

Forthcoming paper, please cite as:

Duxbury, D., Gärling, T., Gamble, A., and Klass, V., (2020). How Emotions Influence Behavior in Financial Markets: A Conceptual Analysis and Emotion-based Account of Buy-Sell Preferences. *European Journal of Finance*, forthcoming.

How Emotions Influence Behavior in Financial Markets: A Conceptual Analysis and Emotion-based Account of Buy-Sell Preferences

Darren Duxbury

Newcastle University Business School,

Newcastle University,

5 Barrack Road, Newcastle upon Tyne, NE1 4SE, UK

Tommy Gärling, Amelie Gamble, and Vian Klass

Department of Psychology and

Centre for Finance, School of Business, Economics, and Law,

University of Gothenburg

P.O. Box 500, SE-405 30 Göteborg, Sweden

How Emotions Influence Behavior in Financial Markets: A Conceptual Analysis and Emotion-based Account of Buy-Sell Preferences

Abstract

We develop a conceptual analysis and account of how emotions influence behavior in financial markets. To motivate our approach and to establish the need for such research, we first review the increasingly important literature on emotions in financial markets. While emotions influence investors in financial markets, there is a lack of precision concerning the exact nature of these influences. To remedy this, we identify and address a number of issues deriving from the current state of the finance literature. One issue concerns the lack of clarity in defining different emotion constructs. Another is the lack of a general emotion-based account of financial behavior. Our contribution is a classification of emotion-related phenomena and an emotion-based account of how anticipatory and anticipated emotions interact to determine investors' buy and sell preferences in asset markets. Preliminary experimental results support our emotion-based account.

Key words: Emotion; Financial market; Investor; Preference

JEL classification: G41

How Emotions Influence Behavior in Financial Markets: A Conceptual Analysis and Emotion-based Account of Buy-Sell Preferences

1. Introduction

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 (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 extension in decision making) is reported in Greifeneder et al. (2011). Empirical studies of the influence of emotions on general decision making are recently reviewed by Lerner et al. (2015) and Phelps et al. (2014). Reflecting the growing attention devoted to the role of emotions in general decision making, our interest is on the influence of emotions in financial markets.

The purpose of this paper is to develop a conceptual analysis and account of how emotions influence behavior in financial markets. Following a critical review of the finance literature examining emotions in financial markets, we present a classification of emotion-related phenomena by drawing on recent developments in emotion research. We identify three important distinctions; evaluations versus emotions, incidental versus integral emotions, and anticipatory versus anticipated emotions. Although these distinctions have theoretically clear definitions, they are frequently blurred in prior empirical studies of financial markets, thus limiting the insight afforded by such studies.

To establish the need for such research, we begin by reviewing briefly the existing research on emotions in financial markets, including studies of financial markets employing mood-based proxies, along with field and laboratory studies investigating individual investor behavior in financial markets. In doing so we extend Duxbury (2015), in which the role of emotions in experimental studies is reviewed, taking a wider and more critical perspective of the finance literature on emotions.¹ On concluding our review, we note a lack of appropriate

¹It is important to distinguish between mood and emotion; a distinction commonly blurred in the finance literature (Duxbury, 2015). Scherer's (1984) typology of affective states provides the following distinction; emotions are affective reactions that are felt intensely, but briefly, and that are triggered by an internal or external event (examples

conceptualizations of emotions in the finance literature. While relatively small, this is a growing body of research, both in volume and in importance, and it is imperative that the literature develops using appropriate and precise conceptualizations of emotions.

The second step in our approach is to establish a classification of emotion-related phenomena of potential importance in financial markets by drawing on “state of the art” emotion research in the psychology and decision research literatures. In this step, we suggest a distinction between the good-bad evaluations that investors make of the outcomes of their trading choices and the emotional responses of elation or disappointment that these evaluations may evoke. We further suggest that before making choices, investors may anticipate their emotional responses of elation or disappointment in response to the outcomes. They may also have anticipatory emotions of hope of earning money or fear of losing money in the future.

The third step in our approach is twin-pronged. First, we conceptualize an emotion-based account of investors’ buy and sell preferences in asset markets. Second, we design and implement an experiment to examine the influence of emotions on sell preferences in stock markets. We provide preliminary experimental evidence in support of our conceptualization and emotion-based account.

It is worth noting that our approach to the study of emotions influence in financial markets differs from that of Tuckett and Taffler (e.g. Tuckett and Taffler, 2008; Tuckett, 2009; Taffler, 2018, among others). Their work focuses largely on explaining the extremes of financial instability, specifically financial crises and stock market bubbles, through an examination of emotional sequence and unconscious phantasy (wishful fantasies). Their assertion is that in times of such high uncertainty, emotions become unconscious to protect investors from frustration, anxiety, guilt etc. Our work differs from Tuckett and Taffler in that we examine emotions under “normal” trading conditions, not the extremes of financial crises and stock market bubbles. As such our work complements that of Tuckett and Taffler, offering a conceptualization of emotions and their influence on financial markets under broader conditions. We believe the future development of emotion research in the finance literature would be best served if future

include; elation, fear), while, in contrast, moods are felt less intensely, but are of longer lasting duration, and often without apparent cause (examples include; cheerful, gloomy). In providing a definition of emotion, Elster (1998) notes that emotions have an intentional object, that is, “they are about something” (p.49), thus supporting Scherer’s (1984) distinction. In a similar vein, Rick and Loewenstein (2008) distinguish integral from incidental emotions, with the latter arising “from dispositional or situational sources objectively unrelated to the task at hand” (p.138); that is, moods, following Scherer’s (1984) typology. Throughout, we maintain the distinction between mood and emotion along these lines.

empirical studies adopt more precise conceptualizations of emotions. We hope the emotion-based account we propose here may act as a blueprint for future research in this arena.

The paper proceeds as follows. Section two reviews the literature on emotions in financial markets, including studies employing mood-based proxies, along with field and laboratory studies of individual investor behavior in financial markets. In section three we present our classification of emotion-related phenomena. Section four provides an emotion-based account of investors' buy and sell preferences in asset markets, offering both a theoretical conceptualization and preliminary experimental evidence. Section five summarizes, concludes, and discusses future research directions.

2. Emotions in Financial Markets

In this review, we start with research showing that emotions influence financial markets in ways in which they are not theoretically expected to be influenced. Although some of these findings, for instance influences of mood proxies, may be explained differently, it seems clear that emotion influences exist at the market level. Whether the influence on markets is due to the emotions of investors, is the question addressed next. Again, we find such influences account for the market effects and thus strengthen the conclusion that emotions have market influences. This leads to the question of why investors are influenced by emotions. In reviewing the previous research, we do not find any unified theoretical account. A useful approach in a few studies is to identify the role of emotions in explanations of known biases in investor decision making causing observed market anomalies. Drawing on contemporary theories of emotions, we note that prior research on emotions in financial markets lacks a conceptualization of emotions, that would otherwise clarify more precisely what is measured and how it relates to financial decision making.

2.1 MOOD PROXIES AND PERFORMANCE OF FINANCIAL MARKETS

A growing number of studies attempt to empirically determine the impact of various mood proxies, that is, factors that are known or assumed to induce positive or negative moods, on aggregate market performance. A number of early studies report that stock returns correlate with a broad range of mood proxies, including weather (Saunders, 1993; Hirshleifer and Shumway, 2003; Dowling and Lucey, 2005, 2008),² temperature (Cao and Wei, 2005), geomagnetic storms

²Such studies tend to use cloud cover at the local stock exchanges as a mood proxy. Using Nasdaq stocks, for which they claim cloud cover in the company's city of listing is a better mood proxy, Loughran and Schultz (2004) find little evidence of a relationship between cloud cover and stock returns.

(Krivelyova and Robotti, 2003), and lunar cycles (Dichev and Janes, 2003; Yuan et al., 2006).³ Seasonal Affective Disorder (SAD, or “winter blues”) has been shown to impact stock returns (Kamstra et al., 2003), as has disruption in sleep patterns due to daylight savings time changes (Kamstra et al., 2000). Dowling and Lucey (2005, 2008) replicate findings elsewhere for several mood proxies related to weather and bio-rhythm in the UK. Other mood proxies seen to impact stock returns include the outcomes of international (Ashton et al., 2003, 2011; Edmans et al., 2007) and local sporting events (Sakkas and Urquhart, 2017). Other studies employ air pollution as a mood proxy, linking, to varying degrees, poor air quality (associated with negative mood) with a negative impact on stock returns, turnover and volatility (Levy and Yagil, 2011; An et al., 2018; Wu et al., 2018). Fear and anxiety, proxied by emotionally charged media coverage of aviation disasters, have been associated with a dramatic negative overreaction, followed by a price reversal (e.g. Kaplanski and Levy, 2010). Elsewhere, commodity-specific market emotions, computed based on textual analysis newswires, internet news sources and social media, capturing market-level sentiments and emotions (optimism, fear and joy), influence individual commodity (e.g. crude oil, gold) returns, but not market index returns (Shen et al., 2017). Using US data from the University of Michigan’s Health and Retirement Study, Lim and Kim (2019) examine the impact of anxiety (using two instrumental variables; traumatic experiences before age 18 and exogenous traumatic experiences, e.g. natural disasters) on stock market participation. They suggest that anxiety, shaped by early life experiences and exogenous traumatic experiences, influences household stock market participation and portfolio choices.

While Lucey and Dowling (2005) note that mood misattribution (Schwartz and Strack, 1999)⁴ is a possible causal mechanism at play, a criticism of the extant literature is 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, and Kramer and Weber, 2012, reviewed below). This leaves such empirical studies open to the criticism that the reported results might be spurious and hence explained by other factors. For example, the evidence relating SAD to market returns in Kamstra et al. (2003) has been challenged by Jacobsen and Masquering (2008, 2009), who suggest it may be explained by a range of non-mood factors related to the season (e.g. ice cream consumption, airline travel) and by Gerlach (2010), who suggest that seasonal patterns in market-related information may explain the SAD-return relationship. Elsewhere, Gregory-Allen et al.

³Keef 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.

⁴In reviewing an extensive number of more recent studies in social psychology, Greifeneder et al. (2011) and Pham (2007) identify a number of other moderators of the influences of mood on judgment and choice, arguing that misattribution is only one. They also argue that misattribution is not necessarily a deviation from rationality depending on how it is defined.

(2010) undertake a comprehensive study of daylight saving time changes and fail to find evidence in support of Kamstra et al. (2000). The debate in the literature over whether changes in investors' moods associated with SAD/daylight savings influence stock market returns continues unabated (for a chronological development of the debate, see, e.g., Jacobsen and Marquering, 2009; Kamstra et al., 2009, 2012; Keef and Khaled, 2011b; Kelly and Meschke, 2010; Khaled and Keef, 2013, 2014) and serves to highlight the problems associated with the use of indirect proxies of mood. The findings in Edmans et al. (2007) and Ashton et al. (2003, 2011), linking the outcomes of international sporting events to market returns, 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), prompting further concerns regarding the use of indirect proxies of mood.

Other studies examining the link between stock market volatility and weather-based mood-proxies produce contradictory evidence, thus casting further doubt on the use of such proxies. Symeonidis et al. (2010), for example, find that cloudiness and night-time length are inversely related to various measures of stock volatility, while Pizzutilo and Roncone (2017) fail to find evidence of a systematic relationship between intraday weather measures (temperature, humidity, pressure, visibility, wind, cloud, rain, snow, etc.) and stock-level data including volume and volatility.

A related emotional influence on behavior in financial markets is investor sentiment or “social moods” (e.g. Nofsinger, 2005), which are the outcomes of interpersonal communication.⁵ Examples include collective optimism versus pessimism or hope about, versus fear of, the future. In particular, investors' buy and sell decisions may be influenced by such optimism or pessimism,⁶ as evidenced by excessive price volatility (Shiller, 2003) or speculative bubbles (Shiller, 2002). More recently, Bialkowski et al. (2012) find that stock returns are higher and less volatile during the month of Ramadan (a significant social event where fasting is believed to have positive mood effects). While Al-Khazali (2014) reports similar results, the effect disappears following the 2008 financial crisis. Gavriilidis et al. (2016) find that a positive mood, including enhanced social interactions, associated with Ramadan results in more herding relative to non-Ramadan days. Similar to the caveats noted in relation to weather-based mood proxies, this research suffers from lack of direct measures of social moods. Other studies, however, begin to address such concerns. Tetlock (2007), for example, examines the daily variation in the “mood” of the Wall Street Journal by constructing a pessimism factor based on the categories of the

⁵ While not of direct relevance to our review of emotion/mood, Tarim (2016) observes the naturally occurring conversations among trading room staff and undertakes follow up interviews to demonstrate the importance of social dynamics of cognition and decision-making in equity markets.

⁶ We return to a discussion of hope and fear later.

Harvard Psychosocial Dictionary. Consistent with prior findings, Tetlock (2007) finds high values of media pessimism exert downward pressure on prices through short-term spikes in trading volume. Similarly, Bollen et al. (2011) develop and cross-validate a measure of social mood based on recordings of daily twitter feeds, with high predictability of stock prices changes observed. More recently, Griffith et al. (2019) examine distinct measures of investor sentiment reflecting both pessimism and optimism, focusing specifically on fear, gloom, joy, and stress. They find that fear has a strong and lasting effect on market returns and volatility, while stress has a short-lived impact on returns only and neither gloom nor joy have any influence on returns or volatility.

Other non-social, potential causes of investment sentiment are proximate to the financial markets (market-related factors) or the economy (economy-related factors) (Shumway, 2010). By way of examples 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. Similarly, Bathia and Bredin (2012) employ a range of market-related proxies, including equity fund flow, closed-end equity fund discount and equity put-call ratio. By way of example of economy-related factors, Fisher and Statman (2003), and similarly Schmeling (2009), examine 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.⁷

Continuing with an examination of investor sentiment and mood, Wang and Markellos (2018) provide a direct challenge to the use of non-economic events, such as of sporting events, as indirect proxies. Examining the stock market impact of gold medal success in the Olympic Games, they find trading volumes and volatility are depressed during the Games and reduce further as a function of the gold medals won, while no effect on market returns is apparent. Such evidence, further backed by online search volumes and survey-based sentiment data, supports an investor (in)attention⁸ explanation over an investor mood or sentiment explanation of stock market reaction to sporting events, thus casting further doubt on the use of indirect proxies of investor mood or sentiment.

⁷In 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.

⁸The impact of investor inattention during major sporting events is further supported by Ehrmann and Jansen (2017), with trading volumes declining by up to 48% when a national team is competing at the World Cup.

Strikingly, using standard empirical models, Novy-Marx (2014) fails to reject the hypothesis that such diverse and seemingly irrelevant factors as the party of the US President, the weather in Manhattan, global warming, El Niño, solar activity, and the planetary aspects are predictive of behavioral anomalies in the US markets. While acknowledging that some of the findings may be rejected on the grounds of plausibility, Novy-Marx (2014) urges caution because such skepticism also casts doubt on widely adopted empirical methods 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; correlations need not be causal evidence.

In the following subsections we review studies that address the criticism that mood should be measured directly rather than inferred from proxies to confirm that mood (or emotions) influences the performance of financial markets. Measuring market performance is still important since the bulk of studies we review next do not do this. Future research is needed to connect the research with these different foci.

2.2 FIELD STUDIES OF FINANCIAL INVESTORS' EMOTIONS

A number of empirical studies have an intermediate role. While they do not measure mood or emotions, they attempt to infer from transaction data their influence on investor decision making, as opposed to aggregate market behavior as in the majority of the studies reviewed in the last section. Using account-level transaction data from Finland, an ideal test-bed due to its geographic, climatic and demographic properties, Kaustia and Rantapuska (2016) examine the direct link between a range of mood proxies and investors' propensities to buy or sell. They report little effect of weather-related mood variables. While precipitation has a significant effect, sunniness and temperature does not. They also find little evidence in relation to the impact of SAD, with length-of-day insignificant or wrongly signed. In contrast, Schmittmann et al. (2015) find evidence of a relationship between weather variables and investor behavior, whereby good weather is associated with a greater inclination to buy than sell and with a decline in purchases of low-risk stocks.

The link between responsibility and emotion is examined in a small number of field studies. Strahilevitz et al. (2011) find investors are reluctant to repurchase (buying behavior) stocks previously sold at a loss or that have risen in price following a sale. Drawing on Summers and Duxbury (2012),⁹ who examine experimentally the influence of responsibility and associated

⁹ Discussed in more detail below.

emotions on selling behavior, they suggest an emotion-based explanation of repurchase behavior linked to feelings of regret and disappointment. Similar findings of reluctance to repurchase are reported by Leal et al. (2018). The importance of responsibility for the original purchase decision is 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 had built the fund themselves. Using a unique dataset, Lehenkari (2012) finds that investors exhibit a lower tendency to hold losing stocks received via inheritance/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 (2012) 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.

Other research attempts to investigate emotions by directly targeting investors' responses. In a pioneering study by Lo and Repin (2002), a broad battery of physiological emotion markers are monitored in professional investors during their regular trading activity. The physiological emotion measurements correlate with market events. Emotion effects related to the price changes are observed and while larger in less experienced investors, they are still present in more experienced investors. A recognized problem, however, is the need to infer the emotional influence on the trading decisions. Consequently, in a subsequent study, Lo et al. (2005) ask trader trainees to provide self-reports of how they felt after each trading day. While modest correlations are found between trading performance and self-reported emotion on a given day, it would have been preferable to examine the emotional influence on decisions for subsequent trading days, but any such influences are not reported.

Fenton-O'Creevy et al. (2012) also obtain physiological emotion-marker data from professional traders. The results support their findings based on 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 has large effects on emotions. These results are consistent with observed higher cortisol levels related to fear responses observed by Coates and Herbert (2008).

While the field studies reviewed here represent a significant step towards an increased understanding of the role of emotions in financial markets, they remain merely empirical demonstrations. To ensure more substantive steps being taken to improve our theoretical understanding, specific hypotheses need to be derived from theory and ideally tested in laboratory experiments; an area to which we now turn.

2.3 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, Seo and Feldman Barret (2007) find that investment performance is 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, and 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, relative to performance observed in the presence of neutral mood, that performance is worse (enhanced) in the face of positive (negative) 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. Prior to making their choices, participants are exposed to a picture intended 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, a previously developed questionnaire assessing seasonal pattern to serve as a diagnostic measure of SAD, along with a task to measure 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 in winter lower risk seeking by SAD-suffers 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 evidence to support weather or seasonal induced changes in mood impacting 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 commitment¹⁰ plays a role. In a two-stage 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 finance markets and find a tendency for participants to sell their stock earlier when fear is induced than in control conditions. 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, Odean, and Li (2015) examine the role of emotions in stock market bubbles and crashes. By inducing emotions via video clips, they likewise focus on non-specific

¹⁰Escalation 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).

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 (2017) 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.

Linking to the field study of Lo and Repin (2002), Muehlfield et al. (2013) examine individual differences in response to positive and negative price shocks. 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.

To further increase our understanding of the role of emotions in financial markets, another approach (see Dowling and 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 sold too soon and losers held too long (Shefrin and Statman, 1985). In explaining the disposition effect, Odean (1998), Shefrin and Statman (1985), and Weber and Camerer (1998) all draw on prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992). A necessary auxiliary hypothesis is that of realization utility (Barberis and Xiong, 2012), that is, that the utility of gains and disutility of losses are derived from realizing the outcome. Frydman et al. (2014) conduct a test of this hypothesis in an experimental market with an unspecified group of participants. For the

average participant the results conclusively support the disposition effect. Evidence in support of the realization utility hypothesis is 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. Comparable results for losses are however not found. In a similar study, Frydman and Camerer (2016) 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 that this is likely to be the case. Another study (Richards et al., 2018) indirectly supports the role of emotion for the disposition effect. In an investor sample, an online questionnaire measure of intuitive emotion-mediated cognitive processes correlate positively and a measure of an emotion-regulation strategy correlate negatively with the size of the disposition effect.

Summers and Duxbury (2012) directly 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 gain/loss experienced in the preceding period and associated self-reported emotions. No responsibility for the decision to hold the risky asset in the first period leads to disappointment/elation due to a loss/gain outcome, while responsibility additionally leads to regret/rejoicing due to a loss/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.

2.4 CONCLUDING REMARKS

Based on the above review of studies of 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; while there is strong evidence that emotions influence investors in financial markets, we conclude that there is a lack of precision concerning the exact nature of these influences.

Drawing on contemporary theories of emotions (see next section), we note that the previous research on emotions in financial markets lacks a conceptualization of emotions that would clarify what is measured and how it relates to financial decision making. This applies to mood proxies where it is neither clear whether it is emotion or mood, or some other emotion-related

phenomenon, that is assessed. Although this does not detract from the value of identifying possible emotion influences on market outcomes, it is insufficient to provide a necessary theoretical understanding of these. Many of the field studies and studies using physiological measures have the same drawbacks; what emotional-related phenomena are measured and are they causes, effects or neither of financial transactions? At the same time the evidence of emotion influences on markets are strengthened. Identifying the roles of emotions in financial decision making is the first step on the road to a unifying theoretical account.

We argue that the situation would be improved by the enhanced clarity to be provided by a classification of emotion-related phenomena, to which we now turn our attention.

3. A Classification of Emotions

In this section, we present a classification of emotion-related phenomena by drawing on recent developments in emotion research (Phelps et al., 2014; Rick and Loewenstein, 2008; Västfjäll and Slovic, 2013). We introduce three distinctions; evaluations versus emotions, incidental versus integral emotions, and anticipatory versus anticipated emotions. Although these distinctions have theoretically clear definitions as shown below, in empirical studies they are frequently blurred. For instance, in many of the reviewed studies it is not clear whether emotions are observed, whether inferred or measured emotions are mood changes in response to weather (incidental emotions), mood changes or emotional responses to changed market conditions (integral emotions), anticipatory emotions related to expected market conditions or anticipated emotions related to expected outcomes of specific actions.

In what follows, we specifically draw on the psychological construction theory of emotions proposed by Russell (2003, 2014). This theory posits that *core affects* are elemental building blocks of all emotional responses or states. More precisely, a core affect is a “neurophysiological state consciously accessible as the simplest raw (nonreflective) feeling evident in moods and emotions” (Russell, 2003, p. 148). Core affects are always consciously accessible and can be described as being neutral or having any value in a dimensional system defined by the orthogonal axis pleasure-displeasure and activation-deactivation. 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). Others have posited that emotions are discrete (e.g. Lazarus, 1991; Lerner et al., 2015). Discrete emotions may, according to Russell (2003, 2014), be conceptualized as combinations of values on the pleasure and activation dimensions. In Figure 1, discrete emotions are located along the periphery of the circle. A wide range of methods to measure core affect are

observed in the literature¹¹ and support the dimensional description. While not all methods converge on the two dimensions of pleasure and activation (or arousal) (Mauss and Robinson, 2009), direct corroboration is provided by means of neuro-imaging data reported in Posner et al. (2009) and Wilson-Mendenhall et al. (2013).

3.1 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. An evaluation as bad or good does not, however, necessarily elicit an *emotional response*. According to several emotion theories (e.g., Carver and 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 financial decision making, gains are examples of good outcomes and losses are examples of bad outcomes. Although such outcomes are naturally evaluated as bad or good, evidence shows that experienced and sophisticated investors regulate their emotional responses (Fenton-O’Creevy et al., 2011; Seo and Feldman Barret, 2007).

The distinction is not always made between evaluations having affective qualities and emotional responses, but it is an important one to make here. It accounts for the fact that investors do not invariably respond emotionally to events which they evaluate as good or bad. It also raises the question of what additional conditions account for emotional responses among investors in financial markets.

3.2 INCIDENTAL VERSUS INTEGRAL EMOTIONS

An emotion state such as *mood* affecting a choice is considered to be incidental because it is nominally unrelated to the choice (see footnote 1). It may still affect pre-choice information processing (Isen, 2000; Schwartz, 2000; Schwartz and 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 et al., 2005). Language is also a fallible source for making the distinction. The similarity of emotional responses and mood is, consistent with Russell’s (2003) theoretical claim, that whereas

¹¹ Including 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].

an emotional response is an instant core affect, mood is a prolonged core affect. This emphasizes that moods are less transient than emotional responses. Furthermore, emotional responses are frequently stronger and thus more likely occupy the conscious¹² focus, with mood residing in the background (Lazarus, 1991). Gärling et al. (2017b) argue that emotional responses frequently result in changes in mood that linger after the transient changes caused by the emotional responses dissipate.

Much of the emotion research in financial markets (e.g., Lucey and Dowling, 2005) targets incidental mood effects. But as noted above, mood changes are not necessarily unrelated to choice outcomes. Experiencing a personally relevant event evaluated as good or bad would result in an immediate positive or negative emotion attributed to the event. Although this feeling is transient, its effect may remain as a changed mood. Thus, while the emotional response to the event is the focus of attention for a limited time only, its effect remains longer in the background in the form of a changed mood. In on-going tasks such as trading in asset markets (e.g. Fenton-O’Creevy et al., 2012; Lo and Repin, 2002; Nguyen and Noussair, 2014; Seo and Feldman Barret, 2007), it becomes difficult, therefore, to distinguish emotional responses to choice outcomes from lingering mood changes due to the emotional responses. In the following, we refer to such mood changes as anticipatory emotions if they are the product of choice outcomes evoking emotional responses.

3.3 ANTICIPATORY VERSUS ANTICIPATED EMOTIONS

*Anticipatory emotions*¹³ are associated with an unspecific event or a series of events that may occur in the future. In the context of financial outcomes, hope of earning money and fear of losing money 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 and Damasio (2005) testing the somatic marker hypothesis,¹⁴ the Iowa Gambling Task is used to investigate risky decision making by asking participants to select cards from decks with varying sequences of gains and losses, with some decks associated with a higher frequency of large losses and gains, others with a lower frequency of large losses and gains. Anticipatory fear, indexed by a somatic marker such as the skin conductance response, is more strongly influenced by the choice-outcome sequences from the

¹² Note the difference here between the perspective we adopt, i.e. *conscious* emotions and that of Tuckett and Taffler in which emotions become *unconscious* during periods of high financial instability (i.e. crises and market bubbles) to protect investors, as per our discussion in the Introduction.

¹³Rick and Loewenstein (2008) refers to “immediate emotions”.

¹⁴The somatic marker hypothesis proposes that an emotion triggers somatic markers (arousal measured by, e.g., heart rate or skin conductance responses) before consciously experienced.

former deck (higher volatility) than from the latter deck (lower volatility). A demonstration in an investment context is reported by Shiv et al. (2005). Using positive-expected-value gambles, they examine whether prior investment-outcomes impact subsequent investment decisions, and conclude, in the context of the equity premium puzzle, that impaired (anticipatory) emotional response prompts less myopic loss aversion and hence more advantageous decisions. Another demonstration is Cantarella et al. (2018) who provide qualified support for the somatic marker hypothesis (Bechera and Damasio, 2005) in a choice task more similar to financial investments than the Iowa Gambling Task. Lucarelli et al. (2015) argue, based on their experimental results, that the somatic marker hypothesis may also play a role in a long-term strategy of asset picking.

Anticipated emotions differ from anticipatory emotions in being associated with specific choice outcomes (Loewenstein et al., 2001; Mellers, 2000), for instance the degree of anticipated elation that in asset markets may vary with the size of gains or the degree of anticipated disappointment that may vary with the size of losses (Summers and Duxbury, 2012). Anticipated emotions are not actual emotions but cognitive representations of emotions that are activated in the pre-choice process (Rick and Loewenstein, 2008). Yet, anticipated emotions have been shown to share with actual emotions the same conscious elements of core affects (Västfjäll et al., 2004).

In our emotion-based account, to be described next, hope and fear are anticipatory emotions, to be felt in response to uncontrollable stock price trends signaling the potential for future monetary gains (rising trend) or losses (falling trend), whereas elation and disappointment are anticipated emotions in response to specific choice outcomes (e.g. before a decision to sell at a gain or loss, respectively). Hence, for an investor holding a given stock, anticipatory emotions of hope and fear arise from the possibility that the stock price might rise or fall tomorrow, irrespective of any action on their part, while anticipated emotions of elation and disappointment will arise as they consider whether to sell or not following a price change. As such, all four, hope and fear, elation and disappointment, are integral emotions resulting from the evaluations of future and past price changes, respectively.

We recognize two benefits of our proposed classification. One is that it clarifies when and how measurements of emotions should be made in field studies or be induced in experiments. For instance, measurements after a targeted change would tap emotional responses or mood changes, whereas measurements before a choice would tap either anticipatory or anticipated emotions depending on how the measurements are made. The second benefit is that the classification would help develop theory. In the next section, we present a first step in this direction by proposing an emotion-based account of how buy and sell preferences are related to

anticipatory and anticipated emotions. We also show in a laboratory experiment how anticipatory and anticipated emotions may be measured and studied.

4. Emotion-based Account of Buy and Sell Preferences

4.1 THEORETICAL PROPOSITIONS

In this section, we present an emotion-based account of buy and sell preferences in asset markets drawing on the distinction in the preceding section between anticipatory and anticipated emotions.¹⁵ This account is applied to evaluations that evoke emotional responses. Specifically, we propose that investor decision making is influenced by (1) anticipatory emotions of hope of earning money and fear of losing money when prices change (Lopes, 1987; Nofsinger, 2005; Shefrin and Statman, 2000), and (2) anticipated emotions of elation associated with decisions to realize gains and anticipated disappointment associated with decisions to realize losses (Loewenstein et al., 2001; Mellers, 2000). Both anticipatory hope and fear, along with anticipated elation and disappointment, are emotions integral to the decisions investors make. We do not rule out influences of incidental mood but assume that proposals (1) and (2) hold independently of mood changes.

Inferred from Yik et al.'s (2011) Figure 1 (p. 706), we further propose that hope-fear varies along an axis at a 30-degree angle to the pleasure-displeasure axis (see Figure 2), whereas elation-disappointment varies along an axis at a 60-degree angle to the hope-fear axis. The bipolarity of the continua implies theoretically that hope (elation) and fear (disappointment) are not experienced simultaneously. Russell and Carroll (1999) show that format of rating scale, measurement errors and measurements not made simultaneously are reasons why the theoretical relationship between bipolar emotions is not always observed empirically. Theoretically, measures with unipolar scales of hope (elation) and fear (disappointment) would be independent, whereas a bipolar scale ranging from hope to fear over neutral compared to ranging from fear to hope over neutral would result in that when hope increases, or the reverse, fear decreases at the same rate such that $\text{hope} = -\text{fear}$. Likewise, when elation increases, disappointment decreases at the same rate, or the reverse, such that $\text{elation} = -\text{disappointment}$. The theoretical relationships may furthermore differ due to impact of different factors making the bipolar emotions shift over time. Assuming independence of the bipolar emotions in the circumplex (Figure 2), we next propose

¹⁵Gärling et al. (2017a) derive equations consistent with the emotion-based account presented here. Their aim is to show how the disposition effect, observed in relation to sell-hold decisions, may be explained. Our focus is wider, encompassing both buy and sell preferences.

how changes in asset prices may influence the anticipatory emotions of hope and fear as well as cognitive anticipations of elation and 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 decreases linearly¹⁶ 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.¹⁷ As the upper graph in Figure 3 shows, above the purchase price the balance (hope–fear) between anticipatory hope and anticipatory fear increases at a lower rate than the balance (elation–disappointment) between anticipated elation and anticipated disappointment does, while below the purchase price the balance between anticipatory hope and anticipatory fear decreases at a higher rate than the balance between anticipated elation and anticipated disappointment does.

Our basic tenet is that the emotions, changing with the price movements, directly impact preferences to buy or sell. It does however appear implausible that professional investors would always respond emotionally to gains and losses (Frydman et al., 2014). As we argued in the last section, evaluations do not always evoke emotions. Preferences to buy or sell are also only one input to a deliberate decision-making process resulting in buy or sell decisions. While we claim that our emotional account has general applicability, only in less experienced and unsophisticated 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; Slovic et al., 2002). Whether buy and sell preferences result in an actual trade also depends on the availability of other willing participants in the market taking the opposite side of the trade.

Investors with anticipatory emotions of hope of earning money exceeding anticipatory emotions of fear of losing may be attracted to purchase assets when price increases (Baker and 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, hence the function does not pass through the origin. We propose that this is when a preference to buy is formed.

¹⁶The linear functions may be replaced by upwards concave and downwards convex power functions with no consequence for the following reasoning.

¹⁷The negatively sloped lines need to cross since otherwise an asset would never be sold. The assumption is the simplest to achieve this.

As shown in the lower graph of Figure 3, we additionally 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.¹⁸

4.2 EXPERIMENT

Tentative support for our emotion-based account is obtained in an experiment that we conducted to investigate sell preferences in a fictitious stock market.^{19, 20} 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, as previously shown in experiments by Kempf et al. (2013) and MacGregor et al. (2000).²¹ 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. To this end, prices increase in one experimental condition and decreases in another experimental condition. We use the sell decision as an indication of the point at which the preference to sell becomes positive.

Table 1 - here

¹⁸Västfjäll 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).

¹⁹A full report is found in Gärling et al. (2016).

²⁰While our emotion-based account speaks also to buy preferences, in the reported experiment we only investigate sell preferences. Also investigating buy preferences is an additional research task to add to those we note in the final section.

²¹Note also that Da Costa et al. (2013) demonstrate experimentally a link between experience and the disposition effect (shown by Summers and Duxbury (2012) to be driven by emotions), with inexperienced investors (i.e. students) exhibiting stronger effects. Thus providing further support for a stronger emotion influence in such individuals.

Undergraduates enrolled in a variety of study programs at the University of Gothenburg, Sweden, are recruited from a pool volunteering to participate in research studies. In e-mails they are asked to access a web address to participate in an online 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, the five highest performing participants (i.e. those selling at the highest price) from among the first ten participants to complete the experiment receive a gift certificate for a cinema ticket worth approximately USD 10.²²

Over a series of fictitious days, and for a maximum period of 10 weeks, 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 ($250 + (\text{Day}+5[\text{Week}-1]) +$ normally distributed random numbers), representing a 2% increase per week, another group are presented opening prices decreasing by 4% per week ($250 - 2(\text{increasing price} - 250)$)²³ 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 (see below), thanked, and debriefed.

The goal in each condition is to obtain data for 30 participants who sell at any point after the first week and no 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 = 6.04) out of 88. Responses to a post-experimental questionnaire indicated that 40 (54.8%) participants do not own stocks or stock fund shares, that 48 (65.8%) never inform themselves about the stock

²²We employ two price conditions, namely price increase and price decrease. The latter means an incentive mechanism based on trading performance would result in participants unavoidably making actual monetary losses, which for ethical reasons could not be collected from participants. Hence we adopt a relative performance-based incentive mechanism.

²³Price 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 et al., 2017a).

market, that self-reported knowledge of stocks and stock markets is low (mean rating 1.43 and Sd = 1.10 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). These figures confirm that we succeed to recruit inexperienced and unsophisticated individuals.

In the condition with a price increase the average week of selling is 4.40 (Sd = 2.39), while in the condition with a price decrease the average week of selling is 5.29 (Sd = 2.45).²⁴ 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 (see Table 1), significantly different from 0 with the right sign. As also expected, when the price decreases, the hope-fear balance is more negative than the elation-disappointment balance for the week-before-selling than for the week-of-selling. In a paired-sample *t*-test the difference (the sell preference) is significant, $t(37) = 3.31, p = .002$. Thus, the sell preference is, as expected, negative and significantly different from 0 the week-before-selling (-1.32) and increases significantly but is not significantly different from 0 the week-of-selling (0.07).

An unexpected finding in the condition with price increase is that some participants reported increased fear. 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 for both the week-before-selling and the week-of-selling. If assuming that the fear ratings are complementary to the hope ratings (i.e. the hope-fear balance = the rating of hope – [10 – the rating of hope]), the hope-fear balance is 4.52 (= 7.26 – [10 – 7.26]) the week-before-selling and 4.80 (= 7.4 – [10 – 7.4]) the week-of-selling. Since the hope-fear balance is then more positive than the elation-disappointment balance in the week-before-selling than in the week-of-selling, the sell preference is as expected negative (4.40 - 4.52 = -0.12) the week before selling and positive (6.03 – 4.80 = 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.

²⁴The 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 eliminated by the twice as large change of the decreasing price as the increasing price. A measure of the disposition effect used in a review by Kaustia (2010) is the ratio of the number of winners sold to the number of losers sold. In the review this ratio is on average about 50%. 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 close to 50%.

Table 2 - here

5. Summary, Conclusions, and Future Research Directions

5.1 REVIEW

A review of the finance literature warrants the conclusion that emotions influence investors in financial markets, although additional research is needed to clarify the nature of these influences. In this research a number of theoretical/conceptual issues should be addressed. First, the lack of precision in defining different emotion constructs. To this end, we highlight several useful distinctions, including a seemingly overlooked distinction between evaluation and emotion. The argument is that it cannot be taken for granted that investors in financial markets respond emotionally to price changes unless they have personal relevance. The counter-argument is that gains or losses of money always have personal relevance. Yet, there are other conditions (e.g. responsibility, see Summers and 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. The potential implications, supported by the decision making literature on self-versus-others (e.g. Andersson et al., 2016; Hermann et al., 2019; Polman, 2012), for fund managers (e.g. pension fund managers) tasked with investing the money of others, and who may be construed as having lower personal relevance, may prove an area of interest in future research.

Second, it is necessary to distinguish between different types of emotions (Phelps et al., 2014; Rick and Loewenstein, 2008; Västfjäll and Slovic, 2013). Initially, it will be helpful to establish whether emotions influence choice instead of being a response to the outcome of a choice. Next, 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 has been noted (Fenton-O’Creevy et al., 2011; Seo and Feldman Barret, 2007), adaptive emotion regulation appears to increase with investor experience and sophistication. Further research is needed to 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 and Hertwig, 2016). Self-reports of emotions are important to provide converging evidence (Mauss and Robinson, 2009; Posner et al., 2009; Wilson-Mendenhall et al., 2013). Applying self-reports is however not always easy and may lead to systematic errors. An example is the problem of obtaining continuous or near-continuous recording of emotions over time (Ariely and Zauberman, 2000, 2003). Here physiological markers would need to complement self-reports. In summary, multi-method approaches are needed to triangulate results.

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 (Finucane et al., 2000; Slovic et al., 2002). In this spirit we propose a more general emotion-based account of buy and sell preferences in asset markets.

5.2 EMOTION-BASED 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, Gärling et al. (2017a) in a companion paper showed how the emotion-based account may explain the disposition effect in less sophisticated investors (who may be the 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-based account we propose that while emotions are an input to deliberate judgment and decision making by experienced and sophisticated investors, the buy or sell choices of such individuals are primarily influenced by information rather than emotions. For less experienced and unsophisticated investors, however, we claim that the cognitive processes are short-cut such that emotions play a more important role. For instance, empirical findings indicating that the disposition effect is stronger for

inexperienced investors (e.g. Da Costa et al., 2013; Feng and Seasholes, 2005) would support such a proposition.

The main tenet of the emotion-based account is that buy and sell preferences depend on price movements (1) that change anticipatory emotions of hope of earning money and fear of losing money, and (2) that 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).

Support for the proposed emotion-based account of trading preferences 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 fictitious 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 for some participants fear as well as hope 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 Vandebosch (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. In an experimental study of perceptions of stock price volatility, Duxbury and Summers (2018) find evidence to support the view that decreasing prices are perceived as more volatile. That price volatility affects fear and not hope is clearly an important issue to take into account in further developing the emotion-based account.

While it is necessary to extend the empirical basis for the emotion-based account via additional empirical studies, there are several lines of conceptual development that are also needed. 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, as these authors also show, 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, and Li, 2015) or measuring mood (Breaban and Noussaire, 2017) 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.

Our intention here is to take a first step on the road to the above and we leave it to future research to pick up the baton. Given the lack of appropriate conceptualizations of emotions in the finance literature, our hope is that we will be able to help guide the development of this increasingly important area of research, free from the potential confusion and distraction that might otherwise ensue from the use of inappropriate and imprecise conceptualizations of emotions.

Funding

Financial support for this research was obtained through grants to the Centre for Finance, School of Business, Economics, and Law, University of Gothenburg, from the Swedish Agency for Innovation Systems (Vinnova) [grant number #2010-02449].

References

- Al-Khazali, O., 2014. Revisiting fast profit investor sentiment and stock returns during Ramadan. *International Review of Financial Analysis*, 33, 158-170.
- An, N., Wang, B., Pan, P., Guo, K., & Sun, Y. (2018). Study on the influence mechanism of air quality on stock market yield and volatility: Empirical test from China based on GARCH model. *Finance Research Letters*, 26, 119-125.
- Andersson, O., Holm, H. J., Tyran, J. R., & Wengström, E. (2016). Deciding for others reduces loss aversion. *Management Science*, 62(1), 29-36.
- Andrade, E.B., Odean, T., and Lin. S. (2015). Bubbling with excitement: An experiment. *Review of Finance*, 20(2), 447-466.
- Ariely, D., & Zauberman, G. (2000). On the making of an experience: The effects of breaking and combining experiences on their overall evaluation. *Journal of Behavioral Decision Making*, 13, 219-232.
- Ariely, D., & Zauberman, G. (2003). Differential partitioning of extended experiences. *Organization Behavior and Human Decision Processes*, 91, 128-139.
- Ashton, J.K., Gerrard, B., & Hudson, R. (2003). Economic impact of national sporting success: Evidence from the London stock exchange. *Applied Economics Letters*, 10(12), 783-785.
- Ashton, J.K., Gerrard, B., & Hudson, R. (2011). Do national soccer results really impact on the stock market? *Applied Economics*, 43(26), 3709-3717.
- Au, K., Chan, F., Wang, D., & Vertinsky, I. (2003). Mood in foreign exchange trading: Cognitive processes and performance. *Organizational Behavior and Human Decision Processes*, 91, 322-338.
- Baker, M., & Wurgler, J. (2007). Investor sentiment in the stock market. *Journal of Economic Perspectives*, 21(2), 129-152.
- Barberis, N., & Xiong, W. (2012). Realization utility. *Journal of Financial Economics*, 104(2), 251-271.
- Bassi, A., Colacito, R., & Fulghieri, P. (2013). 'O Sole Mio: An Experimental Analysis of Weather and Risk Attitudes in Financial Decisions. *Review of Financial Studies*, 26(7), 1824-1852.
- Bathia, D., & Bredin, D. (2013). An examination of investor sentiment effect on G7 stock market returns. *The European Journal of Finance*, 19(9), 909-937.
- Bechara, A., & Damasio, A. R. (2005). The somatic marker hypothesis: A neural theory of economic decision. *Games and Economic Behavior*, 52, 336-372.
- Beedie, C. J., Terry, P. C., & Lane, A. M. (2005). Distinctions between emotion and mood. *Cognition and Emotion*, 19, 847-878.
- Bialkowski, J., Etebari, A., & Wisniewski, T. P. (2012). Fast profits: Investor sentiment and stock returns during Ramadan. *Journal of Banking & Finance*, 36, 835-845.
- Bollen, J., Mao, H., & Zeng, X. (2011). Twitter mood predicts the stock market. *Journal of Computational Science*, 2, 1-8.
- Bosman, R., & Van Winden, F. (2010). Global risk, investment and emotions. *Economica*, 77, 451-471.

- Breaban, A., & Noussair, C. N. (2017). Emotional state and market behavior. *Review of Finance*, 22(1), 279-309.
- Cantarella, S., Hillenbrand, C., Aldridge-Waddon, L., & Puzzo, I. (2018). Preliminary evidence on the Somatic Marker Hypothesis applied to investment choices. *Journal of Neuroscience, Psychology, and Economics*, 11(4), 228-238.
- Cao, M., & Wei, J. (2005). Stock market returns: A note on temperature anomaly. *Journal of Banking & Finance*, 29, 1559-1573.
- Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review*, 97, 19 – 35.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment. *Journal of Personality and Social Psychology*, 67, 319-333.
- Coates, J. M., & Herbert, J. (2008). Endogenous steroids and financial risk taking on a London trading floor. *Proceedings of the National Academy of Sciences*, 105(16), 6167-6172.
- Da Costa Jr, N., Goulart, M., Cupertino, C., Macedo Jr, J., & Da Silva, S. (2013). The disposition effect and investor experience. *Journal of Banking and Finance*, 37(5), 1669-1675.
- Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Avon.
- Dichev, I. D., & Janes, T. D. (2003). Lunar cycle effects in stock returns. *Journal of Private Equity*, 6(4), 8-29.
- Dolansky, E., & Vandenbosch, M. (2012). Perceived variance and preference for sequences of outcomes. *Journal of Product & Brand Management*, 21(4), 285-292.
- Dowling, M., & Lucey, B. M. (2005). Weather, biorhythms, beliefs and stock returns—Some preliminary Irish evidence. *International Review of Financial Analysis*, 14(3), 337-355.
- Dowling, M., & Lucey, B. M. (2008). Mood and UK equity pricing. *Applied Financial Economics Letters*, 4(4), 233-240.
- Duxbury, D. (2015). Behavioral finance: Insights from experiments II: Biases, moods, and emotions. *Review of Behavioral Finance*, 7(2), 151-175.
- Duxbury, D. and Summers, B. (2018). On Perceptions of Financial Volatility in Price Sequences. *The European Journal of Finance*, 24(7-8), 521-543.
- Edmans, A., Garcia, D., & Norli, Ø. (2007). Sports sentiment and stock returns. *Journal of Finance*, 62(4), 1967-1998.
- Ehrmann, M., & Jansen, D. J. (2017). The pitch rather than the pit: Investor inattention, trading activity, and FIFA world cup matches. *Journal of Money, Credit and Banking*, 49(4), 807-821.
- Elster, J. (1998). Emotions and economic theory. *Journal of Economic Literature*, 36(1), 47-74.
- Feng, L., and Seasholes, M.S. (2005). Do investor sophistication and trading experience eliminate behavioral biases in financial markets? *Review of Finance*, 9(3), 305-351.

- Fenton-O’Creevy, M., Lins, J. T., Vohra, S., Richards, D. W., Davies, G., and Schaaf, K. (2012). Emotion regulation and trader expertise: Heart rate variability on the trading floor. *Journal of Neuroscience, Psychology, and Economics*, 5(4), 227-237.
- Fenton-O’Creevy, M., Soane, E., Nicholson, N., & Willman, P. (2011). Thinking, feeling and deciding: The influence of emotions on the decision making and performance of traders. *Journal of Organizational Behavior*, 32, 1044-1061.
- Finucane, M. L., Alhakami, A., Slovic, P., Johnson, S. M. (2000). The affect heuristic in judgments of risk and benefits. *Journal of Behavioral Decision Making*, 13, 1-17.
- Fisher, K. L., & Statman, M. (2003). Consumer confidence and stock returns. *Journal of Portfolio Management*, 30(1), 115-127.
- Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin*, 117, 39-66.
- Frydman, C., Barberis, N., Camerer, C., Bossaerts, P., & Rangel, A. (2014). Using neural data to test a theory of investor behavior: An application to realization utility. *Journal of Finance*, 69, 907-946.
- Frydman, C., & Camerer, C. (2016). Neural evidence of regret and its implications for investor behavior. *The Review of Financial Studies*, 29(11), 3108-3139.
- Fung, K. W. T., Demir, E., Lau, C. K. M., & Chan, K. H. (2015). Reexamining sports-sentiment hypothesis: Microeconomic evidences from Borsa Istanbul. *Journal of International Financial Markets, Institutions and Money*, 34, 337-355.
- Gärling, T. (2011). Heuristics and biases making people rich or poor: A psychological account of stock market anomalies. In W. Brun, G. Keren, G. Kirkeboen & H. Montgomery (Eds.), *Perspectives on thinking, judging, and decision making* (pp. 146-156). Oslo: Universitetsforlaget.
- Gärling, T., Blomman, M., & Carle, T. A. (2017a) Affect account of the disposition effect and consequences for stock prices. *Review of Behavioral Finance*, 9(2), 187-202.
- Gärling, T., Ettema, D., Friman, M., & Olsson, L. E. (2017b). *Updated current mood: A conceptualization of aggregation of instant utilities*. Working paper, The Service and Market Oriented Transport Research Group (SAMOT), Karlstad University, Sweden.
- Gärling, T., Gamble, A., Klass, V., & Duxbury, D. (2016). *Buy and sell preferences in asset markets: Laboratory experiments investigating influences of anticipatory and anticipated emotions*. Paper presented at the Research in Behavioral Finance Conference, Free University of Amsterdam, The Netherlands. Download from <http://cff.handels.gu.se/research/working-papers>.
- Gavriilidis, K., Kallinterakis, V., & Tsalavoutas, I. (2016). Investor mood, herding and the Ramadan effect. *Journal of Economic Behavior and Organization*, 132, 23-38,
- Gerlach, J. R. (2010). Daylight and investor sentiment: A second look at two stock market behavioral anomalies. *Journal of Financial Research*, 33(4), 429-462.
- Gray, J. A. (1987). *The psychology of fear and stress*. Cambridge: Cambridge University Press.
- Greifeneder, R., Bless, H., & Pham, M. T. (2011). When do people rely on affective and cognitive feelings in judgment? A review. *Personality and Social Psychology Review*, 15(2), 107-141.

- Gregory-Allen, R., Jacobsen, B., & Marquering, W. (2010). The Daylight Saving Time Anomaly in Stock Returns: Fact or Fiction? *Journal of Financial Research*, 33(4), 403-427.
- Griffith, J., Najand, M., & Shen, J. (2019). Emotions in the Stock Market. *Journal of Behavioral Finance*, published online.
- Hermann, D. Musshoff, O., & Rau, H. A. (2019). The disposition effect when deciding on behalf of others. *Journal of Economic Psychology*, published online.
- Hirshleifer, D. (2015). Behavioral finance. *Annual Review of Financial Economics*, 7, 133-159.
- Hirshleifer, D., & Shumway, T. (2003). Good day sunshine: Stock returns and the weather. *Journal of Finance*, 56, 1533-1597.
- Isen, A. M. (2000). Positive affect and decision making. In M. Lewis & J. M. Haviland (Eds.). *Handbook of emotions* (pp. 417-435). London: Guilford.
- Jacobsen, B., & Marquering, W. (2008). Is it the weather? *Journal of Banking & Finance*, 32(4), 526-540.
- Jacobsen, B., & Marquering, W. (2009). Is it the weather? Response. *Journal of Banking & Finance*, 33(3), 583-587.
- Jin, L., & Scherbina, A. (2010). Inheriting losers. *Review of Financial Studies*, 24(3), 786-820.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), 263-291.
- Kamstra, M. J., Kramer, L. A., & Levi, M. D. (2000). Losing sleep at the market: The daylight-savings anomaly. *American Economic Review*, 90, 1005-1011.
- Kamstra, M. J., Kramer, L. A., & Levi, M. D. (2003). Winter Blues: A sad stock market cycle. *American Economic Review*, 93, 324-343.
- Kamstra, M. J., Kramer, L. A., & Levi, M. D. (2009). Is it the weather? Comment. *Journal of Banking & Finance*, 33(3), 578-582.
- Kamstra, M. J., Kramer, L. A., & Levi, M. D. (2012). A careful re-examination of seasonality in international stock markets: Comment on sentiment and stock returns. *Journal of Banking & Finance*, 36(4), 934-956.
- Kaplanski, G., & Levy, H. (2010). Sentiment and stock prices: The case of aviation disasters. *Journal of Financial Economics*, 95(2), 174-201.
- Karlsson, N., Juliusson, A., & Gärling, T. (2005). A conceptualization of task dimensions affecting escalation of commitment. *European Journal of Cognitive Psychology*, 17, 835-858.
- Kaustia, M. (2010). Disposition effect. In H. K. Baker & J. R. Nofsinger (Eds.), *Behavioral finance: Investors, corporations, and markets* (pp. 171-190), New York: Wiley.
- Kaustia, M., & Rantapuska, E. (2016). Does mood affect trading behavior? *Journal of Financial Markets*, 29, 1-26.
- Keef, S. P., & Khaled, M. S. (2011a). Are investors moonstruck? Further international evidence on lunar phases and stock returns. *Journal of Empirical Finance*, 18(1), 56-63.

- Keef, S. P., & Khaled, M. S. (2011b). A review of the seasonal affective disorder hypothesis. *Journal of Socio-Economics*, 40(6), 959-967.
- Kelly, P. J., & Meschke, F. (2010). Sentiment and stock returns: The SAD anomaly revisited. *Journal of Banking & Finance*, 34(6), 1308-1326.
- Kempf, A., Merkle, C., & Niessen-Ruenzi, A. (2013). Low risk and high return – affective attitudes and stock market expectations. *European Financial Management*, 20(5), 995-1030.
- Khaled, M. S., & Keef, S. P. (2013). Seasonal affective disorder: onset and recovery. *Journal of Socio-Economics*, 42, 136-139.
- Khaled, M. S., & Keef, S. P. (2014). Yet another careful re-examination of the SAD hypothesis. *International Journal of Managerial Finance*, 10(3), 404-415.
- Klein, C., Zwergel, B., & Henning Fock, J. (2009). Reconsidering the impact of national soccer results on the FTSE 100. *Applied Economics*, 41(25), 3287-3294
- Knutson, B., Wimmer, G. E., Kuhnen, C. M., and Winkielman, P. (2008). Nucleus accumbens activation mediates the influence of reward cues on financial risk taking. *NeuroReport*, 19(5), 509-513.
- Kramer, L. A., & Weber, J. M. (2012). This is your portfolio on winter: Seasonal affective disorder and risk aversion in financial decision making. *Social Psychological and Personality Science*, 3(2), 193-199.
- Krivelyova, A., & Robotti, C. (2003). Playing the field. Geomagnetic storms and intrnational stock markets. Retrieved from <https://www.frbatlanta.org/filelegacydocs/wp0305b.pdf>
- Kubinska, E., Markiewics, L., & Tyszka, T. (2012). Disposition effect among contrarian and momentum investors. *Journal of Behavioral Finance*, 13(3), 214-225.
- Kuhnen, C. M., & Knutson, B. (2005). The neural basis of financial risk taking. *Neuron*, 47, 763-770.
- Kuhnen, C. M., & Knutson, B. (2011). The impact of affect on beliefs, preferences and financial decisions. *Journal of Financial and Quantative Analysis*, 46, 605-626.
- Lazarus, R. S. (1991). *Emotion and adaptation*. New York: Oxford University Press.
- Leal, C. C., Armada, M. J. R., & Loureiro, G. (2018). Individual investors repurchasing behaviour: evidence from the Portuguese stock market. *The European Journal of Finance*, 24(11), 976-999.
- Lee, C. J., & Andrade, E. B. (2011). Fear, social projection, and financial decision making. *Journal of Marketing Research*, 48(SPL), S121-S129.
- Lee, C. J., & Andrade, E. B. (2015). Fear, excitement, and financial risk-taking. *Cognition and Emotion*, 29(1), 178-187.
- Lehenkari, M. (2012). In search of the underlying mechanism of the disposition effect. *Journal of Behavioral Decision Making*, 25(2), 196-209
- Lerner, J. S., Li, Y., Valdesolo, P., & Kassam, K. S. (2015). Emotion and decision making. *Annual Review of Psychology*, 66, 799-823.

- Levy, T., & Yagil, J. (2011). Air pollution and stock returns in the US. *Journal of Economic Psychology*, 32(3), 374-383.
- Lim, Y. & Kim, K.T. (2019). Afraid of the stock market. *Review of Quantitative Finance and Accounting*, 53:3, 773-810.
- Lo, A., and Repin, D. V. (2002). The psychophysiology of real-time financial risk processing. *Journal of Cognitive Neuroscience*, 14(3), 323-339.
- Lo, A., Repin, D. V., & Steenbarger, B. N. (2005). Fear and greed in financial markets: A clinical study of day-traders. *American Economic Review*, 95, 352-359.
- Loewenstein, G. F. (1996). Out of control: Visceral influences on behavior. *Organizational Behavior and Human Decision Processes*, 65, 272-292.
- Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, E. S. (2001). Risk as feelings. *Psychological Bulletin*, 127, 267-286.
- Lopes, L. (1987). Between hope and fear: The psychology of risk. *Advances in Experimental Social Psychology*, 20(3), 255-295.
- Loughran, T., & Schultz, P. (2004). Weather, stock returns, and the impact of localized trading behavior. *Journal of Financial and Quantitative Analysis*, 39(2), 343-364.
- Lucarelli, C., Uberti, P., Brighetti, G., & Maggi, M. (2015). Risky choices and emotion-based learning. *Journal of Economic Psychology*, 49, 59-73.
- Lucey, B. M., & Dowling, M. (2005). The role of feelings in investor decision-making. *Journal of Economic Surveys*, 19(2), 211-237.
- MacGregor, D. G., Slovic, P., Dreman, D., & Berry, M. (2000). Imagery, affect, and financial judgment. *Journal of Psychology and Financial Markets*, 1(2), 104-110.
- Mauss, I. B., & Robinson, M. D. (2009). Measures of emotion: A review. *Cognition and Emotion*, 23, 209-237.
- Mellers, B. A. (2000). Choice and the relative pleasures of consequences. *Psychological Bulletin*, 126, 910-924.
- Muehlfeld, K., Weitzel, U., & Van Witteostuijn, A. (2013). Fight or freeze? Individual differences in investors' motivational systems and trading in experimental asset markets. *Journal of Economic Psychology*, 34, 195-209.
- Nguyen, Y., & Noussair, C. (2014). Risk aversion and emotions. *Pacific Economic Review*, 19(3), 296-312.
- Nofsinger, J. R. (2005). Social mood and financial economics. *Journal of Behavioral Finance*, 6, 144-160.
- Novy-Marx, R. (2014). Predicting anomaly performance with politics, the weather, global warming, sunspots, and the stars. *Journal of Financial Economics*, 112(2), 137-146.
- Oatley, K. (2009). Communication to self and others: Emotional experience and its skill. *Emotion Review*, 1, 206-213.

- Odean, T. (1998). Are investors reluctant to realize their losses? *Journal of Finance*, *53*(5), 1775-1798.
- Peters, E., Västfjäll, D., Gärling, T., & Slovic, P. (2006). Affect and decision making: A "hot" topic (introduction to special issue). *Journal of Behavioral Decision Making*, *19*, 79-85.
- Pham, M. T. (2007). Emotion and rationality: A critical review and interpretation of empirical evidence. *Review of General Psychology*, *11*(2), 155-178.
- Phelps, E. A., Lempert, K. M., & Sokol-Hessner, P. (2014). Emotion and decision making: Multiple modulatory neural circuits. *Annual Review of Neuroscience*, *37*, 263-288.
- Pizzutilo, F., & Roncone, V. (2017). Red sky at night or in the morning, to the equity market neither a delight nor a warning: the weather effect re-examined using intraday stock data. *The European Journal of Finance*, *23*(14), 1280-1310.
- Polman, E. (2012). Self–other decision making and loss aversion. *Organizational Behavior and Human Decision Processes*, *119*, 141-150.
- Posner, J., Russell, J. A., Gerber, A., Gorman, D., Colibazzi, T., Yu, S., Wang, Z., Kangarlou, M. A., Zhu, H., & Peterson, B. S. (2009). The neurophysiological basis of emotion: An fMRI study of the affective circumplex using emotion-denoting words. *Human Brain Mapping*, *30*, 883-895.
- Richards, D. W., Fenton-O'Creedy, M., Rutterford, J., & Kodwani, D. G. (2018). Is the disposition effect related to investors' reliance on System 1 and System 2 processes or their strategy of emotion regulation? *Journal of Economic Psychology*, *66*, 79-82.
- Rick, S., & Loewenstein, G. (2008). The role of emotion in economic behavior. In M. Lewis, J. Haviland-Jones & L. Feldman-Barrett (Eds.), *Handbook of emotion* (pp. 138-156). New York, Guilford.
- Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*, 1161–1178.
- Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, *110*, 145-172.
- Russell, J. A. (2014). My psychological construction perspective with a focus on conscious affective experiences. In L. Feldman Barret & J. A. Russell (Eds), *The psychological construction of emotion* (pp. 183-208). New York: Guilford Press.
- Russell, J. A., & Carroll, J. M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin*, *125*(1), 3-30.
- Sakkas, A., & Urquhart, A. (2017). Basking in reflected glory and stock returns. Working paper.
- Saunders, E. M. (1993). Stock prices and Wall Street weather. *American Economic Review*, *83*, 1337-1345.
- Scherer, K. R. (1984). Emotion as a multicomponent process: A model and some cross-cultural data. *Review of Personality & Social Psychology*, *5*, 37–63.
- Schmeling, M. (2009). Investor sentiment and stock returns: Some international evidence. *Journal of empirical finance*, *16*(3), 394-408.

- Schmittmann, J. M., Pirschel, J., Meyer, S., & Hackethal, A. (2015). The impact of weather on German retail investors. *Review of Finance*, 19 (3): 1143-1183
- Schwarz, N. (2000). Emotion, cognition, and decision making. *Cognition and Emotion*, 14(4), 433-440.
- Seo, M.-G., & Feldman Barret, L. (2007). Being emotional during decision making: Good or bad? An empirical investigation. *Academy of Management Journal*, 50, 923-940.
- Shefrin, H. M., & Statman, M. (1985). The disposition to sell winners too early and ride losers too long. *Journal of Finance*, 40(3), 777-790.
- Shefrin, H. M., & Statman, M. (2000). Behavioral portfolio theory. *Journal of Financial and Quantitative Analysis*, 32(2), 127-151.
- Shen, J., Najand, M., Dong, F., & He, W. (2017). News and social media emotions in the commodity market. *Review of Behavioral Finance*, 9(2), 148-168.
- Shiv, B., Loewenstein, G., Bechara, A., Damasio, H., & Damasio, A. R. (2005). Investment behaviour and the negative side of emotion. *Psychological Science*, 16, 435-439.
- Shiller, R. J. (2002). Bubbles, human judgment, and expert opinion. *Financial Analyst Journal*, 58(3), 18-26.
- Shiller, R. J. (2003). From efficient market theory to behavioral finance. *Journal of Economic Perspectives*, 17, 83-104.
- Shumway, T. (2010). Mood. In Baker H.K. and Nofsinger, J.R. (Eds.) *Behavioral finance: Investors, corporations, and markets* (pp. 671-679). Hoboken, NJ: Wiley.
- Simon, H. A. (1983). *Reason in human affairs*. Stanford, CA: Stanford University Press.
- Slovic, P., Finucane, M., Peters, E., & MacGregor, D. G. (2002). The affect heuristic. In T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Intuitive judgment: Heuristics and biases* (pp. 397-420). New York: Cambridge University Press.
- Strahilevitz, M. A., Odean, T., & Barber, B. M. (2011). Once burned, twice shy: How naïve learning, counterfactuals, and regret affect the repurchase of stocks previously sold. *Journal of Marketing Research*, 48(SPL), S102-S120.
- Summers, B., & Duxbury, D. (2012). Decision-dependent emotions and behavioral anomalies. *Organizational Behavior and Human Decision Processes*, 118, 226–238.
- Symeonidis, L., Daskalakis, G., & Markellos, R. N. (2010). Does the weather affect stock market volatility? *Finance Research Letters*, 7(4), 214-223.
- Taffler, R. (2018). Emotional finance: investment and the unconscious. *The European Journal of Finance*, 24(7-8), 630-653.
- Tarim, E. (2016). Situated cognition and narrative heuristic: evidence from retail investors and their brokers. *The European Journal of Finance*, 22(8-9), 688-711.
- Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *Journal of Finance*, 62(3), 1139-1168.

- Tsai, M.-H., & Young, M. J. (2010). Anger, fear, and escalation of commitment. *Cognition and Emotion*, 24(6), 962–973.
- Tuckett, D. (2009). Addressing the psychology of financial markets. *Economics: The Open-Access, Open-Assessment E-Journal*, 3(2009-40), 1-22.
- Tuckett, D., & Taffler, R. (2008). Phantastic objects and the financial market's sense of reality: A psychoanalytic contribution to the understanding of stock market instability. *The International Journal of Psychoanalysis*, 89(2), 389-412.
- Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297-323.
- Västfjäll, D., & Gärling, T. (2006). Preferences for negative emotions. *Emotion*, 6(2), 326-329.
- Västfjäll, D., Gärling, T., & Kleiner, M. (2004). Preference for mood, emotional reaction, and anticipated emotional reaction. *Scandinavian Journal of Psychology*, 45, 25-34.
- Västfjäll, D., & Slovic, P. (2013). Cognition and emotion in judgment and decision making. In M. D. Robinson, E. R. Watkins, & E. Harmon-Jones (Eds.), *Handbook of cognition and emotion* (pp. 252–271). New York: Guilford Press.
- Volz, K. G., & Hertwig, R. (2016). Emotions and decisions: Beyond conceptual vagueness and the rationality muddle. *Perspectives on Psychological Science*, 11, 101-116.
- Wang, J. Y., & Markellos, R. N. (2018). Is there an Olympic gold medal rush in the stock market? *The European Journal of Finance*, ePub ahead of print, 1-18.
- Weber, M., & Camerer, C. F. (1998). The disposition effect in securities trading: An experimental analysis. *Journal of Economic Behavior & Organization*, 33(2), 167-184.
- Wilson-Mendenhall, C. D., Feldman Barret, L., & Barsalou, L. W. (2013). Neural evidence that human emotions share core affective properties. *Psychological Science*, 25, 947-956.
- Wu, Q., Hao, Y., & Lu, J. (2018). Air pollution, stock returns, and trading activities in China. *Pacific-Basin Finance Journal*, 51, 342-365.
- Yik, M., Russell, J. A., & Steiger, J. H. (2011). A 12-point circumplex structure of core affect. *Emotion*, 11, 705-731.
- Yuan, K., Zheng, L., & Zhu, Q. (2006). Are investors moonstruck? Lunar phases and stock returns. *Journal of Empirical Finance*, 13(1), 1-23.

Tables

Table 1. Hypotheses tested in the experiment.

This table presents the hypotheses tested based on sell-hold preferences in the *price increase* and *price decrease* experimental conditions. The balance of Elation – Disappointment is compared to the balance of Hope – Fear to determine the Sell preference (i.e. Sell preference = Elation – Disappointment – Hope – Fear). When Sell preference is negative the prediction is Hold, while when Sell preference is positive the prediction is Sell.

	<i>Price decrease</i>	<i>Price increase</i>
<i>Holding stocks</i>	Elation – Disappointment < Hope – Fear < 0 Sell preference < 0	0 < Elation – Disappointment < Hope – Fear Sell preference < 0
<i>Selling stocks</i>	0 > Elation – Disappointment > Hope – Fear Sell preference > 0	Elation – Disappointment > Hope – Fear > 0 Sell preference > 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.

This table presents the means (M) and standard deviations (Sd) of emotion ratings for the *week before selling* and the *week of selling* for both the *price increase* and *price decrease* conditions. *Mean sum* is the sum of the difference *Hope – Fear* and the sum of the difference *Elation – Disappointment*. *Mean difference* is the difference *Hope – Fear* and the difference *Elation – Disappointment*. *Sell preference* is the difference between *Mean difference* for *Hope – Fear* and the *Mean difference* for *Elation – Disappointment* (i.e. $Sell\ preference = (Elation - Disappointment) - (Hope - Fear)$).

Note: ***/**/* indicate the values are significantly different from zero at the 0.1%/1%/5% levels, respectively.

	Price decrease (n = 38)		Price increase (n = 35)	
	Week before selling M (Sd)	Week of selling M (Sd)	Week before selling M (Sd)	Week of selling M (Sd)
<i>Hope</i>	2.87 (2.18)	1.58 (1.67)	7.26 (1.46)	7.40 (1.68)
<i>Fear</i>	6.87 (2.17)	7.68 (2.12)	5.31 (2.22)	5.97 (2.60)
<i>Mean sum</i>	9.74 (2.84)	9.26 (2.05)	12.57*** (2.76)	13.37*** (3.08)
<i>Mean difference</i>	-4.00*** (3.30)	-6.10*** (3.22)	1.94*** (2.55)	1.43* (3.11)
<i>Elation</i>	1.89 (2.01)	1.66 (2.16)	7.00 (1.35)	8.17 (1.46)
<i>Disappointment</i>	7.21 (2.07)	7.68 (2.55)	2.60 (1.80)	2.14 (1.90)
<i>Mean sum</i>	9.10 (1.69)	9.34 (1.88)	9.60 (1.94)	10.31 (1.66)
<i>Mean difference</i>	-5.32*** (3.71)	-6.03*** (4.33)	4.40*** (2.52)	6.03*** (2.96)
<i>Sell preference</i>	-1.32** (2.62)	0.07 (2.69)	2.46*** (2.78)	4.60*** (3.31)

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).

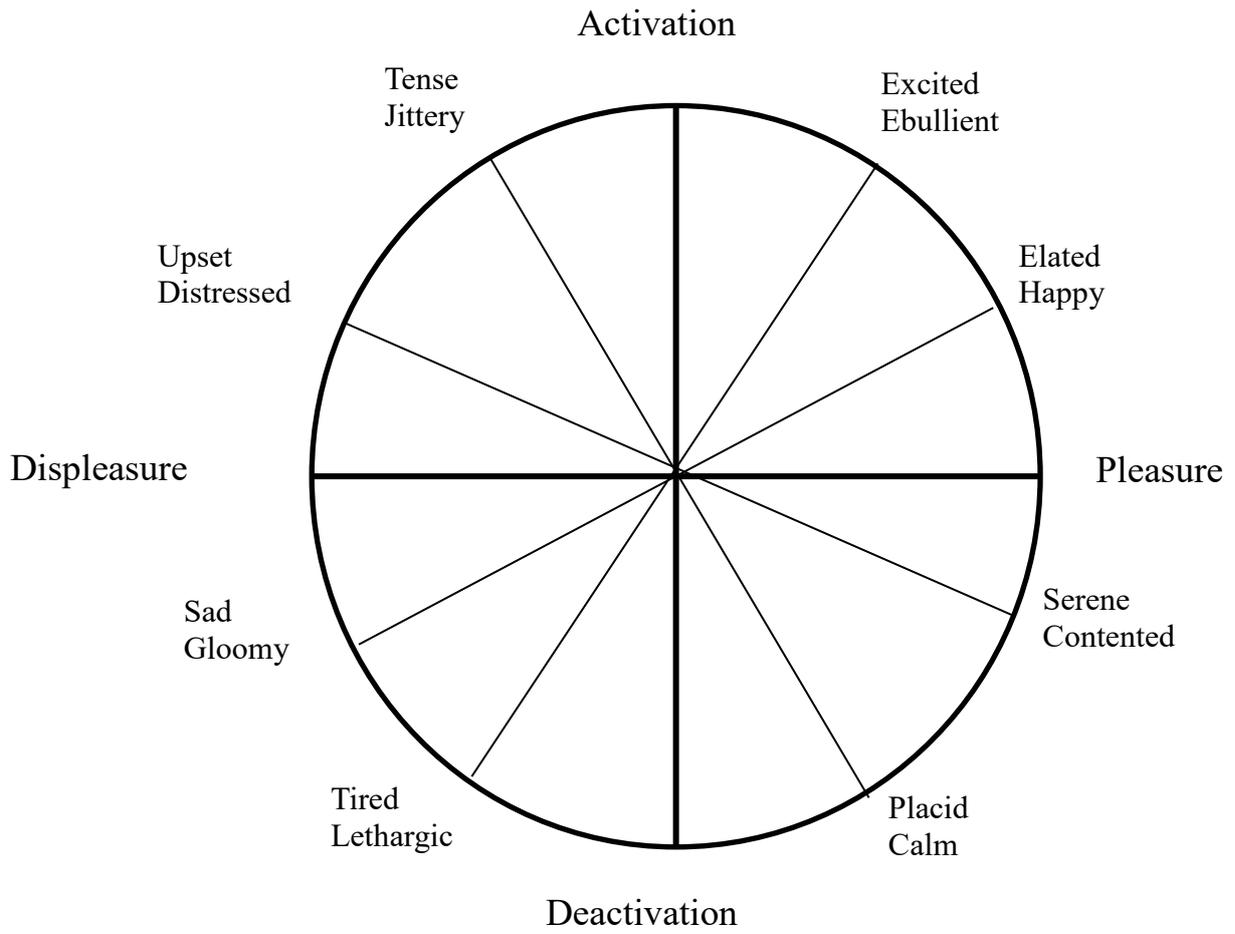


Figure 1

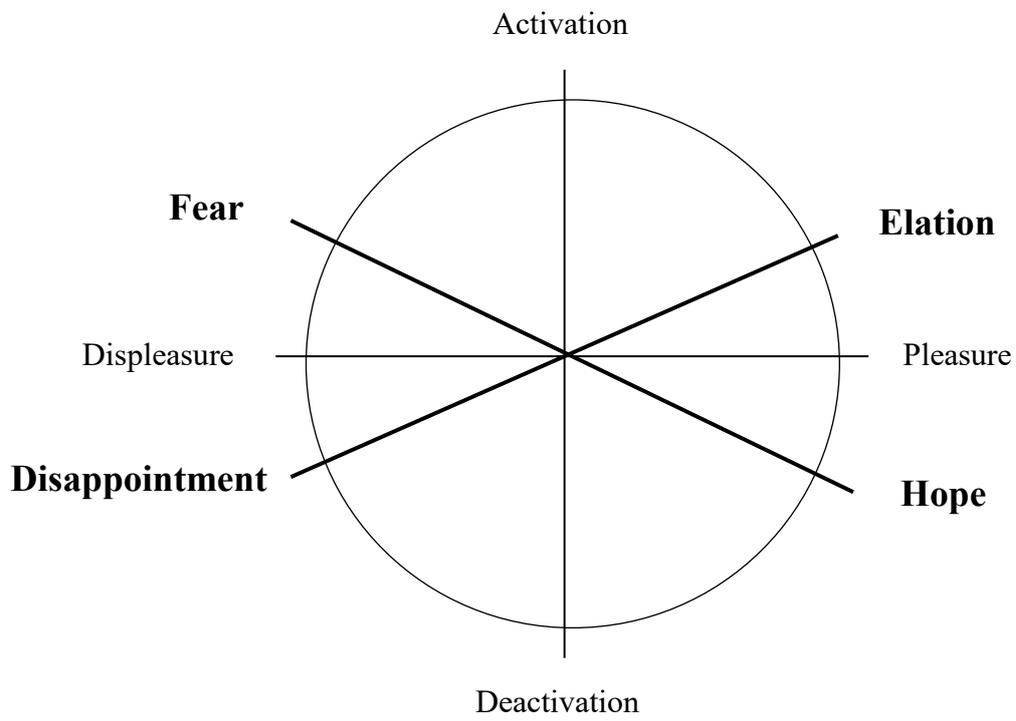


Figure 2

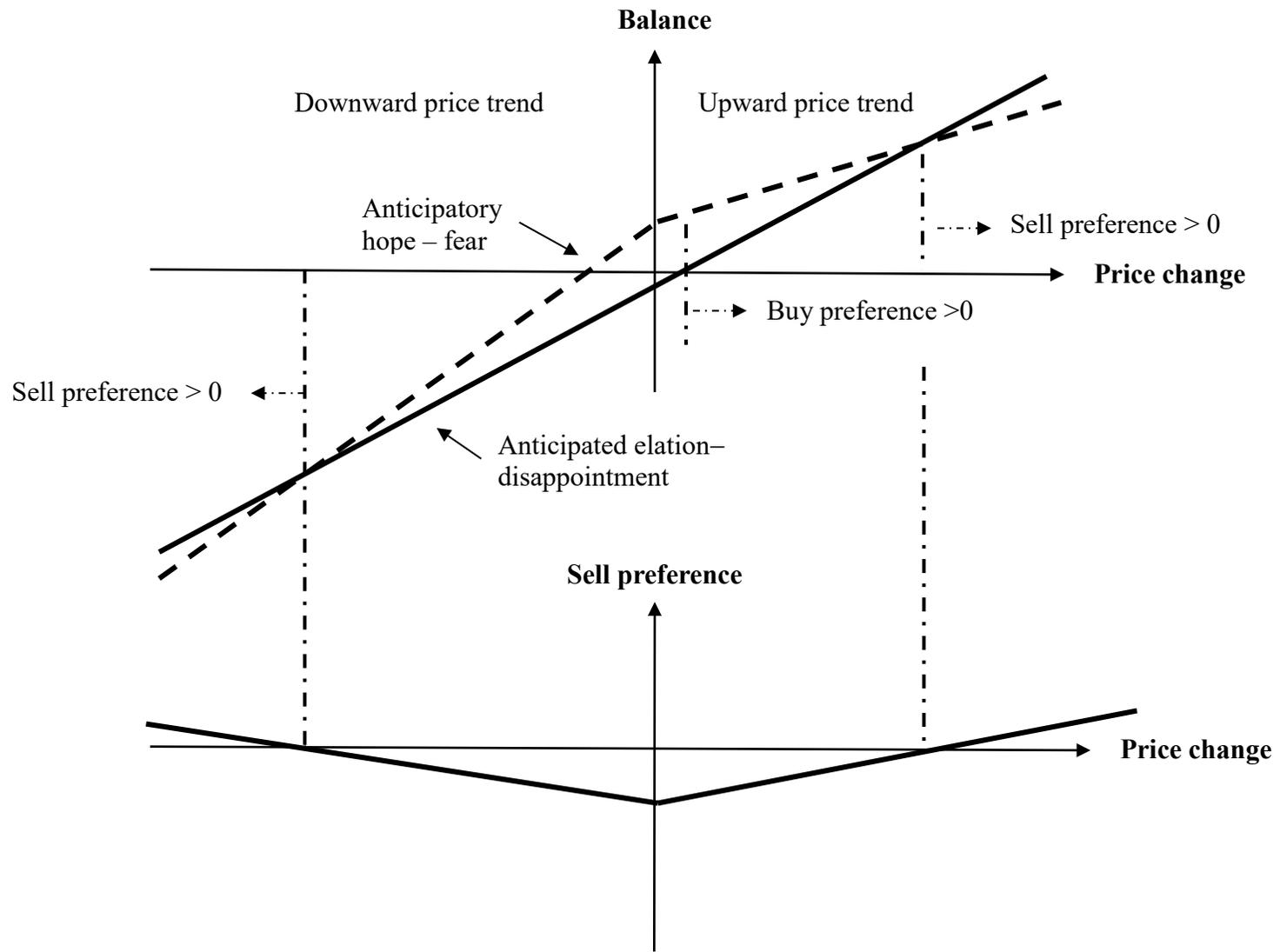


Figure 3