Russia-Ukraine War and systemic risk: Who is taking the heat?

Abstract

The Russia-Ukraine conflict has increased systemic vulnerabilities of the global financial system. We develop a database of news events and investigate the systemic risk implications of the conflict on Russia, Ukraine, France, Germany, Italy, the UK, the USA, and China. Results show that systemic instability costs of the conflict go beyond Russia and Ukraine. Sanctions cause systemic risk spillovers to European countries and the USA. Study findings caution against the accumulation of systemic risk as sanctions may adversely affect the rest of the world aside from the main target - Russia.

Keywords: Systemic risk; Russia-Ukraine war; spillover risk; sanctions

JEL Classification: G01; G21; G32; G18

"Barring a near-miracle, sooner or later, sanctions will cripple Russia's economy. To most economists, that seems like an open and shut case. What's more nuanced, however, is how those same bans on trading with Russia will send ripples through the rest of the global economy." Simon Constable (TIME, 7th March 2020).[1]

1. Introduction

The global economic growth reduced by 3.2% in 2020 due to the COVID-19 pandemic (Jackson, 2021). With the Russia-Ukraine conflict escalating, the European economy, in particular, and the global economy, in general, are experiencing another episode of turmoil. The Russian invasion of Ukraine is not an overnight event but is the direct result of years of Ukraine's determination to become a member of NATO and Russian opposition to it. The Ukrainian government views the Russian position as an attack on its sovereignty. Additionally, the NATO alliance has lent support to Ukraine in its conflict with Russia. The prolonged political dispute led to a military invasion by Russia on 24th February 2022, with an immediate impact on financial markets (Zaghum, Onur, Sun-Yong, & Teplova, 2022). In the wake of the invasion, stock markets worldwide plunged,[2] and energy prices spiked.[3]

Due to financial systems' linkages, financial institutions are interconnected and fragile to systemic shocks (Alexandre, Silva, Connaughton, & Rodrigues, 2021; Elliott, Georg, & Hazell, 2021) **and there are multiple channels through which the Russia-Ukraine conflict may have systemic risk consequences.** The United States and its allies imposed sanctions on Russia following the invasion, including sanctions against the ten largest Russian financial institutions (FIs), constituting 80% of Russian banking assets[4] , and blocking selected Russian banks from SWIFT.[5] In addition to the sanctions, financial firms like Goldman Sachs and Western Union have halted their operations in Russia.[6] Understandably, these measures would have risk implications for the Russian financial system. However, energy price volatility spillovers (Qin, 2020) and loss of bilateral trade (Santana-Gallegoa & Pérez-Rodríguez, 2019) may have systemic risk spillover

[1] https://time.com/6155581/russia-sanctions-global-economic-impact/
[2] https://www.nytimes.com/2022/02/18/business/stocks-bonds-ukraine.html?searchResultPosition=4
[3] https://www.bbc.com/news/uk-northern-ireland-60571922
[4] https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/24/fact-sheet-joined-by-allies-and-partners-the-united-states-imposes-devastating-costs-on-russia/
[5] https://www.reuters.com/world/europe/eu-announces-new-russia-sanctions-with-us-others-including-swift-2022-02-26/
[6] https://www.bbc.com/news/business-60691688

effects on other countries as well. Thus, examining the systemic risk implications of the Russia-Ukraine conflict is imperative.

This study aims to investigate the systemic risk implication of the conflict using a sample composed of Russia, Ukraine, and six affiliated countries: the USA, the UK, France, Germany, Italy, and China, all of which are NATO members or have significant trade and energy ties with Russia. We developed a news event database from 1st January 2021 to 11th March 2022. We categorized news stories (news events) into different categories, such as political actions, military actions, sanctions, invasion, and financial and military support to Ukraine. Using the Autoregressive Moving Average models with independent variables (ARMAX), we examine the effects of different news events on systemic risk, measured by CATFIN, of the sample countries.

The empirical findings suggest that the Russian political actions are not associated with an increase in systemic risk except for China. On the contrary, the political actions of Ukraine are linked with an increase in systemic risk levels for Germany, Russia, and the UK. Results regarding military actions show that Russian actions decrease systemic risk in France and the UK. In contrast, military actions by Ukraine and the rest of the world, such as the increase of NATO's military presence in Eastern Europe[7] and deployment of RC-135W Rivet on the Russo-Ukrainian border by the UK Royal Air Force,[8] induce systemic risk in most of the sample countries. These findings suggest that Ukrainian resistance and military actions by NATO and other countries have worsened the financial stability probably because the market participants perceived these as deteriorating the situation.

The results also show that the sanctions imposed on Russia not only increase the systemic risk of direct parties, i.e., Russia and Ukraine, but also have consequences in terms of an increase in the systemic risk for European countries and the USA. Among the European countries, France faces the strongest impact of these sanctions where, on average, one additional sanction increases the systemic risk of France by 0.347 standard deviations. Similarly, on average, imposing one more sanction increases the systemic risk of the USA by 0.302 standard deviations.

[7] https://www.cbc.ca/news/world/nato-jan24-ukraine-russia-1.6325096
[8] https://ukdefencejournal.org.uk/increased-presence-of-british-surveillance-aircraft-near-ukraine/

These results have certain policy implications. The Russia-Ukraine conflict has significantly increased systemic risk in the EU region along with Russia and Ukraine. Sanctions imposed by the USA and its allies have not only elevated systemic risk in Russia and Ukraine but also in Europe and the USA. These findings highlight the unintended costs of wars on the financial sectors. There is a need to closely monitor the systemic risk build-up in countries affected by the Russia-Ukraine war, especially in the EU. Also, the efficacy of sanctions on Russia might require a thorough cost-benefit analysis.

The rest of the paper is arranged as follows: Section 2 explains the data, news events, and variable construction, section 3 gives the econometric methodology, section 4 discusses results, and section 5 provides the conclusion.

2. Data, news events, and variables construction

We estimate the daily systemic risk using the non-parametric version of CATFIN, which is based on the lower α percentile cutoff point of the excess return (Allen, Bali, & Tang, 2012; Giglio, Bryan, & Seth, 2016). For estimation of the systemic risk, we use market data of countries. Table 1 shows the country-wise detail of the market indices and the number of banks and FIs used to estimate CATFIN.

We collected data on news events from the news articles, websites of news agencies, and other internet sources for the sample period and classified them into ten categories. Figure 2 shows the flow chart that depicts the process used to categorize the news events. Meanwhile, Table 2 shows the descriptive statistics of the news events during the sample period. There are 143 news items[9], of which most of the news events are related to political actions (25.2% rest of the world (ROW),[10] 18.9% Russia, and 14% Ukraine), followed by military actions of Russia (13.3%). The least number of events are in the category of the Russian invasion (0.7%)[11] and military action by Ukraine (2.8%).

[9] There are a total of 130 news stories. Few stories are bilateral in nature and, therefore, categorized news events are 143.
[10] Rest of the world means any news emerging from countries (other than Russia and Ukraine) and organizations such as NATO and the United Nations.
[11] Russian invasion is a military action by Russia but it is categorized separately to see if it has any systemic shock to the sample countries.

3. Econometric Methodology

Autoregressive models are conventionally used to remove variation of a variable that is explainable from its lags (Bai & Ng, 2008; Stock & Watson, 2012). However, due to evidence of non-stationarity in CATFIN, we consider the autoregressive integrated moving average (ARIMA) model for the sample countries. The univariate equation for the $ARIMA$ model is as follows:

$$Y_{i,t}^{d} = \alpha + \sum_{j=1}^{p} \beta_j Y_{i,t-j}^{d} + \sum_{k=1}^{q} \gamma_k \epsilon_{i,t-k} + \epsilon_{i,t} \quad (1)$$

In equation (1), $Y_{i,t}^{d}$ represents the d-differenced dependent variable $Y_{i,t}$ (CATFIN) where i and t are subscripts for country and date, respectively, α is the constant/mean term, while p and q are the lags of the autoregressive and the moving average components, respectively, and $\epsilon_{i,t}$ is the residual term. In equation (1) we introduce the lag of the 7-day rolling average of the news events as independent variables. We use the 7-day rolling average of the news events as we expect persistence in their impact. Moreover, we take a lag to avoid any potential simultaneity concerns.[12]

ARIMA models with independent variables are often referred to as ARMAX models. In ARMAX, the dependent variable is modeled as a linear combination of the independent variables and an ARMA disturbance process. That is, if $\boldsymbol{X_t}$ denotes the column vector of the lag of the 7-day rolling average of news events, the estimation equation can be given as:

$$Y_{i,t}^{d} = \alpha + \boldsymbol{X}_{\boldsymbol{t-1}}' \boldsymbol{\Phi} + \mu_{i,t} \quad (2)$$

In equation (2), $\mu_{i,t}$ is an error term that follows the ARMA process, i.e., we have the following:

$$\mu_{i,t} = \sum_{j=1}^{p} \phi_j \mu_{i,t-j} + \sum_{k=1}^{q} \gamma_k \epsilon_{i,t-k} + \epsilon_{i,t} \quad (3)$$

Note that news events do not have an i subscript in equation (2), as these events are identical for all the countries in the sample.

[12] We treated news events occurring on weekends as news events on Monday to see the effect that the market may have from these events.

For estimation purposes, the appropriate differencing (value of d) is based on the Augmented Dickey-Fuller unit-root test. **Moreover, the lags for the autoregressive and the moving average components (p and q) and the inclusion of constant/mean terms are based on the Akaike information criterion with a correction for small sample sizes (AICc) using the Hyndman-Khandakar algorithm** (Hyndman & Khandakar, 2008)**.** CATFIN was standardized for comparison across countries, and we used robust standard errors for estimation purposes.

4. Results and Discussions

Table 3 shows the country-wise descriptive statistics of CATFIN (non-standardized) during the sample period. Russia shows the highest mean value (0.0342), followed by the USA (0.0300). The least average systemic risk is shown by Ukraine (0.0113) and France (0.0180). Russia also shows the highest volatility in systemic risk (standard deviation (SD) of 0.0458), and China has the least volatility (SD of 0.0024). Figure 1 shows the evolution of systemic risk (standardized) in the sample countries during the sample period. Systemic risk has increased significantly in response to the Russian invasion. For example, as a response to the invasion, the systemic risk of Russia is five SD higher than its sample mean, almost four SD higher for Ukraine, and eight SD higher for France. On the other hand, the systemic risk of China has shown no apparent response to the invasion.

Table 4 provides the regression results in columns (1) to (8) for China, France, Germany, Italy, Russia, the UK, Ukraine, and the USA, respectively. Results show that any news events related to political actions by Russia have a significant positive association with systemic risk in China (0.229)[13] only. On the contrary, the political actions of Ukraine have a significant positive association with the systemic risk in Germany (1.276), Russia (1.945), and the UK (1.154). Political actions by countries other than Russia and Ukraine have a significant negative association with China (-0.276) but have no significant effect on other sample countries. Overall, the results about political actions suggest that financial sectors consider that the political efforts of Ukraine have a deteriorating effect on the conflict and are inducing instability.

[13] This means that any news event related to political actions of Russia, on average, is associated with a 0.229 SD increase in the systemic risk of China (from its sample mean).

In terms of military actions, results show a significant negative association of Russian military actions for France (-0.521) and the UK (-0.421). In contrast, military action by Ukraine has a positive association with the systemic risk of the UK (0.656). Military actions by the rest of the world have a significant positive association for France (0.557), Germany (0.819), Italy (0.969), the UK (0.972), and Ukraine (0.615). Overall, results related to military actions show that Russian military actions reduce systemic risk in France and UK. However, any military response from Ukraine, NATO, or other countries is perceived as escalating the conflict. The results of financial support provided to Ukraine show no significant association with systemic risk for any country. Similarly, military support of Ukraine also shows insignificant results. The results of the Russian invasion show statistical significance for Germany (1.485) only.[14]

One of the study's most important findings is related to the sanctions. Results show that the sanctions imposed on Russia significantly impact the systemic risk of all sample countries except for China. In terms of magnitude, Russia is most adversely affected by the sanctions (0.472) and is followed by France (0.347), Italy (0.322), the USA (0.302), and Germany (0.240). The lowest effect is observed in Ukraine (0.157) and the UK (0.223). These results show that the sanctions posed systemic risk costs for the sampled European countries and the USA. The immunity of the Chinese financial system towards the sanctions can be explained by the fact that China has not imposed any sanctions on Russia and, hence, is not exposed to any collateral consequences.

Overall, the results show that the Russia-Ukraine conflict has severe systemic consequences in the sample countries, especially in Europe, as sanctions imposed on Russia have systemic risk spillover implications. Analysis shows that the geopolitical situation is volatile in the region and the financial systems in the European countries are under immense pressure. Regulators should keep a close eye on the evolving situation of the war, conduct a thorough analysis of the costs and benefits associated with the sanctions, and devise macroeconomic policies to buffer systemic risk spillovers accordingly.

[14] This seems contradicting to the graphical presentation of systemic risk in Figure 1 which shows elevated risk around invasion dates. However, if we consider the results of sanctions, then it can be argued that the increase in systemic risk, as shown in Figure 1, is not solely due to the invasion. Instead, the increase seems to be due to the sanctions imposed on Russia. As a check, we estimated the model without sanctions and the unreported results show significant coefficients for the invasion.

5. Conclusion

Although systemic events are highly unlikely and infrequent but have severe economic consequences. The recent COVID-19 pandemic was one such shock that caused a sudden increase in systemic risk (Rizwan, Ahmad,, & Ashraf, 2020; Rizwan, Ahmad, & Ashraf, 2022). As the world was recovering from the pandemic, the Russia-Ukraine conflict escalated. The battle for Ukraine is more than just a regional conflict: it represents a fracture in Russia-West ties that will have profound implications for the rest of the world. This paper studied the systemic risk response of eight sample countries to the conflict. The results show that the war affects Russia and Ukraine and poses spillover effects on other countries as well. The sanctions pose a systemic risk to the European countries in the sample and the USA. On the other hand, China has shown resilience to the sanctions. Based on the study results, it is recommended that financial regulators, especially in Europe, should remain vigilant and prepare for the economic shocks spilled by the sanctions imposed on Russia. **Future research can be conducted on the macroeconomic consequences of high oil and food prices due to the Russia-Ukraine conflict in different countries.**

References

Alexandre, M., Silva, T. C., Connaughton, C., & Rodrigues, F. A. (2021). The drivers of systemic risk in financial networks: a data-driven machine learning analysis. *Chaos, Solitons & Fractals, 153*, 111588.

Allen, L., Bali, T. G., & Tang, Y. (2012). Does Systemic Risk in the Financial Sector Predict Future Economic Downturns? *Review of Financial Studies, 25*(10), 3000-3036.

Bai, J., & Ng, S. (2008). Forecasting economic time series using targeted predictors. *Journal of Econometrics*, 304-317.

Elliott, M., Georg, C. P., & Hazell, J. (2021). Systemic risk shifting in financial networks. *Journal of Economic Theory, 191*, 105157.

Giglio, S., Bryan, K., & Seth, P. (2016). Systemic Risk and the Macroeconomy: An Empirical Evaluation. *Journal of Financial Economics, 119*(3), 457-471.

Hyndman, R., & Khandakar, Y. (2008). Automatic time series forecasting: The forecast package for R. *Journal of Statistical Software*.

Jackson, J. K. (2021). *Global economic effects of COVID-19.* Congressional Research Service. Retrieved from https://sgp.fas.org/crs/row/R46270.pdf

Qin, X. (2020). Oil shocks and financial systemic stress: International evidence. *Energy Economics, 92*, 104945.

Rizwan, M. S., A. G., & Ashraf, D. (2020). Systemic risk: The impact of COVID-19. *Finance Research Letters, 36*, 101682. doi:https://doi.org/10.1016/j.frl.2020.101682

Rizwan, M. S., Ahmad, G., & Ashraf, D. (2022). Systemic risk, Islamic banks, and the COVID-19 pandemic: An empirical investigation. *Emerging Markets Review*, 100890. doi:https://doi.org/10.1016/j.ememar.2022.100890

Santana-Gallegoa, M., & Pérez-Rodríguez, J. V. (2019). International trade, exchange rate regimes, and financial crises. *North American Journal of Economics*, 85-95.

Stock, J. H., & Watson, M. W. (2012). Generalized shrinkage methods for forecasting using many predictors. *Journal of Business and Economic Statistics*, 481-493.

Zaghum, U., Onur, P., Sun-Yong, C., & Teplova, T. (2022). The impact of the Russia-Ukraine conflict on the connectedness of financial markets. *Finance Research Letters, 48*, 102976. doi:https://doi.org/10.1016/j.frl.2022.102976