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## **The Impact of COVID-19 Pandemic on Global Stock Markets: An Event Study**

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**Abstract:**

**Purpose:** *This study aims to empirically examine the immediate reaction of affected countries' stock market indices to COVID-19.*

**Approach/Methodology/Design:** *The study applies an event study methodology using daily data series of stock price indices.*

**Findings:** *Evidence from eleven global stock market indices shows that the first confirmed COVID-19 case announcement has had a significant negative impact on the returns. Moreover, these effects were more substantial following the WHO announcement of COVID-19 as a global pandemic on March 11, 2020.*

**Practical Implications:** *The rapidly developing outbreak of the COVID-19 pandemic has depressed the affected countries' economies and caused turmoil in global financial markets. The results presented in this paper shed some light on the potential economic and social cost of COVID-19 concerns policymakers and other stock market stakeholders.*

**Originality/value:** *The results suggest that stock markets have captured investors' expectations over potential adverse economic consequences of COVID-19. Moreover, there is evidence for an underreaction to the pandemic's announcement, as shown by the delayed response of stock markets in terms of significant CARs. These findings leave a wish list of topics for future research.*

**Keywords:** *COVID-19, stock markets, abnormal returns, event study.*

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## **1. Introduction**

The outbreak of the novel coronavirus (COVID-19) has disrupted the affected countries' economic activities and become a real threat to the global economy and financial markets (Barro *et al.*, 2020; Ramelli and Wagner, 2020). Most of the global stock markets have plunged, and international financial institutions have cut their growth forecasts for 2020 and beyond (Boone *et al.*, 2020). COVID-19 was originated in Wuhan city, China, last December. Since then, the disease has spread exponentially and infected more than 2 million persons across 210 countries (WHO, 2020).

Accordingly, the WHO announced COVID-19 as a pandemic on March 11, 2020, (WHO, 2020). Numerous reports and policy briefs predict a horrendous impact of the COVID-19 crisis that is comparable to or worse than the Great Depression. Kristalina Georgieva, the managing director of the International Monetary Fund (IMF), stated, "We anticipate the worst economic fallout since the Great Depression" (WHO, 2020). Therefore, the unfortunate event of the COVID-19 outbreak provides an opportunity to assess the immediate impact of an unexpected disease outbreak on the affected countries' stock markets.

The objective of this paper is to investigate the impact of the COVID-19 pandemic on leading stock market indices for a group of the top affected countries. The sample countries are Belgium, China, France, Germany, Italy, The Netherlands, South Korea, Spain, Switzerland, United Kingdom, and the United States. Particularly, we examine the stock markets' immediate reactions to the announcement of the first confirmed case for each country. Moreover, we examine the stock market responses to the announcement of COVID-19 as a global pandemic by the WHO. The WHO announcement came from an increasingly widespread pandemic transmission to more than 110 countries at that time. This declaration is unusual, implying extra containment measures must be applied for the affected countries. Therefore, we expect significant negative abnormal returns in global stock markets following the WHO announcement. In addition, we are not sure whether the WHO announcement has a greater impact on the affected countries' stock markets, compared to the announcement of the first confirmed COVID-19 case confirmed in each country.

Our study is closely related to Nippani and Washer (2004), who examine the effects of the SARS (severe acute respiratory syndrome CoV-1) outbreak of 2003 on stock market indices of six affected countries by comparing these indices to the performance of the pre-event period and the S&P 1200, using conventional t-tests and Mann–Whitney non-parametric tests. They find limited evidence of the negative impact of the SARS epidemic outbreak on China and Vietnam's stock market indices. The remainder of the paper is organized as follows. The potential economic consequences are explored in section 2. The data and methodology are presented in section 3. The empirical results are presented and discussed in section 4. Finally, the conclusion can be found in section 5.

## 2. The Impact of COVID-19 on Stock Markets and the Economy

The COVID-19 pandemic is an unexpected shock to the global economy, with economic destruction on an unprecedented scale (Goodell, 2020). Generally, the COVID-19 is depressing the global economy; however, the outbreak's economic consequences are unequally distributed throughout the economy (Bloom *et al.*, 2018; Guerrieri *et al.*, 2020; Grima *et al.*, 2020). While most industries will bear losses due to economic disruption, some industries are expected to benefit financially, i.e., pharmaceutical industries.

The COVID-19 pandemic has been called "the Great Lockdown," referring to the severe containment measures enforced due to the pandemic outbreak. Several international institutions downgraded their growth forecast due to the COVID-19 pandemic; for instance, the international monetary fund (IMF) has cut the global growth forecast of 2020 to -3%, down by 6.3% from early year projections (IMF, 2020). Similarly, the Organisation for Economic Cooperation and Development (OECD) expects a continued and prolonged outbreak of the coronavirus pandemic may decrease global economic growth by 1.5% for 2020 (OECD, 2020). Moreover, the Asian Development Bank (ADB) predicts the global cost of COVID-19 pandemic to top US\$4.1 trillion, which is more than 40 times the global cost of the SARS outbreak (2002-2003) estimates of US\$ 30-100 billion (Smith, 2006) (Thestar.com, 2020). Also, the International Labour Organization expect global unemployment would increase by approximately 25 million (ILO, 2020) (McKibbin and Fernando, 2020).

Bloom *et al.* (2018) were clairvoyant to show concerns about the potential emergences of economically damaging pandemics—such as various influenza types and other unknown pathogens—ahead of the COVID-19 outbreak. They list various economic risks resulting from pandemic/epidemic outbreak, including costs to the health system, loss to employee productivity, a decline in economic activity, a negative impact on tourism, and a negative impact on foreign direct investment (FDI). Many articles have considered the economic consequences of past epidemics and pandemics on the infected countries. However, the existing literature on the effects of epidemics and pandemics on financial markets is rather limited (Goodell, 2020). The COVID-19 pandemic comes at a larger scale—when compared to modern history pandemics. Nobel laureate Robert Shiller describes potential economic consequences of COVID-19 as "something we have not quite seen before." Detrixhe (2020) emphasizes that unlike the Great Depression—which can largely be attributed to a "pessimistic idea," the COVID-19 economic crisis results from a shock to the real economy, causing the economic activity to slow down deeply.

The pandemic effects could be transmitted to stock markets through several channels. For instance, the spread of contagious diseases induces a decline of economic activity and endures a major challenge for business profitability and continuity in extreme situations as lockdown (Adda, 2016). Moreover, a pandemic

induced economic and financial shocks in one country spreads rapidly to others due to high levels of the interconnectedness of markets due to globalization and financial integration (Chen *et al.*, 2018; Liu *et al.*, 2020). Recently, Zhang *et al.* (2020) show that global financial markets volatilities have increased substantially due to the COVID-19 pandemic outbreak, and the magnitude of volatility commensurate with the severity of the outbreak in each country (Khan *et al.*, 2020). They report significant increases in systemic risk between the affected countries, particularly following the WHO announcement of COVID-19 as a global pandemic. Also, other channels related to panic selling, profit-taking, and the search for more safe assets in times of crises (Lucey and Li, 2014).

Stock markets have long been considered relevant in forecasting real economic activity. Harvey (1989) argues that "the price of equity thus reflects expectations of real activity, and changes in the value of equity partially reflect revisions in these expectations." Thus, market participants' expectations reflected in stock prices could provide a perspective of growth prospects, given the unprecedented uncertainty on the COVID-19 pandemic (Gormsen and Koijen, 2020). Moreover, when an unexpected disastrous event happens, financial investors are induced to exit the unstable market, searching for more stable financial investments (Arin *et al.*, 2008). In a recent study, Ramelli and Wagner (2020) examine stock prices' reactions to the COVID-19 event at the industry level, focusing on international supply chains. They find that US firms with greater trading or supply chain relations with China have experienced lower cumulative abnormal returns (CARs) following the confirmation of the virus's human-to-human transmission on January 20, 2020. They conclude that investors have become more concerned about the economic and financial consequences of the COVID-19 pandemic crisis.

### **3. Methodological Procedures**

Daily data series of stock price indices were obtained from 'investing.com,' which comprise the leading stock price index for each sample country, as shown in Table 1. The data on the first confirmed COVID-19 cases are obtained from major news websites and validated with the COVID-19 database published by the European Centre for Disease Prevention and Control.

This study applies the standard event study methodology of Brown and Warner (1985) to test how stock markets react to the COVID-19 pandemic outbreak. The methodology suggested by Brown and Warner (1985) enables us to examine the significance of the economic impact of the COVID-19 outbreak on the affected countries' stock markets. To do this, we measure the deviation of the stock market index from their historical average. The event study analysis is based on the hypothesis that if the stock market index is affected by an event, the influence would be translated into abnormal returns—as stock prices immediately adjust to the announcement of new information (Fama *et al.*, 1969).

**Table 1.** Global Stock Market Indices Descriptive Summary

Country	Stock Market Index	Index		
		Close Price 31/12/2019	Close Price <sup>1</sup> 24/03/2020	Change (%)
Belgium	BEL 20	3,955.83	2,867.59	-27.51%
China	Shanghai composite index	3,050.12	2,722.44	-10.74%
France	CAC 40	5,978.06	4,242.70	-29.03%
Germany	DAX	13,249.01	9,700.57	-26.78%
Italy	FTSE MIB	23,506.37	16,948.60	-27.90%
Netherlands	AEX index	604.58	461.73	-23.63%
South Korea	KOSPI	2,197.67	1,609.97	-26.74%
Spain	IBEX 35	9,549.20	6,717.30	-29.66%
Switzerland	Swiss market index	10,616.94	8,733.32	-17.74%
United Kingdom	FTSE 100	7542.44	5446.01	-27.80%
United States	S&P 500	3,230.78	2,447.33	-24.25%
World Benchmark	MSCI world index	2,358.47	1,742.61	-26.11%

<sup>1</sup> March 24, 2020 is the end-date of the used sample.

Source: Own study.

Therefore, evidence of significant positive (negative) abnormal returns is expected if the markets react to the event favorably (unfavorably). The analysis commences by examining the reactions of the affected countries' stock market indices to the announcement of the first confirmed case for each country. Subsequently, we examine these indices' reactions to the announcement of COVID-19 as a pandemic by the WHO on March 11, 2020. The Abnormal returns ( $AR_{i,t}$ ) for index  $i$  at day  $t$  is calculated as in equation (1):

$$AR_{i,t} = R_{i,t} - \bar{R}_{i,t} \quad (1)$$

The actual daily returns ( $R_{i,t}$ ) is obtained by calculating the natural log of the price relative as in equation (2).

$$R_{i,t} = \ln(P_{i,t}/P_{i,t-1}) \quad (2)$$

where  $P_{i,t}$  is the close price of index  $i$  at day  $t$ , and  $P_{i,t-1}$  is the close price of index  $i$  at day  $t-1$ . The historical average of stock indices ( $\bar{R}_{i,t}$ ) is calculated using a 100-day estimation window for the period from the day (-110) to the day (-11), where the day (0) represents the event day—the announcement of the first confirmed COVID-19 case for each country. In addition, we use equation (3) to calculate the cumulative abnormal returns ( $CAR_{[t_1,t_n]}$ ).

$$CAR_{[t_1,t_n]} = \sum_{t_1}^{t_n} AR_{i,t} \quad (3)$$

The CARs of 5-days and 10-days are calculated to show further the market's ability to rebound or further deteriorate for some trading days after the announcement day. Finally, the t-test statistics, the ratio of the average AR (CAR) to its estimated

standard error, is calculated for the corresponding AR (CAR)—the null hypothesis is that AR(CAR) in the event window is equal to zero. Therefore, a significant test statistic implies that AR (CAR) is significant, which means that the announcement has been priced.

#### 4. Analysis of Results

Table 2 reports the ARs and CARs (for 5 and 10 days) following the announcement of the first confirmed COVID-19 case(s) in each country. Of 11 major stock indices, 4 have significant negative ARs, 6 have significant negative CARs over the 5-days and 10-days event window. Interestingly, China has insignificant ARs and significant positive CARs following the first case confirmed on December 31, 2019; in our view, this might be due to the limited information about the nature of the virus and lack of containment measures applied until the lockdown of Wuhan city on January 23, 2020—three days after the human-to-human transmission of the virus was confirmed. To check this, we calculate AR and CARs following January 21, 2020. The results show significant negative AR, 5-days CAR, and 10-Days CAR of -1.52%, -9.99%, and -6.69%. Hence, the lockdown protocols, which have been applied later, have the most adverse effect on economic activity.

**Table 2.** Abnormal Returns (ARs) and Cumulative Abnormal Returns (CARs) of Global Stock Markets Indices Following the Announcement of the First Confirmed COVID-19 Cases

Country	Date of First Confirmed Cases	AR%	t(AR)	CAR5 %	t(CAR5)	CAR10 %	t(CAR10)
Belgium	4-Feb-20	1.27%	2.59**	2.45%	22.84***	2.06%	20.58***
China	31-Dec-19	0.31%	0.41	0.77%	3.87***	1.42%	10.47***
China <sup>†</sup>	21-Jan-20	1.52%	2.10**	9.99%	-4.68***	-6.69%	-6.58***
France	24-Jan-20	0.77%	1.04	-3.41%	-7.15***	-0.08%	-0.22
Germany	28-Jan-20	0.75%	0.97	-0.33%	-0.59	1.49%	3.39***
Italy	31-Jan-20	2.45%	2.99**	2.05%	2.79**	2.93%	5.93***
Netherlands	28-Feb-20	3.84%	4.79***	-5.80%	-6.67***	-26.75%	-8.47***
South Korea	20-Jan-20	0.41%	0.55	-3.70%	-4.23***	-5.24%	-6.12***
Spain <sup>‡</sup>	1-Feb-20	0.29%	0.39	4.05%	9.17***	5.61%	16.69***
Switzerland	26-Feb-20	0.21%	0.32	-2.84%	-3.73**	-14.71%	-9.67***
United Kingdom	31-Jan-20	1.38%	1.95*	0.72%	1.87**	-0.40%	-1.72**
United States	21-Jan-20	0.26%	0.35	-1.60%	-3.47**	-0.93%	-2.96***

**Notes:**<sup>‡</sup> Repeated analysis for China (Shanghai composite index) considering January 21, 2020 as the event date. <sup>§</sup>The event date in Spain coincidence with a weekend holiday, therefore, we take the abnormal return of the following trading day. CAR5 and CAR10 refer to 5-days CAR and 10-days CAR, respectively. The asterisks \*\*\*, \*\*, \* indicate significant test statistics at the 1%, 5%, 10% levels, respectively.

**Source:** Own study.

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significant positive CARs following the first case confirmed on December 31, 2019; in our view, this might be due to the limited information about the nature of the virus and lack of containment measures applied until the lockdown of Wuhan city on January 23, 2020—three days after the human-to-human transmission of the virus was confirmed. To check this, we calculate AR and CARs following January 21, 2020. The results show significant negative AR, 5-days CAR, and 10-Days CAR of -1.52%, -9.99%, and -6.69%. Hence, the lockdown protocols, which have been applied later, have the most adverse effect on economic activity.

Some stock markets have shown delayed response to the event, as revealed by insignificant ARs and significant negative CARs (i.e., France, South Korea, Switzerland, and the United States). This is to be taken as evidence for initial underreaction to the pandemic outbreak. Moreover, some distinctive patterns emerge for the remaining countries. For example, Belgium shows an underreaction to the first case's announcement, as shown by the positive AR and CARs; nevertheless, it has one of the highest and abnormal losses and cumulative abnormal loss following the WHO announcement.

**Table 3.** *Abnormal Returns (ARs) and Cumulative Abnormal Returns (CARs) of Global Stock Markets Indices Following the WHO Announcemnt*

Country	WHO Annoucement Date	Number of Days since the first case confirmed	AR %	t(AR)	CAR5 %	t(CAR5)	CAR10 %	t(CAR10)
Belgium		36	-4.05%	-7.58 ***	-20.31%	-10.16 ***	-14.69%	-9.92 ***
China		71	-0.97%	-1.26	-9.48%	-7.34 ***	-7.66%	-8.24 ***
France		47	-0.66%	-0.8	-21.66%	-12.92 ***	-5.55%	-3.68 ***
Germany		43	-0.50%	-0.65	-22.49%	-13.07 ***	-7.58%	-4.89 ***
Italy		40	0.19%	0.23	-17.55%	-14.20 ***	-5.11%	-3.47 ***
Netherlands		12	-0.20%	-0.25	-18.73%	-14.05 ***	-2.93%	-2.01 **
South Korea	March 11, 2020	51	-2.94%	-3.81 ***	-21.71%	- 8.63* **	-15.40%	-6.37 ***
Spain		39	-0.44%	-0.59	-17.94%	-12.49 ***	-8.35%	-7.21 ***
Switzerland		14	-0.58%	-0.88	-10.43%	-20.04 ***	-3.46%	-3.64 ***
United Kingdom		40	-1.48%	-2.10**	-16.39%	-16.43 ***	-5.44%	-4.65 ***
United States		50	-5.01%	-6.73 ***	-18.37%	-7.96 ***	-15.18%	-9.20 ***
MSCI World Index		-	-3.97%	-6.52 ***	-18.35%	-6.18 ***	-13.81%	11.84 ***

**Notes:** CAR5 and CAR10 refer to 5-days CAR and 10-days CAR, respectively. The asterisks \*\*\*, \*\*, \* indicate significant test statistics at the 1%, 5%, 10% levels, respectively.

**Source:** Own study.

Moreover, the United Kingdom shows a volatile reaction to the announcement of COVID-19, as shown by the negative AR, positive 5-day CAR, and lastly, negative 10-day CAR. Besides, Germany shows significant positive CAR on the 10-day window, whereas Italy and Spain show positive CARs on the 5- and 10-day event windows. Similarly, the results of the ARs and CARs, following the announcement of COVID-19 as a global pandemic disease by the WHO, are shown in Table 3. It reveals that almost half of the sample countries experienced significant negative ARs on the event date. Subsequently, all countries experienced significant 5- and 10-days CARs.

The results presented in Tables 2 and 3 suggest a delay in some stock market initial reaction to the first confirmed COVID-19 cases and the WHO announcements. The literature suggests several plausible explanations for the variation of stock market reaction to the pandemic outbreak:

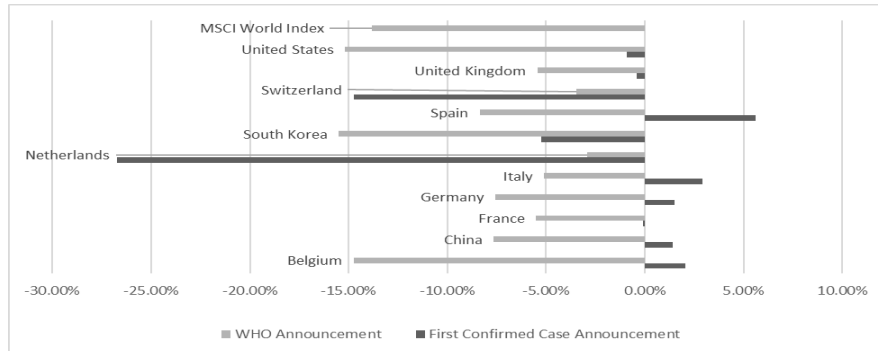
1. Differences in market efficiency; Ramiah *et al.* (2012) theorize that stock markets would react "more leisurely" to announcements, in contrast to the efficient market hypothesis, positing that markets should instantaneously reflect all available information.
2. The investor's confidence in institutional infrastructure; Johnston and Nedelescu (2006) argue that differences in the magnitude and significance of the results might be attributed to the individual countries' authorities' responses to the pandemic investors' "trust" in their institutions' actions.
3. Ru *et al.* (2020) find that the countries that did not experience SARS in 2003 tended to underreact to the COVID-19 outbreak's announcement.
4. Some behavioral explanations suggest that delayed response may be attributed to behavioral anomalies such as disposition and mean reversion (Hirshleifer, 2015; Frazzini, 2006; Barberis *et al.*, 1998).

The CARs of global stock markets reported in Table 3, following the WHO announcement, are generally more negative than their comparable values in Table 2. A comparison of the the10-day CARs for the sample countries are exhibited in Figure 1. Remarkably, countries with the highest 10-day CAR are located in Europe. This goes in line with the excessive pessimistic sentiment of European investors. For instance, a recent survey by the world economic forum—assessing opinions from 74 experts (from the United States and Europe)— shows that 62% of US exports and 82% of European experts expect a coronavirus-driven recession.

Overall, the evidence presented in this paper suggests that global stock markets have correctly anticipated the COVID-19 disastrous impact, as shown by the significant negative ARs and CARs, particularly following the WHO announcement. Moreover, these results are consistent with the journalistic and formal reports' tremendous negative sentiment, which proclaim the devastating consequences of COVID-19 on the global economy.



**Figure 1.** 10-Days CARs Following the First Confirmed Case and the WHO announcements.



Source: Own study.

## 5. Conclusion

This paper provides empirical evidence on the immediate reactions of global stock markets to the unexpected outbreak of COVID-19 global pandemic, using an event study methodology. While it is too early to be certain of the pandemic effects, the results suggest that stock markets have captured investors' expectations over potential adverse economic consequences of COVID-19. Moreover, there is evidence for an underreaction to the pandemic's announcement, as shown by the delayed response of stock markets in terms of significant CARs. The findings of this paper leave a wish list of topics for future research. For instance, it would be worthwhile to investigate the pandemic's effect at a sectoral level for the affected countries—as the impact of the pandemic is unequally distributed (positively and negatively) across sectors (Bloom *et al.*, 2018; Guerrieri *et al.*, 2020). Moreover, it may be useful to examine whether the collapse of global stock markets results from contagion or local factors (e.g., COVID-19 outcomes: confirmed cases and deaths).

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