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The Effect of Fundamental Variables on the Formation of Herding Behavior in the Iranian Capital Market

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ABSTRACT

In recent years, with the governance of behavioral finance paradigm and the standard national theories being challenged, due to their disability in explaining the observed anomalies in the capital market, financial researches have entered into a new intellectual era and in some of the researches, assumptions of modern financial economics have been challenged. One of these assumptions is the assumption that investors are logical and this is seriously challenged and several studies have been devoted to this issue. The purpose of this study is to investigate the effect of fundamental variables on the formation of herding behavior in the Iranian capital market. Experimental findings of the investigation of 110 companies listed on the Tehran Stock Exchange from 2009 to 2019 shows the formation of herding behavior in the Iranian capital market. The results of the present study also confirm that there is a positive and significant relationship between changes in the fundamental variables of accounting (changes in stock returns, changes in assets, changes in sales) and the formation of herding behavior in the Iranian capital market. Analyzing these results, it can be stated that changes in fundamental variables lead to the formation of unintentional herding behavior in the Iranian capital market.

Keywords

Behavioral Finance, Changes in Stock Return, Asset Changes, Sales Changes, Herding Behavior.

1. Introduction

Investing in corporate stocks is one of the most risky options for investors in the financial markets. Financial markets have a non-linear and chaotic system, which is influenced by the political and economic conditions of countries and the psychology of investors and the behavior of the capital market. In recent years, we witness the governance of behavioral finance paradigm and challenging the standard financial theories due to their inability to explain the anomalies observed in the capital market, therefore the financial researches have entered a new intellectual era, in some of which the assumptions of the modern financial economy have been challenged. One of these assumptions is that investors are logical which is seriously challenged and several studies have been devoted to this issue. Today, it has become increasingly important and stock market prices in financial markets are determined more by psychological attitudes and factors than by fundamental and technical analysis, so the study of group behaviors and market psychology has become more important. In emerging financial markets, the lack of information and lack of timely and accurate information about a particular company, as well as the impact of macroeconomic and political factors on financial markets, causes investors to focus on the behavior of other investors and follow them and thus this leads to herding behavior occurs in these markets. Herding behavior is one of the most important Behavioral Biases discussed in the behavioral finance paradigm that can have a significant impact on the performance of capital markets (Jamshidi et al., 2019). Herding behavior as one of the basic topics discussed in the paradigm of behavioral finance, explains a situation in which investors in financial markets trade uniformly and in the same direction for a certain period of time. In case the reason why investors show herding behavior is that they used the same and common information and data, then the herding behavior formed in the capital market is called false or unintentional (spurious) behavior. Unintentional herding behavior can be considered as a kind of fundamental adjustment of prices that shows the market information performance and the optimal allocation of financial resources based on fundamental market variables. In contrast, real (intentional) herding behavior occurs when investors for some irrational or logical reasons, ignore their personal information, analysis, and knowledge and intend to follow and imitate the decisions of other investors. Contrary to the spurious herding behavior which shows the efficiency of the capital market, the real herding behavior is considered an abnormal behavioral phenomenon that can lead to disruption in the equilibrium relationship of the capital market and consequently the inefficiency of the capital market (Saeedi & Farahanian 2015, P 453-460). In fact, what we do in this study is to investigate the effect of fundamental variables on the formation of herding behavior in the Iranian capital market. The collective behavior of investors in the capital market is a type of behavioral biases that can have devastating effects on the performance of capital markets. Various methods and models have been proposed by researchers and experts to measure and quantify the collective behavior of investors in different stock exchanges around the world, each of which is suitable for certain conditions. Accordingly, the main question about the existence or non-existence, why and how collective behavior emerge and its roots and origins of emergence in financial markets is a necessary and unavoidable challenge. Considering the conditions of the Iranian capital market and the probable hypothesis of the existence of the phenomenon of collective behavior in the Iranian capital market, the question can be stated as follows: Is the Iranian capital market affected by the phenomenon of collective or herding behavior? Are the same results obtained in the Iranian capital market under different models and patterns of behavioral phenomenon measurement? Are there any variables that play a determining role in the occurrence of this behavioral phenomenon in the Iranian capital market? What distinguishes this research from other international and domestic researches is that some domestic researches investigated the formation of herding behavior through survey and questionnaire. However, in this study, we examine herding behavior through the financial data of companies listed on the stock exchange. In addition to examining the factors influencing the formation of herding behavior, a model for measuring herding behavior based on fundamental variables is presented. On the other hand, contrary to foreign researches that examine the formation of herding behavior is investigated using one or more limited samples (mainly using the trading data of all investors in one or more stockbrokerage) which are naturally slightly generalizable, in this study, we examine the financial data of companies listed on the

Tehran Stock Exchange for a period of ten years. Finally, in contrast to most related research conducted in developed countries with investors' business attitudes, in this study we examine the formation of herding behavior in a developing country with collectivism features. In the following, theoretical foundations of research, research background, hypotheses, and methodology and research findings are presented.

2. Theoretical foundations and literature review

By the late twentieth century, neoclassical financial theories were the dominant paradigm in national markets. The rationalization of human beings was the basic assumption of these theories, a topic that has been challenged in recent decades, mainly with the introduction of psychology to economics and finance, and behavioral finance has gradually become the dominant discourse among theorists of finance.

2.1. Theoretical foundations

Herding behavior

Behavior is the usual way of acting and living. In psychology, behavior is defined as an individual's reaction (both in normal life and in a particular social situation). According to most experts, collective behavior is the pattern of unstructured, spontaneous, emotional, and unpredictable behaviors. People who follow a collective behavior react to a specific stimulus that may be another person or a specific event. The phenomenon of herding behavior is one of the well-known behavioral biases of investors in financial markets. Collective behavior or herding behavior represents the correlation of investors' transactions and making investment decisions by following the behavior of other investors or showing the same behavior with the investment behavior of the whole market (Xheng and Shiang 2010). The reasons and factors for the formation of herding behavior of investors in financial markets can be classified from different aspects. Being whether individual or institutional investors, analyst or only investor, compulsory or optional, conscious or unconscious herding behavior, all of them are the basis for classifying the phenomenon of collective (herding) behavior in financial markets. In herding behavior, investors and activists in capital markets ignore fundamental and technical knowledge and analysis of companies and their personal experiences with the price and volume of stock exchanges and make decisions only based on the behavior of other micro or institutional investors (Bikhchandani et al., 2000). One of the reasons why investors' judgments at similar times are the same is that people react similarly to the same information, and the community has a tremendous impact on individual judgment of investors. (Johnson, Lindblom, Platan, 2012; pp. 19-18) This concept of human interaction was first used by Niche (1886), and later Keynes (1936) used it in economic terms. Among the growing concerns about the impact of behavioral factors on financial markets, herding behavior has gradually been studied. There are several definitions of herding behavior in financial markets, which are quite similar in nature, but express different manifestations of herding behavior. For example, Bikhchandani et al. (2001) define herding behavior as a situation in which investors ignore their beliefs and imitate other investors. Hence, the irrational aspects of this phenomenon are included. In the present study, a broader definition of herding behavior is used, which is used in the research literature. Herding behavior is seen when "a group of investors trades in the same direction as market indicators or other investors over a period of time" (Nefsinger, Politics, 1999), as pointed out in (Xheng and Shiang, 2010), using this definition, researchers pay attention to both logical and irrational aspects of herding behavior. Therefore, the aim of this study was to provide further evidence of the complex herding behavior problem and the factors associated with its emergence and formation. According to research by Liu and Huang (2011), the phenomenon of herding behavior is evident even in the behavior of institutional investors. Intentional herding behavior is obtained from the strong desire of investors to repeat the actions of other investors in the market. This kind of herding behavior assumes that investors suppress their ideas, beliefs, and knowledge and imitate the decisions of others in pursuit of obedience to the market. Investors deliberately take advantage of such behavior in the form of positive or informational or professional side effects (Gavirilis et al., 2013; Gunny et al., 2017). The subject of herding behavior suggests that human beings tend to behave like other people in society. When the herd or most people in the community do something special or react in a specific way or follow a

certain idea and fashion, it will be mentally difficult for other people in the community to behave differently from the majority of the herd. Be. In other words, herding behavior is the behavior of a group of people who act similarly. Research has shown that many investors in the capital market, who trade stocks, use the information exchanged based on existing relationships between investors. In this regard, we can point to the impact of social networks and the Internet and technology on stock prices (Harrischifer et al., 2012). By studying the economic crisis, we can trace the herding behavior before various crises, especially in the stock market and other financial markets. In stock markets, there are many investors and even investment fund managers who, apart from conducting expert analysis and searching for sufficient information, buy and sell stocks and risky situations and falling prices, they quickly sell stocks and look for another safe place to invest. According to many researchers, the formation of herding behavior increases market fluctuations, fosters market volatility and increases market fragility.

2.2. Research background

In a study, Styliani et al. (2020) examined the impact of monetary policies on the formation of herding behavior at the international level. In this study, for the first time, the investigation was carried out on the expansionary and contractionary monetary policies of the US Federal Reserve and the European Union on the formation of herding behavior in the stock market at the international level. Findings from the study show that central bank policies such as lowering bank deposit rates lead to a shift in liquidity to the stock market. This increase in liquidity will lead to emotional behavior in investors and the formation of herding behavior in the capital market. The central bank's adoption of conventional monetary policies also justifies a significant percentage of the deviant herding behavior in the US stock market. While the EU central bank expansionary policies have led to an increase in the formation of herding behavior in the Italian and Spanish stock markets, Buchner et al. (2020) in a study entitled "Herding Behavior in Investing in Stocks" examined herding behavior in the managers of international investment fund tend to invest in the stocks of holding companies and invest in stocks of companies with a fundamental structure. The study also shows that when stock market faces fluctuations, the herding behaviors emerge in investment fund managers. This group of investment funds are looking for stocks that will increase the fund's returns and reduce the investment risk of the fund.

Zaremba et al. (2020) surveyed the stock market in 64 countries between 1973 and 2018 in a study entitled Herding Behavior and Interest, Market Expansion, and Stock Return. In this study, the effect of market size and stock price returns and fluctuations and the trend of changes in financial markets on the formation of herding behavior in rising and falling periods have been studied. The results show that the herding behavior existed in all markets at different time periods and the size of the stock market and the number of investment portfolios in the rising periods leads to a decrease in herding behavior.

In a study, Wanga & Wang (2019) examined the formation of herding behavior, and the impact of social network on stock price fluctuations in China. The results show that investors' expectations are highly dependent on the views of the environment around them, especially micro shareholders who have been influenced by a trusted person (people with influence as a role model). They believe that micro investors follow the pattern of institutional investors. These capital market leaders (like those with spiritual power) may manipulate and direct financial and price information and data when sending information to their surroundings. Therefore, researchers say that it is not yet clear whether herding behavior in this situation arises from financial markets or not. In a study, Wang et al. (2019) examined the effect of initial public offering on the formation of investor's herding behavior in the Taiwan stock market. In this regard, they stated that the initial public offering in Taiwan mainly includes the initial fixed price and the cost of issuing shares, which only allows individual and small investors to buy the shares and carry out this group of transactions. The research findings show that the initial disclosure of companies' financial information in the initial public offering in the Taiwan stock market has no effect on the formation of herding behavior. Investors are still seeking to buy stocks in the days following the initial supply from the companies which offered it. The request to buy this group of shares, assuming the share price growth in the short term, makes it possible to that the herding behavior of investors in Taiwan emerges. In general, the experimental results of their studies showed that

investors are very attracted to the issue of initial public offering.

In a study, Jamshidi et al. (2019) investigated the behavioral biases and performance of individual investors in Tehran's capital securities market. For this purpose, they examined and analyzed the status of portfolio of individual investors during the five-year period from 2012 to 2016 and used multiple indicators to measure behavioral biases. They also investigated the relationship between behavioral biases and investors' performance through portfolio study. The results show that overconfidence biases and representativeness and disposition effect are more or less common among investors. There is also a significant relationship between overconfidence biases and representativeness with investors' performance, while this relationship is not significant for the disposition effect. Specifically, investors with higher portfolio turnover as well as more focused portfolios have achieved higher returns. Behavioral biases are more or less popular among investors and these biases can affect investors' performance.

Shirazian (2019) has conducted a study entitled "Investigating the effect of different types of herding behavior of analysts on stock prices of companies listed on the Tehran Stock Exchange" using network analysis." In this study, undirected weighted networks were used to study the herding behavior of analysts and then a new index was formed based on the average degree of nodes and the average weight clustering coefficient to examine different types of herding behavior. Research results show that every industry has a certain degree of herding behavior among analysts. In some industries, such as technical and engineering, analysts are conscious of herding behavior, and in others, such as pharmaceuticals, they are unconscious. The next result is that unconscious herding behavior has a positive effect and conscious herding behavior has a negative effect on stock prices.

Shams & Esfandiari Moghaddam (2018) in their study examined the relationship between herding behavior and performance and characteristics of investment companies. In this article, using data related to eighteen investment companies listed quarterly in the capital market of Tehran securities and exchange, the relationship between herding behavior and the performance and features of these companies have been studied using the Vardaru and Jiang model (2013), and in order to analyze the data and test the hypotheses, the method of ordinary least squares and generalized least squares has been used. Also, in order to eliminate self-correlation, the auto-regressive first-order moving average model has been used. The findings suggest that herding behavior in investment firms has a significant negative relationship with the performance (risk-adjusted return) of these companies. In addition, the results indicate that there is a significant relationship between herding behavior and characteristics of these companies. Actually, the herding behavior has an indirect relationship with the growth of assets, return in the previous season, cash flow, change in sales growth, change in net profit and change in gross profit, has a direct and positive relationship with the ratio of cost and portfolio turnover.

Amirkhani & Afshari (2018) in a study examined the effect of confidence and inconfidence in available information and behavioral characteristics of investors on the creation of herding behavior. For this purpose, a questionnaire was first designed, to identify investors' behavioral characteristics and how they make decisions about buying and selling stocks when they have confidential public and private information available, in order to determine which investment and what behavioral characteristics reply more on their confidential information and what investment and what behavioral characteristics use public information more and make decisions accordingly. The data were extracted from the questionnaire and then analyzed with appropriate statistical tests. The results showed that when there is not enough confident in information, people generally use their confidential information or do not make decisions, and when the confidence is average, the majority reply more on the public information and imitate others, and when confidence is high, they also use public information more and follow others, but this degree of confidence leads to less herding behavior than in average confidence because more individuals use analysts' suggestions, which reduces herding behavior in them.

Dostar et al. (2017) in their study, investigated the effects of herding behavior on the risk taking of managers in investment companies of the capital market of Tehran securities and exchange. They stated that today, herding behavior, which is one of the most important behavioral biases among investment companies, managers and investors, plays a very important role in risk acceptance, stock returns and

investment portfolios. The statistical population of the study included all CEOs and managers related to investment in investment companies listed on the capital market of Tehran securities and exchange. To analyze the hypotheses presented in the form of a conceptual research model, they used partial least squares structural equation modeling. The results of their analysis show the confirmation of the main research hypothesis and the four sub-hypotheses associated with it. The results of their study showed that there is a negative relationship between risk-taking and herding behavior of investment company managers. In their research, Shayestemand and Pourzamani (2017) discussed the effect of intangible information on the herding behavior of institutional investors based on the Christie and Huang and Lakonishok, Shleifer and Vishny models. The results indicate that while the effect of intangible information on the herding behavior of the institutional investors is confirmed, this effect is more significant in Christie and Huang model than in Lakonishok, Shleifer and Vishny models. Shams & Esfandiari Moghadam (2017) in their research examined the effect of herding behavior on the performance of investment companies based on modern and postmodern portfolio theories. In this research, the monthly statistical data of 24 investment companies have been studied using the Lakonishok model (1992). For this purpose, first the stationary of the research variables was examined, then the generalized least squares method and generalized method of moments were used to analyze the data and test the hypotheses. The findings show that herding behavior in investment firms has a significant negative effect on performance criteria both on the basis of modern theories and portfolio postmodern theories. In other words, herding has a negative and significant effect on all performance criteria, namely the ratios of Jensen, Sharp, Treynor, Sortino, optimal potential, modified Omega and Treynor, and Modified Jensen. Ramezani & Fallah Shams Lialestani (2016) in their research addressed the impact of unusual fluctuations on the emergence of herding behavior in the capital market of Tehran securities and exchange. They argued that herding behavior is one of the behavioral biases among investors and is considered an important element in financial markets, which sometimes causes turbulence in situations where information is disclosed. Investors in the Tehran Stock Exchange rarely use quantitative methods to determine the value of stocks, and their judgments are based more on imaginations (mental accounting), unscientific information, rumors, and blind following of a small number of people who act as leading contributors in the capital market. In this regard, in this study they examined herding behavior and unconventional deviation of the exchange rate. A multivariate regression model was used with combined data method and compare means test of a population. The results of their research hypotheses showed that there is herding behavior in the securities capital market. Also the results indicate that there is a significant relationship between unconventional deviations of exchange rate and herding behavior and during the period of small changes in the exchange rate, this relationship was negative and when the exchange rate has big changes, this relationship is direct. Soroush Yar & Ali Ahmadi (2016) in a study entitled "Investigation of the impact of momentum and emotions of investors on herding behavior" examined the factors affecting the occurrence of herding behavior. The results of their research showed that investors' feelings have a significant effect on herding behavior. However, no evidence was found about the significant effect of variables of momentum and company size on herding behavior. In the following section, experimental evidence on the subject of herding behavior documented by researchers in this field is explained. According to the structure of the previous section, we first follow the findings of institutional investors and then we have the results of all investors in the financial market. Initially, research on institutional investors was mainly focused on the US market.

3. Research hypotheses

Dong and Lane (2016) stated that non-fundamental factors (factors other than financial data) are the main reason for the formation of herding behavior in financial markets in Vietnam. In a study, Philip et al. (2015) examined four developed European markets, including France, the United Kingdom, Germany, and Italy, and their findings confirmed the presence of investors' herding behavior in the financial markets of developed countries. Lack of transparency in financial data and information asymmetry encourage investors to make decisions by tracking the actions of other investors. These results are not due to the weakness and lack of information quality used in decision

making by the investors. Recent evidence supports the formation of herding behavior in financial markets (Balkilar, Demir, Hamodeh, 2013; Balkilar et al., 2014; Gunny et al., 2017). Several evidence of the formation of herding behavior in financial markets may be related to the lack of distinction between herding behavior resulting from basic and non-fundamental information. If investors show their herding behavior toward the middle market through one type of information, while they release another type of information through it, these effects may lead to no herding behavior if summed up. Therefore, the distinction between herding behavior resulting from fundamental information and non-fundamental factors is very important. Research backgrounds show that the effects of institutional investors on emerging and developing markets are greater than those on developed ones. In this case, investors are expected to exhibit herding behavior, which is largely driven by non-fundamental factors, in less developed markets, due to low information transparency; they are encouraged to use less public information and rely more on herding behavior. (Balkilar, Demir, Hamodeh, 2013; Butcher et al., 2014; Dong and Lane, 2016; Jenny et al., 2017). As a result, in this study, we distinguish between herding behavior caused by fundamental and non-fundamental information and expect that herding behavior in the Iranian financial market emerges by non-fundamental factors due to more transparent information environment so that it forces investors to infer information from the decisions of other investors. Therefore, the first hypothesis is as follows:

Hypothesis 1: In the Iranian capital market, the investors have herding behavior.

The regression model for testing the first hypothesis is based on the Dong, Lane (2016) model, Jenny et al. (2016) and Gunny model et al. (2017) and is as the follows:

$$CASD_{it} = \beta_0 + \beta_1 [R\, m_{it}] + \beta_2 R^2\, m_{it} + U_{it} \quad (1)$$

Experimental studies on the asymmetries of herding behavior show that herding behavior is more evident in the period of negative market returns. Chang et al., (2000); Joel and Lai, (2009); Chiang and Zheng, (2010); Demirer and Kotan, 2006; Morbark et al. (2014); according to the concept of investor loss avoidance and studies conducted on institutional investors, herding behavior is also found in developing markets (Economo et al., 2015). The relationship between herding behavior and market liquidity has not received much attention so far. Experimental evidence state the impact of liquidity on the distribution of stock returns. Tan et al. (2008) found that micro investors, in periods of high liquidity on the Chinese stock exchange, exhibited herding behavior in decision making. Similar conclusions were reached by Lam (2015) for Hong Kong and Spain. Our assumption is that investors show more herding behavior when the Iranian capital market is falling (downward market) and in periods of high liquidity (upward market). Several arguments support the more prominent behavior of herding behavior in falling markets toward rising markets and in periods of high liquidity toward the period of low liquidity. We expect that the behavior of those who show it be due to the collapse of the markets because of non-fundamental factors due to the sale of panic caused by the fear and negative emotions of the market.

Hypothesis 2: Changes in stock returns lead to the formation of herding behavior in the Iranian capital market.

The regression model for testing the second hypothesis is based on the Zaremba et al. (2020) model and is as follows:

$$CASD_{it} = \beta_0 + \beta_1 [R\, m_{it}] + \beta_2 R^2\, m_{it} + \beta_3 RETURN^* R^2\, m_{it} + U_{it} \quad (2)$$

Hypothesis 3: Changes in assets lead to the formation of herding behavior in the Iranian capital market.

The regression model for testing the third hypothesis is based on the Zaremba et al. (2020) model and is as follows:

$$CASD_{it} = \beta_0 + \beta_1 [R\, m_{it}] + \beta_2 R^2\, m_{it} + \beta_3 \Delta ASSETS^* R^2\, m_{it} + U_{it} \quad (3)$$

Hypothesis 4: Sales changes lead to the formation of herding behavior in the Iranian capital market.

The regression model for testing the forth hypothesis is based on the Zaremba et al. (2020) model and is as follows:

$$CASD_{it} = \beta_0 + \beta_1 [R\, m_{it}] + \beta_2 R^2\, m_{it} + \beta_3 \Delta SALES^* R^2\, m_{it} + U_{it} \quad (4)$$

4. Research statistical population

This research is applied in terms of purpose and in terms of classification of research according to the method, is a descriptive-correlation research. In this research, the effect between variables is analyzed based on the purpose of the research. All companies that have been active during the period from 2009 to 2019 and have the following conditions have been selected as the statistical sample of this study.

1) In order for information to be comparable, the end of the financial year of companies must be as of March 19.
2) The companies in the period (10 years) have not changed their financial period.
3) Data on the variables selected in this study are available.
4) Their shares are traded on the market.
5) 110 companies have been selected based on the above limitations.

5- Research variables

In this section, the methods used by researchers in this paper to identify herding behavior in the Iranian financial market are discussed. We use the proposed method of Chang et al. (2016). It focuses on the relationship between market returns and the distribution of individual asset returns and its corrections by Galaryotis et al. (2015) and Dong, Lane (2016).

5.1. Dependent Variable

Chang et al. (2016) model was used to measure herding behavior. According to this model, when the deviation of companies' return from market returns decreases, the signs of herding behavior become apparent. In the proposed model, in order to show the existence of herding behavior in the capital market, the square coefficient of the market return is used. If this coefficient is negative, the square coefficient of market return will be used for the existence of herding behavior on the capital market. If the coefficient is negative, it indicates the existence of herding behavior in the capital market. Also, the linear relationship between the absolute value of market return and the cross-sectional deviation of return indicates the existence of a balance between risk and return in the capitalized pricing model. Chang et al.'s (2016) model is as follows:

(5)

$$CASD_{it} = \beta_0 + \beta_1 [R\, m_{it}] + \beta_2 R^2\, m_{it} + U_{it}$$

CASD: Indicates the deviation of daily stock returns of companies from market returns, Rm: indicates the absolute value of market returns and Rm2: indicates the square market returns. The following equation is used to calculate the return deviation:
Equation (2)

(6)

$$CASD_t = \frac{1}{N}\sum_{1}^{N} |R_{it} - R_{mt}|$$

Share returns (market returns) are also calculated from the difference between the final price (total market index) today and the final price (total market index) yesterday, divided by the final price (total market index) yesterday.

5.2. Independent variables

In this section, operational definitions (how to measure) of the fundamental and non-fundamental variables affecting the herding behavior of investors are presented.

RETURN Δ*:* (Stock return changes): First, the annual stock return is extracted through financial statements for each company and using Novin Rahnavard software. In the following, changes in stock returns are calculated through the difference in stock returns this year compared to that in the previous year.

ASSETS Δ*:* (asset changes): is the growth rate (positive or negative) of total assets compared to the previous year.

SALES Δ*:* (Sales changes): is the growth rate (positive or negative) of total sales (operating income) compared to the previous year.

6. Statistical findings of research

6.1. Descriptive findings

In order to examine the general characteristics of the variables and analyze them accurately, it is necessary to be familiar with the descriptive statistics related to the variables. Figure (4-1) shows the descriptive statistics of the data related to the variables used in the research. Descriptive statistics are related to 110 sample companies over a 10-year period (2009-2019).

Table 1, Descriptive Statistics of Research Variables

kurtosis	Skewness	SD	min	max	median	Mean	Name of variable
17.814	2.765	0.136	0.014	1.397	0.173	0.204	Standard deviation of stock returns
2.904	0.638	0.471	-0.604	1.077	0.163	0.183	Market returns
10.526	0.538	0.135	-0.780	1.322	0.134	0.151	Stock return changes
5.671	0.063	0.223	-0.882	0.983	0.137	0.153	Asset changes
9.349	1.364	0.367	-0.897	2.732	0.156	0.187	Sales changes

The main central indicator is the mean, which indicates the equilibrium point and center of gravity of the distribution, and is a good indicator of data centrality. For example, the mean of sales changes is (0/187), which indicates that most of the data is centered around this point. In general, scattering parameters are a criterion for determining the degree of scattering from each other or their scattering from the mean. One of the most important parameters of scattering is standard deviation. The value of this parameter in general descriptive statistics is 0.471 for market return and 0.135 for stock return changes, which shows that these two variables have the highest and lowest standard deviations, respectively.

6.2. Inferential statistics / testing the stationary of variables

One of the points that should always be considered before fitting the models is to examine the stationary of the research variables. The non-stationariness (lack of stationary) of the variables, or in other words, the randomness of the time series of the variables, leads to the falsification of the estimated regression model. If the time series variables used in estimating the coefficients of the model are unreliable, while there is no conceptual relationship between the model variables, it will lead to incorrect inferences about the degree of relationship between the variables. In order to test the reliability of the research variables, the Im Shin Pesaran, Lin Chao test, and the generalized Dickey-Fuller test and the Phillips-Perron test were used on the standardized data. In the table below, these tests are performed at the level for all variables and we see that all variables have stationary characteristics in terms of the above tests.

Table 2, Stationary Test (Hadri) for research variables

Result	Significance	Test statistic	Name of variable
Stationary	0.000	10.492	Standard deviation of stock returns
Stationary	0.000	5.360	Market returns
Stationary	0.000	8.259	Stock return changes
Stationary	0.000	6.537	Asset changes
Stationary	0.000	3.387	Sales changes

According to Table 2, it is observed that the significance level of all variables is less than 5% and indicates that the variables are stationary.

6.3. Normal distribution detection test

After making any measurements, we always have a number of data (numbers) that we want to discover the connection between them or categorize them so that we can analyze them. To do this, we must first know how to distribute data. In simpler terms, data distribution tells us about the distribution and scattering of the data we have collected. In order to check the normality of the research variables, the Jarcobra test was used. In this test, if the significance. level is less than 5%, it does not indicate a normal distribution:

Result	Significance	Test statistic	Name of variable
The distribution is not normal	0.000	137,533	Standard deviation of stock returns
The distribution is not normal	0.000	90,059	Market returns
The distribution is not normal	0.000	317,907	Stock return changes
The distribution is not normal	0.000	393,455	Asset changes
The distribution is not normal	0.000	262,662	Sales changes

Normality of variability: According to test results, it is observed that the significance level of all variables is less than 5%, so they do not have a normal

distribution. Since the number of observations is more than 30 observations, according to the central limit theorem, there is no need for a normal distribution detection test.

6.4. F Limer Test (Chow) and Hausman Test

Sometimes the data we encounter includes both time series and cross-sectional data. This set of data is generally known as panel data. In estimating the panel data model, we face two general cases. The first case is that y-intercept is the same for all sections and in that we encounter a pool data model. The second case is that y-intercept is different for all sections, which is called the panel data. To identify the above two modes, a test called F-Limer is used. Therefore, the F-Limer test is used to choose between pool data regression methods (conjoint) and regression with constant effects. If the significance of the chow statistic is less than 0.05, the panel data is selected. In this case, a Hausman test should be used to detect constant or accidental effects.

Table 4, F Limer test (Chow) results

Result	Significance level	Test statistic	Name of the model
Panel data	0.000	4.412	The first hypothesis
Panel data	0.000	4.409	The second hypothesis
Panel data	0.000	4.563	The third hypothesis
Panel data	0.000	5.962	The forth hypothesis

According to Table 4, because the significance level of the F-Limer test in each model is less than 5%, therefore, the panel data approach (data panel) is accepted against the pool data approach.

Table 5, Hausman test results

Result	Significance level	Test statistic	Name of the model
Constant effects	0.000	25.365	The first hypothesis
Constant effects	0.000	36.235	The second hypothesis
Constant effects	0.000	29.996	The third hypothesis
Constant effects	0.000	99.203	The forth hypothesis

According to Table 5, because the significance level in each model is less than 5%, therefore, the approach of constant effects is accepted instead of random effects of y-intercept.

6-5 Equivalence of variance in error values

One of the assumptions of the classical linear regression model is that there is a variance homogeneity in error; however conventionally in time series data and cross-sectional data, the variance of the error may be constant and follow the disrupted values of error. Then the problem of variance heterogeneity occurs between errors, and regression predictors will not be effective despite being biased.

The statistical hypotheses of this test are as follows.

Table 6, Results of the variance heterogeneity test (Breusch–Pagan-Godfery)

result	Significance level	Test statistic	Research models
Lack of variance heterogeneity	0.197	1.624	The first hypothesis
Lack of variance heterogeneity	0.250	1.639	The second hypothesis
Lack of variance heterogeneity	0.081	2.241	The third hypothesis
Heterogeneity of variance	0.035	2.861	The forth hypothesis

The results in Table 6 show that the significance level of heterogeneity test in the first second and third models is more than 5% and indicates the absence of variance heterogeneity in errors. The significance level of the heterogeneity test in the fourth hypothesis is less than 5% and indicates the existence of variance heterogeneity in errors. It is necessary to explain that this problem has been solved in the final estimation of the models (by the method of weighting the data through the gls command).

6.6. Self-correlation of error values

In econometric studies based on time series, the assumption of lack of serial self-correlation between hysteresis, which is an important assumption of the classical model, is often violated, so it is necessary to examine the phenomenon of serial self-correlation in hysteresis before interpreting the results; because if there is a series of self-correlations between the error elements, OLS estimators are no longer effective among all unbiased estimators, ie they do not have the minimum variance and as a result of statistical

inference, they will not be reliable. This problem is mostly seen in time series data.

Table 7, Results of Serial Self-Correlation Test (Breusch -Godfery)

Result	Significance level	Test statistic	Research models
Serial self-correlation	0.000	95.689	The first hypothesis
Serial self-correlation	0.000	94.523	The second hypothesis
Serial self-correlation	0.000	98.937	The third hypothesis
Serial self-correlation	0.000	162.939	The forth hypothesis

According to the results of Table 7, it is seen that the significance level of *Wooldridge* test in all four models is less than 5% and indicates the existence of serial self-correlation.

7. Testing research hypotheses

Hypothesis 1: In the Iranian capital market, there is herding behavior among investors.

According to the results of Table 8, it can be seen that the variable of the square market return has a negative coefficient and a significant level of less than 5%, so the first hypothesis is accepted and it can be stated that investors have herding behavior in the Iranian capital market. The adjusted coefficient of determination is equal to 50%, which shows that the independent and control variables in the model have been able to explain 50% of the dependent variable changes. The Fisher statistic also has a significant level of less than 5%, so it can be said that the fitted model has sufficient validity. Also, Watson's camera statistic is between 1.5 and 2.5, indicating the lack of first order self-correlation problem in the model.

Hypothesis 2: Changes in stock returns (as a fundamental variable of accounting), leads to the formation of herding behavior in the Iranian capital market.

Table 8, the final estimation of the first regression model

Collinearity	Significance level	t statistic	Standard deviation coefficients	Coefficients	Variables
2.337	0.000	5.723	0.007	0.040	Market return
2.337	0.002	-3.100	0.005	-0.017	Square market return
	0.000	75.726	0.002	0.195	y-intercept
	Other information statistic				
0.502					Adjusted coefficient of determination
(0.000) 11.044					Fisher's statistic and its significance level
2.027					Watson Camera

Table 9, the final estimation of the second regression model

collinearity	Significance level	t statistic	Standard deviation coefficients	Coefficients	Variables
2.35	0.000	5.775	0.007	0.042	Market return
2.39	0.001	-3.222	0.005	-0.018	Square market return
1.02	0.000	-4.205	0.012	-0.052	Stock return changes Square market return
	0.000	45.666	0.004	0.199	y-intercept
Other information statistic					
0.512					Adjusted coefficient of determination
(0.000) 11.022					Fisher's statistic and its significance level
2.023					Watson Camera

According to the results of Table 9, it can be seen that the variable of the square variable, the variable of interactive effect indicator (stock return changes * square market return), has a negative coefficient and a significant level of less than 5%, which shows that changes in stock returns lead to increased herding behavior in the Iranian capital market. The adjusted determination coefficient is 51%, which indicates that the independent and control variables in the model have been able to explain 51% of the dependent variable changes. The Fisher statistic also has a significant level of less than 5%, so it can be said that the fitted model has sufficient validity. Also, Watson's camera statistic is between 1.5 and 2.5, indicating the lack of first order self-correlation problems in the model.

Hypothesis 3: Asset changes (as a fundamental variable of accounting) lead to the formation of herding behavior in the Iranian capital market.

According to the results of table 10, it can be seen that the variable of the square variable, the variable of interactive effect indicator (changes in assets * the square market return), has a negative coefficient and a significant level of less than 5%, which shows that changes in assets lead to increased herding behavior in the Iranian capital market. The adjusted determination coefficient is 54%, which shows that the independent and control variables in the model have been able to explain 54% of the dependent variable changes. The Fisher statistic also has a significant level of less than 5%, so it can be said that the fitted model has sufficient validity. Also, Watson's camera statistic is between 1.5 and 2.5, indicating the lack of first order self-correlation problems in the model.

The fourth hypothesis

Sales changes (as a fundamental variable of accounting) lead to the formation of herding behavior in the Iranian capital market.

Table 10, the final estimation of the third regression model

collinearity	Significance level	t statistic	Standard deviation coefficients	Coefficients	Variables
2.34	0.000	4.862	0.007	0.034	Market return
2.37	0.005	-2.766	0.005	-0.015	Square market return
1.02	0.000	-4.050	0.011	-0.048	Asset changes Square market return
	0.000	63.849	0.002	0.189	y-intercept
Other information statistic					
0.548					Adjusted coefficient of determination
(0.000)10.645					Fisher's statistic and its significance level
2.029					Watson Camera

Table 11, Final estimation of the forth regression model

collinearity	Significance level	t statistic	Standard deviation coefficients	Coefficients	Variables
2.34	0.092	1.684	0.007	0.012	Market return
2.38	0.000	-8474	0.012	-0.102	Square market return
1.02	0.000	-17.638	0.007	-0.134	sales changes Square market return
	0.000	63.420	0.002	0.177	y-intercept
Other information statistic					
0.569					Adjusted coefficient of determination
(0.000) 13.855					Fisher's statistic and its significance level
2.034					Watson Camera

According to the results of table 10, it can be seen that the variable of the square variable, the variable of interactive effect indicator (changes in sales * the square market return), has a negative coefficient and a significant level of less than 5%, which shows that changes in sales lead to increased herding behavior in the Iranian capital market. The adjusted determination coefficient is 56%, which shows that the independent and control variables in the model have been able to explain 56% of the dependent variable changes. The Fisher statistic also has a significant level of less than 5%, so it can be said that the fitted model has sufficient validity. Also, Watson's camera statistic is between 1.5 and 2.5, indicating the lack of first order self-correlation problems in the model.

8. Conclusions and Suggestions

One of the most challenging issues in the field of financial literature is understanding the process and how investors and market participants in the capital market make decisions. In recent years, with the governance of behavioral finance paradigm and standard financial theories being challenged, due to their inability in explaining the anomalies observed in the capital market, researches have entered a new financial era and in some of them the assumptions of modern financial economics have been challenged. One of these assumptions is that investors are logical which is seriously challenged. The phenomenon of herding behavior is one of the well-known behavioral biases of investors in financial markets. Collective behavior or herding behavior represents the correlation of investors' transactions and investment decision-making by following the behavior of other investors or showing the same behavior with the investment behavior of the whole market. The reasons and factors for the formation of herding behavior in investors in financial markets can be classified from different aspects. Although researches have repeatedly examined the presence or absence of herding behavior in capital markets, the effective and aggravating factors of this phenomenon in the Tehran Stock Exchange have been considered to a small extent. There is a belief about existence of herding behavior in various fields of science such as psychology, sociology, economics and finance. In general, herding behavior can be defined as the imitative actions of a group of people from a representative. Leaving individual thinking and following group behavior can have economic consequences for investors. The results of the present study showed that in the Iranian capital market (Tehran Stock Exchange) there is herding behavior in investors and this is consistent with the results of Dong & Lane research (2016) who stated that non-fundamental factors (factors other than financial data) and fundamental factors (financial data) are the main reasons for the formation of herding behavior in financial markets in Vietnam, and also with the results of research by Philipp et al. (2011) that confirms the existence of herding behavior in investors in the financial markets of the developed countries. The present study also confirms that changes in the fundamental variables of accounting (changes in stock returns, changes in assets, changes in sales) lead to formation of herding behavior in the Iranian capital market, which is consistent with the result of Zaremyar's research (2020), Wang et al. (2019) and Shirazian (2019). According to the background and literature of behavioral finance and psychology of capital market, it is expected that herding behavior be formed in the capital market of Iran at any time. Therefore, it is recommended to the Securities and Exchange Organization to take steps to reduce the herding behavior of investors, by enacting laws and regulations to protect shareholders. Laws that lead to greater transparency of financial information and further reduction of information asymmetry. Investors in the Iranian capital market are recommended to become fully acquainted with the concepts of fundamental and technical analysis and the psychology of traders and capital market behavior. Increasing investor intelligence and financial literacy will lead to a reduction in herding behavior in the capital market. The Securities and Exchange Organization and the Audit Organization are recommended to formulate financial reporting and disclosure requirements in a way that makes it impossible to manipulate and guide investors' decisions. Finally, analysts, investors, and activists in the capital market are suggested to identify and consider other effective factors on formation of herding behavior (such as initial public offering, increase of corporate capital, etc.). Researchers are also encouraged to investigate the impact of non-fundamental factors (such as exchange rate changes, global gold price changes, global oil price changes) as well as the impact of economic and political news on the formation of herding behavior in the Iranian capital market in their later researches.

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