Original Research Article

Financial Markets' Reaction to COVID-19 Pandemic: Panel Data Analysis for SAARC Countries

Abstract

This article looks at the financial markets' reaction to COVID-19 pandemic by using Panel Data Analysis method for SAARC countries over the period January 27, 2020 to June 30, 2020. By employing the Hausman test and random effect model this study finds that stock market has negative reaction to the daily growth in number of COVID-19 confirmed case and deaths. And this reaction is very strong for COVID-19 confirmed case compared to the growth in death. Again, the daily growth in number of recovered corona patient, and the recovery rate have positive association with stock market but weakly. Correlation matrix among variables finds that the daily growth in COVID-19 confirmed cases in SAARC country has strong negative correlation with stock market returns. Overall, this investigation implies that stock markets' reaction depends on severity of the outbreak and stages of COVID-19 spread.

Keywords: COVID-19, Pandemic, SARS-CoV-2, Financial markets, Stock market, SAARC.

1. Introduction

"Coronavirus disease 2019 (COVID-19) was first identified in December 2019 in Wuhan, China, caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). It became an outbreak within very short time period. The World Health Organization declared the outbreak a pandemic on 11 March, 2020. More than 10.47 million cases of COVID-19 confirmed cases with more than 511,253 deaths have been reported in more than 188 countries and territories as of June 30, 2020" (WHO, 2020).

Stock prices in the worldwide financial markets drift go down notably and continuously. Financial markets in the SAARC countries were also trending in similar ways like global financial market.

"The stock market in Bangladesh, which had been on a downward trend for the last few months, has recently witnessed massive falls fuelled by the outbreak as frightened investors went for huge selloffs" (DATABD.CO, 2020).

The sentiments that the COVID-19 pandemic unleashed upon investors, foreign and domestic alike have reflected in the Stock Market of India. Certain sectors such as hospitality, tourism and entertainment in India have been impacted adversely and stocks of such companies have plummeted by more than 40% (Ravi, 2020).

"The Pakistan Stock Exchange (PSX) is negatively affected by the panic scale, as COVID-19 confirmed cases increasing in various parts of Pakistan. During this COVID-19 pandemic KSE-100 has suffered several trade halts these days to safeguard investors and market participants" (Business Recorder, 2020).

"The spread of COVID-19 puts fears over an economic slowdown in Sri Lanka, led to a sell-off in the financial market and capital outflows. The country faced a 70% outflow of foreign-owned T-bills and T-bonds (US$ 372 million or 0.42% of GDP) within two months. On 12th May Sri Lanka's leading stock market index (The CSEALL Price Index) fell to its lowest level in eight years" (The Prospector, 2020).

"Even though Nepal's financial sectors had contributed this year more than doubled over a period of decade, with the onset of the global pandemic the prospect of Nepal's financial sector looks fairly bleak as it is one of the most severely hit" (Paudel, 2020)

Overall economic growth of Bhutan was declining and expected to drop to 4–5 percent growth if the COVID-19 pandemic situation does not improve soon (Krishna, 2020).

Due to COVID-19 will severely affect the tourism sector of Maldives, which will also have a negative spill-over on the other sectors of the economy (Ranjan, 2020).

2. Literature Reviews

Policymakers are looking ways to get out from the severe impact of the coronavirus having on the global economy. The World Economic Forum (2020) asserted that "Globally, the coronavirus shock is severe even compared to the Great Financial Crisis in 2007–08. Policymakers must support vulnerable households and smaller businesses to mitigate the impact of this severe shock."

"The International Monetary Fund (IMF) predicted that for the first time in 60 years, economies in Asia would see no growth this year and the service sector will suffer more. Airlines, factories, shops and restaurants have suffered the economic crisis due to the National lockdowns across the region" (World Economic Forum, 2020a).

Adrian and Natalucci, (2020) stated that many equity markets in large and small economies have suffered declines of 30 percent or more at the drain. Stresses have also surfaced in major short-term funding markets, including the global market for U.S. dollars.

Adrian (2020) argued that it is very difficult to quantify the economic impact due to spread of coronavirus, increases the uncertainty of economic outlook. This abrupt upturn in uncertainty place both economic growth and financial stability at risk.

Economist Shiller (2020) discussed there are two pandemic of COVID-19. The first one is health pandemic and second one is anxiety over the economic consequences of the first. These two pandemic are correlated and we are always thinking about stories of fear in the second pandemic. In response to the stories of COVID-19 the stock market has been falling like a rock exhausting our lifetime saving.

Sansa (2020) studied "the impact of the COVID-19 on the Financial Markets from the period dated 1st March 2020 to 25th March 2020 in China and USA. By employing Simple regression model he found that there is a positive significant relationship between the COVID-19 confirmed cases and all the financial markets (Shanghai stock exchange and New York Dow Jones)".

Naidenova et al. (2020) discovered "the impact of idiosyncratic and systematic shocks of COVID-19 pandemic on financial markets. Having studied 22 countries, their result showed that systematic shocks are consistently harmful and idiosyncratic shocks are more important for the beginning of the deteriorating of epidemiological situation in a particular country".

Ozili and Arun (2020) examined "the influence of social distancing policies on economic activities and stock market indices. The results of their analysis was the increasing number of lockdown days, monetary policy decisions and international travel restrictions severely affected the level of economic activities and stock price of major stock market indices".

Zhang et al. (2020) scrutinized "the patterns of country-specific risks and systemic risks in the global financial markets. The analysis revealed that the risks of global financial market have increased significantly due to the pandemic. The severity of the outbreak in each country is noticeably affect Individual stock market".

According to Wagner (2020) "COVID-19 embodies a terrible and novel risk which stimulated feverish behaviour by investors. Reasonable economic expectations underlay movements in the stock prices of individual companies despite the volatility and the panic".

Ramelli and Wagner (2020) observed "the market reactions to the Coronavirus disease (COVID-19). They described the importance of international trade and financial policies for firm value became less importance. Corporate debt & cash holdings appeared as key value drivers, relevant even after the Fed intervened in the bond market. Their analysis demonstrated how the health crisis morphed into an economic crisis enlarged through financial channels".

Goodell (2020) outlined the impact of COVID-19, either directly or indirectly, on markets and institutions. By taking the features of COVID-19 he found that what research recommends have been the shock of other past events that in some ways approximately equivalent COVID-19.

Ashraf (2020) "used daily COVID-19 confirmed cases, deaths and stock market returns data for 64 countries over the period January 22, 2020 to April 17, 2020 to investigate the stock markets' reaction to the COVID-19 pandemic. He found that stock markets responded negatively to the growth in COVID-19 confirmed cases far more than the growth in number of deaths".

Sharif et al. (2020) studied "the link between the spread of COVID-19, oil price volatility shock, the stock market, geopolitical risk and economic policy uncertainty in the US within a time-frequency framework. Their results showed that The COVID-19 risk is recognized in a different way over the short and the long-run and may be firstly viewed as an economic crisis".

Baker et al. (2020) analyzed "the influence of COVID-19 outbreaks on the stock market behaviour and made a contrast to previous infectious disease outbreaks. The study concluded that news related to COVID-19 developments is greatly the dominant driver of large daily U.S. stock market than previous infectious disease outbreak, including the Spanish Flu".

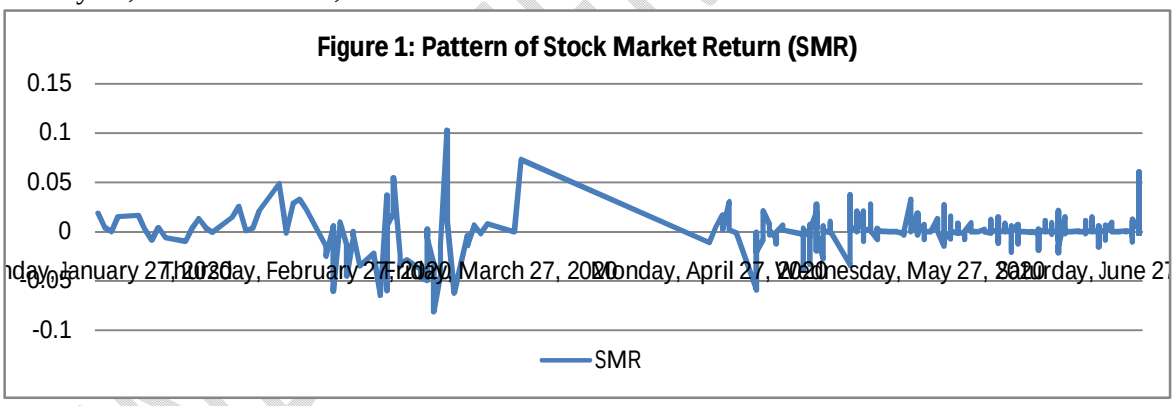
3. Objectives

The objective of this study is to scrutinize that how financial markets react to the COVID-19 pandemic for the SAARC countries during the period from January 27, 2020 to June 30, 2020. That is how the news of COVID-19 Confirmed Cases affects the financial markets or stock market return. I am also interested in exploring the extent by which stock market responses to the information of the number of daily deaths associated with COVID-19 coronavirus.

To what degree the news of the number of patients recovered daily from COVID-19 coronavirus affect the financial markets. Is there any influence of the information regarding fatality rate and recovery rate have on the financial markets.

4. Pattern of Stock Market Return

Pattern of return on stock market index in SAARC countries presented in figure 1 to get insights into the specific financial markets' reaction to covid-19 outbreak over the over the period from January 27, 2020 to June 30, 2020.



As shown in Fig.1, on average, stock market returns fluctuate with positive range during the first few days (around first 30 days). Then market returns move into negative range from January 28, 2020 to March 29, 2020 with high volatility. Due the lack of proper control and measures covid-19 outbreak become worst situation and financial markets return gradually fell to the negative for next 60 to 90 days. From April 30, 2020 to the following 90 days stock market react with negative sentiments to the large number of Covid-19 confirmed case.

5. Methodology

This study examines the impact of daily growth in COVID-19 cases or death or recovered on the financial market of SARRC countries by using the method of panel data analysis. It is often preferable to use cross-sectional and time-series data together by longitudinal or panel data sets because: (i) the COVID-19 stretch grow over almost all country and it is not a one point of time incident. So it will increase number of degrees of freedom and power of the test. (ii) Panel data reduces the problems of multicollinearity and heteroscedastcity arises if time-series & cross sectional data are modelled individually (Baltagi, 2008; Woolridge, 2010). (iii) Time varying

relationship between dependent and independent variables can be explained too accurately by the Panel data regression analysis (Ashraf, 2017).

5.1 Sources of Data

Data of the number of confirmed cases, deaths and recovered from COVID-19 have been gathered from the website of John Hopkins University (JHU)' Coronavirus Resource Centre over the period January 27, 2020 to June 30, 2020. Then, I collected the data on the daily stock market return for the SAARC countries from the www.investing.com website over the same period.

5.2 Definition of variables

Table 1: Description of dependent and independent variables

Symbol	Definition	Estimation Procedure	Expected Signs
SMR	Stock Market Return	The daily percentage change in major stock market index of SAARC country.	
CCC	COVID-19 Confirmed Cases	The daily growth in COVID-19 confirmed cases or patients of SAARC country.	**(-)**
CAD	COVID-19 Associated Deaths	The daily growth in the number of deaths associated with COVID-19 coronavirus of SAARC country.	**(-)**
RCP	Recovered COVID-19 Patients	The daily growth in the number of patients recovered from COVID-19 coronavirus of SAARC country.	**(+)**
FR	Fatality Rate of COVID-19	Ratio of cumulative number of death to the cumulative number of confirmed COVID-19 case on each day of the respective SAARC country.	**(-)**
RR	Recovery Rate of COVID-19	Ratio of cumulative number of recovered patients of COVID-19 to the cumulative number of confirmed COVID-19 case on each day of the particular SAARC country.	**(+)**

5.3 Model Specification

$$SMR_{it} = \alpha_i + \beta_1 CCC_{it} + \beta_2 CAD_{it} + \beta_3 RCP_{it} + \beta_4 FR_{it} + \beta_5 RR_{it} + \varepsilon_{it}$$

Where, i and t in the equation indicate SAARC country and time periods (days) respectively. α_i is the fixed coefficient. β_i is the regression coefficient to be assessed (i is the index of explanatory variables and i = 1, 2, ..., 5). SMR is the Stock Market Return used as a proxy variable of financial markets return. ε_{it} symbolizes an error term.

5.4 Analytical Tools

This research has been done by employing the fixed effect model and random effect model to find out the financial markets' reaction to COVID-19 pandemic. Breusch and Pagan LaGrange Multiplier (LM) test would be performed. Then, Hausman test has been performed to decide which model is appropriate to explain the impact of COVID-19 on the financial market for the SAARC countries. In addition to this descriptive statistics and correlation matrix among the variables under studied would be measured. All of these tests are to be estimated by using Stata-14.2.

6. Result and Discussion

6.1 Descriptive Statistics

The descriptive statistics of variables are reported in Table 2. The mean value of stock market returns (SMR) is -.00013 indicating that on average SAARC countries experienced about to -.013 percent return in stock market. Stock indexes vary between negative 8.13 percent and positive 10.29 percent with standard deviation of around 2 percent.

Table 2: Descriptive Statistics

Variables	N	Minimum	Maximum	Mean	Std. Deviation
SMR	294	-.08137	.10290	-.00013	.01852
CCC	294	.00000	2.00000	.04922	.15218
CAD	294	.00000	.50000	.02343	.04964
RCP	294	.00000	1.06091	.04885	.10475
FR	294	.00000	.12821	.01187	.01687
RR	294	.00000	1.00000	.44782	.28096

Source: Author's own estimation using Stata 14.2.

Then, mean value of CCC is around 5 percent with a wide standard deviation of 15.22 percent. Likewise, the average daily growth in RCP is around 5 percent with a standard deviation of 10.48 percent. The mean value of CAD is 2.34 percent having a standard deviation of 4.96 percent. Following the similar trend, the average value of FR is 1.18 percent with a standard deviation of 1.69 percent. The variable recovery rate (RR) reported highest average value of 44.78 percent with widest variability of 28.09 percent.

6.2 Correlations Matrix of Variables

Table 3 presented the pairwise Pearson correlation between studied variables. Daily growth in COVID-19 confirmed cases in SAARC country has strong negative correlation with stock market returns (r = - 0.129) at 5 percent significance level. Where SMR has positive correlation with CAD (r = .037), RCP (r = .023), FR (r = .095), and RR (r = .049), but are insignificant at 5 percent level.

Table 3: Correlations Matrix

		SMR	CCC	CAD	RCP	FR	RR
SMR	Pearson Correlation	1					
	Sig. (2-tailed)						
CCC	Pearson Correlation	-.129*	1				
	Sig. (2-tailed)	.026					
CAD	Pearson Correlation	.037	.040	1			
	Sig. (2-tailed)	.523	.491				
RCP	Pearson Correlation	.023	-.016	.303**	1		
	Sig. (2-tailed)	.695	.780	.000			
FR	Pearson Correlation	.095	.043	.606**	.237**	1	
	Sig. (2-tailed)	.104	.460	.000	.000		
RR	Pearson Correlation	.049	-.190**	-.218**	-.152**	-.204**	1
	Sig. (2-tailed)	.405	.001	.000	.009	.000	

*. Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Source: Author's own estimation using Stata 14.2.

6.3 Panel Unit Root Test

Levin, Lin & Chu, Fisher–ADF, and Fisher–PP panel unit root test results are reported in Table 4 to check the stationarity of the series.

Table 4: Panel Unit Root Test Results

		Levin, Lin & Chu		Fisher - ADF		Fisher - PP	
Variables		***t* Statistic**	**Prob. ****	**Chi-square**	**Prob. ****	**Chi-square**	**Prob. ****
D(SMR)	**Intercept**	-24.0253	0.0000	233.643	0.0000	164.228	0.0000
	Intercept and Trend	-20.9099	0.0000	628.154	0.0000	1693.64	0.0000
	None	-25.4466	0.0000	1145.96	0.0000	1843.74	0.0000
D(CCC)	**Intercept**	-38.8112	0.0000	182.249	0.0000	157.260	0.0000
	Intercept and Trend	8.25754	0.0000	405.745	0.0000	1123.70	0.0000
	None	-37.8194	0.0000	988.681	0.0000	1194.66	0.0000
D(CAD)	**Intercept**	-9.74148	0.0000	126.516	0.0000	116.645	0.0000
	Intercept and Trend	-5.17063	0.0000	93.3068	0.0000	1033.38	0.0000
	None	-14.1016	0.0000	255.193	0.0000	1053.56	0.0000

D(RCP)	Intercept	-14.3302	0.0000	225.320	0.0000	128.760	0.0000
	Intercept and Trend	-10.4309	0.0000	213.166	0.0000	1357.61	0.0000
	None	-19.3627	0.0000	624.015	0.0000	1399.71	0.0000
D(FR)	Intercept	-6.89287	0.0000	96.9190	0.0000	109.554	0.0000
	Intercept and Trend	-5.31657	0.0000	83.7059	0.0000	92.5153	0.0000
	None	-11.5206	0.0000	134.436	0.0000	156.337	0.0000
D(RR)	Intercept	-16.0287	0.0000	175.650	0.0000	166.861	0.0000
	Intercept and Trend	-16.7103	0.0000	194.153	0.0000	382.028	0.0000
	None	-13.8583	0.0000	308.989	0.0000	439.462	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. Source: Author's own estimation using EViews 7.

The variables have unit root at level whose stationarity test result at level not presented here. The results reported in Table 4 confirm that after taking first deference, panel become stationary at 5% significance level.

6.4 Breusch & Pagan LM and F tests

The result of F test reported in Table 5 indicates that the null hypothesis was rejected (Yerdelen Tatoğlu, 2013) at 5% level. So, there is a difference between cross-sectional units. Hence, pooled OLS is not appropriate for the model of this study.

Table 5: The results of F, and LM tests.

Tests		SMR*
F test	F Statistic	3.57
	Probability	0.0217
Breusch and Pagan LM test	Chi-square Statistic	12.70
	Probability	.00001

*Dependent Variable. Source: Author's own estimation using Stata 14.2.

The Breusch and Pagan LaGrange Multiplier (LM) test result presented in Table 5 signify that at 1% significance level the null hypothesis was rejected (Yerdelen Tatoğlu, 2013). These results demonstrate that individual effects exist and the pooled model is not appropriate against the random effect model.

6.5 Panel Linear Regression Model Testing

Outcomes of panel linear regression model of fixed effect and random effect are reported in Table 6 and Table 7 respectively.

Table 6: Outcomes of Fixed Effect Model

SMR*	Coefficient	Std. Err.	t	P > | t |	[95% Conf. Interval]	
Constant	-.0022355	.002661	-0.84	0.402	-.0074734	.0030025
CCC	- .0147608	.0073704	- 2.00	0.046	-.0292688	-.0002527
CAD	- .0104028	.028606	0.36	0.716	-.0667112	.0459055
RCP	.0002333	.0111436	0.02	0.983	-.0217018	.0221685
FR	.1885797	.1035015	1.82	0.070	-.0151539	.3923132
RR	.0018384	.0046005	0.40	0.690	-.0072173	.0108942
			F (5,282) = 1.70		Prob. > F = 0.1349	

*Dependent Variable. Source: Author's own estimation using Stata 14.2.

Table 7: Outcomes of Random Effect Model

SMR*	Coefficient	Std. Err.	z	P > | z |	[95% Conf. Interval]	
Constant	-.0021787	.0024898	-0.88	0.382	-.0070586	.0027013
CCC	-.0152182	.0072062	-2.11	0.035	-.0293420	-.0010944
CAD	-.0088558	.0279798	-0.32	0.752	-.0636952	.0459836
RCP	.0010546	.0108516	0.10	0.923	-.0202142	.0223234
FR	.1346922	.0806458	1.67	0.095	-.0233707	.2927551
RR	.0030207	.0040254	0.75	0.453	-.0048689	.0109102
			Wald chi^2 (5) = 8.70		Prob > chi^2 = 0.1217	

*Dependent Variable. Source: Author's own estimation using Stata 14.2.

Both models demonstrate that the sign of coefficient of the dependent variables are similar. That is, CCC and CAD have the negative association with SMR. Then RCP, FR and RR have a

positive association with SMR. The decisions based on a particular significance level are mostly same for the two models. Hence, Hausman test has been conducted next.

6.6 Hausman Test

Hausman test has been done to make decision that which model is appropriate to explain the association between dependent and independent variables. The results of Hausman tests are reported in Table 8.

Table 8: Hausman Test to choose between FE and RE Models

	Coefficients			
Variables	(b) Fixed	(B) Random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
CCC	-.0147608	-.0152182	.0004575	.0015474
CAD	-.0104028	-.0088558	-.001547	.0059524
RCP	.0002333	.0010546	-.0008213	.002534
FR	.1885797	.1346922	.0538875	.0648753
RR	.0018384	.0030207	-.0011822	.0022274

b = consistent under H_0 and H_a; obtained from xtreg
B = inconsistent under H_a, efficient under H_0; obtained from xtreg
Test: Ho: difference in coefficients not systematic
Chi^2 (5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 0.96
Prob. > chi^2 = 0.9660

Source: Author's own estimation using Stata 14.2.

Table 8 reported that Chi^2 value of Hausman test is 0.96 and the corresponding probability value is 0.9660. At 5 percent significance level, the null hypothesis, of random effect model is appropriate, can't be rejected. That is, the alternative hypothesis of fixed effect model is appropriate was rejected. So, the results of random effect model have been used to explain the dependent variables more appropriately.

Based on the results of the random effect model, the equation of this research model is;

$$SMR_{it} = -.0021 - .0152CCC_{it} - .0088CAD_{it} + .001RCP_{it} + .1346FR_{it} + .003RR_{it} + \varepsilon_{it}$$

Returns on stock market index of SAARC countries are negatively related with CCC and CAD. One percent increase in the daily COVID-19 confirmed cases results in 1.52 percent fall in the stock market return, and it is significant at 5% significance level. The variables of RCP, FR, and RR are positively associated with SMR, but are insignificant at 5 percent level.

6.7 Findings of the study

Summary of this research outcome is reported in Table 9. Previous studies stated that financial market responses negatively to the COVID-19 Confirmed Cases and to the COVID-19 Associated Deaths. The results of this study are similar to the findings of the studies conducted by (Ashraf, 2020), (Sansa, 2020). Again, Recovered COVID-19 Patients and Recovery Rate of COVID-19 have positive impact on stock market returns. This findings agree with the study of (Naidenova et al., 2020).

Table 9: Summary Results of the Analysis

Variables	Expected Sign	Results Found	Significant (at 5%)
CCC	(-)	(-)	Significant
CAD	(-)	(-)	Insignificant
RCP	(+)	(+)	Insignificant
FR	(-)	(+)	Insignificant
RR	(+)	(+)	Insignificant

7. Conclusion

This paper used panel data analysis technique to examine the financial markets' reaction to the Covid-19 pandemic for SAARC countries over the period from January27, 2020 to June 30, 2020. Using daily Covid-19 confirm case, death, recovered covid-19 patient, fatality rate, and recovery rate this study finds financial market/stock market returns declines as the number of

confirmed case increase in a country. Again, stock market responded negatively to the daily growth in number of deaths but weakly. The news of the daily growth in number of recovered corona patient, and the recovery rate has positive impact on stock market but very little. Overall, this investigation implies that stock markets' reaction depends on harshness of the outbreak and stages of COVID-19 spread.

8. Limitation and Future prospect

This study takes into consideration only limited number of variables with the short period of times from January27, 2020 to June 30, 2020. So, future researches can be conducted by incorporating variables like stock market determinants, the economic activities affected and benefited by the pandemic, the stock market differences and similarities between SAARC countries, the adaptation of stock market portfolio strategies, possible public policy measures, and other macro variables.

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