

Emotion and Financial Markets

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We are merely reminding ourselves that human decisions affecting the future, whether personal or political or economic, cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist; and that it is our innate urge to activity which makes the wheels go round, our rational selves choosing between the alternatives as best we are able, calculating where we can, but often falling back for our motive on whim or sentiment or chance.

—John Maynard Keynes (1964, 162–63)

The popular press commonly reports that psychology drives financial decision making and moves asset prices. Yet traditional implementations of financial economic models routinely assume that individuals incorporate information into their decision processes using the rules of probability and statistics with calculated, unemotional logic. This assumption leaves little room for the influence of emotion. Furthermore, when economists have included emotion in describing the behavior of financial markets, emotion is often characterized as causing unwarranted and undesirable price movements. For example, in his book *Irrational Exuberance*, Robert Shiller states that investors' emotional state "is no doubt one of the most important factors causing the bull market" recently experienced in the United States (2000, 57).

Is a "rational" person a cool, unemotional user of logic and the laws of probability? Two characters from the popular television and movie series *Star Trek* provide an answer. Mr. Spock—who is half Vulcan, a species that suppresses emotion and prizes logic—is presented as a rational thinker who thoroughly considers every piece of information. In contrast, Captain Kirk is likely to respond emotionally. Yet Kirk is portrayed as a good decision maker. Though Spock fully analyzes each situation, he gets too caught up in the details. Emotion allows Kirk to focus and enhances his ability to make critical decisions.

A vast psychological literature shows that emotional state can significantly affect decision making (Elster 1998; Hermalin and Isen 2000). In contrast to studies by some other financial economists, this article demonstrates that emotion actually enhances an individual's ability to make rational choices (see also Frank 1988; Damasio 1994; LeDoux 1996; Elster 1998; Isen 1999). Emotion allows people to transcend the details, prioritize, and focus on the decision to be made. Emotion can drive behavior that is consistent with economic predictions.

Understanding what behavior is economically rational is complex. Behavioral research in finance applies lessons from psychology to financial decision making. One aspect of individual psychology that has received a considerable amount of attention is that of cognitive limitations. Individuals are limited in their abilities to encode, process, and retrieve information. In some cases, psychologists argue that these limitations result in biased judgments. Psychologists posit that individuals develop rules of thumb, or heuristics, to promote good decision making with minimal processing. Heuristics allow people to make decisions while economizing on processing. Although individuals develop habits that often serve them well, these habits might occasionally lead them astray. Behavioral finance research has focused primarily on these biases, paying less attention to the role of emotion.

The examination of cognitive aspects of financial behavior in isolation is troublesome and may be mis-

leading. Emotional reactions or evaluations occur at a very early stage and are more basic than cognitive evaluations (Zajonc 1980; LeDoux 1996). Perceptions encompass emotional aspects, which subsequently guide judgment and decision making. Furthermore, theorists recognize that emotion and cognition are interdependent, rather than competing, influences (Simon 1967).

The purpose of this article is to provide a framework from which future research on emotion in financial markets can build.¹ The discussion begins by describing the vastly different views of human behavior held by economists and psychologists. After differentiating their approaches, the article

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defines the term *emotion*, describes how emotions can be categorized, and then describes how emotions influence human behavior. The focus then turns to three particular aspects of emotion and financial decision making: emotional disposition and stock market pricing, the feeling of regret, and investors' emotional response to information. The conclusion considers emotion and the traditional financial economics paradigm.

The Psychology of Economists

Economists and psychologists take strikingly different approaches to the study of human decision making. Some have cultivated dialogues across the disciplines, but the success of a discussion is dependent on the particular issue (Hogarth and Reder 1986). Economists argue that some empirical analyses in psychology lack a theoretical basis. Furthermore, economists argue that empirical evidence provided by psychologists gives little insight into people's decisions because these studies fail to provide participants with meaningful (for example, monetary) incentives and lack the discipline that markets give to behavior. Some psychologists, on the other hand, argue that economists' models bear little relation to actual behavior. Although economists typically assume that individuals choose among alternatives in an internally consistent way,

behavior in detailed experiments is often inconsistent with this assumption.

Individual psychology plays a limited role in finance theory, which assumes that individuals maximize expected utility, with expectations derived using the rules of probability and statistics. The efficient market hypothesis (EMH), though certainly not the only economic model describing financial market behavior, has been the central paradigm in financial economics for over thirty years. In an efficient market, as Fama (1991) defined it, prices reflect all available information. According to this hypothesis, prices should reflect information in such a way that the marginal profit acquired by acting on information does not exceed the marginal cost of acquiring the information. This simple model revolutionized prevailing thought in the 1970s on how markets function. Early empirical evidence supported the EMH. In his first review of an already vast body of evidence, Fama proclaimed that the "support of the efficient markets model is extensive, and (somewhat uniquely in economics) contradictory evidence is sparse" (1970, 416). In fact, Michael Jensen, another prominent scholar, asserted that "there is no other proposition in economics which has more solid empirical evidence supporting it than the efficient market hypothesis" (1978, 95).

More recently, departures from the predictions of the EMH have been reported, and many now argue that markets do not efficiently incorporate information (Haugen 1995; Shiller 2000; Shleifer 2000). Fischer Black (1986) provides a model in which some investors trade on noise rather than information, and, as a result, market prices are not efficient. Black's noise traders' behavior is not driven by news related to an asset's underlying value and may not be fully rational. Noise traders may trade because they mistakenly believe they are trading on information or perhaps because they simply like to trade. Some empirical evidence is consistent with the proposition that irrational behavior results in market inefficiencies. For instance, Daniel, Hirshleifer, and Teoh (2001) argue that investors frequently make large errors that impede the EMH's corrective forces.

The recognition that individual behavioral influences affect market outcomes initiated a new research stream in financial economics that is called behavioral finance. Behavioral finance research applies lessons from psychology to financial decision making. This research has focused primarily on cognitive biases, paying scant attention to emotion's role. Emotion is clearly an important aspect of human psychology though it is not fully understood. In fact, no generally accepted definition of emotions exists.

What Is an Emotion, and How Does It Influence Behavior?

There is a vast body of research on emotions, but the term is seldom defined. Rather, examples of emotional states are provided. Emotion can be defined loosely as a physiological state of arousal triggered by beliefs about something (Elster 1998). Arnold (1960, 182) defines emotion as “the felt tendency toward anything intuitively appraised as good (beneficial), or away from anything intuitively appraised as bad (harmful).” A strict definition of the term is complex because emotion has cognitive, physiological, social, and behavioral aspects (Solomon 2000).

For many, the substance of an emotion is feeling. But emotions are evaluative, rather than purely bodily sensations or cognitive judgments (Frijda 2000). An emotion may have no cognitive basis whatsoever: “a rose smells good because it smells good” (Frijda 2000, 63). Each individual has a personal assessment of whether an object or state is good or bad. Emotions are evaluative in that they evoke positive or negative valences that can be described using bipolar scales that define a continuous spectrum from unpleasantness to pleasantness—for example, unhappy to happy or pessimistic to optimistic (Bradley and Lang 2000, 247).

Despite the lack of a unified definition of emotion, there is some agreement on the set of emotions that exist. According to Elster (1998), some states are clearly emotions, including, for instance, anger, hatred, guilt, regret, fear, pride, elation, joy, and love. Elster further argues that these emotional states can be differentiated from other mental states on the basis of six features put forth long ago. These features do not provide a complete definition of emotion because not even one feature is an element of every emotion. Yet these six features remain central to current discussion and provide a framework for understanding what an emotion is. The brief descriptions that follow use one emotion—regret—for illustrative purposes.

1. **Cognitive antecedents.** Emotions are triggered by beliefs. An investor regrets an investment decision because she believes that bad outcomes could have been avoided.
2. **Intentional objects.** Emotions are about something. The object of an emotion is usually the cognitive antecedent. For example, the poorly performing investment is the object of the regretful investor.

3. **Physiological arousal.** Changes in hormonal conditions and the autonomic nervous system accompany emotions. The regretful investor may feel pangs, a hollow stomach, or depression.
4. **Physiological expressions.** Observable expressions characterize emotions. Facial expressions, posture, voice intonation, and outward appearance are noteworthy. The regretful investor may appear pale, with slumped shoulders.
5. **Valence.** Emotions can be placed on a scale with pleasure at one extreme and pain at the other. Valence, or the experience of pleasure versus pain, translates to happiness or unhappiness. The regretful investor is decidedly unhappy about the poor investment outcome.
6. **Action tendencies.** Emotions are associated with a tendency to act. The regretful investor might take actions to avoid being exposed to similar investment opportunities.

Where Do Emotions Come from, and Where Do They Take Us?

As a result of millions of years of selection, people are well engineered to solve problems repeatedly encountered during evolution. The ability to learn and adapt is critically important to survival. Many emotions are useful responses that result from evolutionary conditioning (Frank 1988; LeDoux 1996). For example, fear is a natural, rational, and useful response in a dangerous situation. In fact, emotional reactions and preferences can form with no conscious recognition of the stimuli (Zajonc 1980). According to Goleman (1995), an individual’s success in life depends as critically on what Goleman calls the “emotional quotient” as on the individual’s intelligence quotient (IQ). Romer (2000) argues that some behaviors reported to be irrational or inconsistent with well-defined preferences might be better explained by allowing complicated feelings in economic models. People’s preferences may be defined by arguments that are not reflected in some economic models.

Path-breaking work by Damasio (1994) indicates that a lack of emotion has striking effects on decision making. Damasio offers behavioral and physiological evidence in support of the hypothesis that decision making is intertwined with emotion. He studied brain-damaged patients who had impaired emotional responses even though they retained their cognitive abilities. The patients were emotionally flat as a result of frontal brain lobe damage, yet

1. This article does not attempt to provide an overview of the vast literature on investor psychology. A recent review is provided by Hirshleifer (2001).

their knowledge, attention, memory, language, and abstract problem solving were unaffected. These individuals had difficulty making decisions and were unable to plan for the future or choose a course of action. Damasio hypothesizes a connection between flawed reason and impaired feelings.

A patient, referred to as Elliot, provides an example. At that time in his thirties, Elliot had experienced a severe change in personality following the removal of a brain tumor. Before his illness, Elliot was a successful husband, father, businessman, and member of the community. After surgery, Elliot could not hold a job, manage his time, or maintain social relationships. Yet his IQ remained in

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the superior range. Extensive testing indicated that Elliot's memory, perceptual ability, language, arithmetic ability, and ability to learn new material were unaffected. Elliot had normal intellectual functioning but was completely unable to make a decision, particularly one of a personal or social nature. Elliot himself reported that he no longer responded in the same way to emotional stimuli. What had once caused a strong emotional response now caused no reaction whatsoever. Although he could reason through a problem, he could not choose a course of action. For instance, if given the task of sorting clients' documents, Elliot could easily understand the material. Yet his attention might be easily diverted, or he might spend hours reading one document, or he might just as easily spend an extended period of time pondering whether the classification scheme was appropriate. Not surprisingly, it was not long before his employment was terminated. A series of financially ruinous ventures followed.

Damasio concludes that feelings have a very strong influence on reasoning. A complete understanding of human behavior requires recognition of the interconnection between the brain and the body. Reason and emotion are part of the human organism. Although emotional responses typically are characterized as irrational, recent research suggests that emotion and rational decision making are complementary.

Neurobiological studies (Damasio 1994; LeDoux 1996) indicate that emotion improves decision making in two respects. First, emotion pushes individuals to make some decision when making a decision is paramount. In some situations in life there are so many options that an individual could devote excessive amounts of time to the decision-making process. An individual could simply become overwhelmed by the possibilities. Emotion provides a coping mechanism and allows individuals to focus without being caught up in the details.

Second, emotion can assist in making optimal decisions. A vast psychological literature shows that emotional state can significantly affect decision making (Elster 1998; Hermalin and Isen 2000). While strong emotional responses are often associated with poor decisions (particularly those of a financial nature), recent research in psychology indicates that the absence of emotions can also lead to suboptimal decisions. Emotion helps to optimize over the cost of optimization. Even mild emotional states can affect behavior (Isen 2000). Positive feelings can make it easier to access information in the brain, promote creativity, improve problem solving, enhance negotiation, and build efficient and thorough decision making. Emotion facilitates optimal-choice behavior when a person is provided with several courses of action (Rolls 1999).

Little attention has been paid to the direct role of emotion on choices of a financial nature. Recently, Lo and Repin (2001) studied the physiological characteristics of professional securities traders while they are engaged in live trading. They report significant correlation between market events and physiological characteristics including skin conductance and cardiovascular data. They conclude that emotion is an important determinant of a trader's ability to survive in financial markets. Other recent research has focused on the role of emotion in a more indirect fashion. Specifically, anomalous financial behavior is frequently attributed to emotion. The next section reviews some of these studies.

Emotional Disposition

A person's current emotional state may influence financial decision making. For example, an individual in a good mood because of recent experience or current position in life brings this positive outlook to the task at hand. Ashbury, Isen, and Turken (1999) argue that a positive mood enhances individual performance on many cognitive tasks. A large body of literature supports the theory that positive mood allows individuals to better organize and assimilate information and facilitates creative problem solving.

Others have argued that evidence on the importance of emotional disposition is provided by empirical results at the aggregate level (for instance, Hirshleifer and Shumway 2003; Kamstra, Kramer, and Levi 2003). Using data from twenty-six international stock exchanges, Hirshleifer and Shumway argue that good moods resulting from morning sunshine lead to higher stock returns.² The argument is that, because people are more optimistic on a sunny day, they are more inclined to buy stocks.

These aggregate studies of the effect of mood on stock market pricing do not provide evidence on how individual behavior translates into market outcomes. Yet theoretical and experimental evidence suggests that even when individual behavior is, on average, characterized as irrational, market outcomes can be consistent with rational pricing (Ackert and Church 2001; Jamal and Sunder 1996, 2001; Chen and Yeh 2002).

More fundamentally, however, the relationship between mood and risk tolerance is not well established. Risk aversion is important because changes in risk aversion affect how much an individual is willing to pay for a stock in response to changes in mood. When an individual becomes elated, perhaps due to better weather, the individual might become more willing to buy stock at higher prices. If melancholy is associated with greater risk aversion, an individual suffering from depression might associate lower valuations with stocks. The literature does not provide compelling evidence that optimism or euphoria leads to lower risk aversion or that depression or a poor mood leads to increased risk aversion.

According to Thaler and Johnson (1990), it is extremely difficult to make generalizations about preferences toward risk. They conclude that after a series of winning gambles, individuals are willing to take on more risk so that risk aversion declines after prior gains.³ However, after an initial loss, experimental participants become more risk averse. Other research shows that happier people are more opti-

mistic and assign higher probabilities to positive events (Wright and Bower 1992). Yet decision-making research shows that even though happy people are more optimistic about their likelihood of winning a gamble, they are much less willing to actually take the gamble (Isen, Nygren, and Ashby 1988). They are more risk averse. People in a good mood are less likely to gamble because they do not want to jeopardize their good mood. Thus, it is not clear how positive and negative emotional states affect risk preferences and, in turn, translate into market pricing.

Clearly, clinical depression is quite different from a simple bad mood. Depression has a biochemical basis and can occur without cognitive appraisals. A person with no chemical imbalances might naturally experience anxiety in certain situations (for example, a job interview) but a depressed person might feel chronically anxious with a view that the world is an inexhaustible source of threats. Furthermore, the modern view of depression recognizes that the condition may involve altered brain circuitry (LeDoux 2002).

As with the evidence on the effect of mood on risk choices, experimental evidence concerning the relationship between risk tolerance and depression fails to provide a clear picture. Some researchers question the importance of anxiety and depression in explaining choices across risky alternatives (Hockey et al. 2000). Others conclude that risk aversion is correlated with depressive tendencies (Eisenberg, Baron, and Seligman 1998). Importantly, as these authors recognize, risk aversion is correlated with anxiety and depression.⁴ Eisenberg, Baron, and Seligman report that the correlation between depressive symptoms and risk aversion arises from the correlation with anxiety.⁵ The fundamental issue remains unresolved. While a depressed person shying away from risk for no apparent reason may appear to be irrational, it may be perfectly rational for an anxious person to move toward safer alternatives. Again, much research needs to be done to move toward a definitive conclusion.

2. Another stream of research in financial economics investigates the impact of investor sentiment on asset pricing. Sentiment is broadly defined as the deviation in asset returns from that predicted by the fundamental determinants of asset value, such as dividends (Lee, Shleifer, and Thaler 1991). The source of the sentiment may be noise (Black 1986). Though not postulated in the literature, the source of sentiment, as discussed in the finance literature, could also be changes in the emotional disposition of the population of investors.

3. Barberis, Huang, and Santos (2001) have formulated a theoretical model of this behavior that predicts that individuals will become more risk averse after a fall in stock prices. Investors derive utility from changes in wealth and are more sensitive to decreases in wealth than to increases.

4. Note that this study, like many others, is based on hypothetical questions, and, thus, decisions are not financially motivated. Furthermore, the measure of depressive symptoms is based on a survey given to a sample of students registered in a college course. The incidence of clinically diagnosed depression in this sample is not reported.

5. Interpretation of the results becomes even more difficult because Raghunathan and Pham (1999) find that anxiety and sadness have distinct influences on behavior.

Regret

Regret is an emotion that colors an investor's current disposition. Some claim that fear of regret can drive certain financial decisions. This emotion is counterfactual in that it is generated by thoughts about what might have happened but did not. Clearly, regret is a negative emotion. An investor may regret a bad investment decision but is not likely to regret a good one.

Psychologists recognize the important impact regret can have on decision making. According to Kahneman and Tversky (1979), individuals have strong desires to avoid the feeling of regret. They argue that a number of the implications of expected

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utility theory are not corroborated by experimental evidence and provide an alternative to the standard economic paradigm—prospect theory. Central to their theory is the notion of loss aversion: Individuals will change their behavior in order to avoid recognizing losses. Experimental subjects, given the hypothetical choice between \$500 with certainty versus a coin flip for \$1,000, will usually choose the former: they are risk averse.⁶ This risk aversion, however, would also imply that subjects should choose a loss of \$500 with certainty rather than the flip of a coin where they can either return to zero or lose an extra \$500. In the experiments, however, most subjects choose the gamble: They are risk loving in the domain of losses. Kahneman and Tversky argue that individuals wish to avoid the negative feeling of regret that would occur if they have to recognize a loss, and so they alter their “normal” risk-averse tendencies. It is important that the results from these hypothetical situations be interpreted with caution as individuals may behave quite differently if given significant, monetary incentives.

Shefrin and Statman (1985) argue that regret is an important factor explaining the disposition effect—the tendency to sell superior-performing stocks too early and hold on to losing stocks too long. Shefrin and Statman include Kahneman and Tversky's prospect theory as a framework to explain

why investors might sell winners too early while holding on to losers. According to Shefrin and Statman, investors are more likely to realize gains than losses. The fear of regret leads investors to postpone losses whereas, symmetrically, the desire for pride leads to the realization of gains. An individual experiences regret when closing a position with a loss because of the poor investment decision. Conversely, an individual feels pride or elation when closing a position with a gain because his financial decision resulted in a profit.

Standard economic models of choice can be extended to incorporate emotions, including regret. For example, in Hermalin and Isen's (2000) model, individuals are fully rational and maximize the discounted value of future utility. Emotions directly enter utility functions, with negative emotions, such as guilt or regret, reducing utility. This research takes emotions as given, rather than trying to explain why people have emotions, and concludes that incorporating the psychological finding that emotion affects decision making into models of rational behavior gives important insight into behavioral phenomena.

Emotional Reactions

Thus far, this article has argued that emotional disposition, including regret, can affect financial decision making. Emotional responses are also induced by the plethora of stimuli people encounter every day. An individual's affective assessment is the sentiment that arises from the stimulus. For instance, when an individual is negotiating with another party and experiences a feeling of dislike for the other party, the outcome of the negotiation is likely affected. Thus, *affect* refers to the quality of a stimulus and reflects a person's impression or assessment. Cognitively, an individual's perception includes affective reactions so that judgment and decision making are inextricably linked to these reactions.

Arguably, peoples' thoughts are made up of images that include perceptual and symbolic representations (Damasio 1994; Charlton 2000). The images are marked by positive or negative feelings that are linked to somatic (or bodily) states. At the neural level, somatic markers arising from experience establish a connection between an entity or event and a body state (pleasant or unpleasant). In effect, affective reactions are cognitive representations of distinct body states. People are attracted to stimuli associated with positive somatic markers and steer away from those associated with negative somatic markers. Readily

available affective reactions provide expedient means for decision making because they make it far easier to weigh the pros and cons of alternative stimuli (Finucane et al. 2000).

Research that directly examines the role of affect in financial decisions is limited. More research is warranted because affective reactions influence judgment and decision making, even without cognitive evaluations (Zajonc 1980, 1984). Furthermore, when affective reactions and cognitive evaluations diverge, the emotional aspects can exert a dominating influence on behavior (Ness and Klass 1994; Rolls 1999).

In the financial realm, MacGregor et al. (2000) conclude that there is a relationship between the image of a market and what has occurred in the market. In their experiments, participants' willingness to invest in a firm was influenced by affective reactions to the firm's industry membership. Ackert and Church (2002) also examine the portfolio allocation decisions of participants in financial experiments with selective information disclosures concerning available investment alternatives. Again, affective assessments have significant effects on decision making. Other work recognizes that affect is important in understanding managers' financial decisions. Kida, Moreno, and Smith's (2001) experimental results indicate that when making capital budgeting decisions, individuals are more likely to reject projects that elicit negative emotions. Insight into market reactions awaits further investigation.

Conclusion

This article has suggested that although emotion has important influences on financial behavior, it does not contaminate judgment. Some have called for a new paradigm, one that incorporates behavioral influences and better models actual behavior. Without question, the traditional finance paradigm has been challenged. Many anomalies have been reported. Yet a paradigm is rarely displaced by anomalies (Kuhn 1970). If a paradigm is to be replaced, it must be replaced by another paradigm that provides a superior explanation of the facts. According to Kuhn, "so long as the tools a paradigm supplies continue to prove capable of solving the problems it defines, science moves fastest and penetrates most deeply through confident employment of those tools. The reason is clear. As in manufacture so in science—retooling is an extravagance to be reserved for the occasion that demands it. The significance of crises is the indication they provide that an occasion for retooling has arrived" (1970, 76). Has the time for retooling in finance reached Kuhn's crisis level?

Though recent models explain certain aspects of financial decision making that appear to be inconsistent with the efficient market hypothesis, financial economists are without a superior paradigm. Yet that is not to suggest that emotional behavior should be ignored. While some argue that in certain situations emotion may "get in the way" and lead to suboptimal decision making, we believe that emotion is an important aspect of the human condition that can actually enhance decision making.

6. Hypothetical choices may not be consistent with choices made when the incentives are real. In their experiments, Holt and Laury (2002) show that subjects are considerably more risk averse when payoffs are in cash rather than hypothetical.

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