Acta Univ. Sapientiae, Economics and Business, **12** (2024) 132–159

DOI: 10.47745/auseb-2024-0007

COVID-19 or the Conflict: Examining the Catastrophic Effect on the Stock Markets of G-20 Economies

Mahesh DAHAL*
Department of Commerce, PDUAM, Tulungia – 783383, India
e-mail: maheshdahal118@gmail.com

Joy DAS
Department of Commerce, Nagaland University, Kohima Campusm Meriema, Nagaland – 797004, India
e-mail: joy.kxj@gmail.com

Paulami RAY
Academic Associate, Finance and Accounting Area, Indian Institute of Management Bangalore, Bengaluru, Karnataka – 560076, India
e-mail: paulamiray18@gmail.com

Abstract. The present study attempts to capture the stock market reactions of G-20 nations, arising because of COVID-19 and the conflict between Russia and Ukraine. To achieve its objective, the present study employed event study methodology and paired sample t-test on the index return of the G-20 nations. The study found that for the G-20 nations, the impact of COVID-19 is more severe as compared to the conflict. The region-wise analysis showed that for COVID-19, the stock markets of all regions except Europe responded negatively, and during the conflict all regions displayed significant negative returns except America.

Keywords: COVID-19, conflict, G-20 nations, stock market, event study methodology

JEL Classification: G14, G12

1. Introduction

In 2019, amidst intensifying geopolitical tensions driven by the United States–China trade war, Brexit, and the fear of recession looming over the horizon, the novel coronavirus outbreak emerged in the world like a bolt from the blue that

has caused havoc in public health, in the financial and socio-economic scenario globally. As the coronavirus disease (COVID-19) outbreak escalated from a regional emergency in China to a global catastrophe, nations around the world felt an increasing need to close down the economy to be able to get it running again. On 11 March 2020, the WHO (World Health Organization) declared the coronavirus outbreak a pandemic (WHO, 2020; Cucinotta and Vanelli, 2020), following which governments all over the world adopted unprecedented measures to limit the spread of the disease.

To curb the spread of the disease, several countries paused all major economic operations, and the repercussions of these severe measures were seen as several economies experienced historic disruptions in their labour and financial markets. Stock prices are considered a leading economic indicator, as they reflect changes in the economy long before other economic indicators (Bodie et al., 2013), and amid such uncertainties financial markets exhibited high volatility (Baker et al., 2020). Following the announcement of 11 March 2020, stock markets around the world experienced a massive plunge. The SandP 500, NASDAQ, and FTSE100 indices lost close to 10% (Stevens et al., 2020), while BSE Sensex and Nifty declined by more than 8% (Ananda, 2020); this "bloodbath" continued in the European markets too, as the stocks plunged as much as 11% (Carvalho and Adinarayan, 2020), all in a single day. However, the stocks of different sectors had varying reactions to COVID-19 depending on the impact that the outbreak had had on the operations of the business (Mazur et al., 2021).

Declining stock prices show that uncertainty and fear lead investors to behave irrationally, and consequently stock prices exhibit unexpected movements (Isidore and Christie, 2018). Thus, studying stock price movements can reveal a great deal about investors' sentiments and reactions to an event. In this vein, there has been substantial work examining the dynamics of the stock market concerning such "black swan events" in the past and also the coronavirus pandemic in particular (Bannigidadmath et al., 2022; Chowdhury et al., 2022; He et al., 2020; Mishra and Mishra, 2021; O'Donnell et al., 2021).

While the world economy was still gradually recovering from the aftermaths of the COVID-19 pandemic, it was hit with the news of Russia's invasion of Ukraine on 24 February 2022 (Zinets and Vasovic, 2022; Ellyatt, 2022). This invasion ended up in an intense geopolitical conflict whose consequences have spattered across economies and markets globally (Umar et al., 2023; Umar et al., 2022; Alam et al., 2022). Even though it is only expected that rising geopolitical tensions will lead to plunging stock prices, the diverse nature of the markets concerning their geographical location and economic strength makes some nations more resilient than others (Agyei et al., 2022; Będowska-Sojka et al., 2022; Bossman et al., 2023; Boungou and Yatié, 2022). While Russia invaded Ukraine, several Western countries, such as the United States, the members of the European Union, and the

United Kingdom, imposed economic sanctions on Russia, which were expected to result in a substantial contraction of the Russian economy (Pestova et al., 2022). Being the largest country and a major exporter nation, Russia plays a significant role in the global markets, and the economic sanctions imposed on it were expected to have an impact on global markets. Similarly, Ukraine, too, enjoys the status of being an important exporter to many nations (Gill, 2022).

It is also evident from previous literature that war is one such black swan event that influences financial markets globally (Rigobon and Sack, 2005; Leigh et al., 2003; Yousaf et al., 2022). As geopolitical and military conflicts lead to an increase in uncertainty about the future of the companies among investors, the fear leads to irrational behaviour among them, which results in variations in stock prices (Leigh et al., 2003; Choudhry, 2010; Brune et al., 2015).

Now that economic globalization has brought financial markets and financial systems of different regions closer, it has also amplified the degree of interdependency among economies. For investors, this helps in diversifying the financial risks; yet it also increases the chances of a particular financial market's risk, this way jeopardizing the stability of the global financial system (Silva et al., 2016). However, in periods of crisis and uncertainty, the intensity of the consequences in developing economies is expected to be much lesser as compared to advanced economies due to the under-developed economic system in developing markets (Naeem et al., 2023). Also, the exceptional growth potential presented by the emerging markets in recent years has drawn significant investors from the developed markets to include assets from emerging markets in their portfolios (Naeem et al., 2022; Bossman and Agyei, 2022b; Gubareva and Umar, 2020).

Given the dynamics of these markets, analysing the impact that black swan events like conflicts and pandemics can have on equity markets of nations from different economic classes and geographical locations is an important step for asset allocation, risk management, and policy formulation.

Black swan events are extremely rare, and due to the varying nature of such events, financial markets may react differently each time. Additionally, every event of such nature may or may not induce a reaction of the same intensity from global financial markets. Motivated by these issues, the current study aims to present a comparison between the stock market response to the crisis of the COVID-19 pandemic and to the Ukraine–Russia conflict on emerging and developed markets. The findings provide significant information that help gain a better understanding of the investors' behaviour towards such events. The study also aims to demonstrate the varying responses of the financial markets to such black swan events depending on the inherent nature of the market. The G-20 countries were selected for the study, as these account for around 85% of the Gross World Product and approximately 80% of global trade (Liu et al., 2017; Zhang et al., 2020). Thus, the drastic changes experienced by the global financial markets because of the above-mentioned

events can be effectively represented by this group of emerging economies and developed nations.

The rest of the article is organized as follows. Section 2 presents an extensive literature review followed by section 3 comprising all the information regarding data and methodology. Section 4 discusses the findings of the study and provides an in-depth interpretation followed by section 5, which concludes.

2. Literature Review

The COVID-19 outbreak originated in China but has rapidly made its way into different other nations, triggering a global public health crisis (Wang et al., 2020). Later, on 11 March 2020, the outbreak was declared a pandemic by the World Health Organization (WHO, 2020). Lockdowns imposed in the majority of the countries to curb the spread of the disease generated demand- and supply-side shocks and brought the world economy to a standstill (Eichenbaum et al., 2020; Gormsen and Koijen, 2020; Fetzer et al., 2021). The impact of the measures was evident from the disruptions in the real and financial sectors of the affected countries (Banco De Espana, 2020). The financial markets of developing and advanced economies exhibited high volatility and downturns (Anh and Gan, 2021; Narayan et al., 2020; Zhang et al., 2020). Panic and negative sentiments of the investors and other market participants are believed to be the main triggers of the negative stock market performance amid the pandemic (Mishra and Mishra, 2021; Mishra et al., 2020). It has also been observed that an increase in the number of COVID-19 cases directly influenced market volatility (Haroon and Rizvi, 2020; Mishra et al., 2020; Al-Awadhi et al., 2020). Recent studies have also focused on analysing the reasons behind the plummeting stock prices in COVID-19-stricken countries. The studies of Baker et al. (2020), Scherf et al. (2022), and Ashraf (2020a) observed that government-imposed restrictions on movement and pauses in economic operations had a direct impact on the falling stock prices. However, a surge in the number of positive cases of COVID-19 and the number of deaths due to COVID-19 were seen to be affecting stock market movements negatively (Anh and Gan, 2021; Khan, et al., 2020). Sharif et al. (2020) find that the decline in oil prices amid the pandemic is also responsible for the stock market volatility during that period. Taking into consideration the extent of the COVID-19 pandemic, researchers have made numerous attempts to gauge the impact of COVID-19 on the financial markets. Ashraf (2020b) studied the reaction of the stock market and observed a negative relation between the number of cases and stock market returns. A study on the US and European stock markets by Heyden and Heyden (2021) also revealed a negative response of the stock markets to news of COVID-19-related deaths. Bakry et al. (2022), Bannigidadmath et al. (2022), Rahman et

al. (2021), Ashraf (2020a), and Harjoto et al. (2021) looked into the impact that stimulus packages declared by governments had had on the stock market and noticed that the stock market of the respective countries had showed positive reactions to it. There has also been substantial work examining the impact that the COVID-19 pandemic has had across economies, and the results reveal how the pandemic has influenced the stock markets negatively (Ganie et al., 2022; Harjoto et al., 2021; Xu, 2021; Fernandez-Perez et al., 2021; Hasan et al., 2021). In their work, Pandey and Kumari (2021) examined the impact of COVID-19 on the global stock markets, and the results show that the impact on the developed markets is more significant in the long run as compared to that of the emerging nations. Moreover, the study also shows that the impact on the Asian countries is significantly more as compared to that of the American countries. There are also quite a few studies examining the impact of COVID-19 on the stock markets' volatility both at the aggregate and industry levels. Izzeldin et al. (2023) considered the G7 economies and observed heightened volatility and negative impact on consumer services and the healthcare sector. Zehri (2021) considering the Asian and U.S. stock markets and Bora and Basistha (2021) considering the Indian stock market concluded that the pandemic had led to heightened volatility, whereas Li et al. (2021) considering G-20 countries found that the developed economies were the primary spillover transmitters, whereas the developing economies were only the receivers. Studies by Mazur et al. (2021) and Baek et al. (2020) examined the sectoral performance of the markets and noticed that the real estate, hospitality, transportation, and entertainment sectors exhibited a drastic fall, whereas the food and healthcare sectors were resilient during the pandemic.

Thus, it is evident from the above that in recent years the attention of researchers in examining the financial effects of crises has increased as a result of COVID-19, and there has also been significant effort in covering the many aspects of the crisis. However, studies focusing on the impact that conflicts have on global financial markets are comparatively scarce. The work of Frey and Kucher (2000) records the negative impact that wars have on the government bond prices of warring nations. Leigh et al. (2003) examined the impact of the U.S.-led war in Iraq on the stock markets around the world and noticed a substantial fall in the stock prices with an increase in the probability of war, while Schneider and Troeger (2006) considered three events of conflict, namely the war between Israel and the Palestinians, the U.S.-led conflict with Iraq, and the civil wars in former Yugoslavia, and found that all three events influenced the stock market negatively. Regarding the Ukraine–Russia conflict started in 2022, Alam et al. (2022) examine its impact on the connectedness of stock markets and commodity markets of G7 and BRIC nations. The results suggest that gold and silver commodities and the US, China, and Brazil are receivers of shocks,

whereas the other countries are major transmitters of shock. The impact of the Russia–Ukraine crisis on the Australian stock market was analysed by Kamal et al. (2023), which revealed a negative impact on the market. Das et al. (2023) investigated the impact of the conflict on the European stock markets and found a negative effect of the same. Additionally, they also found that the manufacturing, mining, and construction sectors were more affected as compared to other sectors. Sun et al. (2022), Izzeldin et al. (2023), and Sun and Zhang (2023) analysed the varying impacts of the war on global financial markets and noticed that the EU markets experienced more negative effects as compared to other nations. The influence of the Russia–Ukraine geopolitical risk on the major currencies of the world was also studied by Bossman et al. (2023), and it has been observed that the effects were asymmetric across the currencies with CHF and EUR, showing significant insensitivity towards GPR. Federle et al. (2022) further studied if proximity to warring nations has any impact on the economy of a country, and results show that the countries near the warring nations generate more negative returns compared to other countries. Yousaf et al. (2022) analysed the impact that the Ukraine–Russia conflict has on the G-20 nations, and the study revealed that the markets of Poland, Russia, and Hungary exhibit negative reactions in the pre-event window, whereas the other countries react negatively in the post-event window. Moreover, the impact of the Ukraine–Russia-induced geopolitical risk on the E7 and G7 nations was studied by Bossman and Gubareva (2023b), who, again, revealed asymmetric effects across the nations where the markets of Russia and China exhibited significant downfall.

Though there have been published plenty of works on the two major crises of recent times, it is noticeable from the existing literature that there has not been any study comparing the reactions of the global financial markets to two of the most catastrophic events of the recent times. Thus, with this study, we specifically aim to fill this gap in the literature by analysing the impacts of "black swan" events on stock markets, and the researchers also intend to illustrate how the stock markets' responses vary with the nature of the event.

3. Data and Methodology

The Sample

Taking into account the objective, the present study considered the indices of the G-20 countries. The sample consists of 20 countries; however, excluding the European Union, the final sample comprises 19 countries. The final sample countries are further classified into developed/developing countries and region-wise, and the same are presented in *Table 1*.

Table 1. *Classification of the G-20 nations*

G-20 Countries	Developed / Developing	G-20 Countries	Developed / Developing
All Africa		**All Europe**	
South Africa	Developing Economy	France	Developed Economy
All Americas		Germany	Developed Economy
Argentina	Developing Economy	Italy	Developed Economy
Brazil	Developing Economy	Russia	Developed Economy
Canada	Developed Economy	Türkiye	Developing Economy
Mexico	Developing Economy	United Kingdom	Developed Economy
United States	Developed Economy	**All Middle East**	
All Asia/Pacific		Saudi Arabia	Developing Economy
Australia	Developed Economy		
China	Developing Economy		
India	Developing Economy		
Indonesia	Developing Economy		
Japan	Developed Economy		
South Korea	Developing Economy		

Source: author's compilation

The Data

The present study is based on secondary data, i.e. closing prices, collected from an open-source website, investing.com, around the outbreak of COVID-19 and the conflict between Russia and Ukraine.

Events under Study

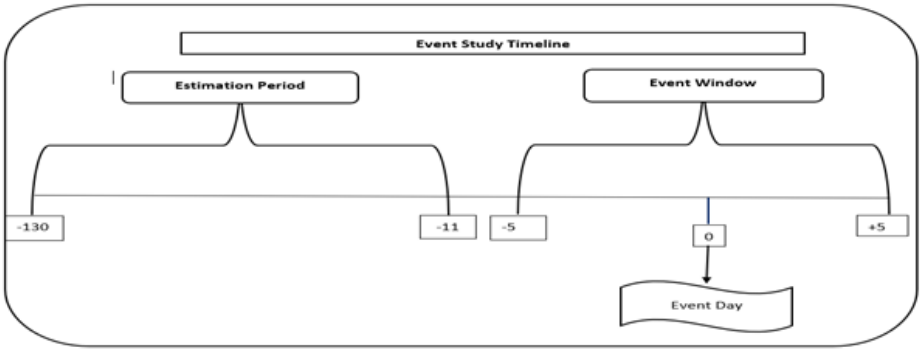
In recent times, the world has witnessed two large-scale devastating events in the form of the COVID-19 pandemic and the conflict between Russia and Ukraine. Both events have impacted almost every nation of the world directly and indirectly as well. Considering the same, the present study has looked into both events to see their impact on the stock market of G-20 nations. In the present study, 11 March 2020 is considered as the announcement date for COVID-19 and 24 February 2022 as the announcement date for the Russia–Ukraine conflict.

Tools and Techniques

The present study employed the event study methodology to empirically capture the market behaviour around the occurrence of an event. This method is considered

one of the effective and popular methods that evaluate the influence of an event on the securities return around the event days. It facilitates the forecasting of securities returns around the announcement of an event (Anwar et al., 2017). Several authors, namely Fama et al. (1969), Brown and Warner (1980), and MacKinlay (1997), played a critical role in enhancing, developing, and popularizing the methodology among finance scholars.

The analysis performed with the help of the event study methodology begins with finalizing the estimation period, and then the impact of the event under study is examined during the event period. Based on Peterson (1989), according to whom a longer time horizon gives better estimation, the estimation period of 120 days is considered and an event window of 11 days (-5 days to +5 days), and the same is graphically presented in *Figure 1*.



Source: authors' calculation

Figure 1. *Event study timeline*

At the outset, the daily returns of the security ($R_{j,t}$) are determined by dividing the price of the security, "j" for the day, "t" with the price of the same security on day, "t–1". In this study, the Excel function "ln", which represents the natural logarithm, is employed for computing the returns of the securities. This approach yields returns that exhibit minimal to no skewness and serial correlation. In essence, utilizing the natural logarithm serves to enhance and improve the normality of the return series.

Proceeding further, the mean return calculated during the estimation period is taken as expected returns E(R) for each index. The study has employed the Stata function as suggested by Pacicco et al. (2018) for conducting the event study.

Further, the abnormal returns (AR) are calculated by subtracting the expected returns E (R) from the actual returns ($R_{j,t}$).

Thereafter, the abnormal returns are calculated for a pool of firms through a cross-sectional aggregation of the abnormal returns.

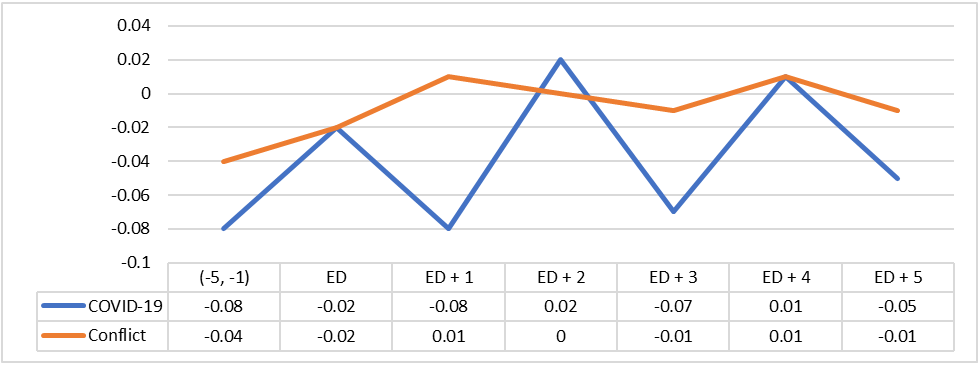
To gain further insight about behaviour, the AAR is aggregated over a period of time, and the impact of the event is observed within those shorter windows, known as cumulative average abnormal returns (CAAR), and is calculated as follows:

After completing the calculation of AAR and CAAR, the final step in the methodology is to examine the economic relevance of the AAR and CAAR by their statistical significance, which is tested using a parametric t-test. Further, to compare the impact of the events, a paired sample t-test is employed on the AAR during COVID-19 and the conflict.

4. Data Analysis and Interpretation

Impact of COVID-19 and the Conflict on the Stock of the G-20 Nations

Figure 2 displays the average changes in the stock of G-20 economies around the event period of the outbreak of COVID-19 and the conflict. From the figure, it can be seen that the stock of G-20 economies is in a positive trend during the conflict as compared to COVID-19. During the pre-event window of both events, the stock was in a negative trend, and on the event day, the stock displayed a similar reaction, but as the days passed, the stock reaction differed depending on the event. Further, the significance of the abnormal returns is tested, and the same is presented in *Table 2*.



	(-5, -1)	ED	ED + 1	ED + 2	ED + 3	ED + 4	ED + 5
COVID-19	-0.08	-0.02	-0.08	0.02	-0.07	0.01	-0.05
Conflict	-0.04	-0.02	0.01	0	-0.01	0.01	-0.01

Source: authors' calculation

Figure 2. *Reaction of G-20 nations during COVID-19 and the conflict*

From *Table 2*, it can be seen that during both events the stock reactions were similar, i.e. -2.00 per cent on the event day. During the pre-event stage, the stock presented a negative impact of 8.00 per cent for COVID-19 and 4.00 per cent for the conflict. Immediately after the outbreak, i.e. on ED + 1, the stock return during COVID-19 is significantly negative; however, in the case of the conflict, a significant positive

trend is witnessed in the stock return. During COVID-19, the market continued to be in a negative trend except for ED + 2 and ED + 4, while during the conflict the market continued to exhibit a positive trend except for ED + 1, ED + 2, and ED + 4.

Table 2. *Reaction of G-20 economies during COVID-19 and the conflict*

Windows	COVID-19	p-v	Conflict	p-v
(-5, -1)	-0.08	0.00***	-0.04	0.00***
ED	-0.02	0.00***	-0.02	0.00***
ED + 1	-0.08	0.00***	0.01	0.00***
ED + 2	0.02	0.00***	0.00	0.11
ED + 3	-0.07	0.00***	-0.01	0.00***
ED + 4	0.01	0.01**	0.01	0.01**
ED + 5	-0.05	0.00***	-0.01	0.05*

Source: authors' calculation

Note: significance levels: * p < 0.10, ** p < 0.05, and *** p < 0.01.

Further, a paired sample t-test was conducted (*Table 3*), which indicated significant differences in the reaction of the G-20 nations around COVID-19 and the conflict. Of the two events, COVID-19 seems to have an adverse effect on the stock of G-20 nations.

Table 3. *Paired sample test of means of G-20 nations during COVID-19 and the conflict*

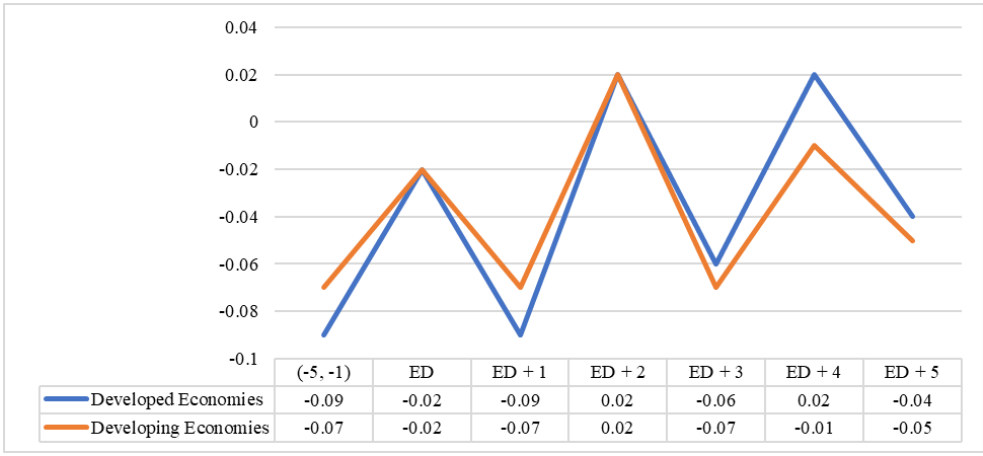
	COVID-19	***Conflict***
Mean	-0.039	-0.009
Observations	7	7
P(T <= t) two-tail	0.08*	
t Critical two-tail	2.44	

Source: authors' calculation

Note: significance levels: * p < 0.10, ** p < 0.05, and *** p < 0.01.

The Impact of COVID-19 on the Stock of Developed and Developing Nations

Figure 3 displays the average changes in the stocks of developed and developing nations around the event period of the outbreak of COVID-19. From the figure, it can be seen that the stocks of both developed and developing nations moved symmetrically with only minor variations. Further, the significance of the abnormal returns is tested, and the same is presented in *Table 4*.



	(-5, -1)	ED	ED + 1	ED + 2	ED + 3	ED + 4	ED + 5
Developed Economies	-0.09	-0.02	-0.09	0.02	-0.06	0.02	-0.04
Developing Economies	-0.07	-0.02	-0.07	0.02	-0.07	-0.01	-0.05

Source: authors' calculation

Figure 3. *Reaction of developed and developing nations during COVID-19*

From *Table 4*, it can be seen that during both events the stock reaction was similar, i.e. -2.00 per cent on the event day. During the pre-event period, the stock represented a negative impact of 9.00 per cent for developed nations and 7.00 per cent for developing nations. Immediately after the outbreak, i.e. on ED + 1, the stocks of both developed and developing nations displayed a negative reaction. However, on ED + 2, a positive response of 2.00 per cent was witnessed for each category. Then again, on ED + 3 and ED + 5, both types of nations displayed negative reactions, while on ED + 4, developed nations showed a positive trend and developing nations exhibited insignificant negative returns.

Table 4. *Reactions of developed and developing economies during COVID-19*

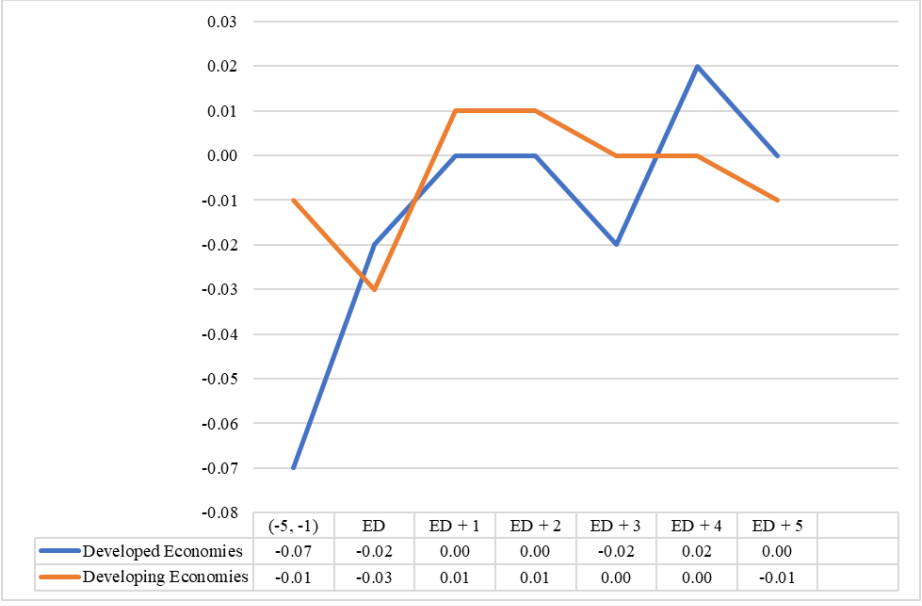
Windows / G-20 Economies	(-5, -1)		ED		ED + 1		ED + 2		ED + 3		ED + 4		ED + 5	
	CAR	p-v	CAR	p-v	CAR	p-v	CAR	p-v	CAR	p-v	CAR	p-v	CAR	p-v
Developed Economies	-0.09	0.00***	-0.02	0.00***	-0.09	0.00***	0.02	0.00***	-0.06	0.00***	0.02	0.00***	-0.04	0.00***
Developing Economies	-0.07	0.00***	-0.02	0.00***	-0.07	0.00***	0.02	0.00***	-0.07	0.00***	-0.01	0.20	-0.05	0.00***

Source: authors' calculation

Note: significance levels: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Impact of the Conflict on the Stock of Developed and Developing Nations

Figure 4 demonstrates the behaviour of developed and developing nations during the conflict, and it becomes clear from the response that, when compared to developing nations, stocks of developed nations were far more sensitive towards the event of the conflict between Russia and Ukraine. On the event day, the stocks of developed nations experienced a greater negative impact compared to developing nations. Followed by a short recovery on ED + 1 and ED + 2, the downward trend continued in the stock markets of developing economies from ED + 3 in the post-event period, whereas for developed nations the results were mixed. Further, the significance of the abnormal returns is tested, and the same is presented in *Table 5*.



	(-5, -1)	ED	ED + 1	ED + 2	ED + 3	ED + 4	ED + 5
Developed Economies	-0.07	-0.02	0.00	0.00	-0.02	0.02	0.00
Developing Economies	-0.01	-0.03	0.01	0.01	0.00	0.00	-0.01

Source: authors' calculation

Figure 4. *Developed and developing nations during the conflict*

It is evident from *Table 5* that during the pre-announcement period, the stock markets of both developed and developing nations exhibited a negative trend with statistically significant negative returns in the case of developed nations. On the event day, both developed and 22 developing nations' stock markets experienced significant negative returns. On the contrary, immediately after the ED, i.e. on ED + 1 and ED + 2, stock markets of both developed and developing nations exhibited positive returns, which were statistically significant in the case of developing nations only. On the following days, i.e. on ED + 3, developed nations experienced negative returns followed by positive returns on ED + 4, all of which were statistically significant.

Table 5. *Reactions of developed and developing countries during the conflict*

Windows / G-20 Economies	(-5, -1)		ED		ED + 1		ED + 2		ED + 3		ED + 4		ED + 5	
	CAR	p-v	AR	p-v	AR	p-v	AR	p-v	AR	p-v	AR	p-v	AR	p-v
Developed Economies	-0.07	0.00***	-0.02	0.00***	0.00	0.45	0.00	0.38	-0.02	0.00***	0.02	0.00***	0.00	0.18
Developing Economies	-0.01	0.20	-0.03	0.00***	0.01	0.00***	0.01	0.01**	0.00	0.53	0.00	0.93	-0.01	0.15

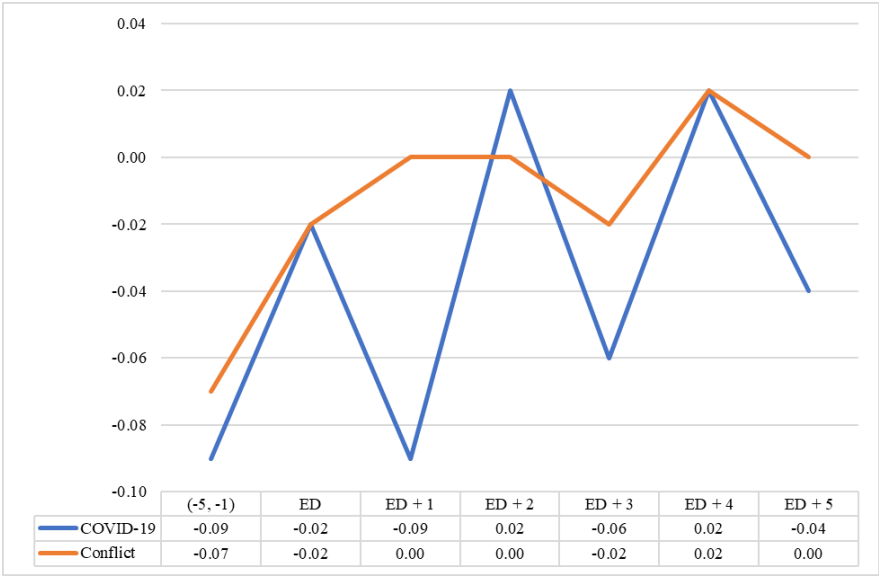
Source: authors' calculation

Note: significance levels: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Impact of COVID-19 and the Conflict on the Stock of Developed Nations

Figure 5 presents the behaviour of developed nations during COVID-19 and the conflict. The stocks of developed nations are comparatively more sensitive towards COVID-19 than towards the conflict. Moreover, on the event day, both events are seen to have caused a similar reaction in the stock markets of developed nations, i.e. a negative one. However, in the subsequent days, the markets exhibited higher fluctuation in times of COVID-19, while they appeared to be more stable during the conflict.

Further, the significance of the abnormal returns is tested, and the same is presented in *Table 6*.



Source: authors' calculation

Figure 5. *Developed nations during COVID-19 and the conflict*

Table 6 further confirms that in the pre-announcement period of both events, the stock markets of developed nations exhibited a negative trend that continued up until the event day. In the case of COVID-19, the market demonstrated high volatility with statistically significant negative returns on ED + 1, ED + 3, and ED + 5 followed by a positive reaction on ED + 2 and ED + 4. However, in the case of the conflict, statistically significant negative returns are observed only on ED + 3 followed by significant positive returns on ED + 4.

Table 6. *Reactions of developed economies during COVID-19 and the conflict*

Windows	COVID-19	p-v	Conflict	p-v
(-5, -1)	-0.09	0.00***	-0.07	0.00***
ED	-0.02	0.00***	-0.02	0.00***
ED + 1	-0.09	0.00***	0.00	0.45
ED + 2	0.02	0.00***	0.00	0.38
ED + 3	-0.06	0.00***	-0.02	0.00***
ED + 4	0.02	0.00***	0.02	0.00***
ED + 5	-0.04	0.00***	0.00	0.18

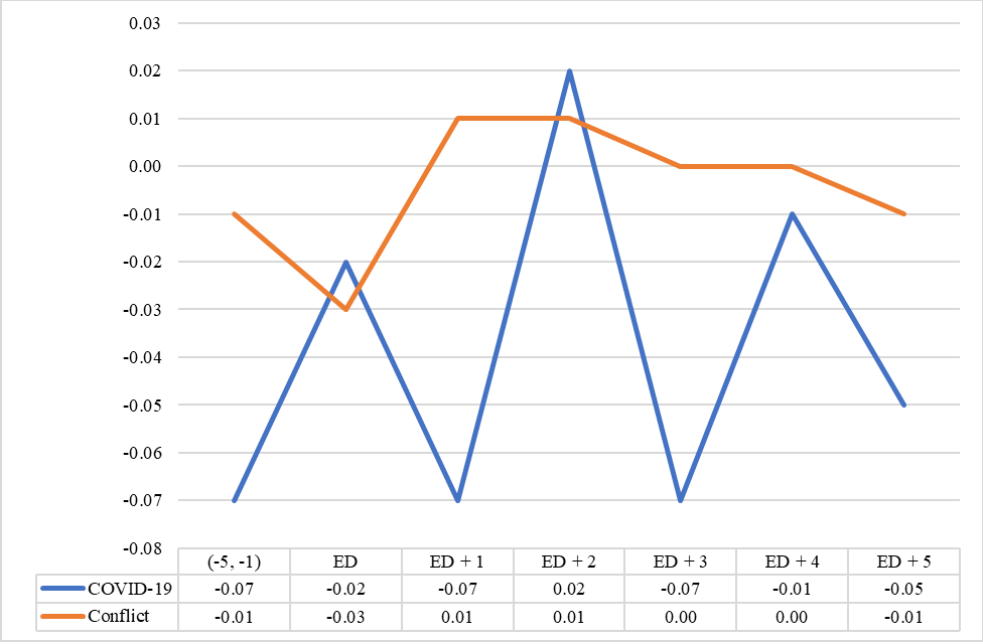
Source: authors' calculation

Note: significance levels: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Impact of COVID-19 and the Conflict on the Stock of Developing Nations

Figure 6 presents the behaviour of developing nations during COVID-19 and the conflict. The stock markets of developing nations are found to be comparatively more sensitive to the COVID-19 outbreak than to the conflict. However, on the event day, the announcement of the conflict caused a rather adverse reaction in the markets of developing economies, but on the subsequent days, the markets appeared to be a lot more stable. On the other hand, in the case of COVID-19, stocks exhibited a greater degree of volatility in the post-announcement period. Further, the significance of the abnormal returns is tested, and the same is presented in *Table 7*.

From *Table 7*, it can be observed that during the pre-announcement period of both events, the stock market exhibited a negative trend, and the same continued up until the event day. However, on ED + 1 for the conflict, the returns were positive and significant, while in the case of COVID-19, the markets continued to be in a negative trend. In the case of the conflict, the stocks continued to be in a positive trend except ED + 5, but none were significant, while in the case of COVID-19, the returns continued to be in a negative trend, and all were significant except for ED + 4.



Source: authors' calculation

Figure 6. *Developing nations during COVID-19 and the conflict*

Table 7. *Reactions of developing economies during COVID-19 and the conflict*

Windows	COVID-19	p-v	Conflict	p-v
(-5, -1)	-0.07	0.00***	-0.01	0.2
ED	-0.02	0.00***	-0.03	0.00***
ED + 1	-0.07	0.00***	0.01	0.00***
ED + 2	0.02	0.00***	0.01	0.01**
ED + 3	-0.07	0.00***	0.00	0.53
ED + 4	-0.01	0.2	0.00	0.93
ED + 5	-0.05	0.00***	-0.01	0.15

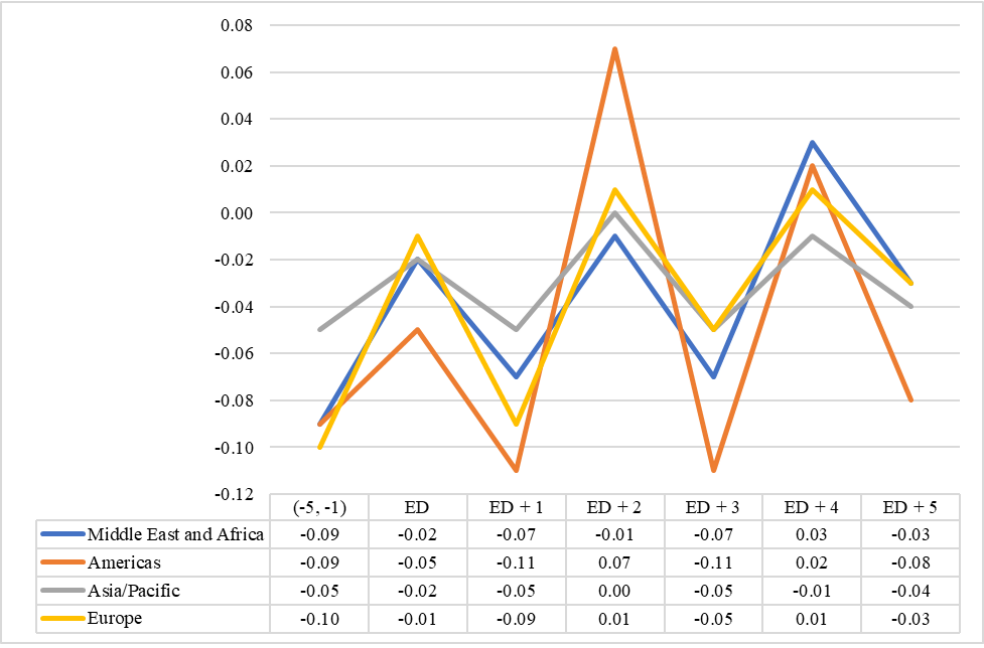
Source: authors' calculation

Note: significance levels: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Region-Wise Impact of COVID-19

Figure 7 presents the stock market behaviour of all regions under G-20 nations during the COVID-19 pandemic and finds that all the stock markets are sensitive towards the outbreak of COVID-19. On event day, all the stock markets report

negative returns, and the markets continue their downward trend on ED + 2. From this, it can be said that the market is slow in responding to the information released during the outbreak of COVID-19. In the subsequent days, a significant fluctuation can be observed, which indicates investors' confused state of mind regarding the COVID-19 pandemic. Further, the significance of the abnormal returns is tested, and the same is presented in *Table 8*.



	(-5, -1)	ED	ED + 1	ED + 2	ED + 3	ED + 4	ED + 5
Middle East and Africa	-0.09	-0.02	-0.07	-0.01	-0.07	0.03	-0.03
Americas	-0.09	-0.05	-0.11	0.07	-0.11	0.02	-0.08
Asia/Pacific	-0.05	-0.02	-0.05	0.00	-0.05	-0.01	-0.04
Europe	-0.10	-0.01	-0.09	0.01	-0.05	0.01	-0.03

Source: authors' calculation

Figure 7. *Region-wise impact of COVID-19*

From *Table 8*, it becomes clear that during the pre-announcement period of COVID-19, stock markets of all the major regions exhibit a negative trend that continues up until ED + 1. However, from ED + 2 onwards, the markets experience high volatility, as the market returns on ED + 2 and ED + 4 are positive and significant for the majority of the regions followed by negative returns on ED + 3 and ED + 5. These fluctuations reflect investors' confused state of mind due to anxiety and fear concerning COVID-19.

Further, a paired sample t-test is conducted (*Table 9*), which found that there was no significant difference in the reactions of the different regions around the COVID-19 pandemic.

Table 8. *Region-wise impact of COVID-19*

Windows / Region	(-5, -1)		ED		ED + 1		ED + 2		ED + 3		ED + 4		ED + 5	
	CAAR	p-v	CAAR	p-v	CAAR	p-v	CAAR	p-v	CAAR	p-v	CAAR	p-v	CAAR	p-v
Middle East and Africa	-0.09	0.00***	-0.02	0.00***	-0.07	0.00***	-0.01	0.30	-0.07	0.00***	0.03	0.00***	-0.03	0.00***
Americas	-0.09	0.00***	-0.05	0.00***	-0.11	0.00***	0.07	0.00***	-0.11	0.00***	0.02	0.01**	-0.08	0.00***
Asia/ Pacific	-0.05	0.00***	-0.02	0.00***	-0.05	0.00***	0.00	0.26	-0.05	0.00***	-0.01	0.04**	-0.04	0.00***
Europe	-0.10	0.00***	-0.01	0.39	-0.09	0.00***	0.01	0.07***	-0.05	0.00***	0.01	0.18	-0.03	0.00***

Source: authors' calculation

Note: significance levels: * p < 0.10, ** p < 0.05, and *** p < 0.01.

Table 9. *Region-wise analysis*

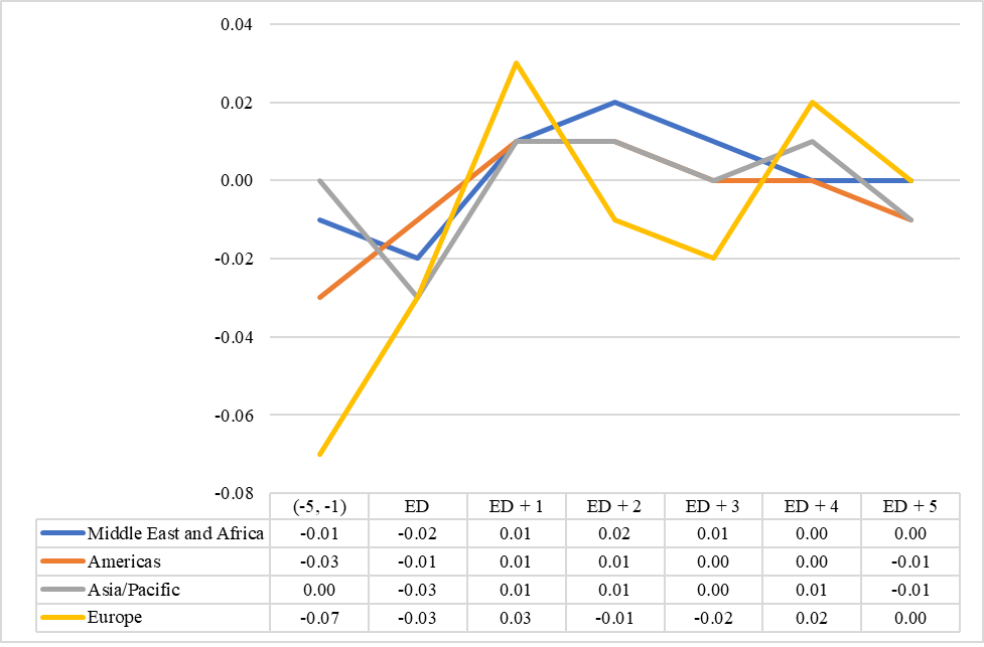
Impact of COVID-19				
SI No.	Region(s)	Mean	t-stat	p-v
1	*Middle East and Africa*	-0.037	0.762	0.237
	Americas	-0.050		
2	*Middle East and Africa*	-0.037	-0.588	0.289
	Asia/Pacific	-0.031		
3	*Middle East and Africa*	-0.037	0.000	0.500
	Europe	-0.037		
4	*Americas*	-0.050	-0.993	0.179
	Asia/Pacific	-0.031		
5	*Americas*	-0.050	-0.804	0.226
	Europe	-0.037		
6	*Asia/Pacific*	-0.031	0.548	0.302
	Europe	-0.037		

Source: authors' calculation

Note: significance levels: * p < 0.10, ** p < 0.05, and *** p < 0.01.

Region-Wise Impact of the Conflict

Figure 8 depicts the reactions of stock markets of different regions around the announcement of the conflict. It is clear from the figure that except for Europe the stock markets of all the other regions exhibit a stable and upward trend around the outbreak of the conflict. The stocks of Europe exhibited a higher degree of fluctuation as compared to other regions. Further, the statistical significance of the fluctuations is tested using a t-test, and the same is displayed in *Table 10*.



	(-5, -1)	ED	ED + 1	ED + 2	ED + 3	ED + 4	ED + 5
Middle East and Africa	-0.01	-0.02	0.01	0.02	0.01	0.00	0.00
Americas	-0.03	-0.01	0.01	0.01	0.00	0.00	-0.01
Asia/Pacific	0.00	-0.03	0.01	0.01	0.00	0.01	-0.01
Europe	-0.07	-0.03	0.03	-0.01	-0.02	0.02	0.00

Source: authors' calculation

Note: significance levels: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Figure 8. *Region-wise impact of conflict*

Table 10 shows that during the pre-announcement period, stock markets in all the regions except Asia/Pacific generated negative returns. On the event day, all the markets except for the Americas continued to react negatively. However, on ED + 1, the stock markets of the Americas, Asia/Pacific, and Europe exhibited positive reactions, which were also reflected in the markets of the Middle East/Africa and Americas on the subsequent days. However, a significant negative response is observed in the markets of Europe on ED + 2, ED + 3, and Asia/Pacific on ED + 5. This indicates the post-conflict negative effect on the stock of the Asia/Pacific region and Europe.

Table 10. *Region-wise impact of the conflict*

Windows / G-20 Economies	Middle East and Africa	p-v	Americas	p-v	Asia/ Pacific	p-v	Europe	p-v
(-5, -1)	-0.01	0.60	-0.03	0.01**	0.00	0.61	-0.07	0.00***
ED	-0.02	0.00***	-0.01	0.31	-0.03	0.00***	-0.03	0.00***
ED + 1	0.01	0.27	0.01	0.03**	0.01	0.00***	0.03	0.00***
ED + 2	0.02	0.01**	0.01	0.07*	0.01	0.17	-0.01	0.04**
ED + 3	0.01	0.17	0.00	0.59	0.00	0.97	-0.02	0.00***
ED + 4	0.00	0.88	0.00	0.96	0.01	0.17	0.02	0.01**
ED + 5	0.00	0.75	-0.01	0.13	-0.01	0.04**	0.00	0.96

Source: authors' calculation

Note: significance levels: * p < 0.10, ** p < 0.05, and *** p < 0.01.

A paired sample t-test is conducted to present the difference in reactions, and the same is displayed in *Table 11*. From the table, it is evident that the mean returns of only the Middle East and Africa and the Americas are significantly different from each other, while in the case of the other regions, there is no significant difference in the reactions around the outbreak of the conflict.

Table 11. *Region-wise analysis*

	Impact of the Conflict			
SI No.	Region(s)	Mean	t-stat	p-v
1	*Middle East and Africa*	0.001	1.549	0.086*
	Americas	-0.004		
2	*Middle East and Africa*	0.001	0.795	0.229
	Asia/Pacific	-0.001		
3	*Middle East and Africa*	0.001	1.162	0.145
	Europe	-0.011		
4	*Americas*	-0.004	-0.505	0.316
	Asia/Pacific	-0.001		
5	*Americas*	-0.004	0.801	0.227
	Europe	-0.011		
6	*Asia/Pacific*	-0.001	0.866	0.210
	Europe	-0.011		

Source: authors' calculation

Note: significance levels: * p < 0.10, ** p < 0.05, and *** p < 0.01.

A Comparative Chart on the Reactions of Different Regions during COVID-19 and the Conflict

Here the reaction of each region during COVID-19 and the conflict is compared using a paired sample t-test. From *Table 12*, it is evident that there exists a significant difference in the reactions of the Middle East and Africa during COVID-19 and the conflict. A similar result is witnessed for the Americas and Asia/Pacific; however, in the case of Europe, no significant difference is witnessed in the reactions during COVID-19 and the conflict.

Table 12. *Comparison of the impact of COVID-19 and the conflict on different regions*

Regions	Event	Mean	t-stat	p-v
Middle East and Africa	COVID-19	-0.04	-2.33	0.03**
	Conflict	0.00		
Americas	COVID-19	-0.05	-1.84	0.06*
	Conflict	0.00		
Asia/Pacific	COVID-19	-0.03	-3.15	0.01**
	Conflict	0.00		
Europe	COVID-19	-0.04	-1.44	0.10
	Conflict	-0.01		

Source: authors' calculation

Note: significance levels: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

5. Conclusions

The COVID-19 pandemic has wreaked havoc all over the world, and the financial consequences were felt all over the financial markets. On the other hand, Russia's invasion of Ukraine led to an intense geopolitical conflict, whose financial implications were felt in the markets globally. Given the varying nature of these events, the present study is an attempt to examine the impact of the COVID-19 outbreak and the Russia–Ukraine conflict on the stock market using an extensive sample of G-20 nations. The sample has been classified into developing and developed nations, and another classification has been carried out based on their region to facilitate the analysis and comparison of the different market reactions. To achieve its objective, the present study employed event study methodology and paired sample t-test on the index return of the G-20 nations.

Results revealed that stock markets all over the world experienced negative returns on the event day for both events. Our findings demonstrate that the stock markets all over the world experienced higher volatility and negative returns during the COVID-19 pandemic, and the same results are confirmed by previous studies (see Anh and Gan, 2021; Ashraf, 2020b; Al-Awadhi et al., 2020; Ganie et al., 2022; Mishra and Mishra, 2021; Mishra et al., 2020), where the stock market indices of different nations exhibited strong negative reactions and an increased degree of volatility. During COVID-19, developing nations experienced a higher volatility caused by the heightened uncertainty related to the pandemic, leading to panic selling in stock markets. The difference in the reactions of the emerging markets as compared to that of the developed markets can also be corroborated by other studies (Harjoto et al., 2021; Pandey and Kumari, 2021).

In the region-wise analysis during COVID-19, the present study finds that there exists no significant differences among the reactions of the various regions, as all the markets experienced significant negative returns and heightened volatility. However, Pandey and Kumari (2021) find that the Asian stock markets have been significantly affected, whereas the American markets have not experienced any significant impact. The present findings regarding the impact of the conflict is comparable to that of Yousaf et al. (2022), who found the adverse impact of the event on the stock markets of G-20 nations. Higher volatility and negative returns in the European and Asian market can be observed from the region-wise analysis conducted during the present study. The difference in reaction can be further backed by the studies of Federle et al. (2022) and Bossman and Gubareva (2023b), which conclude that financial markets closer to and more connected with the warring nations experience higher negative returns. The present study finds an overall negative reaction of the markets to the Russia–Ukraine conflict, which is consistent with previous literature (Kamal et al., 2023; Das et al., 2023).

The findings of the present study provide a clear depiction of the differences and similarities in the market reactions. The findings are extremely valuable and have practical implications for decision makers such as market regulators, investors, and governments across the globe in understanding how such global events resonate within a specific region, as it can be particularly useful to formulate country-specific measures to strengthen stock market resilience globally.

The present study has at least two known drawbacks, the first of which being the consideration of limited events and the second being the limited sample size of only 20 nations. Apart from that, a longer window can also be considered in future research to analyse and compare the long-term behaviour of the markets.

References

Agyei, S. K.; Owusu Junior, P. O.; Bossman, A.; Asafo-Adjei, E.; Asiamah, O.; Adam, A. M. (2022). Spillovers and contagion between BRIC and G7 markets: New evidence from time-frequency analysis. *PLOS ONE* 17(7): e0271088. DOI: 10.1371/journal.pone.0271088.

Al-Awadhi, A. M.; Alsaifi, K.; Al-Awadhi, A.; Alhammadi, S. (2020). Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. *Journal of Behavioral and Experimental Finance* 27: 100326. DOI: 10.1016/j.jbef.2020.100326.

Alam, M. K.; Tabash, M. I.; Billah, M.; Kumar, S.; Anagreh, S. (2022). The impacts of the Russia–Ukraine invasion on global markets and commodities: A dynamic connectedness among G7 and BRIC markets. *Journal of Risk and Financial Management* 15(8). DOI: 10.3390/jrfm15080352.

Ananda, J. (2020, 12 March). Pandemic pandemonium: World markets crash into bear country on Black Thursday. *The New Indian Express*. Retrieved from: https://www.newindianexpress.com/nation.

Anh, D. L. T.; Gan, C. (2021). The impact of the COVID-19 lockdown on stock market performance: Evidence from Vietnam. *Journal of Economic Studies* 48(4): 836–851. DOI: 10.1108/JES-06-2020-0312.

Anwar, S.; Singh, S.; Jain, P. K. (2017). Impact of cash dividend announcements: Evidence from the Indian manufacturing companies. *Journal of Emerging Market Finance* 16(1): 29–60. DOI: 10.1177/0972652716686238.

Ashraf, B. N. (2020a). Economic impact of government interventions during the COVID-19 pandemic: International evidence from financial markets. *Journal of Behavioral and Experimental Finance* 27: 100371. DOI: 10.1016/j.jbef.2020.100371.

(2020b). Stock markets' reaction to COVID-19: Cases or fatalities? *Research in International Business and Finance* 54: 101249. DOI: 10.1016/j.ribaf.2020.101249.

Baek, S.; Mohanty, S. K.; Glambosky, M. (2020). COVID-19 and stock market volatility: An industry-level analysis. *Finance Research Letters* 37: 101748. DOI: 10.1016/j.frl.2020.101748.

Baker, S. R.; Bloom, N.; Davis, S. J.; Kosht, K. J.; Sammon, M. C.; Viratyosin, T. (2020). *The unprecedented stock market impact of COVID-19*. NBER Working Paper no. 26945.

Bakry, W.; Kavalmthara, P. J.; Saverimuttu, V.; Liu, Y.; Cyril, S. (2022). Response of stock market volatility to COVID-19 announcements and stringency measures: A comparison of developed and emerging markets. *Finance Research Letters* 46: 102350. DOI: 10.1016/j.frl.2021.102350.

Bannigidadmath, D.; Narayan, P. K.; Phan, D. H. B.; Gong, Q. (2022). How stock markets reacted to COVID-19? Evidence from 25 countries. *Finance Research Letters* 45: 102161. DOI: 10.1016/j.frl.2021.102161.

Baur, D. G.; Lucey, B. M. (2009). Flights and contagion—An empirical analysis of stock–bond correlations. *Journal of Financial Stability* 5(4): 339–352. DOI: 10.1016/j.jfs.2008.08.001.

Będowska-Sojka, B.; Demir, E.; Zaremba, A. (2022). Hedging geopolitical risks with different asset classes: A focus on the Russian invasion of Ukraine. *Finance Research Letters* 50. DOI: 10.1016/j.frl.2022.103192.

Bodie, Z.; Kane, A.; Marcus, A. J. (2013). *Essentials of investments*. New York: McGraw-Hill.

Bora, D.; Basistha, D. (2021). The outbreak of COVID-19 pandemic and its impact on stock market volatility: Evidence from a worst-affected economy. *Journal of Public Affairs* 21(4): e2623. DOI: 10.1002/pa.2623.

Bossman, A.; Agyei, S. K. (2022b). Interdependence structure of global commodity classes and African equity markets: A vector wavelet coherence analysis. *Resources Policy* 79. DOI: 10.1016/j.resourpol.2022.103039.

Bossman, A.; Gubareva, M. (2023b). Asymmetric impacts of geopolitical risk on stock markets: A comparative analysis of the E7 and G7 equities during the Russian–Ukrainian conflict. *Heliyon* 9(2): e13626. DOI: 10.1016/j.heliyon.2023.e13626.

Bossman, A.; Gubareva, M.; Teplova, T. (2023). Asymmetric effects of geopolitical risk on major currencies: Russia–Ukraine tensions. *Finance Research Letters* 51. DOI: 10.1016/j.frl.2022.103440.

Boungou, W.; Yatié, A. (2022). The impact of the Ukraine–Russia war on world stock market returns. *Economics Letters* 215. DOI: 10.1016/j.econlet.2022.110516.

Brown, S. J.; Warner, J. B. (1980). Measuring security price performance. *Journal of Financial Economics* 8(3): 205–258. DOI: 10.1016/0304-405X(80)90002-1.

Brune, A.; Hens, T.; Rieger, M. O.; Wang, M. (2015). The war puzzle: Contradictory effects of international conflicts on stock markets. *International Review of Economics* 62(1): 1–21. DOI: 10.1007/s12232-014-0215-7.

Carvalho, R.; Adinarayan, T. (2020, 12 March). Markets in virus panic: Day's plunge in charts. *Reuters*. Retrieved from: https://www.reuters.com/article/us-health-coronavirus-global-markets-gra-idUSKBN20Z2YY.

Chen, C.-D.; Chen, C.-C.; Tang, W.-W.; Huang, B.-Y. (2009). The positive and negative impacts of the SARS outbreak: A case of Taiwan industries. *Journal of Developing Areas* 43(1): 281–293.

Choudhry, T. (2010). World War II events and the Dow Jones industrial index. *Journal of Banking and Finance* 34(5): 1022–1031. DOI: 10.1016/j.jbankfin.2009.11.004.

Chowdhury, E. K.; Khan, I. I.; Dhar, B. K. (2022). Catastrophic impact of Covid-19 on the global stock markets and economic activities. *Business and Society Review* 127(2): 437–460. DOI: 10.1111/basr.12219.

Cucinotta, D.; Vanelli, M. (2020). WHO declares COVID-19 a pandemic. *Acta Bio-Medica: Atenei Parmensis* 91(1): 157–160. DOI: 10.23750/abm.v91i1.9397.

Das, B. C.; Hasan, F.; Sutradhar, S. R.; Shafique, S. (2023). Ukraine–Russia conflict and stock markets reactions in Europe. *Global Journal of Flexible Systems Management* 24(3): 395–407. DOI: 10.1007/s40171-023-00345-0.

De Espana, B. (2020). *Reference macroeconomic scenarios for the Spanish economy after COVID-19*. Economic Bulletin. Banco de Espana Article 10/20.

Eichenbaum, M. S.; Rebelo, S.; Trabandt, M. (2020). The macroeconomics of epidemics. *NBER Working Paper* no. 26882. DOI: 10.3386/w26882.

Ellyatt, H. (2022, 24 February). Europe politics: Russian forces invade Ukraine. *CNBC*. Retrieved from: https://www.cnbc.com/2022/02/24/russian-forces-invade-ukraine.html.

Fama, E. F.; Fisher, L.; Jensen, M. C.; Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review* 10(1): 1–21. DOI: 10.2307/2525569.

Federle, J.; Meier, A.; Müller, G.; Sehn, V. (2022). Proximity to war: The stock market response. *CEPR Discussion Papers* 17185.

Fernandez-Perez, A.; Gilbert, A.; Indriawan, I.; Nguyen, N. H. (2021). COVID-19 pandemic and stock market response: A culture effect. *Journal of Behavioral and Experimental Finance* 29: 100454. DOI: 10.1016/j.jbef.2020.100454.

Fetzer, T.; Hensel, L.; Hermle, J.; Roth, C. (2021). Coronavirus perceptions and economic anxiety. *Review of Economics and Statistics* 103(5): 968–978. DOI: 10.1162/rest_a_00946.

Frey, B. S.; Kucher, M. (2000). World War II as reflected on capital markets. *Economics Letters* 69(2): 187–191. DOI: 10.1016/S0165-1765(00)00269-X.

Ganie, I. R.; Wani, T. A.; Yadav, M. P. (2022). Impact of COVID-19 outbreak on the stock market: An evidence from select economies. *Business Perspectives and Research* 1–15. DOI: 10.1177/22785337211073635.

Gill, I. (2022, 9 March). Voices: Developing economies must act now to dampen the shocks from the Ukraine conflict. *WorldBank.org*. Retrieved from: https://blogs.worldbank.org/voices/developing-economies-must-act-now-dampen-shocks-ukraine-conflict?cid=ECR_TT_worldbank_EN_EXT.

Gormsen, N. J.; Koijen, R. S. J. (2020). Coronavirus: Impact on stock prices and growth expectations. NBER Working Paper no. 27387. *Review of Asset Pricing Studies* 10(4): 574–597. DOI: 10.1093/rapstu/raaa013.

Gubareva, M.; Umar, Z. (2023). Emerging market debt and the COVID-19 pandemic: A time–frequency analysis of spreads and total returns dynamics. *International Journal of Finance and Economics* 28(1): 112–126. DOI: 10.1002/ijfe.2408.

Harjoto, M. A.; Rossi, F.; Lee, R.; Sergi, B. S. (2021). How do equity markets react to COVID-19? Evidence from emerging and developed countries. *Journal of Economics and Business* 115: 105966. DOI: 10.1016/j.jeconbus.2020.105966.

Harjoto, M. A.; Rossi, F.; Paglia, J. K. (2021). COVID-19: Stock market reactions to the shock and the stimulus. *Applied Economics Letters* 28(10): 795–801. DOI: 10.1080/13504851.2020.1781767.

Haroon, O.; Rizvi, S. A. R. (2020). Flatten the curve and stock market liquidity – An inquiry into emerging economies. *Emerging Markets Finance and Trade* 56(10): 2151–2161. DOI: 10.1080/1540496X.2020.1784716.

Hasan, M. B.; Mahi, M.; Hassan, M. K.; Bhuiyan, A. B. (2021). Impact of COVID-19 pandemic on stock markets: Conventional vs. Islamic indices using wavelet-based multi-timescales analysis. *North American Journal of Economics and Finance* 58. DOI: 10.1016/j.najef.2021.101504.

He, P.; Sun, Y.; Zhang, Y.; Li, T. (2020). COVID-19's impact on stock prices across different sectors – An event study based on the Chinese stock market. *Emerging Markets Finance and Trade* 56(10): 2198–2212. DOI: 10.1080/1540496X.2020.1785865.

Heyden, K. J.; Heyden, T. (2021). Market reactions to the arrival and containment of COVID-19: An event study. *Finance Research Letters* 38: 101745. DOI: 10.1016/j.frl.2020.101745.

Isidore, R.; Christie, P. (2018). A behavioral finance perspective of the stock market anomalies. *International Journal of Research in Management, Economics and Commerce* 8(4).

Izzeldin, M.; Muradoğlu, Y. G.; Pappas, V.; Petropoulou, A.; Sivaprasad, S. (2023). The impact of the Russian–Ukrainian war on global financial markets. *International Review of Financial Analysis* 87. DOI: 10.1016/j.irfa.2023.102598.

Kamal, M. R.; Ahmed, S.; Hasan, M. M. (2023). The impact of the Russia–Ukraine crisis on the stock market: Evidence from Australia. *Pacific-Basin Finance Journal* 79. DOI: 10.1016/j.pacfin.2023.102036.

Khan, K.; Zhao, H.; Zhang, H.; Yang, H.; Shah, M. H.; Jahanger, A. (2020). The impact of COVID-19 pandemic on stock markets: An empirical analysis of world major stock indices. *Journal of Asian Finance, Economics and Business* 7(7): 463–474. DOI: 10.13106/jafeb.2020.vol7.no7.463.

Lee, W. Y.; Jiang, C. X.; Indro, D. C. (2002). Stock market volatility, excess returns, and the role of investor sentiment. *Journal of Banking and Finance* 26(12): 2277–2299. DOI: 10.1016/S0378-4266(01)00202-3.

Leigh, A.; Wolfers, J.; Zitzewitz, E. (2003). What do financial markets think of war in Iraq? NBER Working Paper no. 9587. *SSRN Electronic Journal*. DOI: 10.2139/ssrn.388762.

Li, Y.; Zhuang, X.; Wang, J.; Dong, Z. (2021). Analysis of the impact of COVID-19 pandemic on G20 stock markets. *North American Journal of Economics and Finance* 58. DOI: 10.1016/j.najef.2021.101530.

Liu, X.; An, H.; Li, H.; Chen, Z.; Feng, S.; Wen, S. (2017). Features of spillover networks in international financial markets: Evidence from the G20 countries. *Physica. Part A* 479: 265–278. DOI: 10.1016/j.physa.2017.03.016.

MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature* 35(1): 13–39.

Mazur, M.; Dang, M.; Vega, M. (2021). COVID-19 and the March 2020 stock market crash. Evidence from S&P1500. *Finance Research Letters* 38: 101690. DOI: 10.1016/j.frl.2020.101690.

Mishra, A. K.; Rath, B. N.; Dash, A. K. (2020). Does the Indian financial market nose-dive because of the COVID-19 outbreak? *Emerging Markets Finance and Trade* 56(10): 2162–2180. DOI: 10.1080/1540496X.2020.1785425.

Mishra, P. K.; Mishra, S. K. (2021). COVID-19 pandemic and stock market reaction: Empirical insights from 15 Asian countries. *Transnational Corporations Review* 13(2): 139–155. DOI: 10.1080/19186444.2021.1924536.

Naeem, M. A.; Agyemang, A.; Hasan Chowdhury, M. I.; Hasan, M.; Shahzad, S. J. H. (2022). Precious metals as hedge and safe haven for African stock markets. *Resources Policy* 78. DOI: 10.1016/j.resourpol.2022.102781.

Naeem, M. A.; Yousaf, I.; Karim, S.; Yarovaya, L.; Ali, S. (2023). Tail-event driven NETwork dependence in emerging markets. *Emerging Markets Review* 55. DOI: 10.1016/j.ememar.2022.100971.

Narayan, P. K.; Devpura, N.; Wang, H. (2020). Japanese currency and stock market—What happened during the COVID-19 pandemic? *Economic Analysis and Policy* 68: 191–198. DOI: 10.1016/j.eap.2020.09.014.

O'Donnell, N.; Shannon, D.; Sheehan, B. (2021). Immune or at-risk? Stock markets and the significance of the COVID-19 pandemic. *Journal of Behavioral and Experimental Finance* 30: 100477. DOI: 10.1016/j.jbef.2021.100477.

Pacicco, F.; Vena, L.; Venegoni, A. (2018). Event study estimations using Stata: The estudy command. *STATA Journal: Promoting Communications on Statistics and Stata* 18(2): 461–476. DOI: 10.1177/1536867X1801800211.

Pandey, D. K.; Kumari, V. (2021). Event study on the reaction of the developed and emerging stock markets to the 2019-nCoV outbreak. *International Review of Economics & Finance* 71: 467–483. DOI: 10.1016/j.iref.2020.09.014.

Pestova, A.; Mamonov, M.; Ongena, S. (2022). *The price of war: Macroeconomic effects of the 2022 sanctions on Russia. London: VoxEU, CEPR policy portal*. DOI: 10.5167/uzh-218249.

Peterson, P. P. (1989). Event studies: A review of issues and methodology. *Quarterly Journal of Business and Economics* 36–66.

Rahman, M. L.; Amin, A.; Al Mamun, M. A. (2021). The COVID-19 outbreak and stock market reactions: Evidence from Australia. *Finance Research Letters* 38: 101832. DOI: 10.1016/j.frl.2020.101832.

Scherf, M.; Matschke, X.; Rieger, M. O. (2022). Stock market reactions to COVID-19 lockdown: A global analysis. *Finance Research Letters* 45: 102245. DOI: 10.1016/j.frl.2021.102245.

Schneider, G.; Troeger, V. E. (2006). War and the world economy: Stock market reactions to international conflicts. *Journal of Conflict Resolution* 50(5): 623–645. DOI: 10.1177/0022002706290430.

Sharif, A.; Aloui, C.; Yarovaya, L. (2020). COVID-19 pandemic, oil prices, stock market, geopolitical risk and policy uncertainty nexus in the US economy: Fresh evidence from the wavelet-based approach. *International Review of Financial Analysis* 70. DOI: 10.1016/j.irfa.2020.101496.

Shu, C. (2020, 12 March). Asian stock markets fall as COVID-19 is declared a pandemic. *TechCrunch*. Retrieved from: https://techcrunch.com/2020/03/11/asian-stock-markets-fall-as-covid-19-is-declared-a-pandemic/.

Silva, T. C.; de Souza, S. R. S.; Tabak, B. M. (2016). Network structure analysis of the Brazilian interbank market. *Emerging Markets Review* 26: 130–152. DOI: 10.1016/j.ememar.2015.12.004.

Singh, M. K.; Neog, Y. (2020). Contagion effect of COVID-19 outbreak: Another recipe for disaster on Indian economy. *Journal of Public Affairs* 20(4): e2171. DOI: 10.1002/pa.2171.

Stevens, P.; Fitzgerald, M.; Imbert, F. (2020, 12 March). Stock market live Thursday: Dow tanks 2300 in worst day since black Monday, S&P 500 bear market. *CNBC*. Retrieved from: https://www.cnbc.com/2020/03/12/stock-market-today-live.html.

Sun, M.; Song, H.; Zhang, C. (2022). The effects of 2022 Russian invasion of Ukraine on global stock markets: An event study approach. *SSRN Electronic Journal*. DOI: 10.2139/ssrn.4051987.

Sun, M.; Zhang, C. (2023). Comprehensive analysis of global stock market reactions to the Russia–Ukraine war. *Applied Economics Letters* 30(18): 2673–2680. DOI: 10.1080/13504851.2022.2103077.

Umar, Z.; Bossman, A.; Choi, S.-Y.; Vo, X. V. (2023). Are short stocks susceptible to geopolitical shocks? Time-frequency evidence from the Russian–Ukrainian conflict. *Finance Research Letters* 52. DOI: 10.1016/j.frl.2022.103388.

Umar, Z.; Polat, O.; Choi, S.-Y.; Teplova, T. (2022). The impact of the Russia–Ukraine conflict on the connectedness of financial markets. *Finance Research Letters* 48. DOI: 10.1016/j.frl.2022.102976.

Wang, C.; Li, W.; Drabek, D.; Okba, N. M. A.; v. van Haperen, R.; Osterhaus, A. D. M. E.; Bosch, B.-J. (2020). A human monoclonal antibody blocking SARS-CoV-2 infection. *Nature Communications* 11(1). DOI: 10.1038/s41467-020-16256-y.

White, H.; Kim, T.-H.; Manganelli, S. (2015). VAR for VaR: Measuring tail dependence using multivariate regression quantiles. *Journal of Econometrics* 187(1): 169–188. DOI: 10.1016/j.jeconom.2015.02.004.

World Health Organization. (2020). World Health Organization (Dirs.). *General's opening remarks at the media briefing on COVID-19*. Geneva: World Health Organization.

Xu, L. (2021). Stock return and the COVID-19 pandemic: Evidence from Canada and the US. *Finance Research Letters* 38: 101872. DOI: 10.1016/j.frl.2020.101872.

Yarovaya, L.; Matkovskyy, R.; Jalan, A. (2020). The COVID-19 black swan crisis: Reaction and recovery of various financial markets. *SSRN Electronic Journal*. DOI: 10.2139/ssrn.3611587.

Yousaf, I.; Patel, R.; Yarovaya, L. (2022). The reaction of G20+ stock markets to the Russia–Ukraine conflict "black-swan" event: Evidence from event study approach. *Journal of Behavioral and Experimental Finance* 35. DOI: https://doi.org/10.1016/j.jbef.2022.100723.

Zehri, C. (2021). Stock market comovements: Evidence from the COVID-19 pandemic. *Journal of Economic Asymmetries* 24: e00228. DOI: 10.1016/j.jeca.2021.e00228.

Zhang, D.; Hu, M.; Ji, Q. (2020). Financial markets under the global pandemic of COVID-19. *Finance Research Letters* 36: 101528. DOI: 10.1016/j.frl.2020.101528.

Zhang, W.; Zhuang, X.; Lu, Y.; Wang, J. (2020). Spatial linkage of volatility spillovers and its explanation across G20 stock markets: A network framework. *International Review of Financial Analysis* 71. DOI: 10.1016/j.irfa.2020.101454.

Zhang, W.; Zhuang, X.; Wu, D. (2020). Spatial connectedness of volatility spillovers in G20 stock markets: Based on block models analysis. *Finance Research Letters* 34. DOI: 10.1016/j.frl.2019.08.022.

Zinets, N.; Vasovic, A. (2022, February 25). Missiles rain down around Ukraine. *Reuters*. Retrieved from: https://www.reuters.com/world/europe/putin-orders-military-operations-ukraine-demands-kyiv-forces-surrender-2022-02-24/.