

---

# “Currency and commodity return relationship under extreme geopolitical risks: Evidence from the invasion of Ukraine”

Olga Dodd, Adrian Fernandez-Perez and Simon Sosvilla-Rivero

---

The Research Institute of Applied Economics (IREA) in Barcelona was founded in 2005, as a research institute in applied economics. Three consolidated research groups make up the institute: AQR, RISK and GiM, and a large number of members are involved in the Institute. IREA focuses on four priority lines of investigation: (i) the quantitative study of regional and urban economic activity and analysis of regional and local economic policies, (ii) study of public economic activity in markets, particularly in the fields of empirical evaluation of privatization, the regulation and competition in the markets of public services using state of industrial economy, (iii) risk analysis in finance and insurance, and (iv) the development of micro and macro econometrics applied for the analysis of economic activity, particularly for quantitative evaluation of public policies.

IREA Working Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. For that reason, IREA Working Papers may not be reproduced or distributed without the written consent of the author. A revised version may be available directly from the author.

Any opinions expressed here are those of the author(s) and not those of IREA. Research published in this series may include views on policy, but the institute itself takes no institutional policy positions.

## *Abstract*

---

We examine the relationship between currency and commodity returns around the invasion of Ukraine in February 2022. We find that the expected positive contemporaneous relationship between currency and commodity returns reverses and becomes negative during this period of extreme geopolitical risks. In addition to commodity returns, currency returns around the invasion of Ukraine are significantly affected by geopolitical factors, particularly geographic distance to the war. Our results indicate that a war between two major commodity-exporting countries significantly affects global currency pricing.

*JEL classification:* F31, F51, G13, G14.

*Keywords:* Foreign exchange rates, Currency return, Commodity return, Russian invasion, Ukraine war, Geographic distance.

Olga Dodd: Finance Department, Faculty of Business Economics and Law, Auckland University of Technology, New Zealand. Email: [olga.dodd@aut.ac.nz](mailto:olga.dodd@aut.ac.nz)

Adrian Fernandez-Perez: Finance Department, Faculty of Business Economics and Law, Auckland University of Technology, New Zealand. Email: [adrian.fernandez@aut.ac.nz](mailto:adrian.fernandez@aut.ac.nz)

Simón Sosvilla-Rivero: Complutense Institute for International Studies, Universidad Complutense de Madrid. 28223 Madrid, Spain. Email: [sosvilla@ccee.ucm.es](mailto:sosvilla@ccee.ucm.es)

## *Acknowledgements*

---

This paper is based on work supported by the Spanish Ministry of Economy and Competitiveness [grant PID2019-105986-GB-C21].

## **1. Introduction**

The Russian invasion of Ukraine on 24 February 2022 was the most violent action against a European sovereign democratic nation since World War II. Although there were strong signs at least from January 2022 that an invasion could occur, it came as a shock to the financial markets, and strict economic sanctions on Russia followed within days. The heightened geopolitical and economic risks associated with the invasion of Ukraine triggered a sharp increase in commodity prices, already impacted by COVID-19-related supply chain disruptions, and an appreciation of the US dollar due to a flight-to-safety (or hedge) motive.

The financialization of commodity markets has increased comovements among commodities (Tang and Xiong, 2012) and across asset classes (Natoli, 2021). Indeed, existing literature documents a positive contemporaneous relationship between currency and commodity returns, particularly in commodity-exporting economies (Chen *et al.*, 2010; Chan *et al.*, 2011; Liu *et al.*, 2020), and accordingly, a negative relationship of the latter and the US dollar (Erb and Harvey, 2006). Moreover, economic theory predicts that spillovers caused by financialization should be particularly relevant in episodes of great uncertainty and high volatility (Basak and Pavlova, 2016). In this paper, we examine whether the war between two major commodity-exporting countries impacts the relationship between currencies and commodity markets.

## **2. Related studies**

Our paper is related to research on the relationship between currencies and commodity prices (e.g., Beckmann *et al.*, 2020). These variables are linked through a variety of channels. The terms of trade channel (Ayres *et al.*, 2020) focuses on real commodity prices and exchange rates, the portfolio and wealth channels (Krugman, 1983) propose a nominal exchange rate to nominal commodity price effect, and the expectations channel (Chen *et al.*, 2010) allows for

nominal causalities in both directions. The causal link between these variables has been documented (e. g., Zhang *et al.*, 2016; Belasen and Demirer, 2019). Moreover, Fan *et al.* (2020) document the information content of speculative pressure across futures commodity and currency markets.

Our paper also connects to the strand of literature dealing with the impact of uncertainty on foreign currency (Bartsch, 2019; Chen *et al.*, 2020) and commodity prices (Joëts *et al.*, 2017; Bakas and Triantafyllou, 2018), with geopolitical risk attracting much attention recently. Qin *et al.* (2020) show how geopolitical concerns have asymmetric effects on energy returns and volatility under various market conditions. Filippou *et al.* (2018) demonstrate that political risk is priced in the cross-section of currency momentum, which provides information not contained in other risk indicators. Caldara and Iacoviello (2022) discover that during times of geopolitical danger, capital flows away from developing economies and towards advanced economies.

Our paper aims to shed further light on the scarcely explored and still an open debate in the literature about the impact of geopolitical risks on pricing in currency markets by analyzing the relationship between currency and commodity returns during the Russian invasion of Ukraine.

### **3. Data**

We study currencies classified as free-floating or floating (IMF, 2021), excluding from our sample the currencies of the countries directly affected by the war (Ukraine, Russia, and Belarus). Our final sample includes 31 currencies (Table 1) and spans from 1 January 2012 to 11 March 2022.<sup>1</sup> We focus on the two subperiods: (1) before the war from 20 January to 23 February 2022, and (2) from the outset of the war from 24 February to 11 March 2022. The

---

<sup>1</sup> Due to the lack of control data availability, we do not consider the currencies of Albania, Georgia, Moldova, Madagascar, Mozambique, Seychelles, Slovak Republic, Somalia, Uganda, Uruguay and Zambia.

“before” period comprises the time of a heightened possibility of war, when many observers reportedly predicted that Russia would move into Ukraine.<sup>2</sup>

To measure the performance of currencies and commodities, we calculate daily currency and commodity log-returns using WM/Refinitiv foreign exchange rates (expressed as the US dollar price of a foreign currency) and S&P GSCI commodity futures index and energy, precious metals, agriculture, and industrial metals subindices (total return) data from Refinitiv Datastream.

We capture the degree of geopolitical risk using measures of political exposure, geographical distance, and economic proximity to the war (Federle *et al.*, 2022). Regarding political exposure to the war, we use three dummy variables that reflect: (1) the heritage of being a member of the Eastern bloc, (2) NATO membership,<sup>3</sup> and (3) being included in the list of Russia’s ‘unfriendly’ countries.<sup>4</sup> We measure the geographic distance to the war using the distance in km between Kyiv, the capital of Ukraine, and the country’s capital (for the euro, we use the distance to Frankfurt, Germany) obtained from cepiigeodist dataset.<sup>5</sup> We determine the economic proximity to the war using the importance of a country’s bilateral trade with Russia, measured by the share of the Russian exports and imports in the country’s total exports and imports (using data from the Direction of Trade statistics DOTS from IMF<sup>6</sup>).

As other potential determinants of currency returns, we include the News Sentiment Index of the Federal Reserve Bank of San Francisco, which captures the US economic uncertainty,<sup>7</sup>

---

<sup>2</sup> On 20 January 2022, the Atlantic Council issued a report confirming that Russia had deployed critical combat capabilities to the border with Ukraine (<https://www.atlanticcouncil.org/blogs/new-atlanticist/will-russia-make-a-military-move-against-ukraine-follow-these-clues/>) and the US President reportedly predicted that Russia would move into Ukraine ("Biden Predicts Putin Will Order Ukraine Invasion, but 'Will Regret Having Done It'". The New York Times. 20 January 2022. Washington D.C. ISSN 0362-4331)

<sup>3</sup> Data source: [https://www.nato.int/cps/en/natohq/nato\\_countries.htm](https://www.nato.int/cps/en/natohq/nato_countries.htm)

<sup>4</sup> Data source: <https://tass.com/politics/1418197>

<sup>5</sup> Available from <https://cran.r-project.org/web/packages/cepiigeodist/cepiigeodist.pdf>

<sup>6</sup> <https://data.imf.org/?sk=9d6028d4-f14a-464c-a2f2-59b2cd424b85&sId=1409151240976>

<sup>7</sup> Data source: <https://www.frbsf.org/economic-research/indicators-data/daily-news-sentiment-index/>

local stock market returns (in local currency) calculated using MSCI stock market indices' prices obtained from Refinitiv Datastream, and the changes in local interest rates calculated using overnight interbank interest rates from Refinitiv Datastream.<sup>8</sup>

Table 1 reports summary statistics. The average currency return across countries is -4.24% per year, which means the sample currencies have lost value relative to the US dollar in the sample period. Local stock market returns have increased, on average, 4.25% per year, and local interest rates marginally decreased (-0.0003%) in the sample period. However, there is considerable heterogeneity across the sample currencies (Table 1).

---

<sup>8</sup> Overnight interbank interest rate is the most common interest rate with the shortest maturity across our sample countries. When overnight interbank interest rates are not available, we use the available interest rate with the shortest maturity.

Currency name	Currency code	Country of the currency	Currency return (%)		Stock market return (%)		Change in interest rates (%)		Former Eastern bloc (Yes=1)	NATO (Yes=1)	Russia's unfriendly country (Yes=1)	Distance to Kyiv (km)	Economic proximity to Russia	Commodity Currency (Yes=1)
			Mean	STD	Mean	STD	Mean	STD						
Australian dollar	AUD	Australia	-3.394	9.768	5.261	15.565	-0.0015	0.1651	0	0	1	14,913	0.17%	1
Brazilian real	BRL	Brazil	-9.884	15.527	4.706	24.094	-0.0001	0.0978	0	0	0	10,569	1.02%	1
Canadian dollar	CAD	Canada	-2.198	7.432	5.756	14.976	-0.0003	0.0221	0	1	1	7,224	0.14%	1
Chilian peso	CLP	Chile	-4.260	10.406	-2.328	18.843	0.0002	0.0622	0	0	0	13,566	0.69%	1
Colombian peso	COP	Colombia	-6.677	12.313	0.173	20.764	-0.0003	0.0482	0	0	0	10,708	0.29%	1
Czech koruna	CZK	Czech Republic	-1.304	9.849	-0.416	16.742	-0.0001	0.0130	1	1	1	1,142	1.79%	0
Euro	EUR	Eurozone (Germany)	-1.630	7.825	5.758	19.160	-0.0004	0.0373	0	1	1	1,204	1.81%	0
Ghanaian cedi	GHS	Ghana	-14.644	11.285	8.754	12.744	0.0029	0.1423	0	0	0	5,756	0.60%	0
Hungarian forint	HUF	Hungary	-3.225	11.647	7.252	22.982	-0.0007	0.1677	1	1	1	896	2.03%	0
Icelandic króna	ISK	Iceland	-0.568	9.344	-0.178	17.594	-0.0017	0.0630	0	1	1	3,379	0.72%	0
Indian rupee	INR	India	-3.550	6.389	11.706	16.691	-0.0022	0.1038	0	0	0	4,583	1.49%	0
Indonesian rupiah	IDR	Indonesia	-4.475	6.321	4.257	21.063	-0.0010	0.7649	0	0	0	9,581	0.72%	0
Israeli Shekel	ILS	Israel	1.552	6.983	0.480	17.928	-0.0010	0.0207	0	0	0	2,071	1.83%	0
Jamaican dollar	JMD	Jamaica	-5.627	4.341	10.568	25.239	0.0002	0.0638	0	0	0	9,650	1.42%	0
Japanese yen	JPY	Japan	-4.234	8.676	9.142	19.179	0.0000	0.0068	0	0	1	8,216	1.32%	0
Kazakhstani tenge	KZT	Kazakhstan	-12.092	13.210	-0.137	31.725	0.0036	0.2636	1	0	0	2,846	23.30%	0
South Korean won	KRW	Korea	-0.686	7.575	4.423	16.552	-0.0008	0.0330	0	0	1	7,309	1.92%	0
Malaysian ringgit	MYR	Malaysia	-2.753	6.175	-1.157	10.605	-0.0005	0.0177	0	0	0	8,424	0.51%	0
Mauritian rupee	MUR	Mauritius	-3.948	6.958	1.192	16.172	-0.0011	0.0462	0	0	0	8,292	0.15%	0
Mexican peso	MXN	Mexico	-3.881	12.393	3.469	15.407	0.0009	0.0431	0	0	0	10,832	0.28%	0
New Zealand dollar	NZD	New Zealand	-1.336	10.578	5.829	14.955	-0.0008	0.1434	0	0	1	17,284	0.74%	1
Norwegian krone	NOK	Norway	-3.945	11.388	4.869	17.382	-0.0005	0.0247	0	1	1	1,630	0.95%	1
Sol	PEN	Peru	-3.164	5.864	-0.111	20.037	-0.0016	0.1290	0	0	0	12,293	0.50%	0
Philippine peso	PHP	Philippines	-1.730	4.330	5.208	19.856	-0.0011	0.0796	0	0	0	8,801	0.43%	0
Polish zloty	PLN	Poland	-2.103	11.030	-0.845	20.100	-0.0004	0.1087	1	1	1	691	2.67%	0
South African rand	ZAR	South Africa	-6.082	15.502	6.414	19.249	-0.0008	0.1648	0	0	0	8,478	0.50%	1
Swedish krona	SEK	Sweden	-3.162	9.785	8.350	18.185	-0.0008	0.0336	0	0	1	1,267	0.98%	0
Swiss franc	CHF	Switzerland	-0.067	8.833	6.970	14.807	-0.0004	0.1052	0	0	1	1,731	0.93%	0
Thai baht	THB	Thailand	-0.554	4.829	2.531	17.544	-0.0011	0.0169	0	0	0	7,430	0.39%	0
Turkish lira	TRY	Turkey	-20.087	19.510	11.624	23.507	0.0012	0.4395	0	1	0	1,181	5.57%	0
British pound	GBP	United Kingdom	-1.678	8.982	2.282	15.804	0.0000	0.0165	0	1	1	2,138	2.59%	0
Whole sample	All	All countries	-4.238	9.518	4.252	18.563	-0.0003	0.1111	0.1290	0.2903	0.4516	6,583	1.89%	0.2581

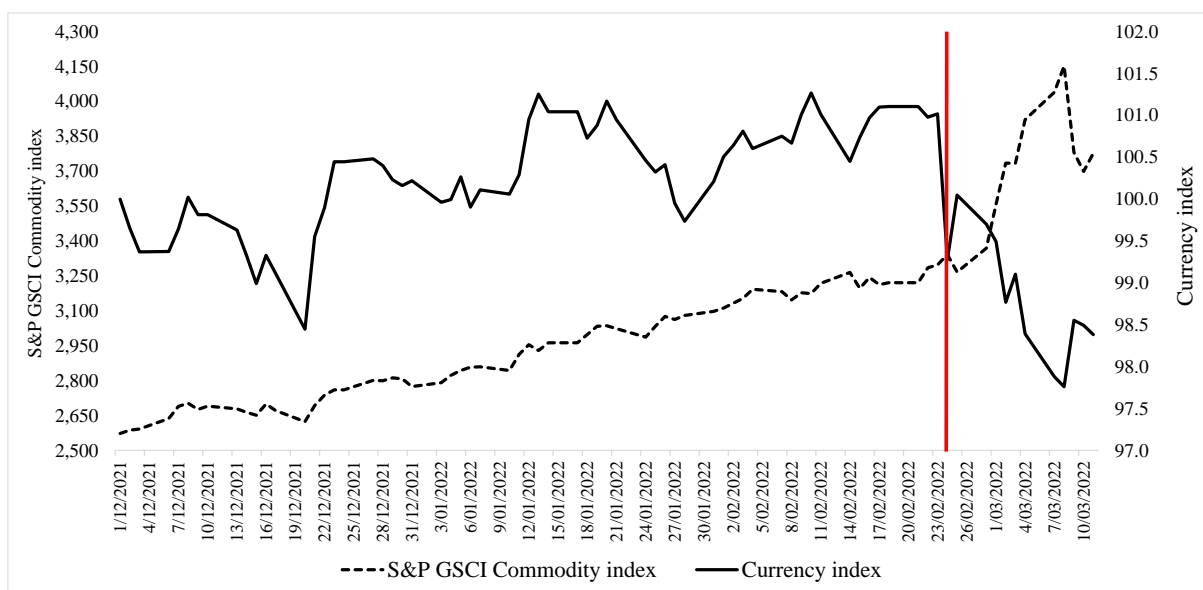
*Table 1. Summary statistics by currency*

This table reports the annualized mean and standard deviation (STD) of currency returns, stock market returns, and interest rate changes by currency. This table also reports country-level variables that capture the exposure to the war: former Eastern bloc and NATO memberships, Russia's 'unfriendly' country status, geographic distance to Kyiv (in km), and economic proximity to Russia. The last column reports an indicator of whether the currency is classified as a commodity currency (Norland, 2020a, 2020b). The sample period is from 1 January 2012 to 11 March 2022.



## 2. Empirical Results

The uncertainty and extreme geopolitical risks associated with the anticipation and the start of the war sent commodity prices (natural gas, oil, industrial metals, and agricultural products) rising, and many currencies, especially European currencies, depreciating against the US dollar. Figure 1 plots the S&P GSCI commodity and the equally weighted currency index of the sample currencies since 1 December 2021. We observe a distinct negative comovement between commodity prices and exchange rates from the invasion date 24 February 2022.



*Figure 1.* Commodity price index and Currency index since 1 December 2021

The figure plots the S&P GSCI commodity price index and the equally weighted index of the sample currencies (expressed as the US dollar price of foreign currency) obtained from Refinitiv Datastream from 1 December 2021 to 11 March 2022. We highlight the invasion date of 24 February 2022 with a vertical line.

Figure 2 plots individual currency returns from 20 January to 23 February 2022 (Before War) and from 24 February to 11 March 2022 (War). Before the war, when there was already a possibility of a war, 61% of the sample currencies suffer losses. From the outset of the war, this number increased to 71%, with currencies of Kazakhstan, Hungary, and Poland having the lowest returns, and currencies of Colombia, Jamaica, and Peru having the highest returns. Importantly, there is significant heterogeneity in responses to the war across currencies.

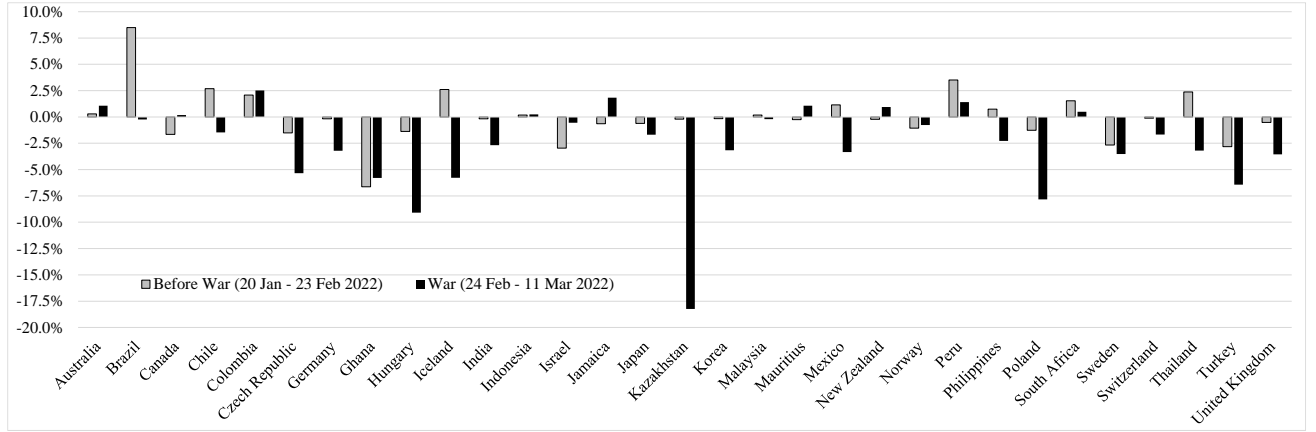


Figure 2. Currency returns around the start of the war

The figure plots cumulative currency returns calculated using foreign exchange rates for two periods: before the war from 20 January to 23 February 2022 and the beginning of the war from 24 February to 11 March 2022.

We employ panel fixed effects regressions to evaluate the relationship between currency and commodity returns. To isolate the impact of the determinants before and after the war, we include interaction terms of the explanatory variables with the dummy variables that capture these subperiods. First, we estimate the relationship between currency and commodity returns without evaluating the role of country-level variables:

$$\begin{aligned}
 fx_{i,t} = & \alpha + (\beta_1 + \beta_1^{Bef} \cdot Before\_war_{i,t} + \beta_1^{War} \cdot War_{i,t}) \cdot Commodity\_return_{i,t} + \\
 & (\beta_2 + \beta_2^{Bef} \cdot Before\_war_{i,t} + \beta_2^{War} \cdot War_{i,t}) \cdot News\_sentiment_{i,t} + \\
 & (\beta_3 + \beta_3^{Bef} \cdot Before\_war_{i,t} + \beta_3^{War} \cdot War_{i,t}) \cdot Stock\_market\_return_{i,t} + \\
 & (\beta_4 + \beta_4^{Bef} \cdot Before\_war_{i,t} + \beta_4^{War} \cdot War_{i,t}) \cdot \Delta Interest\_rate_{i,t} + \varepsilon_{i,t} \quad (1)
 \end{aligned}$$

where  $fx_{i,t}$  is the return of currency  $i$  at day  $t$ ,  $Commodity\_return_{i,t}$  is the commodity index return;  $News\_sentiment_{i,t}$  is the news sentiment index;  $Stock\_market\_return_{i,t}$  is the local stock market return;  $\Delta Interest\_rate_{i,t}$  is the change in local overnight interest rates;  $Before\_war_{i,t}$  and  $War_{i,t}$  are dummy variables equal one from 20 January to 23 February 2022 and from 24 February to 11 March 2022, respectively, and zero otherwise; and  $\varepsilon_{i,t}$  is the residual. We estimate the regression using OLS with currency and month-year fixed effects.

The inferences are based on White t-statistics with double-clustered standard errors by currency and day-year.

Panel A of Table 2 reports the estimation results of Equation (1). Model 1 confirms a significant depreciation of the sample currencies against the US dollar over the sample period and especially from the war's outset. Models 2-6 estimate the impact of commodity returns for global commodity, energy, precious metals, agricultural, and industrial metals commodity indices, respectively. The coefficient estimates on commodity returns for all indices are positive and significant at the 1% level, confirming the positive relationship in normal times (Chan *et al.*, 2011). The coefficient estimates on the interaction term of the commodity return and the war dummy variable are negative and significant at the 1% level for all indices, indicating that the relationship between currency and commodity returns reverses during the war. Before the war (from 20 January 2022), the relationship between currency and commodity returns is negative and significant for the S&P GSCI commodity index, and energy and agricultural commodities indices. These findings are in accordance with other studies highlighting the asymmetric risk-return relationship in financial markets (Bekiros *et al.*, 2018) and the reversal of causal linkages in main commodity markets (Lahmiri, 2017).

Regarding the control variables, the News sentiment index is an insignificant determinant of currency returns. Local stock market returns are positively related to currency returns with an additional positive and significant effect during the war. The changes in interest rates exhibit an insignificant relationship with currency returns over the sample period and during the war but a positive and significant relationship before the war.<sup>9</sup>

---

<sup>9</sup> Appendix 1 shows that the main findings are not affected when we exclude Kazakhstan as a potential outlier (as shown in Figure 2), when we include the USD index returns as control, when we control for the daily geopolitical risk index of Caldara and Iacoviello (2022) or control for local stock market return in US dollars.

	Panel A. Currency and various commodity returns						Panel B. Country-level exposure to the war					
Dep.: Currency returns (%)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Constant	-0.016*** (-6.76)	0.176* (1.80)	0.176* (1.75)	0.081 (0.90)	0.158 (1.60)	0.136 (1.60)	0.173* (1.77)	0.173* (1.77)	0.166* (1.70)	0.176* (1.65)	0.176* (1.80)	0.178 (1.63)
Before war	0.017 (0.72)	-0.052 (-0.24)	-0.085 (-0.39)	-0.076 (-0.38)	-0.073 (-0.34)	-0.090 (-0.55)	-0.050 (-0.23)	-0.042 (-0.19)	-0.035 (-0.16)	-0.348 (-1.18)	-0.056 (-0.26)	-0.519** (-2.11)
War	-0.200*** (-5.94)	-0.571 (-0.76)	-0.600 (-0.79)	-0.877 (-1.23)	-0.807 (-1.27)	-0.398 (-0.47)	-0.512 (-0.67)	-0.507 (-0.69)	-0.543 (-0.75)	-1.985 (-1.59)	-0.503 (-0.65)	-1.175 (-1.49)
Commodity return		0.065*** (5.72)					0.065*** (5.72)	0.065*** (5.72)	0.065*** (5.72)	0.065*** (5.71)	0.065*** (5.72)	0.065*** (5.71)
Commodity × Before War		-0.087* (-1.88)					-0.087* (-1.88)	-0.087* (-1.88)	-0.087* (-1.88)	-0.087* (-1.87)	-0.087* (-1.88)	-0.087* (-1.86)
Commodity × War		-0.137*** (-4.30)					-0.138*** (-4.39)	-0.137*** (-4.30)	-0.137*** (-4.27)	-0.138*** (-4.22)	-0.139*** (-4.39)	-0.139*** (-4.23)
Energy return			0.029*** (4.56)									
Energy × Before War			-0.056* (-1.76)									
Energy × War			-0.078*** (-3.80)									
Precious metals return				0.115*** (6.94)								
Prec. metals × Before War				-0.056 (-0.65)								
Prec. metals × War				-0.249*** (-3.56)								
Agricultural commodity return					0.054*** (6.08)							
Agricultural × Before War					-0.080** (-2.20)							
Agricultural × War					-0.151*** (-3.15)							
Industrial metals return						0.110*** (7.74)						
Industrial × Before War						-0.021 (-0.84)						
Industrial × War						-0.219*** (-3.11)						
Former Eastern Bloc							0.001 (0.14)					0.015 (1.46)
Eastern × Before War							-0.018 (-0.35)					0.026 (0.42)
Eastern × War							-0.571** (-2.30)					-0.242 (-0.86)
NATO								0.000 (-0.01)				-0.016 (-1.54)
NATO × Before War								-0.038 (-0.68)				0.040 (1.01)



*Table 2. The relationship between currency and commodity returns*

This table reports the estimation results of Equation (1). The dependent variable is daily currency returns. Panel A reports estimations between currency and commodity returns. Panel B reports estimations with country-level variables to capture country-level heterogeneity. Distance to Kyiv (km) is in logs. Month-year and currency fixed effects are included in all the models unless otherwise stated. The sample period is from 1 January 2012 to 11 March 2022. White t-statistics with standard errors clustered by currency and day-year (except for Model 1 where standard t-statistics are used) are reported in parenthesis. \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10% level, respectively.

Next, we estimate Equation (1) with country-level variables that capture a country's exposure to the war (instead of currency fixed effects) to evaluate the relationship between currency and commodity returns. We also evaluate whether a country-level exposure to the war can explain currency returns before and during the war. Panel B of Table 2 reports the estimation results that confirm the reversal in the relationship between currency and commodity returns around the war in Ukraine documented in Panel A of Table 2. Regarding the country-level variables, we find that the currencies of former Eastern bloc members depreciate more from the outset of the war. Russia's 'unfriendly' countries have currencies that outperform during the sample period with no significant difference around the war. Currencies of countries that are more geographically distant from the war have higher returns during the war. Countries with significant economic ties to Russia have currencies that underperform during the sample period and even more so from the war's outset. When we include all country-level variables in one regression (Model 12), we find that currencies of 'unfriendly' countries outperform and currencies of countries with economic ties to Russia underperform over the sample period. However, before and during the war, the only significant country-level determinant of currency returns is the geographic distance to the war – the further away from the war, the higher the currency return. This result is in line with the 'proximity penalty' discovered by Federle *et al.* (2022) when examining stock market reactions to the Ukraine conflict, and with the evidence on spillover effects via information transmission from the directly affected markets to the rest (Ehrmann *et al.* 2011). Our results highlight the importance of geopolitical factors in explaining currency returns when geopolitical risks are heightened.

Existing literature documents a strong relationship between currency and commodity returns for major commodity-exporting countries, or ‘commodity currencies’ (Chen and Rogoff, 2003; Clements and Fry, 2008). Next, we examine whether our findings documented in Table 2 hold only for commodity currencies (Norland, 2020a, 2020b). Table 3 reports the estimation results for commodity and non-commodity currencies. Non-commodity currencies experience negative returns during the war (Model 4). In contrast, the returns of commodity currencies during the war are not significantly different from the rest of the sample period (Model 1). However, we find that the positive relationship between currency and commodity returns and the reversal of this relationship around the war documented in Table 2 hold for both commodity and non-commodity currencies. Notably, the coefficient estimates on *Commodity* and *Commodity*×*War* are substantially higher for commodity currencies (Models 2, 3, 5, and 6). Regarding the geographic distance to the war, we find that it is a significant positive determinant of currency returns before the war only for commodity currencies (Models 3).

### **3. Conclusions**

We analyze the relationship between foreign currency (expressed as the US dollar price of a foreign currency) and commodity returns at a period of high geopolitical risk registered in February-March 2022 when Russia invaded Ukraine. We find that while there is a positive association between currency and commodity returns in normal times, this relationship reverses around the conflict. Furthermore, we document that geopolitical factors, notably the distance to the war, have a considerable impact on currency returns. Our findings show that extreme geopolitical risks associated with a war between two large commodity-exporting countries have a significant impact on the currency and commodity price relationship.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep.: Currency returns (%)	Panel A. Commodity currencies			Panel B. Non-commodity currencies		
Constant	-0.020*** (-3.72)	0.244* (1.93)	0.240** (1.98)	-0.015*** (-5.67)	0.166* (1.79)	0.145 (1.39)
Before war	0.083 (1.52)	0.220 (0.56)	-0.297 (-1.03)	-0.006 (-0.22)	-0.146 (-0.81)	-0.340 (-0.98)
War	0.048 (0.62)	-0.601 (-0.39)	-1.001 (-0.77)	-0.286*** (-7.86)	-0.537 (-1.00)	-1.856 (-1.32)
Commodity return		0.128*** (10.30)	0.128*** (10.28)		0.040*** (4.29)	0.040*** (4.29)
Commodity × Before War		-0.114 (-1.30)	-0.114 (-1.28)		-0.079* (-1.77)	-0.079* (-1.77)
Commodity × War		-0.225*** (-4.85)	-0.225*** (-4.64)		-0.103*** (-3.07)	-0.103*** (-3.14)
Distance to Kyiv			0.000 (-0.03)			0.001 (0.12)
Distance × Before War			0.057*** (3.73)			0.023 (0.63)
Distance × War			0.044 (1.24)			0.160 (1.36)
News sentiment		0.268 (1.00)	0.268 (1.00)		0.195 (1.09)	0.195 (1.09)
News × Before War		4.126 (0.65)	4.102 (0.63)		-2.008 (-0.77)	-2.030 (-0.78)
News × War		-3.099 (-0.36)	-3.095 (-0.36)		-1.401 (-0.59)	-1.463 (-0.58)
Stock market return		0.128*** (5.09)	0.128*** (5.03)		0.059*** (2.72)	0.059*** (2.72)
Stock market × Before War		0.069 (0.96)	0.069 (0.94)		0.040 (1.23)	0.039 (1.17)
Stock market × War		-0.012 (-0.10)	-0.013 (-0.10)		0.117** (2.21)	0.114** (2.20)
Δ Interest rate		0.001* (1.90)	0.001* (1.89)		0.000 (-0.76)	0.000 (-0.77)
Δ Interest rate × Before War		0.001 (0.35)	0.001 (0.28)		0.004*** (2.59)	0.004** (2.49)
Δ Interest rate × War		0.002 (0.55)	0.002 (0.54)		0.014 (0.84)	0.015 (0.87)
Month-year fixed effects	No	Yes	Yes	No	Yes	Yes
Currency fixed effects	No	Yes	No	No	Yes	No
R-squared	0.01	14.25	14.24	0.11	4.80	4.72
Observations	20,536	20,536	20,536	54,043	54,043	54,043

*Table 3.* The relationship between currency and commodity returns: Commodity vs. non-commodity currencies

This table reports the estimation results of Equation (1) for two sub-sample: (1) commodity currencies (AUD, BRL, CAD, CLP, COP, NZD, NOK, and ZAR) in Panel A, and (2) non-commodity currencies (the rest of the currencies) in Panel B. The dependent variable is daily currency returns. Distance to Kyiv (km) is in logs. Month-year and currency fixed effects are included unless otherwise stated. The sample period is from 1 January 2012 to 11 March 2022. White t-statistics with standard errors clustered by currency and day-year (except for Model 1 where standard t-statistics are used) are reported in parenthesis. \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% level, respectively.

**Funding:** This paper is based on work supported by the Spanish Ministry of Economy and Competitiveness [grant PID2019-105986-GB-C21].



## References

- Ayres, J., Hevia, C. & Nicolini, J. P. (2020). Real exchange rates and primary commodity prices. *Journal of International Economics*, 122, 103261. <https://doi.org/10.1016/j.jinteco.2019.103261>
- Bakas, D. & Triantafyllou, A. (2018). The impact of uncertainty shocks on the volatility of commodity prices. *Journal of International Money and Finance*, 87, 96-111. <https://doi.org/10.1016/j.jimonfin.2018.06.001>
- Bartsch, Z. (2019). Economic policy uncertainty and dollar-pound exchange rate return volatility. *Journal of International Money and Finance*, 98, 102067. <https://doi.org/10.1016/j.jimonfin.2019.102067>
- Basak, S. & Pavlova, A. (2016). A model of financialization of commodities. *Journal of Finance*, 71, 1511-1556. <https://doi.org/10.1111/jofi.12408>
- Beckmann, J., Czudaj, R. L. & Arora, V. (2020). The relationship between oil prices and exchange rates: Revisiting theory and evidence. *Energy Economics*, 88, 104772. <https://doi.org/10.1016/j.eneco.2020.104772>
- Bekiros, S., Jlassi, M., Naoui, K., & Uddin, G. S. (2018). Risk perception in financial markets: On the flip side. *International Review of Financial Analysis*, 57, 184-206. <https://doi.org/10.1016/j.irfa.2018.03.005>
- Belasen, A. R. & Demirer, R. (2019). Commodity-currencies or currency-commodities: Evidence from causality tests. *Resources Policy*, 60, 162-168. <https://doi.org/10.1016/j.resourpol.2018.12.015>
- Caldara, D. & Iacoviello, M. (2022). Measuring geopolitical risk. *American Economic Review*, 112, 1194-1225. DOI: 10.1257/aer.20191823
- Chan, K., Tse, Y., & Williams, M. (2011). The relationship between commodity prices and currency exchange rates. *Commodity Prices and Markets*, 20, 47. <https://doi.org/10.7208/9780226386904>
- Chen, L., Du, Z. & Hu, Z. (2020). Impact of economic policy uncertainty on exchange rate volatility of China. *Finance Research Letters*, 32, 101-266. <https://doi.org/10.1016/j.frl.2019.08.014>
- Chen, Y. C., & Rogoff, K. (2003). Commodity currencies. *Journal of International Economics*, 60(1), 133-160. [https://doi.org/10.1016/S0022-1996\(02\)00072-7](https://doi.org/10.1016/S0022-1996(02)00072-7)
- Chen, Y. C., Rogoff, K. S., & Rossi, B. (2010). Can exchange rates forecast commodity prices?. *The Quarterly Journal of Economics*, 125(3), 1145-1194. <https://doi.org/10.1162/qjec.2010.125.3.1145>
- Clements, K. W., & Fry, R. (2008). Commodity currencies and currency commodities. *Resources Policy*, 33(2), 55-73. <https://doi.org/10.1016/j.resourpol.2007.10.004>
- Ehrmann, M., Fratzscher, M., & Rigobon, R. (2011). Stocks, bonds, money markets and exchange rates: Measuring international financial transmission. *Journal of Applied Econometrics*, 26, 948-974. <https://doi.org/10.1002/jae.1173>
- Erb, C. B., & Harvey, C. R. (2006). The strategic and tactical value of commodity futures. *Financial Analysts Journal*, 62, 69-97. <https://doi.org/10.2469/faj.v62.n2.4084>
- Federle, J., Meier, A., Müller, G. & Sehn, V. (2022). Proximity to war: The stock market response to the Russian invasion of Ukraine. Discussion Paper 17185, London: Centre for Economic Policy Research. [https://cepr.org/active/publications/discussion\\_papers/dp.php?dpno=17185](https://cepr.org/active/publications/discussion_papers/dp.php?dpno=17185)

- Filippou, I., Gozluklu, A. E., & Taylor, M. P. (2018). Global political risk and currency momentum. *Journal of Financial and Quantitative Analysis*, 53(5), 2227-2259. <https://doi.org/10.1017/S0022109018000686>
- Fan, J.H., Fernandez-Perez, A., Fuertes, A.M. & Miffre, J. (2020). Speculative Pressure. *Journal of Future Markets*, 40, 575-597. <https://doi.org/10.1002/fut.22085>
- IMF (2021). *Annual Report on Exchange Arrangements and Exchange Restrictions 2020*. Washington, DC: International Monetary Fund. <https://www.imf.org/en/Publications/Annual-Report-on-Exchange-Arrangements-and-Exchange-Restrictions/Issues/2021/08/25/Annual-Report-on-Exchange-Arrangements-and-Exchange-Restrictions-2020-49738>
- Krugman, P. (1983). Oil and the dollar. In J. Bhandari and B. Putnam (Eds), *Economic Interdependence Under Flexible Exchange Rates*. Cambridge, MA: Massachusetts Institute of Technology (pp. 179-190).
- Joëts, M., Mignon, V. & Razafindrabe, T. (2017). Does the volatility of commodity prices reflect macroeconomic uncertainty? *Energy Economics*, 68, 313-326. <https://doi.org/10.1016/j.eneco.2017.09.017>
- Lahmiri S. (2017). Cointegration and causal linkages in fertilizer markets across different regimes. *Physica A*, 471, 181-189. <https://doi.org/10.1016/j.physa.2016.12.033>
- Liu, L., Tan, S., & Wang, Y. (2020). Can commodity prices forecast exchange rates?. *Energy Economics*, 87, 104719. <https://doi.org/10.1016/j.eneco.2020.104719>
- Natoli, F. (2021). Financialization of commodities before and after the Great Financial Crisis. *Journal of Economic Surveys*, 35, 488-511. <https://doi.org/10.1111/joes.12408>
- Norland, E. (2020a). The Currency-Commodities Nexus of the Big Eight, CME Group (15 April 2020). <https://www.cmegroup.com/education/featured-reports/the-currency-commodities-nexus-of-the-big-eight.html>
- Norland, E. (2020b). How Commodity Currencies Performed Amid COVID-19, CME Group (12 November 2020). <https://www.cmegroup.com/education/featured-reports/how-commodity-currencies-performed-amid-covid-19.html>
- Qin, Y., Hong, K., Chen, J., & Zhang, Z. (2020). Asymmetric effects of geopolitical risks on energy returns and volatility under different market conditions. *Energy Economics*, 90, 104851. <https://doi.org/10.1016/j.eneco.2020.104851>
- Tang, K and Xiong, W. (2012). Index investment and financialization of commodities. *Financial Analysts Journal*, 68, 54-74. <https://doi.org/10.2469/faj.v68.n6.5>
- Zhang, H. J., Dufour, J.-M. & Galbraith, J. W. (2016). Exchange rates and commodity prices: Measuring causality at multiple horizons. *Journal of Empirical Finance*, 36, 100-120. <https://doi.org/10.1016/j.jempfin.2015.10.005>

## Appendix 1:

This supplementary appendix offers evidence on the robustness of our results under different specifications of the relationship between currency and commodity returns.

	Panel A: No Kazakhstan		Panel B: USD index		Panel C: GPR index		Panel D: Stock returns USD	
Dep.: Currency returns (%)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.185*	0.189*	0.121	0.120	0.178*	0.177	0.138**	0.132*
	(1.84)	(1.74)	(1.50)	(1.35)	(1.79)	(1.64)	(2.22)	(1.82)
Before war	-0.058	-0.362	0.150	-0.154	0.017	-0.279	0.043	-0.069
	(-0.26)	(-1.20)	(0.74)	(-0.46)	(0.07)	(-0.90)	(0.29)	(-0.29)
War	-0.609	-1.843	-0.412	-1.872	-3.452***	-4.980***	-0.348	-1.342
	(-0.93)	(-1.62)	(-0.72)	(-1.62)	(-4.95)	(-4.14)	(-0.77)	(-1.62)
Commodity return	0.065***	0.065***	0.047***	0.047***	0.065***	0.065***	0.009	0.009
	(5.64)	(5.64)	(4.82)	(4.82)	(5.71)	(5.69)	(1.08)	(1.08)
Commodity × Before War	-0.081*	-0.081*	-0.050	-0.051	-0.085*	-0.085*	-0.022	-0.022
	(-1.68)	(-1.68)	(-1.62)	(-1.63)	(-1.76)	(-1.76)	(-0.69)	(-0.69)
Commodity × War	-0.135***	-0.136***	-0.065*	-0.064	-0.166***	-0.167***	-0.050**	-0.051**
	(-4.57)	(-4.40)	(-1.67)	(-1.59)	(-4.83)	(-4.77)	(-2.19)	(-2.17)
Distance to Kyiv		-0.001		0.000		0.000		0.000
		(-0.18)		(-0.09)		(-0.09)		(0.09)
Distance × Before War		0.036		0.036		0.035		0.013
		(1.23)		(1.20)		(1.23)		(0.51)
Distance × War		0.145*		0.172**		0.175*		0.117*
		(1.73)		(2.00)		(1.95)		(1.86)
News sentiment	0.234	0.234	0.051	0.051	0.212	0.212	0.430***	0.430***
	(1.23)	(1.23)	(0.39)	(0.39)	(1.13)	(1.13)	(2.86)	(2.86)
News × Before War	-0.391	-0.423	2.241	2.215	-0.368	-0.396	0.786	0.775
	(-0.12)	(-0.13)	(0.90)	(0.88)	(-0.12)	(-0.12)	(0.34)	(0.34)
News × War	-2.928	-2.970	-1.430	-1.477	-8.461***	-8.616***	-0.580	-0.644
	(-0.88)	(-0.86)	(-0.41)	(-0.42)	(-3.31)	(-3.20)	(-0.26)	(-0.27)
Stock market return	0.086***	0.086***	0.081***	0.081***	0.079***	0.079***		
	(4.31)	(4.31)	(4.46)	(4.46)	(4.15)	(4.15)		
Stock market × Before War	0.041	0.038	0.032	0.030	0.040	0.038		
	(1.04)	(0.97)	(1.27)	(1.17)	(1.32)	(1.23)		
Stock market × War	0.120**	0.115**	0.069	0.064	0.059	0.054		
	(2.52)	(2.20)	(1.48)	(1.40)	(1.37)	(1.24)		
Δ Interest rate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.34)	(0.32)	(-0.66)	(-0.68)	(-0.50)	(-0.52)	(-0.75)	(-0.76)
Δ Interest rate × Before War	0.002	0.002	0.003**	0.003**	0.002*	0.002	0.002	0.002
	(1.60)	(1.42)	(2.36)	(2.06)	(1.73)	(1.53)	(1.44)	(1.33)
Δ Interest rate × War	0.010	0.011	0.011	0.012	0.010	0.011	0.010	0.011
	(0.87)	(0.91)	(0.83)	(0.89)	(0.76)	(0.81)	(1.11)	(1.13)
USD index			-0.432***	-0.432***				
			(-6.63)	(-6.63)				
USD index × Before War			-0.104	-0.105				
			(-0.82)	(-0.83)				
USD index × War			-0.121	-0.131				
			(-0.52)	(-0.55)				
GPR					0.000	0.000		
					(-0.09)	(-0.09)		
GPR × Before War					0.000	0.000		
					(-0.55)	(-0.55)		
GPR × War					0.005***	0.005***		
					(4.18)	(4.21)		
Stock market return in USD							0.254***	0.254***
							(8.81)	(8.81)
Stock market return in USD × Before War							-0.040	-0.041
							(-1.35)	(-1.36)
Stock market return in USD × War							-0.039	-0.044
							(-1.11)	(-1.20)

Month-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Currency fixed effects	Yes	No	Yes	No	Yes	No	Yes	No
R-squared	7.28	7.22	13.73	13.68	6.96	6.91	33.17	33.13
Observations	72,012	72,012	74,579	74,579	74,579	74,579	74,250	74,250

**Table S1. Robustness results under different specifications of the relationship between currency and commodity returns**

This table reports the estimation results of the robustness tests of Equation (1). The dependent variable is daily currency returns in percentages. Panel A excludes Kazakhstan from the sample; Panel B controls for the effect of US dollar index return; Panel C controls for the daily geopolitical risk index of Caldara and Iacoviello (2022); and Panel D employs the local stock market return in US dollars. Distance from Kyiv (km) is in logs. Month-year and currency fixed effects are included in all the models unless otherwise stated. The sample period is from 1 January 2012 to 11 March 2022. White t-statistics with standard errors clustered by currency and day-year are reported in parenthesis. \*\*\*, \*\* and \* denotes significant at the 1%, 5% and 10% level, respectively.

The logo for UBIREA, featuring the text 'UBIREA' in a bold, sans-serif font. The 'U' and 'B' are white, while 'I', 'R', 'E', and 'A' are blue. The text is set against a white rounded rectangular background.

**UBIREA**

---


Institut de Recerca en Economia Aplicada Regional i Pública  
*Research Institute of Applied Economics*

**Universitat de Barcelona**

Av. Diagonal, 690 • 08034 Barcelona

---

**WEBSITE:** [www.ub.edu/irea/](http://www.ub.edu/irea/) • **CONTACT:** [irea@ub.edu](mailto:irea@ub.edu)

A large, semi-circular graphic composed of many thin, parallel lines in a light blue color, creating a textured, fan-like effect. It is positioned in the lower half of the page, overlapping the bottom edge of the contact information.