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BIASES, ANOMALIES, PSYCHOLOGY OF A LOSS AND INDIVIDUAL INVESTMENT DECISION MAKING

***Abstract.** Although the field of modern finance has progressed impressively, it is still hard to explain on a scientific basis why people behave non-rationally when dealing with money. While classic finance assumes people rationalize and optimize their financial decisions, behavioral finance adds the importance of what investors should do and complements the mantra of traditional finance with what people actually do in terms of their economic decisions. The article reviews some psychological concepts relevant and used in the study, in an interdisciplinary effort of understanding the correlation or causality between psychology and finance. The paper aims at demonstrating whether investor psychological biases lead to investment performance deficit. 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. Data base source 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. The statistical interrogation describes the sampling methodology, the frequency of data and the empirical methodology that lead to analysis of the results and concluding remarks.*

Key words: Psychology, biases, efficiency, individual investment.

REL: 5F, 5G, 5K, 7J, 7K,7L, 10B,10F, 11B

JEL Classification: G11, G12, G14

Introduction

Strong psychological impulse but erroneous intuitions and biases present in the individual investment context is the people's negative response to potential loss, or "*loss aversion*," as described by Prospect Theory (Kahneman and Tversky, 1979). Losses loom larger than equal-sized gains. Psychologically speaking, the pain of losing €100 is approximately twice as great as the pleasure of winning €100. In general, we are prepared to enter a fifty-fifty gamble of losing €100 on one hand, only if the sum to be won is at least €100. Fair bets should balance in our favor more than 50% (2/3) to get us into action. Loss aversion also makes us reluctant to make decisions for change because they focus on what they could lose more than on what they might gain. In terms of our personal financial decision, we prefer the status quo and herding with our peers. The study of behavioral finance combines the investigation and expertise from research and practice into smart portfolios of individual investors' portfolios that can overcome cognitive errors and misleading emotions and drive investors to their long term goals of financial prosperity and capital preservation. If 10 years ago, Behavioral Finance was still considered and incipient science, the first Noble Prize in Economics awarded to the study of Behavioral Economics establish 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 establish 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.

Database

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 market (<http://aida.wss.yale.edu/~shiller/data.htm>).

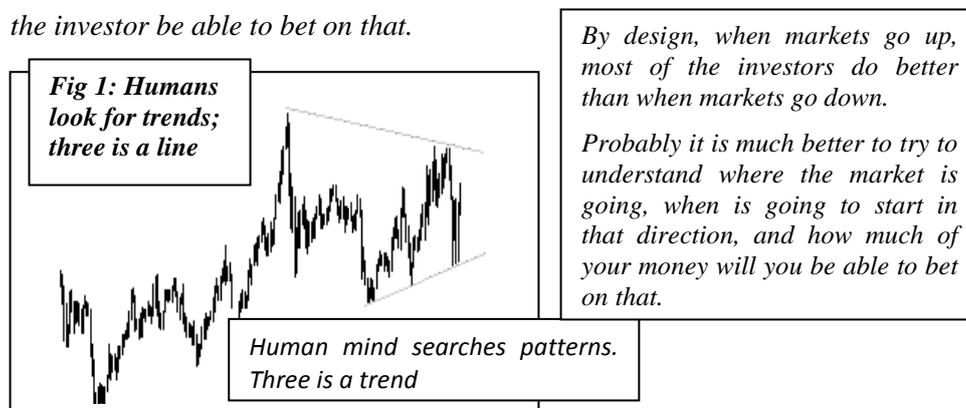
The context

This new field of modern finance named Behavioral Finance investigates the subtle and profound interactions within the human brain when faced with cognitive uncertainties of an economic and investment decision, assuming that the most basic psychological traits of human being (fear, anger, greed and altruism) stamp an indelible mark on people's decisions about money. The intellect (understanding a situation), the reason (long-term consequences of the

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contemplated action) and the emotion (the judge of the course of action) are all interrelated resorts behind human decision-making. The events of the economic crisis ignited by the so-called toxic mortgage debt, position behavioral finance and investor psychology as one possible explanation why the stock markets around the world lost, recoup, and then lost again at unprecedented values. A volatility and stock market gyration of 10% in a week used to be exceptions, now is common. *By design, when markets go up, most of the investors do better than when markets go down. Understand where the market is going, when is going to start in that direction, and how much of your money will*

the investor be able to bet on that.



Investor should accept prices as they are (the market is always right, at least for the moment, and will never get bust, as we can) and should not expect that the prices will rebound and the market will prove her right, in the end. The money is gone, and worrying, regretting, feeling upset or guilty doesn't get it back. As investor loses her mind at the top of the market, she can lose her nerves at the bottom. The simplest difference between a bull and a bear market is that the latter is much more populated with losers. *By design, when markets go up, most of the investors do better than when markets go down. Probably it is much better to try to understand where the market is going, when is going to start in that direction, and how much of your money will you be able to bet on that.*

The Investor Bias

Understanding biases can not only help an investor refine his investment strategy but also time markets. Predisposition and anticipation: We are either having a predisposition to a trend or anticipation of a reversal. This is a strong bias which affects an investor and keeps him subjective and emotional. The other guy: Market is not a casino, but only a few understand that even if know probability, there is a high chance that the counterparty is a compulsive gambler. Things became clearer, as times passed that it's not just about learning to drive the

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forecasting and calculated bet car, but also to take care of the reckless drivers on the capital market highway.

Peter Bernstein, economic historian says that for most of history, in terms of business decisions, the world was agricultural and risk was in weather. And we can't do anything about the weather. But when we got into capitalism in the 17th and 18th centuries and markets began to function, the risk has moved from weather to what will the other guy do? That's what the whole stock market is about. It's the other guy that not only brings risk to the system but also changes how markets work and function. Understanding his biases hence becomes the key to kingdom of success. Biases are false judgment, which lack objectivity. And biases increase or enhance after real money is involved. These emotional fixations are driven by crowd emotions and are different from independent thinking. It has also to do with personal experiences. A failure or winning colors our investment approach to market. A failure makes us more risk averse, while a win makes us take more risk. One method is to get out of the market and reassess. The expert bias: Oil will go to \$200, Citi and GM are negative, Crisis is coming (going) could be some expert calls. First and foremost the experts appear late on the scene. Second, experts have bias too. But the problem is not just the experts, but our inability to really judge accuracy. In time, all calls and forecasts are forgotten. And we don't really look for an expert to tell us something we don't know, we are more interested in him (her) telling things we know. It's like if you are an oil bull, the oil expert comments about \$200 per barrel will be more credible. Or for example financial sector meltdown is all over the place, the reason why the Goldman Sachs call on Citibank's negativity might be true. Markets do not tolerate inflexibility. It trashes it. Removing a bias is difficult, because we are influenced by events and news around us.

A study of history is a good technique. Frederick II, Holy Roman emperor and king of two Sicilies was a confirmed skeptic, refusing to accept data that he could not verify. It was in Frederick's court that Leonardo (Fibonacci) was interviewed on mathematical problems in 1220's when Europe was struggling with mathematical rationality and objectivity. An objective man in such times is an exception. It's more about our preconceived positive or negative bias that we want to enhance, not even once challenging or questioning why these same experts did not tell us at \$40 where oil was heading or telling us way up in 2007 that Citi or GM stocks might crash. Once the stocks reach 10-year and 30-year lows, it's easy. The permanent bias: Making money on trading is tough, or trading both sides of the markets are tough. As we suffer from certainty, linearity, straight line, extrapolation and positive bias. That is why brokerages are in business when markets go up and out of business when markets stagnate or go down. Their profile is linked with market upside not downside. A majority of us suffer from permanent bull bias. Nature has no straight line, but if the stocks are going up today, they will go up tomorrow. If stocks are falling today, they will fall tomorrow are biases we don't challenge. It can also be called as the order bias. If there is order, things are correct and when there is chaos, it's the global economy, the interest rates, the food,

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oil, currency or politics. A majority of us suffer from a permanent bull bias. There are a few who thrive in falling markets, but there are few of them with permanent negative bias. Event and cause bias: A cause is linked with an event, is a bias. If you have the right information, you can profit. The information arbitrage days are over. Knowledge creates a bias linked with overestimation of skills. Before and after we started the markets, the unknown was always greater than the known. And information and cause can never explain the event. The bias creates an illusion. Hamilton Bolton, a forecaster said that it is not the news but the construction placed on the news by the market that confirms the trend.

The Anomalies: the Weekend Effect

In 1931, M J Fields from Harvard wrote a paper on weekend effect in the journal of business. The paper was investigating the conventional Wall Street wisdom at the time that “*the unwillingness of traders to carry their holdings over the uncertainties of a weekend leads to the liquidation of the long accounts and a consequent decline of security prices on Saturday*”. He found prices not only rose on Saturdays but also were on average 52 per cent time more than the Friday to Monday average for the 717 weekends he had studied.

Till 1945, Saturday used to be a trading day. Fields’ idea was revisited by Frank Cross in 1973, who found that in S&P500, there were 60 per cent positive Fridays, but only 40 per cent positive Mondays. Cross said, “*The probability that such a large difference would occur by chance is less than one in million*”. This is known as the weekend effect, which talks about strange order. This order is thoroughly used to challenge randomness in classical economics, but the question why this order in time works is unanswered by behavioral finance.

The Anomalies: the January Effect

A general increase in stock prices during the month of January has established as a rule for investors. This rally is generally attributed to an increase in buying, which follows the drop in price that typically happens in December when investors, seeking to create tax losses to offset capital gains, prompt a sell-off. The January effect is said to affect small caps more than mid or large caps. This historical trend, however, has been less pronounced in recent years because the markets have adjusted for it.

Another reason the January effect is now considered less important is that more people are using tax-sheltered retirement plans and therefore have no reason to sell at the end of the year for a tax loss. However, despite popular belief Sam Stovall’s Book, *The Seven Rules of Wall Street* tabulates how 85% of the positive January years still turn up positive. This is an anomaly which has not vanished yet.

Table 1. January Effect: a general increase in stock prices during the month of January:

January Barometer, 1945-2007			
When the S&P 500's January % Change Was	No. of Times it Occurred	S&P 500 Change in Rest of the Year	Indicator Was Correct
Up	41	11.60%	85%
Down	22	-0.70%	45%
All Years	63	7.30%	NA

If investors look at December 2013, as a remarkable period of holiday shopping, they cannot help to notice the consumerist carnival all over the world was paired by a sustained, across the border market rise.

The Anomalies: Sell in May and Go Away

A well-known trading adage that warns investors to sell their stock holdings in May to avoid a seasonal decline in equity markets. The "*sell in May and go away*" strategy is that an investor who sells his or her stock holdings in May and gets back into the equity market in November - thereby avoiding the typically volatile May-October period - would be much better off than an investor who stays in equities throughout the year.

This strategy is based on the historical underperformance of stocks in the six-month period commencing in May and ending in October, compared to the six-month period from November to April. According to the Stock Trader's Almanac, since 1950, the Dow Jones Industrial Average has had an average return of only 0.3% during the May-October period, compared with an average gain of 7.5% during the November-April period.

There are limitations to implementing this strategy in practice, such as the added transaction costs and tax implications of the rotation in and out of equities. Another drawback is that market timing and seasonality strategies do not always work out, and the actual results may be very different from the theoretical ones. While the exact reasons for this seasonal trading pattern are not known, lower trading volumes due to the summer vacation months and increased investment flows during the winter months are cited as contributory reasons for the discrepancy in performance during the May-October and November-April periods, respectively. Sam Stovall's book tabulates the anomaly over various periods. The Sell in May and Go Away strategy worked on average 70% of the time.

Table 2: The sell in May and go away effect: the summer seasonal effect of market decrease

Equal Periods, Unequal Performances

S&P 500 Price Return Data Through 10/31/08

Since	S&P Price Change		Nov- Apr Beat
	Nov-Apr	May -oct	May - Oct
1929	4.90%	1.60%	68%
1945	6.80%	1.10%	72%
1970	6.60%	0.60%	72%
1990	6.20%	0.50%	68%

Apparent anomalies on choosing past best performers: there's always a Bull Market someplace

Another variation of the *Let Your Winners Ride* strategy that investment managers pursue is to sell and buy the best performing titles from previous period:

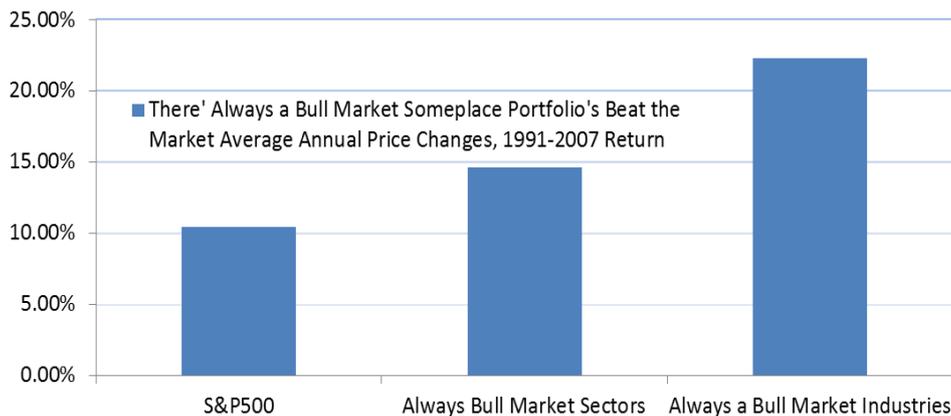
The Strategy: At the beginning of each month. Buy the top (3) performing sectors or the top (10) industries from the past twelve months. Investors review one month later. Managers continue to hold if these remain best performing areas. Otherwise, managers would like to sell and buy the top ranked choices.

The Results: During the 1991-2007 time frames, the top performing sectors portfolio grew 13.4% compounded annually versus gains of 9.2% for the S&P 500. Volatility was similar to the S&P 500. Meanwhile, the top performing industries generated returns of 20.1% per year – beating the market by a whopping 10.9% annually. Volatility was twice that of the market, but this strategy still generated better returns than the market even on a risk-adjusted basis. Both strategies outperformed the market 70-75% of all calendar years.

Table 3: The systematic acquisition of best past performers in best past performing sectors

There' Always a Bull Market Someplace Portfolio's Beat the Market	
Average Annual Price Changes, 1991-2007	
Portfolio	Return
S&P500	10.40%
Always Bull Market Sectors	14.60%
Always a Bull Market Industries	22.30%

Graph1: Best past performers in best past performing sectors- a bull market somewhere



The Psychology of a Loss

Humans are loss averse. And the individual, corporate and society, which understand it, thrive despite odds. *"How did this stuff ever get published?"* was what traditional economists asked when behavioral economists observed that human beings were loss averse. This aversion is at the heart of human psychology and asset pricing. And if professors are fighting over academic leadership over the subject you can understand why the only *"loss"* Google search can handle today is that of *"weight"*.

The psychology of a weight loss is positive and motivational unlike the psychology of a monetary loss, which can be pretty depressing. But despite all negativity around the subject understanding loss aversion is at the heart of an investment strategy and even being a successful money manager. Loss aversion can explain why a price *"bid"* on or off a trading screen is always lower than *"ask"* prices. It's not just because sellers always ask for a higher price than what the buyers can pay but because people attach more pain with a loss of *"x"* than the

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pleasure they experience with a gain of "x". In other words people place more value on giving up an item than on receiving it. Giving up is tougher, more valuable and hence a perceived loss. So it is not the reality of loss that matters but the perception. And propensity to be loss averse is somewhere connected to a real loss. The more one tries to avoid it, the more it grips you. We have seen nations going to over-extended wars until miserable failures, owing to loss aversion. And loss aversion combined with inability to admit or learn from mistakes can only complicate investment decisions, delaying them till they are of no use, as in a capitulation.

The psychology of a loss works against market timing, and clearly explains why masses cycle from complacency to panic. It also explains why entrepreneurs are contrarians, why we are uncomfortable with geographical risks (Indians trading on the Pakistan stock exchange), why very few of us marry foreigners, why very few intra-day traders make profits consistently, why volatility as an index derives its strength from panic, why our over-trading is an extension of loss aversion and why volume rises when the market goes up and vice versa. Eric J Johnson, Simon Gächter and Andreas Herrmann, professors at University of Nottingham found some interesting patterns linking loss aversion with various parameters like, age, income gender, education etc. Age seems to be an important moderator of loss aversion.

The older we get the more loss averse we are. Gender is an insignificant predictor for loss aversion. So being a woman trader or investor has no intrinsic disadvantage. The study concluded that loss aversion is not a constant. Rather a substantial amount of loss aversion can be explained by the decision-maker's knowledge of the attribute and the attribute's importance to the decision-maker. Antonia Bernardo, professor at University of California, Los Angeles, talks about how irrational overconfident behavior can persist. Information aggregation is poor in groups in which most individuals herd. Shinichi Hirota of Waseda University and Shyam Sunder of Yale talk about how investor decision horizons influence the formation of stock prices. In long-horizon sessions, where investors collect dividends till maturity, prices converge to the fundamental levels derived from dividends through backward induction. In short-horizon sessions, where investors exit the market by receiving the price (not dividends), price levels become indeterminate as they lose dividend anchors. It's in this case that investors tend to form their expectations of future prices by future expectations. These reasons are important contributors to the emergence of price bubbles. No wonder aggregate markets look for dividends at bottoms and forget them at market tops.

Building on loss aversion, Ravi Dhar (Yale) and Alok Kumar (University of Texas at Austin) analyzed the impact of price trends on trading decisions of more than 40,000 households with accounts at a major discount brokerage house and found that buying and selling decisions of investors in the sample were influenced by short-term (less than three months) price trends. They classified

investor heterogeneity in trading based on prior returns into momentum buy, momentum sell, and contrarian buy or contrarian sell category.

The trading behavior of all the groups exhibited systematic differences in expectations and behavior. The study could find support to the commonly held belief that relatively more sophisticated investors exhibit contrarian trading behavior. And, the contrarian investor segment had the best overall performance and their portfolios exhibit better characteristics in comparison to the momentum investor segment. It's easy to be a momentum buyer or seller. There's nothing easier than riding a trend down or up. Unfortunately, riding a roller coaster has its risks and it is not consistent and healthy for a long-term portfolio. There's more burn effect. A majority of the economic society does not understand this link in profits, markets, psychology and economics. But a few corporate understand and are already strategizing to be ahead. Merck for example understands this loss aversion and is rewarding scientists for failure.

Inability to admit failure leads to inefficiencies in the industry. Despite the Vioxx failure, Merck's new speed at developing drugs has surprised competitors. Companies are also questioning the fake shareholder power connected with momentum investors with average time durations of ownership barely a few months. They push companies to beat estimates unmindful of the company's long-term strategy. The observations and questions we have raised here have a bearing on where we will head tomorrow. When a society becomes loss averse, it looks for a fast buck, looks for more credit-driven speculation than real investments, ownership horizons keep getting shorter and loss aversion reaches contagion extremes, as the majority sits on the edge ready to exit with the gain. When we reach there, it's time for a painful restructuring, which might even involve suing the brokers we love today. Developed markets may still get you 33 cents per dollar claimed after you sue your broker. But developing markets where legislation itself is weak, we are eons away from suing any Wall Street broker. And both the pain and loss is for us to keep. The faster we understand the psychology of a loss, the better it is for us and for the market.

The Investment Decision Making Process

A recent Harvard Business Review article co-authored by psychologist and Nobel laureate Daniel Kahneman gives a checklist approach to decision making at an institutional level to avoid biases. According to the article, the potential for distortions are so high that knowing biases were not enough to eliminate these. The authors illustrate the reflective and intuitive thinking process. In intuitive thinking, we don't focus on doing things, we just do them. Intuitive is good at making contextual stories. This is when cognitive failures happen, as there is no way of knowing when they are happening. According to the authors, talking doesn't eliminate biases. A more methodical approach is needed. A study observed that eliminating biases achieved 7 percentage points' higher returns.

Kahneman and team suggest eliminating biases can improve decision making profitably. So, if the method works for businesses, the approach should

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also work for investors and markets, and could be an improvement on the three-year reversal cycles of behavioral finance where worst stocks outperform the best. We reviewed Kahneman's checklist for decision makers to see if the approach also assists an investor. Is there any reason to suspect motivated errors (or errors driven by the self-interest of recommending team)? Now, this could be a good business checklist but the markets are known to have a manipulation element, the zero-sum game instruments, your loss is my gain. Above that, we are living at a time of educating society about ethics and conflict of interest. Markets are full of motivated errors.

Have the people making the recommendation fallen in love with it? From a market perspective, advisory services are ranked based on their recommendations. And, few take a detour on a previous forecast. So, market analysts can be assumed to be mostly in love with their forecasts. What if there are dissenting opinions within the recommending team? Though there are always dissenting opinions among market advisories, there is always a clear skew either on the buy or on the sell side. More often on buy than on sell. Hence, dissenting views are not polarized enough in markets. A question that decision makers should ask the team making recommendations - could the diagnosis of the situation is overly influenced by salient analogies? Trading volume and new highs are known to have an undue influence on investors. Other questions include: Can you see the halo effect? Do you know where the numbers came from? If you had to make the decision again in a year, what information would you want? Are people making the recommendation overly attached to past decisions? Investors generally buy companies with an aura. Investors don't just buy numbers, as there are many variables in markets. Hence, stories are bought or sold, not numbers. Few investors learn from mistakes, as there is less annual review. If 80 per cent of investing is momentum, the past trend exerts an excessive influence on investors.

Further, is the base case too optimistic? Is the recommending team overly cautious? Is the worst case bad enough? This depends on the investment style. A contrarian approach is counter intuitive. A contrarian never works with an optimistic base case. When he invests or recommends, s/he suggests taking risk, not be cautious. A contrarian looks at the worst case. The checklist again proves momentum investing is full of biases and hence poor decision making. And, the only way to control our own intuition could be to embrace the objective contrarian approach. Buy the worst and sell the best. People tend to discount the eventual implications of low probability- high negative impact events, but these events, due to their apparent low probability, seem to happen less often than anticipated. The most expected outcome of these possible yet less probable events can have, however, disastrous effects on the prospect value of investor portfolio. High emotional impact events, although rare, have a major, indelible impact on the emotional registry of a person. Any subsequent decision is affected by historical record of successes and failures.

In general, investor that succeeds and survives on the long term, makes small gains systematically (or wins more and more times than they lose). Their investment success is not a simple luck of result of a continuous stream of rational and correct material decisions but of a disciplined and focused approach, prime access to information and ability to assemble on time and correctly the available data, coupled with the ability for innovation and adaptation to the continuous change and challenge of the market game. Investment managers have to prove their repeatable professional ability and sustainable value-adding capability on a continuous basis to their employers, employees, and investment public.

Although the business of managing investment assets is much more complicated, competitive, rewarding and challenging than ever, and investors are increasingly sophisticated, their emotional attributes remain as simple as always - fear of losses and desire to make money. Mental cognitive errors are frequently caused by heuristic simplifications - logical shortcuts by which decision makers use simple rules to solve complex problems. When this approach is used inappropriately for complex problems solving, investors' biases could lead to systematic mental mistakes. These errors of investment performance estimation are predictable, then exploitable, by smarter, more rational decision makers. An example debated in the paper refers to under reaction of investors to information. This late reaction is a direct consequence of an excess of self-confidence in the ability to process and understand new information. The individual is anchored in past opinions and is mentally closed to new information that contradicts the old set of beliefs. Overreaction (early) reaction is a direct consequence of mental generalization and representation. Through generalization, people tend to extrapolate existing information, sometimes based on a single observation and consider it representative for a large population of event.

An interesting example of mental anchoring is price discount posting in a sales interlude: suggested price by the producer > retail price > sales price in this period. The gradual exemplification of the three figures, anchors mentally the prospective buyer into an opportunity for a great deal. People buy compulsively not because of apparently reduced prices but for the reasons that are certain, they have just found an excellent deal. Our wardrobes are a good example of that.

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 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.

For example, it is a usual behavior for the investors to be almost indifferent to the buying opportunities at the incipient phase of a bull market, but they start to be interested when the upside trend is almost obvious for everybody in the market. From this moment on, the buying spree of increased volumes makes a clear upward trend. Nobody wants to be just a spectator of the game; everybody wants a piece of

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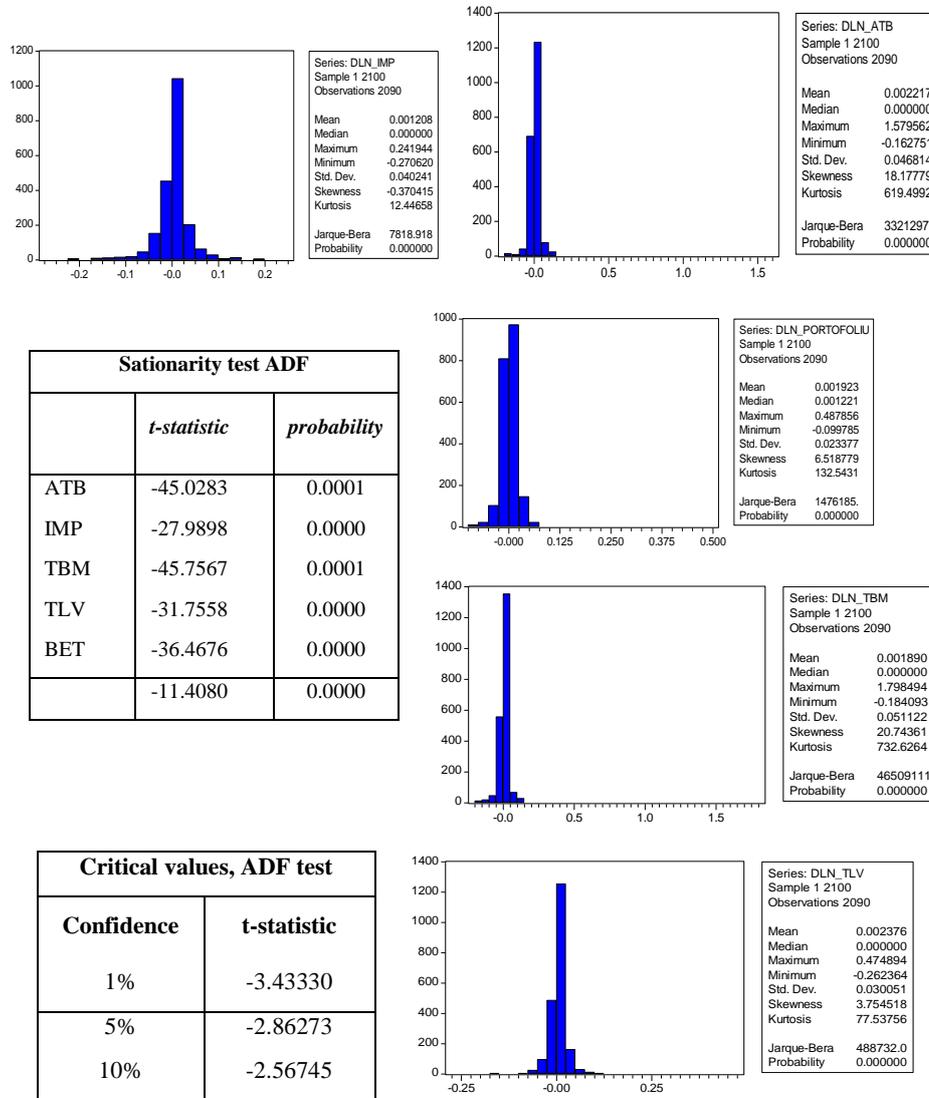
action because of a non-rational herd instinct. From a rational standpoint, however, it should be clear that the upward trend might not continue indefinitely. Just to compound the problem, the objects of investor affection is represented by those stock that performed dearly in the latest period and are obvious most exposed to the eventual correction. Perception of general and immediate context and expectation are key determinants of and investment decision.

One specific example the follows considers a risk factor mapping for a small, easy to follow and manage portfolio. VaR is a measure of inherent volatile of individual and portfolio of stock investments. On a cost efficient and limited attention of the investor, a limited number of risk factors are sufficient to understand the process of statistical optimization vs. intuitive optimization of the portfolio. The behavioral portfolio is usually based on a more qualitative assessment of risk factors and the type of company. The VaR minimization is based on individual stock risk. Companies chosen represent for major sectors - financials (Bank Transilvania, TLV), health care and drugs (Antibiotice, ATB), real estate (Impact, IMP) and industry exporter (Turbomecanica TBM) – all listed and traded on local market, Bucharest Stock Exchange. In the model portfolio, stocks have equal weights. To calculate analytical, historical and volatility (EWMA and GARCH) based VaR for the portfolio, daily values from Jan 1999-May 2013:

Table 4: historical volatility (EWMA and GARCH) based VaR for the portfolio, daily values:

	Median	SD	Asym	Kurt
ATB	0.0022	0.0468	18.1778	619.499
IMP	0.0012	0.0402	-0.3704	12.4466
TBM	0.0019	0.0511	20.7436	732.626
TLV	0.0024	0.0301	3.7545	77.5376
BET	0.0015	0.0158	-0.0568	9.0518
<i>All</i>	0.0019	0.0234	6.5188	132.543

Figure 2: Jarque-Berra Testing:



Summarizing Jarque-Berra Testing for the four stock portfolio and individual stocks and according to ADF testing, the returns series for the sample portfolio of the four stocks and for the general market index BET are stationary. Jarque Berra test concludes that return series distribution is leptokurtic, non-normal. The correlation matrix and graphs reveal the volatility clustering phenomena. Since the distribution is clearly leptokurtic, the conclusion is that all VaR measures based on normal data distribution underestimate the investment risk. Another, more discriminating measures like EWMA or GARCH, based on

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modified volatility probably can provide a more accurate statistical measure of risk variable. The distribution moments for portfolio and individual stocks concludes that the VaR measures that are constructed based on normal distribution of daily returns can underestimate the inherent risk of the investment portfolio.

Daily Return series, distribution moments

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 won a Noble Prize in Economics Science in 2013. 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. (http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2013/fama-facts.html).

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 – prescriptions about how risk should be measured and the relation between risk and expected return, Fischer Black, Myron Scholes and Robert Merton developed the first rigorous options pricing model.

Conclusions

The paper shows that behavioral biases are 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 highest investment returns.

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. Methods that originate in psychology are used as research tools, along with traditional finance research methods. Over these years, the academic and practitioners 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. Probably one of the most interesting and attractive tenets of behavior finance is that it can teach investors to harness his impulse and build self-awareness. The human cortex is wired such that emotions and feelings have, most of time, the upper hand over our cool logic. From an evolutionary perspective, our deeply embedded fear emotions are an essential prerequisite tool for our survival, as individual and species.

The cost of a false positive caused by fear is fairly low: sleeping under a tree, our ancestors suddenly awaken- up by a bush blown over by a burst of wind, would rather not spending any second on deciding whether is a tiger or not but rather climb the tree, survive and then debrief. On the other side, the cost of a false negative can be very severely and the harm irreparable, so our human nature is conditioned as to over exaggerate the risk, and rather error on the caution side, just to fight another day. The payoff is not symmetrical, but this early warning system geared toward survival can be highly detrimental in today's complicated financial matrix. If tests of market efficiency reveal a strong form of efficiency, then a professional portfolio manager could not obtain abnormal returns only if she used 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 departure 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.

The findings 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.

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