Investigating the Effect of Excess Stock Returns Volatility on Investors' Heterogeneous Perceptions: Investment Horizons Test

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ABSTRACT

The nature of each investment is not something but to make more profit and more returns for investors. Accordingly, shareholders always seek to control the potential risks of investment through better market intelligence. Nevertheless, excess stock returns volatility caused by impairment in predicting expected returns do not allow investor perceptions in a market to be unified, and most decisions will be affected by emotions even at higher horizons. The purpose of this research is to investigate the effect of excess stock returns volatility on heterogeneous perceptions of investors with the mediating role of investment horizons. The statistical population of the research is the companies listed at the Tehran Stock Exchange. By systematic elimination sampling, 89 companies were selected as the sample that was studied during the period 2013 to 2017. In this research, due to the dummy nature of the dependent variable, logistic regression was used to test the research hypotheses. The results showed that the effect of excess stock returns volatility on investors' heterogeneous perceptions is positive and significant. It was also found that investment horizons exacerbated the positive impact of excess stock returns volatility on investors' heterogeneous perceptions.

Keywords:

Excess stock returns volatility, Investors' heterogeneous perceptions, Investment horizons test.

1. Introduction

Part of disorders in markets and other agencies originate from costly information that may face different reactions from investors in the capital market. Some economic theories are based on the assumption of information completeness (Saranj et al., 2018, p. 32). Therefore, discussion on the role of information in the capital market emerged from rethinking and questioning one of the assumptions of pure competence. Recently, the information economy and asymmetric information issues have a wide range of applications in the capital market, including their effects on investors' perceptional heterogeneity (Boswijk et al., 2007, p. 1939). Perceptional heterogeneity is a consequence of contradictory beliefs of investors and traders in the capital market that lead to the disruption of market equilibrium. In other words, investors, because of the information asymmetry in the capital market, usually have heterogeneous cognitive beliefs about the firm value that cause them to decide regarding the gap between the expected return and real return. Miller (1977), Mayshar (1983), and Morris (1996) believe that when investors have heterogeneous perceptions due to information asymmetry, their stock usually is sold at a discount. More clearly, information limitations cause the pessimist investor doubt about earning the expected returns, leading to a reduction in the value of the investments due to the atmosphere of a decision to sell stocks. Some researchers such as Brock and Hommes (1998), Chiarella et al. (2012), and Frijins et al. (2010) believe that while perceptional heterogeneity may be related to the market structures, but benefiting from specialized insight and strength or reliance on consultations of brokers can be greatly effective in providing a balance of investors' homogeneous perceptions in the capital market. However, information asymmetry affects the investors' perceptions even with the properties mentioned. One the other hand, the existing researches in the area of behavioral finance refer to perceptional heterogeneity as a kind of functional deficiency of capital market and consider it a consequence of irregular volatility in this market made by various factors such as intermediaries and lack of regulatory mechanisms. In these situations, investors make decisions impressed by their cognitive characteristics and perceptual biases that may result in a spate of failed emotions in the market (Eskandarli, 2019, p. 150). Lof (2015) and Schwert (2002) argue that stock market volatility leads to investors' heterogeneity due to making a gap among the expected returns of the investors. The concept of stock returns volatility has not a consolidated and integrated theoretical concept, and it is not possible to define it based on the changes of fundamental variables such as cash flow or dividends, as Shiller (1981), Xu et al. (2017), and Roll (1998) asserted. Nevertheless, as a simple definition, it can be considered the volatility caused by the deviation of the prices from the basic values. Further, the continuity of this volatility and instant variations of the stock prices and returns can be referred to as the excess stock returns volatility (Llorente et al., 2007, p. 1007). Indeed, excessive volatility leads to noise trading and reduces the ability to predict the expected return on investment in corporate equity. The existence of investment horizons can somewhat be considered as an important factor in the impact of excess stock returns volatility on perceptional heterogeneity. Although there is no scientific documentation for this pre-assumption, some studies, such as the works of Zhenxi (2014) and Li et al. (2017), refer to the existence of long-run horizons as a factor intensifying the stock return volatility, especially in markets with economic issues. This volatility fosters the investors' heterogeneous perceptions in trading in the capital market due to the lack of consolidated regulation on information asymmetry, because with a drop in return or even with an increase in the expected returns the tendency to buy or sell the stock increases, regardless of the rational orientations. This issue may reduce the attractiveness of the capital market as a potential market for earning more efficient returns (Khani et al., 2014). Therefore, this research aims to investigate the impact of excess stock return volatility on investors' heterogeneous perceptions based on investment horizon test.

Theoretical background

Theoretical approaches to perceptional heterogeneity of the investors' behaviors

Investors' actual behavior in the capital market, sometimes, contradicts the theory of utility maximization and some other classic theories. Behavioral finance refers to the existence of irrational investors as the cause of the deviation of some stocks from their intrinsic value. The important point is that investment decisions mainly need rational thinking rather than emotional choice (Eskandarli, 2019, p. 150). However, recent researches imply that investors, even the most proficient and trained ones, often rely on their prior feelings and beliefs in decision-making. Investment decisions are not only affected by economic indicators and rationality, but also by other factors such as investment horizon, risk-taking level, self-confidence, assurance about the option, and investment process in the market. These factors have much influence on the investors' behaviors and their decisions, and finally, they can lead to heterogeneity in investors' beliefs and actual behaviors. Therefore, heterogeneity in investors' beliefs in the capital market, i.e., investors' decisions on the stock price is not often congruent, generally occurs due to the information asymmetry and lack of performance transparency in the capital market (Nagel, 2005, p. 281). In the past, pricing the securities has been carried out using the capital asset pricing model (CAPM) and arbitrage pricing theory (APT). The CAPM analyzes all security investors with a unique method and applies a similar economic viewpoint to all conditions. This matter leads to unique estimates of the probability distribution for cash flows from investment in securities. This assumption is often referred to as homogeneous expectations or homogeneous beliefs (Morris, 1996, p. 1114). However, this is not the case in the real world, and investors have different viewpoints regarding the value of assets. Even when the investors have access to common information, they may interpret it in different ways that may affect the stock returns (Raee et al., 2011, p. 105). Miller et al. (1977) proposed a model in which the divergence in opinions led to overpricing with restricted short selling. This theory anticipates that greater divergence in opinions leads to a decrease in future returns. In another theory, suggested by Willian (1977), heterogeneous opinions among investors lead to uncertainty and risk, and, consequently, higher returns are expected. A growing trend of empirical researches shows that heterogeneous beliefs significantly affect stock returns (Ikeda and Zhang, 2013; Janus et al., 2013; Peng et al., 2016).

Stock returns volatility

Due to economic structures and lack of integrated regulation on information disclosure, usually, stock returns volatility in the capital market is unavoidable, and it is an inseparable part of stock returns, especially in unstructured capital markets, leading to an increase in the level of investment risk in the capital market. Stock return volatility always has been the subject of discussion due to its impact on the performance and attractiveness of the capital markets (Long, 2008, p. 2). The discussion of stock return volatility from the investors' viewpoint is usefulness because stock return volatility is considered as a risk criterion. Further, policy-makers in the capital market take into account the stock return volatility to measure how much the stock market is vulnerable (Hasas-Yeganeh et al., 2017, p. 24). Generally, investors believe that steady profit, compared with volatile profits, ensures higher dividend payout. Furthermore, profit volatilities are considered as an important criterion of a firm's overall risk, and business units with more steady profits have a lower risk. Stock return volatility has a significant role in investment decisions so that when firms decide to assess their investment plans, any deviation from the value-adding of the return may bring unusual and unpredicted volatilities due to unpredictability of the benefits of the investment plan. In other words, firms compare the returns on current investment with the benefits of postponing the investment until the information required is achieved or the business conditions improve. Regarding the benefits of postponing the investment in the hope of earning more returns, the gap between expected returns and real returns may enlarge, leading to excess stock price volatility (Arif, 2016). Indeed, stock returns volatility, which is a kind of noise in investment in the stock market, lead to deviation of asset prices from fundamental values, known as non-fundamental risk. These noises, at least for two reasons below, may create non-fundamental risk, which leads to excess stock returns volatility.

1) Misunderstanding of future return: If investors and traders have pessimistic opinions about the returns on a stock, the stock value is at risk of deterioration. Now, if arbitrageurs buy this stock, and pessimism increases among them, besides the stock price decline, the stock returns volatility increases because there is no true perception of decreasing trend of stock returns and prices in the capital market due to interference of arbitrageurs among investors and traders.
2) Individual investor sentiment and herding: There are two views on stock return co-

movement. Based on the prevailing view, current stock prices reflect the present value of future cash flows. Therefore, the correlation between the returns of two stocks is a result of the correlation between the changes in the fundamental values of the two stocks. In this case, arbitrageurs' actions prevent a shock or change in the investors' tendency to a group of assets and the change of their non-fundamental values. In the second view, investors' interactions with the information asymmetry cause them to decide sentimentally to sell their stock with a rumor or a piece of bad news. Therefore, in addition to a change in fundamental factors, the high dependence on asymmetric news disseminated leads to a decrease in expected returns, which involves in further stock returns volatility.

Development of the research hypothesis

Following an investigation of the information on stock prices over 100 years in UN stock market, Shiller (1981) suggested pointed out that excess volatility in the stock market might increase the level of capital market stagnation due to investors' mistrust. He argued that real stock price volatility, which directly affects stock returns, could affect the economic performance of the market in addition to getting affected by it (Zhang et al., 2018). Researches on excess stock price volatility have had a growing trend in recent decades. Flavin (1983) and Akdeniz et al. (2007) tried to prove that there existed no excess volatility in the stock market according to effective market theory. They argued that evidence of price volatility is related to small-sized statistical populations. Schwert (2002), Ofek and Richardson (2003), and Kim and Nelson (2014) studied the prior stock market volatilities implied that external economic factors such as price bubbles, imbalanced business cycles, information asymmetry, lack of information flow and feedback, as well as shocks caused by other financial markets are the main causes of volatility increase. Boswijk et al. (2007), Chiarella et al. (2012), Franke and Westerhoff (2012), Chiarella et al. (2014), Lof (2015), Adam et al. (2016), Schmitt and Westerhoff (2017), and Hommes and in 't Veld (2017) studied the excess volatility in view of investors' behaviors such as heterogeneous perceptions of firms' strategies and investors' herding and sentimental behaviors. The results of the majority of these researches indicated that factors such as stock market volatility and economic changes in markets could affect investors' perceptions and emotional and sentimental behaviors in financial decision-making. For example, Chiarella et al. (2012) investigated the factors leading to investors' behavioral heterogeneity and implied that factors such as crash risk and excess volatility of the S&P500 index over the period 2000-2010 lead to heterogeneity of investors' behaviors. On the other hand, Lof (2015) applied a nonlinear model to show the causes of heterogeneity of investors' behaviors. He found that economic volatility, wide financial constraints, and inefficiency of firms' investments are the factors leading to the heterogeneity of investors' behaviors. Hommes (2013) also showed that investors have heterogeneous beliefs on future stock returns because he considered switching between the firm's strategies, which leads to a reduction in the expected returns, as the cause of investors' heterogeneous behaviors. Accordingly, the first hypothesis can be stated as follows:

Hypothesis 1: Excess stock returns volatility affects investors' heterogeneous perceptions.

Theoretical approaches mainly study behavioral models based on the characteristics of investors and the market. In contrast, the investment horizons and their effect on decisions characteristics in the capital market have not received notable attention. Indeed, individual investors may have different investment horizons due to diverse consumption models (Lee et al., 1990). Therefore, the returns of a targeted portfolio can be considered as a combination of investors' trading behaviors with different investment horizons. Investment horizon is a period based on which investors seek to meet their investment goals. Determination of horizons depends on individual opinions, economic conditions, or any internal or external factor helping investors to choose and formulate appropriate investment strategies. The size of investors' financial goal usually specifies the length of the investment horizon, because larger and more valuable goals need more time than shorter ones. The time horizon, based on the length of the time investors should invest in, determines that to what extent the investors can take a risk, and it affects decisions on the allocation of assets and resources by investors (Marshall, 1994). In other words, longer investment horizons decrease the investment risk but cause that the expected returns differ from the real returns, and the economic conditions for investors are created. It should be noticed that the investment horizon determines how long investors can use compound interest rule to earn more returns (Campbell et al., 2003). Since investors seek to maximize their expected returns while controlling the investment risk, volatilities in their expected returns can affect their investment behavior (Lof, 2015). Indeed, investment horizon includes a perceptual framework of expected returns for shareholders in which each change in this process due to factors such as stock price crash risk, stock returns volatility, and even information asymmetry can lead to the change of perceptual nature of shareholders' decisions (Grinbllate and Han, 2005). Following the above discussion, the second hypothesis is stated as follows:

Hypothesis 2: Investment horizon intensifies the impact of excess stock returns volatility on investors' heterogeneous perceptions.

Empirical background

Ge et al. (2018) researched on the moderation effect of investors and managers' heterogeneous beliefs on the relationship between advertising and firm value. They found that advertising cost has a positive and significant effect on firm value. Furthermore, the heterogeneity of investors and managers beliefs negatively affect the relationship between advertising cost and firm value. Liu (2018) studied the implications of institutional investors' on stock returns in China's market. The results showed that the magnitude of institutional investors' heterogeneous beliefs that contribute to building the portfolios has a significant relationship with profitability. This relationship is stronger in small companies. Further, the impact of institutional investors' heterogeneous beliefs on stock returns is positive for the recent month, but it tends to be negative in subsequent months. Vinh and Phan (2017) studied the investors' herd behavior in Vietnam's stock market using a sample consisting of 299 companies for the period 2005-2015 and provided a comprehensive analysis using daily, weekly, and monthly frequencies. Their results reflect herding behavior over the whole period. Moreover, when the data is divided into three periods, including pre-crisis, during the crisis, and post-crisis, the results obtained are more robust. Zhu and Niu (2016) investigated the relationship between the investor's sentiments, accounting information, and stock prices in Chinese companies for the period 2002-2014. The results showed that investors' sentiments and accounting information simultaneously affect stock prices, and there is a positive and significant relationship between investors' sentiments and expected earnings growth. Furthermore, the results indicated a negative relationship between investors' sentiments and cost of capital. Foucault et al. (2011) studied the individual investors and stock returns volatility. In their research, which considered the period 2006-2010, they found that if the individual investors' trades have a positive impact on stock returns volatility, then, a drop is expected in the volatility of these stocks. Eskandarli (2019) investigated the effect of accruals on the heterogeneity of investors' beliefs and their interaction on stocks returns. They investigated 151 companies listed at the Tehran Stock Exchange over the period 2009-2016 using panel data and multivariable regression. The results indicated that the level of accruals has a positive and significant effect on heterogeneity of investors' beliefs, and the latter affects stock returns. Furthermore, the heterogeneity of investors' beliefs affects the relationship between accruals and stock returns. Badavar Nahandi and Sarafraz (2018), emphasizing the role of financial constraints and time horizon of stockholders' investments, investigated the relationship between stock mispricing and corporate investments. The statistical population consisted of companies listed at the Tehran Stock Exchange, among which 128 companies were selected using systematic elimination sampling for the period 2009-2014. They found that there is a positive and significant relationship between stock mispricing and corporate investments. Further, financial constraints and time horizon of stockholders' investments do not affect the relationship between stock mispricing and corporate investments. There is no relationship between the extent of stock overvaluation and corporate investments. Also, the extent of stock undervaluation does not relate to corporate investment. Khani et al. (2014) studied the relationship between the behavioral pattern of real investors and volatility of the stock returns. They investigated 77 companies listed at the Tehran Stock Exchange over the period 2010-2011. Their results indicated that the behavioral pattern of real investors significantly affects stock returns volatility.

Research methodology

This study is applied research, and, regarding the data collection method, is a quasi-empirical retrospective study in the scope of positive accounting researches. The analysis has been carried out using multivariable regression and econometric models. The statistical population includes the companies listed at the Tehran Stock Exchange during the period 2013-2017. The sample consists of the companies having the following conditions:

1) The company has been listed on the Tehran Stock Exchange before 2013 until the end of 2017.
2) The company's fiscal year ends at the end of March.
3) The company has not changed its business or fiscal year during these years.
4) The company should not be a type of investment and financial intermediation companies (investment companies were not included due to their different nature of activities)
5) Trading interruption in the company during the period mentioned should not exceed six months.

Regarding the above conditions, 98 companies were selected as the sample. The data were taken from the archive of the Tehran Stock Exchange and its website, other relevant databases, and the Rahavard Novin software. Final analysis of the data was performed using the econometric software package Eviews 9 and Stata 14.

Research variables

Dependent variable: Investors' heterogeneous perceptions

Based on the market microstructure and ask and bid prices of Easley and O'Hara (1987), one can provide the investors' heterogeneous perceptions in terms of unusual orders in which the probability of emotional trading arisen by heterogeneous perceptions can be estimated. The values greater than the median and in the range 0 to 1 are considered as perceptional heterogeneity of the investors, and the values below the median reflect the perceptional homogeneity of the investors. The fundamental assumption of this model is that public information is directly reflected in prices without requiring trade activities, while confidential information is reflected in the process of unusual orders. Easley and O'Hara (1992) defined the probability of trading based on heterogeneous perceptions for a specific stock as the estimated arrival rate of informed trades divided by the estimated arrival rate of all trades in a special day as follow:

$$\text{Heterogeneous perceptions}_{it} = \frac{\alpha\mu}{\alpha\delta+2\varepsilon}$$

where α is the probability of an information event, and δ is the probability of bad information event (bad news). In the model above, if no information event appears on a given day, the model is rewritten as follows:

$$\text{Heterogeneous perceptions}_{it} = \frac{\alpha\mu}{\alpha 1-\delta+2\varepsilon}$$

where $1-\delta$ is the probability of a good information event. For each day, the arrival rate of the uninformed traders (without prior perception) either for buying or selling follows an independent Poisson distribution with the probability ε. Indeed, lack of a driver in the market compels shareholders to trade when an information event with the probability μ exists such that they buy with good news (signal) and sell with bad news without considering the desired and positive previous performances of the company. Therefore, given a bad information event with the probability $\alpha\delta$ at a specific day, the arrival rate of buying orders (α) is less than the arrival rate of selling orders ($\mu+\varepsilon$). Also, for shareholders receiving a good news driver at a special day with the probability $\alpha(1-\delta)$, the arrival rate of buying orders ($\mu+\varepsilon$) is greater than the arrival rate of selling orders (ε). Indeed, here, the existence of news as a driver leads to heterogeneity in investors such that the daily and monthly analysis of investors based on the indexes can vary. More clearly, in time t, before the trade, the expected probability of the existence of news, good news, and bad news for investors are as follow:

$$P_n(t) = 1-\alpha$$

$$P_g(t) = \alpha(1-\delta)$$

$$P_b(t) = \alpha\delta$$

In this situation, investors use the public information to buy or sell and adaptation of their perceptual expectations in the market. Let B_t and S_t denote the estimated number of daily sell or buy, respectively. $\mathrm{P}(\mathrm{t}|\mathrm{S_t})$ represents the adaptation of investors' expectations, $\mathrm{P_n}(\mathrm{t}|\mathrm{S_t})$ represents the expectations conditional to no news, $\mathrm{P_b}(\mathrm{t}|\mathrm{S_t})$ represents the probability of perceptional adaptation of investors to bad news, and $\mathrm{P_g}(\mathrm{t}|\mathrm{S_t})$ show the probability of perceptional adaptation of investors to good news conditional on the fact that a sell order arrives at time t (Onur and Demirel, 2009). Conditional probabilities for the time of arrival of a buy order are derived similarly. Accordingly, based on investors' perceptional adaptation from the capital market emotions as a driver under good or bad news, the following equation can be written:

$$\mathrm{P_n}(\mathrm{t}|\mathrm{S_t}) = \frac{\mathrm{P_n}(\mathrm{S_t}|\mathrm{t})\mathrm{P_n}(\mathrm{t})}{\mathrm{P}(\mathrm{S_t})} = \frac{\mathrm{P_n}(\mathrm{S_t}|\mathrm{t})\mathrm{P_n}(\mathrm{t})}{\mathrm{P_n}(\mathrm{S_t}|\mathrm{t})\mathrm{P_n}(\mathrm{t})+\mathrm{P_g}(\mathrm{S_t}|\mathrm{t})\mathrm{P_g}(\mathrm{t})+\mathrm{P_b}(\mathrm{S_t}|\mathrm{t})\mathrm{P_b}(\mathrm{t})} = \frac{\varepsilon_s \mathrm{P_n}(\mathrm{t})}{\varepsilon_s+\mu \mathrm{P_b}(\mathrm{t})} \tag{6}$$

Based on the above equation, the probability of change in perception related to good and bad news, respectively, are represented as follow:

$$\mathrm{P_b}(\mathrm{t}|\mathrm{S_t}) = \frac{(\varepsilon_s+\mu)\mathrm{P_b}(\mathrm{t})}{\varepsilon_s+\mu \mathrm{P_b}(\mathrm{t})} \tag{7}$$

$$\mathrm{P_g}(\mathrm{t}|\mathrm{S_t}) = \frac{(\varepsilon_s)\mathrm{P_g}(\mathrm{t})}{\varepsilon_s+\mu \mathrm{P_b}(\mathrm{t})} \tag{8}$$

The expected zero profit from the bid price, $\mathrm{b}(\mathrm{t})$, is the expected value of investors from the assets in time t. Therefore, ask price in time t influenced by news perception is as follows:

$$\mathrm{b}(\mathrm{t}) = \frac{\varepsilon_s \mathrm{P_n}(\mathrm{t})\mathrm{V}^* + (\varepsilon_s+\mu)\mathrm{P_b}(\mathrm{t})\underline{\mathrm{V_i}} + (\varepsilon_s)\mathrm{P_g}(\mathrm{t})\overline{\mathrm{V_i}}}{\varepsilon_s+\mu \mathrm{P_b}(\mathrm{t})} \tag{9}$$

where V^* denotes the security value in case of no news, $\underline{\mathrm{V_i}}$ represents the security value in case of bad news, and $\overline{\mathrm{V_i}}$ stands for the security value in case of good news. Also, the ask price at time t is as follows:

$$\mathrm{a}(\mathrm{t}) = \frac{\varepsilon_b \mathrm{P_n}(\mathrm{t})\mathrm{V}^* + \varepsilon_b \mathrm{P_b}(\mathrm{t})\underline{\mathrm{V_i}} + (\varepsilon_b+\mu)\mathrm{P_g}(\mathrm{t})\overline{\mathrm{V_i}}}{\varepsilon_b+\mu \mathrm{P_g}(\mathrm{t})} \tag{10}$$

Therefore, the expected value based on driven perception under the effect of news is as follows:

$$\mathrm{E}[\mathrm{V_i}] = \mathrm{P_n}(\mathrm{t})\mathrm{V}^* + \mathrm{P_b}(\mathrm{t})\underline{\mathrm{V_i}} + \mathrm{P_g}(\mathrm{t})\overline{\mathrm{V_i}}$$

Substituting the equation (11) into equations (8) and (9), we have the followings:

$$\mathrm{b}(\mathrm{t}) = \mathrm{E}[\mathrm{V_i}] - \frac{\mu \mathrm{P_b}(\mathrm{t})}{\varepsilon_s+\mu \mathrm{P_b}(\mathrm{t})}\left(\mathrm{E}[\mathrm{V_i}] - \underline{\mathrm{V_i}}\right)$$

$$\alpha(\mathrm{t}) = \mathrm{E}[\mathrm{V_i}] - \frac{\mu \mathrm{P_b}(\mathrm{t})}{\varepsilon_s+\mu \mathrm{P_b}(\mathrm{t})}\left(\mathrm{E}[\mathrm{V_i}] - \underline{\mathrm{V_i}}\right)$$

In (13), $\mathrm{b}(\mathrm{t})$ is the bid price under the information news drivers, and $\alpha(\mathrm{t})$ represents the ask price under the information news drivers. Finally, the equation (14) is used to determine a unified equation based on the bid-ask spread ($\sum(\mathrm{t})$), which denotes the difference between the bid and ask prices in the presence of good news $\overline{\mathrm{V_i}}$ and bad news $\underline{\mathrm{V_i}}$ (Onur and Demirel, 2009).

$$\textstyle\sum(\mathrm{t}) = \alpha(\mathrm{t}) - \mathrm{b}(\mathrm{t})$$

Equation (14) can be expanded as follows:

$$\textstyle\sum(\mathrm{t}) = \frac{\mu \mathrm{P_g}(\mathrm{t})}{\varepsilon_b+\mu \mathrm{P_g}(\mathrm{t})}\left(\overline{\mathrm{V_i}} - \mathrm{E}[\mathrm{V_i}]\right) + \frac{\mu \mathrm{P_b}(\mathrm{t})}{\varepsilon_b+\mu \mathrm{P_b}(\mathrm{t})}\left(\mathrm{E}[\mathrm{V_i}] - \underline{\mathrm{V_i}}\right)$$

The value obtained from the equation (15) is in the range 0 to 1. The median is used to determine the extent of shareholders' perception heterogeneity. A value greater than the median indicates shareholders' perceptions heterogeneity with the existence of news and information, as a perceptional driver, and it takes the value 1. Furthermore, a value less than the median represents the shareholders' perception homogeneity under the existence of news and information on companies and gets the value 0. It is worth noting that including some qualitative variables such as expert knowledge, market knowledge, and use of stockbrokers consultations cannot participate in the effectivity of these estimators, which is set aside in this research.

Independent variable: Excess stock returns volatility

Stock returns volatility (Vol), also called investment risk, is defined as the probability of occurring a real return different from the expected returns (Zhang et al., 2018). To measure this variable, Koerniadi et al. (2014) suggested the following equation based on the standard deviation of daily stock returns:

$$\mathrm{Vol}_{i.t} = \sqrt{\frac{1}{D_{it}-1}\sum_{1}^{D_{it}}(R_i - \bar{R})^2} \tag{16}$$

where $\mathrm{Vol}_{i.t}$ stands for the stock returns volatility of the company i at time t, and R_i is the daily stock return of the company i. The daily stock return of the companies is given by the following equation:

$$R_i = \frac{P_t - P_{t-1}}{P_{t-1}} \tag{17}$$

Here, D_{it} is the number of days in year t for which the daily stock returns of the company i is calculated.

Moderating variable: Investment horizon

In this research, we follow Hubner and Lejeune (2014) to measure the investment horizon. Accordingly, the stock turnover ratio (SHTU) is used as follows:

$$\mathrm{SHTU}_{i.t} = \frac{\textit{The volume of stocks traded}}{\textit{The number of stocks traded}} \tag{18}$$

The trading volume is the number of stocks traded during a given period. The data of trading volumes for companies in a period of one year was taken from the relevant databases. Note that a higher SHTU indicates a short-term shareholders investment horizon.

Control variables

Return on assets (ROA)

Return on assets reflects how the management can efficiently use the assets, and mostly focus on returns of the operating segment. This factor, together with the debt ratio (how the firm uses financial leverages), constitutes the DuPont system. If excess assets are used in operation, it means that operating costs have increased. One of the significant advantages of the Return on assets formula is that it compels managers to control operating assets through controlling the costs, net earning rate, and sale volume (Karami and Akhondi, 2016).

$$ROA = \frac{net\ income}{total\ assets} \tag{19}$$

Profitability (ROE)

Bargeron et al. (2010) and Koerniadi et al. (2014) argued that profitable companies usually possess many financial resources and investment opportunities, and it is expected that they take more risk compared with other companies. Therefore, here, return on equity is used as a measure of companies' profitability as follows:

$$ROE = \frac{net\ income}{market\ value\ of\ equity}$$

Investment opportunities (MKTBEQ)

Following Ferdinand et al. (1999), Abor and Godfar (2010), and Lopez and Vecente (2010), to measure this variable, we use the ratio of the market value of the stock to book value of the stock. Indeed, for companies with more investment opportunities, the expected returns of this investment may be reflected in pricing the stock in the market but not reflected in book value.

$$\mathrm{MKTBEQ} = \frac{market\ value\ of\ stock}{book\ value\ of\ stock}$$

Research model

The following equation is used to test the research hypothesis:

$$\mathrm{Ln}\left(\frac{\text{Heterogeneous perceptions}_{i.t}}{1-\text{Heterogeneous perceptions}_{i.t}}\right) = \alpha_0 + \alpha_1 \mathrm{Vol}_{i.t} + a_2 \mathrm{Horizons}_{it} + \alpha_4 \mathrm{Vol}_{i.t} \times \mathrm{Horizons}_{it} + \alpha_5 \mathrm{ROA}_{i.t} + \alpha_6 \mathrm{ROE}_{it} + \alpha_7 \mathrm{MKTBEQ}_{it} + \varepsilon_{i.t}$$

Here, $Heterogeneous\ perceptions_{i.t}$ is the heterogeneity or homogeneity of investors' perceptions of company i in year t; $\mathrm{Vol}_{i.t}$ is the excess stock returns volatility of company i in year t; $\mathrm{ROA}_{i.t}$ is the return on assets of company i in year t; ROE_{it} is the profitability of company i in year t; and BM_{it} is the book-to-market value of company i in year t.

Empirical results

Descriptive statistics

It is necessary to provide the descriptive statistics of the variables to investigate their general characteristics and to estimate the model and analysis. Table 1 represents the descriptive statistics of the variables tested, including some measures of central tendency and dispersion, for a sample consisting of

445 companies-year observations in the period 2009-2017.

As seen in table 1, stock returns volatility equals 3.105, and the mean value of investors' heterogeneous perceptions is 0.0019. Moreover, the mean of return on assets is equal to 0.124, showing that 12.4 percent of net income is attained by performing companies' assets. Mean profitability also shows that the net income constitutes 19.2 percent of the market value of equity. Finally, the mean value of investment opportunities is 0.311, meaning that market value is as 31.1 percent of the book value of the stock.

Because the heterogeneity of investors' perceptions was defined to get values 0 and 1, the frequency of the observations is used to describe the status of the variables, as represented in table 2.

Table 1: Descriptive statistics of the research variables

Variable	Number of observations	Mean	Median	Minimum	Maximum	Standard deviation
Vol	445	3.105	2.589	0.232	14.021	2.111
$Perception$	445	0.0019	0.0009	0.0002	0.053	0.0032
ROA	445	0.124	0.112	-0.681	0.729	0.133
ROE	445	0.192	0.186	0.007	0.594	0.211
$MKTBEQ$	445	0.311	0.279	-3.12	3.17	0.486

Table 2: Frequency of binary variables based on observations

Variable	Above the median (1)		Below the median (0)		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Heterogeneous perceptions	324	72.80	121	27.20	445	100

As seen, investors' heterogeneous perceptions in the capital market amount to 324 observations (year-company), showing that the existence of news in the capital market may act as a driver of investors' perceptions and evoke emotional reactions in them. In contrast, 27.20 percent of the total observations reflect perceptional homogeneity in the capital market, indicating that false emotions do not exist due to the news available in the market.

Model estimation

As said about the research model, due to the binary nature of the dependent variable, the logistic regression is used. In this test, first, the goodness-of-fit and Hosmer-Lemeshow test, i.e., model adequacy, is examined.

Goodness-of-fit test

The Omnibus test, which examined the model performance, is used to investigate the goodness-of-fit of the first hypothesis model. In this test, the value of χ^2 shows whether the independent variable affects the dependent variable or not.

$\mathbf{H_0: \chi^2 = 0}$ (Excess stock returns volatility does not affect investors' heterogeneous perceptions.)

$\mathbf{H_1: \chi^2 \neq 0}$ (Excess stock returns volatility affects investors' heterogeneous perceptions.)

As seen in Table 3, regarding the estimated value of Chi-Square (13.027) and corresponding significance level, which is less than 5%, the effect of excess stock returns volatility (Vol) on heterogeneous perceptions is accepted, and the model is good fitted. Therefore, at a 95 percent confidence level, the null hypothesis is rejected, and H_1 is accepted, meaning that the main hypothesis is confirmed.

Table 3: Omnibus test

Test	Chi-Square	df	Sig.	Result
Omnibus	13.027	4	0.002	H_0 rejected

Hosmer-Lemeshow test (model adequacy test)

Hosmer-Lemeshow test examines whether the model is appropriate or not, and it provides an index to identify to what extent observation results match the expected results. This statistics is applied to test the null hypothesis and shows the model adequacy. If the significant level is less than 5%, the matching is weak, and the model is not appropriate. Since the significance level corresponding to the Chi-Square statistics (12.643) is greater than 0.05, therefore, the results show that the data has adequacy required to fit the model.

H_0: The model is appropriate (data adequacy)

H_1: The model is inappropriate (data inadequacy)

Table 4: Hosmer-Lemeshow test

Test	Chi-Square	df	Sig.	Result
Hosmer-Lemeshow	11.715	7	0.119	H_0 rejected

Test of hypotheses

The results of hypotheses testing, based on the following model, are presented in Table 5.

$$\mathrm{Ln}\left(\frac{\text{Heterogeneous perceptions}_{\mathrm{i.t}}}{1-\text{Heterogeneous perceptions}_{\mathrm{i.t}}}\right) = \alpha_0 + \alpha_1 \mathrm{Vol}_{\mathrm{i.t}} + \alpha_2 \mathrm{Horizons}_{\mathrm{it}} + \alpha_4 \mathrm{Vol}_{\mathrm{i.t}} \times \mathrm{Horizons}_{\mathrm{it}} + \alpha_5 \mathrm{ROA}_{\mathrm{i.t}} + \alpha_6 \mathrm{ROE}_{\mathrm{it}} + \alpha_7 \mathrm{MKTBEQ}_{\mathrm{it}} + \varepsilon_{\mathrm{i.t}}$$

Table 5: Results of testing the first hypothesis

Dependent variable: Investors' heterogeneous perceptions	Period: 2013-2017		
Observations: 445 (year-company)	**Number of companies studied: 89**		
	Investors' heterogeneous perceptions (HP)		
	Relationship	**Coefficient**	**Wald statistics**
Intercept	?	0.188	2.105
Excess stock returns volatility (Vol)	+	0.414**	6.081
Investment horizon ($Horizons$)	-	-0.048	-1.404
Investment horizon × Excess stock returns volatility ($Horizons \times Vol$)	+	0.466*	6.624
Return on assets (ROA)	-	-0.461**	-3.993
Profitability (ROE)	-	-0.528*	-4.881
Investment opportunities ($MKTBEQ$)	-	-0.479*	-5.894
Cox and Snell coefficient of determination (R^2)		10.4	
Nagelkerke coefficient of determination (R^2)		12.8	
Likelihood		132.617	
Correct prediction percentage of investors' heterogeneous perceptions		51.04	
Correct prediction percentage of investors' homogeneous perceptions		39.96	
Overall correct prediction percentage		11.08	
Investors' heterogeneous perceptions among the total of 445 observations		324	
Investors' homogeneous perceptions among the total of 445 observations		121	
* indicates significance at 5% level ** indicates significance at 1% level			

The coefficient of determination show to what extent the changes in the dependent variable is explained by the model. Cox and Snell's and Nagelkerke's coefficient of determination are the counterpart of R^2 in linear regression. However, the strict value of R^2 may not be obtained in logistic regression. Based on the results in table 6, the Cox and Snell and Nagelkerke coefficient of determination are 10.4 and 12.8 (approximate upper and lower bound), respectively, meaning that at least 10.4 percent and at most 12.8 percent of changes in investors' heterogeneous perceptions are explained by independent, moderating, and dependent variables in the logistic regression. Examining the regression coefficients of the variables for test of the first and second hypothesis show that the regression coefficient and Wald statistics for excess stock return volatility (Vol) are 0.414 and 6.081, respectively, and the significant level is less than 1%, showing that excess stock returns volatility have a positive and significant effect on investors' heterogeneous perceptions. However, the variable investment horizons (Horizons), regarding that its corresponding regression coefficient and Wald statistics are -0.048 and -1.404, respectively, at a significant level higher than 5%, does not have a significant effect on investors' heterogeneous perceptions. Moreover, the second hypothesis shows that the regression coefficient and Wald statistics for the interaction of investment horizons with excess stock returns volatility are 0.466 and 6.624, respectively, at a significant level less than 5%. This result indicated that increasing the investment horizon (Horizons) intensifies the impact of excess stock returns volatility (Vol) on investors' heterogeneous perceptions. The regression coefficient and Wald statistics for the variable ROA are -0461, and -3.993, respectively, and the corresponding values for ROE are -0.528 and -4.881, respectively. Finally, the associated values for the variable MKTBEQ are -0.479, and -5.894, respectively. Regarding the significance level of 5% and 1%, it is implied that all three independent variables have a negative and significant effect on investors' heterogeneous perceptions. To determine the accuracy of the prediction model, we use expectation-prediction evaluation for the binary specification. The results of the analysis show that, generally, in 11.08% of times, the model can predict the heterogeneity or homogeneity of investors' perceptions correctly using independent, moderating, and control variable. Note that 51.04% of predictions (in year-company) in the period studied indicate the investors' heterogeneous perceptions, and 39.6% of predictions show the investors' homogeneous perceptions.

Conclusion

In recent decades, some models for assets pricing have been introduced emphasizing the role of heterogeneous beliefs in financial markets. Indeed, in these approaches, groups of traders and investors preserve different expectations about future prices that evoke them to show different investment performances and decisions, depending on their cognitive and perceptional characteristics and economic conditions that affect investment markets (Xu et al., 2017, p. 3). Regarding the precedent discussion, the objective of this research is to investigate the moderating role of investment horizons in the impact of excess stock returns volatility on investors' heterogeneous perceptions during the period 2013 to 2017. According to the results of the first hypothesis, excess stock returns volatility, caused by disorders in capital market or due to unbalanced economic policies on the capital market, positively affects the investors' heterogeneous perceptions of decisions to buy or sell the stock. The effect is such that often these decisions are not based on a rational implication and mostly originate from the capital market emotions that influence investors' perceptions through asymmetric news and information and prevent predictability of the market. The informed investors are not easily influenced by external

Information, and they constitute a small proportion of the market, and consequently, they have little nor will they easily spread the influence, making their impact on market liquidity very small. In the long run, noise traders dominate the whole market, thus making market efficiency disappear. Their expectations of the market are vulnerable to the external environment and frequently change, so these lead to changes on market liquidity. Behavioral finance theory shows that most investors are actually behavioral investors, and their investment behavior is not always rational. Behavioral finance theory studies the influence of investor sentiment, information cognitive ability, and expected returns on investment behaviors. Influence on market liquidity. Rational investors will not be blindly affected by external information, More clearly, when the trades in the market diverge from the correct path of assets pricing and the investors' expected returns are overestimated or underestimated, investors' perceptions regarding the buy or sell of their stocks are stimulated, leading to a disorder in companies' cash flows. Excess stock returns volatility and disorders impress motivations for investment in companies' stocks due to unbalanced expected returns of investors, and the tendency to investment decreases, because investors may experience higher risk to their investment. Since investment is a decision based on a perception of more earnings, in this situation, investors mostly are affected by a kind of heterogeneity of perceptions in this market and its investments. Our results are consistent with those of Zhang et al. (2019), Brandt et al. (2010), Llorente et al. (2002), and Khani et al. (2014). It is found from the analysis of the second hypothesis that, indeed, the investment horizon is the kind of time planning based on the kind of insight and approach in investment to acquire more returns. The experiential decision process is reproductive as opposed to productive in the sense that it uses cues mentally retrieved from memories of similar past events in processing information. It also encodes information in the form of concrete exemplars, images and narratives. It appears to be relatively non-symbolic and non-linguistic. It is also holistic and very context sensitive. Most importantly, the experiential decision making process is more emotionally driven and motivated by positive anticipated affect or "feelings". In this decision mode decision makers stress a stronger need to feel that they have made a choice that feels right as opposed to one that just looks right, based upon formal calculation. With increased long-run investment approaches, while excess and on-time stock return volatility exist, the extent of homogeneity of investors' perceptions is affected, and investors' behaviors are intensify impressed by uncertainty and predictions on their assets, and this causes them to sell or even buy stocks. Simpler, when the volatility in the stock market has many ups and downs so that shareholders' expectations to earn higher returns are not met, investors' perceptions are affected based on their investment horizons. Processing rules are culturally based and socially learned. Information is evaluated and integrated using formal logic as opposed to informal associations. The rational process requires greater mental effort and is more time consuming and tends to yield superior results where the decision situation is relatively simple. Accordingly, predictability of the behaviors and investment prerequisites in the capital market are lost. This issue highly affects the increase in the level of financial constraints and decrease in the participation in investment in future projects, because, under this situation, investors prefer to choose a market to invest in that is less volatile concerning stock returns and achieving the expected returns. The result of this hypothesis confirms that of Xu et al. (2017), Zhenxi (2014), and Li et al. (2017).

According to the results, in our country, information asymmetry leads to heterogeneity of investors' perceptions. Therefore, it is suggested that a strong regulatory and surveillance mechanism is defined in which thorough and accurate disclosure of information of companies' performance is authorized to the relevant agents so that the capital market is enhanced with further dynamics. This way can improve the economic condition in which creating investment attractions is severely required to provide liquidity. One of these mechanisms is to create an integrated network of information and companies' performance related to their commitments, because a default regarding the thorough and on-time disclosure of this information may result in an explosion of bad news that leads to false emotions in the market. Moreover, it is recommended that companies estimate their investment returns adapted to the economic condition and various risks and refrain from false emotions that may cause volatility in markets and trading. Companies should have appropriate economic insight in choosing investment plans and projects so that, in this way, while creating investment attractions for traders, the excessive expectations of the future are prevented. Further, companies should draw their investment horizons for shareholders and investors in long-run periods according to their financial strategies so that intense pressures by investors in unplanned periods are prevented, and the problems related to the resource financing are avoided in this situation.

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