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A Theoretical Perspective on Behavioral Finance With Lagrangian Approach

Hakan İNAÇ[1]

Marmara University, Engineering Management Science, 34722, Istanbul, Turkey

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Abstract
Behavioral finance is a combination of economics and finance. Behavioral finance studies how emotions and biases affect financial markets. The behavioral finance approach includes the prospect theory and the efficient market hypothesis.
Prospect theory deals with investors' attitudes towards stocks, while the effect of prices on resources is examined in the efficient market hypothesis. Behavioral finance is interested in the impact of factors such as overconfidence, mental accounting, and gambler's fallacy among the factors affecting the investor's behaviors. This paper aims to explain behavioral finance and the effect of behavioral finance on the market value of a company.

Keywords: Financial Market, Behavioral Finance, Lagrange

Introduction

Behavioral finance is a discipline of finance that interacts with psychology and is concerned with how psychological factors affect investors' behavior and decisions to provide a better explanation of finance. Traditional finance ignores behavior and psychology when examining individuals' financial decisions. Traditional finance theory has two main priorities. First, human behavior is rational in the decision-making process. The second is the expected utility theory. Behavioral finance discusses these two areas. The expected utility theory always assumes individuals learning through experimentation. Investors take their feelings into account when investing. Using minds as calculators is a behavior that is unique to robots. Some traders only consider certain calculations when trading. What is rational is that individuals will consider their cognitive limitations when investing, even if they do not want to. Behavioral finance helps investors understand the market, their own investment decisions, and other investors' investment decisions. Similarly, financial markets make it easier for investors to make recommendations that are appropriate to their needs and wishes. Efforts to understand how people behave when making financial decisions have played an important role in the development of behavioral finance, which has developed further since the 1970s. Although the psychology of the investor is quite effective in the financial markets, it has been neglected from time to time. Investors are only economic when making decisions, or the way they perceive past experiences and opportunities, together with financial indicators, are effective in their decisions. Behavioral finance is the application of psychology to finance. According to behavioral finance, investors are rational. In its broadest sense, behavioral finance is the combination of economics and finance. Behavioral finance is interested in how emotions and biases affect financial decisions, companies, and financial markets. The behavior of investors is the result of prospect theory. Prospect theory describes how people evaluate and frame a decision in case of uncertainty. Framing is a common behavior that influences ideas and decisions. In the prospect theory, people reconsider every investment to examine their losses and gains. These are called mental accounting (Gazel, 2014: 6).

[1] *Corresponding Author: hkninac@gmail.com*

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In investment psychology, mistakes caused by behavioral biases stem from self-deception. Self-deception allows the natural selection process to continue at the point when people see themselves very successful and when people make a fool of others (Gazel, 2014: 7).

The economy in traditional finance assumes that the individual is rational. Accordingly, individuals always try to maximize their profits. On the other hand, in behavioral finance, people sometimes behave irrationally as a result of their biases.

Behavioral biases indicate that a person tends to make systematic mistakes in a given situation. Behavioral biases can be divided into two main categories as conscious and emotional bias. Both have a similar effect; however, emotional biases are more likely to cause mistakes when investing. Behavioral biases arising from emotions such as fear and anxiety have an impact on financial decision making.

The concept of behavioral finance began to develop in the 1980s. It has uncovered many market anomalies with the hypothesis of active markets and traditional theories. Many academics, experts and businessmen working in the field of finance and psychology have emphasized that theories are not sufficient to explain behavioral outcomes. They conducted intensive research until the 2000s. Daniel Kahneman's work on human behavior, expectations and decision-making mechanisms was awarded the Nobel Prize in 2002 (Şimşek, 2018 :20).

The behaviorism approach has been known in psychology since the 1900s. Behavioral finance dates back to older times. Behavioral finance can be traced back to Adam Smith's Theory of Moral Sentiments. In his research on behavioral finance, Smith tried to explain behavioral finance with human psychology. Without forgetting that the investor is also a human, Smith gives an example: People suffer from a transition from a good to a bad state. Then they are happy when they are in a good state again. This can be described as loss aversion and not taking risks in terms of behavioral finance (Tufan, 2003: 23).

In 1913, John D. Watson conducted a study of behavioral finance, which had already been studied by various psychologists for three hundred years. It was found that the factors that reveal behavior are not the internal thoughts but the external environment (Aslan, 2016: 26). In the 20th century, various studies were conducted on the concept of behavioral finance. Kahneman and Tversky introduced the prospect theory in 1979. This theory posits that when making investment decisions in various uncertainty situations, the effect of human intuition on investment decisions is important (Aslan, 2016: 27).

1. Factors Affecting Investor Psychology

Overconfidence

People can be overconfident. Psychologists have found that overconfidence causes people to underestimate risks. Overconfidence has two sides: Incorrect measurement and above-average effect. In incorrect measurement, people determine narrow ranges in a probability distribution. An example is a definition made using 20 questions and an 80% response range. According to the above-average effect, people believe that their abilities are better than the average person (Gazel, 2014: 11).

Mental Accounting

Instead of seeing the money they have as a pool, people allocate their capital to small accounts in line with their own goals and wishes and perform their expenditures in this way. According to mental accounting theory, individuals can make poor or wrong decisions with their expenditures. In mental accounting, poor or wrong decisions can be eliminated by trial and error. Many people often do mental accounting in their daily lives. What individuals fail to realize is that this way of thinking is actually quite rational. For example, according to mental accounting theory, individuals who make holiday plans may occasionally and deliberately defer their credit card debts to save money under the pillow. (URL-1: 2018)

Uncertainty Avoidance

Uncertainty can be an objective concept. On the other hand, where information is thought to be insufficient and unreliable by all investors, uncertainty becomes an objective concept in all markets. Uncertainty avoidance means that individuals prefer to take risks based on known probabilities rather than unknown probabilities. In real life, there are many uncertainties around the individual. The most important of these uncertainties is that individuals do not have sufficient information about the current economic situation. At this point, lack of information prevents individuals to perceive risks correctly. Furthermore, even if information exists as a definition, the meaning expressed by information depends on the mental state of the individual. Information is processed and understood in an intellectual process. This change means that the same information is interpreted differently by different people (Kojabad, 2012: 55-56).

Cognitive Dissonance

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Cognitive dissonance is to evaluate a situation according to the way it exists in memory. To give an example of traffic accidents; even if there is an increase in the likelihood of a traffic accident, drivers often do not drive more carefully. After careful driving continues for some time, it will continue to come back. This behavior is based on human mistakes. (Kuzkun, 2013: 16)

Gambler's Fallacy

It leads to an end to positive or negative returns for investors. Gambler's fallacy can accept the arithmetic mean in regression. The arithmetic mean is sometimes misperceived, and as a result, it is thought that the upward trend in the mean laws should be followed along with the downward trend. (Tufan, 2008:55)

Status Quo Bias

People tend to maintain their present state for various reasons. This situation, which William Samuelson and Richard Zeckhauser called the status quo, is seen in various situations. Although the students do not have a seating plan, all teachers know the tendency of the students to sit in the same place. However, the status quo bias is also seen in high-risk situations and can cause problems.

2. Efficient Market Hypothesis

The efficient-market hypothesis argues that in general, prices in an ideal market are created in a way that effectively allocates resources. Prices reflect all information available at any time. All prices are accessible. Markets are effective if they reflect information. The efficient-market hypothesis posits that financial instruments are priced to reflect all the information available on the market. Financial vulnerabilities are possible. Possible price changes are tried to be eliminated by "arbitrage."

Rational investors perform their valuation based on the net present value by discounting future cash assets with the opportunity cost of capital. Investors with asset value will immediately reflect the price when they learn new information. For this, the market must be competitive, and investors must be entirely rational. However, although investors are not entirely rational, markets can be rational. Irrational investors can make random decisions in the markets. Many traders who randomly act will likely eliminate the other's influence on prices. Thus, prices may occur close to the actual value. This argument is based on the lack of correlation between investors' strategies.

In the Efficient-Market Hypothesis, the decision of a single investor or a group of investors cannot affect the market negatively or positively. The efficient-market hypothesis posits that investors who want to maximize their utility functions compete with each other to accurately predict future value. As a result of numerous trading decisions, the equilibrium price is a consensus on the value of a stock and the value of prices observed at a given time is an objective estimate. According to the effective market hypothesis, investors are informed rationally and thus make the right decisions for themselves. Since the prices of stocks that change quickly and accurately with the flow of new information in the market do not show an upward and downward trend, there is no reversal adjustment (Öncü et al., 2001:5).

Poor market activity, investors, all known historical information of the market (transaction volume, prices, news, past financial statements, stories) is related to historical data. Anyone in the financial market can access this information and the market is said to be a weak market if there is no possibility of abnormal gain. Historical prices do not benefit the analyst as they are reflected in current prices. This type of activity makes technical analysis unusable (Yörükoğlu A., 2007: 9).

In the semi-strong market form, it can be said that all information disclosed to the public is fully reflected in the current price of a security. Therefore, investors do not prefer low-value securities. It is impossible for investors to use this information to obtain superior returns. The information available in the relevant productivity form is available to the public. It reflects all information such as balance sheets, dividends, income statement and earnings to market prices. This productivity form makes basic analysis unnecessary. (Yörükoğlu A., 2007: 10)

Prices that meet all public and private information in the form of strong market security are fully reflected in securities prices. In the form of an efficient market advancing strongly, accessing information faster than other investors will not yield higher profits to the investor. The reason is to focus on new prices. The actual situation of financial markets supports relatively weak and semi-strong forms of productivity and is inefficient in the market. (Yörükoğlu A., 2007: 10)

3. Prospect Theory

In their studies on the prospect theory, which they developed against the expected utility theory, which is accepted as the basis of behavioral finance, Kahneman and Tversky (1979) argue that investors are reluctant to sell depreciating stocks. Later, Kahneman and Riepe (1998) show that the deviations of investors from the superior findings of economic rationality are widespread and systematic. Similarly, De Bondt and Thaler (1985) and De Bondt, Werner and Thaler

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(1987), who presented results contrary to the classical hypothetical functioning of markets, found that investors overreact to harsh or unexpected events or information.
Kahneman and Tversky (1979) proposed the prospect theory that would be the basis for people's decisions about gains and losses. Choices between risky expectations lead to a variety of common effects that conflict with the fundamental principles of the prospect theory. Investors try to eliminate the possible risks by focusing on the outcomes that they are certain to achieve. The certainty effect increases risk aversion in options that include gains and increases the risk of dealing with choices involving losses.
The isolation effect results in inconsistent preferences when the same choice is presented in different ways. An alternative theory was developed in which value is allocated to gains/losses rather than final assets and probabilities are changed by decision weight. The value function is normally concave for gains, usually convex for losses, and steeper for losses rather than gains. Except for the low probabilities range, it is seen that decision weights are generally lower than the relevant probabilities.

4. Impact of Behavioral Finance on a Company's Market Value

The methods used in market value calculations are accepted as rational choices. Emotional behaviors and cognitive deficits such as risk aversion, psychological biases, overconfidence, conservatism, and mental accounting have been observed to prevent investors from making rational decisions. Companies direct their activities for a purpose. Generally, in the 20th century, the main objective is to maximize profit. In order to maximize profits and also to increase the peace and welfare of the investor, importance is given to market value. Since the concept of firm value has been introduced, stakeholders of companies (partners/lenders/government) have sought more information. There are methods developed to determine the value of this company. Companies can always affect their market values with the different decisions they make. (Bilgili and Düzer, 2010: 75)
Another area of study of behavioral finance is: Investors who cannot predict fluctuations may tend to sell their stocks after consecutive decreases in stock prices, thinking that the company they invested for will go bankrupt. This is about how investors perceive the situation. So, the market value may not give accurate results about the company. The value of only a company is seen, and one of the variables can be found.
If there are significant results about the firm's market value, the variability of investor behavior may not occur. Traditional financial theories cannot go beyond calculating the market value of companies for investors who want to analyze the general situation of the country to invest in any company's stock.
Comparison with the other companies in the sector is important. Investors, who receive the same information and make rational decisions, and the investments will determine the market value of the company through the rational investor method. However, how well the valuation method is chosen, behavioral financing is accepted. When investors use the same valuation methods (when psychological and sociological factors are neglected), it is natural that they reach the same conclusions. On the other hand, the main factors that affect an investor's view of a firm are cognitive characteristics, the environment in which the person lives, the general situation of the country and other cultural factors.

4.1 Lagrangian Approach and Behavioral Finance

Studies on behavioral finance benefit from physics. Just like in physics, the problem is tried to be solved by the relations of subatomic particles with each other. In doing this, investors are considered as subatomic particles. Considering that human being is a physical system and the relations of environment and elements with each other are within the same physical system, it is widely suggested that at least some of the laws of physics may be the beginning of the solution of the problem.

$$L=E+\lambda \ln P$$

Provided that N is the system of the number of associated elements, P is the distribution probability of the elements, LnP is entropy, and T is the Lagrange parameter, the system is in equilibrium at the point where L (x, y) is maximum under the relevant constraint function.
According to the Lagrangian approach, entropy is expected to be low at the point where L (x, y) is maximum. At this point, the order expectation occurs. Otherwise, entropy is expected to be high, at which point disorder occurs. When the studies on sociology and anthropology are examined, it is important how individuals/communities think in order and disorder. When detailed data on behaviors are obtained, the following conclusion is made: Decision-making processes in communities/individuals living in a system of order are not free. They are dependent more on others than themselves or their environment. Moreover, it can be said that individuals/communities in the form of order create a system of low

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entropy and decisions in systems of low entropy are more predictable. Otherwise, as the entropy increases, the disorder will increase, it is clear that behaviors and investment decisions will be more erratic and unpredictable.
Considering the markets, investors looking for safe ports with low entropy have to decide in mixed systems with high entropy. From a physical point of view, it is known that market makers, who maximize their portfolio and invest at high levels in the market, try to reduce financial entropy by diversifying their investments. The transactions carried out by those who control the market bring higher entropy transactions for small and medium-sized investors.
If communities are to be modeled, it is best to apply simple methods to individual behavior. When applying the Lagrange method, the dependent variable L (x, y) is considered as a possibility of collective satisfaction. Provided that A and B are two different groups, A is an element of the first group, and B is an element of the second group, E (AA, AB, BA, BB) expresses a four-variable equation for cognitive biases, pursuing one's own ideas when making decisions, or being influenced by others' investment decisions. P(AA) is the probability that a person in group A will act according to his or her decisions, P(BB) is the probability that a person in group B will act according to his / her decisions, P(AB) is the probability that an investor in group A is affected by an investor in another group, and P(BA) is the probability that an investor in group B is affected by an investor in another group.
Looking at the relationship between AB and BA, if P(AB) = x, P(BA) = 1-x. By using the equations;

$$E_A = \frac{n(A)}{n(A)+n(B)} \; ve \; E_B = \frac{n(B)}{n(A)+n(B)}$$, constraint function can be written as follows:

$$F(E,P) = E_A\, P(AA) + E_B P(BB) + E_A P(AB) + E_B P(BA)$$

If the Lagrange transformation is to be written in its final form, λ is the degree of conflict between the people in the groups

$$L = F(E,P) + \lambda\left[ln\frac{[n(A)+n(B)]!}{n(A)!\,n(B)!}\right]$$

5. Literature Review

Barberris and Thaler (2002) studied situations that traditional paradigms cannot explain through the concept of behavioral finance, which offers a more modern approach. Basidi et al. (2013) focused on the relationship between behavioral finance and fundamental value. Kaia et al. (2003) discussed the impact of investors' behaviors and organizational cultures on the value approach. Hirshleifer (2001) studied investor psychology and asset pricing. Damodaran (2003), in his work where he also interprets investors' behaviors, grouped investors as active and passive. According to Shleifer (2000), behavioral finance models explain both current financial data better than the efficient markets hypothesis and produce new empirical estimates. These models can explain anomalies such as superior performance of stock values, high returns of stocks in market indices, the persistence of stock price bubbles, and even the collapse of several well-known hedge funds in 1998.
Traversky and Kahneman (1974) said many of the probabilistic questions with which people are concerned belong to one of the following types: What is the probability that object A belongs to class B? What is the probability that event A originates from process B? What is the probability that process R will generate event A? In answering such questions, people typically rely on the representativeness heuristic, in which probabilities are evaluated by the degree to which A is representative of B, that is, by the degree to which A resembles B. For example, when A ib highly representative of B, the probability that A originates from B is judged to be high. On the other hand, if A is not similar to B, the probability that A originates from B is judged to be low

Conclusion

Behavioral finance deals with the extent to which investors' behavior is influenced by psychological factors and how the decision is shaped. In behavioral finance, investors look at past experiences as well as economic and financial indicators when making decisions, and act by the influence of psychological factors.
The main purpose of the individuals who make investments is to get returns. Therefore, the most appropriate investment tool should be selected. However, many investors make systematic mistakes. The reason for this is considered to be psychological biases.
According to behavioral financing, investors are the result of their investments. Investors who begin to see their mistakes begin to deceive themselves by saying what they know, exaggerate their talents, produce excuses to support their own views only, try to improve their talents and also try to attribute their failures to misfortune.

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According to behavioral finance theory, individuals cannot always make effective decisions or may make wrong financial decisions because of their biases or psychological perceptions.
When individual investors occasionally suffer losses in investments whose consequences they cannot predict, they might tend to think "I knew this would happen." By doing so, they try to "avoid the risk with the least psychological harm." When making investment decisions, individuals tend to behave irrationally because their cognitive abilities are limited.

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