or people) on the basis of similarities to other events relevant information is ignored, and closure would add extraneous information in order to make the perception more complete.

Representativeness, like other heuristics, helps to render complex problems manageable. In so doing it may reduce the level of perceived risk. Busenitz found that the business people who took relatively high risks (entrepreneurs) were the ones with relatively high use of representativeness, and other heuristics such as overconfidence. This is consistent with the view that heuristics reduce the level of perceived risk. The tendency to assume that new situations are identical to previously experienced situations could introduce some inflexibility into thinking and hinder adaptation to change (in this way the representativeness bias can reinforce the conservatism bias).

According to the familiarity bias, people tend to prefer things that seem familiar to them. Correspondingly investors prefer investments with which they feel familiar. Familiarity appears to reduce the perceived risk. Arguably the most familiar investments are those in the company for which the investor works. A study by John Hancock Financial Services (Driscoll, Malcolm, Sirull and Slotter 1995) found that a majority of employees believed that shares in their own company were less risky than a diversified portfolio. Benartzi (2001) reported the findings of a survey which indicated that only 16.4% of respondents believed that shares in their own company were more risky than the stock market
as a whole. Kilka and Weber (2000) found that Americans believed the US stock market would perform better than the German stock market whereas Germans believed that their stock market would be the stronger performer. Generally the evidence indicates that people view familiar stocks favourably, expecting them to deliver both higher returns and a lower level of risk. The result is that portfolios are biased towards investments that seem familiar. Tourani-Rad and Kirkby (2005) confirmed the familiarity bias in New Zealand, in that they found that the portfolios of New Zealand investors contained a disproportionate amount of New Zealand stocks but they did not confirm that it was the result of higher optimism with regard to the future performance of New Zealand stocks.

In relation to institutional investments, such as mutual funds and pensions, trust in the provider could affect the perception of risk. An investor who mistrusts the institution that provides the investment product, or the person who sells it, may perceive a higher level of risk than someone who is more trusting. Cox (2007) identified a UK institutional investor which was similar to other institutional investors in all respects except in perceived trustworthiness. That institution was more trusted by investors. The study found that customers of that institution made investment choices that indicated relatively high risk tolerance. Its retail investors invested a higher proportion, in assets that would normally be seen as risky, than the retail investors of other institutions. This is consistent with the view that trust influences perceived risk. If the provider of an investment product is trusted by investors, those investors will see the investment as less risky. Variations in trust, whether justified or not, could cause variations in the perception of risk. Olsen (2008) suggested that investors use trust as a proxy for statistical measures of risk, particularly when investments are complex and unfamiliar. The trustworthiness of the provider, or adviser, may be used as the measure of risk.

Finance professionals typically measure risk as the expected standard deviation of returns on an investment. The standard deviation of returns is a measure of volatility. It is assumed by conventional finance models, such as the Markowitz portfolio diversification model, that volatility and perceived risk are closely related. However research has found that there can be substantial differences between volatility and perceived risk. Choices appear to be better explained by perceived risk than by volatility (Jia, Dyer and Butler, 1999). Perceived risk, in contrast to volatility, incorporates affective (emotional) reactions to uncertainty (Loewenstein, Weber, Hsee and Welch, 2001). The distinction between
volatility and perceived risk was reinforced by Weber, Siebenmorgen and Weber (2005). They found that presentational factors that affected expected volatility had no effect on perceived risk, and that perceived risk had more effect on investment choice than expected volatility. The familiarity of asset names, which may be expected to elicit emotional responses, had strong effects on risk perception and investment choice. This is consistent with the other evidence relating to the familiarity bias. Byrne (2005) found that perceived risk was positively correlated with expected returns for all investments (except property), which is consistent with generally accepted principles, but that the positive relationship was present only amongst experts. Novices appeared to see no relationship between risk and return.

Vividness appears to be a factor in the incorporation of emotion into the perception of risk. Vividness refers to the emotional interest or excitement engendered by an event (Plous 1993). Stock market bubbles and crashes are examples of vivid events. The effects of vividness on attitudes and behaviour are not necessarily reasonable but are not permanent (Grable, Lytton, O’Neill, Joo and Klock, 2006).

Small differences in how risks are presented can have substantial effects on how they are perceived (Slovic, Fischhoff and Lichtenstein 1980). The differences in presentation could arise in two ways: from variations in the context of a decision and from changes in the wording of the problem (Kahneman and Tversky 1979). Diacon and Hasseldine (2007) investigated framing effects and found that the presentation format of prior performance affected investment fund choice. They found that presenting past information in terms of fund values as opposed to percentage yields significantly affected investment choices. The alternatives were charts one of which showed the accumulated growth in the value of a fund over time relative to a base value, such as 100, and the other showed a series of vertical lines indicating the growth in each year. The charts of cumulative value growth evoked considerably more positive response than series of growth rates. The presentation of a series of vertical lines indicating annual growth rates produced perceptions of greater risk.

Prospect Theory
There are three key elements to prospect theory. (1) Perceived probabilities are subject to bias, (2) investors are more concerned about gains and losses than levels of wealth, and (3) investors feel losses more than gains (Kahneman and Tversky 1972, 1973, 1982).

In relation to perceived probabilities, the biases are tendencies to exaggerate small and large probabilities and under-weight medium ones. See figure 24.2.

![Figure 24.2](image)

In figure 24.2, subjective (perceived) probabilities are referred to as decision weightings. When plotted against actual probabilities the decision weights are too high at low and high probabilities and too low at medium probabilities. The exaggeration of high probabilities suggests that highly likely (but not certain) events are treated as being certain. This is consistent with the idea of overconfidence. Investors can become overconfident about their forecasts to the extent that they forget that markets are uncertain.

Figure 24.3 is a value function. It depicts subjective values assigned to gains and losses relative to a reference point. The reference point is subjective and may, for example, be the purchase price of an investment. The reference point divides the region where someone feels that they are making gains from the region in which they feel that they are making losses.
It is to be noted that the slope of the function for losses is steeper than the slope for gains. This is because, on average, people find the pain of losses to be about 2.25 times as intense as the pleasure from gains. Given an evens chance of winning or losing, people on average require the prospect of a £225 win to balance the prospect of a £100 loss. This relatively large fear of loss, known as loss aversion, will tend to deter retail investors from stock market related investments. When combined with Narrow Framing and Mental Accounting, this asymmetric perception of risk increases the total perceived risk and thereby distorts decision-making. Risk premiums are too high, and hence asset prices are too low.

This is consistent with the ‘endowment effect’ (Thaler 1980). People often require much more to sell something than they were originally prepared to pay for it (Kahneman, Knetsch and Thaler 1990, 1991). This is seen as being associated with the pain of giving something up.

Another feature of figure 24.3 is the tendency for the slope of the value function to become less steep as gains or losses increase. This implies that as gains are made investors will become less inclined to take risks, since the addition to value of a higher gain is less than the reduction in value resulting from

**Figure 24.3**
a lowered gain. It also implies that as losses increase investors become more willing to accept risk. This is because the value of a loss reduction outweighs the value of a further loss. So, for example, in a losing situation an ‘evens’ bet looks attractive. An aspect of loss aversion is that people will avoid the risk of making losses (by avoiding risks) when in a gaining situation but will accept risk in order to attempt to recover from a loss. Prospect theory sees investors as being loss averse rather than risk averse.

This behaviour in a loss-making situation is consistent with the idea of an Escalation Bias (Shefrin, 2001). An Escalation Bias leads to ‘averaging down’ whereby as the price falls the investment is treated as being an increasingly good bargain. The thinking is that if a share was a good buy at £2, it is a fantastic bargain at £1 and more should be bought. It is psychologically difficult to consider the possibility that the initial purchase was at an excessively high price.

According to Prospect Theory, people in a position of gain become increasingly risk-averse and unwilling to accept gambles. When people are in a position of loss they become more inclined to accept risk. This may help to explain the disposition effect. The disposition effect is the inclination, when selling part of a portfolio, to sell assets that have risen in price relative to their purchase prices rather than assets that have fallen in price. The disposition effect can move share prices away from their fair values. Prices rise too slowly because of sales, and fall too slowly because of lack of sales. Prices thus fail to reflect all relevant information.

The disposition effect can be explained in terms of the avoidance of regret and the pursuit of pride. People want to feel good about themselves and hence take decisions that provide pride and avoid regret. Shefrin and Statman (1984) showed that these factors influence investment decisions. The sale of an investment that has risen in price produces the pleasant feeling that the investment decision was a good one. The sale of an investment that has fallen in price produces the unpleasant feeling that the original investment choice was a bad one. By realising successes through selling successful investments, and not realising failures, an investor can preserve the self-image of being a good investor. In consequence investors are more likely to sell investments showing gains than investments showing losses.
There is empirical research evidence in support of the disposition effect. For example Odean (1998) found that, on average, investors are approximately 50% more likely to sell a winner than a loser. Grinblatt and Keloharju (2001) found that if a share outperforms the market by 10%, the likelihood of sales increases by 26%, whereas an underperformance of 10% decreases the likelihood of sales by 14%. It is not just private individuals; professional investors such as institutional fund managers are also prone to the disposition effect (Frazzini 2006). Investors seem to prefer to sell winners rather than losers.

Narrow framing and mental accounting also help to explain the disposition effect. The disposition effect would not operate unless investors mentally separated components of portfolios.

There is evidence from mutual funds supportive of the prospect theory proposition that risk-taking increases following losses, and declines following gains. Elton, Gruber and Blake (2003) studied mutual fund managers who were paid incentive fees; in other words whose fees were related to the performance of the funds managed by them. They observed that mutual fund managers, when paid incentive fees, were more likely to increase risk after periods of poor performance and to decrease risk following periods of strong performance. Incentive fees mean that the fund manager has a personal financial interest in fund performance and the findings of Elton, Gruber and Blake may be dependent upon the presence of incentive fees. This dependence is suggested by a study from Ammann and Verhofen (2007) who found that the behaviour of mutual fund managers seemed to contradict prospect theory. They found that strong prior performance led to increased risk taking (for example increased beta and more small capitalisation stocks) whereas poor performance tended to lead to the adoption of passive strategies, which exhibit lower risk.

**Investors Have Feelings**

The size effect is the apparent tendency for the shares of small firms to outperform the shares of large firms. The book-to-market effect is the apparent tendency for the shares of companies with high book values (balance sheet values) relative to share prices to outperform the shares of companies with relatively low book values. DeBondt and Thaler (1987) argue that Regret Theory is consistent with
both the size and book-to-market effects. Psychologists have found that individuals who make
decisions that turn out badly have more regret (blame themselves more) when that decision was
relatively unconventional. Losses on shares in a major blue-chip firm cause less regret than losses on a
small, little-known, firm. The former loss may be regarded as bad luck whereas the latter loss may be
attributed to poor judgement. Higher book-to-market firms tend to have lower stock prices, perhaps
because they are unfashionable or in difficulties. Investments in firms that are small, unfashionable or
in difficulties are more unconventional. There is a high risk of feeling regret. Such investments are not
the choices of the majority and require more courage and risk-taking on the part of investors. Investors
are betting on the accuracy of their own judgement. More courage is required to make investments in
the shares of small, unfashionable, or problematic firms and as a result the shares of such firms tend to
be shunned by many investors. In consequence those shares tend to have current prices that are low
relative to the objective characteristics of the firms. Such relative under-pricing provides potential for
future out-performance in terms of the total returns on the shares.

In addition to cognitive biases, moods and emotions may have a role in investment decision-making.
Hirshleifer and Shumway (2003) found that sunshine is strongly correlated with stock returns.
Presumably sunshine causes investors to be happy and makes them feel more favourable towards
investments. The relationship between mood (and emotions) and decision-making, has also been
established by other researchers (Loewenstein, Weber, Hsee and Welch 2001; Slovic, Finucane, Peters
quantitative share pricing models involve an element of judgement that is affected by mood and
emotion. For example dividend discount models, such as the Gordon Growth Model, involve estimates
of future dividend growth rates. It may be that optimism arising from a good mood leads to a high
estimate for the growth rate of dividends. That high estimate would result in the expected (fair) price of
the share being relatively high. The rational investor of the Efficient Market Hypothesis is an
unemotional decision-maker. Emotions and moods may be irrelevant pieces of information that become
reflected in share prices.

Users of pricing models are likely to be professionals. Shiller (1984) pointed out that most non-
professional investors do not have knowledge of pricing models and investment analysis. They are
likely to be noise traders affected by rumour and social mood. Social mood is a collectively shared state of mind (Prechter 1999, Nofsinger 2005, Olson 2006). Investors with no knowledge of analysis are particularly likely to be influenced by social mood when making investment decisions. DeLong, Shleifer, Summers and Waldmann (1990) posited a class of investors whose expectations were not justified by fundamentals; they referred to them as noise traders. Unjustified expectations are referred to as investor sentiment. When sentiment is shared amongst investors, stock prices can deviate from fundamental values for long periods.

Evidence for the impact of social mood on stock prices is indicated in the chapter on the psychology of personal investment decisions and in the chapter on stock market bubbles and crashes. Further evidence for the influence of social mood on share prices comes from Edmans, Garcia and Norli (2007) who measured social mood using the results of international football (soccer) matches. Stock markets were found to decline following defeats. The effects were related to the importance of the matches, and to the importance of football to the country (very important in Europe and Latin America, unimportant in North America). The effects were most pronounced amongst smaller company stocks; which is consistent with the observation that smaller company stocks are predominantly held by investors in the company’s own country rather than in international portfolios. It is also consistent with other studies, which have found that the shares of small companies are the most affected by investor sentiment. The effect was found to be present in relation to other sports, but not as strongly as in the case of football. There was no apparent tendency for stock markets to rise following wins.

The findings of Edmans, Garcia and Norli are consistent with the results of other studies relevant to the relationship between football results and social mood. For example Schwarz, Strack, Kommer and Wagner (1987) found that the results of international football matches affected feelings of well-being and views on national issues. Carroll, Ebrahim, Tilling, Macleod and Davey Smith (2002) found a 25% increase in heart attacks in England following England’s defeat by Argentina in the 1998 World Cup. Other studies have found that murder and suicide rates increase following sports defeats. There appear to be no corresponding improvements in social mood following wins. Edmans, Garcia and Norli relate the asymmetry of responses to losses and wins to prospect theory. According to prospect theory the pain of a loss is more than twice the pleasure of a win. Also prospect theory measures gains and losses
against a reference point. If allegiance bias causes supporters to expect their team to win, the outcome of a match is evaluated relative to that expectation. So a win merely confirms the expectation whereas a loss represents a downward deviation from the expected outcome.

Lee, Shleifer and Thaler (1991) found that investment trust (US closed-end fund) discounts were not affected by macroeconomic factors. Those findings imply that the discounts are not affected by economic fundamentals. The researchers observed that investment trusts were particularly popular among small investors, as were smaller company stocks and new issues (initial public offerings). They found that movements in investment trust discounts, small company share prices, and the volume of new issues were correlated. They interpreted this as evidence for the influence of sentiment among small investors.

Emotions can be particularly important when there is ‘ego-involvement’, which entails investors identifying with their investment choices (Dweck and Leggett, 1988). Investors become emotionally attached to some investments. There is evidence that such people may hold on to particular investments too long (Sandelands, Brockner, and Glynn, 1988). Ego-involvement is also likely to magnify the effects of stress (Riess and Taylor, 1984) and thereby reduce the quality of investment decision-making.

Baker and Nofsinger (2002) suggest an attachment bias, whereby investors become emotionally attached to particular investments. Emotional attachment can cause investors to focus on good features and ignore bad ones. Bad news may be ignored. This could hinder the incorporation of information into a share price. If investors ignore bad news, the share price may fail to fully reflect that bad news. Baker and Nofsinger suggest that one way to avoid the effects of emotion, and perhaps other psychological biases, is to invest in index tracker funds. Arguably investors are relatively unlikely to become emotionally attached to index tracker funds.

Investors not only have feelings, they are also prone to superstitions. Kahneman and Tversky (1983) have suggested the existence of a ‘conjunction fallacy’. The conjunction fallacy is the belief that contiguous events have a causal relationship. Unrelated, but simultaneous, events in two markets might
be seen as causally linked whereas they are actually unrelated. Also events in successive time periods may be seen as forming a pattern when in reality they are independent events. From this perspective technical analysis might be seen as a complex set of superstitions.

Evidence on the possibility of negative effects of emotions and moods on investment decision-making comes from research on expert systems. Expert systems are computer programmes that use relationships, provided by experts, to make decisions. Camerer (1981) found that expert systems frequently out-performed the experts whose knowledge had been used in their creation. This phenomenon is known as bootstrapping. It may be the case that the superior performance of the computer arises from the absence of the effects of emotions and moods. Loewenstein, Hsee, Weber and Welch (2001) pointed out that emotional reactions to risks can differ from, and conflict with, cognitive evaluations of those risks. Emotion can dominate reason, and can lead to a failure to learn from experience.

**Criticisms of Behavioural Finance**

There has been a tendency to establish psychological biases in laboratory conditions, and then to assume that they operate in the real world. In the real world investors have data and models for the generation of expectations. In the real world money is at stake. It may be that when money is involved people make a greater effort to behave rationally. Competition between investment professionals might be expected to remove errors of judgement resulting from psychological biases. If rational investors seek profits from arbitraging against irrational investors, the result could be that the market as a whole behaves rationally even though some investors do not. This argument is dependent upon arbitrage being effective. Even in the absence of widespread arbitrage rational investors might come to dominate the markets because they should make more profit, and hence accumulate more resources, than irrational investors. So rational investors should become dominant in the markets in consequence of having more money to invest (Fehr and Tyran 2005).

It has been argued that learning from experience would remove behavioural biases. Stracca (2004) pointed out that such effects of learning depend upon financial markets exhibiting a number of characteristics. Markets would need to be repetitive environments with unchanging circumstances that
allow repeated opportunities for practice. These conditions are unlikely to be met. For example individuals do not repeatedly take out pension plans. Even if learning did eventually remove behavioural biases, there is a constant inflow of new market participants and departure of experienced participants.

It has been argued that since markets are mainly driven by the transactions of institutional investors it is particularly relevant to ascertain whether professional investors are subject to behavioural biases (Nofsinger and Sias 1999, Gompers and Metrick 2001). Professional behaviour in real (as opposed to laboratory) markets by professionals (as opposed to laboratory volunteers) could be influenced by training and by regulatory constraints. If professionals are not significantly affected by behavioural biases, the influence of behavioural factors is limited to investors with little capital. In consequence the influence of behavioural factors would be small. A number of studies have conducted laboratory experiments on professional traders; for example Glaser, Langer and Weber (2007) studied professional investors in relation to the influence of overconfidence. They found that professional experience does not necessarily eliminate the overconfidence bias. This contradicts the view that overconfidence does not play a significant role in financial markets because the professionals who dominate the markets have low susceptibility to the bias.

Haigh and List (2005) tested professional traders for the presence of myopic loss aversion. That is professional traders were investigated to see whether excessive focus on the short run led to an exaggerated perception of risk, and hence apparent high loss aversion. For example the chances of stocks under-performing relative to risk-free assets increases as the period under consideration becomes shorter. It was found that, not only were the professionals prone to myopic loss aversion, they were actually more subject to it than other experimental subjects. Conversely Alevy, Haigh and List (2007) found that financial market professionals demonstrated relatively low susceptibility to information cascades.

Some behavioural finance theories predict that markets over-react to new information, whilst others predict under-reaction. This may lead to an inability to make forecasts and testable predictions. Further Fama (1998) has argued that apparent over-reaction to information is about as common as under-
reaction, and that this is consistent with the efficient market hypothesis. There are other conflicting predictions from behavioural finance. For example the endowment effect and status quo effect predict that investors hold what they have, or do nothing, whereas the overconfidence bias predicts that investors trade too much. The herding tendency to follow the investment behaviour of others also appears to conflict with biases, such as overconfidence, that cause investors to overestimate their abilities to choose potentially successful investments.

It may be argued that, although individually investors are subject to behavioural biases, those biases tend to cancel out. The biases of some investors are offset by the opposite biases of others. The result is an absence of a shared sentiment about the market, and in consequence there is no substantial effect on the direction of stock prices. It might also be argued that, even if behaviourally biased investors shared a common sentiment about the movement of stock prices, arbitragers would trade against them with the result that there are no substantial net effects on prices. Arbitragers would buy under-priced stocks and sell over-priced stocks, thereby stabilising prices around their fair (true) values.

Kumar and Lee (2006) provided evidence to counter such views. They found that when some individual investors are buying, others would be buying too. Similarly selling would occur in concert. They found that changes in retail investor sentiment affected the prices of stocks favoured by retail (individual) investors; including small company stocks and value stocks. Bullish sentiment leads to price rises, and vice versa for bearish sentiment. The styles of stock favoured by individual investors, such as small company and value stocks, were found to exhibit co-movement (their prices tended to move in the same direction).

Arbitrage does not fully counter such effects of investor sentiment partly because many stocks are difficult to arbitrage. Stocks with high non-systematic risk, or with low liquidity, are difficult to arbitrage. Kumar and Lee found that such stocks are particularly subject to the effects of changes in investor sentiment. Overall they concluded that their evidence was consistent with the existence of noise trading, in which the sentiment-driven systematic behaviour of retail investors affected stock prices.
The ideas of noise trading and behavioural finance have been used as criticisms of the Efficient Market Hypothesis. However the impact of these criticisms may depend upon how efficiency is defined. Damodaran (2001) defines market efficiency in terms of market prices being unbiased estimates of true value. According to this interpretation of informational efficiency the market price of a share is not necessarily correct at a point in time, it is merely unbiased. An unbiased price is one that randomly deviates from the true value, and the deviations are not related to other variables. If market efficiency is defined in terms of prices being unbiased estimates of true value, rather than as fully reflecting all relevant information, it may be consistent with noise trading and behavioural finance. Such consistency would depend upon deviations from true value being totally random. This would imply an inability to consistently exploit the deviations in order to make profits from inaccurate pricing.

Much of behavioural finance has been concerned with the identification of sources of irrational behaviour. Irrationality tends to be defined relative to the efficient markets model of conventional financial theory. Frankfurter, McGoun and Allen (2004) suggested that behavioural finance had become prescriptive in the sense that, in addition to identifying deviations from rational decisions, it implies that the deviations from rationality should be remedied. In other words the premise of many behavioural finance theorists seems to be that if people’s behaviour is not in accordance with conventional finance theory there is something wrong with the people rather than with the theory of behaviour. This view tends to label the effects of behavioural factors as anomalies from market efficiency.

**Intuition and Reasoning**

It may be argued that (micro) behavioural finance has not completed the task of replacing ‘rational economic man’ with ‘normal man’. Kahneman (2003) suggested that a further step might be required. Kahneman distinguished between two modes of thinking: namely intuition and reasoning. Reasoning is carried out deliberately and with effort. Intuition is spontaneous without conscious search, calculation or other effort. Intuition accounts for most thoughts and actions.

Stanovich and West (2000) labelled these two forms of cognitive process ‘System 1’ and ‘System 2’. The operations of system 1 (intuition) are fast, automatic, effortless and likely to be influenced by
emotion. They are also subject to habit and hence difficult to modify, so that change as a result of learning would be slow. The operation of system 2 (reasoning) is slow, deliberate, controlled and requires effort. It is relatively amenable to change through learning. Since a person’s capacity for mental effort is limited, attempts at reasoning are not easily done simultaneously with each other whereas intuitions can be simultaneous with each other and with reasoning since intuition requires very little mental capacity.

It was not suggested that intuitive thinking is always, or even typically, bad thinking (Klein 1998). However intuitive thinking can lead to errors and system 2 may monitor intuition to some extent in order to detect potential errors. If a potential error is detected reasoning may be used to correct it. There is evidence that the monitoring role of system 2 is impaired by pressure of time, by simultaneous involvement in another reasoning task and by good moods, with the effect that the ability to avoid errors of intuitive judgment is impaired (Finucane, Alhakami, Slovic and Johnson, 2000; Gilbert 2002; Isen, Nygren and Ashby 1988). Reasoning (system 2) is positively correlated with intelligence and with whether the person enjoys thinking (Stanovich and West, 2000; Shafir and LeBoeuf, 2002).

The rational person of traditional finance is (implicitly) assumed to have a single cognitive system with the ability of a flawless system 2 and the speed and ease of system 1. Behavioural finance has tended to keep this idea of a single mental process but with the rational system amended to allow for cognitive limitations, heuristics and feelings. Arguably a further amendment is needed to allow for the two different ways of thinking: intuition and reasoning.

Neuroscience indicates that the human brain is wired in such a way that the two systems interact (Olsen 2007, Over 2003). The first system (intuitive and rapid) is able to handle complex decisions but arrives at only approximate conclusions, whereas the second system (analytical and slow) can only handle precisely-defined problems that allow for precise solutions.

**Traditional Finance and Behavioural Finance Decision-Making Processes**

Figure 1 illustrates the traditional (rational expectations/efficient markets) view of investment decision-making.
Rational optimization entails thought processes such as those envisaged by Markowitz mean-variance diversification (chapter 13), the capital asset pricing model (chapter 14), dividend discount models (chapter 19), and the efficient market hypothesis (chapter 23). All relevant information is used to the fullest extent in order to obtain the optimal choice.

The behavioural finance view of the decision making process could be depicted by figure 2.
The first difference from the traditional view concerns a distinction between objective information and perceived information (objective reality and perceived reality). What people perceive is influenced by how they select information to process. People are incapable of absorbing all information and are therefore selective as to what information receives their conscious attention. They also need to
distinguish between true information and noise. Each person will interpret information differently. Their interpretations of information are influenced by their motives, their knowledge, their experience, their feelings and by a multitude of other cognitive, emotional and social influences. There is also a closure process. Where information is incomplete people tend to fill the gaps in order to obtain a complete story. Additional ‘information’ is used to supplement what is perceived in order to obtain closure. Some information may be disregarded if it is inconsistent with the perceived ‘story’. The factors that influence closure are similar to those that influence the interpretation of information. What one person sees can be very different to what another person sees even though the objective information is the same (Litterer [1965]; Ricciardi [2008]). Decisions are made on the basis of perceived information.

Behavioural finance takes a different view of information processing to the view taken by traditional finance. Rather than seeing people as optimizing, it sees them as satisficing (Simon 1955, 1956; March and Simon 1958). Satisficing arises from bounded rationality, which is the limited rationality that is present because people do not have the requisite intellectual capacity for fully rational behaviour. When satisficing a person looks at alternatives and chooses the first one that is acceptable (or the best from a restricted set of alternatives). March and Simon described an alternative as optimal if it is possible to compare all the alternatives and one is preferred to all the others. Discovering all the alternatives may be too time consuming, or may even be impossible. In consequence a person would simply find an alternative that satisfies their criteria of acceptability.

Satisficing is subject to a number of behavioural influences such as self-deception, heuristic simplification, social influence, emotion and mood (see chapters 2 and 27). Rationality is reduced by both limited intellectual capacity and various psychological biases that affect cognitive (thought) processes. The departure from full rationality increases as the complexity of decisions increases. It also increases as the time available for decision making is reduced. Time constraints reduce the ability to think about a decision and further intensify the bounds on rationality. A person facing complex decisions and time constraints experiences extremely bounded rationality. There would be a corresponding increased reliance on heuristic simplification (rules of thumb that replace rational thought).
The third way in which the behavioural process differs from the traditional process is in the incorporation of a motivational factor. A person may make a decision but not act on it. Some motivation is required for action. Behavioural finance has identified the presence of procrastination and inhibition in the activation stage of investment decisions. Even when decisions have been made they will not be implemented unless the positive motivation is strong enough to overcome inclinations and feelings that inhibit action (Neukam and Hershey, 2003). The status quo bias and conservatism tend to inhibit action by predisposing the investor against change. Fear of change, and fear of the process of change, can prevent action. This is particularly so if there is uncertainty about the costs and benefits of a decision. Confirmation bias can produce an over emphasis on the case against change. If action requires operating through an agent, there is inhibition if the agent is not trusted. Such agents could include financial advisers and financial organizations that provide financial products for retail investors.

Trust can be an important factor in determining whether action is taken (Olsen 2008). For example, a person may decide to start a pension plan. However if that person does not trust financial advisers, the result could be an absence of action. Mistrust inhibits action. The lack of trust might relate to the competence of financial advisers, or to the ability of advisers to put clients’ interests ahead of their own. Trust entails the acceptance of vulnerability to the decisions of others. If the investor cannot trust the competence or integrity of an adviser, the pension plan will not be implemented. There also needs to be trust in the insurance company (or other company) providing the pension plan. There also needs to be trust in regulators and in the markets in which the underlying investments are made. Although an investor may wish to invest in a pension plan, distrust of the stock and bond markets in which the provider invests could deter the investor from pursuing the pension plan.

**Degrees of Efficiency and the Adaptive Markets Hypothesis**

Arguably the issue is not whether a market is, or is not, efficient. The issue is how efficient a particular market is (Grossman and Stiglitz 1980; Findlay and Williams 2000-2001). Market efficiency could be seen to parallel the perfectly competitive market of economic theory. They are rarely, if ever, achieved in reality. Nonetheless they both constitute a useful benchmark against which to compare actual
markets. They also serve to provide models that are useful for the interpretation and understanding of the real world.

Simon (1955) argued that investors exhibited ‘bounded rationality’, which means that they have limited capacities to absorb and analyse information. They are not able to make the precise calculations, which would provide the optimum solutions to their investment problems. Correspondingly market prices do not reach their precisely correct levels. Instead investors satisfice, which means they attain acceptable approximations to their optimum positions. Satisficing portfolios could be achieved by trial-and-error processes based on the use of behavioural heuristics. When market participants have achieved such satisfactory portfolios, the market will approximate informational efficiency.

Lo (2004) argued that, from time to time, circumstances would change. Changes in circumstances require new portfolios and new equilibrium prices. Market participants move towards the new satisficing portfolios using heuristics in a trial-and-error process. According to this view, behavioural heuristics are not incompatible with the efficient markets hypothesis. Behavioural heuristics are an aspect of the process whereby markets move from one approximation to efficiency to another. Lo called this the ‘adaptive markets hypothesis’. Markets could be seen as following evolutionary paths wherein they adapt to changed circumstances by behavioural iterative processes that mirror the survival of the fittest process of natural selection. Successive solutions to the problem of determining optimal portfolios are tried using heuristics, and the solutions that approximate most closely to the optimum are the ones that survive. The heuristics of behavioural finance are the means of adjusting from one approximation to market efficiency to the next. Behavioural finance is complementary to, rather than a contradiction of, the efficient markets hypothesis.

An implication of the adaptive markets hypothesis is that the degree of market efficiency is not constant. Lo presented evidence showing that market efficiency, as measured by serial correlation, fluctuates over time. It is tempting to think that a market becomes steadily more efficient over time as the market participants become more sophisticated, but that does not appear to be the case. Degrees of efficiency show periods of decline as well as periods of advance. This is consistent with the view that
changes in circumstances disrupt (approximate) efficiency and that markets take time to reach a new (approximate) efficiency.

Lo also explains how the new equilibrium positions can be path dependent. A new set of stock prices are path dependent if they are affected by the process by which the new equilibrium is achieved. A stock market crash could permanently deter some investors from the market. In consequence the market will have fewer investors. The absence of those investors will also affect the risk preference of the market, and hence the equilibrium stock prices (the chapters on capital market theory show how risk preferences, through models such as the Capital Asset Pricing Model, affect equilibrium prices by way of affecting risk premiums). A stock market crash does not simply cause a temporary deviation of stock prices from their ‘correct’ levels; it also changes the ‘correct’ levels towards which the market eventually tends to move.

Zuckerman (1999, 2004) proposed that stock markets may exhibit zones of efficiency and zones of inefficiency. The markets for some stocks may be highly efficient whereas the markets for other stocks might exhibit low efficiency. Zuckerman (1999) distinguished between stocks that had clear sector classifications (e.g. within the banking, retail, transport or leisure sectors) and those whose classification was unclear as shown by inconsistent classifications between analysts. Stocks whose classifications were uncertain were found to trade at a discount. Zuckerman (2004) suggested that financial markets should be seen as structurally incoherent. Structurally incoherent markets are comprised of both clear-cut categories and zones of uncertainty. Stocks in zones of certainty (with classifications generally agreed by investment analysts) are priced relatively efficiently. Stocks in zones of uncertainty (with inconsistent classifications) are priced less efficiently and are prone to higher price volatility.

**Conclusion**

The Efficient Market Hypothesis assumes that investors behave rationally in the sense that they use all relevant information and analyse it in the most effective way with a view of achieving the best possible outcomes (maximising expected utility) for themselves. However many investors appear to behave in
irrational ways; irrelevant information such as rumour is used and the analysis may be subject to misperceptions, emotions and other psychological biases.

The behaviour of such irrational, or noise, traders may nonetheless be consistent with the market being rational in two circumstances. One circumstance would be offsetting behaviour among irrational investors, and the other would be market dominance of rational investors over irrational investors. If the behaviour of irrational investors were random, their irrational actions would tend to cancel out. Irrationally motivated purchases by some would tend to be offset by irrational sales by others with little effect on the market as a whole, so that the investors who behave rationally would determine market movements. Even if there were some uniformity of behaviour among irrational investors, a sufficient preponderance of rational investors could neutralise the effects of the irrationality. For example if irrational behaviour caused an unwarranted fall in the price of a share, rational investors would take advantage of the under-pricing by buying the shares. Those purchases would move the share price back up to its appropriate level. In this way the rational investors would ensure that the market, as a whole, remained rational.

There are reasons to expect that irrational trades would not be mutually offsetting. Behaviours such as herding and positive feedback trading will tend to point the market in a particular direction (see the chapter on stock market bubbles and crashes). For rational investors to offset the resulting distortions they should be sufficient in number, adequately capitalised, and unrestricted. It might be expected that market professionals, such as the managers of institutional investment funds, would be rational. However there is evidence that market professionals are prone to the same social and psychological influences as other investors. Furthermore the fact that obvious arbitrage opportunities can remain unexploited (see the chapter on weak form market efficiency) suggests that the professionals are either inadequately funded or otherwise constrained from investment behaviour that would remove the effects of irrational trading.

From the perspective of the individual retail investor it may seem that irrational institutional investment managers could be avoided by investing in funds that aim to track stock indices. Unfortunately this does not completely avoid irrationality. If irrational investing increases the price of a stock, index
tracker funds will hold a higher proportion of that stock since the price rise increases its market capitalisation. So index tracker funds hold disproportionately large amounts of overpriced shares. Conversely shares that become under-priced would have low weightings in tracker funds because of their low capitalisations. Index tracker funds would hold disproportionately large amounts of over-priced shares, and disproportionately low quantities of under-priced shares.

Further reading.

Readers who would like to further pursue their studies of behavioural finance may find the following books interesting.


