Behavioral Finance and NeuroFinance and Research Conducted in This Area

Mostafa Sadeghnia *(Corresponding Author)*, Abdolhamidhooshmand**, Habibniko***

*Department of Accounting, Sarvestan Branch, Islamic Azad University, Sarvestan, Iran.

** Department Of Accounting, management and economic college, Shiraz Branch, Islamic Azad University, Shiraz, Iran,

***Department of Accounting, Sarvestan Branch, Islamic Azad University, Sarvestan, Iran.

Abstract
The main objective of the present paper is to review the field of behavioral finance, its new area, the Neuro finance, research carried out in this area. In order to achieve this goal, behavioral finance, its characteristics and Neurofinance are briefly presented. After that, a part of the research conducted on this new field will be discussed. Behavioral finance is one of the new field of financial issues which is a combination of finance (economic) and psychology. The aim of behavioral finance is to study the behavior of investors and financial markets. It is concluded that the behavioral finance can explain some certain capital market behaviors that cannot be explained by existing theories.

Keywords: Behavioral Finance, Modern Finance, Market Efficiency, Neurofinance, Cognitive Psychology.

1. Introduction
The financial field consisted of paradigms including: 1) portfolio allocation based on expected return, 2) risk-based pricing models such as Capital Assets Pricing Model and Arbitrage Pricing Theory; 3) Contingent Claims Pricing and 4) Miller and Modigliani theorem. All above economic idea arise from rationality of investor while the above approaches have much impact on financial context. However, there are many uncertain points that these approaches have not addressed them. For example, traditional models consider a limited role for volume, while these theories emphasize the benefits of diversification. Individual investors make less diversified their portfolios. Finally, it does not seem that expected returns change only due to various risks of securities (Subrahmanyam, 2006: 1).

Why do individual investors trade? How do they deal? How do they choose their portfolios? Why stock efficiency change due to reasons but the risk? Traditional finance has a limited role in answering above questions while behavioral finance can find appropriate answers to questions.

In this paper, the behavioral finance and its characteristics is briefly presented. The interactions of modern finance and behavioral finance will be discussed. Then, the behavior finance and performance of the financial markets is discussed. After that, Neurofinance is briefly discussed. Finally, a review of research involving the field of behavioral finance is presented.

2. Modern Finance and Behavioral Finance
2.1. Modern Finance
A glance at the ideas and studies of financial scholars of the past half-century reveals that the framework of modern financial theory consists of:

1– The lack of arbitrage opportunity: it means that there is no risk-free method to earn profits. Modigliani and Miller (1961 and 1985) first introduced the Arbitrage in their famous study on capital structure. Then, it was used by Ross (1976) arbitrage pricing model.

2- Efficient Market Hypothesis, and the Capital Assets Pricing Model means the market use of any information for asset pricing. The primary was introduced by Bachelier (1900) and Kootner (1960) and became operational by Fama (1970). Capital asset pricing model was formed based on the mean-variance analysis and was generalized by Sharpe (1964).

3 - Net Present Value: with this concept, the present value of future payments or vice versa can be obtained. Its main application is in capital budgeting and assets pricing. The concept of net present value became operational by Fisher (1908) and Hirshleifer (1964).
4 - Mean-Variance Analysis and Portfolio Theory: was introduced by Markowitz (1952). It became the root of development of capital assets pricing model and the investment funds.

5 - Expected Utility Theory: in this theory, it is assumed that the decision maker decides among the risky or uncertain aspects by comparing the expected utility values. Later this theory was extended under conditions of uncertainty as Mental Expected Utility Theory, and under risky condition called von Neumann-Morgenstren Theory (1944) who are the original founders of this theory.

In addition to the above concepts, other theories and concepts such as derivative securities valuation, dividend policy and capital structure are of the valuable findings of financial thinkers. However, the influence of the above factors are far more essential.

The focus of research in modern financial theory is summarized in Table 1.

<table>
<thead>
<tr>
<th>Table 1: The research areas of new theories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modern financial theory</td>
</tr>
<tr>
<td>Analysis of mean-variance</td>
</tr>
<tr>
<td>Capital assets pricing model and equilibrium market models</td>
</tr>
<tr>
<td>Application of the theory of rational expectations, Arbitrage Pricing Theory and Market Efficiency</td>
</tr>
<tr>
<td>Variability estimation based on econometric and quantitative models</td>
</tr>
<tr>
<td>Using behavioral models to explain the behavior of economic agents</td>
</tr>
</tbody>
</table>


2.2 - Behavioral Finance

In this section, four definitions of behavioral finance according to various authors are discussed:

Lintner definition: according to Lintner, behavioral finance concerns the study of how to interpret and act based on information for structured investment decisions by the individuals (Lintner, 1965: 8).

Thaler definition: according to Thaler, behavioral finance claims that sometimes to find answers to the riddles of empirical finance, it is necessary to accept the probability that some agents are not fully rational in economics (Thaler, 1999: 13).

Olsen definition: The behavioral finance is not trying to show wrong rational behavior, but it is trying to demonstrate the use of psychological decision-making processes in the prediction of financial markets (Olsen, 1998: 40).

Statman definition: In an interview and in response to a question on behavioral finance, Statman said that behavioral finance is a framework that boosts some portions of the standard finance and replaces some of its parts with other parts. The contexts of behavioral finance include each structure that would account for the investment functioning. Some of them including the behavior of investors and managers are the consequences of the interaction between managers and investors in financial and capital markets (Statman, 2005: 12).

According to the above definitions, behavioral finance can be summarized as follows:

a. The behavioral finance is the combination of classical and finance economics and psychology and decision sciences;

b. Behavioral finance attempts to explain the causes of exceptions in the financial literature.

c. Behavioral finance examines how investors commit systematic or mental errors in their judgments.

3. Behavioral finance characteristics

Behavioral finance includes two major areas of cognitive psychology and limits to arbitrage. Generally, in modern financial theory, the investors have a rational behavior and seek to maximize their utility. While cognitive psychology manifests that the human decision-making processes are affected due to some cognitive limitations. Limits to arbitrage explains that arbitrage forces are effective or ineffective in the market under what conditions (Talangy, 2004: 17-20).

3-1 - Cognitive Psychology

In total, financial incentives stimulate economic decisions and activities. Basically, it is assumed that decisions and behaviors of investors are rational. Rational behavior is the behavior in which decision-makers take best decisions based on the logic methods and current options (Erfani, 2003: 133). In psychology, especially in cognitive psychology, human behavior is like a system which using a clever interpretation of the available data and
information, legislate them. But, it is assumed that other factors systematically involve in the formation of human behavior (Erfani, 2003, p. 138). Table 2 summarizes the decision-making differences in these two areas.

<table>
<thead>
<tr>
<th>Cognitive Psychology</th>
<th>Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision making is an iterative process.</td>
<td>The decision maker’s preferences are fixed among the options.</td>
</tr>
<tr>
<td>Several factors may affect a decision including recognition, which follows its own rules such as beliefs to interpret situations as if they exist. Inherent incentives, such as feelings, and attitudes (stable psychological tendencies associated with a particular environmental phenomenon).</td>
<td>Decision-maker takes his/her expectations from natural situation and processes data based on statistical principles.</td>
</tr>
<tr>
<td>Memories of previous decisions and its consequences have a strong impact on current decisions.</td>
<td>Decision-maker acts according to maximization theory of von Neumann-Morgenstren.</td>
</tr>
<tr>
<td></td>
<td>Decision maker will such act, as if he/she has precisely designed the probabilities of random events and choose actions that maximize his/her utility.</td>
</tr>
</tbody>
</table>

Intuitive decision-making points out the rules in which people make complex decisions in uncertain environments. Decision-making is not a perfectly rational process taking into account all the information, but decision-maker employ mental shortcuts in this process (Tversky and Kahneman, 1974: 1127). Intuitive decision makings can lead to inefficient decisions. The reasons for non-optimal decisions include representativeness, overconfidence, anchoring, availability bias, gambler’s fallacy and halo effect (Raei and Fallahpour, 2004: 86-90).

3.2 - Limits to Arbitrage

Is arbitrage actually able to eliminate false pricing in the market? The response of traditional financial supporters is positive. The behavioral finance scholars did not give a clearly response to this question. However, they believe that in some cases, arbitrage can eliminate this effect and in some cases it is not able to eliminate this effect (Statman, 2005: 16). Four sources of risk affecting unattractiveness the arbitrage opportunities include fundamental risk (Delong et al, 1991: 12); noise trader risk (Lee, 2001: 234); implementation costs and model risk (Benartzi and Thaler, 2001: 86-85). Figure 1 shows two main components of the behavioral finance and its components.

Figure 1: The two main components of behavioral finance and its components
4. Behavioral Finance and Market Efficiency
The market efficiency is of great importance, because the efficient capital market leads to correct determination of securities prices and capital allocation (Namazi, 1998: 17). Hypothesis of market efficiency is defined in three forms of strong, semi-strong and weak. In the weak market, past information is reflected in stock prices. In a semi-strong market, the stock price reflects the past and available data. In a strong efficient market, all information, including past, available and confidential information are reflected in the stock price (Hendriksen and Breda, 1991: 172-173).

From another point of view, hypothesis of market efficiency consists of the three major components including (1) A market that generates the data, (2). Participants' behavior, and (3) efficient market. All three components must be efficient to ensure market efficiency (Namazi, 1985: 29). Figure 2 shows these three components. The supporters of the efficient market hypothesis believe that the market efficiency is not depend on the rationality of all investors. In a single scenario, irrational investors do not communicate with each other, therefore, their deals is random and non-correlated. Due to the large number of such investors, noisy traders would have no effect on securities prices (Ritter, 2003: 437). Obviously, some exceptions occur in the stock market that cannot be explained by efficient market model and price changes by discounted value of future returns. The efficient market theory has not still correlated the stock market fluctuations with the fundamental principles. It seems that behavioral finance can explain market exceptions (khajavi and Ghasemi, 2005: 56).

5. Neurofinance
From another point of view, behavioral finance can be divided into two parts: behavioral finance micro (BFMI) and behavioral finance macro (MFMA). Michael Pompian (2006) divided behavioral finance into two parts and provided the following definitions:
A. Behavioral Finance Micro: it examines the behavioral biases of investors. The most prominent of these biases include "over-confidence" and "mental accounting".

In fact, behavioral finance challenges two basic assumption of the standard finance. The first issue is the economic wise man and the second is rational and efficient markets debate. Behavioral finance micro examines the challenges ahead of the first assumption. Behavioral finance macro deals with the challenges of the second assumption. Obviously, some issues are related to behavioral finance micro and other related behavioral finance macro. Research conducted in the field of behavioral finance micro has led to new concepts such as eurofinance. In fact, neurofinance is a bridge between brain and financial sciences to obtain a better understanding of the financial and economic decisions of individuals. Neurofinance examines the neurological basis of mental state on financial decisions. Neurofinance led to studies that examine the effect of Affects on the decisions. Afterwards, the effect of various types of hormones on risk-taking of individuals. The various parts of the brain and neural pathways and the effects of different drugs and various states of individual on decision-making method were examined. The evidence represents distinct brain systems in regard to emotional processing. Excessive activity or suppression of each of these systems can lead to errors in decision making including financial decisions. However in this paper, as a subjective, personal and immediate experience, emotion-related thoughts and observations are defined. Naturally, external appearances including facial expressions, tone of voice. And posture considered as mental state. A positive state is indicative of optimism and evaluation of profits or anticipated profits. The negative state will prevent us from positive activities.

Fig. 2. The main components of an efficient market
The decision to make a profit, imagination on expected profit, activates the brain’s reward system. The nerves that transmit information to the reward system, transmit information through dopamine neurons messaging (a chemical nerve agent). Recently, it was found that dopamine is involved in the attention, state, educating, stimulating, reward valuation and follow-up. When the concentration of dopamine in the brain boost using electrical stimuli, individual feels an intense pleasure. This is the same state which is obtained by drug. Dopamine has a major effect on the system of success and increase risk-taking in individuals. Cohen et al (2005) found that the activity of brain reward system is correlated with extraversion of individuals.

Another active system in the brain is loss avoidance system. This system has been studied less and contrary to the previous system, located in different regions of the brain (the nucleus of the amygdala and the anterior insula). The chemical intermediates in this system are serotonin and norepinephrine. The activity of these substances is causing anxiety which are blocked by selective serotonin reuptake inhibitors known as antidepressants. Neurofinance seek to understand the increased and decreased activity of these systems in the brain. Also, it is trying to modify behavioral biases that led to the loss of people. It even examines the effects of various drugs. The important thing is to understand these performance of these systems in individuals assessing the level of risk-taking and risk-aversion and providing recommendations based on it.

6. Research Conducted in the Field of Behavioral Finance

6.1. Investor States

A separate study area examines the circumstances of the investor states. Saunders (1993) indicated that The New York Stock Exchange has an interest to achieve positive returns on sunny days. The returns are moderate on cloudy days (p. 1340). Hirshleifer and Shumway (2003) examined this phenomenon in a number of international markets. This suggests that the investor state (mostly on cloudy days) affects the stock market (p. 1010). Goetzman and Zhu (2005) obtained supporting evidence that this effect is due to the trade patterns of each investors. Thus, it is possibly due to the traders states (p. 562). Kamstra et al (2000) demonstrated that returns on weekend arisen from change from summer time to standard time are very negative (see p. 1007). Edmans et al (2005) pointed out that the results of national sporting events has an overall effect on the country's stock market. It is difficult to imagine above things, but states can contribute to this effect (p. 120).

6.2 - Arbitrage Limitations and the Existence of Irrational Investors

Hirshleifer and Vishny (1997) stated that arbitrage may be limited because elimination of inefficient pricing is cost pricing (p. 42). Daniel et al (2001) argued that arbitrages may not be able to eliminate all systematic false pricing due to risk aversion (p. 932).

There are three arguments that irrational investors are willing to stop their long-term influence. Delong et al (1991) argue that irrational representatives can put an end to more risk tolerance and can therefore obtain higher expected returns in the long term (p. 16). Kyle and Wang (1997) argue that even if the representatives are indifferent to risk, overconfidence causes that rational representatives return their trading activity back to its previous size. In the same state, this may cause that representatives who have a lot of confidence gain higher expected profits than rational investors (p. 2085). Hirshleifer et al (2006) argue that when stock prices affect fundamentals by affecting corporate investment, irrational representatives can gain more profits than rational representatives (p. 34).

6.3. Trading Activity and Portfolio Selection

6.3.1. Existing Patterns in Individual Investors’ Trading

The recent papers of Odean and Barber had a significant effect on our understanding of the activities of individual investors. The stimuli of Odean studies is an article by Shefrin and Statmen (1984) on the effect of desire on Individual investors. The desire to sell early by the winner and long-term stock maintenance by one who has lost (Subrahmanyam, 2006: 28). Odean (1998) found evidence which is consistent with this opinion that the realized profits results in self-confidence of a person, but the realized losses cause that a person implicitly admits an incorrect investment decision, thus avoids it (p. 1783).

Odean (1999) showed that those with the highest volume have the worst performance (p. 1285). Barber and Odean (2001) provided interesting evidence about the benefits and performance of the investor. They argued that women have a better performance than men in individual investments (p. 285). Barber and Odean (2002) found that the investors who choose their investments online have better performance than those who does not select their
investments online. It is believed that over-confidence encourage them to change, over-trading following the change, eliminates the profit (p. 467).

Kumar (2006) explained that individuals apparently prefer outstanding stock (p. 65). Barber et al (2005) pointed out that the individual investors’ trades have an important systematic component. This means that it is not possible to eliminate whole individual biases. This is important for the theoretical models including Daniel et al (1998), which assumes that wrong signals intelligence among the representatives correlated with each other (p. 98). Recently, Hvidkjaer (2006) indicated that small traders purely buy loser mutation stocks, consequently converted to a net buyers of these stocks. This means that they can cause a mutation through a poor response to negative information (p. 25). Hvidkjaer (2005) cited that the imbalance of small investors is negatively correlated with future stock returns among the sectors. Small investors over-reacts to information and their feelings reflection may provide the predictability of stocks (p. 471).

Grinblatt and Keloharju (2001 b) confirmed the effect of trends in a comprehensive study on trading activities. They showed that there are also reference price effects where individual are more likely to sell, if the stock price acquire the upper limit of the past month (p. 1062). A graceful particular test was performed on the reference price effects and trends by Kaustia (2,004) in terms of initial public offerings (p. 225). Kaustia (2004) found that if the stock price is below the predicted stock price, the volume is low. However, when the price is higher than the price offered for the first time, it causes a sudden rise in the volume (p. 228).

6.3.2. Evidence of Derivative Securities Markets

Poteshman and Serbin (2002) presented found that representatives clearly do irrational things such as applying authority right when the sale will lead to greater wealth (p. 54). Stein (1989) and Poteshman (2001) showed that representatives do not appropriate react to stock market information in the options markets (p. 1015). Bakhshi et al (2002) presented evidence that representatives often deal such that the option prices of buying and selling stocks move in a manner inconsistent with comparative statics due to traditional rationality assumptions (p. 578). Coval and Shumway (2005) provided evidence in this case that the specific traders in Chicago Board of Trade Exchange tolerate the risk for a long time to cover the losses in the early days (p. 159).

6.3.3. Portfolio Selection

Benartzi and Thaler (2001) presented evidence on the irrational behavior. At the current time, evidence on individual investors' portfolio choices is relatively limited (p. 92). Goertzman and Kumar (2003) showed that individual investors who are young and have little wealth preserve portfolios which have less been diversified and demonstrate strong behavioral biases with this behavior (p. 34).

Huberman (2001) pointed out that investors prefer domestic stocks. They give priority to invest in a local telephone company in comparison with other investments (p. 668). Frieder and Subrahman yen (2005) presented evidence that individual investors prefer stocks which have well-known brands. This supports the hypothesis of the acquaintance (p. 32). In addition, Grinblatt and Keloharju (2001) pointed out that Finns representatives tend to hold share of companies close the location of the investor (p. 593).

Coval and Moskowitz (1999) demonstrated that the preference of local shares is extended to the managers of investment funds. This means that such managers tend to stocks available in the region of managers (p. 158). Huang et al (2005) argued that managers of investment funds more likely buy stocks than similar managers. The factor that affects the portfolio decisions is the effect of oral statements of social interactions among money managers (p. 240). Regardless of the choice of different equity securities portfolios, Huang et al (2005) investigated that which of representatives invest in equity securities using research data. They found that participation in the stock market is influenced by social interactions, thus, more social representatives more likely invest in the stock market (p. 417). In general, the evidence on individual investment state that representatives are not particularly expert in the trading strategy. Articles that examined trading activities of individuals argue that these representatives do not particularly obtain great returns. In fact, Barber (2004) showed that the transfer of wealth from individuals to institutions is performed through the stock market (p. 56).

7. Conclusion

Why do individual investors trade? How do they deal? How do they choose their portfolios? The responses to these questions are clear in modern finance. Risk and expected return play a central role, but do investors really use the risk and expected return for investment decisions, in practice? The answer is no. Many behavioral finance research show that investors do not have the ability to use the concept of expected risk and return, as modern finance is
intended, but they will commit many behavioral biases in this way. In summary, behavioral finance explains that what is it, while the modern finance expresses what needs to be. However, in order to explain the behavior of the capital market, both are needed and each area can be used in its place. It is recommended that authors and researchers examine the characteristics of behavioral finance on the Tehran Stock Exchange to determine how many investors in the Tehran Stock Exchange show behavioral biases and what is the role of these bias in the capital market behavior.
References


