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### Covid-19 Outbreak and Industry Reactions: Evidence from Colombo Stock Exchange

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**Abstract:** Moving along history, it can be identified that the human race has experienced many types of challenges which did have the capacity to decide human existence or extinction from the beginning. Some of these challenges were created by humans by themselves like world wars and some were created by natural forces like natural disasters and deadly viruses. Recently COVID-19 has taken place as a rapidly spreading virus by causing more than two million deaths and more than 95 million cases around the world as being the sixth global pandemic creating considerable influence to different industries such as agriculture, health and transportation in the world. The propose of this study is to identify the impact of COVID-19 on the performance of the industries in Sri Lanka. Using the two events and the event study methodology it is found that industry groups such as automobiles, materials, health care and equipment, household and personal care products are the significantly positively affected industries where industries like insurance and transportation have been negatively affected in Sri Lanka. As per the real business-cycle theory these fluctuations in the industries consider as business cycle fluctuations and the efficient response to exogenous changes in the real economic environment. Hence this impact does not last long, investors and the government can recover quickly with the implementation of effective monetary policies and investment diversifications.

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## INTRODUCTION

Recently COVID-19 has taken place as a rapidly spreading virus by causing more than two million deaths and more than 95 million cases around the world being the sixth global pandemic in the world. When considering the COVID-19, it has also caused a huge negative impact on the world's economy and development as like as previous pandemics according to findings of recent studies [Ru et al., \(2021\)](#). However, according to some researches [He et al., \(2020\)](#) it has been identified that some sectors of China have been affected positively and some sectors have not shown a significant reaction to the pandemic. For example, it has stated that the manufacturing and information technology industries of China have been able to adjust to COVID-19 and continue while agriculture, transportation, and mining industries have recorded a negative response emphasizing that COVID-19 has created both positive and negative consequences in an economy. When it comes to the insurance industry in India [Ramasamy \(2020\)](#) and

China Wang et al., (2020), it has shown an opposite reaction in related territories where the Indian insurance industry has shown a positive reaction while the Chinese insurance industry has shown a negative reaction to the pandemic. Thus, the evidence shows differences in the impact of COVID-19 on different industries while those reactions can be differed depending on the characteristics of a country. This has led the path to undertake a study based on the Sri Lankan stock exchange ( The Colombo Stock Exchange) which represents the performance of all stock investors in Sri Lanka since 1985 while adhering new standards like Global Industry classification Standards where it represents the behavior of investors in such epidemic situations and this study has been able to highlight some areas where investors can put their effort to secure their investments in such conditions on the stock market. Consequently, the objective of this study is to identify safe industries and riskier industries in an epidemic situation based on the COVID-19 pandemic in Sri Lanka. Besides, it is expected to enhance the knowledge of Global Industry Classification (GICS) providing a way for investment diversification within Sri Lanka for various types of investors. This is the introduction section, next section reviewed related literature, and which follows the methodology, findings, and conclusion.

## LITERATURE REVIEW

An economy has built upon different industries. There can be differences among industries depending on one country's classifications, scope, government policies, or on their culture. However, if it is said that there is an impact from COVID-19 on an economy, it means that there should be an impact of COVID-19 on industries within a country directly or indirectly. When it comes to the literature there are plenty of studies that talk about the impact of COVID-19 on different countries on their industries combining with challenges created by the epidemic situation and suggested strategies either from a financial perspective or in a non-financial perspective. However, according to the prevailing situation of the pandemic, none of the countries can be escaped from the negative influence that has been created by the COVID-19 whether it is considered as a developed country or not.

When it comes to developed countries, it can be observed that different industries have been influenced by the COVID-19 pandemic in different degrees in different ways. Accordingly, among many industries, the agricultural industry and live stocks have been affected severely by this pandemic due to the lack of labor-power, lack of animal feed which was risen as a result of containment of traveling and exporting food where it causes prices of meat products, vegetable oil and grains to decrease in the exporting market (Siche, 2020). When it comes to food security, agriculture and COVID-19 in Canada it has been also identified a threat to food security in the long term but not in the short term as it cannot be observed short term price fluctuations in the food market in Canada (Deaton & Deaton, 2020). This negative impact on the food industry is also proven by McEwan et al., ( 2020) regarding the Canadian pork industry. However, in the British context, this epidemic situation has been identified as an useful condition to rebuild and sustain their fishery industry after separating from the European Union by introducing their own fishery policy expecting much value-adding to the UK economy from fisheries in the future even though they are experiencing the same reduction in demand and price currently (Kemp et al., 2020). Likewise, the energy industry has been also subjected to this COVID-19 pandemic due to reducing the demand for coal and other energy resources and it has observed a financial risk associated with the energy sector as governments have been given their top priority to repression of the virus which emphasizes the negative impact of COVID-19 on the energy industry (Eroğlu, 2021). Consistent with this, Zhong et al., (2020) it shows decreasing electricity prices compared to 2019 first quadrant including several European markets and the United States of America. Similarly, it has been found that the tourism industry is more reactive to epidemic situations rather than other industries in the US and Europe (Uğur & Akbıyık, 2020). As like as Pavlyshenko (2020) there have been built up models to identify the risk associate with COVID-19 on stock markets and those emphasizes that different pandemics have made different influences on stock markets from time to time (Baker et al., 2020). Where the comparison can be taken as between the SARS outbreak in 2003 and COVID-19 (Ru et al., 2021). The event study methodology has been used to analyze sixty-five territories including North America and European countries which have active stock exchanges

and found that countries which had early experiences with SARS have been more sensitive towards COVID-19 outbreak compared to countries that did not have experiences with SARS, (Liu et al., 2020; Haroon & Rizvi, 2020). By using 64 countries and statistics of daily cases and deaths Ashraf (2020) it has been able to identify negative movements of stock markets related to developed countries by using an event study. Further, Ramelli and Wagner (2020) stated that the pandemic has created a positive impact for some industries too when considering the US context. In 2013, the Influenza disease has caused a decrease in trading activities, increasing in the bid-ask spread in the United States stock markets McTier, Tse, and Wald (2013) as the flu impacts the behavior of institutional investors and market makers giving us an understating of how the COVID-19 can be affected for such cases currently. Looking at the Ebola virus which was one of the pandemics in history from 2014 to 2016, has also harmed the affected countries and countries which had investments in infected countries which provides us some hints of COVID-19's impact and tackling them. It was found that US stock markets have been more sensitive to the Ebola virus even though the US did not suffer much by Ebola virus but because of US investors had invested in West African countries where Ebola has caused significant declines in unsteady and small stocks indicating to expect such experiences with COVID-19 to (Schell et al., 2020). Thus, it can be said that COVID-19 has created both positive and negative consequences in developed countries as like as previous pandemics.

In developing countries, the agricultural industry experiences the same condition as same as developed countries which emphasis the same problem of lack of labors, increasing the labor expenses and inability to sell agricultural products due to the less demand created by quarantine and lockdown policies where it caused a huge drop in the agricultural industry (Hai-ying & Chang-we, 2020). Similarly, there can be seen a huge impact from COVID-19 on the food and beverage industry in the means of labor absenteeism, waste of perishable food as short term circumstances where it has to be expected less return on investment in food and beverage industry and less apportionment in the GDP as long term consequences (Chowdhury et al., 2020). Also, the sugar industry in India has been influenced by COVID-19 negatively as the pandemic situation has created a reduction in sugar demand and ethanol demand which uses as an energy resource in India (Solomon et al., 2020). However, in the Indian context, the insurance industry has been positively affected by COVID-19 as people are being afraid of the pandemic and afraid of huge hospital expenses if they have to get hospitalized (Ramasamy, 2020). Furthermore, the banking industry in India has been affected adversely by this pandemic because of lacking employees, increasing default risk of customers, increasing risk in personal loans, and absence of outsourced services of banks, etc., (Ramasamy, 2020). The insurance industry in China has been negatively impacted because of decreasing premiums, restrictions on insurance sales agents, online marketing methods, banking services, and other quarantine regulations (Wang et al., 2020). The telecommunication industry in developing countries in Asia seems positively affected in the COVID-19 period because most people had to work from home (Zhang, 2020). Moving on to Saudi Arabia which can be considered as a developing country, it has also been able to take the advantage of the COVID-19 pandemic to initiate their "the Saudi Vision 2030 framework" which aims for a huge digital transition in the future where there are more promotions towards artificial intelligence, mobile applications and for other technological advancements to provide solutions for COVID-19 while aligning with their framework at the same time (Hassounah, Raheel, & Alhefzi, 2020). In Ethiopia, as a consequence of bans for traveling and restrictions on daily lifestyles it has caused for a fall in the insurance industry which is playing a major role in the economy creating an instability in the country (Worku & Mersha, 2020). In Indonesia, the transport system, trading, and health sectors are the sectors that have been negatively affected by the COVID-19 (Susilawati et al., 2020). The Taiwanese hotel industry in 2007 has also impacted due to a deadly virus outbreak (SARS), Chen et al., (2007) which provides us a sign of the impact of a pandemic which can also be expected by the COVID-19.

The tourism and hospitality industry in Sri Lanka has been also adversely affected as like as in China where more than 200,000 employees in the hotel industry have been influenced negatively due to the suspension of working in hotels, restaurants, travel agencies as a requirement of the government COVID-19 prevention policies like lockdowns and quarantine (Sivesan, 2020; Suresh. et al., 2020). In addition to the hotel industry, the apparel industry is another segment that should be considered in the Sri Lankan economy and it has been also faced for negative consequences of COVID-19 as people tend to save money

for necessities rather than spending on unnecessary wants when it comes to local demand and foreign demand respected to exports (Bolonne, 2020). It is found fewer studies in the Sri Lankan context on the industries influenced by the COVID-19. Consequently, this study analyzes the industries which have been affected by the COVID-19 using GICS indices of the Colombo Stock exchange (CSE) employing the event study method. According to the Real Business Cycle Theory, these kind of health problems do not cause for changes in real business cycles as they do not persist with the adaptation of new health practices and new lifestyles though it temporarily changes human expectations unless it has done a permanent damage to labour force and resources significantly (Simposen, 2014). Likewise, in this pandemic the reflection of expectations and changes in monetary factors can be observed in stock markets price fluctuations and by using the event study methodology it is expect to capture those immediate reaction of the Colombo Stock Exchange in industry wise with the unexpected COVID-19 pandemic and it is intended to observe whether the COVID-19 pandemic has caused for a change in real business cycle with respect to the Sri Lankan context.

## METHODS

The event study method is used to evaluate abnormal changes in sample stock prices or indexes following a specific event. The impact of COVID-19 in Sri Lankan industries has been tested by this event study methodology using two event dates. One is the date of reporting the first COVID-19 patient in Sri Lanka on 27<sup>th</sup> January 2020 and the second one is the date of reporting the first local positive COVID-19 patient on 10<sup>th</sup> March 2020.

Cumulative abnormal returns (CAR), Abnormal returns (AR), and Normal returns (R) are the variables that have been considered in this study which returns are calculated by using 20 industry groups in the CSE on the GICS. The industry groups indices include energy, automobiles, materials, health care, household, and personal products, transportation, insurance, consumer durables and textiles, diversified financials, commercial and professional services, consumer services, capital goods, retailing, telecommunication, pharmaceutical, biotechnology, and life industry, utilities, food and staples retailing, banks, real estate and food, beverage and tobacco which represents all listed companies in the CSE. The data was collected from the CSE database.

Each event uses an estimation period of 150 days before the observation period (160 days before the event date) and 10 days after the event date as the post-event period. According to the literature, the estimation period can be started from 250 days to 30 days prior (-250 to -30) for the event date (Aktas et al., 2007). As the daily stock returns have been calculated using GICS industry indices and as it is focused on short-term influences of COVID-19, it is believed that having a ten days long observation period is sufficient for identifying the impact of COVID-19 around the events. The expected returns of the industries during the testing period have been estimated by the market model using Equation 1.

$$R_{i,t} = \alpha_i + \beta_i R_{i,m,t} \quad (1)$$

The average abnormal rate of return of each industry estimated using Equation 2

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{i,m,t}) \quad (2)$$

The cumulative abnormal rate of return of each industry estimated using Equation 3

$$CAR_{i(t1-t2)} = \sum_{t2}^{t1} AR_{i,t} \quad (3)$$

Where,

$R_{i,t}$  = the return of a particular industry index  $i$  on the trading day  $t$

$R_{i,m,t}$  = the rate of return of the market/return of the All Share Price Index  
 $AR_{i,t}$  = the average abnormal rate of return of index  $i$  on the  $t^{\text{th}}$  trading day.  
 $CAR_{i(t1-t2)}$  = the cumulative abnormal return rate of index  $i$  in the event period.

## RESULTS AND DISCUSSION

This section analyzed the positively affected and negatively affected industries by the COVID -19 pandemic in Sri Lanka related to Event 1 and Event 2. Table 1 summarizes the results received related to Event 1 to identify the impact of COVID-19 at its initial stage in Sri Lanka.

**Table 1. The results of Event 1**

Industry	Event Date		Post Event Period	
	CAR	t-value	CAR	t-value
SPCSEEIP	3.19%	0.639	-6.27%	-1.256
PCSEMIP	1.16%	1.335	-1.83%	-0.664
SPCSECGP	-0.65%	-1.228	-1.91%	-1.141
SPCSECPP	-0.35%	-0.168	-4.28%	-0.657
SPCSETP	-1.13%	-0.466	-2.21%	-0.289
SPCSEAMP	1.84%	0.780	0.66%	0.088
SPCSECAP	0.28%	0.253	2.70%	0.776
SPCSERP	0.20%	0.180	-2.54%	-0.713
SPCSEFRP	0.25%	0.320	1.47%	0.603
SPCSEFBP	0.21%	0.426	2.41%	1.553
SPCSEHPP	1.06%	0.671	-2.44%	-0.489
SPCSEHSP	-0.06%	-0.049	1.08%	0.282
SPCSEPLP	0.05%	0.107	0.00%	0.004
SPCSECS	-0.99%	-0.945	-3.92%	-1.189
SPCSEBP	0.13%	0.192	0.10%	0.046
SPCSEDFP	-0.17%	-0.224	-1.34%	-0.563
SPCSEINP	0.94%	0.394	2.92%	0.385
SPCSETIP	0.19%	0.179	-0.58%	-0.171
SPCSEUIP	-0.16%	-0.159	-0.31%	-0.100
SPCSEREP	0.52%	0.363	-0.39%	-0.086

*This table presents the results of the Event analyses one. Event 1 defined as the date of reporting the first COVID-19 patient in Sri Lanka on 27<sup>th</sup> January 2020. Table includes Cumulative average returns (CAR) and T values on event date and post event period. The \* mark (\*\*\*), (\*\*), and (\*) indicate the significant level at 1%, 5% and 10% respectively.*

As exhibited in Table 1, it evident that the industries in the CSE had had not been responded for the Event 1 significantly. This result is quite important when compared with the countries like China, Japan, India, Korea, Singapore, Australia, and Thailand where there were significantly negative reactions in stock markets on the date of 20<sup>th</sup> January 2020, (the date which the official announcement of identification the new COVID-19 virus made to the world) even though considerable number of patients were not identified in their respective territories (Liu et al., 2020). In contrast, CSE had not shown any significant reaction in the means of stock returns while most other countries have responded negatively to the discovery of the novel Coronavirus. In addition to that, as being the first patient identified was a Chinese, there was less attention to the impact of the disease since the patient was not a local person. Moreover, there were no other consecutive cases were reported continuously after this incident within the Sri Lankan context until the first local patient was reported on 10<sup>th</sup> March 2020 where there is a gap of more than 40 days between the two incidents. Due to those reasons as per Table 1, Event 1 has not done a significant impact on any of the industries in CSE.

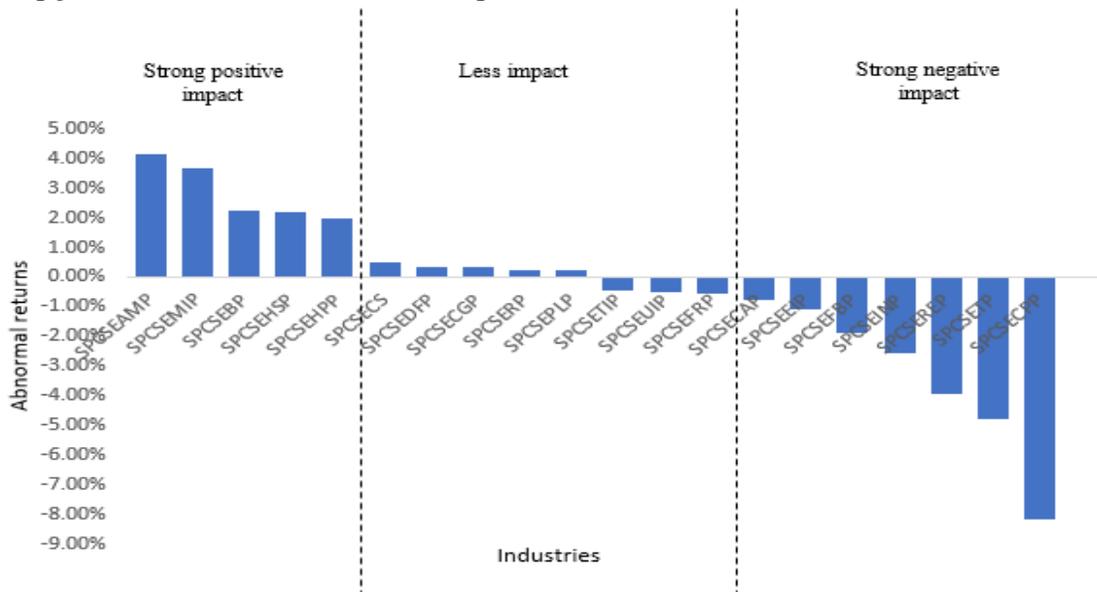
Table 2 exhibits the analyses of Event 2 which have created a significant impact on the industries in the CSE compared to the results of Table 1. As Table 2 shows, some industries have been affected positively while others have been affected negatively.

**Table 2. The results of Event 2**

Industry	Event Date		Post Event Period	
	CAR	t-value	CAR	t-value
SPCSEEIP	-1.08%***	-0.342	15.61%***	4.944
PCSEMIP	3.65%***	4.191	2.47%	1.419
SPCSECGP	0.34%	0.643	0.28%	0.268
SPCSECPP	-8.17%***	-3.968	4.72%	1.146
SPCSETP	-4.79%**	-1.980	-25.94%***	-5.359
SPCSEAMP	4.15%**	1.761	13.64%***	2.895
SPCSECAP	-0.78%	-0.712	-7.86%***	-3.575
SPCSERP	0.22%	0.198	1.22%	0.543
SPCSEFRP	-0.56%	-0.727	-2.18%	-1.412
SPCSEFBP	-1.86%***	-3.776	1.24%	1.259
SPCSEHPP	1.99%	1.263	-5.84%*	-1.852
SPCSEHSP	2.19%*	1.804	-5.10%**	-2.102
SPCSEPLP	0.21%	0.489	0.55%	0.648
SPCSECS	0.48%	0.456	4.49%**	2.151
SPCSEBP	2.26%***	3.233	-2.19%	-1.565
SPCSEDFP	0.35%	0.461	-1.16%	-0.766
SPCSEINP	-2.54%	-1.059	-6.12%	-1.275
SPCSETIP	-0.46%	-0.425	1.74%	0.804
SPCSEUIP	-0.48%	-0.479	-12.13%***	-6.098
SPCSEREP	-3.93%***	-2.729	6.02%**	2.093

This table presents the results of the Event analyses two. Event 2 defined as is the first local positive COVID-19 patient on 10th March 2020. The table includes Cumulative average returns (CAR) and T values on event date and post-event period. The \* mark (\*\*\*), (\*\*) and (\*) indicate the significant level at 1%, 5% and 10% respectively

As per Table 2, Event 2 has provided enough pieces of evidence that the COVID-19 has been created a significant impact on industries rather the Event 1. The behavior of industry returns during the testing period of Event 2 is shown in the Figure 1.



**Figure 1. Behavior of abnormal returns on the "Event 2" and categorization**

According to Figure 1, the classification of industries has done base on the abnormal returns generated by each industry. Industries that had earned more than +1% considered as ‘strong positively impacted industries’, +1% to -1% abnormal returns earned industries as ‘less impact industries’ and those

have earned less than -1% has considered as 'strong negatively impacted industries. The results identified five industry groups namely automobile, materials, banks, health care equipment and services, the household and personal products industries out of twenty as positively impacted industries by the COVID-19 at its initial stage. Industry groups such as consumer services, the diversified financial, the capital goods, retailing, pharmaceuticals, biotechnology and life, the telecommunication services, utility and food, and staples have appeared as less impacted industry groups. Those industry groups namely consumer durables and apparels, energy, food beverage and tobacco, the insurance, real estate, and commercial and professional services were identified as the strongly negatively impacted industry groups. The automobiles and components industry group is the most positively affected industry group in Sri Lanka with a 4.15% of reported abnormal return under a 5% level of significance and the most negatively affected industry group can be considered as the commercial and professional services industry group with a -8.17% abnormal return under a 1% level of significance. So, the abnormal returns generated on the date of the first local COVID-19 patient were identified ranging from +4.15% to -8.15%.

However, according to the results of the post-event period, the energy industry group and real estate industry group had started to earn positive abnormal returns with a considerable significant level, and it is suggested to have further investigation related to those two industry groups. Moreover, when the accumulated abnormal returns take into account, the transportation industry has to be considered as the most negatively affected industry group as it results in a more than 30% decline in the accumulated returns where the energy industry group will become the most positively affected industry group with a more than 14% reported accumulated abnormal return under a 1% level of significance. So, except for these two industries and the banking industry, the reactions of other industry groups are very same as the behavior of industries in other countries where the banking industry in Sri Lanka shows a positive reaction while other countries were reacted negatively. According to the above results, it can be identified that the COVID-19 outbreak has created a significant impact on the CSE not only in a negative manner but also positively in different industries in Sri Lanka depending on the abnormal returns generated during the observation period where those reactions can be observed changing after the immediate reaction on the event date emphasizing the application of Real Business Cycle Theory during a pandemic.

## **CONCLUSION**

The impact of the COVID-19 on the CSE shows a mixed result. Industry groups such as automobiles and components, materials, health care and equipment, household and personal care products, and banks were affected positively by COVID-19 in the short run. However, industry groups such as consumer durables and apparel, energy, food, beverage and tobacco, insurance, real estate, and commercial and professional services industries were identified as riskier industries in the CSE during the pandemic. Hence, this study analyzed the impact of COVID-19 only in the initial months of the pandemic in Sri Lanka, those results have to be further investigated expanding event studies for the phase of the second wave and so on. Thus future studies can be developed on increasing number of events, extending time period considered and also depending on the different variants of Covid-19. Finally, it can be concluded that the COVID-19 pandemic has not created a complete negative influence on the CSE which discards the belief of that the COVID-19 has only created a negative impact on a country allowing Sri Lanka investors to diversify their investments industry wise in a pandemic as led by this study without withdrawing their investments from stock markets but reinvesting them in safe industries combined with effective monetary policies. The results emphasize that the COVID-19 pandemic has not caused for a change in the real business cycle as it has shown price adjustments in CSE after the "Event 2" even it has displayed a significant reaction on the event date at the initial stage of COVID-19 reflecting changes of expectations but not real economic factors.

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