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# SECTORAL COMPARISON OF HERDING DURING GLOBAL FINANCIAL CRISIS AND COVID-19: COMPARATIVE ANALYSIS OF SHARIAH COMPLIANT AND CONVENTIONAL STOCKS

**Syed Faisal Hassan Bukhari [a,*], Waqar Yasir [b], Christian Espinosa Méndez [c], Zia Mustafa [d]**

[a] *Manager Budget, HQ NLC Rawalpindi, Pakistan*
[b] *Assistant Manager Audit, HQ NLC Rawalpindi, Pakistan*
[c] *Departamento de Administracion. Facultad de Administracion y Economía, Universidad de Santiago de Chile, Santiago, Chile*
[d] *Chief Finance Officer, Mohamed Yousuf Naghi Group, Jeddah, Saudia Arabia*

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**ABSTRACT**

The worldwide financial environment has experienced substantial upheavals amid both the Global Financial Crisis (GFC) and the COVID-19 pandemic. Gaining insight into investor behavior, with a specific focus on herd behavior, during these periods is essential for a comprehensive understanding of market dynamics. The authors intend to compare and analyze investor herding behavior in the Pakistani Stock market, specifically focusing on shariah-compliant and conventional stocks during both the Global Financial Crisis (GFC) and the COVID-19 pandemic. The study explores how stock return dispersions behave in response to significant upward and downward movements in the market index. Additionally, the research distinguishes between the overall and sector-specific performance of Shariah-compliant and conventional stocks. To examine participant herding behavior, the authors applied the cross-sectional absolute deviation model (CSAD) to the daily data of the Karachi stock market. The results indicate that both Shariah-compliant and conventional stocks exhibited a weak form of herding during the GFC. Furthermore, different sectors displayed varying degrees of herding intensity during this crisis. Notably, a substantial increase in herding behavior was observed during the COVID-19 pandemic. These findings have crucial implications for portfolio diversification strategies during financial crises, emphasizing the identification of safe havens by constructing portfolios across diverse segments and sectors. This research contributes to the existing knowledge on herding behavior by examining two distinct hypotheses related to conventional and shariah-compliant stocks, and the empirical evidence supports these hypotheses.

* *Email: nadealishanawer@gmail.com*
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## INTRODUCTION

The COVID-19 pandemic quickly transformed into a financial crisis and laid unforeseen impacts on economic and social life across the world. Authorities of all countries have imposed restrictions on gatherings, and lockdowns have severely affected the supply chain of goods and services. All the financial markets experienced severe shocks and extreme uncertainty, which caused an economic depression (Su et al., 2021). In the last two decades, financial crises have frequently haunted the financial markets. The Global Financial crisis (2007-2009) is one of the major financial disasters that occurred in the last two decades. Likewise, COVID-19 has affected all markets of the world. Both crises share wide-scale uncertainty and spread from two leading economies, the USA and China (Li et al., 2022). The long-term effect of the Global Financial crisis has been prolonged due to a strong correlation among capital markets, and volatility has also increased since the crisis. Previous research studies have examined the efficiency of stock markets during the Global Financial crisis and COVID-19 (Choi, 2021). During a crisis period, investors can experience huge losses or generate massive profits. Similarly, institutional investors alter investment strategies and allocate funds to a diverse portfolio to hedge risk (Tiwari et al., 2019).

The existence of herding has gained much importance in the last few decades. The inability of classical financial models to answer the abnormal price movements has piqued curiosity in behavioral finance (Maquieira and Espinosa Méndez, 2022). Behavioral finance describes the psychological aspects that affect investor decision-making. Nath et al. (2023) define that the psychological factors of investors play vital roles in generating the crisis. The financial crisis of the 1990s was the outcome of psychological factors. Psychological factors such as overconfidence, herding behavior, and risk-taking decline with experience. Contrarily, the efficient market hypothesis outlines that investors are rational in their decision-making, and the stock market immediately absorbs new information. However, researchers have critically examined EMH and found notable irregularities with theoretical and empirical evidence (Zhang and Giouvris, 2023).

Herding behavior is mostly present in financial markets; basically, herding behavior is a pattern of relations among stockholders in the marketplace (Aytaç et al., 2018). Herding is a social behavior; it aligns investors' thoughts in a social network, and they act in a group. The herding behavior of investors has been examined with several frameworks in the subject of economics and finance. Various behavioral patterns of herding have been used by

researchers, such as market bubbles, customer preferences, volatile stock prices, and trends (Fernandez-Amador et al., 2011). Chen et al. (2020) claim that investors make similar decisions due to a lack of information in the same situation in the market. Consequently, herding affects market efficiency and stock market returns (Arisanti and Oktavendi, 2020).

Christie and Huang (1995) examined the herding behavior of investors by the standard deviation of cross-sectional returns and found discrepancies during extreme price movements. Furthermore, Chang et al. (2000) contend that the phenomenon of herding behavior is evident in the stock markets of the United States, Japan, South Korea, Hong Kong, and Taiwan. Herding was measured by cross-sectional absolute deviation, and it was found that herding is more pronounced during market booms. They also found that non-disclosure of information directly affects the efficiency of the stock market and stimulates herding behavior in emerging markets. Demirer and Kutan (2006) investigated herding behavior in the Chinese stock market, and their findings are in line with the efficient market hypothesis and rational asset pricing model. Omay and Iren (2019) analyzed herding in foreign investors (Malaysian Stock market) and found strong evidence of herding in foreign investors investing in the Malaysian stock market during the financial crisis. They also pointed out that foreign investors showed faster reactions in the stock market than domestic investors.

Mand and Sifat (2021) employed a two-state Markov Switching model, discovering the existence of herding behavior (a nonlinear phenomenon) among participants in the Malaysian stock market. Kumar et al. (2021) analyzed herding among investors belonging to different regions of the world and found strong evidence of herding in investors of the Asia Pacific region. Yousaf and Yarovaya (2022) employed cross-sectional standard deviation and found herding during low market returns. These results contradict previous studies' findings that herding is more dominant during high stock market returns (Vieito et al., 2023). It was also observed that participants made decisions according to their beliefs during the financial crisis (Bukhari et al., 2021). Chang et al. (2000) conclude that herding has time-varying characteristics, and herding can be present in all situations (high and low) of the market. Sihombing et al. (2021) describe that herding behavior is more prominent in emerging stock markets than in developed ones as the emerging stock markets are informationally less efficient. Maquieira and Espinosa Méndez (2022) claim that COVID-19 has intensified herding behavior in financial markets. Results showed that herding is a short-term phenomenon and rolling regression methodology was used to estimate herding behavior.

In the last few decades, Islamic finance has attracted all stakeholders of the financial market, and massive investments in Sharia-compliant stocks have been injected. Religion affects investor's behavior, and Muslim investors are more attracted to Shariah-compliant stocks in financial markets (Bukhari et al., 2021). Gavriilidis et al. 2016) argue that Islamic events stimulate herding behavior within Muslim countries (Turkey, Egypt, Indonesia, Malaysia, Bangladesh, Morocco, and Pakistan). KR and Fu (2014) compare the Shariah and conventional stocks in the Australian stock market and find that investors are more inclined towards Shariah-compliant stocks than conventional stocks. In a recent study by Aziz et al. (2022), an analysis was conducted to compare Shariah-compliant and conventional stocks in the global energy market. The findings highlighted notable differences in risk between the two categories. The study emphasized that investors tend to show a stronger preference for Shariah-compliant stocks when making investment decisions. Stavroyiannis and Babalos (2017) used the U.S. Dow Jones Islamic Market index to check the herding behavior (January 2007 to December 2014) and concluded that anti-herding sentiment was more intense during turbulent period.

Consistent with the prior discussion, it is important for all the stakeholders to investigate the abnormal price movements in the stock market. Irrespective of the nature of price movement, investor behavior has been driven by price fluctuations in the stock market ( Bukhari et al., 2022). Previous studies have attempted to examine the role of herding behavior in the stock market. However, the existing literature is still silent about the sectoral comparison of herding behavior during the Global Financial crisis and COVID-19. The existing literature about the comparative analysis of Shariah-compliant and conventional stocks is still inconclusive (Delle Foglie and Panetta, 2020). Indeed, there is a recent development in financial literature that explores the conduct of organizations adhering to Islamic Law (Ben-Nasr and Ghouma, 2022). In this context, some studies provide substantial evidence that Shariah Compliant stocks are less volatile and recovered quickly from the shocks of the COVID-19 outbreak (Dharani et al., 2022). On the other hand, a few research studies by Hassan et al. (2021) highlight an identical drop in the valuation and a similar level of volatility in stocks during the period of crisis in both Shariah and Non-Shariah Compliant stocks. Moreover, Boudt et al. (2019) claim that Shariah Compliant investors ignore noise trading and fundamentally analyze every aspect of investment decisions during periods of chaos. In the last decade before COVID-19, the Pakistani stock market performance was better than the Indian and Chinese stock markets. The Pakistani stock market performance was much better than other stock markets in Asia during the GFC period (Yousaf et al., 2018).

The stated literature on herding behavior outlines the conflicting as well as conflating results. Motivated by the significant implications of herd behavior for practitioners and fund managers and considering the varied outcomes in prior research along with the absence of studies on sectoral herding, this paper aims to investigate the presence of herd behavior in Karachi stock markets. There still exists a gap as far as herding at the sector and segment level is concerned (Qureshi, 2022). Moreover, a comparison of herding behavior between COVID-19 and Global Financial in Shariah-compliant and conventional stocks also offers deep insights and provides an opportunity to explore the fundamental cause of herding activity in crises. The objective of this research study is to investigate the sectoral herding behavior in Shariah Compliant and Conventional stocks during the Global Financial Crisis and the recent COVID-19 pandemic. The herding behavior of different sectors and segments exhibits diverse responses to the Global Financial crisis and COVID-19 pandemic. Secondly, this study compares herding behavior in the aggregate market samples during the GFC and COVID-19 pandemic. The characteristics of some sectors during the GFC are different from those observed during the COVID-19 pandemic period. As a result, an analysis of every sector of the stock market is helpful for investors when selecting an optimal portfolio. Prior studies have also affirmed that returns of assets vary across sectors and tend to differ during different crises (Ji et al., 2020; Shahzad et al., 2020). Finally, this study identifies those sectors that are safe havens for all kinds of investors during a financial crisis.

Hypothesis 1: Sectoral herding was present during the GFC in Conventional and Shariah-compliant stocks of the Pakistani stock market.

GFC has made a significant impact on the financial market across the regions. This leads to extreme volatility and creates doubts in the minds of investors. For example, investors are afraid of estimating logical conclusions from information available to them. So, they mimic the actions of other investors in the market (Maquieira and Espinosa Méndez, 2022). Ho et al. (2014) suggest that the performance of Shariah compliance stocks is much better than conventional stocks. Shariah compliance stocks have emerged rapidly as an alternative investment instrument for investors in the last few decades. Investors like to diversify their investments to mitigate potential risks, and Islamic stocks are less risky and more transparent. Shariah-compliant stocks have been the epicenter of investment during the last decade and provide more attractive options for investments, especially during crises. However, the current pandemic has produced an unprecedented financial crisis and unseen volatility in the stock market. Therefore,

Hypothesis 2: Sectoral herding is stronger during COVID-19 in Conventional and Shariah-compliant stock of the Pakistani stock market.

COVID-19 is a roller-coaster ride for investors and generates abnormal anxiety in the investor's behavior. This leads to the irrational behavior of investors. Asian markets suffer more from behavioral biases than European financial markets. Investors in developing markets are attracted and motivated by greed to form a herd during turbulent periods. Previous studies have examined aggregate market sentiments and individual investor's sentiments (Vidya et al., 2023).

## METHODOLOGY

The study employs time series data from two crises. The data and sectoral distribution of stocks are taken from the "Banker Thompson Database." Daily share prices are employed to test the herding behavior of investors among different sectors of Pakistani stock markets. This study covers data from the Global Financial crisis from August 2007 to March 6, 2009. The time period from January 2020 to December 2022 is used to examine the herding behavior during COVID-19. Following Tan et al. (2008), who claim that herding is more obvious with daily data than with weekly or monthly, daily stock returns are computed as:

Rit = Log (Pt/Pt-1)

### Return Dispersion Model

The study employs cross-sectional absolute standard deviations (CSAD) to explore the nonlinear association between return dispersion and overall market returns. In line with Christie and Huang's (1995) findings, rational asset price models forecast that, in normal periods, return dispersion rises with the absolute value of market returns. However, during periods of significant market fluctuations, the escalation in return dispersion exhibits a nonlinear trend, suggesting that investors are more likely to conform to market consensus rather than sticking to their individual convictions. In response to such situations, Christie and Huang (1995) suggested an alternative model, the Cross-Sectional Standard Deviation (CSSD), whereas Chang et al. (2000) presented a method that integrates the entire distribution of stock market returns to tackle this concern.

Considering the observation by Tan et al. (2008) that the methodology of Christie and Huang (1995) is overly strict and demands a higher degree of non-linearity to detect herding, we opt for the CSAD methodology introduced by Chang et al. (2000). This choice is motivated by the significant market turbulence during the Global Financial Crisis of 2008 and the COVID-19 pandemic, marked by unusual values in the stock market. Chang et al. (2000) measure indicates that herding is more likely during periods of substantial price changes, suggesting that variations in investment activity can be discerned in return dispersions. In addition, Chang et al. (2000) method has been extensively applied in financial literature, as seen in works such as ((Espinosa-Méndez and Arias, 2021; Mobarek et al., 2014; Tan et al., 2008) among others. Christie and Huang (1995) introduced the return dispersion model to deduce herding behavior in the stock market; both models specifically target cross-sectional asset returns within stock portfolios. This study adopts the model proposed by (Chang et al., 2000) to detect herd behavior. The econometric model of the CSAD to capture herding presence is outlined as follows:

$$CSAD_t = \propto + \beta_1 |R_{m,t}| + \beta_2 (R_{m,t})^2 + \varepsilon_t \quad (1)$$

In this context, $CSAD_t$ represents a metric for return dispersion and $R_{m,t}$ denotes the market return, calculated as the equally weighted average stock return in the portfolio. The computation of CSAD at time t is articulated as follows:

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

$CSAD_t$ represents the mean absolute return dispersion from $R_{m,t}$ for quantifying return dispersion. $|R_{m,t}|$ and $R_{i,t}$ denote the absolute value of market return and individual stock return for stock *i*, respectively, $\propto$ signifies the intercept, and $\varepsilon_t$ stands for the error term. Given that our investigation centers on the CSAD model, the existence of a statistically significant and negative coefficient $\beta_2$ would suggest the existence of herding behavior.

We expand the foundational model to evaluate the impact of COVID-19 on herding behavior by employing the specified Equation (1).

$$CSDA_t = \propto + \gamma_1 D^{covid} |R_{m,t}| + \gamma_2 \left(1 - D^{covid}\right) |R_{m,t}| + \gamma_3 D^{covid} (R_{m,t})^2 + \gamma_4 (1 - D^{covid}) (R_{m,t})^2 + \varepsilon_t \quad (3)$$

Equation (2) has been adapted from Equation (1) and is utilized to evaluate the presence of herding behavior in the Pakistan stock market both before and after the onset of COVID-19. Negative values of $\gamma_3$ and $\gamma_4$ would significantly indicate the existence of herding behavior subsequent to and preceding the COVID-19 event. The COVID-dummy ($D^{covid}$) takes the value of one after February 26, 2020, and zero before that date.

To ensure the robustness of the findings, we explore the asymmetric effects of market return and distinguish between high and low volatility states, as suggested by (Tan et al., 2008). In the first scenario, the direction of market return might influence investor behavior, and we are keen on identifying any asymmetry in herd behavior based on whether the market is trending upward or downward before and after COVID-19. Additionally, we investigate the asymmetric effects of herding behavior during periods of market volatility preceding and following COVID-19. High market volatility is characterized when observed volatility exceeds the moving average of volatility over the preceding 30 trading days, while low volatility is defined when it does not fall below the moving average of the previous 30 trading days. The 30-day period is considered optimal for displaying volatility effects based on prior studies (Chang et al., 2000; Tan et al., 2008). Market return volatility is computed as the standard deviation of daily market returns multiplied by the square root of yearly trading days.

## RESULTS AND DISCUSSION

Tables 1 to 4 indicate the key descriptive statistics (Mean, Standard Deviation, Kurtosis, Skewness Minimum, and maximum) of daily sectoral returns. The results depict significant variation in Mean and

Standard Deviation across the different periods (GFC and COVID-19) and across the segments (Conventional and Shariah Compliant stocks). During the Global Financial crisis, the Telecom sector – Shariah Compliant segment and Energy sector – conventional segment experienced the highest standard deviation. Similarly, like GFC, during COVID-19, the telecom sector – Shariah Compliant segment had the highest standard deviation. However, in the case of the conventional segment – The technology sector has the highest standard deviation. Higher standard deviation is a sign of shock and displays the sensitivity of the stock market (Chiang and Zheng, 2010).

Table 1. Shariah Compliant Stock GFC.

| Sectors | Variables | Mean | Standard Deviation | Kurtosis | Skewness | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| Consumer cycldical | $r_t^{cc}$ | 0.7507 | 0.5803 | 364.867 | 35.544 | 0 | 72.018 |
| | $CSAD_t^{cc}$ | 0.3539 | 0.423 | 38.773 | 18.713 | 0 | 26.007 |
| Energy | $r_t^{en}$ | 0.5397 | 0.516 | 172.16 | 27.346 | 0 | 50.886 |
| | $CSAD_t^{en}$ | 0.6116 | 0.6735 | 36.747 | 16.143 | 0 | 44.523 |
| Financials | $r_t^{fin}$ | 10.639 | 0.7579 | 12.746 | 0.7483 | 0 | 42.369 |
| | $CSAD_t^{fi}$ | 0.4155 | 0.4743 | 29.705 | 16.989 | 0 | 24.9 |
| Healthcare | $r_t^{hc}$ | 0.563 | 0.364 | -0.8907 | -0.1781 | 0 | 14.849 |
| | $CSAD_t^{hc}$ | 0.3273 | 0.3583 | 32.974 | 15.812 | 0 | 23.813 |
| Industrials | $r_t^{in}$ | 0.7371 | 0.542 | 57.909 | 13.402 | 0 | 39.302 |
| | $CSAD_t^{in}$ | 0.3647 | 0.4237 | 41.969 | 18.818 | 0 | 24.438 |
| Materials | $r_t^{ma}$ | 0.8652 | 0.6935 | 236.433 | 27.926 | 0 | 77.757 |
| | $CSAD_t^{ma}$ | 0.4013 | 0.5293 | 140.401 | 29.192 | 0 | 47.983 |
| Consumer non-cyclical | $r_t^{nc}$ | 0.7081 | 0.5286 | 33.672 | 11.532 | 0 | 33.489 |
| | $CSAD_t^{nc}$ | 0.1954 | 0.2478 | 73.059 | 24.137 | 0 | 16.16 |
| Telecommunication | $r_t^{tc}$ | 0.7049 | 0.7228 | 131.123 | 29 | 0 | 57.618 |
| | $CSAD_t^{tc}$ | 0.7766 | 10.018 | 99.057 | 26.65 | 0 | 78.496 |
| Utilities | $r_t^{ut}$ | 0.9351 | 0.9232 | 105.74 | 26.044 | 0 | 73.145 |
| | $CSAD_t^{ut}$ | 0.5486 | 0.7591 | 71.69 | 24.186 | 0 | 54.18 |
| Aggregate | $r_t$ | 0.6868 | 0.6695 | 134.765 | 23.6 | 0 | 77.757 |
| | $CSAD_t$ | 0.4909 | 0.6672 | 162.022 | 29.424 | 0 | 88.905 |

Table 2. Conventional Stock GFC.

| Sectors | Variables | Mean | Standard Deviation | Kurtosis | Skewness | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| Consumer cyclical | $r_t^{cc}$ | 0.825 | 0.695 | 12.51 | 2.416 | 0 | 5.729 |
| | $CSAD_t^{cc}$ | 0.343 | 0.437 | 7.85 | 2.514 | 0 | 2.84 |
| Energy | $r_t^{n}$ | 0.709 | 0.941 | 9.38 | 2.589 | 0 | 6.862 |
| | $CSAD_t^{en}$ | 0.874 | 1.029 | 2.79 | 1.647 | 0 | 5.837 |
| Financials | $r_t^{fin}$ | 1.079 | 0.79 | 1.8 | 0.884 | 0 | 5.023 |
| | $CSAD_t^{fi}$ | 0.43 | 0.474 | 3.14 | 1.657 | 0 | 2.565 |
| Healthcare | $r_t^{hc}$ | 0.454 | 0.601 | 21.58 | 2.929 | 0 | 6.405 |
| | $CSAD_t^{hc}$ | 0.438 | 0.557 | 8.25 | 1.945 | 0 | 4.732 |
| Industrials | $r_t^{in}$ | 0.748 | 0.725 | 23.5 | 3.512 | 0 | 6.955 |
| | $CSAD_t^{in}$ | 0.377 | 0.471 | 15.71 | 2.982 | 0 | 4.229 |
| Materials | $r_t^{ma}$ | 0.997 | 4.899 | 315.12 | 16.643 | 0 | 95.002 |
| | $CSAD_t^{ma}$ | 0.575 | 0.817 | 37.99 | 4.432 | 0 | 9.747 |
| Consumer non-cyclical | $r_t^{nc}$ | 0.787 | 0.742 | 9.01 | 2.19 | 0 | 6.214 |
| | $CSAD_t^{nc}$ | 0.24 | 0.32 | 12.71 | 2.919 | 0 | 2.633 |
| Technology | $r_t^{tc}$ | 0.713 | 0.933 | 17.67 | 3.302 | 0 | 8.457 |
| | $CSAD_t^{tc}$ | 0.701 | 0.954 | 17.1 | 3.359 | 0 | 8.457 |
| Utilities | $r_t^{ut}$ | 1.103 | 1.208 | 12.97 | 2.852 | 0 | 9.934 |
| | $CSAD_t^{ut}$ | 0.709 | 0.975 | 9.9 | 2.689 | 0 | 7.838 |
| Aggregate | $r_t$ | 0.892 | 0.634 | 2.53 | 0.848 | 0 | 4.603 |
| | $CSAD_t$ | 0.272 | 0.343 | 5.82 | 2.161 | 0 | 2.351 |

Table 3. Shariah Compliant Stock COVID-19.

| Sectors | Variables | Mean | Standard Deviation | Kurtosis | Skewness | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| Materials | $r_t^{ma}$ | 0.997 | 4.899 | 315.12 | 16.643 | 0 | 95.002 |
| | $CSAD_t^{ma}$ | 0.575 | 0.817 | 37.99 | 4.432 | 0 | 9.747 |
| Energy | $r_t^{en}$ | 0.709 | 0.941 | 9.38 | 2.589 | 0 | 6.862 |
| | $CSAD_t^{en}$ | 0.874 | 1.029 | 2.79 | 1.647 | 0 | 5.837 |
| Industrials | $r_t^{in}$ | 0.748 | 0.725 | 23.5 | 3.512 | 0 | 6.955 |
| | $CSAD_t^{in}$ | 0.377 | 0.471 | 15.71 | 2.982 | 0 | 4.229 |
| Consumer cyclical | $r_t^{cc}$ | 0.825 | 0.695 | 12.51 | 2.416 | 0 | 5.729 |
| | $CSAD_t^{c}$ | 0.343 | 0.437 | 7.85 | 2.514 | 0 | 2.84 |
| Consumer non-cyclical | $r_t^{nc}$ | 0.787 | 0.742 | 9.01 | 2.19 | 0 | 6.214 |
| | $CSAD_t^{nc}$ | 0.24 | 0.32 | 12.71 | 2.919 | 0 | 2.633 |
| Financials | $r_t^{fin}$ | 1.079 | 0.79 | 1.8 | 0.884 | 0 | 5.023 |
| | $CSAD_t^{fi}$ | 0.43 | 0.474 | 3.14 | 1.657 | 0 | 2.565 |
| Healthcare | $r_t^{hc}$ | 0.454 | 0.601 | 21.58 | 2.929 | 0 | 6.405 |
| | $CSAD_t^{hc}$ | 0.438 | 0.557 | 8.25 | 1.945 | 0 | 4.732 |
| Technology | $r_t^{it}$ | 0.713 | 0.933 | 17.67 | 3.302 | 0 | 8.457 |
| | $CSAD_t^{it}$ | 0.701 | 0.954 | 17.1 | 3.359 | 0 | 8.457 |
| Utilities | $r_t^{ut}$ | 1.103 | 1.208 | 12.97 | 2.852 | 0 | 9.934 |
| | $CSAD_t^{ut}$ | 0.709 | 0.975 | 9.9 | 2.689 | 0 | 7.838 |
| Aggregate | $r_t$ | 0.892 | 0.634 | 2.53 | 0.848 | 0 | 4.603 |
| | $CSAD_t$ | 0.272 | 0.343 | 5.82 | 2.161 | 0 | 2.351 |

Table 4. Conventional Stock COVID-19.

| Sectors | Variables | Mean | Standard Deviation | Kurtosis | Skewness | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| Materials | $r_t^{ma}$ | 0.5691 | 0.339 | 2.1717 | 1.0342 | 0 | 2.2034 |
| | $CSAD_t^{ma}$ | 0.2801 | 0.2641 | 4.0752 | 1.7269 | 0 | 1.7245 |
| Consumer cyclical | $r_t^{cc}$ | 0.7689 | 0.4099 | 20.3038 | 2.5523 | 0 | 4.936 |
| | $CSAD_t^{cc}$ | 0.608 | 0.7499 | 4.909 | 2.1976 | 0 | 4.1036 |
| Financials | $r_t^{fin}$ | 0.8776 | 0.3335 | 2.7651 | 0.1297 | 0 | 2.4626 |
| | $CSAD_t^{fi}$ | 0.2954 | 0.293 | 7.6639 | 2.117 | 0 | 2.3278 |
| Healthcare | $r_t^{hc}$ | 0.5404 | 0.553 | 1.3902 | 1.3523 | 0 | 3.0021 |
| | $CSAD_t^{hc}$ | 0.5393 | 0.5428 | 1.1364 | 1.2867 | 0 | 2.9114 |
| Industrials | $r_t^{in}$ | 0.7812 | 0.6002 | 390.7929 | 16.6613 | 0 | 14.8888 |
| | $CSAD_t^{in}$ | 0.4444 | 0.4969 | 45.4887 | 4.4657 | 0 | 7.1914 |
| Consumer non-cyclical | $r_t^{nc}$ | 0.635 | 0.266 | 3.87 | 0.72 | 0 | 2.24 |
| | $CSAD_t^{nc}$ | 0.186 | 0.19 | 5.94 | 2.05 | 0 | 1.39 |
| Technology | $r_t^{it}$ | 0.446 | 0.415 | 1.14 | 1.2 | 0 | 2.4 |
| | $CSAD_t^{it}$ | 0.112 | 1.031 | 1.39 | -0.1 | -3.39 | 3.14 |
| Telecommunication | $r_t^{tc}$ | 0.804 | 0.755 | 5.31 | 1.72 | 0 | 6.41 |
| | $CSAD_t^{tc}$ | 0.94 | 0.96 | 11.36 | 2.39 | 0 | 9.56 |
| Utilities | $r_t^{ut}$ | 0.825 | 0.429 | 2.72 | 0.98 | 0 | 3.22 |
| | $CSAD_t^{ut}$ | 0.41 | 0.404 | 6.47 | 2.08 | 0 | 2.88 |
| Aggregate | $r_t$ | 0.734 | 0.276 | 4.05 | 0.32 | 0 | 2.34 |
| | $CSAD_t$ | 0.23 | 0.237 | 7.51 | 2.2 | 0 | 1.91 |

As discussed earlier, this research study considers two crisis periods (Global financial crisis of 2008 and COVID-19). To find robust results, this study examines the herding behavior of investors in the Pakistani stock market within aggregate and sectoral data samples. The regression results of aggregate data samples are summarized in Table 5. The results show that herding behavior was present during COVID-19 along with asymmetric information among investors, but no sign of herding was observed during the global financial crisis. Our results validate the previous study of Bukhari et al. (2021) that herding behavior is more dominant during COVID-19 in the Pakistani stock market. However, our results are contradictory to the claim of (Yousaf et al., 2018) that herding influences stock market trading. Table 6 reports the results of sectoral herding behavior during GFC for the conventional segment. The results show the presence of herding activity only in the financial sector. Table 7 reports the results of sectoral herding behavior during GFC for Shariah-compliant stocks. Four sectors, namely financials, healthcare, industrials, and consumer non-cyclical, demonstrate herding during GFC in the Shariah-compliant segment. The findings indicate that the magnitude of herding varies across the different sectors and segments. These results are consistent with that of contemporary literature (Luu and Luong, 2020).

Further, this study also investigates herding behavior during COVID-19 within aggregate and sectoral data samples. Table 8 reports the results of sectoral herding behavior during COVID-19 for the conventional segment. Results show that herding is more pronounced during COVID-19 as compared to GFC at both aggregate and sectoral level. Consumer cyclical, financials, healthcare, and utility sectors show herding in the conventional segment of the stock market. Table 9 reports the results of sectoral herding behavior during COVID-19 for Shariah Compliant stocks.

The Shariah-compliant segment is also exposed to severe effects of herding activity in the stock market during COVID-19. Results affirm both Shariah-compliant and non-compliant stocks are affected by COVID-19, highlighting the vast scale of destruction caused by the crisis. In addition to that, the pandemic generates psychological fear and instability in the market, which provides the foundation for herding to penetrate the stock market (Espinosa-Méndez and Arias, 2021).

Table 5. Herding in aggregate data samples.

| VARIABLES | Global Fin Crisis | COVID-19 |
|---|---|---|
| $R_{m,t}$ | 1.271*** | 0.957*** |
| | (0.0949) | (0.0466) |
| ${R_{m,t}}^2$ | -0.0123 | -0.144*** |
| | (0.0633) | (0.0370) |
| α | 0.328*** | 0.517*** |
| | (0.0231) | (0.0097) |
| Observations | 412 | 782 |
| R-squared | 0.688 | 0.648 |

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 6. Conventional Stocks GFC.

| Sectors | Rm.t | ${R_{m,t}}^2$ | α | R-squared |
|---|---|---|---|---|
| Materials | 0.908*** | 0.0190** | 0.456*** | 0.699 |
| | -0.0519 | -0.00865 | -0.035 | |
| Consumer Cyclical | 1.403*** | -0.0542 | 0.361*** | 0.677 |
| | -0.105 | -0.0535 | -0.0291 | |
| Financials | 1.983*** | -0.471*** | 0.420*** | 0.57 |
| | -0.13 | -0.0724 | -0.0399 | |
| HealthCare | 0.812*** | 0.0654*** | 0.0654*** | 0.766 |
| | -0.043 | -0.0179 | -0.0189 | |
| Industrials | 0.997*** | 0.142*** | 0.321*** | 0.731 |
| | -0.071 | -0.0278 | -0.0263 | |
| Consumer Non-Cyclical | 2.114*** | -0.0496 | 0.289*** | 0.774 |
| | -0.109 | -0.0675 | -0.0244 | |
| Technology | 0.726*** | 0.0167 | 0.181*** | 0.674 |
| | -0.0539 | -0.0102 | -0.0368 | |
| Utilities | 0.985*** | 0.0204 | 0.375*** | 0.743 |
| | -0.0657 | -0.0145 | -0.0417 | |
| Energy | 0.167* | 0.105*** | 0.373*** | 0.36 |
| | -0.0894 | -0.0239 | -0.0553 | |

Table 7. Shariah Compliant Stocks GFC.

| Sectors | Rm.t | ${R_{m,t}}^2$ | α | R-squared |
|---|---|---|---|---|
| Materials | 0.875*** | 0.0608** | 0.487*** | 0.607 |
| | -0.0776 | -0.0282 | -0.0304 | |
| Consumer Cyclical | 0.782*** | 0.112 | 0.440*** | 0.481 |
| | -0.123 | -0.0756 | -0.0319 | |
| Financials | 2.071*** | -0.546*** | 0.420*** | 0.599 |
| | -0.13 | -0.0736 | -0.0377 | |
| HealthCare | 1.292*** | -0.546*** | 0.269*** | 0.482 |
| | -0.0824 | -0.0608 | -0.0202 | |
| Industrials | 1.233*** | -0.172*** | 0.341*** | 0.586 |
| | -0.0993 | -0.0595 | -0.027 | |
| Consumer Non-Cyclical | 2.124*** | -0.368*** | 0.330*** | 0.688 |
| | -0.14 | -0.129 | -0.0221 | |
| Utilities | 0.918*** | 0.0132 | 0.420*** | 0.619 |
| | -0.0875 | -0.0271 | -0.0399 | |
| Telecommunication | 0.366*** | 0.0400*** | 0.357*** | 0.563 |
| | -0.0514 | -0.0108 | -0.0349 | |
| Energy | 0.270*** | 0.0193 | 0.359*** | 0.169 |
| | -0.0763 | -0.0295 | -0.0358 | |

Table 8. Conventional Stocks COVID-19.

| Sectors | Rm.t | $R_{m,t}{}^2$ | α | R-squared |
|---|---|---|---|---|
| Materials | 1.137*** | -0.0957 | 0.265*** | 0.658 |
| | -0.0649 | -0.0582 | -0.013 | |
| Consumer Cyclical | 0.760*** | -0.171*** | 0.466*** | 0.359 |
| | -0.0445 | -0.0146 | -0.0192 | |
| Financials | 0.961*** | -0.135*** | 0.617*** | 0.497 |
| | -0.0601 | -0.0435 | -0.0144 | |
| HealthCare | 1.455*** | -0.447*** | 0.0174 | 0.505 |
| | -0.0739 | -0.039 | -0.0244 | |
| Industrials | 0.0507 | 0.252*** | 0.647*** | 0.769 |
| | -0.0324 | -0.00801 | -0.0157 | |
| Consumer Non-Cyclic | 1.226*** | -0.0916 | 0.414*** | 0.683 |
| | -0.065 | -0.0771 | -0.00927 | |
| Technology | 0.0843*** | 0.00377 | 0.433*** | 0.045 |
| | -0.0141 | -0.00745 | -0.0166 | |
| Utilities | 0.997*** | -0.164*** | 0.471*** | 0.483 |
| | -0.0616 | -0.0333 | -0.0195 | |
| Telecommunication | 0.325*** | 0.0165* | 0.469*** | 0.254 |
| | -0.0454 | -0.00919 | -0.038 | |

Table 9. Shariah Compliant Stocks COVID-19.

| Sectors | Rm.t | $R_{m,t}{}^2$ | α | R-squared |
|---|---|---|---|---|
| Materials | 0.798*** | -0.130*** | 0.480*** | 0.52 |
| | -0.0475 | -0.0313 | -0.0124 | |
| Consumer Cyclical | 0.719*** | -0.131*** | 0.473*** | 0.458 |
| | -0.0488 | -0.0263 | -0.0153 | |
| Financials | 0.966*** | -0.139*** | 0.606*** | 0.501 |
| | -0.0592 | -0.0434 | -0.0139 | |
| HealthCare | 0.406*** | 0.0367*** | 0.412*** | 0.369 |
| | -0.0222 | -0.00405 | -0.0117 | |
| Industrials | 0.386*** | 0.101*** | 0.535*** | 0.456 |
| | -0.0496 | -0.0255 | -0.0158 | |
| Consumer Non-Cyclic | 1.205*** | -0.143** | 0.460*** | 0.667 |
| | -0.063 | -0.0715 | -0.00936 | |
| Technology | 0.575*** | -0.153*** | 0.408*** | 0.134 |
| | -0.0584 | -0.0204 | -0.0316 | |
| Utilities | 0.861*** | -0.166*** | 0.486*** | 0.418 |
| | -0.0569 | -0.0306 | -0.0177 | |
| Energy | 0.721*** | -0.208*** | 0.332*** | 0.3 |
| | -0.0472 | -0.0214 | -0.0184 | |
| Telecommunication | 0.242*** | 0.0776*** | 0.558*** | 0.471 |
| | -0.0436 | -0.0112 | -0.0279 | |

**Robustness**

The study analyzes whether the results reported in section 4 are reliable. We split the data into different market conditions (low and high) and time periods via the rolling window methodology. We estimate variation in the herding behavior of investors during different market regimes before and after COVID-19. Results indicate that herding is present in all market conditions except upmarket after the pandemic. However, herding appeared with moderate intensity before COVID-19; aggregate and high volatility cases indicate anti-herding. Overall, robust testing confirms our results already reported in Tables 5 to 9.

Table 10. Herding during different regimes.

| Variables | All | Market Up | Market Down | High Volatility | Low Volatility |
|---|---|---|---|---|---|
| Y1 | 0.999*** | 0.666*** | 1.243*** | 0.995*** | 1.252*** |
| | (0.00801) | (0.00318) | (0.0110) | (0.0109) | (0.00584) |
| Y2 | -0.0802*** | -0.0119*** | -0.130*** | -0.0673*** | -0.360*** |
| | (0.00535) | (0.00214) | (0.00710) | (0.00652) | (0.00390) |
| α | 1.209*** | 1.413*** | 1.056*** | 1.239*** | 1.153*** |
| | (0.00183) | (0.000911) | (0.00249) | (0.00287) | (0.00172) |
| Observations | 690,897 | 338,997 | 351,900 | 341,343 | 349,554 |
| R-squared | 0.465 | 0.476 | 0.491 | 0.492 | 0.382 |

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 11. Herding during different regimes after COVID-19.

| Variables | All | Market Up | Market Down | High Volatility | Low Volatility |
|---|---|---|---|---|---|
| Y1 | 1.092*** | 0.628*** | 1.498*** | 1.105*** | 1.297*** |
| | (0.003) | (0.004) | (0.005) | (0.005) | (0.005) |
| Y2 | 0.908*** | 0.691*** | 1.082*** | 0.886*** | 1.372*** |
| | (0.003) | (0.004) | (0.005) | (0.004) | (0.006) |
| Y3 | -0.150*** | 0.006*** | -0.277*** | -0.148*** | -0.347*** |
| | (0.002) | (0.002) | (0.003) | (0.002) | (0.004) |
| Y4 | 0.002 | -0.020*** | -0.017*** | 0.026*** | -0.533*** |
| | (0.002) | (0.003) | (0.002) | (0.002) | (0.005) |
| α | 1.211*** | 1.413*** | 1.055*** | 1.240*** | 1.142*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Observations | 690,897 | 338,997 | 351,900 | 341,343 | 349,554 |
| R-squared | 0.468 | 0.477 | 0.500 | 0.497 | 0.386 |
| t-stat1 (H0:Y1=Y3) | 70346 | 20258 | 49419 | 33775 | 38934 |
| Prob | 0 | 0 | 0 | 0 | 0 |
| t-stat2(H0:Y2=Y4) | 3755 | 34.29 | 5415 | 2420 | 7230 |
| | 0 | 0 | 0 | 0 | 0 |

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

**CONCLUSIONS**

This study highlights the different behavioral dynamics of investors within different segments and sectors of Shariah-compliant and conventional stocks across two crises. The results present diverse behavioral patterns of investors across sectors and segments and lay out an opportunity for prudent decision-making. In addition to that, the magnitude of herding in COVID-19 is far more severe than the global financial crisis. The findings indicate that COVID-19 affected almost all the sectors of the stock market. However, different segments and sectors reacted differently. Moreover, the findings reveal that herding behavior in the Pakistani stock market was lower during the GFC than during the COVID-19 pandemic. In the same vein, the Pakistani stock market offers safe heavens to investors across the sectors and segments during the GFC. Consequently, the study also identifies sectors for portfolio diversification, like Materials, Consumer Cyclical, Utilities, telecom, and energy during GFC. However, during COVID-19, the Pakistani stock market remains riskier and offers weak safe havens for investors across the sectors and segments. Apropos of that, the window for portfolio diversification is very small due to the wide-scale repercussions of COVID-19, and only the Telecom sector showed no sign of herding activity. The findings of the research can be used by investors and fund managers to construct a well-diversified portfolio to yield benefits during the crisis as well. The policy of regulating foreign fund flows, particularly short-term ones, to minimize the risk of investors engaging in herding behaviour during global financial market shocks holds significant importance for policymakers in this region. Finally, the study uses data from the Pakistani stock market, and findings may not be generalizable to developed economies. Future research work can be carried out by incorporating data from developed economies as well.

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