



# THE INDIAN JOURNAL OF COMMERCE

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Vol. 74	No. 1&2	Jan-June, 2021
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## Pandemic Effects on the Asian Emerging Markets and the Korean Stock Market

DHAREN KUMAR PANDEY, VINEETA KUMARI AND VARUN KUMAR RAI

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*Abstract: With the daily log-returns of 17 indices and 48 stocks, we examine the global pandemic's impact on the Asian emerging markets, the Korean stock market, and the KOSPI50 constituent stocks. The study uses the standard event methodology and Spearman's correlation. We also use the simple measure of volatility. Covid-19 had negative impacts on the Asian emerging markets except the Chinese and the Taiwanese market. The Korean stock indices, too, experienced significant negative abnormal returns. The individual stocks' analysis shows that the stock returns have been hit hard by the global pandemic. While the stock indices reaction in a few nations are significantly correlated, those in China, Taiwan, and Malaysia are different. The mean cumulative returns for China and Malaysia are also positive. Although the event has had significance on returns, the overall volatility in the Korean stock indices was insignificant. This study is an addition to the event study literature and provides a basis for future research using a simple measure of volatility regressed through the market model. It is different from others in terms that it examines the impact of the global pandemic in a three-tier deductive approach by first analyzing a lot of Asian emerging markets, then the Korean stock indices, and finally, the stock level abnormal returns.*

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**Keywords:** Global pandemic, event study, abnormal returns, market model, Asian emerging markets, Korean stock market.

### Introduction

The novel coronavirus outbreak was declared the 'global pandemic' by the World Health Organisation (WHO) on 11 March 2020. Although the WHO already alarmed the world by its announcement on 30 January 2020, the financial markets worldwide experienced a sudden fall in their indices around the 'global pandemic' announcement. It was after this date when most of the nations introduced restrictions, including social distancing and lockdowns. Stock market reactions

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to epidemic outbreaks are not new. However, the reactions to this pandemic have been the worst. Stock market reactions are due to the pandemic and the associated mortalities (Correia et al., 2020). Literature evidenced the stock market adverse reactions to the previous epidemics (for example, Chen et al., 2009; Chen, Jang, et al, 2007) and the current global pandemic (for example, Baker et al., 2020; Pandey and Kumari, 2021a; Takyi and Bentum-Ennin, 2020). Although, some studies have focused on the Korean stock market, they seldom use event study method. This study aims to fill this regional as well as methodological gap. This study is different from others in terms that it tries to examine the impact of the global pandemic in a three-tier deductive approach by first analyzing a lot of Asian emerging markets, then the Korean stock indices, and finally, the stock level abnormal returns. It is an addition to the event study literature and provides a basis for future research using a simple measure of volatility regressed through the market model.

## **Review of Literature**

### *The Impacts of Epidemics on Global Stock Markets*

Stock markets are not immune to uncertain shocks, so it has been during the Covid-19 and other previous pandemics. Researchers worldwide have found evidence of the abnormal performance of the global stock markets employing different research methodologies. For example, Baker et al. (2020), using the text-based method, found that previous pandemics had mild impacts on the US markets, but the Covid-19 impacts are intense. Pandey and Kumari (2021a), employing the event study method with a market model estimation on 49 global indices, found that the developed markets were hit hard compared to the emerging markets. They, too, found a significant impact on the Asian stock markets and no significant impact on the American stock markets. Belaid et al. (2020), using the spill-over and causality approach on 22 emerging and developed nations, found that the emerging markets have been badly impacted due to the pandemic effects in the European financial markets. Khatatbeh et al. (2020), in their event study, found significant negative impacts of the pandemic on global stock markets during the announcement of the first confirmed case and more substantial as it was declared a global pandemic. Pandey and Kumari (2021b) used the event study method to find that markets reacted differently to different events. They found evidence for different market reactions to the news of the first Covid-19 cases detected and a similar reaction to the news of the first Covid-19 deaths. It is obvious from the literature that emerging and developed markets, although negatively impacted, have not been impacted with the same intensity.

### ***The Impacts of Epidemics on Regional Stock Markets***

Apart from global markets, few studies have also focused on specific regions. Previous pandemic studies have found significant and negative impacts on regional stock markets (as in Chen et al., 2009; Chen, Jang, et al, 2007); however, positive impacts on biotech stocks (in Chen et al., 2009). Takyi and Bentum-Ennin (2020) employed the Bayesian structural time series approach to examine the short-term impacts of Covid-19 on 13 African countries and found that eight countries were negatively impacted while five countries, although not significantly impacted, experienced negative returns. In their event study, Alam, Wei, and Wahid (2020) found a mix of positive and negative significant abnormal returns from stocks of several sectors in the Australian stock market. Pandey and Kumari (2020a & 2020b), conducting an event study on the Indian stock market, found that the outbreak has negatively and significantly impacted the pharmaceutical and the hospitality and tourism sector stock returns. Adenomon, Maijamaa, and John (2020) found the pandemic's negative impacts on the Nigerian stock market using the GARCH models. He et al. (2020) examined the direct and spill-over effect of COVID-19 on stock markets in eight countries, including South Korea, to find that the pandemic has a short-term negative impact on stock markets; these impacts have bidirectional spill-over effects between Asian countries and European and American countries. Anh and Gan (2020) employed the panel data regression model on 723 listed stocks to conclude that the daily increasing numbers of Covid-19 cases adversely impacted the Vietnamese stock market. Yilmazkuday (2020) employed the structural vector autoregressive (SVAR) model to find that cumulative increase in the number of cases in the United States led to a cumulative decline in the US S&P 500 index. Liu et al. (2020), examining the short-term impact of the outbreak using the event study method on 21 leading stock market indices in eight nations, including Korea, found that Asian countries have experienced more negative abnormal returns than others. They found that since the first confirmed case in Korea, the mean returns of indices fell by 115 percent. Korea is among the nations which confirmed their first human transmission in January 2020. On 13 March 2020, the Korean stock market fell by 20 percent just after two days of the global pandemic declaration (Kim, 2020). Malini (2020) examined the stock return behaviour in six nations to find that the market reaction was different for different nations. She also found that the South Korea markets, along with the US market, has been the fastest responding.

### ***Research Questions and Hypotheses***

After the review of literature we head towards few research questions: "Did the Covid-19 similarly impacted the Korean stock market as the Asian emerging markets?", "Did KOSPI50 constituent stocks reacted in the same way as the KOSPI50 index?" and "How Asian emerging markets are related to each other?".

To find answers to these questions, we need to analyze the Asian emerging market indices, the Korean stock indices, and the KOSPI50 constituent stocks separately. We aim to study the relation between the global pandemic, the Asian emerging markets, and the Korean stock market to determine the degree of impact of the pandemic to the Asian emerging markets with special emphasis on the Korean stock market. Hence, we move to the formation and testing of the following hypotheses:

$H_{01}$ : "The Asian emerging markets have experienced no significant abnormal returns during the event window."

$H_{02}$ : "The Korean stock indices have experienced no significant abnormal returns during the event window."

$H_{03}$ : "The KOSPI50 constituent stocks have experienced no significant abnormal returns during the event window."

$H_{04}$ : "The Asian emerging markets and the Korean stock market were impacted similarly by the global pandemic."

$H_{05}$ : "There exists no correlation between the Asian emerging markets."

$H_{06}$ : "The Korean stock indices have experienced no significant abnormal volatilities during the event window."

## **Data and Methodology**

### ***Data***

The study has been divided into three parts. The first part analyses the Covid-19 impacts on Asian emerging markets (Panel A), the second part examines the Covid-19 impacts on the Korean stock indices (Panel B), and the third part examines the Covid-19 impacts on the KOSPI50 constituent stocks (Panel C). The first and second part examines 4338 observations of daily returns calculated from the daily closing prices of 17 sample indices and one benchmark index for the period from 22 May 2019 to 23 April 2020. Since the study aims to examine the Covid-19 impacts on the Asian emerging markets, we collected the data of standard (large + mid-cap) Morgan Stanley Capital International (MSCI) indices for China, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Taiwan, and Thailand from the MSCI database. The study further aims to concentrate on the Korean stock market. Hence, the data of the Korean stock indices, viz., KOSPI, KOSPI200, KOSPI200 Leveraged, KOSPI50, KOSPI Large sized, KOSPI100, KRX100, and KOSPI200-IT has been collected from [www.investing.com](http://www.investing.com). Hence, this led to two sets of data comprising nine Asian emerging markets indices (the first part) and eight Korean stock market indices (the second part). The descriptive statistics and the index specific estimation-period characteristics are depicted in Table Ia.

Table Ia: Sample description (Panel A and Panel B)

Sample Indices (N=17)	Descriptive statistics of Abnormal Returns					Estimation period characteristics		
	Mean	S.D.	Kurt	Skew	n	S.D.	$\alpha$	$\beta$
China	0.01	0.27	0.44	-0.19	241	0.26	0.01	0.65
India	-0.08	0.73	19.77	-1.82	241	0.39	0.03	0.37
Indonesia	-0.07	0.92	15.70	0.57	241	0.41	0.02	0.34
Korea	-0.02	0.71	9.17	-0.13	241	0.42	0.01	0.44
Malaysia	-0.05	0.36	19.54	-1.53	241	0.21	0.03	0.81
Pakistan	-0.07	0.89	3.45	-1.02	241	0.67	0.02	0.08
Philippines	-0.08	0.78	17.51	-2.38	241	0.41	0.03	0.35
Taiwan	0.03	0.40	9.72	-0.93	241	0.28	-0.01	0.59
Thailand	-0.08	0.65	12.09	-1.54	241	0.30	0.04	0.49
KOSPI	-0.02	0.70	8.56	-0.11	241	0.37	0.01	0.68
KOSPI200	-0.02	0.71	7.62	0.07	241	0.39	0.00	0.63
KOSPI200 Leveraged	-0.03	1.09	7.62	0.06	241	0.59	0.00	0.42
KOSPI50	-0.01	0.71	7.35	0.18	241	0.40	-0.01	0.60
KOSPI Large sized	-0.02	0.70	7.76	0.11	241	0.38	0.00	0.65
KOSPI100	-0.02	0.71	7.40	0.11	241	0.39	0.00	0.62
KRX100	-0.02	0.71	7.80	0.11	241	0.39	0.00	0.64
KOSPI200-IT	-0.01	0.85	7.01	0.21	241	0.51	-0.01	0.43

The data for the third part of the study contains 13279 observations of daily returns calculated from the daily closing prices of 48 sample stocks and one benchmark index for the period from 21 March 2019 to 23 April 2020. The initial sample included 50 constituent stocks of the KOSPI50. However, the data for S. K. Biopharmaceuticals Co. Ltd. and Big Hit Entertainment Co. Ltd. was not available for the period of study, so the final sample was limited to 48 stocks. The data has been collected from [www.investing.com](http://www.investing.com). The descriptive statistics and the firm-specific estimation-period characteristics are depicted in Table-Ib.

Table Ib: Sample description (Panel C)

Sample Stocks (N=48)	Descriptive statistics of Abnormal Returns				n	Estimation period characteristics		
	Mean	S.D.	Kurt	Skew		S.D.	$\alpha$	$\otimes$
KBFinancial	-0.0007	0.009	12.88	0.77	271	0.01	0.0002	0.35
KT	-0.0005	0.005	10.80	-0.47	271	0.00	0.0002	0.26
KT&G	-0.0007	0.006	6.65	-0.47	271	0.00	0.0002	0.20
LG Corp	-0.0005	0.008	8.63	1.20	271	0.00	0.0002	0.36
LG Display	-0.0013	0.012	5.39	-0.06	271	0.01	0.0003	0.18
LGH&H	-0.0002	0.008	2.42	0.16	271	0.01	0.0002	0.19
LG UPLUS	-0.0004	0.008	4.53	-0.27	271	0.01	0.0002	0.08
LG Electronics	-0.0008	0.008	6.59	-0.52	271	0.01	0.0002	0.24
LG Chem	-0.0002	0.011	14.65	-0.60	271	0.01	0.0002	0.24
NAVER	0.0006	0.009	3.07	0.69	271	0.01	0.0001	0.18
POSCO	-0.0009	0.007	5.88	0.75	271	0.01	0.0003	0.39
S Oil	-0.0007	0.011	14.35	1.20	271	0.01	0.0003	0.23
SK	-0.0009	0.012	15.84	1.06	271	0.01	0.0003	0.24
SK Innovation	-0.0015	0.013	19.88	0.85	271	0.01	0.0004	0.28
SK Telecom	-0.0004	0.006	11.20	-1.20	271	0.00	0.0002	0.13
SK Hynix	0.0003	0.009	2.10	0.31	271	0.01	0.0000	0.31
Kangwonland	-0.0007	0.009	7.38	0.61	271	0.01	0.0002	0.19
Korzinc	-0.0005	0.008	10.02	0.75	271	0.01	0.0003	0.26
Kia Corp	-0.0004	0.010	4.97	-0.85	271	0.01	0.0001	0.15
IBK	-0.0015	0.008	11.51	-0.60	271	0.00	0.0004	0.37
Netmarble	-0.0006	0.010	2.97	-0.32	271	0.01	0.0002	0.12
Lotte Chemicalcorp	-0.0008	0.012	16.64	1.22	271	0.01	0.0004	0.25
Samsung SDI Co. Ltd	0.0005	0.012	11.63	-0.40	271	0.01	0.0000	0.22
Samsung C&T	-0.0003	0.008	4.03	0.18	271	0.01	0.0002	0.34
Samsung Biologics	0.0008	0.012	6.04	1.16	271	0.01	0.0001	0.10
Samsung Life	-0.0013	0.009	17.60	1.26	271	0.00	0.0004	0.46
Samsung SDS	-0.0008	0.007	3.37	-0.46	271	0.01	0.0003	0.37
Samsung	0.0001	0.010	3.36	0.05	271	0.01	0.0000	0.26

Contd...



ElecMech								
Samsung Elec	0.0004	0.005	1.37	0.11	271	0.00	-0.0002	0.57
Samsung F&M Ins	-0.0011	0.009	9.02	0.78	271	0.01	0.0003	0.19
Celtrion	0.0000	0.013	12.84	1.11	271	0.01	0.0002	0.15
SinhanGroup	-0.0010	0.008	10.39	0.17	271	0.00	0.0002	0.35
AmoreG	-0.0005	0.013	4.45	0.14	271	0.01	0.0002	0.10
AmorePacific	-0.0004	0.012	2.32	0.39	271	0.01	0.0002	0.12
NCsoft	0.0005	0.009	4.21	0.83	271	0.01	0.0001	0.14
Woori FinancialGr	-0.0012	0.010	7.72	-0.09	271	0.01	0.0002	-0.01
Emart	-0.0011	0.009	2.20	0.38	271	0.01	0.0003	0.17
Kakao	0.0010	0.009	3.50	0.43	271	0.01	0.0000	0.16
COWAY	-0.0009	0.011	14.45	-1.88	271	0.01	0.0002	0.10
HanaFinancialGr	-0.0010	0.009	9.24	-1.04	271	0.01	0.0002	0.29
KEPCO	-0.0008	0.008	2.52	0.01	271	0.01	0.0002	0.14
KSOE	-0.0010	0.012	7.48	-0.41	271	0.01	0.0002	0.22
Hankook Tyre&Tech	-0.0015	0.010	5.06	-0.68	271	0.01	0.0004	0.24
Hanon Systems	-0.0006	0.009	6.89	-0.94	271	0.01	0.0002	0.15
Hyundai Eng&Cons	-0.0009	0.012	7.79	-0.79	271	0.01	0.0003	0.21
HyundaiGlovis	-0.0005	0.010	4.86	0.14	271	0.01	0.0001	0.17
Hyundai Mobis	-0.0004	0.009	10.31	0.90	271	0.01	0.0001	0.27
HyundaiMotors	-0.0006	0.009	9.99	-0.41	271	0.01	0.0001	0.24

## Methodology

We use the Ordinary Least Squares (OLS) market model for estimating the normal return employing the standard event study methodology (Brown & Warner, 1980 & 1985). The event date (t) is when the novel coronavirus outbreak was declared a 'Global Pandemic' by the WHO, i.e., 11 March 2020. For the first and second part, a 180-day estimation period and a 61-day event window, while for the third part, a 210-day estimation period and a 61-day event window, have been used. Although the available literature suggests several models for estimating normal returns, the OLS market model is the most used, along with the Fama-French three-factor model. In Brown and Warner (1980 & 1985) and MacKinlay (1997), we find that the results generated by different models are

similar. The positive thing is that the market model used in this study does not impose any restrictions and that, too, without affecting the results. Hence, we do not employ the three-factor model and proceed with the market model.

The abnormal returns of the index 'i', on day 't', using the market model is calculated as follows:

$$MMAR_{it} = LR_{it} - \alpha - \beta R_{mt} \dots \dots \dots eq. 1$$

where  $LR_{it}$  is the daily log return for the stock 'i';  $\alpha$  and  $\beta$  are intercept and slope coefficients of the OLS regression model; and,  $R_{mt}$  is the rate of return on the benchmark index (MSCI Emerging Markets Index) on day t.

Now with the available daily abnormal returns ( $AR_{it}$ ) for each of the sample indices, the aggregated daily abnormal returns for the 61 days event window is calculated and divided by the sample size ( $N$ ) to arrive at the average abnormal return ( $AAR_t$ ) as follows:

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AR_{it} \dots \dots \dots eq. 02$$

Further, for the shorter event windows, we calculate the AAR as follows:

$$AAR_{p,q} = \frac{1}{n} \sum_{i=1}^n AAR_t \dots \dots \dots eq. 03$$

where  $AAR_{p,q}$  is the average abnormal return for the window period p,q; and  $n$  is the number of days in the window period p,q

The cumulative AAR figures in a window period result in cumulative average abnormal return (CAAR) for that window period. We also analyze the cumulative abnormal returns (CARs) of the individual indices, which are calculated by cumulating the ARs for the number of days in the event window. For example, to calculate the 4-day CARs, we cumulate the ARs for day t to t+3.

### *Testing the significance*

To test the significance of the calculated ARs, CARs, AARs, and CAARs and to accept or reject the null hypothesis discussed in section 3, we calculate the t-statistics as follows:

$$AR_t t = \frac{AR_t}{\sigma_{n,e}} \dots \dots \dots eq. 04$$



calculating the AVs (as in eq.10). We calculate the actual volatility as the first logarithmic difference between the intraday high and low values, as in Floros, (2009) (as in eq.8 & 9). The difference between the actual volatility and the estimated volatility is the AV that will be tested for significance (eq.6).

$$V_{it} = \ln(H_{it}) - \ln(L_{it}) \dots \dots \dots \text{eq. 8}$$

$$V_{mt} = \ln(H_{mt}) - \ln(L_{mt}) \dots \dots \dots \text{eq. 9}$$

$$EV_{it} = \alpha + \beta \cdot V_{mt} \dots \dots \dots \text{eq. 10}$$

$$AV_{it} = V_{it} - EV_{it} \dots \dots \dots \text{eq. 11}$$

Where,  $V_{it}$  is the simple measure of the volatility of the stock  $i$  on day  $t$ ;  $V_{mt}$  is the simple measure of the volatility of the benchmark index (MSCI Emerging Markets Index) on day  $t$ ;  $H_{it}$  and  $L_{it}$  are the high and low figures of the stock  $i$  on day  $t$ ;  $H_{mt}$  and  $L_{mt}$  are the high and low figures of the market index (MSCI Emerging Markets Index) on day  $t$ ;  $EV_{it}$  is the estimated volatility of stock  $i$  on day  $t$ ;  $\alpha$  &  $\beta$  is the intercept and slope coefficients of the OLS regression model; and,  $AV_{it}$  is the abnormal volatility of the stock  $i$  on day  $t$ .

Thereafter, the average abnormal volatility (AAV) and Cumulative average abnormal volatility (CAAV) and the test-statistics for the same is calculated following the equations 02, 03, 06 and 07.

#### Data Analysis and Interpretation

This section contains the data analysis and interpretation of results. It has been divided into four parts, viz., analysis of the nine Asian emerging markets indices, analysis of the eight Korean stock indices regressed with the MSCI emerging markets index, analysis of the 48 constituent stocks of KOSPI50, and the analysis of how the nine Asian emerging market indices are interrelated to each other. The comparison of the findings with pertinent literature goes in line with the discussion in each part.

#### *Covid-19 and the Asian Emerging Markets*

The mean abnormal returns for the sample indices (in Table1a) reflect positive figures only for China and Taiwan, the two nations that have successfully contained the coronavirus's spread. It indicates that the nations who were successful in the early containment of the disease have led to stability in their stock market returns.

Table 3: Country-wise event day abnormal returns and shorter window cumulative abnormal returns

Asian Emerging Markets	SD	Event Day AR	CAR (0,+3)	t-value	CAR (0,+7)	t-value	CAR (0,+10)	t-value
China	0.26	-0.15	-1.06	-2.02	-0.28	-0.37	0.57	0.66
India	0.39	0.48	-3.51	-4.54 <sup>a</sup>	-5.34	-4.89 <sup>a</sup>	-8.75	-6.83 <sup>a</sup>
Indonesia	0.41	-0.33	-4.83	-5.90 <sup>a</sup>	-13.96	-12.04 <sup>a</sup>	-20.42	-15.02 <sup>a</sup>
Korea	0.42	-0.92 <sup>a</sup>	-3.88	-4.63 <sup>a</sup>	-7.67	-6.46 <sup>a</sup>	-4.08	-2.94 <sup>a</sup>
Malaysia	0.21	1.07 <sup>a</sup>	-0.68	-1.60	0.43	0.73	-0.30	-0.43
Pakistan	0.67	0.35	-4.65	-3.47 <sup>a</sup>	-8.51	-4.49 <sup>a</sup>	-15.55	-6.99 <sup>a</sup>
Philippines	0.41	0.43	-6.04	-7.45 <sup>a</sup>	-10.45	-9.11 <sup>a</sup>	-9.07	-6.74 <sup>a</sup>
Taiwan	0.28	-0.09	-1.45	-2.58 <sup>b</sup>	-2.51	-3.16 <sup>a</sup>	-1.95	-2.09 <sup>b</sup>
Thailand	0.30	-0.30	-5.93	-9.73 <sup>a</sup>	-2.04	-2.36 <sup>b</sup>	-4.61	-4.56 <sup>a</sup>

<sup>a</sup> significant at alpha = 0.01. <sup>b</sup> significant at alpha = 0.05

Table-3 presents the event day ARs and the 4-day, 8-day, and 11-day CARs for individual countries. We find only two countries with significant ARs on the event day. While Korea experienced a significant negative AR on the event day, Malaysia had a significant positive AR on the event day. Further, the CARs for shorter durations, including the event day, have been tested for significance. The 4-day CARs are negative for all the sample nations but significant only for India, Indonesia, Korea, Pakistan, Philippines, Taiwan, and Thailand. Similarly, the 8-day and 11-day CARs are negative and significant for these nations only. The CARs of China and Malaysia are negative but not significant. Covid-19 impacts are not noticed for these nations.

Table 4: Test statistics for event window period AARs and CAARs of the Asian emerging markets

Days	AAR <sub>t</sub>	Decision	CAAR <sub>t</sub>	Days	AAR <sub>t</sub>	Decision	CAAR <sub>t</sub>
t-30	-0.14	accept	-0.03	t	0.47	accept	-34.14 <sup>a</sup>
t-29	-2.82 <sup>b</sup>	reject	-0.54	t+1	-12.19 <sup>a</sup>	reject	-32.76 <sup>a</sup>
t-28	-2.80 <sup>b</sup>	reject	-1.07	t+2	-2.93 <sup>b</sup>	reject	-28.44 <sup>a</sup>
t-27	-4.10 <sup>a</sup>	reject	-1.86	t+3	-12.49 <sup>a</sup>	reject	-30.88 <sup>a</sup>
t-26	3.07 <sup>b</sup>	reject	-1.31	t+4	-9.05 <sup>a</sup>	reject	-31.67 <sup>a</sup>
t-25	1.46	accept	-1.05	t+5	-3.32 <sup>b</sup>	reject	-30.26 <sup>a</sup>
t-24	2.06	accept	-0.65	t+6	-14.86 <sup>a</sup>	reject	-33.64 <sup>a</sup>
t-23	-1.09	accept	-0.89	t+7	11.75 <sup>a</sup>	reject	-27.31 <sup>a</sup>
t-22	-1.40	accept	-1.20	t+8	-13.16 <sup>a</sup>	reject	-30.13 <sup>a</sup>

Contd...

t-21	-0.51	accept	-1.34	t+9	-1.54	accept	-29.07 <sup>a</sup>
t-20	0.68	accept	-1.22	t+10	2.97 <sup>b</sup>	reject	-26.83 <sup>a</sup>
t-19	-0.28	accept	-1.31	t+11	7.96 <sup>a</sup>	reject	-23.39 <sup>a</sup>
t-18	-0.48	accept	-1.45	t+12	5.14 <sup>a</sup>	reject	-21.04 <sup>a</sup>
t-17	-0.15	accept	-1.53	t+13	-5.89 <sup>a</sup>	reject	-21.85 <sup>a</sup>
t-16	-0.59	accept	-1.72	t+14	5.83 <sup>a</sup>	reject	-19.60 <sup>a</sup>
t-15	0.80	accept	-1.57	t+15	-3.00 <sup>b</sup>	reject	-19.73 <sup>a</sup>
t-14	-1.07	accept	-1.90	t+16	2.43 <sup>b</sup>	reject	-18.55 <sup>a</sup>
t-13	-2.23	accept	-2.56 <sup>b</sup>	t+17	1.20	accept	-17.75 <sup>a</sup>
t-12	-6.16 <sup>a</sup>	reject	-4.37 <sup>a</sup>	t+18	1.33	accept	-16.97 <sup>a</sup>
t-11	0.29	accept	-4.46 <sup>a</sup>	t+19	6.35 <sup>a</sup>	reject	-15.12 <sup>a</sup>
t-10	-4.90 <sup>a</sup>	reject	-6.13 <sup>a</sup>	t+20	-3.57 <sup>a</sup>	reject	-15.53 <sup>a</sup>
t-9	1.32	accept	-6.02 <sup>a</sup>	t+21	1.98	accept	-14.75 <sup>a</sup>
t-8	-5.49 <sup>a</sup>	reject	-8.17 <sup>a</sup>	t+22	0.05	accept	-14.42 <sup>a</sup>
t-7	-0.51	accept	-8.85 <sup>a</sup>	t+23	0.13	accept	-14.09 <sup>a</sup>
t-6	2.53 <sup>b</sup>	reject	-8.50 <sup>a</sup>	t+24	2.71 <sup>b</sup>	reject	-13.26 <sup>a</sup>
t-5	3.03 <sup>b</sup>	reject	-7.95 <sup>a</sup>	t+25	0.94	accept	-12.82 <sup>a</sup>
t-4	1.25	accept	-8.15 <sup>a</sup>	t+26	-6.72 <sup>a</sup>	reject	-13.87 <sup>a</sup>
t-3	-5.12 <sup>a</sup>	reject	-11.67 <sup>a</sup>	t+27	9.15 <sup>a</sup>	reject	-11.89 <sup>a</sup>
t-2	-12.05 <sup>a</sup>	reject	-20.44 <sup>a</sup>	t+28	-0.09	accept	-11.70 <sup>a</sup>
t-1	0.79	accept	-24.47 <sup>a</sup>	t+29	-4.55 <sup>a</sup>	reject	-12.34 <sup>a</sup>
t	0.47	accept	-34.14 <sup>a</sup>	t+30	1.39	accept	-11.89 <sup>a</sup>

<sup>a</sup> significant at  $\alpha = 0.01$ . <sup>b</sup> significant at  $\alpha = 0.05$

Table-4 depicts the t-statistics for the individual AARs for the 61-day event window. During the pre-event day period, eleven significant AARs (eight at one per cent significance level and three at five per cent significance level) are significant and mostly negative. The event day AAR is positive and not significant. Twenty-one AARs (fifteen at one per cent significance level and six at five per cent significance level) are significant and almost equally distributed positives and negatives in the post-event day period. Higher significant AARs in the post-event day period indicate that the Covid-19 outbreak has significantly impacted the Asian emerging markets. The CAARs are significant for all days through t-13 to t+30. He et al. (2020), Liu et al. (2020), and Pandey and Kumari (2021a) also found evidence of a significant negative impact on Asian emerging markets.



Figure 1: AAR and CAAR trend of Asian stock markets during the event window

Figure 1 exhibits the trend of AAR and CAAR of the Asian emerging markets during the 61-day event window period. The AAR and the CAAR line are seen moving apart more steeply from around the event day, and the distance continues till the end of the event period. It shows that the AARs have been negative most of the time, leading to this gap. The analysis of the shorter window CARs, the longer event window AARs and CAARs, and the graphical presentation reveals that the Asian emerging markets have been hit hard, although China and Taiwan are an exception. The higher negative CAARs in the post-event day period reveals the whole story.

#### *Covid-19 and the Korean Stock Indices*

It is evident from the Table-Ia that the mean abnormal returns for all the eight indices are negative. Table-V presents the event day abnormal returns, 4-day, 8-day, and 11-day cumulative abnormal returns for the Korean stock indices. While the event-day abnormal returns and the shorter window cumulative abnormal returns are significant for all the indices. As compared to the impacts on Asian emerging markets where a few stock markets were least affected or unaffected, the Korean stock indices have been impacted badly – significant negative shorter window CARs evidence for negative impacts.

Table-5 presents the hypothesis testing results for AARs and CAARs of the Korean stock indices in the longer window period of 61 days. During the pre-event day period, thirteen AARs are significant (nine at one per cent significance level and four at five per cent significance level). While five significant AARs are positive, the rest are negative. During the post-event day period, twenty AARs are significant (fifteen at one per cent significance level and five at five per cent significance level).

Table 5: Indices-wise event day abnormal returns and shorter window cumulative abnormal returns

Sample Indices	SD	Event Day AR	CAR (0,+3)	t-value	CAR (0,+7)	t-value	CAR (0,+10)	t-value
KOSPI	0.25	-0.68 <sup>a</sup>	-1.59	-3.19 <sup>a</sup>	-4.47	-6.37 <sup>a</sup>	-3.23	-3.92 <sup>a</sup>
KOSPI200	0.27	-0.76 <sup>a</sup>	-1.51	-2.82 <sup>b</sup>	-4.26	-5.61 <sup>a</sup>	-2.87	-3.22 <sup>a</sup>
KOSPI200 Leveraged	0.43	-0.68 <sup>a</sup>	-1.62 <sup>a</sup>	-6.00	-6.96 <sup>a</sup>	-10.69	-8.77 <sup>a</sup>	-9.07
-6.35 <sup>a</sup>								
KOSPI50	0.29	-0.75 <sup>a</sup>	-1.55	-2.72 <sup>b</sup>	-4.19	-5.18 <sup>a</sup>	-2.48	-2.62 <sup>b</sup>
KOSPI Large sized	0.26	-0.67 <sup>a</sup>	-1.46	-2.82 <sup>b</sup>	-4.15	-5.66 <sup>a</sup>	-2.67	-3.11 <sup>a</sup>
KOSPI100	0.27	-0.74 <sup>a</sup>	-1.51	-2.75 <sup>b</sup>	-4.24	-5.47 <sup>a</sup>	-2.77	-3.05 <sup>a</sup>
KRX100	0.27	-0.69 <sup>a</sup>	-1.47	-2.75 <sup>b</sup>	-4.19	-5.56 <sup>a</sup>	-2.72	-3.08 <sup>a</sup>
KOSPI200-IT	0.41	-1.10 <sup>a</sup>	-3.34	-4.04 <sup>a</sup>	-6.69	-5.71 <sup>a</sup>	-4.39	-3.20 <sup>a</sup>

<sup>a</sup> significant at alpha = 0.01. <sup>b</sup> significant at alpha = 0.05

The event day AAR is also negative and significant at a one per cent level. The CAARs are significant on t-8, t-7, t-6, and all days through t-2 to t+25. The negative impact on the Korean stock indices is not a myth. Liu et al. (2020) and Kim (2020) provide evidence of negative returns in the Korean stock market, while Pandey and Kumari (2021a) found that the number of new cases and deaths were negatively correlated with the returns of the KOSPI.

Table 6: Test statistics for event window period AARs and CAARs of the Korean stock indices

Days	AAR <sub>t</sub>	Decision	CAAR <sub>t</sub>	Days	AAR <sub>t</sub>	Decision	CAAR <sub>t</sub>
t-30	2.13	accept	0.38	t	-5.73 <sup>a</sup>	reject	-12.57 <sup>a</sup>
t-29	-1.88	accept	0.05	t+1	0.01	accept	-8.88 <sup>a</sup>
t-28	-2.47 <sup>b</sup>	accept	-0.41	t+2	-9.72 <sup>a</sup>	reject	-12.86 <sup>a</sup>
t-27	0.95	accept	-0.24	t+3	0.36	accept	-10.96 <sup>a</sup>
t-26	2.71 <sup>b</sup>	reject	0.28	t+4	-6.59 <sup>a</sup>	reject	-12.75 <sup>a</sup>
t-25	0.72	accept	0.42	t+5	-7.94 <sup>a</sup>	reject	-14.88 <sup>a</sup>
t-24	6.69 <sup>a</sup>	reject	1.77	t+6	-19.77 <sup>a</sup>	reject	-21.25 <sup>a</sup>
t-23	-0.81	accept	1.64	t+7	14.29 <sup>a</sup>	reject	-14.83 <sup>a</sup>
t-22	-1.03	accept	1.46	t+8	-7.51 <sup>a</sup>	reject	-16.48 <sup>a</sup>
t-21	1.67	accept	1.85	t+9	17.89 <sup>a</sup>	reject	-9.98 <sup>a</sup>
t-20	0.66	accept	2.04	t+10	9.62 <sup>a</sup>	reject	-6.61 <sup>a</sup>
t-19	0.07	accept	2.10	t+11	-8.32 <sup>a</sup>	reject	-8.73 <sup>a</sup>

Contd...



t-18	2.08	accept	2.64 <sup>b</sup>	t+12	7.60 <sup>a</sup>	reject	-6.28 <sup>a</sup>
t-17	-0.35	accept	2.62	t+13	0.46	accept	-5.93 <sup>a</sup>
t-16	-2.99 <sup>b</sup>	reject	1.97	t+14	1.66	accept	-5.30 <sup>a</sup>
t-15	-0.49	accept	1.91	t+15	-9.56 <sup>a</sup>	reject	-7.52 <sup>a</sup>
t-14	-0.20	accept	1.92	t+16	4.84 <sup>a</sup>	reject	-6.13 <sup>a</sup>
t-13	-2.72 <sup>b</sup>	reject	1.27	t+17	1.12	accept	-5.69 <sup>a</sup>
t-12	-7.42 <sup>a</sup>	reject	-0.74	t+18	7.49 <sup>a</sup>	reject	-3.82 <sup>a</sup>
t-11	2.86 <sup>b</sup>	accept	0.05	t+19	0.69	reject	-3.57 <sup>a</sup>
t-10	-2.77 <sup>b</sup>	reject	-0.78	t+20	-2.76 <sup>b</sup>	reject	-4.08 <sup>a</sup>
t-9	-1.37	accept	-1.25	t+21	1.91	accept	-3.58 <sup>a</sup>
t-8	-6.45 <sup>a</sup>	reject	-3.47 <sup>b</sup>	t+22	2.57 <sup>b</sup>	reject	-2.97 <sup>b</sup>
t-7	1.31	accept	-3.22 <sup>b</sup>	t+23	-5.17 <sup>a</sup>	reject	-3.96 <sup>a</sup>
t-6	-0.26	reject	-3.54 <sup>a</sup>	t+24	2.73 <sup>b</sup>	reject	-3.34 <sup>b</sup>
t-5	5.43 <sup>a</sup>	reject	-1.60	t+25	2.52 <sup>b</sup>	reject	-2.78 <sup>b</sup>
t-4	3.29 <sup>b</sup>	reject	-0.29	t+26	6.81 <sup>a</sup>	reject	-1.42
t-3	-2.41 <sup>b</sup>	reject	-1.52	t+27	-3.42 <sup>b</sup>	reject	-2.04
t-2	-3.01 <sup>b</sup>	reject	-3.50 <sup>a</sup>	t+28	0.91	accept	-1.83
t-1	-0.78	accept	-4.83 <sup>a</sup>	t+29	1.16	accept	-1.59
t	-5.73 <sup>a</sup>	reject	-12.57 <sup>a</sup>	t+30	1.45	accept	-1.30

<sup>a</sup> significant at  $\alpha = 0.01$ . <sup>b</sup> significant at  $\alpha = 0.05$

Figure 2 is the graphical presentation of the AARs and CAARs for the Korean stock. It is noticed that although the CAAR-line is moving apart from the AAR-line from around the event day, it moves closer towards the end of the event window. This is due to positive average abnormal returns after a few days from the event day.

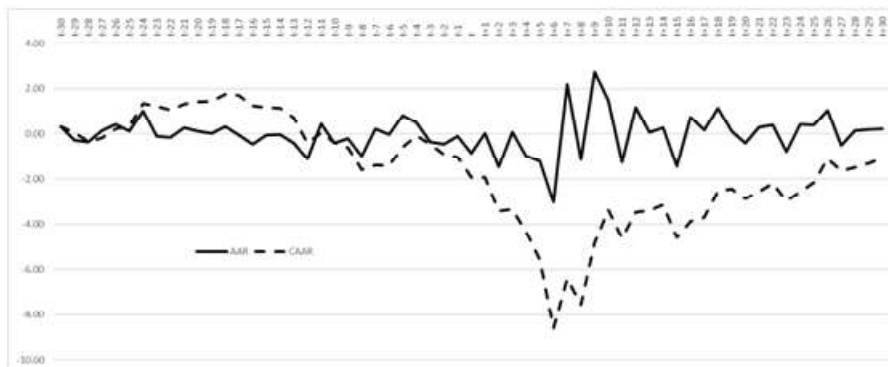


Figure 2: AAR and CAAR trend of Korean stock indices during the event window

The analysis of the shorter window CARs, the longer event window AARs and CAARs, and the graphical presentation reveals that the Korean stock indices have evidenced negative average abnormal return during the event window. However, the impact has been comparatively less intense than the Asian emerging markets.

Table 7: Test statistics for event window period AAVs and CAAVs of the Korean Stock Indices

Days	AAV <sub>t</sub>	Decision	CAAV <sub>t</sub>	Days	AAV <sub>t</sub>	Decision	CAAV <sub>t</sub>
t-30	-2.04	accept	-0.37	t	3.16 <sup>b</sup>	reject	2.17
t-29	1.78	accept	-0.05	t+1	-0.52	accept	1.17
t-28	0.78	accept	0.10	t+2	2.98 <sup>b</sup>	reject	2.67
t-27	0.83	accept	0.26	t+3	-2.40 <sup>b</sup>	reject	1.11
t-26	-1.83	accept	-0.09	t+4	2.26	accept	2.01
t-25	-0.66	accept	-0.22	t+5	-1.23	accept	1.33
t-24	2.41 <sup>b</sup>	reject	0.25	t+6	3.81 <sup>a</sup>	reject	2.67 <sup>b</sup>
t-23	-2.82 <sup>b</sup>	reject	-0.32	t+7	-3.68 <sup>a</sup>	reject	1.20
t-22	0.65	accept	-0.19	t+8	-2.80 <sup>b</sup>	reject	0.20
t-21	-1.06	accept	-0.42	t+9	3.18 <sup>b</sup>	reject	1.19
t-20	0.72	accept	-0.27	t+10	-2.62 <sup>b</sup>	reject	0.35
t-19	0.66	accept	-0.13	t+11	0.81	accept	0.57
t-18	2.18	accept	0.37	t+12	2.04	accept	1.11
t-17	-2.76 <sup>b</sup>	accept	-0.27	t+13	0.08	accept	1.09
t-16	-0.26	accept	-0.34	t+14	-4.46 <sup>a</sup>	reject	-0.10
t-15	1.78	accept	0.09	t+15	3.82 <sup>a</sup>	reject	0.86
t-14	0.71	reject	0.28	t+16	-0.89	accept	0.62
t-13	-3.37 <sup>b</sup>	reject	-0.61	t+17	-1.52	accept	0.24
t-12	1.11	accept	-0.33	t+18	0.24	accept	0.29
t-11	2.28	accept	0.32	t+19	-0.96	accept	0.07
t-10	-2.16	accept	-0.32	t+20	1.10	accept	0.31
t-9	1.00	accept	-0.02	t+21	-3.54 <sup>b</sup>	reject	-0.45
t-8	0.04	accept	-0.01	t+22	4.54 <sup>a</sup>	reject	0.50
t-7	1.07	accept	0.37	t+23	-2.66 <sup>b</sup>	reject	-0.05
t-6	0.58	accept	0.61	t+24	-1.18	accept	-0.28
t-5	1.72	accept	1.37	t+25	3.61 <sup>a</sup>	accept	0.43
t-4	-4.49 <sup>a</sup>	accept	-0.51	t+26	-1.95	accept	0.05

Contd...

t-3	-1.36	accept	-1.25	t+27	1.61	accept	0.35
t-2	0.57	accept	-1.12	t+28	-0.59	accept	0.23
t-1	0.94	accept	-0.70	t+29	1.08	accept	0.43
t	3.16 <sup>b</sup>	reject	2.17	t+30	3.16 <sup>b</sup>	reject	2.17

<sup>a</sup> significant at alpha = 0.01. <sup>b</sup> significant at alpha = 0.05

Table-7 represents the test statistics for the AAVs and CAAVs during the event window. It is seen that five AAVs are significant in the pre-event day period while fourteen AAVs are significant in post-event day period. While only one significant AAV in the pre-event day period is positive, seven significant AAVs are positive in the post-event day period. The event day AAV is also negative and significant. With equal numbers of positive and negative significant AAVs during the post-event day period, it points that the abnormal volatility of the Korean stock indices have been significant but the overall impact on volatility was nil. The CAAVs are insignificant for the event window except on t+6. This, too, indicates insignificant volatility during the event window. The shorter window analysis, i.e., 4-day, 8-day and 11-day also reveals insignificant cumulative abnormal volatilities (the results may be provided if sought). Hence, it is evident that although the global pandemic announcement led to significant abnormal returns, the abnormal volatilities have been insignificant for the Korean stock indices.

#### ***Covid-19 and the KOSPI50 Constituent Stocks***

In the previous parts, we studied the impact on Asian emerging markets indices and the Korean stock indices; now, it calls for examining the impact on individual stocks' returns. Table-1b represents the descriptive statistics of 48 constituent stocks of KOSPI50. The mean abnormal returns of the stocks have been lower than those of the indices. Table-8 exhibits the test-statistics of the 61-day event window period AARs and the CAARs. Twenty-one pre-event day AARs and twenty-six post-event day AARs are significant along with the event-day AAR. While eight positive AARs are significant during the pre-event say period, fourteen positive AARs are significant during the post-event period. It indicates that the KOSPI50 stocks have not followed a common trend of continuous negative or positive AARs during the event window. However, negative and significant CAARs for t-12 to t+30 days indicate that the overall impact has been negative during the event window. It is evident that when individual stocks are examined, the impact is found to be more intense. For example, Takyi and Bentum-Ennin (2020), Pandey and Kumari (2020a & 2020b), and, Adenomon, Maijamaa, and John (2020) found negative impacts in the African, Indian, and Nigerian stock markets, respectively.

Table 8: Test statistics for event window period AARs and CAARs of the KOSPI50 constituents

Days	AAR <sub>t</sub>	Decision	CAAR <sub>t</sub>	Days	AAR <sub>t</sub>	Decision	CAAR <sub>t</sub>
t-30	0.74	accept	0.13	t	-4.31 <sup>a</sup>	reject	-53.80 <sup>a</sup>
t-29	-2.70 <sup>a</sup>	reject	-0.36	t+1	2.02 <sup>b</sup>	reject	-36.61 <sup>a</sup>
t-28	-4.03 <sup>a</sup>	reject	-1.11	t+2	-30.69 <sup>a</sup>	reject	-47.61 <sup>a</sup>
t-27	-3.66 <sup>a</sup>	reject	-1.82	t+3	-12.96 <sup>a</sup>	reject	-47.71 <sup>a</sup>
t-26	3.89 <sup>a</sup>	reject	-1.11	t+4	-9.55 <sup>a</sup>	reject	-46.95 <sup>a</sup>
t-25	-0.64	accept	-1.26	t+5	-17.75 <sup>a</sup>	reject	-50.10 <sup>a</sup>
t-24	10.31 <sup>a</sup>	reject	0.78	t+6	-29.30 <sup>a</sup>	reject	-57.46 <sup>a</sup>
t-23	-2.14 <sup>b</sup>	reject	0.36	t+7	23.36 <sup>a</sup>	reject	-45.49 <sup>a</sup>
t-22	-0.71	accept	0.22	t+8	-18.23 <sup>a</sup>	reject	-48.97 <sup>a</sup>
t-21	3.54 <sup>a</sup>	reject	0.98	t+9	24.87 <sup>a</sup>	reject	-38.59 <sup>a</sup>
t-20	2.09 <sup>b</sup>	reject	1.46	t+10	23.15 <sup>a</sup>	reject	-29.82 <sup>a</sup>
t-19	-3.53 <sup>a</sup>	reject	0.71	t+11	-4.22 <sup>a</sup>	reject	-29.76 <sup>a</sup>
t-18	-1.46	accept	0.39	t+12	6.24 <sup>a</sup>	reject	-26.87 <sup>a</sup>
t-17	-0.85	accept	0.20	t+13	-2.72 <sup>a</sup>	reject	-26.62 <sup>a</sup>
t-16	-1.88	accept	-0.25	t+14	8.01 <sup>a</sup>	reject	-23.65 <sup>a</sup>
t-15	-0.94	accept	-0.49	t+15	-14.39 <sup>a</sup>	reject	-26.49 <sup>a</sup>
t-14	-3.68 <sup>a</sup>	reject	-1.45	t+16	10.06 <sup>a</sup>	reject	-23.26 <sup>a</sup>
t-13	-4.97 <sup>a</sup>	reject	-2.83 <sup>a</sup>	t+17	-2.72 <sup>a</sup>	reject	-23.25 <sup>a</sup>
t-12	-12.53 <sup>a</sup>	reject	-6.42 <sup>a</sup>	t+18	14.38 <sup>a</sup>	reject	-19.33 <sup>a</sup>
t-11	2.33 <sup>b</sup>	reject	-6.00 <sup>a</sup>	t+19	4.42 <sup>a</sup>	reject	-17.85 <sup>a</sup>
t-10	-2.38 <sup>b</sup>	reject	-6.99 <sup>a</sup>	t+20	-1.83	accept	-17.82 <sup>a</sup>
t-9	-2.72 <sup>a</sup>	reject	-8.19 <sup>a</sup>	t+21	7.17 <sup>a</sup>	reject	-15.88 <sup>a</sup>
t-8	-10.47 <sup>a</sup>	reject	-12.12 <sup>a</sup>	t+22	6.48 <sup>a</sup>	reject	-14.18 <sup>a</sup>
t-7	-0.65	accept	-13.09 <sup>a</sup>	t+23	-6.74 <sup>a</sup>	reject	-15.26 <sup>a</sup>
t-6	0.09	accept	-13.96 <sup>a</sup>	t+24	5.95 <sup>a</sup>	reject	-13.76 <sup>a</sup>
t-5	4.71 <sup>a</sup>	reject	-13.16 <sup>a</sup>	t+25	-1.01	accept	-13.69 <sup>a</sup>
t-4	4.08 <sup>a</sup>	reject	-12.59 <sup>a</sup>	t+26	6.12 <sup>a</sup>	reject	-12.26 <sup>a</sup>
t-3	-7.54 <sup>a</sup>	reject	-17.84 <sup>a</sup>	t+27	-0.90	reject	-12.21 <sup>a</sup>
t-2	4.20 <sup>a</sup>	reject	-18.18 <sup>a</sup>	t+28	-3.09 <sup>a</sup>	reject	-12.57 <sup>a</sup>
t-1	-18.01 <sup>a</sup>	reject	-35.00 <sup>a</sup>	t+29	0.49	accept	-12.27 <sup>a</sup>
t	-4.31 <sup>a</sup>	reject	-53.80 <sup>a</sup>	t+30	3.50 <sup>a</sup>	reject	-11.44 <sup>a</sup>

<sup>a</sup> significant at alpha = 0.01. <sup>b</sup> significant at alpha = 0.05

Figure 3 is the graphical representation of the AARs and CAARs for the KOSPI50 constituent stocks. It follows a similar trend as the Asian emerging markets. The CAAR-line moves apart from the AAR-line and the gap is widening from a few days before the event day. However, the gap continues till the end of the event window, indicating continuous negative AARs during the event window.

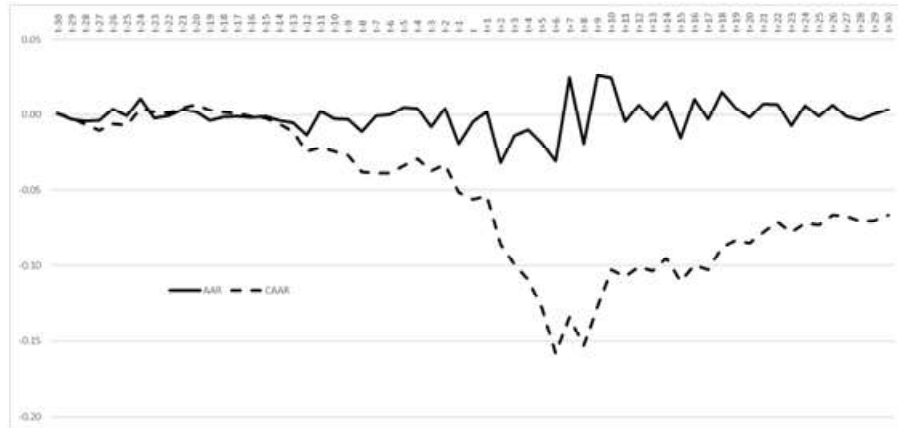


Figure 3: AAR and CAAR trend of KOSPI50 constituents during the event window

### *Association between the Asian Emerging Markets*

While a pandemic may impact different nations, the impact may not be similar for all. Markets around the globe are interrelated, which means the disturbances in one nation's financial market affect the other nation, too. Chiang, Nam, and Li (2007) found evidence of a high correlation among the sample Asian countries during crises. It is interesting to examine the association among various stock markets falling under the same region to ascertain the pandemic impacts on regional stock markets. Table-9 depicts the correlation values between the Asian emerging market indices. It is evident that all the indices, except that of Malaysia, have a positive and significant correlation with the MSCI emerging market index. While China, Taiwan, and Malaysia do not react similarly to other nations' stock indices, Korea, India, Indonesia, Pakistan, the Philippines, and Thailand share a positive and significant correlation. This indicates that the impact of the Covid-19 has been similar on these nations. It can be said that the impact has been different on different nations, as also concluded in Pandey and Kumari (2021a). It could be said that China, Taiwan, and Malaysia reacted differently due to their early control over the novel coronavirus, as we find in Topcu and Gulal (2020), who conclude that the impact has been lesser in nations where the government introduced preventive measures to contain the outbreak within a reasonable time.

Table 9: Correlation among the Asian emerging markets

	1	2	3	4	5	6	7	8	9	10
1. China	1.00									
2. India	0.14	1.00								
3. Indonesia	-0.13	0.54 <sup>a</sup>	1.00							
4. Korea	0.28 <sup>B</sup>	0.48 <sup>A</sup>	0.41 <sup>A</sup>	1.00						
5. Malaysia	-0.23	-0.09	0.09	0.17	1.00					
6. Pakistan	0.18	0.31 <sup>B</sup>	0.35 <sup>A</sup>	0.09	-0.05	1.00				
7. Philippines	0.04	0.39 <sup>A</sup>	0.59 <sup>A</sup>	0.37 <sup>A</sup>	0.01	0.14	1.00			
8. Taiwan	0.00	0.24	0.28 <sup>B</sup>	0.60 <sup>A</sup>	0.29 <sup>B</sup>	0.01	0.37	1.00		
9. Thailand	0.11	0.72 <sup>A</sup>	0.41 <sup>A</sup>	0.37 <sup>A</sup>	0.01	0.40 <sup>A</sup>	0.44 <sup>A</sup>	0.17	1.00	
10. Msci Em	0.48 <sup>A</sup>	0.77 <sup>A</sup>	0.48 <sup>A</sup>	0.68 <sup>A</sup>	-0.26	0.35 <sup>A</sup>	0.48 <sup>A</sup>	0.34 <sup>A</sup>	0.66 <sup>A</sup>	1.00

<sup>a</sup> significant at alpha = 0.01. <sup>b</sup> significant at alpha = 0.05

Table-10 presents the summary of the hypotheses based on the above discussions.

Table 10: Summary of Hypotheses

Sl. No.	Hypothesis Statement	Decision
H <sub>01</sub>	"The Asian emerging markets have experienced no significant abnormal returns during the event window"	Rejected
H <sub>02</sub>	"The Korean stock indices have experienced no significant abnormal returns during the event window"	Rejected
H <sub>03</sub>	"The KOSPI50 constituent stocks have experienced no significant abnormal returns during the event window"	Rejected
H <sub>04</sub>	"The Asian emerging markets and the Korean stock market were impacted similarly by the global pandemic"	Rejected
H <sub>05</sub>	"There exists no correlation between the Asian emerging markets"	Rejected
H <sub>06</sub>	"The Korean stock indices have experienced no significant abnormal volatilities during the event window."	Supported

## Conclusions

The empirical results rejected all the null hypotheses. The Asian emerging markets, the Korean stock indices, and the KOSPI50 stocks have experienced significant negative abnormal returns around the event date. As found in other studies, the pandemic's market reaction has been different in different markets, and there is a strong association between the Asian emerging markets in terms of the reactions, except for a few exceptions, namely, China, Taiwan, and Malaysia. More significant abnormal returns are present in the Korean stock market's pre-event day period

than in the Asian emerging markets. When it comes to individual stocks, the impact of the global pandemic has been the worst. Insignificant impact is found on the volatility of the Korean stock indices. The findings support previous literature.

Since Fama et al. (1969), the efficient market hypothesis has gained interest in financial studies. A semi-strong efficiency is when the stock prices react to the publicly available information. The presence of significant abnormal returns during the pre-event day period may indicate both leakage and anticipation of information regarding an event's occurrence. In the Asian emerging markets and the Korean stock indices, the significant abnormal returns are scattered in the pre-event day period, although not concentrated heavily, which indicates that the markets are semi-efficient. However, for the KOSPI50 constituent stocks, the significant abnormal returns are concentrated around the pre-event-day period indicating prior anticipation of an event's occurrence. Reflecting certain information in the stock prices before the information is made public indicates that the market is inefficient.

### Implications

This study gives an insight into pandemic effects on different sets of markets, initiating from a set of Asian emerging markets to a set of indices in a single market and concluding the analysis on individual stocks constituting one of the major indices of that market. It will help investors build their portfolio during such uncertainties and for the policymakers who work on securities pricing during different market phases. Once one knows how different markets or stocks react to certain uncertain events, it becomes easier to select a particular stock for the portfolio or a particular investment market. As all research does, this study also has a few limitations. This study emphasizes the pandemic effects but fails to discuss the post-pandemic strategies. However, it paves the way to future research based on its findings.

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