Stock markets' responses to COVID-19 in developing countries: evidence from the SAARC region

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Abstract: This study examined the stock markets' responses to the unprecedented outbreak of the COVID-19 pandemic in SAARC countries. The results support these countries' surge in stock market return volatilities amid the rapid spread of the COVID-19 infection caused by investors' pessimistic sentiments. The intensive media coverage of information related to the pandemic has weakened investors' sentiments and caused sudden market plunges in the SAARC region. During the pandemic, the performances of the stock markets in SAARC countries are found to be influenced by the number of COVID-19 confirmed and death cases, and movements in the fear index. The implication is that the stock markets of the SAARC region do not qualify to be semi-strong information efficient. This implication is important for investors.

Keywords: COVID-19; stock market; return volatility; investors' behaviour; SAARC.

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1 Introduction

The year 2020 has been the year of disgrace to both humanity and the economy owing to the unanticipated large-scale and rapid spread of the SARS-CoV-2 virus or coronavirus disease (COVID-19). Although studies ascribe the outbreak of this virus as a novel, the origin of the coronavirus can be traced back to 1960 when a Canadian study reported the identification of nearly 500 patients out of which 17 to 18 cases were confirmed with the virus strain by polymerase chain reaction (Kumar et al., 2020). In recent studies, it has been claimed that the ancestors of East-Asian populations did already adapt to coronavirus infections that infected people for more than 20,000 years ago (Souilmi et al., 2021; Luo et al., 2021). However, a Hong Kong-based leading newspaper reported the identification of the first case of the COVID-19 in China on 17 November 2019[1] albeit WHO announced the identification of the first case in China on 31 December 2019 (Maneenop and Kotcharin, 2020). On 20 January 2020, the NHFC of China declared that the disease is deadly and transmittable among humans (Liu et al., 2020). On 30 January 2020, WHO termed the condition as *global public health emergency* by observing the rapid spread of the virus across countries (Sohrabi et al., 2020). By this time, the virus spread was across 20 countries outside China – mostly in Asia. In the South Asia region, the first confirmed case was reported in Nepal on 23 January 2020 (GoN, 2020), in Sri Lanka on 27 January 2020 (Jayatilleke et al., 2020), in India on 30 January 2020 (Andrews et al., 2020; Mishra and Mishra, 2021a, 2021b), in Pakistan on 26 February 2020 (Waris et al., 2020); in the Maldives on 7 March 2020 (MoED, 2020); and in Bangladesh on 8 March 2020[2]. Given the spread of the virus across 114 countries[3], WHO announced COVID-19 as a *global pandemic* on 11 March 2020.

The fast increase in the number of COVID-19 infection and associated death cases, non-availability of curatives, and consequential spread of uncertainties towards the recovery from the pandemic have all made people panic about the situation. The economies across the globe suffered from the downturns mainly due to the supply and demand shocks. The imposition of lockdowns, suspension of travels, shut down of economic activities, problems with labour supply, border closures, and supply chain disruptions resulted in the spread of supply-side shocks in economies (Rajput et al., 2020; Mishra and Mishra, 2020). On the contrary, country-wide lockdowns, job and income losses, abrupt changes in consumers' behaviour, and a rise in the propensity to save and hoarding for emergency resulted in the spread of demand-side shocks and downturns in economies (Baldwin and Tomiura, 2020; Mishra and Mishra, 2021a, 2021b). By observing the negative demand and supply shocks in India, Raghuram Rajan, the former Governor of the Reserve Bank of India (RBI) rightly pointed out that the situation which

India has been facing amid COVID-19 may be the greatest emergency since independence (Sinha et al., 2020). In the report *South Asia Economic Focus*, the World Bank predicted that all the South Asian nations will face an economic slump due to shut-down of economic activities, the tumble in trade activities, and stress in banking and financial sectors, which might destroy the gains made in poverty alleviation[4].

The outbreak of the COVID-19 pandemic has resulted in the 'worst economic downturn since the Great Depression', posed the 'biggest challenge since World War II', and witnessed the stock markets' crash across the globe to that level not observed since the Global Financial Crisis of 2008[5]. The stock market movements in 23 developed economies as reflected through the MSCI World Index fell by more than 34% between February and March 2020, which has been the lowest since July 2016[6]. In the SAARC region, the pessimistic sentiments of investors resulted in a 7.81% fall in the Nepal Stock Exchange index between 15 March and 19 March 2020[7]. In India, the Sensex and NIFTY witnessed a 38% fall due to the spread of COVID-19 infection. In addition, the stock prices of a few sectors including tourism, hospitality, and entertainment plunged by more than 40%[8]. Especially on 23 March 2020, Sensex and NIFTY witnessed a steep dive of 13.2 and 29% respectively, which have been the biggest single-day falls ever surpassing the infamous drops after spreading the news of the Harshad Mehta Scam on 28 April 1992[9].

The Dhaka Stock Exchange Index (DSEX) in Bangladesh has also witnessed a record level plunge of 279 points immediately after spreading news of the detection of three confirmed cases of the coronavirus in the country[10]. The DSEX dropped to 3,603 on 18 March 2020, which was the lowest in the last seven years, and right away on the next day a historic 'floor price' was set for all the stocks in the market to stop the natural fall of stock prices (Aktar et al., 2020). The leading stock market index in Sri Lanka, CSEALL Price Index, noted its eight-year lowest on 12 May 2020[11]. In Pakistan, the KSE-100 index witnessed a fall of 37% touching a lower level of 27,200 points on 25 March 2020 from its last 52-week high of 43,218 points on 13 January 2020[12]. Such stock market plunges were intensified after nations constrained within and outside country travels and implemented lockdowns in virus-affected areas. To give a quick kick-start to economies, governments and central banks across countries eased fiscal and monetary policies in complement to each other. While the fiscal measures targeted restoring human health, protecting social security of people, creation of job opportunities, and recovery of trade and business, quantitative easing of central banks targeted restoration of liquidity and credit flows in economies[13]. For instance, the Reserve bank of India reduced the repo rate and reverse repo rate by 115 and 155 bps respectively since March 2020, and the Central Bank of Pakistan cut the policy rate by a cumulative 625 bps since 17 March 2020. Such sliding in central bank policy rates across the SAARC countries was expected to have a favourable effect on the stock market indices through cash and credit channels.

It is inferred from the aforesaid discussion that the stock markets in the SAARC region have overreacted to the sudden outbreak of coronavirus disease and rapidly spread over the globe thereby denting investors' confidence level and causing return volatilities. Thus, we hypothesise the overreaction of the stock markets in SAARC nations to the COVID-19 pandemic. In this context, the study investigated the responses of stock markets to the unexpected outbreak of the COVID-19 pandemic in the SAARC region. Specifically, we have studied the return volatilities in the SAARC stock markets along

with the study of the stock markets' responses to the media coverage of COVID-19 infections at the global level. The empirical outcomes of the study lend support to the presence of announcement effects on the stock market movements and return volatilities in the SAARC region.

In the rest of the study, Section 2 reviews the related literature, Section 3 describes the data and methodology, Section 4 draws empirical insights and Section 5 concludes.

2 Literature review

Being originated from China, the spread of COVID-19 – the pandemic of respiratory disease – has been rapid and severe across the globe due to the interconnectedness across countries and non-availability of vaccines and curatives (Wang et al., 2020) which have made the world more vulnerable to demand, supply and financial disruptions (Barro et al., 2020). To contain the rapid spread of such exceptional public health crisis, governments imposed country-wide lockdowns of economic activities, restrictions on movements of people, travel bans and the norms of social distancing (Phan and Narayan, 2020). Nearly, 1/3 of the World's population have been subjected to this *Great Lockdown* (Hoof, 2020) which triggered global economic recession via many channels including demand-and supply-side shocks (Malden and Stephens, 2020; Fetzer et al., 2020; Eichenbaum et al., 2020; Gormsen and Koijen, 2020) that disrupted the global supply chains, consumption behaviours of people, and labour and financial markets (Ahmar and del Val, 2020). Thus, both real and financial sectors of economies have been severely affected across the globe (Pak et al., 2020; IMF, 2020; Maliszewska et al., 2020; World Bank, 2020; WTO, 2020; Banco de España, 2020). In this context, Ramelli and Wagner (2020) concluded that the ongoing public health tragedy has resulted in the economic disaster intensified via financial markets. McKibbin and Fernando (2020) also remarked that the pandemic has resulted in a significant economic slowdown through its impacts on stock market returns and liquidity. In the financial sector, stock markets of developed as well as developing economies demonstrated a high degree of volatilities and downturns amid the human-to-human spread of the pandemic (Ahmar and del Val, 2020; Zhang et al., 2020; Boissay and Rungcharoenkitkul, 2020; Anh and Gan, 2020; Khan et al., 2020; Rabhi, 2020; Narayan et al., 2020; Prabheesh et al., 2020).

Initially, when the virus spread was unanticipated and rapid across nations, the spirals of unprecedented uncertainties were created causing market stress mainly due to the spread of speculative news about the deadly nature of the coronavirus thereby making the investors and other market participants panic and pessimistic of the situation (Liu et al., 2020; Mishra et al., 2020; Mishra and Mishra, 2020; Shanaev et al., 2020; Wagner, 2020). The worldwide spread of financial risks caused individual market nosedives in affected countries (Zhang et al., 2020). Significant differences in the pre- and post-pandemic levels of daily closing stock prices and volumes have been observed (Machmuddah et al., 2020). Comparing the stock market behaviour amid the COVID-19 with that of during bird flu, SARS, swine flu (H1N1), Ebola and MERS, Baker et al. (2020) stated that no previous infectious disease had caused stock market swings as observed during the initial days of COVID-19 outbreak. The volatility levels in the US equity market surpassed those observed in late 1929 and the early 1930s (Baker et al., 2020).

Although the first wave of the global spread of the pandemic started from China, its financial markets revealed mixed effects (Albulescu, 2020; Khan et al., 2020). Xinhua (2020) observed the relative stability of the Chinese financial markets amid the spread of the coronavirus. Huo and Qiu (2020) stated that the industry-level, as well as the firm-level short-term movements in the Chinese stock prices, were mainly because of investors' overreactions to the intensive media coverage of COVID-19 confirmed cases and death cases. Sansa (2020) and Al-Awadhi et al. (2020) found strong evidence of the negative impact of new COVID-19 confirmed cases on the stock market returns in China. Yan (2020) found that the stocks of the larger firms in China were less affected during this public health crisis either due to the availability of ample resources with them or due to greater monopoly power.

Regarding the intensity of stock market volatilities of the COVID-19 pandemic, Ali et al. (2020) observed that such effects were relatively lower in China in comparison to USA, UK, Germany and South Korea. Ramelli and Wagner (2020) observed the negative effects of the virus spread on the stocks of the firms that are US-based and having China exposure. Gormsen and Koijen (2020) concluded that the COVID-19 lockdown in Italy resulted in a downward trend in USA and European countries and the effect on dividend growth was as severe as during the Global Financial Crisis of 2008. In recent studies, the rising trends in COVID-19 confirmed cases were found to be inversely related to financial market liquidity (Haroon and Rizvi, 2020b) and directly related to market volatility (Christensen, 2020; Piksina and Vernholmen, 2020; Al-Awadhi et al., 2020; Mishra et al., 2020; Engelhardt et al., 2021). Mdaghri et al. (2020) confirmed in a sectoral and country-level study that the global coronavirus pandemic had a significant and negative impact on stock market liquidity. Ashraf (2020) observed that the stock markets reacted significantly and negatively to the news of growth in COVID-19 confirmed cases. In line with this observation, it has also been observed that the stock market investors did not react to media announcements in the initial stages of the pandemic, but negatively reacted when the virus spread was intensified (Corbet et al., 2020; Khan et al., 2020; Haroon and Rizvi, 2020a) thereby causing return volatilities and market plunges.

Regarding the reasons for the stock market plunges in COVID-19 affected countries, the extant literature documented the worldwide media coverage of the deadly spread of coronavirus (Xinhua, 2020; Mishra and Mishra, 2020, 2021a,2021b), the government imposed restrictions on trade and commerce and practices of physical/social distancing by people (Baker et al., 2020), the surge in the number of COVID-19 positive cases and death cases (Anh and Gan, 2020; Khan et al., 2020; Rabhi, 2020; Burdekin and Harrison, 2021; Harjoto et al., 2021; Shaikh and Huynh, 2021), and reduction in trade interconnectedness (Vidya and Prabheesh, 2020) as the significant factors. Besides, in certain studies, oil price slump amid the global spread of the virus has been made responsible for market downturns and surge in return volatilities (Apergis and Apergis, 2020; Gil-Alana and Monge, 2020; Sharif et al., 2020; Liu et al., 2020; Qin et al., 2020; Narayan, 2020; Prabheesh et al., 2020). In other studies, abrupt fluctuations in exchange rates during the rapid spread of the virus have been ascribed as the cause of negative stock market returns (Cardona-Arenas and Serna-Gomez, 2020; Rabhi, 2020). Furthermore, the increase in the number of coronavirus infected death cases has also been attributed to the spike in the volatility index and its consequential negative impacts on stock market returns in the USA (Onali, 2020) and Asian countries (Rabhi, 2020).

It has been observed that the larger financial impacts of the global coronavirus pandemic have been noticed in emerging market economies (Ma et al., 2020), and especially for small firms (Harjoto et al., 2020). Further, in terms of regional classification, the negative impacts of COVID-19 on the stock markets have been highest in Asian emerging markets relative to that of European markets (Topcu and Gulal, 2020). Liu et al. (2020) also observed the high persistence of negative stock market abnormal returns in Asia compared to other regions. AlAli (2020) observed lower stock market returns on five largest stock indices, namely, Shanghai Stock Exchange Index, Nikkei 225, Sensex, Hang Seng Indiex and KOSPI Composite Index.

In Asia, the countries in South Asia have been more vulnerable to the global coronavirus pandemic because of their high population density, poverty and unemployment, low nutrition, insufficient government resources and undeveloped market microstructure among others (Pattanaik, 2020). The South Asian region with underfinanced and poorly equipped public healthcare system, insufficient sanitation and other basic facilities, poor ICT connectivity and pervasive informality, has been subjected to short-term closure of economic activities, disruptions in trade and business, job loss and under-employment, problems with labour migration, the falling rate of remittances and national income, rising levels of poverty, and exhausted public healthcare services due to the sudden outbreak of COVID-19 infection (ESCAP, 2020; Wagner and Scholz, 2020). Along with these socio-economic consequences, the financial markets in the SAARC region also faced the consequences of the pandemic. Given the capital market integration within SAARC countries and with the rest of the world (Chowdhury, 2020; Kotishwar, 2020), and given that these stock markets are semi-strong inefficient, the disastrous spread of COVID-19 infection has caused the stock markets of Bangladesh, India, Maldives, Nepal and Pakistan to adjust towards the release of pandemic related information. Thus, these markets witnessed a gradual fall in stock prices and market returns (Sen and Mallick, 2020). In India, Pakistan and Bangladesh, the poor performance of stock markets during the first wave of the pandemic was primarily driven by weakened investors' confidence owing to upsurge in COVID-19 infection cases (Ahmed et al., 2021). Particularly in India, the negative stock market response during early stages of the pandemic was mainly due to fear sentiments of the investors (Al-Qudah and Houcine, 2021).

Recently, the stock markets have been observed to be stabilised though not returned to the pre-pandemic level as a result of the implementation of monetary and fiscal policies by governments (Elgin et al., 2020; Nicola et al., 2020; Carlsson-Szlezak et al., 2020; McKibbin and Fernando, 2020). The financial markets returned to a state of stability due to the central banks' intervention in the form of quantitative easing and injection of additional liquidity (Xinhua, 2020). Ozili and Arun (2020) mentioned that the restrictions on internal movements and higher fiscal spending positively affected the level of economic activities and contributed to the recovery of financial markets.

It is inferred from the above-stated review of related studies that there is a dearth of empirical works on the stock markets' response to the COVID-19 pandemic for SAARC countries. However, it has been observed that the stock markets in SAARC nations overreacted amid the rapid spread of the virus primarily due to intensive media coverage, and subsequently corrected through the policy interventions of the governments and central banks. This observation has been partially supported by Sen and Mallick (2020) leaving the remaining unanswered. The sample period considered in this study is only the initial two months of the virus spread which is too short to conclude about the market

dynamics. Second, it has not studied the likelihood of return volatilities in the SAARC region. This presents the research gaps in the extant literature. Our study fills these gaps by incorporating a long time horizon, and conducting a study of the time-varying properties of return volatilities. Furthermore, in a recent study, Phan and Narayan (2020) put forward for empirical testing of market overreactions to the pandemic 'using an event study approach'. Our study is an attempt to carry forward the suggestions of Phan and Narayan. Hence, we proceed to argue that the COVID-19 pandemic has caused stock market return volatilities, and the abnormal stock market returns have been negatively affected by the intensive media coverage of news of the rapid increase in COVID-19 confirmed as well as death cases in the SAARC region.

3 Data sources and methods of analyses

The study purposively included six emerging stock markets of the SAARC countries (see Table 1) based on the data availability and excluded the stock markets of Afghanistan and Bhutan due to the non-availability of data. The closing stock market price indices on daily basis for the selected SAARC countries have been compiled from the online database of Investing.Com and Yahoo Finance.

Table 1 Stock market indices of SAARC countries

SAARC country	*Stock market index*	*Abbreviation*	*Daily data period*
Bangladesh	Dhaka Stock Exchange Board	DSEX	30 May 2019 to 17 December 2020
India	Nifty 50 Index	NSE	23 July 2019 to 18 December 2020
Maldives	Maldives Stock Exchange Index	MASIX	6 August 2019 to 18 December 2020
Nepal	Nepal Stock Exchange Index	NEPSE	13 June 2019 to 17 December 2020
Pakistan	Karachi 100 Index	KSE 100	26 July 2019 to 18 December 2020
Sri Lanka	Colombo Stock Exchange Index	S&P SL 20	23 July 2019 to 18 December 2020

Source: Authors' compilation

Also, we have compiled the MSCI all-country world equity index, an international index reflecting the all-round performance of stock markets around the globe, from the Yahoo Finance database. The MSCI has been identified as the benchmark index for calculating the abnormal returns on the composite indices listed in Table 1. Besides, we have included the CBOE Volatility Index (VIX) as a measure of market risk and investors' sentiments and its data have been compiled from Yahoo Finance. Further, the online database of ourworldindata.org has been used to gather information on COVID-19 confirmed and death cases on the daily basis.

The stock market responses in the selected SAARC countries to the sudden outbreak of the COVID-19 pandemic have been studied in two stages: *first*, the return volatility in the selected stock markets is studied using the GARCH(1, 1) model for the COVID-19

period. For this purpose, the period from 31 December 2019 to 18 December 2020 has been considered the COVID-19 pandemic era. The analysis begins from December 31, 2019 as coronavirus infection broke out on this official date in China and thereafter spread over to other countries of the world while carrying along with it the impaired investors' behaviour. The GARCH(1, 1) framework is specified as in (1) and (2):

- Conditional mean equation:

$$R_{i,t} = \psi_0 + \psi_1 CONF_{i,t} + \psi_2 DTH_{i,t} + \psi_3 VIX_{i,t} + \tau_{i,t} \tag{1}$$

- Conditional variance equation:

$$\sigma^2_{i,t} = \varphi_0 + \varphi_1 \tau^2_{i,t-1} + \varphi_2 \sigma^2_{i,t-1} \tag{2}$$

In specification (1), $R_{i,t}$, the stock market returns, is calculated by taking the first log difference of the i^{th} stock market index at time t. $CONF_{i,t}$ is the number of COVID-19 confirmed cases in the i^{th} country at time t. $DTH_{i,t}$ is the number of COVID-19 death cases in the country i at time t. $VIX_{i,t}$ is the return based on volatility index. $\tau_{i,t}$ is the residual term. In specification (2), $\sigma^2_{i,t}$ is the forecast variance for one period ahead, calculated based on the flow of past information; φ_0 is the constant term; $\tau^2_{i,t-1}$ is the ARCH term that indicates one-period lag volatility, and $\sigma^2_{i,t-1}$ is the GARCH term that indicates one-period lag forecast variance.

Second, the stock markets' responses to the media announcements on the COVID-19 infections at the global level have been studied using the event study method. This method assumes the pricing efficiency of the stock markets in the SAARC region. In this study, we have taken 20 January 2020 as the event date as the declaration made by Zhong Nanshan, the high-level expert group leader of NHFC of China, about the likelihood of increase of COVID-19 infection among the public globally, became the captions of key media coverage. Keeping in view the efficacy of the event study method in identifying possible effects of the news of coronavirus spread over a short time, only eight event windows consisting of a total of 120 trading days after the event date are considered: (0, 14), (15, 29), (30, 44), (45, 59), (60, 74), (75, 89), (90, 104) and (105, 119). In the event study, the effect of the event is studied on the basis of an estimation window. For this purpose, two estimation windows – (–1, 90) and (–1, 120) – have been taken before the event date. This helps in observing the changing trends in the stock indices in the selected stock markets in SAARC nations. Using these estimation windows, the expected stock returns and abnormal returns based on stock indices have been calculated employing the OLS-based market model as specified in (3), (4) and (5). The use of this statistical market model is very common in economics and finance literature that uses event study approach (Fama et al., 1969; Corrado, 1989; MacKinlay, 1997; Seiler, 2004; Kothari and Warner, 2007; Ahern, 2009; Neuhierl et al., 2013; Schimmer, 2012; Mishra and Mishra, 2020, 2021a). This market model predicts the stock market returns in normal conditions, and is based on the assumption that the benchmark MSCI all-country world equity index is the sole determinant of the returns on individual stock market indices. This relation is linearly modelled as in equation (3) in which the parameters α and β are estimated using OLS estimators. In equation (3), the residual term $u_{i,t}$ is interpreted as the abnormal return based on the assumption that the unexplained part in the model is due to some abnormal event (the sudden outbreak of COVID-19). Based on the estimated values

of these parameters, the predicted stock returns in the event window are calculated by plugging in the market return using equation (4). Then the abnormal returns are calculated by taking the difference between actual and predicted returns for each market at each point in time during the event window using equation (5). The assumption here is that the abnormal returns occur following the major announcement(s) concerning the unanticipated outbreak of the coronavirus disease.

$$R_{i,t} = \alpha_i + \beta_i R_{mt} + u_{i,t} \tag{3}$$

$$E\left(R_{i,t}\right) = \hat{\alpha} + \hat{\beta} R_{mt} \tag{4}$$

$$AR_{i,t} = R_{i,t} - E\left(R_{i,t}\right) \tag{5}$$

Thus, specification (3) is the basic market model that estimates the model parameters, specification (4) is the equation for calculating the expected stock returns, called normal returns, based on the parameter values, and specification (5) is the method of calculating the abnormal stock returns. In all these equations, $R_{i,t}$ stands for the stock return based on i^{th} index, R_{mt} stands for the returns on the benchmark index, i.e., MSCI all-country world equity index, $E(R_{i,t})$ stands for the expected stock return on i^{th} index and $AR_{i,t}$ stands for the abnormal returns on the i^{th} index. In addition to this, we have estimated the cumulative abnormal return (CAR) along with its significance level by using the t-test approach for each of the event windows. The CAR describes the relationship between the expected value of a stock index given the performance of the benchmark index at the international level. The CAR is calculated using the formula: $CAR_i(t_0, t_1) = \sum_{t=t_0}^{t_1} AR_{i,t}$, and its significance is tested using the t-test statistic: $t_{CAR} = \frac{CAR_i}{S.E}$ where the standard error is given by $S.E = \frac{\sigma_{CAR_i}}{\sqrt{n}}$. And, these estimations have been interpreted to understand the behaviour of stock markets in the SAARC region amid the pandemic.

4 Discussion of results

Table 2 presents the basic statistics depicting a broad view of the stock returns in the pre- and post-event periods. The observation is that the average stock returns in the Maldives and Sri Lanka were negative in the post-event period thereby reflecting investors' pessimistic sentiments in the investment decision making. However, in Bangladesh, India, Nepal and Pakistan the average stock market returns are not negative in the post-event period albeit increase in standard deviations thereby indicating market volatilities during the pandemic period. However, for better understanding, the time-series plots of the stock market indices and stock returns in the selected SAARC countries have been created (see Figures 1 and 2). A quick look at these plots reveals the market nosedives and the existence of return volatilities during the pandemic period, particularly between February and April 2020. From the beginning of May 2020, the stock return volatility pattern depicting a trend reversal to the pre-event levels might be due to gain in investors' confidence consequent upon the implementation of pro-active

fiscal and monetary interventions by governments in the SAARC region. However, the GARCH(1, 1) model as specified in equations (1) and (2) have been estimated and the results are presented in Table 3 to check the existence of stock returns volatilities in the COVID-19 period.

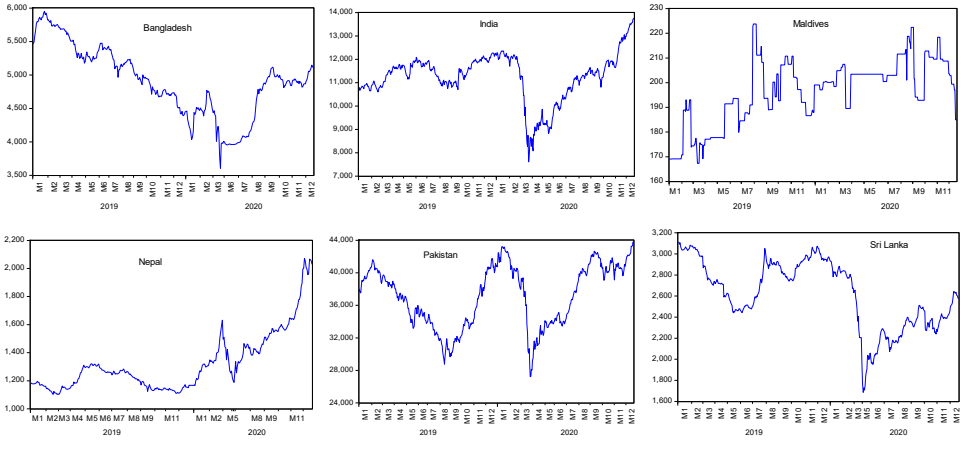
Table 2 Pre- and post-event stock market returns in SAARC countries

Countries in SAARC	*Index*	*Trading days*	*Pre-event*		*Post-event*	
			Mean return	*Std. dev.*	*Mean return*	*Std. dev.*
Bangladesh	DSEX	269	–0.00214	0.0098	0.00138	0.0176
India	NSE	348	0.00071	0.0094	0.00047	0.0207
Maldives	MASIX	359	–0.00107	0.0167	–0.00026	0.0154
Nepal	NEPSE	251	0.00024	0.0092	0.00333	0.0218
Pakistan	KSE 100	349	0.00239	0.0131	0.000057	0.0156
Sri Lanka	S&P SL 20	314	0.00020	0.0093	–0.00042	0.0191

Note: Event – global news of spread of coronavirus; date: 20 January 2020.

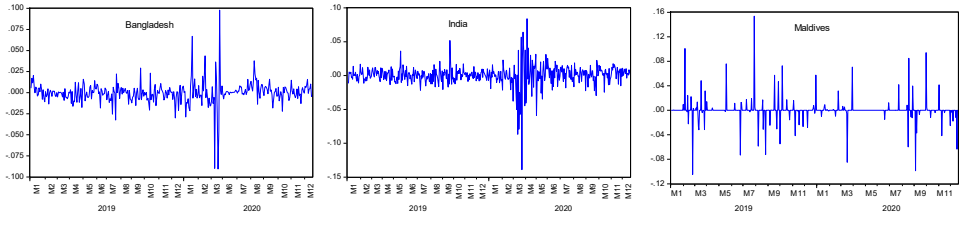
Source: Authors' estimation

Figure 1 Stock market indices in selected SAARC countries (see online version for colours)



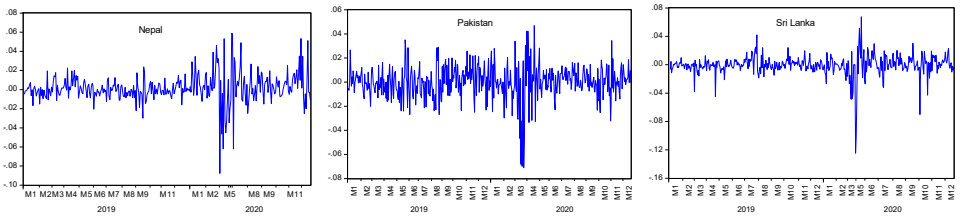
Source: Authors' construction

Figure 2 Stock market returns in selected SAARC countries (see online version for colours)



Source: Authors' construction

Figure 2 Stock market returns in selected SAARC countries (continued) (see online version for colours)



Source: Authors' construction

Table 3 Stock return volatility in SAARC countries during COVID-19

CONDITIONAL MEAN EQUATION		*CONDITIONAL VARIANCE EQUATION*	
Bangladesh	*Coefficient (p-val.)*	*Bangladesh*	*Coefficient (p-val.)*
CONF	2.52E-07 (0.0001)*	C	1.60E-05 (0.003)*
DTH	–1.68E-05 (0.0002)*	ARCH Effect	0.62461 (0.0001)*
VIX	0.003561 (0.609)	GARCH Effect	0.36601 (0.000)*
C	–0.003208 (0.002)*		
India	*Coefficient (p-val.)*	*India*	*Coefficient (p-val.)*
CONF	–1.04E-09 (0.623)	C	9.28E-06 (0.0728)***
DTH	9.56E-08 (0.508)	ARCH effect	0.2003 (0.000)*
VIX	–0.044017 (0.000)*	GARCH effect	0.7693 (0.000)*
C	–0.000729 (0.555)		
Maldives	*Coefficient (p-val.)*	*Maldives*	*Coefficient (p-val.)*
CONF	4.44E-07 (0.838)	C	0.000197 (0.000)*
DTH	–0.000207 (0.745)	ARCH effect	0.1281 (0.0006)*
VIX	0.000326 (0.962)	GARCH effect	0.0237 (0.767)
C	0.000915 (0.631)		
Nepal	*Coefficient (p.val.)*	*Nepal*	*Coefficient (p-val.)*
CONF	–2.13E-08 (0.797)	C	1.30E-05 (0.123)
DTH	6.14E-06 (0.888)	ARCH effect	0.2269 (0.015)**
VIX	0.0305 (0.014)**	GARCH effect	0.7728((0.000)*
C	0.00302 (0.092)***		
Pakistan	*Coefficient (p-val.)*	*Pakistan*	*Coefficient (p-val.)*
CONF	–9.92E-08 (0.411)	C	8.62E-06 (0.0197)**
DTH	5.25E-06 (0.368)	ARCH effect	0.1911 (0.0004)*
VIX	0.0016 (0.817)	GARCH effect	0.7653 (0.0000)*
C	–3.17E-0.997)		

Notes: *p-val. < 0.01; **p-val. < 0.05; ***p-val. < 0.10.
Estimation period: 31 December 2019 to 18 December 2020.

Source: Authors' Estimation

Table 3 Stock return volatility in SAARC countries during COVID-19 (continued)

CONDITIONAL MEAN EQUATION		*CONDITIONAL VARIANCE EQUATION*	
Sri Lanka	*Coefficient (p-val.)*	*Sri Lanka*	*Coefficient (p-val.)*
CONF	–1.44E-07 (0.853)	C	1.79E-05 (0.005)*
DTH	6.62E-05 (0.688)	ARCH effect	0.1675 (0.002)*
VIX	–0.0077 (0.565)	GARCH effect	0.7937(0.000)*
C	–1.27E-05 (0.994)		

Notes: *p-val. < 0.01; **p-val. < 0.05; ***p-val. < 0.10.
Estimation period: 31 December 2019 to 18 December 2020.

Source: Authors' Estimation

Table 4 Abnormal stock market returns in SAARC countries

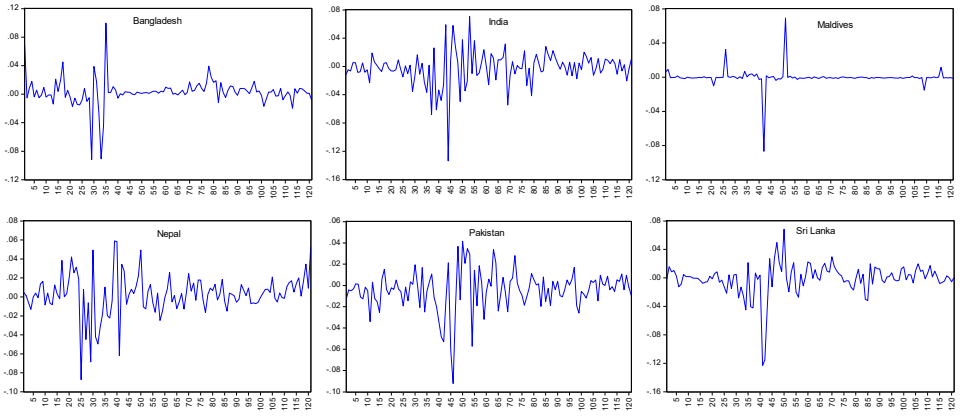
Country	*Index*	*Estimation window (–1, –90)*		*Estimation window (–1, –120)*	
		On event day	*1-day after*	*On event day*	*1-day after*
Bangladesh	DSEX	0.0686	–0.0051	0.0683	–0.0046
India	NSE	–0.0114	–0.0048	–0.0108	–0.0041
Maldives*	MASIX	0.0062	0.0089	0.0077	0.0102
Nepal*	NEPSE	0.0049	0.0015	0.0049	0.0023
Pakistan	KSE 100	–0.0127	–0.0043	–0.0116	–0.0030
Sri Lanka*	S&P SL 20	–0.0018	0.0156	–0.0024	0.0152

Notes: *For Maldives, the abnormal return is negative on the 2nd day of the event day in the estimation window (–1, –90) and the 8th day in the estimation window (–1, –120). For Nepal, the abnormal return is negative on the 2nd day of the event day in both the estimation windows. For Sri Lanka, the abnormal return is negative on the 5th day of the event day in both the estimation windows.
Event day: 20 January 2020.

Source: Authors' estimation

It is noticed from the results from the conditional mean equation in Table 3 that the coefficient of the number of COVID-19 confirmed cases (*CONF*) is negative for all the selected SAARC countries except for Bangladesh and Maldives. This is a simple indication of the negative effect of the worldwide spread of COVID-19 infection. But this negative coefficient is not significant. Furthermore, the coefficient of the number of COVID-19 death cases (*DTH*) is negative in Bangladesh and Maldives, and it is significant only in Bangladesh. This may mean that the investors' behaviour might not have been directly influenced by the news of the spread of COVID-19 infections. This observation is also reflected through the very small magnitude of the *CONF* and *DTH* coefficients. For this purpose, the volatility index (*VIX*) has been estimated in the conditional mean equation to judge the investors' behaviour. But the coefficient of the *VIX* depicts a mixed sign and statistical significance in the selected SAARC nations. Such an observation lends support to the common understanding that the corona pandemic has created confusion in investors' mind while considering investment decisions.

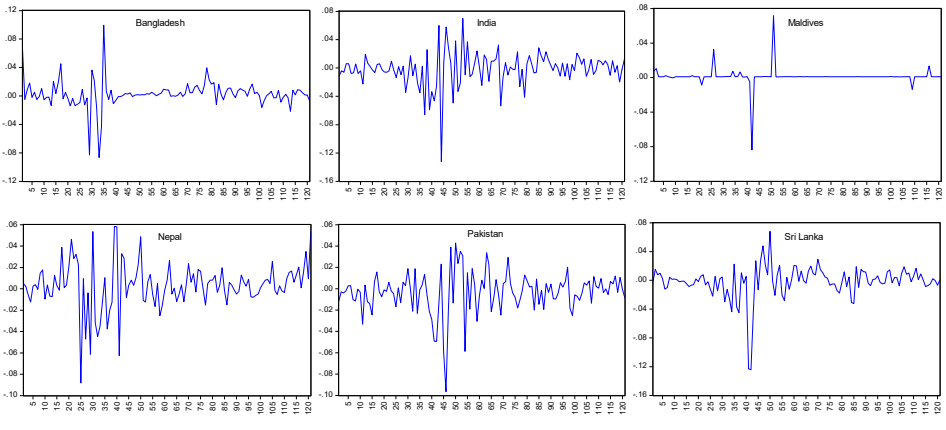
Figure 3 Abnormal stock market returns in selected SAARC countries (see online version for colours)



Note: This plot corresponds to the estimation window (–1, –90) and for the 120 trading days from the event date.

Source: Authors' Construction

Figure 4 Abnormal stock market returns in selected SAARC countries (see online version for colours)



Note: This plot corresponds to the estimation window (–1, –120) and for the 120 trading days from the event date.

Source: Authors' construction

It is observed from the results of the conditional variance equation in Table 3 that the GARCH effect is positive and statically significant for all the selected stock markets except for the Maldives. This means the stock market returns pattern was volatile in countries other than the Maldives during the spread of the coronavirus. The primary reason for such return volatility as indicated through the conditional variance equation is the flow of pessimistic information from the market forecast of the previous day. Such

information flow is around 36.60% in Bangladesh, 76.93% in India, 77.28% in Nepal, 76.53% in Pakistan, and 79.37% in Sri Lanka. Since the total of the ARCH and GARCH coefficient is less than or one in each case, the stability of these estimations is ensured. But, it is difficult to state the exact extent of such information flows that is due to the market uncertainties of the COVID-19 era. So, misinterpretation of the outcomes can't be entirely ignored. However, to a greater extent, Figure 2 indicates that the majority of return volatilities are clustered in the post-event period in countries other than the Maldives. Hence, the event study method has been deployed to examine the response of the stock markets in the post-event period.

The estimated abnormal stock market returns for the day of the event and the immediate next day using the equations (3), (4) and (5) are presented in Table 4. It is noticed that the abnormal returns are negative on the immediate next trading day in all the stock markets except for Maldives, Nepal and Sri Lanka. This is a *prima facie* indication of the beginning of the flow of pessimism among the market participants in response to the spread of worldwide news of the unexpected outbreak of COVID-19 infection. The abnormal returns for these stock markets for 120 trading days from the event date have been plotted in Figures 3 and 4 using estimation windows (–1, –90) and (–1, –120) respectively. It is revealed that the pandemic responses to stock market behaviour are relatively deep in India and Pakistan, moderate in Bangladesh and Sri Lanka, and least in the Maldives. The case of Nepal is unique as Nepal Stock Exchange was closed both of its online and physical transactions from 22 March 2020 to 28 June 2020 except for 12 and 13 May 2020 amid the COVID-19 induced nationwide lockdown.

Now, the question arises whether such negative effect persists; if yes, for how long. For this purpose, the cumulative abnormal returns have been estimated over eight different event windows taking into consideration 120 trading days and both the estimation windows. The outcomes are summarised in Tables 5 and 6. It is revealed from Tables 5 and 6 that the depressing shocks of the unexpected increase of coronavirus infection on the stock market movements persisted between 15 to 44 trading days in Bangladesh. In the Indian stock market, such negative shocks persisted upto 44 trading days and reappeared between 60 to 74 trading days.

The interesting observation is that the negative consequences of the unexpected outbreak of COVID-19 infection for the stock markets of Maldives and Nepal appeared between 30 to 44 trading days. And, these results are statistically significant. This implies the relative resilience of the stock markets in these two countries to the ongoing public health shocks. In Pakistan, the adverse shocks of the deadly disease persisted up to 104 trading days with few exceptions, and such observations are statistically significant. This indicates the persistence of return volatility and the subsequent market downturn in Pakistan. In Sri Lanka, the pandemic-led downturn appeared between 15 to 44 trading days and reappeared between 75 to 89 trading days before the market recovery. All these observations are statistically significant. From this discussion, it is inferred that the unexpected outbreak of the COVID-19 pandemic caused downturns in the stock markets of the selected SAARC countries with relatively smaller effects in Maldives and Nepal.

Table 5 CAR in the stock markets in SAARC countries

Country	*Index*	*CAR (0, 14)*	*CAR (15, 29)*	*CAR (30, 44)*	*CAR (45, 59)*	*CAR (60, 74)*	*CAR (75, 89)*	*CAR (90, 104)*	*CAR (105, 119)*
Bangladesh	DSEX	0.101 (0.00)*	–0.057 (0.00)*	–0.019 (0.06)**	0.041 (0.00)*	0.088 (0.00)*	0.148 (0.00)*	0.051 (0.00)*	0.006 (0.29)
India	NSE	–0.035 (0.00)*	–0.083 (0.00)*	–0.325 (0.00)*	0.129 (0.00)*	–0.027 (0.00)*	0.056 (0.00)*	0.010 (0.14)	0.003 (0.37)
Maldives*	MASIX	0.008 (0.31)	0.021 (0.11)	–0.074 (0.00)*	0.056 (0.00)*	–0.008 (0.31)	–0.008 (0.30)	–0.009 (0.28)	–0.011 (0.25)
Nepal*	NEPSE	0.017 (0.05)**	0.028 (0.00)*	–0.066 (0.00)*	0.031 (0.00)*	0.084 (0.00)*	0.013 (0.10)***	0.047 (0.00)*	0.138 (0.00)*
Pakistan	KSE 100	–0.136 (0.00)*	–0.0123 (0.15)	–0.241 (0.00)*	–0.040 (0.00)*	0.032 (0.00)*	–0.057 (0.00)*	–0.065 (0.00)*	0.024 (0.03)**
Sri Lanka*	S&P SL 20	0.019 (0.01)*	–0.047 (0.00)*	–0.429 (0.00)*	0.157 (0.00)*	0.138 (0.00)*	–0.041 (0.00)*	0.028 (0.00)*	0.054 (0.00)*

Notes: Estimation window: (–1, –90); t-stat within parentheses.
*p-val < 0.01; **p-val < 0.05; ***p-val < 0.10.

Source: Authors' estimation

Table 6 CAR in the Stock Markets in SAARC countries

Country	*Index*	*CAR (0, 14)*	*CAR (15, 29)*	*CAR (30, 44)*	*CAR (45, 59)*	*CAR (60, 74)*	*CAR (75, 89)*	*CAR (90, 104)*	*CAR (105, 119)*
Bangladesh	DSEX	0.101 (0.00)*	–0.042 (0.00)*	–0.027 (0.01)*	0.041 (0.00)*	0.086 (0.00)*	0.145 (0.00)*	0.055 (0.00)*	0.004 (0.34)
India	NSE	–0.025 (0.00)*	–0.072 (0.00)*	–0.311 (0.00)*	0.136 (0.00)*	–0.018 (0.03)**	0.064 (0.00)*	0.020 (0.02)**	0.011 (0.11)
Maldives*	MASIX	0.030 (0.04)**	0.038 (0.02)**	–0.063 (0.00)*	0.086 (0.00)*	0.015 (0.19)	0.015 (0.19)	0.015 (0.19)	0.013 (0.23)
Nepal*	NEPSE	0.023 (0.01)**	0.055 (0.00)*	–0.073 (0.00)*	0.032 (0.00)*	0.085 (0.00)*	0.025 (0.00)*	0.055 (0.00)*	0.133 (0.00)*
Pakistan	KSE 100	–0.120 (0.00)*	0.007 (0.29)	–0.210 (0.00)*	–0.035 (0.00)*	0.047 (0.00)*	–0.046 (0.00)*	–0.051 (0.00)*	0.038 (0.00)*
Sri Lanka*	S&P SL 20	0.011 (0.12)	–0.052 (0.00)*	–0.434 (0.00)*	0.143 (0.00)*	0.132 (0.00)*	–0.051 (0.00)*	0.019 (0.02)**	0.044 (0.00)*

Notes: Estimation window: (–1, –120); t-stat within parentheses.
*p-val < 0.01;**p-val < 0.05; ***p-val < 0.10.

Source: Authors' estimation

5 Conclusions

This study argues that the ongoing global coronavirus pandemic has disrupted the smooth sailing of stock markets by generating market uncertainties and adversely affecting the investors' investment behaviour in SAARC countries. The intensive media coverage of the pandemic weakened the sentiments of investors and caused sudden market plunges in the SAARC region. The study found evidence of the presence of return volatilities in the stock markets of SAARC nations. The use of the event study approach confirmed the adverse effects of the news of the worldwide spread of deadly coronavirus on the abnormal stock market returns in the SAARC region. So this study established the hypothesis of the overreactions of stock markets towards the unexpected outbreak of the COVID-19 pandemic. Further, it has been observed that the market plunges occurred only in the initial phases of the spread of COVID-19 infection, and this downturn was gradual thereby indicating the slow adjustment of the market to newly released public information. Precisely, the stock markets of the SAARC region do not qualify to be semi-strong information efficient. These results of the study will certainly be beneficial to the market participants in better understanding and evaluating the dynamics of stock market behaviour amid pandemics. The implications of the study for investors are twofold – the risk-averse investors should avoid trading during pandemics to protect their investments from unexpected losses due to market volatilities; and second, the risk-lovers should take precautionary steps by resorting to fundamentals before putting money in stocks during pandemics. Since expansionary fiscal and monetary policies proved to be efficient in contributing to market recoveries across SAARC nations, these should be brought to practice to ensure market stability during pandemics. However, this study does not focus on determining the global and country-level fundamental and technical factors determining the dynamics of stock markets during the pandemic. In this direction, the study can further be extended by applying the panel model approach.

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