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# How did African stock markets react to the Russia-Ukraine crisis “black-swan” event? Empirical insights from event study

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This study builds on the recent literature by investigating how various types of African stock markets responded to the Russia-Ukraine crisis (commonly referred to as the black-swan event). The empirical analysis used in this paper centred on event study analysis, a statistical technique used to measure the impact of a specific event. The findings show that the black-swan event had a significant negative impact on African stock markets (14/20), with stocks having a negative abnormal return on the event day, and out of this, nine stocks' abnormal returns are statistically significant. These include Safaricom Kenya, Commercial International Bank, Attijariwafa Bank, Morocco Casablanca Index, Egyptian Exchange 30, Nairobi All Share Index, AVI Equity, MCB Group Ltd, FTSE/JSE All Share, Delta Corp. Ltd, Stock Exchange of Mauritius, Tunisia Stock Exchange, Tanzania All Share Index, and Banque de Tunisie. Furthermore, the study discovers that African stock markets reacted heterogeneously to the impact of the crises, while some stocks were severely affected, some were minimally affected. The study concludes that African stock markets should build a resilient market capable of withstanding external shock and reducing the risk of contagion.

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## Introduction

**O**n 24 February 2022, Russia announced it was going into war with Ukraine. Some international organizations such as the European Union and the G7, as well as countries such as the US and the UK, condemned the act and placed some sanctions on Russia. Some of these sanctions include freezing Russian assets outside Russia, the suspension of Russia from using Swift, the ban on Russian crude oil, and a host of others. Russia, on the other hand, remains unwavering as they have been steadfast in their invasion of Ukraine thereby, affecting their trade ties with other European nations and the rest of the world. The share of Russia's total trade with the rest of Europe in 2020 was 37.3% (European Commission 2022). To put this into context, Russia supplied 46.7% of the total solid fuel to Europe, 41.1% of the natural gas consumed in Europe, and 27% of the total crude oil in Europe (Eurostat 2022). Given the sanctions, Russia's trade with the rest of Europe will tend to have a debilitating effect on Europe and the rest of the world, especially Africa which depends largely on a lot of supplies from Russia.

Trade between Russia and Africa stood at about \$14 billion in 2020 (Trade Map 2022). From this figure, Africa imports 7 times more products from Russia than it exports to Russia (Trade Map 2022). That is, Russia exported \$12.4 billion worth of goods to Africa while it imported \$1.6 billion worth of goods from the African continent, resulting in a trade deficit of \$10.8 billion for Africa. From these figures, Russia exported 30% of the total cereals bought by Africa, and wheat makes up 95% of these cereals. The most populous countries in Africa (Nigeria, Egypt, Sudan, Kenya, Tanzania, and South Africa) import more than half of the wheat supplies to the continent from Russia. This explains why there have been a lot of concerns about the surge in wheat prices in the context of the war in Ukraine. Aside from cereals, Africa also imports mineral fuels such as coal, gas, and oil products from Russia, accounting for 18.3% of the total African imports (Trade Map 2022). However, Africa exports mainly aquatic products, chemical products, precious metals, fruits, and vegetables to Russia. As a reminder, Russia holds 2.4% of the total African market share, dwarfed only by China's 19.6 and 5% respectively for the US, France, and India (Trade Map 2022). Given that Africa represents a strategic trade partner to Russia, the sanctions placed on Russia and its enterprises outside the country may tend to have a debilitating effect on the African continent.

The ongoing war between Russia and Ukraine is unique in many ways. First, it affects global trade relations due to the resettlement of trade relations provoked by Russian alignments (Abbassi et al. 2022). These sanctions are expected to affect trade scenarios and capital markets, especially in a region like sub-Saharan Africa which depends heavily on imports. Second, the ongoing war in Ukraine differs remarkably from previous uncertainties and geo-political risks such as the Russian annexation of Crimea in 2014, the Persian Gulf War, and the Iraq War. This war has triggered geo-political tensions and risks and shaken the global economy (Ahmed et al. 2022). In addition, Caldara and Iacoviello (2022) found that the geo-political threats peaked after Russia invaded Ukraine and this is likely to affect trade, financial intermediation, capital raising, inflation and slow down economic growth.

Due to the connection between Africa's trade with Russia and Ukraine, it is expected that the political instability in the two countries would have severe impacts on the African continent vis-à-vis the trade with these countries which is expected to dwindle creating a supply gap of Russia and Ukraine products in the African continent. Furthermore, the resulting scarcity of Russian goods due to their ban by international bodies raises the prices of these goods due to the market forces resulting in demand rising above the supply of some of these items. Finally, these geo-politics have intensified conflicts around Africa and even the rest of the

world. While this may not be directly connected with the war in Ukraine, however, the war in Ukraine may have instigated several uprisings with several terrorist groups trying to take over their government or certain sections of their country. For instance, since the Russian war in Ukraine, terrorist insurgencies may now be found in the following African countries: Algeria, Burkina Faso, Chad, Democratic Republic of the Congo, Ghana, Ivory Coast, Mauritania, Mozambique, Niger, Sudan, Tanzania, Togo, Tunisia, and Uganda (Wisevoter 2023). The war between Russia and Ukraine may have also contributed to the worsening effect of these disputes. Different groups within these African countries are at odds with one another because of the aforementioned political, economic, and social conflicts or disputes. Besides, numerous other African countries including the Central African Republic, Ethiopia, Libya, Mali, Somalia, and South Sudan, are in the midst of civil wars right now (Wisevoter 2023).

By implication, the war may have a deeper adverse impact on the African stock market than initially feared; and by extension, investors are expected to react to this changing information (Jin et al. 2022). Moreover, the uncertainty around the duration of the war makes this event unpredictable into the foreseeable future, thereby heightening investors' uncertainty and dampening business confidence (Caldara and Iacoviello 2022). As a result of the likely adverse effects of the war in Ukraine on the African stock market, the paper contributes to the literature in several important ways. First, we extend the growing body of literature that examines the impact of the Russia-Ukraine crisis on the stock market to examine the impact of the crisis on the African stock market. To the authors' best knowledge, existing studies on the Russian-Ukraine war and its effect on the stock market (Abbassi et al. 2022; Boubaker et al. 2022; Boungou and Yatié 2022; Yousaf et al. 2022) have focused more on a global scenario. This study intends to fill this gap by focusing on the effect of the Russian-Ukraine crisis on the African stock market. Second, even though studies on the impacts of war and conflicts are not new (Hassan et al. 2022; Lyocsa and Plihal 2022; Umar et al. 2022; Kimbrough et al. 2020; Ruiz Estrada et al. 2019; Carmignani and Kler 2018), the literature does not provide enough information on the factors that influence stock market performance during the war between Russia and Ukraine, especially in Africa.

In addition, it is no surprise that recent research on the war has paid more attention to the G7 countries (Abbassi et al. 2022; Nusair and Olson, 2022), the G20 countries (Yousaf et al. 2022), the European continent (Ahmed et al. 2022; Alsayed 2022; Prohorovs 2022) and the global stock market (Boubaker et al. 2022; Boungou and Yatié 2022). This paper would therefore extend these studies by assessing the levels of resilience in African stock markets to shocks born by the Russian invasion of Ukraine. The purpose of this is to confirm if the African stock markets are mean reverting in the face of an exogenous shock thereby, motivating us to investigate how investors in the African stock markets have reacted to the war in Ukraine.

Similarly, the study contributes to the literature by using other non-parametric event studies tests like the Patell (1976), and the crude dependence adjustment (CDA) test by Brown and Warner (1980) to further consolidate the outcome of the baseline estimation. Furthermore, the study looks at how each country's stock market and selected firms react to the Russo-Ukraine crisis.

Undertaking this study for the region is vital for the following reasons: (1) The Russo-Ukraine crisis is a global event that has affected various countries and regions, including Africa. The study would allow us to understand how interconnected the world is and how events in one part of the world can have ripple effects in other parts, (2) the crisis has led to economic sanctions and political instability, which can have a significant impact on

global trade and economic growth. By studying its impact on African stock markets, you can assess the economic risks that African countries face and how they can mitigate them, (3) The study also provides informed decisions to the investment community on which industries or sectors are more vulnerable to the crisis and which ones are more resilient.

The remainder of this paper is organized as follows: Section 2 presents the empirical review on related literature. The methodology and estimating methodologies are explained in Section 3. Section 4 presents and discusses the empirical estimation, while Section 5 concludes and provides important policy implications.

## Literature review

Abbassi et al. (2022) investigated how the war between Russia and Ukraine has affected the firms on the stock exchange of the G7 countries. The paper provides information on the vulnerability of these firms to war events and how this may affect stock market performance in these countries. Using the event study method on a sample of 531 stock market firms from 02 March 2021 to 08 March 2022 and further conducting a cross-sectional analysis of the cumulative abnormal returns and country-specific and firm-specific variables, the paper found that trade dependence and the level of risk exposure may lead to negative abnormal returns in these countries. The paper also confirmed that stock prices are being affected by geo-political risks and trade dependence. By conducting a firm-level analysis, Berninger et al. (2022) examined the impacts the Russian invasion of Ukraine has had on 806 firms exposed to the war. The paper found negative average abnormal returns during the first twenty trading days after the inception of the war. The paper also found that countries (especially European countries) who left Russia during the invasion had returns lower than those who stayed (European countries who stayed).

By examining how the war has affected global stock markets, Boubaker et al. (2022) examined the heterogeneous impact of the Russian-Ukraine war on global equity markets using an event study methodology. The paper found that the war between Russia and Ukraine led to negative cumulative abnormal returns in global equity markets and the intensity of these returns is heterogeneous across countries. The paper also found that markets that are more globalized are being affected more by the war compared to less globalized markets, although heterogeneously. While countries that are members of NATO posted a more positive stock market performance than countries that are not members of NATO. Also looking at global equity markets, Boungou and Yatié (2022) examined the impact of the Russian and Ukraine war on the world stock market using evidence from 94 countries from 22 January to 24 March 2022. The paper found a negative impact of the war on the global stock market using the fixed effect methodology.

By examining how the war has affected Europe, Ahmed et al. (2022) examined the Russian invasion of Ukraine and its impact on the stock markets in Europe. The paper found the invasion to have a negative effect on European stocks, thereby leading to negative returns on European stocks and stock prices. The paper concluded that the effect of the invasion in individual European countries is heterogeneous in terms of its intensity across the countries, their industries, and company sizes. Also focusing on Europe, Prohorovs (2022) examined the consequences of Russia's invasion of Ukraine on the European countries and the implications of such on businesses and the economy of Europe. The paper showed that the invasion of Ukraine has triggered existing issues in most European nations and has also increased the level of inflation in these countries. The paper opined that the invasion of Ukraine may have a long debilitating impact not just in Ukraine, but also on the rest of Europe.

On the other hand, Umar et al. (2022) examined the impact of the conflict between Russia and Ukraine and how it affected the

connectedness of the Russian, European and global financial markets. The paper adopted a time-based and frequency-based time-varying parameter vector autoregression. The paper found that the relationship between the Russian, European and global financial markets has changed because of the conflict. Furthermore, it found the Russian bonds and the European equities as the main transmitters of the shocks. Lastly, the paper found that the conflicts have affected stock market returns and volatility connectedness both in the short-term and long-term frequencies. Depalo (2022) used a consumer expectations survey of the European Central Bank to estimate expectations of economic outcomes in economies such as France, Italy, Spain and Germany during the Russia-Ukraine war. The survey results showed that there were lower expectations of economic outcomes due to the war, while the war had more impact on countries who were energy dependent.

By establishing the effect of the war on G20 countries, Yousaf et al. (2022) examined the impact of the Russia-Ukraine war on the G20 and other selected countries stock markets using the event study approach. The paper found that the Russia invasion on Ukraine negatively affected the stock markets of the selected countries on the event day and post event days. The paper also found Hungary, Russia, Poland and Slovakia to be the first set of countries affected by the event pre-event day, while Australia, France, Germany, India, Italy, Japan, Romania, South Africa, Spain and Turkey were negatively affected post-event. Lastly, the paper showed that the European and Asian regions were also negatively affected by the Russia-Ukraine war. Also, Nusair and Olson (2022) examined the dynamic relationship between exchange rates and stock prices for the G7 countries using a nonlinear ARDL approach. The findings showed that the exchange rate affects stock prices (flow-oriented approach), and the stock prices affect exchange rates (portfolio balance approach) in the short-run. In the long-run, however, both approaches were not found to exist in G7 countries using the ARDL approach. But the nonlinear ARDL approach shows evidence of the portfolio balance approach in four of the countries. Furthermore, the paper found causality to run from stock prices to exchange rates in six of the countries.

By focusing on wars and the tourism sector, Pandey and Kumar (2022) used the event method to examine the impacts of the war between Russia and Ukraine on the global tourism sector stocks. The paper showed heterogeneous findings across different tourism firms and different stock markets globally. The paper found the effects to be negatively significant across Europe, the Middle East, and Africa, while the event was insignificant for America and Asia. Finally, the paper showed that some country-specific and firm-specific variables affect cumulative abnormal returns. By focusing on wars and global oil market, Ruiz Estrada et al. (2019) carried out a simulation of the US-Iran war and its impact on global oil price behaviour from 1980 to 2025. The paper examined the intensity of wars at different levels using the war oil crisis simulator (WOC Simulator). The findings from the paper showed that the Middle East is a crucial oil-producing region, and continuous conflict between the US and Iran could impede the smooth flow of global oil production, thereby affecting oil prices.

By exploring studies that focus on the links between wars and emerging markets, Zaremba et al. (2022) adopted a news-based gauge of geo-political risk to study the role of asset pricing in global emerging markets. The paper found that a positive change in risk positively predicts future stock market returns. Furthermore, the results showed that the countries with higher changes in uncertainty in geo-political risk perform better than those with lower levels of changes in uncertainty. In addition, Caldara and Iacoviello (2022) adopted a used-based measure of adverse geo-political events and associated risks. The paper adopted an index for geo-political risks and found spikes at the beginning of the Korean war and during the Cuban Crisis and after 9/11. The findings further showed that

higher geo-political tensions reduce investments and increase unemployment. The paper also checked the effect of the aggregate measures on the industry and firm-level measures of geo-political risks. The paper found that investment reduces in firms and industries that are exposed to geo-political risks.

By examining studies that focus on geo-political risks and the currency markets, Long et al. (2022) examined the impacts of geo-political risks on cryptocurrency returns. The study discovered that coins with low geo-political risk values outperformed those with high geo-political risk values using a geo-political risk index. A risk-averse investor may need additional compensation to keep cryptocurrencies with negative risks, but they might be prepared to pay more for crypto assets with positive geo-political risks, the research further claims. On the other hand, Chortane and Pandey (2022) examined the impact of the Russian invasion of Ukraine on the global currency market using the event study methodology and market model estimates. The paper found that the invasion had a negative impact on global currencies. However, when the paper examined the effects by regions, the paper showed that the European region had a currency depreciation against the US dollars during the Russia and Ukraine crisis, while there was an appreciation in the Pacific currencies. However, the results of the analysis showed that the African and Middle East regions have insignificant effects from the invasion of Russia on Ukraine.

By examining studies that explored the links between the war and stock markets in country-specific studies, Alsayed (2022) used a machine learning algorithm approach to predict the Turkish stock market during the Covid-19 pandemic and the Russian invasion of Ukraine from 11 March 2020 to 31 May 2022. The paper adopted the elastic-net regression technique based on empirical mode decomposition to tackle the problems of nonlinearity and non-stationarity in the models and it used the Markov switching technique as robustness to achieve the intended objectives. The paper found that the Covid-19 pandemic significantly affect the Turkish stock market, especially during the first wave, while the Russian-Ukraine war also affected the stock market negatively. The robustness results using the Markov switching regression were also consistent with the main findings. Other studies such as Oyadeyi (2022) was of the view that uncertainty in the macroeconomic environment affects stock prices, while Oyadeyi (2023) opined that these effects tend to affect interest rate transmission as well as capital market developments on the Nigerian economy. In addition, Oyadeyi and Akinbobola (2020, 2022) found that instability affects the transmission of monetary policy to asset prices, thereby affecting the value of stock market development.

Wang and Liu (2022) explored the connection between the COVID-19 pandemic and stock price changes during the period when the disease first appeared in China and before it spread beyond the borders of China. The study, with specific focus on the psychological effects of the pandemic on capital market prices and fluctuations in their returns pointed towards the fact that the pandemic exacerbated the frequent fluctuations in stock market returns during the period of investigation. The study was also able to provide lessens to reduce the price volatility in Chinese capital markets and provide relevant policy considerations to the industry players, the government and regulators. Finally, Ibar-Alonso et al. (2022) adopted a social listening analysis on Twitter to evaluate the sentiment and emotions surrounding green energy. The paper chose the onset of the Russian-Ukraine crisis as the period of the start of the evaluation due to the effect of the crisis on global energy policies. The paper further conducted a dimensionality reduction analysis and a semantic analysis of the most frequently occurring words, a comparison study of attitudes and emotions in both time periods, and an examination of the variance of tweets versus retweets. The analysis' findings indicate that society's perceptions of a transition to green energy shifted due to the Russian-Ukraine

conflict. Furthermore, the paper found that the disagreement led to unpleasant emotions and sentiments on the green energy tweeters. On a final note, the paper found that pessimism was maintained while optimism was separated into optimism and expectancy.

In summary, the study has been able to extensively explore the recent literature on the effects of the war in Ukraine on a host of macroeconomic relationships. The findings have also been able to show that many studies have investigated the effect of the war on the global world, while some have focused on regions such as Europe, America, Asia, and emerging markets. In addition, other studies have investigated how the war has affected cryptocurrency markets, currency markets, and some specific sectors such as the tourism sector, firm sectors, and the oil sector. One thing that is clear from the review is that as of the time of writing, there have not been any established studies on the connection between the war in Ukraine and the African stock markets' response to the war. Therefore, this study will contribute to ongoing discussions on the Russian-Ukraine war by exploring how the war has affected African stock markets. As a result, the paper will answer the research question focused on how the Russia and Ukraine war has affected the African stock market.

## Data and methodology

**Data.** The dataset used in this study was obtained from the Bloomberg terminal.<sup>1</sup> It consists of daily stock prices of 10 selected African countries. The choice of countries and firms was determined by data availability. These countries and firms include Egypt (Commercial International Bank), Ivory Coast (SONATEL BC Equity), Kenya (Safaricom Kenya), Mauritius (MCB Group Ltd), Morocco (Attijariwafa Bank), Nigeria (MTN Nigeria), South Africa (AVI Equity), Tanzania (CRDB Bank PLC), Tunisia (Tunisia Stock Exchange), Zimbabwe (Delta Corp. Ltd). Similarly, we selected the stock price of companies with the highest market capitalization. This makes the total stocks 20. The daily series covers from 5 January 2021 to 5 August 2022 (without weekends). This post-COVID-19 period affords us the ability to conduct an in-depth analysis of the impact of the Russia-Ukraine crisis. The daily return of the series is calculated using Eq. (1):

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) \quad (1)$$

Where  $P_t$  is the price of the selected stock prices on day  $t$ , while  $P_{t-1}$  is the stock price on the day before  $t$ .

*Descriptive statistics of the variables.* In performing the event study, we need to first identify the following: (1) event, (2) event day, (3) event window, and (4) estimation window. The announcement of the war in Ukraine is considered to be the event for the study. It is generally believed that Russia and Ukraine are critical trading partners for African countries. Both countries are said to be leading suppliers of global commodities, and the conflict between the duo has triggered widespread hardship, not just in Africa but also across the globe (Qureshi et al. 2022). Consequently, the economies of African countries have been badly affected (see Fig. 1). The study uses February 24, 2022, as the event date since this is when the war was declared. Furthermore, the event window consists of 26 days from  $t-5$  to  $t+20$  days, while the estimation window consists of 120 days from  $t-125$  to  $t-6$  days. The study only considered trading days in our analysis.

Table 1 provides descriptive statistics for each market used in this study. It is observed that FTSE/JSE stock return for South Africa has an average of 0.0736% before the crisis, while the average stock return after the crisis is -0.0695%. Similarly, the standard deviation before the crisis was 0.996%, while it increased to 1.47% after the crisis. This means there is a lot more/ variability in the stock return



**Fig. 1 Average change in stocks of the selected African countries on the event day.** This figure shows the average change in stock prices of the selected African countries on the day of the Russian war on Ukraine. Source: Made by the authors based on data from Bloomberg.

**Table 1 Summary statistics.**

Securities	Before Russia-Ukraine War			After the Russia-Ukraine War		
	Mean	SD	ADF	Mean	SD	ADF
FTSE/JSE All Share	0.000736	0.00996	-15.797***	-0.000695	0.0147	-9.106***
AVI Equity	-1.87E-06	0.0159	-12.656***	-0.000669	0.0158	-5.955***
Nigerian Stock ASI	0.000471	0.00621	-6.427***	0.000659	0.00705	-8.692***
MTN Nigeria	0.000559	0.0152	-14.163***	0.000659	0.026	-9.801***
Econet Wireless Zimbabwe	0.00918	0.0461	-13.721***	0.00189	0.0531	-6.156***
Delta Corp. Ltd	0.0084	0.043	-11.271***	-0.00352	0.0593	-7.866***
Nairobi All Share Index	0.000248	0.00893	-12.973***	-0.00129	0.0134	-7.535***
Safaricom Kenya	0.000227	0.0133	-13.238***	-0.00179	0.022	-8.206***
Egyptian Exchange 30	0.000151	0.00888	-20.163***	-0.00108	0.0171	-15.139***
Commercial International Bank	0.000408	0.0128	-19.929***	-0.00246	0.024	-16.354***
Ivory Coast All share Index	0.0014	0.00608	-13.347***	-0.000279	0.0062	-8.944***
SONATEL BC Equity	0.000488	0.0137	-12.308***	-0.000117	0.0137	-8.825***
Stock Exchange of Mauritius	0.00098	0.00535	-14.613***	-0.000519	0.0043	-7.624***
MCB Group Ltd	0.000986	0.0117	-18.403***	-0.000169	0.0091	-8.964***
Morocco Casablanca Index	0.000524	0.00434	-13.842***	-0.0011	0.0089	-10.635***
Attijariwafa Bank	0.000377	0.00834	-18.880***	-0.001	0.016	-12.537***
Tanzania All Share Index	0.000253	0.00763	-18.919 ***	-0.000208	0.0147	-14.558***
CRDB Bank PLC	0.00192	0.0206	-16.712***	0.000993	0.0158	-6.426***
Tunisia Stock Exchange	0.000148	0.00355	-13.160***	0.000793	0.0031	-9.426***
Banque de Tunisie	0.00108	0.0117	-17.318***	0.00116	0.0121	-10.073***

ADF the Augmented Dickey Fuller unit root test.

\*\*\*denotes significance at 1%, \*\*at 5% and \*at 10%.

after the crisis than before the event. Similarly, AVI Equity has an average stock return of  $-0.000187\%$ , and a standard deviation of 1.59% before the Russo-Ukrainian War, while the mean return after the war is  $-0.0669\%$  with a standard deviation of 1.58%. Furthermore, the Nigerian All share index has an average stock return of 0.0471% and a standard deviation of 0.621% before the war, while the mean and standard deviation after the war is 0.0659 and 0.705%, respectively. MTN Nigeria has an average equity return of 0.0559% before the crisis and 0.0659% after the crisis. In addition to the descriptive statistics, the stationarity test using the ADF test statistics indicates that all the return series are stationary at level whether before or after the war in Ukraine. This implies that the mean and variance are constant over time, and the series is mean reverting in nature, i.e., it will not drift too far away from its mean because of its finite constant variance.

**Methodology.** This study's analysis applies the Fama et al. (1969) event study methodology to examine how the Russia-Ukraine

situation affected the African market returns. Our event window spans five trading days prior to the event date of February 24, 2022, to the 20th trading days after the event (i.e.,  $[-5 + 20]$ ). We purposefully selected a lengthy event window to see whether the event's short-term influence, if any, was later reversed once the immediate shock of the invasion had passed.

In order to estimate the abnormal market return around the event day, we initially estimated Eq. (2) specified below:

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

Where  $R_{it}$  is the daily return of stock  $i$  on day  $t$ , and  $R_{m,t}$  is the market return on day  $t$ . The parameters  $\alpha_i$  and  $\beta_i$  are estimated through ordinary least square (OLS) regression using a 120-day estimation window that ends 6 days before the event day. As a result, our estimation window dates from 7 September 2021 to 14 February 2022. Using the estimated parameters from the above equation, we then calculate the abnormal return over the

**Table 2 Abnormal returns on the event day.**

Markets	(1) Abnormal return (AR)	(2) t-stat <sub>AR</sub>	(3) t-stat <sub>CDA</sub>	(4) t-stat <sub>Patell</sub>
FTSE/JSE All Share	-0.018*	-1.755	-1.749*	-1.733*
AVI Equity	-0.029	-1.483	-1.471	-1.465
Nigerian Stock ASI	0.001	0.206	0.210	0.203
MTN Nigeria	0.003	0.091	0.091	0.090
Econet Wireless Zimbabwe	0.0139	0.266	0.267	0.262
Delta Corp. Ltd	-0.0139	-0.354	-0.356	-0.349
Nairobi All Share Index	-0.0376***	-4.573	-4.557***	-4.515***
Safaricom Kenya	-0.0594***	-4.732	-4.725***	-4.672***
Egyptian Exchange 30	-0.0377***	-4.154	-4.123***	-4.101***
Commercial International Bank	-0.0577***	-4.447	-4.422***	-4.391***
Ivory Coast All share Index	0.0003	0.057	0.059	0.056
SONATEL BC Equity	0.0464***	5.093	5.064***	5.029***
Stock Exchange of Mauritius	-0.0117**	-2.218	-2.228**	-2.190**
MCB Group Ltd	-0.0252**	-2.424	-2.408**	-2.393**
Morocco Casablanca Index	-0.0410***	-8.503	-8.477***	-8.395***
Attijariwafa Bank	-0.0545***	-6.493	-6.441***	-6.411***
Tanzania All Share Index	-0.0026	-0.551	-0.549	-0.544
CRDB Bank PLC	0.0009	0.028	0.029	0.028
Tunisia Stock Exchange	-0.0059*	-1.766	-1.759*	-1.744*
Banque de Tunisie	-0.0002	-0.013	-0.013	-0.013

t-stat<sub>AR</sub>: Standard t-test assuming cross-sectional independence, according to Serra (2002), t-stat<sub>CDA</sub>: Crude Dependence Adjustment, t-stat<sub>Patell</sub>: Patell test of standardized residuals.

\*\*\*denotes significance at 1%, \*\*at 5% and \*at 10%.

event window:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t}) \quad (3)$$

where  $AR_{i,t}$  is firm's  $i$  daily abnormal return at day  $t$ . By adding the daily abnormal returns for event  $i$  throughout the period  $[\tau_1, \tau_2]$ , we calculate the cumulative abnormal return ( $CAR_i$ ), and this is represented thus:

$$CAR_i = \sum_{t=\tau_1}^{\tau_2} AR_{i,t} \quad (4)$$

Following the argument of Serra (2002) and Kolari and Pynnönen (2010), the t-test of event study methodology typically assumes independence of abnormal returns of the cross-section firms. This leads to the over-rejection of the null hypothesis and underestimation of the standard errors. In addressing this problem, this study uses other non-parametric methods like the Patell test developed by (Patell 1976), and the crude dependence adjustment (CDA) test by Brown and Warner (1980). The CDA test does not account for (possibly) unequal variances across observations. We have for the variance estimation:

$$S_{AAR}^2 = \frac{1}{M-2} \sum_{t=T_0}^{T_1} (AAR_t - \overline{AAR})^2 \quad (5)$$

$T_0$  and  $T_1$  represents the estimation window and

$$\overline{AAR} = \frac{1}{M} \sum_{t=T_0}^{T_1} (AAR_t) \quad (6)$$

The t-test for the null hypothesis  $[=E(AAR_t) = 0]$  is denoted by  $t_{AAR_i} = \frac{AAR_i}{S_{AAR}}$ , while the null hypothesis  $[(H_0 = E(CAAR) = 0)]$  for CAAR is denoted by  $t_{CAAR} = \frac{CAAR}{\sqrt{T_2 - T_1}} * \frac{1}{S_{AAR}}$

Before estimating the t-test, the Patell (1976) standardized residual test assumes standardization of each  $AR_i$  by the forecast-error-corrected standard deviation. This can be specified thus as:

$$S_{AR_{i,t}} = \frac{AR_{i,t}}{S_{AR_{i,t}}} \quad (7)$$

The t-test for the null hypothesis  $[=E(AAR_t) = 0]$  is given by:  $Z_{Patell_i} = \frac{AAR_i}{S_{AR_{i,t}}}$ , while the null hypothesis for CAAR is  $[=E(CAAR_t) = 0]$  is given by:  $Z_{Patell} = \frac{1}{\sqrt{N}} \sum_{i=1}^N \frac{CAAR_i}{S_{CAAR_i}}$

## Empirical results

**Analysis and presentation of results.** The Russian invasion of Ukraine has caused substantial losses in the financial markets around the world, and African countries are not left out. In general, when there is heightened geopolitical tension and uncertainty, investors tend to become more risk-averse and may pull their investments from emerging markets, including those in Africa. This can lead to a decline in stock prices and a decrease in trading volume. On the other hand, if investors believe that certain African countries may benefit from the situation, such as through increased demand for commodities, then those countries' stock markets may see a positive impact.

Figure 1 presents the average price change of the selected African market following the announcement of the 'special military operation'. The results indicate that the highest losers are Safaricom Kenya plc (-5.76%), Commercial International Bank (-5.61%), Attijariwafa Bank equity (-5.30%), Morocco Casablanca index (-4.02%), Egyptian Exchange index (-3.70%), NSEASI index (-3.69%), MCB Group Ltd Equity (-2.49%), and WHLSJ (-2.34%). However, the biggest winners are Ivory Coast All share Index (+0.03%), NGXINDX Index (+0.14), and ECO ZH Equity (+1.40%).

Table 2 presents the abnormal returns and their statistical significance for all the selected African stock markets on the event day. The results indicate that most African stocks (14/20) had negative abnormal returns on the event day, and out of this, nine stocks' abnormal returns are statistically significant. This includes the following: Safaricom Kenya, Commercial International Bank, Attijariwafa Bank, Morocco Casablanca Index, Egyptian Exchange 30, Nairobi All Share Index, AVI Equity, MCB Group Ltd, FTSE/JSE All Share, Delta Corp. Ltd, Stock Exchange of Mauritius, Tunisia Stock Exchange, Tanzania All Share Index, and Banque de Tunisie. This finding is consistent with the empirical outcome of Boungou and Yatie (2022) and Zaremba et al. (2022), which argue that war or geo-political risk event significantly impacts the stock markets and that investors may overreact to news about geo-political risk and conflicts.

Nevertheless, six stocks witnessed positive abnormal returns on the event day, and they include: Ivory Coast All share Index, CRDB Bank Plc, Nigerian Stock ASI, MTN Nigeria, Econet Wireless Zimbabwe, SONATEL BC equity. The results are robust

**Table 3** AAR and CAAR of the Aggregate stock market.

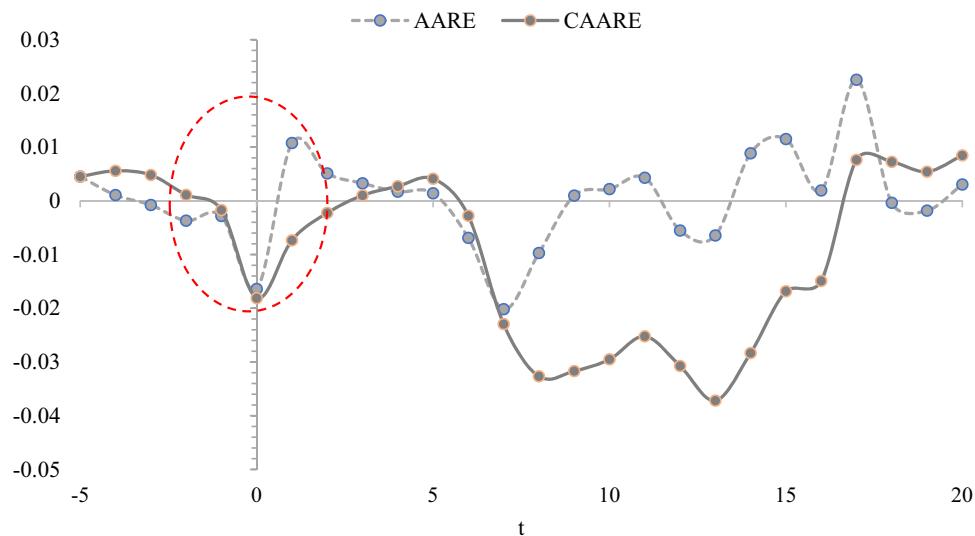
t	AAR	t-stat <sub>AR</sub>	t-stat <sub>CAAR</sub>	t-stat <sub>Patell</sub>
Panel A: Abnormal return surrounding Event Window (Days)				
-5	0.0045	1.010994	0.823925	1.021468
-4	0.0011	0.239949	0.19555	0.085842
-3	-0.0008	-0.17332	-0.14125	-0.57338
-2	-0.0037	-0.8286	-0.67528	-2.01668**
-1	-0.00282	-0.6321	-0.51514	-0.95866
0	-0.01641***	-3.67557	-2.99546***	-8.32348***
1	0.010764**	2.41063	1.964579**	5.527476***
2	0.005099	1.142038	0.930721	2.438077**
3	0.003264	0.731062	0.59579	0.63871
4	0.001707	0.382388	0.311633	0.373912
5	0.001405	0.31455	0.256347	0.339166
6	-0.0069	-1.54574	-1.25972	-3.03684***
7	-0.02017***	-4.51656	-3.68084***	-8.82335***
8	-0.00972**	-2.17595	-1.77332*	-3.51153***
9	0.000972	0.217687	0.177407	1.135717
10	0.002179	0.48809	0.397776	-0.411
11	0.004293	0.961341	0.783459	1.639224
12	-0.00553	-1.23742	-1.00845	-0.98273
13	-0.00644	-1.44276	-1.1758	-0.41432
14	0.008849**	1.981891	1.615171	2.982963***
15	0.011502**	2.575891	2.09926***	2.792079***
16	0.001925	0.431089	0.351322	-0.45593
17	0.022539***	5.047768	4.113752***	6.881614***
18	-0.00037	-0.08276	-0.06745	-0.26036
19	-0.00183	-0.41016	-0.33427	-1.42415
20	0.003034	0.679406	0.553692	1.641322
Panel B: Cumulative average abnormal return surrounding Event Window (Days)				
Pre-event date				
[-25; 0]	0.052***	2.278	1.872*	2.487***
[-20; 0]	0.046***	2.222	1.826*	4.939***
[-15; 0]	0.006	0.307	0.252	-0.558
[-10; 0]	-0.005	-0.340	-0.279	-1.673
[-5; 0]	-0.018*	-1.643	-1.350	-4.084***
[-3; 0]	-0.024***	-2.633	-2.164***	-6.715***
[-2; 0]	-0.023***	-2.941	-2.417***	-7.500***
[-1; 0]	-0.019***	-3.020	-2.482***	-6.844***
Around event date				
[0; 0]	-0.016***	-3.645	-2.995***	-8.323***
[-1; 1]	-0.008*	-1.086	-0.893	-3.653***
[-2; 2]	-0.007	-0.702	-0.577	-3.646***
[-3; 3]	-0.005	-0.384	-0.316	-3.006***
[-5; 5]	0.004	0.276	0.227	-0.699
[-10; 10]	-0.016	-0.798	-0.656	-2.506***
[-15; 15]	0.007	0.272	0.223	-0.297
[-20; 20]	0.072***	2.512	2.065***	6.175***
Post-event date				
[0; 1]	-0.006	-0.887	-0.729	-4.415***
[0; 2]	-0.001	-0.070	-0.058	-3.007***
[0; 3]	0.003	0.302	0.248	-2.688***
[1; 2]	0.016***	2.491	2.047***	7.251***
[1; 3]	0.019***	2.453	2.016***	7.620***
[0; 5]	0.006	0.528	0.434	-2.382***
[0; 10]	-0.028**	-1.862	-1.530	-7.585***
[0; 15]	-0.015	-0.840	-0.690	-6.027***
[0; 20]	0.010	0.493	0.405	-4.535***

The daily abnormal return is calculated as the difference between a firm's actual stock return and the expected return estimated based on the market model over the period between 6 and 125 days prior to the event date. Panel A reports the daily cross-sectional averages of abnormal stock returns (AARs) surrounding the event date. In the event windows surrounding the policy date, Panel B shows the cross-sectional averages of cumulative abnormal stock returns (CAARs). The total of daily abnormal returns over a certain event window is referred to as the cumulative abnormal return. There are additional statistics for the t-tests to determine if the AAR/CAAR is equal to zero. Statistical significance levels at 1, 5, and 10% are indicated by the symbols \*\*\*, \*\*, and \*, respectively.

to the Patell test of standardized residuals (Patell 1976) and the crude dependence adjustment test according to Brown and Warner (1980). The intuition behind this result could be because of the following: (1) Increased demand for safe-haven stocks. The crisis may lead investors to seek out safe-haven investment so that they are able to hedge against market uncertainty, (2) the crisis could lead to fluctuations in exchange rates, which may be beneficial for some companies. For example, companies that export goods to Europe may benefit from a weaker euro, making their products more affordable for European consumers, and (3) Some Bourses are largely domesticated, with most of the companies listed on the exchange operating in the country and neighbouring countries. This means that the market may be less

impacted by global events that do not have a direct impact on the region. Studies such as Fossung et al. (2021) and Dang et al. (2021) have found similar results.

We further estimated the AAR and CAAR for the aggregate stock markets before and after the event period, see Table 3. Similarly, Fig. 2 shows the trend over the twenty-six days (i.e., [-5, +20])) surrounding the event. It is observed that the AAR and CAAR values exhibit negative trend monotonically five days prior to the event day. The news about the conflict and potential invasion was widely reported by the major mainstream media globally, which might be one explanation for this negative trend. Information concerning a potential Russian strike on Ukraine was also made public by the US administration. Investors'



**Fig. 2 Daily average abnormal and cumulative return during the event window.** This figure shows the average abnormal and cumulative return during the event window of Russia's war on Ukraine. Source: Made by the authors based on data from Bloomberg.

perspectives on the potential political crisis were likely to change in the wake of this news, which would negatively affect the market.

Notably, we observe a 1.64% negative abnormal return on the event day, indicating that the actual return on investment was lower than the expected return on the event day. Based on all three tests<sup>2</sup>, the drop in stock prices is statistically significant at the 1% level. The sign and magnitude of market reaction are consistent with previous literature that examined market response to the epidemic and political crisis (see Naidu and Ranjeeni 2021; Buigut and Kapar 2020; Ahmed et al. 2022). Just after the event day (i.e., +1), the stock market made a little recovery and posted a positive AAR. The AAR is statistically significant and persists monotonically over the next five days (i.e., +5). Importantly, the gains recorded started eroding six days later (i.e., +6) when the market recorded a negative return. This trend continues up till the thirteen days (i.e., +13) after the event - the largest drop in stock return during the event window.<sup>3</sup>

In providing additional insights into our results, we present the cumulative abnormal return (CAR) of the stocks over the period surrounding the event day. This result is reported in Panel B of Table 2. The results indicate that all the CAR estimates surrounding the event day, the days prior to the event day, and the days following the event day are seen to be negative and significant. The results are robust to the Patell test of standardized residuals (Patell 1976) and the crude dependence adjustment test, according to Brown and Warner (1980). This provides strong evidence of the negative impact of the Russia-Ukraine crisis on the African stock market. We assess the CAR values across all the days surrounding the event day. For instance, during the crisis [0, 0], three days [-1, +1], five days [-2, +2], seven days [-3, +3], and 21 days [-10, +10] are all negative and statistically significant. It is interesting to note that for the 21 days surrounding the event day (i.e., [-10, +10]), we observe the worse impact (CAR = -1.65%) of the Russian invasion on African stocks.

The market began to be severely affected by the invasion ten days before the event (i.e., [-10, 0]). We, however, observed the most unpleasant stock market performance (CAR = -2.4%) was recorded over the [-3, 0] window, i.e., three days before the event, since the CAR estimate is negative and statistically significant. Furthermore, the CAR estimate is negative and

statistically significant one day (i.e., [0, +1]) and two days (i.e., [0, +2]) after the event. However, the market marginally recovered from the impact of the war over the five-day window. i.e., three days after the event ([0, +3]), one to two days ([1, 2]), one to three days ([1, 3]), and five days after the event ([0, 5]). However, the negative performance returned in the stock market six days after the event (i.e., [0, +6]). The worst post-event CAR (-3.7%) is recorded thirteen days after the event day (i.e., [0, +13]), indicating that the African stocks were severely affected by the crisis. Generally, we observed a negative impact of the Russia-Ukraine war on our sample of African stocks.

Table 4 examines how African countries' individual aggregate returns and company's stock returns react to the Russia-Ukraine crisis for the periods [-5, +20] surrounding the event. The study observes that all the countries all share indexes reacted negatively to the news of the invasion, as their AAR posted negative abnormal returns. For instance, South Africa (-0.889%), Nigeria (-0.084%), Zimbabwe (-0.018%), Kenya (-1.939%), Egypt (-0.012%), Mauritius (-0.035%), Morocco (-0.226%), Tanzania (-0.071%), and Tunisia (-0.304%) recorded. However, only Ivory Coast (0.643%) recorded a positive abnormal return for the one-day pre-event.

Furthermore, while some countries recovered a day after the event ([0, +1]), others still experienced volatility in their abnormal return post-event day and didn't fully recover until 20 days after the event. The country-specific CAAR presented in Table 5 indicates that most countries witness a negative abnormal return on the event day and before the event happened. The results further note that most selected countries witness negative CAAR even after 15 days of the event. For instance, Morocco suffered the worst performance in the post-event window with a negative abnormal return of -7.1% for [0, +20], followed by Mauritius (-2%), Kenya (-2%), Tanzania (-1.2%), and South Africa (1.2%). This signifies that African countries were affected due to the impact of the crisis, which could be because of their over-reliance on trade and investment with Russia. For instance, the total value of trade between Russia and Africa in 2020 was \$16.4 billion. Of this total trade value, the majority (\$14.2 billion) represents Russian exports to African countries, while the remaining \$2.2 billion represents African exports to Russia (UN Comtrade 2020). It is worth noting that while Russia has been expanding its economic ties

**Table 4 Firm-level average abnormal return (AAR).**

Event Windows	Pre-event days				Post-event days							
	<b>Securities</b>	<b>-5</b>	<b>-3</b>	<b>-2</b>	<b>-1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>
FTSE/JSE All Share	-0.457	-1.112	0.166*	-0.889**	0.685	2.477	1.323	-0.188	1.630	0.863	-0.034	
AVI Equity	-0.268	-1.351	0.367	-0.314	1.233	-0.754	0.264	-2.302	1.627	-0.941	1.925	
Nigerian Stock ASI	-0.014	0.198	0.027	-0.084	0.119	0.139	0.186	-0.137	0.162	-0.024	0.006	
MTN Nigeria	-0.100	0.150	0.125	0.100	0.498	0.864	0.985	0.490	0.971	0.244	-0.185	
Econet Wireless Zimbabwe	5.717	0.026	-1.449	-0.018	0.036	-0.719	-0.361	0.054	-0.860	11.135	0.319	
Delta Corp. Ltd	3.384	-1.293	1.549	-1.051	-1.391	-1.391	0.905	-0.303	2.222	4.955	-0.802	
Nairobi All Share Index	0.402	0.042	-0.246	-1.939	1.556	0.137	0.174	1.144	-0.044	-0.951	0.667	
Safaricom Kenya	0.791	-0.052	-0.264	-3.416	3.086	0.835	0.553	1.333	-0.143	-1.288	1.252	
Egyptian Exchange 30	-0.287	-0.288	-1.765	-0.012	-2.235	2.226	1.214	1.028	0.362	0.194	-1.251	
Commercial International	-0.980	1.614	-2.860	-0.583	2.893	-1.234	-0.231	1.053	1.560	1.505	-1.650	
Bank												
Ivory Coast All share Index	1.385	-0.222	-0.213	0.643	1.911	1.134	-0.379	0.299	-0.387	0.233	1.037	
SONATEL BC Equity	0.103	-0.171	1.056	2.268	6.958	2.334	-0.579	0.062	-1.548	-0.065	1.918	
Stock Exchange of Mauritius	-0.173	0.156	-0.247	-0.035	-0.040	-0.155	-0.113	-0.120	0.558	0.508	0.189	
MCB Group Ltd	-1.097	0.078	-0.951	0.079	0.324	0.962	0.878	0.475	1.048	0.805	0.158	
Morocco Casablanca Index	0.125	-0.337	-0.990	-0.226	1.528	-0.666	-0.016	-0.809	-2.510	1.302	0.044	
Attijariwafa Bank	0.228	-0.341	-1.098	0.427	3.754	-0.435	-0.202	-2.721	-2.222	3.966	0.718	
Tanzania All Share Index	0.139	-0.367	0.094	-0.071	-0.002	0.263	-0.797	0.156	0.195	-0.243	0.305	
CRDB Bank PLC	-0.664	-0.284	-0.189	-0.095	0.095	0.378	0.472	0.660	1.315	1.409	1.351	
Tunisia Stock Exchange	0.205	0.026	-0.325	-0.304	0.043	0.128	-0.183	-0.019	0.174	0.291	0.326	
Banque de Tunisie	0.590	-0.211	-0.187	-0.125	0.016	1.836	2.435	2.655	0.248	-0.893	-0.227	

Standard *t*-test assuming cross-sectional independence, according to Serra (2002), \*\*\*denotes significance at 1%, \*\*at 5% and \*at 10%. Estimates reported in percentages. The results of the Patell test and crude dependence adjustment are not reported due to paucity but available upon request.

with Africa in recent years, its investment in the continent is around \$15 billion (Africa Center 2021).

The study further analyzed how selected firms in each country reacted to the crisis. The results presented in Table 5 indicate that the majority of the firms reacted negatively before and after the event. Safaricom Kenya had the worst AAR a day before the event (-3.416%), followed by Delta Corp. Ltd (-1.051%). The results further reveal that AVI Equity, Safaricom Kenya, and Sonatel BC equity are still yet to recover from the shock even after 15 days. Similarly, the CAAR results indicate that most firms witness a negative abnormal return on the event day and before the event happened. Importantly, Safaricom Kenya had the worst performance on the event day, with a CAAR of -5.90%. In summary, we observe that companies in the telecommunication industry were severely affected by the crisis. We believe this might be due to the following: (1) fluctuations in currency exchange rates, which can affect the operations of companies that operate in multiple currencies and (2) investors may have become cautious and are reevaluating their investment portfolios, which can lead to selling of stocks across different sectors and regions.

The trends of individual AAR and CAR are reported in Fig. 3 of the Appendix. The figure corroborates the empirical findings of Tables 4 and 5. What we can infer from the graphs is that while some stocks were severely affected by the event, other stocks were minimally impacted and some stocks were not affected. We can conclude that the impact of the war is heterogeneous on African stocks market return; hence country-specific measures should be adopted to achieve a resilient economy and capital market.

**Discussion of findings.** Based on the findings of the study, and consistent with the empirical outcome of Boungou and Yatié (2022) and Zaremba et al. (2022), who argue that war or geo-political risk event significantly impacts the stock markets and that investors may overreact to news about geo-political risk and conflicts, we find negative abnormal returns in 14 of the 20 examined stock markets. On the other hand, six African stocks posted positive abnormal returns. This finding of positive returns is consistent with other studies such as Fossung et al. (2021) and Dang et al. (2021). Possible reasons for this may include the following: First, the need for haven investments has grown. The crisis may drive investors to seek safe-haven investments so that

they can hedge against market volatility. Second, the crisis might lead to swings in currency rates, which may be good for certain enterprises. For example, firms that export goods to Europe may gain from a lower euro, making their items inexpensive for European customers. Finally, some Bourses are mostly domesticated, with most of the companies listed on the market operating in the nation and surrounding countries.

Generally, the finding of this study is at par with the empirical outcomes of Umar et al. (2022), Ahmed et al. (2022), Prohorovs (2022), Depalo (2022), Abbassi et al. (2022), Boubaker et al. (2022), and Yatié (2022) which argue that the Russia-Ukraine conflicts have affected the global and European stock market returns. Furthermore, these studies concluded that the impact of the invasion is heterogeneous in terms of its intensity across the countries, their industries, and company sizes. The broader negative impact of the war on African stock markets is similar to studies on other regions by Yousaf et al. (2022) on the European and Asian regions. The findings from Yousaf et al. (2022) echoed the findings from our study, highlighting the global repercussions of the conflict on diverse stock markets and underscoring the importance of nuanced considerations. The key difference between the two studies lies in the specific countries and regions that exhibited vulnerability to the Russia-Ukraine war. Our research is thus unique because it provides a thorough analysis of the temporal dynamics of abnormal returns and a targeted investigation of the effect on African stock markets, providing localized and practical insights into the heterogeneous nature of the African capital market.

## Conclusion and policy recommendations

The paper examines the impact of Russia's war on Ukraine on African stock markets, by investigating how the selected African countries and their most capitalized stocks responded to the Black Swan event. The study rests on the event study methodology propounded by Fama et al. (1969). Daily data on the selected stocks were curated from the Bloomberg terminal database (2022) (See <https://www.bloomberg.com/markets/stocks>), while the daily series spans the period 5th January 2021 to 5th August 2022 (weekdays only). Furthermore, the analysis spans the event day, the event window, and the days after the event window to check

**Table 5 Firm-level and Country-specific average cumulative abnormal return (CAR).**

Event windows	Post-event days					Around event days				Pre-event days				
	Securities	[0; 1]	[0; 2]	[0; 5]	[0; 20]	[0; 0]	[-1; 1]	[-5; 5]	[-10; 10]	[-25; 0]	[-15; 0]	[-5; 0]	[-3; 0]	[-1; 0]
FTSE/JSE All Share		-1.100	1.400	3.100	-1.200	-1.800	-2.000	1.100	-3.900	-3.500	-2.000	-3.800	-3.600	-2.600
AVI Equity Nigerian Stock ASI		-1.600 0.300	-2.400 0.400	-4.200 0.200	-7.200 -0.500	-2.900 0.100	-1.900 0.200	-6.000 0.400	-15.400 0.400	-5.700 3.900	-4.300 0.700	-4.700 0.300	-4.200 0.300	-3.200 0.100
MTN Nigeria Econet Wireless		0.800 1.400	1.700 0.700	3.900 0.600	4.300 0.500	0.300 1.400	0.900 1.400	4.000 9.200	7.200 22.600	2.400 56.200	1.600 39.700	-0.200 10.000	-0.500 0.000	-0.100 1.400
Delta Corp. Ltd Nairobi All Share Index		-2.800 -2.200	-4.200 -2.100	-3.900 0.500	0.500 -2.000	-1.400 -3.800	-3.800 -4.100	-2.600 -1.100	1.900 -6.100	20.700 -3.600	15.800 -5.300	-0.100 -5.300	-2.200 -5.900	-2.400 -5.700
Safaricom Kenya Egyptian Exchange 30 Commercial International Bank		-2.900	-2.000	2.200	-1.200	-5.900	-6.300	-0.200	-8.300	-6.700	-8.200	-8.300	-9.700	-9.400
Ivory Coast All share Index SONATEL BC Equity Stock Exchange of Mauritius MCB Group Ltd		-6.000 -2.900	-3.800 -4.100	-2.300 -4.800	0.800 5.000	-3.800 -5.800	-6.000 -3.500	-4.900 -8.400	-14.300 -22.200	-9.500 -9.900	-8.500 -9.400	-6.400 -9.400	-5.800 -7.600	-3.800 -6.400
Morocco Casablanca Index Attijariwafa Bank		1.900	3.100	2.100	3.200	0.000	2.600	3.800	3.900	4.900	4.300	1.700	0.200	0.700
Tanzania All Share Index CRDB Bank PLC		11.600	13.900	12.200	10.000	4.600	13.900	15.900	16.400	15.300	15.400	8.400	7.800	6.900
Tunisia Stock Exchange Banque de Tunisie		-1.200	-1.400	-1.700	-2.000	-1.200	-1.200	-1.600	-0.900	1.200	1.200	-1.100	-1.300	-1.200
		-2.200	-1.200	0.900	0.800	-2.500	-2.100	-1.200	-4.500	-4.300	-3.700	-4.600	-3.300	-2.400
		-2.600	-3.200	-4.800	-7.100	-4.100	-2.800	-6.900	-13.400	-8.100	-9.700	-6.200	-5.700	-4.300
		-1.700	-2.100	-6.500	-10.200	-5.500	-1.300	-6.600	-10.600	-8.100	-9.700	-6.200	-5.700	-4.300
		-0.300	0.000	-0.600	-1.200	-0.300	-0.300	-0.500	-0.400	3.100	0.500	-0.200	-0.600	-0.300
		0.100	0.500	2.200	19.600	0.000	0.000	0.400	0.700	28.500	-8.100	-1.800	-0.600	-0.100
		-0.500	-0.400	0.300	0.300	-0.600	-0.800	-0.300	-0.400	-0.200	-0.700	-1.200	-1.200	-0.900
		0.000	1.800	10.000	6.900	0.000	-0.100	9.700	10.900	2.400	1.600	-0.200	-0.500	-0.100

Standard *t*-test assuming cross-sectional independence, according to Serra (2002), \*\*\*denotes significance at 1%, \*\*at 5% and \*at 10%. Estimates reported in percentages. The results of the Patell test and crude dependence adjustment are not reported due to paucity but available upon request.

for the responses of these stocks' pre-event, during the event, and post-event.

The findings demonstrated that 14 of the 20 selected stocks in Africa had negative abnormal returns on the event day, while the abnormal returns of 9 from these 14 stocks were statistically significant. The list of stocks that posted abnormal returns are Safaricom Kenya, Commercial International Bank, Attijariwafa Bank, Morocco Casablanca Index, Egyptian Exchange 30, Nairobi All Share Index, AVI Equity, MCB Group Ltd, FTSE/JSE All Share, Delta Corp. Ltd, Stock Exchange of Mauritius, Tunisia Stock Exchange, Tanzania All Share Index, and Banque de Tunisie. On the other hand, 6 African stocks posted positive abnormal returns on the event day. The list includes Ivory Coast All share Index, CRDB Bank Plc, Nigerian Stock ASI, MTN Nigeria, Econet Wireless Zimbabwe, SONATEL BC equity. These findings are robust across the Patell and crude dependence adjustment tests. Therefore, these 6 stocks have been found to be resilient compared to the stocks that posted negative abnormal returns during the invasion.

Furthermore, the AAR and CAARE results demonstrated negative values five days before the event day fueled by the existing conflict in the region and the probability of a potential invasion prior to the event day. On the event day, all the selected African stocks negatively reacted to the invasion, thereby leading to negative AAR. In addition, the selected stocks posted negative CAAR 15 days after the event, perhaps, due to the intensity of trade between Russia and the selected countries. Lastly, the findings suggested that the majority of firms within the selected countries negatively reacted pre-event, during the event, and after the event. As a result of these findings,

the paper affirms that Russia's war in Ukraine has had a heterogeneous impact on the returns of the selected African stock market, thereby leading to the recommendation that country-specific measures are more appropriate to achieve resilient stocks in Africa.

Our finding is consistent with Yousaf et al. (2022) who conducted a global analysis of the impact of the Russia-Ukraine war on stock markets, using the event study methodology. They identified adverse effects from the invasion, negatively impacting stock markets in G20 nations and other selected countries both on the event day and in the subsequent days. The study pinpointed specific vulnerable countries, such as Hungary, Russia, Poland, and Slovakia before the event, and Australia, France, Germany, and others after the event. The broader negative impact on European and Asian regions echoed findings from our study, highlighting the global repercussions of the conflict on diverse stock markets and underscoring the importance of nuanced considerations. The key difference between the two studies lies in the specific countries and regions that exhibited vulnerability to the Russia-Ukraine war. While the G20 study identified pre-event susceptibility in Hungary, Russia, Poland, and Slovakia, and post-event impacts in countries like Australia, France, and Germany, our study detailed the impact on specific African countries and stocks, showcasing the heterogeneous reactions within the continent.

Our study is particularly useful because it offers a focused examination of the impact on African stock markets, highlighting resilience in specific stocks and providing detailed insights into the temporal dynamics of abnormal returns. This granularity is

valuable for policymakers, investors, and researchers interested in understanding how a global event such as the Russia-Ukraine war reverberates within a specific region, offering practical implications for crafting country-specific measures to bolster stock market resilience in Africa. The study thus contributes localized and actionable insights, complementing the broader global perspective offered by the G20 study and other related studies.

Based on the aforementioned findings, the study recommends that African stock markets should build a resilient market capable of withstanding external shock. This could be in the form of a strong regulatory framework. A robust regulatory framework would promote transparency, accountability, investors' protection and will increase investor confidence. Secondly, it is important for African markets to embrace technology to improve efficiency, transparency, and accessibility. This includes adopting online trading platforms, mobile applications, and other digital services that can help investors to access the market easily. Thirdly, investors should also be educated. African bourses should provide investor education programs to increase awareness and understanding of the capital market. This will help investors to make informed decisions and reduce the risk of panic-selling during external shocks. Fourthly, diversify products and services: African bourses should develop a diversified product and service offering to attract a wider range of investors. The more diverse the products and services, the better the chances of absorbing external shocks. Fifthly, encourage long-term investment: African bourses should encourage long-term investment by institutional investors such as pension funds, insurance companies, and sovereign wealth funds. Long-term investors are less likely to be affected by short-term external shocks. Lastly, promote regional integration: African bourses should promote regional integration to create larger markets with deeper liquidity. Regional integration can help to absorb external shocks and reduce the risk of contagion.

While our study contributes valuable insights into the impact of the Russia-Ukraine war on African stock markets, it is essential to acknowledge certain limitations. Firstly, the study's focus on African countries may limit the generalizability of findings to other regions. The heterogeneous reactions observed in Africa may not be directly applicable to stock markets in different geopolitical contexts. Secondly, the study's timeframe, from January 5, 2021, to August 5, 2022, might not fully encapsulate the long-term effects of the Russia-Ukraine war on African stock markets. Future research could explore extended temporal scopes for a more comprehensive understanding. Despite these limitations, our study provides valuable insights into the heterogeneous impact of the war on African stock markets, emphasizing the need for nuanced, country-specific measures.

## Data availability

Data available upon request.

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## Notes

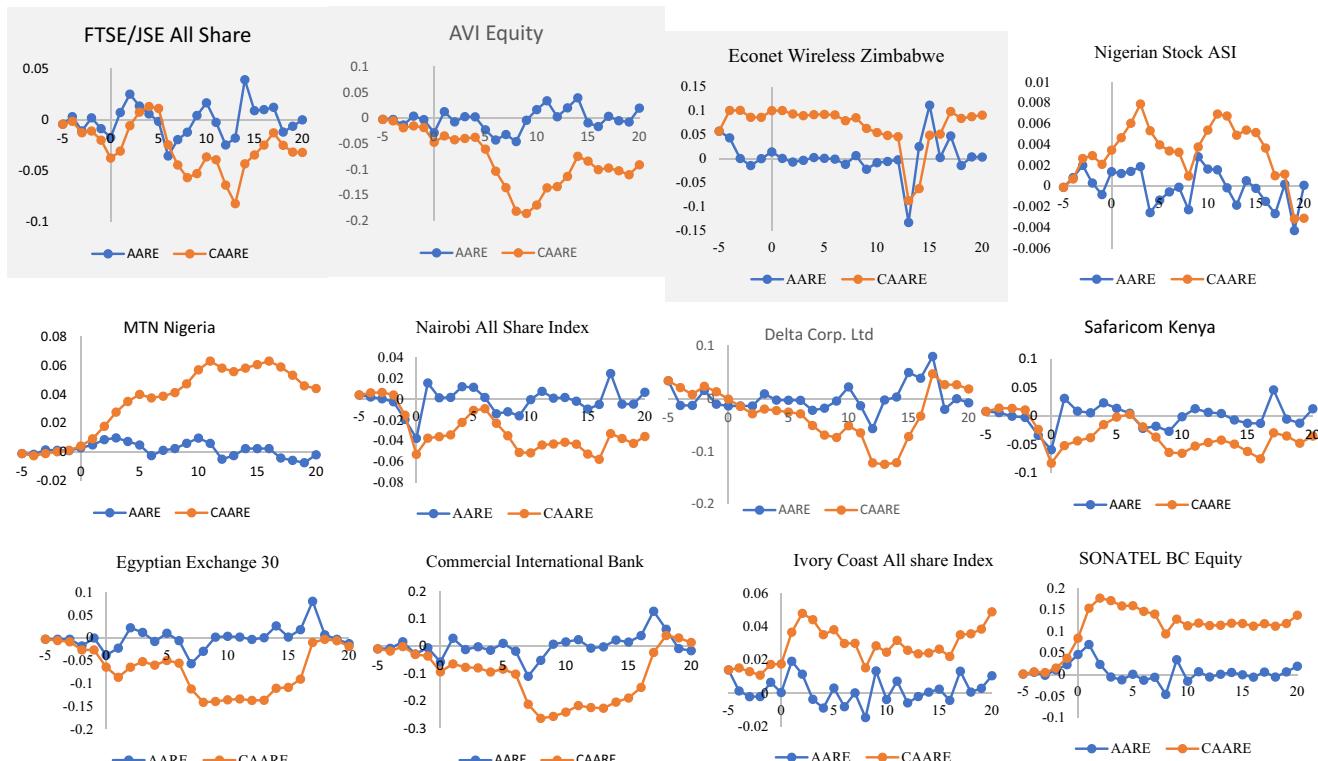
1 See <https://www.bloomberg.com/markets/stocks> for more.

2 Crude Dependence Adjustment and Patell test of standardized residuals.

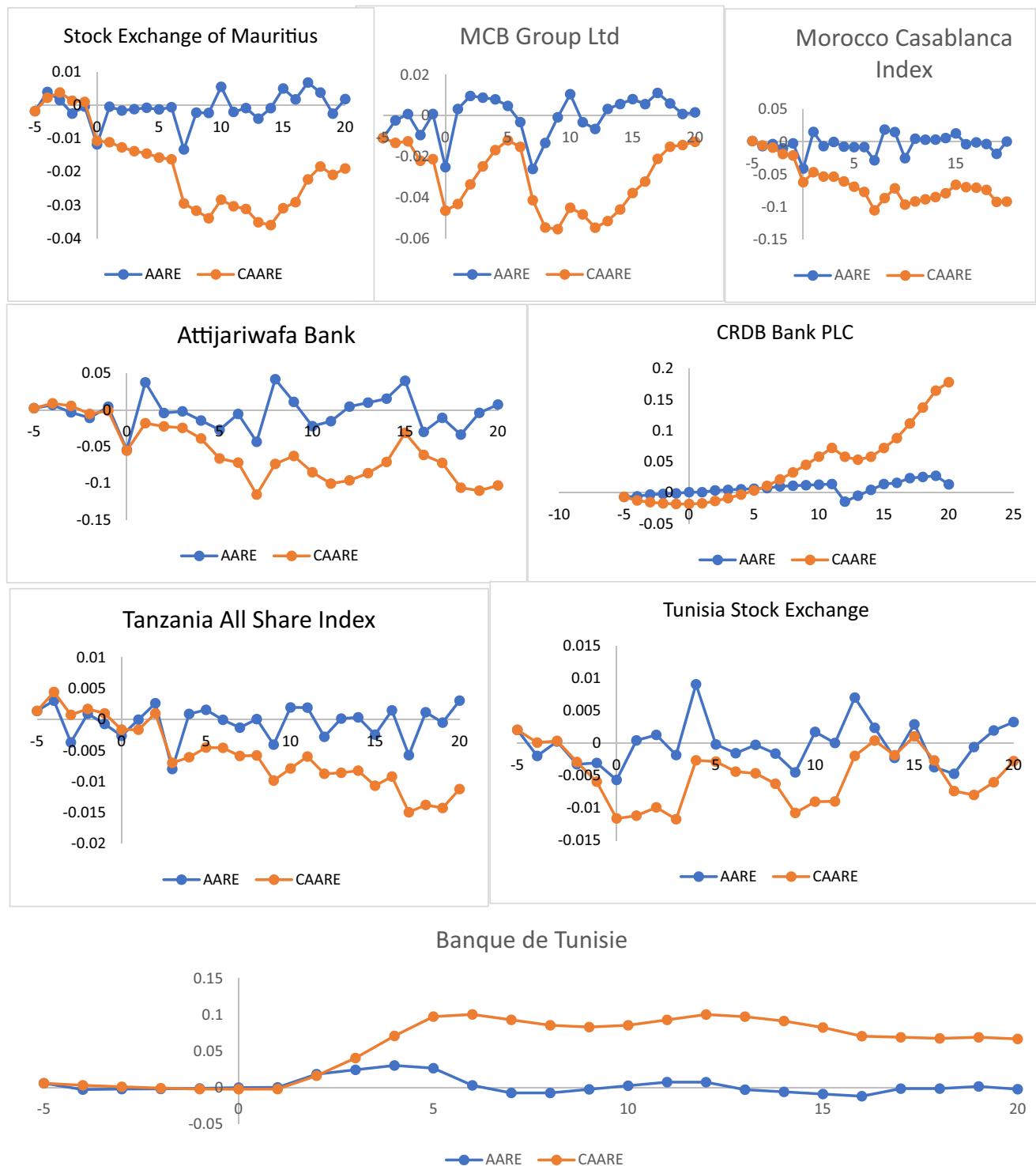
3 This period coincides with when the Russian troops won a battle at Kherson; this was the first major city to fall to Russian forces in the invasion. Russian troops moved on Mykolaiv, attacking it two days later (See Wikipedia for more).

## Appendix

Figure 3



**Fig. 3 The evolution of CAAR and AAR over the event window.** This figure shows the evolution of the average cumulative abnormal stock returns and abnormal stock returns over the event window of Russia's war on Ukraine. Source: Made by the authors based on data from Bloomberg.

**Fig. 3** Continued**References**

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