Herding Spillover among the Stock Markets: Pakistan & China Covering Covid-19 and Its Repercussions

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Abstract

Herding behavior, a phenomenon known to exist in stock markets, where investors tend to mimic each other instead of using their own rational. Such an anomaly therefore leads the market to inefficiency as well as volatility. Hence it is crucial that, from time to time this phenomenon should be investigated in order to see where a certain market stands in terms of it performance in context to its efficiency. This study consists on investigating herding behavior and herding spillovers from one stock market to another, particularly in context to the Chinese and Pakistani stock markets. The data includes top 100 firms' daily returns from the Pakistani stock exchange and the Shanghai stock exchange. Cross sectional absolute deviation is calculated using Christie and Huang method to test herd formation. Based on running linear regression models, the results are further discussed in order to see how the stock markets have been performing from the time period of 1st January, 2010 to 31st December, 2020. Alongside herding behavior and herding spillover would also be investigated during the time of Covid-19 from 1st January, 2010 till 31st December, 2020.

Keywords: Herding Behavior, Herding Spillover, Herd Formation, Covid-19, Stock Markets

1. Introduction

From the perspective of the traditional finance researcher, the settings pertaining to finance are developed not only by the error prone and emotional Homo sapiens, but by the Homo economicus. Such that the homo economicus makes decisions in a perfect rational manner, exercises strong power in terms of processing having any available information and prefers the well stated fundamentals as per the expected utility theory. Having a child, spouse, boss or iota of self-intuition would tend to remark the assumption of Homo economicus to be false. Behaviorists in their financial approach tend to replace Homo economicus with a more prudent model of the financial actor (Bloomfield, 2010).

Throughout history, financial scholars and commentators have emphasized on the significant impact of human psychology on market outcomes and financial decision making. For example, the outstanding economist John Maynard Keynes (1964) implies that the decision making regarding the future cannot fully depend on mathematical expectations because of the element of uncertainty.

Following the first phase, in the second phase which was from the 1960s to the 1970s, neo-classical finance came into being while the primary allure attractions of this time period was the Efficient Market Hypothesis (EMH) as well as the Arbitrage Based Option Pricing theory alongside the Capital Asset Pricing Model (CAPM). The academic progress in the early stages included extensive analysis of literature without much theory to back it out. In regard to this context, (Fama, 1970) tried to illustrate this theory and hence aided in organizing the vast growing evidence based on keen observations. The efficient market theory was then presented in terms of a fair gone model by Fama, emphasizing that investors in terms of being confident, can go to the extent that a current market price of a certain security fully reflects all the available information about that certain security alongside the expected price based on the certain price would be consistent in context to its risk. Going one step even further, Fama argued that for a trading system, it would not be possible based on current available information to have excess returns on a persistent basis. Studies conducted by Bernerd & Thomas (1989) as well as Baruch (1989) alongside Benesh & Peterson (1986) which stated that the reason behind fluctuating stock prices was the revision of earning followed by the earnings surprises and the contribution in terms of the stock prices being positively correlated.

In today's world, a phenomenon of behavioral finance known as 'Herd Behavior' is considered to be quite common. To simply put it, Herd behavior is exhibited by a group of individuals who act without a centralized direction. Its nature is quite dynamic and it varies from time to time. In context of financial markets, herding tends to exist when investors trade in a similar approach. It seems as if investors follow others rationales instead of using their own thinking that others might have better information than them. Furthermore, herd behavior is a result of both certain and uncertain events. Certain events can include various economic or political changes in a country while uncertain events include natural disasters or the current pandemic Covid-19. All these events affect the stock market in either a positive manner or an adverse manner. Therefore, investors keeping in mind these changes tend to make decisions regarding their investments following their own rationales and considerations (Shair et al., 2021).

So either investors make decisions based on their own logic and rationales or they simply follow 'The Crowd'. Hence, it becomes of utmost importance that we should investigate whether herd behavior exists or not. So this study would

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focus on investigating the existence of herding behavior in context to the Pakistan and Chinese stock market extensively covering the recent years of the global pandemic: Covid-19 too. We intend to see how the investor's rationale has been influenced and whether they have exhibited herd behavior over the years or not.

2. Literature Review

Now there are many theories of herding according to empirical research. In today's evolving field of behavioral finance, the proposition of herding being a point of debate and being discussed quiet frequently in last two decades. Herding evolves, market participants restrict their own data or information and opinions or beliefs, and pursue the other investors footsteps, even if their own action contradicts the data at their disposal (Christie & Huang 1995; Ali et al., 2021).

The proposition of Herding is being defined further as "a group of investors trading in the same direction over a period of time." Since having the same set of data, resultant alternatives can be copied i.e., each other randomly or erratically. Frommel (2013) contends that multiple reasons may exist pertaining to herding behavior and cannot term the entire propositions as irrational. The proposition of Herding may also exist pertaining to logical or rational behavior. First theory relates to rational herding which states that Herding cannot be termed always being the outcome of erratic or irrational behaviour. Further, market participant's decisions can surface in relation to others way of decision, because of reasons being logical (Oehler & Chao 2000). Herding not only affects investors's returns but may also result in market inefficiencies (Arisanti and Oktavendi, 2020). For instance, it can be a herd of market agents who trade in similar patterns during the same period of time (Nofsinger & Sias, 1999) or may be the market participants tend to neglect their assessment initially and hence trade by copying trends relating to their previous trade encounters (Avery & Zemsky, 1998) or even it can be imitation on mutual basis according to (Welch, 2000) or it can be predictions of analysts being agreed excessively (DeBondt & Forbes, 1999) or an average concentrated behavior (Hirshleifer & Teoh, 2003) or correlation formof behavior (Hwang & Salmon, 2004) or it can be plausible that market agents following each other in and out based of the same securities (Sias, 2004) and so on so forth many other forms of descriptions. For instance, considering the time span around November 2010 where the vast European bonds sell off by the international market participants drove the Spanish ten-year bond yield to a staggering 5.35 percent which by the way was the highest ever recorded yield since 2002, along with the Portuguese bond yields to 7.23 percent as well as the Irish to 9.42 percent, while the euro observed a massive decline. To support the previous argument Welch (2000) stated that, "Herding in financial markets, inparticular, is often presumed to be pervasive, even though the extant empirical evidence is surprisingly sparse".

A profound popular question, is herding behavior rational? Well some researchers argue that in lieu of adequate circumstances herding can be a logical choice. For example, cash managers may get imitated by or mimic other cash managers in order to retain their own reputation or compensation. Young investors tend to know that if they make sound forecastor diverge from the unanimity, they most likely would end getting fired, as if in case of a bank crisis situation depositors aid to bank runs because they tend to see long lines of other depositors outside of the banks, then knowingly if they do not join those lines early, there might be no funds left for them (Diamond & Dybvig, 1983; Shair, 2020). Other than this, the term spurious herding is differentiated by (Bikhchandani & Sharma, 2000) who stated that such herding means where market agents face somewhat a similar information set driven by the core fundamentals and therefore make identical choices and furthermore, intentional decision is defined as phenomenon where market agents tend to have a tendency to copy other market agents in terms of behavior etc.

The concerns of reputation relating to labor markets with somewhat imperfect information and the urge to share blame when situations lead to uncertainty may tend to make managers mimic each other as a result (Scharfstein & Stein,1990; Shair et al., 2023). In another way, herd mentality may seem to be seen as away of insurance in contrast to under performance of the manger (Rajan, 2006).

A model developed by (Graham, 1999) suggested where investigators were more likely to execute herd mentality considering low ability and high reputation, for example, investigators with the goal to achieve high reputation tend to have incentives greater which they seem to hide in the unanimity so that they can preserve their reputation, while the investigators own information differs from the information of the unanimity and when positive correlation is observed pertaining to strong private signals regarding information. For instance, according to (Froot et al, 1992) suggest that as per their findings market agents having short term prospects may tend to perform herd mentality in order to gain insight what other market participants might know. An informational waterfall is observed in an optimal scenario where market agents tend to follow actions which are observable regarding the agents before them, hence neglecting their own logic and information (Bikhchandani et al., 1992). A model pertaining to choice making where it is logical for choice makers to view their choices made by early choice makers since the early choice makers may have some important concerning information that can prove to be useful for analyzing further choices in terms of fruitful prospects (Banerjee, 1992). A generalized choice model based on sequences where the choice maker will opt

on information acquired from early choices made neglecting private information as will future choice makers is explained by (Bikhchandani et al, 1992). They state an argument that despite desirability at a social level of outcome, the reason behind it might be logical as well as in accordance to (Welch, 1992). Here, it is crucial to note that informational waterfalls are linked in accordance of partial or complete aggregation of informational blockages, which thereforethe element of fragility to smaller informational jolts, stampedes and fads (Hirshleifer & Teoh, 2003) and others. Relating supporting work, with a touch of explored context of research, it was found that herding mentality in regards to informational waterfalls tends to be implausible, if informational structures are simple in nature and that the assumption of mechanisms of price are used (Avery & Zemsky, 1998). Furthermore, in a study experiment, herding mentality in the financial markets was reviewed extensively by (Cipriani & Guarino, 2005) who seemed to illustrate similar results as (Avery & Zemsky,1998) that were that when market agents tend to trade in order to gain information in a more or less frictionless market, herd mentality is unlikely to occur, although they observed that market agents pursued strategy that seemed contrarian or neglected information. Another experiment performed by (Drehmann et al, 2005) tested informational waterfalls in markets and it was found that herd mentality of this intensity was not plausible in a scenario of a more likely flexible market price. For example, it was argued that market agents are affected by factors of sociology which lead the investors to imitate the course of actions or doings of others during time periods of unanimity (Keynes, 1936). On another occasion it was demonstrated by (Baddeley et al, 2004) that even experts exhibit herd mentality including like employment of rules of heuristics, asymmetry and information scarcity. Other researchers distinguished the differentials between arbitrageurs who tend to be logical andnoise traders (Shleifer & Summers, 1990) & (Black, 1986) which means illogical market agents who act upon noise and whose behavior regarding trading is altered due to biases in a systematic manner. They infer that the market agents shift in demand in terms of assetsand alterations in the market agent values tend to be illogical and therefore cannot be justified or explained based on core values, for example, reaction of market agents in context to pseudo signals such as advices of financial gurus. From the point of view of (Shleifer & Summers, 1990) the scenario where a small percentage of market agents follow trends. Although it seems very interesting to note the illogical noise traders with unpredictable and inefficient inaccurate stochastic expectations may not jolt prices of the assets but also resultin obtaining returns of superior quality (DeLong et al., 1990, 1991). To elaborate further, (Barberis et al, 1998) describes a model which defines market agent's values which forecast market agent under reaction and over reaction to available information. The results are staggeringly in line with the empirical evidence which relates to drawbacks of judgement on a personal level under unanimity.

Christie & Huang, 1995 are of the view that research relating to experimental finance portrays that investors somewhat tend to form their opinions on basis of the collective actions of the market, although disagreeing with its predictions. The participation in terms of the early versus the later agents in the market can inspire the following behavior even further in a way that the early agents will add on in terms of contributions to the confinement of the information into the prices (Hirshleifer, Subrahmanyam & Titman, 1994). As per (Trueman, 1988), due to the significance of signaling by institutional investors, the nature of the financial markets can support herding behavior through the formation of herd externalities. (Burghoff & dressel, 2002) have also contributed by identifying the impact of information and the differential access to that information, particularly in the context of herding. Significantly, (Devenow & Welch 1996) made important contributions in terms of pointing out their most well-known applications to be in the banking industry during panicking situations, however, suggesting that evidence regarding the presence of herding behavior in other areas is not clear cut as of yet. Furthermore, it was pointed out by (Christie & Huang, 1995) that herding in equity markets did not occur during the time period of high price volatility or market stress. Later on, (Chang, Cheng & Khorana, 2000; Shair et al., 2021) found limited evidence of herding behavior in equity markets. According to (Bernhardt, Campello & Kutsoati, 2002) herding behavior has alsobeen observed with analysts' forecasts as well. On the contrary, (Olsen, 1996) found herding among analysts to be the reason for the explanation of the biases in the forecasts. He therefore associated herding in accordance to levels of anxiety experienced at the handsof investors that can be due to disagreements in opinions, a well-known characteristic of herders entrenched in the literature of psychology. To add on further (Olsen, 1996) arguedthat the levels of anxiety may well be high in case of analysts who on the basis of their forecasts are constantly evaluated. Hence concluding that herding frequently occurs whenthe forecasting tasks are of difficult nature. To support this argument, (Stickel, 1990) claims that analyst herding has been found to be quite particularly common in scenarios where there is a high proportion of estimates closer to the consensus.

3. Theoretical Framework

The theoretical framework is illustrated as follows:

Rm Market Returns	—	CSAD Cross Sectional Absolute Deviation

Where Market returns is the Independent Variable and Cross sectional absolute deviationis the dependent variable.

3.1. Hypotheses

The hypothesis of this study are as follows:

H1: To investigate whether herding behavior exists in the Pakistan Stock Exchange or not

H2: To investigate whether herding behavior exists in the Chinese Stock Exchange or not

H3: To investigate whether an uncertain event like Covid-19 has influenced herding behaviour in the stock market or not in context to Chinese and Pakistani Stock Exchange

H4: To investigate the herding spillover from Pakistan to Chinese Stock Market, if any and vice versa along with investigating herding spillover for both countries for Covid-19.

4. Research Methodology

The time series data used in this study is from the Pakistani Stock Market (PSX) and for China, it is the Shanghai Stock Exchange(SSX). Top one hundred firms daily returns are selected from each of the stock exchanges. The data ranges from the period from 2010 to 2020.

The methodology used in this study is of empirical nature in order to detect herding behavior in the Pakistani and Chinese stock markets. The proposed methodology is a lessstringent approach. Many methods have been described and used in order to detect herding behaviour pertaining to investors in the financial markets. The most widely used method was suggested by (Christie & Huang 1995) which stated detecting herd behavior in the market through dispersion. Christie & Huang (1995) were of the view that individuals tendto ignore their own information regarding stock prices during large price movements. When investors tend to follow the prevailing market behavior, the level of dispersion decreases in such a way as individual stock returns get close to market returns. The tool used to measure this dispersion is known as cross sectional standard deviation. It explainsthe dispersion from individual stocks to market returns.

The formula is illustrated below:

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{N}(R_{it}^2 - R_{mt}^2)}{N-1}}$$

....Eq.1

Where N is the number of stocks, R_{mt} is the market returns at the time, R_{it} is the stock returns and SSD_t is the cross sectional standard deviation on day t.

Later on, a modified approach was suggested by (Chang EC, Cheng JW, Khorana A 2000) which stated calculating the cross sectional absolute deviation. This model could detect herding behavior during less intense market movements. The formula is illustrated below:

$$CSAD_t = \frac{\sum_{i=1}^{N}|R_{it} - R_{mt}|}{N}$$

....Eq.2

Where N is the number of stocks, R_{mt} is the market returns at the time, R_{it} is the stockreturns and SAD_t is the cross sectional absolute deviation on day t. This model was constructed based on the assumptions of the capital asset pricing model (CAPM) which explained that in terms of dispersion there should be a linear relationship between the market and individual returns. If this was not the case, then it would be safe to say that herding does exist.

To test this non-linearity, the following model is proposed:

$$CSAD_t = B_0 + \beta_1 + |R_{mt}| + \beta_2(R_{mt}^2) + e_t$$

....Eq.3

This regression model would be denoted as equation 3 (Eq 3). According to the rational asset pricing model, β_1 should be positive and β_2 should be zero. If β_2 is negative, it wouldsuggest that herding exists. To further elaborate, herding would exist when there would bea non-linear and negative relationship between CSAD and market returns. A positive β_2 would indicate a linear relationship between market returns and CSAD, hence giving evidence to non-existent

herding behavior.

Moving on, to test herding spillover from one stock market to another, that is, for example,if we are to test herding spillover from the Chinese stock to the Pakistani stock market, thefollowing linear regression model will be used:

$$CSAD_{t,p}=\beta_0+\beta_1|R_{mt,p}|+\beta_2(R_{mt}^2{}_{,p})+\beta_3(CSAD_{t,c})+\beta_4(R_{mt}^2{}_{,c})+e_t.$$ ……………………………………….Eq.4

Where $CSADt$, is the cross sectional absolute deviation of Pakistan at time t, while the β is the beta values, also known as the coefficients. Rmt^2, is the square of market returns of Pakistan at time t. $CSADt, c$ denotes the cross sectional absolute deviation of China at time t. Rmt^2, c denotes the square of market returns of China at time t. This regression model is denoted as equation 4 (Eq 4).

To test herding spillover from Pakistani market to Chinese's stock market, the following linear regression model will be used:

$$CSAD_{t,c}=\beta_0+\beta_1|R_{mt,c}|+\beta_2(R_{mt}^2{}_{,c})+\beta_3(CSAD_{t,p})+\beta_4(R_{mt}^2{}_{,p})+e_t.$$ Eq.5

Where $CSADt$, is the cross sectional absolute deviation of China at time t, while the β is the beta values, also known as the coefficients. Rmt^2, is the square of market returns of China at time t. $CSADt, p$ denotes the cross sectional absolute deviation of Pakistan at time t. Rmt^2, p denotes the square of market returns of Pakistan at time t. This regression model is denoted as equation 5 (Eq 5).

Now, in the first herding spillover equation, if $\beta4$ is negative and significant, it indicates that herding spillover exists because of the spillover from the Chinese stock market to thePakistani stock market.

In case of the second herding spillover equation, if $\beta4$ is negative and significant, then itindicates that herding spillover exists because of the spillover from the Pakistani stock market to the Chinese stock market.

5. Proposed Analysis

The proposed analysis was carried out by running linear regression models in the following order to test herd formation. First the Cross sectional absolute deviation would be calculated for Pakistan, followed by the calculation to test herd formation for China. Then specifically for the time period ranging from 1st January, 2020 to 31st D2020 for Covid-19, cross sectional absolute deviation would be calculated for Pakistan and then for China. After this, the herding spillover was tested using cross sectional absolute deviation for Pakistan followed by China for the time period from 2010-2020 as well as for the Covid-19-time period.

5.1. Descriptive Statistics

The following table illustrates the descriptive statistics of the model, which includes the mean, standard deviation, Jarque-bera with its significance and the number of observationsfor the variables such as the squared market returns of Pakistan and China along with theCross sectional absolute deviation of Pakistan and China.

Table 1: Descriptive Statistics

	SQRR MPK	SQRRMCHI	CSADPK	CSADCHI
Mean	0.0001 63	0.00029 6	0.0246 35	0.0173 88
Std.Deviation	0.0008 96	0.00073 7	0.0137 43	0.0074 38
Jarque-Bera	1.62E+ 09***	381501. 6***	737888 03***	4131.8 92***
Observations	4352	4352	4352	4352

***significant at 1%

The above Table 1 is displaying the descriptive statistics of the different variables pertaining to the data set used in our study. The variable squared returns for Pakistan has a mean of 0.000163, a standard deviation of 0.000896 and total number of observations of4352. It is observed that higher standard deviation is consistent with the lower mean valuein case of the squared returns of Pakistan. While the variable squared returns for China hasa mean of 0.000296, a standard deviation of 0.000737 and total number of observations of4352. It is observed that higher standard deviation is consistent with the lower mean valuein case of the squared returns of China. The variable cross sectional absolute deviation of Pakistan has a mean of 0.024635, a standard deviation of 0.013743 and total number of observations of 4352. It is observed that lower standard deviation is consistent with the higher mean value in case of the cross sectional

absolute deviation of Pakistan. The variable cross sectional absolute deviation of China has a mean of 0.017388, a standard deviation of 0.007438 and total number of observations of 4352. It is observed that lower standard deviation is consistent with the higher mean value in case of the cross sectional absolute deviation of China. Jarque-Bera test provides significant evidence of non-normaldistribution for all the variables.

5.2. Unit Root Analysis

In order to test the problem of a unit root, we use Augmented Dickey Fuller unit test root.This test considers the null of the unit root problem vs alternative of no unit root. Data hasto be stationary in order to proceed with linear regression. If data set is not stationary, it means that the mean, median and variance are not time dependent. On the other hand, if data is non stationary then linear regression does not give reliable results. There are numbers of tests which are used to investigate the problem of unit root. Augmented DickerFuller test is commonly used in the literature. We use ADF unit root test to investigate thetime dependency of mean, median and variance.

Table 2: Unit Root Test

		ADF Test Stat	Critical Value (5%)
	CSAD	-13.21	-2.86
Pakistan	ABSRM	-12.71	-2.86
	SQRRM	-62.41	-2.86
	CSAD	-7.26	-2.86
China	ABSRM	-8.34	-2.86
	SQRRM	-13.09	-2.86

***, means significant at 1%

H0: Unit root exists H1: No unit root exits

Results of Unit root test for stationarity are reports above in Table 2. Since we could notreject the alternative of unit root, therefore, all the stock returns series are stationary at level.

6. Results and Discussion

Now we will move on towards the results and discussion of the linear regression models, they are as follows.
Results for investigating herding behavior in the Pakistani and Chinese Stock Markets using Equation 3:

Table 3: Regression analysis

Pakistan	Intercept	Absolute Returns	Squared Returns
Coefficients	0.021069***	0.257347***	8.656011***
	(0.0000)	(0.0000)	(0.0000)
China	Intercept	Absolute Returns	Squared Returns
Coefficients	0.012922***	0.451239***	-2.784254***
	(0.0000)	(0.0000)	(0.0000)

*, **, *** shows the significance at 10%, 5% and 1% respectively

In Table 3, for Pakistan, the coefficient value for absolute market returns at 0.257347 and for squared market returns at 8.656011. Both having a significant value of 0.0000. Forherding behavior to exist in the particular stock market, $\beta 2$ must be have a significant andnegative value, which in this case is the squared market returns. As per the results, the value for $\beta 2$ is positive equal to 8.656011 with a highly significant value of 0.0000. Henceit is concluded that for the time period ranging from 1st January, 2010 to the 31th December,2020, there was no herding behavior detected in the Pakistani stock market. In case of China, the coefficient values for absolute market returns at 0.451239 and for the squared market returns -2.784254. Both having a significant value of 0.0000. For herding behaviorto exist in the particular stock market, $\beta 2$ must be have a significant and negative value, which in this case is the squared market returns. As per the results, the value for $\beta 2$ is negative equal to -2.784254 being highly significant at 0.0000. Hence it is concluded thatfor the time period ranging from 1st January, 2010 to the 31th December, 2020, herding behavior was detected in the Chinese stock market, Shanghai stock exchange to be specific.
Results for investigating herding behavior in the Pakistani and Chinese Stock Markets (Covid-19) using Equation 3:

Table 4 :Regression analysis

Pakistan	Intercept	Absolute Returns	Squared Returns
Coefficients	0.020399***	0.296725***	7.762576**
	(0.0000)	(0.0099)	(0.0231)
China	Intercept	Absolute Returns	Squared Returns
Coefficients	0.013800***	0.299678***	-0.622010
	(0.0000)	(0.0000)	(0.5098)

*, **, *** shows the significance at 10%, 5% and 1% respectively

In Table 4, for Pakistan, the coefficient value for absolute market returns at 0.296725 and for squared market returns at 7.762576. Both having a significant value of 0.0099 and0.0231, respectively. For herding behavior to exist in the particular stock market, $\beta2$ mustbe have a significant and negative value, which in this case is the squared market returns.As per the results, the value for $\beta2$ is positive equal to 7.762576 with a significant value of 0.0231. Hence it is concluded that for the time period ranging from 1st January, 2020 to the 31th December, 2020, there was no herding behavior detected in the Pakistani stock market. For China, the coefficient values for absolute market returns at 0.299678 and for the squared market returns -0.622010. Having a significance value of 0.0000 and 0.5098, respectively. For herding behavior to exist in the particular stock market, $\beta2$ must be have a significant and negative value, which in this case is the squared market returns. As per the results, the value for $\beta2$ is negative equal to -0.622010 being insignificant at 0.5098. Hence it is concluded that for the time period ranging from 1st January, 2020 to the 31th December, 2020, herding behavior was not detected in the Chinese stock market, Shanghai stock exchange to be specific.
Results for investigating Herding Spillover behavior in the Pakistani and Chinese Stock Markets using Equation 4 for Pakistan and Equation 5 for China:

Table 5: Regression analysis

Pakistan	Intercept	Absolute Returns	Squared Returns	CSAD-China	Squared Returns-China
Coefficients	0.021676***	0.258163***	8.651934***	-0.040470*	0.304330
	(0.0000)	(0.0000)	(0.0000)	(0.0644)	(0.1708)
China	Intercept	Absolute Returns	Squared Returns	CSAD-Pakistan	Squared Returns-Pakistan
Coefficients	0.013274***	0.451721***	- 2.789515***	-0.016362*	0.285047*
	(0.0000)	(0.0000)	(0.0000)	(0.0894)	(0.0536)

*, **, *** shows the significance at 10%, 5% and 1% respectively

In Table 5, for Pakistan, the coefficient value for absolute market returns of Pakistan at 0.258163, squared market returns for Pakistan at 8.651934, cross sectional absolutedeviation of China at -0.040470 and squared market returns for China at 0.304330. All ofthem having significance values of 0.0000, 0.0000, 0.0644 and 0.1708, respectively. For herding spill over to exist in the Pakistani stock market from the Chinese stock market, $\beta4$must be have a significant and negative value, which in this case is the squared market returns of China. As per the results, the value for $\beta4$ is positive equal to 0.304330 with aninsignificant value of 0.1708. Hence it is concluded that for the time period ranging from1st January, 2010 to the 31th December, 2020, there was no herding spillover detected fromthe Chinese stock market to the Pakistani stock market. The data above illustrates, the coefficient value for absolute market returns of China at 0.451721, squared market returnsfor China at -2.789515, cross sectional absolute deviation of Pakistan at -0.016362 and squared market returns for Pakistan at 0.285047. All of them having significant values of0.0000, 0.0000, 0.0894

and 0.0536, respectively. For herding spill over to exist in the Pakistani stock market from the Chinese stock market, $\beta4$ must be have a significant and negative value, which in this case is the squared market returns of Pakistan. As per the results, the value for $\beta4$ is positive equal to 0.285047 with an insignificant value of 0.0536.Hence it is concluded that for the time period ranging from 1ˢᵗ January, 2010 to the 31ᵗʰ December, 2021, there was no herding spillover detected from the Pakistani stock marketto the Chinese stock market.

Results for investigating Herding Spillover behavior in the Pakistani and Chinese StockMarkets (Covid-19) using Equation 4 for Pakistan and Equation 5 for China:

Table 6: Regression analysis

Pakistan	Intercept	Absolute Returns	Squared Returns	CSAD-China	Squared Returns-China
Coefficients	0.018861***	0.292020**	7.825850**	0.102546	-0.717521
	(0.0000)	(0.0115)	(0.0224)	(0.1896)	(0.3721)
China	Intercept	Absolute Returns	Squared Returns	CSAD-Pakistan	Squared Returns-Pakistan
Coefficients	0.012610***	0.302725***	-0.664860**	0.049807**	0.287707
	(0.0000)	(0.0000)	(0.4813)	(0.1577)	(0.7988)

*, **, *** shows the significance at 10%, 5% and 1% respectively

In Table 6, for Pakistan, the coefficient value for absolute market returns of Pakistan at 0.29 2020, squared market returns for Pakistan at 7.825850, cross sectional absolute deviation of China at 0.102546 and squared market returns for China at -0.717521. All of them having significance values of 0.0115, 0.0224, 0.1896 and 0.3721, respectively. For herding spill over to exist in the Pakistani stock market from the Chinese stock market, $\beta4$ must be have a significant and negative value, which in this case is the squared market returns of China. As per the results, the value for $\beta4$ is negative equal to -0.717521 with aninsignificant value of 0.3721. Hence it is concluded that for the time period ranging from 1ˢᵗ January, 2020 to the 31ᵗʰ December, 2020, there was no herding spillover detected fromthe Chinese stock market to the Pakistani stock market. In case of China, the coefficient value for absolute market returns of China at 0.302725, squared market returns for China at -0.664860, cross sectional absolute deviation of Pakistan at 0.049807 and squared marketreturns for Pakistan at 0.287707. All of them having significance values of 0.0000, 0.4813,0.1577 and 0.7988, respectively. For herding spillover to exist in the Pakistani stock marketfrom the Chinese stock market, $\beta4$ must be have a significant and negative value, which inthis case is the squared market returns of Pakistan. As per the results, the value for $\beta4$ is positive equal to 0.287707 with an insignificant value of 0.7988. Hence it is concluded thatfor the time period ranging from 1ˢᵗ January, 2020 to the 31ᵗʰ December, 2020, there was no herding spillover detected from the Pakistani stock market to the Chinese stock market.

7. Conclusion

Starting from identifying the proposed literature gap and urging upon the significance about why it is crucial to investigate herding behavior as well as herding spillover from time to time in order to see the market performance in terms of its efficiency. This anomaly has shown itself to disrupt the market in contributing towards inefficiency, in some cases to say the least. After acquiring data and testing it through running regression analysis, thefollowing has been concluded.

For the proposed hypotheses, H1 and H2 in particular, herding behavior was not detectedin the Pakistani stock market whereas for the Chinese stock market, herding behavior was detected. For H3, during the period of Covid-19, herding behavior was not detected in either of the stock markets. For H4, which was to investigate the herding spillover from one stock market to another, there was no herding spillover detected from the Chinese stock market to the Pakistani stock market and vice versa. Whereas for the time period of Covid-19 no herding spillover was detected either from the Chinese stock market to the Pakistani stock market and vice versa.

In light of the existence of herding behavior pertaining to the Chinese stock market, as proved in hypothesis 2, it can be supported by Christie & Huang, (1995) as they are of theview that research relating to experimental finance portrays that investors somewhat tend to form their opinions on basis of the collective actions of the market, although disagreeing with its predictions. Many information models induce important yield insights into the herding behavior concept along with arguing the way the news circulates within the market, although such behavior might be in fact justifiable from a

standpoint in context of economic   rationality. The participation in terms of the early versus the later agents in the market can inspire the following behavior even further in a way that the early agents will add on in terms of contributions to the confinement of the information into the prices.

Furthermore, this study can further aid to other future studies in terms of providing scholars and researchers with insightful details regarding the herding behavior and herding spillover among stock markets. Also, this research can aid future research by either increasing the size of the data or the number of countries sample size, along with using more advanced econometric techniques to enhance the possibilities of investigating herding behavior and herding spillover, a step further.

References

Ali, M., Shair, W., ur Rahman, F., & Naeem, S. (2021). The relationship between cash flow volatility and dividend payout ratio: evidence from Pakistan's non-financial firms. *Empirical Economic Review*, *4*(2), 32-48.

Arisanti, I., and Oktavendi, T. W. (2020). Herding behaviour in sharia stock? the moderation effect of good governance business sharia disclosure. *J. Account. Invest*, 21, 45–60.

Avery, C., Zemsky, P., 1998. Multidimensional uncertainty and herd behavior in financial markets. *American Economic Review* 88, 724–748.

Barber, B. M., & Odean, T. (1999). The courage of misguided convictions. *Financial Analysts Journal*, *55*(6), 41-55.

Barberis, N., & Thaler, R. (2003). Behavioral finance. *George M. Constan*.

Bartels, L.M. (1988), Presidential primaries and the dynamics of public choice. Princeton, NJ: Princeton University Press.

Baruch, L. (1989). On the Usefulness of Earnings and Earnings Research: Lessons and Directions from Two Decedes of Empirical Research. *Journal of Accounting Research*, 22 supplement.

Benesh, G., & Peterson, P. (1986). On the Relation Between Earnings Changes, Analysts' Forecasts and Stock Price Fluctuations. *Financial Analysts Journal*, 42(6), 29-39.

Bernerd, B., & Thomas, J. (1989). Post Earnings Announcements Drift:Delayed Price Respons or Risk Premium. *Journal of Accounting Research*, 27 Supplement.

Bernstein, P. L. (1998). Against the Gods: The remarkable Story of Risk. USA: John Wiley and Sons.

Blasco de las Heras, N., Corredor Casado, P., & Ferreruela Garces, S. (2009). Herding behaviour generators in the Spanish stock market. *Revista Espanola De Financiacion Y Contabilidad-Spanish Journal Of Finance And Accounting*, *38*(142), 265-291.

Bloomfield, R. J. (2010). Traditional vs. behavioral finance. *Johnson School Research Paper Series*, (22-2010).

Branch, B. (1977). A Tax Loss Trading Rule. *Journal of Business,* 50(2), 198-207.

Branch, B., & Chang, K. (1985). Tax Loss Trading- Is the Game Over or Have the Rules   Changed? *Financial Review*, 20, 55-69

Calvo, G., Mendoza, E., 1998. Rational Herd Behavior and Globalization of Securities Markets. University of Maryland, Mimeo

Caparrelli, F., D'Arcangelis, A. M., & Cassuto, A. (2004). Herding in the Italian stock market: a case of behavioral finance. *The Journal of Behavioral Finance*, 5(4), 222-230.

Chang, E.C., Cheng, J.W. and Khorana, A. (2000). An examination of herd behavior in equity markets: an international perspective. *Journal of Banking and Finance*, 24(10), 1651-1679.

Chari, V.V., Kehoe, P., 1999. Financial Crises as Herds. Federal Reserve Bank of Minneapolis, Mimeo.

Chen, S. H., & Yeh, C. H. (2001). Evolving traders and the business school with genetic programming: A new architecture of the agent-based artificial stock market. *Journal of Economic Dynamics and Control*, *25*(3-4), 363-393.

Christie, W. G., & Huang, R. D. (1995). Following the pied piper: Do individual returns herd around the market? *Financial Analysts Journal*, *51*(4), 31-37.

Clement, M.B. and Tse, S.Y. (2005). Financial analyst characteristics and herding behavior in forecasting. *The Journal of Finance*, 60(1), 307-341.

De Bondt, W. F., & Forbes, W. P. (1999). Herding in analyst earnings forecasts: evidence from the United Kingdom. *European financial management*, *5*(2), 143-163.

Devenow, A., Welch, I., (1996). Rational herding in financial economics. *European Economic Review*, 40, 603– 615.

Diamond, D.W. and Dybvig, P.H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, 91(3), 401-419.

Diks, C., & van der Weide, R. (2005). Herding, a-synchronous updating and heterogeneity in memory in a CBS. *Journal of Economic Dynamics and Control*, 29(4), 741–763.

Fama, E. F. (1998). Market Efficiency, longterm returns and Behavioural Finance. *Journal of Financial Economics*, 49, 283-306.

Ge˛bka, B., & Wohar, M. E. (2013). International herding: Does it differ across sectors? *Journal of International Financial Markets Institutions and Money*, 23,55–84.

Gençay, R., & Gradojevic, N. (2010). Crash of '87 – Was it expected? Aggregate market fears and long-range dependence. *Journal of Empirical Finance*, 17(2), 270–282.

Glaser, M., Nöth, M., & Weber, M. (2003). Behavioral finance. *Rationalitätskonzepte, Entscheidungsverhalten und ökonomische Modellierung*, *3*.

Gleason, K. C., Lee, C. I., & Mathur, I. (2003). Herding behavior in European futures markets. *Finance letters*, *1*(1), 5-8.

Gradojevic, N., & Gençay, R. (2008). Overnight interest rates and aggregate market expectations. *Economics Letters*, 100(1), 27–30.

Gradojevic, N., & Gençay, R. (2011). Financial applications of nonextensive entropy. *IEEE Signal Processing Magazine*, 28(5), 116–141.

Herschberg, M. (2012). Limits to arbitrage: an introduction to behavioral finance and a literature review. *Palermo Business Review*, *7*(1), 7-21.

Hirshleifer, D., & Teoh, S. H. (2009). Thought and Behavior Contagion in Capital Markets, Chapter 1 of handbook of Financial Markets: Dynamic and Evolution. In T. Hens & K. Schenk-Hoppe (Eds.), Handbooks in Finance Series (pp. 1–56). New York: Elsevier/North Holland.

Javaira, Z., & Hassan, A. (2015). An examination of herding behavior in Pakistani stock market. *International journal of emerging markets*.

Joo, B. A., & Durri, K. (2015). Comprehensive review of literature on behavioural finance. *Indian Journal of Commerce and Management Studies*, *6*(2), 11.

Kanehman, D., & Tversky, A. (1972). Subjective Probablility:A Judgment of Representives. *Cognitive Psychology*, 3(3), 430-454.

Keynes, J. M. (1964). The general theory of employment, interest and money (1936). *The Collected Writings of John Maynard Keynes*, *7*, 1971-9.

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, 7(1), 77-91.

Maug, E., Naik, N., 1996. Herding and Delegated Portfolio Management. London Business School, Mimeo.

Montier, J., & Strategy, G. E. (2002). Applied Behavioural Finance: Insights into irrational minds and market. *Unpublished manuscript*.

Nofsinger, J. R. (2001). Investment Madness: How Psychology Affect Your Investing and What To Do About It. USA: Pearson Education.

Nofsinger, J. R., & Sias, R. W. (1999). Herding and feedback trading by institutional and individual investors. *The Journal of Finance*, 54(6), 2263-2295

Nofsinger, J. R., & Sias, R. W. (1999). Herding and feedback trading by institutional and individual investors. *The Journal of Finance*, 54(6), 2263-2295

Olsen, R. A. (2011). Financial risk perceptions: A behavioral perspective. In R. Yazdipour (Ed.), Advances in entrepreneurial finance with applications from behavioral finance and economics (pp. 45–68). New York: Springer.

Philippas, N., Economou, F., Babalos, V., & Kostakis, A. (2013). Herding behavior in REITs: novel tests and the role of financial crisis. *International Review of Financial Analysis*, 29, 66–174.

Rajan, R.G., 1994. Why credit policies fluctuate: a theory and some evidence. *Quarterly Journal of Economics*. 436, 399–442.

Rajan, R.G., 1994. Why credit policies fluctuate: a theory and some evidence. *Quarterly Journal of Economics*, 436, 399–442.

Ritter, J. R. (2003). Behavioral finance. *Pacific-Basin finance journal*, *11*(4), 429-437.

Schreiber, T. (2000). Measuring information transfer. *Physical Review Letters*, 85, 461– 464.

Shair, W. (2020). Is optimizing or non-optimizing objective of a firm in the Gig economy? A chronological approach. *Bulletin of Business and Economics (BBE)*, *9*(2), 101-105.

Shair, W., Naeem, S., & Rasul, F. (2021). Nexus of Covid-19 news with stock market returns and volatility in Pakistan. *Bulletin of Business and Economics (BBE)*, *10*(2), 92-99.

Shair, W., Majeed, M. T., & Ali, A. (2023). Labor participation decision and preferences towards different employment status in response to remittances in Pakistan. *Iranian Economic Review*, *27*(1), 135-152.

Shannon, C. E. (1948). A mathematical theory of communication. Bell System Technical Journal, 27(379–423), 623–656.

Shefrin, H. (2000). Beyond Greed and Fear: Understanding Behavioural Finance and The Psychology of Investors. New York: Oxford University Press.

Shefrin, H. (2001). Behavioural Corporate Finance. *Journal of Corporate Finance*, 14, 113124.

Shefrin, H. (2010a). How psychological pitfalls generated the global financial crisis. Voices of wisdom: Understanding the global financial crisis. New York: Springer.

Shefrin, H. (2010b). Behavioralizing finance. *Foundations and Trends in Finance*, 4, 1– 184.

Shefrin, H. (June 2007). Behavioural Finance: Biases, Mean-Variance Returns and Risk Premium. Equity Research and Valuation Techniques Conference (pp. 4-11). Boston: CFA.

Shiller, R. (2005). Irrational exuberance (2nd ed.). Princeton University Press.

Shiller, R. J. (1981, June). Do Stock Price Move Too Much to be Justified by Subsequent Changes in Dividends? *The American Economic Review,* 71(3), 421-436.

Shiller, R. J. (2000). Irrational Exuberance. USA: Princeton University Press.

Sias, R. (2004). Institutional herding. *Review of Financial Studies*, 17(1), 165–206.

Spyrou, S. (2013). Herding in financial markets: a review of the literature. *Review of Behavioral Finance*.

Stone, D., & Ziemba, W. T. (1993). Land and stock prices in Japan. *Journal of Economic Perspectives*, 7(3), 149-165.

Thaler, R. (1980). Towards a Positive Theory of Consumer Choice. *Journal of Economic Behavior and Organisation*, 1, 39-60.

Thaler, R. H. (2005). Advances in Behavioural Finance (e-Book) (Vol. 11).

Tseng, K. C. (2006). Behavioral finance, bounded rationality, neuro-finance, and traditional finance. *Investment Management and Financial Innovations*, (3, Iss. 4), 7-18.

Tversky, A., & Kahneman, D. (1986). Rational Choice and The Framing of Decisions. *The Journal of Business*, 59(4), S251-S277.

Tversky, A., & Kahneman, D. (1991, November). Loss Aversion in Riskless Choice: A Reference-Dependent Model. *The Quarterly Journal of Economics*, 1039-1062.

Uzar, C., & Akkaya, G. C. (2013). The Mental and Behavioural Mistakes Investors Make. *International Journal of Business and Management Studies,* 5(1), 120-128.

Welch, I. (2000). Herding Among Security Analysts. *Journal of Financial Economics*, 15(3).