HERDING BEHAVIOUR IN THE PAKISTAN STOCK EXCHANGE: INSIGHTS ABOUT SECTORAL RETURNS

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CERTIFICATE

This is to certify that this thesis entitled: "Herding Behaviour in The Pakistan Stock Exchange: Insights about Sectoral Returns" submitted by Mr. Muhammad Yousaf Khan is accepted in its present form by the Department of Business Studies, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree of **Master of Science in Management Sciences**.

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DECLARATION

This thesis is a presentation of my original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions.

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Muhammad Yousaf Khan

DEDICATION

This thesis is dedicated to my parents and my family for their enduring patience, encouragement, love and support and for putting me through the best education possible. I appreciate their sacrifices as I wouldn't have been able to get to this stage without them.

I thanks my wife for the help she showed in my studies and the motivation she gave me during those trying times when I had doubts about my abilities. Her confidence and faith in me helped me in achieving my goals.

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Muhammad Yousaf Khan

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ABSTRACT

The purpose of this study is to investigate the herding behaviour in Pakistan Stock Exchange with the primary focus on herding sector-wise. Daily and monthly data from January 2008 to December 2019 of 12 sectors namely "Automobile assembler, Cement, Chemical, Fertilizer, Paper and Board, Power Generation & Distribution, Refinery, Sugar & Allied Industries, Textile Composite, Textile Spinning, Textile Weaving and Tobacco" have been utilized for the study. Two models i.e. Cross Sectional Standard Deviation (CSSD) proposed by Christie & Huang (1995) and Cross Sectional Absolute Deviation (CSAD) proposed by Chang et al. (2000) were used to find the existence of herding. Different scenarios are used in order to explore the possibility of herding in the Pakistani stock exchange. Results indicate that during extreme market movements and during non-linearity, no evidence of herding has been found in any sector. Furthermore, during the bullish market conditions, herding exists in the sectors Fertilizers, Paper & Bonds, Power Generation & Distribution, Refinery, Sugar & Allied Industries and Textile Spinning by using daily returns, however, by using the monthly returns, herding exists in the sectors Fertilizers, Paper & Bonds, Power Generation & Distribution, Textile Weaving and Tobacco. During bearish market conditions, by using daily and monthly data, herding exists in Textile Spinning, Tobacco and Sugar & Allied Industries respectively. During high volatility state, by using daily data, herding exists in the sectors Paper & Bond, Power Generation & Distribution, Textile Spinning, Textile Weaving and Tobacco. However, at low volatility state, by using daily data, herding exists in two sectors i.e. Automobile Assemble and Power General & Distribution and for monthly data herding exists in three sectors i.e. Fertilizer, Textile Spinning and Textile Weaving. This study has important implication for market players, foreign / domestic investors can formulate their strategies for investment by seeing in which sector the herding exists.

CHAPTER 01

INTRODUCTION

It is evident that due to constantly changing economic environment, economic uncertainty arose which ultimately results in changing of investors decisions. One such type of concept which has attained greater attention in the last decade is 'herding'. People usually influenced by others and they rely on information provided by others in order to make decisions which are defined as "Herding Behaviour". Herding behaviour is seen in financial markets as most of the financial decisions are being made by seeing others. Such behaviour is the tendency between them and results in investors to form a group and asset prices to be correlated (Gebka & Wohar, 2013). Herding behaviour is considered by imitating other actions which relate to the field of behavioral finance that establish the market consensus (Bikhchandan & Sharma, 2000). The inspirations behind the herding are portrayed from different other ways, but there's common congruity about its impact regarding financial markets, with reference to instability in the prices of assets and price volatility (Chang et al., 2000).

A vast body of knowledge on herding behaviour is available confirming the presence or absence of herding in stock markets. Presence of herding in these studies have proven more profound in developing market in comparison with developed markets (Chang, Cheng, & Khorana, 2000 ; Lao & Singh, 2011 ; Economou, Kostakis & Philippas, 2011). During a downward or upward movement of the market, investors are more likely to herd (Demirer, Kutan, & Chen, 2010). In addition, Lao and Singh (2010) reported herd behaviour for asymmetric effects which are described as investors herd more. So it relates to the effect of a financial crisis as extreme return movements constantly occur in these times (Chiang & Zheng, 2010). Furthermore, it is evident that

herding is more profound among smaller stocks in comparison with large capitalization stocks (Bikhchandan & Sharma, 2000).

Sector-level evidence is important as it is expected that herding is more profound in non-financial sectors with smaller capitalization rate and a large number of small retail investors than the financial sector that includes institutional investors. As a result of these factors, we hypothesize that financial specialist conduct may be diverse within the stock trades and segments, causing diverse herd arrangement. In specific, non-financial divisions in common and the littler Pakistani Stock Exchange (PSX) advertise occupied by fabricating & trade firms are more subject to herding.

A major motive of this study is to test herding in PSX sector-wise. PSX has been chosen for the following reasons. Firstly, in May 2017 PSX reclassified as an MSCI Emerging Market, therefore, it is exciting to check whether indeed herd behaviour is more significant in such a developing market. Secondly, the study examines the herding behaviour sector-wise by using the approach "Cross Sectional Absolute Deviation (CSAD)" as proposed by Chang et al. (2000). Shah, Shah and Khan (2017) is the one who studied herding for different firms but untapped the results with the CSAD approach. Subsequently, the role of this study is a scholarly significance, since it gives more knowledge into the impact of herding on asset prices within the PSX, moreover, examining the different impacts on the extent of herding.

1.1 Overview of PSX

In January 2016, three stock exchanges: Karachi Stock Exchange having turnover of 85%, Lahore Stock Exchange having turnover of 14% and Islamabad Stock Exchange having turnover of around 1%, are combined into single stock market named as Pakistan Stock Exchange under the Act, 2012. 553 companies (till October 2019) are

listed with a market capitalization of Rupees 6,607B and the total volume is $24 Million. Listed companies can be categorized as financial and non-financial sectors and there are 35 sectors in total. Five indexes are there in PSX; (1) With the base value of 1000, KSE 100 index, was started in November 1991 and it comprises a hundred firms listed based on their market capitalization (2) KSE all index was announced in August 1995 and become operative in September 1995 (3) KSE 30 index, was established in June 2005 and was presented to supply the speculator with a sense of how huge companies' scrip of Pakistan's value showcase is performing over time (4) KSE-Meezan 30 index, was announced in September 2008, to assist as an instrument for calculating the performance of Shariah-compliant equity investment and (5) all shares Islamic index, was established on November 2015 with a joint effort of management of PSX and Meezan Islamic bank limited with a base value of 15,000 points and its objective was to gauge the performance of the Shariah-compliant segment of the equity market.

PSX comprises of 0.22 million retail investors, 1886 foreign institutional and 883 domestic institutional investors. Due to a constant increase in the number of institutional investors, PSX has 400 brokerage houses and 21 asset management companies. It is one of the leading exchanges of the world being the best performing Stock Exchange in Asia. During 2009 to 2015 PSX is among the world's best performing stock markets which have delivered a 26% a year. It constitutes1 60% by the general public (including shareholders, domestic and foreign investors). In late 2016, for $ 85 million, PSX sold 40% strategic shares to a Chinese consortium.

[1] https://www.psx.com.pk/psx/exchange/profile/about-us

1.2 Theoretical Background

The theoretical framework that is used in this study comes from the evolution of the understanding of investment decisions and the nature of the investors that make these decisions. Mainly there are two significant drivers of investor intentions with regard to close end fund investment.

1.2.1 Efficient Market Hypothesis (EMH) Theory

This theory was developed by Fama (1970), according to this theory, stock prices reflect all available information i.e. all known information about investment securities, is already factored into the prices of those securities. Therefore, it is impossible to consistently choose stocks that will beat the returns of the overall stock market. EMH is the proposition that current stock prices fully reflect all available information about the value of the firm and that when using this information, there is no way to earn higher profits.

Three forms of EMH are detailed below;

a) The first form of EMH is Weak-form which is related to the random walk hypothesis, i.e. price changes are independent of each other and stock prices move randomly, prices show all information of the market regarding that security i.e. past price data. Hence, no abnormal returns are possible by taking into account past prices information.

b) The second form is Semi-strong-form, which elaborates that based on information of public and market information, prices adjusted rapidly i.e. return on stocks and profit statements and economic/political events. Therefore, by analysis, abnormal profits cannot be earned.

c) The third form is Strong-form of EMH, as per this form, it describes that prices reveal the private and public information of the market i.e. investors has no access to monopolistic information.

There are three assumptions of EMH:

a) Firstly, investors value securities on the basis of maximum predictable utility and are presumed to be rational,

b) Secondly, in the case of irrational investors, the trades they made are supposed to be random, offsetting any impact on prices,

c) Thirdly, rational arbitragers are assumed to eliminate any influence irrational investors have on market/security prices.

1.2.2 Behavioural Finance Theory

It is the study of the effect of psychology on the conduct of investors and its effect on markets. Behavioural finance is nowadays is of interest because it helps answer *why* and *how* markets might be inefficient. Behavioural finance is the integration of classical economics and finance with psychology and the decision making sciences. It is an endeavour to clarify what causes a few of the peculiarities that have been watched and detailed within the finance literature as shown in Figure 1.

The first major work on the subject is undoubtedly the work of Simon (1955) on the rational choice behavioural model. As per behavioural finance, the behaviour of the investors in the market depends on the psychological principles of decision making, which explains why people buy and sell investments. It focuses on how investors interpret information and act on information to implement their financial investment decisions. In short psychological process and biases influence investors decision making and influence the market outcomes.

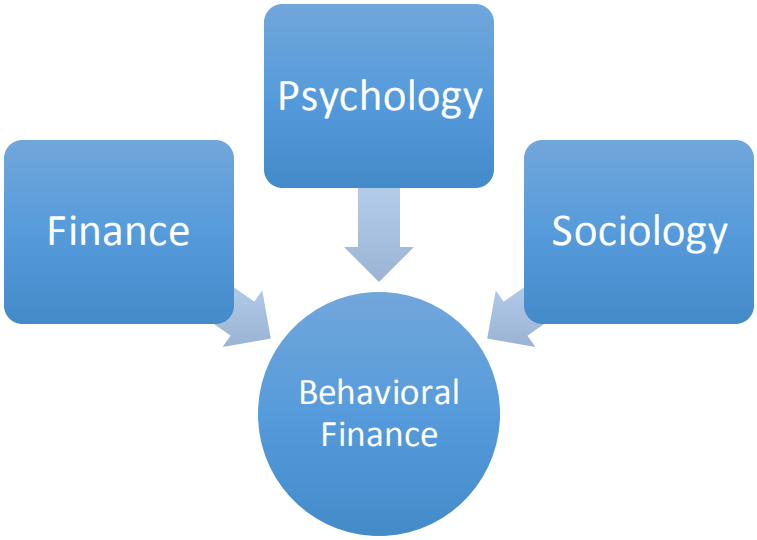

Figure 1: Behavioral Finance

1.2 Problem Statement

By seeing the literature, it is proven that herding behaviour affects the investment decisions of investors who follow others while making financial decisions. Besides, the company's fundamentals are available, investors mostly react to the market and are sensitive to the available aggregate news of the market. The investors sell their stocks by following others to avoid the expected loss. This behaviour is called the irrational behaviour in which they sell the stocks which may have to hold and buy the stocks that are not suitable by following the market sentiments. Due to this irrational behaviour of investors, market results in an unstable and inefficient market. This behaviour of the investors should be examined so that rational investors can lead the market.

1.3 Research Gap

This study investigates the role of herding behaviour from PSX perspective for the period of 12 years from 2008 to 2019. Herding behaviour from Pakistani perspective catch a little attraction as Javed, Zafar and Hafeez (2013), Latief and Shah (2014), Javaira and Hassan (2015), Shah, Shah, and Khan (2017), Kiran, Khan, and Shah (2020)

and Kashif, Palwishah, Ahmed, Vveinhardt, & Streimikiene, (2020) explores the herding behaviour in the context of the Pakistani equity market. The main contribution of this study in the existing literature is as follow,

a. Firstly, this study uses the approach of CSSD and CSAD in order to explore the herding phenomena with respect to sectoral returns.
b. Secondly, this study explores the herding during different directions of the market movements.
c. Thirdly, this study examines the role of herding during asymmetric effects.

1.4 Research Questions

a. Whether herding behaviour exist in sectoral returns in PSX?
b. Whether herding behaviour exists under following different market conditions:
    i. During extreme market conditions,
    ii. During non-linearity,
    iii. During bearish or bullish market conditions,
    iv. During high and low volatility states.

1.5 Research Objectives

a. To check the presence of herding behaviour in sectoral returns of PSX.
b. To explore the existence of herding during extreme market conditions.
c. To investigate the herding behaviour during non-linearity.
d. To study the difference in herding behaviour during bearish or bullish and low or high volatility market conditions.

1.6 Significance of the Study

The theory of Efficient Market Hypothesis (EMH) predicts that prices change due to response of new information and certain past studies showed that it is not always due to new information arrival but it is due to the number of anomalies in the market which are firm, time or behaviour-specific, herding behaviour is one of these anomalies. It opposes with the EMH theory and results in market inefficiency. Due to inefficient information in market participants, the investors make investments by seeing others which ultimately results in herding and markets are destabilized which ultimately results in an inappropriate finding of prices based on asset pricing model because the prices are taken away from rational market value. So this term should be investigated as it increases volatility and destabilizes the financial market.

This study contributes to the body of knowledge as it helps investors and researchers in understanding the phenomena and searches for implications of herding on different market sectors. Generally, it supports investors in the understanding of market operations and serve practitioners and academic to accurately evaluate and predict stock returns. Furthermore, this study is also beneficial for foreign investors as this study investigates the herding behaviour by studying the sector-wise returns. Findings of the study is important for both academics and practitioners in order to understand the working of market keeping in view the herding factor which results in exact valuation, predictions etc while making financial decisions.

1.7 Plan of the Study

In chapter 2, the empirical background has been described. Chapter 3 covers the data description and explain in details the methodology adopted. Chapter 4 discussed data analysis and empirical results. Finally, Chapter 5 reports conclusion and recommendations.

CHAPTER 02

LITERATURE REVIEW

This chapter discusses the detailed literature regarding herding behaviour. At first, it gives details about herding behaviour in emerging and developed markets, afterwards, the studies from Pakistani's perspective are detailed. It is evident from the literature that the pattern of herd behaviour is not the same across the financial markets of the world. Herding also depends on the basis of country and time. Past studies results shown that herding is varying in different phases and market conditions.

2.1 Herding in emerging and developed markets

A huge literature discusses the herding, in herding, firms makes their investment decisions by seeing other firms, the dispersion of individual stock returns to the market returns decrease. Christie and Huang (1995) by using Cross Sectional Standard Deviation (CSSD) model examines herding by observing the effect of equity returns on the part of investors during periods of market stress. The author uses data of monthly and daily returns from the Center for Research in Securities Prices (CRSP) at the University of Chicago. The sample comprises firms with shares CRSP classifies as ordinary common. The daily data for NYSE and Amex firms extend from July 1962 to December 1988, and the monthly data for NYSE firms extend from December 1925 to December 1988. The results for both daily and monthly returns are inconsistent with the presence of herding during periods of large price movements. For example, during extreme down markets, when herding is expected to be most prevalent, the magnitude of the increase in the dispersion of actual returns is mirrored by the increase in the dispersion of predicted returns that are estimated from a rational asset pricing model.

As per the CSSD model, in addition to a linear relationship between stock returns dispersion and market returns exist, a nonlinear relationship can also exist. Chang et al., (2000) study the herding behaviour of investors for Hong Kong, Japan, South Korea, Taiwan and US markets. They use data for the period Jan 1963 – Dec 1997 (daily stock price) for all NYSE and AMEX firms. The daily price and returns series along with the year-end market capitalization for each firm and the equally-weighted index return for Hong Kong (January 1981-December 1995), Japan (January 1976-December 1995), South Korea (January 1978-December 1995), and Taiwan (January 1976-December 1995) used. This study introduced "Cross-Sectional Absolute Deviation (CSAD)" by using CSSD. By taking into account market participants, authors could not find evidence of herding in the US and Hong Kong, however, in Japan, limited evidence of herding has been found. In the case of South Korea and Taiwan (the two developing markets), a significant indication of herding has found.

Cross country herding also exists as studied by Economou, Kostakis and Philippas (2011). They explore herding in markets of Greek, Italian, Portuguese and Spanish for the period from January 1988 to December 2008 by using daily stock price data. Authors used the model CSSD and CSAD. The results of the study conclude the existence of herding in the markets of Italian and Greek, however, mixed evidence of the Portugal market and no existence of herding for the Spanish market has found. Similarly, cross country presence of herding also studied by Gebka and Wohar (2013) and its impact on stock prices, both on the level of national indices and in different industries. The study uses the model CSSD and CSAD. Authors use the data of 32 countries ranging from Jan 1998 to Jan 2012, on national and sector level. The sectors analyzed are: "basic materials, consumer goods, financials, industrials, oil & gas". For the short sample i.e. from Nov 2007 to Jan 2012, they analyzed all nine sectors of 27

countries. No evidence of herding as prices are according to the rational pricing models, but some sectors (basic materials, oil & gas and consumer services) shows herding but it diminishes after some time. Furthermore, Mobarek et al. (2014) investigate herding behaviour in "European Liquid Constituent Indices" from 2001 to 2012 by using CSAD. Findings of the study report existence of herding during crises and different extreme market conditions but no herding are found during normal times. The study also concludes that herding exists in large markets in Europe and they are highly related to similar types of markets. By the global financial crisis, mostly affected markets are continental and PIIGS, however, Nordic markets are most affected by the Eurozone crisis in comparison with the global financial crisis. Chiang and Zheng (2010) examine the herding in international markets by using daily data indices comprising market and industry price, the data range is from 1989 to 2009 covering advanced markets. CSSD and CSAD models were used in order to find herding behaviour in global markets. Except for the US and Latin America, herding in each nationwide market has been found which is against the past studies of Chang, Cheng, and Khorana (2000) and (Demirer & Kutan, 2006). The study also concludes that Herding asymmetry is more profound during rising Asian.

The level of herding also depends on market and stock conditions, Lao and Singh (2011) by using the data of Shanghai A-Share index (SHA) stock prices and trading volume of the top 300 firms (in terms of market capitalization), and from the Bombay Stock Exchange (BSE) index top 300 firms over the period July 1999 to June 2009 explores the possibility of herding by using model CSSD and CSAD. Results indicate the evidence of herding in both stock markets of Chinese and Indian. Herding is evident to be greater during the falling market and high volume trading in the Chinese market. However, in the case of India, herding is evident during up-swings in market

conditions and is more dominant during large market movements in both markets. Similarly, Medhioub and Chaffai (2018) explore the herding in the Gulf Cooperation Council (GCC) Islamic stock markets by using CSSD, CSAD and Generalized Autoregressive Conditional Heteroscedasticity (GARCH) for the period from Jan 2006 to Feb 2016 (monthly data) for stock returns of countries namely Bahrain, Kuwait, Qatar, Saudi Arabia and UAE. As per findings of the study, herding exists in Saudi and Qatari Islamic stock markets only. While checking the herding in down and upmarket periods, herding exists in Saudi Arabia and Qatar during down market periods. Furthermore, authors find that Emirates and Kuwaiti markets herd with national conventional market which shows that both Islamic and conventional markets are interdependent. Similarly, the Kumar, Bharti, and Bansal (2016) studied presence of herding in the Indian stock market in the bearish and bullish market conditions to know the presence of herding in extreme market conditions which are defined as the upper and lower end tails of the return distribution by using CSSD and CSAD. Authors used the data for the period from Jan 2008 to Dec 2015 for daily values of CNX Nifty Index and thirty-six companies that form a part of the Nifty Index. As per the conclusion, no existence of herding in the Indian equity market has been found. It also rejects the presence of herding during extreme market conditions and during bullish and bearish market conditions. Caparrelli, D'Arcangelis and Cassuto (2004) also examine the herding existence in the Italian Stock Exchange by using data from 1988 to 2001. Authors use the models CSSD and CSAD and results indicate that for the Italian Stock market, the observation made by Christie and Huang (1995) is true. Herding is present during extreme market conditions, both in terms of sustained growth rate and high stock levels. Guo and Shih (2008) study the existence of herding within high-tech stocks and stock price co-movement in the Taiwan market by using the model CSSD and CSAD.

The study uses the data from January 1996 to December 2000 (daily) period comprising 443 stocks. Sufficient evidence of herding was found in high tech industries of Taiwan as compared to the other industries. Ahsan and Sarkar (2013) examine the herding behaviour in Dhaka Stock Exchange for the period from January 2005 to December 2011 by using all stocks monthly returns by using the techniques of CSSD and CSAD. Findings of the study show non-presence of herding.

Yao, Ma and He (2013) study the existence and prevalence of investor herding behaviour in a segmented market setting, the Chinese A and B stock markets. The dataset used in this study comprises of both firm-specific and market-level data. To calculate individual stock returns, daily and weekly data on stock prices for all firms listed on the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE) over the period from January 1999 to December 2008 are collected. The study employs CSSD and CSAD. The results show that herding strongly exists in the B-share markets. It is also found that across markets herding behaviour is more prevalent at industry-level, it is stronger for the largest and smallest stocks, and is stronger for growth stocks relative to value stocks. Herding behaviour is also more pronounced under conditions of declining markets. Also, Henker, Henker and Mitsios (2006) examine the existence of herding intraday market wide by using CSSD and CSAD model. The author uses the proactive traded stocks sample of 160 of the Australian Stock Exchange (ASX) and the stocks whose market capitalization is more than 0.5 billion (A$). Prices are taken at five hourly intervals commencing at 10:30 a.m of the trading day. Results indicate the non-existence of intraday herding sector-wise or market-wise.

Herding behaviour can also be seen in the sector-wise returns. For instance, the study conducted by Demirer and Kutan (2006) on Chinese markets explored the existence of herding by using both sector level and individual firm data for 375 Chinese stocks on the Shanghai and Shenzhen Stock Exchanges by using daily stock returns over the period January 1999 - December 2002. The model used in the study is CSSD and CSAD. No presence of herding was found by using firm and sector level data from the Shanghai and Shenzhen Stock Exchanges. Demirer, Kutan and Chen (2010) also test the investor herds sector wise by using firm data for the period from Jan 1995 to Dec 2006 (Taiwan Stock Exchange). The model used by Demirer, Kutan, and Chen (2010) is CSSD and CSAD. By using the model of CSAD existence of herding is evident, however, no herding is found by using CSAD in all sectors. Also during periods of market losses, herding is more profound.

Investors preference also plays a vital role in herding, Nofsinger and Sias (1999) examine the herding by institutional versus individual investors. For data analysis monthly stock returns for the period from 1977 to 1996 are taken. As per results, individual investors had a lesser effect on price variations in contrast to institutional investors with respect to herding behaviour. Also, Chen, Rui and Xu (2003) investigate when the investors herd by using daily stock return data over the sample period from January 1996 to December 2002. Results indicate that nonexistence of information and knowledge about the business of individual firms are more likely to result in investors to herd. Chen, Wang and Lin (2008) investigate whether and why qualified foreign institutional investors (QFIIs) when picking stocks in Taiwan herd. The author uses daily data of 1,223 trading days from January 2002 to December 2006 and the results indicate that QFIIs herd in the securities market. Fu and Lin (2010) investigate the herding and irregular responses of investors with reference to good and bad news in

China equity market by using data covers monthly data of listed stocks and market index from "China Database of Taiwan Economic Journal (TEJ)" for period January 2004 to June 2009. They used the model CSSD and CSAD. As per the findings of the study, there does not exist herding behaviour in China equity market, the existence of asymmetric reaction that investors' tendency toward herding is significantly higher during market downstream. The study partly supports the turnover effect that low turnover stocks significantly converge to market return than high turnover stocks during extreme market conditions.

2.2 Herding behaviour studies in Pakistan

A lot of literature regarding herding behaviour exists which concludes mix results in Pakistan contexts such as Javed, Zafar and Hafeez (2013) study the herding existence of investors in PSX by using models CSSD and CSAD. No evidence of herding was found by using monthly data of firms.

Latief and Shah (2014) by using the model of Amirat and Bouri (2009) examine the influence of mutual funds herding on stock returns. The dependent variable is stock returns and the independent variable is mutual funds. Authors use the monthly data of mutual funds for the period of five years (2006 to 2010). Results indicate that mutual funds herding has a substantial and positive impact.

Javaira and Hassan (2015) explored the possibility of herding behaviour in PSX by using CSSD and CSAD. Monthly and daily data for the period from 2002 to 2007 of KSE-100 index used to explore the possibility of herding. Findings of the study give the absence of herding. This study also denied proved evidence of herding due to market return asymmetry, high and low trading volume states and asymmetric market volatility.

Shah, Shah, and Khan (2017) investigate the herding behaviour in the Pakistan Stock Exchange (PSX) on the daily closing prices data of 609 firms listed on the PSX from January 2004 to December 2013 by using the model CSSD. The authors examined herding from diverse directions. As per the findings of the study, individual firms don't herd, however, big firms herd in market extreme upward directions, furthermore, authors reported that individual firms herd towards industry portfolios in numerous industries, however, industry portfolio did not herd toward the market.

Kiran, Khan, and Shah (2020) analyzed the herding behaviour in PSX by using the sample for a period from 2004 to 2017 of 663 firms. The study uses the model of CSSD and CSAD. Results indicate the non-existence of herding behaviour at a different level of market movements.

A very recent study on herding by Kashif, Palwishah, Ahmed, Vveinhardt and Streimikiene (2020) explores the herding in PSX by using the model CSSD, CSAD and State-space model. Daily stock returns are used for the period from 2000-2016. As per the findings of the study, herding exists in PSX and also during the financial crisis, market volatility and extreme market conditions.

By studying the literature, it can be concluded that herding among investors exists in developing and developed countries. Studies had shown that herding in different market conditions i.e. during extreme market conditions, bearish / bullish conditions and high / low volatility states etc. Therefore, it would be interesting to explore the herding behviour of investors in the Pakistani context by studying sector-wise.

CHAPTER 03

DATA AND METHODOLOGY

Discussion about the data collection techniques and methods are detailed below to explore the possibility of herding in the stock market.

3.1 Data Description

By using daily stocks returns data of 12 sectors namely (Automobile assembler, cement, chemical, Fertilizer, Paper and Board, Power Generation & Distribution, Refinery, Sugar & Allied Industries, Textile Composite, Textile Spinning, Textile Weaving and Tobacco) of 157 companies listed on PSX from 2008 to 2019 herding behaviour sector-wise will be found in PSX. The historical data collected from the business recorder website, investment.com website, PSX website and state bank of Pakistan sources.

3.2 Model Specification

The previous study of Christie and Huang (1995) has identified CSSD and Chang, Cheng and Khorana (2000) identified the CSAD to measure the presence of herding among individual trading related to stocks. In this study, CSSD and CSAD methodology will be used.

In overall market circumstances, Gleason, Mathur, and Peterson, (2004) have tested both CSAD and CSSD to apprehend herding. To examine herd behaviour although CSSD and CSAD are commonly used methods and these methods apprehend herding of investors groups or market participants by security-specific returns. Some empirical studies show that other methods have also been used to apprehend herding, in different model structures, Wagner (2003) used Lux-Marchasi Model.

For specific company shares, the calculation of the observed stock returns is detailed below:

$$R_{i,t} = \ln\left[\frac{p_t}{p_{t-1}}\right] \times 100 \quad (1)$$

Where $\mathbf{R}_{i,t}$ is the return of stock of firm **i** at time **t**, and $\mathbf{P}_t$ is the closing price of the individual returns of stock at time t and t – 1,

$$R_{m,t} = \frac{\sum R_{i,t}}{N} \quad (2)$$

Where $\mathbf{R}_{m,t}$ in equation (2) referred to the cross-sectional mean stock of the **N** returns which is obtained by taking the average of all individual stock returns at time **t**, whereas $\mathbf{R}_{i,t}$ is a term denoting the noted stock return of firm **i** at time **t**, and in selected sample **N** is the number of firms.

The analysis of Cross-Sectional Standard Deviation (CSSD) of returns analysis is proposed as a method to detect herding by estimating individual stock returns with respect to market returns. Model is as under:

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{N} (R_{i,t} - R_{m,t})^2}{N-1}} \quad (3)$$

Where $\boldsymbol{R_{i,t}}$ denotes the individual stock return of firm **i** at time **t** and ***N*** is the number firms in the portfolio, $\boldsymbol{R_{m,t}}$ denotes the cross-sectional average stock of **N** returns in the portfolio at time **t.** By approximating the above model, this study investigates herding behaviour among firms.

While discussing the CSSD of returns, herding behavior indicate conflicting forecast from the traditional asset pricing model during the period of financial market crises. At the time period of large market movements, increased dispersion is the result of conflicting responsiveness of individual securities to the market returns i.e. rational asset pricing model, while in contrary comparatively lower dispersion is the result of existence of herd behavior at the time period of large market movements, accordingly this study examines the herding behavior of the market returns by approximating the empirical model (equation 4) proposed by Christie and Huang (1995).

The CSSD of return is to be estimated with respect to a constant and two dummies so that find the extreme market points. If D^L is 1 then it is assumed that it falls in the extreme 5% & 1% lower tail of the same distribution, otherwise, it is equal to zero, same is presumed regarding D^U for upper tail.

$$CSSD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t \quad (4)$$

Where α denotes the coefficient of the average dispersion of the sample excluding the regions corresponding to the two dummy variables. By this approach, in the case of statistically significant negative values for β_1 and β_2 herding exists.

Chang, Cheng and Khorana (2000) proposed the use of Cross-Sectional Absolute Deviation (CSAD) as another model to measure return dispersion. They contend that the model that is suggested by Christie & Huang (1995) urges characterizing what is implied by the stock market push which is expressed as:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N}\left|R_{i,t} - R_{m,t}\right| \quad (5)$$

Where **N** is the number of firms in the portfolio, $\boldsymbol{R_{i,t}}$ is the stock return of individual firm, $\boldsymbol{R_{m,t}}$ is the equivalent weighted market portfolio normal return that

signifies the market return. The second technique depends on the general quadratic connection amongst $CSAD_t$ and $R_{m,t}$ defined by Chang, Cheng and Khorana (2000), this non-straight relationship is demonstrated as takes after:

$$CSAD_t = \alpha + \gamma_1 \left|R_{m,t}\right| + \gamma_2 R^2{}_{m,t} + \varepsilon_t \quad (6)$$

To capture the nonlinear relationship through a negative estimate of the coefficient γ_2 the squared market return is introduced as an additional term in the regression. The relationship depends on CSAD and $R_{m,t}$ so as to identify herding. Capital Asset Pricing Model assumes that returns' dispersion is linearly related to market return, therefore, a positive value of the coefficient γ_1 indicates herding. However, when herding is encountered during extreme market movements, the cross-sectional dispersion of stock returns is expected to decrease or increase considerably less than proportional with market return, as linear asset pricing models would indicate.

Gleason, Mathur and Peterson (2004) introduced two models by swapping the equation (4) and (6). Models are expressed below:

$$CSAD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t \quad (7)$$

$$CSSD_t = \alpha + \gamma_1 \left|R_{m,t}\right| + \gamma_2 R^2{}_{m,t} + \varepsilon_t \quad (8)$$

3.2.1 Herding behaviour during the market rising and declining

The market rising and declining has a significant consequence on the relationship between the market return and CSAD, during the bull or bear market, it is expected that the herding present. In order to determine this approach, models are detailed below:

$$CSAD_t^{Up} = \alpha + \gamma_1^{Up} \left|R_{m,t}^{Up}\right| + \gamma_2^{Up} (R_{m,t}^{Up})^2 + \varepsilon_t \, , if \; R_{m,t} > 0 \quad (9)$$

$$CSAD_t^{Down} = \alpha + \gamma_1^{Down}\left|R_{m,t}^{Down}\right| + \gamma_2^{Down}(R_{m,t}^{Down})^2 + \varepsilon_t \, , if \; R_{m,t} < 0 \quad (10)$$

Where $R_{m,t}^{Up}$ ($R_{m,t}^{Down}$) shows the rising (bullish) and declining (bearish) trend of the equivalent returns of the weighted portfolio at the time period t and $(R_{m,t}^{Up})^2$ $(R_{m,t}^{Down})^2$ shows market up or down, the squared estimation shows market non-linearity. $CSAD_t^{Up}$ and $CSAD_t^{Down}$ the term is CSAD ensuing at time t to the market returns when the market goes up or down.

3.2.2 Herding behaviour during High or Low Volatility States

For day by day returns instability, δ_t is thought to be high (low) if on day t it is more noteworthy (lesser) then most recent 30 days moving midpoints. So also, for month to month information five months moving midpoints is utilized. So the volatility state is researched by following model:

$$CSAD_t^{\delta^2, high} = \alpha + \gamma_1^{\delta^2, high}\left|R_{m,t}^{\delta^2, high}\right| + \gamma_2^{\delta^2, high}\left(R_{m,t}^{\delta^2, high}\right)^2 + \varepsilon_t \quad (11)$$

$$CSAD_t^{\delta^2, low} = \alpha + \gamma_1^{\delta^2, low}\left|R_{m,t}^{\delta^2, low}\right| + \gamma_2^{\delta^2, low}\left(R_{m,t}^{\delta^2, low}\right)^2 + \varepsilon_t \quad (12)$$

Where $R_{m,t}^{\delta^2, high}$ is high-return instability, $R_{m,t}^{\delta^2, low}$ is low-return instability and $\left(R_{m,t}^{\delta^2}\right)^2$ is square of portfolio return at time t.

CHAPTER 04

RESULTS AND FINDINGS

4.1 Descriptive Statistics

Table 1 represents the details for daily and monthly data which includes CSSD and CSAD.

Table 1: Descriptive Statistics

Industry	Sample	Variable	# Firms	# Observations	Mean %	Standard Deviation %	Min %	Max %
Automobile Assembler	Daily	$R_{m,t}$	8	2927	0.022	1.899	-53.264	53.528
		$CSSD_t$	8	2927	2.140	3.861	0.019	144.485
		$CSAD_t$	8	2927	1.582	2.411	0.012	89.390
	Monthly	$R_{m,t}$	8	115	0.218	0.906	-3.225	5.419
		$CSSD_t$	8	115	2.125	0.954	0.494	8.226
		$CSAD_t$	8	115	1.580	0.686	0.371	5.149
Cement	Daily	$R_{m,t}$	13	2962	0.000	1.768	-21.793	13.935
		$CSSD_t$	13	2962	2.298	2.094	0.016	69.225
		$CSAD_t$	13	2962	1.662	1.206	0.008	35.385
	Monthly	$R_{m,t}$	13	117	0.177	1.503	-4.034	4.989
		$CSSD_t$	13	117	2.343	1.120	0.253	7.007
		$CSAD_t$	13	117	1.706	0.783	0.129	5.141
Chemical	Daily	$R_{m,t}$	16	2925	0.025	1.517	-28.987	27.520
		$CSSD_t$	16	2925	2.451	3.421	0.101	118.130
		$CSAD_t$	16	2925	1.751	1.708	0.048	55.358
	Monthly	$R_{m,t}$	16	114	0.171	1.174	-2.978	4.920
		$CSSD_t$	16	114	2.360	0.855	0.647	6.588
		$CSAD_t$	16	114	1.733	0.592	0.399	3.738
Fertilizer	Daily	$R_{m,t}$	4	2920	0.015	1.188	-9.192	4.864
		$CSSD_t$	4	2920	1.188	0.952	0.020	21.130
		$CSAD_t$	4	2920	0.892	0.720	0.014	15.830
	Monthly	$R_{m,t}$	4	114	0.133	1.460	-9.192	4.864
		$CSSD_t$	4	114	1.457	2.025	0.020	21.130
		$CSAD_t$	4	114	1.087	1.519	0.014	15.830
Paper & Board	Daily	$R_{m,t}$	6	2915	-0.012	4.168	-135.283	92.534
		$CSSD_t$	6	2915	2.080	5.265	0.005	127.295
		$CSAD_t$	6	2915	1.553	4.080	0.004	114.696
	Monthly	$R_{m,t}$	6	113	0.100	1.180	-2.643	3.820
		$CSSD_t$	6	113	1.925	1.035	0.338	6.517
		$CSAD_t$	6	113	1.447	0.764	0.265	4.361

Industry	Sample	Variable	# Firms	# Observations	Mean %	Standard Deviation %	Min %	Max %
Power & Distribution	Daily	$R_{m,t}$	11	2917	0.003	0.903	-5.675	5.419
		$CSSD_t$	11	2917	1.683	0.981	0.046	13.008
		$CSAD_t$	11	2917	1.160	0.621	0.025	7.117
	Monthly	$R_{m,t}$	11	114	0.218	0.906	-3.225	5.419
		$CSSD_t$	11	114	1.545	0.815	0.046	6.065
		$CSAD_t$	11	114	1.069	0.497	0.025	2.881
Refinery	Daily	$R_{m,t}$	4	2919	-0.045	2.144	-41.647	8.667
		$CSSD_t$	4	2919	1.652	2.030	0.001	91.046
		$CSAD_t$	4	2919	1.229	1.514	0.001	68.249
	Monthly	$R_{m,t}$	4	114	0.130	1.935	-4.538	6.277
		$CSSD_t$	4	114	1.779	1.217	0.307	8.814
		$CSAD_t$	4	114	1.309	0.877	0.231	6.357
Sugar & Allied Industries	Daily	$R_{m,t}$	21	2961	0.032	2.391	-65.031	75.387
		$CSSD_t$	21	2961	2.870	3.429	0.023	85.629
		$CSAD_t$	21	2961	1.887	2.439	0.009	71.718
	Monthly	$R_{m,t}$	21	116	0.025	0.954	-5.426	1.792
		$CSSD_t$	21	116	2.797	1.302	0.494	7.166
		$CSAD_t$	21	116	1.868	0.881	0.360	4.732
Textile Composite	Daily	$R_{m,t}$	32	2933	0.022	2.380	-68.982	69.815
		$CSSD_t$	32	2933	3.768	5.112	0.082	124.022
		$CSAD_t$	32	2933	2.182	3.376	0.028	101.627
	Monthly	$R_{m,t}$	32	115	0.135	0.926	-1.973	4.110
		$CSSD_t$	32	115	3.600	2.348	0.693	13.399
		$CSAD_t$	32	115	2.038	1.055	0.237	6.339
Textile Spinning	Daily	$R_{m,t}$	34	2913	0.026	1.782	-57.077	50.439
		$CSSD_t$	34	2913	3.541	4.124	0.086	90.886
		$CSAD_t$	34	2913	1.939	2.400	0.028	70.677
	Monthly	$R_{m,t}$	34	115	0.232	1.141	-3.553	7.143
		$CSSD_t$	34	115	4.518	5.307	0.800	41.650
		$CSAD_t$	34	115	2.268	1.901	0.266	13.866
Textile Weaving	Daily	$R_{m,t}$	5	2772	0.022	3.169	-44.640	71.165
		$CSSD_t$	5	2772	4.108	4.375	0.003	71.193
		$CSAD_t$	5	2772	2.989	3.259	0.002	54.767
	Monthly	$R_{m,t}$	5	109	0.513	2.856	-7.047	15.160
		$CSSD_t$	5	109	4.270	3.443	0.374	17.396
		$CSAD_t$	5	109	3.123	2.568	0.268	15.140
Tobacco	Daily	$R_{m,t}$	3	2637	0.093	5.626	-156.088	151.221
		$CSSD_t$	3	2637	2.444	7.791	0.000	208.432
		$CSAD_t$	3	2637	1.823	5.901	0.000	160.451
	Monthly	$R_{m,t}$	3	107	0.753	1.501	-3.415	4.647
		$CSSD_t$	3	107	2.393	1.242	0.011	5.005
		$CSAD_t$	3	107	1.772	0.888	0.009	3.775

Average market returns are higher in monthly returns as compared to daily return which shows that when the return interval is increased, the variation also increases. Mean and variability are different for both CSSD and CSAD models, in daily data it is higher as compared to monthly data.

4.2 Herding Evidence

4.2.1 Regression Results; (Extreme Market Movements Using CSSD)

This study investigates the herding in the 12 sectors of PSX by using daily and monthly data. During the periods of market stress, herding is more prevailing. Two dummy variable i.e. $\boldsymbol{D_t^U}$ and $\boldsymbol{D_t^L}$ are formed which shows the difference in the behaviour of investors with the extreme market movements which may be up or down. This study uses the 1% and 5% extreme market upward and downward movements. CSSD is basically the difference between the market return and cross sectional return, if the difference is decreasing then it is evidence of herding. CSSD will be smaller during market stress periods and statistically significant negative values of β_1 and β_2 will results. Table 2 below shows the results of the regression of daily and monthly data.

Table 2: Regression Results; (Extreme Market Movements Using CSSD)

$$\boldsymbol{CSSD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t \; at \; 1\% \; and \; 5\% \; criteria}$$

Industry	Sample	1% Criterion β_1^U	1% Criterion β_2^L	5% Criterion β_1^U	5% Criterion β_2^L	Sample	1% Criterion β_1^U	1% Criterion β_2^L	5% Criterion β_1^U	5% Criterion β_2^L
Automobile Assembler	Daily	4.395	7.130	1.331	1.961	Monthly	-1.181	-0.800	-0.009	-0.096
	T-stat	6.771	10.154	4.095	6.034	T-stat	-1.228	-0.832	-0.023	-0.237
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.222	0.407	0.982	0.813
Cement	Daily	4.552	4.927	1.697	1.757	Monthly	2.136	-0.546	1.253	0.339
	T-stat	12.496	13.525	9.900	10.249	T-stat	1.906	-0.487	2.719	0.736
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.059	0.627	0.008	0.463
Chemical	Daily	9.485	8.443	2.766	2.259	Monthly	2.271	1.352	0.859	0.429
	T-stat	15.954	14.201	9.744	7.960	T-stat	2.725	1.622	2.433	1.216
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.007	0.108	0.017	0.227
Fertilizer	Daily	0.538	2.917	0.855	1.459	Monthly	-1.275	19.835	0.750	4.283
	T-stat	3.185	17.252	11.413	19.467	T-stat	-1.540	23.956	0.988	5.646
	Prob.	0.001	0.000	0.000	0.000	Prob.	0.126	0.000	0.325	0.000

Industry	Sample	1% Criterion		5% Criterion		Sample	1% Criterion		5% Criterion	
		β_1^U	β_2^L	β_1^U	β_2^L		β_1^U	β_2^L	β_1^U	β_2^L
Paper & Board	Daily	17.269	11.408	3.897	2.815	Monthly	0.613	4.249	0.325	1.212
	T-stat	19.062	12.592	8.869	6.406	T-stat	0.631	4.375	0.765	2.855
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.529	0.000	0.446	0.005
Power Generation & Distribution	Daily	1.849	2.190	1.222	1.117	Monthly	1.852	0.623	1.184	0.000
	T-stat	10.545	12.493	15.693	14.338	T-stat	2.290	0.771	3.609	0.001
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.024	0.443	0.000	0.999
Refinery	Daily	1.207	4.874	0.253	1.070	Monthly	1.207	4.874	-0.007	0.266
	T-stat	3.283	13.263	1.478	6.237	T-stat	3.283	13.263	-0.014	0.514
	Prob.	0.001	0.000	0.140	0.000	Prob.	0.001	0.000	0.989	0.608
Sugar & Allied Industries	Daily	12.535	8.572	3.389	2.781	Monthly	1.136	3.426	1.363	2.220
	T-stat	22.184	15.170	12.151	9.972	T-stat	0.887	2.675	2.730	4.445
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.377	0.009	0.007	0.000
Textile Composite	Daily	19.809	17.890	6.573	6.200	Monthly	9.963	8.837	3.558	2.719
	T-stat	24.196	21.851	16.363	15.432	T-stat	4.894	4.341	3.908	2.986
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.000	0.000	0.000	0.003
Textile Spinning	Daily	16.884	16.470	6.871	6.708	Monthly	37.662	23.286	13.494	8.974
	T-stat	26.570	25.919	22.436	21.902	T-stat	10.961	6.777	7.968	5.299
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.000	0.000	0.000	0.000
Textile Weaving	Daily	16.537	16.750	8.049	8.332	Monthly	13.334	9.397	6.688	5.494
	T-stat	22.963	23.259	25.393	26.287	T-stat	4.256	3.000	4.870	4.000
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.000	0.003	0.000	0.000
Tobacco	Daily	13.858	17.363	3.143	3.947	Monthly	-2.006	0.550	-0.467	0.576
	T-stat	9.396	11.773	4.552	5.717	T-stat	-1.607	0.440	-0.816	1.006
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.111	0.661	0.417	0.317

Regression results of daily data for all coefficients are significantly positive; therefore, rational asset pricing models are supported by results in this study and no herding is found. However results of monthly data, negative values of β_1 and β_2 results are insignificant, that shows non presence of herding in few sectors.

4.2.2 Regression Results; (Extreme Market Movements Using CSAD)

Gleason et al (2004) model for low or high market movement has been followed in this study, which concludes that herding can also be checked by taking CSAD as dependent variable instead of CSSD. CSAD will be smaller during market stress periods and statistically significant negative values of β_1 and β_2 will results if herding exists. Table 3 below shows the results of the regression of daily and monthly data.

Table 3: Regression Results; (Extreme Market Movements Using CSAD)

$$CSAD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t \text{ at } 1\% \text{ and } 5\% \text{ criteria}$$

Return Dispersions	Sample	1% Criterion		5% Criterion		Sample	1% Criterion		5% Criterion	
Industry		β_1^U	β_2^L	β_1^U	β_2^L		β_1^U	β_2^L	β_1^U	β_2^L
Automobile Assembler	Daily	3.166	4.439	1.014	1.342	Monthly	0.159	1.514	0.180	0.407
	T-stat	7.227	10.134	5.010	6.628	T-stat	0.233	2.214	0.623	1.409
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.816	0.029	0.534	0.162
Cement	Daily	2.811	2.879	1.176	1.227	Monthly	0.703	-0.186	0.968	0.506
	T-stat	13.453	13.777	12.089	12.613	T-stat	0.885	-0.234	3.045	1.594
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.378	0.815	0.003	0.114
Chemical	Daily	5.015	4.656	1.729	1.484	Monthly	1.639	1.342	0.765	0.489
	T-stat	17.120	15.894	12.408	10.652	T-stat	2.881	2.360	3.219	2.057
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.005	0.020	0.002	0.042
Fertilizer	Daily	0.430	2.176	0.718	1.150	Monthly	-0.951	14.865	0.581	3.222
	T-stat	3.359	16.996	12.795	20.489	T-stat	-1.524	23.819	1.022	5.668
	Prob.	0.001	0.000	0.000	0.000	Prob.	0.130	0.000	0.309	0.000
Paper & Board	Daily	12.396	9.248	2.949	2.349	Monthly	0.279	2.942	0.355	0.956
	T-stat	17.549	13.093	8.666	6.901	T-stat	0.384	4.056	1.140	3.071
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.701	0.000	0.257	0.003
Power Generation & Distribution	Daily	1.320	1.477	0.971	0.898	Monthly	0.713	0.537	0.853	0.119
	T-stat	11.987	13.416	20.612	19.046	T-stat	1.428	1.076	4.361	0.610
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.156	0.284	0.000	0.543
Refinery	Daily	0.841	3.571	0.186	0.785	Monthly	2.215	-0.710	0.019	0.219
	T-stat	3.064	13.008	1.457	6.131	T-stat	2.560	-0.820	0.051	0.588
	Prob.	0.002	0.000	0.145	0.000	Prob.	0.012	0.414	0.959	0.558
Sugar & Allied Industries	Daily	6.912	6.627	2.223	2.231	Monthly	0.908	2.896	1.254	1.913
	T-stat	16.770	16.080	11.218	11.259	T-stat	1.068	3.407	4.038	6.160
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.288	0.001	0.000	0.000
Textile Composite	Daily	9.649	10.766	3.396	3.541	Monthly	4.362	2.599	2.110	1.483
	T-stat	16.881	18.834	12.472	13.005	T-stat	4.534	2.702	5.535	3.891
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.000	0.008	0.000	0.000

Return Dispersions	Sample	1% Criterion		5% Criterion		Sample	1% Criterion		5% Criterion	
Industry		β_1^U	β_2^L	β_1^U	β_2^L		β_1^U	β_2^L	β_1^U	β_2^L
Textile Spinning	Daily	9.649	10.766	3.396	3.541	Monthly	11.770	8.047	4.663	3.124
	T-stat	16.881	18.834	12.472	13.005	T-stat	8.441	5.771	7.496	5.021
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.000	0.000	0.000	0.000
Textile Weaving	Daily	12.621	12.964	0.718	1.150	Monthly	12.190	6.585	5.723	3.814
	T-stat	24.444	25.107	12.795	20.489	T-stat	5.425	2.931	5.730	3.819
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.000	0.004	0.000	0.000
Tobacco	Daily	10.510	13.193	1.937	2.131	Monthly	-1.473	0.495	-0.285	0.498
	T-stat	9.411	11.813	10.554	11.610	T-stat	-1.650	0.555	-0.697	1.216
	Prob.	0.000	0.000	0.000	0.000	Prob.	0.102	0.580	0.487	0.227

The results support by the results of Gleason et al. (2004) which concludes that regardless of the measure used for dispersion, the findings from both regressions revealed in two tables; 2 and 3 are same and shows non-existence of herding for above-mentioned sectors of Pakistan stock market by seeing the positive and significant coefficient (β_1 and β_2) which elaborates dispersion of stock returns from stock market portfolio returns. Christie & Huang (1995) investigated that in extreme stock returns the existences of the positively significant coefficient are supported by the supposition of the asset pricing model. However, in some sectors in the monthly data at 5% criteria, the negative coefficient is seen in the sectors i.e. Cement, Fertilizer, Refinery and Tobacco but they are not significant which is evidence of absence of herding.

4.2.3 Non-linearity Regression Results; using CSSD and CSAD

By estimating models of Chang et al. (2000), table 4 shows the results of the regression obtained. To find the likelihood of non-linearity towards change in deviation, the quadratic term is incorporated. If the herding exists, the coefficient γ_2 will be significantly negative.

Table 4: Results of Non-Linear Model; using CSSD and CSAD

Industry	Sample	CSSD		Sample	CSSD		Sample	CSAD		Sample	CSAD	
		γ_1	γ_2		γ_1	γ_2		γ_1	γ_2		γ_1	γ_2
Automobile	Daily	0.271	0.045	Monthly	0.627	-0.110	Daily	0.273	0.026	Monthly	0.552	-0.086
Assembler	T-stat	12.566	96.360	T-stat	1.903	-0.998	T-stat	18.025	78.432	T-stat	2.422	-1.120
	Prob.	0.000	0.000	Prob.	0.060	0.320	Prob.	0.000	0.000	Prob.	0.017	0.265
Cement	Daily	-0.235	0.164	Monthly	0.257	0.010	Daily	0.041	0.076	Monthly	0.434	-0.043
	T-stat	-7.899	49.148	T-stat	0.852	0.126	T-stat	2.251	36.816	T-stat	2.127	-0.835
	Prob	0.000	0.000	Prob	0.396	0.900	Prob	0.024	0.000	Prob	0.036	0.406
Chemical	Daily	0.285	0.132	Monthly	0.340	0.027	Daily	0.371	0.055	Monthly	0.438	-0.012
	T-stat	9.853	86.684	T-stat	1.594	0.448	T-stat	23.298	64.948	T-stat	3.204	-0.312
	Prob	0.000	0.000	Prob	0.114	0.655	Prob	0.000	0.000	Prob	0.002	0.756
Fertilizer	Daily	0.204	0.131	Monthly	-0.230	0.189	Daily	0.192	0.094	Monthly	-0.329	0.255
	T-stat	6.353	16.852	T-stat	-1.852	11.155	T-stat	8.024	16.104	T-stat	-1.995	11.339
	Prob.	0.000	0.000	Prob.	0.067	0.000	Prob.	0.000	0.000	Prob.	0.048	0.000
Paper &	Daily	2.111	-0.009	Monthly	0.870	-0.137	Daily	1.481	-0.005	Monthly	0.894	-0.164
Board	T-stat	78.001	-36.695	T-stat	2.806	-1.305	T-stat	83.983	-32.101	T-stat	4.128	-2.226
	Prob	0.000	0.000	Prob.	0.006	0.194	Prob	0.000	0.000	Prob	0.000	0.028
Power	Daily	0.712	0.014	Monthly	0.528	-0.026	Daily	0.720	-0.047	Monthly	0.669	-0.089
Generation &	T-stat	13.407	0.853	T-stat	2.310	-0.496	T-stat	23.423	-4.891	T-stat	5.182	-3.014
Distribution	Prob.	0.000	0.394	Prob.	0.023	0.621	Prob.	0.000	0.000	Prob.	0.000	0.003
Refinery	Daily	-0.089	0.053	Monthly	0.200	-0.021	Daily	-0.064	0.040	Monthly	0.178	-0.021
	T-stat	-4.802	62.006	T-stat	0.737	-0.394	T-stat	-4.659	62.709	T-stat	0.911	-0.535
	Prob.	0.000	0.000	Prob.	0.463	0.694	Prob.	0.000	0.000	Prob.	0.364	0.594
Sugar &	Daily	2.109	-0.013	Monthly	1.041	-0.045	Daily	1.183	-0.003	Monthly	1.076	-0.074
Allied	T-stat	46.834	-19.196	T-stat	3.325	-0.600	T-stat	61.105	-8.646	T-stat	5.886	-1.676
Industries	Prob.	0.000	0.000	Prob.	0.001	0.549	Prob.	0.000	0.000	Prob.	0.000	0.097
Textile	Daily	2.738	-0.013	Monthly	1.491	0.153	Daily	1.360	0.002	Monthly	1.353	-0.067
Composite	T-stat	45.992	-13.995	T-stat	2.279	0.735	T-stat	60.530	4.592	T-stat	5.576	-0.868
	Prob.	0.000	0.000	Prob.	0.025	0.464	Prob.	0.000	0.000	Prob.	0.000	0.388
Textile	Daily	3.278	-0.030	Monthly	2.851	0.420	Daily	1.630	-0.006	Monthly	1.590	0.036
Spinning	T-stat	57.155	-24.740	T-stat	4.746	3.895	T-stat	76.257	-13.652	T-stat	7.044	0.897
	Prob.	0.000	0.000	Prob.	0.000	0.000	Prob.	0.000	0.000	Prob.	0.000	0.372
Textile	Daily	1.667	-0.010	Monthly	1.667	-0.010	Daily	1.259	-0.006	Monthly	1.168	-0.019
Weaving	T-stat	59.232	-14.633	T-stat	59.232	-14.633	T-stat	66.110	-13.771	T-stat	8.262	-1.505
	Prob.	0.000	0.000	Prob.	0.000	0.000	Prob.	0.000	0.000	Prob.	0.000	0.135
Tobacco	Daily	1.507	-0.001	Monthly	0.987	-0.244	Daily	1.200	-0.001	Monthly	0.869	-0.207
	T-stat	46.115	-4.036	T-stat	2.910	-2.654	T-stat	47.434	-6.425	T-stat	3.662	-3.225
	Prob.	0.000	0.000	Prob.	0.004	0.009	Prob.	0.000	0.000	Prob.	0.000	0.002

By using CSSD daily data, the coefficient γ_2 of following sectors are significantly negative i.e. Paper & Board, Sugar & Allied Industries, Textile Composite, Textile Spinning, Textile Weaving and Tobacco, however, only two sectors in monthly data namely Textile Weaving and Tobacco are significantly negative giving evidence of herding.

Comparatively by using CSAD daily data, the coefficient γ_2 of following sectors are significantly negative (Paper & Board, Tobacco, Power Generation & Distribution, Sugar & Allied Industries, Textile Spinning and Textile Weaving), however, only three sectors in monthly data namely Paper & Board, Power Generation & Distribution, and Tobacco are significantly negative giving evidence of herding. Daily and monthly data of few sectors shows herding and market inefficiency, because at increasing rate the dispersion of market is decreasing. This proposes that during the market stress from the market consensus conditions stock market players resist to trade.

4.3 Herding behaviour; Asymmetric effect

4.3.1 Market Returns

Table 5 shows results in bullish and bearish market conditions. If the herding exists, the coefficient γ_1 and γ_2 will be negative and significant. We use absolute returns because we are concerned about the return size rather than signs.

As per results during bullish market conditions, in the daily data herding exists in the sectors Fertilizers, Paper & Bonds, Power Generation & Distribution, Refinery, Sugar & Allied Industries and Textile Spinning, however, in the monthly data herding exists in the sectors Fertilizers, Paper & Bonds, Power Generation & Distribution, Textile Weaving and Tobacco.

While seeing the results during bearish market conditions in daily data, herding exists in only two sectors i.e. Textile Spinning and Tobacco. However, by using monthly data herding exist in one sector i.e. Sugar & Allied Industries.

It can be concluded that when return is increased in bullish market condition dispersion decrease, however, whenever the loss increase in bearish market condition

dispersion increase. Also it is concluded that herding is more profound during bullish markets.

Table 5: Result estimation during bull market conditions ($R_{m,t}$ >0) and bear market conditions ($R_{m,t}$ <0) using CSAD

Industry	Bull Market ($R_{m,t} > 0$)						Bear Market ($R_{m,t} < 0$)					
	Sample	γ_1^{up}	γ_2^{up}	Sample	γ_1^{up}	γ_2^{up}	Sample	γ_1^{down}	γ_2^{down}	Sample	γ_1^{down}	γ_2^{down}
Automobile Assembler	Daily	0.189	0.027	Monthly	0.594	-0.128	Daily	0.345	0.025	Monthly	0.550	-0.060
	T-stat	9.530	64.235	T-stat	2.292	-1.417	T-stat	15.261	49.393	T-stat	1.327	-0.444
	Prob.	0.000	0.000	Prob.	0.025	0.161	Prob.	0.000	0.000	Prob.	0.191	0.659
Cement	Daily	-0.256	0.132	Monthly	0.665	-0.082	Daily	0.110	0.064	Monthly	0.153	0.005
	T-stat	-7.599	26.375	T-stat	2.452	-1.255	T-stat	4.944	30.659	T-stat	0.469	0.058
	Prob.	0.000	0.000	Prob.	0.017	0.214	Prob.	0.000	0.000	Prob.	0.641	0.954
Chemical	Daily	0.474	0.055	Monthly	0.470	-0.017	Daily	0.279	0.055	Monthly	0.407	-0.019
	T-stat	19.814	42.378	T-stat	2.609	-0.373	T-stat	13.798	53.000	T-stat	1.328	-0.164
	Prob.	0.000	0.000	Prob.	0.011	0.711	Prob.	0.000	0.000	Prob.	0.190	0.870
Fertilizer	Daily	0.770	-0.136	Monthly	0.792	-0.157	Daily	0.136	0.121	Monthly	0.250	0.153
	T-stat	18.910	-10.147	T-stat	4.730	-3.784	T-stat	3.984	17.240	T-stat	1.296	6.993
	Prob.	0.000	0.000	Prob.	0.000	0.000	Prob.	0.000	0.000	Prob.	0.201	0.000
Paper & Board	Daily	1.664	-0.006	Monthly	0.776	-0.159	Daily	0.814	0.000	Monthly	0.225	0.261
	T-stat	62.639	-17.580	T-stat	3.048	-2.012	T-stat	29.223	-0.002	T-stat	0.460	1.190
	Prob.	0.000	0.000	Prob.	0.004	0.049	Prob.	0.000	0.999	Prob.	0.647	0.240
Power Generation & Distribution	Daily	0.867	-0.100	Monthly	0.852	-0.117	Daily	0.594	-0.007	Monthly	0.375	-0.049
	T-stat	19.537	-6.743	T-stat	5.815	-3.853	T-stat	13.903	-0.539	T-stat	1.225	-0.457
	Prob	0.000	0.000	Prob	0.000	0.000	Prob	0.000	0.590	Prob	0.228	0.650
Refinery	Daily	0.229	-0.024	Monthly	-0.110	0.023	Daily	-0.051	0.040	Monthly	0.610	-0.108
	T-stat	5.053	-2.852	T-stat	-0.383	0.440	T-stat	-2.846	59.306	T-stat	2.115	-1.618
	Prob	0.000	0.004	Prob	0.703	0.661	Prob	0.004	0.000	Prob	0.039	0.112
Sugar & Allied Industries	Daily	1.268	-0.004	Monthly	0.293	0.360	Daily	0.968	0.001	Monthly	1.282	-0.111
	T-stat	47.147	-11.420	T-stat	0.448	0.897	T-stat	33.952	3.183	T-stat	5.259	-2.170
	Prob.	0.000	0.000	Prob.	0.656	0.373	Prob.	0.000	0.001	Prob.	0.000	0.035
Textile Composite	Daily	1.256	0.002	Monthly	1.313	-0.066	Daily	1.468	0.001	Monthly	0.775	0.347
	T-stat	47.289	5.306	T-stat	3.690	-0.652	T-stat	39.317	1.125	T-stat	1.331	1.004
	Prob.	0.000	0.000	Prob	0.000	0.517	Prob	0.000	0.261	Prob	0.189	0.320
Textile Spinning	Daily	1.501	-0.002	Monthly	1.272	0.068	Daily	1.738	-0.009	Monthly	0.944	0.471
	T-stat	49.835	-3.304	T-stat	4.706	1.547	T-stat	57.768	-14.76	T-stat	1.744	2.626
	Prob.	0.000	0.001	Prob.	0.000	0.127	Prob.	0.000	0.000	Prob.	0.088	0.012
Textile Weaving	Daily	1.209	-0.007	Monthly	1.209	-0.007	Daily	1.141	0.004	Monthly	1.141	0.004
	T-stat	43.846	-12.833	T-stat	43.846	-12.83	T-stat	40.550	4.256	T-stat	40.550	4.256
	Prob	0.000	0.000	Prob	0.000	0.000	Prob	0.000	0.000	Prob.	0.000	0.000
Tobacco	Daily	0.988	0.000	Monthly	1.239	-0.293	Daily	1.345	-0.002	Monthly	-0.027	0.097
	T-stat	24.643	1.225	T-stat	5.183	-4.804	T-stat	41.783	-9.493	T-stat	-0.044	0.476
	Prob	0.000	0.221	Prob	0.000	0.000	Prob	0.000	0.000	Prob	0.966	0.638

4.3.2 Market Volatility

Table 6 shows the result estimation at high and low volatility state. When the volatility of the market is high, coefficient $\gamma_1^{\delta\text{-high}}$ will be significantly positive which shows that the growth in dispersion from the inefficiency of market returns, however, if coefficient $\gamma_2^{\delta\text{-high}}$ is negative and significant it will represent the decrease in the dispersion of market returns of individuals by average market returns. For low volatility condition, if the $\gamma_2^{\delta\text{-low}}$ coefficient is significantly negative, herding exists.

If we see the results of estimation at high volatility state, in the daily data the coefficient $\gamma_2^{\delta\text{-high}}$ for the sectors Paper & Bond, Power Generation & Distribution, Textile Spinning, Textile Weaving and Tobacco are significantly negative which shows herding in these sectors. However, for monthly data, coefficient $\gamma_2^{\delta\text{-high}}$ for all the sectors are insignificant.

At low volatility state, the results of estimation for the daily data, the coefficient $\gamma_2^{\delta\text{-low}}$ for two sectors i.e. Automobile Assemble and Power General & Distribution and for monthly data coefficient $\gamma_2^{\delta\text{-low}}$ for three sectors Fertilizer, Textile Spinning and Textile Weaving are significantly negative which shows herding in these sectors.

Therefore, it is concluded that during high volatility conditions herding exists in most of the sectors as compared to low volatility conditions which gives mispricing of assets and makes market inefficient.

Table 6: Result Estimation at High and Low Volatility State

Industry	Sample	$\gamma_1^{\delta\text{-high}}$	$\gamma_2^{\delta\text{-high}}$	Sample	$\gamma_1^{\delta\text{-high}}$	$\gamma_2^{\delta\text{-high}}$	Sample	$\gamma_1^{\delta\text{-low}}$	$\gamma_2^{\delta\text{-low}}$	Sample	$\gamma_1^{\delta\text{-low}}$	$\gamma_2^{\delta\text{-low}}$
Automobile Assembler	Daily	0.243	0.026	Monthly	1.099	-0.260	Daily	0.543	-0.067	Monthly	0.251	-0.038
	T-stat	11.518	60.831	T-stat	2.461	-1.824	T-stat	8.757	-3.024	t-stat	0.358	-0.171
	Prob.	0.000	0.000	Prob.	0.019	0.076	Prob.	0.000	0.003	p-value	0.725	0.866
Cement	Daily	-0.009	0.079	Monthly	0.140	0.005	Daily	0.379	-0.018	Monthly	0.140	0.006
	T-stat	-0.312	29.675	T-stat	0.532	0.095	T-stat	9.540	-1.853	t-stat	0.624	0.096
	Prob.	0.755	0.000	Prob.	0.601	0.925	Prob.	0.000	0.064	p-value	0.537	0.924

Industry	Sample	$\gamma_1^{\delta\text{-high}}$	$\gamma_2^{\delta\text{-high}}$	Sample	$\gamma_1^{\delta\text{-high}}$	$\gamma_2^{\delta\text{-high}}$	Sample	$\gamma_1^{\delta\text{-low}}$	$\gamma_2^{\delta\text{-low}}$	Sample	$\gamma_1^{\delta\text{-low}}$	$\gamma_2^{\delta\text{-low}}$
Chemical	Daily	0.391	0.054	Monthly	0.013	0.067	Daily	0.317	0.042	Monthly	0.518	-0.154
	T-stat	16.632	47.791	T-stat	0.061	1.468	T-stat	6.586	2.487	t-stat	1.256	-0.811
	Prob.	0.000	0.000	Prob.	0.952	0.154	Prob.	0.000	0.013	p-value	0.220	0.424
Fertilizer	Daily	0.063	0.113	Monthly	1.240	-0.336	Daily	0.461	0.009	Monthly	0.552	-0.137
	T-stat	1.806	15.109	T-stat	1.115	-0.864	T-stat	8.675	0.420	t-stat	2.354	-2.368
	Prob.	0.071	0.000	Prob.	0.327	0.436	Prob.	0.000	0.675	p-value	0.023	0.022
Paper & Board	Daily	1.627	-0.006	Monthly	0.554	-0.095	Daily	0.235	0.088	Monthly	-0.092	0.190
	T-stat	72.642	-31.64	T-stat	2.166	-1.294	T-stat	6.356	10.722	t-stat	-0.144	0.632
	Prob.	0.000	0.000	Prob.	0.039	0.206	Prob.	0.000	0.000	p-value	0.887	0.533
Power Generation & Distribution	Daily	0.674	-0.037	Monthly	0.443	-0.051	Daily	0.788	-0.097	Monthly	0.366	0.063
	T-stat	15.179	-2.981	T-stat	1.897	-1.136	T-stat	14.055	-3.596	t-stat	0.944	0.349
	Prob.	0.000	0.003	Prob.	0.067	0.264	Prob.	0.000	0.000	p-value	0.356	0.730
Refinery	Daily	-0.102	0.041	Monthly	0.316	-0.078	Daily	0.156	-0.001	Monthly	0.592	-0.044
	T-stat	-5.475	55.333	T-stat	1.173	-1.301	T-stat	3.273	-0.084	t-stat	1.536	-0.696
	Prob.	0.000	0.000	Prob.	0.250	0.203	Prob.	0.001	0.933	p-value	0.140	0.494
Sugar & Allied Industries	Daily	1.237	-0.003	Monthly	0.454	-0.014	Daily	0.659	0.120	Monthly	0.143	0.411
	T-stat	47.873	-8.619	T-stat	0.998	-0.055	T-stat	15.056	12.344	t-stat	0.183	0.724
	Prob.	0.000	0.000	Prob.	0.330	0.957	Prob.	0.000	0.000	p-value	0.856	0.474
Textile Composite	Daily	1.250	0.002	Monthly	0.704	0.064	Daily	1.193	0.011	Monthly	0.821	-0.022
	T-stat	42.658	4.247	T-stat	2.960	0.867	T-stat	37.253	18.169	t-stat	2.629	-0.153
	Prob.	0.000	0.000	Prob.	0.011	0.402	Prob.	0.000	0.000	p-value	0.012	0.879
Textile Spinning	Daily	1.549	-0.005	Monthly	1.055	-0.075	Daily	1.549	0.009	Monthly	1.367	-0.310
	T-stat	51.129	-8.153	T-stat	1.217	-0.145	T-stat	39.238	4.236	t-stat	5.342	-3.231
	Prob.	0.000	0.000	Prob.	0.255	0.888	Prob.	0.000	0.000	p-value	0.000	0.002
Textile Weaving	Daily	1.287	-0.007	Monthly	1.300	-0.060	Daily	0.986	0.024	Monthly	1.492	-0.162
	T-stat	48.972	-12.08	T-stat	65535	65535	T-stat	19.141	4.131	t-stat	5.229	-2.939
	Prob.	0.000	0.000	Prob.	-	-	Prob.	0.000	0.000	p-value	0.000	0.005
Tobacco	Daily	1.152	-0.001	Monthly	0.376	-0.120	Daily	0.485	0.007	Monthly	-0.182	-0.011
	T-stat	33.731	-4.917	T-stat	1.011	-1.462	T-stat	15.726	26.708	t-stat	-0.312	-0.058
	Prob.	0.000	0.000	Prob.	0.322	0.156	Prob.	0.000	0.000	p-value	0.758	0.954

CHAPTER 05

CONCLUSION

5.1 Key Findings

By using the daily and monthly stocks return data of 12 sectors namely automobile assembler, cement, chemical, fertilizer, paper and board, refinery, power generation & distribution, sugar & allied industries, textile composite, textile spinning, textile weaving and Tobacco listed on PSX from 2008 to 2019, this study explores the presence of herding behaviour among the investors in Pakistani stock markets. Different scenarios are used in order to explore the possibility of herding in the Pakistani stock market.

A analysis of the study shows that during extreme market movements, no evidence of herding has been found. Results indicate that equity return dispersions likely to increase rather than decrease during periods of extreme price movements giving an indication of non-herding. These results are consistent with the results of Christie and Huang (1995) which supports assumptions of rational asset pricing model which indicates that during extreme market movements market is efficient. Also, this study results support the model of Chang, Cheng, & Khorana (2000) through which no herding during extreme market movements was found. Findings are consistent with Gleason, Mathur, & Peterson, (2004) who argues that market returns show the same results by using different proxies.

By using Chang, Cheng, & Khorana (2000) model, the possibility of a non-linear relationship is also investigated. The results shows that herding behaviour exists if the non-linear coefficient is significantly negative, on the other hand, significantly

positive indicates non-existence of herding. By using CSSD, herding exists in the sectors i.e. Paper & Board, Sugar & Allied Industries, Textile Composite, Textile Spinning, Textile Weaving and Tobacco, however, only two sectors in monthly data namely Textile Weaving and Tobacco are significantly negative giving evidence of herding. Comparatively by using CSAD on daily data, following sectors are significantly negative i.e. Paper & Board, Power Generation & Distribution, Sugar & Allied Industries, Textile Spinning, Textile Weaving and Tobacco, however, only three sectors in monthly data namely Paper & Board, Power Generation & Distribution, and Tobacco are significantly negative giving evidence of herding.

Asymmetric effect (with reference to market returns and volatility) is also examined in this study. Throughout the bullish market conditions, by using the daily data herding exists in the sectors Fertilizers, Paper & Bonds, Power Generation & Distribution, Refinery, Sugar & Allied Industries and Textile Spinning, however, by using the monthly data herding exists in the sectors Fertilizers, Paper & Bonds, Power Generation & Distribution, Textile Weaving and Tobacco. While seeing results during bearish market conditions, by using daily data, herding exists in two sectors i.e. Textile Spinning and Tobacco. However, by using monthly data herding exists in only one sector i.e. Sugar & Allied Industries. As per results of estimation at high volatility state, by using daily data, herding exists in the sectors Paper & Bond, Power Generation & Distribution, Textile Spinning, Textile Weaving and Tobacco. However, for monthly data, all the sectors are insignificant. At low volatility state, the results of estimation for the daily data, the coefficient for two sectors Automobile Assemble and Power General & Distribution and for monthly data coefficient for three sectors Fertilizer, Textile Spinning and Textile Weaving are significantly negative which shows herding in these sectors.

5.2 Recommendation and Policy Implications

This study has important implications for investors. By analyzing the herding sector-wise, investors can formulate their strategies for investment by seeing in which sector the herding exists. Due to herding, the mispricing of assets arose, investor behaviour is not certain and because of this inefficiency in markets exists. Due to the mispricing of assets, foreign investors must be careful while investing, therefore, herding factor must be taken care of by these investors.

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CERTIFICATE

This is to certify that this thesis entitled: "Herding Behaviour in The Pakistan Stock Exchange: Insights about Sectoral Returns" submitted by Mr. Muhammad Yousaf Khan is accepted in its present form by the Department of Business Studies, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree of **Master of Science in Management Sciences**.

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