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Behavioral finance: new research trends, socionomics and investor emotions

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Abstract. *The paper presents a critique of standard investment analysis, fundamental and technical, and develops an alternative more comprehensive approach that should include some of the tenets of behavioral finance. In the pursuit of understanding the behavior of the market player, the basic argument relies on the supposition that the risk appetite increases exactly at the worst moment - when the capacity to assume additional risk decreases significantly. People view a sample randomly drawn from a population as highly representative and quasi 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 paper aims at demonstrating that investor psychological biases lead to investment performance to tilt to the mean in the long run and by following the trend, the financial market population does not enjoy significant sustainable benefits. As a reflection of the behavioral biases and influences, the statistical demonstration supports the conclusion that markets do not random walk.*

Keywords: psychology, biases, efficiency, individual investment.

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

Introduction

Behavioral finance does not eliminate but complements the standard evaluations approaches - fundamental, technical and markets analysis. It combines the findings of all valuation procedures with the investigation of social, psychological emotional aspects of the market, and relaxes the strict requirement of convergence between price and value. Since markets are always about high financial and social stakes, it is no wonder that most of the time the subjective emotions dominate the objective and logical approach.

Behavioral analysis considers the elements of human perception and evaluation of outside situation and events, and most importantly, the emotions associated, both ex ante and ex post with any financial decision. This new field of modern finance refers to neuroscience debate and assertion that the motivations, emotions, and feelings are indispensable to any human decision, including the financial ones; emotions are essential to any decision and course of action.

The investors interpret market data and events at two cognitive levels: the intellectual level of ordination, process and analysis of real factors (economic data), and the logical and rational level of understanding what this objective identifiable factors will influence the perception of the other players on the market. The information has investment value when is correlated with professional knowledge (human intellect) and interpersonal dynamics of market players (their emotions and sentiments). Due to uncertainty and continuous change in the game of the market, there is a strong interdependence between personal experiences (autobiographic memory) and rational expectations of the investors about the future, since their personal experiences influence the way they interpret and select available data.

Practically, behavioral finance complements but not replaces technical and fundamental analysis by the systematic analysis of the fundamentals of the market prices as a result of the correlation between investor experience and expectations and the market momentum. Slow changes in the market sentiment are not emotionally contagious, but they insinuate slowly in a market trend. Sudden moves, on the other side, are attributed to new strong evidence presented and disseminated by the market; these do not have a lasting effect, once the new resistance or support floor was established. In general, investors tend to accept with relative ease the market momentum that is imposed by the majority rather than adopt a contrarian investment strategy, since dissatisfaction of a negative result, after a contrarian decision, weighs significantly higher than the eventual satisfaction coming from a contrarian decision. Practically, the rational reasoning guides investor behavior based on the network of commercial interests and economic compromises (as unintentional consequences price formation auctions

of the market participants) and maintenance of a stable emotional status quo, lack of internal and external contradictions (emotional dissonance) that can sanction the intellect of the investor to form and implement an investment tactic that is feasible, easy to understand, amend and manage within the risk boundaries that are generally accepted.

Database for the paper

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

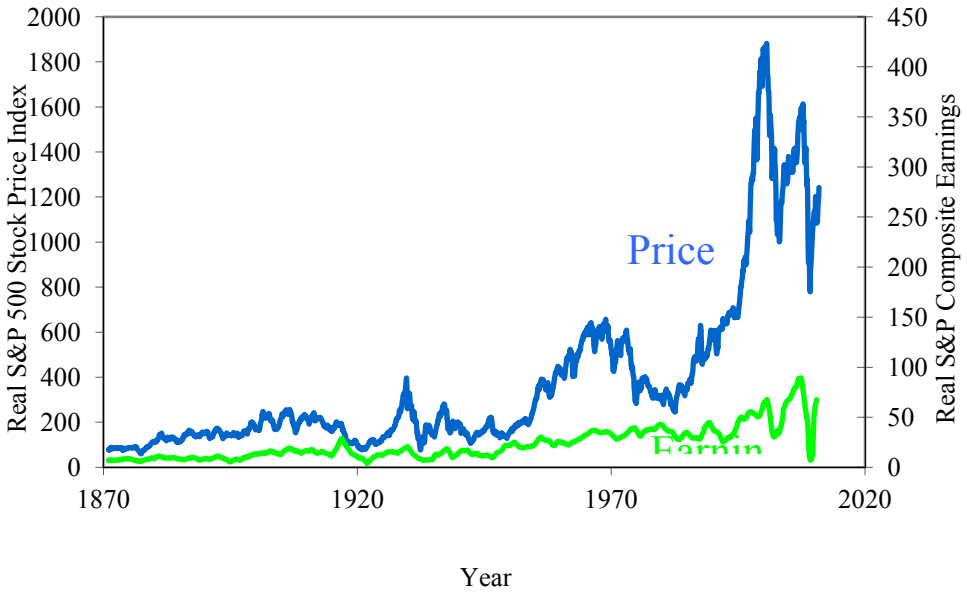
Nobel's inter-disciplinary connections

The 2013 Nobel 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. Somehow my inter-disciplinary mind registered Eugene faster than Fama. After all, Eugene Stanley, the father of econo-physics, could also get a Nobel. If psychologists could get the biggest award for economics, a physicist could have been there, too. But then the surprise became bigger, not because it was Fama not Stanley, but because Robert Shiller shared the award. When behavioral finance got the Nobel for economics in 2005, the Economist magazine carried an article pointing out how a new theory had junked 200-year old classical economics.

It was not just media, but even psychologists who were bent on burying classical economics. Efficient market hypothesis was presumed dead. It was considered deficient. But over the years, defending the underdog changed to understanding the new theories and then finally even questioning them (Shiller's exuberance, end of behavioral finance). It's a fight between perception and reality at a certain point of time, which of course is dynamic, 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 Shiller would definitely make him believe "even together we don't know all the truth". The blind men and the elephant metaphor remains a strong theme. 'My elephant is efficient while yours is inefficient' has been overruled by the Nobel committee which believes that the elephant is both efficient and inefficient sometimes.

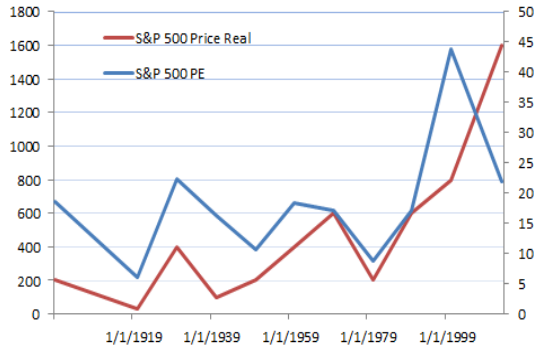
On one side Shiller's exuberance is quite clear from the illustration above, how fundamental earnings diverge from real prices. But on the other side a two scale look (illustration below) shows some similarity in growth and decay seasonality among the two values. The seasonality aspect is not discussed in Shiller's work. The failure of behavioral finance to take it from the fundamentalists can be viewed as a victory of sorts, but it's still an illusion. The Nobel Prize bashers like Taleb also won't enjoy this as their randomness theories get weaker by the day. The committee needed Lars Peter Hansen to balance. What did Hansen do? Hansen says that both efficient and inefficient schools could be understood better with more testing as the economic system is not static, it's a dynamic system with multiple moments.

Is this not a step ahead toward assuming markets as natural systems? Are the laureates not struggling to understand divergence: why are markets not predictable in the short term and why are they predictable in the long term?



Source: Robert Shiller's plot of the S&P Composite Real Price Index, Earnings, Dividends, and Interest Rates, from Irrational Exuberance, 2nd edition, 2005.

Date	S&P 500 PE	S&P 500 Price Real
1/1/2013	21.9	1600
1/1/2000	43.77	800
1/1/1990	17.05	600
1/1/1980	8.85	200
1/1/1970	17.09	600
1/1/1960	18.34	400
1/1/1950	10.75	200
1/1/1940	16.37	100
1/1/1930	22.3	400
1/1/1920	5.99	30
1/1/1900	18.63	200



Source: S&P Composite Real Price-Earnings Ratio and Interest Rates using data from irrationalexuberance.com/shiller_downloads/ie_data.xl

Today's volatile markets systematically complicated the decision making process, especially on the money management dilemmas. The stress hormones, adrenaline and cortisone, although highly efficient defense mechanism from an evolutionary perspective, can severely impair our ability to make clear-head decisions in the daily fragility and volatility of the stock market.

When we, as investors, are nervous and stressed, our ability to think clear diminishes and we become more pessimistic, lose our ability to think clearly and concisely, and become more impatient. Increased level of stress, in line with financial, professional and personal high stakes involved in our investment decisions, lead to biased information-processing mistakes, like overtrading, overconfidence or illusion of control. Our behavior biases and tendencies can harm the investment performance of our portfolio. We feel contented by the illusion of action. Subjected to stress, our brain would rather favor action than inaction, thinking and planning. Rational analysis mixes with up with our gut reaction and prejudices and we often forget that there are no short cuts to the places really worth going. Misses Market has no indulgence on our urge to make quick money.

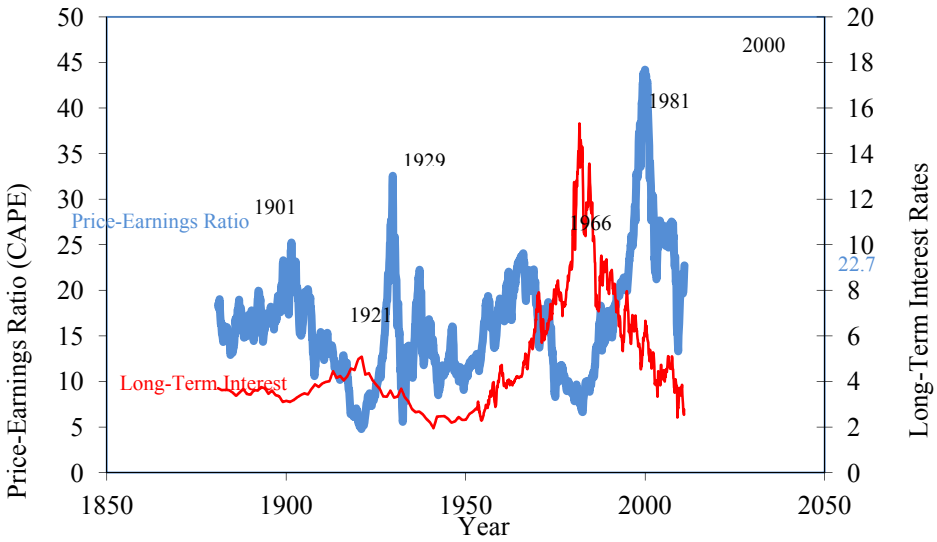
In the article „Emotional Intelligence and Investor Behavior" of John Ameriks, Tanja Wranik and Peter Salovey conducted a survey on private held portfolios. Investment performance correlates positively with high Emotional Intelligence (recognition and usage of one's emotions in a productive manner) scores. However, the main presupposition of intelligent investing is that a constant supply of counterparties trade in the market, probably less emotionally and financial intelligent. Common sense would relate investor emotional intelligence with a better ability for decision making, and consequently a more systematic and disciplined approach on managing financial affairs. A person with high emotional intelligence, is by definition, an individual that is able to identify, comprehend, and regulates her emotions in decision making and problem solving. Personality and emotional features of an individual have both destructive and destructive effects in

the financial decision making process. Investment decisions are often constrained by time pressure, social rules and regulations, and the continuous change and uncertainty of the market place. As such, monetary and financial decisions are significantly influenced by psychological factors.

The topics presented make reference to ideas and research of the great savants of modern finance. They range from Kahneman and Tversky (asymmetric predisposition of individuals response to losses and gains), Shefrin, Statman, Barber, Odean (selling winning investments too early and keeping the losing ones too much), Statman (theory of regret), Gilovich, Griffin, Kahneman (cognitive heuristics and biases) and others. One critical assumption is to consider the return distribution as normal or lognormal. In a normal distribution, return distribution intervals have a constant measure, in a lognormal distribution, the intervals value depends on the relative value of stock price. If stock price variations are independent, the return distribution is normal, and if log differences are independent and have a finite variance, the price distribution is lognormal. An efficient, fair market should preclude any investor to infer immediate evolution based on past evolution (Bodie et al., p. 342).

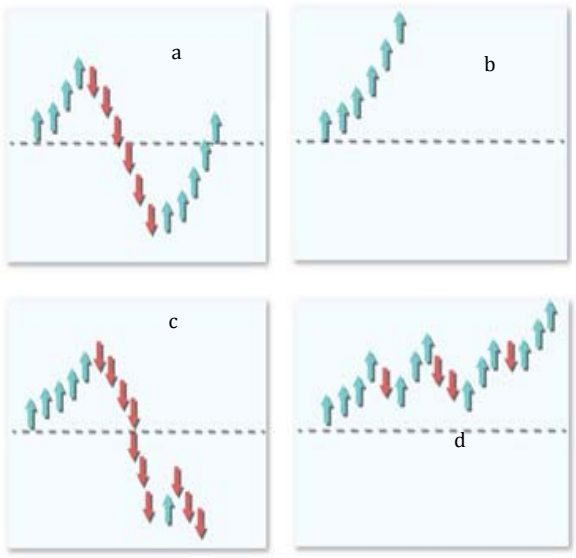
Robert Shiller's' Paper on '*The Volatility of Stock markets Prices'* published in 1987 uses dividend data and real interest rates to seek evidence that true investment value changes through time sufficiently to justify the price changes. His paper concluded that most of the volatility of the stock market 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:



The mean reversion theory suggests that prices and returns eventually move back towards the mean or average. This mean or average can be the historical average of the price or return or another relevant average such as the growth in the economy or the average return of an industry.

This theory has led to many investing strategies involving the purchase or sale of stocks or other securities whose recent performance has greatly differed from their historical averages. However, a change in returns could be a sign that the company no longer has the same prospects it once did, in which case it is less likely that mean reversion will occur. Percent returns and prices are not the only measures seen as mean reverting; interest rates or even the price-earnings ratio of a company can be subject to this phenomenon.



However many times after falling below mean markets don't revert back to the absolute mean (illustration b).

While sometimes after getting oversold (overvalued) and staying above the mean attempting to get back to mean value, markets or asset prices stay overbought and get more overbought (overvalued) (illustration c).

Sometimes there is a clear disregard to mean value, markets ignore the mean totally (illustration d).

A continuous mean-reverting time series can be represented by an Ornstein-Uhlenbeck stochastic differential equation $dxt = \theta(\mu - xt)dt + \sigma dWt$

Figure 1. *How markets pressure to mean reversion*

Ideal mean reversion in illustration 'a' is how markets should express mean reversion. The overbought (overvalued should push back to an absolute mean and vice versa). Where θ is the rate of reversion to the mean, μ is the mean value of the process, σ is the variance of the process and Wt is a Wiener Process or Brownian Motion. In a discrete setting the equation states that the change of the price series in the next time period is proportional to the difference between the mean price and the current price, with the addition of Gaussian noise. One critical assumption is to consider the return distribution as normal or lognormal. In a

normal distribution, return distribution intervals have a constant measure, in a lognormal distribution, the intervals value depends on the relative value of stock price. If stock price variations are independent, the return distribution is normal, and if log differences are independent and have a finite variance, the price distribution is lognormal.

An efficient, fair market should preclude any investor to infer immediate evolution based on past evolution (Bodie et al., p. 342). The local market research introduced also by the paper tests the random walk hypothesis to see if markets move at random and investors do not express any behavioral biases. To test daily return distribution and independence, a regression equation is introduced:

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

Where:
I_t is the index value (the most representative, BET Index) in day t and
ε_t is the residual. Next, to test the linear dependence, paper introduces the regression:

$$\varepsilon_t = \phi_0 + \phi_1 \varepsilon_{t-1}$$

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. Then, the nonlinear dependence is tested by GARCH models
ARCH general model (GARCH (p,q)):

$$r_t = \beta_0 + \beta L(r_t) + \varepsilon_t$$

$$\varepsilon_t \approx N(0, h_t)$$

$$h_t = \alpha_0 + \alpha(L)\varepsilon_t^2 + \gamma(L)h_t$$

Where:
r_t is an ARMA process (p',q')[1] (or AR(p') or MA(q'));
h_t is an ARCH(p) process and GARCH(q).

The 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. We were excited by the idea, first introduced by the paper of Stancu and Stancu (2013), "Rationality versus Irrationality on the Romanian Capital Market", where 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". We have chosen to test BET and BETC as an interesting indicator of the investor over confidence in their prediction power.

The author's conclusion on real economy issuers vs. nominal economy companies: "*The share of successful manufacturing companies confirms the rational economic behavior, consistent with fundamental financial analysis. This conclusion is reinforced by the fact that these companies have evidently stable numbers of trade and significant volumes of sales on the stock market. Moreover, the financial results are obtained based on tangible products sales, which gives confidence in their stability. This is the result of long-term investments in their assets. Other companies in the manufacturing industry, characterized by large fluctuations in turnover and lower trading volumes on the stock exchange, reject the assumption of rational economic behavior. The investors sanction the instability of these companies financial activity and their volatility of the stock price volatility*". This academic path as interesting and a prime on behavioral finance literature: 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., what 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. For the locally available index BET[(2)].

With the following specifications: r_t is AR (1), h_t is ARCH (1), GARCH (1) cu asymmetry factor for *lag* 1, the result is TGARCH (1, 1, 1):

Dependent Variable: D_L_BET
Method: ML - ARCH (Marquardt) - Generalized error distribution (GED)
Sample (adjusted): 3 2721
Included observations: 2719 after adjustments
Convergence achieved after 17 iterations
Variance backcast: ON
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*RESID(-1)^2*(RESID(-1)<0)
+ C(6)*GARCH(-1)

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000481	0.000191	2.520458	0.0117
D_L_BET(-1)	0.194777	0.019558	9.958822	0.0000
Variance Equation				
C	2.69E-05	3.67E-06	7.312937	0.0000
RESID(-1)^2	0.316145	0.039609	7.981630	0.0000
RESID(-1)^2*(RESID(-1)<0)	0.092534	0.057950	1.596802	0.1103
GARCH(-1)	0.557362	0.036212	15.39155	0.0000
GED PARAMETER	1.193076	0.033061	36.08695	0.0000

R-squared	0.027324	Mean dependent var	0.000142
Adjusted R-squared	0.025172	S.D. dependent var	0.015930
S.E. of regression	0.015728	Akaike info criterion	-5.908766
Sum squared resid	0.670881	Schwarz criterion	-5.893556
Log likelihood	8039.967	F-statistic	12.69742
Durbin-Watson stat	2.061150	Prob(F-statistic)	0.000000

This regression is statistically significant, so we can conclude that a significant nonlinear dependence exists between daily returns on that specific index, BET. We can confidently assume that index pattern evolution does not follow a random walk. The local market research introduced also by the paper tests the random walk hypothesis to see if markets move at random and investors do not express any behavioral biases. 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 they are persistent and consistent. For a second index, more comprehensive/composite, BET C:

BETC$^{(3)}$

Dependent Variable: D_L_BETC
Method: ML - ARCH (Marquardt) - Generalized error distribution (GED)
Sample (adjusted): 3 2721,
Included observations: 2719 after adjustments
Convergence achieved after 14 iterations
Variance backcast: ON
GED parameter fixed at 1.5
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*RESID(-1)^2*(RESID(-1)<0)
+ C(6)*GARCH(-1)

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000521	0.000217	2.400159	0.0164
D_L_BETC(-1)	0.200854	0.020807	9.653185	0.0000

Variance Equation

C	2.86E-05	2.67E-06	10.68003	0.0000
RESID(-1)^2	0.308604	0.028024	11.01231	0.0000
RESID(-1)^2*(RESID(-1)<0)	0.090202	0.043393	2.078745	0.0376
GARCH(-1)	0.537597	0.027784	19.34889	0.0000

R-squared	0.026846	Mean dependent var	0.000142
Adjusted R-squared	0.025053	S.D. dependent var	0.015930
S.E. of regression	0.015729	Akaike info criterion	-5.891979
Sum squared resid	0.671210	Schwarz criterion	-5.878942
Log likelihood	8016.145	F-statistic	14.96863
Durbin-Watson stat	2.073197	Prob(F-statistic)	0.000000

For this index also we can construe that this regression is statistically significant, so we can conclude that a significant nonlinear dependence exists between daily returns on that specific index, BETC. We can confidently assume that index pattern evolution does not follow a random walk. 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. For this nonlinear dependence, the model specifications were: r_t is AR (1), h_t is ARCH (1), GARCH (1) with asymmetry factor for *lag* 1, the result is 1, 1, 1). We can confidently assume that BETC index pattern evolution does not follow a random walk.

Conclusions

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 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. 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. The paper advances the idea that the investor psychological biases lead to investment performance to tilt to the mean in the long run and by following the trend, the financial market population do not enjoy significant sustainable benefits. As a reflection of the behavioral biases and influences, the statistical demonstration supports the conclusion that markets do not random walk.

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 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. By following the trend, the financial market populations do not enjoy significant sustainable benefits. 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. The study provides details on raw statistical test scores, regression results and analysis. In this study, I evaluate the association between investors' behavior and her portfolio results. 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 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 financial investment decision and behavior. Personality and other individual circumstances and differences systematically influence investment decisions.

Notes

(1) General format of an AR process with a finite number of p variables contribute to the current level of y variable: $y_t = a_1 y_{t-1} + a_2 y_{t-2} + ... + a_p y_{t-p} + \varepsilon_t$, where a_i are the coefficients to be estimated and ε represents the random residual in a classical regression equation. $\varepsilon_t = y_t(1 - a_1 L^1 + a_2 L^2 + ... + a_p L^p)$. L^i is a lag operator that for the value of the variable for the period and for the current period. The MA process of a q ranking can be arranged as follows: $y_t = \varepsilon_t - \sum_{i=1}^{q} b_i \varepsilon_{t-i}$ and also can be expressed based on time lag: *ARMA process*: $y_t(1 - b_1 L^1 + b_2 L^2 + ... + b_q L^q) = \varepsilon_t(1 - b_1 L^1 + b_2 L^2 + ... + b_q L^q)$.

(2) BET index public data: Apr. 1998 – Ian. 2012.

(3) BET index public data: Apr. 1998 – Ian. 2012.

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