DO INVESTORS HERD

Do Investors Herd: An Emerging market Evidence

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This paper has been presented in the
3rd International Conference on Business Management February 27-28, 2013
organized by
School of Business and Economics
University of Management and Technology, Lahore, Pakistan

ABSTRACT

This study examines whether herding behavior exists for an emerging market for which no such study has so far been conducted. We employ two empirical models to evaluate herd behavior at the market-wide and industry-wide using daily stock price data from 18 sectors for Pakistan's market. These models are based on cross-sectional dispersions of stock returns. The linear model of Christie and Huang (1995) finds no evidence of herd formation, in any of the sectors, during periods of large market movements. In line with the results of the Christie and Huang model, the non-linear model of Chang et al (2000) also finds no evidence for herd behavior for all sectors and finds significant non-linear herding behavior for two sectors for the entire sample as well as when the sample was separated into up and down market movements. Overall, the results tend to support the notion of no herd formation in the Pakistan's market.

Key words: *herd behavior, herding, institutional investors, cross-sectional standard deviation of returns*

INTRODUCTION

The phenomenon that humans 'tend to mimic the behavior and actions of others' has been observed in a variety of social environments, including the actions of agents in economic setting. This 'imitative behavior' in financial markets is called herding[1]. This correlated behavior, as described by Nofsinger and Sias (1999), results in "a group of investors trading in the same direction over a period of time". This tendency of investors to imitate the observed behavior of other fellow investors carry an important implication for financial markets as herding may imply that investors may be suppressing their private information (Hwang and Salmon, 2004) and this may lead prices to deviate from the fundamental value. In contrast, herding can be rational in a number of ways such as information-based herding (Welch, 1992)[2] or it can be rational in a "utility maximizing" sense, with the thinking that other participants in the market are better-informed. Other potential sources taken into consideration in the behavioral finance literature arise when moving away from the market consensus can be potentially costly, such as in case of remuneration of fund managers (Banerjee, 1992)[3].

Herding in financial markets has become well-documented empirical evidence. There is a growing body of literature on the herding behavior of investors. The empirical studies have predominantly focused on the investment behavior of institutional investors, mainly on financial institutions (e.g., Kremer and Nautz, 2011), pension funds (e.g., Voronkova and Bohl, 2005; Badrinath and Wahal, 2002), fund manager (e.g., Liao, Huang, and Wu, 2011), mutual funds (e.g., Walter and Weber, 2006; Sellami, 2007; Grinblat, Titman and Wermers, 1995) or foreign institutional investors (Shyu and Sun, 2010). This growing interest in the institutional investor's behavior is partly stimulated by their relative importance in the market (Nofsinger and Sias, 1999) and the growing dominance of these institutional investors in financial markets worldwide and the possible influence of their trading patterns on asset prices and, partly, because of the common perception that institutional investors engage more in herding and feedback trading than the individual investors and this may contribute to the destabilization of the stock prices and thereby capital markets, diluting the information quality of the prices and aggravating the stock price volatility (Walter and Weber, 2011; Voronkova and Bohl, 2005). Nevertheless, some authors (see e.g., Natividad, Pilar and Sandra, 2011) argue that institutional investors are expected to be more well-equipped, better informed (Li, Rhee and Wang, 2009) and have superior capabilities and resources to better interpret the information as compared to other participants in the market and consequently/resultantly, may not have an apparent

[1] Hwang and Salmon (204) explains "Herding arises when investors decide to imitate the observed decisions of others or movements in the market rather than follow their own beliefs and information" while Devenow and Welch (1996) and Avery and Zemsky (1998) propose herding involves "a form of correlated behavior where investors imitate and follow other investors' decisions while suppressing their own private information and beliefs".

[2] In this case, independent and informed investors such as institutional investors, take actions spurred by the movements in fundamentals. Bikhchandani and Sharma (2001) call this type of herding as "spurious" or "unintentional herding".

[3] Other reasons could be reputation (Scharfstein and Stein, 1990), compensation-based herding (Roll, 1992).

incentive to engage in an intentional herd behavior. Thus, many studies on institutional herding, for instance, Grinblatt, Titman and Wermers (1995), Wermers (1999), Nofsinger and Sias (1999),Li and Yung (2004) and more recently,Liou, Haung and Wu (2011), Kallinterakis and Ferreira (2011) find diverse results. Hence, results from the studies on the behavior of institutional investors can't be generalized to the individual investors, in particular, and to the overall market in general. This necessitates the need to pay more attention to the behavior of the individual retail investors in markets dominated by domestic individual investors. This study attempts to fill this gap by examining an emerging market.

Our study examines whether herding behavior exists at the overall market and at the industry level. In contrary to the evidence on institutional investor's investment behavior we know little about individual investment behavior and whether they herd, particularly, in emerging financial markets. This paper extends the literature to an emerging yet relatively ignored market for such studies. To the best of our knowledge, this is the first study on individual investor herding behavior on the Pakistan's market, a market dominated by individual retail investors as compared to foreign or institutional investors.

Our study contributes to the research on investor herd behavior in several ways. First, this study measures herding for a market for which no such study has so far been conducted. Second, there is limited and mixed evidence on herd behavior in emerging markets and these studies are restricted to a few markets such as Taiwan, Hong Kong, South Korea and few Latin American markets. This study extends the literature to Pakistan's market. We extend the study to this market in three distinct aspects namely, (i) market-wide as well as sector-specific evidence of herd behavior, (ii) employ different methodologies in one study and compare their robustness for the same market, and (iii) provide evidence by employing most recent daily data from Jan 2002 to December 2009. Finally, we use sufficiently large sample interval to minimize the influence of any bias produced by any market effects.

LITERATURE OVERVIEW

Empirical examinations of herding in financial markets have been conducted along two distinct paths. The first path, pioneered by Christie and Hwang (1995), examines herd behavior on the basis of the cross-sectional dispersion (CSSD) of stock returns in different extreme market conditions. In this model, the CSSD of individual stock returns is regressed against a constant and two dummies that attempts to capture extreme positive and extreme negative returns. Chang et al (2000) modified C&H model and use absolute measure of CSSD for examining herding for US and some Asian markets. The C&H model is based on the notion that during normal market conditions, the rational asset pricing models would predict that the cross-sectional dispersion of returns would depend on the absolute value of the market returns as

the assets differ in their market sensitivity to aggregate movements in the market. While, when market participants are engaged in herd behavior (when they suppress their own private information and base their actions/decisions on the collective actions/behavior of the market) individual stock returns will tend to deviate little from the overall aggregate market returns, and hence lower cross-section dispersions in individual security returns—a sign of presence of herd behavior. Hence the 'herd behavior' and 'rational asset pricing models' tend to differ in their predictions on the behavior of stock return dispersion, though particularly during market stress. These models have been applied to a range of markets (both advanced and developing markets), mainly during conditions of market stress, and for both institutional and individual investors. The evidence of herd behavior has predominantly been found for developing markets as compared to developed markets. For instance, in their study of herding behavior in five different markets, Chang et al (2000) report that investors in the US and Hong Kong markets do not herd while those of the South Korea and Taiwan do herd significantly. Gleason, Mathur and Peterson (2004) used the C&H model for Exchange Traded Funds (ETFs) and find no evidence of herd behavior either during extreme up or extreme down market movements for ETFs. Demier and Kutan (2006) find no evidence of herd behavior for Chinese market using firm and sector level data, during periods of extreme up and down markets. While, Dorn, Hubberman and Psengmuller (2003) find strong evidence of herd behavior for German retail investors at a German broker using daily and quarterly intervals.

Recently, in a different study, Li, Rhee and Wang (2009) examines differences in institutional and individual investors herding for Chinese market and document more intense herding by better-informed institutional investors as compared to individual investors. Nevertheless, the paper also documents less informed individual trader's more reliance on public information and, hence, their vulnerability to the influence of market sentiments and popular eye-catching events. More recently, Chaing and Zhen (2010) examines herding behavior in 18 countries using C&H model and find evidence of herding behavior in Asian and Advanced countries and no evidence of herding in US and Latin American markets. This herd behavior was found during both up and down markets, though, the intensity was more pronounced for Asian markets, particularly during up markets.

In addition to the C&H model of cross-sectional dispersion of returns, another model that has found wide-spread application in the literature on herd behavior is the one developed by Hwang and Salmon (2004). Though the spirit of the model is the same as that of the C&H, this model is based on the cross-sectional dispersion of the factor sensitivity of assets instead of the returns and enables the model to avoid the influence of idiosyncratic components. The Hwang and Salmon (H&S henceforth) suggest that the normal risk-return relationship in the conventional CAPM model is disturbed when the investors 'herd towards the market portfolio'

as this would bias the betas away from their equilibrium values, causing their cross-sectional dispersion to be smaller than what it would have been in equilibrium. H&S explains this biasness in individual betas because of the 'shift in beliefs so as to follow the performance of the overall market". H&S apply their model to the US and South Korean stock markets and found that herd behavior show significant variation and persistence over time that was independent of given market conditions and macro-economic factors as these factors failed to explain any variations in the herding. Other studies that have used H&S model include Demirer, Kutan and Chen (2007) for Taiwanese stock market using firm-level data and document strong evidence of herding in all sectors of the economy for the market. Danxewang and Canella (2007) examines herd behavior at the market index level for 21 markets, categorized as developed, Latin American and Asian groups, using H&S model and Fama-French three factor mdoel, the paper document higher levels of herd behavior for emerging markets of Asia compared to the developed markets. Recently, Kallinterakis (2009) extends the model to Vietnam market and adjusts returns for thin trading—a feature of emerging markets. The study finds that the adjustments for thin trading depress the herding significance in the market.

In summary, whether the studies have used either one model or the other, the results for the presence of herd behavior in different markets for both individual and institutional investors are mixed, and at times, elusive. The evidence of the presence of herding in financial markets, however, tilts more towards developing markets.

DATA AND METHODOLOGY

We employ two empirical models in this study to evaluate herd behavior at the market-wide and industry-wide. These models are based on cross-sectional dispersions of stock returns. This section outlines these models. Christie and Huang (1995) proposed a model to empirically identify herd behavior at the market-wide level by utilizing cross-sectional data on stock returns. Christie and Huang (henceforth C&H) developed this model, known as Cross-Sectional Standard Deviation (CSSD), as a measure of the average proximity of asset returns to the overall (or portfolio) market average to test herd behavior (Chang et al, 2000). C&H defines CSSD by the following equation:

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{n}\left(r_{i,t}-r_{p,t}\right)^2}{n-1}} \qquad (1)$$

Where n is the number of stocks in the portfolio and $r_{i,t}\left(r_{p,t}\right)$ is the realized individual security (equally-weighted portfolio) returns for day t.

The rationale behind this measure is that, in the presence of the herd behavior, individual asset returns will move in tandem with the overall market returns as investors will suppress their own private information (opinion) and will make investment decisions solely on the basis of the

collective market actions. This would lead the cross sectional dispersion among the stocks to be lower than the usual dispersion and would be an indicative of the presence of herd behavior. Contrary to this notion, the traditional asset pricing models contend that the cross sectional dispersion would increase with the absolute aggregate market returns as the assets differ in their sensitivity to the market movements. Since dispersion measures the proximity of asset returns to the market mean, when all stock's returns move in line with the market returns, there will be no cross sectional dispersion. When individual stock returns differ from the market average, the level of dispersion increases.

C&H model also assumes that the tendency of investors to herd would be higher during extreme market movements as they would most likely suppress their opinion in favor of market consensus during such market conditions. The traditional asset pricing models and the literature on herd behavior in financial markets have different predictions for the cross sectional variations in asset returns. The asset models predict that this cross sectional variation would be higher during market stress because of the different sensitivities of assets to market aggregate changes. In contrast the market-wide herding behavior suggest that the dispersion would be lower during large market movements as there is a higher tendency that investors would be "swept" along the collective market behavior. Hence, we also test for the presence of market herding during large market movements through the following equation of the C&H model.

$$CSSD_t = \propto + \gamma^L D_t^L + \gamma^U D_t^U + \varepsilon_t \qquad (2)$$

Where $D_t^L (D_t^U)$ is a dummy variable that is equal to one if the market returns on a day t fall in the extreme lower (upper) boundary of the returns distributions[4]. $CSSD_t$ represents cross sectional dispersion of variations in asset returns as defined by equation (1) and the coefficient $\propto$ represents mean dispersion for the sample not including the days represented by the two dummies. Thus, the two dummy variables attempt to capture the differential return dispersion between extreme up or down market movements and the normal market movements. Statistically significant negative (positive) coefficients for the two dummies would be indicative of the presence (absence) of herd behavior in the market during extreme up or down markets.

Asymmetric Behavior of Herding and herding under different market conditions

[4]C&H have used 1 (5) percent of observations in lower (upper) tail of the return distributions to define extreme up (down) market

To avoid the possibility that $CSSD_t$ measure is sensitive to outliers since it is calculated as squared return-deviations, Chang, Chen and Khorana (2000) propose an alternative model to that of C&H by incorporating absolute value of deviations and define the Cross-sectional Absolute Deviation (CSAD) as a measure of return dispersion, which is described by the following specification:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N}\left|r_{i,t} - r_{m,t}\right| \quad (3)$$

Chang et al (2000) builds their model on the theoretical intuition that the linear relationship between CSAD (a measure of return dispersion) and market returns, as suggested by the asset pricing models (CAPM), may not necessarily hold during periods of market stress if investors tend to herd during extreme market movements. Instead the relationship can become non-linearly increasing or even decreasing. Chang et al models this non-linear relationship by the following equation:

$$CSAD_t = \propto + \gamma_1\left|r_{m,t}\right| + \gamma_2 r_{m,t}^2 + \varepsilon_t \quad (4)$$

Where $r_{m,t}$ is the realized return on an equally-weighted portfolio of all stocks on day t and $\left|r_{m,t}\right|$ is the absolute term. In this model the relationship between CSAD and market returns would act to detect presence of herd behavior. If investors herd during periods of large price movements we would expect a negative and statistically significant non-linear coefficient (γ_2) that implies that the dispersion between individual returns and the market returns would non-linearly decline during large market movements. Alternatively, a statistically significant positive γ_2 will indicate that there will be no evidence of herding during market stress.

To be more specific and comprehensive in our analysis and allowing for the possibility of an asymmetric relationship of herd behavior for up-market in comparison to the days when market was down, we run the following two additional equations of Chang et al (2000) model:

$$CSAD_t^{UP} = \propto + \gamma_1^{UP}\left|r_{m,t}^{UP}\right| + \gamma_2^{UP}\left(r_{m,t}^{UP}\right)^2 + \varepsilon_t \quad (5)$$

$$CSAD_t^{DOWN} = \propto + \gamma_1^{DOWN}\left|r_{m,t}^{DOWN}\right| + \gamma_2^{DOWN}\left(r_{m,t}^{DOWN}\right)^2 + \varepsilon_t \quad (6)$$

Where $r_{m,t}$ represents returns on an equally-weighted market portfolio and $\left|r_{m,t}^{UP}\right|\left(\left|r_{m,t}^{DOWN}\right|\right)$ is the up (down) realized market returns on the equally-weighted portfolio on day t. The up (down) market returns are defined as positive (negative) returns on a day t (Chang et al, 2000).

Herding and Thin Trading

One of the features of emerging markets is the infrequent (thin) and non-synchronous trading where infrequently traded stocks have long sequences of zero returns and, hence, induces false autocorrelations in the returns series. This can induce bias in empirical estimations, in particular, with relation to market efficiency estimates. A number of studies have examined the issue of thin trading and its possibility of inflecting bias in empirical estimations, including those of Lo and McKinley (1990), Miller et al (1994), Antoniou et al (1997), to mention a few, and their results have confirmed that such a bias do exist in empirical investigations. In such a case, we could expect thin trading to also have an effect on herding estimations in a developing market like Pakistan. Kallinterakis and Kratunova (2007) showed that thin trading can underestimate the intensity of herd behavior in a thinly traded market. Utilizing data of top capitalization stocks of SFIX index for Bulgarian market the authors find insignificant herding estimations prior to thin trading adjustments to the data whereas post-adjustments showed increasing signs of significant herd formations. The authors attribute this to the illiquidity of the market and suggest illiquidity as a hindrance in the way of herding by market participants. Another study by Kallinterakis (2009) for Vietnam market also suggests thin trading to have positive bias over herding.

To correct for thin trading, we employ the methodology of Miller et al. (1994) which requires estimation of moving average model reflective of the number of non-trading days. Owing to the difficulty of identifying the number of non-trading days in the sample, Miller et al. have shown that returns can be adjusted for thin trading through an AR (1) process:

$$R_t = \propto_1 + \propto_2 R_{t-1} + \varepsilon_t \qquad (7)$$

Adjustment of returns for thin trading are then made as:

$$R_t^{adj} = \frac{\varepsilon_t}{(1-\varepsilon_t)} \qquad (8)$$

Antonio et al. (1997) suggests that equation (8) implies that the adjustment for thin trading remains constant over time, which may not be the case for emerging markets as these markets often accommodate substantial windows of trading inertia (Kallinterakis, 2009). As an alternative, Antonio et al suggest a recursive estimation of the equation (8) which we also adopt in this study given the very possibility of thin trading in Pakistan's market.

Data

We use daily stock price data and year-end market capitalization returns data for 284 firms traded on the Karachi Stock Exchange from Jan 1, 2002 to December 31, 2010 for examining herding in the Pakistan's market. The daily stock prices and market capitalization data for these

firms were collected from the online database maintained by 'The Businessrecorder', a premier daily business newspaper in Pakistan. The sample time period covers various ups and downs in the market that includes the March 2005 crisis and the bear market period of 2008 as well as the bull market period from 2002 up to earlier part of 2005.

Prior studies on herd behavior have based their analysis on the basis of a rationale that a group is more likely to be involved in the herd behavior if it is sufficiently homogenous. In other words, members in the group are faced with a similar decision problem and each member can observe actions of other members in the group. Empirical studies on herding in financial markets have, therefore, conducted the herding tests on groups (sectors) of stocks[5].In line with these studies we assign each of the 284 stocks to one of the eighteen sector groups including Cement, Fertilizer, Oil and Gas Exploration, Oil and Gas Marking, Commercial Banks, Automobiles Assembler, Glass and Ceramics, Chemicals, Engineering, Paper and Board, Woolen, Pharmaceuticals, Power Generation and Distribution, Refinery, Sugar and Allied Industries, Synthetic and Rayon, Technology and Communication, Vanaspati and Allied Industries. An equally-weighted portfolio returns for each sector was then calculated for all firms in that sector. We use Karachi Stock Exchange 100 Index to proxy for market returns. KSE-100 Index is a value-weighted index of 100 companies selected from all sectors of the economy and represents more than 80 percent of the market capitalization and, hence, is a fair representative of the market.

EMPIRICAL RESULTS

Summary Descriptive Statistics

Summary descriptive statistics for mean daily log returns, standard deviation of returns and mean absolute return dispersion (CSAD)[6] for various sectors and the total number of firms used to calculate these statistics for the sample period are reported in Table 1. As panel A of the table shows that average returns for all except three sectors (power generation and distribution, synthetic and rayon and banks) are positive while 'power generation and distribution' and 'synthetic and Rayon' have highest daily mean returns volatility. Panel B reports univariate summary statistics for the measure of daily cross-sectional return dispersion (CSAD) for each sector. In line with statistics in panel A, we observe highest cross-sectional return dispersion for Technology and Communications (0.055461) followed by synthetic and Rayon (0.026369) while 'Fertilizer' sector displays the lowest level of dispersion (0.011081). Comparing the maximum and minimum values of the daily CSAD indicates that Technology and Communications sector has the highest (1.529264) value while Fertilizer sector has the lowest

[5] Christie and Huang (1995), Henker and Henker (2006), Demirer, Kutan and Chen (2007), Chiang and hen (2010) are some of the studies that have classified stocks in to various sectors

[6] We also calculated descriptive summary statistics for CSSD. The mean and standard deviation values of CSSD for majority of the sectors were higher than that of CSAD

maximum value (0.062006). On the other hand, a number of sectors have a minimum value of zero for CSAD that shows that on those days there was no trading in any of the stocks in a particular sector. The table also reports autocorrelation values at different lags for the CSAD series. It is evident from the table that the time series of the CSAD for all sectors appear to have high autocorrelations. The first-order autocorrelation has a maximum value of 0.339 for Technology and Communications and lowest value of 0.13 for Vanaspati and Allied. Hence we adjust the standard errors of the estimated regression coefficients for autocorrelations and heteroscedasticity by employing an approach due to Newey and West (1987). Further, it is evident from the table that CSAD for all the sectors exhibit significant positive skewness and kurtosis while Jerque Bera statistics shows significant departures from normality. We also conduct Dickey and Fuller (1979) test to examine stationarity of the CSAD series and the test results indicate that it is stationary for all sectors.

Evidence of Herd Behavior: Returns Dispersion Model

Results of the dispersion model (equation 2) are reported in Table 2. We use daily returns of Karachi Stock Exchange Index (KSE-100 Index) as a proxy for market returns and use the upper and lower 5 percentiles of the index returns as periods of large price movements, termed as market stress. As shown by Table 2, positive and significant dummy variable coefficients indicate that we do not find any evidence of herd behavior, in any of the sectors, during large price movements. The significant positive dummy coefficients ($B^L$and B^D) also imply that the equity return dispersions tend to increase during periods of large price movements in the market. These findings are not consistent with our definition of herding in which case we would have observed a decrease in equity dispersion levels.

Table 3 reports results for the Christie et al (2000) model of equations (4), (5) and (6). Following the standard procedure of the model by running three separate regressions for each sector, i. e., one using data of the entire sample and one regression each for the periods of up and down market movements[7]. These procedures help us to allow for any significant non-linear asymmetric effects in herd behavior. First we examine coefficient results of the model for the entire sample period. Mean value of the equity dispersions, as measured by the regression coefficient $\propto$, has the highest value of 2.7171 percent for Technology and Communication and lowest value of 0.7981 percent for Fertilizer sector. Furthermore, the table shows that γ_1 coefficient for all sectors for the linear term,$|R_{mt}|$, are positive and statistically different from zero[8] for the model (entire sample). These results imply that CSAD tends to increase with $|R_{mt}|$. Next, we consider linear term coefficient (γ_1) for the two sub-periods. γ_1 for periods of up and down market movements are also positive and statistically significant for majority of the

[7]Up (Down) markets was defined as one when the index returns were positive (negative) on a day t.
[8]Coefficients for three sectors are negative but not statistically significant.

sectors. This implies that equity return dispersions also tend to increase with market movements irrespective of the direction of the market. We cannot, however, differentiate, as a whole, whether the increase in equity dispersion is higher (on the basis of the values of γ_1) for either up or down market movements as, for some sectors, this increase is higher for up market movements and for other sectors this increase is higher for down market movements. In other words, it does not suggest that the dispersions are, on average, wider for up or down market movements.

We now examine results for the non-linear coefficient (γ^2). This coefficient is not statistically significant for all except three sectors for the two sample intervals namely entire sample data and the up market period. This statistically insignificant γ^2 supports the predictions of the rational asset pricing models and are consistent with the results of Table 2. That is, positive linear relationship of CSAD with market returns and, hence, absence of herd formations in majority of the sectors. The only exceptions to these results where non-linear γ^2 estimates are different than the rest are three sectors namely oil and gas marketing, oil and gas exploration and Pharmaceuticals for which γ^2 for the entire sample as well as up market periods are negative and statistically significant. Thus, positive and linear relationship between equity dispersion and market returns does not hold for these sectors. Hence, results imply that as the average market returns gets large the cross-sectional return dispersion in the two sectors increases at a decreasing rate—a sign of absence of herd formation. The negative γ^2 also implies that CSAD increases at a decreasing rate as investors suppress private information in favor of the sector consensus. Several plausible explanations could be offered to the occurrence of herding formations in these two inter-related sectors. First, it may be sample-specific anomaly. Second, most of the stocks in the oil and gas exploration sector are considered as cash rich stocks. In addition, foreign investors are mainly concentrated in this sector and hold large chunk of their investment portfolio in the sector[9].

When we examine regressions run separately for up and down market returns, we do not find any difference in the patterns of equity return dispersions for the two market movements. Similar to the data for entire sample, evidence of herd formation is not found for any of the sectors, except for two sectors (oil and gas exploration and oil and gas marketing) only during up market movements and for only one sector during down market movements. Hence, overall, empirical results tend to support the notion of no herd formation in the Pakistan's market. These results are not in line with many of the findings for the developing markets where although the evidence is mixed with some studies finding the presence of herd behavior in many developing markets while some studies finding no such evidence in other markets. However, the balance of the evidence is more tilted towards herd formations in developing

[9] Bava (2012) estimates that almost 50% of the portfolio of foreign investors are concentrated in oil and gas sector

markets as compared to more developed markets. Several explanations may be offered for the results for Pakistan's market. First, being a developing market, Pakistan's market is characterized by thin trading and low turnover. Many of the stocks in various sectors are not actively traded and very few stocks are being actively traded. Second, Pakistan's market is mainly dominated by small investors and the institutional investor's presence is thin.

CONCLUSION AND FURTHER SUGGESTIONS

There is a growing body of literature in behavioral finance on the study of herd behavior in financial markets, particularly emerging markets. In this paper we extend models of herd behavior to an emerging market by employing firm-level data for eighteen sectors in the Pakistan's market. Two models of herding were used in the study. The linear model of Christie and Huang (1995) finds no evidence of herd formation, in any of the sectors, during periods of large market movements. In line with the results of the C&H model, the non-linear model of Chang et al (2000) also finds no evidence for herd behavior for all sectors and finds significant non-linear herding behavior for only two sectors for the entire sample as well as when the sample was separated into up and down market movements. Overall, the results tend to support the notion of no herd formation in the Pakistan's market. However, our results should be interpreted with caution as it analyzes herd behavior by using only two models and there are other tests of herd behavior that may also be considered for herd tests. Further, the phenomenon of thin trading is a typical of many markets and the study may be extended to a multi-market study incorporating such market frictions to generalize the results and arrive at more reliable and robust conclusions.

Table 1 Descriptive Statistics Panel A: Average Daily Rates of Returns

Sector	Mean	Std. Dev.			
Chemicals	0.0486	1.5449			
Engineering	0.0803	1.4726			
Glass and Ceramics	0.00854	1.8822			
Paper and Board	0.0114	1.5324			
Pharmaceuticals	0.0532	1.0949			
Power Generation and Distribution	-0.0047	2.3557			
Refinery	0.00159	2.1425			
Sugar and Allied Industries	0.0439	1.6492			
Synthetic and Rayon	-0.0487	3.1384			
Technology and Communication	-0.013	2.1803			
Vanaspati and Allied	0.0642	1.9047			

Industries					
Woolen	0.11475	1.7179			
Cement	0.0136	2.1863			
Fertilizer	0.0327	1.7047			
Oil and Gas Exploration Companies	0.0478	2.1142			
Oil and Gas Exploration Marketing	0.0172	1.7596			
Commercial Banks	-0.0189	1.9060			
Automobiles Assembler	0.0104	1.5825			

Table 1Panel B: Descriptive Statistics for Cross-Sectional Standard Deviation (CSSD)

	Mean	Maxi.	Mini.	Std. Dev.	Sk.	Kurt.	J-Bera	# of Obs.	# of Firms	Serial Correlations for different lags						
										1	2	3	4	5	20	DF test
Banks	0.016844*	0.183637	0.000265	0.010845	5.96	70.65	2904.16*	1968	26	0.234	0.208	0.174	0.12	0.124	0.134	-10.488*
Cement	0.017935*	0.169146	0.001776	0.00939	4.33	57.56	1289.68*	1968	24	0.315	0.258	0.214	0.252	0.232	0.153	-10.714*
Chemicals	0.021966*	0.272528	0.0000	0.012084	7.52	145.67	8629.11*	1968	27	0.166	0.134	0.117	0.054	0.086	0.035	-12.20*
Engineering	0.023406*	0.139884	0.0000	0.012048	1.93	12.36	9648.11*	1968	17	0.176	0.084	0.075	0.013	-0.02	0.049	-14.93*
Fertilizer	0.011081*	0.062006	0.0000	0.007253	1.69	8.80	3399.67*	1968	5	0.186	0.094	0.062	0.045	0.062	-0.001	-13.206*
Glass and Ceramics	0.022899*	0.156029	0.0000	0.015429	2.60	15.88	4808.54*	1968	14	0.298	0.193	0.165	0.116	0.093	0.059	-12.78*
Oil and Gas	0.0121	0.1586	0.0000	0.0101	3.8	47.58	18555	1968		0.13	0.08	0.10	0.10	0.14	0.09	-

Exploration	69*	37		97	6		.8*		6	2		7	8		3	9.7765*
Oil and Gas Marketing	0.012204*	0.091603	0.0000	0.0081	2.23	16.76	2405.62*	1968	7	0.183	0.138	0.15	0.104	0.061	0.047	-12.488*
Paper and Board	0.01493*	0.125522	0.0000	0.0152	3.09	16.04	1188.58*	1968	13	0.217	0.133	0.09	0.024	0.033	0.012	-13.99*
Pharmaceuticals	0.015377*	0.083988	0.0000	0.007758	2.13	14.73	2006.23*	1968	9	0.201	0.165	0.169	0.152	0.142	0.11	-11.699*
Power Generation and Distribution	0.022276*	0.181054	2.18E-05	0.011849	2.94	29.73	8977.39*	1968	15	0.282	0.213	0.181	0.147	0.11	0.099	-13.463*
Refinery	0.014064*	0.100666	0.0000	0.01031	2.35	15.09	8879.59*	1968	5	0.15	0.093	0.085	0.077	0.123	0.004	-11.608*
Sugar and Allied	0.024984*	0.076089	0.002684	0.010366	0.96	4.52	1127.14*	1968	46	0.325	0.24	0.223	0.216	0.166	0.093	-11.154*
Synthetic and Rayon	0.026369*	0.183956	0.0000	0.021022	1.77	9.02	3506.60*	1968	22	0.176	0.091	0.09	0.083	0.065	0.029	-13.395*
Technology and	0.055461*	1.529264	0.0000	0.071867	7.85	141.31	4247.	1968	13	0.339	0.257	0.205	0.213	0.155	0.091	-13.40

Communications							86*									7*
Vanspati and Allied	0.021125*	0.210348	0.0000	0.016331	2.26	19.53	1866.84*	1968	13	0.13	0.128	0.068	0.1	0.063	0.046	-13.255*
Woolen	0.013122*	0.255648	0.000	0.09789	3.07	30.48	2418.99*	1968	7	0.22	0.11	0.06	0.05	0.04	0.03	-11.107*
Auto Assembler	0.021634*	0.179393	0.001097	0.01146	5.33	60.65	1858.76*	1968	15	0.22	0.12	0.1	0.1	0.12	0.06	-12.199*

NOTE: * (**) indicates significance at 1% (5%) level. Sk,Kurt and DF stand for skewness, kurtosis and Dickey Fuller, respectively.

Table 2 Regression analysis CSSD

Industry	α	γ^U	γ^L	Adj.R^2	F-test
Cement	0.017894*	0.022892*	0.160265*	0.02895	
Fertilizer	0.011477*	0.001073*	0.01807*	0.0479	20.598*
Oil and Gas Exploration	0.011101*	0.101583*	-0.00778**	0.0394	9.858*
Oil and Gas Marketing	0.011731*	0.00144*	0.025057*	0.044	20.67*
Commercial Banks	0.019242*	0.000515	0.089764*	0.054	25.87*
Automobiles Assembler	0.016744*	0.013428*	0.037902*	0.050	20.65*
Engineering	0.028074*	0.007279*	0.000623	0.028	12.89*
Glass and Ceramics	0.021634*	0.006259	0.002241	0.080	51.34*
Paper and Board	0.021521*	0.00269	-0.002867*	0.038	17.83*
Pharmaceuticals	0.017253*	0.00032	0.001394*	0.029	13.89*
Refinery	0.014401*	0.004231*	-0.00036	0.048	22.83*
Sugar and Allied	0.027963*	0.001091	-0.00077	0.078	37.22*
Synthetic and Rayon	0.035081*	0.013287*	0.002419	0.042	19.96*
Technology and Communication	0.021596*	0.003938	-0.00016	0.028	8.49*
Vanaspathi and Allied Industries	0.023976*	0.000809	-0.0006	0.027	7.59*
Woolen	1.106688*	-0.39046	-0.06105	0.032	6.89*

Chemicals	0.027987*	0.009532*	0.00096	0.019	5.59*
Power Generation and Distribution	0.038873	0.015596	0.182717	0.001	1.78

Table 3 CSAD Regression

	Entire Sample			Up Market			Down Market		
Sector	α	β_1	β_2	α	β_1	β_2	α	β_1	β_2
Commercial Banks	0.011739*	0.14584*	-1.163967	0.00739*	0.25940*	-4.34865*	0.01334*	-0.02356	3.04407
Cement	0.00927*	0.125286*	-0.223118	0.00912*	0.11114*	-1.05566	0.01231*	0.14162	0.85239
Chemicals	0.016827*	0.130795*	1.671739	0.01876*	0.07419	2.92633	0.01602*	0.19135**	0.58808
Engineering	0.017771*	-0.016103	2.876994**	0.01945*	-0.03579	3.58704*	0.01875*	0.05436	0.90074
Fertilizer	0.007981*	0.090548**	-0.357929	0.00925*	0.06531	-0.24812	0.00831*	0.10178	0.49541
Glass and Ceramics	0.014608*	0.149844	0.002173	0.01598*	0.08498	-0.12311	0.01418*	0.22395	-0.02838
Oil and Gas Exploration	0.009236*	0.297445*	-7.853395*	0.00789*	0.32072*	-8.12919*	0.01058*	0.23756	-7.00378
Oil and Gas Marketing	0.008219*	0.304207*	-5.800644*	0.00900*	0.30922*	-5.48519*	0.00662*	0.32127*	-6.647838**
Paper and Board	0.012066*	-0.091429	2.593554	0.01230*	0.07639	0.81013	0.01392*	-0.31787*	6.47876*
Pharmaceuticals	0.011082*	0.137569*	-0.476152	0.00997*	0.16242*	-1.93420*	0.00982*	0.05392	2.10852
Power Generation and Distribution	0.014654*	0.207876*	1.322429	0.01656*	0.08571	2.96384	0.01334*	0.34218*	0.48964
Refinery	0.011488*	0.095328	-2.490957*	0.01099*	0.12504	-1.71961	0.01321*	0.06718	-2.83024
Sugar and Allied Industries	0.016261*	0.063485	1.099795	0.01348*	0.00740	0.56344	0.01807*	0.09486	2.43091
Synthetic and Rayon	0.019995*	0.120944	2.975147	0.01968*	0.09718	2.99329	0.02107*	0.06368	5.69117

Technology and Communication	0.027171*	0.163668	10.08568	0.02333*	0.39166	-4.49060	0.04001*	-0.32935	27.6655
Vanaspati and Allied	0.018109*	-0.011952	1.582772	0.01755*	-0.05776	2.04428	0.02006*	0.08247	0.48357
Automobiles Assembler	0.01341*	0.05479	1.40414	0.0179*	0.0248	2.3333	0.01394*	0.12835	0.05626

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