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Hybrid Warfare and Financial Market Volatility: The Case of the Recent Ukrainian Crisis of 2021

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Abstract: The purpose of this article is to study the impact of a hybrid war on the volatility of financial markets. The data on the returns of Ukrainian, Russian, German, American, English and French stock indices are taken from the Boursorama database during the tension period from November 10, 2021 to February 23, 2022. The results of our study with the ARCH / GARCH models show that military escalation conveyed by aggressive speeches, arms transfers, troop massification, fake news, military exercises, threats of sanctions, suspicions of invasion as well as de-escalation conveyed by talks, soothing speeches, cessation of military exercises and withdrawal of Russian troops from the Ukrainian border significantly impact the volatility of the stock market indexes studied. This work could be useful to understand the anticipation and the reaction of rational and irrational investors on the markets in case of a hybrid war situation but also the contagion that this could generate on the other financial markets through the channels of financial contagion in this context of hybrid war that are the dependence on certain commodities (gas, wheat, oil) and also a psychological contagion due to the extreme fear and the emotion of investors on the markets.

Keywords: Hybrid War, Volatility, Stock Indices, Financial Markets, Ukrainian Crisis

1. Introduction

The world has been shaken by several wars, from the first and second world wars, to the Kuwait war to the Libyan war, resulting in loss of life, material damage, and environmental and economic consequences. Some authors such as, Cranna, 1994 [8], Barbieri, 2002 [3], Mansfield and Pollins, 2003 [18], have tried to analyze the causes as well as the consequences of a war on the economy. Their various results show that armed conflicts always have negative consequences on economic growth. Other authors go even further by demonstrating that the harmful effects of a war on the economy and the environment can only be dissipated after a minimum of twenty years [19]. For his part, Caplan, 2002 [7], distinguishes the effect of a war as a "negative effect" for a country directly affected and a "positive effect" for a country not affected by the war. To support these remarks, he gives the example of the economic development of the United States during the Second World War, which mainly concerned European countries. These different consequences of the war on the economies are also materialized through the financial markets. However, the effect of the war in Iraq relativizes Caplan's position when we observe a volatility of the American and European stock market indices with an often-negative effect for this war outside their territory. Moreover, the various studies on the impact of war on financial markets are studies conducted at the time of and after the armed conflict [21]. However, we are witnessing a new concept of war called "hybrid warfare" popularized by Hoffman F. G. [11] who conceives it as a war that materializes through strictly military practices of non-state actors to destabilize a given opponent. However, if Hoffman F. G. [11] had restricted this concept to the circle of military specialists by excluding states, it will evolve with the Russo-Ukrainian crisis of 2014 where it will be characterized by the use by state actors of certain means such as propaganda, information warfare, fakes news, and cyber-attacks to weaken a state and make it vulnerable.

The last Ukrainian crisis that started in 2021 and is still ongoing with the different state belligerents that are mainly Ukraine, Russia, Germany, France, the United Kingdom and the USA has resulted in a hybrid war (during the period from

November 10, 2021 to February 23, 2022) before becoming a full-scale war. This hybrid war is characterized by threats of invasions by the Russians, speeches going to war between Russians, Ukrainians, Europeans and Americans, talks, threats of sanctions, formation of blocs, arms transfers, troop movements, information wars, cyberattacks, moments of de-escalation etc. Studies have been conducted in the past to investigate the effect of an all-out war or a trade war on the reaction of stock market indices [21-27]. However, what about the effect of a hybrid war (a suspicion of total war blowing hot and cold) on the volatility of these stock market indices? From this main question, the following specific questions arise:

Don't the situations of uncertainty and extreme perplexity resulting from a hybrid war situation influence the behavior of investors on the financial markets?

Through what channel would a hybrid war situation influence the volatility of stock market indices?

The general objective of this research is to see if the parameters of a hybrid war ("ante-war", i.e., before a "total war") would influence the return spreads of stock market indices. In terms of specific objectives, it will:

1. To analyze their impact on the volatility of stock market indices of the countries of the main belligerents through the behavior of investors.
2. To analyze the influence of this hybrid war on the yield spreads of these stock market indices.

Our study focuses on the volatility of stock market indices of six (6) countries, which are Russia (RTS Index), Germany (DAX Index), France (CAC 40 Index), the United States (DOW JONES Index), Great Britain (FTSE 100 Index) and Ukraine (PFTS Index). The statistics on the stock market returns of these countries show a high volatility of the indices over the period from November 10, 2021 to February 23, 2022. The average standard deviation of the Russian stock index is 2.45%, followed by Germany at 0.87%, France at 0.80%, Great Britain at 0.69%, the USA at 0.60% and finally Ukraine which was more stable with a volatility of 0.02%. These statistics prove that these markets were shaken by the pre-war events. This work is of considerable interest, it will not only enrich the literature on "war and financial markets" but also to know the explanatory factors of the volatility of stock market returns in the case of such a pattern. It will highlight the interconnection and interdependence of financial markets, which would be of paramount importance for politicians who could then make compromises to avoid the transition from a hybrid war to a total war. This work could also influence the investment and disinvestment strategies in times of uncertainty to mitigate the negative effect of such a situation through a reallocation of investments. In order to conduct our research work, we will start by reviewing the theoretical and empirical literature to formulate our research hypotheses before describing the methodology. We will conclude with the econometric treatment of the data and the discussion.

2. Review of the Theorical and Empirical Literature

The impact of war on economic growth and financial market volatility could be explained by several theories, including trade liberalism, the theory of information economics, the theory of investor rationality and irrationality, and the theory of financial contagion. According to the theory of trade liberalism, openness and trade interdependencies promote economic growth. According to this theory, a situation of war would be harmful to trade and would thus promote a negative market reaction. For the theory of information economics, the market panics in a crisis situation because of uncertainty and asymmetric information. This is what Pena-Marin et al., 2020 [20], demonstrated with the collapse of stock market returns due to investor phobia in the context of the Covid 19 health crisis. For classical finance theorists, investors are rational and make decisions on the basis of financial logic, ignoring emotion and other personal considerations. Thus, the market reacts according to new information and according to the context of war or peace. However, for the proponents of behavioral finance, Tversky and Kahneman, 1974 [25], Kahneman and Tversky, 1979 [14], and Kahneman and Smith, 2002 [15], the behavior of investors is not rational, since their decision is based more on personal feelings that are exacerbated in extreme situations. Thus, fear in an uncertain context of a probable war leads to irrational decisions that cause the markets to react. Finally, according to the theorists of financial contagion, Kaminsky and Reinhart, 1999 [16], financial markets react in a crisis context through a monsoon effect, an interdependence effect and a psychological effect. Thus, a hybrid war between Russia and Ukraine could influence the volatility of the financial markets either through a common shock (e.g. a rise in the price of gas), or through commercial links or simply through the behaviour of investors, who may sometimes be followers. For the theorists of the psychological factor, the investors react brutally in extreme situation; it is besides for that that Solt and Statman, 1998 [23], Brown and Cliff, 2005 [6], Baker and Wurgler, 2006 [2], support that the feeling of the investors affects the expected returns of the securities on the financial market. Empirical studies on the impact of a war on financial markets are not numerous. On the one hand, we have the impact of a trade war on stock market returns and on the other hand, the impact of a total war on the volatility of these stock markets. For the works related to the impact of the trade war on the financial markets, it is mainly about the trade war between China and the United States. Among other works, we have the work of Wang et al., 2020 [27], who studied the impact of the trade war between the United States and China on Chinese listed companies. Their study reveals a negative effect of the trade war on Chinese companies exporting much more to the United States before the trade war, thus negatively impacting Chinese stock markets. While Wang et al., 2020 [27], analyzed the impact of the trade war only on Chinese companies, Shi et al., 2021 [22], go further by studying the impact of the trade war between China and the United States

on the stock market movements of the two leading economies. They use a regression analysis of event studies with the GARCH dynamic conditional correlation method over the period from January 03, 2017 to January 23, 2020. Their results show that news items informing the start of the trade war between the two major world economies positively affect the co-movements between the US, Mainland China and Hong Kong stock markets. Regarding the impact of a total war on stock markets, we can refer to the work of Schneider, and Troeger (2006); who studied the reaction of financial markets during international military crises. Through a time, series analysis of the daily stock market prices of the FTSE, Dow Jones and CAC 40 indices during the conflicts in Iraq, the former Yugoslavia and Israel-Palestine over the period 1990 to 2000, their study shows that the war had a significant negative impact on stock market returns. For their part, Hudson, and Urquhart, 2015 [12], worked on the effects of World War II on the British stock market. They used a series of important historical events by classifying them into two categories: one category of events called positive event and another category called negative event to analyze the reaction of British stock prices in each case. Their result does not confirm significant correlations between positive and negative war events and market returns, although some significant price changes are linked to negative war events. The same authors Hudson and Urquhart, 2022 [13], went further by trying to incorporate the impact of a natural disaster specifically the sinking of investment ships in the UK market. They found that despite the emotion felt by investors, it did not significantly influence the British stock market. While previous studies have looked at the reaction of financial markets to trade wars, total wars and natural disasters based on real events, other authors such as Leight et al., 2003 [17], have conducted an ex-ante scenario analysis by making probabilistic assumptions about the likely reaction of markets in the event of a war against Iraq. To do so, the authors used a futures contract traded online on a Paris stock exchange and whose gains or losses were based on whether or not the US-led coalition would oust Iraqi President Saddam Hussein.

Through various scenario studies, they conclude that in case of war, this will have a negative impact on the financial markets through the increase of the price of oil by 10 US dollars per barrel with a more significant effect on the return of American stocks of about 15%. At the end of the literature review, we can say that the markets react strongly in case of a crisis situation (military conflict, trade war, financial crisis, health crisis). And as a hybrid war leads to a more pronounced situation of doubt with escalation events that make us think of a future total war and de-escalation events that make us anticipate a situation of total non-war, the financial markets react. Thus, we formulate the following hypotheses:

Hypothesis 1: a hybrid war leading to a situation of uncertainty (with moments of escalation and de-escalation without being a total war) influences stock market return differentials through investors' perplexity and doubt.

Hypothesis 2: In a hybrid war situation, financial contagion makes the reaction of stock market indices strong through the channel of dependencies on raw materials, notably gas, oil, gold, etc.

3. Data and Methodology

Our study focuses on the performance of the stock market indices of the main players in the Ukrainian crisis, namely Ukraine, Russia, the United States, Germany, Great Britain and France, during the period of tension between Russia and Ukraine from 10/11/2021 (the date on which President Joe Biden demanded an explanation of Russian troop movements on the Ukrainian border) to 23/02/2022 before moving to an all-out war on 24/02/2022 at 08:45 GMT (the time at which the Russian president announced a special military operation in Ukraine by his country). The daily performances of the different indices were collected from the Boursorama database. The periods of hybrid warfare were collected through a study of the events with the news feed of the main news channels (New York Times, Russia Today, Sputnik, France 24 and Reuters).

Table 1. List of events during the period of the hybrid war studied.

Date	Evènements
November 10, 2021	Joe Biden asks for explanations about Russian troop movements on the Ukrainian border
November 15, 2021	The USA strengthens its presence in the Black Sea and carries out military exercises.
December 01, 2021	Poutine sets out his demands (a guarantee that Ukraine will never join Nato)
December 10, 2021	Moscow deploys soldiers to Belarus for military exercises
December 24, 2021	NATO strengthens its forces in the Eastern European country's members of the alliance
January 14-16, 2022	A massive cyberattack that Kiev blames on Russian hackers
January 26, 2022	Biden threatens Vladimir Putin with personal sanctions
January 28, 2022	Washington threatens to use gas weapons and brings the matter before the UN Security Council
January 29, 2022	American troops approach Eastern Europe
January 31, 2022	An army of civilians prepares for the Russian invasion
February 01, 2022	Westerners plan economic sanctions against Russia
February 02, 2022	Washington announces to send 3000 men to the borders of Eastern Europe
February 03, 2022	New day of talks, Erdogan enters the diplomatic ballet
February 04, 2022	Washington accuses Moscow of faking attacks to invade Ukraine
February 06, 2022	Russia is preparing a large-scale invasion (according to US intelligence)
February 08, 2022	Emmanuel Macron expected in Kiev to defuse the crisis
February 09, 2022	France, Germany and Poland united to avoid a war in Europe
February 10, 2022	Biden asks US citizens to leave Ukraine in face of military maneuvers

Date	Evènements
February 12, 2022	Russia is warned by Joe Biden, the Kremlin denounces "hysteria at its peak
February 13, 2022	Biden and Zelensky want to pursue "diplomacy" and deterrence against Moscow
February 14, 2022	German Chancellor on diplomatic mission to Kiev for de-escalation
February 15, 2022	The big maneuvers have begun
February 16, 2022	Moscow announces the end of the maneuvers in Crimea
February 17, 2022	Threat of Russian invasion of Ukraine: "they are ready to attack Ukraine" says Joe Biden
February 18, 2022	Ukraine and pro-Russian separatists accuse each other of new bombings
February 19, 2022	A communication war between Ukraine and separatists in the Donbass
February 20, 2022	Emmanuel Macron and Vladimir Putin discuss ceasefire, fear of invasion in Ukraine
February 21, 2022	Volunteers arrive from all over the world to help Kiev
February 22, 2022	On the Russian-Ukrainian border, ceasefire violations are becoming more frequent
February 23, 2022	Joe Biden raises his voice and fears "the beginning of an invasion"

Source: The authors, based on information gathered from The New York Times, Russia Today, Sputnik, France 24 and Reuters.

In terms of methodology, we use a positivist paradigm with hypothetical-deductive reasoning and a quantitative approach.

Table 2. *List of stock market indices studied by country.*

Country	Stock Indices
Russia	RTS Index
Ukraine	PFTS
USA	DOW JONES
France	CAC 40
Germany	DAX
Great Britain	FTSE 100

Source: The authors.

The dependent variable

This is a binary variable (BV) that takes the number 1 for days of tension (aggressive speeches, transfer of arms to the belligerents, increase in military exercises, suspicions of invasion) and 0 for days of de-escalation (calmed speeches, talks, inoffensive speeches, cessation of military exercises and withdrawal of Russian troops). For the explanatory variables, we retained those that measure the standard deviation of the daily returns (σ_{Ri}) of the indices obtained by the daily variation of the price of the index of Russia, Ukraine, USA, France, Germany and Great Britain. The daily return of the index i which we note (R) is equal to the variation of the price of the index i at the period t with:

$$\sigma_{Ri} = \sigma(\text{index price}_{(t)} - \text{index price}_{(t-1)} / \text{index price}_{(t-1)})$$

Thus, as an analysis model, we will have:

$$BV_{i,t} = \alpha + \beta_1 RTSI_{i,t} + \beta_2 FTS_{i,t} + \beta_3 DJI_{i,t} + \beta_4 CAC40_{i,t} + \beta_5 DAXXETRA_{i,t} + \beta_6 FTSEUK100_{i,t} + \mathcal{E}_{i,t} \quad (1)$$

With:
BV: The binary variable;
α: The constant;
β1,....... B8: The parameters to be estimated;
$\mathcal{E}_{i,t}$ i,: The error term.

To estimate equation 1, we use the ARCH and GARCH (Generalized Autoregressive Conditional Heteroscedasticity) models. Indeed, the latter allow us to generate episodes of high volatility (large positive or negative $\mathcal{E}i$) followed by episodes of lower volatility; exactly as described in equation 1. Our model below is based on the "event study" analysis of Gourinchas and Obstfeld, 2012 [9], and Shi et al., 2021 [22], in which they estimate the conduct of stock returns following a series of crises (four types of crises) for the former study and the impact of a trade war on the returns of the Chinese and U. S. stock indices for the latter. Thus, to analyze the relationship between the events of a hybrid war and the volatility of stock returns, we use the conditional correlation method (DCC)-GARCH (1, 1). The DCC-GARCH (1, 1) model, originally developed by Bollerslev, 1986 [4], proposes a standard GARCH model in which the conditional variance is linearly related to the lagged conditional variance. Thus, Hansen and Lunde, 2005 [10], show in many situations that the DDC-GARCH (1, 1) model is more suitable for studying conditional volatilities.
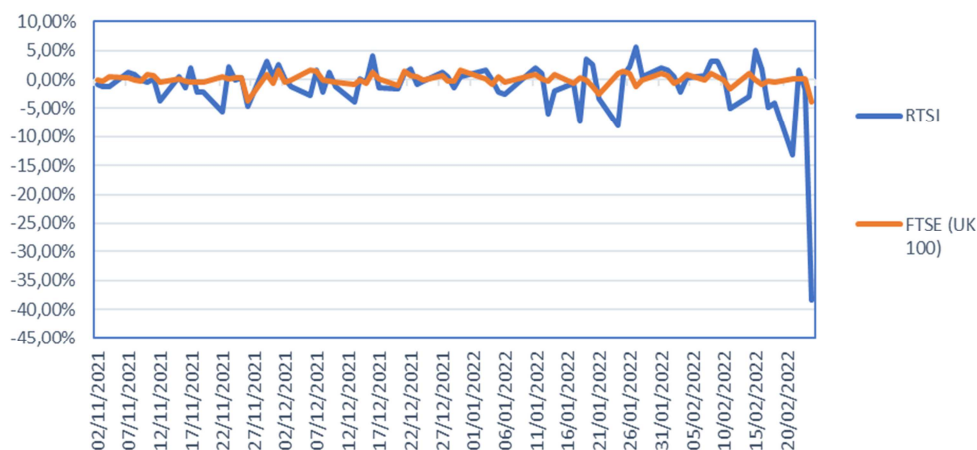

Figure 1. *Evolution of the stock exchange indices of Russia and Great Britain during the hybrid war (November 10 to February 23).*
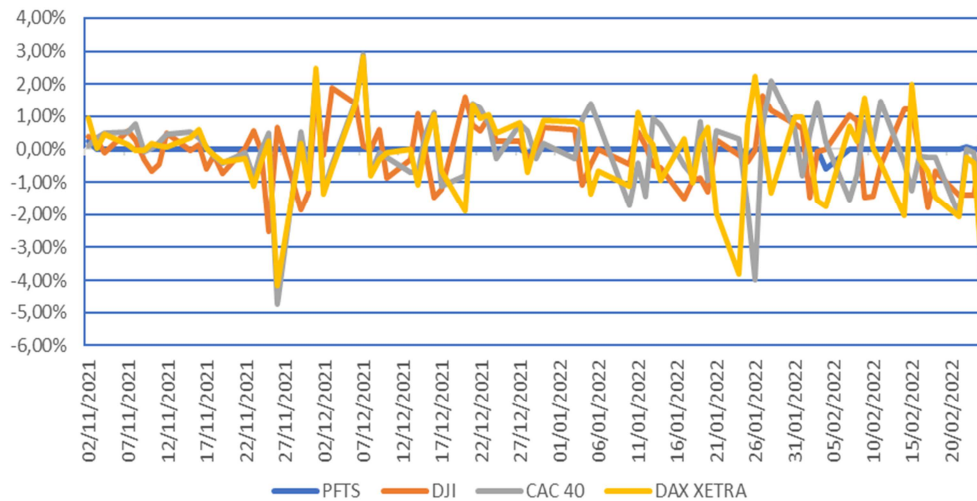
Figure 2. *Evolution of the Stock Market Indices of Germany, France, the United States and Ukraine During the Hybrid War (November 10 to February 23, 2022).*

The above figures show a strong reaction of investors on these stock markets. Indeed, the aggressive speeches, the expressions go to war, the threats of sanctions and others; made very volatile the stock exchange indexes of the concerned countries. However, Russia is more affected by this phenomenon of volatility followed by Germany, Great Britain, the United States, France and finally Ukraine which has experienced the lowest volatility.

4. Results and Discussion

4.1. Results

The analysis of Table 3 below shows us the different descriptive statistics of our variables. We note a high volatility of Russian yields over the period as well as those of France, Great Britain, the USA and Germany. We also observe a stationarity of our variables in level.

Table 3. *Descriptive Statistics of Our Variables.*

VARIABLES	MEAN	SD	MIN	MAX	SKEW.	KURT.	ADF STAT
RTSI	0.025	0.033	0	0.258	4.847	33.686	0.000
PFTS	0	0.001	0	0.004	4.852	26.994	0.000
DJI	0.006	0.005	0	0.023	1.258	4.007	0.000
CAC40	0.008	0.008	0	0.037	1.684	5.879	0.000
DAXXETRA	0.009	0.008	0	0.032	1.281	3.867	0.000
FTSEUK100	0.007	0.007	0	0.032	1.779	6.453	0.000

Source: authors' calculation

The Pairwide correlation table 4 tells us that the correlation between our variables is not very strong, in other words, we can estimate our variables in the same equation. On the other hand, we notice that the indices for France, Germany and Great Britain are significant and positively correlated with the index for Russia.

Table 4. *Correlation Test of our Variables.*

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) RTSI	1.000					
(2) PFTS	-0.060 (0.597)	1.000				
(3) DJI	0.041 (0.717)	-0.154 (0.173)	1.000			
(4) CAC40	0.356* (0.001)	0.030 (0.794)	0.412* (0.000)	1.000		
(5) DAXXETRA	0.356* (0.001)	0.059 (0.605)	0.356* (0.001)	0.698* (0.000)	1.000	
(6) FTSEUK100	0.342* (0.002)	-0.105 (0.355)	0.441* (0.000)	0.630* (0.000)	0.584* (0.000)	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source: authors' calculations.

The ARCH and GARCH results on stock returns in our study in Table 5 below confirm the high volatility of most of our variables. For example, all the coefficients associated with the ARCH of the Russian, German and Ukrainian indices are significant. We note that these financial markets have experienced turbulent moments with this hybrid war. Russia and Ukraine were directly affected by this hybrid war, investors could anticipate a collapse in the prices of most stocks in these markets in the event of a military war. Germany, on the other hand, is not directly involved in this

war, but the connection of the activities of listed companies with many materials from Russia could explain this high volatility.

Table 5. *Estimation of the ARCH and GARCH Model.*

Variables	ARCH_RTSI	ARCH_DJI	ARCH_CAC40	ARCH_DAXXETRA	ARCH_FTSEUK100	ARCH_PFTS
L. arch	0.617***	-0.0489	-0.00210	0.0664***	-0.0623	-0.179
	(0.211)	(0.0459)	0	(0.0147)	(0.0717)	(0.141)
L. garch	0.322***	-0.668	1.842	-2.362***	1.182	-1.072***
	(0.111)	(0.439)	0	(0.436)	(1.614)	(0.0216)
Constant	0.000127	9.47e-05***	-0.000118***	0.000487***	-1.64e-05	4.88e-07***
	(9.47e-05)	(2.94e-05)	(2.71e-07)	(6.36e-05)	(0.000107)	(4.83e-08)

Source: authors' construction.

Table 6. *Estimation of our Equation (1).*

Variables	(1) BV	(2) GARCH
RTSI	7.093*** (1.982)	
PFTS	144.4 (175.2)	
DJI	38.67** (15.85)	
CAC40	2.131 (14.37)	
DAXXETRA	10.88 (15.99)	
FTSEUK100	9.358 (14.76)	
L. arch		0.451 (0.512)
L. garch		-0.231 (0.927)
Constant		0.268 (0.319)
Observations	80	80

Standard errors in parentheses.
*** p < 0.01, ** p < 0.05, * p < 0.1
Source: authors' construction.

The estimation of our basic equation proves that the Russia index is positively and statistically significant. The positive relationship between these variables, proves that moments of aggressive rhetoric, military escalation and the like, have an effect on the volatility of stocks in the financial markets.

4.2. Discussion

This price volatility in this context of hybrid warfare could be explained by the classical theory of market efficiency. According to this theory, investors are rational in financial markets because their decision integrates all available information to make optimal decisions. Thus, faced with threats of invasion, aggressive speeches, talks, military exercises on the Ukrainian border by Russian forces, not to mention threats of sanctions on Russian gas, particularly with the Nord Stream 2 project, combined with the possibility of making American LNG gas more attractive as a substitute for Russian gas to meet some of Europe's needs as winter approaches, investors make rational decisions that influence the volatility of Russian, American and European stock market indices. The hypothesis of the transformation of this hybrid war situation into a total war pushes rational investors to anticipate a rise in the price of firms operating in certain sectors such as the energy, arms and food sectors, particularly wheat, to reallocate their investments. Thus, faced with this, an arbitrage opportunity arises for the investor. The interconnections between the markets with a strong dependence of Europeans on Russian gas hit by threats of sanctions as well as the presence of some European companies in Russia such as Renault which assembles about 96,000 cars each year, Mercedes-Benz and their subsidiary in Russia; without forgetting the threats of sanctions on the banking sector with a large presence of European banks in Russia also influence the volatility of stock market indices, especially European. Thus, in the face of such financial panics, rational investors reallocate their investments by preferring certain securities over others. For example, during the period under study, the prices of gold, Brent crude oil, gas and wheat rose by an average of 0.07%, 0.23%, 0.25% and 0.26% respectively. While Renault and Société Générale experienced a daily average decrease of 0.15% and 0.07% respectively. Moreover, the volatility of these stock market indices in this context of hybrid warfare could also be explained by the behavioral finance approach, Broihanne et al., 2005 [5], have made a detailed presentation of this behavioral finance in their work on the behavior of investors on financial markets) which emphasizes the irrationality of investors who may make decisions that instead of being based on Cartesian reasoning embracing financial logic, would be more based on personal feelings, extreme fears or simply sheep-like behavior. These personal considerations make investors myopic or hyperopic, pushing them to integrate certain information and to neglect others that would be more rational. Thus, such decisions lead to errors of judgment and influence the volatility of securities. Furthermore, some investors are followers and react according to the reaction of others. As a result, some decisions are not based on a financial or personal logic, but rather on the situation at the time (t). The volatility of stock market indices in this context of uncertainty is in line with the approach of Tversky and Kahneman, 1982 [26], who postulate that the decisions of investors in situations of extreme uncertainty (in the case of our study: will the hybrid war turn into a total war or not?) are based on heuristics. This way of making decisions by the latter leads to the reaction of prices on the market. Allais, 1953 [1], experiment showed that individuals abhor ambivalence and therefore change their decision according to an uncertain situation. Moreover, the very nature of investors (risk-averse, risk-averse or moderate) and their optimism or pessimism about the markets in this context of hybrid warfare can also explain the reaction of these stock market indices. The aplomb and ardor of hyper-optimistic financial analysts, even in a very critical situation, with a zeal of confidence because they believe themselves to be the best drivers, as

Svenson, 1981 [24], said are also likely to create a bias in their decision-making and make stock prices react.

5. Conclusion

We are at the end of this article which attempted to study the impact of a hybrid war on the volatility of financial markets. After a review of the literature, both theoretical and empirical, which allowed us to formulate our hypotheses, we declined the methodology to finally discuss the results. The ARCH-GARCH model showed us that hybrid warfare influences the main stock market indices studied. We have shown that this volatility of the indices is first of all due to a situation of uncertainty and the prospect of total war that panics the markets. The interdependencies as well as the interconnections of the markets are rallies of this volatility. The dependence of Europeans on Russian gas and Ukrainian wheat, not to mention the presence of major European firms in Russia or their subsidiaries, which are likely to be hit by sanctions, are panicking investors on the markets. The support of the USA to Ukraine with the prospect of an embargo on Russian gas makes American LNG indispensable for Europeans. Faced with all these parameters, rational investors following a financial logic reallocate and diversify their investment to mitigate the negative effect or even take advantage of this situation to realize capital gains. On the other hand, other investors faced with this situation of uncertainty and extreme panic and on the basis of emotions, make irrational decisions that can make the financial markets volatile through an emotional contagion. Thus, the effects of a hybrid war on the financial markets would be comparable to the effects of a trade war, a total war or a financial or health crisis on stock market returns. It would be interesting to analyze the magnitude of the effect of a hybrid war on the volatility of stock market indices compared to the magnitude of the effect of a total war on this volatility. Wouldn't this hybrid war benefit certain countries and certain large investors?

References

[1] Allais M., (1953). «Le comportement de l'homme rationnel devant le risque, Critiques des postulats et axiomes de l'école américaine», Econometrica, 21, 1953, p. 503-546.

[2] Baker M and Wurgler J. (2006), «Investor Sentiment and the Cross-Section of Stock Returns», Journal of Finance 61, 1645-1680.

[3] Barbieri, K. (2002). The liberal illusion: Does trade promote peace? Ann Arbor: University of Michigan Press.

[4] Bollerslev, T., 1986. Generalized autoregressive conditional heteroskedasticity. J. Econom. 31, 307–327. https://doi.org/10.1016/0304-4076(86)90063-1.

[5] Broihanne, M. H, Merli, M., et Roger, P. (2005). Le comportement des investisseurs individuels, Revue Française de Gestion. Vol 4 n° 157, PP 145-168. DOI 10.3166/rfg.157.145-168.

[6] Brown G. W and Cliff M. T. (2005), «Investor Sentiment and Asset Valuation», Journal of Business 78, 405-440.

[7] Caplan, B. (2002), How does war shock the economy. Journal of International Money and Finance 21: 145-62.

[8] Cranna, M, (1994) The true costs of conflict. New York: New Press. ed. 1994.

[9] Gourinchas, P. O., Obstfeld, M., 2012. Stories of the twentieth century for the twenty-first. Am. Econ. J. Macroecon. 4, 226–265. https://doi.org/10.1257/ mac.4.1.226.

[10] Hansen, P. R., Lunde, A., 2005. A forecast comparison of volatility models: does anything beat a GARCH (1, 1)? J. Appl. Econom. 20, 873–889. https://doi.org/ 10.1002/jae.800.

[11] Hoffman F. G., (2007); Conflict in the 21st Century. The rise of hybrid Wars, Virgina, Potomac Institute for policy Studies, P 28.

[12] Hudson R, et Urquhart A. (2015), War and stock markets: The effect of World War Two on the British stock market, International Review of Financial Analysis; Volume 40, Pages 166-177. https://doi.org/10.1016/j.irfa.2015.05.015

[13] Hudson R, et Urquhart A. (2022), Naval disasters, world war two and the British stock market, Research in International Business and Finance, Volume N° 59, https://doi.org/10.1016/j.ribaf.2021.101556

[14] Kahneman D. and Tversky A. (1979), "Prospect theory: an analysis of decision under risk", Econometrica, Volume 47, Number 2.

[15] Kahneman, D., and Smith V. (2002). "Foundations of Behavioral and Experimental Economics " Nobel Prize in Economics documents 2002-1, Nobel Prize Committee.

[16] Kaminsky G., Lizindo S., Reinhart C., (1999), «Leadin indications of currency crises», IMF Staff Papers 45, 1-48.

[17] Leight A., Wolfers J., Zitzewitz E., (2003), What do financial markets think of war in iraq ? Working Paper 9587 http://www.nber.org/papers/w9587

[18] Mansfield, E. D., and Pollins B., (2003). Economic interdependence and international conflict: New perspectives on an enduring debate. Ann Arbor: University of Michigan Press.

[19] Organski, A. F. K., and Kugler J. (1977); The costs of major wars. American Political Science Review 71: 1347-66.

[20] Pena-Marin, J., Adaval, R., Shen, L. (2020), «Fear in the Stock Market: How COVID-19 Affects Preference for High- and Low-Priced Stocks», Journal of the Association for Consumer Research.

[21] Schneider G, et Troeger V. E; (2006), War and the World Economy: Stock Market Reactions to International Conflicts, The Journal of Conflict Resolution, Vol. 50, N°5 pp. 623-645. DOI: 101177/0022002706290430.

[22] Shi Y., Wang L., et Ke J., (2021), Does the US-China trade war affect co-movements between US and Chinese stock markets? Research in International Business and Finance, Volume 58, https://doi.org/10.1016/j.ribaf.2021.101477

[23] Solt, M. E and Statman M. (1988), «How Useful is the Sentiment Index?», Financial Analysts Journal 44, 45-55.

[24] Svenson O., (1981). "Are we all Less Risky and more Skillfull than our Fellow Driver", Acta Psychologia, 47, 1981, p. 143-148.

[25] Tversky A. et Kahneman D. (1974), Judgement under uncertainty: heuristics and biases, Science, 185, p. 1124-1131.

[26] Tversky A. et Kahneman D. (1982); «Judgments of and by Representativeness», in Judgment Under Uncertainty: Heuristics and Biases, Kahneman D., and Slovic P., and Tversky A., CUP.

[27] Wang et al., (2020), The impact of US-China trade War on Chinease Firms: evidence from stock market reactions. Appl. Econ. Lett. (2020), pp. 1-5, https://doi.org/10.1080/13504851.2020.1764477