HUMAN BEHAVIOR AND THE EFFICIENCY OF THE FINANCIAL SYSTEM

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ABSTRACT

Recent literature in empirical finance is surveyed in its relation to underlying behavioral principles, principles which come primarily from psychology, sociology and anthropology. The behavioral principles discussed are: prospect theory, regret and cognitive dissonance, anchoring, mental compartments, overconfidence, over- and underreaction, representativeness heuristic, the disjunction effect, gambling behavior and speculation, perceived irrelevance of history, magical thinking, quasi-magical thinking, attention anomalies, the availability heuristic, culture and social contagion, and global culture.

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Theories of human behavior from psychology, sociology, and anthropology have helped motivate much recent empirical research on the behavior of financial markets. In this paper I will survey both some of the most significant theories (for empirical finance) in these other social sciences and the empirical finance literature itself.

Particular attention will be paid to the implications of these theories for the efficient markets hypothesis in finance. This is the hypothesis that financial prices efficiently incorporate all public information and that prices can be regarded as optimal estimates of true investment value at all times. The efficient markets hypothesis in turn is based on more primitive notions that people behave rationally, or accurately maximize expected utility, and are able to process all available information. The idea behind the term "efficient markets hypothesis," a term coined by Harry Roberts (1967),[1] has a long history in financial research, a far longer history than the term itself has. The hypothesis (without the words efficient markets) was given a clear statement in Gibson (1889), and has apparently been widely known at least since then, if not long before. All this time there has also been tension over the hypothesis, a feeling among many that there is something egregiously wrong with it; for an early example, see MacKay (1841). In the past couple of decades the finance literature, has amassed a substantial number of observations of apparent anomalies (from the standpoint of the efficient markets hypothesis) in financial markets. These anomalies suggest that the underlying principles

[1]The Roberts (1967) paper has never been published; the fame of his paper apparently owes to the discussion of it in Fama (1970).

of rational behavior underlying the efficient markets hypothesis are not entirely correct and that we need to look as well at other models of human behavior, as have been studied in the other social sciences.

The organization of this paper is different from that of other accounts of the literature on behavioral finance (for example, De Bondt and Thaler, 1996 or Fama, 1997): this paper is organized around a list of theories from the other social sciences that are used by researchers in finance, rather than around a list of anomalies. I organized the paper this way because, in reality, most of the fundamental principles that we want to stress here really do seem to be imported from the other social sciences. No surprise here: researchers in these other social sciences have done most of the work over the last century on understanding less-than-perfectly-rational human behavior. Moreover, each anomaly in finance typically has more than one possible explanation in terms of these theories from the other social sciences. The anomalies are observed in complex real world settings, where many possible factors are at work, not in the experimental psychologist's laboratory. Each of their theories contributes a little to our understanding of the anomalies, and there is typically no way to quantify or prove the relevance of any one theory. It is better to set forth the theories from the other social sciences themselves, describing when possible the controlled experiments that demonstrate their validity, and give for each a few illustrations of applications in finance.

Before beginning, it should be noted that theories of human behavior from these other social sciences often have underlying motivation that is different from that of economic theories. Their theories are often intended to be robust to application in a variety of everyday, unstructured experiences, while the economic theories are often intended to be robust in the different sense that,

even if the problems the economic agents face become very clearly defined, their behavior will not change after they learn how to solve the problems. Many of the underlying behavioral principles from psychology and other social sciences that are discussed below are unstable and the hypothesized behavioral phenomena may disappear when the situation becomes better structured and people have had a lot of opportunity to learn about it. Indeed, there are papers in the psychology literature claiming that many of the cognitive biases in human judgment under uncertainty uncovered by experimental psychologists will disappear when the experiment is changed so that the probabilities and issues that the experiment raises are explained clearly enough to subjects (see for example, Gigerenzer, 1991). Experimental subjects can in many cases be convinced, if given proper instruction, that their initial behavior in the experimental situation was irrational, and they will then correct their ways.

To economists, such evidence is taken to be more damning to the theories than it would be by the social scientists in these other disciplines. Apparently economists at large have not fully appreciated the extent to which enduring patterns can be found in this 'unstable' human behavior. The examples below of application of theories from other social sciences to understanding anomalies in financial markets will illustrate.

Each section below, until the conclusion, refers to a theory taken from the literature in psychology, sociology or anthropology. The only order of these sections is that I have placed first theories that seem to have the more concrete applications in finance, leaving some more impressionistic applications to the end. In the conclusion I attempt to put these theories into perspective, and to recall that there are also important strengths in conventional economic theory and in the efficient markets hypothesis itself.

Prospect Theory

Prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992) has probably had more impact than any other behavioral theory on economic research. Prospect theory is very influential despite the fact that it is still viewed by much of the economics profession at large as of far less importance than expected utility theory. Among economists, prospect theory has a distinct, though still prominent, second place to expected utility theory for most research.

I should say something first about the expected utility theory that still retains the position of highest honor in the pantheon of economic tools. It has dominated much economic theory so long because the theory offers a parsimonious representation of truly rational behavior under uncertainty. The axioms (Savage, 1954) from which expected utility theory is derived are undeniably sensible representations of basic requirements of rationality. For many purposes, it serves well to base an economic theory on such assumptions of strictly rational behavior, especially if the assumptions of the model are based on simple, robust realities, if the model concerns well-considered decisions of informed people, and if the phenomenon to be explained is one of stable behavior over many repetitions, where learning about subtle issues has a good chance of occurring.

Still, despite the obvious attractiveness of expected utility theory, it has long been known that the theory has systematically mispredicted human behavior, at least in certain circumstances. Allais (1953) reported examples showing that in choosing between certain lotteries, people systematically violate the theory. Kahneman and Tversky (1979) give the following experimental evidence to illustrate one of Allais' examples. When their subjects

were asked to choose between a lottery offering a 25% chance of winning 3,000 and a lottery offering a 20% chance of winning 4,000, 65% of their subjects chose the latter, while when subjects were asked to choose between a 100% chance of winning 3,000 and an 80% chance of winning 4,000, 80% chose the former. Expected utility theory predicts that they should not choose differently in these two cases, since the second choice is the same as the first except that all probabilities are multiplied by the same constant. Their preference for the first choice in the lottery when it is certain in this example illustrates what is called the "certainty effect," a preference for certain outcomes.

Prospect theory is a mathematically-formulated alternative to the theory of expected utility maximization, an alternative that is supposed to capture the results of such experimental research. (A prospect is the Kahneman–Tversky name for a lottery as in the Allais example above.) Prospect theory actually resembles expected utility theory in that individuals are represented as maximizing a weighted sum of "utilities," although the weights are not the same as probabilities and the "utilities" are determined by what they call a "value function" rather than a utility function.

The weights are, according to Kahneman and Tversky (1979) determined by a function of true probabilities which gives zero weight to extremely low probabilities and a weight of one to extremely high probabilities. That is, people behave as if they regard extremely improbable events as impossible and extremely probable events as certain. However, events that are just very improbable (not extremely improbable) are given too much weight; people behave as if they exaggerate the probability. Events that are very probable (not extremely probable) are given too little weight; people behave as if they underestimate the probability. What constitutes an extremely low (rather than

very low) probability or an extremely high (rather than very high) probability is determined by individuals' subjective impression and prospect theory is not precise about this. Between the very low and very high probabilities, the weighting function (weights as a function of true probabilities) has a slope of less than one.

This shape for the weighting function allows prospect theory to explain the Allais certainty effect noted just above. Since the 20% and 25% probabilities are in the range of the weighting function where its slope is less than one, the weights people attach to the two outcomes are more nearly equal than are the probabilities, and people tend just to choose the lottery that pays more if it wins. In contrast, in the second lottery choice the 80% probability is reduced by the weighting function while the 100% probability is not; the weights people attach to the two outcomes are more unequal than are the probabilities, and people tend just to choose the outcome that is certain.

If we modify expected utility function only by substituting the Kahneman and Tversky weights for the probabilities in expected utility theory, we might help explain a number of puzzling phenomena in observed human behavior toward risk. For a familiar example, such a modification could explain the apparent public enthusiasm for high-prize lotteries, even though the probability of winning is so low that expected payout of the lottery is not high. It could also explain such phenomenon as the observed tendency for overpaying for airline flight insurance (life insurance policies that one purchases before an airline flight, that has coverage only during that flight), Eisner and Strotz (1961).

The Kahneman–Tversky weighting function may explain observed overpricing of out-of-the-money and in-the-money options. Much empirical work on stock options pricing has uncovered a phenomenon called the "options

smile" (see Mayhew, 1995, for a review.). This means that both deep out-of-the-money and deep in-the-money options have relatively high prices, when compared with their theoretical prices using Black–Scholes formulae, while near-the-money options are more nearly correctly priced. Options theorists, accustomed to describing the implied volatility of the stock implicit in options prices, like to state this phenomenon not in terms of option prices but in terms of these implied volatilities. When the implied volatility for options of various strike prices at a point in time derived using the Black–Scholes (1973) formula are plotted, on the vertical axis, against the strike price on the horizontal axis, the curve often resembles a smile. The curve is higher both for low strike price (out-of-the-money) options and for high strike price (in-the-money) options than it is for middle-range strike prices. This options smile might possibly be explained in terms of the distortion in probabilities represented by the Kahneman– Tversky weighting function, since the theory would suggest that people act as if they overestimate the small probability that the price of the underlying crosses the strike price and underestimate the high probability that the price remains on the same side of the strike price. The Kahneman–Tversky weighting function might even explain the down-turned corners of the mouth that some smiles exhibit (see Fortune, 1996) if at these extremes the discontinuities at the extremes of the weighting function become relevant.[2]

We now turn to the other foundation of prospect theory, the Kahneman

[2]There are other potential explanations of the options smile in terms of non-normality or jump processes for returns, and these have received the attention in the options literature. Such explanations might even provide a complete rational basis for the smile, though it is hard to know for sure. Since the 1987 stock market crash, the options smile has usually appeared distorted into an options "leer," with the left side of the mouth higher (e.g., the deep out-of-the-money puts are especially overpriced), see Bates (1995), Jackwerth and Rubinstein (1995) and Bates (1991). Public memories of the 1987 crash are apparently at work in producing this "leer."

and Tversky (1979) value function. The value function differs from the utility function in expected utility theory in a very critical respect: the function (of wealth or payout) has a kink in it at a point, the "reference point," the location of which is determined by the subjective impressions of the individual. The reference point is the individual's point of comparison, the "status quo" against which alternative scenarios are contrasted. Taking value as a function of wealth, the Kahneman–Tversky (1979) value function is upward sloping everywhere, but with an abrupt decline in slope at the reference point (today's wealth or whatever measure of wealth that is psychologically important to the subject). For wealth levels above the reference point, the value function is concave downward, just as are conventional utility functions. At the reference point, the value function may be regarded, from the fact that its slope changes abruptly there, as infinitely concave downward. For wealth levels below the reference point, Kahneman and Tversky found evidence that the value function is concave upward, not downward. People are risk lovers for losses, they asserted.

Perhaps the most significant thing to notice about the Kahneman–Tversky value function is just the discontinuity in slope at the reference value, the abrupt downward change in slope as one moves upward past the reference value. Prospect theory does not nail down accurately what determines the location of the reference point, just as it does not nail down accurately, for the weighting function, what is the difference between very high probabilities and extremely high probabilities. The theory does not specify these matters because experimental evidence has not produced any systematic patterns of behavior that can be codified in a general theory. However, the reference point is thought to be determined by some point of comparison that the subject finds

convenient, something readily visible or suggested by the wording of a question.

This discontinuity means that, in making choices between risky outcomes, people will behave in a risk averse manner, no matter how small the amounts at stake are. This is a contrast to the prediction of expected utility theory with a utility function of wealth without kinks, for which, since the utility function is approximately linear for small wealth changes, people should behave as if they are risk neutral for small bets. That people would usually be risk neutral for small bets would be the prediction of expected utility theory even if the utility function has such a slope discontinuity, since the probability that wealth is currently at the kink is generally zero. With prospect theory, in contrast, the kink always moves with wealth to stay at the perceived current level of wealth (or the current point of reference); the kink is always relevant.

Samuelson (1963) told a story which he perceived as demonstrating a violation of expected utility theory, and, although it came before Kahneman and Tversky's prospect theory, it illustrates the importance of the kink in the value function. Samuelson reported that he asked a lunch colleague whether he would accept a bet that paid him $200 with a probability of .5 and lost him $100 with a probability of .5. The colleague said he would not take the bet, but that he would take a hundred of them. With 100 such bets, his expected total winnings are $5,000 and he has virtually no chance of losing any money. It seems intuitively compelling to many people that one would readily take the complete set of bets, even if any element of the set is unattractive. Samuelson proved that if his colleague would answer the same way at any wealth level, then he necessarily violates expected utility theory.

Samuelson's colleague is not, however, in violation of prospect theory.

When viewing a single bet, the kink in the value function is the dominant consideration. If he were to judge 100 bets sequentially, the kink would always be relevant (the reference point would move with each successive bet) and he would reject all of them. But if he were to judge 100 bets together, the collective outcomes would be far above today's value function kink, and the bet is, by prospect theory, clearly desirable.

The failures to accept many such bets when one considers them individually has been called "myopic loss aversion" by Benartzi and Thaler (1995). They argue that, under estimated values for the magnitude of the kink in the Kahneman–Tversky value function, the "equity premium puzzle" of Mehra and Prescott (1985) can be resolved; see also Siegel and Thaler (1997).

Today, the term "equity premium puzzle," coined by Mehra and Prescott (1985), is widely used to refer to the puzzlingly high historical average returns of stocks relative to bonds.[3] The equity premium is the difference between the historical average return in the stock market and the historical average return on investments in bonds or treasury bills. According to Siegel (1994), the equity premium of U.S. stocks over short-term government bonds has averaged 6.1% a year for the United States for 1926 to 1992, and so one naturally wonders why people invest at all in debt if it is so outperformed by stocks. [4] Those who have tried to reconcile the equity premium with rational investor

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[3]Mehra and Prescott did not discover the equity premium. Perhaps that honor should go to Smith (1925), although there must be even earlier antecedents in some forms. Mehra and Prescott's original contribution seems to have been, in the context of present-value investor intertemporal optimizing models, to stress that the amount of risk aversion that would justify the equity premium, given the observed correlation of stocks with consumption, would imply much higher riskless interest rates than we in fact see.

[4]Siegel (1994, p. 20). However, Siegel notes that the U.S. equity premium was only 1.9% per year 1816–70 and 2.8% per year 1871–1925.

behavior commonly point out the higher risk that short-run stock market returns show: investors presumably are not fully enticed by the higher average returns of stocks since stocks carry higher risk. But, such riskiness of stocks is not a justification of the equity premium, at least assuming that investors are mostly long term. Most investors ought to be investing over decades, since most of us expect to live for many decades, and to spend the twilight of their lives living off savings. Over long periods of times, it has actually been long-term bonds (whose payout is fixed in nominal terms), not the stocks, that have been more risky in real terms, since the consumer price index has been, despite its low variability from month to month, very variable over long intervals of time, see Siegel (1994). Moreover, stocks appear strictly to dominate bonds: there is no thirty-year period since 1871 in which a broad portfolio of stocks was outperformed either by bonds or treasury bills.[5]

Benartzi and Thaler show (1995) that if people use a one-year horizon to evaluate investments in the stock market, then the high equity premium is explained by myopic loss aversion. Moreover, prospect theory does not suggest that in this case riskless real interest rates need be particularly high. Thus, if we accept prospect theory and that people frame stock market returns as short-term, the equity premium puzzle is solved.

Benartzi and Thaler (1996) demonstrated experimentally that when subjects are asked to allocate their defined contribution pension plans between

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[5]Siegel (1994, p. 31). It should be noted that one must push the investor horizon up to a fairly high number, around 30 years, before one finds that historically stocks have always outperformed bonds since 1871; for ten year periods of time one finds that bonds often outperform stocks. There are not many thirty-year periods in stock market history, so this information might be judged as insubstantial. Moreover, Siegel notes that even with a thirty-year period stocks did not always outperform bonds in the U.S. before 1871.

stocks and fixed incomes, their responses differed sharply depending on how historical returns were presented to them. If they were shown 30 one-year returns, their median allocation to stocks was 40%, but if they were shown 30-year returns their median allocation to stocks was 90%. Thaler, Tversky, Kahneman and Schwartz (1997) shows further experiments confirming this response.

Loss aversion has also been used to explain other macroeconomic phenomena, savings behavior (Bowman, Minehart and Rabin, 1993) and job search behavior (Bryant, 1990).

Regret and Cognitive Dissonance

There is a human tendency to feel the pain of regret at having made errors, even small errors, not putting such errors into a larger perspective. One "kicks oneself" at having done something foolish. If one wishes to avoid the pain of regret, one may alter one's behavior in ways that would in some cases be irrational unless account is taken of the pain of regret.

The pain of regret at having made errors is in some senses embodied in the Kahneman–Tversky notion of a kink in the value function at the reference point. There are also other ways of representing how people behave who feel pain of regret. Loomes and Sugden (1982) have suggested that people maximize the expected value of a "modified utility function" which is a function of the utility they achieve from a choice as well as the utility they would have achieved from another choice that was considered. Bell (1982) proposed a similar analysis.

Regret theory may apparently help explain the fact that investors defer selling stocks that have gone down in value and accelerate the selling of stocks

that have gone up in value, Shefrin and Statman (1985). Regret theory may be interpreted as implying that investors avoid selling stocks that have gone down in order not to finalize the error they make and not to feel the regret. They sell stocks that have gone up in order that they cannot regret failing to do so before the stock later fell, should it do so. That such behavior exists has been documented using volume of trade data by Ferris, Haugen and Makhija (1988) and Odean (1996b).

Cognitive dissonance is the mental conflict that people experience when they are presented with evidence that their beliefs or assumptions are wrong; as such, cognitive dissonance might be classified as a sort of pain of regret, regret over mistaken beliefs. As with regret theory, the theory of cognitive dissonance (Festinger, 1957) asserts that there is a tendency for people to take actions to reduce cognitive dissonance that would not normally be considered fully rational: the person may avoid the new information or develop contorted arguments to maintain the beliefs or assumptions. There is empirical support that people often make the errors represented by the theory of cognitive dissonance. For example, in a classic study, Erlich, Guttman, Schopenback and Mills (1957) showed that new car purchasers selectively avoid reading, after the purchase is completed, advertisements for car models that they did not choose, and are attracted to advertisements for the car they chose.

McFadden (1974) modelled the effect of cognitive dissonance in terms of a probability of forgetting contrary evidence and showed how this probability will ultimately distort subjective probabilities. Goetzmann and Peles (1993) have argued that the same theory of cognitive dissonance could explain the observed phenomenon that money flows in more rapidly to mutual funds that have performed extremely well than flows out from mutual funds that have

performed extremely poorly: investors in losing funds are unwilling to confront the evidence that they made a bad investment by selling their investments.

Anchoring

It is well-known that when people are asked to make quantitative assessments their assessments are influenced by suggestions. An example of this is found in the results survey researchers obtain. These researchers often ask people about their incomes using questionnaires in which respondents are instructed to indicate which of a number of income brackets, shown as choices on the questionnaire, their incomes fall into. It has been shown that the answers people give are influenced by the brackets shown on the questionnaire. The tendency to be influenced by such suggestions is called "anchoring" by psychologists.

In some cases, at least, anchoring may be rational behavior for respondents. They may rationally assume that the deviser of the questionnaire uses some information (in this case, about typical people's incomes) when devising the questionnaire. Not fully remembering their own income, they may rely on the information in the brackets to help them answer better. If the brackets do contain information, then it is rational for subjects to allow themselves to be influenced by the brackets.

While anchoring undoubtedly has an information-response component in many circumstances, it has also been shown that anchoring behavior persists even when information is absent. In one experiment Tversky and Kahneman (1974), subjects were given simple questions whose answers were in percentages, e.g., the percentage of African nations in the United Nations. A wheel of fortune with numbers from 1 to 100 was spun before the subjects.

Obviously, the number at which the wheel of fortune stopped had no relevance to the question just asked. Subjects were asked whether their answer was higher or lower than the wheel of fortune number, and then to give their own answer. Respondents' answers were strongly influenced by the "wheel of fortune." For example, the median estimates of the percentage of African countries in the United Nations were 25 and 45 for groups that received 10 and 65, respectively, as starting points (p. 184).

Values in speculative markets, like the stock market, are inherently ambiguous. Who would know what the value of the Dow Jones Industrial Average should be? Is it really "worth" 6,000 today? Or 5,000 or 7,000? or 2,000 or 10,000? There is no agreed-upon economic theory that would answer these questions. In the absence of any better information, past prices (or asking prices or prices of similar objects or other simple comparisons) are likely to be important determinants of prices today.

That anchoring affects valuations, even by experts, was demonstrated by Northcraft and Neale (1987) in the context of real estate valuation. All subjects were taken to a house for sale, asked to inspect the house for up to 20 minutes, and were given a ten-page packet of information about the house and about other houses in the area, giving square footage and characteristics of the properties, and prices of the other properties. The same packet was given to all subjects except that the asking price of the property under consideration and its implied price per square foot were changed between subjects. Subjects were asked for their own opinions of its appraisal value, appropriate listing price, purchase price, and the lowest offer the subject would accept for the house if the subject were the seller. The real estate agents who were given an asking price of $119,900 had a mean predicted appraisal value of $114,204,

listing price of $117,745, purchase price of $111,454 and a lowest acceptable offer of $111,136, while the real estate agents who were given an asking price of $149,900 had a mean appraisal value of $128,754, listing price of $130,981, predicted purchase price of $127,318, and a lowest offer of $123,818. The changed asking prices thus swayed their valuations by 11% to 14% of the value of the house. Similar results were found with amateur subjects. While this experiment does not rule out that the effect of the asking price was due to a rational response to the assumed information in the asking price, the effects of asking price are remarkably large, given that so much other information on the house was also given. Moreover, when subjects were asked afterwards to list the items of information that weighed most heavily in their valuations, only 8% of the expert subjects and only 9% of the amateur subjects listed asking price of the property under consideration among the top three items. Note that the valuation problem presented to these subjects is far less difficult or ambiguous than the problem of determining the "correct" value for the stock market, since here they are implicitly being asked to assume that the comparable properties are correctly valued. (See also McFadden, 1974 and Silberman and Klock, 1989.)

One might object that the notion that anchoring on past prices helps determine present price in the stock market might be inconsistent with the low serial correlation of stock price changes, that is with the roughly random-walk behavior of daily or monthly stock prices that has been widely noted.[6] This

[6]The notion that speculative prices approximately describe "random walks" was first proposed by Bachelier (1900, 1964). It became widely associated with the efficient markets hypothesis, the hypothesis that market prices efficiently incorporate all available information, with the work of Fama (1970). For further information on the literature on the random walk and efficient markets theory see also Cootner (1964), Malkiel (1981), and Fama (1991).

conclusion is not warranted however. Models of "smart money" (i.e., people who are unusually alert to profit opportunities in financial markets) seeking to exploit serial correlation in price, models which also include ordinary investors, are consistent with the implications that serial correlation is low and yet the anchoring remains important for the level of stock prices (see Shiller, 1984, 1990).

By extension from these experimental results, it is to be presumed that very many economic phenomena are influenced by anchoring. Gruen and Gizycki (1993) used it to explain the widely observed anomaly[7] that forward discounts to not properly explain subsequent exchange rate movements. The anchoring phenomenon would appear relevant to the "sticky prices" that are so talked about by macroeconomists. So long as past prices are taken as suggestions of new prices, the new prices will tend to be close to the past prices. The more ambiguous the value of a commodity, the more important a suggestion is likely to be, and the more important anchoring is likely to be for price determination.

The anchoring phenomenon may help to explain certain international puzzles observed in financial markets. U.S. investors who thought in the late 1980s that Japanese stock price–earnings ratios were outrageously high then may have been influenced by the readily-available anchor of (much lower) U.S. price–earnings ratios. By the mid 1990s, many U.S. investors feel that the Tokyo market is no longer overpriced (see Shiller, Kon-Ya and Tsutsui, 1996), even though price–earnings ratios remain much higher than in the U.S. perhaps because the anchor of the widely-publicized high Tokyo price–earnings ratios of the late 1980s appears to be another anchor.

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[7]For a discussion of the anomaly, see Backus, Foresi and Telmer (1995) and Froot and Thaler (1990).

Anchoring may also be behind certain forms of money illusion. The term money illusion, introduced by Fisher (1928), refers to a human tendency to make inadequate allowance, in economic decisions, for the rate of inflation, and to confuse real and nominal quantities. Shafir, Diamond and Tversky (1997) have shown experimentally that people tend to give different answers to the same hypothetical decision problem depending on whether the problem was presented in a way that stressed nominal quantities or in a way that stressed real quantities. The quantities that were shown in the question (whether nominal or real) may have functioned as anchors.[8]

Mental Compartments

Related to the anchoring and framing phenomena is a human tendency to place particular events into mental compartments based on superficial attributes. Instead of looking at the big picture, as would be implied by expected utility theory, they look at individual small decisions separately.

People may tend to place their investments into arbitrarily separate mental compartments, and react separately to the investments based on which compartment they are in. Shefrin and Statman (1994) have argued that individual investors think naturally in terms of having a "safe" part of their portfolio that is protected from downside risk and a risky part that is designed for a chance of getting rich. Shefrin and Thaler (1988) have argued that people put their sources of income into three categories, current wage and salary income, asset income, and future income, and spend differently out of the present values of

[8]There appears to be much more to money illusion than just anchoring; people associate nominal quantities with opinions about the economy, anticipated behavior of the government, fairness, and prestige, opinions that are not generally shared by economists, see Shiller (1997a,b).

these different incomes. For example, people are reluctant to spend out of future income even if it is certain to arrive.

The tendency for people to allow themselves to be influenced by their own mental compartments might explain the observed tendency for stock prices to jump up when the stock is added to the Standard and Poor Stock Index (see Shleifer, 1986). It might also help explain the widely noted "January effect" anomaly. This anomaly, that stock prices tend to go up in January, has been observed in as many as 15 different countries (Gultekin and Gultekin, 1983). The anomaly cannot be explained in terms of effects related to the tax year, since it persists also in Great Britain (whose tax year begins in April) and Australia (whose tax year begins in July), see Thaler (1987). If people view the year end as a time of reckoning and a new year as a new beginning, they may be inclined them to behave differently at the turn of the year, and this may explain the January effect.

A tendency to separate out decisions into separate mental compartments may also be behind the observed tendency for hedgers to tend to hedge specific trades, rather than their overall profit situation. René Stulz (1996, p. 8), in summarizing the results of his research and that of others on the practice of risk management by firms, concludes that:

> It immediately follows from the modern theory of risk management that one should be concerned about factors that affect the present value of future cash flows. This is quite different from much of the current practice of risk management where one is concerned about hedging transaction risk or the risk of transactions expected to occur in the short run.

The Wharton/CIBC Wood Gundy 1995 Survey of Derivatives Usage by U.S. Non-Financial Firms (Bodnar and Marston, 1996) studied 350 firms: 176 firms in the manufacturing sector, 77 firms in the primary products sector,

and 97 firms in the service sector. When asked by the Wharton surveyors what was the most important objective of hedging strategy, 49% answered managing "volatility in cashflows," 42% answered managing "volatility in accounting earnings," and only 8% answered managing "the market value of the firm" (1% answered "managing balance sheet accounts and ratios"). Fifty percent of the respondents in the survey reported frequently hedging contractual commitments, but only 8% reported frequently hedging competitive/ economic exposure.

It is striking that only 8% reported that their most important objective is the market value of the firm, since maximizing the market value of the firm is, by much financial theory, the ultimate objective of the management of the firm. It is of course hard to know just what people meant by their choices of answers, but there is indeed evidence that firms are driven in their hedging by the objective of hedging specific near-term transactions, and neglect consideration of future transactions or other potential factors that might also pose longer run risks to the firm. In the Wharton study, among respondents hedging foreign currency risks, 50% reported hedging anticipated transactions less than one year off, but only 11% report frequently hedging transactions more than one year off. This discrepancy is striking, since most of the value of the firm (and most of the concerns it has about its market value) must come in future years, not the present year.[9]

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[9]Recent surveys of hedging behavior of firms indicates that despite extensive development of derivative products, actual use of these products for hedging is far from optimal. Of the firms cited in the Wharton/study, only 40.5% reported using derivatives at all. On the other hand, Dolde (1993) surveyed 244 Fortune 500 companies and concluded that over 85% used swaps, forwards, futures or options in managing financial risk. Nance, Smith and Smithson (1993) in a survey of 194 firms reported that 62% used hedging instruments in 1986. These studies concentrated on rather larger companies than did the Wharton study. Overall, these studies may be

Overconfidence, Over- and Under-Reaction and the Representativeness Heuristic

People often tend to show, in experimental settings, excessive confidence about their own judgments. Lichtenstein, Fischhoff and Philips (1977) asked subjects to answer simple factual questions (e.g., "Is Quito the capital of Ecuador?") and then asked them to give the probability that their answer was right: subjects tended to overestimate the probability that they were right, in response to a wide variety of questions.

Such studies have been criticized (see Gigerenzer, 1991) as merely reflecting nothing more than a difference between subjective and frequentist definitions of probability, i.e., critics claimed that individuals were simply reporting a subjective degree of certainty, not the fraction times they are right in such circumstances. However, in reaction to such criticism, Fischhoff, Slovic and Lichtenstein (1977) repeated the experiments asking the subjects for probability odds that they are right and very clearly explaining what such odds mean, and even asking them to stake money on their answer. The overconfidence phenomenon persisted. Moreover, in cases where the subjects said they were certain they were right, they were in fact right only about 80% of the time: there is no interpretation of subjective probability that could reconcile this result with correct judgments.

A tendency towards overconfidence among ordinary investors seems apparent when one interviews them. One quickly hears what seem to be overconfident statements. But how can it be that people systematically are so

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interpreted as revealing a surprisingly low fraction of respondents who do any hedging, given that firms are composed of many people, any one of whom might be expected to initiate the use of derivatives.

overconfident? Why wouldn't people learn from life's experiences to correct their overconfidence?

Obviously, people do learn substantially in circumstances when the consequences of their errors are repeatedly presented to them, and sometimes they even overreact and show too little confidence. But still there seems to be a common bias towards overconfidence. Overconfidence is apparently related to some deep-set psychological phenomena: Ross (1987) argues that much overconfidence is related to a broader difficulty with "situational construal," a difficulty in making adequate allowance for the uncertainty in one's own view of the broad situation, a more global difficulty tied up with multiple mental processes. Overconfidence may also be traced to the "representativeness heuristic," Tversky and Kahneman (1974), a tendency for people to try to categorize events as typical or representative of a well-known class, and then, in making probability estimates, to overstress the importance of such a categorization, disregarding evidence about the underlying probabilities.[10] One consequence of this heuristic is a tendency for people to see patterns in data that is truly random, to feel confident, for example, that a series which is in fact a random walk is not a random walk.[11]

Overconfidence itself does not imply that people overreact (or underreact) to all news. In fact, evidence on the extent of overreaction or underreaction of speculative asset prices to news has been mixed.

There has indeed been evidence of overreaction. The first substantial

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[10]People tend to neglect "base rates," the unconditional probabilities or frequencies of events, see Meehl and Rosen (1955).

[11]Rabin (1996) characterizes this judgment error as a tendency to over-infer the probability distribution from short sequences. Part of overconfidence may be nothing more than simple forgetting of contrary evidence; a tendency to forget is by its very nature not something that one can learn to prevent.

statistical evidence for what might be called a general market overreaction can be found in the literature on excess volatility of speculative asset prices, Shiller (1979, 1981a,b) and LeRoy and Porter (1981). We showed statistical evidence that speculative asset prices show persistent deviations from the long-term trend implied by the present-value efficient markets model, and then, over horizons of many years, to return to this trend. This pattern of price behavior, it was argued, made aggregate stock prices much more volatile than would be implied by the efficient markets model. It appears as if stock prices overreact to some news, or to their own past values, before investors come to their senses and correct the prices. Our arguments led to a spirited debate about the validity of the efficient markets model in the finance literature, a literature that has too many facets to summarize here, except to say that it confirms there are many potential interpretations of any statistical results based on limited data.[12] My own view of the outcome of this debate is that it is quite likely that speculative asset prices tend to be excessively volatile. Certainly, at the very least, one can say that no one has been able to put forth any evidence that there is not excess volatility in speculative asset prices. For an evaluation of this literature, see Shiller (1989), Campbell and Shiller (1988, 1989), West (1988), and Campbell, Lo and MacKinlay (1997, Ch. 7).

Since then, papers by De Bondt and Thaler (1985), Fama and French (1988), Poterba and Summers (1988), and Cutler, Poterba and Summers (1991) have confirmed the excess volatility claims by showing that returns tend to be negatively autocorrelated over horizons of three to five years, that

[12]There has been some confusion about the sense in which the present-value efficient markets model puts restrictions on the short-run (or high frequency) movements in speculative asset prices. The issues are laid out in Shiller (1979), (appendix). Kleidon (1986) rediscovered the same ideas again, but gave a markedly different interpretation of the implications for tests of market efficiency.

an initial overreaction is gradually corrected. Moreover, Campbell and Shiller (1988, 1989) show that aggregate stock market dividend yields or earnings yields are positively correlated with subsequently observed returns over similar intervals; see also Dreman and Berry (1995).[13] Campbell and Shiller (1998) connect this predictive power to the observed stationarity of these ratios. Since the ratios have no substantial trend over a century and appear mean reverting over much shorter time intervals, the ratio must predict future changes in either the numerator (the dividend or earnings) or the denominator (the price); we showed that it has been unequivocally the denominator, the price, that has restored the ratios to their mean after they depart from it, and not the numerator. La Porta (1996) found that stocks for which analysts projected low earnings growth tended to show upward price jumps on earnings announcement dates, and stocks for which analysts projected high earnings growth tended to show downward price jumps on earnings announcement dates. He interprets this as consistent with a hypothesis that analysts (and the market) excessively extrapolated past earnings movements and only gradually correct their errors as earnings news comes in. The behavior of initial public offerings around announcement dates appears also to indicate some over-reaction and later rebound, see Ibbotson and Ritter (1988) and Ritter (1991).

On the other hand, there has also been evidence of what might be called

[13]An extensive summary of the literature on serial correlation of US stock index returns is in Campbell, Lo and MacKinlay (1997). Chapter 2 documents the positive serial correlation of returns over short horizons, but concludes that the evidence for negative serial correlation of returns over long horizons is weak. Chapter 7, however, shows evidence that long-horizon returns are negatively correlated with the price-earnings ratio and price-dividend ratio. Recent critics of claims that long-horizon returns can be forecasted include Goetzmann and Jorion (1992), Nelson and Kim (1993) and Kirby (1997). In my view, they succeed in reducing the force of the evidence, but not the conclusion that long-horizon returns are quite probably fore-castable.

underreaction. Most days when big news breaks have been days of only modest stock market price movements, the big movements tending to come on days when there is little news, see Cutler, Poterba and Summers (1989). Cutler, Poterba and Summers (1991) also found that for a number of indices of returns on major categories of speculative assets there has been a tendency for positive autocorrelation of short-run returns over short horizons, less than a year; see also Jegadeesh and Titman (1993) and Chan, Jegadeesh and Lakonishok (1996).[14] This positive serial correlation in return indices has been interpreted as implying an initial underreaction of prices to news, to be made up gradually later. Bernard and Thomas (1992) found evidence of underreaction of stock prices to changes, from the previous year, in company earnings: prices react with a lag to earnings news; see also Ball and Brown (1968).[15] Irving Fisher (1930, Ch. XXI, pp. 493–94) thought that, because of human error, nominal interest rates tend to underreact to inflation, so that there is a tendency for low real interest rates in periods of high inflation, and high real rates in periods of low inflation. More recent data appear to confirm this behavior of real interest rates, and data on inflationary expectations also bear

[14]Lo and MacKinlay (1988) and Lehmann (1990), however, find evidence of *negative* serial correlation of individual weekly stock returns between successive weeks. As explained by Lo and MacKinlay (1990), weekly returns on portfolios of these same stocks still exhibit positive serial correlation from week to week because the cross-covariances between returns of individual stocks are positive. They conclude that this pattern of cross-covariances is not what one would expect to find based on theories of investor inertia. Lehmann, however, has a different interpretation of the negative week-to-week serial correlation of individual weekly stock returns, that the negative serial correlation reflects nothing more than the behavior of market makers facing order imbalances and asymmetric information.

[15]Firms' management appear acutely aware that earnings growth has a psychological impact on prices, and so attempt to manage earnings accounting to provide a steady growth path. Impressive evidence that they do so is found in Degeorge, Patel and Zeckhauser (1997).

out Fisher's interpretation that the phenomenon has to do with human error; see De Bondt and Bange (1992) and Shefrin (1997).[16]

Does the fact that securities prices sometimes underreact pose any problems for the psychological theory that people tend to be overconfident? Some observers seem to think that it does. In fact, however, overconfidence and overreaction are quite different phenomena. People simply cannot overreact to everything: if they are overconfident they will make errors, but not in any specified direction in all circumstances. The concepts of overreaction or underreaction, while they may be useful in certain contexts, are not likely to be good psychological foundations on which to organize a general theory of economic behavior.

The fact that both overreaction and underreaction are observed in financial markets has been interpreted by Fama (1997) as evidence that the anomalies from the standpoint of efficient markets theory are just "chance results," and that therefore the theory of market efficiency survives the challenge of its critics. He is right, of course, that both overreaction and underreaction together may sometimes seem a little puzzling. But one is not likely to want to dismiss these as "chance results" if one has an appreciation for the psychological theory that might well bear on these phenomena. In his survey of behavioral finance Fama (1997) makes no more than a couple of oblique references to any literature from the other social sciences. In fact, Fama states that the literature on testing market efficiency has no clearly stated alternative, "the alternative hypothesis is vague, market inefficiency" (p. 1). Of course, if one has little appreciation of these alternative theories then one might well

[16]Modigliani and Cohn (1979) argue that public failure to understand the relation of interest rates to inflation has caused the stock market to overreact to nominal interest rate changes.

conclude that the efficient markets theory, for all its weaknesses, is the best theory we have. Fama appears to believe that the principal alternative theory is just one of consistent overreaction or underreaction, and says that "since the anomalies literature has not settled on a testable alternative to market efficiency, to get the ball rolling, I assume that reasonable alternatives must predict either over-reaction or under-reaction" (p. 2). The psychological theories reviewed here cannot be reduced to such simple terms, contrary to Fama's expectations.

Barberis, Shleifer and Vishny (1997) provide a psychological model, involving the representativeness heuristic as well as a principle of conservatism (Edwards, 1968), that offers a reconciliation of the overreaction and underreaction evidence from financial markets; see also Daniel, Hirshleifer and Subrahmanyam (1997) and Wang (1997). More work could be done in understanding when it is that people overreact in financial markets and when it is that they underreact. Understanding these overreaction and underreaction phenomena together appears to be a fertile field for research at the present time. There is neither reason to think that it is easy obtain such an understanding, nor reason to despair that it can ever be done.

Overconfidence may have more clear implications for the volume of trade in financial markets than for any tendency to overreact. If we connect the phenomenon of overconfidence with the phenomenon of anchoring, we see the origins of differences of opinion among investors, and some of the source of the high volume of trade among investors. People may fail to appreciate the extent to which their own opinions are affected by anchoring to cues that randomly influenced them, and take action when there is little reason to do so.

The extent of the volume of trade in financial markets has long appeared

to be a puzzle. The annual turnover rate (shares sold divided by all shares outstanding) for New York Stock Exchange Stocks has averaged 18% a year from the 1950s through the 1970s, and has been much higher in certain years. The turnover rate was 73% in 1987 and 67% in 1930. It does not appear to be possible to justify the number of trades in stocks and other speculative assets in terms of the normal life-cycle ins and outs of the market. Theorists have established a "nonspeculation theorem" that states that rational agents who differ from each other only in terms of information and who have no reason to trade in the absence of information will not trade (Milgrom and Stokey, 1982l; Geanakoplos, 1992).

Apparently, many investors do feel that they do have speculative reasons to trade often, and apparently this must have to do with some tendency for each individual to have beliefs that he or she perceives as better than others' beliefs. It is as if most people think they are above average.

Odean (1996a), in analyzing individual customer accounts at a nationwide discount brokerage house, examined the profits that customers made on trades that were apparently not motivated by liquidity demands, tax loss selling, portfolio rebalancing, or a move to lower-risk securities. On the remaining trades, the returns on the stocks purchased was on average lower, not higher, than on those sold. This appears to be evidence of overconfidence among these investors.

Within the week of the stock market crash of October 19, 1987 I sent out questionnaires to 2,000 wealthy individual investors and 1,000 institutional investors, asking them to recall their thoughts and reasons for action on that day; see Shiller (1987b). There were 605 completed responses from individuals and 284 responses from institutions. One of the questions I asked

was: "Did you think at any point on October 19, 1987 that you had a pretty good idea when a rebound was to occur?" Of individual investors, 29.2% said yes, of institutional investors, 28.0% said yes. These numbers seem to be surprisingly high: one wonders why people thought they knew what was going to happen in such an unusual situation. Among those who bought on that day, the numbers were even higher, 47.1% and 47.9% respectively. The next question on the questionnaire was "If yes, what made you think you knew when a rebound was to occur?" Here, there was a conspicuous absence of sensible answers; often the answers referred to "intuition" or "gut feeling." It would appear that the high volume of trade on the day of the stock market crash, as well as the occurrence, duration, and reversal of the crash was in part determined by overconfidence in such intuitive feelings.[17]

If people are not independent of each other in forming overconfident judgments about investments, and if these judgments change collectively through time, then these "noisy" judgments will tend to cause prices of speculative assets to deviate from their true investment value. Then a "contrarian" investment strategy, advocated by Graham and Dodd (1934) and Dreman (1977) among many others, a strategy of investing in assets that are currently out of favor by most investors, ought to be advantageous. Indeed, there is much evidence that such contrarian investment strategy does pay off, see for example, De Bondt and Thaler (1985), Fama and French (1988, 1992), Fama (1991), and Lakonishok, Shleifer and Vishny (1994). That a simple contrarian strategy may be profitable may appear to some to be surprising: one might

[17]See also Case and Shiller (1988) for a similar analysis of recent real estate booms and busts. On the other hand, Garber (1990) analyzes some famous speculative bubbles, including the tulipomania in the 17th century, and concludes that they may have been rational.

think that "smart money," by competing with each other to benefit from the profit opportunities, would ultimately have the effect of eliminating any such profit opportunities. But, there are reasons to doubt that such smart money will indeed have this effect; see Shiller (1984), De Long et al. (1990a,b), and Shleifer and Vishny (1996).[18]

The Disjunction Effect

The disjunction effect is a tendency for people to want to wait to make decisions until information is revealed, even if the information is not really important for the decision, and even if they would make the same decision regardless of the information. The disjunction effect is a contradiction to the "sure-thing principle" of rational behavior (Savage, 1954).

Experiments showing the disjunction effect were performed by Tversky and Shafir (1992). They asked their subjects whether they would take one of the bets that Samuelson's lunch colleague, discussed above, had refused a coin toss in which one has equal chances to win $200 or lose $100. Those who took the one bet were then asked whether they then wanted to take another such bet. If they were asked after the outcome of the first bet was known, then it was found that a majority of respondents took the second bet whether or not they had won the first. However, a majority would not take the bet if they had to make the decision before the outcome of the bet was known. This is a puzzling result: if one's decision is the same regardless of the outcome of the first bet, then it would seem that one would make the same decision before

[18]Even public expectations of a stock market crash does not prevent the stock market from rising; there is evidence from options prices that the stock market crash of 1987 was in some sense expected before it happened; see Bates (1991, 1995). Lee, Shleifer and Thaler (1991) argue that investor expectations, or rather "sentiment" can be measured by closed-end mutual fund discounts, which vary through time.

knowing the outcome. Tversky and Shafir gave their sense of the possible thought patterns that accompany such behavior: if the outcome of the first bet is known and is good, then subjects think that they have nothing to lose in taking the second, and if the outcome is bad they want to try to recoup their losses. But if the outcome is not known, then they have no clear reason to accept the second bet.

The disjunction effect might help explain changes in the volatility of speculative asset prices or changes in the volume of trade of speculative asset prices at times when information is revealed. Thus, for example, the disjunction effect can in principle explain why there is sometimes low volatility and low volume of trade just before an important announcement is made, and higher volatility or volume of trade after the announcement is made. Shafir and Tversky (1992) give the example of presidential elections, which sometimes induce stock market volatility when the election outcome is known even though many skeptics may doubt that the election outcome has any clear implications for market value.

Gambling Behavior and Speculation

A tendency to gamble, to play games that bring on unnecessary risks, has been found to pervade widely divergent human cultures around the world and appears to be indicative of a basic human trait, Bolen and Boyd (1968). Kallick et al. (1975) estimated that 61% of the adult population in the United States participated in some form of gambling or betting in 1974. They also estimated that 1.1% of men and 0.5% of women are "probably compulsive gamblers," while an additional 2.7% of men and 1% of women are "potential compulsive gamblers." These figures are not trivial, and it is important to

keep in mind that compulsive gambling represents only an extreme form of the behavior that is more common.

The tendency for people to gamble has provided a puzzle for the theory of human behavior under uncertainty, since it means that we must accommodate both risk-avoiding behavior (as evidenced by people's willingness to purchase insurance) with an apparent risk-loving behavior. Friedman and Savage (1948) proposed that the co-existence of these behaviors might be explained by utility functions that become concave upward in extremely high range, but such an explanation has many problems. For one thing, people who gamble do not appear to be systematically risk seekers in any general sense, instead they are seeking specific forms of entertainment or arousal.[19] Moreover, the gambling urge is compartmentalized in people's lives, it tends to take for each individual only certain forms: people specialize in certain games. The favored forms of gambling tend to be associated with a sort of ego involvement: people may feel that they are especially good at the games they favor or that they are especially lucky with these.

The complexity of human behavior exemplified by the gambling phenomenon has to be taken into account in understanding the etiology of bubbles in speculative markets. Gamblers may have very rational expectations, at some level, for the likely outcome of their gambling, and yet have other feelings that drive their actual behavior. Economists tend to speak of quantitative "expectations" as if these were the only characterization of people's outlooks that mattered. It is my impression, from interviews and

[19]According to the American Psychiatric Association's DSM–IV (1994), "Most individuals with Pathological Gambling say that they are seeking 'action' (an aroused, euphoric state) even more than money. Increasingly larger bets, or greater risks, may be needed to continue to produce the desired level of excitement" (p. 616).

survey results, that the same people who are highly emotionally involved with the notion that the stock market will go up may give very sensible, unexciting, forecasts of the market if asked to make quantitative forecasts.

The Irrelevance of History

One particular kind of overconfidence that appears to be common is a tendency to believe that history is irrelevant, not a guide to the future, and that the future must be judged afresh now using intuitive weighing only of the special factors we see now. This kind of overconfidence discourages taking lessons from past statistics; indeed most financial market participants virtually never study historical data for correlations or other such statistics; they take their anchors instead from casual recent observations. Until academic researchers started collecting financial data, most was just thrown away as irrelevant.

One reason that people may think that history is irrelevant is a human tendency toward historical determinism, a tendency to think that historical events should have been known in advance. According to historian Florovsky (1969, p. 364):

> In retrospect we seem to perceive the *logic* of events, which unfold themselves in a regular order, according to a recognizable pattern, with an alleged inner necessity, so that we get the impression that it really could not have happened otherwise.

Fischhoff (1975) attempted to demonstrate this tendency towards historical determinism by presenting experimental subjects with incomplete historical stories, stories that are missing the final outcome of the event. The stories were from historical periods remote enough in time that the subjects would almost certainly not know the actual outcome. Subjects were asked to assign probabilities to each of four different possible conclusions to the story

(only one of which was the true outcome). There were two groups of subjects, one of which was told that one of the four outcomes had in fact happened. The probability given to the outcomes was on average 10% higher when people were told it was the actual outcome.

Fischhoff's demonstration of a behavior consistent with belief in historical determinism may not demonstrate the full magnitude of such behavior, because it does not capture the effects of social cognition of past events, a cognition that may tend to remember historical facts that are viewed as causing subsequent historical events, or are connected to them, and to forget historical facts that seem not to fit in with subsequent events. It will generally be impossible to demonstrate such phenomena of social cognition in short laboratory experiments.

A human tendency to believe in historical determinism would tend to encourage people to assume that past exigencies (the stock market crash of 1929, the great depression, the world wars, and so on) were probably somewhat known in advance, or, at least, that before these events people had substantial reason to worry that they might happen. There may tend to be a feeling that there is nothing definite on the horizon now, as there presumably was before these past events.[20] It is in this human tendency toward believing history is irrelevant that the equity premium puzzle, discussed above, may have its most important explanation. People may tend just not to think that the past stock market return history itself gives any indication of the future, at least not until they perceive that authorities are in agreement that it does.

According to the representativeness heuristic, discussed above, people

[20]This feeling can of course be disrupted, if a sudden event calls to mind parallels to a past event, or if the social cognition memorializes and interprets a past event as likely to be repeated.

may see past return history as relevant to the future only if they see the present circumstances as representative in some details of widely remembered past periods. Thus, for example, the public appears to have made much, just before the stock market crash of 1987, of similarities in that period to the period just before the crash of 1929. Newspapers, including the *Wall Street Journal* on the morning of the stock market crash of October 19, 1987, showed plots of stock prices before October 1929 superimposed on a plot of stock prices before October 1987, suggesting comparisons. In this way, historical events can be remembered and viewed as relevant, but this is not any systematic analysis of past data.

Lack of learning from historical lessons regarding financial and economic uncertainties may explain why many investors show little real interest in diversification around the world and why most investors appear totally uninterested in the correlation of their investments with their labor income, violating with their behavior one of the most fundamental premises of financial theory. Most people do not make true diversification around the world a high priority, and virtually no one is short the company that he or she works for, or is short the stock market in one's own country, as would be suggested by economic theory.[21]

A prominent reason that most people appear apathetic about schemes to protect them from price level uncertainty in nominal contracts is that they just do not seem to think that past actual price level movements are any indicator of future uncertainty. In a questionnaire I distributed (1997a) to a random

[21]Kusko, Poterba and Wilcox (1997) showed, using data on 10,000 401k plan participants in a manufacturing firm, found that barely 20% of participants directed *any* of their own balances into an S&P index fund, while nearly 25% of participants directed *all* of their discretionary balances into a fund invested completely in the own company stock.

sample from phone books in the U.S.A. and Turkey, the following question was posed:

> We want to know how accurately you think that financial experts in America (Turkey) can predict the price level in 2006, ten years from now. Can you tell us, if these experts think that a "market basket" of goods and services that the typical person buys will cost $1,000 (100 million TL) in 2006, then you think it will probably actually cost:
>
> (Please fill in your lower and upper bounds on the price:)
>
> Between $_____ (TL) and $_____ (TL)

The median ratio between high and low was 4/3 for U.S. respondents and 3/2 for Turkish respondents. Only a few respondents wrote numbers implying double- or triple-digit ratios, even in Turkey. The ratios not far from one that most respondents revealed would seem to suggest excessive confidence in the predictability of price levels. Note that in Turkey the CPI increased three-fold between 1964 and 1974, 31-fold between 1974 and 1984, and 128-fold between 1984 and 1994. But, Turkish respondents appear to connect the price level movements with prior political and social events that may be perceived as having largely predicted the price movements, events that are themselves not likely to be repeated in the same way. While these people have apparently learned to take certain steps to protect themselves from price level uncertainty (such as not investing in long-term nominal bonds), they do not appear to have a well-developed understanding of the potential uncertainty of the Turkish Lira that would allow them to deal systematically with such uncertainty. For example, they have shown relatively little interest in government indexed bonds.

Magical Thinking

B. F. Skinner (1948) in what is now regarded as a classic experiment fed starved experimental pigeons small quantities of food at regular fifteen-second intervals with no dependence whatsoever on the bird's behavior. Even though the feeding was unaffected by their behavior, the birds began to behave as if they had a "superstition" that something in their behavior caused the feeding (see also McFadden, 1974). Each pigeon apparently conditioned itself to exhibit a specific behavior to get the food, and because each bird exhibited its characteristic behavior so reliably, it was never deconditioned:

> One bird was conditioned to turn counter-clockwise in the cage, making two or three turns between reinforcements. Another repeatedly thrust its head into one of the upper corners of the cage. A third developed a " tossing" response, as if placing its head beneath an invisible bar and lifting it repeatedly.... (1948, p. 168)

Arbitrary behaviors that are so generated are referred to with the term "magical thinking" by psychologists.

A wide variety of economic behaviors are likely to be generated in exactly the same way that the arbitrary behaviors of the pigeons are generated. Thus, for example, firms' investment or management decisions that happened to precede increases in sales or profits may tend to be repeated, and if this happens in a period of rising profits (as when the economy is recovering from a recession) the notion that these decisions were the cause of the sales or profit increase will be reinforced. Because firms are similar to each other and observe each other, the magical thinking may be social, rather than individual, and hence may have aggregate effects.

Roll (1986), with his hubris hypothesis concerning corporate takeovers, argued that managers of bidder firms may become overconfident of their own abilities to judge firms, because of their luck in their first takeovers.

This overconfidence can cause them to overbid in subsequent takeover attempts.

The tendency for speculative markets to respond to certain news variables may be generated analogously. The U.S. stock market used often to be buoyed by positive news about the economy, but in recent years it appears to tend to be moved in the opposite direction by such news. This new "perverse" movement pattern for the stock market is sometimes justified in the media by a theory that the good news will cause the Federal Reserve to tighten monetary policy and that then the higher interest rates will lower the stock market. But the whole belief could be the result of a chain of events that was set off by some initial chance movements of the stock market. Because people believe these theories they may then behave so that the stock price does indeed behave as hypothesized, the initial correlations will persist later, and thereby reinforce the belief.

Quasi-Magical Thinking

The term quasi-magical thinking, as defined by Shafir and Tversky (1992), is used to describe situations in which people act as if they erroneously believe that their actions can influence an outcome (as with magical thinking) but in which they in fact do not believe this. It includes acting as if one thinks that one can take actions that will, in effect, undo what is obviously predetermined, or that one can change history.

For example, Quattrone and Tversky (1984) divided subjects into a control and experimental group and then asked people in both groups to see how long they could bear to hold their hands in some ice water. In the experimental group subjects were told that people with strong hearts were better

able to endure the ice water. They found that those in the experimental group in fact held their hands in the ice water longer. If indeed, as appears to be the case, those in the experimental group held their hands in the ice water longer to prove that they had strong hearts, then this would be quasi-magical, since no notion was involved that there was any causal link from holding hands in ice water to strengthening the heart.

While this particular experimental outcome might also be explained as the result of a desire for self deception, Shafir and Tversky report as well as other experiments that suggest that people do behave as if they think they can change predetermined conditions. Shafir and Tversky (1992) show, with an experimental variant of Newcomb's Paradox, that people behave as if they can influence the amount of money already placed in a box.

Quasi-magical thinking appears to operate more strongly when outcomes of future events, rather than historical events, are involved. Langer (1975) showed that people place larger bets if invited to bet before a coin is tossed than after (where the outcome has been concealed), as if they think that they can better influence a coin not yet tossed.

It appears likely that such quasi-magical thinking explains certain economic phenomena that would be difficult to explain the basis of strictly rational behavior. Such thinking may explain why people vote, and why shareholders exercise their proxies. In most elections, people must know that the probability that they will decide the election must be astronomically small, and they would thus rationally decide not to vote. Quasi-magical thinking, thinking that in good societies people vote and so if I vote I can increase the likelihood that we have a good society or a good company, might explain such voting. The ability of labor union members or oligopolists to act in concert

with their counterparts, despite an incentive to free-ride, or defect, may also be explained by quasi-magical thinking.

The disposition effect (Shefrin and Statman, 1985) referred to above, the tendency for individuals to want to hold losers and sell winners might also be related to quasi-magical thinking, if people feel at some level that holding on to losers can reverse the fact that they have already lost. Public demand for stocks at a time when they are apparently overvalued may be influenced by quasi-magical thinking, a notion that if I hold, then the stocks will continue to rise.

Attention Anomalies and the Availability Heuristic

William James (1890, p. 402) criticized earlier psychologists, who in their theories effectively assumed that the human mind takes account of all sensory input, for taking no note of the phenomenon of selective attention:

> But the moment one thinks of the matter, one sees how false a notion of experience that is which would make it tantamount to the mere presence to the senses of an outward order. Millions of items of the outward order are present to my senses which never properly enter into my experience. Why? Because they have no *interest* for me. *My experience is what I agree to attend to*. Only those items which I *notice* shape my mind — without selective interest, experience is utter chaos.

The same criticism might equally well be applied to expected utility maximization models in economics, for assuming that people attend to all facts that are necessary for maximization of the assumed objective function (Berger, 1994, elaborates on this point).

Attention is associated with language; the structure of our language invites attention to categories that are represented in the language. Taylor (1989) showed, for example, that certain concepts of "the self" were apparently

absent from languages in the time of Augustine. The language shapes our attention to even the most inward of phenomena.

In economics, certain terms were apparently virtually absent from popular discourse fifty or more years ago: gross national product, the money supply, the consumer price index. Now, many economists are wont to model individual attention to these concepts as if they were part of the external reality that is manifest to all normal minds.

Attention may be capricious because it is affected by the "salience" of the object; whether it is easily discerned or not (Taylor and Thompson, 1982) or by the "vividness" of the presentation, whether the presentation has colorful details. Judgments may be affected, according to the "availability heuristic," that is, by the "ease with which instances or associations come to mind" (Tversky and Kahneman, 1974).

Investment fashions and fads, and the resulting volatility of speculative asset prices, appear to be related to the capriciousness of public attention (Shiller, 1984, 1987). Investor attention to categories of investments (stocks versus bonds or real estate, investing abroad versus investing at home) seems to be affected by alternating waves of public attention or inattention. Investor attention to the market at all seems to vary through time, and major crashes in financial markets appear to be phenomena of attention, in which an inordinate amount of public attention is suddenly focussed on the markets.[22]

Economic theories that are most successful are those that take proper account of the limitations and capriciousness of attention. One reason that the hypothesis of no unexploited arbitrage opportunities (a hypothesis that has led to the Black–Scholes (1973) option pricing theory, the Ross (1976) arbitrage

[22]There is evidence that the stock market crash of 1987 can be viewed in these terms, see Shiller (1989).

pricing theory, and other constructs of finance) has been so successful is that it does not rely on pervasive public attention. The essence of the no-arbitrage assumption, when it is used successfully to produce theories in finance, is that the arbitrage opportunities, were they to ever exist, would be exploited and eliminated even if only a tiny fraction of investors were paying attention to the opportunity.

Culture and Social Contagion

The concept of culture, central to sociology and cultural anthropology ever since the work of Tylor (1871), Durkheim (1893) and Weber (1947), is related to the selective attention that the human mind exhibits. There is a social cognition, reenforced by conversation, ritual and symbols, that is unique to each interconnected group of people; to each nation, tribe, or social group. People tend not to remember well facts or ideas that are not given attention in the social cognition, even though a few people may be aware of such facts. If one speaks to groups of people about ideas that are foreign to their culture, one may find that someone in the group will know of the ideas, and yet the ideas have no currency in the group and hence have no influence on their behavior at large.

The array of facts, suppositions, symbols, categories of thought that represent a culture have subtle and far-reaching affects on human behavior. For a classic example, Durkheim (1897), in a careful study of differing suicide rates across countries, found that there was no apparent explanation for these differing rates other than cultural differences.

Cultural anthropologists have used methods of inferring elements of primitive culture by immersing themselves in the society, observing their everyday

life, and talking and listening to them nonjudgmentally, letting them direct the conversation. From such learning, for example, Lévy–Strauss (1966, pp. 9–10) wrote persuasively that the customs of primitive people that we may tend to view as inexplicably savage actually arise as a logical consequence of a belief system common to all who belong to the society, a belief system which we can grow to understand only with great difficulty:

> The real question is not whether the touch of a woodpecker's beak does in fact cure toothache. It is rather whether there is a point of view from which a woodpecker's beak and a man's tooth can be seen as 'going together' (the use of this congruity for therapeutic purposes being only one of its possible uses) and whether some initial order can be introduced into the universe by means of these groupings.... The thought we call primitive is founded on this demand for order.

The same methods that cultural anthropologists use to study primitive peoples can also be used to study modern cultures. O'Barr and Conley (1992) studied pension fund managers using personal interviews and cultural anthropological methods. They concluded that each pension fund has its own culture, associated often with a colorful story of the origin of their own organization, akin to the creation myths of primitive peoples. The culture of the pension fund is a belief system about investing strategy and that culture actually drives investment decisions. Cultural factors were found to have great influence because of a widespread desire to displace responsibility for decisions onto the organization, and because of a desire to maintain personal relationships within the organization.[23]

Psychological research that delineates the factors that go into the formation of culture has been undertaken under the rubric of social psychology and

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[23]The psychologist Janis (1972) has documented with case studies how social patterns ("groupthink") within decision making groups can cause even highly intelligent people to make disastrously wrong decisions.

attitude change, or under social cognition. There is indeed an enormous volume of research in these areas. For surveys, one may refer to McGuire (1985) for attitude change or Levine and Resnick (1993) for social cognition.

One difficulty that these researchers have encountered with experimental work is that of disentangling the "rational" reasons for the imitation of others with the purely psychological. Some recent economic literature has indeed shown the subtlety of the informational influences on people's behavior (learning from each other), see Bannerjee (1992), Bikhchandani et al. (1992), Leahy (1994), and Shiller (1995).

A Global Culture

We see many examples of imitation across countries apparently widely separated by both physical and language barriers. Fashions of dress, music, and youthful rebellion, are obvious examples. The convergence of seemingly arbitrary fashions across nations is evidence that something more is at work in producing internationally-similar human behavior than just rational reactions to common information sets relevant to economic fundamentals, see Featherstone (1990).

And yet it will not be an easy matter for us to decide in what avenues global culture exerts its influence (Hannerz, 1990, p. 237):

> There is now a world culture, but we had better make sure that we understand what this means. It is marked by an organization of diversity rather than by a replication of uniformity. No total homogenization of systems of meaning and expression has occurred, nor does it appear likely that there will be one any time soon. But the world has become one network of social relationships, and between its different regions there is a flow of meanings as well as of people and goods.

Sociologists have made it their business to study patterns of influence

within cultures, and we ought to be able to learn something about the nature of global culture from their endeavors. For example, one study of patterns of influence regarded as a classic among sociologists is the in-depth study of the town of Rovere by sociologist Robert Merton (1957). After extensive study of the nature of interpersonal influence, he sought meaningful ways to categorize people. He found that it was meaningful to divide people into two broad categories: locals (who follow local news and derive status by their connectedness with others) and cosmopolitans (who orient themselves instead to world news and derive status from without the community). He found that the influence of cosmopolitans on locals transcended both their numbers and their stock of useful information. We must bear this conclusion in mind when deciding how likely it is that incipient cultural trends are pervasive across many different nations.

Reading such sociological studies inclines us to rather different interpretations of globally similar behaviors than might occur naturally to many traditional economists. Why did the real estate markets in many cities around the world rise together into the late 1980s and fall in the early 1990s? (See Goetzmann and Wachter, 1996 and Hendershott, 1997.) Why have the stock markets of the world moved somewhat together? Why did the stock markets of the world show greater tendency to move together after the stock market crash of 1987? (See von Furstenberg and Jeon, 1989 and King, Sentana and Wadhwani, 1994.) If we recognize the global nature of culture, there is no reason to assume that these events have anything to do with genuine information about economic fundamentals.

Concluding Remarks

Since this paper was written in response to an invitation to summarize literature on behavioral theory in finance, it has focussed exclusively on this topic, neglecting the bulk of finance literature. Because of its focus on anomalies and departures from conventional notions of rationality, I worry that the reader of this paper can get a mistaken impression about the place of behavioral theory in finance, and of the importance of conventional theory.

The lesson from the literature surveyed here, and the list of varied behavioral phenomena, is not that "anything can happen" in financial markets. Indeed, while the behavioral theories have much latitude for interpretation, when they are combined with observations about behavior in financial markets, they allow us to develop theories that do have some restrictive implications. Moreover, conventional efficient markets theory is not completely out the window. I could have, had that been the goal of this paper, found very many papers that suggest that markets are impressively efficient in certain respects.

Financial anomalies that intuitive assessments of human nature might lead one to expect to find, or anomalies one hears casually about, often turn out to be tiny, ephemeral, or nonexistent. There is, for example, virtually no Friday the thirteenth effect (Chamberlain et al., 1991; Dyl and Maberly, 1988). Investors apparently aren't that foolish.

Heeding the lessons of the behavioral research surveyed here is not going to be simple and easy for financial researchers. Doing research that is sensitive to lessons from behavioral research does not mean entirely abandoning research in the conventional expected utility framework. The expected utility framework can be a workhorse for some sensible research, if it is used

appropriately. It can also be a starting point, a point of comparison from which to frame other theories.

It is critically important for research to maintain an appropriate perspective about human behavior and an awareness of its complexity. When one does produce a model, in whatever tradition, one should do so with a sense of the limits of the model, the reasonableness of its approximations, and the sensibility of its proposed applications.

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