A comparative analysis between Fintech and Traditional stock markets: using Russia and Ukraine WAR data

Abstract

In this paper we extend the current literature by seeking answers to two questions: (1) were/are traditional stock markets or Fintech markets more volatile during the Russia-Ukraine War? (2) Which market returns were/are higher during the Russia-Ukraine War - traditional stocks or Fintech stocks. We explored whether cumulative abnormal returns (CARs) and the stock price of the Fintech market, proxied by Global X Fintech ETF, of firms listed in 28 different countries' stock markets differ during the Russia-Ukraine War than before the war. Our data set covers the period from June 1, 2021, through November 22, 2022. Our results found that traditional stock markets have been more volatile than Fintech stock markets during the Russia-Ukraine War than before the war. On the other hand, we can see that traditional market returns have been lower than Fintech market returns during the Russia-Ukraine war than before the war.

Key words: Traditional stock market; Fintech; War; Russia; Ukraine

JEL classifications: G11, G14, G15, G24, G34, H56

1. Introduction

“The war is expected to have a considerable impact on the global economy.’’

[Christine Lagarde, President of the ECB, 27 March 2022.]

The traditional market is changing more quickly as a result of a recent wave of Fintech developments. The Fintech phenomenon is altering the structure of financial intermediation, along with big-tech’s rapidly expanding position in the financial services market (Frost et al., 2019). FinTech emerging market participants offer a severe challenge to the existing business model by reducing information asymmetries and developing new distribution and service methods (Boot et al., 2020). Diverse disruptive technologies, such as automated payment systems and digital wealth management, have had a significant impact on the financial sector (Chen et al., 2022). Fintech may increase efficiency and deepen financial inclusion in underdeveloped financial industry segments. Banks can gain a variety of advantages by automating back-office procedures, leading to lower costs, quicker customer service, and an easier way of keeping regulatory compliance. Increases in efficiency in the loan markets are mostly attributable to the disintermediation of processes and the reduction of transaction costs brought on by loan personalization.

On February 24, 2022, Russia launched an official attack against Ukraine after placing military outposts close to the border. Concerns regarding the ongoing war include: (i) its protracted nature; (ii) Russia's reaction to Western sanctions; and (iii) its potential impact on the world economy, notably on the reactions of the financial markets (Boungou and Yatie, 2022). After the Cold War ended, it seemed that geopolitical tensions between NATO members and Russia were diminishing. However, they have now significantly increased, culminating in the invasion of Ukraine. This invasion took most politicians and Ukrainians by surprise, and it was an exogenous shock for foreign businesses with Russian operations (Berninger et al., 2022).

Company executives have had to make decisions concerning their Russian activities ever since the crisis started, despite the fact that the majority of corporations in North America and Europe support Ukrainian independence and decry Russia's behaviour. Russia is the world's largest country by area and one of the ten most populous nations, making it a crucial market for businesses operating on a worldwide scale. However, it appears that firms will not be able to continue working in Russia as before due to the invasion and the sanctions put in place by Western countries as a response. They must now choose whether they want to continue in Russia and deal with significant obstacles to their operations brought on by Western-imposed sanctions and the possibility of being perceived negatively for being pro-Russian, or if they want to completely exit the Russian market.

The main aim of this paper is to determine whether traditional stock markets have been more volatile than Fintech stock markets during the Russia-Ukraine War. Moreover, we also investigate which market returns have been higher during the conflict - traditional stock markets or Fintech stock markets. In order to answer to these questions, we view the impact of the Russia-Ukraine War and Fintech innovations on traditional stock markets as the result of supply and demand for this specific circumstance in the current world economy. The amount of returns that Fintech stock market may generate for the global economy during the current Russia-Ukraine war is what drives demand for it. There might be more demand for Fintech stocks if the regular stock markets' operating systems and services are, for example, essentially outmoded. In contrast, the supply of Fintech stocks is made up of businesspeople who are prepared to start their own businesses at this time of conflict. A significant number of investment bankers who lost their jobs following the 2008 financial crisis and are eager to apply their financial expertise in a related and promising financial sector may be the driving force behind this supply. During the war, they have made a concerted effort to decrease volatility on Fintech stock markets and increase returns more than traditional stock markets. To answer the above questions, we explored whether cumulative abnormal returns (CARs) and the stock price of the Fintech market, proxied by Global X Fintech ETF (R_Fintech), by firms listed on 28 different countries stock markets differed from normal times than during the Russia-Ukraine War. Using a wide sample from June 1, 2021, through November 22, 2022, we concentrated on CARs announcements in the event window [-1,+1] and the stock price of the Fintech market represented by the Global X Fintech ETF. To conduct this research paper, we used two different model specifications. In each model specification our independent variables and control variables were the same but the dependent variables differed. To do the robustness and endogeneity test we used a two-stage system generalized method of moments (GMM) estimation.

This work contributes to the literature in several ways. This is the first time anyone has considered the question of whether traditional stock markets or Fintech stock markets have been more volatile during the Russia-Ukraine War, and also whether market returns have been higher during the war - traditional stock markets or Fintech stock markets. Secondly, we show the results after and before controlling for industry effects. Thirdly, we employed a larger data set compared to studies in this area.

Our results reveal that traditional stock markets have been more volatile than Fintech stock markets during the Russia-Ukraine War compared to before the war. These results are consistent for our full sample period (June 1, 2021, through November 22, 2022). On the other hand, we can see that traditional stock markets returns have been lower than Fintech stock markets during the Russia-Ukraine War than before it. These results are also consistent for the full sample period (June 1, 2021, through November 22, 2022). The results of the robustness test confirmed the results of the initial regression. All findings show that our basic findings are robust and endogeneity-free.

The remainder of the paper is organised as follows. Section 2 discusses the relevant theories and develops the hypotheses. Sample and model specifications are explained in Section 3. Section 4 present the empirical results and discussion, and Section 5 concludes the paper.

2. Theoretical discussions and development of hypotheses

2.1 Brief overview of Fintech

Financial services are significantly impacted by digitalization because all financial products are dependent on information that is readily available in the market (Puschmann, 2017). The majority of developments are only implemented when there is no physical interaction (e.g., online payment or stock trading). John Reed, the then chairman of Citicorp, initially introduced the concept of Fintech in the early 1990s from the perspective of the "Smart Card Forum." Fintech refers to cutting-edge financial solutions backed by information technology and financial service providers. However, financial innovations are divided according to several innovation criteria (Frame & White, 2014).

Financial companies have been paying close attention to developments in Fintech. According to Gopalan et al. (2012), IT expenses make up about 15–20% of the operating costs for financial enterprises and are ranked as the second-highest expense these businesses have (after labour costs). Because IT is a primary driver of costs for financial firms, businesses, including banks, insurance companies, and other financial intermediaries, were among the early adopters and supporters of advancements in Fintech (Lamberti & Buger, 2008). The emergence of ATMs in 1959, trading on the NASDAQ in 1971, internet banking in 1994, mobile banking in 1999, and the introduction of digital currencies in 2010 are just a few examples of the stages that the development of Fintech innovation has gone through (Puschmann, 2017).

Based on the changes that Fintech has brought about in the financial services sector, businesses are growing increasingly at ease conducting financial transactions over the Internet, using mobile devices for banking, and employing digital currencies. The transmission mechanism involved in carrying out monetary policy activities could potentially be impacted by a change in the financial system. Cell phones, Internet technology, and virtual currencies (Bitcoin, Litecoin, Ethereum, and Ripple) are all considered Fintech components in this study investigating the connection between Fintech and monetary policy (Mumtaz and Smith, 2020).

2.2 Hypotheses

There is still a lack of academic research on the Russian invasion of Ukraine on February 24, 2022; however, there are some early tentative studies analysing the reaction of the financial markets. Federle et al. (2022) analysed stock market responses in 66 countries and utilised the distance from Ukraine as a factor. They demonstrated how living near Ukraine has reduced market returns. Yousaf et al. (2022) came to a similar conclusion when they observed that the Russian invasion significantly affected the stock markets of Europe and Asia. The conflict between Russia and Ukraine was also examined by Deng et al. (2022), who concentrated on the environmental, social, and governance (ESG) aspects of firms and demonstrated that ESG ratings do not provide a reliable signal of a company's resilience in a crisis. They also showed how different regions, depending on their reliance on Russian energy sources, have been affected differently. It may also be possible to draw insights from earlier research on other conflicts (e.g., Frey and Waldenström, 2004; Leigh et al., 2003).

As a result of supply and demand in this specific situation in the current global economy, we explore the impact of the Russia-Ukraine War and Fintech innovations on traditional stock markets. Demand for Fintech stocks is mostly driven by the potential gains they may provide for the world economy during the ongoing Russia-Ukraine conflict. If, for instance, traditional stock market operating systems and services are antiquated, there might be a greater demand for Fintech stocks. On the other hand, the supply of Fintech stocks is made up of entrepreneurs who are ready to launch their own companies at this time of conflict. Such a supply may be driven by a sizable number of investment bankers who have lost their employment as a result of past financial crises and are keen to use their financial experience in a related and attractive financial sector. They could have made a determined attempt to reduce the volatility of Fintech stock markets and boost returns relative to traditional stock markets during this war.

The safe haven characteristics of cryptocurrencies have been examined by numerous scholars, but their results are often contradictory. From both the long- and short-term views, Baumöhl (2019) identified sizable negative links between forex and Bitcoin and came to the conclusion that diversification between these two assets would be a prudent move. According to Bouri et al. (2017), Bitcoin has acted as a potent safe haven against weekly sharp declines in Asian market prices. Symitsi and Chalvatzis (2019) acknowledged the diversification advantages of Bitcoin and noted that even their high volatility does not outweigh the reduction in overall portfolio risk that results from their low correlation with other assets. According to Yermack (2013), most widely used currencies and gold have no association with daily exchange rates, Bitcoin is useless for risk management. Similar conclusions were reached by Baur et al. (2018), who asserted that Bitcoin is uncorrelated with traditional asset classes, like commodities, bonds, and equities, in both good and poor economic conditions.

According to research by Klein et al. (2018), Bitcoin positively correlates with bearish markets and may even raise portfolio risk, in contrast to gold. Because it lacks a number of traditional asset qualities that are helpful to investors during times of crisis, such as lower transaction costs, better liquidity, and lower volatility, bitcoin cannot be viewed as a safe haven (Smales, 2019). Several more research (Cheema et al., 2020; Conlon and McGee, 2020; Kristoufek, 2020), in a similar vein, questioned whether Bitcoins shield investors from market volatility during periods of financial and economic instability, such as war. Urquhart and Zhang concurred that Bitcoin behaved similarly to six other foreign currencies in their 2019 analysis. Shahzad et al. (2019) examined several stock market indexes in both developed and underdeveloped countries, including the US and China, and came to the conclusion that, at best, Bitcoin can only be considered as a subpar safe-haven asset in specific situations. Based on the above arguments, we developed the following hypotheses:

H1a: Traditional stock market returns have been lower (more negative) during the Russia-Ukraine war.

H1b: Fintech stock markets' returns have been higher (more positive) during the Russia-Ukraine war.

The possibility of war occurring in the United States was estimated by Rigobon and Sack (2005), who also considered how this 'war risk' component influences the stock market. They discovered that stock price volatility is significantly influenced by the likelihood of conflict. Similar to this, Choudhry (2010) demonstrated that war (WWII) was largely to blame for US stock market volatility between 1939 and 1945. The literature generally comes to the conclusion that enterprises exposed to war experience significant negative effects.

A discussion about Fintech's impact on market volatility and financial stability was sparked by the industry's rapid rise. The speed and volume of financial transactions are both greatly enhanced by the new technology. Fintech, however, may also endanger financial stability. Whether Fintech encourages financial stability or increases volatility and instability in the market is up for dispute. Given the current issues seen in the markets for cryptocurrencies, peer-to-peer lending, and other developing Fintech applications, this issue is becoming increasingly crucial (Zhang et al., 2017; Philippon, 2016; Yao et al., 2018; Chen et al., 2019; Kurka, 2019; Li et al., 2020). To find a unidirectional Granger causation between P2P and banks, for instance, Zhang et al. (2017) utilised a bootstrapped panel causality research in China. The vector auto-regression (VAR) impulse response model was used by Yao et al. (2018) to identify a highly advantageous relationship between third-party payments and the traditional banking industry. Li et al. (2020) found that there is a positive correlation between Fintech institutions and financial institutions using a Granger causality test. Based on the above arguments, we developed the following hypotheses:

H2a: Traditional stock market returns have been more volatile during the Russia-Ukraine war.

H2b: Fintech stock markets returns have been less volatile during the Russia-Ukraine war.

3. Sample and Model Specification

3.1 Data, sample selection, and variables

The data for this study (see Table 1), comes from the Thompson Reuters Eikon database and covers the period from June 1, 2021, through November 22, 2022. We divided our data sample into three different periods: (1) the full sample period; (2) the pre-Russia-Ukraine War period (1^{st} June 2021 – 23^{rd} February 2022); and (3) only during the Russia-Ukraine War (23^{rd} February 2022 - 22^{nd} November 2022). The dependant variables are cumulative abnormal returns (CAR) and the stock price of the Fintech market, proxied by the Global X Fintech ETF (R_Fintech) (following, Adekoya, 2022). Our independent variables are volatility and the Russia-Ukraine War. We use the standard event study methodology to calculate the CAR.

One of our control variables is firm size, determined by taking the natural logarithm of a company's market capitalization. Because of their broad capabilities, which include their ability to implement efficient operations and scale- and scope-related cost savings, larger organisations are known to perform better than smaller ones (Majumder, 1997; Penrose, 1959).

The relationship between business size, firm returns, and market volatility should therefore be obvious. Leverage is a key indicator of a firm's returns, and as Lazar (2016) pointed out, increased debt can lead to agency problems and underinvestment (Ibhagui and Olokoyo, 2018). Table 1 lists the remaining traditional control variables.

<Insert Table 1 here>

The given dataset provides us with data for 28 countries, including 23 European, 2 North American, 1 Asian, and 2 Australasian countries (see Table 2). The number of observations broken down by country are shown in Table 3. A total of 112,481 observations in total were made for this study. The country with the most observations (16,264) is Japan, and the country with the fewest observations is Latvia (152). The North American Industry Classification System (NAICS) industry classifications was used. The most observations are in the NAICS 31-33, with 38,456; the fewest are in the NAICS 61, with only 152.

<Insert Table 2 here>

<Insert Table 3 here>

<Insert Table 4 here>

3.2 Event study

To determine the effect of information about the Russia-Ukraine War on stock returns, we employ the event study methodology. We also look into the correlation between such returns and stock market volatility. The day that information becomes accessible (t) is set to coincide with the reported round's closure date. The raw returns are calculated as follows:

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

To calculate abnormal returns, one uses the difference between the expected returns and the actual stock returns of firm *i* on day *t*. Using Sharpe's (1963) market model, the anticipated returns are calculated (Campbell et al., 1997):

$$\hat{R}_{i,t} = \alpha_i + \gamma_i R_{mkt,t} + \varepsilon_{i,t} \quad (2)$$

where $\hat{R}_{i,t}$ is the estimated normal stock returns of firm *i* at day *t*, α_i is the intercept of the regression line and γ_i is the slope of the regression line. $R_{mkt,t}$ is the benchmark market index on day *t*. In this study, predicted returns were calculated using the MSCI World Index as the benchmark market[1]. $\varepsilon_{i,t}$ is the standard error. We use the market model because, in addition to lowering the variance of abnormal returns (Brown and Warner, 1980), it also has a small marginal explanatory power (Brown and Warner, 1985; Campbell et al., 1997), which is particularly true when the sample is made up of companies in the same industry (MacKinlay, 1997).

To estimate γ_i, a timeframe spanning from 250 days to 30 days prior to the announcement date was utilised to measure the correlation between the stock and the market index. We consider different event window lengths, both before and after the announcements, since information may be available prior to new information.

The abnormal return ($AR_{i,t}$) of firm *i* for day *t* is calculated as:

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\hat{\gamma}}_i F_t) \quad (3)$$

The average abnormal return ($\overline{AR_t}$) on day *t* is measured as the average abnormal stock return for all n firms on day *t*:

[1] The performance of large and mid-cap stocks in all 23 developed market nations is represented by the MSCI World Index, a comprehensive global equity index. It covers about 85% of each nation's free float-adjusted market capitalization.

$$\overline{AR}_t = \frac{1}{n}\sum_{i=1}^{n} AR_{i,t} \quad (4)$$

We calculate the CAR for each stock *i*, $CAR_{i,(\tau_1,\tau_2)}$, as the sum of the average abnormal returns for all day's *t* in the event window:

$$CAR_{i,(\tau_1,\tau_2)} = \sum_{t=\tau_1}^{\tau_2} AR_{i,t} \quad (5)$$

Finally, we estimate the mean CAR in the event windows ($\overline{CAR\ (\tau_1,\tau_2)}$) by measuring the average $CAR_{(\tau_1,\tau_2)}$ for all n firms:

$$\overline{CAR\ (\tau_1,\tau_2)} = \frac{1}{n}\sum_{i=1}^{n} CAR_{i,(\tau_1,\tau_2)} \quad (6)$$

3.3 Model specifications

In this paper we used two different model specifications to examine the impact of the Russia-Ukraine War on global stock market returns and volatility. In both model specifications our independent and control variables are the same; only our dependent variables are different. In equation 1 our dependent variable is CAR [-1, +1] and in equation 2 our dependent variable is the stock price of the Fintech market proxied by the Global X Fintech ETF (R_Fintech). Our first model is:

$$CAR_{i,t}^{[-1,+1]} = \alpha_0 + \beta_1(Volatility)_{i,t} + \beta_2(Russia - Ukraine\ War)_{i,t} + \lambda_1(Controls)_{i,t-1} + \sum \varphi_2\ Industry_I + \varepsilon_{i,t} \quad (7)$$

where $CAR_{i,t}^{[-1,+1]}$ is the CAR for firm *i* on date *t*, and we used event window [-1,+1]. Volatility and the Russia-Ukraine War are our independent variables. The vector of controls includes a host of firm-specific variables known to predict returns, such as Log size, B/E, Leverage, ROE, Invest/A, Log PPE. We also included industry-fixed effects. We clustered the standard error at the firm level.

$$(R\_Fintech)_{i,t} = \alpha_0 + \beta_1(Volatility)_{i,t} + \beta_2(Russia - Ukraine\ War)_{i,t} + \lambda_1(Controls)_{i,t-1} + \sum \varphi_2\ Industry_I + \varepsilon_{i,t} \quad (8)$$

where $(R\_Fintech)_{i,t}$ is Global X Fintech ETF (proxy of the stock price of the fintech market).

3.4 Summary of statistics

The variables' descriptive statistics are shown in Table 5. Overall, the findings point to a robust pre-assessment picture for our analysis. We can see that volatility has a low mean value (0.023) and a very low standard deviation value (0.012) compared to other variables. From Table 5 we can see that size and log PPE have higher mean values, 8.219 and 6.602 respectively. We can also note a large difference between the minimum and maximum value of size - this is because our sample may have large firms and as well as smaller ones.

<Insert Table 5 here>

In Table 6, we present the cross-correlation of our main variables. Table 6 shows that returns are positively and statistically significantly ($p<0.05$) correlated with war and volatility, but negatively and statistically significantly ($p<0.05$) correlated with leverage, log PPE and B/E.

<Insert Table 6 here>

4. Results and Discussion

4.1 Value creation of dividend announcements

Table 7 displays the cumulative average abnormal returns for three separate sample periods (in percentage terms): (1) full sample period; (2) pre-Russian-Ukraine War (1st June 2021 - 23rd February 2022); (3) during Russia-Ukraine war (24th February 2022 – 22nd November 2022). These numbers show the mean for the sample within the time frame surrounding the transaction's event day. Except for CAR [-10, +10], our CAR value is positive and statistically significant for all our event windows. These numbers, from T_2 = -20 to T_3 = 20, reflect the average CAR for the sample over the time frame before the transaction's event day.

<Insert Table 7 here>

A greater necessary rate of return during that time supports the assumption that the relevant risk per unit of time during the occurrence is larger (Kalay and Loewenstein, 1985). Due to the increased risk per unit of time in this era, an investor needs greater rates of return to keep stocks during periods of conflict and stock market volatility. For this reason, all of our model specifications include a positive intercept.

4.2 Empirical results (baseline model)

In Table 8, we report the results using equation 7 and equation 8. Panel A represents the results from the former and panel B represents the results from the latter. In both equations our independent variables and control variables are the same; only our dependent variables are different. Panel A reports the results based on traditional stock markets, where we use CAR [-1, +1] as our dependent variable. In panel A we divided our sample into three different periods: (1) full sample period; (2) pre-Russian-Ukraine War (1st June 2021 - 23rd February 2022); (3) during Russia-Ukraine war (24th February 2022 – 22nd November 2022).

From Table 8, panel A, we can see that in columns 1 and 3 volatility is positive and statistically significant ($p<0.01$), meaning that for the full sample period stock markets were less volatile. We see the similar results in columns 5 and 7, but, based on columns 9 and 11, we see that traditional stock markets were more volatile than during a normal period. These results are consistent based on current market story because if we look at global markets, we can see that from February 24th, 2022, when the Russia-Ukraine War started, until now (November 22nd, 2022), the markets were more volatile, and many remained in negative territory.

If we look at traditional stock markets returns based on war (Table 8, panel A), then we can see that from columns 1-4 (i.e. full sample period) and columns 9-12 (during the Russia-Ukraine War), the war values are negative and statistically significant ($p<0.001$), indicating that during war global stock markets returns are lower (more negative), and this has a direct impact on the full sample period and hence we have statistically significant and negative returns for the full sample period. On the other hand, the pre-Russia-Ukraine War period (columns 5-8), stock market returns were positive and statistically significant ($p<0.01$).

<Insert Table 8 here>

Table 8, panel B, reports the results based on Fintech stock markets, where our dependent variable is $(R\_Fintech)_{i,t}$, which is the Global X Fintech ETF (a proxy for the stock price of the Fintech market). Table 8 shows that global Fintech stock markets were not volatile in any of the sample periods, although in all columns volatility signs are consistent with our hypothesis (but the results are not statistically significant). On the other hand, Table 8, panel B, shows that Fintech stock markets returns were positive (higher) during the Russia-Ukraine War. This is may be attributable to investors having less (negative) confidence in traditional stock markets than in Fintech stock markets. A plausible justification is that soon after the war started, traditional markets crashed and investors lost money, but on the other hand Fintech stock markets were stable and so investors were attracted to investing in them, which drove those market returns higher. We can see the opposite results before the war, and these results are consistent with our hypothesis.

In Table 8, panel B, we see higher constant values in all columns than in panel A. In panel B, none of our controls are statistically significant, and we observe that the signs of controls are different in the two different panels. Our R^2 values are consistently low in both panels.

4.3 Robustness test (GMM estimation)

The robustness test, based on a GMM estimate using equations 7 and 8, is presented in Table 9. Here, we take into account the three different data samples and the system GMM estimation. We utilised the GMM approach to evaluate panel data sets because it is effective when a panel data collection has a small-time dimension (where t=532 days) in comparison to its cross-sectional size (where N=112,481) (Asongu et al., 2018). Reverse causality could be the root of many issues, such as measurement errors, unobserved heterogeneity, endogeneity, and omitted variable bias. The GMM estimation method addresses these issues (Alam et al., 2019; Hasan et al., 2022; Mthanti and Ojah, 2017).

To do the GMM estimation, we use the same dependent, independent, and control variables in Table 8, using industry-fixed effects. All the standard errors are clustered using firm-level dimensions. For both traditional stock markets and Fintech stock markets we have three different sample periods.

<Insert Table 9 here>

Table 9's results are consistent with Table 8's results and with our hypotheses. Table 9's results shows that traditional stock markets have been more volatile during the Russia-Ukraine War than Fintech stock markets. Table 9 also shows that traditional stock markets returns have been lower (more negative) during the war period, but Fintech stock market returns have been higher (more positive).

5 Conclusion

Fintech stock markets have significantly altered the dynamics of stock markets during the past decades compared to traditional stock markets. Fintech components are more frequently used by businesses to complete transactions. It is true that today's investors are more interested in investing in Fintech stock markets than in traditional stock markets, a trend which began before, but became more pronounced after, the Russia-Ukraine war started. Investors are losing confidence in traditional stock markets due to the crash in traditional stock markets since the war began. Using the Global Fintech ETF and indices from 28 different countries' stock markets, we investigated the dynamic returns and volatility between Fintech and traditional stock markets by taking data about the Russia-Ukraine War, namely the period between 1st June 2021 and 22nd November, 2022. We divided our sample period into three different period: (1) the full sample period; (2) pre-Russia-Ukraine War (1st June 2021 – 23rd February 2022); and (3) during the Russia-Ukraine War (23rd February 2022 - 22nd November 2022).

Our findings demonstrate that traditional stock markets were more volatile than Fintech stock markets before the Russia-Ukraine war, findings which hold true for the entire sample period. However, we can see that traditional stock market returns have been lower (more negative) in the pre-Russia-Ukraine War period than during this period. These results are constant over the course of our whole sample period. The robustness test's findings support those of the original regression. All the results demonstrate the robustness and endogeneity-free nature of our core conclusions.

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Table 1 Variable definition

Table 1 shows all variables definitions. CAR and Financial Technology (R_Fintech) are our dependent variables. Our independent variables are volatility and War (Russia and Ukraine war). We also have other cross-sectional return variables (controls) including log size, book-to-equity, leverage, return on equity, log PPE, and investment. We have industry fixed effect. The sample period is 1st June 2021- 22nd November 2022.

	Variables	Definition
Dependent variables	CAR	Cumulative abnormal return
	Financial Technology (R_Fintech)	The stock price of the Fintech market proxied by Global X Fintech ETF.
Independent variables	Volatility	It the standard deviation of returns
	War (Russia and Ukraine War)	Following Boungou and Yatié (2022), we consider the log of Wikipedia Trends search data. It measures the intensity of internet searches related to the

		current conflict between Russia and Ukraine (reported in Table with Russia-Ukraine war).
Control variables	Log size	Natural logarithm of firm's market capitalization
	B/E	Book value divided by its value of equity
	Leverage	Total debt divided by total assets
	ROE (Return on Equity)	Firm's earnings performance (Net yearly income divided by the value of its equity)
	Invest/A	Represent the firm's capital expenditure divided by the book value of its assets
	Log PPE	Natural logarithm of firm's Property, Plant and Equipment
Fixed Effect	Industry fixed effect	NAICS industry classification

Table 2 Index name by country

Table 2 represents all the index name by country used in this research paper. In this research paper we used 28 main indexes from 28 different countries. In our data set we have 23 countries from Europe, 2 from North America, 1 from Asia and 2 from Australia. The sample period is 1st June 2021- 22nd November 2022.

No.	Country name	Index
1	Australia	S&P_ASX-200
2	Austria	ATX
3	Belgium	BEL-20
4	Bulgaria	BES SOFIX
5	Canada	S&P_TSX Composite
6	Croatia	CROBEX
7	Denmark	OMX Copenhagen-20
8	Estonia	Baltic Index- Tallinn

9	Finland	OMX Helsinki-25
10	France	CAC 40
11	Germany	DAX
12	Hungary	BUX
13	Ireland	ISEQ Overall
14	Italy	FTSE MIB
15	Japan	Nikkei 225
16	Latvia	Baltic Index- Riga
17	Lithuania	Baltic Index-Vilnius
18	Netherlands	AEX
19	New Zealand	NZX 50
20	Norway	OSE All Share
21	Poland	WIG 30
22	Russia	MICEX
23	Spain	IBEX 35
24	Sweden	OMX Stockholm 30
25	Switzerland	SMI
26	Ukraine	PFTS
27	United Kingdom	FTSE-100
28	United States of America	NASDAQ 100

Table 3 Firm's number by country

Below table present the number of firm years by country. In this research paper we used 29 main indexes from 28 different countries. In our data set we have 23 countries from Europe, 2 from North America, 1 from Asia and 2 from Australia. The sample period is 1st June 2021- 22nd November 2022.

Country name	Freq.	Percent	Cum.
Australia	13,604	12.09	12.09
Austria	1,216	1.08	13.18
Belgium	1,216	1.08	14.26
Bulgaria	760	0.68	14.93
Canada	15,808	14.05	28.99
Croatia	1,672	1.49	30.47
Denmark	4,712	4.19	34.66
Estonia	684	0.61	35.27

Finland	1,596	1.42	36.69
France	2,660	2.36	39.05
Germany	2,736	2.43	41.49
Hungary	1,140	1.01	42.50
Ireland	2,128	1.89	44.39
Italy	2,433	2.16	46.55
Japan	16,264	14.46	61.01
Latvia	152	0.14	61.15
Lithuania	608	0.54	61.69
Netherlands	1,748	1.55	63.24
New Zealand	3,191	2.84	66.08
Norway	13,542	11.96	78.04
Poland	1,141	1.01	79.05
Russia	2,736	2.43	81.49
Spain	2,280	2.03	83.51
Sweden	1,976	1.76	85.27
Switzerland	1,976	1.76	87.03
Ukraine	740	0.67	87.70
United Kingdom	6,100	5.42	93.12
United States of America	7,752	6.89	100.00
Total	112,481	100.00	

Table 4 Industry representation by number of firms

Industry representation by number of firms. The table reports the distribution of unique firms in our sample with regard to NAICS industry classification. Total represents the total number of firms in our sample. In this research paper we used 29 main indexes from 28 different countries. In our data set we have 23 countries from Europe, 2 from North America, 1 from Asia and 2 from Australia. The sample period is 1st June 2021- 22nd November 2022.

No.	NAICS sector code	# of firms observation
1	11	1,596
2	21	12,920
3	22	4,940
4	23	3,800
5	31-33	38,456
6	42	3,192

7	44-45	6,157
8	48-49	6,840
9	51	11,096
10	52	8,133
11	53	4,484
12	54	6,004
13	56	1,672
14	61	152
15	62	835
16	71	684
17	72	1,140
18	81	380
Total		112,481

Table 5 Descriptive statistics

Table 5 represent the descriptive statistics. The sample period is 1st June 2021- 22nd November 2022. This table presents the descriptive statistics among cross-section return variables including log size, leverage, ROE (%), investment, log PPE, B/E and volatility.

Variables	Obs.	Mean	Std. Dev.	Minimum	Maximum
Volatility	112,481	0.023	0.012	0	0.175
Size	112,481	8.219	2.113	0.027	14.671
Leverage	112,481	0.832	3.472	0	5.089
Return on Equity (ROE)	112,481	0.347	0.907	-0.647	0.941
Log PPE	112,481	6.602	2.636	-6.908	2.331

B/E	112,481	0.706	1.300	-0.222	0.739
Invest/A	112,481	0.222	0.385	-0.667	1.222

Table 6 Cross-Correlation of the variables

Table 6 presents the cross-correlation of the variables including, independent, dependent and control variables. The sample period is 1st June 2021- 22nd November 2022. The variables definitions are given in Table 4. * 5% significance.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Return	1.000								
(2) Volatility	0.025*	1.000							
(3) War(Russia-Ukraine)	0.019*	0.000	1.000						
(4) Size	0.003	-0.323*	-0.000	1.000					
(5) Leverage	-0.068*	0.083*	0.000	-0.171	1.000				
(6) ROE	0.005	0.044*	0.000	-0.019*	-0.003	1.000			
(7) Log PPE	-0.009*	-0.267*	0.000	0.702*	0.037*	0.009*	1.000		
(8) B/E	-0.011*	-0.014*	-0.000	-0.006	-0.151*	-0.015*	-0.057*	1.000	
(9) Invest/A	0.001	0.025*	0.000	-0.005	0.005	0.682*	0.032*	-0.017*	1.000

Table 7 Cumulative Average Abnormal returns

This table reports the cumulative average abnormal returns, $\overline{CAR}$, of Russia-Ukraine war. We report $\overline{CAR}$ for the entire event window [-20,+20], 10 days prior the event date and 10 days after the event date [-10,+10], 5 days before the event date and 5 days after the event date [-5,+5], at and one day after the announcement [0,1] and around the Russia-Ukraine war [-1,+1]. The sample period is 1st June 2021- 22nd November 2022. The sample *, **, and *** denote statistical significance at the 10%, 5%, 1% level, respectively.

	Full Sample Period	Pre Russia-Ukraine War Period	During Russia-Ukraine war period
$\overline{CAR}$ $[0, +1]$	1.056**	0.789**	0.785*
$\overline{CAR}$ $[-1, +1]$	1.785***	0.984***	0.857***
$\overline{CAR}$ $[-5, +5]$	1.567**	0.563*	0.684**
$\overline{CAR}$ $[-10, +10]$	1.490	0.748	0.758
$\overline{CAR}$ $[-20, +20]$	1.673	0.693*	0.785*

Table 8 The effect of Russia-Ukraine war on traditional and Fintech stock market returns

This table reports the baseline regression models of the effect of Russia-Ukraine war on traditional and fintech stock market. The sample period is 1st June 2021- 22nd November 2022. This table divided into two panels, Panel A report the traditional stock market, where *CAR [-1+1]* is our depended variable. On the other hand, panel B report the fintech stock market, where our depended variable is Global X Fintech EFT (*R_Fintech*) is the proxy of the stock price of the Fintech market. We present each panel into three different sections, where our first section is based on full data sample, second section is based on pre-Russia-Ukraine war (1st June 2021- 23rd February 2022) and third section is based on during Russia-Ukraine war (24th of February 2022- 22nd November 2022). For each of the panels our independent variables are volatility and war (Russia-Ukraine) and our control variables are size, leverage, ROE, log PPE, B/E and Invest/A. All variables are defined in Table 4. We additionally include industry fixed effect, and we report the results of the pooled regression with standard errors clustered at the firm level dimension. ***1% significance; **5% significance; *10% significance, and standard errors are in parentheses.

Panel A: Traditional Stock Market												
	Full Sample				Pre Russia-Ukraine War				During Russia-Ukraine War			
CAR [-1,+1]	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Volatility	0.066***		0.062***		0.076***		0.077***		-0.055***		-0.047***	
	(0.007)		(0.008)		(0.010)		(0.011)		(0.009)		(0.009)	
War(Russia-Ukraine)	-0.013***	-0.015***	-0.012***	-0.013***	0.056***	0.056***	0.054***	0.056***	-0.034**	-0.035**	-0.034*	-0.034*
	(0.019)	(0.016)	(0.019)	(0.019)	(0.020)	(0.019)	(0.019)	(0.020)	(0.018)	(0.017)	(0.018)	(0.018)
Size	-0.006	-0.002**	-0.006	-0.009	-0.018**	-0.008	-0.002*	-0.001	-0.003***	-0.004***	-0.003***	-0.003***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.009)	(0.007)	(0.009)	(0.010)	(0.007)	(0.007)	(0.007)	(0.007)
Leverage	-0.005***	-0.006***	-0.005***	-0.005***	-0.006***	-0.005***	-0.007***	-0.005***	-0.005***	-0.006***	-0.006***	-0.006***
	(0.002)	(0.004)	(0.003)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
ROE	0.264	0.328*	0.325*	0.422**	0.365	0.439	0.457	0.544	0.161	0.217	0.245	0.298
	(0.202)	(0.203)	(0.203)	(0.202)	(0.311)	(0.311)	(0.313)	(0.319)	(0.255)	(0.254)	(0.256)	(0.258)
Log PPE	0.006	0.004	0.005	0.003	0.007	0.003	0.001	0.008	0.001**	0.001*	0.009	0.003
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.007)	(0.008)	(0.008)	(0.006)	(0.006)	(0.007)	(0.006)
B/E	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.004***	-0.004***	-0.004***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.008)	(0.008)	(0.008)
Invest/A	-0.003	-0.003	-0.003	-0.004	-0.001	-0.009	-0.001	-0.002	-0.006**	-0.008*	-0.007*	-0.004*
	(0.003)	(0.003)	(0.004)	(0.003)	(0.009)	(0.004)	(0.005)	(0.009)	(0.004)	(0.004)	(0.003)	(0.007)
Constant	0.004*	0.003***	0.002***	0.004*	0.005***	0.003***	0.009***	0.006***	0.003***	0.005***	0.006*	0.002**
	(0.004)	(0.003)	(0.008)	(0.007)	(0.006)	(0.005)	(0.001)	(0.001)	(0.005)	(0.004)	(0.009)	(0.008)
Industry fixed effect	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observation	27,960	27,960	27,960	27,960	14,010	14,010	14,010	14,010	13,950	13,950	13,950	13,950

R-Squared	0.064	0.055	0.068	0.062	0.020	0.019	0.021	0.020	0.007	0.006	0.008	0.007
Panel B: Fintech Stock Market												
	Full Sample				Pre Russia-Ukraine War				During Russia-Ukraine War			
R_Fintech	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Volatility	-0.025		-0.028		-0.025		-0.029		0.019		0.020	
	(6.054)		(6.597)		(9.554)		(10.411)		(7.323)		(7.980)	
War(Russia-Ukraine)	0.061***	0.060***	0.061***	0.061***	-0.003***	-0.003***	-0.002***	-0.003***	0.007***	0.008***	0.007***	0.008***
	(0.017)	(0.018)	(0.017)	(0.019)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Size	0.005	0.006	0.007	0.007	0.008	0.008	0.009	0.009	0.002	0.001	0.004	0.003
	(0.050)	(0.049)	(0.056)	(0.055)	(0.079)	(0.078)	(0.088)	(0.089)	(0.061)	(0.059)	(0.068)	(0.067)
Leverage	-0.001	-0.001	-0.002	-0.003	-0.002	-0.003	-0.004	-0.002	-0.000	-0.000	-0.009	-0.002
	(0.022)	(0.021)	(0.023)	(0.022)	(0.034)	(0.034)	(0.035)	(0.035)	(0.026)	(0.026)	(0.027)	(0.026)
ROE	-0.028	-0.030	-0.015	-0.017	-0.009	-0.009	-0.010	-0.009	-0.005	-0.004	-0.006	-0.006
	(0.002)	(0.003)	(0.008)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Log PPE	-0.006	-0.008	-0.008	-0.007	-0.008	-0.007	-0.009	-0.009	-0.003	-0.003	-0.005	-0.005
	(0.039)	(0.032)	(0.049)	(0.048)	(0.062)	(0.061)	(0.077)	(0.075)	(0.047)	(0.048)	(0.059)	(0.0580
B/E	0.001	0.002	0.006	0.005	0.004	0.003	0.004	0.003	0.002	0.003	0.002	0.003
	(0.056)	(0.056)	(0.057)	(0.056)	(0.088)	(0.088)	(0.089)	(0.089)	(0.067)	(0.068)	(0.069)	(0.068)
Invest/A	0.000	0.002	0.003	0.003	0.005	0.000	0.000	0.005	0.000	0.002	0.000	0.003
	(0.029)	(0.029)	(0.028)	(0.029)	(0.045)	(0.045)	(0.046)	(0.045)	(0.035)	(0.034)	(0.035)	(0.034)
Constant	11.569***	11.568***	11.570***	11.569***	12.657***	12.656***	12.658***	12.657***	8.935***	8.934***	8.935***	8.934***
	(0.381)	(0.302)	(0.676)	(0.646)	(0.610)	(0.488)	(1.072)	(1.026)	(0.461)	(0.366)	(0.817)	(0.782)
Industry fixed effect	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observation	112,481	112,481	112,481	112,481	56,241	56,241	56,241	56,241	56,240	56,240	56,240	56,240
R-Squared	0.011	0.010	0.018	0.016	0.004	0.003	0.004	0.008	0.037	0.038	0.036	0.037

Table 9 GMM estimation of the effect of Russia-Ukraine war on traditional and fintech stock market returns

This table represent the GMM estimation of the effect of Russia-Ukraine war on traditional and fintech stock market returns. The sample period is 1st June 2021- 22nd November 2022. In the traditional stock market, *CAR [-1+1]* is our depended variable and in the fintech stock market, our depended variable is Global X Fintech EFT (*R_Fintech*) is the proxy of the stock price of the Fintech market. We present our results into three different sections, where our first section is based on full data sample, second section is based on pre-Russia-Ukraine war (1st June 2021- 23rd February 2022) and third section is based on during Russia-Ukraine war (24th of February 2022- 22nd November 2022). In here our independent variables are volatility and war (Russia-Ukraine) and our control variables are size, leverage, ROE, log PPE, B/E and Invest/A. All variables are defined in Table 4. We additionally include industry fixed effect. ***1% significance; **5% significance; *10% significance, and standard errors are in parentheses.

	Traditional Stock Market						*Fintech Stock Market*					
	Full Sample		Pre Russia-Ukraine War		During Russia-Ukraine War		Full Sample		Pre Russia-Ukraine War		During Russia-Ukraine War	
	CAR	*CAR*	*CAR*	*CAR*	*CAR*	*CAR*	*R_Fintech*	*R_Fintech*	*R_Fintech*	*R_Fintech*	*R_Fintech*	*R_Fintech*
Volatility	0.062***		0.077***		-0.048**		-0.028		-0.029		0.020	
	(0.021)		(0.029)		(0.031)		(6.597)		(10.409)		(7.979)	
War(Russia-Ukraine)	-0.002***	-0.001***	0.006***	0.005***	-0.003**	-0.004**	0.006***	0.007***	-0.003***	-0.002***	0.007***	0.007***
	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)	(0.002)	(0.007)	(0.007)	(0.001)	(0.001)	(0.006)	(0.007)
Size	-0.006	-0.009	-0.001	-0.001	-0.002***	-0.003***	0.007	0.007	0.009	0.009	0.003	0.004
	(0.007)	(0.007)	(0.001)	(0.002)	(0.008)	(0.009)	(0.056)	(0.055)	(0.088)	(0.088)	(0.067)	(0.068)
Leverage	-0.006***	-0.005***	-0.006***	-0.005***	-0.006***	-0.005***	-0.002	-0.001	-0.004	-0.001	-0.009	-0.002
	(0.006)	(0.005)	(0.001)	(0.001)	(0.006)	(0.006)	(0.022)	(0.022)	(0.035)	(0.035)	(0.027)	(0.027)
ROE	0.004	0.004	0.005	0.005	0.002	0.003	-0.002	-0.002	-0.009	-0.009	-0.007	-0.006
	(0.003)	(0.003)	(0.006)	(0.006)	(0.002)	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.002)	(0.002)
Log PPE	0.000	0.003	0.000	0.000	0.000	0.002	-0.008	-0.007	-0.009	-0.008	-0.005	-0.005
	(0.000)	(0.006)	(0.001)	(0.000)	(0.000)	(0.009)	(0.049)	(0.048)	(0.076)	(0.075)	(0.057)	(0.058)
B/E	-0.005***	-0.004***	-0.005**	-0.005**	-0.004***	-0.004***	0.007	0.005	0.004	0.003	0.003	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.057)	(0.056)	(0.089)	(0.089)	(0.069)	(0.069)
Invest/A	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.003	0.003	0.005	0.004	0.003	0.004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.029)	(0.028)	(0.045)	(0.046)	(0.035)	(0.035)
Constant	0.002***	0.004**	0.009***	0.006***	0.006**	0.002**	11.570***	11.569***	12.658***	12.657***	8.935***	8.934***
	(0.008)	(0.007)	(0.001)	(0.001)	(0.001)	(0.009)	(0.675)	(0.646)	(1.068)	(1.021)	(0.817)	(0.781)
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	27,960	27,960	14,010	14,010	13,950	13,950	112,481	112,481	56,241	56,241	56,240	56,240