Behavioral finance: biased individual investment decision making; like the company but dislike the investment

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Abstract. Classical economics considers people to be rational, self-interested and self-controlled. Behavioral economics showed instead that we are not as logical and efficient as we might think: we do care about others, and we are not as disciplined as we would like to be. Our intuitive mind works by mean of mental shortcuts that lead to erroneous decisions, since our mind delivers the products of these mental shortcuts, and we accept to follow them, spending the significant mental resources remaining available for other, survival related tasks.

Keywords: psychology, biases, efficiency, individual investment.

JEL Classification: G11, G12, G14.
REL Classification: 5F, 5G, 5K, 7J, 7K, 7L, 10B, 10F.
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., US Stock Price Data, Annual, with consumption, both short and long rates, and present value calculations. (http://aida.wss.yale.edu/~shiller/data.htm). We also use extensively publicly available stock market data for US, Europe and Romanian market.

Introduction
Behavioral finance integrates economic principles with psychological influences of human behavior in the investment decision. The systematic cognitive errors and biases are recurrent and predictable but this can be observed mostly ex post. It is relatively easy to find an explanation on why a certain person assumed a financial decision in some circumstances but it is extremely difficult to use the explanatory power of behavior finance to predict how the respective person will react in the future to the same type of events and within similar circumstances. From a psychological standpoint, investors make non-rational mistakes because the inner resorts of human nature prevail over any education, training and computing power. No matter how sophisticated is the financial and statistical data, the decision has to be implemented by a human being, subjected to emotions and fears, job security constraints, etc. If these biases and errors are recurrent and predictable, that means that a rational investor can profit from non-rational decisions of some noisemakers activating in the market.

A group of Swiss soldiers gets lost the Alps, and after several days of dwindling supplies and increased fatigue, one of the men realizes that he has a map, and with this map on hand, the platoon managed to reach a town. Back to their base, the commanding officer was briefed on how the soldier realized that they have a map. “You found a map, but it’s not a map of the Alps, it’s a map of the Pyrenees...” The story was told by Daniel Kahneman the distinguished laureate of a Nobel Prize in behavioral economics and finance. Although the map was a worthless document, it provided an energetic boost to the soldiers’ confidence, sense of security and the marching order out of trouble.

By understanding stress and how we cope or react under it, the more we understand and believe in what we do in terms of strategic and analytic financial decisions and rely less on guts, rules of thumb, heuristics or emotional biases.
Investors have chronic attention deficit/hyperactivity disorder (AD/HD) with inability to see that stock investing is for the long run. By an articulated discipline an investor can gain confidence on a strategy that worked in the past and on the process in place to measure and ensure that the strategy is repeatable. Investors should not focus on things outside of their control, i.e. stock market prices, but rather on what they really control, information and knowledge. Emotional pain of a financial loss is temporary, but quitting is permanent. Nothing is more difficult, and therefore more precious, than to be able to decide.

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.

Human mind searches patterns. Three is a trend

The field of modern finance has progressed impressively in the last half century, from intuitive concepts of present value of future economic benefits, to diversification and risk measurement, to monetary value of the option to choose, the cycle is complete with behavioral finance comprehensive approach of considering the essential influence of human element in the financial decision. Classic finance foundation lays on strict rationality and optimization of financial decisions. Behavioral finance adds to the equation the psychological and emotional facets of the human decision but still has a difficult task in explaining, on a strict scientific basis, why people behave apparently non-rational when dealing with their or other people’s money.

The larger context: investors should zoom out: the current and historical context is essential. What your competitors do matters most, since the impact of your decisions can be influenced by what competition does

Graph 1: The context is critical in any investment decision:

Central Banks rates of FED, BCE and BNR (the right vertical axis): Consumption, investment lending in sustainable conditions is still far away, while taking into consideration the prolonging and even intensification of cross-border financial deleveraging, monetary accommodation competition between the large central banks.
In general, those that succeeds on the long term, make small gains, systematically (or wins more and more times than they lose). Their investment success is not a simple 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.

Understanding the psychological foundation of human behavior in financial markets facilitates the formulation of investment policy statements for individual investors. 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. Beating the market by outsmart moves ahead of competition, finding undervalued and overvalued securities and implementing the buying and selling decision at the right timing is difficult, if not impossible, in the long run, sustainable way.

Nobody wants to be just a spectator of the game; everybody wants a piece of 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 context and expectation are key determinants of and investment decision. An investor analyzing the table below most probably would be interested in the booming Romanian market:
Investors put too much weight into most recent financial experiences and ignore a longer term, larger perspective. They evaluate other players decisions as discretionary 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. Based on local market data (Romanian Stock Market), the paper contends that benefits of active allocation are small and unsustainable. 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.

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., 1989).
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 FI Index) in day \(t\) and \(\varepsilon_t\) is the residual value.

Next, to test the linear dependence, the paper introduces the regression \(\varepsilon_t = \phi_0 + \phi_1 \varepsilon_{t-1}\). If \(\phi_1\) 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.

**BETFI(1)**

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.012179</td>
<td>0.004333</td>
<td>2.810478</td>
<td>0.0050</td>
</tr>
<tr>
<td>L_BETFI(-1)</td>
<td>0.998839</td>
<td>0.000450</td>
<td>2220.474</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared: 0.999582
Adjusted R-squared: 0.999582
S.E. of regression: 0.026907
Log likelihood: 4534.456
Durbin-Watson stat: 1.739751

Mean dependent var: 9.544222
S.D. dependent var: 1.315671
Akaike info criterion: -4.391915
Schwarz criterion: -4.386457
F-statistic: 4930504.
Prob(F-statistic): 0.000000
Behavioral finance: biased individual investment decision making; like the company but dislike the investment

Regression equation: \( \epsilon_t = \phi_0 + \phi_1 \epsilon_{t-1} \)

Dependent Variable: RESID_BETFI
Method: Least Squares
Sample (adjusted): 3 2065
Included observations: 2063 after adjustments

<table>
<thead>
<tr>
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<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-1.50E-06</td>
<td>0.000588</td>
<td>-0.002556</td>
<td>0.9980</td>
</tr>
<tr>
<td>RESID_BETFI(-1)</td>
<td>0.129934</td>
<td>0.021846</td>
<td>5.947840</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared          0.016875     Mean dependent var -3.18E-06
Adjusted R-squared 0.016398     S.D. dependent var 0.026906
S.E. of regression 0.026685     Akaike info criterion -4.408477
Sum squared resid   1.467593     Schwarz criterion -4.403017
Log likelihood      4549.344     F-statistic 35.37680
Durbin-Watson stat  1.993355     Prob(F-statistic) 0.000000

According to the regression equation that was tested, the \( \phi_1 \) coefficient is statistically significant, we can infer that there is linear dependence between daily returns, and the index series of BETFI does not follow a random walk pattern. Other factors could influence this evolution, and they are persistent and consistent.

For the specific analysis of eventual behavioral influences in the investment management decision making process we tested the nonlinear dependence through GARCH models for financial company’s index, BETFI. We were excited by the idea first introduced by the paper of Stancu and Stancu (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”. We have deliberately chosen to test the financial companies’ index BETFI as a more suggestive of investor over confidence in their prediction power.
The nonlinear dependence is tested through a GARCH model, that is an ARCH general (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 (p’, q’)(2) process, (or AR (p’) or MA (q’)); \( h_t \) is a process ARCH (p) and GARCH (q).

**BETFI**

Dependent Variable: D_L_BETFI
Method: ML - ARCH (Marquardt) - Normal distribution
Sample (adjusted): 3 2065
Included observations: 2063 after adjustments
Convergence achieved after 22 iterations
Variance backcast: ON

\[
\text{LOG}(GARCH) = C(3) + C(4)\text{ABS(RESID(-1)/@SQRT(GARCH(-1)))} + C(5)\text{LOG(GARCH(-1))}
\]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.001589</td>
<td>0.000366</td>
<td>4.346874</td>
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<tr>
<td>D_L_BETFI(-1)</td>
<td>0.118050</td>
<td>0.021970</td>
<td>5.373306</td>
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</table>

**Variance Equation**

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(3)</td>
<td>-0.667941</td>
<td>0.053915</td>
<td>-12.38880</td>
</tr>
<tr>
<td>C(4)</td>
<td>0.319185</td>
<td>0.015548</td>
<td>20.52874</td>
</tr>
<tr>
<td>C(5)</td>
<td>0.942138</td>
<td>0.006394</td>
<td>147.3410</td>
</tr>
</tbody>
</table>

R-squared 0.016616 Mean dependent var 0.001093
Adjusted R-squared 0.014705 S.D. dependent var 0.026949
S.E. of regression 0.026750 Akaike info criterion -4.729761
Sum squared resid 1.472674 Schwarz criterion -4.716111
Log likelihood 4883.748 F-statistic 8.693593
Durbin-Watson stat 1.965885 Prob(F-statistic) 0.000001
According to the tested results, for the financial index BETFI there is a statistical nonlinear dependence, with the following specifications: $r_t$ is AR (1), $h_t$ is an exponential ARCH (1) and GARCH (1), with the end result of E-GARCH (1, 1).

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

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.
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.

Behavioral finance integrates economic principles with psychological influences of human behavior in the investment decision. The systematic cognitive errors and biases are recurrent and predictable but this can be observed mostly ex post. It is relatively easy to find an explanation on why a certain person assumed a financial decision in some circumstances but it is extremely difficult to use the explanatory power of behavior finance to predict how the respective person will react in the future to the same type of events and within resembling circumstances. From a psychological standpoint, investors make non-rational mistakes because the inner resorts of human nature prevail to any education, training and computing power. No matter how sophisticated is the financial and statistical data, the decision has to be implemented by a human being, subjected to emotions and fears, job security constraints, etc. If these biases and errors are recurrent and predictable, that means that a rational investor can profit from non-rational decisions of some noisemakers activating in the market.
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Notes

(2) General format of an AR process with a finite number of p variables contribute to the current level of y variable: \( y_t = a_1 y_{t-1} + a_2 y_{t-2} + \ldots + a_p y_{t-p} + \varepsilon_t \), where \( a_i \) are the coefficients to be estimated and \( \varepsilon \) represents the random residual in a classical regression equation.

\[ \varepsilon_t = y_t (1 - a_1 L^1 + a_2 L^2 + \ldots + a_p L^p) \]

where \( L^p \) 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:

\[ y_t (1 - b_1 L^1 + b_2 L^2 + \ldots + b_q L^q) = \varepsilon_t (1 - b_1 L^1 + b_2 L^2 + \ldots + b_q L^q) \]


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