

THE ROLE OF FEELINGS IN INVESTOR DECISION-MAKING

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Abstract. This paper surveys the research on the influence of investor feelings on equity pricing and also develops a theoretical basis with which to understand the emerging findings of this area. The theoretical basis is developed with reference to research in the fields of *economic psychology* and *decision-making*. Recent advancements in understanding how feelings affect the general decision-making of individuals, especially under conditions of risk and uncertainty [e.g. Loewenstein *et al.* (2001). *Psychological Bulletin* 127: 267–286], are covered by the review. The theoretical basis is applied to analyze the existing research on investor feelings [e.g. Kamstra *et al.* (2000). *American Economic Review* (forthcoming); Hirshleifer and Shumway (2003). *Journal of Finance* 58 (3): 1009–1032]. This research can be broadly described as investigating whether variations in feelings that are widely experienced by people influence investor decision-making and, consequently, lead to predictable patterns in equity pricing. The paper concludes by suggesting a number of directions for future empirical and theoretical research.

Keywords. Decision-making; Emotions; Image; Investment; Misattribution

1. Introduction

Recent research by Loewenstein (2000, p. 426) argues that the emotions and feelings experienced at the time of making a decision ‘often propel behaviour in directions that are different from that dictated by a weighing of the long-term costs and benefits of disparate actions’. Equity pricing involves the weighing of long-term benefits (the right to a share in the future net cash flows due to an equity) and costs (the riskiness of the future cash flows), so it seems reasonable to speculate that the emotions and feelings¹ of investors influence their pricing of equities.

Two recent areas of stock market research have addressed the impact of feelings on investor decision-making. The first area covers *mood misattribution*. This research investigates the impact of environmental factors, such as the weather, the body's biorhythms and social factors, on equity pricing. This area builds on research from psychology which argues that people's decisions are guided, in part, by their feelings. While this is generally seen as beneficial for efficient decision-making, people sometimes allow feelings induced by transient factors, such as the weather, to influence unrelated decisions, a phenomenon labelled 'mood misattribution'. This is especially the case with complex decisions involving risk and uncertainty. Thus, mood fluctuations induced by variations in the weather and the body's biorhythms (which are both widely experienced) are argued to partially influence equity investment decisions. For example, compared to the judgements of people in a neutral mood, people in a good mood because of good weather are argued to make more optimistic judgements about equities, and people in a bad mood are argued to make more pessimistic judgements.

The second area of research looks at the impact of *image* on investor decision-making, the argument here being that the image of a stock induces emotions in investors that partially drive their investment behaviour. This research can be contrasted with the first area in that it is concerned with emotion arising out of the investment decision-making process, whereas the environmental factor research is concerned with the impact of emotions arising out of events unrelated to the investment decision-making process.

This paper presents a comprehensive synthesis of these emerging areas of research. Currently, no such synthesis exists. The emphasis is on relating the existing research, which is almost exclusively empirical, to the underlying psychological literature on how feelings influence decision-making. This approach enables us to suggest future research hypotheses and research questions which are argued to be richer than the previous research on investor feelings.

The paper is organized as follows: Section 2 summarizes the underlying research on which the investigation of investor feelings is based. The section draws on literature from the fields of *decision-making* and *economic psychology*. Section 3 develops the theoretical arguments for feelings influencing investor decision-making. Sections 4 and 5 contain a summary of existing empirical evidence. Section 4 discusses the misattribution of environmental factors, such as weather, biorhythms and social factors, by investors, and Section 5 discusses the influence of the image projected by equities on investor feelings and, in turn, investor decision-making. Section 6 concludes and suggests future directions for research into the role of feelings in investor decision-making.

2. Feelings and Decision-Making Involving Risk and Uncertainty

The traditional perspective of how people make decisions involving conditions of risk and uncertainty assumes what Loewenstein *et al.* (2001) describe as a 'consequentialist perspective'. In this traditional model, the decision-maker is assumed to quantitatively weigh the costs and benefits of all possible outcomes and choose

the outcome with the best risk-benefit trade-off. This perspective can be seen in the traditional finance theories of Markowitz portfolio theory (Markowitz, 1952) and the Capital Asset Pricing Model (e.g. Sharpe, 1964).

The traditional consequentialist perspective is argued to be unrealistic, as it takes no account of the influence of feelings on decision-making. There is ample evidence that feelings do significantly influence decision-making, especially when the decision involves conditions of risk and/or uncertainty (e.g. Zajonc, 1980; Schwarz, 1990; Forgas, 1995; Isen, 2000; Loewenstein *et al.*, 2001).

An advance on the traditional perspective has been to include the impact of anticipated emotions on decision-making. Anticipated emotions are emotions that are expected to be experienced by the decision-maker given a certain outcome. For example, it might be assumed that the decision-maker is influenced by the effect of emotions such as regret and disappointment if they experience a negative outcome (this can be seen in the model of regret developed by Loomes and Sugden, 1982). This perspective has been applied in finance; for example, the myopic loss aversion theory of Benartzi and Thaler (1995) utilizes the implication of the emotional reaction of investors to losses on their investments to explain the equity risk premium puzzle identified by Mehra and Prescott (1985).

While the inclusion of anticipated emotions is an advance over the traditional consequentialist perspective, the perspective does not incorporate the significant influence of emotions experienced at the time of making a decision on the decision-maker. Thus, for example, it does not incorporate the finding that people in good moods at the time of making a decision make different decisions to people in negative moods (e.g. Schwarz, 1990). This has been found to be true even if the cause of the mood state is unrelated to the decision being made (Schwarz and Clore, 1983).

The risk-as-feelings model was developed by Loewenstein *et al.* (2001) primarily to incorporate the fact that the emotions people experience at the time of making a decision influence their eventual decision. The model is based on a number of premises, each of which is well supported. The combined effect of the premises of the risk-as-feelings model is to show that every aspect of the decision-making process is influenced by the feelings of the decision-maker. Figure 1 provides an illustration of the decision-making process argued for by the risk-as-feelings model and the contrasting decision-making processes assumed by the traditional consequentialist model and the consequentialist model incorporating anticipated emotions.

Three premises which Loewenstein *et al.* (2001) use to support the argument that decision-making involving risk and uncertainty is influenced by feelings are of particular relevance to understanding how investor decision-making might be influenced by the feelings of investors. These are:

1. Cognitive evaluations induce emotional reactions. This argument is well established by psychologists. In a review of psychologist's research on emotions and feelings, Zajonc (1980) summarizes that emotions are 'considered by most contemporary theories to be postcognitive, that is, to occur only after considerable cognitive operations have been accomplished' (p. 151).

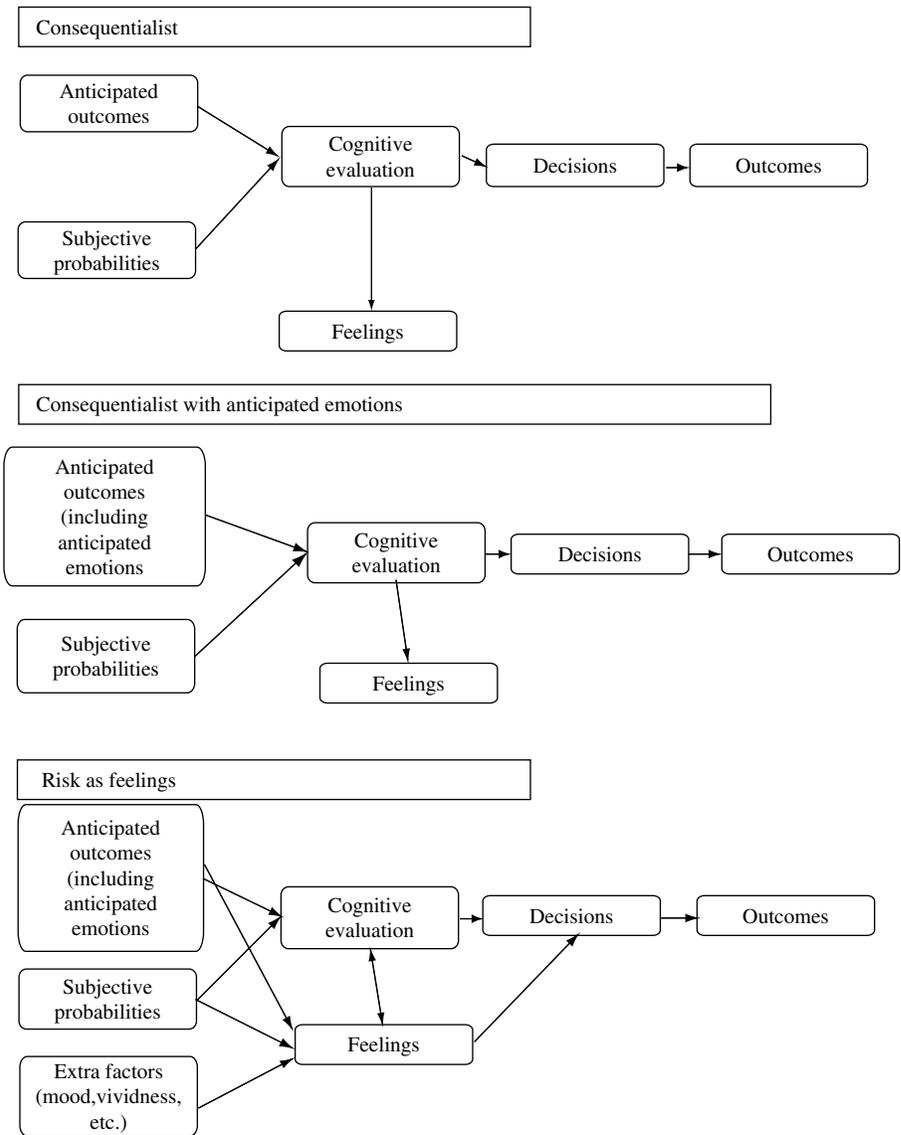


Figure 1. Adapted from Loewenstein *et al.* (2001)

2. Emotions inform cognitive evaluations. The idea that emotions inform cognitive evaluations is also well established by researchers in psychology and decision-making. That emotions inform cognitive evaluations can be seen from the body of research which shows that people in positive moods tend to make optimistic judgements, while people in negative moods tend to

make pessimistic judgements (e.g. Isen *et al.*, 1978; Bower, 1981; Johnson and Tversky, 1983; Bower, 1991). For example, Isen *et al.* (1978) found that inducing good mood in people by giving them a gift led to more favourable reviews of a shopping experience.

3. Feelings can affect behaviour. Damasio (1994) showed that emotions play a vital role in decision-making by studying people who had an impaired ability to experience emotion. People with impaired ability to experience emotions had difficulty making decisions and tended to make suboptimal decisions. In a study of the influence of emotions on decision making, under conditions of risk and uncertainty, Damasio and colleagues (Bechara *et al.*, 1997) set up a card-playing game. They found that subjects who could experience emotions played differently to subjects who could not experience emotions, indicating an influence of emotions on decision-making. This experiment is discussed in greater detail in the next section.

Thus, there is considerable support for feelings influencing the decision-making process. Specifically, it can be summarized that decisions involving cognitive evaluation will result in emotional reactions and these emotional reactions appear to influence the eventual decision. However, Loewenstein *et al.* argue that their model is of limited benefit if it cannot make decisions more predictable, and to this end, they suggest some factors that they term to be 'determinants of feelings' (p. 274). These are factors which have a predictable emotional influence on people's decision-making. Generally, factors that induce positive mood in people lead them to make more optimistic judgements than when they were in a neutral mood, while factors that induce negative mood in people lead them to make more pessimistic judgements than when they were in a neutral mood. The two determinants of feelings of greatest importance to this paper are mood misattribution and image. Sections 4 and 5 of this paper discuss these two factors in detail.

An aspect of feelings influencing decision-making, which is not covered by Loewenstein *et al.*, is the extent to which people rely on their feelings. The affect infusion model (AIM) of Forgas (1995) addresses this area by developing a model that is complementary to the risk-as-feelings model of Loewenstein *et al.* Forgas argues that feelings affect decision-making depending on how risky, uncertain and abstract the decision is. He argues that there are low affect infusion strategies (LAIS) and high affect infusion strategies (HAIS). LAIS are typically used in decisions that require 'little generative, constructive processing' (p. 40). Thus, for example, LAIS would be used for decisions that people are familiar with and that have a low complexity. HAIS involve the use of feelings as a major input into the decision-making process. Typically, HAIS are employed when the decision is highly complex. Thus, we would expect that the more complex the decision (e.g. equity investment decisions), the greater the influence of feelings on the decision. The AIM of Forgas is further support for investor's being influenced in their investment decision-making by their mood states, as the high complexity surrounding investment decisions should classify them as HAIS decisions. Furthermore, investment decisions involving higher-than-average complexity should have

a higher-than-average influence from feelings, and similarly, investment decisions involving lower-than-average complexity should have a lower-than-average influence from feelings. However, it is important to note that Forgas does not refer to investment decisions in his work.

2.1 *Risk-as-Feelings in Economics*

There has been a recent increase in interest in the influence of emotions and feelings on economic behaviour (e.g. Elster, 1998; Loewenstein, 2000; Romer, 2000; Thaler, 2000). For example, a recent paper by Thaler (2000) on the future directions in economic research argues that economists will become increasingly interested in the influence of emotions on economic decision-making.

Much of this recent research notes the importance attached to feelings and emotions by early economists. For example, Bentham (1781) made clear the role of personal emotions in his concept of utility:

By the principle of utility is meant that principle which approves or disapproves of every action whatsoever, according to the tendency it appears to have to augment or diminish the happiness of the party whose interest is in question: or, what is the same thing in other words to promote or to oppose that happiness (p. 14)

Similarly, Keynes (1936) is frequently cited as an early espouser of the importance of emotions in explaining economic behaviour. For example, his assertion that investment is driven by animal spirits (p. 161) is argued by post-Keynesian researchers to be indicative of a support for emotions influencing economic activity (e.g. Dow and Dow, 1985; Marchionatti, 1999).

Researchers investigating the influence of decision-maker's bounded rationality on economic behaviour have been particularly keen to incorporate emotions research into their models (Simon, 1967, 1983; Etzioni, 1988; Kaufman, 1999; Hanoch, 2002). For example, Simon (1983) argued that 'in order to have a complete theory of human rationality, we have to understand the role emotion plays in it' (p. 20).

The area where feelings are potentially of greatest importance is in making 'satisficing' decisions. Satisficing behaviour is defined by Simon (1987b) as 'faced with a choice situation where it is impossible to optimize, or where the computational cost of doing so seems burdensome, the decision-maker may look for a satisfactory, rather than an optimal, alternative' (p. 243). Conlisk (1996) argues that making a decision is costly in terms of time and resources, and that satisficing is a means of avoiding the deliberation costs associated with rational decision-making. In fact, 'optimal' decision-making is possibly really suboptimal, as the cost (deliberation time and search cost) of making an optimal decision might be more than the marginal loss incurred from making a satisficing decision. This drives Knight (1921) to say 'it is evident that the rational thing to do is to be irrational, where deliberation and estimation cost more than they are worth' (p. 67). Emotional decision-making is a means of avoiding the deliberation cost

associated with optimal decision-making. Allowing emotions to partially drive the satisficing decision involves less deliberation cost and can be quite efficient according to Lo and Repin (2001), who argue that this type of intuitive decision-making allows 'a large number of cues [to be] processed simultaneously' (p. 13). In contrast to this view of emotions aiding efficient decision-making, Kaufman (1999) argues that extremes in emotions (extremely high or low emotional arousal) lead to increasingly bounded rationality as emotions cloud the decision maker's judgements.

Hanoch (2002) and Etzioni (1988) also argue that emotions are important as a focusing mechanism in economic decision-making. Much research has pointed out the near impossibility of making decisions based on pure logic. For example, Barber and Odean (2001) find that an investor using the Internet to gather information to make an investment decision has access to over three billion pieces of information. Damasio's (1994) research suggests how emotions help us focus on certain information. He argues that we have emotional responses, or somatic markers, to certain outcomes or actions and this determines what we focus our attention on.

In support of these theoretical arguments, there is considerable empirical and experimental support for economic behaviour being affected by emotions. For example, Bechara *et al.* (1997) find that strategy and performance in a risky card game was influenced by whether or not the participants could experience emotions. Participants who could not experience emotions were more likely to follow a high-risk strategy (where they could either win a large amount or lose a large amount). Participants with a normal ability to experience emotions were more likely to follow a risk averse strategy (where they could consistently win small amounts). Bechara *et al.* (1997) argue that the participants who could not experience emotions did not experience the emotional deterrent attached to the possibility of losing a large amount.

Luce *et al.* (1999) find that the consumer's desire to avoid negative emotions has an effect on their purchase selection. Loewenstein *et al.* (2002) and Laibson (2000) outline many instances of the influence of emotions on economic behaviour, including on advertising and on consumer expenditure. Finally, evidence of emotions affecting financial decision-making can be seen from purchasing patterns in insurance, where people are more likely to have insurance against emotionally vivid events (such as terrorist attacks), even if these events are not very probable (Johnson *et al.*, 1993).

3. Feelings and Investor Decision-Making

The previous section outlined how decision-making involving conditions of risk and uncertainty can be influenced by feelings. As the decision-making of investors involves conditions of risk and uncertainty, it is reasonable to hypothesize that feelings influence investor decision-making. Research by Lo and Repin (2001) provides some direct support for this hypothesis.

Lo and Repin (2001) take a novel approach to investigate whether feelings play a role in investor decision-making. Using a sample of 10 professional traders of financial derivatives, they attach biofeedback equipment to each trader in order to collect information on the physiological characteristics associated with emotional reactions (e.g. sweating and heart palpitations). They find that traders have heightened emotional arousal around economically important events such as increased price volatility. Lo and Repin argue that the ability to make quick decisions with reference to their emotional state is necessary for the rapid decision-making required of successful derivative traders. The authors do not investigate whether heightened emotional arousal is associated with negative or positive performance by traders.

It is important to note that feelings influencing investor decision-making does not necessarily equate to feelings having an effect on equity prices. The influence of feelings might simply lead to individual investors making suboptimal investment decisions, with 'market forces', such as arbitrage, ensuring that equity prices are unaffected. Whether or not this is the case is primarily a matter for empirical inquiry (and papers we cite in Sections 4 and 5 do provide some empirical support for feelings having an effect on equity prices).

An interesting recent paper by Mehra and Sah (2002) does provide theoretical support for feelings influencing equity prices. Mehra and Sah argue that the feelings of investors will have an effect on equity prices if

- investor's 'subjective parameters' (such as their level of risk aversion and their judgement of the appropriate discount factor) fluctuate over time because of fluctuations in mood;
- the effects of these fluctuations in mood on investor's subjective parameters are widely and uniformly experienced;
- investors do not realize their decisions are influenced by fluctuations in their moods.

On the basis of these three premises, Mehra and Sah argue that fluctuations in investor mood will be linked to fluctuations in equity prices. They compute that a 0.10% fluctuation in investors' beliefs about the discount factor can cause a 3–4% standard deviation in equity prices. Fluctuations in attitudes to risk have a smaller, but still important, impact on standard deviation of equity prices.

While the conclusions of Mehra and Sah are based on an assumption that mood fluctuations are widely and uniformly experienced, it is possible that equity prices will still be affected even if only a subset of investors are influenced by mood fluctuations. This relies on 'limits to arbitrage' arguments (e.g. Shleifer, 2000; Barberis and Thaler, 2001). The traditional argument against the existence of equity mispricing is that if some investors misprice an equity (for example, by being influenced by irrelevant mood states), then informed market participants will arbitrage the mispricing out of the market (e.g. Friedman, 1953). However, there appear to be a number of serious limits to arbitrage, and this has led some researchers to argue that equities can sometimes remain mispriced even if arbitrageurs suspect mispricing. Some limits to arbitrage are (Barberis and Thaler, 2001):

- Implementation costs. The cost of arbitrage (e.g. transaction costs and borrowing costs) might be more than the benefit to be gained from arbitrage.
- Noise trader risk. The mispricing might worsen after the arbitrageur takes out his/her arbitrage positions. For example, an arbitrageur might have correctly identified that Internet stocks were overvalued in 1999 and as a result taken out a short position on Internet stocks. However, the arbitrageur would have lost money as the overpricing increased between 1999 and 2000. Noise trader risk especially affects arbitrageurs who have a short-term investment horizon.
- Model risk. The arbitrageur cannot be certain that the pricing model he/she is using is correct.
- Fundamental risk. The equity may receive information while the arbitrageur holds his/her position that moves the fundamental value of the equity in a direction that results in losses for the arbitrageur.

Because of limits to arbitrage, mispricing may result from the actions of only a small subset of investors. This implies that even if only a small group of investors are influenced by their mood states, it may still result in identifiable patterns in equity returns. The following two sections provide evidence of such a relationship between equity returns and variables proxying for mood fluctuations.

4. Misattribution of Environmentally Induced Mood by Investors

An emergent body of research investigates the relationship between equity pricing and fluctuations in mood caused by the weather, biorhythms and social events. This research is motivated by the theoretical research summarized in Sections 2 and 3. Specifically, this research argues that there are broadly uniform fluctuations in the mood of large groups of people caused by the weather, biorhythms and social events. These fluctuations in mood influence investor decision-making, and as the decision-making of a large number of investors is affected, equilibrium stock prices are also affected.

The underlying psychological literature is discussed in the following section, and the empirical evidence of mood fluctuations induced by weather, biorhythm and social events influencing equity returns is discussed in sections 4.2, 4.3 and 4.4.

4.1 Mood-as-Information and Misattribution

The mood-as-information hypothesis argues that our moods inform our decisions; in effect, when we are making a decision we ask ourselves 'How do I feel about it?' and this guides our eventual decision (Schwarz and Clore, 1988; Schwarz, 1990; Clore and Parrott, 1991). The general impact of mood is summarized by Schwarz (1990) as:

Negative affective states, which inform the organism that its current situation is problematic, foster the use of effortful, detail-orientated, analytical processing, whereas positive affective states foster the use of less effortful heuristic strategies. (p. 527)

People in positive moods have been found to make more optimistic decisions, and people in negative moods have been found to make more pessimistic decisions. For example, Schwarz and Clore (1983) found that, in a phone survey, people reported greater life satisfaction when the weather was sunny than when the weather was overcast and was rainy. Transient fluctuations in the weather had a large influence on people's assessment of their life satisfaction. Yet, objectively it should only have had a very minor, perhaps even no influence on the rating of life satisfaction. Similarly, Isen *et al.* (1978) found that inducing good mood in people by giving them a small gift at the start of the experiment resulted in them rating a shopping experience as more favourable than people who were not induced to have a good mood.

Something evident from the two studies just described, and a key element of the mood-as-information hypothesis, is that mood tends to inform decisions even when the cause of the mood is unrelated to the decision being made. This phenomenon is labelled mood misattribution.

Johnson and Tversky (1983) reported on how misattribution can affect risk assessments. In one experiment they report, half of the subjects were asked to read negative news stories in order to induce depression. These subjects were then asked to rate the riskiness of 18 possible causes of death. The subjects rated the riskiness of death higher, for all causes, than subjects who did not read negative news stories. In another experiment, the authors found that asking subjects to read a positive news story resulted in them rating riskiness of the various causes of death lower than subjects who did not read a positive news story. These relationships held even when the information in the news story was unrelated to the cause of death being rated.

The mood-as-information theory and the associated phenomenon of misattribution has prompted researchers in behavioural finance to investigate whether equity investors might misattribute the source of their moods and allow irrelevant feelings to inform their equity investment decisions. Sections 4.2, 4.3 and 4.4 discuss this research.

4.2 *Weather and Equity Returns*

A paper by Saunders (1993) is the seminal work examining whether there is a relationship between weather-induced mood and equity returns. This paper investigates whether variations in New York equity prices are related to the level of cloud cover in New York. Saunders' hypothesis is that the negative mood effects of bad weather (in this case, cloudy days) result in lower equity prices, whereas the positive mood effects of good weather (in this case, clear and bright days) result in higher equity prices.

There is strong psychological support for Saunders' hypothesis. Sunshine is one of the most significant weather-based influences on mood and behaviour. As hours of sunshine increase, depression (Eagles, 1994) and scepticism (Howarth and Hoffman, 1984) are reduced, while optimism (Howarth and Hoffman, 1984) and general good mood (Persinger, 1975) increase. With regard to behaviour,

people have been found to be more generous in tipping (Cunningham, 1979), more willing to answer questions for an interviewer (Cunningham, 1979) and more willing to give money to beggars (Lockard *et al.*, 1976) in good weather. Even giving false information about the weather to people who cannot observe or feel the weather can influence their tipping behaviour (Rind, 1996).

In his investigation, Saunders (1993) finds a significant relationship between the level of cloud cover in New York and the movement of New York-based equities. This finding is based on an examination of daily data for the *Dow Jones Industrial Index* from 1927 to 1989 and value-weighted and equal-weighted NYSE/AMEX indices from 1962 to 1989. Two levels of cloud cover were found to be important; when cloud cover was 100% (85% of rain occurs at this time) mean returns were significantly below average, and when cloud cover was 0–20% (clear, sunny days) mean returns were significantly above average. There was little variation in returns on days with between 30 and 90% cloud cover. Saunders argues that there would be little expected variation in mood on days with between 30 and 90% cloud cover.

The effect that Saunders found was not confirmed in two small follow-up studies by Trombley (1997) and Kramer and Runde (1997). These studies could not find any significant relationship between weather and equity returns. Trombley does, however, note that there appears to be a relationship between very cloudy weather and equity returns, with returns on days with 100% cloud cover being consistently lower across the data tested.

A study by Hirshleifer and Shumway (2003) is the latest to investigate Saunders' findings. This study examines the relationship between cloud cover and equity returns in 26 international equity markets and introduces a number of innovations to the investigation. The study tests de-seasonalized cloud cover instead of absolute cloud cover. De-seasonalized cloud cover is calculated by first finding the average cloudiness for each week for each city over the full sample period and then taking this value away from the actual daily cloudiness figures to give the de-seasonalized figure for each day. This measure is argued to lead to a more accurate measure of the relationship between cloud cover and equity prices, as it avoids the possibility of identifying a relationship that is a proxy for other seasonal affects. However, no psychological literature is cited to support this argument. None of the papers cited by Hirshleifer and Shumway on the effect of weather on mood test whether the relationship only holds for unexpected weather.

The results show that 18 of the 26 cities have a negative sign on the coefficient measuring the relationship between cloud cover and equity index returns, whereas four of the cities have a significant negative relationship (at 5% level, using one-tailed test) between equity index returns and cloud cover. The negative sign of the relationship means that days with high cloud cover are associated with lower returns than days with low cloud cover, thus, the weather effect is confirmed.

Further studies have tested weather variables other than cloud cover. Krivelyova and Robotti (2003) find a relationship between times of heightened geomagnetic storms and equity returns. Psychological studies have linked heightened

geomagnetic storm activity with depression (e.g. Kay, 1994). Thus, this study is consistent with the hypothesis that bad weather is associated with below-average returns.

Cao and Wei (2002) expand the area further by testing the relationship between temperature and equity returns. This study hypothesizes that lower temperatures lead to higher returns, whereas higher temperatures are hypothesized to either lead to higher or lower returns (that is, returns at higher temperatures will deviate from average, but the direction of the deviation is unclear). The study confirms the hypotheses, with low temperatures being associated with above-average returns, and high temperatures being associated with below-average returns.

The causal chain argued by Cao and Wei is that extremes in temperature, either too hot or too cold, lead to aggression (Schneider *et al.*, 1980; Bell, 1981), whereas extreme hot temperatures also lead to apathy (Cunningham, 1979; Schneider *et al.*, 1980). The authors hypothesize that aggression leads to increased risk-taking, and hence higher equity returns, while apathy reduces risk-taking, and hence results in lower equity returns. Thus, low temperatures are hypothesized to lead to above-average returns, whereas the direction of returns in times of high temperatures is unclear (as both apathy and aggression are a factor at high temperatures).

However, there are a number of difficulties with the construction of this hypothesis. First, no psychological research is cited to support the psychological assumptions that aggression leads to increased risk-taking and apathy leads to reduced risk-taking. Second, research not cited by Cao and Wei finds that extremes in temperature (specifically, extremely high temperature) does lead to aggression, but this aggression is manifested by an increased negative evaluation of one's surroundings, other people and oneself (Griffitt and Veitch, 1971). It is unclear how such aggression would lead to investors increasing their risk-taking. Presumably, it would actually have the opposite effect and result in increased pessimism about the prospect for equities.

Other research on mood misattribution in equity pricing has taken one of two directions; either testing mood proxy variables that are not weather-related or seeking to understand the mechanism by which the influence of mood proxy variables is priced in equity returns. The first area is important in terms of building up a body of evidence showing mood influences in equity returns, but the second area is potentially more important as it can provide evidence of how mood influences on individual investors results in an effect on equilibrium equity prices. The next two sections review these two areas.

An interesting approach to investigating the relationship between weather and stock pricing is taken by Goetzmann and Zhu (2002). These researchers use a database of the trading accounts of 79,995 investors for the period January 1991 to November 1996 to investigate whether investors trade differentially on sunny vs. cloudy days. When they find no significantly different trading patterns attributable to the weather, they hypothesize that the weather effect is caused by market makers. In support of this, they find that market maker behaviour does appear to be related to the weather, with greater bid-ask spreads (indicating greater risk aversion) for cloudy days than for sunny days.

4.3 Other Mood Proxy Variables

In an expansion on the investigation of weather-related mood proxy variables, recent research has argued that there is a connection between biorhythms (the body's natural biological cycles) and equity pricing. This research can be argued to be motivated by the same arguments that motivate the research on the relationship between the weather and equity returns. Similar to the weather-effect research, this area examines whether widely experienced fluctuations in mood because of biorhythms, are misattributed by investors and allowed to inform the equity investment decision.

Kamstra *et al.* (2003) argue that the seasonal variation in hours of sunlight in the day, which leads to widespread depression (a depression known as Seasonal Affective Disorder (SAD) when it is severe, but the mild form of which is simply called 'winter blues') is predictive of a seasonal variation in equity returns. This hypothesis is based on the considerable evidence of a link between seasonal variation in sunlight and depression (Cohen *et al.*, 1992; Rosenthal, 1998; Mayo Clinic, 2002).

The investigation is carried out in nine countries and includes the most northerly major equity index, the *Veckans Affarër* index in Sweden. It is argued that the effect of SAD will be more extreme at more extreme latitudes as the seasons are more extreme at these latitudes (cf. Young *et al.*, 1997). The investigation also includes a number of Southern Hemisphere countries, including the most southerly major equity index, the All Ordinaries index in Australia. It is expected that any SAD effect will be evident in reverse in Southern Hemisphere countries as their seasons are the reverse of the Northern Hemisphere countries. It is surprising that the Chile stock exchange in Santiago is not included in the studies as it is one of the major Southern Hemisphere stock markets and it is significantly larger than the New Zealand stock market, which is included in the study.

The SAD variable is only included in the regression for September to March, otherwise it is set to zero. It is argued that there is an asymmetry between the effect of SAD, and thus the hypothesized effect on investor mood, between the effect of SAD from the Autumn Equinox (c. September 21st) to the Winter Solstice (c. December 21st), and the effect of SAD from the Winter Solstice to the Spring Equinox (c. March 20th). Autumn to Winter is argued to be associated with increasingly negative returns as the length of night increases, while Winter to Spring is argued to be associated with increasingly positive returns as the length of night decreases. This asymmetry is supported by the psychological literature (e.g. Palinkas and Houseal, 2000).

The findings are as expected; the SAD variable is significant. In the author's own words,

[The results are] consistent with a SAD-induced seasonal pattern in returns as depressed and risk averse investors shun risky assets in the fall and resume their risky holdings in the winter, leading to returns in the fall which are lower than average and returns following the longest night of the year which are higher than average. (p. 14)

Of interest in the findings is the fact that the SAD effect has a high impact on the Swedish exchange which is the exchange the furthest away from the equator, and a relatively low impact on the Australian index which is the biggest exchange which is close to the equator (and thus unlikely to be affected by SAD to as great a degree as the other exchanges due to the lesser seasonal fluctuation in Australia). However, the exchange that is closest to the equator, South Africa, has a high level of significance for the SAD variable, and this is not consistent with the hypothesis. The findings also confirm that the effect on equity prices is reversed in the Southern Hemisphere, in line with the reversed seasons as compared to the Northern Hemisphere countries.

In a further biorhythm study, Kamstra *et al.* (2000) investigate the effect of interruptions to sleep patterns caused by the Daylight Savings Time Changes (DSTCs) which occur twice a year, in Spring when clocks go forward an hour and in Autumn when clocks go back an hour. This causes an interruption to the circadian (daily 24 h) cycle of the body and has been argued to cause anxiety (Coren, 1996). Whether an hour of sleep is gained or lost does not appear to be important, the dominating factor leading to anxiety is that the regular sleep pattern is interrupted.

The interruption to sleep patterns caused by DSTCs can be linked to other work on the effect of interruption to sleep patterns or irregular sleep patterns (an area of research known as 'sleep desynchronization'). For example, irregular sleep patterns, such as in shift workers, has been associated with anxiety, depression and illness (Coren, 1996), and DSTC in specific have been associated with an increase in automobile accidents (Monk and Aplin, 1980; Coren, 1996).

Using data for the US, Canadian, German and UK markets, the authors find that returns for Mondays following DSTC, both in Spring and Autumn, are significantly negative when compared with other Monday/weekend returns. Thus, although negative Monday returns are a recognized historical anomaly, the returns on Mondays following a DSTC are significantly more negative. The one exception is Germany, but the lack of data availability for that market is possibly the cause (Germany only introduced DSTC in 1980), also, although the finding is not significant for Germany, it is still in the expected negative direction.

In a comment on the finding of a DSTC effect in equity markets, Pinegar (2002) argued that the effect discovered was primarily due to two outliers in the dataset used. Kamstra *et al.* (2002) replied that the effect can be seen to be not because of two outliers by the fact that there is a lower-than-average percentage of positive returns on Mondays following DSTCs.

A final mood proxy variable that has been tested is lunar phases. Investigations by two teams of University of Michigan researchers (Dichev and Janes, 2001; Yuan *et al.*, 2001) find that returns are significantly higher in the days surrounding new moon dates than in the days surrounding full moon dates.

These investigations depend on a questionable link between mood and lunar phases. Both sets of researchers cite the dominant view in psychology that there is no relationship between mood and lunar phases (e.g. Campbell and Beets, 1978; Rotton and Kelly, 1985; Kelly *et al.*, 1996). The authors instead argue that

because of the tradition and the persistence of beliefs about lunar cycle effect on human behaviour (Dichev and Janes, 2001, p. 3), it is worthy of investigation. In support, they cite a survey carried out by Kelly *et al.* (1996), where approximately 50% of respondents said they believed that abnormal behaviour is associated with the full moon.

4.4 *Social Events and Equity Returns*

Shiller (1984, 2000) argues that the fashions and fads that affect people in their everyday lives also affect equity pricing.

Investors spend a substantial part of their leisure time discussing investments, reading about investments, or gossiping about others' successes or failures in investing. It is thus plausible that investor behaviour (and hence prices of speculative assets) would be influenced by social movements. (1984, p. 457).

In support of Shiller, Hong *et al.* (2001) find that households that interact more with other households are more likely to invest in the stock market than nonsocial households. Nofsinger (2003) provides a comprehensive review of research in support of the influence of social mood on equity pricing. It is, therefore, possible to hypothesize that widely experienced fluctuations in social moods influence equity returns, with positive social feelings resulting in optimistic/higher equity pricing and negative social feelings resulting in pessimistic/lower equity pricing.

In a test of this hypothesis in relation to equity pricing, Boyle and Walter (2003) investigate whether the past performances of the New Zealand national rugby team (the 'All Blacks') is related to fluctuations in equity pricing on the New Zealand stock exchange using monthly data from 1950 to 1999. According to psychological research, the performance of a sports team has an important impact on the mood of its fans (Sloan, 1979; Hirt *et al.*, 1992). Based on this, Boyle and Walter (2003) hypothesize,

When an investor's team wins, self-confidence rises and so does the desire to undertake new investments, but a loss results in lower self-confidence and a curtailment of new investment activity. (p. 3)

The findings show that equity returns are in the correct predicted direction when the All Blacks are playing what they consider to be their principal opponents [South Africa, Wales (up to 1980), and Australia (since 1980)]. Returns were higher in months with positive results, than in months with negative results. However, the sample size of positive and negative months totalled only 49 vs. 551 months with no matches played. The restriction imposed by having to use monthly data, because of the lack of availability of daily index returns for much of the sample period, also hampers this investigation, as we would expect a mood effect to have only a short-term influence on investor mood.

Boyle and Walter do test to see whether returns on the Monday following All Black performances are different depending on positive or negative performance using the available daily data from 1986 to 2000. Returns following positive

(winning) weekends against principal opponents are less negative than for losing weekends. However, this is based on just 43 observations. Also, returns following neutral weekends (i.e. no matches played) are less negative than both positive and negative weekends. Thus, it is not possible to conclude that social feelings induced by All Black team performance influenced New Zealand equity returns. However, the restrictions imposed by the lack of data availability mean that more research should be conducted in this area.

5. The Affect Heuristic and Investor Decision-Making

The 'affect heuristic' is a concept that has been developed by Paul Slovic and colleagues as a theory of how people assess risks (Alhakami and Slovic, 1994; Peters and Slovic, 1996; Finucane *et al.*, 2000; Slovic, 2000; Slovic *et al.*, 2002). These authors argue that people's decision-making is guided by the images and associated feelings that are induced by the decision-making process. This section discusses how the research on the affect heuristic is relevant to understanding the role of feelings in investor decision-making.

5.1 *The Affect Heuristic*

The research on the affect heuristic (hereafter, 'affect') arose out of early research into why the public's perception of the risk of nuclear power differed so dramatically from the more objective assessment of the risk of nuclear power held by experts on risk assessment. The research investigated why the public's perception was so different. The main finding was that the public feared the unknown risks associated with nuclear power.

It is not just in nuclear power that the public's perception of risk differs from the expert's assessments, it occurs across a wide range of activities and technologies. Slovic (1987) argues that there is consistency in the public's deviations from objective risk assessments. It occurs where there is a high fear of unknown risks, known as 'dread risk', i.e. where there is a potential for a major accident, where death is an easily identifiable risk from a technology, where there is a perceived lack of control over a technology. Unknown risk is also important; this is where risks are viewed as being unobservable, unknown, new and delayed in their manifestation of harm (p. 226). An example is the risk of genetically modified food. On the other end of the scale, people tend to underestimate the risks of technologies that they consider to be useful, e.g. vaccinations and X-rays.

In a series of studies, Slovic and colleagues find evidence that affective/emotional reactions appear to drive both perceived benefit and perceived risk (Alhakami and Slovic, 1994; Finucane *et al.*, 2000). This relationship is shown in Figure. 2. In summary, they find that

If an activity was 'liked', people tended to judge its risks as low and its benefits as high. If the activity was 'disliked', the judgements were the opposite – high risk and low benefit. (Finucane *et al.*, 2000; p. 4)

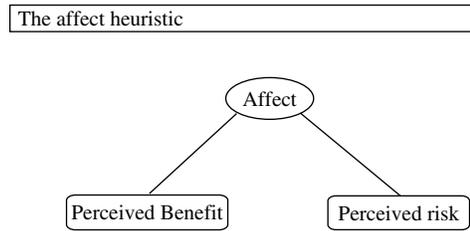


Figure 2. Adapted from Slovic (2000)

In an experiment to test the hypothesis that perceived risk and benefit are based partly on affect, the researchers induced affect in some subjects but not in others, in order to see whether perceived risk and benefit differed under the affect condition compared to the control condition. The manipulation used by the researchers to induce affect was to force people to answer questions in a restricted amount of time. This was argued to force people to rely on affective evaluations as they could not make a purely cognitive assessment within the limited time available to them. The control group was given as much time as it wanted. The questions asked were on perceived risk and perceived benefit of certain activities and technologies.

The authors argue that increasing affect in subjects leads to a greater negative relationship between risk and return. To explain this expected relationship, we can first look at the relationship that would be expected from a normative perspective. Normative theory would say that high-risk activities and technologies should have high benefits; otherwise, they would not be acceptable to society. Similarly, low-benefit activities would be expected to have low risk. Thus, we would expect a positive correlation between risk and benefit. However, the authors argue that affective/emotional decisions are based on liking or disliking, and this leads to a negative relationship between risk and return. Thus, it is expected that something with high benefit should also be judged to have low risk; similarly something with high risk should be judged to have low benefit. The authors' expected results were realized. Subjects in the time pressure condition, and thus argued to be using an affective evaluation method, were far more likely to see a negative relationship between risk and benefit, than subjects in the no time pressure condition.

A second experiment, by Finucane *et al.* (2000), attempted to manipulate affect in such away as to lead people to differentially perceive risks and were expected; if subjects were given information that risk is high, they were expected to infer low benefit; if they were given information that risk is low, they were expected to infer high benefit.

The experiment tested the ratings of three technologies – nuclear power, natural gas and food preservatives. People were given qualitative information that risk is either high or low and then asked to give quantitative ratings of degrees of risk and benefit for the technologies. By comparing risk and benefit ratings made

before the subjects read the information indicating that risk is high or low, to after, it was possible to check the effect such manipulations have.

The relationships expected under the affect heuristic theory were broadly confirmed. For example, subjects who were given information indicating that risk is low for nuclear power reduced their ratings of the risk of nuclear power from 7.48 before reading the information to 6.61 after reading the information (on a 10-point scale of riskiness, where 10 is very risky, and 1 means low risk). And, more importantly, the subjects also increased their rating of the benefit of nuclear power from 5.25 to 6.02, even though none of the information they were given related to the benefits of nuclear power. Thus, the information that risk is low appears to have increased the subjects overall liking of nuclear power and led to a more positive affective rating of the benefits of nuclear power.

5.2 *Affect and the Investor*

Recent research has investigated the applicability of the affect heuristic to understanding investor decision-making (MacGregor *et al.*, 2000; Dreman *et al.*, 2001; MacGregor, 2002). This research indicates that investors appear to make decisions consistent with the predictions of the affect heuristic; the valuation of a company's equity appears to be influenced by whether the investor likes or dislikes the company.

This effect is illustrated by MacGregor *et al.* (2000). Each participant in a study gave an image rating for 20 industries, with the image rating ranging from 'highly negative' to 'highly positive'. The 20 industries selected included 10 that were stock market high performers in the previous year, and 10 that were stock market underperformers in the previous year. Participants were also asked to estimate the stock market performance of the industry in the previous financial year, the performance of the industry over the coming year and whether or not they would be willing to buy into an IPO from a company in the industry.

The results confirmed that image played a significant role in participant's estimates of investment performance. Overall, the image ratings were positively skewed, indicating that the overall sample of industries had a positive image. The average image rating was +0.56, based on a scale that ranged from -2.0 (highly negative) to +2.0 (highly positive). The results illustrated what the authors termed 'internal consistency'; affective rating was closely correlated with judgements of past performance and judgements of future performance and willingness to invest in an IPO. That is, a positive image was linked to perceived good past performance and led to a belief in future good performance and a willingness to purchase future IPO's in the industry.

However, while the link between image rating and judgements of past and future stock market performance are internally consistent according to the affect heuristic, this link is not consistent with rational/efficient investor decision-making. It is not rational to expect future equity price outperformance or underperformance based on past equity price outperformance or underperformance. Nor is it rational that a positive image of a company should lead to positive rating

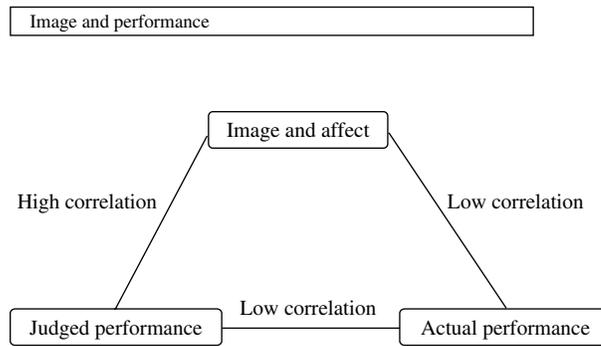


Figure 3. Adapted from MacGregor (2002)

of a stock, as all available information, including the factors that led to the company having a positive image, are assumed to be already incorporated in equity prices. Thus, if a company has a negative image because it sells cigarettes, this negative image should not influence the evaluation of future returns for the company's equity. According to the Efficient Market Hypothesis, any predictable financial implications of this negative image will already be incorporated in the equity price.

There is some empirical support for the argument that the feelings induced by image influence not only individual investor decision-making, but also equity prices. A survey by Shefrin (2001) of equity market professionals found that they appeared to predict the future price performance of a company's equity based on their image of the company. He argued that people were making the mistake of believing that 'stocks of good companies are representative of good stocks' (p. 5). This finding is supportive of the Affect Heuristic, but contrary to efficient equity pricing, as it resulted in stocks with low risk being predicted to have high future returns, and stocks with high risk being predicted to have low future returns – an inverse of the accepted positive relationship between risk and expected return (e.g. Sharpe, 1964).

Some anomalies in finance can also be argued to be supportive of the affect heuristic and image influencing equity pricing. These anomalies include Cornell's (2000) analysis of the pricing of Intel and Cooper *et al.*'s (2001) analysis of the pricing of Internet companies following a name-change.

Cornell (2000) investigated an Intel share price drop of 30% on 21st September 2000. The drop followed the company issuing a press release announcing a small slowdown in sales in the company's European operations. Cornell analysed the press release the company issued for information that would justify such a fall and could not find any information. He also analysed the behaviour of analysts who followed and made investment recommendations on Intel. He found that analysts were more strongly rating the equity when it was worth \$75 in August than when it was worth \$40 at the end of September. Yet, the company had not given sufficient information to indicate a dramatic slowdown in sales, just a minor

slowdown in one market. Nor did the analysts justify their changed views using discounted cash flow analysis; Cornell states, 'it is difficult to understand how the analysts arrive at their estimates of fundamental value' (p. 20). He goes on to claim, 'analysts are in some sense rating the company, rather than the investment' (p. 22). Thus, analysts appear to have been evaluating Intel on the basis of its image, rather than on its investment potential.

The study of equity returns following corporate name changes to 'Internet related dotcom names' by Cooper *et al.* (2001) is also indicative of image influencing the investment decision of investors. For a sample of 95 stocks over the period from June 1998 to July 1999, a positive abnormal equity return of 53% was found over the 5 days surrounding an announcement of a name change. The level of the return did not appear to be related to the level of involvement of the company with the Internet, indicating an element of irrationality by investors. The authors conclude that 'investors seem to be eager to be associated with the Internet at all costs'. Internet stock investors appear to have been driven by their positive image of the Internet and not by a quantitative assessment of the risks and expected returns associated with these stocks.

6. Conclusion and Future Directions for Research

This paper has provided a synthesis of the emerging research on the influence of feelings on investor decision-making and equity pricing. Section 4 described how investors appear to allow their mood state at the time of making an investment decision to influence their judgement. While this is an efficient decision-making tool and is consistent with our knowledge of how people generally make decisions, it can result in errors if the investor allows irrelevant mood states to influence their judgements. Section 5 described another manner in which investors allow their feelings to influence their investment decisions. It was shown that investors can sometimes invest in an equity based on whether they like or dislike a company. While this is consistent with what we know about how people make decisions, it is not usually consistent with efficient equity pricing.

Given the strength of the theoretical support for investors investing in a manner consistent with their feelings, this research area deserves further investigation. Especially, as many of the findings in the area are inconsistent with existing theories of how investors should make investment decisions.

Previous studies in this area, especially in the area of environmentally induced mood effects on equity pricing, have been mainly empirical, with (arguably) limited theoretical foundations. For research into the influence of feelings on investor decision-making to progress and become paradigmatic, it must start to develop richer hypotheses with greater theoretical support. The following suggestions for future research might be interesting in this regard.

1. Deepen the breath of investigations into the relationship between mood proxy variables and asset pricing. There has not yet been sufficient study in this area to allow anything other than very preliminary conclusions to be

made about the relationship between mood and asset pricing. There is a need for investigations into asset classes other than equity returns, such as bonds, commodities and derivatives. There is also a need to investigate whether there are relationships between the mood proxy variables and the aspects of pricing other than returns. This could include volatility and the higher moments. The volatility of asset prices could be due, in part, to some investors being influenced by their mood states. It has been shown from the literature reviewed in this paper that investors who are influenced by mood states, and especially, investors who allow irrelevant mood states to influence their decision-making, will arrive at an asset valuation that differs from a valuation that will be calculated by investors who are rational in the EMH sense. This will create differing opinions regarding asset valuations. Difference of opinion amongst traders regarding asset valuation is one of the explanations given for excess volatility in financial markets (e.g. Black, 1986).

2. Investigate the influence of social feelings on investor decision-making. The influence of social factors on stock pricing and investor behaviour has largely been ignored in finance research (Hirshleifer, 2001, p. 1577). The main exception is Shiller's (1984, 2000) work. While there is convincing theoretical support for social influences on stock pricing, it has been difficult to specify hypotheses that are empirically testable. A solution to this might be to conduct qualitative investigations of social influences on investor behaviour. Another possibility might be research into the influence of social feelings on investor decision-making using approaches applied in the research outlined in Section 4. An example is research that adopts the approach used by Boyle and Walter (2003) that searches for broad measures of social feelings that could influence investor decision-making.
3. Develop integrated hypotheses of investor decision-making using both the mood misattribution and the affect heuristic literature. The two approaches, outlined in Sections 4 and 5, to investigating the influence of feelings on investor behaviour have, to-date, developed separately. It appears likely that integrating these two areas of research would lead to richer hypotheses being developed. One richer hypothesis would be to investigate whether equities with more vivid images are more susceptible to fluctuations because of mood misattribution. That is, are stocks with more vivid images likely to (say) rise more on days with good weather, or fall more on days with bad weather, compared to stocks with relatively neutral images?
4. Investigate the influence of feelings on investor decision-making with new research methods. Simon (1987a) complained that the economists' almost total reliance on aggregate data and econometric tools was not suited to understanding fully the decision-making patterns of economic actors. He called for greater use of alternative investigative tools, such as case studies, surveys, laboratory experiments and computer simulations. As with other areas of financial economics, investigations of the influence of feelings on investor decision-making have been hampered by a reliance on aggregate

data. With the exception of Lo and Repin (2001) and Goetzmann and Zhu (2002), investigations in this area have used aggregate equity prices to test their hypotheses. This restricts studies of mood influences on investor behaviour to mood-inducing variables that are widely experienced. Clearly, this leaves out many determinants of individual's moods. We need microanalysis of all influences of mood on investor decision-making. This information could then be used to formulate prescriptive advice for investors on how they should control for negative effects of mood on their investment decision-making. This would be similar to Kahneman and Riepe's (1998) paper giving prescriptive advice to investors based on investigations in the bounded rationality area of behavioural finance.

5. Identify existing anomalies in finance that can be explained by investor feelings. If the role of feelings in investor decision-making is to become paradigmatic in finance, it must be able to explain some of the behaviour that the dominant EMH paradigm cannot convincingly explain. Investor feelings can potentially explain some of the anomalies in the EMH. For example, the historically high returns prior to bank holidays (e.g. Ariel, 1990) could be explainable by investors being in a good mood due to the prospect of having a holiday. Low Monday returns (e.g. French, 1980) could potentially be explainable by depression caused by irregular sleep patterns between weekends and weekdays (Kramer, 2001). The apparently greater anomalies in the pricing of small stocks and closed-end funds (as opposed to, say, large cap stocks) may be explainable by the greater reliance on emotional decision-making by the small investors who have a greater influence on the pricing of these financial instruments (Lee *et al.*, 1991; Chopra *et al.*, 1993). Small investors are more likely to allow feelings to affect their decision-making as the decision-making process is characterized by greater uncertainty for them than for the professional investors who dominate the pricing of large stocks. Greater uncertainty has been linked with greater use of feelings in the decision-making process (Forgas, 1995).
6. Integrate the influence of investor mood into descriptive models of how equities are priced. For this area to be of greater interest to financial market participants, it must seek to integrate its findings into models of how equities are priced. Possibly, it is too early for this to occur, as we do not yet know enough about the influence of feelings on equity pricing. A means of integration might be to include some mood-based factors in an APT-type multifactor model along with mainstream economic factors.

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Notes

1. Throughout this paper, the terms 'emotions', 'moods', 'feelings' and 'affect' are used interchangeably, as the distinction between these terms is not consistent in the psychology literature. The general distinction between the terms is that 'emotions' are defined as lasting for a very short period of time and being directed at an object. 'Moods' are defined as being longer lasting than emotions, not directed at anything in particular, and of a lower intensity than emotions. 'Feelings' and 'affect' are general terms used to describe either emotions or moods. Oatley & Jenkins (1996) give further information on these distinctions.

References

- Alhakami, A. and Slovic, P. (1994). A psychological study of the inverse relationship between perceived risk and perceived benefit. *Risk Analysis* 14(6): 1085–1096.
- Ariel, R. A. (1990). High stock returns before holidays: Existence and evidence on possible causes. *Journal of Finance* 45(5): 1611–1626.
- Barber, B. M. and Odean, T. (2001). The internet and the investor. *Journal of Economic Perspectives* 15(1): 41–54.
- Barberis, N. and Thaler, R. (2001). A survey of behavioral finance. Working Paper, University of Chicago.
- Bechara, A., Damasio, A., Tranel, D. and Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy. *Science* 275: 1293–1295.
- Bell, P. A. (1981). Physiological comfort, performance and social effects of heat stress. *Journal of Social Issues* 37: 71–94.
- Benartzi, S. and Thaler, R. (1995). Myopic loss aversion and the equity premium puzzle. *Quarterly Journal of Economics* 110(1): 73–92.
- Bentham, J. (1781). *An Introduction to the Principles of Morals and Legislation*. Kitchener: Batoche Books.
- Black, F. (1986). Noise. *Journal of Finance* 41(3): 528–543.
- Bower, G. H. (1981). Mood and memory. *American Psychologist* 36: 129–148.
- Bower, G. H. (1991). Mood congruity of social judgments. In J. P. Forgas (ed.), *Emotion and Social Judgment*. Oxford: Pergamon Press, pp. 31–54.
- Boyle, G. and Walter, B. (2003). Reflected glory and failure: International sporting success and the stock market. *Applied Financial Economics* 13: 225–235.
- Campbell, D. E. and Beets, J. L. (1978). Lunacy and the moon. *Psychological Bulletin* 85: 1123–1129.
- Cao, M. and Wei, J. (2002). Stock market returns: A temperature anomaly. Working Paper, SSRN.com
- Chopra, N., Lee, C. M.C., Shleifer, A. and Thaler, R. (1993). Yes, discounts on closed-end funds are a sentiment index. *Journal of Finance* 48(2): 801–808.
- Clore, G. L. and Parrott, W. G. (1991). Moods and their vicissitudes: Thoughts and feelings as information. In J. P. Forgas (ed.), *Emotion and Social Judgment*. Oxford: Pergamon Press, pp. 107–123.
- Cohen, R. M., Gross, M., Nordahl, T. E., Semple, W. E., Oren, D. A. and Rosenthal, N. E. (1992). Preliminary data on the metabolic brain pattern of patients with winter seasonal affective disorder. *Archives of General Psychiatry* 49(7): 545–552.
- Conlisk, J. (1996). Why bounded rationality? *Journal of Economic Literature* 34(2): 669–700.
- Cooper, M. J., Dimitrov, O. and Rau, P. R. (2001). A Rose.com by any other name. *Journal of Finance* 56(6): 2371–2388.

- Coren, S. (1996). *Sleep Thieves*. New York: Free Press.
- Cornell, B. (2000). Valuing Intel: A strange tale of analysts and announcements. Working Paper, Anderson Graduate School of Management and SSRN.com.
- Cunningham, M. R. (1979). Weather, mood and helping behavior: Quasi-experiments with the sunshine samaritan. *Journal of Personality and Social Psychology* 37(11): 1947–1956.
- Damasio, A. (1994). *Descartes' Error: Emotion, Reason, and the Human Brain*. New York: Putnam.
- Dichev, I. D. and Janes, D. (2001). *Lunar Cycle Effects in Stock Returns*. Working Paper, University of Michigan Business School and SSRN.com.
- Dow, A. and Dow, S. (1985). Animal spirits and rationality. In H. Pesaran (ed.), *Keynes' Economics. Methodological Issues*. London: Routledge, pp. 46–55.
- Dreman, D., Johnson, S., MacGregor, D. G. and Slovic, P. (2001). A report on the March 2001 Investor Sentiment Survey. *Journal of Psychology and Financial Markets* 2(3): 126–134.
- Eagles, J. M. (1994). The relationship between mood and daily hours of sunlight in rapid cycling bipolar illness. *Biological Psychiatry* 36: 422–424.
- Elster, J. (1998). Emotions and economic theory. *Journal of Economic Literature* 36(1): 47–74.
- Etzioni, A. (1988). Normative-affective factors: Towards a new decision-making model. *Journal of Economic Psychology* 9(2): 125–150.
- Finucane, M. L., Alhakami, A., Slovic, P. and Johnson, S. M. (2000). The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making* 13: 1–17.
- Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin* 117: 39–66.
- French, K. (1980). Stock returns and the weekend effect. *Journal of Financial Economics* 8: 55–69.
- Friedman, M. (ed.) (1953). The case for flexible exchange rates. *Essays in Positive Economics*. Chicago: University of Chicago Press.
- Goetzmann, W. N. and Zhu, N. (2002). Rain or shine: Where is the weather effect? Working Paper, Yale and SSRN.com
- Griffitt, W. and Veitch, R. (1971). Hot and crowded: Influences of population density and temperature on interpersonal affective behavior. *Journal of Personality and Social Psychology* 17(1): 92–98.
- Hanoch, Y. (2002). “Neither an Angel nor an ant”: Emotion as an aid to bounded rationality. *Journal of Economic Psychology* 23: 1–25.
- Hirshleifer, D. (2001). Investor psychology and asset pricing. *Journal of Finance* 56(4): 1533–1597.
- Hirshleifer, D. and Shumway, T. (2003). Good day sunshine: Stock returns and the weather. *Journal of Finance* 58(3): 1009–1032.
- Hirt, E. R., Zillman, D., Erikson, G. A. and Kennedy, C. (1992). Costs and benefits of allegiance: Changes in fan's self-ascribed competencies after team victory versus defeat. *Journal of Personality and Social Psychology* 63(5): 724–738.
- Hong, H., Kubik, J. D. and Stein, J. C. (2001). Social interaction and stock-market participation. Working Paper, SSRN.com
- Howarth, E. and Hoffman, M. S. (1984). A multidimensional approach to the relationship between mood and weather. *British Journal of Psychology* 75: 15–23.
- Isen, A. M. (2000). Positive affect and decision making. In J. M. Haviland (ed.), *Handbook of Emotions*. London: Guilford Press, pp. 261–277.
- Isen, A. M., Shalker, T. E., Clark, M. and Karp, L. (1978). Affect, accessibility of material in memory, and behavior: A cognitive loop? *Journal of Personality and Social Psychology* 36: 1–12.
- Johnson, E. J., Hershey, J., Meszaros, J. and Kunreuther, H. (1993). Framing, probability distortions, and insurance decisions. *Journal of Risk and Uncertainty* 7: 35–51.

- Johnson, E. J. and Tversky, A. (1983). Affect, generalization, and the perception of risk. *Journal of Personality and Social Psychology* 45: 20–31.
- Kahneman, D. and Riepe, M. W. (1998). Aspects of investor psychology. *Journal of Portfolio Management* 24(4): 52–65.
- Kamstra, M. J., Kramer, L. A. and Levi, M. D. (2000). Losing sleep at the market: The daylight-savings anomaly. *American Economic Review* 90(4): 1005–1011.
- Kamstra, M. J., Kramer, L. A. and Levi, M. D. (2002). Losing sleep at the market: The daylight saving anomaly: Reply. *American Economic Review* 92(2): 1257–1263.
- Kamstra, M. J., Kramer, L. A. and Levi, M. D. (2003). Winter Blues: A sad stock market cycle. *American Economic Review* 93(1): 324–343.
- Kaufman, B. E. (1999). Emotional arousal as a source of bounded rationality. *Journal of Economic Behavior & Organization* 38: 135–144.
- Kay, R. W. (1994). Geomagnetic storms: Association with incidence of depression as measured by hospital admission. *British Journal of Psychiatry* 164: 403–409.
- Kelly, I. W., Rotton, J. and Culver, R. (1996). The moon was full and nothing happened: A review of studies on the moon and human behavior and human belief. In T. Genoni (ed.), *The Outer Edge*. Amherst, NY: Committee for the Scientific Investigation of Claims of the Paranormal.
- Keynes, J. M. (1936). The state of long-term expectation. *The General Theory of Employment, Interest and Money*, Vol. 7. London: Macmillan for the Royal Economic Society, pp. 147–164.
- Knight, F. H. (1921). *Risk, Uncertainty and Profit*. New York: Sentry Press.
- Kramer, L. A. (2001). Intraday stock returns, time-varying risk premia, and diurnal mood variation. Working Paper 23, SSRN.com.
- Kramer, W. and Runde, R. (1997). Stocks and the weather: An exercise in data mining or yet another capital market anomaly? *Empirical Economics* 22: 637–641.
- Krivelyova, A. and Robotti, C. (2003). Playing the field: Geomagnetic storms and international stock markets. Working Paper, SSRN.com.
- Laibson, D. (2000). A cue-theory of consumption. Working Paper, Harvard Business School.
- Lee, C. M., Shleifer, A. and Thaler, R. (1991). Investor sentiment and the closed-end fund puzzle. *Journal of Finance* 46: 75–110.
- Lo, A. W. and Repin, D. V. (2001). The psychophysiology of real-time financial risk processing. NBER Working Paper no. 8508.
- Lockard, J. S., McDonald, L. L., Clifford, D. A. and Martinez, R. (1976). Panhandling: Sharing of resources. *Science* 191: 406–408.
- Loewenstein, G. (2000). Emotions in economic theory and economic behavior. *American Economic Review* 65: 426–432.
- Loewenstein, G., O'Donoghue, T. and Rabin, M. (2002). Projection bias in predicting future utility. Working Paper, University of California, Berkeley.
- Loewenstein, G., Weber, E. U., Hsee, C. K. and Welch, N. (2001). Risk as feelings. *Psychological Bulletin* 127: 267–286.
- Loomes, G. and Sugden, R. (1982). Regret theory: An alternative theory of rational choice under uncertainty. *Economic Journal* 92: 805–824.
- Luce, M. F., Payne, J. W. and Bettman, J. R. (1999). Emotional trade-off difficulty and choice. *Journal of Marketing Research* 36(2): 143–159.
- MacGregor, D. G. (2002). Imagery and financial judgment. *Journal of Psychology and Financial Markets* 3(1): 15–22.
- MacGregor, D. G., Slovic, P., Dreman, D. and Berry, M. (2000). Imagery, affect, and financial judgment. *Journal of Psychology and Financial Markets* 1(2): 104–110.
- Marchionatti, R. (1999). On Keynes' animal spirits. *Kyklos* 52(3): 415–439.
- Markowitz, H. (1952). Portfolio selection. *Journal of Finance* 7(1): 77–91.
- Mayo Clinic (2002). Seasonal affective disorder.

- Mehra, R. and Prescott, E. C. (1985). The equity premium puzzle. *Journal of Monetary Economics* 15: 145–161.
- Mehra, R. and Sah, R. (2002). Mood fluctuations, projection bias and volatility of equity prices. *Journal of Economic Dynamics and Control* 26: 869–887.
- Monk, T. H. and Aplin, L. C. (1980). Spring and autumn daylight saving time changes: Studies of adjustment in sleep timings, mood, and efficiency. *Ergonomics* 23(2): 167–178.
- Nofsinger, J. R. (2003). Social mood and financial economics. Working Paper, Washington State University.
- Oatley, K. and Jenkins, J. M. (1996). *Understanding Emotions*. Oxford: Blackwell Publishers.
- Palinkas, L. A. and Houseal, M. (2000). Stages of change in mood and behavior during a winter in Antarctica. *Environment and Behavior* 32(1): 128–141.
- Persinger, M. A. (1975). Lag responses in mood reports to changes in the weather matrix. *International Journal of Biometeorology* 19(2): 108–114.
- Peters, E. and Slovic, P. (1996). The role of affect and worldviews as orienting dispositions in the perception and acceptance of nuclear power. *Journal of Applied Social Psychology* 26: 1427–1453.
- Pinegar, J. M. (2002). Losing sleep at the market: Comment. *American Economic Review* 92(4): 1251–1256.
- Rind, B. (1996). Effects of beliefs about weather conditions on tipping. *Journal of Applied Social Psychology* 26(2): 137–147.
- Romer, P. M. (2000). Thinking and feeling. *American Economic Review* 90(2): 439–443.
- Rosenthal, N. E. (1998). *Winter Blues: Seasonal Affective Disorder: What it is and How to Overcome it*. London: Guilford Press.
- Rotton, J. and Kelly, I. W. (1985). Much ado about the full moon: A meta analysis of lunar-lunacy research. *Psychological Bulletin* 97: 286–306.
- Saunders, E. M. (1993). Stock prices and wall street weather. *American Economic Review* 83(5): 1337–1345.
- Schneider, F. W., Lesko, W. A. and Garrett, W. A. (1980). Helping behavior in hot, comfortable, and cold temperatures: A field study. *Environment and Behavior* 12(2): 231–240.
- Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In E. T. Higgins (ed.), *Handbook of Motivation and Cognition*, Vol. 2. New York: Guilford Press, pp. 527–561.
- Schwarz, N. and Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology* 45: 513–523.
- Schwarz, N. and Clore, G. L. (1988). How do I feel about it? The informative function of affective states. In J. Forgas (ed.), *Affect, Cognition, and Social Behavior*. Toronto: Hogrefe, pp. 44–62.
- Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance* 19(3): 425–442.
- Shefrin, H. (2001). Do investors expect higher returns from safer stocks than from riskier stocks? *Journal of Psychology and Financial Markets* 2: 176–181.
- Shiller, R. J. (1984). Stock prices and social dynamics. *Brookings Papers on Economic Activity* 2: 457–510.
- Shiller, R. J. (2000). Conversation, information, and herd behavior. *American Economic Review* 85: 181–185.
- Shleifer, A. (2000). *Inefficient Markets: An Introduction to Behavioral Finance*. Oxford: Oxford University Press.
- Simon, H. A. (1967). Motivational and emotional controls of cognition. *Psychological Review* 74: 29–39.
- Simon, H. A. (1983). *Reason in Human Affairs*. Stanford: Stanford University Press.
- Simon, H. A. (1987a). Behavioural economics. In P. Newman (ed.), *The New Palgrave: A Dictionary of Economics*, Vol. 1. London: Macmillan, pp. 221–225.

- Simon, H. A. (1987b). Satisficing. In P. Newman (ed.), *The New Palgrave: A Dictionary of Economics*, Vol. 4. London: Macmillan, pp. 243–245.
- Sloan, L. R. (1979). The function and impact of sports for fans: A review of theory and contemporary research. In J. H. Goldstein (ed.), *Sports, Games and Play*. Hillsdale, NJ: Erlbaum.
- Slovic, P. (1987). Perception of risk. *Science* 236: 280–285.
- Slovic, P. (2000). *The Perception of Risk*. London: Earthscan.
- Slovic, P., Finucane, M. L., Peters, E. and MacGregor, D. G. (2002). The affect heuristic. In D. Kahneman (ed.), *Heuristics and Biases: The Psychology of Intuitive Judgment*. Cambridge: Cambridge University Press.
- Thaler, R. H. (2000). From homo economicus to homo sapiens. *Journal of Economic Perspectives* 14(1): 133–141.
- Trombley, M. A. (1997). Stock prices and wall street weather: Additional evidence. *Quarterly Journal of Business and Economics* 36: 11–21.
- Young, M. A., Meaden, P. M., Fogg, L. F., Cherin, E. A. and Eastman, C. I. (1997). Which Environmental variables are related to the onset of seasonal affective disorder? *Journal of Abnormal Psychology* 106(4): 554–562.
- Yuan, K., Zheng, L. and Zhu, Q. (2001). Are investors moonstruck? Lunar phases and stock returns. Working Paper, University of Michigan and SSRN.com
- Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist* 35: 151–175.

