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Stock Market Volatility during Rumours of War and Actual War: Case of Russia-Ukraine Conflict

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Abstract: Investors are humans and are sensitive to rumours of war and actual war events, which appear to have different impacts on stock market performance. Objective: this paper evaluates a two-stage differential effect of the current Russian invasion in Ukraine on stock market volatility in EU, UK and US stock markets. Prior work: the paper inclines on related prior works on the effect of international conflicts on stock markets. Method: the paper uses stock market data for EU, US and UK for 21 days before Russian troop build-up on Ukraine boarders in 2021 and 21 days during the troop build. It also collected 21 days stock market data for 21 days in 2022 before Russian invasion in Ukraine and for 21 days during the Russian invasion. Data were analysed using the t-test statistics and line graphs for trends. Finding: results show that Russian invasion in Ukraine has significantly caused stock market volatility for EU(FTSE EU), UK (FTSE London) and US (S&P500). However, the EU stock market (FTSE EU) has suffered higher volatility compared to UK and US. In the same vein results show that, the US stock market (S&P500) remains the less volatile and safest investment haven to safeguard stocks during the ongoing war in Ukraine. Implication: The results contribute latest stock market investment information to investors and stock market hedgers to make risk and investment decisions in this conflict times. It also offers an important new case study for business economic classes in higher education business schools, and highlights an agenda for further research. Value: the paper contributes a two-stage differential analysis approach (stage 1 troop build-up stage, and stage 2 actual war stage) – and reveals divergent implications of a two stage application and results for stock market analysis.

Key words: Stock markets; volatility; stock price; investment; stock market events

JEL Classification: M21; M16; E32

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1. Introduction

Although the armament industry equity shares and bonds tend to benefit from wars (Forbes, 2022), conventional stock market assets outside the country at war have a general known history of fluctuations ranging from negative to positive gain from rumours of war or actual episode of war (Bloomberg, 2022). This paper focusses on an overview and analysis of stock market fluctuations arising from the Russian invasion of Ukraine in February 2022. The stock market is naturally sensitive to rumours of instability; at the onset, the build-up of Russian troops around Ukrainian borders sent shock waves to global stock markets (Chatterjee & Masoni, 2022). Some investors began to scour markets in search for safe heaven investment options as the tensions mounted high (Chatterjee & Masoni, 2022). When the invasion came to reality in February 24 2022, it brought some jittery to stock investors and volatility (with losses and gains) in international stock markets – both in the EU, UK, and the US. As the invasion rages on, global reactions with sanctions – mostly from the EU and other Western countries has had further asphyxiating effect on stock markets around the world. In addition, the oil market has also suffered from unprecedented market fluctuations arising from the invasion. As an example, during the first week of invasion, gas and oil prices skyrocketed before plummeting. The oil prices rose to $100 per barrel – a historical price record last seen in 2014. In the same vein, the UK and Dutch gas prices increased by about 40%-50% due to fears of disruption in oil and gas supply because of the war in Ukraine (Wallace et al, 2022).

Although research on stock market effect of wars is not as ubiquitous as conventional economic and finance research topics, some previous research examined the effect of previous wars on the stock markets. These include the impact of "World War Two on the British Stock market" (Hudson and Urquhart, 2015); the effect of war on stock market oil price (Kollias, et al 2013). Others include "effect of Spanish civil war on Portuguese Stock Market" (Leitão et al, 2013); contradictions on the effect of international conflicts on stock markets (Brune et al, 2015); effect of war on the Brussels Stock Exchange (Verdickt, 2020). However, there is currently a dearth of empirical research on the effect of current Ukraine war on the EU, UK and US stock markets. This paper contributes new value to the economic literature by applying a two-stage differential analysis to provide the most current empirical analysis of the effect of Russian invasion of Ukraine on the stock markets of EU, UK and the US.

1.1. Problem of Paper

Conflicts possess a risk of sparking investors' negative sentiment for more-risky stocks in preference to safer investments such as gold, bonds and high-value currencies including the U.S. dollar (Chatterjee & Masoni, 2022). Such negative investment sentiments affects not only the stock markets, it also affects global

economic growth – given the linkage between the stock markets and general economic activities. This has warranted the recent United Nations announcement of an unprecedented reduction in global economic growth outlook – citing reasons based on the war in Ukraine (UNCTAD, 2022). Albeit the raging war in Ukraine and the rippling effects, academic research from economic and finance scholars is dominated by conventional research problems of allocation of scarce resources to grow the wealth of the business and to reward the owners of business capital with interests and dividends accruing from profit. Still at the macro-level, researchers also appear to be more engrossed with national productivity, economic growth, employment, exports, imports, and foreign reserve. Whilst these aforesaid research problems are indeed critical and occupy centre stage for economic growth and development, it is less ubiquitous to read a plethora of research, which links conflicts, wars, rumours of wars with global stock market performance – especially in current dispensation, when the global economy has somewhat become linked. Therefore, drawing from this preface, the problem of this paper is the dearth of empirical research in economic and finance journals, which dwells on stock market implication of Russia-Ukraine tensions – beginning from building up of forces and into the period of Russian invasion of Ukraine. Given the economic importance of these two nations in global economy (NPR, 2022), this current paper attempts to bridge this existing gap in current knowledge and presents the first inter-continental analysis of stock market implications of Russian invasion of Ukraine. No previous analysis has been done on two scenarios, namely during military troops build around the Ukraine boarders and during actual invasion and war. Therefore, this paper contributes new findings to existing literature on the effect of ward on stock market prices. This problem is significant for current research given that many countries, businesses, and stock markets of the world are feeling the economic impact of the war.

1.2. Objective of the Paper

Accordingly, drawing from the foregoing problem, the objective of this paper is to present an analysis of a two-stage effect of the war in Ukraine on three global stock market volatility namely the EU stock market, the U.S. stock market, and the UK stock markets. The paper aims to present the first empirical stock market impact analysis of the Russian invasion of Ukraine to pave an agenda for wider application to other stock markets and to act as initial findings to extrapolate future stock market impact of prolonged war.

2. Literature Review

The stock market operates within the society where regulation, socio-political, conflicts, and environmental events play a pivotal role in stock market performance trajectory (Roe, 2006). Accordingly, there are two diverse scenarios for stock markets during outbreak of wars – there are stocks or stock markets that benefit from war and there are stock or stock markets that loses from war (Duggan, 2022). Furthermore, given the politically imbued cause of wars, stock market volatility during wars assume diverse trends, which traumatise investors towards averseness or faithfulness in retaining their investments or committing new investments. As an instance, the stock market, which emerged in London in the ending years of the seventeenth century, emerged from a convergence of economic, political, social, and cultural developments (Parkinson, 2013). Hence, the few literature on war and stock market approach the subject either from official news, rumours and/or actual war or conflicts. Using news analysis approach to measure the likelihood of a war resulting from a conflict Brune et al (2015) find that a at an initial stage of the likelihood of war, there is a decrease in stock prices. Further, they opine that a surprise occurrence of war has the propensity to decrease stock prices. However, the rumour of a quick end of the war may increase the stock price, as sentiments turn positive. Brune et al (2015) highlight that it is impossible to completely explain with certainty such stock price movement based on risk aversion. In another closely related research, Schneider and Troeger (2006) examined the reactions of stock markets to international conflicts. According to the research by Schneider and Troeger (2006), one of the lasting questions within the scientific study of war is how war influences the general economy.

Accordingly, Schneider and Troeger (2006) examine the impact of political issues on worldwide financial markets (CAC, Dow Jones, FTSE) from 1990 to 2000. They applied the rational expectation framework – a hypothesis between war and stock markets. With daily stock market data, they find that the conflict had an adverse effect in the stock markets of the Western world. In addition, Hudson and Urquhart (2015) studied the impact of World War Two (WWII) on the British stock market. They applied an event study to examine the structural stock market breaks during the war. Overall, their findings show limited proof of convincing links between war events and market returns, but their findings show support for the negative impact of the war on British stock markets (Hudson & Urquhart 2015).

Other strands of the literature have looked at the impact of war-risk on managerial investor risk activities on the stock market; there is evidence that stock market investors and mangers alike present strong risk averse behaviour following a war news (Verdickt, 2020). This behaviour manifested during the build-up of Russian troops around the Ukraine boarders as investors and traders began scouring alternative stock markets to secure their investments in the event of escalation to

actual Russian invasion of Ukraine (Chatterjee & Masoni (2022). Previous literature provides an empirical proof, as an instance, Verdickt (2020) applied news-based assessment of war approach. His analysis found that managers cut dividend payments and postpone initial public offerings (IPO) during outbreak of war. In addition, Verdickt (2020) found that multinational companies resident in war countries have the propensity to delist from the stock market when ward breaks out in their host country and investors present a negative reaction to news and rumours of war reported by the media. Furthermore, Verdickt (2020) discovered an evidence of mean stock reversion following the threat of war and concomitant negative risk drift after the commencement of war, but proximity to the areas of military conflict does matter for extent of risk behaviour. In addition to stock market impact of recent wars, historical wars such as the Spanish civil war also had a noticeable effect on the Portugal's Stock Market. Scholars have studied the impact of the Spanish civil war of 1936 to 1939 on the Portugal's stock market (Leitão et al, 2019). They analysed stock investor's response to news emanating from the Spanish War by applying a weekly panel of stock returns of companies listed in the Lisbon Stock Market. They apply dynamic specifications with a configuration of monthly and firm fixed effects. They also used London interest rate and events in Portugal as control variables. Their statistical findings show that the Spanish Civil War events affected stock market returns negatively (Leitão et al, 2019). In their investigation regarding whether peace and war affect stock market movement, Jha et al (2022) analysed how the siege of Paris by the Prussian army in 1870 led to differentials in the bond market price of French sovereign bond differed between Paris and other markets (Jha et al, 2022). Other researchers such as Kollias et al (2013) study the impact of actual war and terrorism and examine their impacts separately on the stock markets. For instance, Kollias et al (2013) examine the effect of war and terrorism on the covariance movement of oil prices and stock markets prices of for main stock markets namely the FTSE100, CAC40, European-DAX, and S&P500. They applied the nonlinear BEKK–GARCH techniques and found that the covariance of stock prices and oil price returns are affected by war. As regards the terrorism impact, they find that terrorism affects the stock markets of CAC40, DAX and oil price returns with no significant effect on S&P500, FTSE100 stock markets.

In their analysis of effect of war and peace on stock markets, Berkman and Jacobsen (2006) studied 440 international crises within an expanded period of 1918 to 2002, their findings show that crises of global nature does influence a reduction of stock returns in global stock markets with a degree of about four percent yearly. Their further detailed analysis reveal that huge and adverse reactions on the stock market occur mostly within the first month of the war with a below average stock returns within the remaining months of the war and some partial recovery effect at the end of the war. They thus show that international wars inflict strong stock market volatility on mean stock market returns. Berkman and Jacobsen (2006) note

additional important finding, which is that stock market volatility is stronger when a war involves major world powers at opposing ends of the crises. This finding resonates with the current Russian invasion war in Ukraine, which has attracted the condemnation and humanitarian support of world powers such as the EU, the UK, and the USA amongst others.

3. Method

In order to evaluate the effect of Russian invasion war in Ukraine stock on market volatility, the paper applies a two stage differential analysis to measure the significance level of mean-stock price difference for stages one and two of Russian invasion. Stage one analysis focuses on the stock-market price difference before and during the period of troop build-up around Ukrainian boarders to ascertain if tensions due to troop build-up had an effect on the stock market prices. Stage two analysis measures the mean stock market price difference between the troop build-up stage and during the actual full-scale invasion and attendant war in Ukraine. This is to determine the extent that actual war affects stock market price. For each of the stages described above, stock market price data includes 21 days covering each period of examination. Data collection were as follows: 21 days in September 2021 before Russian troops build-up; 21 days in October 2021 during the Russian troops build-up; 21 days in January 2022 before Russian troops invaded Ukraine and 21 days from 24 January 2022 into March 2022 during the actual invasion of Ukraine. The data were collected from the historical stock market prices of Fusion Media's Investing Indexes (Fusion Media, 2022). A statistical t-test of difference in means was applied to check for two-tail significant differences at an alpha level of 5% (0.05). Accordingly, a significance level of below 0.05 is significant for either the one tail or the two tail tests. Therefore, the paper applied the Rumsey (2010) t-test statistics model for paired differences, which is represented as follows:

$$\frac{\overline{d} - u_d}{\frac{S_d}{\sqrt{n}}}$$

Where: $\overline{d}$ = mean of paired differences; S_d = standard deviation of paired differences; $\mu_d = 0$ and $\frac{S_d}{\sqrt{n}}$ = standard error.

The following explanations represent the acronyms in the analysis tables and figures:

- BTBU= before Russian troop build-up

- DTBU = During Russian troop build-up

- BW= Before Russian invasion war

- DW= during Russian invasion war

4. Results

Table 1 (stage one analysis) and Table 2 (stage two analysis) show the results for EU Stock Market with data from FTSE Europe (FTFREU). On the one hand, Table 1 results show that the build-up of Russian troop around the Ukraine boarder in October of 2021 affected the volatility of the EU stock market significantly at a p-value of 0.000096826, which is below the research alpha level of 0.05. On the other hand, Table 2 results show that the actual Russian invasion of Ukraine significantly inflicted a volatility level on the EU stock market with a significant p-level of 0.00000001. This significant level is even stronger, which shows that the actual war affected the volatility of the EU market more than the period of troop build-up. The line graphs in Figures 1 and Figure 2 confirm the statistics results by showing the stock price trends in opposite directions before and within the war. This sheds light on the overriding effect of actual war on the stock market, which thus confirms previous research findings regarding previous wars, such as (Berkman and Jacobsen, 2006; Brune et al, 2015).

Regarding the UK stock market, Table 3 (stage one analysis) and Table 4 (stage two analysis) show the results for UK Stock Market with data from FTSE All-Share London. Unlike the EU market, the UK market differ slightly from troop build-up shock to UK stock market volatility. Table 3 results indicate that the build-up of Russian troop around the Ukraine boarder in October of 2021 did not have a significant effect on the volatility of the EU stock market at a p-value of 0.146418, which is above the research alpha level of 0.05. On the other hand, Table 4 results show that the actual Russian invasion of Ukraine significantly caused a volatility level on the UK stock market with a p-level of 0.00000001. The line graphs in Figure 3 and Figure 4 (for FTSE UK) shows the stock price decreasing trends during the troop build-up and during the war. The UK stock market results show that some stock markets may not necessarily oscillate on rumours of war, but may become volatile when the actual war kicks in. The stage one result regarding troop build-up is different from previous research result by Verdickt (2020) which shows that rumours of war may present a negative reaction by investors. However, the stage two findings on actual war confirms previous research findings by (Leitão et al, 2019).

The final analysis appear in Table 5 and Figure 5 (stage one analysis), Table 6, and Figure 6 (stage two analysis) show the results for US Stock Market with data from S&P500. Table 5 results show that the build-up of Russian troop around the Ukraine boarder in October of 2021 had no significant effect on the volatility of the US stock market (S&P500) since the p-value 0.333088939 is higher than the alpha value of

0.05. On the other hand, Table 5 results show that the actual Russian invasion of Ukraine significantly influence the volatility level on the US stock market at a significant level of p-level = 0.011681283. This shows that the actual war affected the volatility of the US stock market more than the period of troop build-up. An important point to note is that, judging from the P-values, the US stock market shows a lesser significance level compared to EU and UK. This signifies that the US stock market is more resilient to the impact of war and thus provides a safer haven for investors.

Table 1 Stage One Results for the EU Stock Market (FTSE EU- FTFREU): Mean Stock Price Difference before Russian Troop Build-up and During Russian Troop Build-up on Ukraine Boarders

t-Test: Paired Two Sample for Means		
	FTSE-EU-BTBU	FTSE-EU-DTBU
Mean	6200.309048	6337.35
Variance	4620.469739	8148.97318
Observations	21	21
Pearson Correlation	-0.510156355	
Hypothesized Mean Difference	0	
df	20	
t Stat	-4.552376601	
P(T<=t) one-tail	0.000096826	
t Critical one-tail	1.724718243	
P(T<=t) two-tail	0.000193653	
t Critical two-tail	2.085963447	

**Table 2. Stage Two Results for the EU Stock Market (FTSE EU - FTFREU): Mean
Stock Price Difference before the Russian-Ukraine Invasion War and During the War**

t-Test: Paired Two Sample for Means		
	FTSE-EU-BW	FTSE-EU-DW
Mean	6680.7419	6200.036
Variance	5833.93256	35789.75
Observations	21	21
Pearson Correlation	-0.2826772	
Hypothesized Mean Difference	0	
df	20	
t Stat	9.87200083	
P(T<=t) one-tail	0.00000001	
t Critical one-tail	1.72471824	
P(T<=t) two-tail	0.00000001	
t Critical two-tail	2.08596345	

**Table 3. Stage One Results for the UK Stock Market (FTSE ALL-SHARE
LONDON): Mean Stock Price Difference before Russian Troop Build and during
Russian Troop Build on Ukraine Boarders**

t-Test: Paired Two Sample for Means		
	FTSE-UK-DTBU	FTSE-UK-BTBU
Mean	4087.01	4068.804
Variance	2085.573	1477.657
Observations	21	21
Pearson Correlation	-0.68371	
Hypothesized Mean Difference	0	
df	20	
t Stat	1.080363	
P(T<=t) one-tail	0.146418	
t Critical one-tail	1.724718	
P(T<=t) two-tail	0.292837	
t Critical two-tail	2.085963	

Table 4, Stage Two Results for the UK Stock Market (FTSE All-Share London): Mean Stock Price Difference before the Russian-Ukraine Invasion War and during the War

	FTSE-UK-BW	FTSE-UK-DW
Mean	4223.640952	4052.762381
Variance	1462.573339	10462.04212
Observations	21	21
Pearson Correlation	-0.42814408	
Hypothesized Mean Difference	0	
df	20	
t Stat	6.336047853	
P(T<=t) one-tail	0.00001	
t Critical one-tail	1.724718243	
P(T<=t) two-tail	0.00001	
t Critical two-tail	2.085963447	

Table 5. Stage One Results for the US Stock Market (S&P500): Mean Stock Price Difference before Russian Troop Build and during Russian Troop Build on Ukraine Boarders

	US-S&P-DTBU	US-S&P-BTBU
Mean	4460.707619	4445.543333
Variance	9816.036099	4589.213883
Observations	21	21
Pearson Correlation	-0.80324027	
Hypothesized Mean Difference	0	
df	20	
t Stat	0.437863122	
P(T<=t) one-tail	0.333088939	
t Critical one-tail	1.724718243	
P(T<=t) two-tail	0.666177877	
t Critical two-tail	2.085963447	

Table 6. Stage Two Results for the US Stock Market (S&P500): Mean Stock Price Difference before the Russian-Ukraine Invasion War and During the War

|	US-S&P-BW	US-S&P-DW
Mean	4438.882381	4341.101905
Variance	9353.603059	11551.50136
Observations	21	21
Pearson Correlation	-0.596721373	
Hypothesized Mean Difference	0	
df	20	
t Stat	2.455111856	
P(T<=t) one-tail	0.011681283	
t Critical one-tail	1.724718243	
P(T<=t) two-tail	0.023362567	
t Critical two-tail	2.085963447	
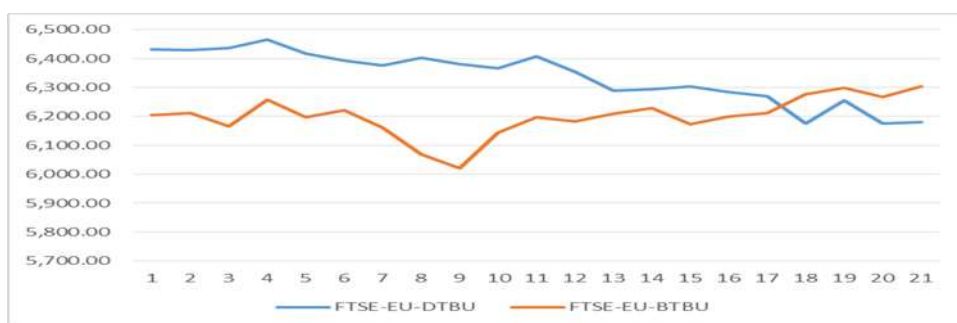
Figure 1. FTSE-EU Stock Price before & During Russian Troup Build Up At Ukraine Boarder
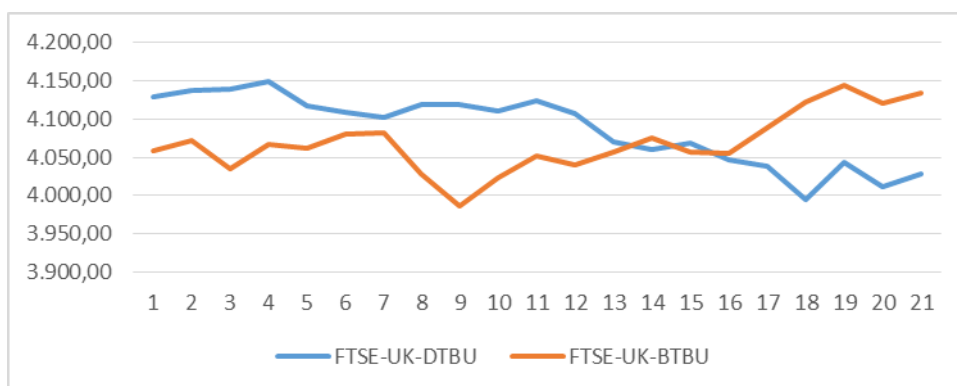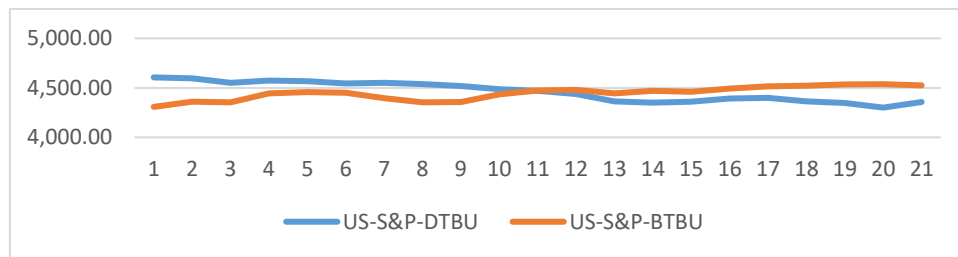
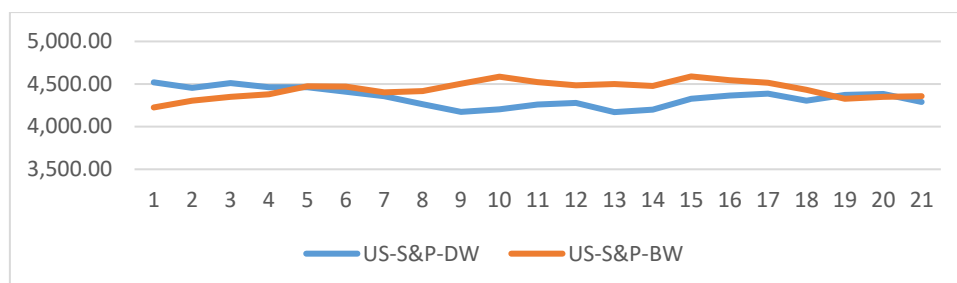**Figure 2. FTSE-EU Stock Price During and Before Ukraine War**
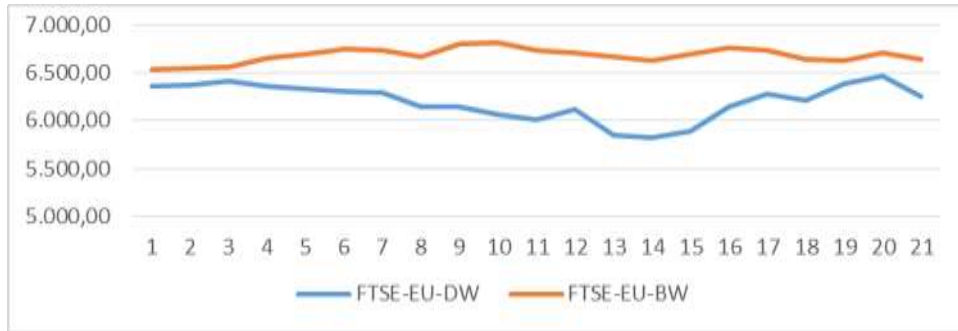
Figure 3. FTSE-UK Stock Price before & During Russian Troup Build Up At Ukraine Boarder
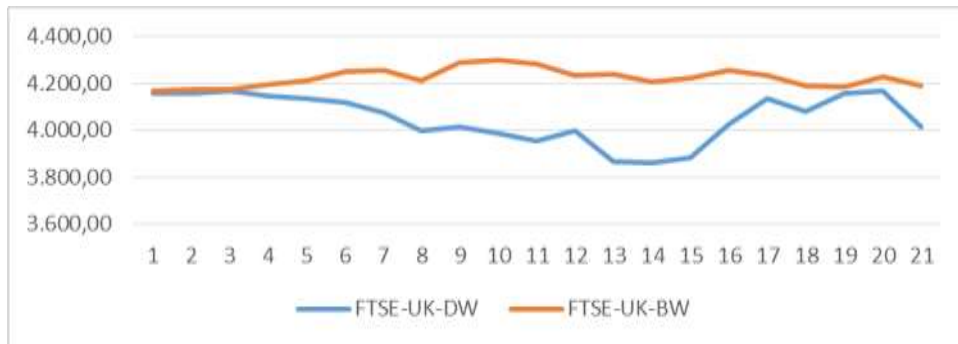
Figure 4. FTSE-UK Stock Price during and Before Ukraine War

Figure 5. US S&P Stock Price before and during Russian Troop Build Up At Ukraine Boarder

Figure 6. US S&P Stock Price Before and During Ukraine War

4.1. Implications

The foregoing results provide important stock market implications for investors, stock market hedging players, and stock market analysts. The results provide additional information for risk analysis as it has shown that the less volatile stock market during the Ukraine war is the US stock market. This is because the US S&P500 showed a lesser significant effect from the war with a p-value of 0.023362567, followed by the UK with a p-value of 0.00001 and the EU with a p-value of 0.00000001. Accordingly, risk averse investors can utilise this result in deciding where to keep their investment during this war. Stock price hedgers may also draw lessons from this result to avail themselves of best hedging opportunity. The paper presents a very recent case study for university business schools to link current stock market events in studying the economic effects of business environment in stock market prices and investments. Given the different volatility variances in the stock markets studied, investors may learn to diversify their investors across various stock markets to be safer in the eventuality of conflicts. Therefore, the results provide an avenue for further research to apply this approach to explore the effect on other stock exchanges such as Asia and Africa.

4.2. Value (Contribution)

This paper adds a novel value to existing literature on war and stock market performance by contributing a two-stage differential analysis approach – (one for troop build-up era, and another for actual war) – this is the first paper to adopt this approach to understand the stock market volatility impact of Russian troop siege and war in Ukraine.

5. Conclusion

A fundamental point to note from this paper regarding the effect of the war in Ukraine on US stock market (S&P500) is that it has suffered the least volatility effect when compared to the EU and UK volatility effects. By implication, the US stock market (S&P500) provides the safest investment haven during the current Russian invasion in Ukraine. Whilst the S&P tumbled amidst the war, its volatility was quicker to cushion more than the EU and UK stock markets. Overall, the EU stock market appears to have experienced a higher volatility effect resulting from the Ukraine war. This can be explained partly as the war is within the precinct of the EU and the EU states are feeling the direct economic effect regarding businesses, oil import and hosting of refugees. This is also coupled with uncertainties of escalation, which itself can cause jittery for stock market players and risk averter investors. This made visible from the high volatility variance of 35789.75 for the EU stock market, which is far higher than the stock market volatility variance for the UK and the US. This may lead to a tentative conclusion that, within the confines of this paper, stock markets within closer precinct of the war may have higher volatility impact than other stock markets. Furthermore, based on the variance factor, the UK stock market appear to have a more stable (smooth) stock market volatility shock from the Ukraine war as it has the least stock price volatility variance of 10462.04 during the war, which is lower than the variance of the EU and the US stock markets. The smoother volatility thus makes it somewhat easier for investors in striving to predict the stock price of the UK stock market during this period of war in Ukraine. Overall, this paper has shown that the Russian troop build-up at Ukraine boarder and Russian invasion of Ukraine has had a volatility effect on the EU, UK and US stock markets. The paper also reveal through the graphs that despite the initial shocks with attendant volatility, the stock markets have the resilience to recover after a while from initial shocks and initial volatility and may proceed with some positive trends as time passes by. This practically means that all hopes are not lost for stock market investors during the current war in Ukraine; volatility is certain to occur, but investors need to be wise and study the volatility trends as provided in this paper – to know when and where to invest safely during the current conflicts in Europe. The paper adds novelty to the literature by being one of the first to conduct an empirical analysis with a two-stage approach on stock market effect of Ukraine war. It offers new information to stock market analysts and investors and offers the most current case study on conflict effect on stock market price for higher education studies.

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