Impacts of Ongoing Global Geopolitical and Economic Turbulences on Exchange Rates: A Case Study of the Australian Dollar

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Abstract

This research investigates the impact of the 2022 Ukraine conflict and subsequent economic sanctions on Russian exports on global supply chains and energy prices. Utilizing daily data from 2022, this study employs time-varying Granger causality and DS-ARDL techniques to analyze the effects of these events on the foreign exchange market. The results reveal a significant relationship between energy price shocks and exchange rates, with the Australian dollar appreciating against Euro, British pound, and Japanese yen. The study suggests that while major consumers of raw materials and energy, like Japan and European nations, face adverse effects due to the conflict, Australia could potentially benefit due to its role as a primary exporter of commodities. These results have noteworthy implications for policymakers and investors, highlighting the need for strategic reassessment of geopolitical risks and their direct and indirect effects on financial markets and economies.

Keywords: *geopolitical risk, commodity currencies, exchange rates, energy price shocks*

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Introduction

The war in Ukraine and subsequent allied trade embargo on Russia since March 2022 have set the global economy on a course of inflationary pressures largely driven by steep increases in the price of energy and food. Given Russia's significant role as a leading global energy exporter, the substantial surge in international gas and oil prices came as a predictable outcome. Besides, the sanctions against Russia exacerbate the COVID-related supply-chain disruptions that the world was already dealing with before the war (OECD, 2022)

Countries are unevenly affected by the economic consequences of this conflict. European countries are the hardest hit as they are highly exposed to the war through refugee flows and energy imports. Another price of war for these countries is less economic growth projections which will be paid through fewer investments and lower incomes (World Bank, 2022). Japan as the main consumer of raw materials is another economy affected by the war. The steep increases in commodity prices cause higher input costs, reduced income, and diminished operational profit margins for Japanese corporations (OECD, 2022). As these economies have to allocate a greater amount of foreign currency to facilitate the importation of their required commodities, their local currencies depreciate.

On the other hand, Australia significantly contributes to the global export market of commodities that are primarily impacted by the ongoing conflict (e.g., oil, liquefied natural gas, and metals). With Russia's ejection from global trade flows, the mining industry of Australia is expected to experience conditions similar to the mining boom, the surge in Australia's mining activities that increased the household per capita income by 13% over the decade to 2010 (Battellino, 2010). As the conflict continues to trigger a global commodity crisis, there is potential for Australia to experience a renewed surge in mining activity, akin to a prospective mining boom, with record-breaking exploration spending. Hence, the Australian dollar is one of the commodity currencies that could be benefited from the uncertainties in the market and higher commodity prices.

Consequently, the Australian dollar (AUD) is anticipated to emerge as the beneficiary, while the Euro (EUR), British pound (GBP), and Japanese yen (JPY) are poised to encounter adverse effects stemming from this conflict. This outlook suggests a potential decrease in the EUR/AUD and GBP/AUD exchange rates, coupled with an anticipated increase in the AUD/JPY exchange rate.

Nonetheless, the narrative becomes notably intricate when viewed through the lens of economic theory. Golub (1983) and Krugman (1983a,b) present theoretical frameworks that delve into the intricate interplay between shifts in commodity prices and their impact on exchange rates. Initially, the assertion that escalating energy prices inevitably trigger decline in the value of domestic currency and precipitate balance of payments deficits in oil-importers might appear evident. However, this supposition is contingent upon a myriad of additional variables, notably including the elasticity of energy demand within oil-importing countries and the expenditure patterns observed in oil-exporting counterparts.

The stability of exchange rates, in this context, can remain unaltered if oil-exporting nations channel their augmented revenue towards the importation of goods or assets.

Furthermore, the currency valuation of a specific oil-exporting country is influenced by a spectrum of determinants, encompassing the entity's proportional stake in the overall energy market and the celerity with which the nation adjusts its expenditures subsequent to the shock induced by oil price fluctuations.

In this particular context, the primary objective of the present study is to conduct an empirical exploration into the repercussions of energy price shocks stemming from the conflict, thereby delving into their influence on the dynamics of foreign exchange markets. The investigation is specifically focused on assessing the ramifications of spillover effects resulting from the Ukraine conflict on the relative valuation of the Australian dollar. The research is designed to ascertain the degree to which alterations in oil and gas prices exert an impact on the valuation of the Australian dollar in relation to major currencies, namely the EUR, GBP, and JPY, over the course of the war period.

Studying foreign exchange rates is of vital importance at both micro and macro levels. At the micro level, it determines the real rate of return of investors' portfolios. At the macro level, it not only affects countries' trade balance but also measures the relative level of money-based health and stability of an economy. Consequently, in situations involving global and domestic risks arising from events such as warfare, conducting a comprehensive analysis of the intricate mechanisms underlying the propagation of energy price shocks to currency exchange rates holds the potential to yield significant advantages for investors and facilitate decision-making for policymakers.

The daily data is adopted and two methodologies including time-varying Granger causality approach proposed by Shi et al. (2020) and Dynamic Simulated Autoregressive Distributed Lags (DS-ARDL) introduced by Jordan and Philips (2018) are employed in our analysis to study the effect of war-driven energy price movements on foreign exchange markets. The time-varying Granger causality approach meticulously examines the causal connections between energy prices and exchange rates within the context of the Ukraine war. As a complement to this technique, the DS-ARDL approach is utilized to visualize the impact of shocks in energy prices on the Forex market.

To our current understanding, this study represents a pioneering endeavor that employs these methodologies to investigate the repercussions of fluctuations in oil and gas prices on the intricate dynamics of exchange rates, focusing specifically on commodity-linked currencies. This investigation takes a unique approach by examining the context of the Ukraine war, a situation deemed cataclysmic for the global economy.

The structure of this study unfolds in the following manner. The subsequent section offers an in-depth review of pertinent literature. This is followed by sections 2 and 3, which provide a comprehensive explanation of the data utilized and the methodology employed. Section 4 engages in a detailed discussion of the findings. The final section serves to draw conclusions based on the analysis conducted throughout the study.

1. Literature Review

The body of literature that offers theoretical frameworks to elucidate the connections between energy prices and exchange rates can be classified into two distinct categories. The first category of research is centered around the wealth effect, which is predicated upon the balance of payment dynamics exhibited by energy-importing and energy-exporting entities. In this context, Krugman (1983a; 1983b) introduces a theoretical construct wherein escalations in oil prices facilitate a transfer of wealth from energy-importing nations to energy-exporting counterparts. However, this model posits that the determination of exchange rates is contingent upon additional variables, such as energy demand elasticity within energy-importing nations and the expenditure patterns observed in energy-exporting nations. Notably, exchange rates might remain unaltered if energy-exporting nations choose to allocate their augmented income towards the importation of goods or acquisition of assets.

Presenting a different perspective, Golub (1983) advances the notion that the wealth distribution effect stemming from heightened energy prices contributes to an increase in the current account deficit of oil-importing countries and, conversely, augments the current account surplus of oil-exporting nations. This, in turn, fosters a decrease in the demand for oil and foreign currency within oil-importers.

The second line of research posits that the transmission of energy price shocks to exchange rates can be facilitated through the mechanism of terms of trade. A model pioneered by Amano and Van Norden (1998a,b) elucidates the process by which exogenous terms-of-trade shocks are encapsulated by fluctuations in energy prices, subsequently influencing the determination of exchange rates. The examination of this quandary is undertaken through diverse empirical methodologies, focusing on the US effective exchange rate. The findings underscore a consistent correlation connecting oil price fluctuations and the US real effective exchange rate throughout the post-Bretton Woods era. The outcomes indicate that oil price dynamics might have served as the prevailing source of enduring real exchange rate disturbances, implying that energy prices possess notable implications for forthcoming research concerning exchange rate conduct. This study not only establishes an intriguing correlation between the genuine domestic oil prices and the real effective exchange rates of the US, Japan, and Germany but also furnishes a rationale for why actual oil prices encapsulate exogenous terms-of-trade perturbations. Furthermore, it elucidates why such perturbations could hold paramount importance in shaping long-term real exchange rate trends.

Empirical research focused on the examination of trade relationships between oil-importing and oil-exporting nations reveals that fluctuations in oil prices play a pivotal role in elucidating trade variations, consequently impacting the economies of both categories. Noteworthy studies in this regard include the works of Cashin et al. (2004), Chen and Rogoff (2003), and Kassouri and Altıntaş (2020). It is observed that alterations in oil prices exert a significant influence on the trade dynamics of both oil-importing and oil-exporting economies.

Specifically, a positive shock in terms of trade engenders a strengthening of the domestic currency in oil-exporting nations, as evidenced by research conducted by Buetzer et al. (2012), Wang et al. (2022), and Kumeka et al. (2022). Conversely, this same shock leads to an adverse trade balance outcome and subsequently prompts the devaluation of the local currency in oil-importing economies. This pattern is demonstrated in the studies of Fratzscher et al. (2014) as well as Shang and Hamori (2021).

Some recent studies that investigate the interactions between energy prices and commodity currencies include Sokhanvar and Lee (2023), Sokhanvar, Çiftçioğlu and Lee (2023), and Sokhanvar and Bouri (2023). Their results show that the war in Ukraine has had a considerable impact on exchange rates, primarily due to significant fluctuations in energy prices.

Empirical investigations into the relationship between energy prices and exchange rates have been characterized by diverse methodological approaches, which can be categorized into three distinct categories. The first category encompasses studies that have employed cointegration or causality tests, or vector autoregressive (VAR) approaches to dissect the intricate connection between energy prices and exchange rates. Notable instances of such studies include Zhang et al. (2016), Belasen and Demirer (2019), Donkor et al. (2021), Bashar and Kabir (2013), and Jain and Biswal (2016). In addition, Lizardo and Mollick (2010) and Bouoiyour et al. (2015) assert the proposition that energy prices hold a Granger-causal relationship with the Forex market.

Beckmann and Czudaj (2013) contribute by identifying a causality between exchange rates and energy prices, specifically highlighting how heightened energy prices lead to the depreciation of the US dollar. Bal and Rath (2015) delve into this interplay and reveal a bidirectional causal effect between exchange rates and oil prices. Building on this line of thought, Sadorsky (2000) highlights the presence of cointegration between exchange rates and energy prices, contending that shocks originating from energy prices reverberate onto exchange rates. On a contrasting note, Soytas et al. (2009) and Sari et al. (2010) utilize the VAR model to probe this nexus and find no significant linkage between these variables.

It is worth noting that certain limitations exist when utilizing the Granger causality or cointegration tests. As per Brooks (2014), these methodologies fail to illustrate whether the discerned correlation between the variables is of a positive or negative nature, nor do they indicate the duration required for these impacts to manifest. Several research papers, such as those by Coudert et al. (2011) and Diebold and Yilmaz (2012), utilize techniques like variance decomposition or impulse response functions to explore how a particular variable responds to changes in other variables. However, the outcomes derived from these methods are notably sensitive to the quantity of series present within the VAR system.

The second category of research incorporates studies that employ the Generalized Auto-Regressive Conditional Heteroskedasticity (GARCH) approach, focusing on the dynamic relationships between energy prices, exchange rates, and financial markets. Within this group, Turhan et al. (2014) utilize the refined dynamic conditional correlation GARCH while Cifarelli and Paladino (2010) apply multivariate GARCH. Both studies reveal a meaningful correlation between exchange rates and oil prices. Tian and Hamori (2016) utilize a time-varying structural vector autoregression model with stochastic volatility to examine cross-market financial shocks transmission in the United States. They find that all markets are efficient and volatility shocks have gradual and varying effects over time. Anjum (2019) uses univariate and bivariate GARCH models to study volatility dynamics between oil prices and the US dollar exchange rate, finding significant transmission after accounting for structural breaks. Ahmed and Huo (2020) utilize a VAR-BEKK-GARCH framework to analyze the associations between oil prices, exchange rates, and stock markets in emerging Africa. They discovered proof of substantial return and volatility interactions, with high oil returns leading to currency appreciation and stock market boosts. These studies highlight the importance of considering volatility dynamics and structural breaks in understanding the relationships between energy prices, exchange rates, and financial markets.

The third category of studies involves those that employ the ARDL model to dissect the repercussions of energy price movements on exchange rates. Within this domain, Singhal et al. (2019) use the ARDL Bound testing cointegration approach to examine the dynamic relationships between international oil prices, international gold prices, exchange rates, and stock market index in Mexico. The findings suggest that gold prices have a positive effect on the stock market while oil prices have a negative effect. Additionally, oil prices negatively influence exchange rates in the long run, while gold prices do not have a significant impact. Their results highlight the pressure that crude oil prices can create on stock markets and exchange rates. Similarly, Baek and Kim (2020) utilize an ARDL approach to investigate the effect of oil price fluctuations on exchange rates in selected sub-Saharan countries. However, unlike previous studies, they incorporate the asymmetric effects of oil price changes using the nonlinear ARDL model. The results show strong evidence of asymmetric effects in the long run, with real exchange rates responding more to oil price increases than decreases.

It's worth noting that ARDL models, which integrate first differences as well as contemporaneous and lagged values of both independent and dependent variables, typically exhibit a complex structure, posing challenges in interpreting the long- and short-term impacts of independent variables (Jordan and Philips, 2018).

In an attempt to rectify some of the limitations identified in prior research, our current study employs the time-varying Granger causality approach proposed by Shi et al. (2020). This cutting-edge approach provides a flexible and evolving perspective to analyze the complex connections existing among the variables. We also use the DS-ARDL approach introduced by Jordan and Philips (2018) (as a complement to the causality test) to delineate the distinct disturbances affecting various commodities and meticulously explore the influence of each individual disruption on currency exchange rates.

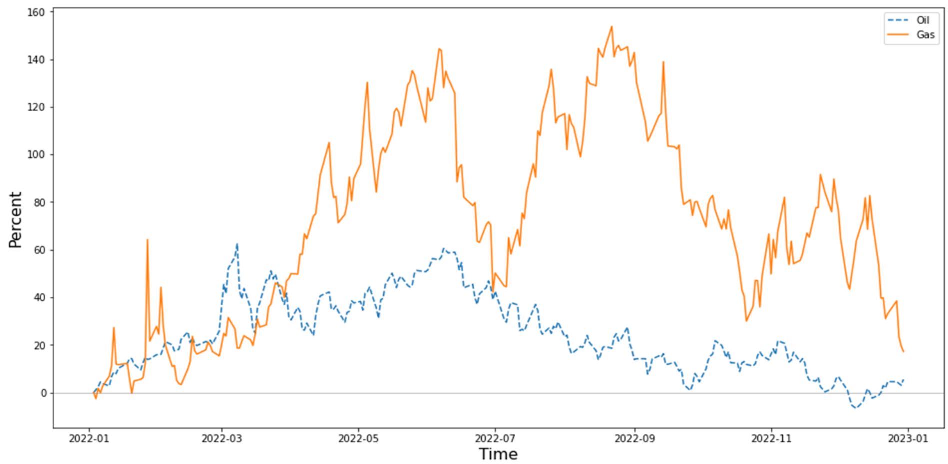
Furthermore, prior research substantiates the notion that diverse energy price shocks, stemming from either supply or demand dynamics, yield distinct effects on economies at large and specifically on exchange rates (as evidenced by Kilian, 2009; Ready, 2018). Consequently, the implications derived from previous research may not be readily transferable to the context of the global economy grappling with disruptions precipitated by warfare. Hence, a discrete analysis of the ramifications of energy price shocks during the Ukraine war is imperative, necessitating a separate examination to formulate pertinent policy responses tailored to the unique circumstances at hand.

2. Data

This study employs a dataset comprising daily observations of crude oil and gas prices, alongside three distinct exchange rates: EUR/AUD, GBP/AUD, and AUD/JPY. The data is obtained from Yahoo Finance. The temporal span considered ranges from January 3, 2022, to December 31, 2022 – a period marked by heightened tensions between Ukraine and Russia. During this timeframe, Figure 1 provides an illustrative visualization of the percentage fluctuations in both crude oil and gas prices. These fluctuations are presented in relation to their baseline values recorded on January 3, 2022. Notably, the effects of sanctions imposed on Russian energy exports becomes discernible as an observable shock on energy prices, emerging subsequent to the commencement of the war in February 2022.

F i g u r e 1

Percentage Change in Natural Gas and Crude Oil Prices



Note: The values are relative to the price on 2022-01-03.
Source: Author's analysis.

F i g u r e 2

Percentage Change in EUR/AUD, GBP/AUD, and AUD/JPY Exchange Rates

Note: See the notes to Figure 1.
Source: Author's analysis.

Figure 2 visually represents the percentage variations observed in the exchange rates of EUR/AUD, GBP/AUD, and AUD/JPY during the periods characterized by heightened conflict between Ukraine and Russia. The provided values are measured in relation to the baseline recorded on January 3, 2022. Of noteworthy significance is the noticeable appreciation of AUD in contrast to the EUR, GBP, and JPY subsequent to February 2022.

Subsequently, a further step involves the computation of the returns corresponding to each series value, followed by the determination of the order of integration for the said series. To accomplish this, the ERS unit root test established by Elliott, Rothenberg and Stock (1996) is used. This test bears resemblance to the augmented Dickey-Fuller test, with the distinction that the variables undergo a transformation through a generalized least squares regression prior to the test execution. This transformation enhances the test's statistical power.

The outcomes of the unit root test, as well as the descriptive statistics of the data enlisted in this study, are detailed in Table 1. It's pertinent to note that the critical values corresponding to this test stand at –3.480, –2.890, and –2.570 for significance levels of 1%, 5%, and 10% respectively. The optimal lag is chosen based on minimum modified Akaike information criterion (MAIC). The findings of this analysis reveal that all the examined series exhibit characteristics of stationarity.

T a b l e 1

Descriptive Statistics and Unit Root Test Results

	Count	Mean	Std	Min	25%	50%	75%	Max	ERS
AUDJPY	251	91.11036	4.492103	80.635	89.89	92.814	94.0845	98.287	
EURAUD	251	1.516286	0.044702	1.43183	1.47965	1.50994	1.55535	1.61775	
GBPAUD	251	1.779062	0.057356	1.65296	1.743405	1.76775	1.80219	1.9155	
Gas	251	6.541924	1.569529	3.717	5.304	6.551	7.8265	9.68	
Oil	251	94.33147	12.39296	71.02	85.57	91.93	104.23	123.7	
Return on AUDJPY	250	0.000321	0.008079	–0.03957	–0.00497	0.000299	0.005611	0.023687	–5.342***
Return on EURAUD	250	0.000048	0.006322	–0.02505	–0.00407	–0.00051	0.003971	0.018911	–4.321***
Return on GBPAUD	250	–0.000160	0.005985	–0.0246	–0.00363	–0.00052	0.003356	0.029985	–4.242***
Return on Gas	250	0.002595	0.063574	–0.25954	–0.03329	0.004361	0.04174	0.464812	–7.034***
Return on Oil	250	0.000678	0.030396	–0.12126	–0.01786	0.002993	0.020622	0.083544	–5.560***

Notes: ERS indicates the unit root test statistic based on Elliott, Rothenberg and Stock (1996);
The return on series represents the percentage change of each value compared to its previous value;
*** indicates significance in 1% level.

Source: Author's analysis.

3. Methodology

In this research, we utilize the DS-ARDL model as a supplementary tool to the time-varying Granger causality method. The aim is to construct a robust model that illustrates the impact of war-induced energy price fluctuations on currency exchange rates.

3.1. Time-Varying Granger Causality

In this study, we adopt the time-varying Granger causality approach proposed by Shi et al. (2020) to meticulously examine the causal connections between energy prices and exchange rates within the context of the Ukraine war. This innovative methodology introduces a dynamic and adaptive lens through which to dissect the intricate relationships prevailing between these variables. The core mechanism of this approach rests upon a recursive evolving algorithm, which, in turn, employs subsample tests of Granger causality while nested within a lag-augmented vector autoregressive framework.

The execution of the recursive evolving procedure encompasses the time span spanning from January 1, 2022, to December 30, 2022 – a temporal range that aligns with the duration of the Ukraine war. The minimum window size employed is 50 observations, effectively corresponding to two trading months. Through this meticulous process, we undertake a thorough analysis of the transformation and dynamics governing the interrelationships among the variables of interest throughout the course of the war.

Suppose that an n-dimensional vector variable is generated by the model defined by Equation (1):

$$z_t = a_0 + a_1 t + e_t \tag{1}$$

where z_t is a variable that we consider to explain how this causality test works, and e_t follows a VAR(q) process such as

$$e_t = b_1 \cdot e_{t-1} + \ldots + b_q \cdot e_{t-q} + \mu_t \tag{2}$$

where μ_t is the error term. If we substitute $e_t = z_t - \left(a_0 + a_1 t\right)$ from Equation (1) into Equation (2), we get

$$z_t = g_0 + g_1 t + b_1 \cdot z_{t-1} + \ldots + b_q \cdot z_{t-q} + \mu_t \tag{3}$$

where g_i is a function of a_i and b_j with $j = 1, \ldots, q$ and $i = 0$ and 1.

The lag-augmented VAR model for an n-dimensional vector z_t can be written as

$$Z = S\Psi' + X\Phi' + \tau\Gamma' + \mu \tag{4}$$

where $= (z_1, z_2, \ldots, z_T)'_{T\times n}$, $S = (s_1, \ldots, s_T)'_{T\times nd}$, $X = (x_1, \ldots, x_T)'_{T\times nk}$, $\tau = (\tau_1, \ldots, \tau_T)'_{T\times 2}$ and $\mu = (\mu_1, \ldots, \mu_T)'_{T\times n}$. The maximum order of integration of z_t is presented with *d*.

If $Q_\tau = I_T - \tau(\tau'\tau)^{-1}\tau'$, then *Q* can be defined as $Q = Q_\tau - Q_\tau Z(Z'Q_\tau Z)^{-1} Z'Q_\tau$. The OLS estimator is defined by Equation (5).

$$\hat{\Phi} = Z'QX(X'QX)^{-1} \tag{5}$$

The standard Wald statistic to test the causal flow between variables is

$$W = (\rho\hat{F})' \left[\rho\left(\hat{\Sigma}_\varepsilon \otimes (X'QX)^{-1}\right)\rho'\right]^{-1} \rho\hat{F} \tag{6}$$

where ⊗ is the Kronecker product, $\hat{\Sigma}_\varepsilon = \frac{1}{T}\hat{\varepsilon}'\hat{\varepsilon}$, $\hat{F} = vec(\hat{\Phi}) = vec(\hat{\Phi})$, and ρ is a $m \times n^2 q$ matrix, and *m* indicates the number of restrictions. The Wald Statistic *W* has the usual χ^2_m asymptotic null distribution.

According to Shi et al. (2020), among the results provided by their causality test, the results obtained by the recursive evolving window algorithm are the most reliable ones. Therefore, we use this algorithm in our analysis. In the recursive procedure, a sequence of Wald statistics $\{W_{j_1,j_2}\}_{j_2=j}^{j_1\in[0,\, j_2-j_0]}$ can be obtained for each observation *j*. The test statistic is defined by Equation (7) which is the supremum of the Wald statistic sequence.

$$SW_j(j_0) = \sup_{j_2=j,\; j_1\in[0,\, j_2-j_0]} \{W_{j_1,j_2}\} \tag{7}$$

The Akaike information criterion is used in each VAR model to obtain the optimal lag length.

3.2. DS-ARDL

In our study, we use the DS-ARDL technique as formulated by Jordan and Philips (2018) to construct models illustrating how exchange rates respond to shocks in both oil and gas prices. This sophisticated method serves to generate models capable of simulating the impacts of both positive and negative shocks on any of the explanatory variables. Notably, this technique effectively discerns the distinct impacts of varying shocks on diverse explanatory variables.

By engaging this method, we undertake a comprehensive analysis of both short-term and long-term interrelationships among variables. This framework serves a dual purpose: it not only adeptly addresses the endogeneity challenge but also navigates around criticisms directed at traditional ARDL models. Importantly, the visual representation of regression outcomes in the form of graphs alleviates the need for grappling with intricate lag structures – a feature that enhances the accessibility and interpretability of the DS-ARDL methodology.

The DS-ARDL (*p, q, r*) model employed in this research is represented by Equations 5 and 6.

$$Ln\_ER_t = \sum_{j=1}^{p}\varphi_j Ln\_ER_{t-j} + \sum_{j=0}^{q}\theta_j Ln\_OP_{t-j} + \varepsilon_t \tag{8}$$

$$Ln\_ER_t = \sum_{j=1}^{p}\varphi_j Ln\_ER_{t-j} + \sum_{j=0}^{q}\theta_j Ln\_GP_{t-j} + \varepsilon_t \tag{9}$$

where ER_t is the exchange rate, GP_t is gas price, OP_t is oil price, φ_j is the autoregressive parameter, and ε_t is the error term. We use Stata-17 software for the analysis.

4. Results and Discussion

4.1. Results of Time-Varying Granger Causality Test

The causal implications of oil price shocks on exchange rates are delineated in Figure 3. The graphical representations substantiate the significant influence of oil price fluctuations on exchange rates.

It is observed that oil prices exert a causal impact on the AUD/JPY exchange rate. This effect is statistically significant during the period from July to December 2022. Similarly, oil prices demonstrate a causal influence on the EUR/AUD exchange rate, with a significant effect observed from June to December 2022. Furthermore, oil prices also have a causal effect on the GBP/AUD exchange rate, with a notable impact in March, mid-April, May, June, and post-October 2022.

The causal effects of gas price shocks on exchange rates are expounded in Figure 4. The graphical data corroborates the substantial effects of gas price alterations on exchange rates.

Gas prices show a causal effect on the AUD/JPY exchange rate, with a significant impact detected from July to December 2022. Additionally, gas prices have a causal effect on the EUR/AUD exchange rate, with a significant influence discerned post-April 2022. Gas prices also exert a causal effect on the GBP/AUD exchange rate, with a significant impact primarily in May and June, and post-September 2022.

It is pertinent to note that the causal effect estimated at each point in Figures 3 and 4 (in the Appendix) is calculated utilizing daily data spanning two months, ending at that specific point. Detecting causal effects of energy prices on exchange rates in our analysis is consistent with the findings of previous studies, such as Belasen and Demirer (2019) and Donkor et al. (2021) reviewed in the second section.

4.2. Results of DS-ARDL Analysis

The visual depictions of the simulations concerning the repercussions of surges in energy prices are portrayed through Figures 5 and 6 (in the Appendix). Within these figures, the designated time point of "10" signifies the moment of shock occurrence. The data points represent the average forecasted values, while the shaded lines – progressing from the darkest to the lightest – encompass the 75%, 90%, and 95% confidence intervals.

Figure 5 outlines the consequences ensuing from a positive shock in oil prices upon exchange rates. Notably, this shock leads to a decline in both the EUR/AUD and GBP/AUD exchange rates, accompanied by an increase in the AUD/JPY rate. Figure 6, on the other hand, elucidates the aftermath of a positive shock in gas prices on exchange rates. Comparable to the oil price shock, this gas price shock results in a decrease in both EUR/AUD and GBP/AUD rates, coupled with an elevation in AUD/JPY rate. The statistical significance of these effects is established at the 10% and 5% levels for oil and gas prices, respectively. It is worth mentioning that a decline in the GBP/AUD and EUR/AUD exchange rates signifies a depreciation of the Euro and the Pound relative to the Australian dollar. Conversely, an increase in the AUD/JPY rate represents the appreciation of the Australian dollar against Japanese yen.

Upon scrutinizing the outcomes depicted in Figures 5 and 6, a noteworthy observation emerges: the devaluation of EUR, GBP, and JPY vis-à-vis the Australian dollar is primarily attributed to the shocks in gas prices. This occurrence can potentially be attributed to the prominence of gas within Australian exports. Notably, Australia stands as the globe's largest LNG exporter, thus evidently reaping benefits from heightened gas prices during the Ukraine war.

The results of our DS-ARDL analysis align with the findings of previous studies that employed ARDL-based methodologies to study energy prices-exchange rates nexus including Singhal et al. (2019) and Baek and Kim (2020) reviewed in the second section. Moreover, our research has revealed that war-related energy price shocks have a significant impact on the appreciation of domestic currency for energy exporters compared to energy importers. This finding is consistent with the results of Sokhanvar and Lee (2023), Sokhanvar, Çiftçioğlu and Lee (2023), and Sokhanvar and Bouri (2023).

4.3. Discussion

The ongoing Russia-Ukraine conflict, coupled with subsequent economic sanctions imposed by Western nations on Russia, has significantly disrupted the supply chains of essential resources such as energy, food, and raw materials. These disruptions have precipitated price escalations across these sectors, thereby contributing to inflationary pressures. This phenomenon is largely attributed to Russia's pivotal role as a major global exporter of critical commodities, including gas, oil, metals, and fertilizers. The reverberations of this disruption are acutely felt by economies in Japan and Europe, which heavily rely on imports of these materials. Consequently, their respective currencies have experienced substantial depreciation.

In straightforward terms, as international commodity prices surge, these economies are compelled to expend greater quantities of their own currencies to secure the same volume of imported commodities. This heightened demand for foreign currencies leads to the devaluation of their domestic currencies. While the European Union (EU) bears a more pronounced connection to Russia's economy, the United Kingdom (UK) also confronts substantial implications. Despite having relatively fewer direct economic ties to Russia, the UK imported approximately 13% of its total fuel from Russia in 2019. Moreover, disturbances in Europe's energy supply network have a ripple effect, influencing wholesale prices in the UK.

Conversely, the impact of the conflict on the Australian economy is anticipated to be minimal. In fact, Australia is poised to benefit from these tensions due to its status as a prominent exporter of the very commodities that are affected by the conflict. Figure 2 underscores how the Australian dollar (AUD) has strengthened its position in response to the prospects of heightened commodity prices.

The findings of our analysis align closely with the aforementioned factors, reinforcing the observed trends. The outcomes of our study underscore the devaluation of the Euro (EUR), British pound (GBP), and Japanese yen (JPY) against the Australian dollar (AUD) in response to elevated energy prices. The geographical proximity of European Union (EU) member states to Russia, coupled with their substantial reliance on Russian gas imports, contributes to the notable impact of gas price shocks on the depreciation of the euro. This effect, however, is less pronounced for the British pound and Japanese yen, as the economies of the United Kingdom and Japan exhibit lower dependency on Russian gas imports, thus resulting in a comparatively less significant impact.

Recent policy measures implemented across European nations have predominantly revolved around measures such as price controls, subsidies, and augmented trade restrictions with Russia. Regrettably, these approaches have inadvertently contributed to the exacerbation of shortages within the affected supply chains. In seeking to navigate this challenging landscape, it becomes paramount to draw insights from analogous episodes of commodity price shocks, thereby enabling the formulation of optimal macroeconomic policies. Prior instances of energy price hikes have triggered demand reductions through the adoption of alternative energy sources, efficiency enhancements, and the emergence of novel supply avenues. Consequently, policymakers must pivot their attention towards fostering an environment conducive to investment in new, zero-carbon energy sources, while simultaneously advocating for advancements in energy efficiency.

From the vantage point of forex traders, our empirical findings underscore the significance of accounting for the impact of energy price fluctuations on volatility in the Forex market. In light of surging oil and gas prices, a strategic focus on trading dynamics is paramount. Betting against currencies such as the Euro, British pound, and Japanese yen, while concurrently investing in commodity-linked currencies like the Australian dollar, emerges as a potentially profitable strategy. To succinctly encapsulate, engaging in trades such as selling EUR/AUD and GBP/AUD, and buying AUD/JPY represents a judicious maneuver when confronted with escalated energy prices.

Conclusions

The conflict in Ukraine, coupled with the subsequent implementation of trade restrictions on Russian exports during 2022, has wielded a disproportionately significant influence over the global supply chains. This chain of events has propelled energy prices to highest levels since 2013. While prices reached their highest point in 2022, these prices are anticipated to remain elevated beyond previous estimations. In this landscape, currencies intrinsically tied to commodities, such as the Australian dollar, are poised for potential strengthening. This is particularly relevant given Australia's pivotal role as a primary exporter of the very commodities that experience disruptions due to the conflict involving Ukraine and Russia.

This study marks an inaugural endeavor to empirically delve into the ramifications of energy price shocks stemming from the conflict, discerning their impacts on the appreciation of the Australian dollar vis-à-vis other currencies. By using daily data between the first and the last trading day of 2022, our analytical approach, integrating time-varying Granger causality and DS-ARDL techniques, offers a graphical representation that elucidates the intricate dynamics governing the effects of energy price movements on the Forex market.

Our study's focus on ongoing global geopolitical and economic turbulences allows us to explore how prolonged disruptions to energy markets influence currency movements over time. By examining the implications of an ongoing conflict, we contribute to a deeper understanding of the evolving relationship between energy prices and exchange rates.

Our study has yielded compelling results, underscoring a notable association between fluctuations in energy prices and shifts in currency exchange rates. Specifically, the surge in energy prices sparked by the conflict has manifested in the appreciation of the Australian dollar – an emblematic commodity currency – against the Japanese yen, the Euro, and the British pound. This trend underscores a notable divergence in the impact experienced by various economies: while Japan and European nations, being major consumers of energy, confront adverse effects, the Australian economy stands to gain from the heightened commodity prices that characterize the war period.

The implications of the Ukraine war on the Australian economy are not only projected to be minimal but also potentially favorable. This is attributable to Australia's position as a significant exporter of commodities that are acutely affected by the global commodity crisis sparked by the war. This unique positioning has led to an exceptionally favorable trade balance, surpassing even the levels witnessed during the mining boom of 2010. This confluence of factors points towards the potential resurgence of another mining boom in Australia's economic landscape.

The empirical outcomes unveiled by this study carry profound implications for both investors and policymakers alike. Our results shed light on the imperative connection between energy market risks stemming from war scenarios and their prompt transmission to the foreign exchange markets. This ripple effect, in turn, engenders a substantial overhaul of the global trade and investment landscape. As corporations strategically reassess the heightened geopolitical risks, a discernible shift in production away from more volatile regions can be observed.

The timing of the conflict presents a formidable challenge for the Japanese and European economies. These nations were already grappling with the aftermath of the COVID crisis and now confront the added complications stemming from the war-induced supply chain disruptions, which in turn intensify price pressures and exert constraints on economic growth. Furthermore, the devaluation of their domestic currencies amplifies the challenge of inflation, contributing to a more pronounced rise in overall price levels. This multifaceted scenario underscores the intricate interplay between geopolitical events, financial markets, and broader economic dynamics.

While our findings offer valuable insights, it's essential to acknowledge the limitations inherent in our research. As the war continues, the full extent of its effects on global supply chains and exchange rates might not yet be fully realized. Our study primarily captures the immediate consequences up to the point of our data cutoff, and thus, there might be subsequent developments that our analysis hasn't encompassed.

By incorporating more recent and comprehensive data, researchers can obtain a more accurate depiction of the evolving dynamics between energy price shocks and currency movements resulting from the ongoing conflict. This would likely provide a more comprehensive understanding of the long-term effects and fluctuations in exchange rates, as well as potential adjustments in global supply chains.

There are also some other avenues for further exploration. Firstly, expanding the analysis to encompass a broader range of commodity currencies and their interactions with different geopolitical events could offer a more comprehensive understanding of these relationships. Secondly, incorporating additional variables such as political stability, trade agreements, and global economic trends could provide a more nuanced perspective on the drivers of exchange rate movements. Lastly, employing more advanced modeling techniques and potentially exploring machine learning approaches could help refine the predictive accuracy of our findings. By addressing these limitations and pursuing the suggested research directions, future studies can continue to deepen our understanding of the complex interplay between geopolitical events, energy markets, and currency movements.

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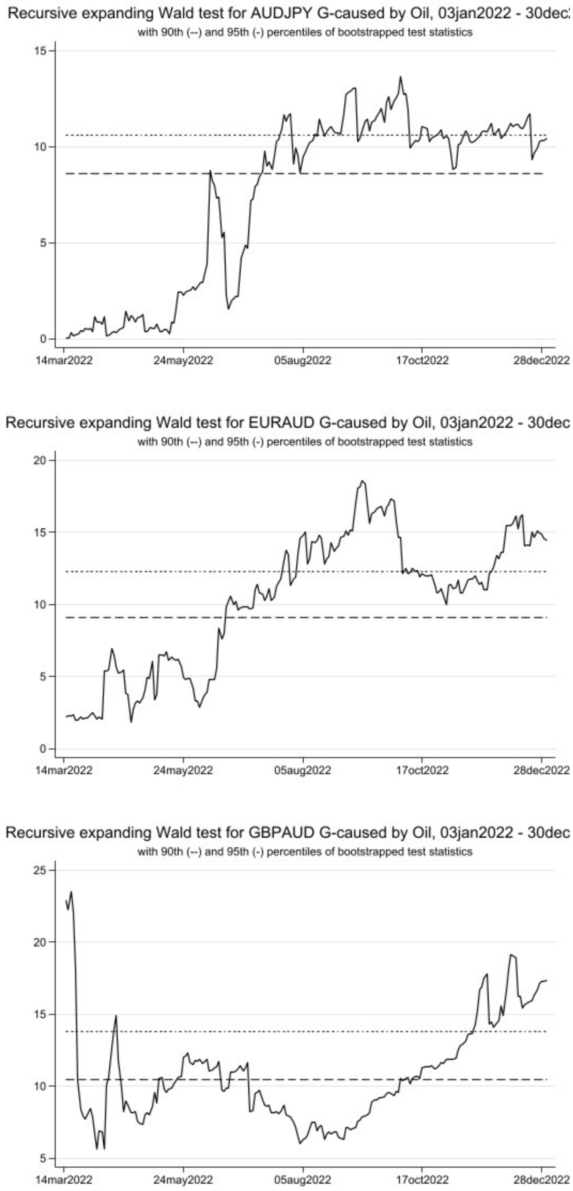
A p p e n d i x

F i g u r e 3

The Causal Effects of the Oil Prices on Exchange Rates

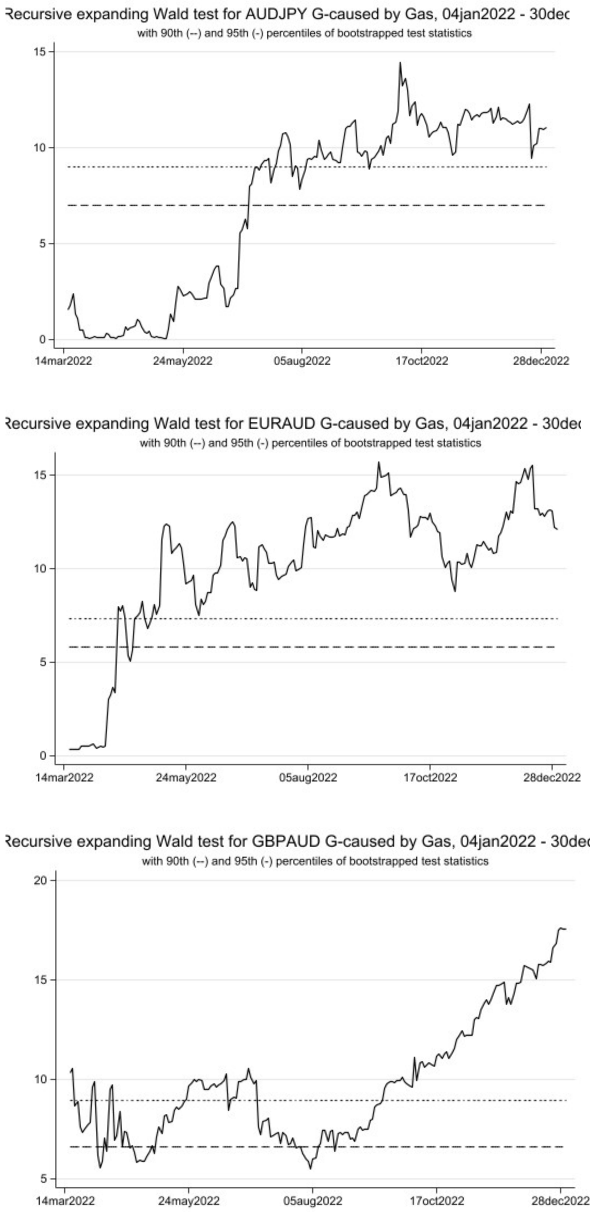


Notes: The graphs show the test statistics obtained based on the recursive evolving procedure of the time-varying Granger causality test. The optimal lag order in each case is selected based on the Akaike information criterion.

Source: Author's analysis.

F i g u r e 4

The Causal Effects of the Gas Prices on Exchange Rates



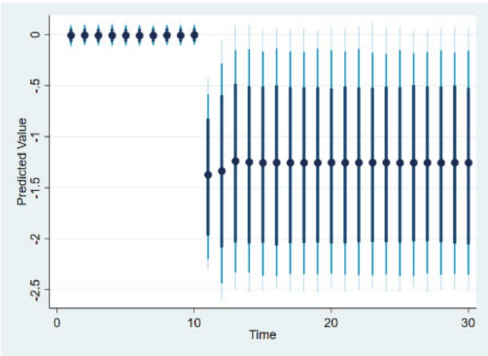
Note: See the notes under Figure 3.
Source: Author's analysis.

F i g u r e 5

The Impact of a Positive Oil Price Shock on the Exchange Rates

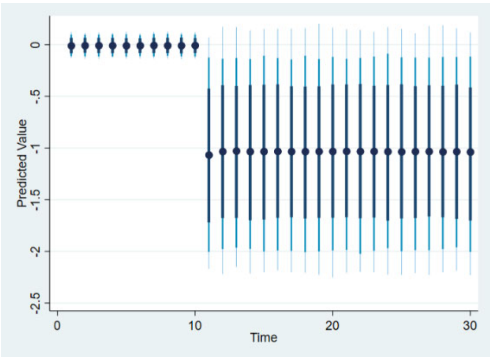
Panel A.

Response of EUR/AUD to Oil Price Shock



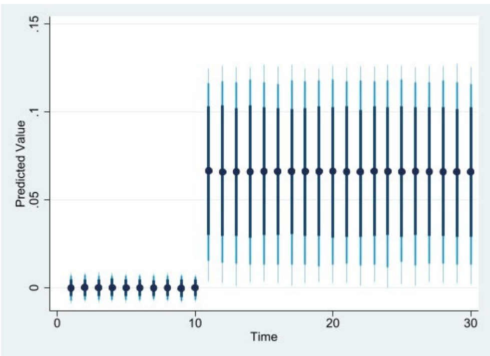
Panel B.

Response of GBP/AUD to Oil Price Shock



Panel C.

Response of AUD/JPY to Oil Price Shock



Notes: Time = 10 is the time at which the shock occurs. Shaded lines indicate the 75%, 90%, and 95% confidence intervals and dots indicate the average predicted values.

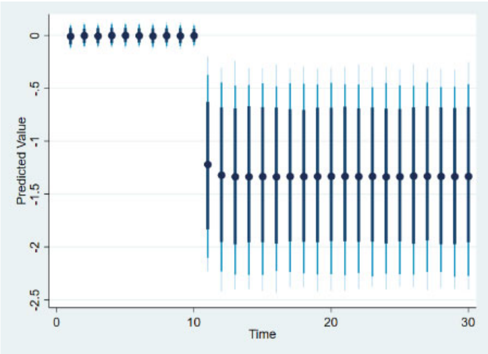
Source: Author's analysis.

F i g u r e 6

The Impact of a Positive Gas Price Shock on the Exchange Rates

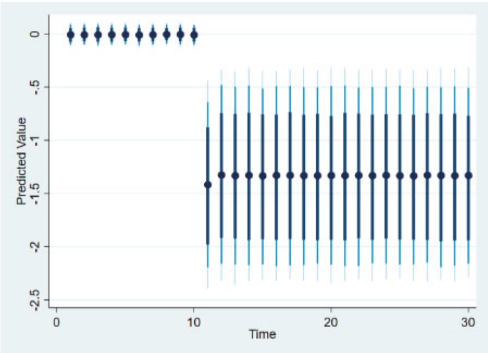
Panel A.

Response of EUR/AUD to Gas Price Shock



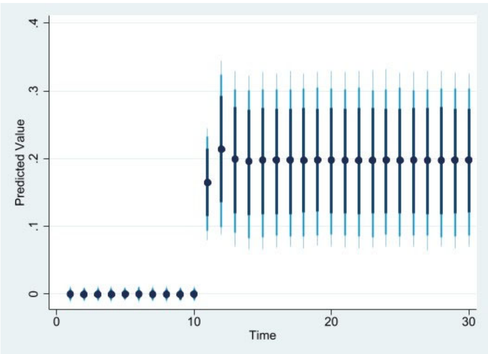
Panel B.

Response of GBP/AUD to Gas Price Shock



Panel C.

Response of AUD/JPY to Gas Price Shock



Note: See the notes under Figure 5.

Source: Author's analysis.