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# Herding Behaviour: Empirical Analysis of Pakistan, China, USA Stock Market

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## Abstract

The present study investigates market-wide herding of stock market, industry indices of Pakistan, China and the US, A-cross border herding of Pakistan stock market with Chinese stock market and the US stock market. With Cross-Sectional-Absolute-Deviation, to check whether geographical distance matters to influence the stock markets or not and USA as its major influential, cannot be ignored. Market-wide herding in Pakistan is found only during 2004 and 2008 and A-cross border herding for Pakistan is only found from the US which support asset pricing model and market efficiency. Pakistan market do not herd around China, this negates the matter of geographical distance and influence in determining investor behaviour in stock markets. It is revealed that Pakistan stock market does not observe as much herding behaviour in stock investment as the other markets (USA and China), so it can be said that Pakistan stock exchange index, which is representative of Pakistan Stock market, is efficiently operating in contest of Herding.

## Introduction

Herd behaviour is the approach considered by the absence of individual decision-making, instigating folks to deliberate and do in the same manner as the others do. In stock markets herding occurs when people overlook the individual features of stock and follow-up the market. In simple words, people do not collect information for investing in stocks but they rely on the decisions made by other individuals. In the market, it's also the relationship of different investor's actions during transactions.

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Stock market herding can take three forms, one is information-based herding which can be detected when the investor expect herding to sell stocks instead of buying. When everyone in the market acts the same as the announced or available information. Second is reputation-based herding when a big investor or trading house takes some specific trading standpoint. In institutional-based herding, a sizeable fraction of investors follow an established trend even in a setting where there are no reputational incentives and the third is compensation-based herding which occurs when some specific circumstances occur, enabling many money-managers to make earnings. These behaviours generate huge volumes in those sectors that comprise of prevalent organized port-folio investment. This prompts those who are watching to react quickly. In compensation-based herding, investor rely on the information that are known about market-heading rather-than when the market is in crisis.

In the stock market, the conception of efficient market means that prices fully reflect the available information. When there is the existence of herding behaviour, then the market becomes inefficient because stocks are mispriced and do not truly reflect their original worth. In the world of uncertainties, something can be expected to happen at any given time. In stock markets where buyers and sellers interact with each other and transactions take place, each act according to his specific abilities and the information available to them, and to the extent they utilize the information they have. It will be very reasonable to discuss here the financial sights of investment behaviour of the participants in stock market. There are two broad views on investment decision making: traditional-finance and behavioural-finance. Traditional finance theory states that investors will act rationally, they assume normative principles to model how markets should act and they have access to the right information. They act accordingly in a self-interested manner and are risk-averse (Sharpe, 1964 & Lintner, 1965). The theory was challenged in the early nineties by the emergence of behavioural finance which negates the very essence of traditional finance theory. Per behavioural finance, psychology of investors influence the decision making rather than principals and models.

Herding can be categorized both as rational and irrational. It can be further classified into three categories when it is detected. These three forms are stationary herding, intentional herding, and feedback herding. Stationary herding is whatever the market conditions are as it will give a signal for the existence of the phenomenon. Intentional-herding refers to predictions of investor's concern with all of the assets. If herding in the present situation depends on previous then this form of herding is called Feedback herding. When it is clear that there is something happening factually in stock markets then it is time to detect it by real-time data. To detect herding behaviour there are many ways currently present in the literature. The presence and absence of Herding from a single industry to the overall market can be detected. In case of detecting A-cross border herding no work has been done so far. For PSX 100 index, to detect A-cross border herding the first developed market is that of the neighbour country, China. For this, we include SSE 180 and the S&P 500 index. This research traces the investor behaviour during bullish, bearish and normal market conditions.

Herding behaviour in the stock-market has been investigated in the various studies for PSX 100 index which shows the presence in the Pakistan stock-market. Now in the advanced studies, there is a prevailing concept of the A-cross border herding which means that domestic market conditions are influenced by foreign stock markets to a great extent. Whether geographical distance matters in influencing market conditions or not, those countries which are near to you or in other words which share borders with you, have influence in your markets. No such study for PSX has been done so far to investigate A-cross border herding. This study investigates the A-cross border herding of PSX against SSE and the S&P market. China and USA stock markets have been selected because these countries share a border with Pakistan. China has most economic linkages with Pakistan and the US is an important global influential market. The study i) investigates the 'existence of herding behaviour' in Pakistan Stock-Market (PSX 100 index), China Stock Market (SSE180) and USA stock market (S&P 500) in normal market conditions. ii) It also Investigates herding behaviour during bullish and bearish markets (Up and down market conditions) for the domestic market which is PSX 100. iii) A-cross border herding

for PSX 100 index against SSE 180 of China and S&P 500 of USA is investigated to check whether geographical distance matters or not in influencing the market conditions.

Investors make their investment choices based on the expected returns given by the capital asset pricing models, rational asset pricing models per concept given by an efficient capital market hypothesis. However, when there is herding, the investors overlook the features of single stock and follow-up the actions of mass in determining investment choice. When investors ignore their own beliefs and start following others, it leads to the mispricing of assets. So, it is important to 'investigate the presence of herding behaviour' in stock-markets, particularly for portfolio manager; a rational stakeholder, and other market agents, both domestically or internationally. Now this research will take forward these linkages to investigate whether the 'Pakistan stock-market' herds around 'the China' and 'the US' or not. It depicts how an investor in Pakistan responds to the prevailing news in the market. Whether its behaviour changes or not.

## 2. Literature review

In 1970, Fama was the first to detect the efficacy of the stock-market; at any given period the prices reflect full information about any particular stock. According to EMH investment theory, it is difficult to beat the market as the efficiency of stock-market affects share prices to integrate and imitate all the available evidence. The EMH is built on the supposition that the investor is rational and the market is perfect. Herding in stocks occurs when investor behaviour is irrational in decision making. It is when an investor makes an investment decision based on how other investors are investing. When herding occurs, EMH no longer remains valid. The assumptions of EMH are violated and stocks do not reflect their original value. Fama research work was further carried and models were developed to investigate herding behaviour.

A study of Pakistan stock market utilised primary data of 26 brokers and 500 individuals for investigating behavioural determinants of individual investors and their impact on investment decision process suggest  that people follow rumours and media

news in case of making their investment decisions by (Ghufran et.al., 2011).

Aversion to risk and quick money making attitude lead individuals to herd. (Malik & Elahi, 2014) suggested that the investors herd during both (Bearish and Bullish) markets and even during normal-market days. Khan (2014) detected industry-wide herding and market-wide herding resulting non-linear herding for only two sectors. From the whole sample is found in aggregate while no evidence of herding has been detected in KSE (Javaria & Hassan 2015; Javed' 2013). Framing and herding effects have a positive and significant association with perceived investment performance. However, (Ali et al. 2011) explored co-movements between under-developed and developed stock markets. They found mix results of co-integration among markets where Herding consists of three components Stationary, Intentional and Feedback herding (Hachicha 2010).

Further review of the literature studies from across the country comparison will be done in this context. Lindhe (2012) investigated herding behaviour in the Nordic region, due to foreign factor that is European Union (Chaing & Zheng, 2010) and the geographical distance can also be the factor of herding between countries A-cross national borders of neighbouring countries.

In the light of the literature discussed above, the study is focused on examining the herding behaviour for two points that the US is a global factor and it influences the markets and the geographical distance between countries matters in exhibiting herding behaviour. No such study with respect to Pakistan has been done which focuses on the herding behaviour of cross country comparison. The study explores the herding behaviour in Pakistan stock market along with one regional market (China) and one globally influential market (USA). The cross-country herding behaviour is investigated in different market conditions bull, bear and normal market.

## 3. Data and Methodology

### 3.1. Data

Daily data from business recorder is employed in the study and the timeframe of the data is from 5th January 2004 to 31st December

2015. Data of US market S&P 500 is taken from the website of Stock Historical Data[2], data of the Chinese stock market SSE180 is also taken from the website of Stock Historical Data. Data has been divided into sub-periods to specify the herding behaviour in a specific year. First of all, closing prices of all industries are aligned together then all of these are converted in US dollars, and the exchange rate data is taken from US FOREX[3]. After converting series into exchange rate returns are calculated of the single industry by taking Cross-sectional Average and returns are calculated, after that CSAD is calculated for each country.

## 3.2. Methodology

The study uses the method of (Chiang & Zheng, 1995) to investigate, the herding behaviour of the stock-markets of Pakistan, China, and the US. In the first step, returns are measured using daily changes in industry indexes. Then return dispersions are measured using CSAD proposed by CCK which is also used by CZ. After measuring CSAD, market-wide herding is estimated using regression for each country. When market-wide herding is investigated then using dummies of herding during 'Bearish' and 'Bullish' market's condition is investigated. A-cross border herding is estimated which is the main purpose of this paper to check whether investor behaviour in Pakistan is similar to the investors' behaviour in China and the US.

At the first step returns are measured using this formula:

$$R_t = 100 * (\log(P_t) - \log(P_{t-1})) \tag{1}$$

$R_t$ is return at time $t$ which is obtained by the change in industry indices.

$P_t$ here denotes the industrial stock price index.

At the second stage this study measure CSAD$t$ as

$$\text{CSAD}t = \frac{1}{N} \sum_{i=1}^{\acute{N}} |\acute{R}_{i,t} - \acute{R}_{m,t} \tag{2}$$

'N' denotes, number of industries selected in sample

$\acute{R}_{i,t}$ is the stock-returns of industry $i$ at the time $t$

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[2] http://www.stockhistoricaldata.com/stock-exchanges
[3] http://www.usforex.com/forex-tools/historical-rate-tools/historical-exchange-rates

$Ŕ_{m,t}$ is the (Cross-Sectional average stock) of Ń return's in a portfolio at the time ṭ.

Third step is to investigate market-wide herding, estimate following equation which is proposed by CZ.

$$CSAD_t = \gamma o + \gamma_1 Ŕ_{m,t} + \gamma_2 |Ŕ_{m,t}| + \gamma_3 Ŕ_{m,t}^2 + \varepsilon^t \tag{3}$$

$CSAD_t$ the return's dispersion measure to be used.

$Ŕ_{m,t}$ is 'equal weighted-realized return' of all industry indices on day ṭ.

Absolute term $|Ŕ_{m,t}|$ is added to be prudent of a-symmetric behaviour of the investor in three market situations (Bull, Bear, Normal). CCK notes that (APM) implies in-lines relationship among the returns of the market portfolio, the dispersions of individual-asset-returns. Rise in the absolute value of market returns causes an increase in returns of an individual asset.

$R_{m,t}^2$ is the squared term or non-linear term which is added, as the case of large market fluctuations, investors may react in identical fashion to exhibit herding behaviour. This behaviour is to be expected to increase the co-relation amongst returns of the asset. This related dispersal decreases or increases at less than the proportionate ratio with the market-return, for such a purpose a non-linear term is included. So, significantly the negative coefficient of this 'non-linear' term is dependable on the existence of herd behaviour.

At the fourth step, this study investigates herding during (up and down) market days by using dummies.

$$CSAD_t = \gamma_0 + \gamma_1 + (1-D)\dot{R}_{m,i} + \gamma_2 D|\dot{R}_{m,t}| + \gamma_3 (1-D)\dot{R}_{m,t}^2 + \gamma_4 D\dot{R}_{m,t}^2 + \varepsilon_t \tag{4}$$

D is a dummy variable, which is equal to zero when the market-return is greater than or equal to 0 and the value of D is one when the market return is negative. The coefficient $\gamma 3$ indicates herding in up-market-days when it is negative and significant. The coefficient $\gamma 4$ indicates herding during down-market-days when it is negative and significant. It investigates herding A-cross border because in a present era where everything is linked with each other

in some specific manner, stock markets are facilitated with high technology and information and signals reach from one place to other in no time, so it is the reason to take in important foreign variable in this study to investigate the role and importance of universal factors. For this purpose, the Chinese and US stock markets are included in the study. Following equations allows this study to investigate herding A-cross border.

$$CSAD_t = \gamma_0 + \gamma_1 + (1 - D)\dot{R}_{m,t} + \gamma_2 D|\dot{R}_{m,t}| + \gamma_3(1 - D)\dot{R}_{m,t}^2 + \gamma_4 CSAD_{US,t} + \gamma_5 \dot{R}_{US,mt}^2 + \varepsilon_t \qquad (5)$$

$$CSAD_t = \gamma_0 + \gamma_1 \acute{R}_{m,t} + \gamma_2|\acute{R}_{m,t}| + \gamma_3 \acute{R}^2_{m,t} + \gamma_4 CSAD_{CHINA,t} + \gamma_5 \acute{R}^2_{CHINA,m,t} + \varepsilon^t \qquad (6)$$

Following equations are estimated in order to check whether Pakistan stock market herds around global factors (China and Us markets). In these equations, CSAD t is the Cross-Sectional-Absolute-Deviation or measure of return dispersions. $\acute{R}m, t$ is the Cross-Sectional Average return of N stocks at the time t. $|\acute{R}m, t|$ is the absolute term. The difference here from equation 3 is that two new terms $CSAD_{CHINA,t}$ , $R^2{}_{CHINA,m,t}$ are added which represents the squared returns and dispersion in the Chinese market. Above equations show, market-wide herding is shown negatively and significant value of $\gamma 3$. A-cross border herding depict negatively and significant value of $\gamma 5$. Highly positive significant value of $\gamma 4$ indicate the Chinese return dispersion with a leading influence on the market. Study estimate simple OLS regression and to overcome the problems of HAC, consistent (HAC) estimator is used and further results are obtained.

## 4. Empirical Results

Table-1 explains the descriptive stats of return dispersion by using CSAD. Higher mean value (which is *7.70* for Pakistan*)* indicates high variation in markets A-cross industrial returns and similarly, on the other hand, lower value is for China is *1.75*. This indicates less variation or nearly stable industrial returns A-cross market, the USA market has a mean value of *3.96* which also shows that there are high variations in market A-cross industrial returns but these

variations are less, as compared to the market of Pakistan. Chinese market at this stage is more stable or has less variation than from both markets of Pakistan and USA. Standard deviation indicates cross-sectional variations, and higher standard deviation values indicate unusual Cross-Sectional variations. These uncommon Cross-Sectional variations can occur from shocks or from sudden news. If we look at these three markets and compare them with each other, Pakistan among these three high standard deviation value depicting there are more unusual cross-sectional variations due to shocks and unexpected news. Standard deviation value for the USA market is also near to that of Pakistan which shows that both markets have unusual cross-sectional variations. Market of China, in that case, is more stable or has less cross-sectional variation.

Table 1
*Descriptive Statistics for CSAD*

| Statistics | CSAD_PAK | CSAD_CHINA | CSAD_USA |
|---|---|---|---|
| Mean | 7.70 | 1.75 | 3.97 |
| Median | 7.15 | 1.61 | 3.21 |
| Maximum | 30.19 | 6.80 | 29.32 |
| Minimum | 0.267 | 0 | 0 |
| Std. Dev. | 3.26 | 0.79 | 2.82 |
| Skewness | 1.25 | 1.48 | 2.95 |
| Kurtosis | 6.08 | 8.61 | 16.74 |
| Jarque-Bera | 1946.35 | 4964.80 | 27523.81 |
| Probability | 0 | 0 | 0 |
| Observations | 2953 | 2953 | 2953 |

Note: These figures represent the descriptive statistics of Cross-Sectional-Absolute Deviation for three countries namely: USA, CHINA and PAKISTAN the stock return dispersion is defined as

$$CSADt = \frac{1}{N} + \sum_{i}^{N} \left( \left| \acute{R}_{i,t} - \acute{R} \right| \right).$$

The Graphical representation of stock returns dispersions is as follows:
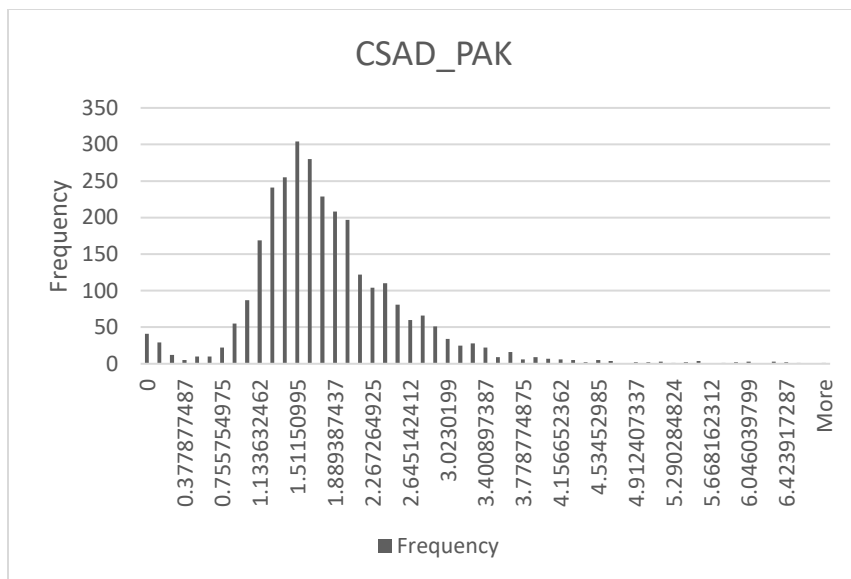
*Figure 1.* CSAD_PAK - Graph explains the skewness and kurtosis of cross-sectional returns dispersions for the stock market of Pakistan (KSE 100 index)
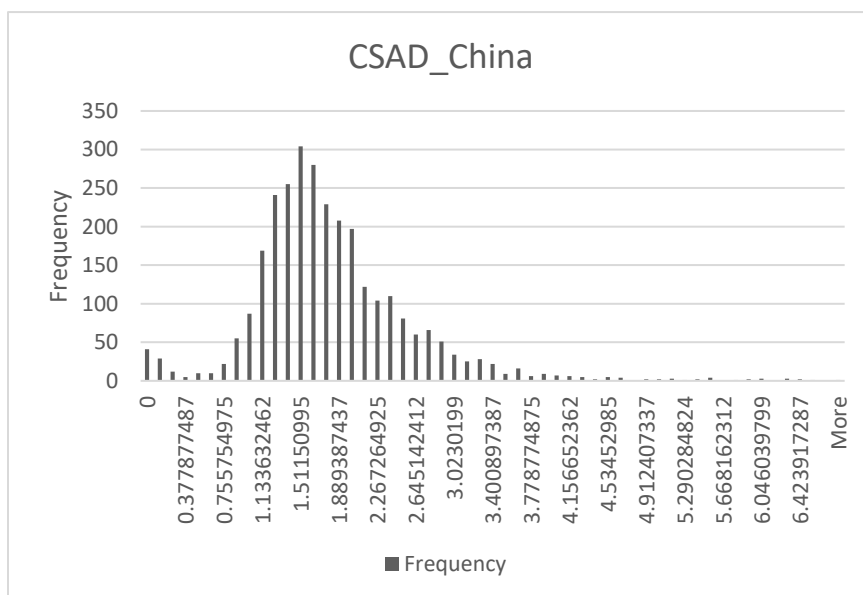


*Figure 2.* CSAD_China **-** Graph explains the skewness and kurtosis of cross-sectional returns dispersions for the stock market of China (SSE180).
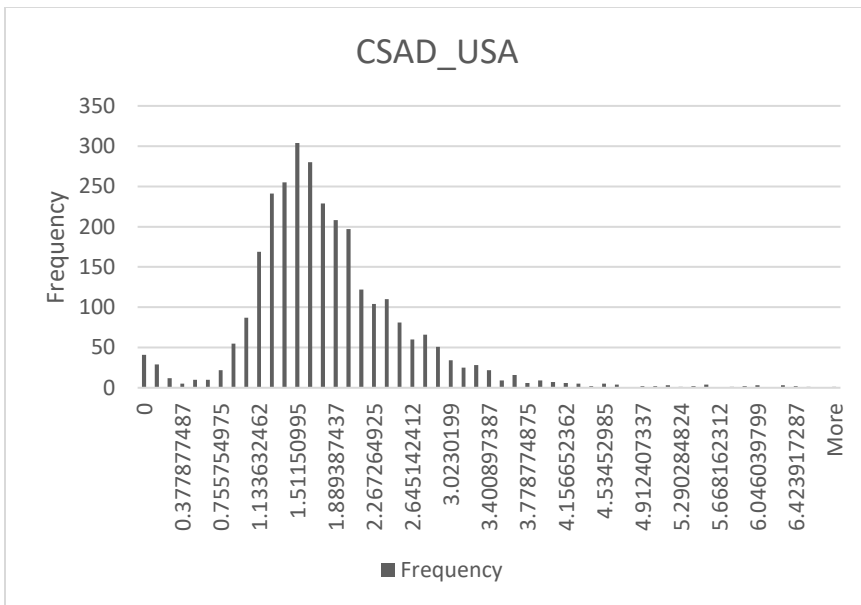
*Figure 3.* B3 – CSAD_US - The Graphs explain the skewness and kurtosis of Cross-Sectional returns dispersions for the stock market of the USA (S&P 500). The distribution of stock returns dispersion is not normal in the above graphs. Because skewness for (PAKISTAN, CHINA and USA) is positive and have excess kurtosis value respectively.

## 4.1. Results of Regression Analysis

It presents the findings of regression estimates and interpretation of the obtained results.

**4.1.1. Cross country herding behaviour.** At first step equation number 3 is estimated for each country (Pakistan, China and the USA) to investigate if the markets selected of these countries exhibit herd behaviour. Separate regression is run for each country for the whole data from 2004 and 2015 then the data of each country is divided into sub-periods each period represent one year. As it is explained above that the presence of herding behaviour, shown by negatively and statistically significant value of $\gamma 3$ , which is a coefficient of $R^2_{m,t}$ .

Table 2

*Results of Herding Behaviour based on Equation 3*

| Statistics | $\gamma_0$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ | Adjusted $\overline{R^2}$ | Durbin Watson | White Test |
|---|---|---|---|---|---|---|---|
| PAK | 7.25** (61.01) | 0.12*** (2.18) | 0.56*** (4.06) | -0.01 (-0.82) | 0.18 | 1.8 | 0.53 |
| CHINA | 1.32*** (38.75) | -0.09*** (-6.11) | 0.53*** (12.55) | -0.05*** (-8.27) | 0.23 | 1.84 | 0.57 |
| USA | 13.07*** (16.75) | 0.18 (0.36) | 10.53*** (6.21) | -0.72*** (-3.29) | 0.43 | 1.92 | 0.82 |

Note: The t-statistics are enclosed in brackets. The *. **, ***shows significance level at 10%,5%,1% respectively.

Table 3

*Correlation Matrix*

| | MR_PAK | AMR_PAK | MR2_PAK |
|---|---|---|---|
| MR_PAK | 1 | -0.1225 | -0.032 |
| AMR_PAK | -0.1225 | 1 | 0.39828 |
| MR2_PAK | -0.032 | 0.39828 | 1 |

The table 2 show herding behaviour insignificant for the PSX 100 index which is stock market of Pakistan but looking at the sign of the estimated herding coefficient ($\gamma_3$), which is negative, show that there is little chance of existence of herding but insignificant. Chinese stock-market provide the strong evidence of market-wide herding behaviour exists in the SSE 180 index, depicted by the negative and statistically significant value of ($\gamma_3$). In the market of USA, there is strong evidence of market-wide herding. These results show that KSE is more stable as compared to the markets of China and the US. Estimations are done by using OLS and to overcome the problems of Autocorrelation and Heteroscedasticity HAC Newy West estimator results are obtained. Durbin Watson (D.W) test of autocorrelation shows that there is no autocorrelation problem exist in the model, however, if D.W value is close to 2 then there is no autocorrelation problem. White test is used for detecting heteroscedasticity and the null hypothesis is there with no heteroscedasticity and alternate. There is heteroscedasticity problem so here in all three regressions i.e. Pakistan, China and the US, p-values are greater than 5% so we accept our null hypothesis which is no heteroscedasticity.

Table 3, Correlation matrix of Market Return, Absolute Market Return and squares of market-return shows the correlation values which lies between zero and one. If the correlation value is close to one, it shows a high correlation between variable and if it is close to zero then it shows no correlation between variable here. The correlation among Market return and Absolute Market Return is -0.1225 which show negative correlation meaning so there is a negative small co-relation between Market return and Absolute Market Return and there is no herding behaviour in Pakistan stock-market.

**4.1.2. Country-wise herding behaviour.** Now to examine the presence of country-wise herding in specific years, data of each country is divided into sub-parts and then again estimations are done. The results of those regressions are discussed below in table 4, 5 and 6.

The estimated results depict presence of herding behaviour during 2004 and 2008 and there is no market-wide herding observed

in the remaining years. Evident to market-wide herding in 2004 proves that people have some kind of news before the 2005 liquidity crash, so individual investors start herding and move according to the performance of market that is why individual return dispersion CSAD followed the market performance in 2004 with the significance of herding. Another supporting argument is that dataset of SBP showed, there was a total US $38 Million net outflow during that period, prior to the settlement of investor inevitably occurred.

Table 4
*Results of Herding in Pakistan Stock-market*

| Pakistan KSE 100 index | $\gamma_0$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ |
|---|---|---|---|---|
| 2004 | 6.46*** | 0.00 | 1.66*** | -0.12*** |
|  | (20.65) | (0.02) | (4.58) | (-3.21) |
| 2005 | 6.46*** | 0.15 | 0.9*** | -0.07 |
|  | (22.38) | (1.06) | (2.95) | (-1.32) |
| 2006 | 7.41*** | -0.12 | -0.51 | 0.19 |
|  | (19.96) | (-0.78) | (-0.74) | (0.92) |
| 2007 | 7.10*** | -0.15 | 0.01 | 0.00 |
|  | (24.22) | (-1.03) | (0.04) | (0.14) |
| 2008 | 4.47*** | 0.044 | 2.55*** | -0.28*** |
|  | (10.46) | (0.29) | (4.40) | (-2.25) |
| 2009 | 8.75*** | -0.05 | 1.52*** | -0.21 |
|  | (18.25) | (-0.34) | (2.34) | (-1.38) |
| 2010 | 8.85*** | 0.28 | 0.38 | 0.018 |
|  | (23.41) | (1.30) | (0.60) | (0.10) |
| 2011 | 7.13*** | 0.31 | 0.90 | 0.13 |
|  | (19.92) | (1.55) | (1.47) | (0.81) |
| 2012 | 7.20*** | 0.40*** | 1.29*** | -0.00 |
|  | (19.16) | (2.82) | (2.64) | (-0.07) |
| 2013 | 6.78*** | 0.10 | 0.50 | 0.11 |
|  | (31.71) | (0.78) | (1.42) | (1.10) |
| 2014 | 6.45*** | -0.05 | 0.78 | 0.11 |
|  | (20.72) | (-0.26) | (1.43) | (0.68) |
| 2015 | 6.29*** | 0.097 | 0.41 | -0.04 |
|  | (25.16) | (0.61) | (0.87) | (-0.31) |

Note: The t-statistics are enclosed in brackets. The *. **, ***show significance level at 10%, 5%,1% respectively.

Thus index dropped-down by 25% in the eight transaction events later by 15th March, with the major drop in the entire history of the market with 4.6 % in a single session. In 2008, evident findings of herding are established. This year was also the year of crisis not for Pakistan stock market but the larger market of the world also crashed during this period. Only these two years show the results of significance herding rest all years do not show the herding behaviour in the investor's decisions.

Table 5
*Results of Herding in the Chines Stock-market SSE180*

| CHINA SSE180 index | $\gamma_0$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ |
|---|---|---|---|---|
| 2004 | 1.03*** | -0.035*** | 0.25*** | -0.02*** |
|  | (22.19) | (-2.40) | (5.73) | (-5.52) |
| 2005 | 0.97*** | -0.10*** | 0.41*** | -0.04*** |
|  | (19.89) | (-5.70) | (9.56) | (-7.68) |
| 2006 | 1.26*** | -0.09*** | 0.62*** | -0.06*** |
|  | (15.07) | (-2.68) | (5.37) | (-2.55) |
| 2007 | 1.67*** | -0.11*** | 0.51*** | -0.05*** |
|  | (17.38) | (-4.57) | (5.90) | (-3.80) |
| 2008 | 1.49*** | -0.06*** | 0.38*** | -0.03*** |
|  | (17.00) | (-4.66) | (6.18) | (-4.02) |
| 2009 | 1.54*** | -0.09*** | 0.38*** | -0.03*** |
|  | (22.49) | (-4.58) | (4.65) | (-1.71) |
| 2010 | 1.39*** | -0.12*** | 0.33*** | 0.00 |
|  | (19.74) | (-3.90) | (2.72) | (0.24) |
| 2011 | 1.52*** | -0.10*** | 0.01 | 0.10*** |
|  | (35.36) | (-3.88) | (0.17) | (1.85) |
| 2012 | 1.44*** | -0.02 | -0.36 | 0.57*** |
|  | (27.07) | (-0.68) | (-1.62) | (2.83) |
| 2013 | 1.41*** | 0.02 | 0.22 | 0.15 |
|  | (25.57) | (0.53) | (1.25) | (1.30) |
| 2014 | 1.22*** | 0.03 | 0.32 | 0.17 |
|  | (19.30) | (0.79) | (1.45) | (1.16) |
| 2015 | 1.78*** | -0.46*** | 1.20*** | -0.17*** |
|  | (15.51) | (-7.72) | (6.25) | (-2.88) |

Note: The t-statistics are enclosed in brackets. The *. **, *** show significance level at 10%,5%,1% respectively.

These results of the SSE 180 index show the prevalence of the market-wide herding in the stock-market from 2004-2009 with the significant negative values of $\gamma_3$, a coefficient of $R_{m,t}^2$ which provides the estimates of the non-linear association amongst the returns of individual market dispersions and overall market returns. This period is famous for the bubble burst of China in 2007 of February 27th, November of 2007, with the sponged market worth. No evidence of market-wide herding has been detected from this data from 2010 to 2014, and in 2015 results show a presence of significant market-wide herding behaviour. By 8th, 9th July 2015, the Shanghai stock market fell 30 per cent over the period of three weeks. This period was also of significant importance due to instability of stock market (China) bursting on 12th June, 2015 till February 2016.

Table 6

*Results for Herding in USA S&P500*

| USA S&P500 index | $\gamma_0$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ |
|---|---|---|---|---|
| 2004 | 13.59*** | -1.16 | 2.31 | -1.22 |
|  | (13.62) | (-1.48) | (0.78) | (-0.71) |
| 2005 | 15.03*** | -1.73* | -4.44 | 2.93 |
|  | (12.17) | (-1.87) | (-1.10) | (1.18) |
| 2006 | 12.29*** | -1.29 | 4.80 | -2.45 |
|  | (9.11) | (-1.44) | (1.08) | (-0.89) |
| 2007 | 2.93 | -2.12 | 43.00*** | -8.60*** |
|  | (0.46) | (-0.63) | (3.51) | (-2.00) |
| 2008 | 24.54*** | 0.86 | 6.82 | -0.42 |
|  | (3.95) | (0.62) | (1.39) | (-0.80) |
| 2009 | 14.22*** | 0.30 | 12.58** | -1.77 |
|  | (2.63) | (0.21) | (1.94) | (-1.20) |
| 2010 | 11.96*** | 1.49 | 7.87* | 0.38 |
|  | (3.25) | (0.85) | (1.80) | (0.49) |
| 2011 | 18.25*** | -0.27 | 11.27*** | -1.73* |
|  | (5.16) | (-0.22) | (2.55) | (-1.87) |
| 2012 | 12.58*** | -0.04 | -1.32 | 1.58 |
|  | (12.09) | (-0.06) | (-0.51) | (1.21) |
| 2013 | 12.77*** | 1.09 | 4.35 | 2.34 |
|  | (5.42) | (0.60) | (0.69) | (0.78) |
| 2014 | 14.02*** | -2.68 | 17.24* | -5.60 |

| USA S&P500 index | $\gamma_0$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ |
|---|---|---|---|---|
| | (4.40) | (-1.04) | (1.86) | (-1.18) |
| 2015 | 14.47*** | -0.37 | 14.65*** | -1.62** |
| | (4.56) | (-0.17) | (3.20) | (-2.13) |

Note: The t-statistics are enclosed in brackets. The *. **, *** shows significance level 10%, 5%, 1% respectively.

Market-wide herding behaviour for S&P 500 index which is representing the USA market has been investigated from 2004 to 2015, there is sign of significance herding in 2007, 2011 and 2015 while no evidence of herding is found in other remaining years from 2004 to 2015. In the USA 2007-2009 bear market remained for 17 months when there was financial crisis with 50% loss of stock worth.

**4.1.3. Herding behaviour during up and down market.** Now this study goes further by investigating herding behaviour during up and down market days. For this a purpose equation no. 4 is used which will help us investigating herding behaviour during bearish and bullish markets. According to results of equation 4 herding behaviour during down market days are shown by negative significant value of $\gamma 4$ for which the coefficient of is $DR^2{}_{m,t}$, and herding behaviour during up market days is shown by the significant negative value of $\gamma 3$ which is the coefficient of $(1 - D)R^2 m, t$.

Table 7 and Table 8 show the results for the equation number 4 and 5. There is no significant evidence of herding for Pakistan in up and down market days but the value of $\gamma_3$ is negative which shows herding in up-market days, but it statistically insignificant. There is significant evidence of herding for China and USA markets for both (up and down market days), represented by the significant negative values of $\gamma_3$ and $\gamma_4$. Furthermore, the Wald test is also used to examine the asymmetry in herding behaviour. Null hypothesis for no asymmetry is $\gamma_3 = \gamma_4$. Results for Wald test are shown in panel 2 which is represented by table number 6. The results of the Wald test propose, there is no asymmetry among the investors in Pakistan, China and the USA. The results are in line with recent studies (Javed et al., 2013). Now this study is further investigating the A-cross border herding for KSE 100 with the markets of China and the USA. For this purpose, the equation number 5 and 6 are employed.

Table 7

*Herding Behaviour during Up and Down Market Days*

Panel-1 Regression estimates Panel 1

| Market | $\gamma_0$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ | $\gamma_4$ | *Adjusted $\overline{R^2}$* |
|---|---|---|---|---|---|---|
| Pakistan | 7.01*** | 0.93*** | -0.66*** | -0.00 | 0.00 | 0.53 |
| | (54.64) | (4.81) | (-4.24) | (-0.07) | (0.27) | |
| China | 1.33*** | 0.41*** | -0.64*** | -0.04*** | -0.05*** | 0.23 |
| | (38.57) | (10.58) | (-11.04) | (-5.35) | (-7.86) | |
| USA | 13.07*** | 10.30*** | -10.82*** | -0.61*** | -0.83*** | 0.43 |
| | (16.87) | (5.66) | (-5.65) | (-2.55) | (-3.28) | |

Note: The t-statistics enclosed in brackets. The *. **, *** shows significance level at 5%, 10%, 1% respectively.

Table 8

*Wald Test of Herding Coefficients between Bearish and Bullish Markets*

Panel 2 Wald test results

| MARKET | $\gamma_3$ | $\gamma_4$ | Difference | Chi-square | P- value |
|---|---|---|---|---|---|
| Pakistan | -0.003 | 0.00 | -0.009 | 22.59 | 0.00 |
| China | -0.04 | -0.05 | 0.01 | 113.69 | 0.00 |
| USA | -0.61 | -0.83 | 0.21 | 32.09 | 0.00 |

Note: the hypothesis is $\gamma 3 = \gamma 4$ check the equality of herding coefficient between up and down market day.

Table 9

*Herding of Pakistan Stock Market with USA*

| Market | $\gamma_0$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ | $\gamma_4$ | $\gamma_5$ | $\overline{R^2}$ |
|---|---|---|---|---|---|---|---|
| Pakistan | 7.00*** | 0.10* | 0.81*** | -0.00 | -0.00** | -0.03** | 0.57 |
|  | (53.21) | (1.92) | (4.95) | (-0.007) | (1.40) | (-2.12) |  |

Note: The t-statistics are enclosed in brackets. The *. **, *** shows significance level at 10%, 5%,1% respectively.

Below Table shows the estimation results of CSAD based on equation 5.

Table 10

*Herding of Pakistan with China*

| Market | $\gamma_0$ | $\gamma_1$ | $\gamma_2$ | $\gamma_3$ | $\gamma_4$ | $\gamma_5$ | $\overline{R^2}$ |
|---|---|---|---|---|---|---|---|
| Pakistan | 6.99*** | 0.07 | 1.29*** | -0.15*** | -0.10 | 0.00*** | 0.60 |
|  | (37.58) | (1.41) | (6.98) | (-3.35) | (-1.31) | (3.93) |  |

Note: The t-statistics are enclosed in brackets *. **, *** shows significance level at 10%, 5%, 1% respectively.

According to equation 6 which is estimated to examine the herding of Pakistan stock-market toward the market of USA, results suggest that Pakistan stock market herds around the USA market with significant negative value of $\gamma_5$ .These results are similar to (Iqbal, 2011), a uni-directional causation occur from the USA to Pakistan stock-market. In this equation $\gamma_3$ still represents the local market-wide herding. However, significant negative value of $\gamma_4$ suggest, USA return dispersion has an impact on the stock market.

Now according to the results of table 10, local market-wide herding coefficient $\gamma_3$ is negatively significant. Other results of the estimated equation suggest that Pakistan stock market does not exhibit herd behaviour around the market of China, neither return dispersions of Chinese market have dominant influence on the Pakistan stock market. The results are consistent with (Demirer & Kutan, 2006). It can be said that investors do not have irrational choices, both financial markets have equal information and following findings support rational asset pricing model.

## 5. Conclusions and Policy Implications

In this study, the behaviour of investment between the market participants are explored in the markets of Pakistan, China and the USA. More focus is on Pakistan stock market, however, to examine the influence of China and the USA market to determine the investor behaviour , A-cross border herding is also detected for Pakistan stock market,. Herding behaviour has been discussed is market-wide herding behaviour. Results show that investors in Pakistan stock market do not exhibit herd behaviour as investors in the markets of China and the USA. In Pakistan herding only occurred during the years of 2004 and 2008 which support asset pricing model and market efficiency. Those years were the years of crisis. In the US, the results show herding behaviour during the years of 2007, 2011 and 2015. Although in other years there is herding behaviour during 2004, 2006, 2009 and 2014, it has no significant effect on the local market. Results for China stock market (SSE 180) index are interesting where market herd behaviour is consistent constantly from 2004 to 2009 and then from 2011 to 2012 and then again in the year 2015. Further results suggest that investor in Pakistan stock

market herds around the market of the US, but do not exhibit herding around the stock-market of China.

## 5.1. Policy Implications of the Study

It has been discussed in the study that the presence of herding behaviour will cause stocks to be mispriced so the time periods in which herding phenomenon occur will, for the first time, make investor to invest in stocks but later it will cause damage or loss to the investment. So study implies that before investing in stocks, investors must judge whether stocks are fairly trading. One should be aware if there is any artificial hype created in the market or not. In other words, investor should depend on the secretly collected evidence instead of randomly following market participants. It can be observed that PSX is far better than the Chinese market in case of investing in stocks due to the absence of herding behaviour.

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