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Sectoral Herding and Contagion effect: Pre and during COVID-19 crisis

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ABSTRACT
This article investigates herding contagion of investor using aggregate market datasets and industries datasets of Chinese stock market (Shanghai stock market) and Pakistani Stock market (Karachi stock market). We employed daily stock return of all stocks from Jan 2019 to Dec 2019 (before COVID) and Jan 2020 to Feb 2021 (COVID period). Further data divided into sectors as per Global Industry Classification Standard. We used Cross Sectional Absolute Deviation (CSAD) to check the herding contagion across the different industries of Chinese and Pakistani stock market. Our empirical results found weak association between market level herding and industry level herding. Our results authenticate that investors forms small clusters in stock market (Sectoral herding). Secondly, herding contagion not appear in any sample (both aggregate and industry level) between Chinese stock market and Pakistani stock market. Therefore, it concluded that Chinese market is segmented market and has no influence on herding activity taking place in Pakistani stock market. This study recommends that investor needs be more focus on sectoral level herding.

KEYWORDS
Contagion, Pandemic, Sectoral and Cross Sectional Absolute Deviation

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INTRODUCTION

Coronavirus is a novel and contagious disease, World Health Organization (WHO) has officially name coronavirus as COVID-19 on 11 Feb 2020. COVID-19 has made remarkable scale of destruction on every aspect of life, which led WHO to declared global emergency on 20 Feb 2020 and pandemic on 11 Mar 2020. COVID-19 first reported in Wuhan central city of China. Afterwards, COVID-19 spread worldwide at exponential speed. In Pakistan, first case of COVID-19 was reported on 26 Feb 2020 in Karachi. Since the outbreak pandemic, all major financial markets of world (developed and emerging) observed sharp decline (Ali et al., 2020).

The ongoing situation of pandemic has triggered fear among the stakeholders of financial markets. This fear and uncertainty in stock markets leads to herding behavior (Economou et al., 2018). Herding describe as investor follow the actions of others investors or intend to mimic the behavior of fellow investors and surpassing own private information (Banerjee, 1992). Especially during the period of turmoil investors ignore his private information and follow the crowd (Chauhan et al., 2020). During herding behavior cycle investors deviate from rational decision process and imitate others which leads to irrational decisions (Yousaf et al., 2018). Investor behavior always been a debatable topic for researchers and particularly herding behavior gain much importance in last 3 decades due to its contagious nature.

China and Pakistan have close financial linkages since 1963 and signed first long term bilateral trade agreement. In recent years, China and Pakistan become major trade partner in terms of export/import. In addition, China and Pakistan signed China-Pakistan Economic Corridor (CPEC) in 2015, which strengthen the strategic economic cooperation between two countries. Chinese government has announced to invest $46 billion in all segments of economy to boost financial ties (Irshad & Xin, 2015). The financial ties in all sectors of economy have made both markets more connected with each other. Therefore, crisis in any sector of Chinese stock market can affect the performance of Pakistani stock market (Shehzad et al., 2021).

In normal trading days, investors have ample time to gather information, analyze the outcomes and take rational decision (Mertzanis & Allam, 2018). However, COVID-19 has caused chaos in financial markets and dented the investor confidence. Nath and Brooks (2020) argue that herding behavior is prime suspect during periods of crisis and when domestic crisis travel across the countries is called contagion (Wahyudi et al., 2018). In this study, we discuss contagion effect of herding behavior at industry level due unusual circumstances developed by COVID-19. This situation provide opportunity to assess the dynamics of stock market during unexpected and unforeseen disease. Earlier research studies (Wahyudi et al., 2018; Chiang et al., 2007) have employed aggregate market data sets and found herding contagion across the countries. Thus, our study fills the gap by throwing the light on the herding behavior and its contagion effect in the sectors of Chinese and Pakistani stock markets. Further, fundamental objective of this study to evaluates the dynamic association among the sectors of economy before and during COVID-19.

This study is organized as follows. Section 2 of this study present theoretical framework & literature review, in section three we discuss data & methodology, in section four we lay out our research findings and at last section five we conclude.

THEORETICAL FRAMEWORK & LITERATURE REVIEW

Now COVID-19 is settling down and major countries like USA, Russia and China etc. have developed vaccine to fight back. In recent past, we survived from multiple sickness like SARS, Swine Influenza and Eloba and on other hand financial crunch such as 9/11 attack, global financial crisis 2008-09 and cold war between USA & China. All these events have created insecurity in the financial markets and remain activated for considerable time. However, investors have survived these difficult times and yield normal returns (Abdeldayem & Aldulaimi, 2020). COVID 19 trigger unseen financial crisis and global recession. As a result, investors follow the peer and form a herd (Kizys et al., 2021).

Herding behavior is a well-recorded human characteristic; especially in the subjects of finance and economics. Herding behavior is as old as financial markets. Wang and Wang (2018) describe that herding behavior is a phenomenon in which investors behavior is influenced by gurus in the market. Herding behavior is a transmission of thoughts and pattern of relationship among investors at workplace (Aytaç et al., 2018). Banerjee (1992) explored that in mostly cases investors who want to increase their wealth and wants to gain from their investment choose to herd, instead of utilizing their private information to make investment decisions. BenSaïda (2017) examine that herding behavior appear due to wrong interpretation of information or less informed market players in the course of crisis. Further, this crisis spread to other stock markets resulting in contagion effect.

Forbes and Rigobon (2002) define financial contagion as a significant increase in cross financial market linkages, after a shock to one country / group of countries. As per World Bank definition of financial contagion is a general process of shock spread / transmit across the countries. There are different channels of contagion, by which shocks / crisis spread to other countries or market. Dornbusch et al. (2000) discuss fundamental channels of contagion such as trades links and financial links between countries. Financial intuitions are common agents of spreading contagion to countries. Trade agreements between countries are also facilitators of spreading fundamental contagion. Leung et al. (2017) discuss pure contagion and provide evidence that pure contagion spread through irrational behavior of investors. Investors follow the herd and herding leads to liquidity issue in the market. Liquidity issue or financial crisis spread to other markets and countries. Burzala (2016) pointed out that trade links and geography of country play an important role in spreading crisis. They find logical framework to understand the contagion effect due to herding behavior. During financial crisis periods contagion mostly travel from developed markets to emerging markets (Hernandez & Valdes, 2001).

Traditional models fail to predict financial crisis and its spread across the countries. This creates an important question for all the stakeholders of financial markets. Fenzl and Pelzman (2012) pointed out the inability of conventional theories to predict and explain the financial crisis. Herding behavior is a process which leads to contagion effect and COVID-19 provide the foundation. COVID -19 has drastically effected the economy across the world, social and medical uncertainty has provided fuel to the fire. In these circumstances investors followed their agents simultaneously in most of the stock markets (Espinosa-Méndez & Arias, 2021). During COVID-19 period waves of irrational behavior of investors spread across the different stock markets. Pandemic pose threat to financial stability and efficiency of global economies. The whole cycle starts from pandemic, investor irrational behavior and spill over to other economies has make whole financial structure vulnerable (Chang et al., 2000). Research studies has shown consensus that COVID-19 has jolt the foundation of global economies for more than a year. This shock has weakened the economic output and 14% cumulative loss is estimated (Caggiano et al., 2020).

Vo and Phan (2019) argues that herding behavior studies shows inconsistency and variation especially during crisis. Herding formations mainly depends on time and location. Abundance of research work has been done on irrational behavior of investors but still unsettled. Kindleberger et al. (2005) describes the financial crisis occurs when behavior of investor shifts from selling to buying or vice visa (herding). This kind of conflicting investor behavior has been observed regularly in the financial markets ever since these started operational and it further leads to volatility in the stock market. Herding behavior is core reason in spreading the financial crisis or shocks across different markets and countries. Sruthi and Shijin (2017) finds empirical evidence that herding contagion spread internationally through investors owing international stock portfolios during financial crisis period.

Against this literature, current paper will examine following important questions.

i. Does herding behavior present (aggregate data sample and Sectoral data samples) in Chinese and Pakistani stock markets before & during COVID-19 period?
ii. Does herding contagion travel across the countries (Chinese and Pakistani stock market) before and during COVID-19 period?

DATA AND METHODOLOGY

The data has taken from “Banker Thompson database”. Data is divided in 11 different sectors according to Global Industry Classification standard (GICS) of Chinese and Pakistani stock markets. Trading volume of said Stock markets was tremendously lifted up in last two decades. Daily prices of stocks are taken to analyze the research problem. This study utilizes the data for the period January, 2019 to December, 2019 (before COVID 19) and January, 2020 to February, 2021 (during COVID-19).

METHODOLOGY TO CHECK HERDING BEHAVIOR

The first tool to check the descriptive statistics and general characteristics of data. Approach of this study to examine herding behavior is uniform with previous researches (Chang et al. 2000). Which is as follows.

$$CSAD_t = \alpha + y_1 \left| R_{m.t} \right| + y_2 R^2_{m.t} + e_t \quad (1)$$

In this equation $R_{m.t}$ represent the cross sectional stock average in N returns at the time t in the stock portfolio. γ_1 is the coefficient of the variable $R_{m.t}$. γ_1 Shows that $R_{m.t}$ & CSAD have +ve or –ve relationship. γ_2 is the coefficient of the variable $R^2_{m.t}$. γ_2 Shows that $R^2_{m.t}$ & CSAD have +ve or –ve relationship. Return on dispersion measure through the $CSAD_t$, which is cross-sectional absolute deviation.

$$CSAD_t = 1/N £^n_i = 1 \left| R_{i.t} - R_{m.t} \right| N \quad (2)$$

In the above equation is Ri.t return of total number of stock at time t. N representing the number of firms, which are observed in the portfolio. $R_{m.t}$ is average return of stocks in portfolio. Negative coefficient γ_2 will indicate that herding behavior present in the market / sector.

Return on stock is estimated by following model.

$$Rt = 100 \times (\log (Pt) - \log (Pt\text{-}1)). \quad (3)$$

TOOLS AND TECHNIQUE TO DETERMINE HERDING CONTAGION

Tools and techniques employ to determine the herding contagion is in line with previous research study (Wahyudi et al., 2018). In this technique we calculate Cross Sectional Absolute Dispersion of all stock markets or industries. Further we use Cross Sectional Absolute Dispersion as explanatory variable to check the dominance of one stock market / industry to other stock market / industry. Example of model explained is as under:-

$$CSAD_{PAK.t} = \gamma_1 + \gamma_2 \, CSAD_{CHN\ t\text{-}1} + e_t \quad (4)$$

Equation no.4 explain that whether CSAD of Pakistani stock market is define by CSAD of Chinese market. Further, to check whether herding activity in Chinese stock market influence the decisions of investor trading in Pakistani stock market.

$$CSAD_{PAK.t\ (Financial).t} = \gamma_1 + \gamma_2 \, CSAD_{CHN\ t\text{-}1\ (Financial)\ t\text{-}1} + e_t \quad (5)$$

Equation no.5 determine that sectoral herding in Chinese stock market effect the sectoral herding in Pakistani stock market (Chiang & Zheng, 2010).

EMPIRICAL ANALYSIS AND DISCUSSION

In this section, we first inspect the herding behavior within the 11 sectors of Chinese and Pakistani stock markets. Secondly we detect herding contagion across the sectors of China and Pakistan. As discussed earlier, herding behavior present when nonlinear relationship holds between cross sectional absolute deviation (CSAD) and squared mean return of stocks. Resultantly, significant and negative coefficient (y_2) shows investors are inclined towards herd. The results of estimation are in support of our hypothesis that investors herd around the different sectors of stock markets.

Table No.1 Descriptive Statistics Pakistan Pre COVID

CSAD		*|Rm.t|*		$R^2_{m.t}$	
Mean	0.891	Mean	0.327	Mean	0.198
Std. Error	0.019	Std. Error	0.019	Std. Error	0.021
Median	0.893	Median	0.250	Median	0.063
Mode	0.000	Mode	0.000	Mode	0.000
Std. Dev.	0.314	Std. Dev.	0.303	Std. Dev.	0.343
Variance	0.098	Variance	0.092	Variance	0.118
Kurtosis	2.100	Kurtosis	1.664	Kurtosis	10.645
Skewness	-0.623	Skewness	1.345	Skewness	3.012
Minimum	0.000	Minimum	0.000	Minimum	0.000
Maximum	1.776	Maximum	1.457	Maximum	2.122

Descriptive statistics of CSAD, Rmt and Rmt^2 are shown at table No.1, 2, 3 & 4 (relates to Pre and during COVID-19). Mean returns of both countries (Chinese and Pakistani stock market) in pre COVID and during COVID are positive. Expect pre COIVD period of Pakistan data sample, all other data sets have showed (coefficient positive and greater than 3) leptokurtic distribution. All data sets of both stock markets are positively skewed. Table No.5 present the results of aggregate data sample of Chinese and Pakistani stock market (pre and during COVID periods), it notices that herding exists all data sets except pre COVID period of China. It indicate that investors has taken rational decisions and appropriate information available to them in pre COVID period (Ahsan & Sarkar, 2013). Table No.6 shows results of sectoral herding in Pakistani stock market during pre COVID period, 6 sectors out of 11 show herding behavior. On the other hand, table No.7 indicate results of pre COVID period in Chinese stock market, herding is present within 8 out of 11 sectors. Further, we examined herding behavior during COVID period in all sectors of Pakistani stock market and herding discover in all sectors expect real estate and communication as

shown at table No.8. On the flip side herding present in all sectors of Chinese stock markets (results shown at table No.9). Our results show that herding is present in most of the sectors of Pakistani and Chinese stock market but not in all sectors (pre and during COVID).

Table No.2 Descriptive Statistics Pakistan During COVID

CSAD		*Rm.t*		$R^2_{m.t}$	
Mean	0.959	Mean	0.334	Mean	0.253
Std. Error	0.018	Std. Error	0.022	Std. Error	0.039
Median	0.929	Median	0.229	Median	0.053
Mode	0.000	Mode	0.000	Mode	0.000
Std. Dev.	0.312	Std. Dev.	0.376	Std. Dev.	0.681
Variance	0.097	Variance	0.141	Variance	0.464
Kurtosis	4.090	Kurtosis	9.160	Kurtosis	47.795
Skewness	-0.041	Skewness	2.572	Skewness	6.127
Minimum	0.000	Minimum	0.000	Minimum	0.000
Maximum	2.132	Maximum	2.674	Maximum	7.150

Table No.3 Descriptive Statistics China Pre COVID

CSAD		*Rm.t*		$R^2_{m.t}$	
Mean	0.544	Mean	0.388	Mean	0.320
Std. Error	0.012	Std. Error	0.026	Std. Error	0.049
Median	0.525	Median	0.255	Median	0.065
Mode	0.000	Mode	0.000	Mode	0.000
Std. Dev.	0.201	Std. Dev.	0.412	Std. Dev.	0.793
Variance	0.040	Variance	0.170	Variance	0.629
Kurtosis	2.708	Kurtosis	8.091	Kurtosis	67.102
Skewness	-0.345	Skewness	2.239	Skewness	7.004
Minimum	0.000	Minimum	0.000	Minimum	0.000
Maximum	1.306	Maximum	3.043	Maximum	9.258

Table No.4 Descriptive Statistics China during COVID

CSAD		*Rm.t*		$R^2_{m.t}$	
Mean	0.643	Mean	0.380	Mean	0.327
Std. Error	0.014	Std. Error	0.025	Std. Error	0.062
Median	0.659	Median	0.266	Median	0.071
Mode	0.000	Mode	0.000	Mode	0.000
Std. Dev.	0.236	Std. Dev.	0.429	Std. Dev.	1.080
Variance	0.056	Variance	0.184	Variance	1.166
Kurtosis	3.168	Kurtosis	18.712	Kurtosis	164.059
Skewness	-1.020	Skewness	3.130	Skewness	11.506
Minimum	0.000	Minimum	0.000	Minimum	0.000
Maximum	1.666	Maximum	4.047	Maximum	16.381

Table No.5 Results of Aggregate Data Sample (Herding Behavior)

Sector	γ_1	γ_2	**α**	**R-squared**
Pre COVID Pak	1.16***	-0.364***	0.58***	0.59
	(10.168)	(-3.597)	(24.487)	
Pre COVID China	0.35***	-0.05	0.42***	0.30
	(6.610)	(-1.94)	(24.685)	
During COVID Pak	0.829***	-0.134***	0.716***	0.56
	(-3.33)	(11.368)	(36.025)	
During COVID China	0.38***	-0.06***	0.52***	0.21
	(7.496)	(-3.42)	(27.919)	

*t statistics in parenthesis

Table No.6 Results of Pre COVID Pakistan (Herding Behavior) (statistics in parenthesis)

Sector	γ_1	γ_2	α	R-squared
Real estate	1.005*** (7.680)	-0.093 (-1.590)	0.362*** (7.290)	0.531
Utilities	0.787*** (7.600)	-0.137*** (-2.390)	0.545*** (15.410)	0.404
communication	0.43*** (4.530)	0.008 (0.270)	0.685*** (13.000)	0.353
Information technology	0.709*** (4.980)	-0.051 (-0.640)	0.383*** (7.900)	0.379
Healthcare	0.869*** (7.640)	-0.481*** (-6.100)	0.459*** (14.800)	0.219
Consumer Staples	1.205*** (7.840)	-0.292 (-1.940)	0.581*** (20.710)	0.508
Consumer Discretionary	0.752*** (7.760)	-0.192*** (-3.130)	0.482*** (16.010)	0.442
General Industries	0.884*** (9.310)	-0.33*** (-5.420)	0.491*** (17.030)	0.39
Construction material	0.723*** (8.480)	-0.098 (-1.930)	0.504*** (18.840)	0.528
Energy	0.797*** (7.330)	-0.463*** (-6.780)	0.438*** (13.360)	0.173
Financial	1.181*** (7.850)	-0.311*** (-2.570)	0.688*** (20.440)	0.48

Table No.7 Results of Pre COVID China (Herding Behavior)

Sector	γ_1	γ_2	α	R-squared
Real estate	0.348*** (6.140)	-0.066*** (-2.46)	0.431*** (21.680)	0.222
Utilities	0.4*** (7.180)	-0.06*** (-2.070)	0.353*** (19.970)	0.344
communication	0.328*** (5.850)	-0.058*** (-2.43)	0.44*** (19.380)	0.208
Information technology	0.365*** (6.890)	-0.08*** (-3.53)	0.519*** (22.890)	0.23
Healthcare	0.418*** (6.640)	-0.095*** (-2.800)	0.424*** (18.860)	0.243
Consumer Staples	0.43*** (5.140)	-0.07 (-1.280)	0.426*** (18.660)	0.296
Consumer Discretionary	0.346*** (6.640)	-0.07*** (-2.740)	0.422*** (24.270)	0.249
General Industries	0.321*** (5.570)	-0.052 (-1.780)	0.423*** (22.280)	0.232
Construction material	0.37*** (7.250)	-0.077*** (-3.22)	0.396*** (22.510)	0.269

Energy	0.497*** (7.280)	-0.085*** (-2.420)	0.309*** (12.650)	0.334
Financial	0.539*** (13.090)	-0.039 (-1.620)	0.184*** (17.590)	0.709

*t statistics in parenthesis

Table No.8 Results of During COVID Pakistan (Herding Behavior)

Sector	γ_1	γ_2	**α**	**R-squared**
Real estate	0.675*** (6.430)	-0.04 (-1.070)	0.57*** (10.880)	0.354
Utilities	0.88*** (10.260)	-0.21*** (-5.790)	0.547*** (17.250)	0.384
communication	0.374*** (4.470)	0.065 (-3.030)	0.713*** (12.480)	0.501
Information technology	0.731*** (7.800)	-0.14*** (-3.660)	0.397*** (9.010)	0.358
Healthcare	0.597*** (7.490)	-0.122*** (-2.810)	0.442*** (18.220)	0.334
Consumer Staples	1.351*** (12.680)	-0.279*** (-3.650)	0.582*** (25.120)	0.609
Consumer Discretionary	0.76*** (9.290)	-0.149*** (-3.980)	0.477*** (16.640)	0.429
General Industries	0.65*** (9.220)	-0.152*** (-5.080)	0.594*** (22.540)	0.332
Construction material	0.567*** (8.410)	-0.078*** (-2.650)	0.63*** (26.140)	0.411
Energy	0.711*** (9.930)	-0.221*** (-7.800)	0.348*** (11.050)	0.272
Financial	1.162*** (11.560)	-0.236*** (-4.180)	0.667*** (23.330)	0.491

*t statistics in parenthesis

Table No.9 Results of During COVID China (Herding Behavior)

Sector	γ_1	γ_2	**α**	**R-squared**
Real estate	0.462*** (9.990)	-0.115*** (-6.960)	0.436*** (24.240)	0.26
Utilities	0.393*** (8.260)	-0.091*** (-5.230)	0.383*** (21.460)	0.2
communication	0.429*** (8.110)	-0.106*** (-5.420)	0.429*** (17.910)	0.197

Information technology	0.429*** (8.560)	-0.098*** (-5.050)	0.512*** (23.190)	0.243
Healthcare	0.586*** (7.470)	-0.144*** (-3.200)	0.466*** (17.580)	0.278
Consumer Staples	0.448*** (7.120)	-0.096*** (-3.630)	0.563*** (22.790)	0.192
Consumer Discretionary	0.434*** (8.190)	-0.12*** (-6.360)	0.537*** (26.070)	0.184
General Industries	0.423*** (8.490)	-0.099*** (-5.170)	0.483*** (25.250)	0.216
Construction material	0.394*** (7.250)	-0.098*** (-4.600)	0.528*** (25.090)	0.166
Energy	0.453*** (9.720)	-0.105*** (-5.930)	0.312*** (15.530)	0.269
Financial	0.492*** (14.360)	-0.039*** (-2.390)	0.215*** (20.890)	0.653

*t statistics in parenthesis

From the COVID perspective, Chinese stock market experience historical drop and Pakistani stock also effected by turbulent situation. So taking into account uncertain situation in stock markets during COVID-19, our results show that herding and pandemic has direct relationship (Bouri et al., 2021). Further, aggregate market herding differ from herding within industries. Particularly no herding found in aggregate sample of Chinese stock market for pre COVID period, however, during the same period 8 industries experience herding. Thus, herding is much stronger within industries as compare to aggregate stock markets and aggregate market herding does not affect investors who form clusters within industries (Zheng et al., 2017). Further, herding is more prevalent during COVID period as indicated in our results, aggregate samples and all sectors of Chinese and Pakistani stock market experience herding except real estate and communication of Pakistani stock market. Trading volume may be the cause of dissimilar results of sectors (like real estate and communication) before and during COVID-19 (Qureshi et al., 2017; Cakan & Balagyozyan, 2016).

Results of herding contagion are reported at table No.10 & 11 and Chinese stock market has similar characteristic before and during COVID period. Herding in Chinese stock market has no effect on the herding activity in the Pakistani stock market (both at aggregate level and industry level). Resultantly, CSAD of Chinese market does not affect the dispersion of returns of Pakistani stock market. Therefore, it concluded that Chinese stock market is segmented market, which has no effect on international stock market. Characteristics of segmented stock markets differ from integrated stock markets regarding presence of herding behaviour. Further, integrated stock markets have efficient and reliable information to all the investors as compared to segmented stock markets. Hence, presence of herding contagion differs from segmented stock market to integrated stock markets and Chinese stock market is not bilaterally integrated with Pakistani stock market. In addition, during COVID Pakistani stock market does not experience herding contagion from Chinese stock market, which is verified by our results. These findings authenticate previous studies results that herding contagion does not apply to segmented market (Chinese stock market) during tranquil and crisis periods (Wahyudi et. al, 2018).

Table No.10 Results of Pre COVID (Herding contagion)

	Pakistan				
China	**Sector**	Utilities	Healthcare	Consumer Discretionary	Energy
	Utilities	-0.042 (-0.39)			
	Healthcare		0.039 (0.71)		
	Consumer Discretionary			-0.117 (-1.18)	
	Energy				0.059 (0.89)

*t statistics in parenthesis

Table No.11 During COVID (Herding Contagion)

		Pakistan								
	Sector	Utilities	Info tech	Healthcare	Cons Staples	Cons Discre	General Industries	Cons material	Energy	Financial
China	Utilities	-0.042 (-0.39)								
	Information technology		-0.039 (0.4)							
	Healthcare			0.039 (0.71)						
	Consumer Staples				0.050 (0.61)					
	Consumer Discretionary					-0.049 (0.5)				
	General Industries						0.12 (1.61)			
	Construction material							-0.048 (-0.67)		
	Energy								0.058 (0.75)	
	Financial									0.06 (0.52)

*t statistics in parenthesis

CONCLUSION

This paper pioneer to examine herding behaviour at industry level using GICS 11 industries classification. This study employed Chiang and Zheng (2010) model to detect the herding behaviour. The outcomes of this study are in line with previous studies and support our hypothesis that herding behaviour are stronger at sectoral level as compared to aggregate market sample (Zheng et al., 2017; Cakan & Balagyozyan, 2016). Our estimates also exhibit that herding behaviour is more pronounced at industry instead aggregate level under different market conditions (pre COVID and during COVID). Further, our examination also suggested that herding is present in all sectors of both stock markets except real estate and communication of Pakistani stock market during COVID period.

In this study herding contagion analyzed at both aggregate and industry level. However, in all scenario herding contagion has not been transmitted from Chinese stock market to Pakistani stock market. Thus, herding activity in Chinese stock market is not effecting Pakistani stock market or bilaterally. These findings authenticate the theory of herding contagion with regards to segmented market and integrated markets during the period of turmoil. The results of this paper offers new strategies while dealing with current financial crisis triggered by COVID-19. This paper has novel practical implications for all the shareholders and fund managers. Our results offer new techniques to all stakeholders while selecting stock portfolio during the periods fear and chaos. Our results highlight the importance of sectoral herding and funds distribution across the sectors. Our findings helpful for policy makers to design procedure which can avert future economic instability. The study has limitation and only two stock markets data employed to analyze the herding contagion. Future studies can examine herding contagion with larger database and multiple stock markets.

CREDIT AUTHOR STATEMENT

Syed Faisal Hasan Bukhari: Conceptualization, Methodology, Software, Data curation, Writing- Original draft preparation. Visualization, Investigation, Software and Validation. **Dr Habib Ahmad***:* Supervision, Reviewing and Editing.**: Dr. Hasan Hanif**: Reviewing and Editing

COMPLIANCE WITH ETHICAL STANDARDS

It is declare that all authors don't have any conflict of interest. Furthermore, informed consent was obtained from all individual participants included in the study.

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