Review, Conceptual Analysis, and Account of Emotions in Financial Markets

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Abstract
We review the relatively scant research on emotions in financial markets including studies of effects of mood proxies on market performance, field studies measuring investors’ emotions, and laboratory studies of emotion influences on investor decision making. The review warrants the conclusion that emotion influences investors in financial markets, although additional research is needed to clarify the nature of these influences. We note a number of issues to be addressed in this research. One issue is lack of clarity in defining different emotion constructs. Our contribution is a classification of emotion-related phenomena drawing on basic emotion research. Another issue is lack of a general emotion account. We present a first step in this direction by showing how anticipatory and anticipated emotions may interact in accounting for naïve investors’ buy and sell preferences in asset markets. We argue that this is the level that needs to be examined to understand the influence of emotions on financial markets.

Key words: Emotion; Financial market; Naïve investor; Preference
Emotions in Financial Markets

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Emotions have historically played a minor role in decision-making research (Simon, 1983). About two decades ago this started to change (Lerner et al., 2015; Peters et al., 2006), importantly due to influences from the neuropsychological research by Damasio and collaborators (Damasio, 1994). We consider this to be a desirable development since, as argued by among others Forgas (1995), Loewenstein (1996), and Schwarz (2000), the influences of emotions on judgment and decision making are ubiquitous and not necessarily irrational. The same argument related to financial decision making is made by Pham (2007), Rick and Loewenstein (2008), and more recently Hirshleifer (2015). A recent empirical assessment of the important role of emotions in judgment (and by implication in decision making) is reported in Greifeneder et al. (2011). Empirical studies of influences of emotions on decision making are recently reviewed by Lerner et al. (2015) and Phelps, Lempert, and Sokol-Hessner (2014). Duxbury (2015) reviews the role of emotions in experimental studies of asset trading.

Our claim elaborated on below is that emotions are an invariant input to a deliberate investor decision-making process in financial markets, but that investors’ experience and sophistication override or moderate the impact of emotions. This complex interaction of emotion, cognition, and decision making at play in financial markets needs to be a focus of behavioral finance research if the aim is to understand heterogeneous investors’ behaviors.

In this paper we first review research on emotions in financial markets. Since this research tends to lack appropriate conceptualizations of emotions, in a following section we present a classification of emotion-related phenomena drawing on basic emotion research. A section then follows in which based on this classification we propose an emotion account of naïve investors’ buy and sell preferences in asset markets. A final section summarizes, concludes, and discusses future research directions.

Mood proxies and performance of financial markets

Although few would deny that emotions have some influence on judgment and decision making in financial markets, the market impacts may not be substantial (Mehra & Sah, 2002). Addressing this issue, several studies have attempted to empirically determine market impacts of mood proxies, that is, factors that are known or assumed to induce positive or negative mood.

In some early studies below-average returns in equity markets are shown to correlate with (1) cloudy weather possibly leading to a negative mood (Saunders, 1993; Hirshleifer & Shumway, 2003), (2) geomagnetic storms presumably causing depression (Krivelyova & Robotti, 2003), and (3) the full moon phase of the lunar cycle associated with depressed moods (Dichev & Janes, 2003; Yuan et al., 2006). Another reported finding is above-average returns associated with lower temperatures believed to increase aggressive risk-taking (Cao & Wei, 2005). Below-average returns due to season are also observed (Kamstra et al., 2003), presumably because daylight hours is shorter (“winter blues”). Other studies (Kamstra et al., 2000) have attempted to show negative effects of disruption in sleep patterns dependent on

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1These two studies use cloud cover at the local stock exchanges to examine whether the moods, and therefore trading behavior, of market professionals at or near the exchanges are affected by the weather. In contrast, given that a disproportionate volume of trade for Nasdaq stocks originates in the city where the company is based, Loughran and Schultz (2004) examine the relationship between stock returns and the cloud cover in the company’s city of listing. While they claim this is in general a better proxy for investors’ moods, they find little evidence of a relationship between cloud cover and stock returns.

2Keef and Khaled (2011) conclude from their data that while there is evidence of an enhanced new moon effect, there is little evidence of a depressed or negative full moon effect.
daylight savings time changes. Two studies in the UK (Dowling & Lucey, 2005, 2008) including several mood proxies related to weather and bio-rhythm replicated some of the previous results. The outcomes of international sporting events, a possible proxy for investor mood, are shown to correlate with stock market reactions (e.g. Ashton et al., 2003, 2011; Edmans et al., 2007). Kaplanski and Levy (2010) examine the impact on stock prices of investor fear and anxiety associated with emotionally charged media coverage of large-scale aviation disasters, which can be construed as an extreme mood proxy. They report an immediate and dramatic negative overreaction, followed by an almost complete price reversal.

In reviewing these and other findings published before 2005, Lucey and Dowling (2005) note that mood misattribution (Schwartz & Strack, 1999) is a possible causal mechanism. A criticism is still that mood proxies have been studied with little or no attempt to measure investors’ moods directly (but see experimental evidence in Bassi et al., 2013, reviewed below). This leaves such empirical studies open to the criticism that the reported results are explained by other factors. For example, Jacobsen and Masquering (2008, 2009) suggest that the findings reported in Kamstra et al. (2003) may be explained by a range of other factors related to the season (they illustrate with ice cream consumption and airline travel), thus calling into question Kamstra et al.’s conclusion that changes in investors’ moods associated with the Seasonal Affective Disorder (SAD) directly influence stock market returns. The findings in Kamstra et al. (2003) are also challenged by Gerlach (2010), who provides empirical evidence suggesting that their results may be driven by seasonal patterns in market-related information and not by changes in investor mood. In a comprehensive study of daylight saving time changes, Gregory-Allen et al. (2010) fail to find evidence to support Kamstra et al.’s (2000) hypothesis of an impact on stock returns by investor mood changes due to disrupted sleep patterns. The findings in Edmans et al. (2007) and Ashton et al. (2003, 2011), suggesting that the outcomes of international sporting events impact stock market returns, thus reflecting investor mood, have also been cast in doubt by studies re-examining their results using alternative statistical approaches (e.g. Fung et al., 2015; Klein et al., 2009).

Another criticism is that other measures of market performance than returns are needed to increase understanding of the role of emotions. A notable exception is the study by Symeonidis et al. (2010) examining the association between stock market volatility and mood-proxies related to the weather conditions (cloudiness, temperature, and precipitation) and night-time length. They report that cloudiness and night-time length are inversely related to various measures of volatility. Using account-level transaction data from Finland, Kaustia and Rantapuska (2015) examine the direct link between mood and investors’ propensity to buy or sell, as opposed to the aggregate market behavior examined in many prior studies. They report little effect of weather-related mood variables (of the three variables examined, sunniness, temperature, precipitation, only the latter is statistically significant) and little or contrary evidence in relation to the impact of SAD, with the length-of-day insignificant or wrongly signed. Strikingly, using standard regression models, Novy-Marx (2014) fails to reject the hypothesis that such factors as the party of the US President, the weather in Manhattan, global warming, El Niño, solar activity, and the planetary aspects have statistical power in predicting behavioral anomalies in the US markets. While acknowledging that readers may reject some of the findings on the grounds of plausibility (notably those in

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3In reviewing an extensive number of more recent studies in social psychology, Greifeneder et al. (2011) and Pham (2007) identify a number of moderators of the influences of mood on judgment and choice and argue that misattribution is not necessarily deviations from rationality depending on how it is defined.

4The debate over whether changes in investors’ moods associated with SAD influence stock market returns continues unabated (for a chronological development of the debate, see, e.g., Jacobsen & Marquering, 2009; Kamstra et al., 2009, 2012; Keef & Khaled, 2011b; Kelly & Meschke, 2010; Khaled and Keef, 2013, 2014) and only serves to highlight the problems associated with the use of indirect proxies of mood.
relation to El Niño, solar activity and the planetary aspects), Novy-Marx (2014) urges caution in this regard because such skepticism also casts doubt on the standard empirical methods adopted in the return predictability literature. Implicitly, the findings in Novy-Marx (2014) may be viewed as a further challenge to the evidence relating mood proxies, such as the weather and bio-rhythms, to stock market returns.

Another factor having emotional influence on prices in financial markets is investor sentiment (see early studies by DeLong et al., 1990; Lee et al., 1991). Investor sentiment may be caused by widespread moods in a society. Nofsinger (2005) and others refer to this as “social moods”, which are the outcomes of interpersonal communication. Examples include optimism, pessimism or hope about or fear of the future. In particular investors’ buy and sell decisions in asset markets may be influenced by such optimism or pessimism, as suggested by excessive price volatility (Shiller, 2003). Furthermore, speculative bubbles may be driven by optimism (Shiller, 2002). Similar to the caveats noted above, this research suffers from lack of measures of social moods. Yet, more recent studies begin to address such concerns. In one of the first studies of the influence of media content on stock prices based on quantitative content (textual) analysis, Tetlock (2007) examines the daily variation in the “mood” of the Wall Street Journal “Abreast of the Market” column by constructing a pessimism factor based on the categories of the Harvard Psychosocial Dictionary. Consistent with the DeLong et al. (1990), Tetlock (2007) reports evidence of high values of media pessimism exerting downward pressure on prices through short-term spikes in trading volume. Bollen et al. (2011) develop and cross-validate a measure of social mood based on recordings of daily twitter feeds. A high degree of predictability of changes in stock prices is observed. Another approach is exemplified by Bialkowski et al. (2012) who in 14 predominantly Muslim countries find that stock returns are higher and less volatile during the month of Ramadan, which is a significant social event when fasting is believed to have positive mood effects. While Al-Khazali (2014) reports similar results for a sample of 15 Muslim countries across a range of time periods, the effects disappear following the outbreak of the financial crisis in 2008. Gavrilidis et al. (2015) find that positive mood, including enhanced social interactions, associated with Ramadan translates into more herding compared to non-Ramadan days in a sample of seven predominantly Muslim countries.

Other potential causes of investment sentiment are proximate to the financial markets (market-related factors) or the economy (economy-related factors) (Shumway, 2010). Serving as an example of the influence of market-related factors, Baker and Wurgler (2007) construct a sentiment index based on financial market variables including the closed-end fund discount, market turnover, number of IPOs and associated first day returns, dividend premium, and equity share in new issues. Fisher and Statman (2003) serve as an example of economy-related factors by examining the relationship between consumer confidence survey responses and stock returns. Shumway (2010) notes the difficulty with sentiment-based research to disentangle the direction of causality between the observed sentiment measures and stock market returns.  

A number of empirical studies attempt to infer from market data the influences of emotions on investor decision making, as opposed to mood influencing the market as in the studies reviewed above. Strahilevitz et al. (2011), for example, note that investors are reluctant to repurchase stocks previously sold at a loss or that have risen in price following a prior sale. Drawing on Summers and Duxbury (2012), they suggest an emotion-based explanation of the behavior they observe related to counterfactual thinking and feelings of regret and disappointment. Using a unique dataset in which it is possible to distinguish between stocks

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5In contrast, the direction of causality between mood-proxies (e.g. weather conditions and biorhythms associated with daylight, seasons or lunar phases) and stock returns is unambiguous since stock returns do not cause changes in the mood-proxies.
that investors buy themselves and those they receive via inheritance or as gifts, Lehenkari (2012) finds that investors exhibit a lower tendency to hold losing stocks received via inheritance or as gifts than the losing stocks they bought themselves. While the observed behavior fits a regret-driven account of the tendency to hold losing stocks, the empirical approach in Lehenkari (2011) only entails observations of whether investors are responsible for the initial decision to buy, thus inferences need to be made about the emotions influencing their decision making. The importance of responsibility for the original purchase decision is further supported by Jin and Scherbina's (2011) finding that mutual fund managers taking over an old fund display a lower tendency to continue to hold stocks with poor returns than if they themselves have built up the fund.

Field studies of financial investors’ emotions

Other research attempts to investigate emotion effects by directly targeting investors’ responses. In semi-structured interviews of investors employed by four London investment banks, Fenton-O’Creevy et al. (2011) find that emotion and cognition are inextricably linked in the investors’ investment decisions. The issue they raise is therefore whether there are more or less effective strategies of regulating emotions. A possible answer is that high-performing investors regulate emotions better than low-performing investors, in particular by avoiding being unduly influenced by negative emotions. Experience also improves efficient emotion regulation. A related observation is that high-performing experienced investors are less influenced by (e.g., weather-related) mood not being relevant to their decisions.

In a pioneering study by Lo and Repin (2002), a broad battery of physiological emotion markers is applied to monitor emotions in ten professional investors during their regular trading activities. The measurements are correlated with real market data including several types of price changes identified in advance by the investors themselves to be in need of their attention. Emotion effects related to the price changes are observed compared to controls, larger in less than in more experienced investors but still present in the latter. A recognized problem is to infer the emotions’ influence on the trading decisions. In a subsequent study by Lo et al. (2005) asking trader trainees to provide self-reports of how they felt after each trading day, modest correlations are found between trading performance and emotion. In this study possible emotion influences on decisions would be observed on subsequent trading days, but any such influences are not reported.

Fenton-O’Creevy et al. (2012) obtain physiological emotion-marker data from 28 professional traders. The results support their previous interview data (Fenton-O’Creevy et al., 2011) in showing that experienced traders are less influenced by emotions. Consistent with the results of Lo and Repin (2002), high price volatility have large effects on emotions. These results are consistent with observed higher cortisol levels related to fear responses observed by Coates and Herbert (2008).

The reported studies are significant steps towards an increased understanding of the role of emotions in financial markets. Yet, the studies are merely empirical demonstrations. Hypotheses need to be derived from theory and tested in laboratory experiments.
Laboratory studies of emotion influences on financial investors

In laboratory studies complementing the research on effects of mood proxies, emotions are measured or induced in participants who perform an investment task. A general notion is that emotions may have both positive and negative effects on investment performance. Seo and Feldman Barret (2007) therefore distinguish between feelings that induce various biases in the decision-making process, for instance, that people in a positive mood make judgments congruent with their mood (Isen, 2000), and feelings that improve decision making, for instance, that people in a negative mood invest more effort in pre-choice information processing (Schwartz, 2000). In an empirical study, investment performance is found to be related to emotions measured by means of checklists of adjectives describing emotions that vary in both pleasure and activation (arousal) (Russell, 1980, 2003; Yik, Russell, & Steiger, 2011). On each of 20 trading days participants are asked to make simulated investment decisions and report their feelings, broadly defined as mood or discrete emotions directed towards an object. Higher emotional responsiveness is hypothesized and found to have positive effects on investment performance. A similar procedure is used by Au et al. (2003) to study foreign exchange trading. An important difference is that positive and negative moods are induced in different experimental groups. The results show that in a positive mood performance is worse and in a negative mood better than in a neutral mood. Similar results are obtained by Kuhnen and Knutson (2011) in a task designed to measure probability beliefs and risk-taking in repeated choices between a risky security and a riskless bond. A picture is shown before choices to induce a highly arousing positive, a highly arousing negative or a neutral mood. Less suboptimal risk-taking is observed following negative pictures compared to positive or neutral pictures.

Bassi et al. (2013) provide direct experimental evidence of a link between weather, mood, and risk-taking in financial decisions. In the experiments they conduct, participants choose one lottery from a series of lottery pairs to construct a risk tolerance measure, and then they complete a questionnaire assessing mood, amongst other things, along with their subjective assessment of the weather conditions (also measured objectively). The nature of the experiments allows the isolation of the effect of weather on individual choices through changes in risk tolerance. Bassi et al. (2013) find that a positive mood (e.g. joviality, self-assurance, and attentiveness) is associated with good weather conditions and increased risk tolerance, thus providing direct experimental evidence of the impact of mood. Kramer and Weber (2012) provide further experimental evidence of mood impacting risk taking. In a survey of faculty and staff at a large North American university, participants complete a number of personality measures, including an accepted seasonal pattern assessment questionnaire to serve as a diagnostic measure of SAD, along with a task to measure their willingness to accept financial risk. They conduct the survey in three waves (summer-winter-summer) and compare the responses of SAD and non-SAD participants in all waves. Consistent with the SAD hypothesis they find lower risk seeking by SAD-suffers in winter than non-SAD-suffers and a significant interaction between SAD and season. Jointly, the findings in Bassi et al. (2013) and Kramer and Weber (2012) offer direct support for that weather or seasonal induced changes in mood impact risk aversion and thus stock prices, as advocated in a number of empirical asset pricing studies for which only indirect support is provided (e.g. Hirshleifer and Shumway, 2003; Kamstra et al., 2003).

Tsai and Young (2010) investigate the impact of fear and anger in financial decisions and other types of decisions in which escalation of commitment plays a role. In a two-stage

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6Escalation of commitment or the sunk cost effect refers to the irrational tendency observed in many studies to continue to invest in a failing course of action (see Karlsson, Juliusson, & Gärling, 2005, for a review).
experiment, fear and anger are induced via a recall task before a financial-based escalation-of-commitment task is completed. The induced emotions are similar to mood since they are not in a specific way related to the task. They find that fear promotes a higher risk perception and reduced tendency to escalate than is observed for anger. Lee and Andrade (2011) investigate the impact of non-specific fear on selling behavior in experimental financial markets and find a tendency for participants to sell their stock earlier when fear is induced than in control conditions where it is not. Lee and Andrade (2015) examine conditions in which non-specific fear may promote or discourage risk taking. Fear and excitement share two emotional components (high arousal and high uncertainty), but fear has a negative valence (promoting risk aversion) and excitement a positive valence (promoting risk seeking). Hence, if what is scary can become exciting, then changes in risk taking driven by fear or excitement may prompt changes in financial behavior. Lee and Andrade (2015) induce fear and then ask participants to make financial decisions in a task framed either as a stock market investment or a casino-based gamble. Their results suggest that fear promotes risk-averse behavior in the investment task, but encourages risk taking in the gambling task, implying a different response between traders excited by stock market investing and those not. Andrade et al. (2015) examine the role of emotions in stock market bubbles and crashes. By inducing emotions via video clips, they likewise focus on non-specific emotions. They find that excitement is associated with larger bubbles, while fear does not appear to play a strong role.

A number of additional studies examine experimentally the impact of choice-related emotions in financial decision making. By observing facial expressions Nguyen and Noussair (2014) observe participants’ emotional responses during a risky choice task, hence they are able to examine choice-related emotions, and in particular choice-related fear. They find, among other things, a strong correlation between the level of fear experienced in a risky choice and the extent of risk-aversion in subsequent choices. Also observing facial expressions, Breaban and Noussair (2013) examine the influence of emotions on trading in asset markets known to induce bubbles and crashes. In heightened positive emotional states participants buy more during a boom, while during a crash there is a strong relationship between anger and magnitude of loss, with fear strongly correlated with loss aversion. They provide evidence, therefore, that choice-related emotions play important roles in the irrational exuberance that drives bubbles and crashes.

Laboratory studies have also attempted to examine investor sentiment. Bosman and Van Winden (2010) designed an experiment to simulate influences of social moods, fear due to international terrorism or political risks that may nourish aversion to risky investments. In repeated trials participants either choose or did not choose a risky option. After each choice they rate how they felt on scales defined by emotion words. In a “global risk” condition subsequent to the base-line condition, participants are told that they with some probability at the end would lose what they earn. In this condition compared to the base-line condition, choices of the risky option are on average lower. It is also found that amount invested is related to rated fear but no difference between the “global risk” and base-line conditions.

Social moods may in a society and in subgroups such as investors induce positive or negative attitudes towards industrial sectors, for instance, information technology or specific companies listed on stock markets. An investment option associated with a positive or negative affect-laden evaluation may when other information is unavailable or inaccessible influence choice of the option. Slovic et al. (2002) refer to this as the affect heuristic. In a pioneering study (MacGregor et al., 2000) it is shown that positive affect images associated with industrial sectors influence banking students’ simulated investments such that the subsequent financial outcomes are worse. In a similar study of a sample of business and
economics undergraduates, Kempf et al. (2013) find that if attitudes towards companies rated on adjective scales are classified as positive, returns on stocks in these companies are rated high and risk low. In contrast, if the attitudes are classified as negative, returns are rated low and risk high. Financial literacy reduces the difference, thus implying a more accurate rating consistent with that return and risk are in general positively correlated. Suggesting that time pressure may have negative impacts on professional investors, Finucane et al. (2000) find that a positive correlation between rated returns and risk is less positive under time pressure than under no time pressure.

A study attempting to show individual differences in response to positive and negative price shocks are reported by Muehlfield et al. (2013). Their hypothesis is that investors differ depending on the relative impact of two different motivational systems (Gray, 1987), the Behavioral Approach System (BAS) and the Behavioral Inhibition System (BIS). Investors high in BAS (as measured by the BAS/BIS self-report scale developed by Carver and White, 1994) should emphasize the upside of price movements, people high in BIS should in contrast emphasize the downside. Shocks are expected to exaggerate these differences. An asset–market experiment employing undergraduates shows that irrespectively of shock, high BAS compared to high BIS participants trade more actively, are more risk taking and, except when the shock is negative, generate higher profits. Positive shocks “unfreeze” participants high in BIS who start to trade more and take more risk.

In order to further increase the understanding of the role of emotions in financial markets, still another approach (see Dowling & Lucey, 2005; Gärling, 2011) is to identify the role emotions play for observed anomalies in financial markets. One of the most well-documented and robust anomalies is the disposition effect referring to the observation that winners are held too short and losers too long (Shefrin & Statman, 1985). In explaining the disposition effect, Odean (1998), Shefrin and Statman (1985), and Weber and Camerer (1998) all draw on prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). A necessary auxiliary hypothesis is that of realization utility (Barberis & Xiong, 2012), that is, that the utility of gains and disutility of potential (paper) losses are derived from realizing the outcome. Frydman et al. (2014) conducted a test of this hypothesis in an experimental market with an unspecified group of 28 participants. For the average participant the results conclusively demonstrated the disposition effect. Evidence in support of the realization utility hypothesis was obtained from brain-scanning (functional magnetic resonance imaging or fMRI) data showing that at the moment of making a sell decision, neural activity in the brain is proportional to the capital gain. Similar results for losses are however not found. In a similar study, Frydman and Camerer (2015) report results based on neural data and experimental trading data that are consistent with a regret-based explanation of the repurchase behavior observed in Strahilevitz et al. (2011). In addition, they report significant correlations across participants both between measures of the disposition effect and repurchase effect and between the neural signals that stimulate them, to support the view that such behaviors are driven by a common mechanism. It may however be asked whether the observed neural activity corresponds to emotions. Related studies by Kuhnen and Knutson (2005) and Knutson et al. (2008) suggest it does.

Summers and Duxbury (2012) also investigate the role of emotion in accounting for the disposition effect. They do this in experiments examining whether sell versus hold decisions in one period are influenced by the outcome (a potential gain or loss) experienced in the preceding period and its associated self-reported emotions. No responsibility for the decision to hold the risky asset in the first period leads to disappointment due to a loss outcome and elation due to a gain outcome, while responsibility additionally leads to regret due to the loss and rejoicing due to the gain outcome. It is concluded that regret is necessary to drive
investors to continue holding losing shares, while elation is necessary to cause investors to sell winning shares.

A Classification of Emotions

In this section we present a classification of emotion-related phenomena by drawing on basic emotion research (Phelps et al., 2014; Rick & Loewenstein, 2008; Västfjäll & Slovic, 2013). Emotions may be experienced as a consequence of the outcome of a choice. Emotions may also precede and influence a choice. We introduce three related, less inclusive distinctions; evaluations versus emotions, incidental versus integral emotions, and anticipatory versus anticipated emotions.

Evaluations versus emotions

An outcome of a choice is normally perceived to have an affective quality (e.g., good, bad or neutral) (Russell, 2003). We refer to this as an evaluation of the choice outcome, which may be related to but is distinct from an emotional response to the choice outcome. Thus, an evaluation as bad or good does not necessarily elicit an emotional response. According to several emotion theories (e.g., Carver & Scheier, 1990; Lazarus, 1991; Oatley, 2009), this will occur if and only if the outcome has personal relevance, for instance if it is perceived to facilitate attainment of a personally positive consequence or prevent the occurrence of a personally negative consequence.

In what follows we draw on the psychological construction theory of emotions proposed by Russell (2003, 2014). This theory posits that core affects are elemental building blocks involved in all emotional responses or states. More precisely, a core affect is a “neurophysiological state consciously accessible as the simplest raw (nonreflective) feelings evident in moods and emotions” (p. 148). Core affects are always consciously accessible, either being neutral or having any other value in a dimensional system defined by the orthogonal axis pleasure-displeasure and activation-deactivation. Several different methods to measure core affects (self-reports, peripheral physiology, startle responses, face expressions measured as electric muscle potentials [electromyography or EMG] or classified from video recordings by means of automated pattern recognition systems, and measures of brain activity including electrophysiological methods such as electroencephalogram [EEG], neuro-imaging with fMRI or positron emission tomography [PET]) support a dimensional description although all the methods do not converge on the two dimensions of pleasure and activation (or arousal) (Mauss & Robinson, 2009). Approach-avoidance has been proposed to be a third dimension. Yet, this dimension is a function of valence and activation (Mehrabian & Russell, 1974; Västfjäll et al., 2001). Another criticism (e.g. Lazarus, 1991; Lerner et al., 2015) is that emotions are discrete. A counter-argument is that discrete emotions may be conceptualized as combinations of multiple dimensions. Figure 1 displays the two-dimensional system of pleasure-displeasure and activation-deactivation referred to as the affect grid (Russell, 1980; Yik et al., 2011). Discrete emotions are located along the periphery of the circle. Direct corroborations by neuro-imaging data are reported in Posner et al. (2009) and Wilson-Mendenhall et al. (2013).

Incidental versus integral emotions

An unrelated emotion state such as mood affecting a choice is considered to be incidental because it is nominally unrelated to the choice. It may still affect pre-choice information processing (Isen, 2000; Schwartz, 2000; Schwartz & Strack, 1999). Whereas mood is an incidental emotion, an emotional response to a choice outcome is an integral emotion. The distinction between emotional responses and mood is however ambiguous to lay people and researchers alike (Beedie, Terry, & Lane, 2005). Language is also a fallible source for making the distinction. The similarity of emotional responses and mood is consistent with Russell’s
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(2003) claim that mood is a prolonged core affect, also emphasizing that moods are less transient than emotional responses. Emotional responses are furthermore frequently stronger, thus would more likely occupy the conscious focus with mood residing in the background (Lazarus, 1991). Gärling et al. (2016b) argue that emotional responses frequently result in changes in mood that linger after that the transient changes caused by the emotional responses dissipate. A good-bad evaluation of a personally relevant experienced choice outcome is thus likely to elicit an emotional response, which to some degree changes mood in a positive or negative direction.

The bulk of emotion research in financial markets (e.g., Lucey & Dowling, 2005) appears to target incidental mood effects. If recognizing that emotional responses to choice outcomes change mood (Gärling et al., 2016b), mood effects are however not necessarily unrelated to choices. Field studies of trading in asset markets (e.g. Fenton-O’Creevy et al., 2012; Lo & Repin, 2002; Nguyen & Noussair, 2014; Seo & Feldman Barret, 2007) probably measure emotional responses to choice outcomes as well as lingering mood changes due to the emotional responses. In the following we refer to mood as anticipatory emotions if attributed to the choice outcomes that elicit the emotional responses.

**Anticipatory versus anticipated emotions**

Anticipatory emotions are associated with an unspecific event or series of events when people think about what may happen in the future. In the context of financial outcomes hope of earning and fear of losing would qualify (Lopes, 1987). Investor sentiment of optimism and pessimism are similar anticipatory emotions recognized in financial markets (Nofsinger, 2005; Tetlock, 2007). In the neuropsychological research by Bechara & Damasio (2005), the Iowa Gambling Task is used to investigate choices between sequences of choices (decks of cards) that either are associated with a higher volatility due to higher frequencies of large losses and gains or sequences of choices associated with lower volatility due to lower frequencies of large losses and gains. Anticipatory fear indexed by a physiological marker, such as the skin conductance response, is more strongly influenced by choices of the former choice sequences than by the latter choice sequences. A demonstration in an investment context is reported by Shiv et al. (2005).

Anticipatory emotions differ from anticipated emotions. In contrast to the former, anticipated emotions are associated with specific choice outcomes (Loewenstein et al., 2001; Mellers, 2000), for instance the degree of anticipated elation that may vary with the size of gains or the degree of anticipated disappointment that may vary with the size of losses. Anticipatory and anticipated emotions may furthermore differ in quality, in our emotion account to be described next, anticipatory hope and fear versus anticipated elation and disappointment. Anticipatory emotions are felt, whereas anticipated emotions are cognitive representations that are activated in the pre-choice process. Yet, both have been shown to share the same conscious elements of core affects (Västfjäll et al., 2004).

**Emotion Account of Buy and Sell Preferences**

**Theoretical propositions**

In this section we present an emotion account of buy and sell preferences in asset markets drawing on the distinction in the preceding section between anticipatory and anticipated emotions. We specifically propose that investor decision making is influenced by (1) price movements changing anticipatory emotions of hope of earning money and fear of losing

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7Note that Rick and Loewenstein’s (2008) “immediate emotions” is similar to what we refer to as anticipatory emotions.

8Gärling, Blomman, and Carle (2016) derive equations consistent with the emotion account presented here. Their aim is to show how the disposition effect may be explained.
money (Lopes, 1987; Nofsinger, 2005; Shefrin and Statman, 2000), and (2) price movements changing anticipated emotions of elation associated with choices to realize gains and anticipated disappointment associated with choices to realize losses (Loewenstein et al., 2001; Mellers, 2000). We do not rule out incidental mood influences but assume these are either less important or mediated by anticipatory emotions.

We further propose that hope-fear varies along an axis at a 30-degree angle to the main axes in the affect grid (see Figure 2), whereas elation-disappointment varies along an axis at a 30-degree angle to the hope-fear axis. When moving from one end-point to the other end-point on the continuum, hope increases at the same rate as fear decreases, or the reverse, such that Hope = −Fear. Likewise, when elation increases, disappointment decreases at the same rate, or the reverse, such that Elation = −Disappointment.

When the price of a single asset increases above its purchase price, we hypothesize that anticipatory hope and anticipated elation increase and anticipated disappointment decrease linearly at the same rates. Conversely, when the price decreases below the purchase price, anticipatory hope and anticipated elation decrease and anticipated disappointment increases linearly at the same rates. In contrast, anticipatory fear decreases linearly at a lower rate above the purchase price and increases linearly at a higher rate below the purchase price. As the upper graph in Figure 3 shows, this results in that above the purchase price the balance (hope−fear) between anticipatory hope and fear increases at a lower rate than the balance (elation−disappointment) between anticipated elation and disappointment does, and that below the purchase price the balance between anticipatory hope and fear decreases at a higher rate than the balance between anticipated elation and disappointment does.

Our basic tenet is that the emotions changing with price movements determine preferences to buy or sell. Emotions may in this way influence all investors. Yet, preferences to buy or sell are only one input to a deliberate decision-making process resulting in buy or sell choices. In less experienced and sophisticated investors, the decision process is likely to be short-cut such that emotions play a larger role than they otherwise would do (Finucane et al., 2000; Kempf et al., 2013). Whether buy and sell preferences result in an actual choice also depends on the availability of buyers in the market.

Investors with anticipatory emotions of hope exceeding anticipatory emotions of fear may be attracted to purchase assets when price increases (Baker & Wurgler, 2007; Kubinska et al., 2012). Purchasing assets evokes anticipated feelings of elation moderated by anticipated feelings of disappointment. This is illustrated in the upper graph of Figure 3 for a single asset assuming some lag before anticipated elation exceeds anticipated disappointment. We propose that this is when a preference to buy is formed.

As shown in the lower graph of Figure 3, we further propose that a sell preference is proportional to how much the balance between anticipated elation and disappointment exceeds the balance between anticipatory hope and fear. This implies that sell preferences are positive both when the price increases (the elation-disappointment balance being more positive than the hope-fear balance) and when the price decreases (the elation-disappointment balance being less negative than the hope-fear balance). Even though anticipatory hope exceeds anticipatory fear, a stronger anticipated elation exceeding anticipated disappointment is preferred, and, conversely, a stronger anticipated disappointment exceeding anticipated elation is preferred to a stronger anticipatory fear exceeding anticipatory hope.¹⁰

¹⁰Västfjäll and Gärling (2006) show empirically that when being of equal strength positive emotions high in activation (e.g. elation) are preferred to positive emotions low in activation (e.g. hope), whereas negative emotions low in activation (e.g. disappointment) are preferred to negative emotions high in activation (e.g. fear).
**Experiment**

Tentative support for the emotion account is obtained in an experiment that we conducted to investigate sell preferences in a fictitious stock market. Undergraduates with limited knowledge of stock markets were chosen as participants because, in a stock investment context, they are likely to be more influenced by emotions than professional investors are. We test the hypotheses presented in Table 1 (see also Figure 3) that for price increases the sell preference changes from negative to positive when the positive balance between anticipated elation and anticipated disappointment exceeds the positive balance between anticipatory hope and anticipatory fear, and that for price decreases the sell preference changes from negative to positive when the negative balance between anticipated elation and anticipated disappointment is less negative than the negative balance between anticipatory hope and anticipatory fear.

<table>
<thead>
<tr>
<th>Holding stocks</th>
<th>Price decrease</th>
<th>Price increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elation – Disappointment &lt; Hope – Fear &lt; 0</td>
<td>0 &lt; Elation – Disappointment &lt; Hope – Fear</td>
<td>Sell preference &lt; 0</td>
</tr>
<tr>
<td>Sell preference &lt; 0</td>
<td>Sell preference &lt; 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selling stocks</th>
<th>Price decrease</th>
<th>Price increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 &gt; Elation – Disappointment &gt; Hope – Fear</td>
<td>Elation – Disappointment &gt; Hope – Fear &gt; 0</td>
<td>Sell preference &gt; 0</td>
</tr>
<tr>
<td>Sell preference &gt; 0</td>
<td>Sell preference &gt; 0</td>
<td></td>
</tr>
</tbody>
</table>

*Sell preference = Elation – Disappointment – Hope – Fear

Undergraduates at University of Gothenburg are recruited from a pool of psychology students volunteering to participate in research studies. In e-mails they are asked to access a web address to participate in an on-line experiment investigating how people feel when trading in the stock market. When accessing the web address participants receive instructions to imagine that they have inherited a sum of money for which they purchase 1,000 stocks at the price of SEK 250 (about USD 24.0) in a successful company and that they want to sell to earn a profit or avoid losing when the price changes. In order to motivate participants to respond promptly and to exert maximal effort, five participants selling at the highest price among those ten participants who first finish the experiment are promised a gift certificate for a cinema ticket worth approximately USD 10.

Participants are presented the opening prices of the purchased stock on each of 5 days of the first week, then also the opening prices on each of 5 days the second week, and so forth until the 10th week or the week they sell. One group is presented increasing opening prices \((250 + (\text{Day} + 5(\text{Week} - 1)) + \text{normally distributed random numbers})\), representing a normal price development in the Swedish stock market at the time of the study, another group are presented decreasing opening prices \((250 - 2(\text{increasing price} - 250))\) that incur losses. When presented the opening prices for a new week, participants rate on two 0-to-10 numerical scales how strongly they hope the price will increase and how strongly they fear the price will decrease. Thereafter, they rate on two other 0-to-10 numerical scales how strongly they anticipate to feel elated and how strongly they anticipate to feel disappointed if selling at the opening price the last day. Finally, they indicate whether or not they would sell at that price. If they choose to sell they are asked to answer a few questions, thanked, and debriefed.

The goal in each condition is to obtain data for 30 participants who sell after the first week and not later than the last week. In the condition with increasing prices the criterion was fulfilled by 35 participants (25 women, mean age 26.63 and Sd = 7.35) out of 70 and in the condition with decreasing prices by 38 participants (20 women, mean age 25.63 and Sd =

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11A full report is found in Gärling et al. (2016).

12Price decreases are chosen to be twice as large as price increases since we expect the disposition effect to make sell preferences increase at a lower rate (Gärling, Blomman, & Carle, 2016a).
6.04) out of 88. Replies to questions after having finished indicated that 40 (54.8%) do not own stocks or stock fund shares, that 48 (65.8%) never inform themselves about the stock market, that self-reported knowledge of stocks and stock markets is low (mean rating 1.43 and Sd = 1.26 on a 1-to-5 scale), and that willingness to take investment risk is low (mean rating 2.14 and Sd = 1.26 on a 1-to-5 scale).

In the condition with price decrease the average week of selling is 4.40 (Sd= 2.39), in the condition with a price increase the average week of selling is 5.29 (Sd = 2.45). Table 2 shows means of the ratings across all participants the week before they sell and the week they sell. As tested by one-sample t-tests, all the mean differences (the hope-fear balance and the elation-disappointment balance) are as expected significantly different from 0 with the right sign. As expected when the price decreases, the hope-fear balance is more negative than the elation-disappointment balance the week before selling than the week of selling. In a paired-sample t-test the difference (the sell preference) is significant, t(37) = 3.31, p = .002. Thus, as expected the sell preference is negative and significantly different from 0 the week before selling and increases significantly but is not significantly different from 0 the week of selling.

An unexpected finding in the condition with price increase is that some participants rated that fear increases. This resulted in mean sums significantly higher than 10 (the expected sum of complementary ratings) and no increase of the hope-fear balance from the week before selling to the week of selling. Due to the increase of the elation-disappointment balance the sell preference increases despite being significantly larger than 0 both the week before selling and the week of selling. If assuming that the fear ratings are complementary to the hope ratings (the hope-fear balance = the rating of hope – [10 – the rating of hope]), the hope-fear balance is 4.54 the week before selling and 4.80 the week of selling. Since the hope-fear balance is then more positive than the elation-disappointment balance the week before selling than the week of selling, the sell preference is as expected negative (-0.11) the week before selling and positive (1.23) the week of selling. A paired-sample t-test shows that the increase in sell preference is significant, t(34) = 2.50, p = .017, although in an one-sample t-test only in the week of selling the sell preference differs significantly from 0.

Table 2. Means (M) and standard deviations (Sd) of emotion ratings the week before selling and the week of selling for price increase and price decrease.

<table>
<thead>
<tr>
<th></th>
<th>Price decrease (n = 38)</th>
<th>Price increase (n = 35)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week before selling</td>
<td>Week of selling</td>
</tr>
<tr>
<td></td>
<td>M (Sd)</td>
<td>M (Sd)</td>
</tr>
<tr>
<td>Hope</td>
<td>2.87 (2.18)</td>
<td>1.58 (1.67)</td>
</tr>
<tr>
<td>Fear</td>
<td>6.87 (2.17)</td>
<td>7.68 (2.12)</td>
</tr>
<tr>
<td>Mean sum</td>
<td>9.74 (2.84)</td>
<td>9.26 (2.05)</td>
</tr>
<tr>
<td>Mean difference</td>
<td>-4.00*** (3.30)</td>
<td>-6.10*** (3.22)</td>
</tr>
<tr>
<td>Elation</td>
<td>1.89 (2.01)</td>
<td>1.66 (2.16)</td>
</tr>
<tr>
<td>Disappointment</td>
<td>7.21 (2.07)</td>
<td>7.68 (2.55)</td>
</tr>
<tr>
<td>Mean sum</td>
<td>9.10 (1.69)</td>
<td>9.34 (1.88)</td>
</tr>
<tr>
<td>Mean difference</td>
<td>-5.32*** (3.71)</td>
<td>-6.03*** (4.33)</td>
</tr>
<tr>
<td>Sell preference</td>
<td>-1.32** (2.62)</td>
<td>0.07 (2.69)</td>
</tr>
</tbody>
</table>

*p<.05  ** p<.01  ***p<.001  *Sell preference = Elation – Disappointment –Hope – Fear

The difference in week of selling is significant in an independent-samples t-test (t = 9.37, p < .001) and suggests that the disposition effect (selling winning stocks earlier than losing stocks) is not compensated by the twice as large change of the increasing price as the decreasing price. In previous research a measure of the disposition effect developed by Odean (1998) is the ratio of the number of sold winners to the number of sold losers. This ratio is on average about 50% (Kaustia, 2010). A comparable estimate from our data (Gärling et al., 2016) is that proportionally 25.9% (51/70 versus 51/88) more winning stocks than losing stocks are sold in the allotted time span of 10 weeks. If the rate of change had been the same for increasing and decreasing prices, this percentage would likely have been closer to 50%.
Summary, Conclusions, and Future Research Directions

Review

Our review warrants the conclusion that emotions influence investors in financial markets although additional research is needed to clarify the nature of these influences. In future research a number of issues should be addressed. One is lack of clarity in defining different emotion constructs. We highlight several useful distinctions. One seemingly overlooked is that between evaluation and emotion. The argument is that it cannot be taken for granted that investors in financial markets respond emotionally unless they have some personal involvement. The counter-argument is that gains or losses of money always have personal relevance. Yet, there are other conditions (e.g., responsibility, see Summers & Duxbury, 2012) which for at least some investors increase personal relevance and therefore more likely result in emotional responses. It may be rewarding in future research to attempt to identify additional factors related to personal relevance such as liquidity constraints, being a private or professional investor, or being a trader or investor.

Another distinction is that between different types of emotions (Rick & Loewenstein, 2008; Västfjäll & Slovic, 2013). First, it is necessary to establish whether emotions influence choice instead of being a response to the outcome of a choice. Second, it needs to be specified whether mood, anticipatory emotions or anticipated emotions are investigated. Knowledge of how these types of emotions interact is essential for identifying antecedent conditions and thus for advancing theory. As have been noted (Fenton-O’Creevy et al., 2011; Seo & Feldman Barret, 2007), adaptive emotion regulation appears to increase with investor experience and sophistication. Further studies should clarify whether this is because of weaker emotional responses, weaker influences of emotions on pre-choice information processing, or weaker influences on mood. Our distinction between types of emotions is a useful starting point.

Some recent finance research appears to exclusively rely on physiological markers. It may then be difficult to claim that emotion is studied (Russell, 2014; Volz & Hertwig, 2016). Self-reports of emotions are important to provide converging evidence (Mauss & Robinson, 2009; Posner at al., 2009; Wilson-Mendenhall et al., 2013).

We finally review research that tests emotion explanations of observed anomalies in financial markets. Although such research promises to more accurately identify the role of emotions in investor decision making that is irrational, an unfortunate implication is that emotions are solely associated with irrational behavior. As Loewenstein (1996) notes, such an association may only be true of extreme emotions. We argue that emotions are input to all personally relevant decisions but that in varying degrees cognitive factors control their influences (Slovic et al., 2002). In this spirit we propose a more general emotion account of buy and sell preferences in asset markets.

Emotion Account

We draw on our distinction between anticipatory and anticipated emotions in proposing how their interaction may account for buy and sell preferences in asset markets. We argue that this is the level that needs to be examined to understand the influence of emotions on investors’ behavior although not undermining the value of analyses of market consequences. As an example of this, Gärling et al. (2016a) in a companion paper showed how the emotion account may explain the disposition effect in less sophisticated investors (who may be main drivers of the effect) and how stock prices are influenced. In order to understand market consequences, it is still essential to recognize that investors are heterogeneous (Hirshleifer, 2015), varying in characteristics that moderate emotion influences. In our emotion account we propose that emotions are input to deliberate judgment and decision making by experienced and sophisticated investors that eventually result in buy or sell choices primarily influenced by information rather than emotions. For less experienced and sophisticated investors, we claim that the cognitive processes are short-cut such that emotions play a decisive role.
The main tenet of the emotion account is that buy and sell preferences depend on price movements that (1) change anticipatory emotions of hope of earning and fear of losing money, and (2) change anticipated emotions of elation associated with decisions to realize gains and anticipated disappointment associated with decisions to realize losses. Sell and buy preferences are proposed to be influenced by differences in strength between the anticipatory emotions (the hope-fear balance) and the anticipated emotions (the elation-disappointment balance) (see Figure 3).

Support for the proposed emotion influences is obtained in a laboratory experiment. In this experiment we investigate how undergraduate students with limited knowledge of stock markets rate anticipatory and anticipated emotions when a stock price increases or decreases and how their sell preferences change accordingly. An unexpected finding is an asymmetry of how fear varies with price increases and decreases. We find that fear as well as hope, for some participants, increases when price increases, whereas fear increases and hope decreases when price decreases. One possible explanation is that price volatility influences anticipatory fear of losing more than it influences anticipatory hope of gaining. In a study by Dolansky and Vandenbosch (2012) of the mediating effect of perceptions of variance on ascending or descending sequence preferences, an increasing sequence is judged to be less variable than a decreasing sequence with identical variance, thus suggesting an impact of perceptions of stock price volatility such that decreasing prices are perceived as more volatile. How price volatility affects fear and hope is clearly an important issue in further developing the emotion account.

Apart from that it is necessary to extend the empirical basis for the emotion account by additional empirical studies, there are several lines of conceptual development that are desirable. A basic assumption is that some emotions are preferred to other emotions (anticipated elation preferred to anticipatory hope and anticipated disappointment preferred to anticipatory fear) when being of equal or higher strength. Empirical support is obtained by Västfjäll and Gärling (2006). Yet, situation-specific moods may influence the preference order. An example is the moderating effects of influences of incidental fear on sell decisions demonstrated in a simulated stock market by Lee and Andrade (2011). An additional incentive to investigate how incidental mood moderates our proposed emotional determinants of buy and sell preferences is that the bulk of finance studies have examined effects of mood-proxies. Inducing different moods (e.g., Andrade, Odean, & Shengle, 2012) or measuring mood (Breban & Noussaire, 2013) before asking stock-selling participants to rate their anticipatory and anticipated emotions would shed light on the issue. It would also be a valuable way of increasing a general understanding of how incidental emotions interact with integral emotions.

Another issue concerns the interaction between anticipatory and anticipated emotions. The former is a proper emotion, whereas the latter is a cognitive representation of an emotion. Although sharing the same conscious elements of core affects (Västfjäll et al., 2004), anticipated emotions are possibly more easily controlled than anticipatory emotions. This may then partly account for why experience and sophistication seems to lead to less emotion influences.

Acknowledgements

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References


Dolansky & Vandenbosch (2012)


Figure Captions

Figure 1. The dimensional description (referred to as the affect grid) of core affects (Russell, 1980; Yik et al., 2011).

Figure 2. The hypothetical representation of anticipatory hope-fear and anticipated elation-disappointment in the affect grid shown in Figure 2.

Figure 3. The hypothetical relations of the hope-fear and elation-disappointment balance to increases and decreases of a stock price from the purchase price (upper graph), and the resulting changes in buy and sell preferences (lower graph).
Figure 1

Emotions in Financial Markets
Figure 2
Figure 3

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