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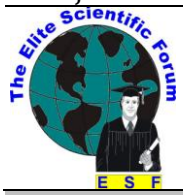

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RESEARCH ARTICLE

An Empirical Investigation of Herding: Case of Karachi Stock Exchange

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ABSTRACT

Herding as a bias refers to the investment decision based on the decisions of other investors in market. This study aims at finding out whether Pakistani investors, in extreme market conditions, are prone to herding bias while making their investment decisions or not. Cross Sectional Standard Deviation (CSSD) and Cross Sectional Absolute Deviation (CSAD) have been used to measure herding. Higher the value of CSSD, lower the tendency of herding and vice versa. Extreme market has been defined at 5% and 10% extreme values of the series of daily market returns for the period 2000-2014. Extreme market situation, when defined at 5%, exhibits the existence of herding in down market situation with a negatively significant value of β_2 ($\beta 2$ = -0.0026, t-value = -1.94). Whereas for the extreme market defined at 10%, herding is significantly found in both up and down market conditions depicted by negatively significant values of β_1 and β_2. Examination of non linear and asymmetric relationship between cross sectional standard deviation (CSSD) and market returns also shows the same results. As for the turnover effect in herding, value of the β for D^L_t and D^U_t remain positive and insignificant for high turnover stocks implying that dispersion between stock returns and market returns does not reduce in up and down markets i.e. no herding exist. However for Low Turnover Standard Deviation (LTSD) value of β_2 that is for D^L_t remain significantly negative (t-value = -5.33) showing reduction in dispersion between low turnover stock returns and market returns in down market which is exactly in accordance to herding theory.

INTRODUCTION

Human decisions of buying and selling acts as a life blood to the stock market. Any factor that helps explain the human and social psychology can be vital to understand the behavior of stock market. Recent research is attempting to explain the anomalies persistent in market with help of the concepts and theories relating to the field of psychology. Literature in psychology describes individuals with limited information processing capabilities, prone to systematic bias in processing information, tend to make mistakes, largely influenced by emotions, sentiments and perceptions and has a tendency to base their decisions on the opinion of others.

Investor being accepted as irrational in decisions either under reacts or over reacts to every event or new information. Since market may over react to a piece of information and under react to other piece of information, there is a need to highlight the biases, specifically heuristic driven biases, that causes same investor to under react to some information or event and over react to other (Fama, 1998). Number of heuristics driven biases and cognitive errors has been discussed as root cause for the investor's over or under reaction such as anchoring bias, overconfidence and self-attribution, representativeness, conservatism, herding etc. Each of these biases effects the investment decisions in their own way; present study is focused on herding bias only.

Herding refers to the intention of investors to replicate the behavior of other investors (Bikhchandani and Sharma, 2001). Banerjee (1992) states a herd involves "everybody doing what everyone else is doing even when their private information suggests doing something else". Herding can provoke a mispricing of securities due to biased opinion / expectation of expected risk and return threatening the rational decision making (Chang et al., 2000). Herding normally emerges in the period of huge price movement or

market stress. Investors are more likely to suppress their private beliefs in favor of consensus during periods of unusual market movement (Christie and Huang, 1995).

Different researches have given different theories why investors herd. It is found that investor's attraction for similar securities with similar attributes like historical returns, size and liquidity may be just a coincidence (Gompers and Metrick, 2001; Falkenstein, 1996). Herding behavior is most common in investors, managers, portfolio managers, analysts etc. because normally their compensation depends upon their performance (Trueman, 1994; Scharfstein and Stein, 1990). Reasons for herding behavior to exist may be time and cost involved in gathering information (Kultti and Miettinen, 2006), increased confidence of investors on the collective judgment (Subash, 2012), uncertainty about own valuation (Prechter and Parker, 2007), belief on the consensus forecast (Gallo et al, 2002; Lamont, 2002; Clement and Tse, 2005) however having consensus cannot necessarily show herding behavior (Zitzewitz, 2001).

Evidence of herding behavior has been found in Japan, South Korea and Taiwan (Chang et al, 2000), China's A and B share markets (Zhou, 2007; Tan et al, 2008), Australian equity market (Henker et al, 2003), Asia and Middle East (Demirer et al., 2007). However, no evidence of herding has been found in U.S. and Hong Kong (Chang et al., 2000), Africa, Western Europe, Eastern and Central Europe, and Latin America (Demirer et al., 2007), National stock exchange of India (Prosad et al., 2012), Dhaka Stock Exchange (Ahsan et al., 2013).

Herding may exist at any level whether it be in terms of stock returns, market conditions or stock turnover etc however it cannot always be considered irrational as relying on an analysis by a trustworthy source instead of making own judgment may prove to be good (Garber, 2000). Herding behavior proves to be a noise in financial markets and increases the risk that things will not go as suggested by fundamentals. This results into momentum returns and overreaction of investors (DeLong et al., 1990). Low turnover stocks are not very attractive for the investors and thus no or less information about these stocks arrive at the market. Due to lack of information, investors find it reliable to herd whereas this is not the case with high turnover stocks (Gregroriou and Ioannidis, 2006).

Investors are found to herd in extreme market situations (Chang et al., 2000; Christie and Huang, 1995) where either information is costly or investors do not have time for valuations and thus they follow consensus decision. When herd behavior exists, dispersion among individual stock returns and market returns minimizes or increase at a diminishing rate.

In efficient markets, investors are perceived to respond to the information immediately, reflected in stock prices as well as stock market index. However, in times of extreme market conditions when markets are found to be highly volatile, investors tend to rely on movement of market rather than depending upon their own information. The returns earned during this period by an investor cannot be expected to be significantly different from that of whole market. Thus the analysis of dispersion between individual security returns and market returns can provide a reliable evidence of herding. In order to find whether herd behavior exists in Pakistani market or not, we have formulated our hypothesis as:

H_1: Dispersion between individual stock returns and market returns decrease in extreme market conditions.

Fu and Lin (2010) examine Chinese stock markets and report that turnover rate may influence herding. The study proposed that the stocks with low turnover rate may have higher tendency to herd market. For high turnover stocks generally investors rely on their own calculations and do not follow the trends in market. This trend has been termed as Turnover Effect in Herding. According to the Avery and Zemsky (1998) investors may not have sufficient information; they may observe and follow the other investors' action. Since for low turnover stocks usually much information is not available thus herding is more expected for such stocks. In this case dispersion between market returns and low turnover stock returns is expected to be found very low. Since an examination of turnover effect can also help founding the evidence of herding, we hypothesize for turnover effect as follows:

H_2: Dispersion between low turnover stock returns and market returns decrease in extreme market conditions.

Karachi stock exchange is an emerging market and there is a need to assess the investor behavior in such market conditions. Keeping in view, this study was conducted to find whether herding behavior exist among investors of Karachi stock market and also to r out the nature of stocks and market conditions that are more prone to herding.

MATERIALS AND METHODS

In extreme market situations, investors tend to follow the trends of market instead of relying on their own signals. This tendency, termed as herding, has been tested for KSE-100 Index companies by measuring Cross Sectional Standard Deviation (CSSD) and Cross Sectional Absolute Deviation (CSAD) between market and individual stock returns. Also the turnover effect on herding has been measured through High Turnover Standard Deviation (HTSD), High Turnover Absolute Deviation (HTAD), Low Turnover Standard Deviation (LTSD) and Low Turnover Absolute Deviation (LTAD).

Data for the purpose i.e. daily stock returns and daily market returns have been gathered from the official website of Karachi Stock Exchange (KSE) and Business Recorder. Restricted by the data availability, analysis period has been confined to the years 2000-2014.

CSSD measure used by Christie and Huang (1995) and by number of other studies to test herding has been defined as:

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{N_t} (R_{i,t} - R_{m,t})^2}{N_t - 1}}$$

Where:

$R_{i,t}$ = Daily stock return at time t,

$R_{m,t}$ = Cross-sectional stock market index returns at time t.

N_t = Number of stock listed in equity market during time period t.

Model I to test Herd behavior would be estimated as:

$$CSSD_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t$$

Where:

D_t^u = 1 when return on the market for time period *t* belongs to the extreme upper tail of the returns distribution. A value of zero "0" would be assigned otherwise.

D_t^L = when return on the market for time period *t* falls in the extreme lower tail of the returns distribution. A value of zero "0" would be assigned otherwise.

Most of the studies referred above have defined extreme market at 5% of return distribution. Demirer et al. (2007) while analyzing daily returns for 1998-2004 applies two strategies to define extreme market -e at 5% and at 1%. This study is analyzing daily returns for the period 2000 to 2012 i.e. 4910 observations which is a large data set to analyze. Thus this study defines Extreme market condition at 5% as well as at 10% of return distribution after arranging it in descending/ascending order.

When return distribution has been arranged in descending order, upper 5% observations indicate extreme upper tail of return distribution and lower 5% indicate the extreme lower tail of return distribution.

Since for herding to exist dispersion between individual return and market returns should be minimum, a small value of CSSD in extreme market situations support the evidence of herding. Thus to have an evidence of herd behavior in KSE, values of regression coefficients i.e. β_1 and β_2 should be significantly negative.

Non linearity of herding

Non-linearity of a relationship refers to a non-proportional increase/decrease between two variables. Christie and Huang (1995) held that herd behavior contradicts with the traditional asset pricing theories which states that dispersion increases with the absolute market returns because of differing sensitivity of stocks to market returns. It is not necessary that a change in returns always bring about same magnitude of change in spread between stock returns and market returns. Based on this idea, Chang et al. (2000), negating linear relationship of dispersion and market returns proposed by rational asset price models used cross sectional absolute deviation (CSAD) to capture dispersion and propose a new model covering all possibilities of non linear relationships between returns and dispersion. CSAD has been defined as:

$$CSAD_t = \frac{1}{N_t} \sum_{i=1}^{N_t} |R_{i,t} - R_{m,t}|$$

Model II to test herding based on measure of CSAD has been implied as:

$$CSAD_t = \theta + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t$$

Where:

$CSAD_t$ is the average cross-sectional absolute deviation of each stock with respect to the equally-weighted market return, $R_{m,t}$ in period *t*. According to this model, in case herd behavior exists, a non linear relationship would be indicated by significantly negative value of γ_2.

Swap of Dependent Variable

Fu and Lin (2010) test herding by swapping both the dependent variables in model I and Model II.

Same methodology has been implied to see whether results change or remain the same. After swapping dependent variables, the equations are changed as follows:

$$CSAD_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t$$

$$CSSD_t = \theta + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t$$

Turnover effect on Herding

Turnover effect has its roots in the notion that low turnover stocks are more prone to herding as compared to high turnover stocks due to lack of information (Fu and Lin, 2010; Gregoriou and Ioannidis, 2006). In order to test turnover effect on herding, stocks have been divided into two groups; high turnover stocks and low turnover stocks on the basis of average turnover for the period. Stocks above median turnover over are classified as high turnover stocks and below median stocks are classified as low turnover stocks. Based on the concept of standard deviation (SD) and absolute deviation (AD), four measures of dispersion from market (two each for high and low turnover stocks) have been established following Fu and Lin (2010) as under:

$$HTSD_t = \sqrt{\frac{\sum_{h=1}^{N_t/2} (R_{h,t} - R_{m,t})^2}{N_t/2}}$$

$$LTSD_t = \sqrt{\frac{\sum_{l=1}^{N_t/2}(R_{l,t} - R_{m,t})^2}{N_t/2}}$$

$$HTAD_t = \frac{1}{2N_t}\sum_{h=1}^{N_t/2}|R_{h,t} - R_{m,t}|$$

$$LTAD_t = \frac{1}{2N_t}\sum_{l=1}^{N_t/2}|R_{l,t} - R_{m,t}|$$

Where:
t = Time period,
$R_{m,t}$ = Daily market returns,
$R_{h,t}$ = Daily return of high turnover stocks,
$R_{l,t}$ = Daily returns of low turnover stocks,
N_t = Number of stocks at time period t.

Low dispersion from market returns implies the existence of herding. Since low turnover stocks are more likely to herd due to lack of sufficient information, turnover effect to exist needs significantly higher mean values for HTSD and HTAD than the LTSD and LTAD. All the four measures of dispersion calculated for turnover effect will be tested for Model I and Model II (specified above) with the exception that HTSD, HTAD, LTSD, and LTAD will be used as dependent variable (Y_t) respectively. The generic models will thus take the shape as under:

$$Y_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t$$

$$Y_t = \theta + \gamma_1|R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t$$

Significantly negative values of β_1, β_2, γ_2 for LTSD and LTAD being dependent variables implies turnover effect in extreme market situations. Extreme market has been defined at 5% and 10% on same pattern as defined above. However, for HTSD and HTAD as dependant variables, β_1, β_2, and γ_2 does not need to be significantly negative.

Asymmetry test

Since markets behave differently to good and bad news, same behavior cannot be expected for whole sample. Implying the same measures of herding, a further bifurcation of herding model can be made for up and down markets to find out asymmetric behavior of these variables in two distinct states of market. Variance between the up market returns and down market returns will show the asymmetry between responses to news. Basic model for CSAD has been modified by Fu and Lin (2010) as follows to test asymmetry in herding behavior:

$$Y_t = \alpha + \gamma_{1,up}|R_{m,t}| + \gamma_{2,up}(R_{m,t})^2 + \varepsilon_t$$

$$Y_t = \alpha + \gamma_{1,down}|R_{m,t}| + \gamma_{2,down}(R_{m,t})^2 + \varepsilon_t$$

CSSD, CSAD, HTSD, HTAD, LTSD, and LTAD have been used one by one as dependent variable Y_t. In order to test asymmetry in reactions, market returns are first ranked into ascending order. Market has been defined as down market up to the point where market returns are zero. Beyond this point, when returns turn positive, market has been defined as up market. To have an evidence of asymmetric herding behavior in up and down markets, not only γ_2 has to be negative but also value of $\gamma_{2,up} - \gamma_{2,down}$ should be significantly different than zero or H_0: $\gamma_{2,up} - \gamma_{2,down} = 0$ should be rejected.

RESULTS

Descriptive Statistics

Mean, Median, skewness, kurtosis, standard deviation and standard error for the data series of CSSD, CSAD, HTSD, HTAD, LTSD, LTAD and market returns for the period 2000 to 2014 has been presented in Table 1. Descriptive stats shows that mean value for KSE 100 index returns is 0.0005 or 0.05% with a standard deviation of 0.0121 or 1.21% showing less volatile returns earned by the market during sample period.

Table 1: Descriptive Statistics for KSE-100 index

	Mkt Ret	CSSD	CSAD	LTSD	LTAD	HTSD	HTAD
Mean	0.0005	0.0173	0.0115	0.0226	0.0056	0.0238	0.0057
Median	0	0.0188	0.0129	0.0233	0.0059	0.0255	0.0062
Maximum	0.0851	0.4667	0.2051	0.5594	0.128	0.3584	0.0831
Minimum	-0.0774	0	0	0	0	0	0
Std. Dev.	0.0121	0.0212	0.0115	0.0282	0.0062	0.0254	0.0056
Skewness	-0.2338	8.141	4.4846	8.015	6.8439	4.1028	3.5009
Kurtosis	9.0746	132.0003	62.5277	124.9693	111.4856	43.2205	41.6336
std error	0.0002	0.0003	0.0002	0.0004	0.0001	0.0004	0.0001
Observations	4749	4749	4749	4749	4749	4749	4749
Paired Mean Test							
		HTSD and LTSD				HTAD and LTAD	
Mean Difference		0.0013				0.0001	
T- value		2.2781*				1.1635	

*significant at 5% level of significance

Table 2: Model I - Test of Herding in KSE-100 Index

Cross Sectional Standard Deviation (CSSD)		
	5% extreme market	10% extreme market
Intercept	0.0163	0.0324
	(5.8406)*	(5.1404)*
D^u_t	0.0201	-0.0101
	(14.9392)*	(-16.7942)*
D^L_t	-0.0026	-0.0157
	(-1.9402)**	(-16.9664)*
R^2	0.0449	0.1428
Adj R^2	0.0445	0.1424
F-Value	15.3132*	18.3482*

*significant at 99% level of confidence; **significant at 90% level of confidence; β_1, β_2 are the coefficients for D^u_t and D^l_t respectively; t-values in parenthesis

Table 3: Model II - Test of Non Linearity of Herding in KSE 100 Index

Cross Sectional Absolute Deviation (CSAD)	
Intercept	0.0051
	(13.1877)*
$R_{m,t}$	1.206
	(14.8870)*
$R^2_{m,t}$	-1.1401
	(-12.4326)*
R^2	0.4347
Adj R^2	0.4345
F-value	19.956*

*significant at 99% level of confidence; γ_1, γ_2 are the coefficients for $|R_{m,t}|$ and $(R_{m,t})^2$ respectively. t-values in parenthesis

Mean value of CSSD has been found as 0.0173 which is higher than the mean value of CSAD i.e. 0.0115 however the standard deviation of CSSD 0.0212 or 2.12% is higher than the standard deviation of CSAD that is 0.0115 or 1.15%. Thus the cross sectional standard deviation (CSSD) contains more volatility as compared to cross sectional absolute deviation (CSAD). Low turnover standard deviation (LTSD) when compared with Low turnover absolute deviation (LTAD) mean value for LTSD is found higher than the LTAD that is a value of 0.0226 against the mean value of 0.0056 for LTAD. Standard deviation for both the series is 0.0282 and 0.0062 (2.82% and 0.06%), respectively. Series of HTSD and HTAD shows mean values of 0.0238 and 0.0057 that is 2.38% and 0.05% respectively portraying higher values for HTSD series. Standard deviation is 0.0254 and 0.0026 or 2.54% and 0.02% respectively. Dispersion among the observations of HTSD is way higher than the HTAD which has a very low standard deviation. Thus the characteristics of both the series seems to be very different till this point. In order to have basis to test turnover effect on herding, it is necessary to test whether there exist any significant difference in means of two measures or not. If mean value of HTSD and HTAD is significantly higher than the LTSD and LTAD, turnover effect will be found. Paired mean test for HTSD and LTSD shows the mean difference of 0.0013 with a t value of 2.2781 which is significant at 5% level of confidence. Results for paired mean test for HTAD and LTAD found a mean difference of 0.0001 and a t-value of 1.1635 that is positive but insignificant. Significantly high mean value of HTSD shows that low turnover stocks have less dispersion from market and thus are tenderer for herding. However, this cannot be generalized for HTAD and LTAD since t-value remains insignificant.

Test of Herding

In order to find evidence of herding in KSE-10 0 index during the period 2000 to 2014, basic test of herding has been implied through two different models with two different dependent variables.

Table 2 explains the regression results for model I of herding measuring cross sectional standard deviation (CSSD) in extreme market conditions. Extreme market has been defined at 5% and 10% respectively. β_1 and β_2 are the coefficients for dummy variables used to explain up market and down market states, respectively. Results reveal a significantly positive value for β_1 that is 0.0201 (t-value = 4.9392) when extreme market is defined as top and bottom 5% values of return distribution. Coefficient for down market β_2 is -0.0026 (t-value = -1.9402) which is significant at 90% confidence interval. These results show that there exists a positive relationship between CSSD and up market. When market is enjoying high returns, cross sectional standard deviation between stock returns and market return increases which is against the norms of herding. Thus no evidence of herding can be proved for up market when defined at 5%. Significantly negative value of β_2 proves the negative relationship between CSSD and down market state. When market on the whole is earning low returns, standard deviation between stock returns and market returns decreases i.e. investors rely more on the market behavior rather than on their own signals in down market conditions.

Extreme market when defined at 10% shows the values of β_1 andβ_2 as -0.0101 and -0.0157 with the t-values of -16.7942 and -16.9664 that is significant at 99% confidence interval. This shows that there exists significantly negative relationship between CSSD and extreme market returns. Standard deviation between market returns and stock returns decreases in extreme market which provides the evidence of herding in both up and down market conditions. R^2 of model is 14.28% for 10% extreme market and 4.45% for 5% extreme market.

Model II: Non linearity of herding

Herding measured by CSAD accommodating non linear relationship of dispersion and returns has been presented in model II. Results for Model II are given as under:

Table 4: Swap of CSSD and CSAD in Model I and Model II

Swap Model I		Swap Model II	
Dependent Variable:CSAD		Dependent Variable: CSSD	
Intercept	0.0099	Intercept	0.0086
	(6.3649)*		(4.3560)*
D^u_t	0.0159	$R_{m,t}$	1.6497
	(13.3364)*		(18.6843)*
D^L_t	0.0158	$R^2_{m,t}$	-1.7819
	(11.1175)*		(-13.6152)*
R^2	0.1729	R^2	0.2321
Adj R^2	0.1726	Adj R^2	0.2318
F-value	15.5674*	F-value	24.1873*

*significant at 10% level of significance; β_1, β_2 are the coefficients for D^u_t and D^l_t respectively; γ_1, γ_2 are the coefficients for $|R_{m,t}|$ and $(R_{m,t})^2$ respectively. t-values in parenthesis

Table 3 depicts the regression results for cross sectional absolute deviation and market returns. Results shows significantly positive value for $R_{m,t}$ that is 1.2060 (t-value = 14.8870) and significantly negative value for $R^2_{m,t}$ = -1.1401 (t-value = -12.4326). There exists positive relationship between absolute market returns and cross sectional absolute deviation (CSAD) i.e. increase in market returns increases the deviation between stock and market returns. However relationship between CSAD and squared market returns is significantly negative depicting the non linear negative relationship between CSAD and market returns. As the market returns increases at double rate, dispersion between stock returns and market returns decreases by magnitude of one half. This is exactly the same as document by theory of herding. R^2 of the model is 43.47% which is reasonable enough to rely on evidence of herding.

Swap of Dependent Variables

As we swap the dependent variables in Model I and Model II, the results obtained are as follows:

Table 4 above shows the result for swap of dependent variables in basic Model I and Model II. D^u_t and D^L_t are the coefficients of up and down market respectively, defined as top and bottom 5% returns of a series of market returns. $R_{m,t}$ and $R^2_{m,t}$ are the coefficients for market returns and squared market returns respectively. When CSAD is put to the model I as dependent variable, results reveal significantly positive coefficients for D^u_t and D^L_t (D^u_t = 0.0159, t-value = 13.3364 and D^L_t = 0.0158,t-value = 11.1175) which shows when there is an upward trend in market, cross sectional absolute deviation (CSAD) also increases means in up market investors do not give much weightage to the buy and sell decisions of other market participants and act on their own signals. Same trend has been found when market on the whole has a downward trend. R^2 of this model is 17.29%. These are the results contrary to the results of model I testing existence of herding with CSSD being dependent variable which indicates a tendency of herding in Pakistani investors in down market conditions.

Table 5: Model I - Turnover Effect in KSE 100 Index

	5% Extreme Market		10% Extreme Market	
	HTSD	LTSD	HTSD	LTSD
Intercept	0.02	0.021	0.0179	0.0222
	(14.1606)*	(5.3907)*	(14.4329)*	(4.3724)*
D^u_t	0.0241	0.0279	0.0241	0.0099
	(13.4090)*	(17.5937)*	(12.6259)*	(8.1289)*
D^L_t	0.0269	-0.0282	0.0227	-0.0065
	(13.9018)*	(-17.7196)*	(13.5436)*	(-5.3399)*
R^2	0.0744	0.1109	0.1104	0.0178
Adj R^2	0.074	0.1105	0.1101	0.0174
F-Value	19.8371*	29.0061*	12.6061*	42.9939*

*significant at 1% level of significance; β_1, β_2 are the coefficients for D^u_t and D^l_t respectively; t-values in parenthesis

When CSSD is put to the Model II as dependent variable in place of CSAD, results shows significantly positive value as coefficient of $R_{m,t}$ = 1.6497 (t-value = 18.6843) and significantly negative coefficient for $R^2_{m,t}$ = -1.7819 (t-value = -13.6152). Negative value of $R^2_{m,t}$ (γ_2) proves the non linear relationship of cross sectional standard deviation (CSSD) with market returns. These results are exactly the same as found by Model II with CSAD being dependent variable Thus we may conclude that herding exists in Pakistani market in a non linear manner. R^2 for this model is higher than that of Model I with CSAD being dependent variable that is 23.21%.

Turnover Effect

Once the evidence of herding has been discovered partly for model I and in full for Model II, its relationship with turnover is to be investigated. To measure Turnover Effect KSE-100 index has first been divided into high turnover stocks and low turnover stocks. Based on standard deviation and Absolute deviation four different measures have been calculated. Basic Model I and model II have been estimated with high turnover standard deviation (HTSD), Low turnover standard deviation (LTSD), high turnover standard deviation (HTAD) and low turnover absolute deviation (LTAD) being dependent variables respectively. Results for market model I are given below.

Table 5 shows the results for turnover effect on herding using the basic model I based on extreme market situation with HTSD and LTSD being dependent variables. Extreme market has been defined at 5% as well as at 10% of return series to have a more comprehensive view of herding. D^u_t shows the coefficient for the dummy variable depicting up market (top 5% and 10% of market return series) and D^L_t depicts the coefficient for dummy variable used to depict down market or bottom 5% and 10% of market return series. Results for HTSD shows positively significant values of β_1 and β_2 (β_1 = 0.0241, t-value = 13.4090 and β_2 = 0.0269, t-value = 14.9018) when extreme market is defined at 5%. R^2 of the model is

7.44%. These results reveal that as the market moves up standard deviation between high turnover stock returns and market returns increases. Similarly when market has a downturn and earnings are lowest, dispersion between high turnover stock returns and market returns increases or remains the same implying no herding for high turnover stocks.

Results for low turnover standard deviation (LTSD) shows positive value of β_1 (β_1 = 0.0279, t-value = 17.5937) which is significant at 99% confidence interval. This shows that dispersion between low turnover stock returns and market returns does not reduce in up market condition. However significantly negative value of β_2 (β_2 = -0.0282, t-value = -17.7196) implies that in down market, dispersion between low turnover stock returns and market returns decreases. This gives us the evidence of herding in down market situation for low turnover stocks. R^2 of the model is 11.09%.

When extreme market is defined at 10% of return series, the results remain the same. Highly significant positive values are obtained for β_1 and β_2 when HTSD is used as dependent variable. Thus for high turnover stocks dispersion between stock returns and market returns does not reduce in up and down markets which implies no herding exist. However for LTSD as dependent variable, regression results show significantly positive coefficient for β_1 but significantly negative coefficient for β_2 implying reduction in dispersion between low turnover stock returns and market returns in down market which is exactly in accordance to herding theory.

Table 6: Model II - Turnover Effect for KSE 100 Index

	5% Extreme Market		10% Extreme Market	
	HTAD	LTAD	HTAD	LTAD
Intercept	0.0048	0.0049	0.0043	0.0043
	(14.2835)*	(23.1019)*	(24.6529)*	(14.5512)*
D^U_t	0.0069	0.0079	0.0066	0.0073
	(17.7723)*	(12.5740)*	(13.8245)*	(12.1773)*
D^L_t	0.0071	0.0079	0.0061	0.0067
	(18.4062)*	(13.4627)*	(12.0363)*	(10.3753)*
R^2	0.1158	0.1812	0.1665	0.2521
Adj R^2	0.1154	0.1809	0.1661	0.2518
F-value	23.7889	15.164*	31.999*	19.9683*

*significant at 99% confidence interval; **significant at 90% confidence interval; β_1, β_2 are the coefficients for D^u_t and D^l_t respectively; t-values in parenthesis

Table 6 explains the turnover effect on herding with HTAD and LTAD as dependant variable when market is defined as extreme market at 5% and 10% of market return series respectively. The results reveal values of D^u_t and D^L_t are significantly positive for High turnover absolute deviation (HTAD) and low turnover absolute deviation (LTAD). This implies that dispersion between stock returns and market returns does not reduce for high turnover stocks as well as for low turnover stocks in extreme market situations. Results remain the same when extreme market is defined at 10% of market return series for the period 2000 to 2014.

In order to have a turnover effect on herding, values of β_1 and β_2 has to be negatively significant for LTSD and LTAD as dependent variable. However for HTSD and HTAD no such condition applies for high turnover stocks, whether market is up or down. Since high turnover stocks are generally considered as favorites (or winners) they do not lack relative information which is available to all. Investors on the basis of freely available information can make their own judgments easily and thus no herding behavior arises for high turnover stocks. As far as low turn over stocks are concerned, information is either less available or it is costly thus investors prefer to rely on the overall trend of market which gives birth to herding. Results of regression reveals partial existence of turnover effect (with significantly negative β_2) only for down market (both at 5% and 10% extreme market) only when LTSD is estimated by Model I. However as far as high turnover stocks are concerned, they exhibit turnover effect as documented.

Turnover Effect: Model II

Table 7 below shows the regression results for model II based on non linear nature of herding. In order to test turnover effect, HTSD, HTAD, LTSD and LTAD have been regressed with market returns and the results are as under:

Table 7: Model II - Turnover Effect for HTSD, LTSD, HTAD, LTAD

	HTSD	LTSD	HTAD	LTAD
Intercept	0.0194	0.023	0.0047	0.0048
	(4.9674)*	(5.1002)*	(3.2454)*	(6.2327)*
$R_{m,t}$	0.0991	0.0443	0.0274	0.0283
	(3.0959)*	(1.4665)	(3.9872)*	(4.7862)*
$R^2_{m,t}$	0.4347	-0.3545	0.5226	0.2633
	(12.0734)*	(-6.1002)*	(7.6486)*	(3.6464)*
R^2	0.1015	0.0081	0.1397	0.2199
Adj R^2	0.1011	0.0076	0.1394	0.2195
F-value	17.9916*	9.0253	5.4779*	8.9817*

*significant at 90% level of confidence; γ_1, γ_2 are the coefficients for $|R_{m,t}|$ and $(R_{m,t})^2$ respectively; t-values in parenthesis

Results in Table 7 show values of $R_{m,t}$ = 0.0991, t-value = 3.0959 and $R^2_{m,t}$ = 0.4347, t-value = 12.0734) are significantly positive when HTSD is regressed with market returns. Similarly positive and significant values of γ1 and γ_2 have been found for HTAD and LTAD regressed with market returns. However the results for LTSD are different with γ_1 = 0.0443 and corresponding t-value = 1.4665 which shows a positive but insignificant relationship between LTSD and market returns. γ_2 has obtained a value of -0.3545 and

corresponding t-value is -6.1002 which is negative and significant with 99% confidence interval. R^2 of the model is extremely low that is only 0.81%.

In order to have a turnover effect, negative value of γ_2 is required for LTSD as well as LTAD. However, only a partial evidence of turnover effect (i.e. only for LTSD) has been found by results obtained. Results for turnover effect measured by Model II are some what same as the results of model I where only for LTSD evidence of turnover effect is found for down market situation.

Asymmetry test

Since investors as well as market do not react to good and bad news in same manner, it is hypothesized that there exist asymmetric responses of market participants for up and down markets. This tendency has been tested for the measures of herding and turnover effect. Results for asymmetry test are as under:

Table 8: Asymmetry Test for Herding using CSAD and CSSD

	Up Market		Down Market	
	CSSD	CSAD	CSSD	CSAD
Intercept	0.0211	0.0128	0.0051	0.003
	(2.5592)*	(3.1897)*	(5.6380)*	(3.3299)*
$R_{m,t}$	0.4905	0.4842	1.9409	1.4091
	(4.2468)*	(9.5750)*	(8.0515)*	(4.3832)*
$R^2_{m,t}$	0.4445	-0.6398	-1.0495	-1.0846
	(0.1855)	(-0.6096)	(-14.2328)*	(-12.8895)*
R^2	0.0488	0.1773	0.3419	0.5559
Adj R^2	0.0478	0.1764	0.3414	0.5556
F-value	8.1510*	9.467*	17.3377*	18.287*

*significant at 90% level of confidence; γ_1, γ_2 are the coefficients for $|R_{m,t}|$ and $(R_{m,t})^2$ in up and down markets respectively. t-values in parenthesis

Table 8 shows the results of regression with CSSD and CSAD where up market has been defined as one where returns are positive. All the zero and negative returns are included in down market. For asymmetric reaction to exist, difference between $\gamma_{2\,(up)}$ and $\gamma_{2\,(Down)}$ has to be significantly other than zero. Value of γ_1 for CSSD in up as well as down market is positively significant with 99% confidence interval. γ_2 for CSSD in up market is 0.4445 with a t-value of 0.1855 which is positive and insignificant. γ_2 for CSSD in down market is -1.0495 with a t-value of -14.2328 i.e. significant at 99% confidence interval.

γ_1 for CSAD is again positive and significant at 99% confident interval for both up and down market. Value of γ_2 for CSAD for up market is negative i.e. -0.6398 with a t-value of -0.6096 which is an insignificant value. γ_2 for CSAD in down market is also negative i.e. -1.0846 but significant (t-value = -12.8895). Difference between $\gamma_{2\,(up)}$ and $\gamma_{2\,(down)}$ for CSSD is 1.494 i.e. >0 and that for CSAD is 0.4448 which is again greater than zero showing asymmetry between the reactions of investors.

Table 9: Asymmetry Test for Turnover Effect in Up and Down Market

	Up Market			
	HTSD	LTSD	HTAD	LTAD
Intercept	0.0285	0.024	0.0065	0.0063
	(2.3912)*	(2.2861)*	(5.5081)*	(3.3305)*
$R_{m,t}$	0.604	0.5386	0.2048	0.2368
	(3.6747)*	(4.0486)*	(6.5308)*	(10.1857)*
$R^2_{m,t}$	0.2777	-1.1263	-0.4322	-0.2352
	(-0.0814)	(-2.943)**	(-1.664)***	(-1.787)***
R^2	0.0357	0.0103	0.0854	0.2007
Adj R^2	0.0346	0.0092	0.0844	0.1998
F- value	32.553*	9.1523*	8.1044*	20.714*
	Down Market			
	HTSD	LTSD	HTAD	LTAD
Intercept	0.0065	0.0185	0.0015	0.0015
	(6.4033)*	(4.3569)*	(6.5662)*	(9.5039)*
$R_{m,t}$	2.5001	0.8927	0.6725	0.6881
	(13.1165)*	(7.8618)*	(11.6504)*	(2.6187)*
$R^2_{m,t}$	-1.07397	-1.36448	-0.978	-0.6376
	(-14.716)*	(-4.626)*	(-18.711)*	(-2.032)*
R^2	0.3853	0.0325	0.4457	0.5536
Adj R^2	0.3849	0.0318	0.4453	0.5533
F-value	5.4199*	5.0709*	12.117*	18.262*

*significant at 1% level of significance; ** Significant at 5% level of Significance; ***Significant at 10% level of Significance; γ_1, γ_2 are the coefficients for $|R_{m,t}|$ and $(R_{m,t})^2$ in up and down markets respectively; t-values in parenthesis

Asymmetric turnover effect

Since market responds differently to good and bad news, turn over effect is also expected to appear asymmetrically for given sample. Results of investigation are given below:

Results for Table 9 shows significantly positive values of γ_1 for all the dependent variables i.e. HTSD, HTAD, LTSD, and LTAD in both up and down market conditions. When comes to γ_2, insignificant positive value has been obtained (γ_2 = 0.2777, t- value = 0.0814) for HTSD in up market. γ_2 for LTSD is negatively significant with a coefficient of -1.1263 and t-value of -2.943 in up market. Rest LTAD and HTAD both have significantly negative value for γ_2. Result for down market shows significantly negative values for all the four measures of turnover effect in herding that is HTSD, LTSD, HTAD and LTAD. However the level of significance in down market is higher as compared to that of up market.

DISCUSSION

Results for the Cross Sectional Standard Deviation (CSSD) and Cross Sectional Absolute Deviation (CSAD) between market and individual stock returns in extreme market situations have found that investors rely more on the market behavior rather than on their own signals in down market conditions whereas no such evidence is found for up market condition. However,

extreme market when defined at 10% provides the evidence of herding in both up and down market conditions depicted by negative relationship of CSSD and extreme markets. The evidence so found is in accordance to the results presented by Demirer et al. (2007) for Asian and Middle East stock market, Zhou (2007) for China's A and B share markets, Demirer and Kutan (2006) for Shanghai and Shenzhen stock exchanges, Kapusuzoglu (2011) for Istanbul Stock Exchange and findings of Christie and Huang (1995). Also the non linear and asymmetric relation remains the same when CSAD is used as dependent variable. Based on the evidences found, this study accept its first alternate hypothesis i.e. Dispersion between individual stock returns and market returns decrease in extreme market conditions. As for the turnover effect in herding, for high turnover stocks dispersion between stock returns and market returns does not reduce in up and down markets which implies that no herding exist. However for Low Turnover Stocks results show reduction in dispersion between low turnover stock returns and market returns in down market which is exactly in accordance to herding theory. The way investors deem to follow market trend instead of making personal judgments is also reflected in pattern of trading turnover. Same results were found by Fu and Lin (2010) and Gregroriou and Ioannidis (2006). Based on the results found, this study accepts its second alternative hypothesis i.e. Dispersion between low turnover stock returns and market returns decrease in extreme market conditions.

Roots of this tendency of herding found in investors in up and down markets may be found in human psychology. Humans naturally have a tendency to be a part of the crowd to have a sense of conformity against fear of being left out. When market has a downward trend characterized by negative returns, investors consider it safe to mimic the general trend of market instead of relying on its own judgment and be an odd one out. Similarly when market has an upward trend, investors tend to herd not only due to their fear of left behind but also due to the natural emotions of greed and envy.

Other than the psychological reasons, herding behavior of investors may also be explained in terms of fundamentals. The cost of gathering financial information may be a factor restraining the investors to make personal judgment finding it easy and economical to follow masses. Karachi stock exchange is an emerging market where it is not easy for the individual investor to get some insider information to form their investment strategies. Also a major chunk of market is owned by some large group of companies. Investors not being confident about their own information and judgment prefer to rely on generalized opinions to avoid probable losses. Human psychology and investor sentiments may trigger the overreaction in investors to the upcoming news, particularly bad news. Herding found in the periods of negative returns may also be associated to this overreaction to the bad news arriving to the market.

Conclusions and recommendations

Combining the human psychology with the traditional finance, tendency to Herd has been tested for KSE-100 Index companies for the period 2000 to 2014. Results show that when extreme market is defined at 5%, CSSD measured between market returns and stock returns has been lowered in down market situation. However, extreme market when defined at 10% provides the evidence of herding in both up and down market conditions depicted by negative relationship of CSSD and extreme markets. Also the non linear and asymmetric relation remains the same when CSAD is used as dependent variable. As for the turnover effect in herding, for high turnover stocks no herding exists. However for Low turnover stocks evidence of herding has been found.

The way investors deem to follow market trend instead of making personal judgments, demonstrates the investor overreaction to bad news arriving in market. Same is confirmed by the pattern of investment based on trading turnover. Since the investment decisions are largely based on investor sentiment, as shown by the evidence of herding behavior in Pakistani stock market, investors may exert more consciousness while making their investment decision. Being aware of the fact that investment decisions in extreme market situations are widely influenced by their fears, greed or merely an overreaction to the bad news, investors may assign more weight to their personal judgment and may look for some insider information to outperform market. Such conscious efforts may improve the efficiency of Karachi stock exchange making investors more rational in decision making.

Authors' contribution

All the authors have contributed equally towards the manuscript.

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