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Borsa İstanbul Review

Borsa İstanbul Review xx (2014) 1–9
http://www.elsevier.com/journals/borsa-istanbul-review/2214-8450

Behavioral finance: Finance with normal people

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Abstract

Behavioral finance is under construction as a solid structure of finance. It incorporates parts of standard finance, replaces others, and includes bridges between theory, evidence, and practice.

Behavioral finance substitutes normal people for the rational people in standard finance. It substitutes behavioral portfolio theory for mean-variance portfolio theory, and behavioral asset pricing model for the CAPM and other models where expected returns are determined only by risk. Behavioral finance also distinguishes rational markets from hard-to-beat markets in the discussion of efficient markets, a distinction that is often blurred in standard finance, and it examines why so many investors believe that it is easy to beat the market. Moreover, behavioral finance expands the domain of finance beyond portfolios, asset pricing, and market efficiency and is set to continue that expansion while adhering to the scientific rigor introduced by standard finance.

We often hear that behavioral finance is nothing more than a collection of stories about investors swayed by cognitive errors and misleading emotions; that its lacks the solid structure of standard finance. Yet today's standard finance is no longer solid, as wide cracks have opened between its theory and the evidence. This article extends Statman (2010), offering an outline of behavioral finance as a solid structure that incorporates parts of standard finance, replaces others, and includes bridges between theory, evidence, and practice.

Behavioral finance is finance with normal people in it, people like you and me. Standard finance, in contrast, is finance with rational people in it. Normal people are not irrational. Indeed, we are mostly intelligent and usually 'normal-smart.' But sometimes we are 'normal-stupid,' swayed by cognitive errors such as hindsight and overconfidence, and misleading emotions such as exaggerated fear or unrealistic hope.

Standard finance is built on four foundation blocks:

1. People are rational,
2. Markets are efficient,
3. People should design portfolios by the rules of mean-variance portfolio theory and do so, and,
4. Expected returns of investments are described by standard asset pricing theory, where differences in expected returns are determined only by differences in risk.

Behavioral finance offers an alternative foundation block for each of the foundation blocks of standard finance. According to behavioral finance:

1. People are normal,
2. Markets are not efficient, even if they are difficult to beat,
3. People design portfolios by the rules of behavioral portfolio theory and,
4. Expected returns of investments are described by behavioral asset pricing theory, where differences in expected returns are determined by more than differences in risk.

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Peer review under responsibility of Borsa İstanbul Anonim Şirketi

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.bir.2014.03.001

Please cite this article in press as: Statman, M., Behavioral finance: Finance with normal people, Borsa İstanbul Review (2014), http://dx.doi.org/10.1016/j.bir.2014.03.001

1. Normal investors

Miller and Modigliani (1961) described investors as rational in their article on dividends. Rational investors, they wrote, are investors who "always prefer more wealth to less and are indifferent as to whether a given increment to their wealth takes the form of cash payments or an increase in the market value of their holdings of shares." This is a good beginning of a description of rational investors.

Shefrin and Statman (1984) argued that investors' wants, cognitive errors, and emotions affect their preferences for particular stocks. Miller (1986) responded: "[S]tocks are usually more than just the abstract 'bundles of return' of our economic models. Behind each holding may be a story of family business, family quarrels, legacies received, divorce settlements, and a host of other considerations almost totally irrelevant to our theories of portfolio selection. That we abstract from all these stories in building our models, is not because the stories are uninteresting but because they may be too interesting and thereby distract us from the pervasive market forces that should be our principal concern." (p. S467).

Yet questions about the effects of family business, family quarrels, legacies, and divorce settlements are questions of finance. We might splurge our parents' bequest money but feel compelled to preserve for our children money they labeled legacy. We might be reluctant to sell stocks and spend their proceeds, yet ready to spend dividends. Moreover, pervasive market forces are powered by our behavior. We cannot hope to understand these forces unless we understand our behavior.

Rational investors are immune to framing errors, the cognitive errors that lead many normal investors to conclude, in error, that a dollar in the form of dividends from shares of a stock is different in substance from a dollar in the form of the shares themselves when, in truth, the two dollars are different only in frame. Moreover, rational investors are immune to the entire range of cognitive errors and misleading emotions beyond framing errors.

Normal investors, unlike rational ones, are not immune to cognitive errors and misleading emotions. Yet normal investors are not all alike, varying in their wants of utilitarian, expressive, and emotional benefits and standing at places along the range from normal-ignorant to normal-knowledgeable. Knowledgeable investors have learned, imperfectly and with much effort, to overcome their cognitive errors and misleading emotions through science-based knowledge. Knowledgeable investors know, for example, that the cognitive error of hindsight fools them into believing that the future is as easy to forecast as the past. Still, even knowledgeable investors find it difficult to resist the intuition of hindsight, and sometimes they fail.

Ignorant investors have not learned to overcome their cognitive errors and misleading emotions through science-based knowledge. Moreover, some ignorant investors mistrust scientific evidence. Sapienza and Zingales (2013) asked economic experts and average Americans whether they agree or disagree with statements such as "It is hard to predict stock prices." They found that 100% of economic experts agreed that it is hard to predict stock prices, whereas only 55% of average Americans agreed. The mistrust of average Americans in science is evident in the fact that the proportion of average Americans who agree that it is hard to predict stock prices declined from 55% to 42% when told that economic experts agree that such forecasts are difficult.

In truth, there is much evidence that it is difficult to forecast stock prices. For example, Fisher and Statman (2000) examined the ability of three groups of investors to predict stock prices: individual investors, writers of investment newsletters, and Wall Street strategists. They found that none are good at predicting stock prices. Indeed, predictions of high returns were followed by relatively low returns more often than they were followed by relatively high returns. And predictions of low returns were followed by relatively high returns more often than they are followed by relatively low returns.

2. What normal investors really want: utilitarian, expressive, and emotional benefits

Ask investors what benefits they want from their investments and they are likely to say: high returns with low risk. What more is there to want? In truth, we want more benefits from our investments as we want from almost all products and services.

We want three kinds of benefits, utilitarian, expressive and emotional, described in Statman (1999, 2011). Utilitarian benefits are the answer to the question, What does it do for me and my pocketbook? The utilitarian benefits of a car are in ferrying us from one place to another, and the utilitarian benefits of investments are in increasing our wealth with high returns and low risk.

Expressive benefits convey to us and to others our values, tastes, and status. They answer the question, What does it say about me to others and to me? An environmentally friendly Prius hybrid, like an environmental mutual fund, expresses environmental responsibility, whereas a stately Bentley, like a hedge fund, expresses high status.

Emotional benefits are the answer to the question, How does it make me feel? A Prius and environmental mutual funds make us feel virtuous, whereas a Bentley and hedge funds make us feel proud.

We regularly speak about emotions as if 'emotions' are shorthand for 'misleading emotions.' We are often advised to set aside emotions when we make investment decisions. But this advice is neither feasible nor smart. Emotions complement reason more often than they interfere with it, and the interaction between emotions and reason is mostly beneficial, often critically so. Emotions prevent us from being lost in thought when it is time to act, and emotions reinforce lessons we must learn.

Emotional benefits come with positive emotions such as exuberance, hope, or pride. We seek these emotional benefits and are regularly willing to pay for them with utilitarian dollars. The desire for the benefits of hope motivates lottery players to pay a dollar for lottery tickets that pay, on average, only 50 cents. And the desire for the benefits of hope

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motivates employees to accept stock options in place of salaries, even when, on average, stock options are worth less than foregone salaries. Negative emotions such as fear, sadness, and regret are unpleasant but often useful. Fear prompts us to slam on the brakes fast when the car in front of us suddenly stops, and sadness over a lost job guides us to slow down, reflect on our lives and careers, and decide what to do next.

3. Investment and consumption

Rational investors are different from normal investors, whether ignorant or knowledgeable, in their willingness to separate their roles as investors from their roles as consumers. As investors, rational investors care about only about wealth, the utilitarian benefit of investments. As consumers, they care about the full range of benefits, utilitarian, expressive, and emotional, of the products and services they buy with the wealth they accumulate. For example, rational investors who object to the harm done by gun violence, nevertheless invest in stocks of gun manufacturers if such stocks add more to their wealth than other stocks. Then, as consumers, they enjoy the expressive and emotional benefits of fighting against gun violence by contributing some of their wealth to gun-control campaigns.

Yet normal investors, even knowledgeable ones, are reluctant to separate their roles as investors from their roles as consumers. Socially responsible investors abhor the comingling of investments in stocks of gun manufacturers and contributions of the proceeds to gun-control campaigns. Instead, they commingle their roles as investors and consumers by divesting their portfolios of stocks of gun manufacturers.

A gunman murdered 20 children and six adults at the Sandy Hook school in Newtown, Connecticut in December 2012, a horrible carnage that increased the expressive and emotional stigma of gun manufacturers. Cerberus, a private equity firm, owned Freedom Works, the manufacturer of AR-15, the rifle used by the Newtown gunman. The carnage prompted Cerberus' immediate decision to sell Freedom Works, and many public pension funds, including CalPERS, the pension fund of California public employees, divested themselves of the stocks of gun manufacturers.[1]

Gun manufacturers are commonly shunned by socially responsible investors, along with companies in the tobacco, alcohol, gambling, military, and nuclear industries. Yet evidence shows that stocks of shunned companies earned higher returns, even when adjusted for risk, than stocks of other companies. Knowledgeable investors know the tradeoffs between benefits and some of them are willing to pay for the higher expressive and emotional benefits of excluding gun manufacturers in lower utilitarian benefits of foregone returns. Similarly, knowledgeable investors know that low-cost index funds yield greater wealth, on average, than high-cost hedge funds, yet some of them choose to invest in hedge funds for the expressive and emotional benefits of the status they convey, akin to the status conveyed by membership in exclusive clubs.

Knowledgeable investors might deny their want of status when they speak to others, concerned that such want is unseemly. But knowledgeable investors are less likely to deny their want of status to themselves. Ignorant investors, however, might not know that low-cost index funds yield greater wealth, on average, than high-cost hedge funds, and able to deny it to themselves, even if they know.

4. Wants and cognitive errors

The reluctance of normal investors to separate their roles as investors from their roles as consumers implies that many wants, beyond those of virtue and status, affect investment choices. Thrills and sensations, whether in fast driving or fast trading, are also examples of wants, illustrating the difference between wants and cognitive errors.

We can divide sensation-seekers into two groups, knowledgeable sensation-seekers, and ignorant ones. Ignorant sensation-seekers are blind to the cognitive error of overconfidence. They want thrills and sensations but are ignorant of their price. Knowledgeable sensation-seekers, however, have learned to see their overconfidence. They want thrills and sensations and know their price.

Grinblatt and Keloharju (2009) found that heavy traders in Finland also tend to be fast drivers, accumulating many speeding tickets. Some of these traders are ignorant sensation seekers, as overconfident in their trading abilities as in their abilities to negotiate hairpin turns at ferocious speeds. Yet others are knowledgeable sensation-seekers, free of overconfidence, who know the high price of heavy trading and fast driving and willing to pay it. The price of heavy trading is high indeed. Barber and Odean (2000) found that the returns of heavy traders lag, on average, the returns of light traders, and the returns of light traders lag the returns of investors who abstain from trading.

5. Behavioral portfolios

Mean-variance portfolio theory is the theory of standard finance whereas behavioral portfolio theory is the theory of behavioral finance. Markowitz (1952a, 1959) described mean-variance portfolio theory and Shefrin and Statman (1987, 2000) described behavioral portfolio theory. Another article by Markowitz (1952b) is part of the foundation of behavioral portfolio theory.

Mean-variance portfolio theory is a *construction* theory. It provides the tools necessary for the construction of mean-variance portfolios to investors who care only about the expected returns of their portfolios and their risks. But what *goals* do mean-variance investors have for the money in their portfolios? Do their goals consist only of protection from poverty or do they include a chance at riches? Do they consist of funding a comfortable retirement and a modest bequest to

[1] http://news.yahoo.com/calpers-divest-stake-two-makers-guns-ammunition-210242643–sector.html.

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children or a bare-bone retirement and a considerable bequest to charity? The construction of mean-variance portfolios is only a station on the way to ultimate investors' goals yet mean-variance portfolio theory is silent about these goals. Behavioral portfolio theory is a theory of both *construction* and *goals*. It begins with investors' goals which determine the construction of portfolios.

Markowitz (1999) noted that the benefits of diversified portfolios were known long before he introduced mean-variance portfolio theory. "What was lacking prior to 1952 was an adequate *theory* of investment that covered the effects of diversification when risks are correlated, distinguished between efficient and inefficient portfolios, and analyzed risk-return trade-offs on the portfolios as a whole."[2] Markowitz provided that in mean-variance portfolio theory.

Mean-variance portfolio theory is *prescriptive*, prescribing optimal mean-variance portfolios to investors who accept its assumptions. Behavioral portfolio theory is both *prescriptive* and *descriptive*. It prescribes optimal behavioral portfolios to investors who accept its assumptions but also describes portfolios actually constructed by investors.

Mean-variance portfolio theory prescribes portfolios to investors who evaluate portfolios by their expected returns and risk, measured by the standard deviation of its returns. Mean-variance investors are always risk-averse when risk is measured by the standard deviation of returns − never risk-seeking. They prefer high expected returns over low and low standard deviations of returns over high. Behavioral investors, however, are often risk-seeking when risk is measured by the standard deviation of returns.

Behavioral portfolio theory describes investors who measure risk by the probability of failing to reach goals, by expected shortfalls from goals or by the product of the two. Behavioral investors are risk-averse, like mean-variance investors, but unlike mean-variance investors they are not averse to high standard deviations of returns. Portfolios assessed as high-risk by mean-variance investors because they have high standard deviations of returns are assessed as low-risk by behavioral investors when such portfolios offer low probabilities of failing to reach their goals.

Consider an investor with a portfolio worth $1 today and a $100 million goal a week from now. The standard deviation of the returns of a lottery ticket is higher than the standard deviation of the returns of any diversified portfolio of stocks and bonds and the expected return of lottery tickets is negative, whereas the expected return of a diversified portfolio is positive. Therefore, mean-variance portfolio theory describes lottery tickets as riskier than diversified portfolios and it describes as risk-seeking investors who prefer lottery tickets over diversified portfolios. Mean-variance portfolio theory never prescribes lottery tickets.

Yet behavioral portfolio theory describes as risk-averse investors who prefer lottery tickets over diversified portfolios if they have lofty goals because behavioral investors are averse to the risk of failing to reach these goals. Behavioral portfolio theory prescribes lottery tickets to investors who aim to reach a $100 million goal with $1 because the probability of failing to reach a $100 million goal with a $1 lottery ticket, however large, is smaller than the probability of failing to reach it with a diversified portfolio.

6. Mental accounting

Behavioral investors begin the process of constructing behavioral portfolios by dividing their portfolio into mental accounts as layers in a portfolio pyramid, commonly referred to as mental accounting 'buckets.' One mental account might be a 'downside protection' mental account, designed for protection from poverty. Another might be an 'upside potential' mental account, designed for a chance at riches. Investors might behave as if they are risk-averse in the downside protection mental account, when risk is measured by the standard deviation of returns, while behaving as if they are risk-seeking in the upside potential mental account, when risk is measured by the standard deviation of returns.

Consider an investor with $100,000 of initial wealth and an ambitious $130,000 goal and an investor with $100,000 of initial wealth and a modest $105,000 goal. We combine them into one investor with $200,000 of initial wealth and two mental accounts, an upside potential mental account with $100,000 of initial wealth and $130,000 goal and a downside protection mental account with $100,000 of initial wealth and $105,000 goal. Imagine that the investor can form portfolios composed solely of one of two stocks, Lottery and Moderate, or combinations of the two.

The optimal portfolio for this investor may consists of an undiversified upside potential mental account consisting of only Lottery stock and a diversified downside protection mental account consisting of both Lottery stock and Moderate stock. More generally, the downside protection mental account would be composed of diversified stocks and bonds, perhaps conservative mutual funds and the upside of an undiversified handful of stocks or aggressive mutual funds.

Das, Markowitz, Scheid, and Statman (2010) developed a mental accounting portfolio structure that combines mean-variance portfolio theory with the mental accounting feature of behavioral portfolio theory. Consider a 50-year-old investor with a $1 million portfolio. She divides her portfolio into three mental accounts, each associated with a goal, target wealth, and target date for that goal. She places $800,000 to a mental account dedicated to a retirement goal with a $1,917,247 target wealth, implying a 6% annualized return during the 15 years till the target terminal date. She places $150,000 to a mental account dedicated to an education goal with an $188,957 target wealth, implying a 6% annualized return during the 3 years till the target terminal date. She places $50,000 to a mental account dedicated to a bequest goal, with a $850,003 target wealth, implying a 12% annualized return during the 25 years till the target terminal date.

Each mental account is optimized by the mean-variance procedure, where risk is measured by the standard deviation

[2] (p. 5).

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of returns. The optimal mental account for the retirement goal is the one that corresponds to a 6% target annualized return. The target annualized return also determines the risk of that account. Mental accounts are created similarly for the education goal, with its 8% target annualized return, and the bequest goal with its 12% target annualized return.

Our investor faces three investments: a bond mutual fund with a 2% expected annual return and a 5% standard deviation of returns, a conservative stock mutual fund with an 8% expected annual return and a 20% standard deviation of returns, and an aggressive stock mutual fund with a 15% expected annual return and a 40% standard deviation of returns. The correlations between the bond fund and each of the two stock funds are zero. The correlation between the returns of the two stock funds is 0.25.

The investor finds mean-variance efficient portfolios for each of the three mental accounts. The standard deviation of the returns of the retirement mental account is the lowest at 10.45%, followed by the 15.23% of the education mental account and the 25.28% of the bequest mental account. The 6.60% expected return of the portfolio as a whole is a weighted average of the returns of the portfolios of the three mental accounts, but the 11.85% standard deviation of the portfolio as a whole is different from the weighted average of the standard deviations of the three mental accounts.

Asking our investor to state her preferences for target returns and standard deviations for each mental account is better than asking her to state her preferences for target returns and standard deviations of the portfolio as a whole since the latter requires that she aggregate the three mental accounts in her mind. This is difficult. It is easier to match low risk tolerance with the retirement mental account, medium risk tolerance with the education mental account and high risk tolerance with the bequest mental account than to match a weighted average risk tolerance in the portfolio as a whole.

Moreover, since our investor has little sense of her true risk tolerance in the portfolio as a whole, asking her to state that risk tolerance is likely to result in a choice of a portfolio on the mean-variance efficient frontier that does not correspond well to her true risk tolerance. There is a loss that comes from a choice of the wrong portfolio, ranging from fractions of a percentage point of annual returns to several percentage points.

The proportion allocated to the bond fund is highest in the retirement mental account, lower in the education mental account, and lowest in the bequest mental account. Arranging the portfolio as a set of the three mental accounts does not imply that we need three 'real' accounts for each fund, one for the bond fund in the retirement mental account, another for the bond fund in the education mental account, and a third for the bond fund in the bequest mental account. Instead, we have one real bond fund account and three 'virtual' bond accounts listing the allocation in the bond fund of each mental account. Investors can observe portfolios in two formats, a real account format for the portfolio as a whole and a virtual account format for each of the mental accounts.

7. Behavioral asset pricing models

Useful asset pricing models associate expected returns of investment assets, such as stocks and bonds, with features that determine expected returns, such as risk or liquidity, allowing us to estimate expected returns once we know the features. In that, investment asset pricing models are like pricing models of meals, cars, movies and every other product and service.

The features in meal pricing models reflect diners' preferences for the full range of meal benefits — utilitarian, expressive and emotional. The utilitarian benefits of meals include nutrition, the expressive benefits include prestige and display of discerning taste, and the emotional benefits include ambiance and aesthetics. The nutrition of fast food meals might equal that of Michelin-star meals, but the prestige and aesthetics of Michelin-star meals exceed those of fast food meals. We are not surprised to learn that prices of Michelin-star meals exceed prices of fast food meals.

Shefrin and Statman (1994) outlined a behavioral asset pricing model. The behavioral asset pricing theory outlined by Statman (1999) draws on Lancaster (1966) approach to consumer theory. Lancaster turned his focus away from products, such as meals, to their features or characteristics. These include not only utilitarian nutrition but also expressive and emotional aesthetics and social connections. We derive benefits from a meal, he wrote, as it "possesses nutritional characteristics but it also possesses aesthetic characteristics, and different meals will possess these characteristics in different relative proportions." The same feature, such as aesthetics, may be included in many products "so that goods which are apparently unrelated in certain of their characteristics may be related in others."[3]

There is affinity between behavioral asset pricing models and Ross (1976) arbitrage pricing theory (APT) where features determine expected returns, except that the APT does not identify the features. There is also affinity between behavioral asset pricing models and William Sharpe's (1992, 2007) factor models where factors are indexes of returns, such as those of international stocks, domestic bonds, growth stocks and value stocks, and there is affinity between behavioral asset pricing models and Fama and French's (1992) three-factor model where factors are differences between indexes of returns, such as the difference between an index of the returns of value stocks and the returns of an index of growth stocks. These models differ from behavioral asset pricing models in that they account only for only utilitarian benefits whereas behavioral asset pricing models also account for expressive and emotional benefits.

Utilitarian benefits in behavioral asset pricing models include low risk and high liquidity. Expressive and emotional benefits include the virtue of socially responsible mutual funds, the prestige of hedge funds, and the thrill of trading. Widespread preference for investments with great utilitarian, expressive and emotional benefits is likely to lower their

[3] pp. 133–134.

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expected returns such that the expected returns of low-risk stocks are lower than those of high-risk stocks, the expected returns of stocks of virtuous companies are lower than the expected returns of stocks of tobacco and other 'sin' companies, and the expected returns of heavy traders are lower than those of light traders.

Meal pricing models reflect not only diners' preferences for utilitarian, expressive, and emotional benefits but also their cognitive errors and misleading emotions. Plassmann, O'Doherty, Shiv, and Rangel (2008) found in diners' words and fMRI brain scans that they perceived identical wines as more pleasant when told that their prices are high than when told that their prices are low.

Cognitive errors reflected in investment asset pricing models include underestimation of intangible capital such as employee benefits that impose costs today but enhance future profits by much more, described by Edmans (2011). Misleading emotions include affect, misleading investors to favor stocks of admired companies exuding positive affect over stocks of spurned companies exuding negative affect even when the expected returns of admired companies' stocks are lower than the expected returns of spurned companies' stocks, described in Statman, Fisher, and Anginer (2008).

We can present the association between the features of a meal and its expected price in a meal pricing model as:

Expected price of a meal = Function of (Nutrition; Prestige; Aesthetics, etc; Cognitive errors; Misleading emotions).

Similarly, using stocks as an example of investment assets, we can present the association between the expected return of a stock and the features that determine it in a behavioral asset pricing model as:

Expected return of a stock = Function of (Risk; Liquidity; Social Responsibility; Prestige; Thrill, etc; Cognitive errors; Misleading emotions).

Asset pricing models can be characterized as theoretical or empirical. Theoretical models begin with theoretical rationales for investor preferences for utilitarian, expressive and emotional benefits as well as investor cognitive errors, and misleading emotions. They proceed with an examination of empirical evidence about associations between asset returns and features reflecting preferences, cognitive errors and misleading emotions. For example, we can begin with the theoretical rationale that investors prefer investments with low risk over investments with high risk and proceed with an examination of the empirical evidence about that association, examining whether low-risk investments yielded lower realized returns on average than high-risk investments.

Empirical asset pricing models begin with empirical evidence about associations between asset returns and features, such as evidence that small-capitalization stocks had higher returns than large-capitalization stocks, and proceed with an examination of possible theoretical rationales for the associations.

The first asset pricing model of standard finance, introduced by Sharpe (1964) and Lintner (1965) is the theoretical Capital Asset Pricing Model (CAPM) where the risk of an investment asset determines its expected return. The CAPM is built on Markowitz's mean-variance portfolio theory with the added assumption that all investors accept the mean-variance prescription, choosing portfolios on the mean-variance efficient frontier by their personal tradeoff between expected returns and standard deviations. This implies that the description of portfolios actually chosen corresponds to the mean-variance prescription.

All is not well with the CAPM. "The peak of euphoria in research on finance [was] in the early 1970s," said Eugene Fama (2008) in an interview. Until then "the CAPM looked rather good, and market efficiency looked rather good. However, then things on the asset pricing side started to fall apart…It turned out that the CAPM never really worked. We had just never looked at it carefully enough."

Few are satisfied with the current state of asset pricing models, and Fama is not among them. In the same interview he said: "There's been a ton of work done on asset pricing, risk, measurement of risk, and measurement of the relation between expected return and risk, but it hasn't been all that satisfying. For example, if we knew more, the Fama–French three-factor model would not have had such a large impact because it's a pure empirical asset pricing model. We concocted that model to cover what we observed. It's used among academics; it's used everywhere. That's a comment on the fact that more formal theories developed to explain risk and return just haven't worked that well. An empirically generated theory such as the Fama–French model seems to do better than the theoretically constructed paradigms."

Concoction of asset pricing models to cover what we observe is the current norm in asset pricing models. Researchers are busy 'factor mining,' finding statistically significant associations between factors and realized returns, pausing little to ask for theoretical rationales for the associations. The number of factors associated with stock returns continues to grow. Harvey, Liu, and Zhu (2013) counted 314 factors and noted that this number likely underestimates the population of factors. They recommended that the t-statistic necessary to establish a statistically significant association between a factor and returns be increased from the usual 2.0 to 3.0 to account for the likelihood that the association reflects nothing more than factor mining. Yet theoretical rationales for factors should matter as much as the statistical significance of the association between factors and returns in currently available data.

There is a statistically significant association between the factors of small-large and values-growth and returns, but Sharpe (2007) is right to challenge their place in asset pricing models, knowing that the statistical significance of associations between factors and returns in currently available data might be strong even when the theoretical rationales for such associations are weak, and that the statistical significance of associations between factors and returns in currently available data might be weak even when the theoretical rationales for such associations are strong. Sharpe (2007) wrote: "The empirical record may indicate that markets are more complex than posited in the simple CAPM. But it seems highly unlikely that expected returns are unrelated to the risks of doing badly in bad times. In this broader sense, announcement of the death of beta appears to be highly premature." (p. 200).

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Still, Fama is overly harsh in denigrating the three-factor model as "concocted…to cover what we observed." Admittedly it is pleasing to have theory first, such as the CAPM, offering testable hypotheses followed by empirical evidence that supports the hypotheses or refutes them. It is especially pleasing to have a theory such as the CAPM that offers unexpected hypotheses where underlying theoretical rationales become obvious only once the theory had been presented. We were surprised by the hypothesis that beta is the measure of risk of an asset rather than, say, the standard deviation of its returns. Yet theoretical models are not necessarily superior to empirical ones once the theoretical rationales for empirical associations are identified. Empirical evidence about both Penicillin and X-rays appeared before their theoretical rationales were identified.

8. Market efficiency

The decision of the Nobel Prize committee to award the 2013 Nobel Prizes in economics to Eugene Fama and Robert Shiller confused many. "If you've been wondering whether it's possible to regularly beat the stock market averages," wrote Rattner (2013), "you didn't get any guidance from the Nobel Prize committee this year."

At one corner is Shiller "who argues that markets are often irrational and therefore beatable." At the other corner is Fama, "the father of the view that markets are efficient…Mr. Fama's followers believe that investors who try to beat the averages will inevitably fail." Rattner who described himself as "someone whose professional life centers on evaluating investment managers," placed himself in Shiller's corner because he has "met many investors who have consistently outperformed the market," including Warren Buffett.

In truth, the decision of the Nobel Prize committee provides good guidance on the question of "whether it's possible to regularly beat the stock market averages." The Nobel Prize committee said, in effect, that Warren Buffett and his peers can beat the market consistently, but ordinary investors cannot.

Much of the confusion stems from lumping the terms 'rational markets' and 'hard-to-beat' markets into 'efficient markets' and concluding, as Rattner does, that markets that are not rational are easy to beat. *Rational markets* are markets where securities' prices always equal their intrinsic values. *Hard-to-beat markets* are markets where some investors are able to beat the market consistently by exploiting gaps between prices and intrinsic values, but ordinary investors are unable to do so. It turns out that Fama and Shiller agree more than they disagree. Both accept that markets are not always rational and both accept that markets are hard to beat by ordinary investors.

9. Rational markets and hard-to-beat markets

Warren Buffett illustrated the distinction between 'rational markets' and 'hard-to-beat markets' and the confusion that arises when they are lumped into 'efficient markets.' Buffett was considering bonds of Citizens Insurance, established by the state of Florida to cover hurricane damage and backed by state taxes. Berkshire Hathaway, his company, received three bids, one at 11.33%, one at 9.87% and one at 6.00%. "It's the same bond, the same time, the same dealer. And a big issue," said Buffett. "This is not some little anomaly, as they like to say in academic circles every time they find something that disagrees with their [efficient market] theory."

Buffett used the term 'efficient market' where the term 'rational market' would have been more precise. The story of the Citizens Insurance bonds is, as Buffett noted, an anomaly, contradicting the claim that the market for these bonds is rational. The intrinsic value of each Citizens Insurance bond is identical to the intrinsic value of every other Citizens Insurance bond since all Citizens Insurance bonds are identical in every feature. The fact that the bonds are selling at different prices contradicts the claim that the market of these bonds is rational since three different prices cannot all equal one intrinsic value. Two of the prices, and perhaps all three, must diverge from intrinsic value.

'Hard-to-beat markets,' however, are distinct from 'rational markets.' Whereas prices always equal intrinsic values in rational markets, prices sometimes deviate from intrinsic values in hard-to-beat markets. A market is hard-to-beat if investors find it hard to earn average returns higher than average market returns by exploiting gaps between prices and intrinsic values.

Rational markets are unbeatable because excess returns come from exploiting gaps between prices and intrinsic values, gaps absent in rational markets. But unbeatable markets are not necessarily rational. It might be that prices deviate from intrinsic values but deviations are hard to identify in time or difficult to exploit for consistent excess returns.

The intrinsic value of a stock is determined by dividends received during its life, including a dividend received at the end of its life, whether zero if it goes bankrupt or billions if another company buys it. Dividends are received in installments over many years so we discount future dividends to account for their time-value and expected return determined by the correct asset pricing model. Time-value involves the observation that dividend money received in the future is less valuable than dividend money received today. Expected return involves the observation that actual future dividends might differ from expected returns. The intrinsic value of a stock is the sum of the dividends it is estimated to bring during its lifetime, discounted to account for time-value and expected returns. Rational investors refuse to buy stocks at prices exceeding intrinsic values.

In practice, it is difficult to determine whether a market if rational because it is difficult to obtain good estimates of the future fortunes of companies and their resulting future dividends. Moreover, the discount rate we apply to these dividends might be biased by an incorrect asset pricing model. As Fama (1991) noted, market efficiency per se is not testable. Instead, market efficiency must be tested jointly with an asset pricing model, such as the CAPM or the three-factor model. For example, the excess returns relative to the CAPM of small-capitalization stocks and stocks with high book-to-market

Please cite this article in press as: Statman, M., Behavioral finance: Finance with normal people, Borsa İstanbul Review (2014), http://dx.doi.org/10.1016/j.bir.2014.03.001

ratios might indicate that the market is not efficient or that the CAPM is an incorrect model of expected returns.

10. Warren Buffett and ordinary investors

Investors find it hard to beat the market if they are poor at identifying securities whose prices deviate from intrinsic values, such as concluding mistakenly that the price of a Citizens Insurance bond yielding 6.00% exceeds intrinsic value whereas the price of a Citizens Insurance bond yielding 11.33% is short of intrinsic value, or when the cost of digging for information about gaps between prices from intrinsic values and exploiting them are so high that those who seek to beat the market end up beaten by it, earning average returns lower than average market returns.

Buffett is able to beat the market with unique information, insights, and low cost of access and trading. He can confine his bond buying to Citizen Insurance bonds yielding 11.33%, bypassing the bonds yielding 9.87% and 6.00% and earning a higher return than the 9.07% average return of the three bonds. But an observation that markets are beatable by the likes of Warren Buffett does not imply that they are easy to beat by all. Buffett cautioned ordinary investors not to jump too fast from evidence that markets are not rational to a conclusion that markets are easy to beat by all. When asked "What advice would you give to someone who is not a professional investor," Buffett said: "Well, if they're not going to be an active investor—and very few should try that—then they should just stay with index funds. Any low-cost index fund…. They're not going to be able to pick the right price and the right time." (Varchaver, 2008).

Buffett's distinction between the very few that should try to beat the market and the many who should stick with index funds is important. Markets are beatable by some, such as Buffett, but not by all. Indeed, as know from Grossman and Stiglitz (1980) we cannot expect markets to be fully rational because markets where prices always equal intrinsic values provide no compensation to investors who dig for information.

Fama noted implicitly the difference between Buffett and his peers at one side and ordinary investors at the other as he divided the efficient market hypothesis into three forms, strong, semi-strong, and weak. The strong form is the claim that even investors with unique (private) information, such as corporate insiders or the likes of Warren Buffett are unable to beat the market. The semi-strong form accepts that investors with unique information and insight can beat the market but claims that ordinary investors with no more than widely available (public) information, such as information published in the Wall Street Journal, are unable to beat the market. The weak form is a claim that ordinary investors with nothing more than widely available information about past stock prices and volume of trading are unable to beat the market.

There is much evidence that corporate insiders and the likes of Buffett are able to beat the market consistently by using unique information and insight to exploit gaps between prices and intrinsic values. This contradicts the strong form of the efficient market hypothesis, indicating that markets are not rational. But there is also much evidence that ordinary investors without access to unique information or insight are unable to beat the market consistently. This supports the semi-strong and weak forms of the efficient market hypothesis, indicating that markets are hard to beat.

In the end, Rattner reached the same conclusion. He wrote: "Fortunately, Mr. Fama's work on efficient markets did a favor for the small investor: it spawned low-cost index funds that replicate market averages. That's where the non-expert should park his money…as the commercials say, when it comes to active investing, don't try this at home."

Why is it that so many small non-expert investors fail to adopt Rattner's advice and that of many who preceded him, from Jack Bogle to Warren Buffett? Standard finance does not offer an answer but behavioral finance does. Small non-expert investors continue their costly attempts to beat the market on their own or by hiring active money managers because they are fooled by cognitive errors and misleading emotions and because they seek the expressive and emotional benefits of attempts to beat the market.

Framing errors fool investors to frame trading as the equivalent of tennis against a practice wall rather than tennis against a possibly better trader, such as an insider, on the other side of the trading net. Investors who understand that they are trading against a possibly better trader on the other side of the trading net sometimes stumble on overconfidence, believing that they are the better players even when objective information tells otherwise. Some are fooled by hindsight, believing that they have seen past market ups and down in foresight and therefore can see future market ups and downs in foresight when, in truth, they have seen past market ups and downs only in hindsight. Others are fooled by confirmation errors, believing that beating the market is easy because they hear many beat-the-market success stories, unaware that they are more likely to hear success stories than failure ones.

Misleading emotions include fear that drives investors to sell at market bottoms as it increases the perception of risk and diminishes the perception of future returns, and exuberance that drives them to buy at market tops as it decreases the perception of risk and increases the perception of future returns. They also include regret that discourages investors from realizing losses despite the tax advantages of loss realization and pride that encourages investors to realize their gain despite their tax disadvantages (Shefrin and Statman, 1985).

Expressive and emotional benefits include the thrill of trading even when heavy trading reduces returns, the preference for investments that convey status and sophistication, such as hedge funds and private equity, and the preference for socially responsible investments excluding tobacco and other sin industries even when stocks of sin companies provide high returns.

11. Conclusion

Behavioral finance is under construction as a solid structure of finance. It incorporates parts of standard finance, replaces others, and includes bridges between theory, evidence, and

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practice while adhering to the scientific rigor introduced by standard finance.

Behavioral finance substitutes normal people for the rational people in standard finance. It substitutes behavioral portfolio theory for mean-variance portfolio theory, and behavioral asset pricing models for the CAPM and other models where expected returns are determined only by risk. Behavioral finance also distinguishes rational markets from hard-to-beat markets in the discussion of efficient markets, a distinction that is often blurred in standard finance, and it examines why so many investors believe that it is easy to beat the market.

Behavioral finance expands the domain of finance beyond portfolios, asset pricing, and market efficiency. It explores the behavior of investors and managers in direct and indirect ways, whether by examining brains in fMRIs or examining wants, errors, preferences, and behavior in questionnaires, experiments, and the field. For example, behavioral finance explores saving and spending behavior, beyond portfolio formation, as savings underlie portfolios and are spent from them. And it explores financial choices affected by culture, fairness, social responsibility, and other expressive and emotional wants.

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