Empirical Study of Herd Behavior: The National Stock Exchange, India

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Abstract

The paper examines the presence of herd behavior in the S&P CNX Nifty 50 index of the National Stock Exchange of India, which arises out of the informational asymmetries found in the emerging markets around the globe. A price-based model with logarithmic cross-sectional deviation employing Kalman filter is used to measure the presence of herding. This study exposes the severe effects of herd behavior on the Nifty index. We have found highly significant herding in the Nifty index on a market-wide level during the period of 1997-2008. We also state that this type of behavior is decidedly exhibited by the market participants of the Nifty index, during the bull runs in the market and correspondingly less exhibited during the bear runs. Our work also examines the various events that took place during our sample period (May 1997-December 2008) and relates it to the course of herding in the Nifty index.

Keywords: Herd Behavior, informational asymmetries, logarithmic cross-sectional deviation, Kalman filter.

JEL Classification: C02, C21, G11, G14

1. Introduction

Capital account liberalization has not only led the developing countries around the world achieve high growth rate figures but it has also led to information inefficiency, in these booming economies. These information asymmetries have given birth to some severe problems like moral hazard, adverse selection and herding, which can all be summed up together for being the major causes behind some of the worst crisis in economic history like the Asian crisis, the dot com bubble, the ongoing sub-prime crisis and so on. In this paper we have chosen herd behavior to be our area of interest and study.

Herd behavior in its literal form advocates for the tendency of an individual to disregard his own privately held information while imitating another individual, who according to him is more superior on the information front. A substantial amount of literature in finance has been devoted to the study of this phenomenon of herding. According to Bikhchandani and Sharma (2001), herding can be of two types namely 'intentional herding' which includes both rational and irrational herding and 'spurious herding'. Herding can be irrational when an investor blindly imitates his successor due to some psychological reasons while it can be rational when the investor has a reason to believe that he is essentially lacking information or other people are better informed or he is potentially not good at processing the information at hand. Certain low quality investment professionals often revert to rational herding so as to save their reputation in the market and correspondingly earn a name for them (Scharfstein and Stein; 1990, Truman; 1994, Zwiebel; 1995, Prendergast and Stole; 1996, De Bondt and Teh; 1997). Spurious

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herding on the other hand arises out of necessity rather than choice. The economic scenario often forces the investors to herd spuriously.

Herd behavior is a non-quantifiable behavior so its careful study has become an inevitable part of the finance literature. It is a widely held view of the researchers that, herding strongly boasts of its presence in the emerging markets across the globe (Bikhchandani and Sharma; 2001, Chari and Kehoe; 2003, Kim and Wei; 2002, Agarwal et al; 2007, Chang et al; 1999). For these reasons and for more, we have devoted our study on one of the segment of the world's third largest and second fastest growing stock exchanges: National Stock Exchange: S&P CNX Nifty. Our research provides a market-wide view of herd behavior on the Nifty index which has never been done before.

We have employed our herd model based on Hwang and Salmon (2004) model of herd behavior on our chosen index Nifty 50 on a market-wide level, and subsequently tested for the presence or absence of herd behavior on an equally-weighted and a value-weighted portfolio. In order to make our conclusions concrete about the presence of highly significant herding in the Nifty 50 , we have also examined the index for herd behavior after controlling two state variables that fluctuate with the changes in the macro-economic environment namely market volatility and market direction.

Our empirical tests suggest us that herding in the Nifty index is persistent and relatively high when the market rallies up and is low when the market dips down. We have also explained the evolution of herding in the Nifty index and have connected our theory to the real life events that took place in the Nifty index right from the start of our sample. We have also opened up a new area for future research on the same index and feel that the results achieved by us will form a core part of the finance literature to be written in future.

The remaining part of the paper is organized in the following manner: Section 2: provides the literature review, Section 3: gives details of the data employed and the methodology adopted, Section 4: illustrates the empirical findings of our research and discussion of the results and finally Section 5: concludes the paper.

2. Literature Review

In the financial world the practice of going by the general consensus or more precisely doing what everyone else is doing even when our privately held information recommends us to do something different, is called herd behavior, (Keynes 1936). Also, Bartels (1988) infers that individuals tend to get influenced by others greatly as they feel that a whole group of individuals cannot be wrong, which makes them overlook the information at hand and herd the group. Thus, as stated by Alemani and Ornealas (2008) herding has in literal sense challenged the efficient market hypothesis.

According to Bikhchandani and Sharma (2001), herding can be done knowingly (Intentional Herding) or it can be done unknowingly (Spurious Herding) and it is very important to categorize these two forms of herding to understand its presence in any market. Intentional herding has its roots in the phenomena of conformity which makes individuals feel more secure when they do something that others are also doing. According to Bikhchandani and Sharma (2001), this type of herd behavior is fragile and idiosyncratic. One may not essentially imitate others due to psychological reasons alone but also due to some rational considerations. These rational considerations can arise out of lack of information, believing that others are better informed or one may not be out rightly capable of processing the information at hand. These circumstances force an investor to replicate others as they feel that it is the 'right' thing to do, as the people they are following are better informed in their view and therefore it would lead them to make a profit in the form of an informational payoff (Devenow and Welch 1996). This vicious circle of falling prey to the information held by a group of early investors and eventually dumping one's own information leads to the formation of informational cascades or herd behavior rooting/routing from informational asymmetries (Banerjee 1992, Bikhchandani et al 1992). This type of herd behavior leads to an increase in the volatility in the market. Thus, when investors become dependent on the information held by other people then what follows is known as information based herding (Frenkel, Hommel, Rudolf and Dufey 2005: p789).

Another form of intentional herding which is limited to investment professionals who herd amongst themselves is known as reputation based herding. Investment professionals are generally rated periodically against the performance of their fellow counterparts (Scharfstein and Stein; 1990, De Bondt and Teh; 1997). Thus, in this way the less able professionals virtually copy the investment activity of the highly able professionals and make a name for themselves in the market (Bikhchandani and Sharma;

2001, Hong et al 2000). Moreover, Kallinterakis et al (2007) explain that even the highly able professionals see an incentive in herding the other investment professionals if there is a uniformity of decision in the market and thus can preserve their reputation. This is also supported by Graham (1999) who suggests that the risk of a probable failure overpowers the highly beneficial success achieved by these individuals. Also, as pointed out by Wermers; (1999) and De Bondt and Teh; (1997), these investment professionals are more or less from similar backgrounds in terms of their education/qualifications so they might feel it safer to imitate their peers rather than imitating others.

Another form of intentional herding is based on the compensation structure of the individuals termed as compensation based herding. As suggested by Maug and Naik (1996), investment professionals are expected to produce a return in excess or equal to the return of the benchmark. If they under-perform the benchmark then their compensation is affected or otherwise. Thus, this is another reason for such individuals to follow the art of herding and save themselves from taking home a low compensation.

On the contrary spurious herding takes place when investors lying along identical indifference curves and having identical preferences, keeping in mind the budget line, unintentionally make similar decisions. Such a situation may arise if the government decides to increase the interest rates making the stock market less attractive for investment.

2.1. Herding in Financial Markets

A number of authors including Banerjee (1993), Shiller (1990) and Topol (1991), have similar views on the potential cause for the excessive volatility in the world financial markets to be herd behavior. To support this, Scharfstein and Stein (1990) carried out a study which showed that fund managers who play a major role in the financial markets throughout the world, revert to herding to maintain their reputations in the market. Scharfstein and Stein (1990), provide significant evidence in support of herd behavior leading to excessive volatility in the stock markets. According to them when money managers imitate their counterparts as members of a herd then they "tend to amplify exogenous stock price shocks". In consistency with the findings of Scharfstein and Stein (1990), Grinblatt et al (1995) in their study of 'Mutual Fund Behavior', find that herd behavior can be encountered largely on the buying front of the mutual funds.

Trueman (1994) states that "analyst's exhibit herd behavior, whereby they release forecasts similar to those previously announced by other analysts, even when this is not justified by their information". The primary reason behind this act is to save their reputations in the market, attract more clients and charge high fees by showing that their prediction matches with the other analysts in the market. The study carried out by Ivo Welch (1996) also supports the findings of Trueman.

Chari and Kehoe (2003) with their modified herd behavior models conclude that herd behavior breeds heavily in emerging markets and they can be one of the possible causes of the unprecedented financial crisis taking place in the stock markets around the world. The seminal works of Bikhchandani et al (1992) and Banerjee (1992) assume that herding is a sequential process wherein each individual makes his/her decision in line with the decision made by the one before them. This assumption of a sequential process has been contradicted by certain researchers like Chari and Kehoe (2003) and Cont and Bouchaud (2000). They explain that the inter play of the various information in the market accordingly give rise to the acceptable market variables. Also, the assumption of 'bigger the herd the more the cost of joining it' in the Bikhchandani et al model has been relaxed by Cont and Bouchaud. This type of setting gives them a heterogeneous market structure. Chari and Kehoe (2003) in their model have further relaxed the assumption of entry into the market at the same time by different individuals.

However, there are certain researchers who believe that herding is not responsible for increased volatility in the financial markets. According to Avery and Zemsky (1998), herding is impossible in the presence of undemanding information structures and simultaneously it does not cause the market to fluctuate. Lakonishok et al (1992), suggest that herding is probable only during 'short-term' horizons. According to them, the world stock markets are influenced by the foreign institutional investors (FIIs), and are responsible for stock market crashes and the bull runs. In support of this Puckett and Yan (2008), state that "short term buy and sell herd have an asymmetric effect on the efficiency of equity".

Thus, herding has become paradoxical in the financial world with certain researchers agreeing to its existence

and also its massive role in the movements of the stock markets around the world while certain researchers have an opposing point of view. In the following section we will see, how herding plays a major role in the emerging markets of the world with special emphasis on some of the fastest emerging economies and stock markets in Asia.

2.2. Herding in Emerging Markets

Bikhchandani and Sharma (2001) in their seminal paper state that herd behavior is much likely to take place in emerging markets. And hence it becomes a necessity to study how herd behavior is affecting the emerging markets around the world.

Foreign institutional investors (FIIs) base their major chunk of investments in emerging markets. Academicians have found that these institutional investors enter emerging markets at the time of boom and exit the market at the time of slump or crisis, in a herd. This activity of herding by institutional investors has led to an increased bit of volatility in these emerging markets. The Asian Currency crisis[1] of November 1997 has produced a number of well-known studies in herd behavior. The crisis led to a spurious herd behavior (as it is an economic choice and not imitation) by the international banks in these emerging markets. Japanese banks exited the markets of the emerging countries affected by the Asian crisis and the consequent effect on the markets of Latin America led to the pulling out of the U.S investors from its market. Krugman (1997) and Komulainen (2001) examined two reasons for herding during the Asian Crisis – (1) the bandwagon effect of the investors and (2) the management of the finances invested in these emerging markets by the agents rather than directly by principals.

Kim and Wei (2002) studied the Korean Stock market during the Asian currency crisis and concluded in favour of the existence of herding before and after the crisis. They found that there was a conflict between the trading strategies used by the home institutional investors and the foreign institutional investors before the currency crisis. Similar results were found in a recent study by Agarwal et al (2007) where they examined the Indonesian stock market for herd behavior and their results proved conformity with the prior results of Bowe and Domuta (2004) on the same market.

Batra (2003) carried out a study on the Indian stock markets by taking into consideration the effect of the trading behavior of the foreign institutional investors on the stability of the markets. The study indicates that these institutional investors show signs of herd behavior at different time intervals i.e. they all might not herd together while maintaining the sell side herding at almost identical levels. These studies in general have failed to give an explanation of the herd behavior pattern specific to events. Moreover, majority of these studies do not consider the macro-economic events which might influence the herd behavior.

3. Data and Methodology

The empirical research is done on the National Stock Exchange (NSE), India. The S&P CNX Nifty is a value-weighted index which incorporates the 50 most liquid stocks weighted by market capitalisation right from the year of its inception on the National Stock Exchange in 1996.

The data is collected from the DataStream database and it includes daily closing prices covering the period 1997 – 2008. The list of the changes made to the S&P CNX Nifty constituents was extracted from the NSE India (http://nse-india.com/) website. The selection of the period was governed by the availability of data from the year 1997 till date. The data includes all the stocks traded during the chosen sample period and the 91 day Treasury bill (INPTB91).

3.1. Methodology

In order to test for herding, we use a model based on the Hwang and Salmon (2004) price-based model. This model is selected as it corrects the belief that during crisis hit periods herding disappears (Christie and Huang 1995), by showing that during the Asian crisis and the Russian crisis herding appears before, after and during the crisis (Hwang and Salmon 2004). The model also considers the factor-sensitivity of assets at the cross-sectional level of the market.

The risk-return relationship of assets may be influenced by an investor's specific behavioral characteristics. If an

[1] The Asian currency crisis was a result of depreciation of the Thai currency 'Baht' in 1997. This crisis largely affected not only the emerging markets in Asia namely Philippines, Malaysia, Indonesia and Korea, but also the markets of Russia and Latin America.

investor decides to follow the market wide agreement then there is a likely chance of the individual asset returns moving in tandem with the market returns and also the CAPM- betas straying away from their equilibrium values. This implies that as the investor sentiments oscillates, the beta values of the stocks change from the initial constant. If there exists market-wide herding, then the stock betas will unanimously confine themselves to the market beta which is unity.

3.1.1. Testing for Herding on the Basis of Equally-Weighted Cross Sectional Dispersions

The model assigns equilibrium beta as (let β_{imt}) and its behaviorally biased counterpart as (β^{b}_{imt}) and form a relationship amongst the two in terms of the following equation:

$$\frac{E^{b}_{t}(r_{it})}{E_{t}(r_{mt})} = \beta^{b}_{imt} = \beta_{imt} \quad h_{mt}(\beta_{imt} \quad 1) \tag{1}$$

Where E^{b}_{t} is the behaviorally biased short run conditional expectation on the excess return of asset *i* at time t, $E_t(\gamma_{mt})$ is the conditional expectation of the excess returns of the market at time *t*, h_{mt} which is less than or equal to unity in the above equation is a time-variant herding constraint. To calculate h_{mt}, the approximate cross-sectional dispersion of β^{b}_{imt} is taken as:

$$Std_c(\beta^{b}_{imt}) = Std_c(\beta_{imt})(1 \quad h_{mt}) \tag{2}$$

Taking logarithms on both sides of equation (2) and applying the product rule we have:

$$\log[Std_c(\beta^{b}_{imt})] = \log[Std_c(\beta_{imt})] + \log(1 \quad h_{mt}) \tag{3}$$

Equation (3) is rewritten as:

$$\log[Std_c(\beta^{b}_{imt})] = \mu_m + H_{mt} + \nu_{mt} \tag{4}$$

Where, $\log[Std_c(\beta_{imt})] = \mu_m + \nu_{mt}$ (5)

$\mu_m = E[\log[(Std_c(\beta_{imt}))]]; \nu_{mt} \sim iid(0, \sigma^2_{m\nu})$, and

$$H_{mt} = \log(1 - h_{mt}) \tag{6}$$

Since H_{mt} follows an Auto-Regressive (1) process we get:

$$\log[Std_c(\beta^{b}_{imt})] = \mu_m + H_{mt} + \nu_{mt} \tag{7}$$

$$H_{mt} = \phi_m H_{mt-1} + \eta_{mt} \tag{8}$$

Where, $\eta_{mt} \sim iid(0, \sigma^2_{mn})$

Equations (7) and (8) state that, herding is considered as an unobservable element. Kalman filter is used to make herding observable. This enables $\log[Std_c(\beta^{b}_{imt})]$ to vary with different levels of herding. This changes the value H_{mt} enabling us to detect the presence or absence of herding. When $\sigma^2_{m\eta}$ becomes 0, we infer that there is no herding in the market as =0. Similarly, when $\sigma^2_{m\eta}$ has a significant value, we infer that herding exists.

Variables[2] are added to equation (7) to confirm that the value of H_{mt} remains significant. However, if the changes in the variable with relation to the newly added variables are considered, then we can conclude that market wide herding (H_{mt}) is insignificant.

Adding the variable, equation (7) is re-written as:

$$\log[Std_c(\beta^{b}_{imt})] = \mu_m + H_{mt} + c_1\gamma_{NIFTY,t} + \nu_{mt} \tag{9}$$

$$\log[Std_c(\beta^{b}_{imt})] = \mu_m + H_{mt} + c_2 \log\sigma_{NIFTY,t} + \nu_{mt} \tag{10}$$

Where γ_{mt} depicts the return of the NIFTY index at time *t* and $\log\sigma_{\text{NIFTY, }t}$ stands for the market's logarithmic volatility valued on the foundation laid by the NIFTY index. The index returns ($\gamma_{\text{NIFTY, }t}$) are estimated as the percentage log-differenced returns of the NIFTY index for each time period and $\sigma_{\text{NIFTY, }t}$ (market volatility) is approximated by squaring the daily returns using the Schwert (1989) methodology, used by Hwang and Salmon (2004).

3.1.2. Testing for Herding on the Basis of Value-Weighted Cross Sectional Dispersions

This type of estimation holds value as it is essential to comprehend the effect of small stocks on our end result.

Here [$Std^{v}_{c}(\beta^{b}_{mt})$] is calculated as:

$$Std^{v}_{c}(\beta^{b}_{mt}) = \sqrt{\sum_{t=1}^{N_t} w_{it}(\beta^{b}_{imt} - \overline{\beta^{b}_{imt}})^2} \tag{11}$$

Where, $\overline{\beta^{b}_{imt}} = \sum_{t=1}^{N_t} w_{it}\beta^{b}_{imt}$

N_t, in the above equation stands for the number of securities in a given month *t* and *i* is the value of the security in accordance to the total market value at time .

We run the following regression using OLS:

$$r_{itd} = \alpha^{b}_{it} + \beta^{b}_{it} r_{mtd} + \varepsilon_{itd} \tag{12}$$

Where, r_{itd} refers to daily excess return of stock *i*, r_{mtd}

[2] The variables include: market volatility, market direction (reflected through index returns),

denotes the daily excess returns of the NIFTY index for the month *t*. Excess returns is calculated by subtracting the 91 day T-bill values (INPTB91) from the log differenced returns of the NIFTY index and its stocks. The betas for each month for each stock with respect to market excess returns and the monthly return of each stock are calculated and we create a monthly time-series by calculating the cross-sectional standard deviations of the monthly betas. Finally, we re-estimate the cross-sectional standard deviations of the monthly betas by applying logarithms. The Kalman filter is then used on the logarithmic values to test for herding.

4. Empirical Results

4.1. Descriptive Statistics

Table 1 shows the descriptive statistics of S&P CNX Nifty. It represents the cross-sectional deviations (CSD) and the logarithmic cross-sectional deviations (LCSD) from the mean value, of the betas for both equally-weighted and value-weighted dispersions.

Table 1. Descriptive Statistics

	Cross Sectional Standard Deviation of OLS Betas		*Logarithmic Standard Deviation of OLS Betas*	
	Equally Weighted	*Value Weighted*	*Equally Weighted*	*Value Weighted*
Mean	0.611306 (0.000000)	0.584393 (0.000000)	-0.226807 (0.000000)	-0.255308 (0.000000)
Variance	0.023396	0.038453	0.011355	0.018642
Skewness	0.661001 (0.001585)	1.100455 (0.000000)	0.112212 (0.591802)	0.353585 (0.091092)
Kurtosis	-0.044607 (0.916330)	1.030944 (0.015179)	-0.427369 (0.314156)	-0.314632 (0.458680)
Jarque-Bera	10.206459 (0.006077)	34.456615 (0.000000)	1.359229 (0.508612)	3.494646 (0.174240)

Our sample consists of 140 observations selected on the basis of their active participation in the market i.e. in our case Nifty 50. To test for herding using the Kalman filter we have to make sure that data set is a normal distribution or at least approximates it. The cross-section dispersion statistics of the equally-weighted portfolio states that the data does not belong to a normal distribution which can be justified by a significant positive skewness (0.661001) and a negative excess coefficient of kurtosis (platykurtic) (-0.044607). The deviations of skewness and kurtosis from the affirmative zero results in a highly inflated value of Jarque-Bera (10.206459) and we reject the joint null hypothesis of normality. Similar cross-section dispersion statistics can be observed for the value-weighted portfolio rejecting the joint null hypothesis.

However, the logarithmic cross-section deviation statistics of both equally-weighted and value-weighted portfolios approximate the required state of normality showing insignificant values of skewness, kurtosis and Jarque-Bera. The null hypothesis is not rejected in these cases. Thus, we use the logarithmic cross-section deviation statistics in the Kalman Filter to test for herding in the market.

4.2. Results

Table 2 shows the output of the Kalman filter with the logarithmic cross-section deviation statistics (equally-weighted and value-weighted) as the inputs. We focus on the two major herding parameters.

Table 2. Herding Results

Equally-Weighted - $\log[Std_c(\beta^b_{imt})] = \mu_m + H_{mt} + v_{mt}$,

$v_{mt} \sim iid(0, \sigma^2_{mv})$

Value-Weighted - $Std^v_c(\beta^b_{mt}) = \sqrt{\sum_{i=1}^{N_t} w_{it}(\beta^b_{imt} - \overline{\beta^b_{imt}})^2}$

Herd Behavior Equation -

$H_{mt} = \phi_m H_{mt-1} + \eta_{mt}, \eta_{mt} \sim iid(0, \sigma^2_{m\eta})$,

Variable	*Equally-Weighted Portfolio*	*Value Weighted Portfolio*
ϕ_m	0.972528931 (0.00000000)*	0.975667639 (0.00000000)*
μ_m	-0.247970952 (0.00000000)*	-0.253842068 (0.00000000)*
$\sigma_{m,\eta}$	0.000255891 (0.04132648)**	0.000513168 (0.02673456)**
$\sigma_{m,v}$	0.007383070 (0.00000000)*	0.009170906 (0.00000000)*
Signal-Proportion Values	0.15011674	0.165913824

* = significance at 1%, ** = significance at 5%

The values of both $\sigma_{m,\eta}$ which is the standard deviation of the state-equation error (η_{mt}) and ϕ_m which is the persistence parameter, in case of equally-weighted and value weighted are highly significant at the 5% significance level. The values of ϕ_m for both equally-weighted (44.59395) and value-weighted (46.90686) are greater than 1, stating that herding in the given market is not an explosive process or a sudden process. Taking into account these parameters, we can very well say that there is highly significant herding in the NIFTY index. The other two variables (μ_m and σ_{mv}) in table 2 also represent high level of significance for both equally-weighted and value-weighted portfolios. The variable represents the mean of the logarithmic cross-section deviation of the betas in our respective portfolios and μ_m is accountable for the logarithmic cross-section deviation of the betas. The table also indicates the signal- proportion values, an indicator of smoothness of herding in the market. It explains the proportion to which herding explains the consistency of the logarithmic cross-section deviations of the betas. These values are calculated by dividing $\sigma_{m\eta}$ by the logarithmic cross-section deviation series of the betas. These signal-proportion values are relatively low for both - the equally-weighted (0.15011674) and the value-weighted (0.165913824) portfolios stating the progress of smooth herding in the market.

Table 3 represents the two state variables incorporated in our model to test the consistency of the herding parameters $\sigma_{m\eta}$ and ϕ_m influenced by the changes in the macro economic prevalent in the market. Significant values of the herding parameters in the presence of these state variables will prove that herding does exist and is strong enough during the crisis periods or the periods of under-reaction and overreaction in the market.

Table 3. Herding Results after Incorporating State Variables Namely: Market Volatility and Market Direction

$$\log[Std_c(\beta^b_{imt})] = \mu_m + H_{mt} + c_1\gamma_{NIFTY,t} + v_{mt},$$

$$v_{mt} \sim iid(0,\sigma^2_{mv})$$

$$\log[Std_c(\beta^b_{imt})] = \mu_m + H_{mt} + c_2 \log\sigma_{NIFTY,t} + v_{mt},$$

Variable	*Market Volatility Controlled*	*Market Direction Controlled*
ϕ_m	0.992941821 (0.00000000) *	0.971574189 (0.00000000) *
μ_m	-0.174370675 (0.00000001) *	-0.247125200 (0.00000000) *
C_1	-0.297338084 (0.00000000) *	N/A
C_2	N/A	0.148988243 (0.00173413)*
$\sigma_{m,\eta}$	0.000170682 (0.02614454) **	0.000253643 (0.03475325) **
$\sigma_{m,v}$	0.005000531 (0.00000000) *	0.006863602 (0.00000000) *
Signal-Proportion	0.122601420	0.14945589

* = significance at 1%, ** = significance at 5%

From table 3 for market volatility we find that the two major herding parameters $\sigma_{m\eta}$ and ϕ_m are highly significant at the 5% significance level. This indicates significant herding in the market in the presence of a state variable which is in consistency with our previous results. It can also be noted that the volatility coefficient (c_1) which is significant and negative (-0.297338084) in our results, is an indicator of the relationship between market volatility and [$Std^v_c(\beta^b_{mt})$]. Now, since (c_1) is negative, we conclude that there is an inverse relationship between $Std^v_c(\beta^b_{mt})$ and market volatility. Also, the signal-proportion value for market volatility is relatively low (0.122601420), indicating smoothness of herding in the market during such periods.

From the results in table 3, for market direction we state that herding does exist in the market following the significant values of $\sigma_{m\eta}$ and (5% significance level). Also, the value of (which is significant and positive

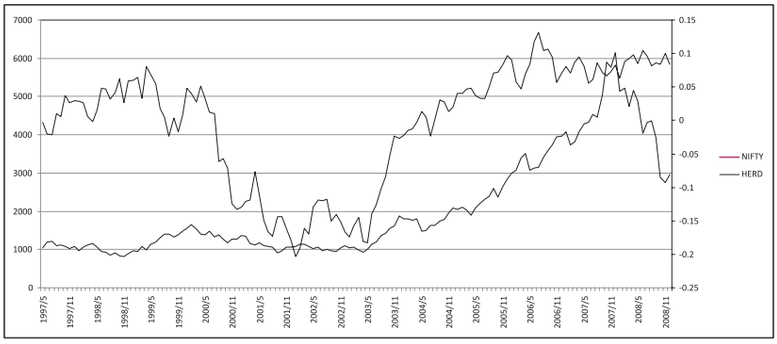
(0.148988243), denotes a direct relationship between market direction and $[Std_c^v(\beta_{mt}^b)]$. Similar conclusions about smoothness of herding prevailing in the market are made from the signal-to-noise ratio of market direction which is equal to 0.14945589.

Therefore we firmly conclude that herding in case of NIFTY is highly apparent even in the presence of certain macro-economic factors and also herding increases in the market with an increase in the market returns while it decreases in case of an increase in the market volatility.

4.3. Discussion

Figure 1 clearly highlights of the presence of herding in the NIFTY index. We shall also try to associate the economic factors that have played a major role in the rise and fall of the NIFTY index right from the start of our sample period, with the course of herding.

Figure 1. Herding Graph for the Equally-Weighted Portfolio



The graph reveals a steady course of herding until April 1999 and then it declines at an increasing rate. This is because in the Indian financial perspective herding is inversely related to the market movements. The period before 1997 was a prime period for the Indian stock markets as it witnessed some new economic reforms which led to a rise in the economic growth and hence a rise in the value of the NIFTY index. Post 1996 the NIFTY index represents the after shocks of the Asian Currency Crisis. It is worth noting that India was amongst the very few countries that could with stand the effect of this massive crisis of the Thai Baht, though the growth rate of India during this period had fallen from 5.6% to 4.8 %.

A sudden decline at an increasing rate can be seen in herd behavior in the market April 1999 till the end of April 2003. The NIFTY index also shows a decline during the same period. The reason can be attributed to a series of events that took place in the market which led to the fall in investor confidence to a great extent. The gradual fall in herd behavior in the years of 1998 and 1999 was due to the fall of exports leading to the economic slowdown as a result of the Asian crisis. The reason for a sudden spurt in the herd behavior and also in the market can be chased back to the dotcom boom of the early 2000 which saw an excessive amount of speculation in the market. But this dotcom boom did not last for long and the bubble burst on 14th Feb 2000 which saw the market crash down. The year 2001 was a year of mixed sentiments from the investors. These are attributed to the good investor centered finance budget, which led to a rise in the investor confidence. However, the Ketan Parekh scam came as a whirl pool in the market. The 9/11 shock of United State led the market further down. For these reasons the herd behavior in the market for the year 2001 is on a drop. The year 2002 witnessed a major fall in the herd behavior. The reason for this is the outburst of the U.S 64 scam. This mutual fund was the biggest of its type in India and the middle income class of the investors. The scam led to its price falling from 19 INR to 5.81 INR, a drop of 69.42 %.

It is clear from the figure that till April 2003 investors failed to regain their confidence in the market and herd behavior has been at its lowest during this period. After this period the market saw a surge in the herd behavior in the NIFTY and also a surge in the value of the NIFTY index. May 2004 suffered another drop in the herd behavior as well as in the market in May 2004. This is because of the fall of the National Democratic Alliance government of India on May 17th 2004, the Black Monday. Post this period, the Nifty saw a steady rise till the year 2008. The herd behavior in the market during this period shows a positive trend.

The cause of this invariable rise in the NIFTY index and in herd behavior can be attributed to the investor friendly budget given by United Progressive Alliance government. Also, the months of June to September witnessed an increase in the participation of Foreign Institutional Investors (FIIs) in the Indian markets. The market also achieved its highest ever inter-day gain in December 2007 when the NIFTY reached a staggering 6138 points.

But, with the U.S recession and the sub-prime crisis hitting the global markets, the Indian markets rallied down, post January 2008. The figure shows the market edging out deeply and the subsequent fall in herd behavior.

Figure 2. Herding Graph for the Value – Weighted Portfolio

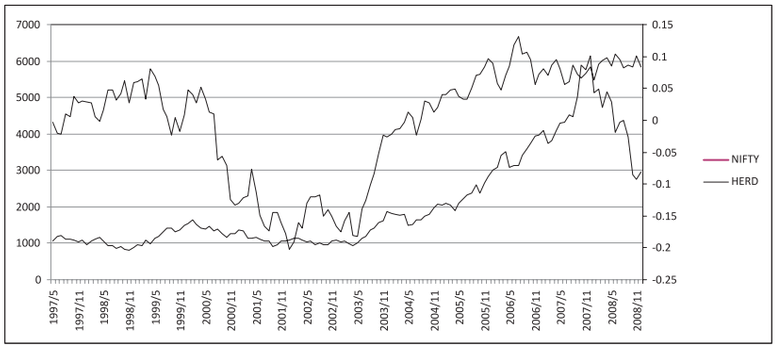


Figure 3. Herding Graph when the State Variable Market Volatility is Included

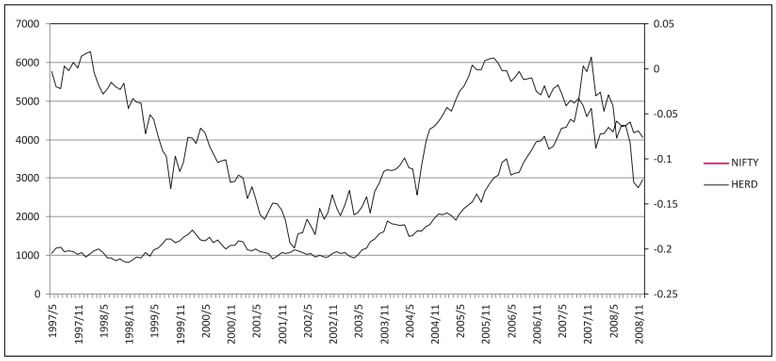
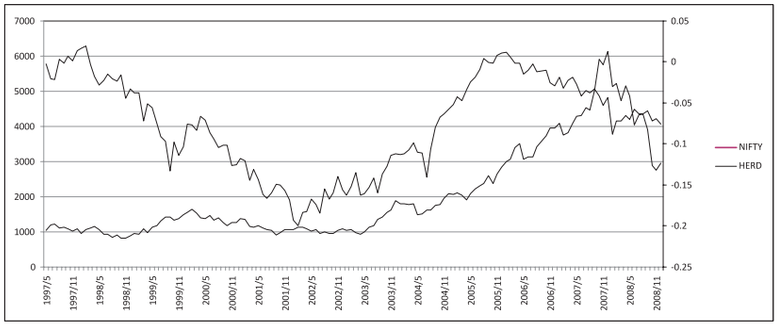


Figure 4. Herding Graph when the State Variable Market Direction is Included



The above findings are consistent in Figure 2, 3 and 4 which indicate the effects of herding on the value-weighted portfolio, the equally-weighted portfolio considering market volatility and the equally-weighted portfolio considering market-direction. The only key difference that we can note in the graphs 3 and 4 is that the

herd behavior has also decreased at the end of our sample period, December 2008. The reason for this finding can be related to the effects of these state variables on herd behavior. This proves that these state variables do have an effect on herding but the effect is very minimal and diminishes as the market enters a bullish phase.

5. Concluding Remarks

The liberalization of capital markets around the world has become a potential threat to the efficient market hypothesis leading to information asymmetries which in turn leads to herding. The anomaly of herd behavior has had far reaching impact on the emerging stock markets around the world. The same has been well established by a number of researchers in their study of the herd behavior in financial markets. In order to take this study further, we have examined a key segment of the National Stock Exchange of India, S&P CNX Nifty, for herd behavior on a market-wide level for the period of May 1997-December 2008.

We have conducted a comprehensive study of the Nifty index by investigating the presence of herd behavior in case of an equally-weighted portfolio and a value-weighted portfolio using price-based methodology. We have found the presence of significant herding in the Nifty index in both the aforementioned cases. Our findings are further strengthened by the incorporation of two state variables namely market volatility and market direction that take into account the macro-economic aspects affecting the market. Herding parameters remain significant even after controlling for market volatility and market direction.

Our empirical results also suggest that the market participants in the Nifty index, tended to exhibit high level of herd behavior during the bull runs and correspondingly a low level of herd behavior during the slack periods. The area for further research would potentially be to see if the effect of herding can be seen in the Nifty index after correcting for thin trading of individual stocks that affect the individual portfolio returns.

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