Impact of the COVID-19 pandemic on banking and financial sector stock returns

Mahnoor Hanif (Corresponding Author)
PMAS- Arid Agriculture University Rawalpindi, Pakistan
Email: mahnoorhanif289@gmail.com

Majdi Hassan
ESSEC Tunis, University of Tunis, Tunisia
Email: majdi.hassen@gmail.com

Basma Henchiri
Faculty of Economics and Management, University of Sfax, Tunisia
Email: henchiri_b@yahoo.com

Muhammad AlDaas
Azman Hashim International Business School, University Teknologi Malaysia, Malaysia
Email: Aldaas1988@graduate.utm.my

Abstract

Using the Indian banking and financial services stocks, this study set out to examine the impacts of the global pandemic and government measures on the stock returns around four pandemic-related events. This study employs the event study methodology with the market model estimation for a 210-day estimation window [-214,-5] and a 15-day event window [-4,+10]. The reaction was mild to the announcement of 'Health Emergency of Global Concern', but as soon as the coronavirus outbreak was declared a 'global pandemic', the market reacted significantly. Further, due to the expected economic stimulus, the Reserve Bank of India's financial measures resulted in a positive response from the market. The public and private sector banks are almost non-reactive to the first event. The findings deny that with the available prices, during an event, abnormal returns are impossible. The analysis results make it easier for them to formulate sustainable policies and constitute a high-yield moderate-risk portfolio during such emergencies.

Keywords: Global pandemic; event study; market model; emerging market; returns.

1. Introduction

COVID-19 is an uncertain event that badly impacted lives and health around the globe. While impacting the public health and the health of the economies, the impacts of the pandemic are more intense than the previous ones. Concomitantly, the banking and financial sector has been active throughout the pandemic. Although people were locked up in their houses, the banks were open for transactions. Banking services, available online, engendered the economy to run even during the nation-wise lockdowns. The policy authorities worldwide have protracted their support to commercial banks in two ways. First, by enhancing the capacity of the banks to lend, and second, by enhancing their willingness to lend. India's growth in outstanding credit account balances regarding personal loans, home loans, credit cards, and auto loans has been sluggish during 2020[1]. Although the economic wheel has been running, economies worldwide have underperformed due to the pause in production. The reports published by the Reserve Bank of India indicate that the economic shutdown adversely

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[1] https://m.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=1179

impacted the banking sector. To measure these impacts, this study set out to examine the stock returns of the banking and financial sector stocks during the pandemic period.

The growing body of COVID-19 literature is evidencing that all sectors of the economies worldwide have experienced the pandemic effect, be it the restaurant industry *(Song et al., 2020)*, the tourism sector *(Hu et al., 2021; Pandey & Kumar, 2021; Yang et al., 2020)*, energy sector *(Foglia & Angelini, 2020; Shaikh, 2021)*, food supply chain *(Höhler & Lansink, 2021)*, or the banking sector *(Demirguc-Kunt et al., 2021; Phuong, 2021; Wu & Olson, 2020)*. The pandemic has engendered turbulence in the different sectors *(Alam et al., 2020; Hasaj & Scherer, 2021; Pandey, Banerjee, et al., 2022)*.

Up to now, very few studies have attempted to examine the abnormal returns of the banking and financial sector around pandemic-related events. This study is one of the first attempts to examine the event-induced returns around four pandemic-related events thoroughly. The first two events, 06/01/2020 and 30/01/2020, represent the early stages of the pandemic. The third event, 11/03/2020, is the red signal event that impacted the financial markets the most. The fourth event, 27/03/2020, is the stimulus event wherein the government infused fiscal and monetary measures. These events cover the period of the progress of the pandemic and engender the stock returns significantly. Although the peak in daily new cases and deaths has been noticed months after the events considered in this study, the early stage is to what the market impulses. This study has important implications for the management, investors, and policymakers, aiding them in formulating sustainable policies and constituting a high-yield moderate-risk portfolio during such emergencies. While contributing to the previous literature on market efficiency during epidemics and crises, this study also has important implications for emerging markets.

The remaining part of the paper is as follows: Section *2* presents a review of extant literature, Section *3* demonstrates the data and methodology, Section *4* discusses the findings, and Section *5* concludes the findings of the study.

2. Literature review

Many studies have explored the pandemic effects on the global market *(Ali et al., 2020; Baker et al., 2020; Belaid et al., 2021; Heyden & Heyden, 2021; Khatatbeh et al., 2020; Pandey & Kumari, 2021a, 2021b)*, on developed markets *(Alhenawi et al., 2022; Goodell & Huynh, 2020; Heyden & Heyden, 2021; Mazur et al., 2021)*, on emerging economies *(Alam et al., 2020; Anh & Gan, 2020; Harjoto & Rossi, 2021; Pandey et al., 2021; Pandey, Kumari, et al., 2022; Pandey & Kumari, 2021b, 2021c; Rakshit & Neog, 2021; Topcu & Gulal, 2020)*, and, on the forex markets *(Aslam et al., 2020; Bazán-Palomino & Winkelried, 2021)*. These studies confirm the significant impact of the pandemic. However, this section focuses on the studies concentrating on the banking and financial services sector.

Demirguc-Kunt et al. (2021) examined a sample of 3043 firms, including commercial banks and non-bank financial firms, from 44 developed and developing nations to find that the banking sector was under considerable stress and underperformed during the pandemic. The COVID-19 shock more adversely impacted the banks than other corporates and non-banking financial companies. They also find evidence for moderating impacts of policy interventions though different for different banks and circumstances.

Wu and Olson (2020) divided the pandemic's impact into short-term, long-term, and systematic risks. *Kandil Göker et al. (2020)*, in their event study, examined the pandemic effects on 26 Borsa Istanbul sector indices and found that the CAARs of only the banking sector and three other sectors were positive; however, the returns of the banking sector were

insignificant. *Phuong (2021)* examined the COVID-19 impacts on the Vietnamese banking sector stocks using the event study method around three lockdown events and found that the lockdowns positively impacted the banking sector stock returns. *Demir and Danisman (2020)*, with a sample of banking companies across 53 nations, found that the bank stocks have suffered more than other companies. They also find more adverse impacts on public banks.

From the studies reviewed here, it is evident that although previous studies evidence heterogenous market reaction, very little literature on the banking and financial sectors is available. Being a significant pillar of any economy, studying the impacts on banking and financial services sectors becomes essential. It is evident from the available literature that only *Demirguc-Kunt et al. (2021)*, *Demir and Danisman (2020)* and *Phuong (2021)*, and to some extent, *Kandil Göker et al. (2020)*, have focused on the banking stock price behavior to the policy announcements during the pandemic while the rest have reviewed the impacts on banking activities. The scant literature is somewhat controversial, and there is no general agreement about the pandemic impacts on the banking sector. While *Demir and Danisman (2020)*, and *Demirguc-Kunt et al. (2021)* find a significantly negative impact on banks (from a global perspective), *Kandil Göker et al. (2020)* provide evidence for an insignificant impact on the banking sector (Borsa Instanbul), *Phuong (2021)* provide evidence for positive impacts of lockdown events on banking stocks (Vietnamese stock exchange). To date, there has been no conclusive evidence of how these events impact the banking sector stocks. This study set out to fill the gap in the literature by providing evidence of the pandemic effects on the Indian banking and financial services sector stocks.

In particular, this study set out to examine the research question of whether the banking and financial sector stock returns are vulnerable to the global pandemic. The literature review points out the following hypotheses:

H_1: *"the abnormal return in the banking and financial sector is zero on or around the event day."*
H_2: *"the abnormal returns cumulated over different periods is zero."*

3. Data and Methodology

3.1. Data

Our initial sample consisted of 42 stocks that constitute the PSU Bank Index, Private Bank Index, and the Financial Services Index of the NIFTY. However, five stocks are common among the three indices. Hence, the final sample consists of 37 stocks. We collect the data from the NSE website. We further divide the sample into three parts. The first part comprises NIFTY PSU Bank Index components (12), the second part comprises NIFTY Private Bank Index components (10), and the third part comprises of NIFTY Financial Services Index (15)). *Table 1* presents the sample. The data consists of all the stocks' daily closing prices and that of the three indices for 284 days (18 February 2019 to 17 April 2020).

3.2. Methodology

Recent studies evidence the use of event study methodology to examine the impacts of events on stock market returns *(Anolick et al., 2021; Pandey & Jaiswal, 2017; Rai & Pandey, 2021; Rai et al., 2022; Rai & Kumari, 2022)*. This study uses the Ordinary Least Squares (OLS) market model (MM) *(Armitage, 1995; Mackinlay, 1997; Pandey & Kumari, 2020a)* for estimating the expected returns by employing the standard event study methodology *(Brown and Warner, 1980, 1985)*. We have four sample events for analysis. The event date (t) is the day on which the sample events occurred:

   a) Event1 (e1): 06/01/2020: The World Health Organisation posted the first information about the new coronavirus on 04/01/2020, and for the first time, the

news aired on 05/01/2020. Both days being a trading holiday, we take 06/01/2020 as the event date.

b) Event2 (e2): 30/01/2020: The World Health Organisation declared the novel coronavirus outbreak as a Public Health Emergency of Global Concern on 30/01/2020.

c) Event3 (e3): 11/03/2020: The World Health Organisation declared the novel coronavirus outbreak as a 'Global Pandemic' on 11 March 2020.

d) Event4 (e4): 30/03/2020: The Reserve Bank of India (RBI) announced liquidity measures on 27/03/2020. Since the announcement came at 06:00 pm, we consider the effective event date as 30/03/2020.

Table 1: Descriptive statistics of daily returns for the sample period

Sample Stocks	Mean	Standard Error	Standard Deviation	Sample Variance	Kurtosis	Skewness	N
1. SBIN*	-0.0006	0.0007	0.0123	0.0002	5.9108	-0.5726	281
2. PNB	-0.0012	0.0007	0.0123	0.0002	2.5724	-0.5294	281
3. UNIONBANK	-0.0014	0.0008	0.0138	0.0002	2.2488	-0.4731	281
4. CENTRALBK	-0.0013	0.0007	0.0123	0.0002	5.7043	1.3015	281
5. J&K BANK	-0.0019	0.0010	0.0172	0.0003	3.4815	0.6410	281
6. IOB	-0.0008	0.0006	0.0108	0.0001	5.0312	0.4033	281
7. BANKBARODA	-0.0011	0.0008	0.0132	0.0002	6.1302	-0.5532	281
8. MAHABANK	-0.0005	0.0007	0.0122	0.0001	5.0585	1.0732	281
9. UCOBANK	-0.0010	0.0008	0.0131	0.0002	10.9479	2.0526	281
10. CANBK	-0.0014	0.0008	0.0142	0.0002	10.7873	-1.8664	281
11. INDIANB	-0.0024	0.0008	0.0139	0.0002	4.8430	-0.7156	281
12. BANKINDIA	-0.0013	0.0007	0.0123	0.0002	4.1257	-0.6426	281
13. AXISBANK*	-0.0008	0.0008	0.0138	0.0002	43.4663	-3.6178	281
14. HDFCBANK*	-0.0012	0.0012	0.0198	0.0004	181.8215	-12.1316	281
15. ICICIBANK*	0.0000	0.0007	0.0117	0.0001	12.8966	-1.3786	281
16. BANDHANBNK	-0.0014	0.0012	0.0196	0.0004	17.7034	0.6196	281
17. CUB	-0.0005	0.0006	0.0108	0.0001	25.0504	-2.6723	281
18. KOTAKBANK*	0.0000	0.0006	0.0099	0.0001	10.7781	-1.1580	281
19. IDFCFIRSTB	-0.0011	0.0008	0.0136	0.0002	7.9083	-1.5532	281
20. FEDERALBNK	-0.0011	0.0008	0.0133	0.0002	24.3038	-2.5749	281
21. RBLBANK	-0.0024	0.0012	0.0193	0.0004	6.4293	-1.5412	281
22. INDUSINDBK	-0.0020	0.0012	0.0204	0.0004	22.5367	0.4375	281
23. SRTRANSFIN	-0.0007	0.0011	0.0178	0.0003	8.7061	-1.1240	281
24. M & MFIN	-0.0014	0.0009	0.0157	0.0002	26.9501	-3.1276	281
25. BAJAJFINSV	-0.0005	0.0008	0.0130	0.0002	36.2545	-3.9251	281
26. BAJAJHLDNG	-0.0006	0.0007	0.0124	0.0002	19.0988	-2.2599	281
27. ICICIPRULI	0.0002	0.0008	0.0136	0.0002	23.2091	-0.5784	281
28. SBILIFE	0.0003	0.0007	0.0110	0.0001	12.0034	-1.4272	281
29. ICICIGI	0.0004	0.0007	0.0117	0.0001	13.7061	-0.7973	281
30. HDFCLIFE	0.0004	0.0007	0.0121	0.0001	13.0005	-0.7983	281
31. CHOLAFIN	-0.0032	0.0027	0.0449	0.0020	214.0529	-13.7884	281
32. HDFC	-0.0002	0.0006	0.0107	0.0001	9.0490	-1.0252	281
33. BAJFINANCE	-0.0002	0.0008	0.0140	0.0002	18.1492	-2.4414	281
34. PEL	-0.0013	0.0009	0.0158	0.0002	4.6158	-0.2278	281
35. PFC	-0.0002	0.0007	0.0124	0.0002	5.0438	-0.7762	281
36. RECLTD	-0.0005	0.0007	0.0123	0.0002	5.1300	-1.0309	281
37. HDFCAMC	0.0010	0.0007	0.0120	0.0001	6.7755	-1.0534	281

Notes: * indicate stocks common in the Financial services index have been considered only once in their primary category. First 12 banks form the part of the PSU bank index, banks from serial number 13 to 22 form the part of private bank index, and the rest belong to the financial services index.

This study uses a 210-day estimation period from t-214 to t-5 and a 15-day event window from t-4 to t+10 (further divided into shorter windows) for each event. It uses shorter windows to control confounding effects *(Mcwilliams and Siegel, 1997; Sorescu et al., 2017)*.

Emphasis has been given to event window selection so that the findings yield valid inferences about the events. We divide the entire data from 18 February 2019 to 13 April 2020 into four parts to accommodate every event with an estimation and event window (see Figure 1).
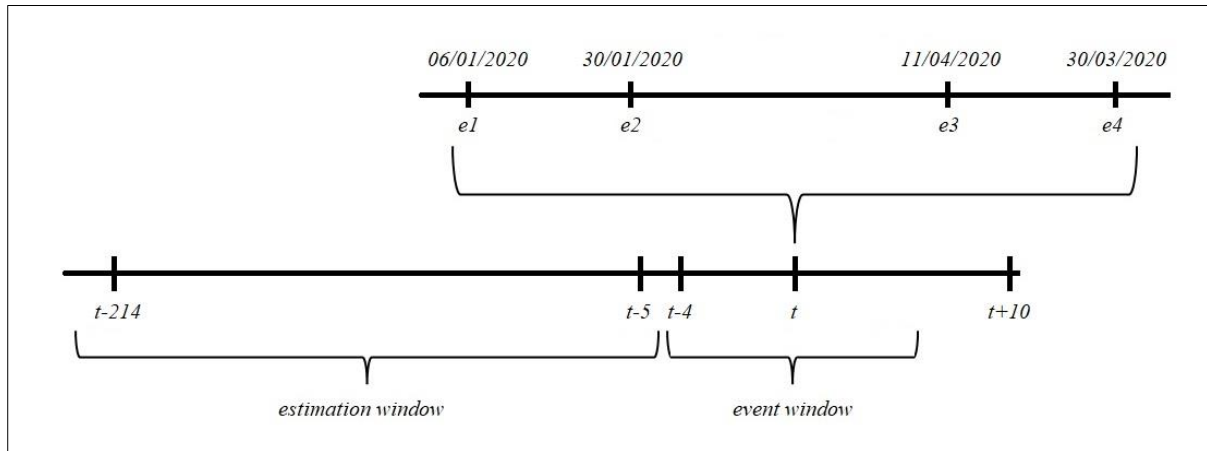

Figure 1: Event timeline

The abnormal returns of the stock 'c', on day 't', using the OLS Market model, is calculated as follows:

$$MMAR_{ct} = LR_{ct} - (\hat{\alpha} + \hat{\beta}R_{mt}) \tag{01}$$

where, LR_{ct} is the daily log return for the stock 'c'; α & β are the estimators; and, R_{mt} is the daily log return for the benchmark index on day t.

We have the daily abnormal returns (AR_{ct}) calculated for each stock. These abnormal daily returns for each of the stocks are then aggregated for the 15 days event window and further divided by the sample size (N), to arrive at the average abnormal return (AAR_t) as follows:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{ct} \tag{02}$$

We calculate the cumulative average abnormal return (CAAR) using these AARs. Further, we arrive at the shorter event window AAR as follows:

$$AAR_{p,q} = \frac{1}{n}\sum_{i=1}^{N} AAR_t \tag{03}$$

where, $AAR_{p,q}$ is the AAR for the window period p,q; and n is the number of days from p to q. For instance, the AAR for window (-1,+1) will be the average of the ARs for these three days.

We calculate the CAAR for the shorter event windows by summing up the AARs in that window period as below:

$$CAAR_{p,q} = \sum_{i=1}^{N} AAR_t \tag{04}$$

where, $CAAR_{p,q}$ is the CAAR for the window period p,q. For instance, the CAAR for window (-1,+1) will be the sum of the AARs for these three days.

3.3. Testing the significance

Once we have calculated the AARs and CAARs, we need to test the significance of these results to test the hypotheses. We calculate the t-statistics as follows:

$$AAR_t \ t = \frac{AAR_t}{\sigma_{N,e}} \tag{05}$$

$$CAAR_t \ t = \frac{CAAR_t}{\sigma_{N,e}\sqrt{N_{t+1}}} \tag{06}$$

where, $\sigma_{N,e} = \sqrt{\frac{\sum_{i=1}^{N} \sigma_{c,e}^2}{N^2}}$, is the aggregated standard deviation, $\sigma_{c,e}^2$ is the standard deviation for each stock during the estimation period, and, N_{t+1} is the absolute value of event day t plus 1.

The t-statistics, as obtained from the above calculations, are tested for significance. Significantly positive abnormal returns infer that the market reacted positively. We have tested the significance of CAARs for long and shorter event windows (as in *Mackinlay (1997), Pandey and Jaiswal (2017), Pandey and Kumari (2020b)*, and many similar studies). We present the critical t-value for different sample sizes in *Table 2*.

Table 2: Critical t-values for the different sample sizes

Sample	df	Range of critical value	
		1% significance level	5% significance level
Banking & Financial Services Sector (N=37)	36	-2.72 to +2.72	-2.03 to +2.03
PSU Banks (N=12)	11	-3.11 to +3.11	-2.20 to +2.20
Private Banks (N=10)	9	-3.25 to +3.25	-2.26 to +2.26
Financial Services Sector (N=15)	14	-2.98 to +2.98	-2.14 to +2.14

4. Data Analysis and Interpretation

This section includes six sub-sections wherein we analyze the impacts on the PSU banks, Private banks, financial services stocks, and the whole sample during the 15-day event window and the shorter pre-and post-event windows. The last sub-section provides insights into the association between the abnormal returns from all four events.

4.1. Impacts on the banking and financial services sector

Table 3 exhibit the AARs and CAARs of the banking and financial services stocks around the four event windows. While the event day AAR is negative and significant for all the events except the e3, the event day CAAR is negative and significant for e1, e2, and e3 except for e4, where the event day CAAR is significantly positive. No significant AARs during the pre-and post-event day are significant for e1, and the CAAR is significant only for the next two days, indicating that the sample stocks significantly reacted on the event day and usually behaved later on. During e2, the AARs and CAARs are significant and negative on only three days during the post-event day period. The e2 evidence mild impacts on the sample stocks. The e3 evidence two significantly negative AARs in the pre-event day period, seven significantly negative and one significantly positive AARs.

The CAARs are negative and significant from day t-2 to t+10. It implies that e3 has badly impacted the sample stocks, i.e., the global pandemic announcement. Significant AARs and CAARs in the pre-event window indicate that the market had already anticipated the happening of e3. One negative and two significant positive AARs in the pre-event day period during e4, while one negative and four significant positive AARs in the post-event day period imply that financial measures' announcement has positively impacted the market. The CAARs during e4 are significantly positive through days t-2 to t+10. Also, positive abnormal returns in the pre-event day period may be due to the lockdown announcements a few days before e4.

Furthermore, the results indicate that investors can outperform the market around positive announcements. The results for the first three events are similar to *Demir and Danisman (2020),* and *Demirguc-Kunt et al. (2021)* but opposed *Kandil Göker et al. (2020).* With positive cumulative returns in e4, the findings align with *Phuong (2021).*

Table 3: AAR and CAAR for all the four events (Sample N = 37)

Events	Event1		Event2		Event3		Event4	
Days	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR
t-4	-0.173	-0.173	0.15	0.15	-0.229	-0.229	-0.887**	-0.887
	(-0.83)	(-0.37)	(0.73)	(0.33)	(-1.10)	(-0.49)	(-3.26)	(-1.46)
t-3	-0.173	-0.173	0.15	0.15	-0.229	-0.229	-0.887**	-0.887
	(-0.28)	(-0.55)	(-0.22)	(0.25)	(1.14)	(0.02)	(5.68)	(1.21)
t-2	-0.057	-0.23	-0.046	0.104	0.237**	0.008**	0.630**	-0.257**
	(1.05)	(-0.03)	(-0.91)	(-0.23)	(-5.03)	(-2.89)	(10.88)	(7.68)
t-1	0.219	-0.011	-0.188	-0.084	-1.049**	-1.041**	2.192**	1.935**
	(-0.30)	(-0.25)	(0.78)	(0.27)	(-8.73)	(-9.71)	(0.34)	(9.64)
t	-0.063**	-0.073**	0.162*	0.078*	-1.82	-2.862**	0.051**	1.985**
	(-3.24)	(-3.60)	(-2.49)	(-2.11)	(-1.04)	(-14.77)	(-3.71)	(9.93)
t+1	-0.675	-0.749*	-0.513	-0.436	-0.216**	-3.078**	-0.222	1.764**
	(-0.23)	(-2.71)	(-0.72)	(-2.00)	(-11.99)	(-18.92)	(0.09)	(7.08)
t+2	-0.048	-0.796*	-0.149**	-0.585**	-2.499	-5.577**	-0.225	1.539**
	(-0.49)	(-2.49)	(-4.35)	(-4.15)	(-0.51)	(-15.75)	(-1.00)	(5.21)
t+3	-0.102	-0.898	-0.898	-1.483**	-0.107**	-5.685**	0.126**	1.665*
	(1.35)	(-1.49)	(-1.38)	(-4.28)	(-6.85)	(-17.06)	(-3.85)	(2.58)
t+4	0.28	-0.618	-0.285*	-1.768**	-1.427**	-7.111**	-0.540*	1.126**
	(0.17)	(-1.25)	(2.16)	(-2.86)	(-4.9)	(-17.45)	(2.31)	(3.34)
t+5	0.035	-0.583	0.446	-1.322	-1.021**	-8.132**	-0.106**	1.019**
	(1.30)	(-0.61)	(1.85)	(-1.86)	(-9.03)	(-19.62)	(5.45)	(5.28)
t+6	0.271	-0.312	0.382*	-0.94	-1.882**	-10.014**	1.360**	2.380**
	(-0.04)	(-0.58)	(2.62)	(-0.73)	(-7.29)	(-20.92)	(4.00)	(6.39)
t+7	-0.008	-0.32	0.54	-0.399	-1.519	-11.533**	0.482	2.862**
	(0.59)	(-0.33)	(0.71)	(-0.43)	(1.53)	(-19.03)	(-1.89)	(5.31)
t+8	0.124	-0.196	0.147	-0.252	0.319**	-11.215**	-0.171	2.691**
	(0.17)	(-0.26)	(-0.87)	(-0.70)	(-20.11)	(-24.64)	(0.77)	(5.26)
t+9	0.036	-0.16	-0.179	-0.432	-4.19**	-15.405**	0.439	3.129**
	(-0.21)	(-0.31)	(-1.19)	(-1.04)	(-4.11)	(-24.68)	(1.39)	(5.43)
t+10	-0.043	-0.204	-0.245	-0.677	-0.858**	-16.262**	0.214**	3.343**
	(-1.91)	(-0.87)	(-1.18)	(-1.34)	(4.78)	(-22.09)	(6.11)	(7.02)

Notes: * and ** indicate values significant at alpha=0.01 and 0.05, respectively. Figures in parenthesis represent t-values. AARs and CAARs in percentage.

4.2. Impacts on the public sector banks

Table 4 presents the AARs and CAARs of the public sector bank stocks around the four event windows. The stocks of the public sector banks have been neutral to e1 with no significant abnormal returns during the event window. While no AARs are significant during e2, the event-day CAAR and eight CAARs during the post-event day period are negative and significant. It implies that e2 has had mild impacts on the public sector bank stocks. While two AARs each in the pre-and post-event day period are significant and negative during e3, the CAARs through t-1 to t+10 days are negatively significant, implying that the 'global pandemic' declaration has badly impacted the stock returns. During e4, one significant positive AAR each in the pre-and post-event day period is present.

In contrast, CAARs on days t-1, t, and six days in the post-event period are significant and positive, indicating a positive impact on stock returns. Although e3 impacts have been more, the four events' overall impact is lesser on the public sector banks than the whole sample. The results are similar to *Demir and Danisman (2020)* and *Demirguc-Kunt et al. (2021)* but contrary to *Kandil Göker et al. (2020).*

Table 4: AAR and CAAR for all the four events (PSU Banks N = 12)

Events	Event1		Event2		Event3		Event4	
Days	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR
t-4	-0.277	-0.277	0.121	0.121	-0.070	-0.070	0.107	0.107
	(-0.96)	(-0.43)	0.44	(0.20)	(-0.25)	(-0.11)	(0.38)	(0.17)
t-3	-0.056	-0.332	-0.040	0.081	0.536	0.466	-0.066	0.041
	(-0.20)	(-0.58)	(-0.14)	(0.15)	(1.94)	(0.85)	(-0.24)	(0.07)
t-2	0.166	-0.166	-0.461	-0.380	-0.820*	-0.354	0.843**	0.884
	(0.58)	(-0.33)	(-1.67)	(-0.79)	(-2.98)	(-0.74)	(3.01)	(1.82)
t-1	-0.075	-0.241	-0.084	-0.464	-1.165**	-1.519**	0.141	1.025*
	(-0.26)	(-0.59)	(-0.30)	(-1.19)	(-4.23)	(-3.90)	(0.50)	(2.59)
t	-0.244	-0.485	-0.319	-0.783*	0.031	-1.489**	-0.251	0.774*
	(-0.85)	(-1.69)	(-1.15)	(-2.83)	(0.11)	(-5.40)	(-0.90)	(2.76)
t+1	-0.005	-0.489	-0.014	-0.797	-1.928**	-3.417**	-0.067	0.707
	(-0.02)	(-1.21)	(-0.05)	(-2.04)	(-7.00)	(-8.77)	(-0.24)	(1.78)
t+2	-0.306	-0.795	-0.196	-0.994	-0.160	-3.577**	0.310	1.017
	(-1.07)	(-1.60)	(-0.71)	(-2.07)	(-0.58)	(-7.49)	(1.11)	(2.10)
t+3	0.291	-0.504	-0.583	-1.576*	-0.091	-3.668**	0.060	1.077
	(1.02)	(-0.88)	(-2.11)	(-2.85)	(-0.33)	(-6.65)	(0.21)	(1.92)
t+4	-0.105	-0.609	-0.224	-1.801	0.026	-3.642**	0.384	1.461*
	(-0.37)	(-0.95)	(-0.81)	(-2.91)	0.09	(-5.91)	(1.37)	(2.33)
t+5	0.164	-0.445	-0.274	-2.074*	-0.529	-4.171**	0.122	1.583*
	(0.57)	(-0.63)	(-0.99)	(-3.06)	(-1.92)	(-6.18)	(0.43)	(2.30)
t+6	0.112	-0.333	0.175	-1.899*	-0.163	-4.334**	0.278	1.860*
	(0.39)	(-0.44)	(0.63)	(-2.60)	(-0.59)	(-5.94)	(0.99)	(2.51)
t+7	0.082	-0.251	-0.193	-2.092**	0.013	-4.321**	-0.242	1.618
	(0.29)	(-0.31)	(-0.70)	(-2.68)	(0.05)	(-5.54)	(-0.86)	(2.04)
t+8	0.290	0.039	-0.047	-2.139*	-1.489**	-5.810**	0.386	2.004*
	(1.01)	(0.05)	(-0.17)	(-2.58)	(-5.40)	(-7.03)	(1.38)	(2.38)
t+9	-0.098	-0.058	-0.435	-2.574*	0.142	-5.668**	0.128	2.132*
	(-0.34)	(-0.06)	(-1.57)	(-2.94)	(0.52)	(-6.50)	(0.46)	(2.41)
t+10	0.191	0.132	-0.551	-3.125**	-0.043	-5.711**	0.955**	3.087**
	(0.67)	(0.14)	(-1.99)	(-3.41)	(-0.16)	(-6.25)	(3.41)	(3.32)

Notes: * and ** indicate values significant at alpha=0.01 and 0.05, respectively. Figures in parenthesis represent t-values. AARs and CAARs in percentage.

4.3. Impacts on the private sector banks

Table 5 presents the AARs and CAARs of the private sector bank stocks around the four event windows. As public sector banks, the private sector banks have also been neutral to e1 with no significant abnormal returns during the event window. During e2, none of the AARs are significant, while event day CAAR and those on days t+2 and t+3 are negative and significant. While two AARs in the pre-event day period and eight AARs in the post-event day period are significant, the CAARs through the days t-1 to t+10 are significantly negative during e3. Out of the three events concomitants to COVID-19, the private banks have been more reactive to the 'global pandemic' declaration. During e4, two significant positive and one significant negative AARs in the pre-event day period, while three significant negative and two significant positive AARs in the post-event day period are present.

Two CAARs in the pre-event day period and four CAARs in the post-event day period are significant and negative. The impacts on the private bank stocks are not favorable during the e4. Although the private banks have reacted intensively to the e3, their returns are not positive even after the RBI's announcement. The investors had low confidence in private banks' stocks, which delayed recovery even after the positive announcements. The results are similar to *Demir and Danisman (2020)* and *Demirguc-Kunt et al. (2021)* but contrary to *Kandil Göker et al. (2020)*.

Table 5: AAR and CAAR for all the four events (Private Banks N = 10)

Events	Event1		Event2		Event3		Event4	
Days	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR
t-4	-0.097	-0.097	0.09	0.09	0.146	0.146	-3.941**	-3.941**
	(-0.27)	(-0.12)	(0.25)	(0.11)	(0.41)	(0.18)	(-9.31)	(-4.16)
t-3	-0.107	-0.204	0.043	0.132	0.144	0.29	-0.474	-4.415**
	(-0.3)	(-0.29)	(0.12)	(0.19)	(0.40)	(0.40)	(-1.12)	(-5.21)
t-2	0.225	0.021	-0.103	0.03	-1.154*	-0.864	3.905**	-0.51
	(0.63)	(0.03)	(-0.29)	(0.05)	(-3.20)	(-1.39)	(9.22)	(-0.7)
t-1	0.096	0.117	-0.222	-0.193	-2.528**	-3.392**	1.109*	0.599
	(0.27)	(0.23)	(-0.63)	(-0.38)	(-7.02)	(-6.66)	(2.62)	(1.00)
t	-0.717	-0.600	-0.766	-0.958**	-0.792	-4.183**	-0.182	0.418
	(-2.03)	(-1.70)	(-2.16)	(-2.70)	(-2.20)	(-11.62)	(-0.43)	(0.99)
t+1	-0.518	-1.118	0.122	-0.836	-1.834**	-6.018**	-1.869**	-1.451*
	(-1.46)	(-2.23)	(0.35)	(-1.67)	(-5.10)	(-11.82)	(-4.41)	(-2.42)
t+2	-0.033	-1.151	-0.569	-1.405*	-1.757**	-7.774**	-0.213	-1.665*
	(-0.09)	(-1.88)	(-1.6)	(-2.29)	(-4.88)	(-12.47)	(-0.50)	(-2.27)
t+3	0.165	-0.986	-0.381	-1.786*	-1.887**	-9.661**	-1.363*	-3.027**
	(0.47)	(-1.39)	(-1.07)	(-2.52)	(-5.24)	(-13.42)	(-3.22)	(-3.58)
t+4	0.432	-0.554	0.223	-1.563	-2.381**	-12.043**	-1.36*	-4.387**
	(1.22)	(-0.7)	(0.63)	(-1.97)	(-6.62)	(-14.96)	(-3.21)	(-4.63)
t+5	0.332	-0.222	0.195	-1.368	-2.952**	-14.994**	2.749**	-1.638
	(0.94)	(-0.26)	(0.55)	(-1.57)	(-8.20)	(-17.01)	(6.49)	(-1.58)
t+6	-0.055	-0.277	0.617	-0.751	-2.199**	-17.194**	0.392	-1.246
	(-0.16)	(-0.3)	(1.74)	(-0.8)	(-6.11)	(-18.05)	(0.93)	(-1.11)
t+7	-0.189	-0.466	0.319	-0.432	0.258	-16.935**	0.98*	-0.267
	(-0.53)	(-0.47)	(0.9)	(-0.43)	(0.72)	(-16.63)	(2.31)	(-0.22)
t+8	-0.277	-0.743	-0.149	-0.581	-3.451**	-20.387**	0.209	-0.058
	(-0.78)	(-0.7)	(-0.42)	(-0.55)	(-9.59)	(-18.88)	(0.49)	(-0.05)
t+9	-0.098	-0.841	0.024	-0.557	-3.969**	-24.356**	0.239	0.181
	(-0.28)	(-0.75)	(0.07)	(-0.5)	(-11.03)	(-21.40)	(0.56)	(0.14)
t+10	-0.592	-1.432	-0.017	-0.573	-0.181	-24.538**	0.896	1.078
	(-1.67)	(-1.22)	(-0.05)	(-0.49)	(-0.5)	(-20.55)	(2.12)	(0.77)

Notes: * and ** indicate values significant at alpha=0.01 and 0.05, respectively. Figures in parenthesis represent t-values. AARs and CAARs in percentage.

4.4. Impacts on the financial services sector

Table 6 presents the AARs and CAARs of the stocks of the financial services around the four event windows. With only the event day negative and significant AARs, the financial sector stocks' returns have been normal during the e1 window period. With two positive and one significant negative AAR and two significant negative CAARs in the post-event day period during e2, the stocks seem to have mildly impacted, inferring no direct relationship with the event. During e3, two pre-event day AARs and six post-event day AARs are negative and significant, while two post-event day AARs are significantly positive.

The CAARs through the days t-2 to t+10 are negative and significant. It implies that the e3 has negatively impacted the financial services sector stock returns. Two AARs each in the pre-and post-event day period are significantly positive, while the CAARs through days t-3 to t+10 are significantly positive during e4. The good announcement has significantly positively impacted the financial services sector. The results are similar to *Demir and Danisman (2020), Demirguc-Kunt et al. (2021)* and *Phuong (2021),* where they find moderating and positive impacts of liquidity measures' announcements, respectively.

4.5. Impacts in the shorter window periods

In the above sub-sections, we find that e3 is the most negative COVID-19 event for all samples, and e4 has been positive for all samples, except the private banks. In this section, we examine the shorter window period impacts. There are five shorter window periods, two in the

pre-event day period and three in the post-event day period. The event day AARs do not constitute part of the shorter windows.

Table 6: AAR and CAAR for all the four events (Financial Services N = 15)

Events	Event1		Event2		Event3		Event4	
Days	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR
t-4	-0.14	-0.14	0.214	0.214	-0.607	-0.607	0.353	0.353
	(-0.36)	(-0.16)	(0.54)	(0.24)	(-1.53)	(-0.68)	(0.83)	(0.37)
t-3	-0.025	-0.166	-0.111	0.103	0.06	-0.547	1.922**	2.275*
	(-0.06)	(-0.21)	(-0.28)	(0.13)	(0.15)	(-0.69)	(4.51)	(2.67)
t-2	0.258	0.093	-0.025	0.078	-1.163*	-1.71*	2.13**	4.405**
	(0.66)	(0.14)	(-0.06)	(0.11)	(-2.92)	(-2.48)	(5.00)	(5.97)
t-1	-0.159	-0.066	0.614	0.691	-1.873**	-3.583**	-0.727	3.678**
	(-0.4)	(-0.12)	(1.56)	(1.24)	(-4.71)	(-6.37)	(-1.71)	(6.10)
t	-0.992*	-1.059*	-0.501	0.191	-0.031	-3.613**	-0.224	3.453**
	(-2.52)	(-2.69)	(-1.27)	(0.48)	(-0.08)	(-9.09)	(-0.53)	(8.10)
t+1	0.232	-0.827	-0.438	-0.248	-3.399**	-7.012**	0.745	4.198**
	(0.59)	(-1.48)	(-1.12)	(-0.45)	(-8.55)	(-12.47)	(1.75)	(6.96)
t+2	0.015	-0.812	-1.679**	-1.927*	1.035*	-5.977**	0.206	4.404**
	(0.04)	(-1.19)	(-4.27)	(-2.83)	(2.60)	(-8.68)	(0.48)	(5.96)
t+3	0.348	-0.464	0.016	-1.911*	-2.189**	-8.166**	-0.47	3.933**
	(0.88)	(-0.59)	(0.04)	(-2.43)	(-5.51)	(-10.27)	(-1.10)	(4.61)
t+4	-0.118	-0.582	1.132*	-0.779	-0.951*	-9.118**	0.337	4.271**
	(-0.3)	(-0.66)	(2.88)	(-0.89)	(-2.39)	(-10.26)	(0.79)	(4.48)
t+5	0.316	-0.266	1.033*	0.254	-2.252**	-11.369**	1.425**	5.696**
	(0.8)	(-0.28)	(2.63)	(0.26)	(-5.66)	(-11.67)	(3.34)	(5.46)
t+6	-0.072	-0.338	0.781	1.035	-2.15**	-13.519**	0.706	6.402**
	(-0.18)	(-0.32)	(1.99)	(0.99)	(-5.41)	(-12.85)	(1.66)	(5.68)
t+7	0.365	0.027	0.304	1.339	0.604	-12.915**	-0.881	5.521**
	(0.93)	(0.02)	(0.77)	(1.2)	(1.52)	(-11.49)	(-2.07)	(4.58)
t+8	0.042	0.069	-0.305	1.034	-6.844**	-19.759**	0.634	6.155**
	(0.11)	(0.06)	(-0.78)	(0.88)	(-17.21)	(-16.57)	(1.49)	(4.81)
t+9	0.036	0.105	-0.273	0.761	0.417	-19.342**	0.265	6.42**
	(0.09)	(0.08)	(-0.69)	(0.61)	(1.05)	(-15.38)	(0.62)	(4.76)
t+10	-0.74	-0.634	-0.149	0.612	2.613**	-16.729**	1.197*	7.617**
	(-1.88)	(-0.49)	(-0.38)	(0.47)	(6.57)	(-12.69)	(2.81)	(5.39)

Notes: * and ** indicate values significant at alpha=0.01 and 0.05, respectively. Figures in parenthesis represent t-values. AARs and CAARs in percentage.

Table 7 and *Table 8* depicts the analysis of the shorter window period AARs and CAARs, viz., 3-days (pre), 4-days (pre), 3-days (post), 5-days (post), and 7-days (post). The shorter window period AARs and CAARs during e1 are insignificant for all the sample sizes, while those of the public and private sector banks have been insignificant during e2. The post-event 3-days AARs and CAARs are negative and significant for the sample during e2. The post-event 3-days CAAR is negative and significant for financial services stocks during the e2. The e1 and e2 have not significantly impacted any of the sample sizes. During e3, all the shorter window period CAARs are negative and significant for all the sample sizes. The shorter window period AARs are negative and significant only for the sample, the private sector banks, and the financial services sector. Only post-event 3-days AAR is negative and significant for the public sector banks, indicating that e3 has mildly impacted public sector banks while e3 has highly impacted the rest. The pre-event AARs and CAARs are significantly positive for the sample, with negative and significant post-event 3-days CAAR during e4. In the shorter window analysis, the public sector banks are insignificant to e4. The pre-event 3-days AARs and CAARs are significantly positive, while the post-event AARs and CAARs are negative and significant for private sector banks during e4. While the pre-event 3-days and 4-days AARs and CAARs are significantly positive for the stocks of the financial services, only the 5-days CAAR is significantly positive during e4.

Table 7: Results of the shorter window analysis

Event-wise AAR & CAAR		Pre-event		Post-event		
		[-3,-1]	[-4,-1]	[+1,+3]	[+1,+5]	[+1,+7]
PSU Banks (N=12)						
Event1	AAR	0.012	-0.060	-0.006	0.008	0.033
		(0.04)	(-0.21)	(-0.02)	(0.03)	(0.12)
	CAAR	0.035	-0.241	-0.019	0.040	0.234
		(0.07)	(-0.42)	(-0.04)	(0.06)	(0.31)
Event2	AAR	-0.195	-0.116	-0.264	-0.258	-0.187
		(-0.7)	(-0.42)	(-0.96)	(-0.93)	(-0.68)
	CAAR	-0.585	-0.464	-0.793	-1.291	-1.309
		(-1.22)	(-0.84)	(-1.66)	(-2.09)	(-1.79)
Event3	AAR	-0.483	-0.380	-0.726*	-0.536	-0.405
		(-1.75)	(-1.38)	(-2.64)	(-1.95)	(-1.47)
	CAAR	-1.450*	-1.519*	-2.179**	-2.682**	-2.832**
		(-3.04)	(-2.76)	(-4.57)	(-4.35)	(-3.88)
Event4	AAR	0.306	0.256	0.101	0.162	0.121
		(1.09)	(0.91)	(0.36)	(0.58)	(0.43)
	CAAR	0.918	1.025	0.303	0.809	0.844
		(1.89)	(1.83)	(0.62)	(1.29)	(1.14)
Private banks (N=10)						
Event1	AAR	0.07	0.03	-0.13	0.08	0.02
		(0.2)	(0.08)	(-0.36)	(0.21)	(0.05)
	CAAR	0.213	0.117	-0.386	0.378	0.134
		(0.35)	(0.16)	(-0.63)	(0.48)	(0.14)
Event2	AAR	-0.094	-0.048	-0.276	-0.082	0.075
		(-0.27)	(-0.14)	(-0.78)	(-0.23)	(0.21)
	CAAR	-0.282	-0.193	-0.827	-0.410	0.526
		(-0.46)	(-0.27)	(-1.35)	(-0.52)	(0.56)
Event3	AAR	-1.179**	-0.848*	-1.826**	-2.162**	-1.822**
		(-3.28)	(-2.36)	(-5.07)	(-6.01)	(-5.06)
	CAAR	-3.538**	-3.392**	-5.478**	-10.811**	-12.752**
		(-5.67)	(-4.71)	(-8.79)	(-13.43)	(-13.39)
Event4	AAR	1.513**	0.150	-1.148*	-0.411	-0.098
		(3.57)	(0.35)	(-2.71)	(-0.97)	(-0.23)
	CAAR	4.540**	0.599	-3.445**	-2.056	-0.684
		(6.19)	(0.71)	(-4.70)	(-2.17)	(-0.61)
Financial Services (N=15)						
Event1	AAR	0.025	-0.017	0.198	0.158	0.155
		(0.06)	(-0.04)	(0.5)	(0.4)	(0.39)
	CAAR	0.074	-0.066	0.594	0.792	1.086
		(0.11)	(-0.08)	(0.87)	(0.9)	(1.04)
Event2	AAR	0.159	0.173	-0.700	0.013	0.164
		(0.4)	(0.44)	(-1.78)	(0.03)	(0.42)
	CAAR	0.477	0.691	-2.101**	0.063	1.148
		(0.7)	(0.88)	(-3.09)	(0.07)	(1.1)
Event3	AAR	-0.992*	-0.896*	-1.518**	-1.551**	-1.329**
		(-2.49)	(-2.25)	(-3.82)	(-3.90)	(-3.34)
	CAAR	-2.975**	-3.583**	-4.553**	-7.756**	-9.302**
		(-4.32)	(-4.51)	(-6.61)	(-8.72)	(-8.84)
Event4	AAR	1.108	0.919*	0.160	0.449	0.295
		(2.60*)	(2.16)	(0.38)	(1.05)	(0.69)
	CAAR	3.324**	3.678**	0.480	2.243*	2.068
		(4.50)	(4.31)	(0.65)	(2.35)	(1.83)

Notes: * and ** indicate values significant at alpha=0.01 and 0.05, respectively. Figures in parenthesis represent t-values. CARs in percentage.

The analysis reveals that while the 'global pandemic' declaration has badly impacted the different sample sizes, the post-event impacts of the RBI measures announcements are not significant in the shorter event window. The shorter window analysis results, too, are similar to *Demirguc-Kunt et al. (2021)*.

Table 8: Results of the shorter window analysis

Event-wise AAR & CAAR		Pre-event		Post-event		
		[-3,-1]	[-4,-1]	[+1,+3]	[+1,+5]	[+1,+7]
Sample (N=37)						
Event1	AAR	0.033	-0.018	0.043	0.087	0.079
		(0.16)	(-0.09)	(0.21)	(0.42)	(0.38)
	CAAR	0.099	-0.073	0.130	0.436	0.552
		(0.28)	(-0.18)	(0.36)	(0.94)	(1)
Event2	AAR	-0.024	0.019	-0.444*	-0.101	0.026
		(-0.12)	(0.09)	(-2.15)	(-0.49)	(0.13)
	CAAR	-0.073	0.078	-1.333**	-0.504	0.183
		(-0.2)	(0.19)	(-3.73)	(-1.09)	(0.34)
Event3	AAR	-0.878**	-0.715**	-1.344**	-1.387**	-1.162**
		(-4.21)	(-3.43**)	(-6.45)	(-6.66)	(-5.58)
	CAAR	-2.633**	-2.862**	-4.033**	-6.936**	-8.136**
		(-7.29)	(-6.87)	(-11.17)	(-14.88)	(-14.76)
Event4	AAR	0.957**	0.496**	-0.213	0.123	0.132
		(5.63)	(3.40)	(-1.59)	(0.6)	(0.73)
	CAAR	2.872**	1.985**	-0.638**	0.616	0.927
		(9.75)	(6.82)	(-2.75)	(1.34)	(1.93)

Notes: * and ** indicate values significant at alpha=0.01 and 0.05, respectively. Figures in parenthesis represent t-values. CARs in percentage.

4.6. Association between the average abnormal returns during the four events

Table 9 presents the correlation coefficient among the average abnormal returns during the four events. The e3 AARs negatively correlate with the AARs during e1, e2, and e4. However, the coefficient is not significant at 1% or 5% significance level. The rest of the pairs share a positive correlation but are insignificant, inferring that the AARs around the four events are not significantly correlated, and the pattern of the abnormal returns in all the events is different.

Table 9: Correlation among the AARs of the Sample (N=37) during the four events

	e1AAR	e2AAR	e3AAR	e4AAR
e1AAR	1			
e2AAR	0.371044	1		
e3AAR	-0.4064	-0.19163	1	
e4AAR	0.25842	0.051899	-0.03104	1

From the above analysis, it is evident that e3 has been the most negatively impacting event while e4 has been favorable. Hence, we present the AARs during these two events for all the sample sizes in *Figure 2*. The AARs around the 'global pandemic' declaration are mostly negative, while those around the RBI announcement are above the origin.

5. Conclusions

Returning to the question posed at the end of section 2, it is now possible to state the market response of the Indian banking and financial sector stocks to different pandemic-related events. The stocks do not react until the market anticipates the news to impact the economy to which they belong directly. The reaction was mild to the announcement of 'Health Emergency of Global Concern', but the market reacted significantly after the coronavirus outbreak was

declared a 'global pandemic'. Further, the announcement of the financial measures by the RBI resulted in a positive response from the market. These results support *Demir and Danisman (2020)* and *Demirguc-Kunt et al. (2021)*.

Figure 2: AARs for all the sample sizes during e3 and e4

The findings indicate a minor impact on returns during the first two event windows, a significant and worst impact around the third event, and a significant positive impact around the fourth event. While the public and private sector banks have been insignificant to the first

event, the financial services sector reflects significant abnormal returns during the first event window.

However, the shorter window period analysis reflects similar impacts across these sectors. These results suggest that investors lose their confidence during emergencies, but as soon the government measures are injected into the economy, there is a boost to the confidence level in the market. While rejecting the hypotheses, the findings deny that abnormal returns are impossible with the available prices during an event. Although our findings oppose *Kandil Göker et al. (2020)*, since the study was limited to the Indian banking and financial sector, further research concentrating on a sample of more economies may support evidence.

Despite its limitations, the findings of this study have important implications for emerging markets. This study evidence favorable returns after the announcement of positive news, i.e., the stimulus package announcement, which is in line with *Phuong (2021)*, who provides evidence from Vietnam, an emerging market. Given the external shocks affecting the market efficiency, the emerging markets overreact owing to the lack of experienced and matured stock markets *(Risso, 2009; Wang & Wang, 2021)*.

With the contradictory findings in the scant literature, this study investigated the impact of the pandemic-related events on the Indian banking and financial sector. This study adds to the growing body of research that indicates a heterogenous market reaction to pandemic-related events, especially the banking and financial services sector stocks. The findings of the study make it easier for the management, investors, and policymakers to formulate sustainable policies and constitute a high-yield moderate-risk portfolio during such emergencies.

Declaration of Conflicting Interests

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