POST BEHAVIORAL FINANCE ADOLESCENCE

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Abstract

The study of behavioral finance combines the investigation and expertise from research and practice into smart portfolios of *individual investors' portfolios*. Understanding cognitive errors and misleading emotions drive investors to their long-term goals of financial prosperity and capital preservation. 10 years ago, Behavioral Finance was still considered an incipient, adolescent science. First Nobel Prize in Economics awarded to the study of Behavioral Economics in 2002 established the field as a new, respected study of economics. 2013 Nobel Prize was awarded to three economists, one of them considered the one of the founders of the Behavioral Finance. As such, by now we are entering the coming of age of behavioral finance. It is now recognized as a science of understanding investors behaviors and their biased patterns. It applies quantitative finance and provides practical models grounded on robust understanding of investors behavior toward financial risk. Financial Personality influences investment decisions. Behavioral portfolio construction methods combine classic finance with rigorously quantified psychological metrics and improves models for financial advice to enhance investors chances in reaching their lifetime financial goals. Behavioral finance helps understanding psychological profile dissimilarities of individuals and how these differences manifest in investment decision process. This new science has become now a must topic in modern finance.

Key words
behavioral finance, psychology of finance, biases, market efficiency, interdisciplinary research, lifetime investing

Classification
REL 5F, 5G, 5K, 7J, 7K,7L, 10B,10F
JEL: G11, G12, G14

1.Introduction and research question context

Research in behavioral finance has important practical and academic applications. The study can help guide investment portfolio allocation decisions, helping the understanding errors that investors tend to make in managing their portfolios, and also by allowing us to understand better how to allocate assets and locate profit opportunities for investment managers. Understanding the psychological foundation of human behavior in financial markets facilitates the formulation of investment policy statements for individual investors. Methods that originate in psychology are used as research tools, along with traditional finance research. Over these years, the academic and practitioners of finance have seen the blossoming of behavioral finance into a significant body of knowledge. The combination of theoretical and empirical work has allowed psychological theories to understand financial phenomena. The newly developed body of knowledge in Investment Finance is an important addition to the theory and practice of modern finance. The paper compiles a plethora of evidence for considering behavioral finance a science now well beyond romantic adolescence.

If tests of market efficiency reveal a strong form of efficiency, then a professional portfolio manager could not obtain abnormal returns only if she uses insider information. A lack of liquidity and depth of the market can be profitable for some investors that are capable to use this apparent inefficiency and parting from random-walk, for the increased investment performance. From academics and economists' perspective, financial world is populated by rational investors, but from practical perspective, behavioral investors manage the world. By following the trend, the financial market populations do not enjoy significant sustainable benefits. In the pursuit of understanding the behavior of the market player, the basic argument relays on the supposition that the risk appetite increases exactly at the worst moment-when the capacity to assume additional risk decreases. This attitude is detrimental to investment performance.

Data base sources[i] for the article shows that psychological characteristics have salient relationships with various aspects of investment decision making process making and the transactional activity of the individual investor. People view a sample randomly drawn from a population as highly representative and cvasi-similar to the population in all its essential characteristics. They expect any two samples drawn from a particular population to be more similar to one another and to the population than is statistically justifiable. This behavior is different from the tenets of classic finance theory. The human tendency to regard a sample as a representation of the whole population manifests in a wide

variety of situations when subjects act as if every segment of a random sequence must reflect the true proportion. If the sequence has strayed from the population proportion, a corrective bias in the other direction is most probably expected, based on the misconception of the fairness of the laws of chance.

When the player or gambler feels that the fairness of the coin entitles her to expect that, any deviation in one direction will soon be cancelled by a corresponding deviation in the other. Because even the fairest of coins cannot be as fair as the gambler expects, it is highly probable that errors can take a long time to cancel each other out to reflect the image of an active self-correcting process. By the time the extreme deviations cancel out, the investor can be already out of business. Being right is not sufficient to be a successful survivor in the financial market; the investor has to be right at the right time. Some familiar processes in nature obey such laws as mean reverting: a deviation from a stable equilibrium produces a force that restores the equilibrium. The laws of chance, in contrast, do not work that way; deviations are not canceled as sampling proceeds, they are merely diluted. Worst even, as in any financial crisis, market correction; deviations on the downside seem to compound into vicious circle of distrust and pessimism on the future.

The paper presents arguments on why sometimes it looks like the difference between price and value is so difficult to discover and why it so rarely tends to zero. Rational investors look at the turbulence in today's markets and calmly evaluate the potential risks and rewards of remaining invested, not confusing certainty with safety. They recognize that, although the principal value of funds invested in risk-free government bills, bank deposits or mutual funds may be certain, after factoring in for taxes and dez/disinflation, the return on these highly conservative portfolios may fall significantly short of real return expectations, with a direct impact on their future standard of living.

Behavioral investors see the frightening headlines bombarded with financial disasters, get into panic, fly to safety, sell stock for cash, and decimate their long-term financial health by not remaining committed to a sound long-term investment policy. The fusion between classical investment analysis and behavioral evaluation should help investors and financial analysts for a larger, more informed perspective on understanding the resorts behind the stock market mechanism. Consequently, investors are better able to protect their portfolios from uninformed and less successful investment decisions. After going through the motions of the extremely volatile markets of present economic preoccupations, investors have understood more clearly that what their competitors and other players do is equally important with what they do in terms of money management decisions. Today's leitmotif is just to survive the fierce game of market uncertainty. Classic investment finance approach is in general reactive, but adding the behavioral finance reflective perspective into the financial equation can help in understating how other market participants will react in that specific circumstance. Human behavior is in general reactive and less proactive, and consequently difficult to frame and predict in the narrow set of rules of standard finance. Behavioral finance can explain with relative ease why an individual investor took a certain financial decision, but find it still difficult to explain what decision will take that individual in the future and in a new, different economic circumstance. Market roller coaster gyrations proved repeatedly that financial analysis require a more profound understanding of the psychological resorts behind the investment and money management decision-making process.

2. End of adolescence of behavioral finance? What is next in financial personality field

Behavioral finance academic papers capture attention with their provocative, thought leadership research questions. "Can the markets add and subtract[ii]?"; *The winner's curse*[iii]; *The gambler's fallacy*[iv], "Does the stock market overreact?[v]" While the popularity of the subject has increased and behavioral biases have got so pervasive that everybody seems to be interested in and have a bias opinion on it, the question is whether the behavioral finance experts are bias free? Behavioral finance is a subject built around price anomalies. Anomaly is a deviation or departure from the normal. But usually, prices tend to deviate from normal most of the time. Markets tend to overvalue or undervalue asset prices more often than staying at fair value. So, whether it is stock markets diverging from the real economy or a performing sector diverging from an underperforming one, it all boils down to divergence in opinions. This idea of deviation, departure or divergence can be extended from the markets to nature. A low paying job versus a high paying job, lot of rain compared to drought, magnetic anomalies, divergences are all over the place. It's not the task of behavioral finance experts to look for transcending rules across areas of study, be it psychology or nature. Many though-provoking thinkers are so focused on "pattern seeking" that sometimes the elude the big picture. For example, Mandelbrot[vi] in connecting diverse areas, concluded that it was all geometry, there was no law. Statisticians look at standard deviations, departures from expected as systematic errors, leptokurtosis, skewness, fat tails and any other mutations that are more normal than irregular. So, if diversions are a reality across nature, then is the incipient science of behavioral finance not getting ahead of itself by basing every stock market departure as more dependent to psychology, ignoring the unexplained rest of the natural divergences?

The five aspects Thaler points out in his paper 'End of behavioral finance[vii]' (a term he confidently used to suggest that behavioral finance will be the only form of finance left) are 1) Equity premium puzzle, 2) Predictability, 3) Dividends, 4) Volatility and 5) Volume myth. All of these five aspects can be explained as mean reversion failures. First; the equity premium puzzle is that the undue premium equities get over risk-free treasuries are more than justified by the inherent risk in equities. So, the question behavioral finance is asking here is why equity premium (above the risk premium) does not revert to the mean (disappear), or why don't equities erase the respective premium vs. treasuries

return over a certain period. Second; behavioral finance suggests that predictability of markets movement is mostly a factor of mispricing of securities and a buying opportunity.

When value gets mispriced versus growth, market invariably corrects the bias and delivers abnormal returns. Here behavioral finance suggests that because a mispriced asset reverts to mean investment value, through this process, it delivers extra returns. This again is a case of a mean reversion failure followed by a regular mean reversion. Third; dividends, i.e. why do most large companies pay cash dividends? And why do stock prices rise when dividends are initiated or increased when companies can make their taxpaying shareholders better off by repurchasing shares rather than paying dividends? Here behavioral finance seems to be questioning why dividend stocks earn a premium when they shouldn't. Mostly probably, is instant availability of cash as an opportunity for future exciting acquisitions.

Or, in other words why dividend premium should not revert to a mean value (disappear)? Fourth and fifth; volatility and volume are other cases of mean reversion failure. Both volatility and volume are unexplained, since they exhibit extreme behavior and apparently don't adhere to any standard finance models. If mean reversion failure is the ubiquitous phenomenon witnessed across markets and nature, then is psychology or social mood not just a tail, small explanation of an elephant, large phenomenon? If mean reversion lack of confirmation is the big picture, why don't statistician's counterargument on behavioral finance experts with bolder academic headlines illustrating the limitation in "psychological pattern seeking". The argument is elegantly described in 'Does the stock market overreact[viii]?'

Table 1: Active management underperforms. More evident in strong up-markets

Time periods	% growth rate of per capita real consumption		% real return on a relatively riskless security		% risk premium		% real return on S&P 500	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
1889–1978	1.83 (Std error = 0.38)	3.57	0.80 (Std error = 0.60)	5.67	6.18 (Std error = 1.76)	16.67	6.98 (Std error = 1.74)	16.54
1889–1898	2.30	4.90	5.80	3.23	1.78	11.57	7.58	10.02
1899–1908	2.55	5.31	2.62	2.59	5.08	16.86	7.71	17.21
1909–1918	0.44	3.07	−1.63	9.02	1.49	9.18	−0.14	12.81
1919–1928	3.00	3.97	4.30	6.61	14.64	15.94	18.94	16.18
1929–1938	−0.25	5.28	2.39	6.50	0.18	31.63	2.56	27.90
1939–1948	2.19	2.52	−5.82	4.05	8.89	14.23	3.07	14.67
1949–1958	1.48	1.00	−0.81	1.89	18.30	13.20	17.49	13.08
1959–1968	2.37	1.00	1.07	0.64	4.50	10.17	5.58	10.59
1969–1978	2.41	1.40	−0.72	2.06	0.75	11.64	0.03	13.11

Active management underperforms mostly in strong up markets. Passive investment, however, increases systemic risk, apparently making the markets more prone to strong corrections. In case of market reversals, from bull to bear, volatility increase mostly to limited diversification, and the correction could prove to more profound, more prolonged. A too large shift to passive investments makes the markets less efficient, open to a new opportunity for active managers in the search of arbitrage opportunities that are more evident in lesser-efficient markets and periods.

3. Behavioral Finance, an adolescent: good at explanations, not so at predictability

Professor Herbert Simon received Nobel Prize for economic science in 1978 for his research on the decision-making process within economic organizations, an application of psychology into economic reasoning. Accordingly, people optimize their decision and behavior for optimization not for ideal outcomes. A study of the history of behavioral finance cites his 1955 paper 'A behavioral model of rational choice[ix]' as the first thought that started it all. Paper starts with the need for a revision of the economic model which assumes that the economic man is rational, has knowledge, is well organized with stable system of preferences, can plan alternative courses of action and reach highest attainable point on preference scale. But it also clearly states that the aim of the paper is not to discuss these doubts but to think about a revision - a direction towards a better economic model. Herbert's bounded rationality thus became a concept at the core of behavioral economics. The, professor Daniel Kahneman (Nobel Prize winner, 2002) proposes the concept of bounded-rationality[x] as a model to overcome some of the limitations of the rational-agent models in economics. Heuristic simplification of decision making should not lead us to conceive of human thinking as riddled with irrational cognitive biases, but rather to conceive rationality as an adaptive tool that is not identical to the rules of formal logic or the probability calculus. Then, on his next research challenge, Herbert's initial thoughts on Artificial

Intelligence were ignored for seven years. But the paper which got its due attention in economics and psychology is the one he wrote in 1962 on the 'Architecture of complexity'[xi].

In that paper, Herbert Simon assumed that complexity frequently takes the form of hierarchy. Systems are hierarchic systems independent of specific content. He then detailed hierarchical social systems, biological, symbolic, self-reproducing and evolving systems and even hierarchic commanding structures in social interactions. Herbert's attempt to explain power law distributions (exponentially in nature) was that complexity had to evolve from simplicity and the path of construction of a complex system is through the theory of hierarchy.

Can behavioral finance also suffer from bounded rationality? Claiming humans to be irrational in their decision making when they were the ones who created such great things in the first place, the irrationality does not seem to add up somewhere. Can behavioral finance define and quantify long reversals in markets? Are these long reversals recurring? How different are these long reversals from the subject of time cycles (order) written over the last few hundred years? Is there an order between passive index performances? Is this performance cyclical? If market success connected to addition and subtraction (Thaler, Lamont[xii]) what is the mathematics in long reversals and behavioral finance? Did the behavioral finance professional and professors gurus got it all wrong with reasonable explanations? Does this prove that fundamentalists are indeed correct in suggesting that behavioral finance is the great story of human errors? It was not just the fundamentalists who mentioned about the behavioral finance overelaboration of human decision-making limitations and the human inability to cope with optimized thinking. Other, simple alternatives to a full rationalizing analysis and how simple heuristics frequently sometimes lead to better decision making and outcomes than the theoretically optimal procedure. Heuristics suddenly start to sound better than what behavioral finance made it out to be - just an error.

The 2013 Nobel Prize in Economic Sciences has forced us further in the inter-disciplinary path where fundamentalists, statisticians, psychologists, physicists must work hand in hand to find new universal laws which can select. It was not just media, but even psychologists who were bent on burying classical economics in favor of behavioral economics of prof. Shiller[xiii]. Efficient market hypothesis was presumed unconfirmed. It was considered deficient. But over the years, defending the underdog Classic Finance changed to understanding of the new theories of Behavioral Finance[xiv] and then finally even questioning their validity and explanatory power. It's a competition between perception and reality at a certain point of time, which of course is dynamic, that is leading to new perceptions and new realities at new points in time. Now that Fama has been acknowledged yet again, his tough stand against behavioral finance as stories of anomalies can be seen in milder light. After all, standing there with Profesor Robert Shiller would definitely make him believe "even together we don't know all the truth".

4. On the predictive power of an adolescent science

Where does the predictive element vanish, and reappear? Is the question for the 2013 Nobel Prize winners not about understanding error in the context of time? Which is what Hansen is saying; we need to look at the fluctuations, errors and divergences over multiple moments before we start to understand what works and why it works. We may call it conflict resolution or Hansen's way to explain why interconnected variables fail and succeed but at the end of the day the objective is to understand complexity and risk. So, the 2013 Nobel concluded a few things. First and foremost, markets are natural, dynamic systems with coexisting efficiency and inefficiency.

Advanced investment management may use psychology to explain the effects but we are still far away from determining the underlying laws driving risk, growth and decay in all natural systems. Do the answers still lie in understanding the framework for universal laws, confluences and interactions in our ecosystems in which they operate and influence the multitude of groups creating the deterministic, disordered chaos? The 2013 Nobel has forced us further in the interdisciplinary path where fundamentalists, statisticians, psychologists and physicists must work hand in hand to find new universal laws which can select, invest and predict trends.

As of result of this plethora of information, investors tend to overestimate their individual professional skills in terms of education, intellect and ability to process, disseminate and understand market data and info and underestimate the power behind market price, which is supported down and resisted up by a multitude of educated, determined, intelligent, and psychologically – strong individuals that act for one single scope – keep on maintaining the privilege to survive as a market player. Job security is the most important argument that prevails in the mind of investment managers. Subsequently, most of their investment decisions are under influence of this Darwinian surviving obligation. Based on our experiences, we developed intuition – our exceptional ability to discern patterns that can help in our decision making. Intuition is of great decision making value only if it based on extensive experience. Experts usually favor their first idea and they build their solid intuition system not only by understanding the data but also making sense of how inner mechanism parts works.

In a very low interest environment, high valuation of assets is a logical consequence, since there is no strong evidence that after the 2008 crisis, active investment management performed better than indexing or passive investment style. Investors, in their disappointment, wonder if their portfolios would be decimated by the next correction. Why should pay an active investment manager for the privilege of sure-losing capital when they still lose money but without paying the active fee. Evidently, some managers managed through the troubled waters better that other, but this is

evident only in hindsight. Can an investor pick up the active manager with the skill, before the correction? Probably is not so easy. Passive investing cannot shield from increased volatility and protect from a market protracted downturn.

Table 2: Market Total Return. Historical data for a large, market index S&P 500, Dec. to Dec. data:

Large, market index	2010-2011	2010-2011	2010-2011	2010-2011	2010-2011
S&P 500	-3.42%	+15.92%	+28.07%	+14.34%	+1.23%
Average active fund	2.9%	+15.7%	+30.1%	+17.1%	+5.3%
Average bond fund	+0.6%	+12.4%	+24.1%	+12.3%	+6.4%
ETF equity income	0.0%	+20.3%	+22.6%	+4.2%	-0.7%

Source: Google Finance

Diversification might have not work in a post crisis environment, as an efficient portfolio risk architecture. Almost all risk assets moved in tandem, since investors fixation only to macro events, transcending all asset classes and domiciles. High financial stress increase correlation of all asset classes since investors with different risk personalities, time horizons and strategies focus suddenly and simultaneously on clear and present dangers. Diversification, in times of bear markets stress, does not protect against systemic market risk or loss of principal risk. The real benefits of diversification manifest imperceptibly over a multi investment period.

5. Behavioral Finance, an interdisciplinary science

The science of Behavioral Finance has graduated the adolescence. Now it is young, stand alone, inter-disciplinary course that is taught at universities around the word[xv]. The faculty of Finance of Bucharest Academy of Economics in Romania has already incorporated Behavioral Finance into two of its flagship Masters in Advanced Finance[xvi] and investment Finance programs[xvii]. Worldwide, schools and academic research have embraced this spectacular new discipline.

In 2013, Eugene F. Fama, Lars Peter Hansen and Robert J. Shiller were awarded the Nobel Memorial Prize in Economic Science. Robert Shiller won the prices with his theme that real estate bubble was a reality, Eugene Fama with his theme of rationality and efficiency of all markets. Fama is one of the fathers of rational, efficient markets, and the advent of passive, index investing. If markets are so good and efficient, then of a net of costs basis markets are efficient and passive investment is as good as active. Peter Hansen, is the pure mathematician of all three. He has developed a method to statistically evaluate price movements of financial assets- now a basic tool in all social sciences.

There is, however, a common, absolutely wonderful red thin line that can be wavered from their Nobel award winning theory: financial markets are most probably unpredictable and apparent irrational (F. Fama: "I do not *understand the word bubble...")* for the short term; for the long term, however, a certain degree of predictability can help the academia and the practicians understand the reasons, the whys and how's the prices of financial assets align to a long term, more predictable evolution of under and over performance – probably a normal(ized) performance. All three look to agree on one fact: markets react, move, trend and have evolution based on a cocktail of rationality and fundamentals and non-rationality and behavioral emotions. The scientific accolade recognizes financial, economic, statistical, psychological and social work that has been innovative within the academic ivy tower but very relevant outside it: Prof. Fama's conclusions about market efficiency have encouraged the emergence of so-called index funds in financial markets. Prof. Shiller has applied his work by creating the monthly Case-Shiller index (with Karl Case), which many asset managers now find to be an indispensable tool to measure house prices and Prof. Hansen's statistical models have been used in all sorts of scientific research and applications. Kahneman and Tversky, the precursors of Behavioral Finance (and Daniel Kahneman won) introduced first the idea in 1984 that bad is tangible stronger than the good feeling. They had experiment participants perform a simulation in which they either gain or lost the same amount of capital. The players that lost reported a higher quantity of emotional distress over losing some money; this was significantly greater that the monetary satisfaction related to winning and exact amount of money, opposite of their losing bet. Consecutive effect, snowballing of bad outcomes were not present on good (consecutive) situations.

The inter-disciplinary path of Behavioral Finance, where fundamental analysts, statisticians, psychologists, physicists must work hand in hand to find new universal laws which can select to explain market happenings. On one side Shiller's exuberance[xviii] is quite clear from the Graph 1 illustration, how fundamental earnings diverge from real prices. But on the other side a two-scale look (Graph 1 diagram, below) shows some similarity in growth and decay seasonality among the two values. The seasonality aspect is not discussed in Shiller's work. The failure of behavioral finance to take it from the fundamentalists can be viewed as a partial victory, but it's still an illusion. Robert Shiller's' Paper on '*The Volatility of Stock Markets Prices'* published in 1987 uses dividend data and real interest rates to provide evidence that true investment value changes through time sufficiently to justify the price changes. His paper concluded

that most of the volatility of the stock market prices appears unexplained. Shiller volatility or fluctuations prove that behavior of markets is not normal. Non-normal distribution series is a widely-followed proof of inefficiency in prices.

6. Behavioral Efficient Market Theory

In the perspective of behavioral finance studies presented, investors will always prefer to follow the current trend. If market would have been highly efficient, accordingly, stock prices are extremely difficult to predict in the short run, and that new information is very quickly incorporated into prices. These theoretical findings not only had a profound impact on subsequent research but also changed market practice - the emergence of low cost index funds in stock markets all over the world is a prominent example. Although the theory started more than one century ago, all spectacular names in modern finance are related their research and findings to this magnificent though leading theory: Harry Markowitz' thesis on portfolio theory, the theorems of Merton Miller and Franco Modigliani on the irrelevance of the financing decisions of firms, William Sharpe, John Lintner, Robert Merton, Robert Lucas, Douglas Breeden, and others developed major asset pricing models – descriptions about how risk should be measured and the relation between risk and expected return. Fischer Black, Myron Scholes and Robert Merton[xix] developed the first rigorous options pricing model. The model of Bachelier was introduced to new world of finance in 1964 by Paul Cootner: "The Random Character of Stock Market Prices"[xx]. If markets should follow a Random Walk, that feature would be a strong argument against behavioral finance – that predicts that due to investor biases and emotions, market moves are forming patterns that can be profitable to exploit. After Louis Bachelier – the inventor of the concept of Random Walk or Fair Game (expected return for a speculator is zero), his outstanding research follower Eugen Fama[xxi] won a Noble Prize in Economics Science in 2013.

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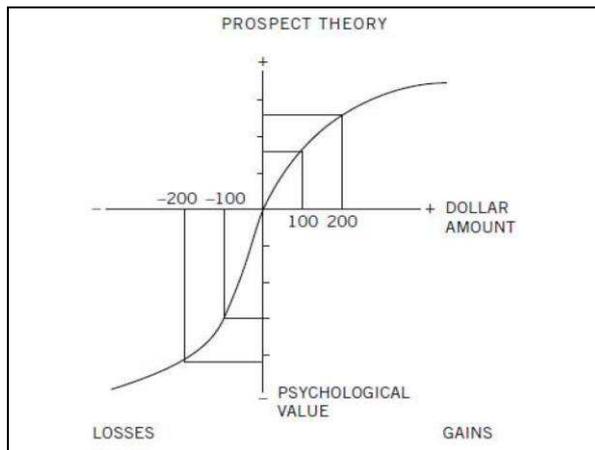

Figure 1: An interpretation of Prospect Theory:
By analogy, overreaction and exaggeration typology can be related to the Prospect Theory of Daniel Kahneman. His Nobel Prize theory suggests that when the investment portfolio is in the domain of loss, the investors are becoming more interested, almost non-rationally, by an increased bias for exposure to risk.
The most recent events have the greatest impact on autobiographic memory, since recent losses or gains are more salient in their emotional and social impact
Investors attached more weightage to a loss than to a gain, the reason for risk aversion. Also, the motive why there are more momentum investors tracking winners, compared to contrarian bets that are looking at depressed, recent investment losers.
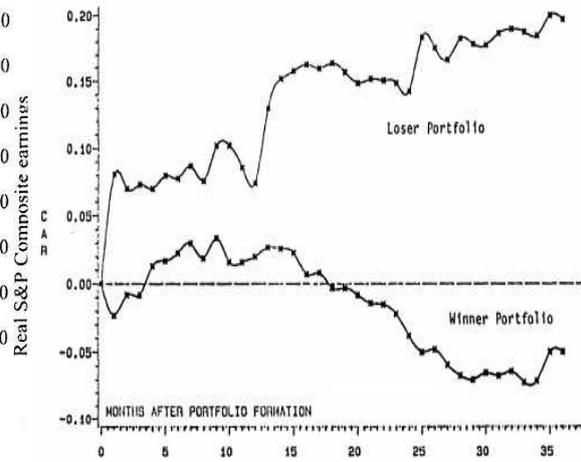
Figure 1: Prospect Theory

Graph 1: Volatility vs. Earnings   **Graph 2: Losers vs Winners**
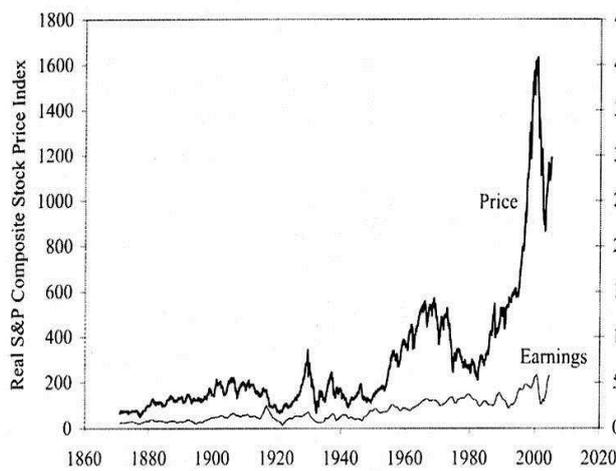
Graph 1: Robert Shiller's'
'The Volatility of Stock Markets Prices'1989[xxii].

Graph 2: De Bondt, Werner F. M., and Richard H. Thaler.
"Anomalies: A Mean-Reverting Walk Down Wall Street

Volatility and volume are other cases of mean reversion failure. Both volatility and volume are unexplained, exhibit extreme behavior and don't adhere to any standard models. If mean reversion failure is the ubiquitous phenomenon witnessed across markets and nature, then is psychology or mood not just a tail explanation of an elephant phenomenon. And second, if mean reversion failure is the big picture, why don't statisticians jump on behavioral finance experts with bolder academic headlines illustrating the authors the limitation in "psychological pattern seeking" and why using the word "end" along with a loving creation could be risky. In their 1985 paper 'Does the stock market overreact?', DeBondt and Thaler[xxiii] explained the idea of mean reversion and how it leads to the Loser's portfolio of 3 years outperforming the Winner's portfolio of the same time (graph 2 above).

Investors put too much weight into most recent financial experiences and ignore a longer term, larger perspective. They evaluate other players' decisions as discretional and non-rational and assume their own decision to be logical and rational, and in conformity with all existing information. Active investment is strongly influenced by behavioral biases. Careful asset allocation and appropriate timing of rebalancing can improve the chances of higher portfolio efficiency. Investors should be better off by focusing on asset and sector allocation and less on security selection and market timing.

The financial anticipatory behavior of most investors, who would rather take into account the market developments rather than the financial and economic performance of a company, is predominant. The idea[xxiv] was first introduced by the paper of Professors Stancu, I., Stancu, D., (2013), "Rationality versus Irrationality on the Romanian Capital Market"; the authors contend that: "The shares of financial services companies confirm the second case, that of irrational, subjective behavior, not only at the level of the individual investor but also at the level of the community of stock exchange operators. The shares are traded mostly for short-term gains purpose. Their stock prices reflect investor expectations of the stock market development and not the issuer's financial performance. As a consequence, investors have the priori belief that these performances are greater that they are in reality. With that in mind, their concern is purely speculative". This academic path of investigative research is interesting and a prime on behavioral finance literature suggesting that: not only personal and individual circumstances or market and contextual influence converge to an investment decision; a third factor can modify the investor perception, i.e., the type of company is the focus of investment analysis. Different sectors have different life cycles, but most important, sectors swap places in investor's scope from great interest (like) to complete disregard (dislike). These new dimensions add an informative angle to investment and behavioral portfolio management.

7. The Research question

The paper question also investigated the local stock market. Research introduced also by the paper tests the random walk hypothesis to see if local markets move at random and investors do not express any behavioral biases. This subject was extensively tested for developed markets, but less so for developing markets as Romanian Stock Exchange. To test daily return distribution and independence, a regression for the BET stock market index is introduced:

$$\ln(I_t) = \mu + \rho \ln(I_{t-1}) + \varepsilon_t, \; I_t \quad \varepsilon_t = \phi_0 + \phi_1 \varepsilon_{t-1}$$ [1]

is the index value (the most representative, BET Index) in day t and ε is the residual value?
According to the regression equation that was tested:
- If ϕ_1 coefficient is statistically significant we can infer that there is linear dependence between daily returns, and the index series of BET does not follow a random-walk pattern. That is, other factors could influence this

Value Function in Prospect Theory
Kahneman, Tversky [1979, pag 263-291]

evolution, and they are persistent and consistent. Research tested linear dependence with a regression, applied also the same data for other local indexes, the results are conclusive in the same manner as for the BET. If ϕ_1 proves to have statistical significance than we can conclude with the degree of confidence that the evolution is linear dependent, the market does not follow a random walk.

- According to the regression equation that was tested, the ϕ_1 coefficient is statistically significant
- We can infer that there is linear dependence between daily returns, and the index series of BET does not follow a random walk pattern. Other factors could influence this evolution, and are persistent and consistent.

The findings of our research suggest that psychological biases can have an impact on risk return optimization, asset allocation on investment portfolios and finally on investment outcome. The sources of investor biases that lead to investor finance errors the investment management industry can apply the data for the development of products and services (automated pilot investing) that may help save investors from sabotaging their financial standing and future prospects. Also, new behavioral portfolio construction methods should combine evidently classic finance math with rigorously quantified psychological metrics to improve models for operators use in giving financial advice and create investor portfolios that enhance investors chances for reaching their life time financial goals. Methods that originate in psychology are used as research tools, along with traditional finance research methods. Over these years, the academic and practioners world of finance have seen the blossoming of behavioral finance into a significant body of knowledge.

The combination of theoretical and empirical work has allowed us to see the relevance of the basic psychological theories to many financial phenomena. The newly developed body of knowledge is an important addition to the theory and practice of modern finance[xxv]. Analyzing the data for this study leads to the interesting conclusion that individual psychological biases and differences should not be confounded with noise within econometric models but rather manifest a solid influential role on the dependent variable - investment outcome. Data base source for the article shows that psychological characteristics have salient relationships with various aspects of investment decision making process and the transactional activity of the individual investors:

BET Index (BET index public data: Apr. 1998 – Ian. 2016)

$$\ln(I_t) = \mu + \rho \ln(I_{t-1}) + \varepsilon_t,$$ [2]

Dependent Variable: L_BET: Method: Least Squares, Sample (adjusted): 2 2859 and secondly,

Regression: $\varepsilon_t = \phi_0 + \phi_1 \varepsilon_{t-1},$ [3]

Dependent Variable: RESID_BET, Method: Least Squares, Sample (adjusted): 3 2859, Included observations: 2857 after adjustments

Variable	Coeff.	Std. Error	t-Statistic	Prob.
C	0.001696	0.002346	0.722856	0.4698
L_BET (-1)	0.999814	0.000307	3251.907	0.0000

R-squared	0.999730	Mean dependent var		7.546971
Adjusted R-squared	0.999730	S.D. dependent var		1.127493
S.E. of regression	0.018530	Akaike info criterion		-5.138167
Sum squared resid	0.980624	Schwarz criterion		-5.133998
Log likelihood	7344.441	F-statistic		10574900
Durbin-Watson stat	1.570400	Prob(F-statistic)		0.000000

Variable	Coeff.	Std. Error	t-Statistic	Prob.
C	3.82E-06	0.000339	0.011283	0.9910
RESID_BET (-1)	0.214740	0.018278	11.74829	0.0000

R-squared	0.046115	Mean dependent var		3.26E-06
Adjusted R-squared	0.045781	S.D. dependent var		0.018529
S.E. of regression	0.018100	Akaike info criterion		-5.185117
Sum squared resid	0.935320	Schwarz criterion		-5.180946
Log likelihood	7408.939	F-statistic		138.0223
Durbin-Watson stat	1.996614	Prob(F-statistic)		0.000000

According to the regression equations that was tested, the ϕ_1 coefficient is statistically significant.

We can infer that there is linear dependence between daily returns, and the index series of BETC does not follow a random walk pattern. Other factors could influence this evolution, and they are persistent and consistent.

8. Behavioral Finance: advanced from adolescence to a comprehensive science

Research in behavioral finance has important practical and academic applications. The research can help guide investment portfolio allocation decisions, both by helping the understanding the kinds of errors that investors tend to make in managing their portfolios, and also by allowing us to understand better how to allocate assets and locate profit opportunities for investment managers. Understanding the psychological foundation of human behavior in financial markets facilitates the formulation of investment policy statements for individual investors. Behavioral biases appear detrimental to the investment return of individual investor portfolios. As a direct influence of behavioral biases, the intuitive correlation between risk and return does not hold. Low risk investments have the highest returns along all dimensions of the market. The practical findings contrast the principles of efficient markets – high risk is not correlated with high expected return and low risk/safe investments have high investment returns. There is a low correlation between professional abilities and investment success.

Investors have high confidence that somehow, someday they will succeed in beating the markets, in a systematic way. Outmaneuvering the market by outsmart moves ahead of competition, finding undervalued, overvalued securities and implementing the buying, selling decision at the right timing and with sufficient capital is difficult if not impossible, in the long run, sustainable way. The shift to passive investing has historical evidence of counter performance of active. Changes in behavioral attitude of investors to risk (an inversion of risk-return tradeoff), is also influenced by new robotic, algo-driven decision makers as marginal traders. In a world of passive wining over active, investments and risks are too much concentrated in two few products.

Classic investment management basic assumptions
1. Investors make rational asset allocation and security selection, process new information quickly and correctly
2. Investors construct portfolios by the rules of mean-variance portfolio theory
3. Investors save and spend by life-cycle theory, Smoothing spending over the life-cycle
4. Although financial markets are efficient, active management can still beat passive
5. Expected returns are determined only by risk, measured by beta coefficient of systemic correlations
6. Investors associate only utilitarian factors; financial capital to growth wealth to become wealth, some day
7. Investors construct portfolios based on how much return on invested capital meets future spending needs

Classic Investment Advisory assumptions
1. Investors have normal expectations on their risk-return allocations
2. Investors construct portfolios by the rules of behavioral portfolio theory
3. Investors save and spend by behavioral life-cycle, by framing, mental accounting, imperfect self-control
4. Markets are not efficient (but still are not as easy to beat as many normal investors think)
5. Reducing financial stress by reducing market volatility transmission into investor portfolio volatility
6. Expected returns are determined by more than risk, e.g. utilitarian, expressive and emotional factors
   Why is it hard to resist intuition, even when it is wrong?   John Nash - A Beautiful Mind
7. Performance is evaluated vs. predetermined benchmark: what competition does is important

Advanced Behavioral Finance management focus
1. Smart use of debt, mortgage, credit cards, tax efficient investing, lifelong financial planning
2. Comprehensive financial planning and emotional finance management
3. Performance is evaluated vs. investor personal financial and well-being goals, dreams, desires, fears
4. Investing with a predetermined plan, making correction function of ever changing capital market expectations
5. Human and social capital
6. How much savings of capital to meet future spending needs
7. How wealth is defined in correlation with personal and family well-being, acceptance, recognition, etc.

9. The explained factor: Diversification

Investor psychological biases lead to investment performance to tilt to the mean in the long run. As a reflection of the behavioral biases and influences, the statistical demonstration supports the conclusion that markets do not random walk. In the research reported here investigated the market pattern zigzag to see any predilections or biases or a random walk. Analyzing the data for this study leads to the interesting conclusion that individual psychological biases and differences should not be confounded with noise within econometric models but rather manifest a solid influential

role on the dependent variable-investment outcome. By fear of losing opportunity, investors do not keep temper, act impulsively, extrapolate short-term trend into a long-term investment attraction. Risk profile changes, investors appear to be able to bear more risk that would be otherwise reasonable, advisable and rational

Table 3: 2017 Portfolio diversification: 50% stocks + 50% bonds. Diversification along sectors, assets, managers

Economy (2017-2020)	Probability	a (energy sector)	b (financials sector)
Boom	0.25.	20%	5%
Normal	0.50	10%	10%
Recession	0.25	0%	15%

Where: s - stocks, b - bonds and a, b are scenarios for energy, financial sectors

- $R_a =$ (0.25) (0.20) + (0.50) (0.10) + (0.25) (0.00) = 0.10   [4]
- $R_b =$ (0.25) (0.05) + (0.5) (0.10) + (0.25) (0.15) = 0.10   [5]
- $\sigma^2_a =$ (0.25) (0.20-0.10)2 + (0.5) (0.10-0.10)2 + (0.25) (0.00-0.10)2 = 0.005   [6]
- $\sigma^2_b =$ (0.25) (0.05-0.10)2 + (0.5) (0.10-0.10)2 + (0.25) (0.15-0.10)2 = 0.00125   [7]
- $Cov_{(ab)} =$ (0.25) [(0.20-0.10) (0.05-0.10)] + (0.50) [(0.10-0.10)] + (0.25) [(0.00-0.10) (0.15-0.10)] = - 0.0025   [8]
- $\rho_{(a, b)} = cov (a, b) / \sigma^2_a \sigma^2_b = - 1$ [9]

Table 3 Conclusions:
-Expected return per unit of risk (standard deviation) for an even diversified portfolio is best/impeccable ($\rho = - 1$).
-For perfect diversification, risk return depends only on asset allocation; individual scenarios probabilities, risk and return characteristics are irrelevant. An informed/diversified investor make more or lose less money by exploitation of behavioral inefficiencies of the market.

Table 4: Risk return Scenarios indiference is robust efficient; diversification for dummies 1995-2005:

	Probability	Equity fund % (s)	Bond fund % (b)	50% equity + 50 % bonds
Recession	1/4	- 10	5	-2.5
Normal	1/2	+ 6	- 2	+ 2.0
Boom	1/4	+ 12	- 5	+3.5
Expected return		3.5	-1	1.25
Variance		81	9	4.5
Standard deviation		9	3	2

Except for a major correction in the market, the diversification is indifferent to economic scenarios.
Efficient portfolios compromise: More Risk or More Capital 1995-2005:

- $Cov (s, b) = 0,25(-10-3.5) (5+1) + 0.5(6-3.5) (-2+1) + 0.25(12-3.5) (-5+11) = -20$ [10]
- $\rho (s, b) = cov (s, b) / \sigma_s\sigma_b = -20 / [(9) (3)] = - 0.75$ [11]

Table 4 Conclusions:
-In a normal monetary word, expected return per unit of risk (standard deviation) for a 50%/50% diversified portofolio (1.25/2) is tangible higher than for the riskiest equity (3.5/9).
-Most simplistic diversification multiplies investment efficiency, in the presented scenarios by 66%:

10. The unexplained: the human factor

However, sometimes there is not even a small reason for an instant volatility in the market. The example of a big block of share of a major company, PG had the highest velocity ever in the market. No reasonable explanation, fundamental, technical, or technological stands as justification. Most probably a human element:

Figure 2: Highest velocity ever of a market reaction May 6
(source: Bloomberg quotes, news, May 6, 2011)

A big block of P&G (2:30), followed by another huge block, right before market crashed, then, nothing, probably sell orders, big enough to blow all bids, in minutes, buyers just disappeared
- Existing stop-loss orders on P&G forced selling into a no-bid market
- Every $1 change in price in a stock, results in a 7.56 (1/0.132319125) change in DJIA
- Worst timing: stocks had started selling off earlier, panicked. The velocity/severity triggered stop-loss selling, **feeding on itself**
- Even as P&G's share price was recovering; bids were falling rapidly in the other 29 Dow components; at one point was down 997

That research tried to answer on a scientific basic whether an informed investor make more or lose less money by exploitation of behavioral inefficiencies of the market. Bears in bull market and bulls in bear market assume contrarian decisions (against the general trend or momentum of the market). When the respective trade options lead to negative results (negative return vs. market index), the investors are much more penalized (financially and emotionally) that are rewarded those who took contrarian decisions that led to positive results. In cases of contrarian investment decisions, the emotional and psychological implications of a negative result bring in significant emotional discomfort that upsets much more, in absolute terms, than pleases a positive result.

In the perspective of behavioral finance studies presented, investors will always prefer to follow the current trend. If market would have been highly efficient, accordingly, stock prices are extremely difficult to predict in the short run, and that new information is very quickly incorporated into prices. These theoretical findings had a profound impact on research, changed market practice - the emergence of low cost index funds in stock markets all over the world is a prominent example. Psychologically, as the markets rise, investors begin to believe that they are "smart" because their portfolio is going up. In reality, it is primarily more a function of "luck" rather than "intelligence" that is driving their portfolio. Investors behave much the same way as individuals who addicted to gambling. When they are winning, they believe that their success is based on their skill. However, when they began to lose, they keep gambling thinking the next "hand" will be the one that gets them back on track. Eventually – they leave the table broke. It is true that bull markets are more fun than bear markets. Bull markets elicit euphoria and feelings of psychological superiority. Bear markets bring fear, panic, and depression. Bears in bull market and bulls in bear market assume contrarian decisions (against the general trend or momentum of the market). When the respective trade options lead to negative results (e.g. negative return vs. market index), the investors are much more penalized (financially and emotionally) that are rewarded those who took contrarian decisions that led to positive results. In cases of contrarian investment decisions, the emotional and psychological implications of a negative result bring in significant emotional discomfort that upsets much more, in absolute terms, than pleases a positive result.

11. Conclusions

The findings of our research suggest that psychological biases can have an impact on risk return optimization, asset allocation on investment portfolios and finally on investment outcome. The sources of investor biases that lead to investor finance errors the investment management industry can apply the data for the development of products and services (automated pilot investing) that may help save investors from sabotaging their financial standing and future prospects. Also, new behavioral portfolio construction methods should combine evidently classic finance math with rigorously quantified psychological metrics to improve models for operators use in giving financial advice and create investor portfolios that enhance investors chances for reaching their life time financial goals.

Methods that originate in psychology are used as research tools, along with traditional finance research methods. Over these years, the academic and practioners world of finance have seen the blossoming of behavioral finance into a significant body of knowledge. The combination of theoretical and empirical work has allowed us to see the relevance of the basic psychological theories to many financial phenomena. The newly developed body of knowledge is an important addition to the theory and practice of modern finance. As such, by now we are entering the coming of age of behavioral finance. It is now established as a science of understanding investors behaviors and distill these patterns with quantitative finance to provide practical models grounded on robust understanding of investors as well as investments. New behavioral portfolio construction methods should combine evidently classic finance math with rigorously quantified psychological metrics to improve models for operators use in giving financial advice and crate investor portfolios that enhance investors chances for reaching their life time financial goals. The future research. Students of Behavioral Finance still have much to research on influence of psychological profile dissimilarities between individuals and how these dissimilarities manifest in real investment decision and behavior.

[i] (The sources of this data include Stock Market Confidence Indexes –as linked from Yale School of Management International Center for Finance as directed by the 2013 Nobel Prize in Economics Dr. Robert Shiller – the Investor Behavior Project. Additionally, S&P/Case-Shiller Home Price Indices is a key source of data. Another, significant input of data is relatively easily downloadable from Shiller, R., U.S. Stock Price Data, Annual, with consumption, both short and long rates, and present value calculations. We also use extensively publicly available stock market data for US, Europe and Romanian listed securities market)

[ii] (Can the Market Add and Subtract? Mispricing in Tech Stock Carve-outs. Owen A. Lamont and Richard H. Thaler University of Chicago, NBER)

[iii] (*Winner's curse* – a tendency in any auction for the winning bidder to offer more than intrinsic value of the item. Reasons for overbidding - behavioral, emotional attachment, social pressure, asymmetry/incomplete information, etc.)

[iv] (*The gambler's fallacy* – investors tendency to attach increased probability of an otherwise low probability event, followed by a vice versa balancing)

[v] (Does the market overreact? W. DeBondt, R. Thaler. The Journal of Finance. Vol 40, no 3, 1984)

[vi] (Complexity can be created from simple rules. Chaos, like clouds or shorelines, actually have order).

[vii] (The End of Behavioral Finance, R. Thaler, Financial Analyst Journal, 1999, issue 6, volume 55)

[viii] (Source: De Bondt, Werner F. M., Richard H. Thaler. 1989. "Anomalies: A Mean-Reverting Walk Down Wall Street." Journal of Economic Perspectives, 3(1): 189-202)

[ix] (A Behavioral Model of Rational Choice. Herbert A. Simon The Quarterly Journal of Economics, Vol. 69, No. 1. (Feb., 1955), pp. 99-118)

[x] (Bounded rationality suggests that there is never enough knowledge to take decisions and, hence, inherent the limitations in decision making)

[xi] (Architecture of complexity. H. Simon. Proceedings of the American Philosophical Society, Vol. 106, no 6, 1962)

[xii] (Anomalies the Law of One Price in Financial Markets. O. Lamont, R. Thaler. Journal of Economic Perspectives, vol 17/4, 2003, pages 191–202)

[xiii] (*"determinants of long term asset prices such as stock prices or home prices: what, ultimately, drives these prices to* change as they do from time to time and how can we interpret these changes? role of rationality in the formation of these prices and the growing trend towards behavioral finance/economics, the growing acceptance of the importance of alternative psychological, sociological, and epidemiological factors as affecting prices. Statistical methods allow us to learn about the sources of price volatility in the stock market and the housing market, and evidence that has led to the behavioral finance revolution in financial thought in recent decades. R. Shiller. Nobel Prize Lecture)

[xiv] (According to conventional financial theory, investors are, for the most part, rational "wealth maximizers". There are many instances where emotion and psychology influence investors decisions, unpredictable and irrational attitudes. Behavioral finance combines cognitive psychological theory with conventional economics and finance and provides explanations for why people make irrational financial decisions)

[xv] (https://www.behavioraleconomics.com/be-grad-programs/)

[xvi] (http://www.cefin.ase.ro/index.php/curriculum-cefin/anul-ii-semestrul-i/finante-comportamentale)

[xvii] (http://www.dafi.ase.ro/plan/15.pdf)

[xviii] (Source: Robert Shiller's plot of the S&P Composite Real Price Index, Earnings, Dividends, and Interest Rates, *from „*Irrational Exuberance*",* 2005)

[xix] (Robert C. Merton and Myron S. Scholes have, in collaboration with Fischer Black, developed the pioneering formula for the valuation of stock options. Methodology has paved the way for economic valuations in many areas, for new financial instruments, facilitated more efficient risk management in society and financial markets. Traders and investors now use this formula every day to value stock options in worldwide markets)

[xx] (*M. Sales; David McLaughlin, 1997; „Fractals in Financial Markets";*http://ftp.ec.vanderbilt.edu/Chaos/FMH/main.html)

[xxi] (The Fama-French Three Factor Model is a method used by finance professionals to explain the risk and return of equity portfolios. The Three Factor Model compares a portfolio to three distinct risks found in the equity market to assist in decomposing returns. Before the Three Factor Model, there was the Capital Asset Pricing Model (CAPM), a single factor way to explain portfolio returns)

[xxii] (*On one side Shiller's exuberance is quite clear from the ill*ustration above, how fundamental earnings diverge from real prices. But on the other side a two-scale look (illustration below) shows some similarity in growth and decay seasonality among the two values)

[xxiii] (Source: De Bondt, Werner F. M., and Richard H. Thaler. 1989. "Anomalies: A Mean-Reverting Walk Down Wall Street." Journal of Economic Perspectives, 3(1): 189-202)

[xxiv] (Source: Stancu, I., Stancu, D., (2013). Rationality versus Irrationality on the Romanian Capital Market. Theoretical and Applied Economics Journal 17, International Finance and Banking Conference)

[xxv] (*The End of Behavioral Finance, 2010. R. Thaler: „I predict that in the not-*too-distant future, the term behavioral finance will be correctly viewed as a redundant phrase. What other kind of finance is there? In them enlighten, *economists will routinely incorporate as much „behavior" into their models as they observe into the real word. After*

all, to do otherwise, would be irrational.")

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