Pakistan Journal of Social Research
ISSN 2710-3129 (P) 2710-3137 (O)
Vol. 4, No. 4, December 2022, pp. 664-682.
www.pjsr.com.pk

DYNAMICS OF HERDING BEHAVIOUR DURING EXTREME MARKET MOVEMENTS IN CHINA AND PAKISTAN

Kamran Ahmed*
PhD Scholar, Department of Management Sciences, COMSATS University Islamabad, Wah Campus, Pakistan
kamran.wah@gmail.com

Khuram Shafi
Associate Professor, Department of Management Sciences, COMSATS University Islamabad, Wah Campus, Pakistan
drkhuramshafi@ciitwah.edu.pk

Samina Nawab
Professor, Department of Management Sciences, COMSATS University Islamabad, Wah Campus, Pakistan
samina@ciitwah.edu.pk

ABSTRACT
This paper investigates herding behaviour in China and Pakistan by using dynamic herding approaches and herding during extreme market movements. We use daily returns of the Shanghai stock exchange (SSE) and Pakistan stock exchange (PSX) from 2006 to 2021. Several models are used to study herding, such as least squares model, generalized linear model, and Bai and Perron's structural change model. Overall, results through the linear model show that China has significant herding, but no herding is found in Pakistan. According to Bai and Perron's model, herding is evident in two different regimes of both countries. The first regime shows herding during USA global financial crisis of 2008. The second regime was during the Hong Kong protest, which drove herding in China. In Pakistan, herding is found during political crisis and terrorism activities. From the perspective of extreme market movements, China and Pakistan both showed herding during 10% values. Contrary, no herding was found during 1% values, but Pakistan showed herding during 5% values at both extremes, and China only showed herding during the upper extreme. Hence, herding should be measured at 10% rather than 5% and 1%.
Keywords: Behavioural finance, herding behaviour, extreme market movements, cross-sectional absolute deviation, structural change model.
Jel classification: G01, G11, G12.

INTRODUCTION
Traditional finance is different from behavioural finance. In traditional finance, investing in the stock market helps to increase capital, gain dividends, and hedge currency devaluation (Richard & Bradley, 1998). The other important characteristic that makes investment in stock market attractive compared to other investments is its liquidity (Hussain et al., 2022). Usually, in traditional finance, asset prices are solely determined through potential returns (Sharpe, 1964). On the contrary, De Long et al. (1990) argued that emotions also play a significant role in decision-making. The use of emotions in finance is termed as behavioural finance. In behavioural finance, investors' decisions are influenced by the cognitive biases and emotions that they experience during uncertain conditions or crises that cause financial anomalies (Ritter, 2003; Shiller, 2003). Such anomalies lead to market inefficiency (Chang et al., 2000; Yousaf et al., 2018). Herding is one of the market anomalies in which investors mimic others' decisions by ignoring their own beliefs (Nofsinger & Sias, 1999). Herding behaviour is defined as an investor's clear intention to imitate the actions of other investors (Bikhchandani & Sharma, 2000).

Herding is considered a threat to market stability because of blind trust in others' decisions (Yasir & Önder, 2022). To avoid this instability, the investor tries to find new markets to invest in, and

* Corresponding Author

there is a chance that the new market also has herding. In this case, the investor fails to judge this situation leading them to a considerable loss. The same happened during the USA housing crisis when Lehman Brothers collapsed (Bekiros et al., 2017). Therefore, herding in the financial market is a hot topic for economists and investors. Economists are interested in how behavioural finance affects stock prices. On the other hand, investors are interested in herding because it could lead to attractive trading opportunities (Tan et al., 2008). The empirical investigation of herding is crucial because it helps to clarify whether investors in the financial markets act in a coordinated manner or not (Khan & Rizwan, 2018). However, herding may cause cluster decision-making, but this is not certain (Cipriani & Guarino, 2014; Hirshleifer & Teoh, 2009).

This study investigates herding in China and Pakistan. The Chinese market is considered an emerging market (Yasir & Önder, 2022), whereas the Pakistan stock market is a developing one (Khan & Rizwan, 2018). We examined the Chinese market because (a) it was a controlled market for a very long time; (b) it behaves in an unpredictable manner, and (c) high turnover of foreign investors during the last few years. Pakistan is highly vulnerable to global economic developments; therefore, several reasons are mentioned below for studying Pakistan: (a) very few dominant institutional investors are present in the market, (b) foreign portfolio investment exposure; and (c) immature market participants (Hussain et al., 2022; Tauseef, 2022).

Most of the literature has used a linear model to study herding behaviour. This linear approach provides an *overall* presence of herding but does not provide results based on different time spans. As it is evident from the literature that, *overall*, herding cannot be generalized throughout different time spans. This research uses ordinary least squares (OLS) and structural change models to study herding in China and Pakistan. We also use extreme market movements to investigate herding behaviour based on the 10%, 5%, and 1% data sets. The literature on herding mostly deals with individual studies of extreme values. A research gap exists in comparing all three data sets with extreme values of 10%, 5%, and 1%. Therefore, this research investigates herding with three data sets of extreme values. The remaining paper includes a literature review, methodology, results, and conclusion.

REVIEW OF LITERATURE

Herding behaviour is the tendency of investors to imitate what other investors do blindly. Banerjee (1992) defines herding behaviour as people doing what everyone else does instead of using their knowledge. It is also described by Grinblatt et al. (1995) as the extent to which groups of people purchase or sell the same stock simultaneously. The literature suggests that an individual's actions can be influenced by their peers (Andreoni & Bernheim, 2009). As a result, they are more helpful to members of their group (Chen & Li, 2009). According to BenSaïda (2017), herding behaviour is measured through two types (i) herding among institutional investors, such as fund managers and other financial analysts by using transactional data (Lakonishok et al., 1992; Nofsinger & Sias, 1999), and (ii) by changes in individual stock returns' dispersion (Babalos et al., 2015; Litimi et al., 2016).

In literature, herding behaviour is investigated in different stock markets of several countries, for instance, USA (Yasir & Önder, 2021), Australia (Espinosa-Méndez & Arias, 2021), Egypt (Boubaker et al., 2015), China (Chen & Ru, 2021), Pakistan (Kashif et al., 2021) and Taiwan (Huang et al., 2015).

Herding in Chinese stock market

Chen and Ru (2021) used the model of Chen and Lux (2018) simulated method of moment estimator to investigate herding in China. The researchers found that both large and small-cap stocks herd during the crisis. They also found that large stocks herd more before crises and small stocks herd more during and after crises. Chen and Zheng (2022) also used the simulated moment estimator method to study herding in the markets of China and USA. They found herding behaviour in both stock markets. Herding in China is mainly driven by behavioural dynamics, while fundamental factors drive the USA market.

Wu et al. (2020) examined herding in China during COVID-19 and under extreme market conditions. The researchers found that herding is more prominent for upward market movement, lower trading volume, and lower market volatility. Sharma et al. (2015) reported herding in China. They investigated herding during up and down markets and found that herding in up-market is more significant than in down markets. Sharma and colleagues concluded that herding in some sectors is more prominent after comparing herding in different sectors during different times.

Zheng et al. (2015) investigated how institutional herding affects Chinese stock market. According to them, short-term and long-term stock returns are positively associated with herding behaviour. Herding is more prominent on the buying side and during a crisis, whereas the herding effect is high for the high-return stock. When institutional investors herd on a larger scale, the effect is assertive herding behaviour in China, but this effect is for a shorter period. Other researchers also found herding in China (Tan et al., 2008; Yao et al., 2014).

Demirer and Kutan (2006) explored herding in China using firm and sector-level data along with the herding during up and down markets. They found that herding does not exist in the Chinese stock market, and the stock returns are more dispersed during high index movements. Demirer and Kutan (2006) also found that adverse market movements showed substantially lower volatility in stock returns. Fu (2010) investigated herding and investors' asymmetric reactions to good and bad news in China. Fu (2010) found that herding is not present in the equity market.

Herding in Pakistan stock market

Malik and Elahi (2014) examine herding behaviour in the Karachi stock exchange (KSE) using OLS and quantile regression analysis for normal, bullish, and bearish markets. The data is ranged from 2003 to 2013. The results showed that herding exists in these markets. Greed encourages risky investments, so investors tend to follow each other and ignore rational analysis. Herding is essential to study because investor mistakes can lead to inefficient asset pricing. Sabir et al. (2019) aim to determine how overconfidence and investment experience affect herding behaviour among KSE investors. They used quantitative and cross-sectional methods by surveying 352 KSE investors. The structural equation model was assessed using partial least square (PLS). They found that overconfidence and investment experience motivate investors to herd, and financial literacy moderately affects the cognitive profile-herding behaviour relationship.

Sabir et al. (2020) researched the moderating role of Islamic religiousness on investor herding behaviour. One hundred sixty-six individual investors were surveyed for quantitative research. Their research concluded that Islamic religiosity moderates demographic factors and herding behaviour. The younger investors tend to herd due to inexperience, and low-income investors are risk-averse and follow others' investment decisions. Using different models, Kashif et al. (2021) examine herding behaviour and how it responds to asymmetric market conditions. They used time series data from 2000-2016. They also reported herding in Pakistan over the entire sample period, and it was more significant under extreme market movements, market volatility, and financial crisis.

Qasim et al. (2019) examine how herding and overconfidence affect Pakistan's investors' decisions. They collected data from 100 stocks. OLS was used to test the relationships between investors' decision-making, herding, and overconfidence. Their result reveals that herding and investor overconfidence influenced investors' decisions. Tauseef (2022) investigated investors' herd behaviour for calendar events and stock portfolio sizes. He considered three calendar effects: (a) crises (COVID-19 and other financial crises), (b) political news announcements, and (c) popular calendar anomalies (month-of-the-year and day-of-the-week). They worked on the firm-level daily data for 496 KSE stocks from 2001–2020. All three calendar effects showed herding along with the herding in the largest and smallest stocks over time.

Some researchers found different results in which herding was not found in Pakistan. For instance, Jabeen and Salman (2019) calculated herding using a Chiang and Zheng model (2010). The findings indicated that herding did not take place in Pakistan. Kiran et al. (2020) investigated herding across all levels of market movement and found no evidence of herding.

Extreme market movements

As discussed earlier about the studies on extreme market moup and down markets (Demirer & Kutan, 2006; Fu, 2010; Sharma et al., 2015). The extant literature only studies one data set, neglecting the comparison based on the different extreme market movements. Therefore, the current research addresses this void by investigating herding behaviour during extreme market movements through three data sets (e.g., 10%, 5%, and 1%).

RESEARCH METHODOLOGY

Data

The data for this research are collected from China and Pakistan. Both countries are emerging and developing markets, respectively (Khan & Rizwan, 2018; Yasir & Önder, 2022). We examined the

Chinese market because (a) it was a controlled market for a very long time; (b) it behaves in an unpredictable manner, and (c) high turnover of foreign investors during the last few years. Pakistani market has: (a) very few dominant institutional investors, (b) foreign portfolio investment risk; and (c) immature market participants (Hussain et al., 2022; Tauseef, 2022). We obtained the daily data on stock indices and individual stocks from Shanghai stock exchange (SSE) and Pakistan stock exchange (PSX). The data ranged from January 2006 to December 2021. This period includes the 2007–2008 USA global financial crises and the COVID-19 pandemic. In order to measure herding in extreme market movements, the data was sorted out from highest to lowest values; afterwards, they were selected and modelled based on 10%, 5%, and 1% values.

General model

We used Chang et al. (2000) to measure herding in the selected countries by using cross-sectional absolute deviation (CSAD). This measure can be used through eq. 1:

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

Where,

N = number of firms in the portfolio

$R_{i,t}$ = the stock returns (observed)

$R_{m,t}$ = the cross-sectional average returns

The relationship between CSAD and returns is derived through the eq. 2 (Chang et al., 2000; Economou et al., 2011):

$$CSAD_t = \gamma_o + \gamma_1\left|R_{m,t}\right| + \gamma_2 R_{m,t}^2 + e_t \quad (2)$$

γ_2 is the coefficient used to capture the non-linearity between CSAD and market returns. Herding only exists when γ_2 is negative and significant (Economou et al., 2011).

Bai and Perron Structural change approach

OLS provides an *overall* presence of herding but does not provide results based on different time spans. To study the indepth analysis of data, we adopted Bai and Perron (1998) model to investigate the unknown structured breaks. The model is given in eq. 3:

$$CSAD_t = \gamma_{o1} + \gamma_{11}\left|R_{m,t}\right| + \gamma_{21}R_{m,t}^2 + \varepsilon_t, \qquad t = T_1\ to\ T_m \quad (3)$$

Where we considered T_1 to T_m as unknown break points.

By minimizing the sum of square residuals (SSR), this study obtained the least square estimator in eq.4:

$$= \sum_{i=1}^{m+1}\sum_{t=T_{i-1}+1}^{T_i}\left(CSAD_t - \gamma_{o1} - \gamma_{11}\left|R_{m,t}\right| - \gamma_{21}R_{m,t}^2\right)^2 \quad (4)$$

To find numbers of breaks, we used a test for no breaks vs fixed number of breaks *[Sup $F_r(K)$Test]* (Bai & Perron, 1998, 2003).

Extreme market movements

The data was sorted out from highest to lowest values to measure herding behaviour in extreme market movements. Afterwards, they were selected and modelled based on the 10%, 5%, and 1% value data set. We use eq. 5 and eq. 6:

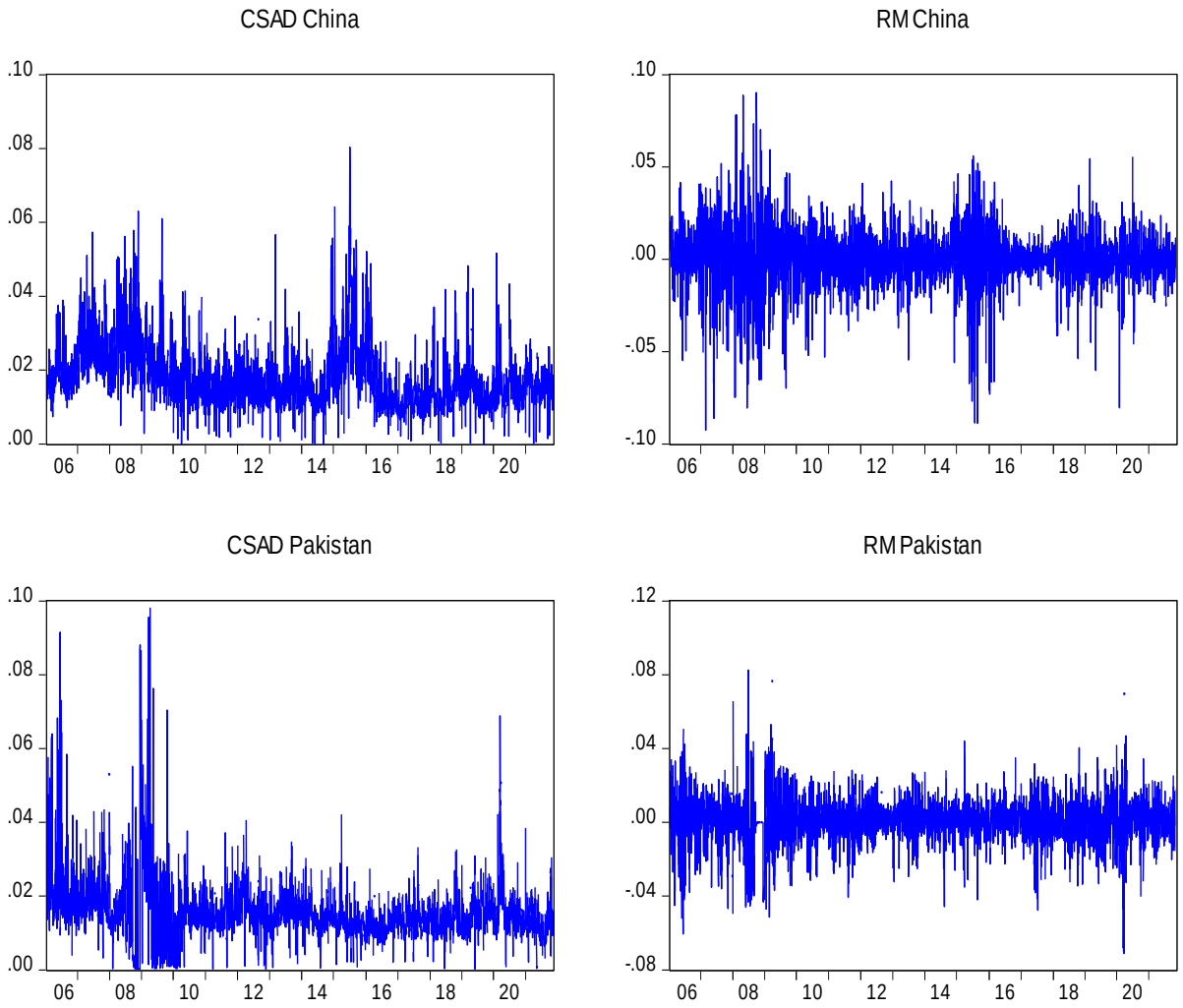
$$CSAD_t^{up} = \gamma_o + \gamma_1^{up}\left|R_{m,t}^{up}\right| + \gamma_2^{up}\left(R_{m,t}^{up}\right)^2 + e_t \quad (5)$$

$$CSAD_t^{Down} = \gamma_o + \gamma_1^{Down}\left|R_{m,t}^{Down}\right| + \gamma_2^{Down}\left(R_{m,t}^{Down}\right)^2 + e_t \quad (6)$$

Graphical representation of the data

The graphical representation of the whole set of data is given in figure 1.

Figure 1. Graphical representation of the data



RESULTS

Descriptive statistics

Table No. 1 Descriptive statistics

Country	Variables	Mean	Median	Standard deviation	Jarque-Bera
Pakistan	CSAD	0.0158	0.0145	0.0085	56455.99***
	$R_{m,t}$	0.0004	0.0006	0.0125	2595.898***
China	CSAD	0.0178	0.0159	0.0090	5226.006***
	$R_{m,t}$	0.0002	0.0008	0.0159	4071.991***

Note(s): *** represents the level of significance at 1%

The descriptive statistics show that CSAD China has the highest mean and median values. Contrary, $R_{m,t}$ China has the lowest mean value and $R_{m,t}$ Pakistan has the lowest median value (see Table 1). The CSAD Pakistan has the lowest standard deviation and $R_{m,t}$China has the highest value of standard deviation. All Jarque-Bera test statistics are significant at the 1% level, which supports the existence of non-normal distributions in the data.

Regression analysis

Equation 2 is used to determine overall herding behaviour. When a herding anomaly is present in any data set, the coefficient (γ_2) of squared market return ($R^2_{m,t}$) has a negative and significant value (Chang et al., 2000). Table 2 estimates the herding equation using the least squares and generalized linear models. Both models show the same results. The result described that γ_1 for China and Pakistan is positive and significant, which means that $R_{m,t}$ has a positive effect on CSAD in both countries. In China, the coefficient γ_2 of $R^2_{m,t}$ is negative and significant, demonstrating the presence of herding in the Chinese stock market. Chong et al. (2017) also reported similar results. In Pakistan, coefficient γ_2 of $R^2_{m,t}$ is negative but insignificant, which demonstrated that herding is not present in Pakistan stock market. The similar result was reported in Pakistan stock market by Javaira and Hassan (2015).

Table No. 2 Regression models

Countries	Exchange	Least Squares Linear Model			Generalized Linear Model		
		γ_o	γ_1	γ_2	γ_o	γ_1	γ_2
China	**SSE**	0.014	0.386*** (17.666)	-1.663*** (-4.497)	0.01404	0.386*** (17.666)	-1.663*** (-4.497)
Pakistan	**PSX**	0.011	0.521*** (18.039)	-0.907 (-1.331)	0.01144	0.521*** (18.039)	-0.907 (-1.331)

Note(s): *, **, *** represents the level of significance at 10%, 5% and 1%. t-statistics are reported in parenthesis

Herding behaviour using Bai and Perron approach

Table No. 3 Bai and Perron model

China Breaks Dates				Pakistan Breaks Dates			
9/08/2009, 11/19/2013, 4/01/2016, 10/09/2018				5/20/2009, 9/26/2011, 4/28/2014, 4/08/2019			
Coefficients	γ_o	γ_1	γ_2	**Coefficients**	γ_o	γ_1	γ_2
Regime 1 11/03/2006 9/04/2009	0.021	0.219*** (5.610)	-1.664*** (-2.760)	**Regime 1** 1/03/2006 5/19/2009	0.012	1.001*** (21.025)	-9.600*** (-9.779)
Regime 2 9/08/2009 11/18/2013	0.015	0.014 (0.223)	3.942** (2.192)	**Regime 2** 5/20/2009 9/23/2011	0.011	0.152 (1.344)	14.658*** (3.676)
Regime 3 11/19/2013 3/31/2016	0.015	0.528*** (14.255)	-2.142*** (-4.227)	**Regime 3** 9/26/2011 4/25/2014	0.016	0.309*** (2.454)	-2.272 (-0.420)
Regime 4 4/01/2016 10/08/2018	0.011	0.143 (1.310)	2.766 (0.756)	**Regime 4** 4/28/2014 4/05/2019	0.011	0.399*** (6.028)	-5.788*** (-2.726)
Regime 5 10/09/2018 12/01/2021	0.013	0.291*** (4.776)	-0.971 (-0.738)	**Regime 5** 4/08/2019 12/01/2021	0.012	0.298*** (4.998)	1.654 (1.367)

Note(s): *,**,*** represents the level of significance at 10%,5%, and 1%. t-statistics are reported in parenthesis.
The number of regimes is determined according to Sup F test results by Andrews (1993).
Trimming is at 15%.
The maximum number of breaks is 5.

Bai and Perron's approach is used to find robustness in the result that is given in table 3. The Sequential *Sup F Test* determines the number of breaks (Andrews, 1993). Regime one is from 11/03/2006 to 9/04/2009, including the USA global financial crisis of 2008. In this regime, we found significant evidence of herding in the Chinese stock market, as the herding coefficient in regime one is -1.664 and is significant at a 1 % level; the result of this study is in line with the result of Yasir and

Önder (2022) who found herding in Chinese stock market during global financial crises time, but no evidence of herding during post-financial crisis, regime four, and regime five. Regime five covers the COVID-19 pandemic. However, in regime three, from 11/19/2013 to 3/31/2016, we found significant evidence of herding in the Chinese stock market, as the herding coefficient in regime three is -2.142 and is significant at 1 %. This period includes the Hong Kong protest in 2014 and the collapse of the Chinese stock market in 2015. The result of this regime is in line with the results of Chiang and Zheng (2010).

The Pakistan results also show four breaks and five regimes. Regime one from 1/03/2006 to 5/19/2009 shows strong evidence of herding in Pakistan stock exchange during USA financial crisis of 2008 as the coefficient value is -9.600 and is significant at a 1% level. We found no evidence of herding behaviour in post-crisis regimes, i.e., regime two, three, and five. However, in regime four, we found strong evidence of herding with the coefficient value of -5.788 and significance at a 1% level. The regime is from 4/28/2014 to 4/05/2019, covering many events in Pakistan, including Imran Khan's protest for 126 days in 2014, Army Public school attack in 2014, the Lahore blast in 2016, Prime minister Nawaz Sharif's disqualification in 2017, Tehreek Labbaik protest 2017, unrest political and security conditions in 2018, followed by the general election. Due to these events, herding exists in this regime in Pakistan.

Extreme market conditions

Table No. 4 Extreme market movements

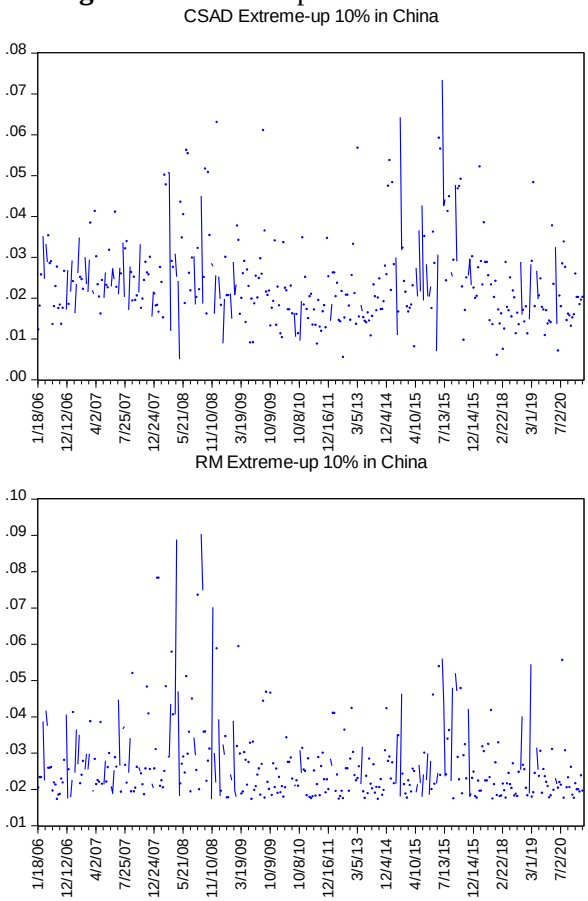
	China			**Pakistan**		
Coefficients	γ_o	γ_1	γ_2	γ_o	γ_1	γ_2
Extreme Up 1 %	-0.041	2.529 (1.422)	-20.238 (-1.443)	0.017	0.798*** (0.292)	-6.933 (-0.282)
Extreme Up 5 %	0.016	0.405*** (3.440)	-2.014** (-2.006)	-0.011	1.820*** (4.776)	-15.388*** (-3.387)
Extreme Up 10 %	0.013	0.481*** (5.577)	-2.286*** (-2.656)	0.003	1.100*** (6.006)	-7.768*** (-3.036)
Extreme Down 1 %	0.009	0.630 (0.286)	-4.388 (-0.282)	0.154	-4.518 (-0.962)	40.392 (-0.941)
Extreme Down 5 %	0.013	0.471* (1.828)	-2.879 (-1.159)	-0.002	1.378*** (2.858)	-12.827*** (-2.0812)
Extreme Down 10 %	0.013	0.467*** (3.632)	-2.859** (-1.975)	0.002	1.136*** (5.392)	-10.111*** (-3.104)

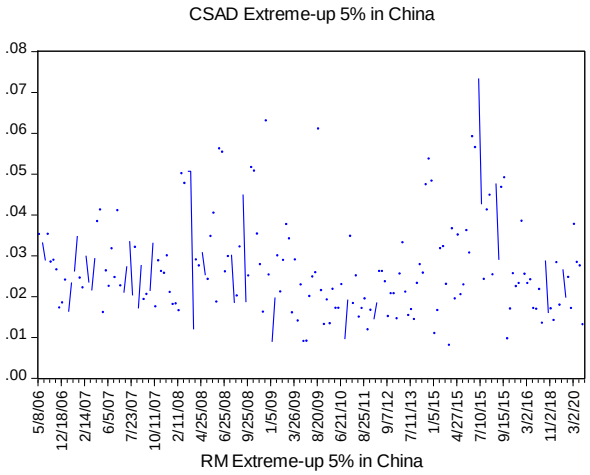
Note(s): *,**,*** represents the significance at 10%,5%, and 1% level. t-statistics are reported in parenthesis.

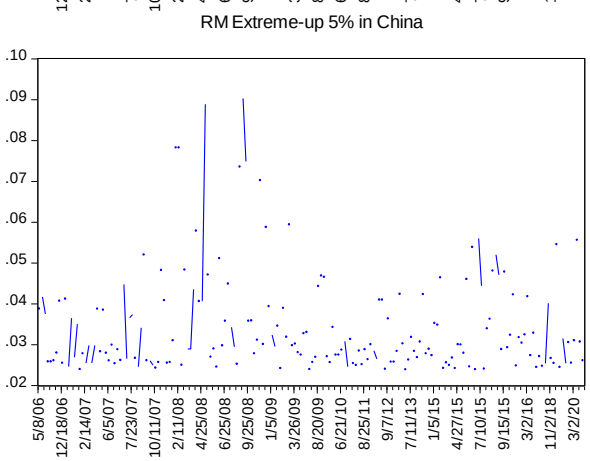
Table 4 summarises the herding during extreme conditions through different data sets. The result described that no evidence of herding is found in China and Pakistan with the data set of 1% extreme up and down market movements. The data set with 5% extreme up and down market showed herding in Pakistan, but no herding in China during the lower extreme. During 10% extreme up and down market herding is found in both markets, but the significance level is different. In China, it is significant at a 5% level, but in Pakistan, it is significant at a 1% level.

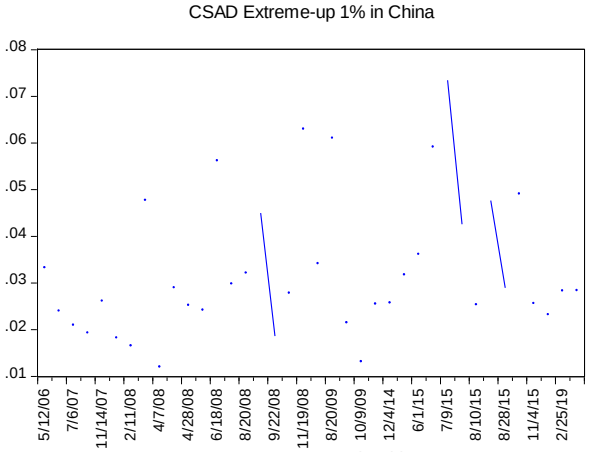
The visual depiction of the data is given in figures 2 to 5. These figures have two columns: the left column provides CSAD, and the right column depicts RM.

Figure. 2 Extreme-up movements in China




CSAD Extreme-up 5% in China
.08
.07
.06
.05
.04
.03
.02
.01
.00
5/8/06
12/18/06
2/14/07
6/5/07
7/23/07
10/11/07
2/11/08
4/25/08
6/25/08
9/25/08
1/5/09
3/26/09
8/20/09
6/21/10
8/25/11
9/7/12
7/11/13
1/5/15
4/27/15
7/10/15
9/15/15
3/2/16
11/2/18
3/2/20


RM Extreme-up 5% in China
.10
.09
.08
.07
.06
.05
.04
.03
.02
5/8/06
12/18/06
2/14/07
6/5/07
7/23/07
10/11/07
2/11/08
4/25/08
6/25/08
9/25/08
1/5/09
3/26/09
8/20/09
6/21/10
8/25/11
9/7/12
7/11/13
1/5/15
4/27/15
7/10/15
9/15/15
3/2/16
11/2/18
3/2/20


CSAD Extreme-up 1% in China
.08
.07
.06
.05
.04
.03
.02
.01
5/12/06
7/6/07
11/14/07
2/11/08
4/7/08
4/28/08
6/18/08
8/20/08
9/22/08
11/19/08
8/20/09
10/9/09
12/4/14
6/1/15
7/9/15
8/10/15
8/28/15
11/4/15
2/25/19

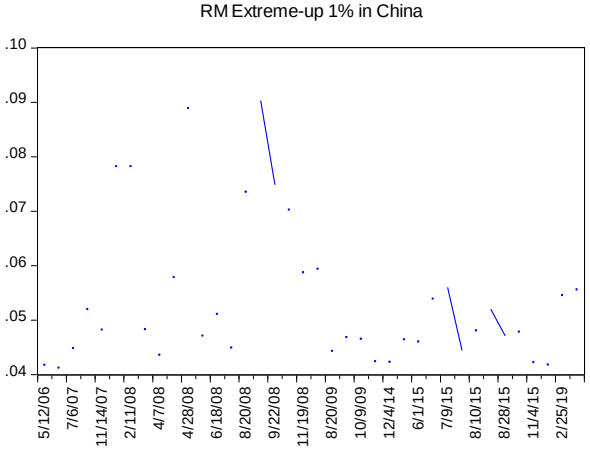
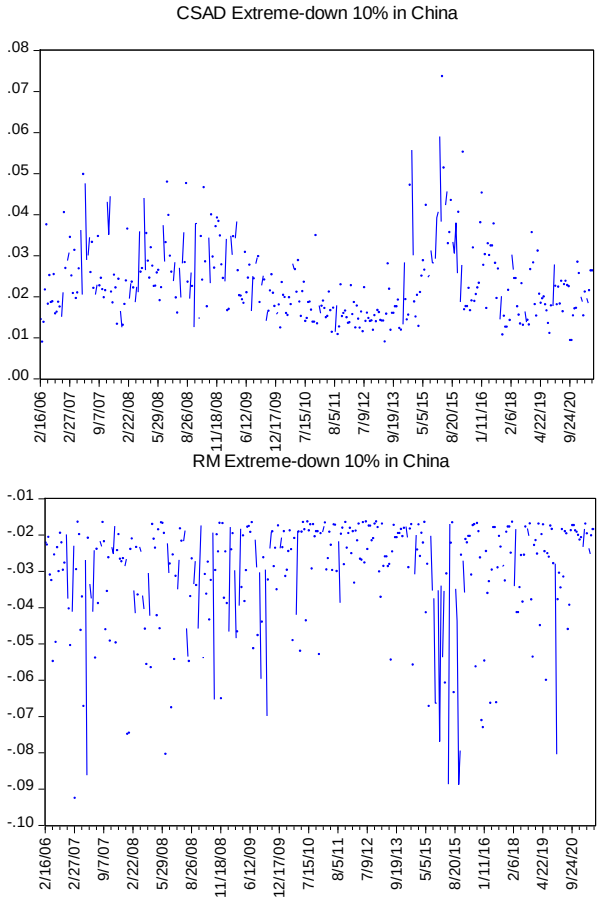
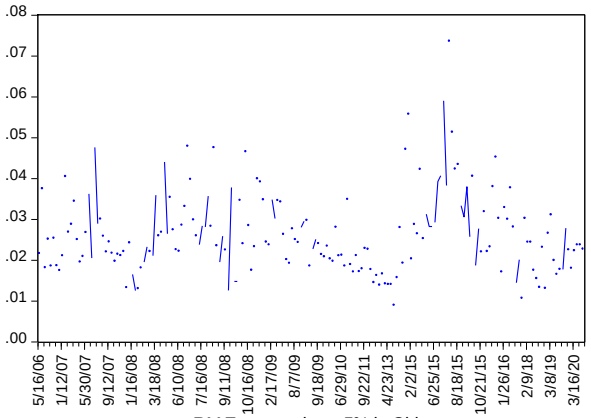

RM Extreme-up 1% in China
.10
.09
.08
.07
.06
.05
.04
5/12/06
7/6/07
11/14/07
2/11/08
4/7/08
4/28/08
6/18/08
8/20/08
9/22/08
11/19/08
8/20/09
10/9/09
12/4/14
6/1/15
7/9/15
8/10/15
8/28/15
11/4/15
2/25/19

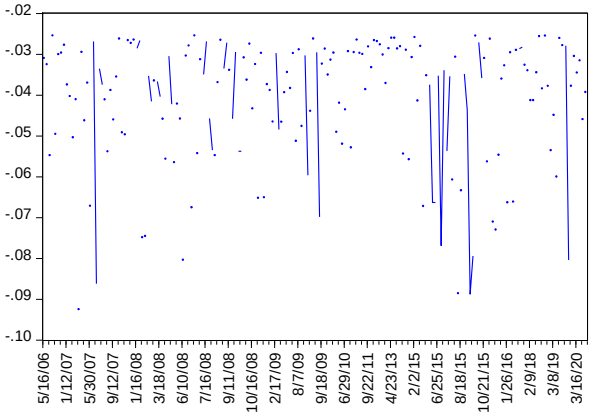
Figure. 3 Extreme-down movements in China



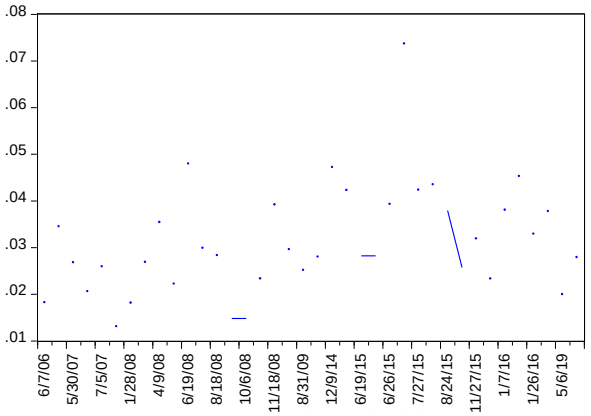
CSAD Extreme-down 5% in China



RM Extreme-down 5% in China



CSAD Extreme-down 1% in China



RM Extreme-down 1% in China

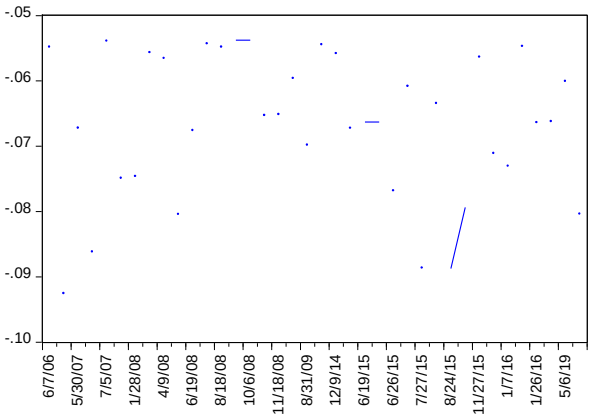
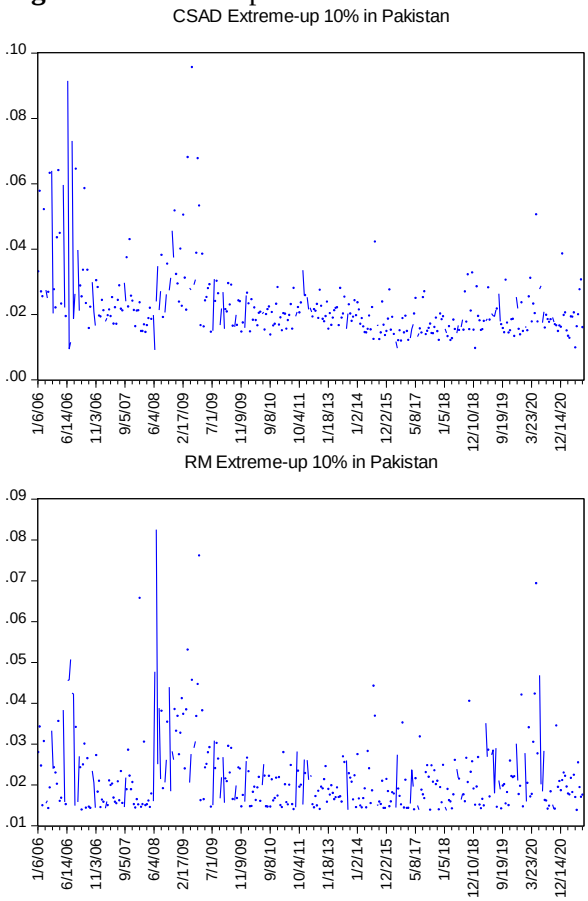
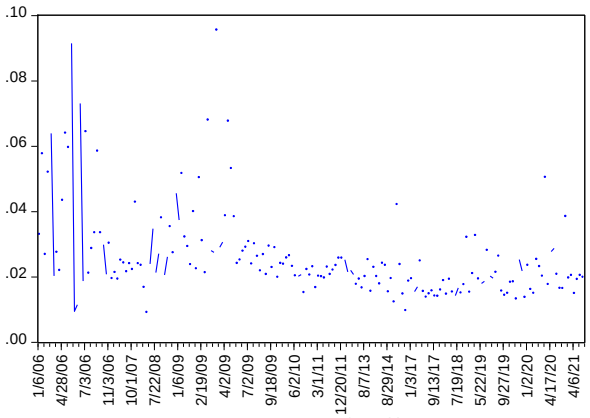


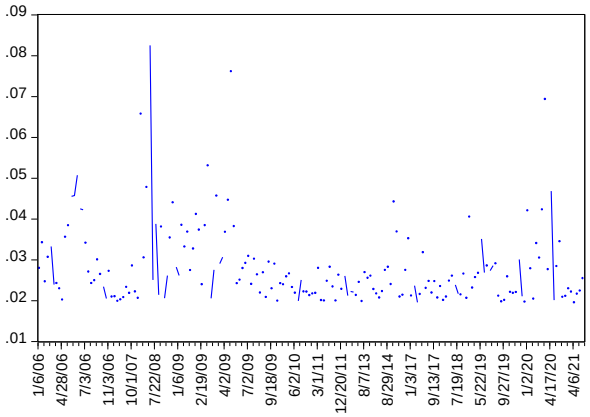
Figure. 4 Extreme-up movements in Pakistan



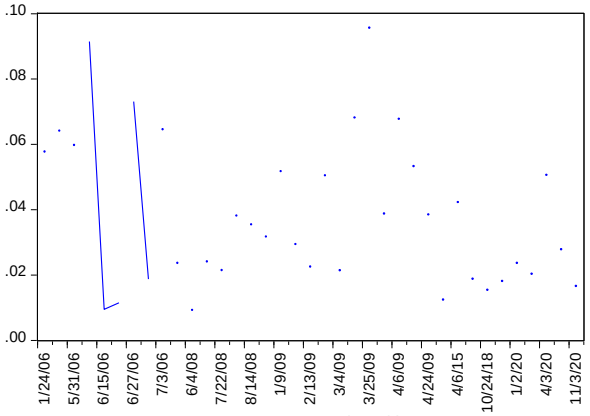
CSAD Extreme-up 5% in Pakistan



RM Extreme-up 5% in Pakistan



CSAD Extreme-up 1% in Pakistan



RM Extreme-up 1% in Pakistan

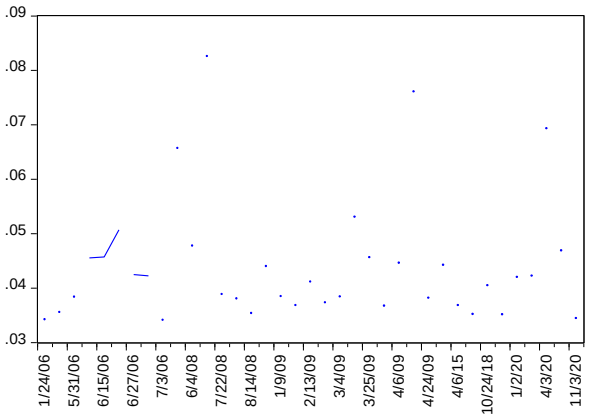
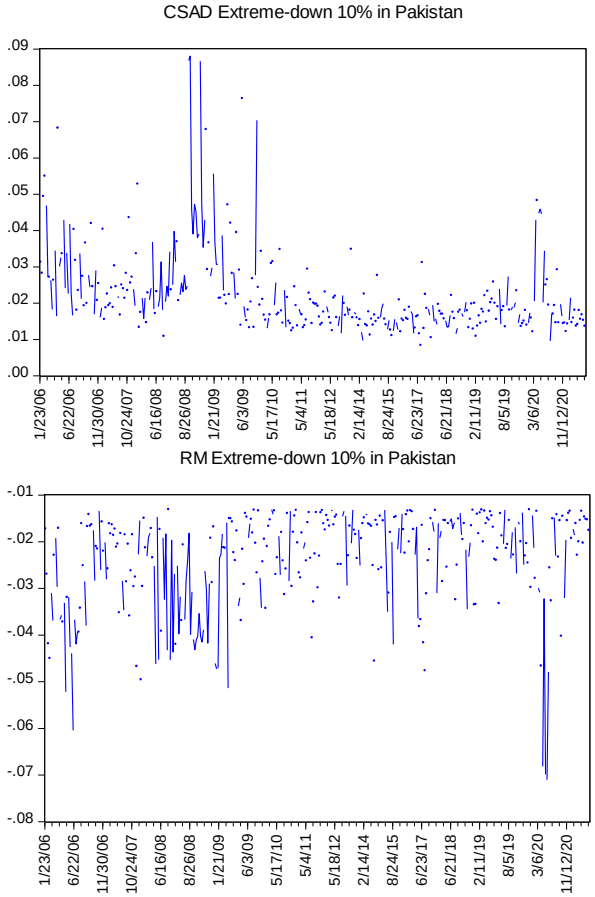
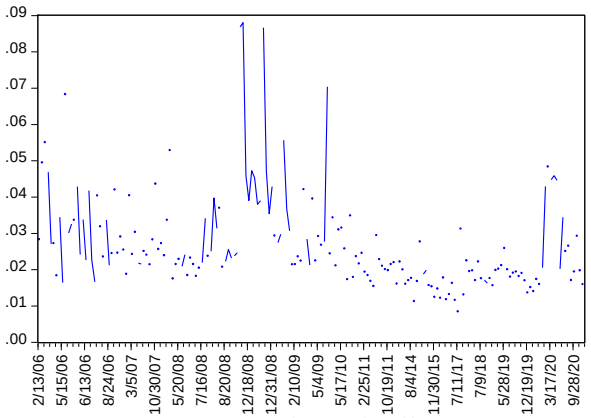


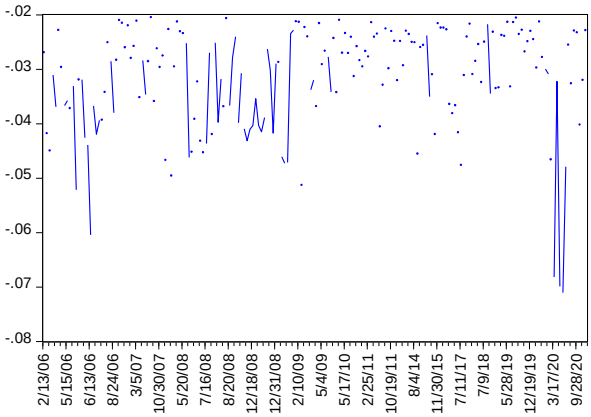
Figure. 5 Extreme-down movements in Pakistan



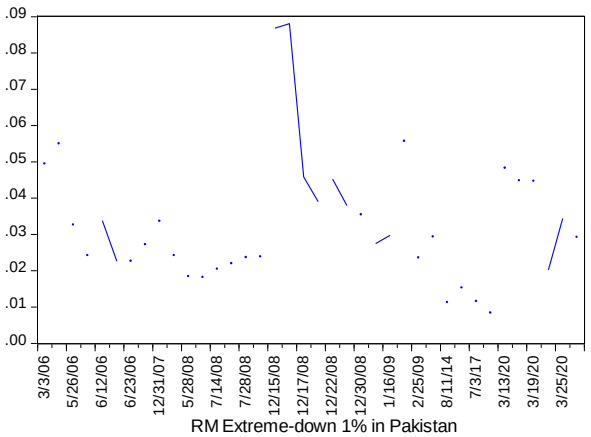
CSAD Extreme-down 5% in Pakistan



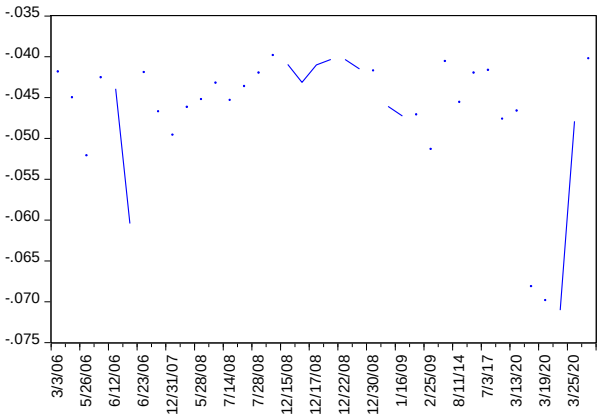
RM Extreme-down 5% in Pakistan



CSAD Extreme-down 1% in Pakistan



RM Extreme-down 1% in Pakistan



CONCLUSION AND FUTURE DIRECTIONS

In this research paper, herding behaviour in the China and Pakistan stock markets is investigated using daily stock returns of individual stocks. Previous studies show mixed results while investigating herding in different countries. This study tries to provide new findings using different data sets and approaches. We used the CSAD approach to measure herding. When Least Squares regression is applied to the selected countries, strong evidence of herding is found in the Chinese stock market; however, no evidence of herding is found in the Pakistan context.

Bai and Perron's (1998) approach, generally known as the structural change model, is also used to fulfil the aim of this research. This model helps us to investigate herding under different time regimes. The structural change model results reveal substantial evidence of herding in both countries during the global financial crisis of 2008. On the other hand, both countries showed no herding during the COVID-19 pandemic and post-crisis regimes. One plausible explanation could be that the investors in China are more rational and behave more stably during crises, while in Pakistan, the government took strong measures to overcome COVID-19. However, in the Chinese stock market, herding is found in regime three from 11/19/2013 to 3/13/2016 due to the Hong Kong protest in 2014 and the collapse of the Chinese stock market in 2015. In Pakistan, herding is also found in regime four from 4/28/2014 to 4/05/2019, which is considered one of the most disturbing economic and political periods.

From the perspective of extreme market movements, China and Pakistan showed herding with 10% of the data set. Contrary, no herding was found with 1% data set, but Pakistan showed herding during 5% at both extremes, and China only showed herding during the upper extreme. One important theoretical contribution is using a data set with 10% extreme values to study herding. In literature, researchers have tried to investigate herding at 5% extreme values, which is not an appropriate dataset to find herding.

Information technologies can allow investors to examine the inherent value of financial assets to prevent them from financial crises. Strict laws and punishments would prevent listed businesses from creating artificial demand for their stock. Therefore, investors should gather more knowledge, put more weight on business portfolios, and consider all information before investing.

This study has several contributions, but it is not without limitations. For instance, we found herding at 10% extreme values with data sets of two countries. It causes a problem of generalizability, which can be addressed by taking data sets from different countries. Furthermore, we have researched the topic of behavioural finance, but we have missed an important variable that can play a significant role in herding behaviour: investor sentiment. Investor sentiment is a belief about future cash flows and investments that is not supported by the current information (Baker & Wurgler, 2007). It is also derived through several macro factors, for instance, Hong Kong protests, political turmoil, and others. This research has studied these factors but does not cover the role of these factors in deriving investor sentiments that ultimately affect herding behaviour. Another research gap that needs attention from researchers is to study the spill-over effect of an emerging market on a developing market and vice versa.

REFERENCES

Andreoni, J., & Bernheim, B. D. (2009). Social Image and the 50-50 Norm: A Theoretical and Experimental Analysis of Audience Effects. *Econometrica*, *77*(5), 1607–1636. https://doi.org/10.3982/ecta7384

Andrews, D. W. K. (1993). Tests for Parameter Instability and Structural Change With Unknown Change Point. *Econometrica*, *61*(4), 821. https://doi.org/10.2307/2951764

Babalos, V., Balcilar, M., & Gupta, R. (2015). Herding behavior in real estate markets: Novel evidence from a Markov-switching model. *Journal of Behavioral and Experimental Finance*, *8*, 40–43. https://doi.org/10.1016/J.JBEF.2015.10.004

Bai, J., & Perron, P. (1998). Estimating and Testing Linear Models with Multiple Structural Changes. *Econometrica*, *66*(1), 47. https://doi.org/10.2307/2998540

Bai, J., & Perron, P. (2003). Computation and analysis of multiple structural change models. *Journal of Applied Econometrics*, *18*(1), 1–22. https://doi.org/10.1002/JAE.659

Baker, M., & Wurgler, J. (2007). Investor sentiment in the stock market. *Journal of Economic Perspectives*, *21*(2), 129–151. https://doi.org/10.1257/jep.21.2.129

Banerjee, A. V. (1992). A simple model of heed behavior. *Quarterly Journal of Economics*, *107*(3),

797–817. https://doi.org/10.2307/2118364

Bekiros, S., Jlassi, M., Lucey, B., Naoui, K., & Uddin, G. S. (2017). Herding behavior, market sentiment and volatility: Will the bubble resume? *The North American Journal of Economics and Finance*, *42*, 107–131. https://doi.org/10.1016/J.NAJEF.2017.07.005

BenSaïda, A. (2017). Herding effect on idiosyncratic volatility in U.S. industries. *Finance Research Letters*, *23*, 121–132. https://doi.org/10.1016/j.frl.2017.03.001

Bikhchandani, S., & Sharma, S. (2000). Herd behavior in financial markets. *IMF Staff Papers*, *47*(3), 279–310. https://doi.org/10.5539/ibr.v6n6p31

Boubaker, S., Farag, H., & Nguyen, D. K. (2015). Short-term overreaction to specific events: Evidence from an emerging market. *Research in International Business and Finance*, *35*, 153–165. https://doi.org/10.1016/j.ribaf.2014.10.002

Chang, E. C., Cheng, J. W., & Khorana, A. (2000). An examination of herd behavior in equity markets: An international perspective. *Journal of Banking and Finance*, *24*(10), 1651–1679. https://doi.org/10.1016/S0378-4266(99)00096-5

Chen, Y., & Li, S. X. (2009). Group identity and social preferences. *American Economic Review*, *99*(1), 431–457. https://doi.org/10.1257/aer.99.1.431

Chen, Z., & Lux, T. (2018). Estimation of Sentiment Effects in Financial Markets: A Simulated Method of Moments Approach. *Computational Economics*, *52*(3), 711–744. https://doi.org/10.1007/s10614-016-9638-4

Chen, Z., & Ru, J. (2021). Herding and capitalization size in the Chinese stock market: a micro-foundation evidence. *Empirical Economics*, *60*(4), 1895–1911. https://doi.org/10.1007/s00181-019-01816-z

Chen, Z., & Zheng, H. (2022). Herding in the Chinese and US stock markets: Evidence from a micro-founded approach. *International Review of Economics and Finance*, *78*, 597–604. https://doi.org/10.1016/j.iref.2021.11.015

Chiang, T. C., & Zheng, D. (2010). An empirical analysis of herd behavior in global stock markets. *Journal of Banking and Finance*, *34*(8), 1911–1921. https://doi.org/10.1016/j.jbankfin.2009.12.014

Chong, T. T. L., Liu, X., & Zhu, C. (2017). What Explains Herd Behavior in the Chinese Stock Market? *Journal of Behavioral Finance*, *18*(4), 448–456. https://doi.org/10.1080/15427560.2017.1365365

Cipriani, M., & Guarino, A. (2014). Estimating a structural model of herd behavior in financial markets. *American Economic Review*, *104*(1), 224–251. https://doi.org/10.1257/aer.104.1.224

De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). Noise Trader Risk in Financial Markets. *Journal of Political Economy*, *98*(4), 703–738. https://doi.org/10.1086/261703

Demirer, R., & Kutan, A. M. (2006). Does herding behavior exist in Chinese stock markets? *Journal of International Financial Markets, Institutions and Money*, *16*(2), 123–142. https://doi.org/10.1016/j.intfin.2005.01.002

Devenow, A., & Welch, I. (1996). Rational herding in financial economics. *European Economic Review*, *40*(3–5), 603–615. https://doi.org/10.1016/0014-2921(95)00073-9

Economou, F., Kostakis, A., & Philippas, N. (2011). Cross-country effects in herding behaviour: Evidence from four south European markets. *Journal of International Financial Markets, Institutions and Money*, *21*(3), 443–460. https://doi.org/10.1016/j.intfin.2011.01.005

Espinosa-Méndez, C., & Arias, J. (2021). Herding Behaviour in Asutralian stock market: Evidence on COVID-19 effect. *Applied Economics Letters*, *28*(21), 1898–1901. https://doi.org/10.1080/13504851.2020.1854659

Fu, T. (2010). Herding in China Equity Market. *International Journal of Economics and Finance*, *2*(2), p148. https://doi.org/10.5539/ijef.v2n2p148

Grinblatt, M., Titman, S., & Wermers, R. (1995). American Economic Association Momentum Investment Strategies, Portfolio Performance, and Herding: A Study of Mutual. *Source: The American Economic Review*, *85*(5), 1088–1105.

Hirshleifer, D., & Teoh, S. H. (2009). Thought and Behavior Contagion in Capital Markets. In *Handbook of Financial Markets: Dynamics and Evolution* (pp. 1–56). North-Holland. https://doi.org/10.1016/B978-012374258-2.50005-1

Huang, T. C., Lin, B. H., & Yang, T. H. (2015). Herd behavior and idiosyncratic volatility. *Journal of Business Research*, *68*(4), 763–770. https://doi.org/10.1016/j.jbusres.2014.11.025

Hussain, M., Sadiq, S., Rasheed, M. H., & Amin, K. (2022). Exploring the Dynamics of Investors' Decision Making in Pakistan Stock Market: A Study of Herding Behavior. *Journal of Economic Impact*, *4*(1), 165–173. https://doi.org/10.52223/jei4012220

Jabeen, S., & Salman, R. S. (2019). Herd Behaviour, Short-Lived Phenomenon: Evidence from Pakistan Stock Exchange. *Lahore Journal of Business*, *8*(1), 51–72. https://doi.org/10.35536/ljb.2019.v8.i1.a3

Javaira, Z., & Hassan, A. (2015). An examination of herding behavior in Pakistani stock market. *International Journal of Emerging Markets*, *10*(3), 474–490. https://doi.org/10.1108/IJoEM-07-2011-0064

Kashif, M., Palwishah, R., Ahmed, R. R., Vveinhardt, J., & Streimikiene, D. (2021). Do investors herd? An examination of Pakistan stock exchange. *International Journal of Finance and Economics*, *26*(2), 2090–2105. https://doi.org/10.1002/ijfe.1895

Khan, S. U., & Rizwan, M. F. (2018). Do Investors Herd: Evidence from an Emerging Market. *Lahore Journal of Business*, *6*(2), 27–46. https://doi.org/10.35536/ljb.2018.v6.i2.a2

Kiran, F., Khan, N. U., & Shah, A. (2020). The herding behaviour on Pakistan stock exchange - Using firm-level data. *Afro-Asian Journal of Finance and Accounting*, *10*(1), 71–84. https://doi.org/10.1504/AAJFA.2020.104407

Lakonishok, J., Shleifer, A., & Vishny, R. W. (1992). The impact of institutional trading on stock prices. *Journal of Financial Economics*, *32*(1), 23–43. https://doi.org/10.1016/0304-405X(92)90023-Q

Litimi, H., BenSaïda, A., & Bouraoui, O. (2016). Herding and excessive risk in the American stock market: A sectoral analysis. *Research in International Business and Finance*, *38*, 6–21. https://doi.org/10.1016/j.ribaf.2016.03.008

Malik, S. U., & Elahi, M. A. (2014). Analysis of Herd Behavior Using Quantile Regression: Evidence from Karachi Stock Exchange (KSE). *SSRN Electronic Journal*, *55322*. https://doi.org/10.2139/ssrn.2622413

Maug, E., & Naik, N. (2011). Herding and Delegated Portfolio Management: The Impact of Relative Performance Evaluation on Asset Allocation. *Quarterly Journal of Finance*, *1*(2), 265–292. https://doi.org/10.1142/S2010139211000092

Nofsinger, J. R., & Sias, R. W. (1999). Herding and feedback trading by institutional and individual investors. *Journal of Finance*, *54*(6), 2263–2295. https://doi.org/10.1111/0022-1082.00188

Qasim, M., Hussain, R. Y., Mehboob, I., & Arshad, M. (2019). Impact of herding behavior and overconfidence bias on investors' decision-making in Pakistan. *Accounting*, *5*(2), 81–90. https://doi.org/10.5267/j.ac.2018.7.001

Richard, T., & Bradley, E. S. (1998). *The Stock Market, 7th Edition*. 576.

Ritter, J. R. (2003). Behavioral finance. *Pacific Basin Finance Journal*, *11*(4), 429–437. https://doi.org/10.1016/S0927-538X(03)00048-9

Sabir, S. A., Javed, T., Hameed, W. U., & Yousaf, H. Q. (2020). Demographic Factors and Herding Behaviour of Investors: Moderating Role of Islamic Religiosity. *Review of Applied Management and Social Sciences*, *3*(2), 193–203. https://doi.org/10.47067/ramss.v3i2.53

Sabir, S. A., Mohammad, H. Bin, & Shahar, H. B. K. (2019). The role of overconfidence and past investment experience in herding behaviour with a moderating effect of financial literacy: Evidence from pakistan stock exchange. *Asian Economic and Financial Review*, *9*(4), 480–490. https://doi.org/10.18488/journal.aefr.2019.94.480.490

Sharma, S. S., Narayan, P., & Thuraisamy, K. (2015). Time-varying herding behavior, global financial crisis, and the Chinese stock market. *Review of Pacific Basin Financial Markets and Policies*, *18*(2), 1–31. https://doi.org/10.1142/S0219091515500095

Sharpe, W. F. (1964). CAPITAL ASSET PRICES: A THEORY OF MARKET EQUILIBRIUM UNDER CONDITIONS OF RISK. *The Journal of Finance*, *19*(3), 425–442. https://doi.org/10.1111/j.1540-6261.1964.tb02865.x

Shiller, R. J. (2003). From efficient markets theory to behavioral finance. *Journal of Economic Perspectives*, *17*(1), 83–104. https://doi.org/10.1257/089533003321164967

Tan, L., Chiang, T. C., Mason, J. R., & Nelling, E. (2008). Herding behavior in Chinese stock markets: An examination of A and B shares. *Pacific Basin Finance Journal*, *16*(1–2), 61–77. https://doi.org/10.1016/j.pacfin.2007.04.004

Tauseef, S. (2022). Herd behaviour in an emerging market: an evidence of calendar and size effects.

Journal of Asia Business Studies, *ahead-of-p*(ahead-of-print). https://doi.org/10.1108/JABS-10-2021-0430

Wu, G., Yang, B., & Zhao, N. (2020). Herding Behavior in Chinese Stock Markets during COVID-19. *Emerging Markets Finance and Trade*, *56*(15), 3578–3587. https://doi.org/10.1080/1540496X.2020.1855138

Yao, J., Ma, C., & He, W. P. (2014). Investor herding behaviour of Chinese stock market. *International Review of Economics and Finance*, *29*, 12–29. https://doi.org/10.1016/j.iref.2013.03.002

Yasir, M., & Önder, A. Ö. (2021). Dynamic herding behaviour in the US stock market. *Prague Economic Papers*, *30*(1), 115–130. https://doi.org/10.18267/j.pep.760

Yasir, M., & Önder, A. Ö. (2022). Time-varying herding spill-over for emerging countries: evidence from BRIC countries and Turkey. *Review of Behavioral Finance*. https://doi.org/10.1108/RBF-10-2021-0218

Yousaf, I., Ali, S., & Shah, S. Z. A. (2018). Herding behavior in Ramadan and financial crises: the case of the Pakistani stock market. *Financial Innovation*, *4*(1), 1–14. https://doi.org/10.1186/s40854-018-0098-9

Zheng, D., Li, H., & Zhu, X. (2015). Herding behavior in institutional investors: Evidence from China's stock market. *Journal of Multinational Financial Management*, *32–33*, 59–76. https://doi.org/10.1016/j.mulfin.2015.09.001