Investigating the investors' herd behavior in five industries of Tehran Stock Exchange

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ABSTRACT

This study examines the herding behavior of investors, during 2004-2009, using deviation of daily stock returns of average returns, in the portfolio of five sectors with the highest volume and the number of trading days in Tehran Stock Exchange. According to the non-linear model based on the cross-sectional absolute deviation (CSAD) by Chang (2000), the existence of herd behavior during upward and downward movements of the market index in five sectors is indicated. As a result, we found evidence of herd formations in four sectors. The herding behavior was not observed in the investment's sector.

It was also observed that return dispersions during extreme downside movements of the market are much lower than those for upside movements, indicating that stock returns behave more similarly during down markets.

KEYWORDS: Behavioral Finance Theory, Herding behavior of investors, Tehran Stock Exchange

1- INTRODUCTION

The behavioral finance theory helps to understand the investors' behavior, way of creating the portfolio, and the ways of their investment over time. Due to the expansion of financial markets and the investors' more attention to this market, the studies on in this field have become more important. The behavioral finance theorists have challenged the efficient market hypothesis. Thaler (1993) has simply defined the behavioral finance as the intellectual finance and claimed that to find a solution to an empirical issue (financial), sometimes we may take into consideration this fact that some of the factors seldom follow full wisdom in the economy. However, the behavioral and psychological aspects involve in investment, and thus there are numerous exceptions in financial markets. The investors' herd behavior is one of these exceptions which reinforce the behavioral finance theory. The herd behavior is defined as buying or selling the stock by some investors over time. It is done due to a variety of reasons including the exposure to the same information, social impact, etc, and thus the same judgment is formed. When people are faced with the same judgment in a community, they are likely to consider their differently responses wrong, thus they show similar behavior which leads to the formation of collective behavior. This temporal behavioral model is explicitly or implicitly measured by cross-sectional data.

Most of the analyses on the financial crises have placed special emphasis on the role of investors' mistakes due to the ignorance or human cognitive and perceptual weaknesses in creating such these crises. So far, numerous studies have indicated that the people are largely affected by surrounding environment; especially in crises, the individuals' judgments are affected by their communities. It is thought that when a large group of people have the same judgments, they are certainly doing the right actions. Therefore, the people follow others in their decisions and the herds of people are created with the same type of behavior. The investors' herd behavior is significantly important due to its effects on return volatility, price momentum, incorrect valuation of market, created bubbles, etc in stock market.[1]

In this regard, the test on the way of creating the herd behavior among the managers and investors is among the models which examine the way of making the investment decisions by participants in capital market. The financial economists and professional investors believe that the traders are affected by other investors' decisions and the herd behavior is among the investors' types of behavior which is resulted from ignoring their beliefs and predictions of stock price and making the investment decisions only based on the behavior of the entire market [2].The importance of identifying the herd behavior is rooted in this fact that the investors form the collective activities by following the other individuals' behavior and activities, and this leads to the creation of gap between the stock market price and its intrinsic price and provides the field for speculation. In the long term and failed attempts to converge the stock price market to intrinsic price, the herd behavior leads to the higher market inefficiency .[3]

Given the importance of capital market as a sub-set of financial system and its fundamental role in directing the long-term savings of community towards the investment in generating and employment activities and ultimately its impact on the macro-economy of country and since the stock exchange market can have a

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positive and constructive impact on the country's macro-economy and there are the necessary conditions available such as the close trading stock prices to intrinsic value, it is essential to study and find the roots the Iranian investors' behavior. Creating the favorable conditions for investors leads to improved economic conditions and employment and makes solving the economic crisis possible. Given the importance of this issue, it is essential to avoid the risks which threaten these markets in order to provide the mentioned appropriate conditions through the constitutional arrangements. Furthermore, since the stock market of Iran is at beginning of development compared to the developed market exchanges, investigating different weak sectors prevent the repeated problems in old markets.

2- THEORETICAL LITERATURE

Behavioral finance can be investigated according two categories of Limit to Arbitrage and Cognitive psychology. The Limit to Arbitrage Theory considers the improper valuation of financial assets as a common phenomenon from which it is difficult to gain the unusual profit. The improper valuation has two kinds: Some of them are repetitive and arbitrage and the others are non-repetitive and long. The trading strategy can be profitable in repetitive pricing. The second set of limits refers to a group of constraints on decision-making process and can be explained through the theory of expectations introduced by Kahneman and Tversky (1979) [4]. This theory covers four major sections of investors' behavioral dimensions including the regret aversion, loss aversion, mental accounting, and self control. The cognitive psychology investigates the increased prevalence of behavior based on the experience and trial and error. These decision rules imply that the individuals make complex decisions in uncertain environments. Decision-making is not a perfectly rational process and according to all information, but the decision maker utilizes the mental shortcuts in this process [4]. Different types of this behavior in financial markets are as follows: disposition effect, overconfidence, overreaction, anchoring, representativeness, gambler's fallacy, and herd behavior.

3- Herd Behavior Theories

One of the reasons for the same individual actions and judgments in a community is that they are exposed to the same information and this leads to the creation of artificial herds. Sometimes a large number of investors buy the hot stocks just because of the relevant information obtained by investors, but not due to the collective behavior; and this is called the artificial herd behavior [2]. Another reason is the social impact which plays the big role in directing the individual judgment. When the people are faced with the same judgment of a large group of fellows, they assume that their different responses may be incorrect. These people simply think that all people cannot be wrong, so they change their views and become coordinated with them and this is called the informed herd behavior. Therefore, the herd behavior can be studied in two main categories as described in Figure 1:
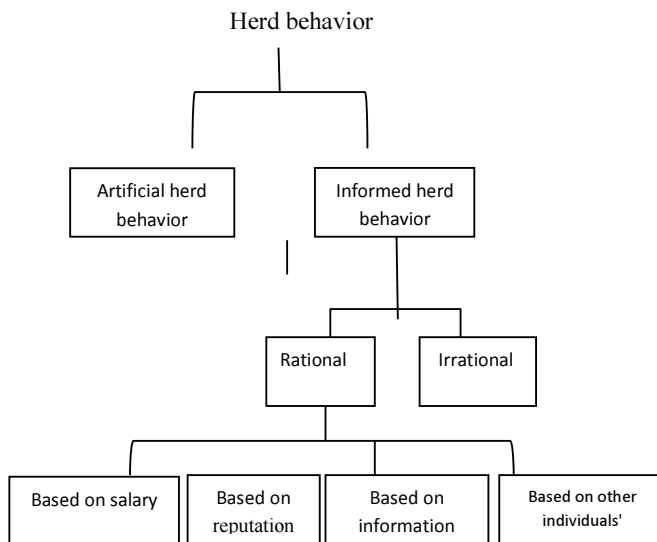

Figure 1: Classifying the herd behavior (Devenow and Welch, 1996)

Devenow and Welch (1996) [2] have suggested that there are two different perspectives on the informed herd behavior, the irrational and rational perspectives. Irrational perspective: The irrational perspective focuses on the investor psychology and considers the agents' behavior like a rat and blind following of others. Furthermore, it is assumed that the rational people can take advantage of these conditions for make profits. The

initial studies have presented different explanations of reasons for herd behavior. Lux (1995) [5] has focused on the psychology of herd behavior. In this theory, the unskilled traders do not have access to basic information about the market and act based on what they see in the market. Assuming that the market often involves the optimistic traders and since most of the traders are unskilled and imitate other's behavior, the pessimistic traders change their views and become optimistic. According to Lux's theory, the herd behavior is as the spread of disposition. Devenow and Welch (1996) [2] have utilized the behavioral arguments suggesting that the investors feel safe by following the majority.

Rational perspective: The rational perspective focuses on the external factors and the optimal decision is distorted by information barriers and incentives. The medium perspective suggests that the decision makers are near-rational. For detailed explanation of rational herd behavior model, it should be noted that this model occurs based on one or more than four following effective factors: 1- Herd behavior based on other individuals' observations: The other individuals' payoff externalities result in increased number of people who commit similar actions. Banerjee (1992) [6] considers the herd behavior as what a person does since others have done despite being opposite to personal information. He has proposed the general learning model and suggests that the individual decisions are affected by results of other individual decisions. 2- Herd behavior based on the information: The rational herd behavior focuses on the herd behavior based on the information. According to the herd behavior theory based on the information, the informed traders' activities may be resulted from the useful information which is inaccessible to all investors [7] and [8], [9], [10]. 3- Herd behavior based on reputation (Representative): In this perspective, the investors may be reluctant to act according to their personal information. They fear of harming their reputation. If they are successful, the public view emphasizes on the indiscretion and in the case of unsuccessfulness, they are obviously not favored. Therefore, it is concluded that the traditional failure is better than the nontraditional success [11]. 4-herd behavior based on the salary: Maug, E and Naik, N (1996) [12] have studied the herd behavior among the financial directors and claimed that since the directors are compared with their colleagues, they become motivated to imitate others.

3-1- Local and foreign studies

Several models are proposed to test the herd behavior. Since a common definition of herd behavior needs being informed of the investors' reasons for trade, it difficult to measure the herd behavior. However, the models based on deviations of returns in stock market focus on the cross-sectional standard deviation (absolute) of returns. The state space model is also utilized with respect to the cross-sectional change of sensitivity (risk) to study the herd behavior. Christie and Huang (1995) [13]: In 1995, Christie and Huang utilized the cross-sectional linear standard deviation model in Eurobonds. In this model, they introduce a direct criterion which investigates the impact of herd behavior on the asset price and consider the difference between the stock and market returns as the reason for existence of herd behavior. They have also argued that the herd behavior is higher in market stress because the investors are more likely to suppress the opinions during this period. They have expressed that the asset pricing model predicts the increase in deviation of returns from the absolute return of market during the periods without stress because the investors trade based on their personal information that are different. Chang et al (2000) [14]: In 2000, Chang et al introduced another model for investigating the herd behavior and it was stronger than the previous model. It was a nonlinear model which examined the herd behavior during the normal status in addition to the stress status. Chang applied this model in international stock exchanges of Korea, Taiwan, Japan, Hong Kong, and the United States and also considered the impact of portfolio size and different periods of time and found no evidence for the existence of herd behavior in Stock Exchange of the United States and Hong Kong, but the results suggested the existence of herd behavior in two emerging markets of South Korea and Taiwan and partially in Japan. Henker et al (2006) [15]: They have investigated the herd behavior model in Australian Stock Exchange based on the Christie and Huang (1995) [13] and Chang's models (2000) [14]. The obtained results indicate the absence of herd behavior in both modes. Tan et al (2008) [3]: In 2008, they studied the herd behavior through Christie and Huang and Chang's models in both Shanghai and Shenzhen Stock Exchanges in China in two types of shares, A and B, during 1994 or 2003. The results indicate the existence of herd behavior with daily data in both stock exchanges and the stocks A and B of this country, but it is so weak with weekly and monthly data. Therefore, it is concluded that the herd behavior is a phenomenon which occurs in short-term time horizon. The herd behavior is observed both in fall and rise conditions. Cajueiro & Tabak (2009) [16]: In 2009, they investigated the herd behavior for a large collection of stocks traded on Tokyo stock market under the market stress conditions and based on Christie and Huang and Chang's models from January 2000 to February 2006. Their results indicate the existence of herd behavior in stock market stress conditions of this country. Demirera & Kutan & Chen (2010) [17]: In 2010, they investigated the herd behavior at the industry level in Taiwan Stock Exchange. Based on their observations, there is no herd behavior according to Christie and Huang's model (model of cross-sectional standard deviation of stock return from market return, but there is the herd behavior in stock market of this country based on Chang's non-linear model as well as Hwang and Salmon's model (2004) [18] (state space). Furthermore, the results indicate that the herd behavior is higher during the failure of market. Bidgoli and Shahriari (2007) [19]: In 2007, they investigated the herd behavior in Tehran Stock Exchange. They utilized two models presented by

Christie and Huang and Tan. Their research findings suggest that there is no herd behavior during the market upturn in Tehran stock market, but there is evidence of herd behavior during the market downturn using daily data. However, according to the fundamental difference of this research with mentioned study, we have examined the herd behavior in the industry because the numerous studies such as the research by Sharma et al (2004) [20] have indicated that there is a higher probability of herd behavior in the industry than the whole market because the information signs are classified by industries; most of the business managers provide their recommendations at the level of industry and the investors may obtain the signs of target company through the information available to other companies in the same industry and thus there is a high probability of formed herds in groups because each member is faced with decision-making problems and can observe the transactions by other members of group. Ignoring the industry may lead to the incorrect or imprecise results. The measurement method is also different and proportional to variables. Izadinia and Hajiannejad (2009) [21]: In another study, [21] investigated the investors' herd behavior in selected industries in Tehran Stock Exchange. They utilized the model by Christie and Huang in their research. According to this study, which is based on the deviation of stock returns from market returns during 2001 to 2008 in four investment, pharmaceutical, cement, lime and plaster, and chemical industries, the results indicate that there is no herd behavior is examined portfolio and there is no confirmed significant relationship between high price volatility and emergence of herd behavior. This study differs from our research in the type of applied model, number and type of investigated industries. Chang's models applied in this study and have several advantages compared to Christie and Huang's model. Chang et al have argued that Christie and Huang have optionally considered the upper and lower limit of market return equal to one and five percent. According to their viewpoints, the investors have different opinions about the final limit of market return and their views may change over time. Furthermore, Christie and Huang's model is only for investigating the herd behavior during the unusual market volatility, while the herd behavior may occur in any time of return distribution.

4- Research hypotheses

The following hypotheses are suggested based on the proposed theoretical literature and model by Chang et al (2000) [14]:

Hypothesis 1: The deviation of stock return from market return is low in Tehran Stock Exchange.

Hypothesis 2: In the case that the deviation of stock returns from market return is significant, the deviation of market downturn is lower than the deviation of market upturn.

5- RESEARCH METHODOLOGY

5 -1- Chang et al's model

The main idea of this model is to reduce the deviation of corporate stock returns from the market returns (portfolio) assuming the existence of herd behavior. Chang challenged the asset pricing model which assumed that the asset return would be higher than the market return due to the difference between the asset sensitivity and the market return and it was a linear relationship.

$$CSAD_t = \alpha + \gamma_1 |r_{p,t}| + \gamma_2 r_{p,t}^2 + \varepsilon_t$$

$|r_{p,t}|$: Absolute value of portfolio return in day t;

$r_{p,t}^2$: Squared portfolio return in day t;

α: The average deviation of stock returns from portfolio returns in inactive market.

The existence of significant and positive γ_1 coefficient indicates the increased deviation of stock returns from market returns in normal market conditions. Chang et al believe that there is a nonlinear relationship between the deviation of stock returns and market returns in high market volatility; and significant and negative γ_2 coefficient indicates a negative relationship between cross-sectional standard deviation (dependent variable) and market volatility. Since the market return may affect the investors' behavior, Chang et al defined the regression separately, once for growing market and then for declining market. [17] In growing market:

$$CSAD_t^{up} = \alpha + \gamma_1^{up} |r_{p,t}^{up}| + \gamma_2^{up} (r_{p,t}^{up})^2 + \varepsilon, if \ r_{p,t} > 0$$

$r_{p,t}^{up}$: Average return of N company during the time of t in studied portfolio when the market is growing.

$(r_{p,t}^{up})^2$: Squared portfolio return when market is growing

$CSAD_t^{up}$: CSAD during the time of t associated with $r_{p,t}^{up}$

In declining market:

$$CSAD_t^{down} = \alpha + \gamma_1^{down}\left|r_{p,t}^{down}\right| + \gamma_2^{down}\left(r_{p,t}^{down}\right)^2 + \varepsilon, \text{ if } r_{p,t} < 0$$

$r_{p,t}^{down}$: Average return of N company during the time of t in studied portfolio when market is declining.

$\left(r_{p,t}^{down}\right)^2$: Squared portfolio return when market is declining.

$CSAD_t^{down}$: CSAD during the time of associated with $r_{p,t}^{down}$

5 -2- Data analysis method

The regression analysis is the method for data analysis in this research. In the section of descriptive statistics, the central indexes (maximum, minimum, mean) are investigated as well as the distribution index of standard deviation. In the section of inferential statistics, the significance of model is investigated by F statistics. Furthermore, the regression method is utilized for hypothesis test. The research variables are measured through Excel spreadsheet software. The Eviews and SPSS software are applied for statistical analysis of hypotheses.

5 -3- Statistical sample and population

Given the use of large volumes of data related to the stocks in studied models of herd behavior, five industries including the industries of metallic minerals mining, cement, lime and plaster, investment, machinery and equipment, and chemical products are selected as the population from 37 industries listed on Tehran Stock Exchange considering two features. First, the minimum number of firms in that industry should be more than 5 at any time; and second, they should had the maximum trading volume and number of transactions in available industries of stock exchange for a 6-year period from 2004 to 2009. Since the exploration of herd behavior in all five industries are considered in this study, the entire population is studied and only the companies with stopped brand for more than 6 months are excluded from studied sample for preventing the confounding variables.

6- RESEARCH RESULTS

Figure 1: Results of estimating the regressions of Chang et al's model in five studied portfolios

Machinery and equipment	In distribution of entire market return	UP	DOWN
α	0.096663	0.104305	0.090014
	(19.36171)*	(13.28570)*	(13.64660)*
γ_1	0.052023	0.055408	0.055491
	(3.729994)*	(2.719472)*	(2.897356)*
γ_2	-0.010288	-0.010115	-0.013807
	(-2.979668)*	(-2.168370)*	(-2.441402)*
F-statistic	6.956490	3.699495	6.990327
R^2	0.009530	0.009642	0.031301

Investment	In distribution of entire market return	UP	DOWN
α	0.049516	0.049814	0.048129
	(13.11436)*	(8.407180)*	(7.945255)*
γ_1	0.012336	0.039867	0.033911
	(2.316230)*	(5.508401)*	(3.202004)*
γ_2	0.005505	-0.0000442	-0.000385
	(3.500638)*	(-5.508525)*	*(-3.273933)
F-statistic	52.42271	26.62739	12.41905
R^2	0.183346	0.148402	0.085993

Metallic material portfolio	In distribution of entire market return	UP	DOWN
α	0.059424	0.090383	0.068496
	(15.56360)*	(8.583218)*	(8.368129)*
γ_1	0.014038	0.050908	0.052364
	* (3.360875)	(2.693325)*	(3.266301)*
γ_2	0.003107-	-0.0000556	-0.000580
	(-3.572332)*	(-2.697406)*	(-3.249505)*
F-statistic	112.5112	3.675985	14.29610
R^2	0.373985	0.009446	0.060672

Chemicals	In distribution of entire market return	UP	DOWN
α	0.118933	0.127810	0.127884
	(15.32121)*	(11.13809)*	(13.20384)*
γ_1	0.087151	0.062270	0.035462
	(5.647121)*	(5.191415)*	(2.231944)*
γ_2	-0.011203	-0.0000692	0.000393-
	(-3.103372)*	(-5.198681)*	(-2.221801)*
F-statistic	35.50071	24.41347	7.809556
R^2	0.129015	0.161060	0.066478

Cement, lime, plaster	In distribution of entire market return	UP	DOWN
α	0.100848	0.140858	0.094853
	(10.04196)*	(9.446052)*	* (8.076480)
γ_1	0.130779	0.037145	0.108263
	(5.054001)*	(1.742731)*	(4.578780)*
γ_2	-0.016343	-0.0000412	0.001195*
	(-2.064361)*	(-1.744366)*	(-4.540091)*
F-statistic	13.59805	10.12136	4.766702
R^2	0.053940	0.062048	0.041655

Sources: research findings, * significant at confidence level of 95% (t statistic in parentheses)

F statistic refers to the overall significance of regression and it can be concluded according to the values of this statistic in tables above that all regression equation are confirmed and significant at the confidence level of 95%.

R^2 Represents the percentage of changes in dependent variable by explanatory variables. Low R^2 is one of the commonalities of all these estimates, but the regression coefficients are significant. Since the sectional deviation and then the regression are measured for firm data per market return during a time period, the higher coefficient of determination is not considered as a reliable criterion for goodness of fit and thus we should pay attention to the significance of regression coefficients. The autocorrelation and heteroscedasticity are investigated for regression equations and they are solved by Eviews software in the case of existence. $\left|R_{m,t}\right|$ coefficient, which refers to a linear relationship between the market and stock returns, and also $R_{m,t}^2$ coefficient, referring to the herd behavior during the market stress, are significant in market downturn and upturn at the confidence level of 95%.

According to the first hypothesis of research, the deviation of stock return is lower than the market return in the case that the investors follow the market factor. All coefficients in overall market distribution and declining and growing conditions are significant and $\left|R_{m,t}\right|$ coefficient, which indicates a linear relationship between market and stock returns, is positive in five studied industries, and thus the deviation of market return from stock return is enhanced in normal status of stock exchange with positive and negative moderate volatility. The coefficient of $R_{m,t}^2$ variable, which indicates the herd behavior in market stress, is significant and negative in four industries of metallic materials, machinery and equipment, chemical products, cement, lime and plaster in the overall distribution of market and it indicates the herd behavior of these industries in overall distribution of market. However, the coefficient of this variable is positive in investment industry and indicates the lack of created herd behavior in this industry. The coefficient of $\left|R_{m,t}^{up}\right|$ variable, which refers to the linear relationship between the market and stock return in upturn market, is positive in five studied industries and thus indicates the enhanced deviation of market return from stock return in positive moderate volatility of stock market. The coefficient of $\left(R_{m,t}^{up}\right)^2$ variable, which indicates the herd behavior in upturn market, is significant negative in 5 studied industries and refers to the herd behavior of these industries in upturn market. In declining status, the coefficient of $\left|R_{m,t}^{down}\right|$ variable, which refers to the linear relationship between the market and stock returns, is positive in 5 studied industries and indicates that the deviation of market return from stock market is enhanced in stock exchange with positive moderate volatility. The coefficient of $\left(R_{m,t}^{down}\right)^2$, which refers to the herd behavior in declining market return, is significant and negative in 5 studied industries and indicates the herd behavior of these industries in market downturn. Therefore, the first hypothesis, indicating that the existence of herd behavior reduces the market return compared to stock return, is confirmed in overall distribution of market in upturn and downturn market conditions in 5 industries.

According to the second research hypothesis, if the deviation of market return is meaningful from the market return, the deviation of market downturn period is less than the market upturn period according to McQueen et al's viewpoints (1996) because all stocks tend to react quickly to negative news. To test the second hypothesis, we should pay attention to coefficients of $\left(R_{m,t}^{up}\right)^2$ and $\left(R_{m,t}^{down}\right)^2$ variables. According to the comparison of $\left(R_{m,t}^{down}\right)^2$ coefficient related to downturn market with $\left(R_{m,t}^{up}\right)^2$ coefficient related to upturn market in five studied industries, the return deviation in downturn market period is far less than the return deviations in upturn market period. Therefore, the second hypothesis, indicating that the deviation of market downturn in less than the upturn market, is confirmed in five mentioned industries in the case of significant deviation of stock return from market return.

7- CONCLUSION

According to the results, the herd behavior is seen in stock market and it indicates that the investors follow the market return and do not consider the fundamental variables and make decisions only based on imitating other investors. This can be justified by different approaches such as the market efficiency and the capital asset pricing model (CAPM). According to the efficient market theory, the prices reflect what is understood about a final asset and it is assumed that the economic factors have rational performance. Despite the inefficiency of Tehran stock market at the weak level according to the research by Fadaeinejad (1995) [22] and the inefficiency at the semi-strong level according to the research by Sinaei and Mahmoudi (2005) [23] and also the impossible evaluation of efficiency at the strong level, there is the information asymmetry in the Stock Exchange, and thus a group has the information advantage compared to other group and the herds can be created. According to this phenomenon, the market is inefficient and the behavioral and psychological sciences in financial field (the complex psychological factors and different economic values) have higher impact on stock price. According to this viewpoint, the human shows the behavioral biases in some circumstances even if he is rational. These behavioral biases lead to the limited or unreal recognition and thus sometimes lead to the irrational reactions. According to the results of this research, in the case that the deviation of stock return from the market return is significant, the deviation of market downturn in less than the market upturn and it is confirmed in five studied industries. These results are consistent with the findings of research McQueen et al (1996) [24] indicating that the large stocks tend to react quickly to negative macro-economic news. Based on the obtained results of this model, it can be concluded that the investors show quick reaction to the negative economic and political news and the negative return in addition to the stock sale queues and show the behavior similar to the market. However, the stock return has a distance from market return and the return deviations are increased in growing market. Tese results are inconsistent with the results of research by Lin and Swanson (2003) and consistent with the results obtained by Chiang, Lee, Tan (2010) [25], and Bidgoli and Shahriari (2005) [19]. According to the results of hypotheses, the policy makers can prevent such this behavior in Stock Exchange by taking proper measures and since the herd evidence is more obvious in declining status, it can be effective to take measures to create the market-making institutions in stock exchange and prevent the failure as well as adjusting the market. The expansion of stock consulting and analysis institutions, which have the required expertise and experience in analyzing the data and investigating the impact of data on prices, can reduce these types of investors' behavior. Furthermore, the legal punishment for offenders should be guaranteed and there should be the legal experts proficient in stock issues for consideration and following up the crimes.

Due to the lack of data associated with daily return on the stock websites, we are forced to measure the return of each stock during the target period; and, an error coefficient should be possibly considered due to different numbers of days.

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