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Version Pre-print/accepted manuscript

Citation (published version) Kramer, L.A. (2014). Human Psychology and Market Seasonality. In Investor Behavior (eds H.K. Baker and V. Ricciardi). <https://doi.org/10.1002/9781118813454.ch20>

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Human Psychology and Market Seasonality

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Abstract

Evidence suggests that human psychology plays a role in individuals' financial decisions, with economically meaningful consequences observed even at the aggregate market level. This chapter considers many instances whereby human mood induced by exogenous factors is associated with economically large, statistically significant effects in financial markets. Some regularities covered by this chapter arise due to environmental factors. For instance, a relationship appears between length of day and stock returns, working through seasonal changes in depression and risk aversion. This chapter also considers financial market regularities that are consistent with mood changes due to events in the news, such as terrorist attacks, and forms of entertainment such as sporting events. In most cases, authors of the original studies apply extensive robustness checks to explore alternate hypotheses, namely that the phenomenon may arise for non-psychological reasons. The body of research builds a compelling case that human mood can markedly affect markets.

Key Terms: *anomalies, emotions, financial decisions, market seasonality, mood, sentiment*

Introduction

Classical economics and traditional finance rest partly on the premise that individuals make decisions unencumbered by emotions. Of course, the assumed goal of economic agents is to maximize utility, which can equally be thought of as happiness. Happiness is clearly an emotional state, yet many economists and financial academics seem to prefer not to think of happiness in terms of emotions, and the lexicon associated with feelings is typically deemed to be irrelevant in the realm of standard economic and financial analysis. Traditional economics and

finance has no room for sadness, excitement, or any other mood-related characteristics that most people would admit affect their daily lives to some extent.

If people experience their emotions randomly over time and/or across individuals, then ignoring the impact of their emotions on economic quantities could be prudent. Similarly, if emotions affect decisions but those effects do not amount to anything in aggregate when considering financial markets or the economy broadly, then quantitative analyses need not take account of emotions or other features of human psychology. If, in contrast, mood affects individuals' economic and financial decisions, and if the sum effects of those decisions fail to net to zero across individuals or at the macroeconomic level, then conventional economic analysis faces major challenges. This chapter provides evidence that human psychology has important implications on decisions at the individual level and outcomes at the macro level, commonly known as micro and macro behavioral finance. More specifically, this chapter analyzes the extent to which synchronicity in the psychological experiences of many members of a population may lead to widespread seasonal patterns in financial markets.

To the extent compelling evidence exists that human emotions have an impact on individual investors' financial decisions, this clearly has important implications for investors making portfolio management decisions, financial professionals who provide advice to individuals, and the personal finance industry in general. These implications apply irrespective of whether individual-level behavioral tendencies have widespread implications at the overall market level. If, however, compelling evidence exists that marketwide regularities arise as a consequence of emotion-influenced decisions of individuals, then the implications are even broader-reaching, applying not only to individual investors, financial advisors, and professionals who work in the personal finance industry, but also to hedge fund and mutual fund managers, other large financial institutions, financial regulators, and the academics who conduct research on financial economics.

Moods, Emotions, and Sentiment

In the parlance of psychologists, moods and emotions are distinct concepts. Emotions are affective states that tend to be fleeting and transitory, such as a momentary burst of anger experienced by a motorist or the sense of joy experienced by a parent watching an offspring's school play. Moods, in contrast, are a much more persistent affective state, including depression that can last for months or even years at a time and the joyful honeymoon phase experienced by newlyweds. Sentiment, which is a term more commonly used by economists, encompasses both mood and emotion. For simplicity, this chapter uses all three

terms interchangeably, though the reader is advised to keep in mind the distinction between mood and emotion that exists more broadly.

Weather, Mood, and Markets

Richard Roll, a noted finance professor, may be the first researcher to suggest that the weather might influence financial markets. His insights came a decade before the start of a major surge in the academic literature studying the connection between emotions and markets. Roll (1984) finds that temperature surprises in Florida significantly influence the futures market price for orange juice. One can imagine non-psychological reasons for a connection between weather and orange juice futures prices. For instance, freezing temperatures in Florida can markedly affect the orange crop, and such events could conceivably have rational price implications, especially when the temperature extremes are unanticipated. Roll finds evidence, however, of a persistent impact of temperature shocks on prices that seems to suggest some degree of market inefficiency. Nonetheless, his arguments make no reference to human psychology, instead leaving the connection between weather and price changes as an unexplained phenomenon.

Saunders (1993) provides the next important step exploring a link between the weather and markets. He studies U.S. stock index returns for the Dow Jones Industrial Average as well as both the value-weighted and equal-weighted New York Stock Exchange and American Stock Exchange indices and finds they are significantly related to the local weather in New York City. Aside from commenting that both clinical and experimental research show that weather has significant effects on human behavior and noting that the weather likely influences the mood of traders and other workers, he does not attempt to specify a formal path through which weather-induced mood might affect markets.

Hirshleifer and Shumway (2003) build on the work of Saunders (1993), revisiting the relationship between stock returns and the weather in the city of a market's exchange in 26 countries. They devise a novel measure for weather, considering surprises relative to seasonal average weather effects instead of surprises relative to recent weather forecasts issued 36, 24, and 12 hours in advance as studied by Roll (1984) or raw observed weather effects as utilized by Saunders (1993). Based on their measure, Hirshleifer and Shumway find that daily deviation from seasonally normal cloudiness is negatively related to stock return indexes. That is, the cloudier the weather is in the city of the exchange (relative to seasonal weather norms), the more negative is the impact on returns for that exchange. The authors ascribe this finding to the psychological phenomenon known as *misattribution bias*. The idea is that when one is in a bad mood, she is

more likely to focus on negative information, or symmetrically, when one is in a good mood, she tends to focus on positive information. Further, people frequently misattribute their state of mind to the incorrect source, which can have spillover effects on decisions. The example Hirshleifer and Shumway cite is that people are often happier on sunny days than on cloudy days, which in turn can influence choices a person makes during the day, including financial choices. The misattribution bias can be attenuated if people are asked about the weather, perhaps because the question prompts them to recognize the direct connection between their mood and the weather. Hirshleifer and Shumway also cite evidence that sunshine and sunlight are linked with positive mood. They hypothesize that if people are in a good (bad) mood due to the weather, they may be more (less) inclined to buy stock, especially given the effects of misattribution bias.

Further exploring the importance of weather for financial markets, Cao and Wei (2005) perform an in-depth study of nine stock return indices across eight countries and find a negative correlation between temperature and stock returns. They conclude their findings are consistent with research in psychology that relates various temperatures to apathy and/or aggression. Their results are maintained after controlling for other known market regularities and performing various robustness checks.

Daylight, Mood, and Markets

A stream of studies has emerged exploring the link between seasonality in daylight, seasonality in mood, seasonality in financial risk tolerance, and seasonality in market returns. Before considering the empirical findings themselves, considering the underlying literature in medicine and psychology is useful.

Weather, Daylight, and Mood

Weather is separate from but not independent of daylight. The time between sunrise and sunset defines daylight. While sunshine is a stochastic weather feature that may or may not be observed during daylight hours (depending on the amount of cloud cover), daylight itself is deterministic and perfectly predictable by date and latitude, following a cycle akin to a sine wave.

Humans and other animals experience circadian rhythms that vary with daylight, both at a high frequency (e.g., over the 24-hour cycle of a day) and at a low frequency (e.g., over the course of the year). Over the span of day, humans have sleep/wake cycles that are cued by daylight. During the year, people

experience seasonal variation in mood that medical researchers and psychologists have extensively studied. Perhaps the best known form of seasonal mood variation in humans is seasonal affective disorder (SAD), a seasonal form of depression commonly known as winter blues. Individuals suffering from seasonal depression experience a range of symptoms—one of the most problematic of which is a dampened mood.

Studies suggest the basis for seasonal depression is physiological, with leading theories suggesting the condition is related to disruption in functions related to neurotransmitters and hormones such as serotonin. For example, Westrin and Lam (2007) discuss the etiology of SAD. Various researchers including Molin et al. (1996) and Young et al. (1997) consider a range of environmental factors, such as temperature, cloud cover, rainfall, humidity, and length of day. They find the amount of time between sunrise and sunset is the strongest cause of seasonal depression. Interestingly, authors including Watson (2000) and Keller et al. (2005) find no significant correlation between a range of weather variables and *transient* mood (i.e., mood fluctuations of short duration, in contrast to the persistent mood dampening associated with seasonal depression).

As catalogued by Kamstra, Kramer, and Levi (2012a), major challenges arise to estimating the prevalence of seasonal depression in populations, and especially in making comparisons across populations, in part because different researchers use different diagnostic criteria and sample selection methods. Nonetheless, studies suggest that between 1 and 10 percent of the U.S. population suffers from severe seasonal depression. Studies by Mersch (2001) and Thompson, Thompson, and Smith (2004) find estimates of the percentage of the population affected can vary considerably depending on latitude as well as sample selection and diagnostic criteria. Accordingly, different estimates invariably emerge from different studies. For example, Rosen et al. (1990) find 2 percent of the population in Florida and 10 percent of the population in New Hampshire suffer from SAD. Furthermore, severe seasonal depression appears to be the extreme of a continuum along which most or possibly all humans experience some degree of seasonal depression. For instance, Mersch et al. (1999, p. 1020) state “mood fluctuations over the seasons are not only present in SAD, but are—with smaller amplitude—also present in normal subjects as well.” Further, Harmatz et al. (2000) find that even among individuals who do not meet the diagnostic criteria for SAD, depression varies significantly across the seasons and peaks in fall/winter, especially for women.

Clinical studies by researchers including Young et al. (1997) and Lam (1998) suggest that among North Americans who suffer from SAD, the onset of symptoms can begin in summer for a tiny subset of individuals, but most people begin suffering around the time of autumn equinox, when daylight is changing most rapidly. A small fraction of individuals begins recovering immediately after

winter solstice, with the peak point of recovery occurring around spring equinox when daylight is increasing most quickly. As for locations outside of North America, researchers including Lam (1998) and Magnusson (2000) indicate that SAD appears to be more prevalent in countries located at higher latitudes, and Rosenthal et al. (1984) report that symptoms are milder closer to the equator. The timing of symptom onset and recovery appears to be similar across countries.

Mood and Financial Risk Aversion

An important element of the connection between mood and financial markets is the research finding that has been established between depression and risk aversion. Several studies show that depressed people are more averse to risk. For instance Carton, Jouvent, Bungener, and Widlöcher (1992) and Carton, Morand, Bungener, and Jouvent (1995) find depressed individuals score significantly more highly on standard risk aversion questionnaires than non-depressed individuals. Zuckerman, Buchsbaum, and Murphy (1980), Zuckerman (1984), and Horvath and Zuckerman (1993) provide further evidence of the connection between depression and risk aversion. Turning to the financial domain, Wong and Carducci (1991) and Harlow and Brown (1990) show that standard measures of risk aversion extend to risk of a specifically financial nature. Several other studies including Sciortino, Huston, and Spencer (1987), Harlow and Brown (1990), and Smoski et al. (2008) demonstrate an association between dampened mood and increased aversion to risk specifically of a financial nature.

Seasonality in Mood, Seasonality in Risk Aversion, and Seasonality in Markets

Given the apparent prevalence and synchronicity with which the seasons affect the moods of individuals, a natural question is whether seasonality in mood translates into seasonality in financial decisions and aggregate financial markets. A set of studies conducted over the past decade seeks to explore that question, as discussed in the next sections.

Stock Returns

Kamstra, Kramer, and Levi (2003) hypothesize that seasonality in depression is associated with large seasonal variation in the return to holding risky stocks in markets around the world. According to their hypothesis, if diminished length of day in the autumn causes investors' risk aversion to increase, those investors become less inclined to hold risky stocks. This would have an immediate

negative influence on stock prices and returns. The price pressure would continue until investors sell sufficient quantities of their risky holdings to ensure their revised portfolios are consistent with their now higher risk aversion, or until the now higher expected return to holding risky stock sufficiently compensates them for their heightened distaste for risk. Following winter solstice, as the length of day starts to increase, investors would begin recovering from their depression and would become more willing to hold risky assets, at which time stock prices and returns would be positively influenced.

Kamstra et al. (2003) test this hypothesis using daily stock index returns and daylight data for nine international markets. They find significant seasonal variation in returns, and their attempt to identify the source of the seasonal variation rests on two factors. First, the fact that the prevalence and intensity of depression increase with latitude implies seasonal variation in returns ought to increase with latitude. Second, the fact that seasons are six months out of phase in the southern hemisphere suggests the seasonality in returns should be offset by six months in southern hemisphere markets. Thus, the authors consider stock markets at various latitudes in the northern hemisphere, ranging from Japan at 36°N to Sweden at 59°N . In the southern hemisphere, they consider South Africa, New Zealand, and Australia, all of which are located between 26°S and 37°S . After controlling for standard stock return regularities, they find significant evidence of seasonal variation in returns consistent with seasonally varying investor risk aversion that arises due to seasonal depression. The patterns are more prominent in stock markets at extreme latitudes, such as Sweden, where the seasonal fluctuations in daylight are more extreme. Furthermore, both the seasonal patterns and the seasons are six months out of sync in southern hemisphere markets such as Australia.

Other authors consider broader sets of countries. For example, Dowling and Lucey (2008) find similar results based on data from 37 countries. Further, Kamstra et al. (2012a) report similar evidence based on 36 countries' stock return indexes, studying the series individually and clustered into groups based on latitude and hemisphere, and employing various different econometric methods and modeling approaches.

Time-Varying Price of Risk

Garrett, Kamstra, and Kramer (2005) further examine the hypothesized relationship between seasonal depression and seasonal stock returns, exploring time-varying risk aversion in an equilibrium asset pricing model context and allowing the price of risk to vary through the seasons. Using daily and monthly data for six countries in both the northern and southern hemispheres, they find evidence consistent with the seasonal depression hypothesis. Specifically, the

authors find that a conditional capital asset pricing model (CAPM), which allows the price of risk to vary seasonally (coincident with the timing documented in clinical studies of individuals who suffer from SAD), fully explains observed seasonal variation in returns. Stated differently, they find the price of risk varies seasonally.

Treasury Security Returns

Kamstra, Kramer, and Levi (2012b) consider the other side of the risk coin. Whereas Kamstra et al. (2003) study seasonality in the rate of return to risky stocks, Kamstra et al. (2012b) examine seasonality in returns to safe securities. Their argument is that if seasonality in investor mood and investor risk aversion is associated with investors disfavoring risky stocks during some seasons, then investors ought to symmetrically favor safe securities during those same seasons. The study uses monthly returns to U.S. Treasury securities, arguably the safest securities available to investors worldwide, and a range of maturities spanning the medium-to-long term. The authors omit the shorter end of the maturity spectrum from their tabulated analysis due to the fact that the Federal Reserve Board aims explicitly to remove seasonal fluctuation in interest rates in the short-term Treasury securities. Nonetheless, they document similar evidence for all Treasury maturities in an earlier version of their manuscript.

Overall, Kamstra et al. (2012b) find statistically significant evidence of economically large seasonal differences in returns to U.S. Treasury securities. This is consistent with seasonal depression and seasonal risk aversion having an influence on investors' preference for safe securities. The authors find the seasonal variation in Treasury security returns does not appear to be driven by any of a wide range of alternate explanations, including macroeconomic cyclical, various standard measures of investor sentiment, cross-market hedging between equity and Treasury securities, seasonality in the Treasury debt supply, seasonality in the Federal Open Market Committee meeting cycle, and seasonal variation in risk.

Mutual Fund Flows

Kamstra, Kramer, Levi, and Wermers (2012) consider whether seasonal depression and seasonal variation in investor risk tolerance are associated with seasonal variation in the flow of funds into and out of mutual funds. If seasonal depression causes seasonal reallocation between safe and risky asset classes, this should show up in flows. They analyze net flow and net exchange data for risky and safe categories of mutual funds in Canada and the United States and for risky mutual funds in Australia. The authors find significant flows out of risky mutual

fund categories and into safe categories in the fall, when daylight is diminishing. Further, their evidence shows that these patterns reverse when daylight is becoming more abundant. The patterns for risky mutual fund categories are offset by six months in Australia, as are the seasons. These results hold after controlling for other known regularities in mutual fund flows, and the findings withstand many robustness checks. A novelty of this paper relative to several other studies that consider the link between seasonal depression, seasonal risk aversion, and financial market seasonality is the fact that it considers quantities (by way of flows of funds) instead of prices.

Preference Parameters in an Asset Pricing Model

Kamstra, Kramer, Levi, and Wang (2012) seek to determine whether a reasonable set of preference parameters exists that accounts for the empirically observed seasonal variation in equity returns and Treasury security returns. They consider an asset pricing model in which the representative agent has Epstein and Zin (2009) recursive preferences, with risk aversion and the elasticity of intertemporal substitution (EIS) both varying by season. Calibrating to consumption data, the model is able to match the magnitudes of equity and Treasury returns observed in U.S. markets across the seasons. Importantly, they find that it is essential to allow for seasonal variation in both risk aversion and EIS in order to closely match to the characteristics of observed returns. Allowing variation in only one or the other is insufficient.

Analyst Earnings Forecasts

Dolvin, Pyles, and Wu (2009) explore the possibility that the widespread prevalence of seasonal depression has implications for the earnings forecasts issued by financial analysts in the United States. They find analysts are typically optimistic, similar to the finding of several other studies, and the optimism decreases during the months when seasonal depression is commonly observed. Further, the authors find stronger seasonal effects for analysts located in more northern states, consistent with the finding that seasonal mood effects are stronger at higher latitudes. Lo and Wu (2010) find similar results with respect to less optimistic analyst forecasts during periods when individuals experience seasonal depression.

Initial Public Offering Returns

Dolvin and Pyles (2007) consider the possibility that seasonality in investor depression and investor risk aversion affect initial public offering (IPO) prices in the United States. They consider more than 4,000 issues of which just under half

occurred during the fall and winter. Their results show significantly more IPO underpricing in the fall and winter seasons compared to the rest of the year. The authors recommend that for firms with flexibility in the timing of their public offerings, avoiding the times of the year during which people experience seasonal depression may be financially advantageous.

Real Estate Prices and Real Estate Investment Trust Returns

Kaplanski and Levy (2012) study real estate price data from the United States, the United Kingdom, and Australia. They find prices follow a sinusoidal pattern over the course of the year on average during their 20-year sample and in most individual years of their sample. The authors also find greater seasonality at higher latitudes. Overall, their findings are consistent with the notion that individuals experience mood changes that spill over into the real estate market. Kaplanski and Levy explore a range of alternative explanations and find the SAD hypothesis dominates.

Perceived Market Risk

In a study using data on the implied volatility of S&P 500 index options (i.e., the VIX), Kaplanski and Levy (2009) explore the possibility that SAD may lead to changes in investors' perception of risk. Commonly denoted the "fear index," the VIX is typically interpreted as a measure of the perceived volatility of stock returns over the next 30 days. Stock volatility is naturally determined largely by economic fundamentals, but may also be driven by changes in investor sentiment. Hence, variation in the VIX could come from either source. The authors decompose the VIX into one part that is explained by fundamentals and another part by sentiment. They find the sentiment-driven component of the VIX is significantly correlated with hours of daylight, which is consistent with the notion that seasonal depression helps to drive investors' perception of market risk. Notably, the authors do not find a significant relationship between hours of daylight and actual risk. Given their findings with respect to seasonality in financial risk perception, Kaplanski and Levy speculate that people's perceptions of the risks associated with other important life events may vary seasonally, including marriage and elective surgical procedures.

Bid-Ask Spreads

DeGennaro, Kamstra, and Kramer (2008) study bid-ask spreads for U.S. stocks and find additional results consistent with the notion that seasonal depression and seasonal risk aversion influence financial markets. After controlling for several regularities known to influence spreads, they find the

spreads quoted by an individual dealer are significantly wider during seasons when people are more risk-averse due to seasonal depression. This finding aligns with theory introduced by Stoll (1978) and Ho and Stoll (1981, 1983) that suggests greater dealer risk aversion leads to wider spreads. DeGennaro et al. contend that the interaction between seasonal variations in the width of spreads and previously documented seasonal variation in equity returns leads to a counterintuitive outcome for inside spreads. That is, during the seasons when individuals are more risk averse and quoted spreads are wider, inside spreads (i.e., the difference between the best bid and ask prices across all dealers) are narrower. These findings are robust to various tests and specification changes.

Individual-Level Analysis

Most of the papers just described examine the connections between seasonality in mood, seasonality in risk aversion, and seasonality in markets by employing aggregate financial market data exclusively, and not data about individual-level decisions. Kramer and Weber (2012) are an exception in that they consider data from surveys and experiments conducted at the individual level. This enables them to examine whether individuals experience seasonally varying mood, seasonally varying risk aversion, and/or seasonally varying financial choices. The study participants include more than 300 faculty and staff at a large North American university, all of whom responded to questions at each of three points in time over the course of a year. The participants completed several questionnaires that clinicians use, including some that screen for current bouts of depression and others that diagnose whether one is prone to suffer from SAD in general. The researchers measured financial risk aversion by having participants take part in an incentive-compatible exercise. Participants received \$20 in compensation for participating in the study and each had an opportunity to “invest” all, some, or none of those funds after the study ended. The investment, titled the Safe Asset Versus Risky (SAVR) task, mimics an actual financial investment by incorporating higher expected compensation for bearing risk. Those who preferred to take maximal risk could choose to invest all of their \$20; in so doing they faced 50:50 odds of losing the entire \$20 or receiving \$42. Those who preferred not to take risk could choose to invest none of their \$20, in which case they kept the entire amount. Those who chose to take intermediate levels of risk could allocate portions of their \$20 (in 10 percent increments) between the safe and risky alternatives.

The outcome of the study reveals that individuals who are predisposed to experience seasonal depression (i.e., those who suffer from SAD) exhibit significantly greater levels of depression in the fall/winter than in the summer, and they are significantly less willing to take financial risk in the fall/winter than in the summer. Furthermore, individuals who suffer from SAD are significantly more

depressed and less willing to take financial risk in the winter than are individuals who do not suffer from SAD.

The timing of this particular study overlapped with the financial crisis of 2008–2009, which complicated the analysis to some extent, with non-SAD sufferers becoming more averse to financial risk as the financial crisis deepened. This suggests that a promising line of inquiry may exist into the combined interactions among seasons, the business cycle, and financial risk aversion.

Daylight-Saving Time Changes, Mood, and Markets

Humans' sleep habits have a profound impact on their state of mind, and on their performance in the workplace. Kamstra, Kramer, and Levi (2001) highlight some catastrophic events from history that have been linked to humans' sleep imbalances, including the nuclear accident at Chernobyl, the Exxon Valdez oil spill, and the narrowly averted nuclear disaster at Three Mile Island. They also point to evidence from the psychology literature that documents an increase in car accident rates arising immediately after changes in sleep patterns that accompany daylight-saving time changes, whether an hour of sleep is lost or gained. Building on these findings, the authors explore whether the changes in sleep patterns that accompany daylight-saving time changes are associated with a systematic impact on stock market return, perhaps through the anxiety that often accompanies sleep pattern disruption.

Kamstra et al. (2001) examine daily stock index returns from Canada, the United States, Germany, and the United Kingdom, and find significantly negative returns on the trading day that immediately follows the time change, both in the spring and in the fall. This finding is consistent with the possibility that investors become more averse to financial risk when their routine sleep habits are disturbed by the daylight-saving time change.

Kamstra, Kramer, and Levi (2002) explore the data more deeply and rule out the possibility that a few negative outliers drive the effect. Instead, they find that the entire distribution of returns is shifted more toward negative values on the trading day immediately following daylight-saving time changes relative to other trading days that immediately follow a weekend. They also comment on the possibility that the disruptions most individuals experience in their sleep patterns on weekends relative to weekdays, not just daylight-saving time change weekends, may help explain the more general Monday effect, whereby stock returns on Mondays are more negative on average relative to other trading days.

Elation, Deflation, and Markets

Researchers have examined numerous ways in which events that are widely covered by the popular press or entertainment experiences that synchronize large numbers of individuals may affect financial markets. Among these are sporting events, catastrophes such as hurricanes, plane crashes, and terrorist attacks, shared experiences watching popular films, and the dissemination of sentiment through social networking websites.

Sporting Events and Marketwide Effects

Several papers study the possibility that the sentiment emerging from the outcome of major international sporting events may spill over into financial markets. Edmans, García, and Norli (2007) study international soccer, cricket, rugby, and basketball games. Their soccer sample includes international soccer matches, including World Cup tournaments, for 39 countries over 30 years, for a total of over 1,100 matches. They find economically large and statistically significant market declines after losses for a particular country. The effect is strongest for soccer matches, particularly important soccer matches, but it is evident for the other sporting events as well. The authors do not find a corresponding positive impact on markets following a country's win in an international sporting event. For the loss effect, the impact is greatest among small stocks. At the index level, the effect amounts to a one-day abnormal return of -49 basis points on average.

Edmans et al. (2007) maintain that a mood variable must satisfy three criteria in order to be plausibly linked to asset returns. First, the variable must have a strong and unambiguous impact on human mood. Second, the variable must impact a large fraction of the population and hence investors. Third, some degree of synchronicity or correlation must exist across individuals in terms of the mood impact. With respect to the context of sporting events in particular, the authors point to evidence from the psychology literature that suggests sporting fans respond asymmetrically to wins versus losses, which may help explain why they find significant marketwide effects following losses but not wins.

Kaplanski and Levy (2010a) explore the possibility of developing a profitable trading strategy based on the impact of sports-related sentiment on financial markets, particularly exploiting the asymmetric effect of wins versus losses and the fact that local market returns can spill over to influence aggregate U.S. market returns. The authors find a negative abnormal return in total U.S. equity markets. They note that investors can incorporate this regularity into an investment strategy in at least two different ways: (1) reduce an individual's

exposure to U.S. equities during the period when the World Cup is being held and (2) seek negative exposure to U.S. equities during the World Cup period by short selling. With the availability of exchange-traded funds with negative beta relative to the S&P 500, investors can implement the short-selling strategy at relatively low cost, though it comes with obvious risk because factors other than sports-related sentiment can lead to unexpected movements in returns.

Disasters and Marketwide Effects

Several studies examine the impact of catastrophes such as terrorist attacks, aviation accidents, and natural disasters on financial markets, in particular stock markets.

Terrorist Attacks

Some papers studying terrorist attacks find the negative abnormal returns that occur during the period following the terrorist attack are roughly commensurate with the magnitude of property losses and anticipated future earnings losses (Carter and Simkins, 2004; Karolyi and Martell, 2010) According to Karolyi (2006, p. 15), the possibility remains that part of the share price reaction following terrorist attacks may reflect “some kind of psychological overreaction.” Consistent with this line of reasoning, Becker and Rubenstein (2004) explore an asset pricing model that allows for fear of terror to affect investor behavior. Their model is novel in that it distinguishes between investor risk aversion and investor fear.

Aviation Accidents

Papers studying the market reaction to fatal plane crashes provide mixed findings. For instance, Barrett, Heuson, Kolb, and Schropp (1987) study a set of 78 fatal airline crashes and find a negative impact on airline stock returns that is significant for only one day after the accident. They conclude this finding is consistent with the efficient markets hypothesis in that there is no evidence of overreaction or underreaction. In contrast, a study of aviation accidents by Kaplanski and Levy (2010b) compares the magnitude of the abnormal negative returns associated with airline disasters with the magnitude of the economic losses associated with the crash. The authors find the temporary impact on airline prices is more than 60 times larger than the economic losses, which they conclude is consistent with the notion that increased investor anxiety following the disaster leads to a reduction in willingness to hold risky stocks which in turn affects

returns. Kaplanski and Levy find stock returns recover a couple of days later, once investor anxiety presumably dissipates.

Natural Disasters

To date, the behavioral finance literature has not focused much attention on the possibility that investor behavior may lead to an association between natural disasters and stock market returns. An exception is a study by Shan and Gong (2012) who exploit a natural experiment arising from an earthquake in China. Following the earthquake, firms with headquarters near the earthquake's epicenter experienced significantly lower stock returns than other firms. Further, they find the magnitude of economic losses and changes in systematic risk cannot account for the difference. This finding suggests human sentiment may play a role.

Some evidence from the insurance literature suggests devoting additional resources to investigating the possible connection between natural disasters and market returns may be worthwhile. For example, Lazarus and Narayanan (1996) study the impact of large hurricanes, such as Hurricane Andrew, on the stock price of insurance firms. While two potentially opposing effects influence firm values, one through the increase in cash outflows to fund insurance claims and the other through the increase in expected firm cash inflows due to higher future premiums, on balance the authors find a significant negative return to insurance firms that had policyholders who suffered losses. Lazarus and Narayanan do not investigate whether the magnitude of the stock impact is on par with the expected net losses to the firms and are thus agnostic on the question of overreaction/underreaction. Nevertheless, the possibility remains that human psychology plays a role in this context because the authors find evidence that insurance companies without exposure in hurricane-affected states experience negative returns at the time of the disaster, which implies the presence of industrywide contagion effects.

Entertainment, Social Media, and Marketwide Effects

Researchers have recently begun to explore the degree to which forms of entertainment such as motion pictures or social networking websites might play a role in financial markets.

Comedy Movie Attendance

As discussed above, prior research suggests environmental factors such as daylight exposure and weather may affect investors and consequently financial

markets. Lepori (2010) explores a completely different environmental factor: comedy movie attendance. His study starts with the observation that investors typically perform the bulk of their investment planning over the same period of time when they typically see movies: over the weekend. He incorporates findings from psychology studies showing that viewing film clips, whether happy or sad, influence individuals' moods. His overall finding is that stock returns are lower on the Monday immediately following high attendance at comedy movies, which he claims is consistent with the mood maintenance hypothesis (Isen and Patrick, 1983), whereby individuals in a good mood are more likely to be cautious. Perhaps future research will seek to reconcile this finding with the seemingly contradictory evidence from other environmental studies suggesting an association between negative mood states such as depression and negative daily stock returns.

Social Media: Facebook and Twitter

Recent studies have turned to the task of using information gleaned from social networking websites to predict movements in financial markets. For example, Karabulut (2011) studies a measure constructed by Facebook Inc. called Gross National Happiness (GNH) and finds changes in GNH are positively correlated with the next day's U.S. stock index return. Further, Mao, Counts, and Bollen (2011) find evidence that sentiment data extracted from Twitter posts may be better able to predict financial market movements than standard consumer sentiment indices and macroeconomic data. These findings imply that financial market speculators may be able to exploit human sentiment in real time.

Summary

Over the past decade in particular, a surge of research has explored the ways in which human emotion may affect both decision making at the individual level and aggregate financial markets. While much evidence supports the claim that emotions and markets are intricately related, researchers should continue to explore reasonable alternative hypotheses. A feature of social science research is that definitively proving a particular human psychological characteristic is causatively related to a particular observed marketwide phenomenon may be impossible. Nevertheless, financial researchers should explore plausible alternative hypotheses besides appealing behavioral explanations. To the extent that many existing studies attempt to comprehensively explore both rational and behavioral explanations for what appear to be anomalous patterns in financial markets, convincing support exists for the view that emotions play a role in markets. Future research in this area promises to be worthy of additional attention.

Discussion Questions

1. Provide an example of an economic mechanism through which a particular human emotion can affect financial markets. That is, describe in economic terms how a particular emotion may lead to a particular outcome in financial markets.
2. Discuss whether correlation between an environmental factor (such as cloud cover) and stock market index returns implies causation and indicate the implications of your response for behavioral finance researchers.
3. Identify three financial market regularities that are consistent with mood impacting markets.
4. Compare and contrast the traditional economics paradigm with the behavioral finance paradigm concerning the possibility that emotion or mood can affect humans' decisions.

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