EFFECTS OF CURRENCY FLUCTUATION AND HERDING BEHAVIOR ON EMERGENCE OF BULL AND BEAR MARKETS IN TEHRAN STOCK EXCHANVE

Samira Abbasi Shehni[1]

Abstract: This study analyzed the effects of currency fluctuations and herding behavior of investors on the emergence of bull and bear markets in 36 industries listed in the Tehran Stock Exchange. The Christie-Huang model (1995) and the Kalman filter were employed to evaluate herding behavior and currency shock, respectively, in order to detect the days on which these fluctuations acted as anomalous pulses. In addition, the logistic regression was utilized to analyze and predict bull and bear markets because the dependent variable was dichotomous. According to the results, herding behavior had no effects on the market trend and emergence of bull and bear markets; however, currency fluctuations showed very slight effects.

Keywords: currency fluctuation, herding behavior, bull market, bear market

Statement of the Problem

Considering the recent ever-increasing advances in financial markets, behavioral finance has attracted many researchers stating that personal and psychological characteristics affect financial decisions. It also states that various events and incidents affect financial markets in addition to the mass and emotional behavior of investors (Chiang Li, 2005).

Introduced into financial markets for a few decades, behavioral finance analyzes the behavior of investors and tries to identify and perceive their reactions accurately. Hence, it analyzes external and internal factors affecting the emergence of bull and bear markets and leading to people's herding behavior, resulting in their emotional processes of making sales and purchases.

Master of Business Administration in Finance, Sheikhbahaee University, Isfahan, Iran.

Currency fluctuations refer to the volatility of currency exchange rates, a situation that can also be called currency turbulence or currency crisis. In fact, it is an economic variable, closely related to financial markets and basically in line with inflation. The volatility of currency exchange rates affects the share price by changing the value of business assets. Currency fluctuation is not a new phenomenon in economy because many cases of this incident have occurred in both Iranian and global economies. The volatility of currency exchange rate has generally been in line with inflation and price rises, although it has not followed a steady and balanced trend because of sudden and unpredicted rises and reductions. Accordingly, many economists believe that what leaves negative effects on economy is not the increased currency exchange rate but sudden increases or decreases in currency exchange rate (Zareh H. & Rezaei Z., 2006).

In the behavioral finance paradigm, herding is considered a case of behavioral bias which can significantly affect the performance of capital markets. Recently, herding has dramatically emerged as one of the major setbacks of capital markets, inasmuch as markets have been so deprived of analysis that there is no difference in what share is purchased and whether all shares and groups become simultaneously negative or positive. Herding behavior indicates a human's tendency to act like others. When a mass society performs a particular action or shows a particular reaction, it is subjectively difficult for other people to act in the opposite direction of the mass. In other words, herding behavior refers to the behavior shown by a group of people who act similarly. In fact, there is a correlated behavioral pattern among people (Chiang Li, 2005).

Herding behavior has also been defined as accepting high risks without having sufficient information, something that can be interpreted as the obvious intention of some investors to copy and follow the behavior of other investors. Herding behavior is the most public phenomenon known in financial markets within the framework of psychology. This phenomenon can provoke illogical reactions shown by investors (Izadinia, 2007).

Herding behavior is actually the emotional behavior of investors in

specific events. According to a market analysis, the investors of the Tehran Stock Exchange are no exception. Sales and purchasing lines are formed because of emotional and herding behavior shown by people who enter the market late because they are not willing to take risks. Intending to gain more profit, then they enter the market at the wrong time so as not to fall behind. Finally, they make hasty decisions to make sales or purchases with the most insufficient information (Yousefi, 2009).

Purchase-encouraging and sale-encouraging markets are colloquially described as bull and bear markets, respectively. In fact, they describe the general trend in the capital market. The emphatic assumption regarding the two terms bull market and bear market refers to how these two animals fight because a bull uses its horns to hit and throw up an enemy, whereas a bear uses its claws to hit and knock an enemy down to the ground (Nyberg, 2013).

In a study entitled *Market Emotions*, Blasco *et al.* (2012) used daily data to analyze the factors affecting herding behavior in the Spain Stock Exchange between 1997-2003. They realized that herding behavior was influenced by previous returns, investors' emotions and subjectivity, and their imitation tendency.

The goal of this study is to analyze the effects of currency fluctuations and herding behavior on the emergence of bull and bear markets in the Tehran Stock Exchange.

Research Methodology

This applied study employed the existing documents of the Tehran Stock Exchange to analyze the effects of currency fluctuations and herding behavior of investors on the emergence of bull and bear markets. The research data were monthly collected from the stock market database at www.tse.ir. In fact, the data pertaining to 2011-2015 were used as the research input. This was a prospective study based on objective data.

The Kalman filter – an algorithm using a series of measurements including errors over time to estimate the status of a dynamic system – was employed in Eviews to analyze monthly currency fluctuations in an effort to detect the months in which

these fluctuations acted as anomalous pulses.

Then the Christie-Huang model (1995) was utilized to determine the herding behavior by calculating the cross-sectional standard deviation (CSSD) of returns in the Tehran Stock Exchange.

$$\text{CSSD}_t = \sqrt[2]{\frac{\sum_{i=1}^{N_t}(R_{i,t}-R_{m,t})^2}{N_t-1}}$$

N_t: the number of companies analyzed at t

$R_{i,t}$: returns of Company i at t

$R_{m,t}$: market return

Chang, Cheng and Khorana (2000) extended this method and used a nonlinear model focusing on the cross-sectional absolute deviation (CSAD):

$$\text{CSAD}_t = \frac{1}{N_t}\sum_{i=1}^{N_t}\left|R_{i,t}-R_{m,t}\right|$$

The quality of being a bull or bear market is evaluated in the following way. P_t is the price of entering the market at t ($P_t < (>) P_t 1_-^+$; i=1,...,L; L is the magnitude of financial capacity). In this case, a rise occurs at t.

Given the identification of rises and reductions, the rise-to-reduction (or reduction-to-rise) periods are defined as bear (or bull) markets with $D_t=1$ ($D_t=0$), which is a binary variable (Nyberg, 2013).

Since the dependent variable was dichotomous, the binomial logistic regression (binary) was employed to make predictions. Dichotomy means the occurrence of a random incident in two possible situations. In fact, the logistic regression predicts a probability ranging between 0 and 1. The regression coefficients of the logistic regression equation provide specific information on the chance of each specific case to join the zero group or the one group.

The following equation was employed to make estimations in Eviews 9:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e$$

Research Variables

Y: the dependent variable stating the quality of being a bull or bear market (in the form of a virtual variable)

X₁: herding behavior

X₂: currency fluctuation

e: error component

Data Analysis

The collected data were processed to lay the foundations for the analysis of the interplay between data to test the research hypotheses. The regression was estimated in Eviews 3, and then specific tests were conducted to analyze the hypotheses. Finally, the estimation results were taken into account to draw conclusions and interpret the research hypotheses.

Research Data

The necessary data included currency exchange rates, code 1 indicating bull markets, code 0 indicating bear markets, and data showing investors' herding behavior. These data were collected daily from the stock market database at www.tse.ir, www.cbi.ir, and other databases such as www.estjt.ir and www.banksepah.ir. The collected data, used as the research inputs, pertained to years 2014-2016. It was impossible to extract documented data pertaining to currency exchange rates before November 23, 2014, the date from which all the research data were collected for the necessity of historical conformity.

Regarding the data pertaining to bull and bear markets, the returns on market daily indices were calculated on specific dates once the closing prices of market indices were obtained. Then the moving average was obtained in a five-day span. According to the linear diagram of moving averages, the significant range was determined between -0.004 and +0.004 after performing several calculations and trial-and-error processes with different values. Then it was formulated by using the if function in Excel. Therefore, if the moving average of returns on the closing market index exceeds +0.004, then it is a bull market shown by 1; otherwise, if the moving average is below -0.004, then it is a bear market shown by 0.

The designated currency was the dollar. After extracting the currency exchange rate on the research dates in the market, the currency fluctuations were determined in Eviews 3 through the Kalman filter used as a very efficient turning method. There are basically two major advantages to the use of this filter. First, it helps monitor unobservable variables (trend and rotation) because it is used in the economic literature topics including logical expectations, missing observations, the permanent consumption income theory, unobservable elements in business intervals, and the natural unemployment rate. Second, they can be estimated to observe them and see the trend diagram.

According to Figure (1), the trend of fluctuations was obtained through the Kalman filter after entering currency fluctuation variables. Then the diagram was drawn.
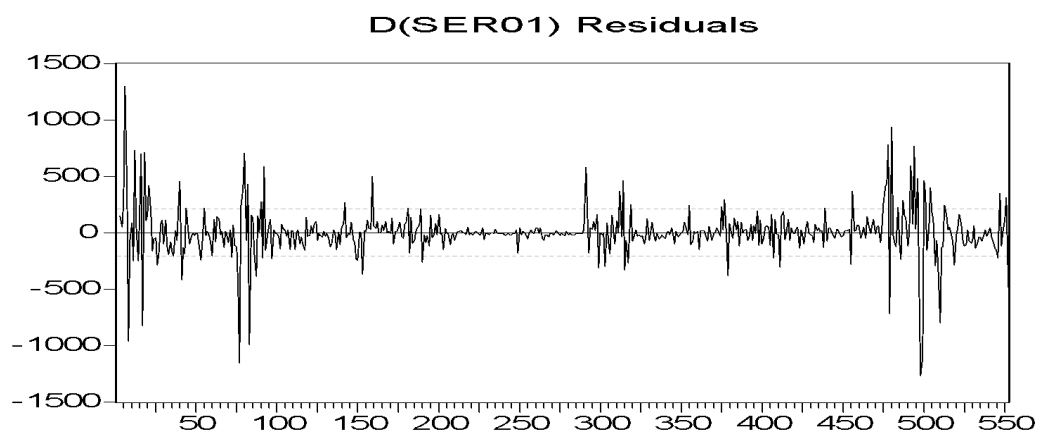
Figure (1). Currency Exchange Rate Fluctuations (Source: Eviews)

The third series of data pertained to herding behavior, determined through the Christie-Huang formula for 36 out of 39 industries listed in the Tehran Stock Exchange. For this purpose, the total indices of industries were extracted for the designated dates. Then their daily returns were calculated and put into the Christie-Huang formula to determine the herding intensity, shown by Figure (2).

$$CSSD_t = \sqrt[2]{\frac{\sum_{i=1}^{N_t}(R_{it}-R_{mt})^2}{N_t-1}}$$

Figure (2): Herding Behavior
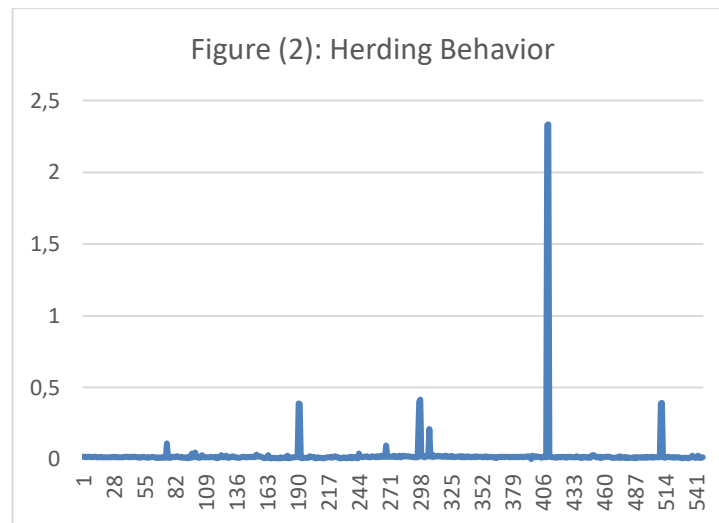
Estimation of Data and Interpretation of Results

To estimate the logit model, a work file was first created in Eviews to enter variables. Then the research data, including dependent and independent variables, were inserted into the file.

The final estimation included the variable, coefficient, standard error of regression coefficients (Std. Error), z-statistic, and relevant probability (Prob.) or the p-value. In addition, RE is the dependent variable pertaining to the quality of being a bull or a bear market (shown by 1 or 0). The independent variables included HE (herding behavior) and SH (currency exchange rate fluctuations). If the p-value of a test is below 0.10, then it is significant.

The logistic regression was employed to make regression estimations with 1-5 interrupts in the significant range in order to test the research hypotheses. Figure (3) shows the market trend variables.

438

Figure (3): Market Trend
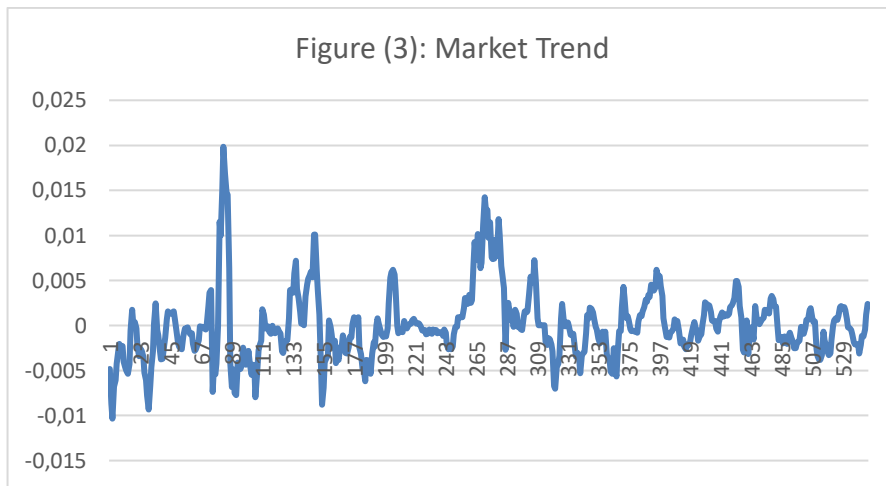
Table (1) shows an overview of the results of calculating estimations at different levels.

Table (1). An Overview of P-Values Pertaining to the Significant Probability Range

Significant Probability Range		rob	Prob(-1)	rob(-2)	Prob(-3)	Prob(-4)	rob(-5)
+0.001 , -0.001	e	.28	0.40	0.28	0.27	0.27	0.27
Obs=360	e(-)		0.52	0.36	0.35	0.38	0.36
Dep=0 204	h	.98	0.77	0.74	90	0.87	0.84
Dep=1 156	h(-)	.09	0.62	0.53	64	0.97	0.98
			0.16	0.19	20	0.20	0.23
+0.002 , -0.002	e	.44	0.64	0.45	41	0.40	0.37
	e(-)		0.70	0.67	36	0.60	0.40

439

O bs=258	h	.53	.73	0.75	0.43	.57	.53
D ep=0 148	h(-)		.65	0.51	0.33	.51	.54
D ep=1 110		.64	.09	0.16	0.35	.21	.17
+ 0.003 , - 0.003	He	.94	.72	0.45	0.49	.49	.49
O bs=143	e(-)	.72	.51	0.44	0.43	.99	.99
D ep=0 77	Sh		.50	0.94	0.90	.76	.76
D ep=1 66	h(-)	.53	.23	0.29	0.60	.81	.82
	C		.69	0.14	0.22	.27	.28
+ 0.004 , - 0.004	He	.33	.27	.36	0.43	.34	0.35
O bs=119	e(-)	.56	.17	.26	0.35	.14	.16
D ep=0 56	h		.50	.87	0.94	.68	.35
D ep=1 63	h(-)	.71	.06*	.08*	0.37	.12	.22
			.21	.38	0.46	.17	.20
+ 0.005 , - 0.005	He	.55	.47	.56	0.79	0.48	.57
O bs=78	e(-)	.43	.33	.42	0.11	0.04*	.06*
D ep=0 29	Sh		.33	.42	0.14	0.18	.11
D ep=1 49	h(-)	.21	.22	.08*	0.14	0.14	.76
	C		.60	.75	0.25	0.11	.16

Obs: number of observations; dep: quality of being a bull or a bear market; he: herding behavior variable; (-)he: herding behavior variable with an interval; sh: currency fluctuations variable; (-)sh: currency fluctuations variable with an interval; c: constant coefficient; prob: probability (Source: Research Findings)

Since the test p-value is considered lower than 0.10 in Table (1), numbers with * are significant at the relevant intervals; however, the [-0.004, +0.004] is a more logical range because the number of observations decreased within [-0.005, +0.005]. With the regression estimation, coefficients were significant for currency fluctuations in 1-day and 2-day intervals.

The first research hypothesis is as follows:

Currency fluctuations affected the emergence of bull and bear markets (in a case study conducted on 36 industries listed in the Tehran Stock Exchange).

H_0: Currency fluctuations had no effects on the market trend.

H_1: Currency fluctuations affected the market trend.

Given the significance level of these intervals ($<\%10$), the null hypothesis was rejected; therefore, the test was significant. As a result, currency fluctuations affected the emergence of bull and bear markets.

The second research hypothesis is as follows:

The herding behavior of investors affected the emergence of bull and bear markets (in a case study conducted on 36 industries listed in the Tehran Stock Exchange).

H_0: Herding behavior had no effects on the market trend.

H_1: Herding behavior affected the market trend.

Given the significance level of these intervals ($<\%10$) than which the coefficients were greater, the test was not significant. Therefore, the hypothesis was not rejected, and herding behavior

441

had no effects on the emergence of bull

and bear markets.

Table 2. Regression Estimation:

Dependent Variable: RE

Method: ML - Binary Logit

Date: 09/05/17   Time: 10:08

Sample(adjusted): 1 454

Included observations: 119

Excluded observations: 335 after adjusting endpoints

Convergence achieved after 7 iterations

Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
HE	12.50378	12.98939	0.962615	0.3357
SH	-0.000415	0.000727	-0.570470	0.5684
C	-0.104154	0.288237	-0.361348	0.7178
Mean dependent var	0.529412	S.D. dependent var		0.501245
S.E. of regression	0.502723	Akaike info criterion		1.420436
Sum squared resid	29.31673	Schwarz criterion		1.490498
Log likelihood	-81.51593	Hannan-Quinn criter.		1.448886
Restr. log likelihood	-82.27851	Avg. log likelihood		-0.685008

LR statistic (2 df)	1.525174	McFadden R-squared			442 0.009268
Probability (LR stat)	0.466458				
Obs with Dep=0	56	Total obs			119
Obs with Dep=1	63				

Table 3. One-Day Interval Estimation

Dependent Variable: RE

Method: ML - Binary Logit

Sample(adjusted): 2 454

Included observations: 118

Excluded observations: 335 after adjusting endpoints

Convergence achieved after 8 iterations

Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
HE	15.95076	14.559 03	1.0955 93	0.2733
HE(-1)	24.47926	18.231 97	1.3426 56	0.1794
SH	-0.000587	0.0008 89	-0.659827	0.5094

443

SH(-1)	-0.001806	0.000981	-1.841212	0.0656
C	-0.546133	0.440758	-1.239078	0.2153

Mean dependent var	0.533898	S.D. dependent var	0.500977
S.E. of regression	0.494459	Akaike info criterion	1.403241
Sum squared resid	27.62730	Schwarz criterion	1.520642
Log likelihood	-77.79119	Hannan-Quinn criter.	1.450909
Restr. log likelihood	-81.51997	Avg. log likelihood	-0.659247
LR statistic (4 df)	7.457556	McFadden R-squared	0.045741
Probability (LR stat)	0.113596		

Obs with Dep=0	55	Total obs	118
Obs with Dep=1	63		

Table 4. Two-Day Interval Estimation

Dependent Variable: RE

Method: ML - Binary Logit

Date: 09/05/17   Time: 10:21

Sample(adjusted): 3 454

Included observations: 117

Excluded observations: 335 after adjusting endpoints

Convergence achieved after 8 iterations

Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
HE	11.85558	13.14133	0.902160	0.3670
HE(-2)	15.58629	13.96480	1.116113	0.2644
SH	-0.000137	0.000873	-0.157469	0.8749
SH(-2)	-0.001437	0.000832	-1.726059	0.0843
C	-0.336591	0.388792	-0.865736	0.3866

Mean dependent var	0.538462	S.D. dependent var		0.500663
S.E. of regression	0.497884	Akaike info criterion		1.416186
Sum squared resid	27.76349	Schwarz criterion		1.534228
Log likelihood	-77.84690	Hannan-Quinn criter.		1.464110
Restr. log likelihood	-80.75172	Avg. log likelihood		-0.665358
LR statistic (4 df)	5.809656	McFadden R-squared		0.035972

Probability	0.21382		
(LR stat)	1		
Obs with Dep=0	54	Total obs	117
Obs with Dep=1	63		

Then the final model was estimated at the designated intervals with respect to the significance of p-values.

Table 5. Final Model

Dependent Variable: RE

Method: ML - Binary Logit

Date: 09/06/17   Time: 13:52

Sample(adjusted): 3 454

Included observations: 117

Excluded observations: 335 after adjusting endpoints

Convergence achieved after 8 iterations

Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
HE	16.13160	15.05959	1.071184	0.2841
SH	-0.000455	0.000924	-0.492562	0.6223
SH(-1)	-0.001623	0.000996	-1.628906	0.1033

	Coefficient	Std. Error	z-Statistic	Prob.
SH(-2)	-0.001541	0.000861	-1.789054	0.0736446
C	-0.118054	0.319096	-0.369965	0.7114

Mean dependent var	0.538462	S.D. dependent var	0.500663
S.E. of regression	0.495575	Akaike info criterion	1.407846
Sum squared resid	27.50664	Schwarz criterion	1.525888
Log likelihood	-77.35899	Hannan-Quinn criter.	1.455769
Restr. log likelihood	-80.75172	Avg. log likelihood	-0.661188
LR statistic (4 df)	6.785461	McFadden R-squared	0.042014
Probability (LR stat)	0.147669		
Obs with Dep=0	54	Total obs	117
Obs with Dep=1	63		

Since prob=0.07 of the two-day interrupt, pertaining to currency fluctuations, is smaller than 0.10 in comparison with prob=0.10 of the one-day interval, it is more significant; thus, H_0 is rejected. In other words, the coefficient is statistically valid. In this estimation, the Mc Fadden R-squared statistic indicates %4.2 of goodness of fit in the model regression and explanatory power. Regarding the logistic regression model, it is similar to R^2 in the ordinary regression. In fact, it ranges between 0 and 1 and measures the goodness of fit. The closer this index to 1, the more the

447

model matches reality, and the higher the goodness of fit, and vice versa.

The total regression significance was analyzed at the %90 confidence level along with the accuracy of model explicitness with the LR statistic. Finally, two independent variables were employed in two significant ranges for the dependent variable with five interrupts after testing different combinations to delete the herding behavior variable from the model.

After selecting the optimal model, the coefficients were presented:

Table 6. Model Coefficients

Pro b	Z- Statistic	Std Error.	Coeffici ent	Varia ble
0.28 41	1.071 184	15.05 959	16.1316 0	HE
0.62 23	- 0.492562	0.000 924	- 0.000455	SH
0.10 33	- 1.628906	0.000 996	- 0.001623	-1)SH (
0.07 36	- 1.789054	0.000 861	- 0.001541	-2)SH (
0.71 14	- 0.369965	0.319 096	- 0.118054	C

(Source: Research Findings)

The final analysis of variables indicates that currency fluctuations had slightly negative effects on the emergence of bull and bear markets; however, the herding behavior had no effects on the market trend.

Table 7. Final Effects of Variables

R1=he	6.09855882998
R2=sh	-0.000172005729714
(-1)R3=sh	-0.00091347795352
(-2)R4=sh	-0.000582546850796
R5=c	-0.0446305279158

(Source: Research Findings)

Analyzing the Results of Testing the First Hypothesis

The first sub-hypothesis: Currency fluctuations affected the emergence of bull and bear markets (in a case study conducted on 36 industries listed in the Tehran Stock Exchange).

At the significance level ranging from 0.005^{-+} to 0.001^{-+}, the tested hypothesis for the prob values of research findings indicated that one-day and two-day intervals were significant at the %90 confidence level. Therefore, the null hypothesis was rejected, something which indicated that currency fluctuations affected the emergence of bull and bear markets.

Analyzing the Results of Testing the Second Hypothesis

The second sub-hypothesis: The herding behavior of investors affected the emergence of bull and bear markets (in a case study conducted on 36 industries listed in the Tehran Stock Exchange).

At the significance level ranging from 0.005^{-+} to 0.001^{-+}, the tested hypothesis for the prob values of research findings indicated that one-to-five-day intervals were not significant at the %90 confidence level. Therefore, the null hypothesis was not rejected, something which indicated that the herding behavior had no effects on the emergence of bull and bear markets.

References

Blasco, N. Corredor, P. Fereruela. (2012)." Does herding affect volatility? implications for the Spanish stock market", *Quantitative Finance Journal,* 12 (2), 311– 327.

Chien.Chiang Lee, (2005). Energy consumption & GDP in developing countries: A cointegrated panel analysis, *Energy Economics*, Elsevier, 27(3), 415-427, May.

Henry, Nyberg. (2013). "Predicting bear and bull stock markets with dynamic binary time series models", *Banking & Finance Journal*, 3351-3363.

Izadinia, N. and Hajian, A. (2009). "Analyzing and testing the herding behavior in the industries listed in the Tehran Stock Exchange". *Stock Exchange Quarterly*, 2(7): 105-132.

Yousefi, R. (2009). "Investigating and testing the herding behavior of investors in Stock Exchange". *Journal of Development and Evolution Management*, 2(5): 57-64.

Zareh, H. and Rezaei, Z. (2006). "Effects of currency, coin, and housing market on the Tehran Stock Exchange trend: vector error correction model". Journal of Human Science Research (University of Isfahan), 21(2): 99-112