Behavioral Finance: Quo Vadis?

Werner De Bondt, Gulnur Muradoglu, Hersh Shefrin, and Sotiris K. Staikouras

Behavioral finance endeavors to bridge the gap between finance and psychology. Now an established field, behavioral finance studies investor decision processes which in turn shed light on anomalies, i.e., departures from neoclassical finance theory. This paper is the summary of a panel discussion. It begins by reviewing the foundations of finance and it ends with a discussion of the future of behavioral finance and a self-critique. We describe the move from the standard view that financial decision making is rational to a behavioral approach based on judgmental heuristics, biases, mental frames, and new theories of choice under risk. A new class of asset pricing models, which adds behavioral elements to the standard framework, is proposed.

■Proponents of behavioral finance argue that poorly informed and unsophisticated investors might lead financial markets to be inefficient. The debate between neoclassical and behavioral finance is wide ranging, and sometimes explains differences in policy recommendations on such issues as financial regulation, corporate governance, or the privatization of social security. It had immediate impact worldwide including emerging markets (Muradoglu, 1989).

Behavioral finance emerged as a field in the early 1980s with contributions by, among others, David Dreman, Robert Shiller, Hersh Shefrin, Meir Statman, Werner De Bondt and Richard Thaler. Soon, this small group of financial economists was meeting regularly with psychologists — including Paul Andreassen, Daniel Kahneman, and Amos Tversky — at the Russell Sage Foundation in New York. Five or six years later, the National Bureau of Economic Research began organizing semi-annual meetings. From its beginnings as a fringe movement, behavioral finance moved to a middle-of-the-road movement, with spillover effects on marketing, management, experimental economics, game theory, political science and law. Now behavioral finance is poised to replace neoclassical finance as the dominant paradigm of the discipline.

Traditionally, economists model behavior in terms of rational individual decision-makers who make optimal use of all available information. There is ample evidence that the rationality assumption is unrealistic. The path-breaking work of Herbert Simon, Tversky and Kahneman, Lola Lopes, and others on bounded rationality, judgmental heuristics, biases, mental frames, prospect theory, and SP/A theory has provided new foundations for financial economics. Behavioral finance studies the nature and quality of financial judgments and choices made by individual economic agents, and examines what the consequences are for financial markets and institutions. Investment portfolios are frequently distorted, with consequent excess volatility in stock and bond prices. Examples include the stock market crash of 1987, the bubble in Japan during the 1980s, the demise of Long-Term Capital Management, the Asian crisis of 1997, the dot-com bubble, and the financial crisis of 2008. Most everyone agrees that it is problematical to discuss these dramatic episodes without reference to investor psychology.

The term "behavioral finance" has a variety of meanings. Our paper aims to provide an over-arching view of the field. It is a summary of a panel discussion. The paper is written for a wide spectrum of readers, including financial practitioners. It begins by examining the current state of finance, reviews some fundamental questions, and then

Werner De Bondt is a Professor of Finance at DePaul University in Chicago, IL. Gulnur Muradoglu is a Professor of Finance at Cass Business School in London, UK. Hersh Shefrin is a Professor of Finance at Santa Clara University in Santa Clara, CA. Sotiris K. Staikouras is a Senior Lecturer in Finance at Cass Business School in London, UK.

introduces behavioral concepts. "Behavioral finance: Quo Vadis?" Sections I and II review modern and behavioral finance, respectively. Section III briefly delves into the efficient markets literature. Section IV discusses key building blocks of the behavioral approach. Section V explores some new ideas in behavioral asset pricing and behavioral corporate finance. Section VI provides a self-critique. Section VII concludes.

I. What Is Finance?

Let us start by defining finance. Even though the real economy and finance are linked, we usually make a distinction between the two. The real economy is where goods and services are produced and consumed, and where wealth is created. The world of finance is mostly seen as a sideshow. Even so, finance serves important functions such as the payment system, the pooling and transferring of funds, saving and investing, contract design, organizational architecture, and risk management. Anyone who contemplates the functions of finance, and the financial institutions involved in them (e.g., the banking system; insurance companies; money management firms; pension funds; rating agencies, and so on), soon realizes that the central unifying concept is asset valuation. Certainly, the theory of value, and comparisons of price and value, is what much of finance is about. Of course, valuation also impacts the decisions investors make about the composition of their portfolios and the decisions which managers make about the sources and uses of funds in their firms.

Modern (or neoclassical) finance is the paradigm that has governed thinking in academic finance since the late 1950s. It flows from a philosophical tradition (the 18th century Enlightenment) that aims to reconstruct society with individual rational action as its centerpiece. Modern finance is built on two pillars. The first pillar is the concept of "beautiful people", defined as logical, autonomous agents characterized by expected utility maximization (over time), risk aversion, Bayesian updating, and rational expectations. The second pillar is the concept of "beautiful markets" i.e. depending on the problem-at-hand, perfect, liquid, competitive, complete markets. Based on these two concepts as well as the mutual adjustment of demand and supply (plus an assortment of auxiliary assumptions), various asset pricing theorems are derived. In equilibrium, all agents reach their optimum. Investment portfolios are mean-variance efficient. Only systematic non-diversifiable risk is priced. There are no opportunities left for rational arbitrage. Conditional on what is known about the future, price equals value.

What is the role of institutional factors such as market organization, regulatory framework, tax systems etc. in neoclassical finance? To a first approximation, there is none. Rational agents work around institutional frictions and thereby render them immaterial to market outcomes. Of course, the process may take time. Merton Miller made this type of institutional arbitrage a favorite lecture theme. He spoke about institutions as potential distortions, though ultimately neutral mutations. Miller's comments were often formulated in the context of regulatory barriers to financial innovation, but the link with the Miller-Modigliani theorems and the work of Ronald Coase is obvious. Robert Merton's views are similar. His writings say that the basic functions of finance are the same, always and everywhere. What does change is the technological and regulatory environment. That is why banking in 2008 is different from banking in 1908, and why banking in Switzerland is different from banking in Egypt.

How do modern finance theorists plead their case? They mostly reason in a logically deductive way starting from axioms that have a priori normative appeal.[1] In the past, modern finance theorists rarely administered surveys (Muragdoglu, 1989) and they did not run experiments, although this is starting to change(Muragdoglu, Salih, and Mercan, 2005). Still, many financial economists believe that the swaying power of data cannot match the power of logic.

II. What Is Behavioral Finance?

Behavioral finance does not assume rational agents or frictionless markets. It suggests that the institutional environment is vitally important. The starting point is bounded rationality. Paul Slovic (1972) writes that "a full understanding of human limitations will ultimately benefit the decision-maker more than will naive faith in the infallibility of his intellect." That economic and financial intuition is fragile may clash with our aspirations for mankind, but it looks more plausible than the opposite view that investors and advisors (as well as bankers and corporate managers) know perfectly well what to do.

Behavioral finance is the study of how psychology impacts financial decisions in households, markets and organizations. The main question is: What do people do and how do they do it? The research methods are mostly (but not exclusively) inductive. Behavioral researchers collect "facts" about individual behavior (based on experiments, surveys, field studies, etc.) and organize them into a number of "super-facts." The psychology of decision-making can be explored in various ways. A quarter-century ago, most effort went into cognition. Consider, for instance, the heuristics and biases literature pioneered by Tversky and Kahneman (1974) and Kahneman and Tversky (1979). Their main focus was on

[1]The normative approach asks *how decision-makers logically should act* while the positive approach looks at *how decisions are truly made*.

questions such as: How do people think? How do they decide? Current work continues to draw on cognitive research. In addition, it studies emotion (mood; affect) and social psychology (especially herding behavior).

What has been learned? The central insights of behavioral finance are described in Barberis and Thaler (2003), Daniel et al. (2002), De Bondt (2002, 2005, 2008a), Dreman (1995), Shefrin (2001a, 2002) and Thaler (1993).[2] There are three classes of findings. First, there is a catalog of biases, i.e., predictable mistakes such as overconfidence in judgment, wishful thinking, procrastination, myopia, etc. Intuition is fragile. Note that it is *not* alleged that financial intuition is broken, only that it *can* break. Specific errors depend on context, but are systematic nonetheless. The research examines psychological mechanisms which illuminate how the human mind works. It also explains why financial judgment is fallible.

Behavioral finance is based on three main building blocks, namely sentiment, behavioral preferences, and limits to arbitrage.

The second class of findings relates to the speculative dynamics of asset prices in global financial markets. Here, the main insight is that the systematic errors of unsophisticated investors ("noise traders") create profit opportunities for experts, even if noise traders create a great deal of risk. Investor sentiment matters. Widely-shared misconceptions (that may be self-reinforcing) cause transient price bubbles, large and small. Certainly, rational arbitrage matters too but, since most people's investment horizons are short, arbitrage does not wipe out inefficiencies.

The third class of findings has to do with how decision processes shape decision outcomes.[3] Here too, the study of fiascoes is informative, since it guides us to decision process variables that are critical. Numerous specific applications of this finding appear in *Nudge*, a book authored by Richard Thaler and Cass Sunstein (2008). One striking example has to do with organ donation (Johnson and Goldstein, 2003). The U.K. participation rate in organ donation is approximately 15% whereas in Belgium it is over 95%. What explains this difference? For an answer, we look to the decision process plus the well-known fact that people tend to stick with the status-quo. In case of a fatal car accident in the U.K., the law assumes –-unless the driver signs his license to the contrary-– that his bodily organs will *not* be donated. In Belgium, the default solution is the opposite, i.e. the driver's organs are donated. Note that in either country all it takes to modify the default is a signature.[4]

Why is behavioral research often so convincing? One reason is that "good" behavioral research depends on support from multiple sources. For instance, laboratory research permits any reader who doubts the results to replicate the experiment "at home." Further, many studies rely on surveys or observe individual behavior (e.g., trading records) in a natural environment (e.g., Odean, 1998, 1999). Lastly, behavioral researchers also make use of conventional market-level price and volume data. This "one-two-three punch," we believe, provides a discipline to behavioral theorizing that is far superior to what is typical for research in modern finance. Decision anomalies (in the laboratory), matched with anomalies in the behavior of individual agents (in a natural environment), matched with market anomalies (when social interaction allows fine-tuning) produce a powerful body of evidence. Take, for example, investor overreaction. Certainly, experiments teach us that subjects do not update beliefs in Bayesian fashion (De Bondt, 1993, Muradoglu, 2002). Second, when asked, investors tell us that they like to buy past winner stocks but that they stay away from past losers. Regardless of what investors say, their trading records confirm the bias.[5] Third, at the market level, we find predictable reversals in share prices (De Bondt and Thaler, 1985). The laboratory, financial behavior, and market results appear to be connected.

III. Price and Value

Milton Friedman (1953) and Eugene Fama (1965) argue that, even though naive investors may push security prices away from intrinsic values, more sophisticated traders will

[2]These works lay emphasis on investment and asset pricing. However, Shefrin (2005) focuses on behavioral corporate finance. Apart from agency and asymmetric information problems, there are behavioral costs that obstruct the corporate value maximization process.

[3]This type of research is especially relevant to the study of organizations. Everyday we learn more about committee decision-making (e.g. boards), the role of top managers in the creation of corporate wealth, and the pros and cons of bureaucratic formalities and red tape. As president of the American Finance Association, Michael Jensen asked that we break open the black box called the firm. Behavioral finance is contributing to that effort.

[4]Our economist friends emphasize incentives. We ask them: What incentive scheme may achieve the same outcome (95% participation) that a seemingly minor adjustment in the decision process produces effortlessly?

[5]Ironically, investors are more likely to hang on to losers than to winners if the changes in value occurred while the stocks were part of their portfolio (Shefrin and Statman, 1985).

find it worthwhile to correct any mispricing. In other words, competitive rational arbitrage guarantees that, at all times, the market valuation of any security reflects what is —and what can be— known about its future cash flows and the opportunity cost of capital. Based on market efficiency, finance academics have made two main assumptions about security valuation. First, securities have an intrinsic value based on their fundamentals; and second, their prices are not predictable on the basis of publicly available information. Among others, Fama (1965) argued that the competitive activity of arbitrageurs will bring security prices into line with fundamentals. Thus, the arbitrage activity of rational traders will prevail (over irrationals) as long as securities have close substitutes. Over the decades, this perspective, the efficient markets hypothesis, has been examined by many scholars.

Behavioral finance has provided evidence which contradicts the notion of efficient markets. An example is the case of "Siamese twins" stocks (Rosenthal and Young, 1990; Froot and Dabora, 1999). Consider the share price movement of Royal Dutch/Shell Group, where Royal Dutch stock trades in the US/Netherlands and Shell stock trades in the U.K. The two companies' original merging interests were on a 60:40 basis for Royal Dutch and Shell respectively. Thus a ratio of 1.5 (price of Royal Dutch relative to Shell) should have been achieved in order for the prices to reflect fundamentals. Froot and Dabora (1999) and Lamont and Thaler (2003) find that the relative price ratio ranges from 15% overvalued to 35% undervalued. This contradicts "the law of one price." In relation to these stocks, there is also evidence that noise trader risk is a significant impediment to arbitrage (Scruggs, 2007).

The efficiency of security prices has also been challenged by Graham (1949), Nicholson (1968), Basu (1977), Dreman (1977, 1980), and many others who believe that stocks with low price-to-earnings (PE) ratios are undervalued and stocks with high PE ratios are overvalued. Investors, these authors suggest, are overly pessimistic about the prospects of low PE stocks. Since the crowd avoids them, investing in low PE stocks is a profitable contrarian strategy.[6] De Bondt and Thaler (1985) extend this idea with their analysis of investor overreaction and with the finding of predictable price reversals for long-term winner and loser stocks. Poterba and Summers (1988) obtain analogous reversals for national stock price indexes.

There are other widely documented phenomena which are difficult to reconcile with efficient markets. Consider the following examples:

• *Price volatility that is not linked to news*: Cutler et al. (1991) show that during periods with "no" major news announcements equity prices experience some of their largest one-day moves. A vivid example was the 22.6% drop in the Dow Jones Industrial Average on October 22, 1987. Roll (1984, 1988) offers systematic evidence of market volatility, not associated with information arrival.

• *Excess volatility*: Keynes (1936, pp. 153-4) observes how "day-to-day fluctuations in the profits of existing investments …tend to have an altogether excessive, and even absurd, influence on the market." This comment anticipates Shiller's (1981, 1993) work on equity volatility. There, it is suggested that fluctuations in economic fundamentals alone (e.g., dividends) cannot possibly account for the observed aggregate price movements.

• *Earnings momentum*: Stock prices "underreact" to annual and quarterly announcements of corporate earnings causing a post-announcement drift in returns, markedly for firms with low institutional shareholdings (Bartov et al., 2000). Bernard and Thomas (1989, 1990) were among the first to establish this effect, but the research goes back to Ball and Brown (1968).[7]

• *Price momentum*: For holding periods up to one year, Jegadeesh and Titman (1993, 2001) and others show trends in share prices of individual stocks, i.e., past winner stocks remain winners, and past losers remain losers.[8] Yet, beyond one year, momentum is often followed by reversals. European and emerging markets exhibit similar patterns (Rouwenhorst, 1998, 1999; Muradoglu, 2000). Small firms feature more momentum than large firms (Jegadeesh and Titman, 1993; Grinblatt and Moskowitz, 1999; Lee and Swaminathan, 2000). Price momentum may be due to positive feedback trading. That is, when large increases in stock prices pull in new investors, the inflow of funds causes prices to rise further. It is probable that the phenomenon is also partly explained by earnings momentum, investor underreaction, and the gradual dissemination of news. Grinblatt and Han (2005) and Frazzini (2006) suggest that momentum can be explained by the disposition effect, a concept introduced by Shefrin and Statman (1985) whereby investors sell winners too early and hold losers for too long.

• *Equity premium puzzle*: Historically, the spread between the return on equities and fixed income US government

[6]Other price-scaled ratios, e.g., the book-to-price ratio, also forecast stock returns. See, e.g., De Bondt and Thaler (1987) and Fama and French (1992).

[7]Corporate news that is not directly related to earnings also predicts returns. See, e.g., Michaely et al. (1995) on dividends or Ikenberry et al. (1995) on share price repurchases. For a critique of these findings, see Fama (1998).

[8]Trends are also visible in stock indexes of US industries and investment styles, and in stock indexes of foreign equity markets. See Chen and De Bondt (2004) and De Bondt (2008b) for details.

securities has exceeded 6%. It is difficult to reconcile the magnitude of this premium with modern asset pricing theory (Mehra and Prescott, 1985) since it implies that the representative investor is exceedingly risk-averse.

• *Size and calendar effects*: Small firms earn anomalous high returns. There is also ample literature on calendar effects. For example, there are curious patterns in equity returns related to weekends, the turn of the month, and the turn of the year (Siegel, 1998; Keim, 1983, 1986; Reinganum, 1983; Roll, 1983).

The main point of the above examples is that business fundamentals alone do not explain the structure and dynamics of asset prices. Behavioral finance offers promising, plausible alternative explanations for some of these phenomena. In the next section, we describe some of the key psychological building blocks of the behavioral framework.

IV. Key Building Blocks

Behavioral finance is based on three main building blocks, namely sentiment, behavioral preferences, and limits to arbitrage. By sentiment is meant investor error. Errors originate at the level of the individual but can manifest themselves at the level of the market. Behavioral preferences capture attitudes about risk and return which do not conform with the principles of expected utility theory. In neoclassical finance, rational information traders exploit the behavioral inconsistencies of irrational noise traders, and in so doing lead prices to be efficient. Proponents of behavioral finance suggest that there are limits to the process of arbitrage, and as a result prices need not be efficient. We next describe each of these building blocks in greater detail.

Psychology shows that people's *beliefs* are often predictably in error. In many cases, the source of the problem is cognitive. That is, the problem is a function of how people think. Some psychological mechanisms have been modeled as heuristic rules of thumb. By and large, heuristics perform well but, sometimes, they lead to systematic error. A few biases in beliefs are described below.

• *Anchoring* is a form of bias where beliefs rely heavily on one piece of information, perhaps because it is was available first, and are not sufficiently adjusted afterward. For instance, investor forecasts may anchor on the price at which they bought a security (De Bondt, 1993; Muradoglu and Onkal, 1994). "Conservatism" is closely related. Investors may place excessive weight on past information relative to new information, i.e., they underreact.

• *Representativeness* is overreliance on stereotypes. Investors who regard recent time-series trends as representative of an underlying process are vulnerable to extrapolation bias. The "law of small numbers" is a related bias whereby people behave as if the statistical properties of small samples must conform to the properties of large samples. Investor overreaction is partly rooted in representativeness. The "gambler's fallacy" is also connected to representativeness but leads investors to make unwarranted predictions of reversal.

• *Availability bias* means that investors overweigh information that is easily accessible, e.g., that is easily recalled from memory or that corresponds to a future scenario that is easy to imagine. People are likely to remember events that receive a lot of attention by the media and this influences their behavior (see, e.g., Barber and Odean, forthcoming).

• *Overconfidence* implies that individuals overvalue their knowledge or abilities. It has many consequences. For instance, overconfidence may lead investors to underestimate risk or to overestimate their ability to beat the market. Overconfidence bias may also cause excessive trading. Daniel et al. (1998, 2001) suggest that investors suffer from a combination of overconfidence and self-attribution bias, i.e., people attribute success to their own skills, but blame failure on bad luck.

Investor *preferences* constitute the second key element of financial models. In this regard, there are several behaviorally-based preference frameworks. The best known is prospect theory, developed by Kahneman and Tversky (1979) to describe the manner in which people systematically violate the axioms of expected utility theory. Prospect theory differs from expected utility theory in that probabilities are substituted by decision weights, and the value function is defined over gains and losses, not final wealth.[9] Other behavioral preference frameworks include SP/A theory, change of process theory, regret theory, affect theory, and self-control theory.

The following list describes some of the most important features of behavioral preferences:

• *Loss aversion* portrays investors' reluctance to realize losses. Tversky and Kahneman (1992) argue that people weight losses twice as much as gains of a similar magnitude. Unlike what is assumed in neoclassical finance, loss averse investors may be inconsistent towards risk. People may prefer

[9]Fellner (1961) introduces the concept of decision weight to explain ambiguity aversion. Kahneman and Tversky (1979) state: "In prospect theory, the value of each outcome is multiplied by a decision weight. Decision weights are inferred from choices between prospects much as subjective probabilities are inferred from preferences in the Ramsey-Savage approach. However, decision weights are not probabilities: they do not obey the probability axioms and they should not be interpreted as measures of degree or belief."

to avoid risk in order to protect existing wealth, yet may assume risk in order to avoid sure losses.[10]

• *Mental accounting* refers to how people categorize and evaluate financial outcomes (Henderson and Peterson, 1992). Shefrin and Thaler (1988) assume that people categorize wealth in three mental accounts: current income, current wealth, and future income. It is furthermore assumed that the propensity to consume is greatest from the current income account and smallest from the future-income account. One consequence is the tendency to treat a new risk separately from existing risks, usually called narrow framing.[11] Narrow framing poses dangers. Investors may act as if they are risk averse in some of their choices but risk seeking in other choices. Shefrin and Statman (2000) develop behavioral portfolio theory in single and multiple mental account versions (SMA and MMA). In the SMA version, investors integrate their portfolios into a single mental account; in the MMA version, investors prefer securities with non-normal, asymmetric distributions that combine downside protection (in the form of a floor) with upside potential.

Sentiment impacts the prices of all assets, and drives the difference between what behavioral and neoclassical finance tell us about the relationship between risk and return.

• *Myopic loss aversion* combines time horizon-based framing and loss aversion. Investors are more averse to risk when their time horizon is short than when it is long (Haigh and List, 2005). Benartzi and Thaler (1995) argue that the size of the equity premium suggests that investors weigh losses twice as much as gains, and that they evaluate their portfolios on an annual basis.

• *Self-control* refers to the degree to which people can control their impulses. Thaler and Shefrin (1981) analyze how people exhibit self-control with respect to saving behavior. Shefrin and Statman (1984) develop a theory of dividends based on this idea, where mainly elderly investors have a preference for dividends. Shefrin and Statman (1985) refer to self-control when they explain how investors deal with the impulse to hold onto losing investments for too long (see Lease et al., 1976, for empirical evidence).

• *Regret aversion* stipulates that investors may wish to avoid losses for which they can easily imagine having made a superior decision (ex post). Regret helps to explain the dividend puzzle if, ex ante, investors want to avoid the regret of having sold shares that later went up in price. Such regrets may also encourage investors to hold on to loser stocks (Shefrin and Statman, 1985). Koening (1999) argues that investors will bet on good assets, in order to avoid regret, which in turn could possibly trigger some sort of herding behavior.

Finally, limited arbitrage plays a crucial role in behavioral asset pricing. To repeat, a basic tenet of modern finance is that arbitrageurs force prices to converge to their true fundamental values. Yet, research has uncovered a series of financial market phenomena that do not conform to the notion that full arbitrage is always carried out. For this reason, behavioral asset pricing models focus on the limits that arbitrageurs face in attempting to exploit mispricing. Markets are not frictionless because of transaction costs, taxes, margin payments, etc. Therefore, the actions of noise traders (i.e., traders with biased beliefs, not based on fundamental information) may cause prices to be inefficient. As a result, arbitrage can be risky (Shleifer, 2000). Mispricing has been the focus of many studies, e.g., Cornell and Liu (2001), Schill and Zhou (2001), or Mitchell et al. (2002).

V. Behavioral Analogues to Neoclassical APV and SDF-based Pricing

Asset pricing theory and corporate finance are in the process of becoming behavioralized. At the moment, the behavioral approach is somewhat piecemeal, whereas the neoclassical approach is more coherent and integrated. Shefrin (2005, 2008a,b) argues that in the future finance will combine the best of neoclassical and behavioral elements, thereby presenting a coherent, integrated framework for describing how markets are impacted by psychological phenomena.

Behavioral asset pricing emphasizes that asset prices reflect investor sentiment, broadly understood as erroneous beliefs about future cash flows and risks (Baker and Wurgler, 2007). Sentiment impacts the prices of all assets, and drives the difference between what behavioral and neoclassical finance tell us about the relationship between risk and return. In this regard, consider the global financial crisis that began in 2008. Academics, media, and policy makers have all contributed to the question of what caused the crisis. In a *New York Times*

[10]In *The Theory of Moral Sentiments,* Adam Smith (1759) says that "we suffer more when we fall from a better to a worse situation than we ever enjoy when we rise from a worse to a better." Smith's observation captures the modern notion of loss aversion.

[11]In the traditional approach, investors judge a new gamble via its contribution to total wealth.

article, Lohr (2008) discussed the failure of financial engineering to incorporate the human element. Notably, the behavioral stochastic discount factor (SDF) approach developed by Shefrin incorporates the human factor into financial engineering. Lohr says that Wall Street analysts *did* use risk models that correctly predicted how the market for subprime mortgage backed securities would be impacted by a decline in real estate prices. However, analysts attached too low a probability of a major decline in real estate prices. This type of situation is typical of events that take place in a behavioral SDF model, where investors collectively commit errors in their judgments of probabilities, thereby leading some derivatives and their underlying assets to be mispriced.

One of the most important points made in behavioral corporate finance is that although the principles taught in traditional corporate finance have great value, psychological obstacles may prevent organizations from putting them into practice (Shefrin, 2005). Many normative aspects of traditional corporate finance remain intact. Yet, they need to be augmented so that there is a narrowing in the gap between what academics preach and what managers do. Tomorrow's managers should understand why people, including themselves, make mistakes, and how as managers they should deal with market inefficiencies.[12] The new approach should be specific, not general, and focus on how to make decisions about capital budgeting, capital structure, mergers and acquisitions, payout policy, and corporate governance. In this regard, Shefrin (2008a,b) introduces the concept of "behavioral adjusted present value." He begins with traditional adjusted present value (which combines net present value and financing side effects) but adds a component to capture the effects of inefficient prices.

Shefrin (2008a, b) suggests that an appropriate starting point for discussing the asset pricing paradigm transition is the book written by John Cochrane (2005). Cochrane's excellent work is built around the concept of a stochastic discount factor. His approach offers a unified treatment. In particular, the capital asset pricing model (CAPM), Fama-French multifactor model, and models for the yield curve and option prices all appear as special cases of a general SDF framework. For example, the CAPM corresponds to the special case when the SDF is a linear function of the growth rate of aggregate consumption in the economy. The weakness of the neoclassical SDF approach is that its underlying assumptions are behaviorally unrealistic.

Although an extensive discussion is beyond the scope of the present study, a point worth addressing is whether behavioral assumptions alter the basic neoclassical relationship between the SDF and mean-variance frontier. They do not. What they do is alter the shape of the SDF and the ingredients of mean-variance portfolios. In neoclassical theory, the SDF is monotone declining. However, Aït-Sahalia and Lo (2000) and Rosenberg and Engle (2002) find that, during the first half of the 1990s, the SDF features an oscillating shape that supports the predictions based on behavioral assumptions. Moreover, using survey expectations data, Shefrin (2005, 2008) predicted that the shape of the SDF would change during 2001-2004, with a decline in the left portion displayed in Figure 1. Notably, Barrone-Adesi et al. (2008) report that during 2002-2004 the left portion of the SDF does indeed feature a flat shape.[13]

Mean-variance analysis is very useful for bringing out the implications of behavioral phenomena for the pricing of all assets. To see how different behavioral and neoclassical mean-variance portfolios can be, consider figure 1. This figure contrasts the equilibrium returns to two mean-variance portfolios, one neoclassical and the other behavioral, as functions of aggregate consumption growth in the economy. The return to a neoclassical mean-variance portfolio is essentially linear, and corresponds to the return from combining the risk-free security and the market portfolios. In contrast, the return to a behavioral mean-variance portfolio oscillates with economic growth, reflecting the impact of investor sentiment. The construction of efficient portfolios under the neoclassical paradigm is done by combining an investment in the risk-free asset and the market portfolio. The theoretical outcome of such combination is known as the two-fund separation theorem (Tobin, 1985).[14] Behavioral mean-variance portfolios satisfy the two-fund separation theorem. However, the risky asset used to construct behavioral mean-variance portfolios features the use of derivatives.

It is a well-established fact that investors require compensation to assume risk. Risk can take any form in financial markets but, in broad terms, the neoclassical framework focuses on fundamental risk. The behavioral approach adds sentiment risk. Therefore, behavioral risk premiums serve as compensation for bearing both sentiment and fundamental risks. Behavioral risk premiums, like their neoclassical counterparts, will be associated with betas and factor pricing models. To illustrate this point, consider figure 2. This figure displays a mean-variance return pattern whose shape is that of an inverse U. Notably, such a shape is implied

[12]Behavioral corporate finance emphasizes organizational heuristics and biases. Such heuristics and biases were endemic to financial firms involved in the global financial crisis that began in 2008.

[13]If investors underestimate the probability of extreme negative events, which is part of the "black swan" phenomenon emphasized by Taleb (2006), then the SDF will typically be upward sloping in its left tail.

[14]In the case of leveraged portfolios, the theorem still holds but a negative position with respect to the risk-free asset is held.

FIGURE 1

Contrasting the return to a neoclassical mean-variance portfolio and the return to a behavioral mean-variance portfolio, as functions of aggregate consumption growth in the economy.

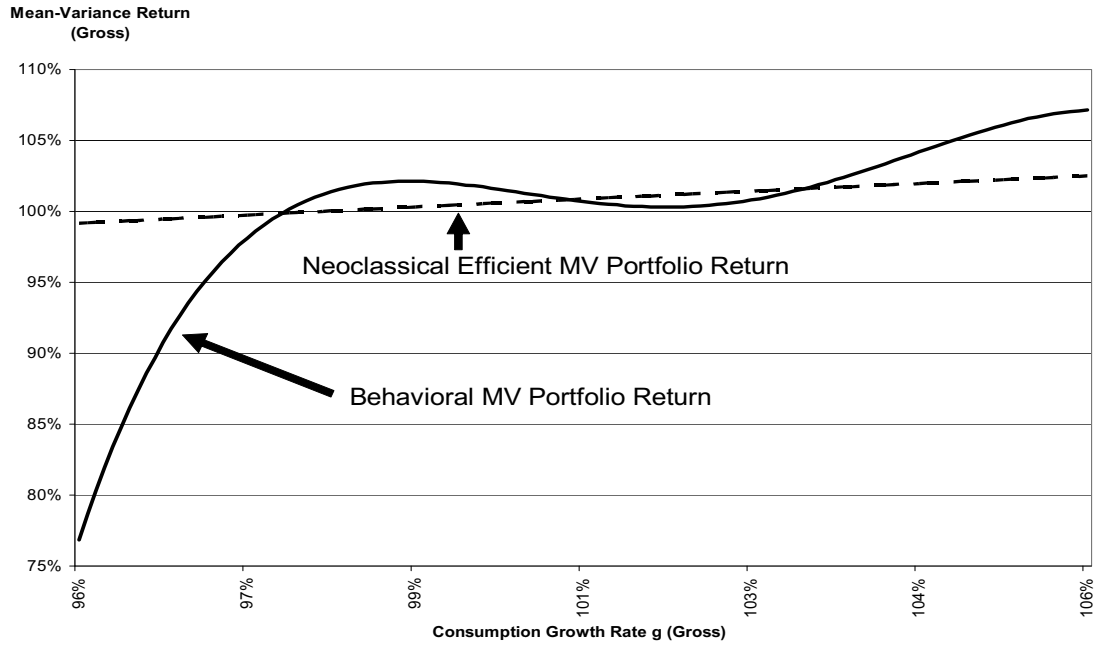
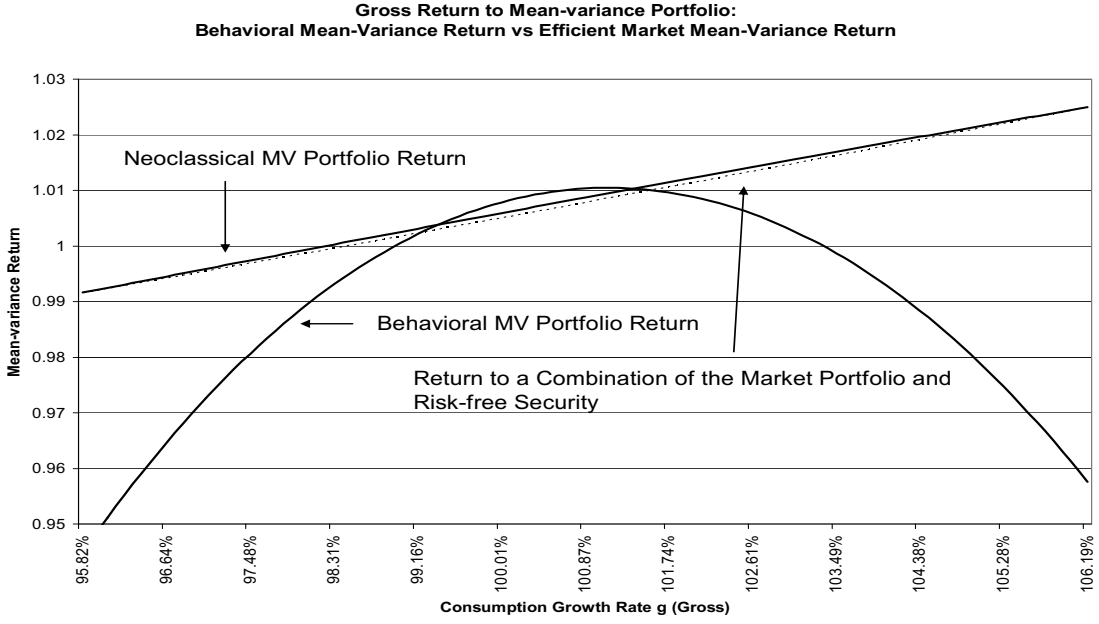


FIGURE 2

Special case of Figure 1, when behavioral mean-variance return function has the shape of an inverse-U. This figure also shows that the neoclassical mean-variance return is approximately linear. In the CAPM, the mean-variance function is exactly linear.



by the work of Dittmar (2002). When the inverse U shape is quadratic, the risk premium for any security can be expressed as a function of two factors, the return to the market portfolio and the squared return to the market portfolio. Models involving squared returns to the market portfolio are associated with the analysis of coskewness. The work of Barone-Adesi and Talwar (1983), Harvey and Siddique (2000), and Barone-Adesi et al. (2004) indicates that coskewness is important in the determination of risk premiums. Much of the explanatory power of size, book-to-market equity and momentum plausibly derives from coskewness.

VI. Strengths and Weaknesses

Behavioral research has four major strengths. First, it has proven itself to be productive. For example, it has led to a series of new empirical findings. Examples include over- and underreaction in share prices, the new issues and stock repurchase puzzles, and the role the stock split effect. Second, with its focus on the impediments to optimal decision-making, behavioral finance brings a pragmatic approach to the study of financial decisions. For instance, insights from behavioral finance help our understanding of how to structure the relationship between a firm's investors and its managers. Certainly, the behavioral approach suits the professional business school which aims to educate managers and to improve their expertise. Third, behavioral finance potentially brings a new type of discipline to social science research. Discipline fundamentally implies triangulation i.e. the synthesis of data from multiple sources. ("Finance you can believe in" requires more than mathematical proof.) The final strength of behavioral finance is simply that it is a stimulating field of scholarship. People and money: What can fascinate more? Perhaps the appeal of behavioral finance is that it is social science, but with strong emphasis on both the social and the science.

Behavioral finance also has weaknesses. As mentioned in the previous section, it lacks the unified theoretical core of neoclassical finance, and can be lacking in discipline. For example, there is no single preference framework to accommodate the features in prospect theory, SP/A theory, regret theory, self-control theory, and affect theory.[15] Indeed, a series of recent works has identified the limitations of prospect theory in explaining the behavior of real world investors.[16] There are multiple behavioral explanations for momentum, not all mutually consistent.[17] In this regard, many behavioral asset pricing models are eclectic and ad hoc. Some models rely on the assumption that prices are set by a representative behavioral investor, even though aggregation theory indicates that such an assumption is unwarranted. As for the winner-loser effect, there is no clear explanation as to why reversals only appear to occur in January.

One of the most important points made in behavioral corporate finance is that although the principles taught in traditional corporate finance have great value, psychological obstacles may prevent organizations from putting them into practice.

To be sure, behavioral finance is a work in progress. It is unfinished. Indeed, at the present time, many researchers refer to "behavioral finance" to describe their work[18] but there is no common accepted definition of what it is. Perhaps, this is not an issue in the long-term. After all, the main goal of behavioral finance is to behavioralize finance, not to create a separate field of scientific study.

The second weakness can be described by analogy. Just as a study of the economic function of payments and settlements cannot tell us much about the practical organization of the payment system (cash vs. credit cards etc.), in the same way, undivided focus on psychological mechanisms (e.g. impulses and predispositions, or psychophysics) does not allow an adequate interpretation of economic and financial events. An individual is much more than a biological organism; (s)he is also a person, a social-historical creation. Reality is socially constructed. Philosophers often compare man's conduct to

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[15]This list is hardly exhaustive. Investors also have preferences which include issues that go beyond returns, an example of which is socially responsible investing. See Statman (2008).

[16]See Hens and Vlcek (2005), Barberis and Xiong (forthcoming), and Shefrin (2008)

[17]There are at least four separate theories to explain why markets exhibit short-term momentum but long-term reversals. Some psychological explanations, such as Barberis, Shleifer, and Vishny (1998) emphasize underreaction. Other psychological explanations, such as Daniel, Hirshleifer, and Subrahmanyam (2001) emphasize overreaction. Grinblatt and Han (2005) emphasize the disposition effect.

[18]Hong and Stein (1998) develop a behavioral model in which some investors rely on fundamental analysis and other investors rely on technical analysis. However, there are no specific psychological elements in their model.

that of a stage actor. People enact roles. Their motives, outlook and self-image are shaped by what is expected from them in society. Hence, research in behavioral finance should examine the tangible content of people's thought processes.[19] Evidently, this issue cannot be resolved without reference to social, cultural and historical factors. We need to look more into the content, structure and style of intuitive economic stories. For example, how do Swiss citizens (who in majority rent) think about home ownership, and likewise how do Americans? In general, what sorts of economic arguments (true or false) sound plausible to investors, persuade them and motivate their actions? Investment bankers, client relationship and financial marketing managers, among others, would be interested in answers to these questions. Yet, so far, behavioral finance has little to say.

Third, behavioral finance must move beyond the narrow micro-level study of typical "mistakes." If not, too much behavior remains unintelligible. Yes, US data suggest that CEOs, entrepreneurs and investors tend towards unrealistic optimism – an error with perilous consequences. But, one may ask, what causes over-optimism? Is it context-specific? Does it stem from past personal success? Or is it an incontestable part of the American character? A more fundamental critique is to pose the related question: What is a mistake? Economists take a hard line. Error, they say, is strictly about the contrast between actions that are taken and actions that rationally should be taken in accordance with an individual agent's costs and benefits. Economists' chief concern is efficiency. However, the concept of error is elastic. James March and Chip Heath (1994) draw a useful distinction between the economic "logic of consequences" and the more broadly applicable "logic of appropriateness." Consider, for instance, someone who breaks the rules of etiquette. His norm violations may be embarrassing, perhaps inexcusable, but may also make little practical difference. Still, collective beliefs and norms often make *all* the difference. For example, aside from efficiency, there are other criteria of economic and financial organization such as sustainable development or equity and fairness. These may be "protected values," i.e., people reject all trade-offs for money.

Finally, there is a disconnect between the emphasis in behavioral research on human frailties and the reality that in many corners of the globe people lead a pretty good life. Why are we collectively so strong, yet as individuals so weak? Why does societal rationality transcend individual rationality? Orthodox economic theory places the pinnacle of rationality in the brains of individual people whose self-interest drives market prices.[20] It blames social evils on dysfunctional incentives and disarray, mainly in corporate bureaucracies and government. The truth may be nearly the opposite. Rationality and well-being derive from organization, spontaneous or deliberate. Why are institutions so crucially important? The reason is that everyone in society depends on everyone else. We sell 99% of what we produce, we buy 99% of what we consume, and we lead better lives for it. Incessant technological progress, product and service standardization, and economic organization are central. The secret is encapsulated by the motto of the 1933 Chicago World's Fair: "Science finds, industry applies, man conforms."

Technological artifacts make us smart for several reasons (Norman, 1993). First, technology greatly extends man's cognitive capabilities. Because we forget, we use a notepad or we access the Internet. Second, technology is coupled with labor specialization. For example, experts make decisions (e.g. in relation to the nation's supply of electricity) that tens of thousands are incapable of making for themselves. Third, technology embodies knowledge. Few of us know exactly how the watches on our wrists function. Fortunately, we do not need to know. It is enough that we are able to read the time.[21] Finally, technological artifacts often allow cheap replication. So, good products or ideas spread quickly. However, people and machines have to work together.. Technology can be easy or difficult to use. Similarly, administrative organization can be effective or ineffective. Smart technology and organization are human-centered (Reason, 1990). In the short run, this is a matter of design, i.e., of pragmatic behavioral research. Over longer periods, it is the outcome of an evolutionary process. To ask about the "logic" of American corporate law or the dashboard of an automobile is a bit like asking who designed the French language, to what purpose and under which specifications.

That in modern society the balance between individual and institutional forces has shifted often gets on our nerves. We lament that man must "conform," that personal freedom is lost when either law regulates what we do or large corporations – e.g. because of network externalities – control our choice options. Yet, man is limited by his brainpower, habits, and conception of purpose. Organization produces

[19]It is difficult to interpret human action without knowing first how people think about a problem. An extravagant illustration, far removed from finance, has to do with the September 2001 attacks in New York. The questions that we would ask in relation to these evil acts are as follows: How did the perpetrators comprehend the world, and how did they understand their self-interest so that they wanted to be suicide-pilots?

[20] Austrian, institutional and evolutionary economics do not. These economists espouse the private enterprise system but call attention to the fact that its assumed virtues (innovativeness, responsiveness, administrative parsimony) have no solid basis in microeconomic theory.

[21]Occasionally, however, society forgets why some systems or technologies were designed the way they were, and this can be very costly. Recall the Y2K problem.

predictability. This is fundamental. Rules and regulations coordinate society while reducing the individual's need to think.[22] Of course, financial technology is often customer-friendly and performs brilliantly. Take, for instance, the ATM-machine. Still, it is easy to come up with counter-examples. Retirement saving plans and asset allocation tools can be made more effective. The US mortgage debt crisis of 2007-2008 is a gigantic drama from which, one can only hope, the industry will learn. The global wave of financial deregulation that allowed unparalleled growth in the use of complex derivatives may produce even more spectacular failures since quantitative risk models disregard rare events and try to model what arguably cannot be modeled. In every instance, the solution of these problems starts with the recognition that people are human. What is required is "financial ergonomics," a discipline that engineers financial products and services according to human needs and that optimizes well-being and overall system performance. Behavioral finance holds the potential to create much value for society but it also has a great deal of work to do.

VII. Conclusion

Over the last few decades, our understanding of finance has increased a great deal, yet there are countless questions begging for answers. On the whole, financial decision making processes in households, markets and organizations remain a grey area waiting for behavioral researchers to shed light on it.

A major paradigm shift is underway. Chances are that "the new paradigm" will combine neoclassical and behavioral elements. It will replace unrealistic, heroic assumptions about the optimality of individual behavior with descriptive insights tested in laboratory experiments. Asset pricing theory, we hope, will combine a new realism in assumptions with methods and techniques first developed in neoclassical finance. (Behavioral mean-variance portfolios may explain risk premiums. A unified SDF framework may also provide the basis for behavioral explanations of option pricing, the term structure of interest rates, and other asset prices.) Finally, and more broadly, history requires that economic and financial systems are continually updated, and that they are intelligently reconstructed to meet social changes and to take advantage of technological progress. It is clear that, if academicians are to succeed in understanding financial institutions and actors, and if the agents themselves, as well as policy-makers, want to make wise decisions, they must take into account the true nature of people, that is to say their imperfections and bounded rationality.■

References

Aït-Sahalia, Y. and A. Lo, 2000, "Nonparametric Risk Management and Implied Risk Aversion," *Journal of Econometrics* 94, 9-51.

Baker, M. and J. Wurgler, 2007, "Investor Sentiment in the Stock Market," *Journal of Economic Perspectives* 21 (No. 2), 129-151.

Barber, B. and T. Odean, 2007, "All that Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors," *Review of Financial Studies,* forthcoming.

Barberis, N.A. Shleifer, and R. Vishny, 1998, "A Model of Investor Sentiment," *Journal of Financial Economics* 49 (No. 3), 307-344.

Barberis, N. and R. Thaler, 2003, "A Survey of Behavioral Finance," in Ed. by G.M. Constandinides, M. Harris and R. Stulz, *Handbook of the Economics of Finance* Elsevier.

Barberis, N. and W. Xiong, 2009, "What Drives the Disposition Effect? An Analysis of a Long-Standing Preference-Based Explanation," *Journal of Finance* 64 (No. 2), 751-784.

Barone-Adesi, G. and P. Talwar, 1983, "Market Models and Heteroscedasticity of Residual Security Returns," *Journal of Business and Economic Statistics* 1 (No. 2), 163-168.

Barone-Adesi, G., P. Gagliardini and G. Urga, 2004, "Testing Asset Pricing Models with Coskewness," *Journal of Business and Economic Statistics* 22, 474-485.

[22]Behavioral finance also offers a framework for understanding financial market regulation. See Shefrin and Statman (1993b).

Barone-Adesi, G., R. Engle and L. Mancini, 2008, "A GARCH Option Pricing Model with Filtered Historical Simulation," *Review of Financial Studies* 21(No. 3), 1223-1258.

Basu, S., 1977, "Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," *Journal of Finance* 32 (No. 3), 663–682.

Benartzi, S. and R. Thaler, 1995, "Myopic Loss Aversion and the Equity Premium Puzzle," *Quarterly Journal of Economics* 110 (No. 1), 75-92.

Bernard, V., 1992, "Stock Price Reactions to Earnings Announcements," In *Advances in Behavioral Finance*, Edited by R.H. Thaler, Russell Sage Foundation.

Bernard, V. and J.K. Thomas, 1989, "Post-earnings Announcement Drift: Delayed Price Response or Risk Premium?" *Journal of Accounting Research* 27 (Supplement), 1-48.

Bernard, V. and J.K. Thomas, 1990, "Evidence that Stock Prices do not Fully Reflect the Implications of Current Earnings for Future Earnings," *Journal of Accounting and Economics* 13, 305–340.

Bartov, E., I. Krinsky and S. Radhakrishnan, 2000, "Investor Sophistication and Patterns in Stock Returns after Earnings Announcements," *Accounting Review* 75, 43–63.

Black, F., 1986, "Noise," *Journal of Finance* 41 (No. 3), 529-543.

Chen, H.-L. and W. De Bondt, 2004, "Style Momentum Within the S&P 500 Index," *Journal of Empirical Finance* 11(No. 4), 483-507.

Cochrane, J., 2005, *Asset Pricing*, Princeton University Press.

Cornell, B., and Q. Liu, 2001, "The Parent Company Puzzle: When is the Whole Worth Less Than One of its Parts?" *Journal of Corporate Finance* 7, 341-366.

Cutler, D., J. Poterba, and L. Summers, 1991, "Speculative Dynamics," *Review of Economic Studies* 58 (No. 3), 529–546.

Daniel, K.D., D. Hirshleifer and A. Subrahmanyam, 1998, "Investor Psychology and Security Market Under- and Over-Reactions," *Journal of Finance* 53 (No. 6), 1839-1886.

Daniel, K.D., D. Hirshleifer and A. Subrahmanyam, 2001, "Overconfidence, Arbitrage, and Equilibrium Asset Pricing," *Journal of Finance* 56 (No. 3), 921-965.

Daniel, K.D., D. Hirshleifer and S.H. Teoh, 2002, "Investors Psychology in Capital Markets: Evidence and Policy Implications", *Journal of Monetary Economics* 49 (No. 1), 139-209.

De Bondt, W.F.M., 1993, "Betting on Trends: Intuitive Forecasts of Financial Risk and Return," *International Journal of Forecasting* 9 (No. 3), 355–371.

De Bondt, W.F.M., 2002, "Bubble Psychology," in W. Hunter and G. Kaufman (eds.), *Asset Price Bubbles: Implications for Monetary, Regulatory, and International Policies*, MIT Press.

De Bondt, W.F.M., 2005, *The Psychology of World Equity Markets*, Edward Elgar.

De Bondt, W.F.M., 2008a, "Stock Prices: Insights from Behavioral Finance," in Alan Lewis (ed.), *The Cambridge Handbook of Psychology and Economic Behavior*, Cambridge University Press.

De Bondt, W.F.M., 2008b, "Investor Psychology and International Equity Markets," *Revue Economique et Sociale* 66 (No. 4), 107-121.

De Bondt, W.F.M. and R. Thaler, 1985, "Does the Stock Market Overreact?" *Journal of Finance* 40 (No. 3), 793-808.

De Bondt, W.F.M. and R. Thaler, 1987, "Further Evidence on Investor Overreaction and Stock Market Seasonality," *Journal of Finance* 42 (No. 3), 557-581.

De Bondt, W.F.M. and R. Thaler, 1990, "Do Security Analysts Overreact?" *American Economic Review* 80 (No.2), 52–57.

Dittmar, R., 2002, "Nonlinear Pricing Kernels, Kurtosis Preference, and Evidence from the Cross Section of Equity Returns," *Journal of Finance* 57 (No. 1), 369-403.

Dreman, D.N., 1977, *Psychology and the Stock Market*, Amacom.

Dreman, D.N., 1980, *The New Contrarian Investment Strategy*, Random House.

Dreman, D.N., 1995, "Exploiting Behavioral Finance: Portfolio Strategy and Construction," In *Behavioral Finance and Decision Theory in Investment Management*, Edited by Arnold S. Wood, AIMR.

Fama, E.F., 1965, "The Behavior of Stock Market Prices," *The Journal of Business* 38 (No. 1), 34–106.

Fama, E.F., 1998, "Market Efficiency, Long-Term Returns, and Behavioral Finance," *Journal of Financial Economics* 49 (No. 3), 283–306.

Fama, E.F. and K. French, 1992, "The Cross-Section of Expected Stock Returns," *Journal of Finance* 47 (No. 2), 427–465.

Fellner, W., 1961, "Distortion of Subjective Probabilities as a Reaction to Uncertainty," *Quarterly Journal of Economics* 75, 670-690.

Frazzini, A., 2006, "The Disposition Effect and Underreaction to News," *Journal of Finance* 41 (No. 6), 2017-2046

Friedman, M., 1953, "The Case for Flexible Exchange Rates," *Essays in Positive Economics*, University of Chicago Press.

Froot, K. and E. Dabora, 1999, "How are Stock Prices Affected by the Location of Trade?" *Journal of Financial Economics* 53 (No. 2), 189-216.

Graham, B., 1949, *The Intelligent Investor: A Book of Practical Counsel*, Harper.

Grinblatt, M., and T. Moskowitz, 1999, "The Cross-Section of Expected Returns and its Relation to Past Returns: New Evidence," UCLA Anderson School, Working Paper No. 24-99.

Grinblatt, M., S. Titman and R. Wermers, 1995, "Momentum Investment Strategies, Portfolio Performance and Herding: A Study of Mutual Funds Behavior," *The American Economic Review* 85, 1088-1105.

Han, B. and M. Grinblatt,. 2005, "Prospect Theory, Mental Accounting and Momentum," *Journal of Financial Economics* 78 (No. 2), 311-333.

Haigh, M.S. and J.A. List, 2005, "Do Professional Traders Exhibit Myopic Loss Aversion? An Experimental Analysis," *Journal of Finance* 60 (No. 1), 523-534.

Harvey, C. and A. Siddique, 2000, "Conditional Skewness in Asset Pricing Tests," *Journal of Finance* 55 (No. 3), 1263-1295.

Henderson, P. and P. Peterson, 1992, "Mental Accounting and Categorization," *Organizational Behavior and Human Decision Processes* 51 (No. 1), 92-117.

Hens, T. and M. Vlcek, 2005, "Does Prospect Theory Explain the Disposition Effect?" University of Zurich working paper.

Ikenberry, D., J. Lakonishok, and T. Vermaelen, 1995, "Market Underreaction to Open Market Share Repurchases," *Journal of Financial Economics* 39 (No. 2-3), 181–208.

Jegadeesh, N. and S. Titman, 1993, "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency," *Journal of Finance* 48 (No. 1), 65-91.

Jegadeesh, N. and S. Titman, 2001, "Profitability of Momentum Strategies: An Evaluation of Alternative Explanations," *Journal of Finance* 56 (No. 2), 699–720.

Johnson, E.J. and D. Goldstein, 2003, "Do Defaults Save Lives?" *Science* 302 (No. 5649), 1338-1339.

Kahneman, D. and A. Tversky, 1979, "Prospect Theory: An Analysis of Decision Making under Risk," *Econometrica* 47, 263-291.

Keim, D., 1983, "Size-Related Anomalies and Stock Return Seasonality: Further Empirical Evidence," *Journal of Financial Economics* 12, 13-32.

Keim, D., 1986, "Dividend Yields and the January Effect," *Journal of Portfolio Management* 12 (Winter), 54-60.

Keynes, M., 1964, "The General Theory of Unemployment, Interest and Money," Harcourt Brace Jovanovich, reprint of the 1936 edition.

Koening, J., 1999, "Behavioral Finance: Examining Thought Processes for Better Investing," *Trust and Investments* 69, 17-23.

Lamont, O.A. and R.H. Thaler, 2003, "Can the Market Add and Subtract? Mispricing in Tech Stock Carve-outs," *Journal of Political Economy* 111 (No. 2), 227-268.

Lease, R.C., W.G. Lewellen, and G.G. Schlarbaum, 1976, "Market Segmentation," *Financial Analysts Journal* 32, 53-60.

Lee, C.M. and B. Swaminathan, 2000, "Price Momentum and Trading Volume," *Journal of Finance* 55 (No. 5), 2017–2069.

LeRoy, S. and R.D. Porter, 1981, "Stock Price Volatility: A Test Based on Implied Variance Bounds," *Econometrica* 49, 97-113.

Lohr, S., 2008, "In Modeling Risk, the Human Factor Was Left Out," *New York Times*, November 5.

Lopes, L., 1987, "Between Hope and Fear: The Psychology of Risk," *Advances in Experimental Social Psychology* 20, 255-295.

March, J. and C. Heath, 1994, *A Primer on Decision Making: How Decisions Happen*, Free Press.

Michaely, R., R.H. Thaler, and K. Womack, 1995, "Price Reactions to Dividend Initiations and Omissions: Overreaction or Drift?" *Journal of Finance* 50 (No. 2), 573–608.

Mitchell, M., T. Pulvino, and E. Stafford, 2002, "Limited Arbitrage in Equity Markets," *Journal. of Finance* 57 (No. 2), 551-584.

Muradoglu, G., 1989, "Factors Influencing Stock Demand in Turkey," Unpublished thesis, Bogazici University, Istanbul, Turkey.

Muradoglu, G., 2000, "Turkish Stock Market: Anomalies and Profit Opportunities," In *Security Market Imperfections in Worldwide Equity Markets*, Edited by D. Keim, and W. Ziemba, Cambridge University Press.

Muradoglu, G., 2002, "Portfolio Managers and Novices' Forecasts of Risk and Return: Are There Predictable Forecast Errors?" *Journal of Forecasting* 21 (No. 6), 395-416.

Muradoglu, G,. A. Salih, and M.Mercan, 2005, "A Behavioral Approach To Efficient Portfolio Formation" *The Journal of Behavioural Finance* 6 (No. 4), 202-212.

Muradoglu, G. and D. Onkal, 1994, "An Exploratory Analysis of Portfolio Managers' Probabilistic Forecasts of Stock Prices," *Journal of Forecasting* 13 (No. 7), 565–578.

Nicholson, F., 1968, "Price Ratios in Relation to Investment Results," *Financial Analysts Journal* 24 (No. 1), 105-109.

Norman, D.A., 1993, *Things That Make Us Smart*, Perseus Books.

Odean, T., 1998, "Are Investors Reluctant to Realize Their Losses?"*Journal of Finance* 53 (No. 5), 1775-1798.

Odean, T., 1999, "Do Investors Trade Too Much?" *American Economic Review* 89 (No. 5), 1279-1298.

Poterba, J.M. and L.H. Summers, 1988, "Mean Reversion in Stock Returns: Evidence and Implications," *Journal of Financial Economics* 22, 27–59.

Reason, J., *Human Error*, Cambridge University Press, Cambridge, 1990.

Reinganum, M., 1983, "The Anomalous Stock Market Behavior of Small Firms in January: Empirical Tests for Tax-Loss Selling Effects," *Journal of Financial Economics* 12, 89-104.

Roll, R., 1983, "The Turn-of-the-Year Effect and the Return Premia of Small Firms," *Journal of Portfolio Management* 9 (Winter), 18-28.

Roll, R., 1984, "Orange Juice and Weather," *American Economic Review* 74 (No. 5), 861–880.

Roll, R., 1988, "R^2," *Journal of Finance* 43 (No. 3), 541–566.

Rosenberg, J. and R. Engle, 2002, "Empirical Pricing Kernels," *Journal of Financial Economics* 64 (No. 3), 341-372.

Rosenthal, L., and C. Young, 1990, "The Seemingly Anomalous Price Behavior of Royal Dutch/Shell and Unilever N.V./PLC," *Journal of Financial Economics* 26 No. 1), 123–142.

Rouwenhorst, K.G., 1998, "International Momentum Strategies," *Journal of Finance* 53 (No. 1), 267–284.

Rouwenhorst, K.G., 1999, "Local Return Factors and Turnover in Emerging Stock Markets," *Journal of Finance* 54 (No. 4), 1439–1464.

Scruggs, J.T., 2007, "Noise Trader Risk: Evidence from the Siamese twins," *Journal of Financial Markets* 10 (No. 1), 76-105.

Shefrin, H., 2001a, *Behavioral Finance*, Edward Elgar.

Shefrin, H., 2001b, "Behavioral Corporate Finance," *Journal of Applied Corporate Finance* 14 (No. 3), 113-124.

Shefrin, H., 2002, *Beyond Greed and Fear*, Oxford University Press.

Shefrin, H., 2005, *Behavioral Corporate Finance*, McGraw-Hill.

Shefrin, H., 2008a, *A Behavioral Approach to Asset Pricing*, Elsevier Academic Press (2nd Ed.).

Shefrin, H., 2008b, "Risk and Return in Behavioral SDF-Based Asset Pricing Models," *Journal of Investment Management* 6 (No. 3), 1-19.

Shefrin, H. and M. Statman, 1984, "Explaining Investor Preference for Cash Dividends," *Journal of Financial Economics* 13, 253-282.

Shefrin, H. and M. Statman, 1985, "The Disposition to Sell Winners too Early and Ride Losers too Long: Theory and Evidence," *Journal of Finance* 40 (No. 3), 777-790.

Shefrin, H. and M. Statman, 1993a, "Behavioral Aspects of the Design and Marketing of Financial Products," *Financial Management* 22 (No. 2), 123-134.

Shefrin, H. and M. Statman, 1993b, "Ethics, Fairness and Efficiency in Financial Markets," *Financial Analysts Journal* 49 (No. 6), 21-29.

Shefrin, H. and M. Statman, 2000, "Behavioral Portfolio Theory," *Journal of Financial and Quantitative Analysis* 35 (No. 2), 127-151.

Shefrin, H. and R.H. Thaler, 1988, "The Behavioral Life-Cycle Hypothesis," *Economic Inquiry* 26 (No. 4), 609-643.

Schill, M.J. and C. Zhou, 2001, "Pricing an Emerging Industry: Evidence from Internet Subsidiary Carve-outs," *Financial Management* 30 (No. 3), 5-34.

Shiller, R.J., 1981, "Do Stock Market Prices Move too Much to be Justified by Subsequent Changes in Dividents?" *American Economic Review* 71, 421–436.

Shiller, R.J., 1993, *Market Volatility*, MIT Press.

Shleifer, A., 2000, *Inefficient Markets*, Oxford University Press.

Siegel, J.J., 1998, *Stocks for the Long Run*, McGraw-Hill.

Slovic, P., 1972, "Psychological Study of Human Judgment: Implications for Investment Decision Making," *Journal of Finance* 27 (No. 4), 779-799.

Smith, A., 1759, *The Theory of Moral Sentiments*, Liberty Fund (published in 1982).

Statman, M., 2008, "The Expressive Nature of Socially Responsible Investors," *Journal of Financial Planning*, (February).

Taleb, N., 2007, *The Black Swan: The Impact of the Highly Improbable*, New York, Random House.

Thaler, R., 1993, *Advances in Behavioral Finance*, Russell Sage Foundation.

Thaler, R. and H. Shefrin, 1981, "An Economic Theory of Self Control," *Journal of Political Economy* 89 (No. 2), 392-410.

Thaler, R.H. and C.R. Sunstein, 2008, *Nudge: Improving Decisions about Health, Wealth, and Happiness*, Yale University Press.

Tobin, J., 1958, "Liquidity Preference as Behavior Towards Risk," *Review of Economic Studies* 25 (No. 67), 65-86.

Tversky, A. and D. Kahneman, 1974, "Judgment under Uncertainty: Heuristics and Biases," *Science* 185 (No. 4157), 1124-1131.

Tversky, A. and D. Kahneman, 1992, "Advances in Prospect Theory: Cumulative Representation of Uncertainty," *Journal of Risk and Uncertainty* 5 (No. 4), 297-323.