Determining the relationship between annual EPS and stock trading volume based on expectancy theory

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Abstract

To overcome the shortcomings and deficiencies in the efficient market theory, financial literacy needed approaches to be more consistent with the empirical evidences. Therefore, some activities called non-expecting utility theories "non-EU" were proposed and other models were also proposed in order to answer empirical evidences. One of the most important theories is the Expectancy Theory. In descriptive model of expectancy theory, investors maximize their value function. Schifrin and Stedman (1985) have changed the expectancy theory to a wider theoretical framework with investment approach, which is called disposition effect. Disposition effect states that investors sell shares in the position of profit sooner and keep shares in the position of loss for a long time. This study examines the explanation of annual EPS in stock trading volume based on disposition theory in Tehran Stock Exchange. To achieve this goal, two hypotheses were proposed: 1) there is a meaningful relationship between positive surprises of EPS and trading volume, 2) there is no meaningful relationship between negative surprise of EPS and trading volume. The results indicate that the relationship between annual EPS and stock trading volume is based on disposition theory. And according to the results of the research hypotheses, there is disposition effect in Iran.

Keywords: Disposition Theory, Expectancy Theory, Earnings per Share

Introduction

Disposition effect is one of the proposed issues in behavioral finance paradigm that expresses one's position when deciding. Disposition effect that is rooted in expectancy theory of Kahneman and Tversky refers to formation of reference point and states that investors will decide based on their selected reference point.

Expectancy theory was first presented by Kahneman and Tversky in 1979. They were looking to propose a theory that describes the behavior of decision makers when facing uncertainty options. They found that decision makers prefer to make the selection options simpler and choices are more satisfactory than having maximum utility. Kahneman and Tversky stated that EU theory is unable to express some of the empirical evidences; so they proposed an S-shaped function. Given to some criteria and based on their view people called all their potential profits and losses the reference point. Expectancy theory is a descriptive decision making theory under uncertain condition, which is in contrast to EU theory. The main part of Expectancy theory is the value function (v).

Disposition effect emphasizes on reference point to investigate the investors' behavior. But what is to be considered as a reference point depends on the investor's preferences. In some researches, purchase price or quarterly EPS or annual EPS is considered as the reference point.

In this paper, is the annual EPS is the reference point, and tries to evaluate the behavior of investors in the form of expectancy theory and disposition effect.

Research literature and Background

One of the most important issues in exploring and discovering patterns and rules governing market is the way of pricing securities traded. Most studies on financial issues emphasize on actively economic rationality and market efficiency. Recent empirical researches have shown that some of the behaviors of investors are

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in contrast with modern financial and neoclassic paradigms; therefore, researchers were faced with a lot of exceptions that were not explainable in terms of theoretical models in the form of modern financial theory or were not compatible with theories of efficient market. Therefore, a new paradigm called behavioral was presented to explain the investors' behavior. Behavioral finance can be known as a combination of financial and economics with behavioral science which tries to explain existing exceptions in the finance literature and people's judgment in systematic errors. In the meantime, many theories were proposed to explain investors' behavior based on theoretical models; therefore, expectancy theory and disposition effect were of such issues presented in 1980s and many studies have been presented so far to investigate this theory.

Jin and Zhou (2008) in an article titled "Behavioral Portfolio Selection in Continuous Time" investigated the optimal behavioral portfolio based on probable and random behavior of variables, and discussed the behavioral concepts' effect on the portfolio selection model in continuous time in Kahneman and Tversky's proposed framework and using Otto process.

Fernandez et al (2009) in an article titled "Behavioral Finance and Estimation Risk in Random Portfolio Optimization Process" examined four behavioral variables: loss aversion, mental accounting, asymmetric risk taking and probability weighting function simultaneously. In this study, they have surveyed estimation risk of the variables based on daily stock index changes in 26 countries in addition to aggregation and testing all four variables in the process of portfolio selection in multiple time periods.

Das and others (2009) in an article titled "Portfolio Optimization with mental accounting" studied and compared Markowitz portfolio selection model, and Stedman and Schifrin proposed portfolio selection model based on mental accounting. They defined risk as the probability of inability to achieve threshold level of yields. Their model is a combination of Markowitz model and mental accounting with the concept of value at risk.

Almenberg and Karaptin (2010) in an article titled "Mental accounting in the housing market" showed that Ness phenomenon has significant impacts on homeowners' borrowing behavior so that leads to tendency towards larger and more expensive loans.

Valery Zakamouline (2010) in an article titled "Portfolio Performance Evaluation based on Loss Aversion" investigated the loss aversion phenomenon and its effects on portfolio performance evaluation and proposeda more comprehensive framework for portfolio performance evaluation beside distribution index of relative torques.

Ert and Ayrf (2010) in an article titled "Description of loss aversion value in decision makings under risk conditions" provided five field researches which show that loss has greater growth than profit. These results show that only under specific conditions, we can have a pattern that loss aversion can be clearly visible. However, this pattern does not appear in the short-term experiments or in other words, it did not appear in the first 10 experiments of long-term experiments. Also, this pattern was not observed in long-term experiments. But, the observed behavior in this condition shows the property of risk neutrality in choices between betting on small size.

They also presented their research in the form of studies conducted by Central Bank of Brazil and showed their research priority in weighting selection of risky assets by comparing their proposed model with Markowitz model.

The only study that could be introduced as the background for this research is the research titled "Survey of quarterly EPS of stock companies as a reference point and its effect on Trading Volume" conducted by Alireza Saranj and Mohsen Sadeghi Batani (2010). The main objective of this study is investigating the formation of reference point on quarterly EPS with respect to its achieved percentage and investigating trading volume from disposition effect view. The results show that the percent of quarterly coverage of EPS over trading volume is more affected by negative and positive adjustments of announced profit. So that by adjusting EPS, trading volume increases and thus disposition effect won't be approved.

Expectancy Theory

Expectancy theory was first proposed by Kahneman and Tversky in 1979. They looked to propose a theory that describes the behavior of decision makers when facing uncertainty options. They found that decision makers prefer to make the selection options simpler and choices are more satisfactory than having maximum utility.

Disposition Theory

Disposition effect is well known in modern theories. This error indicates a natural desire to sell winning stock (profitable) quickly and hold losing stock (loss making) too much. Note that the second part of the disposition effect could provide substantial losses (avoid cutting loss and inutility deals).This effect is observed in small frequent earnings and small

low-frequent losses. In fact trading is impressed by this effect. Accordingly, trading volume is rising in a growing market, and falling in the stagnant market.

Research Hypotheses

The first hypothesis: there is a meaningful relationship between positive surprise of EPS and trading volume.

The second Hypothesis: there is no meaningful relationship between negative surprise of EPS and trading volume.

Research variables and how they are calculated

In this study, the effect of positive and negative surprises or in other words the effect of US and DS variables on trading volume will be discussed; Therefore, the ratio of trading volume increase or decrease should be calculated. For this purpose, trading volume of the day is compared to the average trading volume of 25 working days prior to the announcement and is defined as follows:

$$\ln(V_{it}) = \frac{vol_i}{Mvol_{t-3}}$$

In which vol_{it} is equal to trading volume of the announcement day and $Mvol_{t-25}$ is equal to the average trading volume of 25 working days prior to the announcement and finally natural logarithm is used in order to show the changes in trading volume both negatively and positively.

In the above equations:

US: is a virtual variable that its value is 1 if upside surprise occurs in EPS; otherwise its value is 0.

DS: is a virtual variable that its value is 1 if downside surprise occurs in EPS; otherwise its value is 0.

In terms of mathematics, we can write:

US: Accrual Quarterly EPS > Expected Quarterly EPS

Similarly, decrease surprise in EPS or DS can be expressed as follows:

DS: Accrual Quarterly EPS >Expected Quarterly EPS

PAE: is the effect of positive change of a virtual variable that its value is 1 if positive change is greater than negative change; otherwise its value is 0.

NAE: is the effect of negative change of a virtual variable that its value is 1 if negative change is greater than positive change; otherwise its value is 0.

According to the above descriptions, the method used to perform the regression is integrated re-gression. The used regression is in matrix form and is of cross-sectional data and time-series.

To test the first hypothesis that there is a meaningful relationship between positive surprise of EPS and trading volume, a regression model will be used as follows:

$$v = \beta_0 + \beta_1 US + \beta_2 PAE$$

To test the second hypothesis that there is no meaningful relationship between negative surprise of EPS and trading volume, a regression model will be used as follows

$$v = \beta_0 + \beta_1 DS + \beta_2 NAE$$

According to the disposition theory it is assumed that estimated EPS is considered as reference point, so annual coverage of EPS indicates firm performance and according to the annual declaration of dividend, investor expects estimated EPS achievement to be about 100%. Therefore, if the difference between expected coverage percentage of EPS(as a reference point) and achieved coverage percentage is greater than 5% it is considered as a special event or as a surprise and its effect on trading volume will be investigate. Therefore if the EPS coverage is greater than the expected ratio it is considered as US (Upside Surprise) in the EPS, and if the percentage of achieved estimated EPS coverage is smaller than the expected ratio it is considered as DS (Downside Surprise) in the EPS.

In this study, the effects of positive and negative surprises, or in other words the effects of US and DS variables on trading volume will be investigated. Therefore, the ratio of trading volume increase or decrease should be calculated. For this purpose, trading volume of the day is compared to the average trading volume of 25 working days prior to the announcement and is defined as follows:

$$\ln(V_{it}) = \frac{vol_i}{Mvol_{t-3}}$$

In which vol_{it} is equal to trading volume of the announcement day and $Mvol_{t-25}$ is equal to the average trading volume of 25 working days prior to the announcement and finally natural logarithm is used in order to show the changes in trading volume both negatively and positively.

Methodology

The purpose of this research is practical. The research method is correlational in nature and content. Research has been carried out in the framework of de-

ductive-inductive reasoning. The theoretical principles and research background have been done through library studies, articles, and websites in the form of deductive and information gathering for confirming and rejecting the hypotheses has been done in inductive form.

Statistical Population and Sample

The number of listed companies in Tehran Stock Exchange at the end of 2011 was equal to 466 companies. Data of 117 firms among listed companies in the period of 2002 to 2011 have been used to test the hypotheses.

Methods and tools for collecting

The data used in this study came from the financial statements and notes attached to financial statements, as well as basic information of stock panel.

Research method is correlative, because the variables are interval. In order to perform the statistical tests:

1. Kolmogorov − Smirnov test to investigate normality of variables,

2. Durbin-Watson test to investigate the lack of autocorrelation between errors or errors' independence in regression,

3. Multivariable regression and scatter diagram and line equation that have smaller standard error compared to other statistical methods have been used.

Hypotheses Testing

There is a meaningful relationship between positive surprise of annual EPS and trading volume.

According to the tests, we can conclude that there is a positive correlation coefficient between positive surprise of annual EPS and trading volume in listed companies in Iran's capital market and the F-statistic equal to 1020/37 and Sig=0 indicates significant relationship between positive surprise of annual EPS and trading volume. Thus, hypothesis H_0 is rejected and there is a meaningful relationship between positive surprise of annual EPS and trading volume in listed companies in Tehran Stock Exchange.

Table 1. The first hypothesis test results

Variables	Coefficient estimate	Standard error	T-test statistic	T-test probability
PAE	4.98E+08	21799478	22.84156	0.0000
US	2.98E+08	17969965	16.58085	0.0000
C	-4.65E+09	6.92E+08	-6.713817	0.0000
Coefficient of determination	0.704658	Akaike criterion		48.49241
Adjusted coefficient of determination	0.703967	Schwartz statistic		48.50844
Statistic F-limer	1020.371	Hannan−Quinn information criterion		48.49843
Probability F-limer	0.0000	Durbin-Watson criterion		2.320418
Significance level			0.0000	

V= - 4/65E+09+2/98E + 08*US +4/98E +08 *PE

The t-statistic indicates the significance of independent variables' and control coefficient at the level of α=5% with independent variable. The t-statistic value is equal to 16.580, indicating a direct relationship between trading volume and positive surprise of annual EPS. According to the results, positive surprise of annual EPS and trading volume in firms listed in Tehran Stock Exchange are directly related, it means that by increase of positive surprise of annual EPS, trading volume increases and vice versa.

There is no meaningful relationship between negative surprise of EPS and trading volume.

According to the tests, we can conclude that there is no positive correlation coefficient between negative surprise of annual EPS and trading volume in listed companies in Iran's capital market and the F-statistic equal to 2.37 and Sig=0/065 do not indicate significant relationship between negative surprise of annual EPS and trading volume. Thus, hypothesis H_0 is not rejected and there is no meaningful relationship between negative surprise of annual EPS and trading volume in listed companies in Tehran Stock Exchange.

Table 2. The second hypothesis test results.

Variables	Coefficient estimate	Standard error	T-test statistic	T-test probability	
DS	4.98E+08	21799478	3.884156		0.0654
NAE	-25845.78	3814.54	-2.775595		0.1125
C	-4.65E+09	6.92E+08	-1.713817		0.0952
Coefficient of determination	0.154658	Akaike criterion			48.49241
Adjusted coefficient of determination	0.123967	Schwartz statistic			48.50844
Statistic F-limer	2.370101	Hannan–Quinn information criterion			48.49843
Probability F-limer	0.065214	Durbin-Watson criterion			2.142418
Significance level				0.2325	

$$V = -4.65E+09 + 4.98E + 08*DS + 4/98E - 25845.78*NAE$$

The t-statistic does not indicate the significance of independent variables' and control coefficient at the level of $\alpha=5\%$ with independent variable. The t-statistic value is equal to 3.884, indicating lack of relationship between trading volume and positive surprise of annual EPS. According to the results, there is no relationship between positive surprise of annual EPS and trading volume in firms listed in Tehran Stock Exchange.

Conclusions

Disposition effect is one of the proposed issues in behavioral finance paradigm that expresses one's position when deciding. The results of the first hypothesis are the same as the results of Kahneman and Tvrsky's research in which they proposed expectancy theory and proved it, and also are the same with the results of the Jean and Zhou's study in which they found that trading volume significantly reacts to price increase rather than price decrease, this confirms the utility theory. Shamoy and Arbor described yield with regard to loss aversion using a model based on a set of rational expectations, and their research results are the same as the results of this research.

Schifrin and Stedman have explained layers of the proposed pyramid with respect to the relationship between risky and risk-free assets, existence of home bias and expectation of investor's growth and income level and their results are the same as the results of this hypothesis that confirm the existence of disposition theory in Tehran Stock Exchange. Grinbilatt and Han have surveyed investors' disposition to hold stock faced with price decrease in an article titled "prospect theory, mental accounting, and momentum". They state that this behavior is affected by prospect theory and mental ac-

counting that leads to gap creation between intrinsic value and market value of shares due to lower response to information. Convergence between these prices is created by accidental and gradual evolution of the intrinsic value and updating reference point and confirms the disposition theory, and their research results are alike the results of the second hypothesis of this research.

The results of the first hypothesis are opposed to the results of Rae and others' research. Their results show that the percentage of coverage of quarterly EPS does not affect trading volume and trading volume is more influenced by negative and positive adjustments of announced profit so that by adjusting EPS, trading volume increases and thus the disposition effect is not approved. Another reason that can be cited as the difference between the two papers is that they did tests on 51 companies and the other is the study period that their study is one-year period but ours is 10- years. Another reason is that their research investigated quarterly profits but this research investigates annual profits. Test method was also different in the two researches, Rae and others have used line regression but in this paper the method of data panel has been used.

The results of the second hypothesis are opposed to the results of Rae and others' research. Their results show that the percentage of coverage of quarterly EPS does not affect trading volume and trading volume is more influenced by negative and positive adjustments of announced profit so that by adjusting EPS, trading volume increases and thus the disposition effect is not approved.

Suggestions for further research

Doing a research can open a new door toward future researches and more research is felt necessary.

The following topics are recommended for study by other researchers:

- Investigating the relationship between predicted profits with firm's trading volume

- Investigating the relationship between management performances with firm's trading volume and annual EPS

- Investigating the relationship between annual EPS with the quality of discretionary and non-discretionary accruals

- Investigating the relationship between annual EPS and trading volume with agency cost

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