

CAPITAL UNIVERSITY OF SCIENCE AND  
TECHNOLOGY, ISLAMABAD



# Impact of Covid-19 on Herding Behavior in Equity Market of Pakistan

by

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A thesis submitted in partial fulfillment for the  
degree of Master of Science

in the

Faculty of Management & Social Sciences  
Department of Management Sciences

2021

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*This thesis is dedicated to my parents 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 thank my siblings for the interest they showed in my studies and the motivation they gave me during those trying times when I had doubts about my abilities. Their confidence and faith in me helped me in achieving my goals.*



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## *Acknowledgement*

In the name of Allah, the Most Gracious and the Most Merciful, all praise to Allah for His blessings in completion of this task despite my weaknesses and limitations. I would like to express my sincere thanks to a number of people who have made the completion of this thesis possible. I am extremely grateful to all of them.

I would like to thank my thesis supervisor Dr. Arshad Hassan, who has provided me continuous inspiration, assistance, support and motivation to complete this study. His dedication to financial research and hard work will continue to be a source of motivation and guidance for me long after the completion of this degree.

Finally, I would also like to thank my family and friends. Their persistent encouragement and support has made the difference in helping me persevere towards the completion of this journey. All errors in this thesis are my sole responsibility.

**(Nida Naeem)**

## *Abstract*

This study investigate the impact of Covid-19 on equity market and herding behavior in equity market of Pakistan, using monthly returns of selected companies of Pakistan Stock Exchange (PSX), during the time frame of 2010 to 2020. A quantitative approach is used to detect herding behavior. Cross sectional standard deviation (CSSD) and cross sectional absolute deviation (CSAD) proposed by Christie and Huang (1995) and Chang et al. (2000) are used to measure the existence of herding behavior among individual trading stocks. The results indicate that the dispersion of equity return tend to increase during the periods of extreme price movements rather than decreasing and hence depicting the absence of any herding behavior. The findings are supporting rational asset pricing model and indicate a higher degree of dispersion of equity related returns i.e. no herding during extreme high and low price movement days. The markets are irrational and inefficient.

**Keywords:** Herding behavior, Covid-19, Equity market, Pandemics, Market returns, and Asymmetric behavior.



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# Abbreviations

<b>ABBT</b>	Abbott Laboratories Pak Ltd
<b>ATLAS</b>	Atlas Battery Ltd
<b>ATRL</b>	Attock Refinery Limited
<b>BHWL</b>	Baluchistan Wheels Ltd
<b>BYCO</b>	BYCO Petroleum Pak Ltd
<b>COLG</b>	Colgate Palmolive (Pak) Ltd
<b>CRST</b>	Crescent Steel & Allied Product
<b>DGKC</b>	D.G. Cement Company Ltd
<b>EFERT</b>	Engro Fertilizer Ltd
<b>ENGRO</b>	Engro Corporation Ltd
<b>EPCL</b>	Engro Polymer & Chemicals Ltd
<b>EXIDE</b>	Exide Batteries Pakistan
<b>FCCL</b>	Fauji Cement company Ltd
<b>FFBL</b>	Fauji Fertilizer Bin Qasim Ltd
<b>FFC</b>	Fauji Fertilizer Company Ltd
<b>GHNI</b>	Ghandhara Industries Ltd
<b>GLAX</b>	Glaxo SmithKline Pakistan Ltd
<b>GTYR</b>	General Tyre And Rubber Co of Pakistan
<b>HATC</b>	Honda Atlas Car(Pakistan) Ltd
<b>HUBC</b>	Hub Power Company Limited
<b>INDM</b>	Indus Motor Company Ltd
<b>INIL</b>	International Industries Ltd
<b>KEL</b>	K-Electric Limited
<b>KOTA</b>	Kot Addu Power Company

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<b>KTML</b>	Kohinoor Textile Mills Ltd
<b>LOTT</b>	Lotte Chemical Pakistan Ltd
<b>LUCK</b>	Lucky Cement Ltd
<b>MARI</b>	Mari Petroleum Company Ltd
<b>MPLF</b>	Maple Leaf Cement Ltd
<b>MTL</b>	Millat Tractors Ltd
<b>NCL</b>	Nishat Chunian Ltd
<b>NML</b>	Nishat Mills Ltd
<b>NTRL</b>	National Refinery Ltd
<b>NTSL</b>	NetSol Technologies Ltd
<b>OGDCL</b>	Oil and Gas Development company Ltd
<b>PKCB</b>	Pakistan Cables Ltd
<b>PKEL</b>	Pak Elektron Ltd.
<b>PKOL</b>	Pakistan oilfield Ltd
<b>PKSU</b>	Pakistan Suzuki Motor Co Ltd
<b>PPL</b>	Pakistan Petroleum Limited
<b>PSO</b>	Pakistan State Oil Company Ltd
<b>PTC</b>	Pakistan Telecommunication Company Ltd
<b>SAZG</b>	Sazgar Engineering Works Ltd
<b>SEAR</b>	The Searle Company Ltd
<b>SHEL</b>	Shell Pakistan Ltd
<b>SIEM</b>	Siemens (Pak) Eng. Co. Ltd
<b>SNGP</b>	Sui Northern Gas Pipelines Ltd
<b>SSGC</b>	Sui Southern Gas Co Ltd
<b>TRGP</b>	TRG Pakistan Ltd
<b>WAVE</b>	WAVES Singer Pakistan Ltd

# Chapter 1

## Introduction

The outbreak of the pandemic coronavirus (COVID-19) in China in early January 2020 and its gradual spread across world resulted in millions of casualties which extremely affected health care, economy, transportation, and other fields in different industries and regions globally. As death toll raised up, population mobility sharply fell as a result of the quarantine policy, which led to declining economy. On the other side at macro level, the COVID-19 outbreak caused the worst global recession since 1930, when the economy got absolutely emulsified. Like all sector, financial sector especially investor were also affected by coronavirus. Its also affect the trading and pricing significantly.

For a long time, academicians believed that efficient market hypothesis lead the working of equity market (Fama 1970). The traditional finance theories, such as “Efficient Market Hypothesis”, claims that information on various investment forecasts are equally available for investors and explained with clarity accordingly, in normal and realistic manner. Usually equity markets show uncertainty, and investors herd together on similar actions undertaken by others, making investment plans simply based on decisions and actions of other contemporary investors (Fernandez et al., 2011; Mohammad and Shahar, 2019). Lately, the behavioral finance theory progresses a useful and realistic explanation of clustered market volatility because human reactions and responses to the events are more important than the events themselves (Baruch, 1960). Psychological and social theories explain



basically due to behavioral perspective of market anomalies where investors are victims of faults and cognitive biases.

Behavioral reasoning supposes that the excessive volatility is derived from emotion and volatile beliefs; it is a persistent event and exists as long as the investor expresses irrational behavior. Excess volatility is present in expected return of speculative equity market which gives the hint to examine the reason. West (1988) recommends models such as fads, sociological and psychological mechanisms may affect the pricing dynamics of stock markets. Kindleberger (1996) explain the importance of psychological and irrational factors in providing investors historical financial crisis. Herding is one of these behavioral phenomenon. Kindleberger (1996) and Galbraith (1993) believe that evidence of bubbles and crashes are due to the mass errors caused by the erratic natures of herd formation. Human beings have a very long history of signifying herding behavior which can be sketched back to the early Iron Age, almost 1200 BC (Wallace, 2003).

At the end of the Nineteenth Century, initial social psychologists devised the term to describe collective behavior carried out by crowds with “irrational, impulsive and primitive emotions” (LeBon, 1895), as cited in (Vaughan and Hogg, 2005). Following the progress of social psychology, many social psychologists believe that herding behavior is not necessarily irrational and unconscious but is rather connected to a human need for conformity (Rook 2006). Thus, the psychological definition of herding behavior has developed and been stated to as a scenario in which individuals abide by the group decision, even when they perceive the group to be wrong (Christie and Huang, 1995; Rook, 2006). People have a trend to maintain an interest in what others are doing and, at times, follow them while overlooking their own logical skills. Therefore, herding is supposed to be a human nature and is always present in human decision-making processes. This is beneficial in explanation of investors’ behavior which cannot otherwise be explained through an Efficient Market Hypothesis (Chang et al., 2000). From a financial viewpoint, herding behavior can be explained in two ways - irrational and rational. Basically, the former views about herding are a tendency of investors who irrationally ignore their own analysis and information and conform to the market

consensus, even if they do not agree with it (Christie and Huang, 1995). Investors do so because it diminishes their uncertainty and fulfills their need to feel confident (Vaughan and Hogg, 2005). Behavioral biases explain the affecting results due to investors' decisions (Baker & Ricciardi 2015). These explanations are provided for many inadequacies and anomalies exhibited in financial markets that theories of traditional finance cannot explain.

On the other hand, the latter rational behavior is driven by the need to protect one's irrational. It may also occur among individual investors. They may rationally herd others whom they believe may be better informed and possess information which is unavailable to the market. By doing so, their performance may not be below the market average (Demirer and Kutan, 2006). Therefore, both explanations of herding behavior illustrate that investors do not base their decisions on their own analysis and information, but follow the market consensus. In addition, Nofsinger and Sias (1999) suggest herding behaviour occurs when investors trade in the same direction over time.

Economic agents usually survey others behavior in their investment decisions and their effect on the market (De Bondt et al., 2008). These derivative behaviors are generally referred to as herd behavior in equity markets. Bikhchandani and Sharma (2001) define herding behavior as a situation where investors hold back their own information and blindly follow the observed patterns of others in the equity markets. Efficient market hypothesis (EMH), which assumes that investors are rational economic agents of the market and that irrational asset prices can be oppressed by smart arbitragers. On the other hand, in views of behavioral finance investors are irrational economic agents because of their feelings, emotions and inadequate rational power. The irrational investors create arbitrage opportunities which cannot be easily oppressed as there exists the limits to arbitrage (Barberis and Thaler 2003). Traditional financial models haven't explained several anomalies which behavioral finance have explained and herding behavior is one of them. Aftermath several financial crises, the issue of investors' herding behavior in equity markets has been widely recognized. Herding behavior is often associated with the volatility of stock returns Christie and Huang (1995). Furthermore, they argue

that the phenomenon of herding behavior can be easily observed during extreme market movements.

Herding behavior has attracted attention of researchers in various markets across the globe such as the U.S. market Chiang and Zheng (2010), and European markets (Chiang et al., 2010; Khan et al., 2011). Walter and Moritz Weber (2006) represent that German mutual fund managers follow herd during extreme market movements. But on other hand, Christie and Huang (1995) find no evidence of herding in US market during extreme market movements. Similarly, Chang et al. (2000) find no evidence of herding in US market; however, they found significant evidence of herding in Taiwan and South Korea during extreme market movements. Similarly, Malik and Elahi (2014) provide significant evidence of herding behavior in Pakistani stock market during extreme market movements. However, Javed et al. (2011) observe no herding during extreme market movements in Pakistani market. In Chinese stock market, Demirer and Kutan (2006) represent no evidence of herding while Chiang and Tan (2010) and Yao et al. 2014 observe significant evidence of herding.

Several studies particularly focus on herding in crisis period; such as Bowe and Domuta (2004) find significant evidence of herding in Jakarta Stock Exchange during Asian financial crisis in 1997. Similarly, Asma et al. (2014) observe herding in European countries during European crisis. Almost all previous studies highlight herding behavior of investors in extreme market movements and during crisis period. Furthermost of these studies focus on developed countries and several Asian countries.

Financial world is very complex where defining herding is not an easy task. Many people try to differentiate herding from normal behavior in the market. There are different types of herding such as spurious and intentional herding (Devenow & Welch, 1996). Several studies recognized different forms of concentrations in financial literature regarding herding behavior. Some studies recognize three kinds of herding the unintentional, intentional and spurious herding (Kremer & Nautz 2013). According to them, the first one is basically fundamental herding that has been driven because almost all institutions receive same private information and

therefore examine the same factors. This leads them to reach a similar conclusion for each stock. Intentional herding has been defined to be more sentiment-driven as other market participants are being copied consciously by investors, that results in trading of the same stocks regardless of any kind of information that reveals about them or previous beliefs. This is the reason asset prices do not reflect accurate and fundamental information resulting in serious exacerbation of volatility and destabilization of markets. So it can be said that herding because of its bad consequences have the potential to create or at least contribute towards the failure of financial markets.

Most of the studies recognize that herding behavior can examine the significance of externalities from which the process of decision making is affected (Chen, Wu & Huang, 2017). Herding may unintentionally exist in the market when investors follow other investor's investment decision whether or not similar information is followed for decision making. On other side herding may intentionally exist in market which is different in a way that investors are consciously copying others and overwhelming their own decision making power despite the fact that they may have appropriate information (Caparrelli, D Arcangelis and Cassuto, 2004). Spurious herding is described as an effective outcome of groups taking similar decisions, when possessing same information and the investors face the problem of decision making related to cognition (Bikhchandani and Sharma 2001).

Actually this kind of herding is known to be caused by fundamental factors. If an investor makes portfolio such that it contains a smaller percentage of stocks that are affected by increase or decrease in interest rates which ultimately results in loss of attraction towards stocks. This is actually not herding, but a reaction to publically known information. Moreover, other authors explain that in intentional herding investors show different behavior. They copy behavior or information of other investors. From literature it is also known that spurious herding results in efficient decision-making usually, but this is not the case with intentional herding. It is of high importance to distinguish between the two classes of herding, but studies have revealed that this is empirically difficult. So, herding helps us to understand this concept more thoroughly and to distinguish between intentional

and spurious herding, where the latter one is not contributing towards market inefficiency and does not affect stock prices (Bikhchandani & Sharma, 2001).

The psychological view states that cognitive psychology can explain irrational herding (Prast 2000). Many authors represent cognitive conflict in the herding behavior and state that psychological factors affected the financial decisions when collecting and interpreting information on it. In the same way, it explain that Cognitive conflict is a situation where a person is opposed with new information that opposes his existing beliefs, but chooses to ignore new beliefs and going with his own in order to disappear the feeling of regret over deceptive beliefs.

Many author explain that herding as a strategy may be seen differently. An investor's behavior that is neither rational nor fully irrational is said to be momentum-investment strategy and that is based on positive feedback training. This explains the behavior of investors to different classes of stocks.. The investors are motivated towards buying good performing stocks while selling poor performing stocks. But this kind of strategy is related to herding in financial markets in a way that both institutional and individual investors show the same trend of trading over a certain period of time by moving in the same direction (Nofsinger and Sias 1999). So, we can say that this approach may be in between the limitations of rational and irrational behavior, as this is partially and intentionally adopted to benefit from this strategy showing rationality. Contrarily, it also refers to noise traders or stock traders who take investment decisions irrationally and irregularly.

It is also evident that herding in whatever form can cause adverse significances in the financial markets. The presence of these two herding can cause severe price movements in stock markets, leading to volatility, even if all traders behave rationally (De Long, Schleifer, Summers & Waldman, 1990). Hence, it can be said that irrational herding originate because of same psychological behavior of investors, while rational behavior is the intended one resulting from informational cascades. In between these two, positive feedback training is found somewhere.

In contrast author believe that the herding is a normal activity which only outbursts reaches to extremes during the periods of upward and downward volatility (Chang et. al., 2000). The authors, finally tend to analyze the difference between

rational and irrational herding (Nofsinger & Sias s 1999). According to them, financial investors involve in the same behavior that is herding behavior because they want to use positive feedback trading (PFT).

In addition to these understandings evaluation of herding behavior also keep us informed that half investors decisions influence the prices in the market. This includes rational or irrational approach. Although there is a difficulty in investigating these psychological processes, this study is still useful as it provides us with further understanding into the analysis of herding behavior and provides the opportunity for future investigation.

This study contributes to the above literature in several ways. First, there is no research found in Pakistan that measures herding behavior, especially herding of firms during Covid-19 pandemic. Second, present studies have not investigated the herding behavior in the equity market and herding in sectors. The study performs an extensive analysis to see herding pattern and impact of Covid-19 as in present condition in equity as well as sectorial market. It further explains the rate of pandemic in diverse market condition.

## 1.1 GAP Analysis

As COVID-19 is a recent pandemic, this has left its impact on every sector. It is a global crises and financial markets are also affected. There are limited studies which investigate the impact of COVID-19 on equity market in Pakistan. The outbreak of the novel coronavirus COVID-19 in January 2020 has triggered a public health emergency of international concern, and has exacerbated national health systems across the globe. Although the coronavirus crisis has become a major threat to particularly vulnerable members of the society, governments in both developed and emerging market countries have responded with a varying degree of stringency to save lives and alleviate growing pressures on their health sectors. some study examine the impact of herding behavior in Pakistan stock market Javaira and Hassan (2015) under different market conditions. The presence of pandemic has created a completely new condition in the market. The presence

of herding and its impact towards industry and market must be study to identify that companies would herd towards industry or market. So it is need to investigate the phenomenon in the present pandemic environment.

## 1.2 Theoretical background

### Efficient Market Hypothesis (EMH) Theory

There are two views about stock market behavior one is traditional view and the other is Behavioral Finance view; that explain investment decisions in stock market. Still the theory of EMH is known as a foundation in investment decisions. In an efficient market, stock prices reveal all appropriate available information and in long run the market participants cannot earn abnormal profit. Market efficiency is explained at three levels where each level is described on the basis of information available. These three forms are named as weak, semi-strong and strong form of efficiency.

In weak form of efficiency securities are priced on the basis of older or historical information. This historical information is available to everyone as 640 can earn return on the basis of this information. Semi-strong form describes the prices of securities include public information. The third one strong form efficiency tells that the security prices reflect both public and private information. It includes the reflection of fundamental and technical analysis to attain the accurate pricing.

Efficient Market Hypothesis depends on certain factors like rational behavior of investors and Arbitrage. The rational decision involves being rational but still if some investors perform irrationally it would not disturb stock prices. The cause is that investors take decisions randomly and this random behavior will cancel the effect on stock exchange pricing. Arbitrage, a result of market inefficiencies will also cancel out the rational investor. There are certain studies that support Efficient Market Hypothesis theoretically and experimentally. Behavioral finance challenges EMH in the context of participants of the market. Many other academicians Thaler (1981) and Shiller (1981) resist the EMH and provide explanation on

the basis of human behavior. The concept of behavior finance is actually the blend of psychology and neoclassical economics.

In seventies, some experimental results relate the inefficiency of EMH by showing the securities having higher price to earnings ratio (P/E) ratio are priced beyond the fair value and vice versa (Basu,1977). An anomaly in the behavior of earnings of some securities, conflicting EMH then opens up a new room of argument and gave rise to behavioral finance. This is the broader term covering both psychology and sociology. If the herding phenomenon exists which shows market is not efficient but in case herding is not present which indicates market is efficient. Behavioral finance is not in line with efficient market hypothesis and it conflicts EMH.

### 1.3 Problem Statement

The pandemic created a fear across the globe and Pakistan is not on exception. This fear translate into decision making process of individuals as well as investors. Pakistan equity market is generally perceived as high risk and high return. Herding behavior is observed in the market in earlier condition (Javaria & Hassan, 2015).The pandemic is a phenomenon that is observed herding behavior in the market. Therefore is a worth investigating herding behavior during Covid-19 and its impact on equity market is remain unexplained.

### 1.4 Research Questions

The study has the following Questions:

1. Does equity market get affected when exposed to Covid-19 in Pakistan?
2. Does herding behavior during extreme period volatility differ in Covid-19?
3. Does herding exist in Pakistani market?
4. Is herding behavior differ during bullish and bearish period?



5. Does herding behavior during bullish & bearish period differ in Covid-19?
6. Is herding behavior differ during extreme market condition?
7. Does herding behavior differ during Covid-19 period?

## 1.5 Objectives of the Study

This study has the following objectives:

1. To investigate the impact of Covid-19 on equity market return in Pakistan.
2. To investigate the impact of Covid-19 on herding behavior of Pakistan.
3. To investigate the presence of herding behavior under bullish and bearish market.
4. To investigate the impact of Covid-19 on herding behavior during bullish and bearish period.
5. To investigate the presence of herding behavior during under extreme market movement.
6. To investigate the impact of Covid-19 on herding behavior during extreme market movement.

## 1.6 Significance of the Study

The herding behavior of investors is a major cause of speculative bubbles and implies that investors are taking similar trading decisions which may lead to deviations of the stocks prices from their fundamental value. The herding behavior have become an exciting topic in the literature, especially after the occurrence of a financial crisis and Covid-19, due to the fact that amplifies volatility, destabilizes the financial markets and increases the fragility of the financial system. The presence of herding behavior may lead to an incorrect assessment of stock prices,

since the decisions of the investors may be influenced by the manifestation of subjective expectations regarding the future evolution of risk and profitability. As a result, the existence of herding behavior can provide valuable information in to the investors to forecast the evolution of stock prices. The contribution of this study is to explore not only the impact of Covid-19 on equity market but also the herding behavior in good equity market.

## **1.7 Plan of the Study**

The purpose of the study is to examine the impact of Covid-19 and herding behavior in Pakistan equity market. This study is organized into following five chapters. Chapter 1: Cover introduction, theoretical background, research questions, problem statement, and significance of the study. Chapter 2: Literature review is narrated in this chapter. Chapter 3: Data and methodology is discussed in this chapter. Chapter 4: It comprises of results and findings. Chapter 5: Conclusion, key findings, policy implications, future research and limitation are discussed.

# Chapter 2

## Literature Review

Behavioral finance deals with the intersection of finance and psychology criticizes traditional financial theories. It raises questions about the efficient market hypothesis (EMH), which is the cornerstone of many financial models. It contains that investors may be irrational and has argumentative information that influences their decision making, thereby contribute to a better understanding of the financial market.

According to a study by Shusha & Touny (2016), behavioral financing refer to “a phenomenon of deviation of investor decision-making from a rational path” that cannot be explained by classical theory. The studies explain that this behavior and point out that decision making involves human behavior and the thinking patterns of investors, including the emotional factors that influence the extent of decision-making.

Therefore, we must pay attention to investor decision-making process and its impact not only on the investment decisions but also to the financial markets on which these decisions affect. If some market outcomes may differ from those expected by traditional financial theories, including Efficient Market Hypothesis (EMH) theory, these outcomes can be used to influence investment decision.

Baker & Ricciardi (2015) state that phenomenon using behavioral theories that cannot be explained by traditional financial theory may be based on the behavioural bias of the decision-makers. This research study define the “dominant

behaviour of a herd,” and it suggests that is necessary to examine the herd’s behaviour.

The term herding describes the spirit of animals and explains the naive optimism and confidence of the capital market investors. Herding is defined as “the behaviour of investors that tends to mimic or follow the behaviour of other investors.” According to Ricciardi and Simon (2000), herding behaviour is related to people that blindly following the decisions of others. The definition describes by a group of investors that the herding mean is “the willingness of a group of managers to buy or sell shares, especially at the same time, as opposed to the trend that can be expected when portfolio managers do things themselves.”

When people replicate others in major pronouncements, they make judgments or decisions that how can they make every individual rational? Yousaf, Ali, and Shah (2018) describes that herding is one of the essential behaviours of people to explain people’s deviation from rational decision-making. In the presence of herding, the stock price deviates from its intrinsic value, leading to over/under pricing (Bikhchandani and Sharma, 2001). This deliberate imitation leads to market fragility, excessive volatility, and systemic growth.

From the above, it can be said that there are many definitions of the herding behavior. The following quote captures the essence of the herding behavior: “In the financial market, investors are influenced by others for their participation in the market. This influential effect can lead to the convergence of investor behaviour. Several theoretical models have been proposed in the rational herding literature to explain these phenomena.

As defined above, more and more analyses on herding literature have used different methods to check the dispersion of stock returns by using the stock exchange transactions at the times of large stock price fluctuations. This is because while changes in stock returns are generally more concentrated during periods of market pressure. This shows that there are stock price fluctuations that have nothing to do with the essential characteristics of the stock market.

Christie & Huang (1995) argues that these periods are beneficial because when a group of individual investors suppresses their faith and follows market consensus, it

is easier to build a herding under market pressure because the transverse variance of expected returns is low. The herding behaviour might be positive, but it also hurts the development of the capital market.

If an investor's behaviour with accurate information makes the market's growth positive, the herding behavior is positive; otherwise, it is negative. Suppose an investor's wrong decision leads to devastation or a financial crisis (such as the capital market in Argentina from 2000 to 2006 and the Asian financial crisis from 1997 to 1998). In that case, the herding is not considered a good thing because it leads to the assumption that if the share price falls, the shares will be bought, and vice versa. In certain situations, such as during crises, investors tend to behave irrationally.

## 2.1 COVID-19 Pandemic and Herding Behavior

Huang and Christie (1995) define herding performance as a background in which investors follow collective decision-making. The collective decision making is a situation in which investors choose the one alternative amongst many other alternatives as a group choice.

Previous studies have shown that the behavior of the stock has severely affected the stock market trend. The herding cause turmoil in the stock market, which is therefore, an essential factor for policymakers in the market. According to Stein and Scharfstein (1990), managers who handle the investors' portfolio are more sensitive to the herding effect because they are afraid of losing their vital status in the equity market.

Furthermore, it was noted that there was no herding effect on the US and Hong Kong stock exchanges. In addition to this, the results of Zheng and Chiang (2010) shows that the performance of herding can lead to differences in asset or stock prices. Balcilar (2014) use cross-border stock market data and find strong evidence for herding behavior in stock exchanges of Kuwait, Dubai, Saudi Arabian, and Qatar. It shows that herding behavior on the Abu Dhabi stock exchange is low.

The Asian financial markets indicate herding behavior, while the North American market exhibit no herding formation. Lakonishok (1992) showed that the performance of herding could be observed at short time intervals in the stock market. Caparrelli (2004) argues that herding performance is severe under extreme conditions of the Italian stock exchange. Philippas (2020) noted that investor sentimentality is associated with different external indications from different sources. In addition to this, Lao and Singh (2011) find apparent herding behaviour on Chinese and Indian stock exchanges and point out that herding behaviour is more severe on the Chinese stock market. On the contrary, a recent study by Kumar and Dutta (2016) find out that no substantial market herding is found in India's stock market. Furthermore, Ganesh (2016) confirmed the herding behavior of the stock have no signs of the performance on the stock traded in the stock market of India.

In addition to this, it is also motivating to identify that the latest research discoveries are finding a valid hypothesis for the market - meaning that Indian stock market information is valid and investors make rational choices about financial instruments. On the other hand, the current global epidemic COVID-19 has generated fear and panic in the stock market environment, which leads to high instability, more market attentiveness, fewer earnings, and a comparatively high capability to stimulate new speculation.

Therefore, we assume that at the time of the current global epidemic COVID-19, the potential for the formation of herding behavior on the Indian stock market is comparatively higher than under the customary conditions of the market.

While the coronavirus epidemic is worrying, the world has survived such environments in past decades, including several diseases outbreaks, the black Monday financial crisis of 1987, the dreaded traffickers attacked High-tech spare airbags on 11th September 2001, the find crisis of the year 2008 to 2009, the 2016 Brexit referendum, and the American-Chinese currency war. Each of these occasions causes extreme slowdown in the market that lasts for a long time during the year 1980 to the year 2019. Over a similar time, the global market also showed resilience

that the average annual return on the MSCI World list index earns 8 percent. The average annual return on the MSCI Emerging Markets index earns 10.7 percent. History has demonstrated the benefits of maintaining devotion in early turbulent market scenarios. The COVID-19 epidemic is an incredibly complex short-term emergency, but almost every speculator builds an investment horizon after the epidemic. Focusing on this horizon help, financial experts to use better risk models and ultimately give them better performance. In a turbulent market, long-term financial experts generate more returns. If long-term liquidity is available, it is a reasonable first choice for long-term financial experts to continue to invest in stocks.

The most successful financial experts face complex and considered challenges and use the money in the emergencies such as the COVID-19 scenarios. In this situation, a notional speculator will understand that the world is far from the imaginations and this thing will lead to the human behaviour that will affect the responses to epidemics along with the risks and benefits generated by the forex market. Conservation speculators believe that this emergency provides an opportunity for managers to increase results in line with their association's motivations.

In addition to this, Abdeldayem et al. (2020) estimate that during the COVID 19 epidemic, volatility decreased in the last seven days of March 2020. This may be due to market weakness or fragile vulnerabilities as new realities become standardized and the most pessimistic situation is assessed. As experts have pointed out that the concern about how market risks respond to reports of new coronavirus cases. In this case, the elasticity of instability increases further. In general, death due to infection, or the increasing "severity" of infections and the "unlimited" liability of professionals which is due to the mix of mitigating monetary effects, have an impartial psychological effect.

Another explanation for the sudden onset of volatility may be the significant increase in alternatives used before the COVID 19 pandemic. In February 2020, speculators will use several alternatives to support their portfolios or increase convexity. In most cases, financial experts use alternatives to their investments to support surprising business activities which is the most critical point where the

cost of hidden resources is lower than the cost of implementation. In any case, with the sharp decline in the market, most of these alternatives have become cash options. Whether speculators choose the cash option or want to consider the risk of their investment portfolio by comparing the costs of the alternative options with the strike price, it has been found that the financial professionals are more interested in market returns.

The higher the number of advanced options, the higher the total support rate required to select a provider. Finally, no matter how uncertain the market trend, its development can be achieved with the gradual support of alternative providers. This increase in transient power is due to the part of the magnitude of the daily fluctuations which is observed by the investor's herding behavior towards stock market. Due to the sharp fall in the market, the cost of options including any real safeguard has increased significantly, which reassures future effects.

Exploring the impact of a pandemic emergency on the appreciation of monetary resources, it has been found that it is still in its infancy. It is also found out that there are two outstanding exceptional cases which includes, Donadelli et al. (2017) was studied that the mentality of financial experts in the United States and other countries than United States in the context of the international news towards the global risks such as the SARS, H1N1, influenza, polio, and Ebola virus, Ichev and Marinc (2018) report that the Ebola epidemic is linked with significant increase in risk in the US forex market.

According to Onali's (2020), COVID-19 cases does not affect the outcome of US financial transactions in the stock market. Baker et al. (2020), further point out that at the time of the pandemic, the relationship between Chinese stock market instability and cryptocurrency are substantially increased.

## **2.2 Rational and Irrational Herding**

Several definitions have been proposed to recognize herding behavior in the literature. Rendering to these descriptions, the two different stock methods can be seen. The first one is the primary which is the balanced stock, and the second is the



unbalanced stock. In terms of the rational behavior of herding, herding is related to how investors try to reestablish their earnings by deliberately disregarding their examination. There is a need to keep an eye on or copy some other managers who have an additional consistent basis to get evidence or, even better analyze the investment decisions.

It is more problematic to differentiate between unbalance herding behavior and balanced herding behaviour from time to time. Many studies focus on the rational behaviour. According to the irrational conception of herding, herding behaviour is related to the collective activities of personalities in indeterminate circumstances. Stockholders decrease uncertainty and intensify the assurance in speculation earnings through stock behaviour.

In a period of market pressure, herding behavior is usually characterized by large information fluctuations and significant market changes in which investors are willing to ignore their faith and knowledge to follow the market consensus. In this extreme market situation, investors seek the psychological security of the group and hope to take collective action to protect them from the pain of regret caused by personal failure. Herding behavior is generally defined as “imitating related patterns of behaviour” and targeting various market participants such as the individual investors, institutional investors, fund managers, and financial analysts and financial markets such as the stock exchanges, securities markets, and real estate markets, carried out an in-depth analysis of commodity markets, exchange-traded funds, foreign exchange markets, futures markets, etc.

Although it seems reasonable to imitate at the individual level, this usually leads to group behavior, which is irrational. Interestingly, Posner (2009) believes that herding can be risky but not irrational because the asymmetry of existing information justifies the idea that other people may have better information set.

Due to investor psychology and some behavioral prejudices, the herding can also be classified as irrational. In both cases, empirical evidence has seriously questioned market efficiency, which is of great importance to individual and institutional investors. Market participants face unpredictable herding behavior, which can cause significant fluctuations in stock prices and deviations from their base values.

In this sense, herding can provoke or exacerbate existing crises and ultimately lead to bubbles in the stock market which might be positive or negative, while creating profitable opportunities. A development-friendly motivational strategy can also be attributed to herding. The assumption of market efficiency is also violated, as decisions based on herding can seriously skew decisions that might lead to loss of information.

Herding behavior means that investors are irrational, which is reflected in asset pricing and has a potentially devastating effect on the market. Herding research can give investors a better understanding of asset pricing.

In addition to this, the large number of active return relationships in the presence of herding behaviours has significantly reduced the benefits of diversification which might be domestic and international, and therefore requires a large number of assets. Diversification is not a market with a weak correlation in return on assets. From a regulatory point of view, such coordinated investor behavior and inter-market stock activity may increase market volatility and ultimately threaten overall market stability. The literature shows that the relationship between stock and market turmoil has further exacerbated the fragility of the financial system.

It has recently been documented that there is a herding effect on all four stock exchanges in Greece, Italy, Portugal, and Spain, leading to a potentially destabilizing effect and eventually lead to a regional financial crisis. Similarly, cross-market herding is closely linked to the concept of the spread of the crisis and the spread of the financial crisis on the international market. Institutional investors pay particular attention to the role of institutional investors, as capital flows triggered by their herding behavior can also significantly increase market volatility and jeopardize the stability of the financial system.

People can contribute to the herd's performance which is fascinating the findings of others, even if they distinguish that the other performs like a herd. Although this behaviour is personally rational but the behaviour of the resulting group is irrational. According to Shiller (1981), the root of this irrational group behaviour is the stairs of information. The same concept is discussed by (Bikhchandani et al., 1992). In a financial investment environment, an information waterfall occurs

when investors' decisions are influenced by the choices of other investors rather than information gathered independently by individual investors.

Shiller's irrationality is based on the fact that the information waterfall has an independent life and can spread false information when activated. Shiller (1981) fears that those looking for a straight-line investment strategy will "not waste their time and energy in making judgments about the market, so they choose not to exert independent influence in the market." These people are easily attracted to the herd and, once enjoyed, are easily influenced by the herd's behaviour.

Although people have reached a consensus on the emotional nature of investors herding behaviour which led to the disagreements about the impact of herding on the pricing of financial assets. Here, the analysts have identified two key investors, namely noise traders, and arbitrators.

Noise dealers are considered irrational. They mistakenly believe that they have specific information about the asset's future price and therefore present an error of excessive subjective certainty. Noise traders often form groups by communicating their investment strategies through social interaction that usually achieved through modern communication technologies. Collective gambling has been extended to allow rational traders to view the original value of bonds. As a result, the action of noise traders strengthened, and the size of the herding increased.

## 2.3 Heuristic Theory

The "rule of thumb" is a phenomenon that makes decision-making increasingly accessible, especially in complex and uncertain circumstances; it provides some definitions of heuristic theory to reduce the prediction of value by evaluating and simply judging the probability of this complexity. In general, especially for a limited time, heuristic effects are beneficial. On the other hand, some researchers try to prove that heuristic effects often lead to biasness. Historically, Kahneman and Tversky (1979) are thought to be the first authors of the topic who have examined three essential factors which are representation, usability, and anchor bias and all of them are included in the heuristic theory. Waweru and colleagues

(2013) list two other factors referred to as the “overconfidence” and “player error,” which are also the part of the heuristic theory.

It is believed that “overconfidence” can improve endurance, increase intelligence, improve determination, and improve risk resistance. More specifically, it can improve the awareness and skills of others and helps them to improve the efficiency and professional performance, thereby accelerating the achievement of rapid promotion and extending the investment period. For example, if investors want to overestimate the ability to acquire the proper knowledge to learn about the available data, initial forecasts may be considered as underestimated.

Therefore, if one tends to overestimate the accuracy and correctness of one’s news, they are correctly defined as “investors as well” instead of using it with public information signs because the people think that their decisions and their actual situation are better than the real situation. These people are called “overconfident investors.” In more recent psychological literature and financial theory, their behaviour is called “overconfidence herding behavior.”

Other studies have shown that excessive self-confidence in human behaviour is the main decisive factor and the important reason that leads investors to over-market trading in the financial market. Barber and Odean (2001) argue that high business volume can be attributed to investors’ overconfidence, who often regret that their past judgments and decisions are incomparable to those of other people.

Considering the influence of different factors on the herding behavior of stock market, DeLisle (2015) suggest that the stock market losses triggered by the SARS epidemic in the year 2003 must be as high as the “Asian financial crisis”, with an expected GDP loss of \$ 3000 million and a decline in the equity financial market, with an estimated loss of \$ 2 trillion. Washer and Nippani (2004) identifies the influence of SARS in some administrative regions in “Canada, China, Hong Kong, Indonesia, China, Singapore, Philippines, Vietnam, and Thailand”. The study provides that only SARS, Chinese, and Vietnamese stock exchanges are impacted. Paltrinieri and Touch observe that between the years of 2006 and 2015. The “Ebola virus” hour severely impact on the flow of money. Macciocchi et al. (2016)

identifies the temporary economic effects of the “Zika virus” occurrence in “Brazil, Argentina, and Mexico”. The results present that, excluding Brazil, the stock markets of “Latin American and Caribbean countries” fluctuated the day after each shock and show a significant negative return to the markets. In addition to this, the normal “rate of return” observed in these a market is 0.90 percent, but for diverse circumstances and districts, the “rate of return” is - 4.87 percent. Singh (2006) use incident exploration methods to observe the influence of the SARS epidemic on the effectiveness of hotel promotions in “Taiwan” and conclude that during the SARS epidemic, the revenue and price share of seven Taiwanese hotels companies decreased immediately.

After and throughout the SARS epidemic, the average conditions about return on hotel shares in Taiwan are adverse which indicates the negative influence of the SARS epidemic on the performance of hotel stock. Mei-ping Chen et al. (2018) examine the effect of the SARS on the long-lasting relationship amongst the “China and the four Asian stock exchanges” and results confirm that the overall stock price index shows a relationship that fluctuates over time. It has been also observed that the SARS crisis declined the long run relationship between China and the other market. Yang et al. (2017) recommend that an outbreak of the infectious disease has a significant effect on the returns of biotechnology stock in Taiwan. Conferring to Wurgler et al. (2020), stockholders might be doubtful regarding the speculation views of a given market because they sold stocks of that market when an infectious syndrome broke out.

The stock market is interconnected and interdependent. The studies report a close connection between markets during the crisis. Nam et al. (2006) examine the day-to-day earnings on shares in “Nine Asian markets between the year 1996 and 2003” and find a robust correlation amongst the sampled countries in Asia throughout the epidemic. Herding behavior also attracted attention in Pakistani equity markets. The first study was conducted by Javed et al. (2011) who examined herding in companies included in the KSE-100 Index. The second study was conducted by Malik and Elahi (2014) who tested herding behavior in daily share prices of 261 firms for the period 2003–2013 during bullish, bearish and normal market

trend. All listed firm of the Pakistan stock exchange PSX especially observed herding behavior of the firm during crisis period. The study used a rich data set of 609 firms listed on the PSX from January 2004 to December 2013. No other study used such a comprehensive coverage of firms listed on PSX. Second, existing studies in Pakistan have not investigated herding of firms with industry and the stock market. The study considers these aspects as important determinants of herding behavior because firms in a given industry are likely to be affected by similar economic conditions.

## 2.4 Hypothesis of the Study

On the basis of above literature, the following hypothesis are drawn:

**H1:** Covid-19 has significant impact on equity market return.

**H2:** Covid-19 has significant impact on equity market volatility.

**H3:** Covid-19 has significant impact on herding in equity market.

**H4:** Herding is higher in market when market is bullish.

**H5:** Impact of Covid-19 on herding behavior during bearish period is higher.

**H6:** Impact of Covid-19 on herding behavior during bullish period is higher.

# Chapter 3

## Research Methodology

### 3.1 Data

The current study investigates the presence of the impact of Covid-19 and herding behavior in Pakistan stock market. Population for this study includes companies' listed Pakistan stock exchange (PSX). The sample contains top largest companies from listed sector. The sample period of study is 11 years from 2010-2020. The historical data is obtained from the website <https://www.investing.com/>. The following list of sectors is presented in Table 3.1.

TABLE 3.1: List of Sectors

<b>Sr.no.</b>	<b>Sectors</b>
1	Oil & Gas Sector
2	Fertilizer Sector
3	Oil & Gas Marketing Sector
4	Auto Mobile Sector
5	Auto Parts Sector
6	Cable & Electronics Sector
7	Cement Sector
8	Technology Sector
9	Textile Sector
10	Pharmaceutical Sector
11	Power Generation Sector
12	Engineering Sector
13	Chemical Sector
14	Refinery Sector

Christie & Huang (1995) proposed (CSSD) cross sectional standard deviation and Chang et al. (2000) proposed (CSAD) cross sectional absolute deviation. To measure the presence of herding behavior. In this study cross sectional standard deviation (CSSD) and cross sectional absolute deviation (CSAD) have used as measuring of herding.

Gleason et al. (2004) also recommends both CSAD and CSSD to apprehend herding behavior. To test herd behavior, 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, 2002, Hwang and Salmon 2004).

## 3.2 Calculation of Stock Returns

The observed stock return, for individual firm shares prices in stock market are calculated as:

$$R_t = \ln \left[ \frac{P_{i,t}}{P_{t-1}} \right] \times 100 \quad (3.1)$$

In above equation the term  $R_t$  represented the observed return of firm at time t, and  $P_t$  and  $P_{(t-1)}$  are the closing price of the stock at time t and t-1.

$$R_{m,t} = \frac{\sum R_{i,t}}{N} \quad (3.2)$$

In above equation the term cross-sectional average stock of N returns ( $R_{(m,t)}$ ) is calculated by taking average of all individual stock returns at time t whereas  $R_{(i,t)}$  represented the observed stock return of firm i at time t, and N is number of firms included in the sample.

## 3.3 Methodology

This study investigates the presence of Covid-19 and herding behavior in Pakistan equity market. Two methodologies Christie and Haung, (1995); Chang et al.,



(2000); Gleason et al., (2004) are used for the data analysis. OLS regression estimation technique is used for the analysis of data.

$$R_t = \beta_t + \beta_1 Cov, D_t \quad (3.3)$$

In the above equation we have calculated returns of the firms.

$$\sigma_t^2 = \gamma_0 + \gamma_1 Cov, D_t \quad (3.4)$$

Above equation represents the garch series of the data we have used it to find the volatility of the firms returns. This empirical study for the investigation of herding is based on the two methodologies of (Christie and Huang, 1995; Chang et al., 2000 ; Gleason et al., 2004). Average proximity is measured by Christie and Haung (1995) to detect herding behavior. The proximity is measured as of realized market returns to individual asset returns by using the model CSSD that is expressed as follows:

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^N (R_{i,t} - R_{m,t})^2}{N - 1}} \quad (3.5)$$

In the above equation where N represented the number of firms in the portfolio,  $R_{(i,t)}$  represented the observed stock return of the firm i at time t,  $R_{(m,t)}$  represented the cross-sectional average of N returns in the portfolio at time t. By approaching the following empirical model proposed by Christie and Huang (2005), this study examines herding behavior amongst firms.

$$CSSD_t = \alpha + \beta_1^{Bull} D_t^{Bull} \quad (3.6)$$

In the above equation,  $D_t^{Bull} = 1$ , if the return on the aggregate market portfolio for the time period t lies in the extreme upper tail of the returns distribution, and 0 otherwise. Thus, the presence of statistically significant negative  $\beta_1$  and  $\beta_2$  coefficients would specify herd formation by market participants. Conversely, significant positive  $\beta_1$  coefficients indicates rational asset pricing model.

$$CSSD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t \quad (3.7)$$

In the above equation,  $D_t^U = 1$ , if the return on the aggregate market portfolio for the time period  $t$  lies in the extreme upper tail of the returns distribution, and 0 otherwise.  $D_t^L = 1$ , if the return on the aggregate market portfolio for time period  $t$  lies in the extreme lower tail of the returns distribution, and 0 otherwise. Thus, the presence of statistically significant negative  $\beta_1$  and  $\beta_2$  coefficients would specify herd formation by market participants.

Conversely, significantly positive coefficients  $\beta_1$  and  $\beta_2$  establish the prediction of rational asset pricing model.

$$CSSD_t = \alpha + \beta Cov, D \quad (3.8)$$

$$CSSD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L \times Cov, D \quad (3.9)$$

In the above equation (6),  $D_t^{Bull}$ , ( $D_t^{Bear}$ ) represent the equal-weighted portfolio returns during the bullish (bearish) market trends at time  $t$ , and to investigate the non-linearity in market returns when market is rising (declining). CSSD at time  $t$  consequent to rising (declining) market returns.  $Cov, D$ , represent a dummy to assess the presence for COVID-19 in equity market. Significantly negative values of  $\beta_2$  would indicate the presence of differences in herding during COVID-19.

The robustness of the results has been tested by using Christie and Huang (1995). To recognize the herding behavior an alternative methodology was proposed by Chang et al. (2000). He argue that the model proposed by Christie and Huang (1995) requires to define market stress.

They used CSAD rather than the previously used CSSD. And CSAD can be expressed as follows:

$$CSAD_t = \frac{1}{N} \sum_{i=1}^N |R_{i,t} - R_{m,t}| \quad (3.10)$$

In the above condition,  $R_{(m,t)}$  is the return of the equivalent weighted market portfolio that indicates the market return, though at time  $t$ ,  $R_{(i,t)}$  is the individual stock return of firm.

$$CSAD_t = \alpha + \beta_1^{Bull} D_t^{Bull} \quad (3.11)$$

In the above equation,  $D_t^{Bull} = 1$ , if the return on the aggregate market portfolio for the time period  $t$  lies in the extreme upper tail of the returns distribution, and 0 otherwise. Thus, the presence of statistically significant negative  $\beta_1$  and  $\beta_2$  coefficients would specify herd formation by market participants. Conversely, significant positive  $\beta_1$  coefficients indicates rational asset pricing model.

$$CSAD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t \quad (3.12)$$

In the above equation,  $D_t^U = 1$ , if the return on the aggregate market portfolio for the time period  $t$  lies in the extreme upper tail of the returns distribution, and 0 otherwise.  $D_t^L = 1$ , if the return on the aggregate market portfolio for time period  $t$  lies in the extreme lower tail of the returns distribution, and 0 otherwise. Thus, the presence of statistically significant negative  $\beta_1$  and  $\beta_2$  coefficients would specify herd formation by market participants. Conversely, significantly positive coefficients  $\beta_1$  and  $\beta_2$  establish the prediction of rational asset pricing model.

$$CSAD_t = \alpha + \beta Cov, D \quad (3.13)$$

$$CSAD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L \times Cov, D \quad (3.14)$$

In the above equation,  $D_t^{Bull}$ ,  $(D_t^{Bear})$  represent the equal-weighted portfolio returns during the bullish (bearish) market trends at time  $t$ , and to investigate the non-linearity in market returns when market is rising (declining). CSSD at time  $t$  consequent to rising (declining) market returns.  $Cov, D$ , represent a dummy to assess the presence for COVID-19 in equity market. Significantly negative values

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of  $\beta_2$  would indicate the presence of differences in herding during COVID-19. The robustness of the results has been tested by using Chang et al. (1995).

# Chapter 4

## Results and Discussion

This chapter covers impact of Covid-19 on returns, volatility and herding in various sectors. The herding towards industry and market is examined by using CSSD and CSAD. The study also investigates the presence of herding during bullish and bearish period. It further provides investigate about herding during extreme market condition. This study uses the monthly data of respective sectors companies for a sample period of 2010 to 2020. To examine the impact of Covid-19 on return and herding behavior in the respective sectors.

### 4.1 Oil and Gas Sector

Table 4.1 shows impact of Covid-19 on return of Oil and Gas sector. The sample companies in oil and gas sector are OGDCL, PPL, POL & MARI and a significant effect of Covid-19 is found which shows a decrease in returns of OGDCL, PPL, POL & MARI during Covid-19.

TABLE 4.1: Impact of Covid-19 of Oil and Gas sector

Items	COVID	S.E	t-value	p-value	f-statics
OGDCL	-0.425	0.081	-5.278	0	27.854
PPL	-0.436	0.084	-5.163	0	26.658
POL	-0.348	0.084	-4.164	0	17.339
MARI GAS	-0.328	0.12	-2.531	0.013	6.407

Table 4.1.1 shows the impact of Covid-19 on volatility of the stocks returns. Results indicate that Covid-19 has significant positive effect on the volatility which indicating the volatility was higher during Covid-19 period.

TABLE 4.1.1: Impact of Covid-19 on Volatility of returns of Oil and Gas sector

	<b>C</b>	<b>ARCH</b>	<b>GARCH</b>	<b>COVID</b>
<b>OGDCL</b>	0.135 (0.079)	0.017 (0.19)	0.021 (0.122)	0.264 (0.01)
<b>PPL</b>	-0.034 (0.108)	0.007 (0.161)	0 (0.137)	0.621 (0.005)
<b>PKOL</b>	0.05 (0.1)	0.201 (0.163)	0.017 (0.256)	0.133 (0.009)
<b>MARI GAS</b>	0.016 (0.118)	0.116 (0.171)	0.221 (0.262)	0.515 (0.004)

Standard errors in parentheses ( )

Table 4.1.2 shows the impact of Covid-19 on herding behavior in oil and gas sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that no impact of Covid-19 is observed when herding is measured toward industry or market. The same results are confirmed by using CSAD proposed by (Chang et al., 2000). The results indicates that in Oil and Gas sector Covid-19 have no effect on herding towards industry and market.

TABLE 4.1.2: Impact of Covid-19 on Herding behavior

		<b>Industry</b>		<b>Market</b>	
		<b>C</b>	<b>Covid</b>	<b>C</b>	<b>Covid</b>
<b>CSSD</b>	<b>Coefficient</b>	0.074	0.021	0.055	0.002
	<b>T-value</b>	17.712	1.391	15.186	0.117
	<b>P-value</b>	0	0.167	0	0.907
<b>CSAD</b>	<b>Coefficient</b>	0.041	0.002	0.053	0.015
	<b>T-value</b>	15.262	0.195	17.841	1.433
	<b>P-value</b>	0	0.846	0	0.154

Table 4.1.3 reports the difference in herding towards industry or market during bullish period. With reference to industry and market both results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market.

TABLE 4.1.3: Impact of Herding during bullish market condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.076	-0.001	0.002	0.05	0.003	-0.005
	<b>T-value</b>	11.554	-0.155	0.099	9.31	0.471	-0.321
	<b>P-value</b>	0	0.877	0.922	0	0.639	0.749
CSAD	<b>Coefficient</b>	0.03	0.002	-0.005	0.05	-0	0.002
	<b>T-value</b>	9.466	0.359	-0.374	11.6	-0.11	0.146
	<b>P-value</b>	0	0.721	0.709	0	0.911	0.884

Table 4.1.4 provides the estimate for Oil and Gas sector companies during extreme market movements 5% criteria is used to restrict the dummy variable for the upper and lower tail of the stock market return. The first 2 columns of the table report the result for herding towards industry for up and down market. The results indicate that when herding is measured towards industry, herding is present in extreme market. Subsequently the impact of herding towards market is examined in up and down market.

The results indicate that when herding is measured towards market, herding is present in extreme market condition. Coefficients for both up and down for industry and market returns are significant and positive and violating the assumption of asset pricing model.

TABLE 4.1.4: Presence of Herding during extreme market conditions

	Industry		Market	
	Up	Down	Up	Down
<b>CSSD</b>	0.007 (0.013)	0.157 (0.013)	0.031 (0.011)	0.603 (0.012)
<b>CSAD</b>	0.098 (0.009)	0.008 (0.009)	0.008 (0.009)	0.098 (0.009)

Standard errors in parentheses ( )

Table 4.1.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

TABLE 4.1.5: Impact of Covid-19 on herding during extreme market condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.539 (0.033)	0.133 (0.056)	0.94 (0.029)	0.867 (0.04)
<b>CSAD</b>	0.93 (0.021)	0.706 (0.02)	0.492 (0.023)	0.073 (0.033)

Standard errors in parentheses ( )

In Oil and Gas sector impact of Covid-19 is present in all companies. Returns of all companies are lower during Covid-19 period. Covid-19 has significant positive effect on the volatility. No influence of herding is observed. During bullish and bearish period herding is observed towards industry and market. During extreme market condition, herding is present in industry or market.

## 4.2 Fertilizer Sector

Table 4.2 shows impact of Covid-19 on return of Fertilizer sector. The sample companies in fertilizer sector have ENGRO, FFC, FFBL and EFERT and an insignificant effect of Covid-19 is found and which shows returns of ENGRO, FFC, FFBL and EFERT during Covid-19 are not different from the returns of rest of the period.

TABLE 4.2: Impact of Covid-19 on Fertilizer sectors

Items	COVID	S.E	t-value	p-value	f-statics
<b>ENGRO</b>	0	0.034	-0.292	0.771	0.085
<b>FFC</b>	0.051	0.032	1.604	0.111	2.572
<b>FFBL</b>	0.05	0.031	1.628	0.106	2.65
<b>EFERT</b>	0.032	0.07	0.455	0.64	0.207

Table 4.2.1 shows the impact of Covid-19 on volatility of the stocks returns. Results indicate that Covid-19 has significant positive effect on the volatility of FFC



indicating the volatility is higher during Covid-19 period. ARCH affect has been tested on ENGRO, FFBL and EFERT, which suggests data is not heteroskedastic. So GARCH model is not applicable in case of ENGRO, FFBL and EFERT.

TABLE 4.2.1: Impact of Covid-19 on Volatility of return of Fertilizer sector

	<b>C</b>	<b>ARCH</b>	<b>GARCH</b>	<b>COVID</b>
<b>FFC</b>	-0.153 (0.002)	0.071 (0.072)	0.002 (0.189)	0.015 (0.001)

Standard errors in parentheses ( )

Table 4.2.2 shows the impact of Covid-19 on herding towards industry or market. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry or market. The result indicates that no impact of Covid-19 is observed when herding is measured toward both industry and market.

The same results are confirmed by using CSAD proposed by (Chang et al., 2000). The results confirmed that in Fertilizer sector Covid-19 have no effect on herding towards industry or market.

TABLE 4.2.2: Impact of Covid-19 on Herding behavior.

		<b>Industry</b>		<b>Market</b>	
		<b>C</b>	<b>Covid</b>	<b>C</b>	<b>Covid</b>
<b>CSSD</b>	<b>Coefficient</b>	0.12	0.021	0.113	0.001
	<b>T-value</b>	23.258	1.0321	22.05	0.044
	<b>P-value</b>	0	0.304	0	0.965
<b>CSAD</b>	<b>Coefficient</b>	0.083	0.001	0.086	0.011
	<b>T-value</b>	22.428	0.072	24.883	0.893
	<b>P-value</b>	0	0.943	0	0.374

Table 4.2.3 reports the difference in herding towards industry and market during bullish market. With reference to industry and market, results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different

from rest of the bullish period and these results are consistent with reference to industry or market.

TABLE 4.2.3: Impact of Covid-19 on Herding During Bullish Market Condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.139	-0.01	0.001	0.12	-0.014	-0.007
	<b>T-value</b>	15.858	-1.1	0.051	15.2	-1.348	-0.301
	<b>P-value</b>	0	0.275	0.959	0	0.18	0.764
CSAD	<b>Coefficient</b>	0.089	-0.01	-0.006	0.09	-0.009	0
	<b>T-value</b>	15.48	-1.38	-0.339	17.1	-1.274	-0.018
	<b>P-value</b>	0	0.17	0.735	0	0.205	0.986

Table 4.2.4 provides difference in herding behavior during extreme market condition. The first 2 columns of the table report the results for herding towards industry that has been estimated for up and down market. The results indicate that when herding is measured towards industry, impact of herding is present during declining market but not present in rising market. Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that when herding is measured towards market, impact of herding is present in bearish market but not present in bullish market.

TABLE 4.2.4: Presence of Herding during extreme market condition

	Industry		Market	
	Up	Down	Up	Down
<b>CSSD</b>	0.947 (0.014)	0 (0.013)	0.697 (0.013)	0.009 (0.012)
<b>CSAD</b>	0.604 (0.009)	0.009 (0.009)	0.657 (0.009)	0.001 (0.008)

Standard errors in parentheses ( )

Table 4.2.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

In Fertilizer sector impact of Covid-19 is not present in returns of sample companies. Covid-19 has significant positive effect on the volatility of returns of FFC

TABLE 4.2.5: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.654 (0.035)	0.003 (0.035)	0.708 (0.033)	0.11 (0.033)
<b>CSAD</b>	0.716 (0.024)	0.116 (0.024)	0.658 (0.021)	0.003 (0.021)

Standard errors in parentheses ( )

only. No influence of Covid-19 on herding is observed. During bullish and bearish period herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market but only in declining market.

### 4.3 Oil and Gas Marketing Sector

Table 4.3 shows impact of Covid-19 on return of Oil and Gas Marketing sector. The sample companies in oil and gas marketing sector have PSO, SHEL, SNGP & SNGC in which an insignificant effect of Covid-19 is found which shows returns of PSO, SHEL, SNGP & SSGC during Covid are not different from the rest of the sample period.

TABLE 4.3: Impact of Covid-19 on Oil and Gas Marketing sector

Items	COVID	S.E	T	p-value	f-statics
<b>PSO</b>	0.023	0.031	0.731	0.466	0.534
<b>SHEL</b>	0.034	0.04	0.834	0.406	0.696
<b>SNGP</b>	-0.049	0.043	-1.152	0.251	1.328
<b>SSGC</b>	-0.012	0.038	-0.3	0.764	0.09

Table 4.3.1 shows the impact of Covid-19 on volatility of the stocks returns of PSO, SHEL and SNGP. Results indicate that Covid-19 has significant positive effect on the volatility which indicating the volatility was higher during Covid-19 period. ARCH effect tested on SSGC suggests that data is not heteroskedastic. So GARCH model is not applicable on SSGC.

TABLE 4.3.1: Impact of Covid-19 on Volatility of returns on Oil and Gas Marketing sector

	<b>C</b>	<b>ARCH</b>	<b>GARCH</b>	<b>COVID</b>
<b>PSO</b>	-0.066 (0.1)	0.141 (0.1)	0.059 (0.292)	0.132 (0.002)
<b>SHEL</b>	-0.02 (0.123)	0.008 (0.081)	0 (0.146)	0.165 (0.003)
<b>SNGP</b>	0.085 (0.109)	0.291 (0.145)	0.45 (0.346)	0.073 (0.021)

Standard errors in parentheses ( )

Table 4.3.2 shows the impact of Covid-19 on herding in oil and gas marketing sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry or market. The result indicates that no impact of Covid-19 is observed when herding is measured toward both industry and market.

The same results are confirmed by using CSAD proposed by Chang et al. (2000). The results confirmed that in Oil and Gas Marketing sector Covid-19 have no effect on herding towards industry or market.

TABLE 4.3.2: Impact of Covid-19 on Herding Behavior

		<b>Industry</b>		<b>Market</b>	
		<b>C</b>	<b>Covid</b>	<b>C</b>	<b>Covid</b>
<b>CSSD</b>	<b>Coefficient</b>	0.093	0.014	0.07	0.007
	<b>T-value</b>	23.714	0.954	21.668	0.619
	<b>P-value</b>	0	0.341	0	0.537
<b>CSAD</b>	<b>Coefficient</b>	0.053	0.004	0.067	0.002
	<b>T-value</b>	21.453	0.427	24.526	0.242
	<b>P-value</b>	0	0.66	0	0.809

Table 4.3.3 reports the difference in impact of bullish trend on herding towards industry and market during bullish and bearish market. With reference to industry and market both results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different

from rest of the bullish period and these results are consistent with reference to industry or market.

TABLE 4.3.3: Impact of Covid-19 on herding during bullish condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.096	-0.003	0.002	0.075	-0.006	0.003
	<b>T-value</b>	15.568	-0.444	0.11	14.719	-0.997	0.21
	<b>P-value</b>	0	0.658	0.912	0	0.321	0.834
CSAD	<b>Coefficient</b>	0.055	-0.004	0	0.06	-0.004	-0.006
	<b>T-value</b>	14.343	-0.753	0.016	16.284	-0.761	-0.497
	<b>P-value</b>	0	0.453	0.987	0	0.448	0.62

Table 4.3.4 reports presence of herding behavior during extreme market condition of Oil and Gas Marketing sector companies. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market condition. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that when herding is measured towards market, impact of herding is present in extreme market condition.

TABLE 4.3.4: Presence of herding during extreme market condition

		Industry		Market	
		Up	Down	Up	Down
CSSD		0.583	0.007	0.935	0.033
		-0.012	(0.012)	(0.01)	(0.01)
CSAD		0.792	0.12	0.562	0.001
		(0.008)	(0.008)	(0.008)	(0.009)

Table 4.3.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

In Oil and Gas Marketing sector impact of Covid-19 on returns is not present in sample companies. Covid-19 has significant positive effect on the volatility of returns of PSO, SHEL and SNGP. Covid-19 has no influence on herding is observed.

TABLE 4.3.5: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.343 (0.02)	0.009 (0.042)	0.211 (0.025)	0.13 (0.036)
<b>CSAD</b>	0.274 (0.019)	0.131 (0.027)	0.475 (0.021)	0.012 (0.029)

*Standard errors in parentheses ( )*

During bullish and bearish period herding is same in both industry and market. During extreme market condition, effect of herding is present towards industry and market.

## 4.4 Auto Mobile Sector

Table 4.4 shows impact of Covid-19 on return of Auto Mobile sector. Sample companies in auto mobile sector have INDM, PKSU, SAZG, HATC, GHNI and MTL in which an insignificant effect of Covid-19 on returns is found and which shows returns of INDM, PKSU, SAZG, HATC, GHNI and MTL during Covid-19 are not different from returns of rest of the sample period.

ARCH effect has been tested on INDM, PKSU, SAZG, HATC, GHNI and MTL, which suggests data is not heteroskedastic. So GARCH model is not applicable on INDM, PKSU, SAZG, HATC, GHNI and MTL.

TABLE 4.4: Impact of Covid-19 on Auto Mobile sector

Item	COVID	S.E	T	p-value	F-stats
<b>INDM</b>	0.007	0.034	0.194	0.847	0.037
<b>PKSU</b>	0.005	0.048	0.1	0.913	0.012
<b>SAZG</b>	0.021	0.048	0.431	0.667	0.186
<b>HATC</b>	0.02	0.05	0.598	0.551	0.358
<b>GHNI</b>	0.083	0.066	1.258	0.211	1.582
<b>MTL</b>	0.041	0.02	1.38	0.167	1.931

Table 4.4.1 shows the impact of Covid-19 on herding in automobile sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry

and market both. The result indicates that when herding is measured toward industry, impact of Covid-19 is observed but when herding is measured toward market, no impact of Covid-19 is observed in automobile sector. The same results are confirmed by using CSAD proposed by (Chang et al., 2000).

The results confirmed that in Auto Mobile sector Covid-19 have no effect on herding towards industry but have effect on herding towards market.

TABLE 4.4.1: Impact of Covid-19 on Herding behavior

		Industry		Market	
		C	Covid	C	Covid
CSSD	<b>Coefficient</b>	0.121	0.037	0.101	0.018
	<b>T-value</b>	23.213	1.952	23.98	1.191
	<b>P-value</b>	0	0.053	0	0.236
CSAD	<b>Coefficient</b>	0.076	0.0142	0.087	0.028
	<b>T-value</b>	25.206	1.302	24.084	2.094
	<b>P-value</b>	0	0.195	0	0.038

Table 4.4.2 reports the difference in herding towards industry and market during bullish and bearish period. With reference to industry and market both results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market.

Table 4.4.3 reports presence of herding behavior during extreme market condition in Auto Mobile sector companies. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market condition. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact of herding towards market is examined in both up and down market.

TABLE 4.4.2: Impact of Covid-19 on Herding During Bullish Market Condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.125	-0.002	0.029	0.109	0	0.01
	<b>T-value</b>	15.045	-0.185	1.209	16.412	-1.184	1.012
	<b>P-value</b>	0	0.854	0.229	0	0.239	0.313
CSAD	<b>Coefficient</b>	0.08	-0.006	0.013	0.086	0.005	0.024
	<b>T-value</b>	16.959	-0.936	0.957	14.953	0.638	1.424
	<b>P-value</b>	0	0.351	0.34	0	0.525	0.157

The results indicate that when herding is measured towards market, impact of herding is present in extreme market condition.

TABLE 4.4.3: Presence of Herding During Extreme Market Condition

	Industry		Market	
	Up	Down	Up	Down
<b>CSSD</b>	0.337 (0.016)	0.273 (0.017)	0.446 (0.013)	0.089 (0.014)
<b>CSAD</b>	0.4 (0.009)	0.125 (0.000)	0.131 (0.011)	0.307 (0.012)

Table 4.4.4 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

TABLE 4.4.4: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up × Covid	Down × Covid	Up × Covid	Down × Covid
<b>CSSD</b>	0.002 (0.03)	0.211 (0.056)	0.008 (0.032)	0.433 (0.046)
<b>CSAD</b>	0.019 (0.023)	0.472 (0.033)	0.001 (0.027)	0.151 (0.039)

*Standard errors in parentheses ( )*

In Auto Mobile sector impact of Covid-19 is not present on returns of sample companies. Covid-19 has no effect on the volatility. Impact of Covid-19 on herding is observed towards industry when CSSD is used as a measure of herding, impact



of Covid-19 on herding is observed towards market only when CSAD is used as a measure of herding. During bullish and bearish period herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market.

## 4.5 Auto Parts Sector

Table 4.5 shows impact of Covid-19 on return of Auto Parts sector. The sample companies in auto parts sector have GTYR, EXIDE, ATLAS & BWHL in which an insignificant effect of Covid-19 is found and which shows returns of GTYR, EXIDE, ATLAS and BWHL during Covid-19 period are not different from the rest of the sample period.

TABLE 4.5: Impact of Covid-19 on Auto Parts Sector

COVID	S.E	T	p-value	F-stats
0.049	0.044	1.097	0.275	1.204
0.333	0.055	0.607	0.545	0.368
0.059	0.044	1.326	0.187	1.758
0.051	0.042	1.202	0.232	1.445

Table 4.5.1 shows the impact of Covid-19 on volatility of the stocks returns of BWHL. Results indicate that Covid-19 has significant positive effect on the volatility which indicating the volatility is higher during Covid-19 period. ARCH effect on GTYR, EXIDE , ATLAS which suggests that data is not heteroskedastic. So GARCH model is not applicable on GTYRE, EXIDE, ATLAS.

TABLE 4.5.1: Impact of Covid-19 on volatility of returns of Auto Parts sector.

	C	ARCH	GARCH	COVID
<b>BWHL</b>	-0.04 (0.115)	0.077 (0.212)	0.895 (0.244)	0.657 (0.007)

Table 4.5.2 shows the impact of Covid-19 on herding behavior of auto part sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that no impact of Covid-19 is

TABLE 4.5.2: Impact of Covid-19 on Herding Behavior

		Industry		Market	
		C	Covid	C	Covid
CSSD	<b>Coefficient</b>	0.133	0.004	0.102	0.011
	<b>T-value</b>	20.43	0.149	19.058	0.574
	<b>P-value</b>	0	0.882	0	0.567
CSAD	<b>Coefficient</b>	0.075	0	0.095	0.005
	<b>T-value</b>	19.338	0.702	20.753	0.29
	<b>P-value</b>	0	0.484	0	0.772

observed when herding is measured toward both industry or market. The same results are confirmed by using CSAD proposed by Chang et al. (2000). The results provide that in Auto Parts sector, Covid-19 have no effect on herding towards industry or market both.

Table 4.5.3 reports the difference in herding during bullish and bearish trend towards industry or market both. With reference to herding towards industry and market, results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market. The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market.

TABLE 4.5.3: Impact of Covid-19 on Herding During Bullish Market Condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.138	-0.007	-0.013	0.109	-0.011	-0.006
	<b>T-value</b>	13.475	-0.541	-0.435	13.099	-1.053	-0.248
	<b>P-value</b>	0	0.58	0.664	0	0.294	0.804
CSAD	<b>Coefficient</b>	0.081	-0.008	0.003	0.097	-0.002	-0.004
	<b>T-value</b>	13.256	-1.012	0.153	13.457	-0.253	-0.173
	<b>P-value</b>	0	0.313	0.878	0	0.801	0.863

Table 4.5.4 reports presence of herding behavior during extreme market condition in auto parts. The first 2 columns of the table report the result for herding

towards industry that has been estimated for up and down market. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact of herding towards market is examined in up and down market condition. The results indicate that when herding is measured towards market, impact of herding is present in extreme market condition.

TABLE 4.5.4: Presence of Herding During Extreme Market Condition

	Industry		Market	
	Up	Down	Up	Down
<b>CSSD</b>	0.005 (0.01)	0.187 (0.02)	0.019 (0.016)	0.018 (0.017)
<b>CSAD</b>	0.012 (0.012)	0.014 (0.012)	0.001 (0.014)	0.245 (0.014)

Table 4.5.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

TABLE 4.5.5: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.185 (0.05)	0.047 (0.071)	0.393 (0.04)	0.003 (0.057)
<b>CSAD</b>	0.211 (0.02)	0 (0.042)	0.123 (0.035)	0.069 (0.04)

In Auto Parts sector impact of Covid-19 on returns is not present in sample companies. Covid-19 has significant positive effect on the volatility of returns of BWHL only. No influence of Covid-19 on herding is observed.

During bullish and bearish period, herding is same in both industry and market. During extreme market condition, effect herding is present towards industry or market.

## 4.6 Cable and Electronics Marketing Sector

Table 4.6 shows impact of Covid-19 on return of Cable and Electronics marketing sector. The sample companies in cable and electronics sector have PKEL, PKCB, SIEM & WAVE in which an insignificant effect of Covid-19 is found and which shows returns of PKEL, PKCB, SIEM & WAVE during Covid-19 period is not different from rest of the sample period.

TABLE 4.6: Impact of Covid-19 on Cable & Electronics sector

Item	COVID	S.E	T	p-value	F stats
<b>PKEL</b>	0.051	0.053	0.97	0.334	0.941
<b>PKCB</b>	0.001	0.039	0.037	0.971	0.001
<b>SIEM</b>	0.001	0.042	0.02	0.977	0.001
<b>WAVE</b>	0.021	0.046	0.462	0.645	0.213

ARCH effect has been tested on PKEL, PKCB, SIEM & WAVE, which suggests data is not heteroskedastic. So GARCH model is not applicable on PKEL, PKCB, SIEM & WAVE.

Table 4.6.1 shows the impact of Covid-19 on herding in Cable and Electronics sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that impact of Covid-19 is observed when herding is measured toward both industry and market. The same results are confirmed by using CSAD proposed by Chang et al. (2000). The results confirmed that in Cable and Electronics sector Covid-19 have an effect on herding towards industry and market both.

TABLE 4.6.1: Impact of Covid-19 on Herding Behavior

		Industry		Market	
		C	Covid	C	Covid
<b>CSSD</b>	<b>Coefficient</b>	0.129	-0.057	0.105	-0.043
	<b>T-value</b>	27.143	-3.348	22.912	-2.567
	<b>P-value</b>	0	0.001	0	0.011
<b>CSAD</b>	<b>Coefficient</b>	0.078	-0.031	0.092	-0.03
	<b>T-value</b>	22.862	-2.561	26.815	-3.181
	<b>P-value</b>	0	0.012	0	0.002

Table 4.6.2 reports the difference in bullish and bullish trend on herding towards industry or market. With reference to industry and market, both results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 herding is different from the rest of the bullish period toward industry but bullish period is not different from the rest of the bullish period towards market only when CSSD is used as a measure of herding. When CSAD is used as a measure of herding, results indicates that during Covid-19 period herding is not different from rest of the bullish period toward industry but bullish period is different from the rest of the bullish period towards market.

TABLE 4.6.2: Impact of Covid-19 on Herding During Bullish Market Condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
<b>CSSD</b>	<b>Coefficient</b>	0.114	0.016	-0.052	0.095	0.01	-0.035
	<b>T-value</b>	14.842	1.692	-2.352	12.95	1.124	-1.627
	<b>P-value</b>	0	0.093	0.02	0	0.263	0.106
<b>CSAD</b>	<b>Coefficient</b>	0.071	0.007	-0.027	0.083	0.011	-0.037
	<b>T-value</b>	12.971	1.065	-1.728	14.81	1.557	-2.312
	<b>P-value</b>	0	0.289	0.086	0	0.122	0.022

TABLE 4.6.3: Presence of Herding During Extreme Market Conditions

		Industry		Market	
		Up	Down	Up	Down
<b>CSSD</b>		0.381	0.419	0.335	0.452
		(0.015)	(0.016)	(0.015)	(0.015)
<b>CSAD</b>		0.41	0.526	0.377	0.612
		(0.011)	(0.011)	(0.011)	(0.012)

*Standard errors in parentheses ( )*

Table 4.6.3 reports presence of herding behavior during extreme market condition of Cable and Electronics sector. The first 2 columns of the table report the result

for herding towards industry that has been estimated for up and down market both. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that when herding is measured towards market, impact of herding is present in extreme market condition.

Table 4.6.4 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period

TABLE 4.6.4: Impact of Covid-19 on Herding During Extreme Market Conditions

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.999 (0.039)	0.428 (0.055)	0.701 (0.037)	0.667 (0.052)
<b>CSAD</b>	0.752 (0.027)	0.849 (0.039)	0.694 (0.028)	0.588 (0.03)

In Cable and Electronics sector, impact of Covid-19 on returns is not present in all companies. Covid-19 has no effect on the volatility of returns. Influence of herding is observed towards industry or market. During bullish and bearish period herding towards industry and market are in same direction. During extreme market condition, effect of herding is present in industry as well as market.

## 4.7 Cement Sector

Table 4.7 reports the impact of Covid-19 on return of Cement sector. The sample companies in cement sector have FFCL, MPLP, DGKC and LUCK in which an insignificant effect of Covid-19 on returns is found.

Table 4.7.1 shows the impact of Covid-19 on volatility of the stocks returns of LUCK. Results indicate that Covid-19 has significant positive effect on the volatility which indicating the volatility was higher during Covid-19 period.

TABLE 4.7: Impact of Covid-19 on Returns of Cement Sector

Item	COVID	S.E	T	p-value	F stats
<b>FCCL</b>	0.029	0.034	0.842	0.401	0.7
<b>MPLF</b>	0.043	0.048	0.905	0.367	0.81
<b>DGKC</b>	0.043	0.037	1.164	0.247	1.354
<b>LUCK</b>	0.019	0.02	0.652	0.516	0.425

ARCH effect suggests that data is not heteroskedastic. So GARCH model is not applicable on FFCL, MPLP and DGKC.

TABLE 4.7.1: Impact of Covid-19 of Returns of Cement Sector

	C	ARCH	GARCH	COVID
<b>LUCK</b>	0.109 (0.099)	0.461 (0.157)	0.913 (0.761)	0.158 (0.009)

Table 4.7.2 shows the impact of Covid-19 on herding in cement sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that no impact of Covid-19 is observed towards industry or market. The same results are confirmed by using CSAD proposed by (Chang et al., 2000). The results indicates that in cement sector Covid-19 have no effect on herding towards industry and market both.

TABLE 4.7.2: Impact of Covid-19 on Herding Behavior

		Industry		Market	
		C	Covid	C	Covid
<b>CSSD</b>	<b>Coefficient</b>	0.089	-0.004	0.057	-0.009
	<b>T-value</b>	20.223	-0.277	18.106	-0.78
	<b>P-value</b>	0	0.782	0	0.437
<b>CSAD</b>	<b>Coefficient</b>	0.043	-0.007	0.065	-0.001
	<b>T-value</b>	18.419	-0.892	20.315	-0.069
	<b>P-value</b>	0	0.374	0	0.945

Table 4.7.3 reports the difference in herding towards industry and market during bullish and bearish trend. With reference to industry and market, both results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well

as market. The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market.

TABLE 4.7.3: Impact of Covid-19 on Herding During Bullish Market Condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.091	-0.004	-0.016	0.058	-0	-0.021
	<b>T-value</b>	13.206	-0.477	-0.779	11.55	-0.24	-1.434
	<b>P-value</b>	0	0.634	0.438	0	0.812	0.154
CSAD	<b>Coefficient</b>	0.041	0.002	-0.016	0.068	-0.01	-0.008
	<b>T-value</b>	14.617	0.51	-1.497	13.54	-0.77	-0.576
	<b>P-value</b>	0	0.611	0.137	0	0.446	0.566

Table 4.7.4 reports herding behavior during extreme market condition of Cement sector companies. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market both. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition.

Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that when herding is measured towards market, impact of herding is present in extreme market condition.

TABLE 4.7.4: Presence of Herding During Extreme Market Condition

		Industry		Market	
		Up	Down	Up	Down
CSSD		0.04	0.231	0.463	0.403
		(0.014)	(0.014)	(0.001)	(0.01)
CSAD		0.63	0.227	0.028	0.151
		(0.007)	(0.007)	(0.001)	(0.01)

*Standard errors in parentheses ( )*

Table 4.7.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.



TABLE 4.7.5: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.189 (0.034)	0.103 (0.048)	0.923 (0.025)	0.134 (0.035)
<b>CSAD</b>	0.953 (0.018)	0.287 (0.026)	0.112 (0.025)	0.124 (0.035)

In Cement sector impact of Covid-19 on returns is not present in sample companies. Covid-19 has significant positive effect on the volatility of returns of LUCK only. No influence of Covid-19 is observed on herding towards industry or market. During bullish and bearish period herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market.

## 4.8 Technology Sector

Table 4.8 present the impact of Covid-19 on the returns of Technology sector in Pakistan. The sample companies in technology sector have TRGP, PTC and NSL in which a significant effect of Covid-19 is found in TRGP and NTSL, which shows an increase in returns of TRGP and NTSL. While PTC shows an insignificant effect of Covid-19.

TABLE 4.8: Impact of Covid-19 on Technology Sector

Item	COVID	S.E	T	p-value	F stats
<b>TRGP</b>	0.129	0.06	2.142	0.034	4.588
<b>PTC</b>	0.013	0.03	0.445	0.657	0.198
<b>NTSL</b>	0.131	0.057	2.31	0.022	5.381

Table 4.8.1 shows the impact of Covid-19 on volatility of the stocks returns. Results for TRGP indicate that Covid-19 has insignificant positive effect on the volatility. While results for NTSL indicate that Covid-19 has significant positive

effect on the volatility which indicating the volatility was higher during Covid-19 period. ARCH effect suggests that data for PTC is not heteroskedastic. So GARCH model is not applicable on PTC.

TABLE 4.8.1: Impact of Volatility on Returns of Technology Sector

	<b>C</b>	<b>ARCH</b>	<b>GARCH</b>	<b>COVID</b>
<b>TRGP</b>	0.152 (0.095)	0.099 (0.109)	0.027 (0.245)	0.25 (0.113)
<b>NTSL</b>	0.092 (0.068)	0 (0.023)	0 (0.000)	0.041 (0.013)

*Standard errors in parentheses()*

Table 4.8.2 shows the impact of Covid-19 on herding in Technology sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that impact of Covid-19 is observed when herding is measured toward both industry and market.

The same results are confirmed by using CSAD proposed by (Chang et al., 2000). The results provides that in technology sector Covid-19 have effect on herding towards industry and market both.

TABLE 4.8.2: Impact of Covid-19 on Herding Behavior

		<b>Industry</b>		<b>Market</b>	
		<b>C</b>	<b>Covid</b>	<b>C</b>	<b>Covid</b>
<b>CSSD</b>	<b>Coefficient</b>	0.134	0.117	0.097	0.094
	<b>T-value</b>	19.121	4.636	16.58	4.473
	<b>P-value</b>	0	0	0	0
<b>CSAD</b>	<b>Coefficient</b>	0.071	0.068	0.093	0.081
	<b>T-value</b>	16.879	4.486	20.484	4.913
	<b>P-value</b>	0	0	0	0

Table 4.8.3 reports the difference in impact of bullish trend on herding towards industry and market during bullish and bearish periods. With reference to industry and market, both results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market. The results also report the difference

of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is different from rest of the bullish period and these results are consistent with reference to industry or market.

TABLE 4.8.3: Impact of Covid-19 on Herding During Bullish Market Conditions

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.143	0	0.125	0.105	-0.002	0.103
	<b>T-value</b>	12.016	0.006	3.789	10.72	-0.2	3.754
	<b>P-value</b>	0	0.995	0	0	0.842	0
CSAD	<b>Coefficient</b>	0.076	0	0.072	0.098	0.004	0.078
	<b>T-value</b>	13.853	0.032	3.667	16.26	0.416	3.575
	<b>P-value</b>	0	0.974	0	0	0.678	0

Table 4.8.4 reports presence of herding behavior during extreme market condition of Technology sector. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market both. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that impact of herding is present in extreme market condition.

TABLE 4.8.4: Presence of Herding During Extreme Market Conditions

	Industry		Market	
	Up	Down	Up	Down
<b>CSSD</b>	0.632 (0.024)	0.96 (0.025)	0.345 (0.011)	0.824 (0.02)
<b>CSAD</b>	0.342 (0.014)	0.852 (0.015)	0.531 (0.016)	0.919 (0.016)

Table 4.8.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when CSSD is used as a measure of herding towards industry or market, herding is not significantly different from rest of the period. While the results indicates that when CSAD is used as a measure of herding towards industry or market, herding is significantly different from rest of the period.

TABLE 4.8.5: Impact of Covid-19 on Herding Extreme Market Condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.058 (0.058)	0.126 (0.082)	0.006 (0.047)	0.042 (0.066)
<b>CSAD</b>	0 (0.034)	0.038 (0.048)	0.034 (0.038)	0.041 (0.053)

In Technology sector impact of Covid-19 on return is present in two companies. Covid-19 has significant positive effect on the volatility of returns of TRGP & NTSL. Through CSSD and CSAD influence of herding is observed towards both industry and market. During bullish and bearish period herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market.

## 4.9 Textile Sector

Table 4.9 shows impact of Covid-19 on return of Textile sector. The sample companies in textile sector have NML, NCL and KTML in which an insignificant effect of Covid-19 on returns is found and which shows returns of NML, NCL and KTML are not affected by Covid-19.

TABLE 4.9: Impact of Covid-19 on Textile sector

Item	COVID	S.E	T	p-value	F stats
<b>NML</b>	-0.007	0.036	-0.184	0.854	0.034
<b>NCL</b>	0	0.038	-0.002	0.998	0
<b>KTML</b>	0.038	0.049	0.785	0.434	0.617

Table 4.9.1 shows the impact of Covid-19 on volatility of the stocks returns of KTML. Results indicate that Covid-19 has significant positive effect on the volatility which indicating the volatility was higher during Covid-19 period. ARCH effect

suggests that data is not heteroskedastic for NML and NCL. So GARCH model is not applicable on NML and NCL.

TABLE 4.9.1: Impact of Volatility on Returns of Textile Sector

	<b>C</b>	<b>ARCH</b>	<b>GARCH</b>	<b>COVID</b>
<b>KTML</b>	0.171	0.003	0.916	0.132
	(0.132)	(0.22)	(0.152)	(0.023)

*Standard errors in parentheses*

Table 4.9.2 shows the impact of Covid on herding in Textile sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that no impact of Covid-19 is observed when herding is measured toward both industry and market. The same results are confirmed by using CSAD proposed by Chang et al. (2000). The results indicates that in textile sector Covid-19 have no effect on herding towards industry and market both.

TABLE 4.9.2: Impact of Covid-19 on Herding Behavior

		<b>Industry</b>		<b>Market</b>	
		<b>C</b>	<b>Covid</b>	<b>C</b>	<b>Covid</b>
<b>CSSD</b>	<b>Coefficient</b>	0.101	0.022	0.067	-0.008
	<b>T-value</b>	19.327	1.14	17.966	-0.599
	<b>P-value</b>	0	0.252	0	0.551
<b>CSAD</b>	<b>Coefficient</b>	0.049	-0.005	0.07	0.015
	<b>T-value</b>	17.774	-0.526	18.815	1.156
	<b>P-value</b>	0	0.59	0	0.24

Table 4.9.3 reports the difference in herding towards industry and market during bullish and bearish trend. With reference to industry and market, both results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market. The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market.

TABLE 4.9.3: Impact of Covid-19 on Herding During Bullish Market Condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.099	0.005	0.009	0.105	-0.002	-0.008
	<b>T-value</b>	12.082	0.463	0.384	10.715	-0.2	-0.446
	<b>P-value</b>	0	0.644	0.702	0	0.842	0.656
CSAD	<b>Coefficient</b>	0.044	0.007	-0.005	0.05	0	0.005
	<b>T-value</b>	10.316	1.205	-0.362	10.353	1.307	0.302
	<b>P-value</b>	0	0.23	0.718	0	0.194	0.764

TABLE 4.9.4: Presence of Herding During Extreme Market Condition

		Industry		Market	
		Up	Down	Up	Down
CSSD		0.056	0.048	0.001	0.166
		(0.016)	(0.017)	(0.011)	(0.012)
CSAD		0.001	0.127	0.138	0.05
		(0.008)	(0.009)	(0.012)	(0.012)

Table 4.9.4 explores herding behavior during extreme market condition of Textile sector companies. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market both. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition.

Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that impact of herding is present in extreme market condition.

Table 4.9.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

In Textile sector impact of Covid-19 on returns is not present in sample companies. Covid-19 has significant positive effect on the volatility of returns of KTML. No influence of Covid-19 on herding towards industry or market is observed. During bullish and bearish period, herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market.

TABLE 4.9.5: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.16 (0.039)	0.005 (0.056)	0.813 (0.029)	0.982 (0.041)
<b>CSAD</b>	0.875 (0.022)	0.932 (0.031)	0.104 (0.028)	0 (0.03)

## 4.10 Pharmaceutical Sector

Table 4.10 shows impact of Covid-19 on return of Pharmaceutical sector. The sample companies in pharmaceutical sector have SEAR, GLAX & ABBT in which an insignificant effect of Covid-19 on returns is found.

TABLE 4.10: Impact of Covid-19 on Pharmaceutical Sector

Item	COVID	S.E	T	p-value	F stats
<b>SEAR</b>	0.013	0.034	0.372	0.701	0.139
<b>GLAX</b>	0.008	0.036	0.22	0.825	0.049
<b>ABBT</b>	0.05	0.037	1.626	0.106	2.644

Table 4.10.1 shows the impact of Covid-19 on volatility of the stocks returns of GLAX. Results indicate that Covid-19 has significant positive effect on the volatility which indicating the volatility was higher during Covid-19 period. ARCH effect suggests that data is not heteroskedastic for SEARL and ABBT. So GARCH model is not applicable on these companies.

TABLE 4.10.1: Impact of Covid-19 On Volatility on Returns Of Pharmaceutical Sector

	C	ARCH	GARCH	COVID
<b>GLAX</b>	-0.235 (0.103)	0.003 (0.146)	0.86 (0.221)	0.041 (0.002)

Table 4.10.2 shows the impact of Covid-19 on herding in Pharmaceutical sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for

industry and market both. The result indicates that no impact of Covid-19 is observed when herding is measured towards industry. When herding is measured towards market, impact of Covid-19 is observed.

The same results are confirmed by using CSAD proposed by (Chang et al., 2000). The results indicates that in Pharmaceutical sector Covid-19 have an effect on herding towards industry, while Covid-19 have no effect on herding towards market.

TABLE 4.10.2: Impact of Covid-19 on Herding Behavior

		Industry		Market	
		C	Covid	C	Covid
CSSD	<b>Coefficient</b>	0.09	0.03	0.062	0.03
	<b>T-value</b>	16.915	1.554	15.844	2.147
	<b>P-value</b>	0	0.123	0	0.034
CSAD	<b>Coefficient</b>	0.045	0.022	0.064	0.018
	<b>T-value</b>	15.87	2.154	16.477	1.318
	<b>P-value</b>	0	0.033	0	0.18

Table 4.10.3 reports the difference in herding towards industry and market during bullish and bearish market. With reference to industry and market both, results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the impact of Covid-19 on bullish period towards industry or market. It indicates that during Covid-19 herding is not different from the rest of the bullish period toward industry but bullish period is different from the rest of the bullish period towards market only when CSSD is used as a measure of herding. When CSAD is used as a measure of herding, results indicates that during Covid-19 period herding is different from rest of the bullish period toward industry but bullish period is not different from the rest of the bullish period towards market.

Table 4.10.4 explores herding behavior during extreme market condition of Pharmaceutical sector companies. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market both.



TABLE 4.10.3: Impact of Covid-19 on herding during bullish market condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.087	0.009	0.037	0.055	0.013	0.059
	<b>T-value</b>	10.311	0.826	1.496	9.024	1.735	3.379
	<b>P-value</b>	0	0.41	0.137	0	0.085	0.001
CSAD	<b>Coefficient</b>	0.05	0	0.042	0.061	0.006	0.019
	<b>T-value</b>	14.548	-1.744	3.322	10.07	0.757	1.054
	<b>P-value</b>	0	0.084	0.001	0	0.45	0.295

The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that when herding is measured towards market, impact of herding is present in extreme market condition.

TABLE 4.10.4: Presence of Herding During Extreme Market Conditions.

	Industry		Market	
	Up	Down	Up	Down
<b>CSSD</b>	0.134 (0.017)	0.675 (0.017)	0.0329 (0.012)	0.7942 (0.013)
<b>CSAD</b>	0.039 (0.009)	0.804 (0.009)	0.104 (0.012)	0.476 (0.013)

*Standard errors in parentheses ( )*

Table 4.10.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

TABLE 4.10.5: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up × Covid	Down × Covid	Up × Covid	Down × Covid
<b>CSSD</b>	0.049 (0.041)	0.005 (0.057)	0 (0.02)	0.306 (0.042)
<b>CSAD</b>	0.003 (0.022)	0.283 (0.031)	0.055 (0.029)	0.003 (0.041)

In Pharmaceutical sector impact of Covid-19 on return is not present in sample companies. Covid-19 has significant positive effect on the volatility of returns of GLAX only. Through CSSD influence of herding is observed towards market and through CSAD influence of herding is observed towards industry. During bullish and bearish period herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market.

## 4.11 Power Generation Sector

Table 4.11 shows impact of Covid-19 on return of Power Generation sector. The sample companies in power generation sector have HUBC, KEL and KOTA in which an insignificant effect of Covid-19 on returns is found.

TABLE 4.11: Impact of Covid-19 on Power Generation Sector

Item	COVID	S.E	T	P-value	F stats
<b>HUBC</b>	-0.023	0.024	-0.925	0.357	0.855
<b>KEL</b>	0.003	0.039	0.06	0.945	0.005
<b>KOTA</b>	0.022	0.024	0.944	0.347	0.89

Table 4.11.1 shows the impact of Covid-19 on volatility of the stocks returns of KOTA. Results indicate that Covid-19 has significant positive effect on the volatility which indicating the volatility was higher during Covid-19 period.

ARCH effect suggests that data for HUBC and KEL is not heteroskedastic. So GARCH model is not applicable on these companies.

TABLE 4.11.1: Impact of Covid-19 on Volatility on Returns of Power Generation Sector

	C	ARCH	GARCH	COVID
<b>KOTA</b>	-0.05 (0.09)	0.001 (0.004)	0 (0.001)	0.206 (0.001)

Table 4.11.2 shows the impact of Covid-19 on herding in Power Generation sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for

industry and market both. The result indicates that no impact of Covid-19 is observed when herding is measured toward industry or market, no impact of Covid-19 is observed. The same results are confirmed by using CSAD proposed by (Chang et al., 2000). The results indicates that in Power and Generation sector Covid-19 have no effect on herding towards industry and market both.

TABLE 4.11.2: Impact of Covid-19 on Herding Behavior.

		Industry		Market	
		C	Covid	C	Covid
CSSD	<b>Coefficient</b>	0.078	0.008	0.057	0.007
	<b>T-value</b>	20.307	0.584	16.611	0.551
	<b>P-value</b>	0	0.561	0	0.583
CSAD	<b>Coefficient</b>	0.042	0.005	0.054	0.008
	<b>T-value</b>	16.115	0.543	21.83	0.932
	<b>P-value</b>	0	0.588	0	0.353

Table 4.11.3 reports the difference in herding towards industry and market during bullish and bearish market. With reference to industry and market both, results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market

Table 4.11.4 explores herding behavior during extreme market condition of Power Generation sector companies. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market both. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition.

Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that impact of herding is present in extreme market condition.

TABLE 4.11.3: Impact of Covid-19 on Herding During Bullish Market Condition.

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	Coefficient	0.043	-0.002	0.009	0.059	-0.002	-0.006
	T-value	13.577	-0.322	0.516	13.947	-0.261	-0.359
	P-value	0	0.748	0.606	0	0.795	0.72
CSAD	Coefficient	0.05	0	-0.005	0.053	0.002	0.007
	T-value	14.548	-1.744	-0.405	13.718	0.384	0.609
	P-value	0	0.084	0.686	0	0.701	0.544

TABLE 4.11.4: Presence of Herding During Extreme Market Conditions

		Industry		Market	
		Up	Down	Up	Down
CSSD		0.748	0.962	0.695	0.778
		(0.012)	(0.012)	(0.011)	(0.011)
CSAD		0.599	0.828	0.469	0.978
		(0.008)	(0.009)	(0.007)	(0.008)

Table 4.11.5 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

TABLE 4.11.5: Impact of Covid-19 on Herding During Extreme Market Condition

		Industry		Market	
		Up × Covid	Down × Covid	Up × Covid	Down × Covid
CSSD		0.593	0.656	0.999	0.962
		(0.03)	(0.042)	(0.027)	(0.038)
CSAD		0.984	0.992	0.514	0.53
		(0.021)	(0.029)	(0.019)	(0.027)

In Power Generation sector impact of Covid-19 on returns is not present in sample companies. Covid-19 has significant positive effect on the volatility of returns of KOTA only. No influence of Covid-19 on herding towards industry or market is observed. During bullish and bearish period, herding is same in both industry

and market. During extreme market condition, effect of herding is present in both industry and market.

## 4.12 Engineering Sector

Table 4.12 shows impact of Covid-19 on return of Engineering sector. The sample companies in engineering sector have ADPK, CRST and INIL in which an insignificant effect of Covid-19 on returns is found.

TABLE 4.12: Impact of Covid-19 on Engineering Sector

Item	COVID	S.E	T	p-value	F stats
ADPK	0.009	0.065	0.137	0.891	0.019
CRST	0.035	0.041	0.863	0.38	0.744
INIL	0.055	0.04	1.362	0.176	1.855

ARCH effect has been tested on ADPK, CRST and INIL, which suggests that data is not heteroskedastic. So GARCH model is not applicable on ADPK, CRST and INIL.

Table 4.12.1 shows the impact of Covid-19 on herding in Engineering sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that no impact of Covid-19 is observed when herding is measured toward both industry and market. The same results are confirmed by using CSAD proposed by Chang et al. (2000).

The results indicates that in Engineering sector Covid-19 have no effect on herding towards industry and market both.

Table 4.12.2 reports the difference in herding towards industry and market during bullish and bearish market. With reference to industry and market both, results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

TABLE 4.12.1: Impact of Covid-19 on Herding Behaviors

		Industry		Market	
		C	Covid	C	Covid
CSSD	<b>Coefficient</b>	0.141	-0.002	0.097	0.016
	<b>T-value</b>	16.974	-0.07	13.244	0.595
	<b>P-value</b>	0	0.937	0	0.553
CSAD	<b>Coefficient</b>	0.072	0.011	0.098	0.001
	<b>T-value</b>	12.952	0.533	18.144	0.046
	<b>P-value</b>	0	0.595	0	0.963

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market.

TABLE 4.12.2: Impact of Covid-19 on Herding During Bullish Market Condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.123	0.029	0.003	0.1	-0.006	0.006
	<b>T-value</b>	9.514	1.775	0.067	11.273	-0.397	0.175
	<b>P-value</b>	0	0.078	0.947	0	0.692	0.861
CSAD	<b>Coefficient</b>	0.06	0.005	0.002	0.088	0.016	0.007
	<b>T-value</b>	8.001	0.419	0.083	10.437	1.547	0.288
	<b>P-value</b>	0	0.676	0.934	0	0.124	0.773

Table 4.12.3 explores herding behavior during extreme market condition of Engineering sector. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market both. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact of herding towards market is examined in both up and down market. The results indicate that impact of herding is present in extreme market condition.

Table 4.12.4 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when CSSD is used as a measure of herding

TABLE 4.12.3: Presence of Herding During Extreme Market Conditions

	Industry		Market	
	Up	Down	Up	Down
<b>CSSD</b>	0.655 (0.026)	0.221 (0.027)	0.988 (0.023)	0.938 (0.024)
<b>CSAD</b>	0.984 (0.017)	0.955 (0.018)	0.497 (0.017)	0.206 (0.017)

towards industry or market, herding is not significantly different from rest of the period.

While the result indicates that when CSAD is used as a measure of herding towards industry, herding is not significantly different from rest of the period but towards market, herding is significantly different from rest of the period.

TABLE 4.12.4: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.489 (0.065)	0.443 (0.092)	0.78 (0.057)	0.194 (0.081)
<b>CSAD</b>	0.781 (0.043)	0.187 (0.061)	0.261 (0.042)	0.496 (0.059)

In Engineering sector impact of Covid-19 on returns is not present in sample companies. Covid-19 has no effect on the volatility. No influence of Covid-19 on herding towards both industry or market is observed. During bullish and bearish period, herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market.

### 4.13 Chemicals Sector

Table 4.13 shows impact of Covid-19 on return of Chemicals sector. The sample companies in chemicals sector have EPCL, LOTT and COLG in which an insignificant effect of Covid-19 on returns is found and which returns of EPCL, LOTT and COLG are not affected by Covid-19.

TABLE 4.13: Impact of Covid-19 on Chemicals Sectors

<b>Item</b>	<b>COVID</b>	<b>S.E</b>	<b>T</b>	<b>p-value</b>	<b>F stats</b>
<b>EPCL</b>	0.037	0.036	1.012	0.313	1.024
<b>LOTT</b>	0.022	0.034	0.668	0.505	0.446
<b>COLG</b>	0.01	0.028	0.693	0.48	0.48

ARCH effect has been tested on EPCL, LOTT and COLG, which suggests data is not heteroskedastic. So GARCH model is not applicable on EPCL, LOTT and COLG.

Table 4.13.1 shows the impact of Covid-19 on herding in Chemical sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that no impact of Covid-19 is observed when herding is measured toward industry or market.

The same results are confirmed by using CSAD proposed by (Chang et al., 2000). The results indicates that in Chemicals sector Covid-19 have no effect on herding towards industry and market both.

Table 4.13.2 reports the difference in herding towards industry and market during bullish and bearish market. With reference to industry and market both, results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market.

Table 4.13.3 explores the herding behavior during extreme market condition of Chemicals sector companies. The first 2 columns of the table represent the result for herding towards industry that has been estimated for up and down market both. The results also indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact



TABLE 4.13.1: Impact of Covid-19 on Herding Behavior

		Industry		Market	
		C	Covid	C	Covid
CSSD	Coefficient	0.095	0.014	0.072	0.014
	T-value	21.025	0.864	17.951	0.943
	P-value	0	0.389	0	0.348
CSAD	Coefficient	0.053	0.008	0.067	0.009
	T-value	17.977	0.533	20.957	0.761
	P-value	0	0.431	0	0.448

TABLE 4.13.2: Impact of Covid-19 on Herding During Bullish Market Condition

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	Coefficient	0.094	0.004	0.025	0.068	0.009	0.026
	T-value	13.176	0.411	0.021	10.743	1.086	0.183
	P-value	0	0.682	0.225	0	0.692	0.166
CSAD	Coefficient	0.04	0.006	0.016	0.068	0	0.017
	T-value	10.765	1.056	1.214	13.328	0.143	1.15
	P-value	0	0.293	0.227	0	0.279	0.248

of herding towards market is examined in both up and down market. The results indicate that impact of herding is present in extreme market condition.

TABLE 4.13.3: Presence of Herding During Extreme Market Conditions

		Industry		Market	
		Up	Down	Up	Down
CSSD		0.004	0.282	0.01	0.355
		(0.014)	(0.014)	(0.012)	(0.013)
CSAD		0.01	0.298	0.01	0.191
		(0.009)	(0.009)	(0.000)	(0.01)

Table 4.13.4 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

TABLE 4.13.4: Impact of Covid-19 on Herding During Extreme Market Condition

	Industry		Market	
	Up $\times$ Covid	Down $\times$ Covid	Up $\times$ Covid	Down $\times$ Covid
<b>CSSD</b>	0.257 (0.035)	0.185 (0.049)	0.381 (0.032)	0.651 (0.044)
<b>CSAD</b>	0.373 (0.023)	0.583 (0.033)	0.195 (0.025)	0.25 (0.035)

In Chemicals sector impact of Covid-19 on returns is not present in sample companies. Covid-19 has no effect on the volatility. No influence of Covid-19 on herding towards both industry or market is observed. During bullish and bearish period herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market.

#### 4.14 Refinery Sector

Table 4.14 shows impact of Covid-19 on return of Refinery sector. The sample companies in refinery sector have ATRL and BYCO in which an insignificant effect of Covid-19 on returns is found and which shows returns of ATRL and BYCO are not affected by Covid-19. While NTRL in which a significant effect of Covid-19 on return is found and which shows returns of NTRL is affected by Covid-19.

ARCH effect has been tested on ATRL, BYCO and NTRL, which suggests data is not heteroskedastic. So GARCH model is not applicable on ATRL, BYCO and NTRL.

TABLE 4.14: Impact of Covid-19 on Refinery Sector.

Item	COVID	S.E	T	p-value	F stats
<b>ATRL</b>	0.071	0.042	1.688	0.094	2.85
<b>BYCO</b>	-0.066	0.136	-0.486	0.628	0.236
<b>NTRL</b>	0.118	0.042	2.779	0.006	7.721

Table 4.14.1 shows the impact of Covid-19 on herding in Refinery sector. Herding is measured by using CSSD proposed by Christie and Huang (1995) for industry and market both. The result indicates that no impact of Covid-19 is observed when herding is measured toward both industry and market. The same results are confirmed by using CSAD proposed by (Chang et al., 2000). The results indicates that in Refinery sector Covid-19 have no effect on herding towards industry and market both.

TABLE 4.14.1: Impact of Covid-19 on volatility on Returns of Engineering Sector

		Industry		Market	
		C	Covid	C	Covid
CSSD	<b>Coefficient</b>	0.259	-0.033	0.205	-0.053
	<b>T-value</b>	15.898	-0.559	14.683	-1.054
	<b>P-value</b>	0	0.577	0	0.294
CSAD	<b>Coefficient</b>	0.155	-0.044	0.157	-0.004
	<b>T-value</b>	14.53	-1.138	17.032	-0.115
	<b>P-value</b>	0	0.257	0	0.909

Table 4.14.2 reports the difference in herding towards industry and market during bullish and bearish market. With reference to industry and market both, results are insignificant. It indicates that during bullish period herding is not different from bearish period and these results are consistent with reference to industry as well as market.

The results also report the difference of herding towards industry or market during Covid-19 period. It indicates that during Covid-19 period herding is not different from rest of the bullish period and these results are consistent with reference to industry or market.

Table 4.14.3 explores herding behavior during extreme market condition of Refinery sector. The first 2 columns of the table report the result for herding towards industry that has been estimated for up and down market both. The results indicate that when herding is measured towards industry, impact of herding is present in extreme market condition. Subsequently the impact of herding towards market

TABLE 4.14.2: Impact of Covid-19 on Herding During Bullish Market Condition.

		Industry			Market		
		C	Bull	Bull×Covid	C	Bull	Bull×Covid
CSSD	<b>Coefficient</b>	0.237	0.031	-0.007	0.209	-0.022	-0.031
	<b>T-value</b>	9.285	0.957	-0.096	12.305	-0.784	-0.479
	<b>P-value</b>	0	0.34	0.924	0	0.434	0.633
CSAD	<b>Coefficient</b>	0.142	0.015	-0.03	0.146	0.017	0.02
	<b>T-value</b>	8.451	0.718	-0.608	10.095	0.963	0.48
	<b>P-value</b>	0	0.474	0.544	0	0.337	0.632

is examined in both up and down market. The results indicate that impact of herding is present in extreme market condition.

TABLE 4.14.3: Presence of Herding During Extreme Market Conditions

		Industry		Market	
		Up	Down	Up	Down
CSSD		0.937	0.977	0.621	0.862
		(0.051)	(0.053)	(0.044)	(0.046)
CSAD		0.582	0.834	0.726	0.906
		(0.034)	(0.035)	(0.029)	(0.02)

Table 4.14.4 provides the impact of Covid-19 on herding during extreme market conditions. The results indicate that when herding is measured towards industry or market, herding is significantly different from rest of the period.

TABLE 4.14.4: Impact of Covid-19 on Herding During Extreme Market Condition

		Industry		Market	
		Up × Covid	Down × Covid	Up × Covid	Down × Covid
CSSD		0.715	0.218	0.426	0.263
		(0.128)	(0.17)	(0.1)	(0.155)
CSAD		0.41	0.27	0.287	0.205
		(0.084)	(0.118)	(0.072)	(0.101)

In Refinery sector impact of Covid-19 on returns is not present in sample companies. Covid-19 has no effect on the volatility No influence of Covid-19 on herding towards both industry and market is observed. During bullish and bearish period,

herding is same in both industry and market. During extreme market condition, effect of herding is present in both industry and market.

# Chapter 5

## Conclusion

This study investigates the existence of herding behavior and impact of Covid-19 in equity market and on herding in Pakistan. The analysis of monthly returns provides evidence of herding behavior and impact of Covid-19 on herding. The empirical results specify that during Covid-19 periods of extreme price movements, equity return dispersions tend to increase rather than decrease, hence providing indication against herd behavior.

Significant impact of Covid-19 on returns is found in Oil and Gas sector, in two companies of Technology (TRGP AND NTSL) and in one company of Refinery (NTRL) sectors but no impact of Covid-19 on returns is find in Fertilizer, Oil and Gas Marketing, Auto Mobile, Auto Parts, Cable and Electronics Marketing, Cement, Technology (PTC), Textile, Pharmaceuticals, Power and Generation, Engineering, Chemicals and Refinery (ATRL) sectors.

This study finds significant positive impact of Covid-19 on volatility of return is observed in Oil and Gas, in one company of Fertilizer (FFC), in three companies of Oil and Gas Marketing, in one company of Auto Parts (BWHL), in one company of Cement (LUCK), Technology, in one company of Textile (KTML), In one company of Pharmaceuticals (GLAX) and in one company of Power and Generation (KOTA) sectors. And insignificant impact of Covid-19 on volatility of return is find in Auto Mobile, Cable and Electronics Marketing, Engineering, Chemicals and Refinery sectors.

This study find significant impact of Covid-19 on herding behavior in Auto Parts, Cable and Electronics, Technology and Pharmaceutical sectors but no effect of Covid-19 on herding behavior is found in Oil and Gas, Fertilizer, Oil and Gas Marketing, Auto Parts, Cement, Textile, Power and Generation, Engineering, Chemicals and Refinery sectors. This study shows results observed by Christie and Huang (1995) method with results based on Chang et al. (2000) model insight. These results support the Gleason et al. (2004) argument that measure of dispersion used is relevant as market returns display same behavior for different proxies. The herding pattern is found similar during bullish and bearish period. It is worth mentioning that presence of herding is observed in all sectors during extreme market movement.

## 5.1 Policy Implications

This study provides:

1. Returns in different sector and its influenced by the Covid-19 in general .However, the returns of oil and gas sector are lower due to low mobility, low economic activity. So the sector that is directly connected with economic activities is affected.
2. The Covid-19 increased volatility in most of the sectors so investors should be vigilant that unsystematic risk may increases due to such uncertainties. This rising risk demands rate a risk measures.
3. The herding is observed in extreme market condition. However, find bullish and bearish trend different from herd behaviour. So investors be cautions in extreme condition and manage their risk exposure.

Future research can focus on herding behavior of institutional investors, and individual investors separately as this study tested only firm level herding.

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