

Impact of Russian Stock Exchange on world oil prices with US dollar as the mediating variable

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ABSTRACT

Purpose — *The purpose of this study is to analyze the impact of Russian Stock Exchange (IMOEX) on world oil prices (WTI), with the US Dollar variable serving as a mediating factor in the exchange rate between the US Dollar and the Russian currency (Ruble).*

Method — *The research employs an associative causality research approach for data analysis. Path analysis techniques are utilized to examine the nexus between Russian Stock Exchange (IMOEX) and world oil prices with the US dollar serves as intervening variables. The study relies on secondary data collected on a weekly basis over a two-year period, specifically from 2021 to 2022. A total of 96 sample data points were gathered from various sources, including the internet, papers, books, and other references that support the research.*

Result — *The findings indicate a significant positive impact of the Russian Stock Exchange (IMOEX) on the US Dollar/Rubles exchange rate. However, the US Dollar variable does not have a direct effect on world oil prices. Additionally, the Russian Stock Exchange (IMOEX), when mediated by the US Dollar, does not show any significant impact on the world oil price of WTI.*

Novelty — *To the best of our knowledge, no studies were identified that employed the US Dollar as a mediating variable in the Ruble/USD exchange rate. This study introduces a novel aspect by incorporating this mediating variable into the analysis.*

Keywords: *world oil prices, russian stock exchange, US dollar*

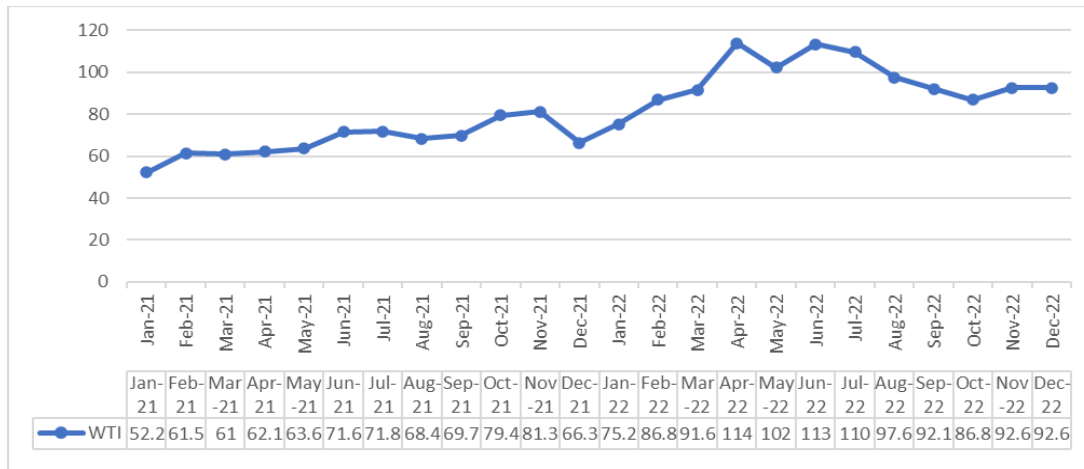
INTRODUCTION

Crude oil is a globally influential commodity as it serves as the primary source of energy, followed by other hydrocarbon resources such as coal and natural gas (Heinlein et al., 2021). Simultaneously, prices in the crude oil market have risen, most likely as a hedging strategy for equities and due to perceived oil supply disruptions in the OPEC market. Oil prices, which directly or indirectly affect many sectors of the economy, are essential indicators of economic performance (Abubakirova, 2021). Khan (2023) explains why changes in the oil market or oil prices create chain reactions in the economies of countries and the world, as oil prices are independent or dependent on many factors that influence each other. Oil prices can indirectly affect macroeconomic indicators and stock markets mainly by influencing industrial production and inflation (Dias et al., 2021). High oil prices increase production costs and subsequently decrease production output or revenue expectations.

In light of the crude oil market, while fluctuations in oil prices have been evident since the commercialization of oil, the year 2020 stood out as an exceptional period for crude oil. Considering that the previous global crisis, the Global Financial Crisis (GFC), underscored the financialization of commodity markets, it is crucial to begin exploring the potential implications that the current global health crisis may have on the relationship between the oil market and the stock market (Ganguly & Bhunia, 2022).



Figure 1. Trend of world oil prices (WTI) during 2021-2022



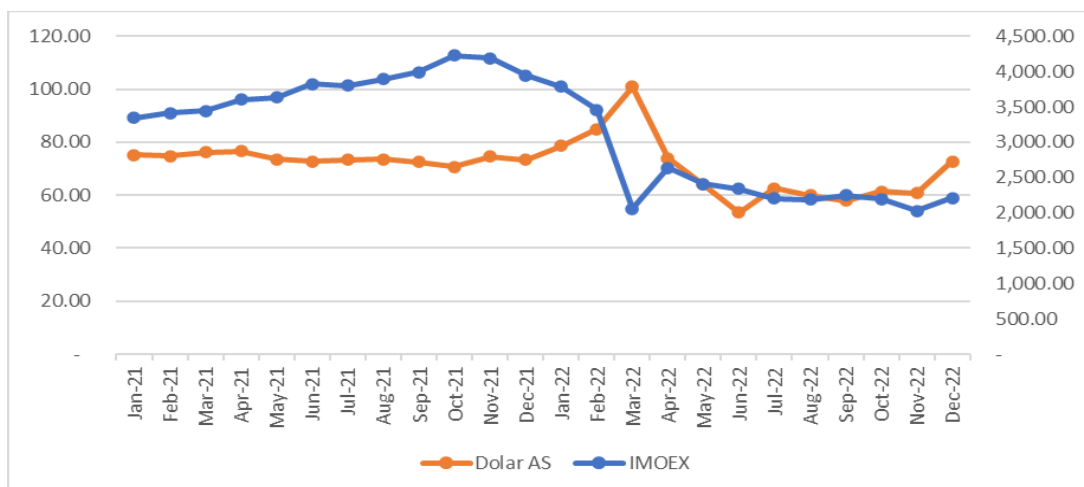
Source: Investing.com (2022)

The information in Figure 1 above depicts the trend of WTI world oil prices for two years, specifically from January 2021 to December 2022. The movement of world oil prices is quite volatile, given that the rise and fall of these prices can impact an economy. No country today abstains from using energy for its daily needs, even in the industrial sector.

From January 2022 to December 2022, the movement of world oil prices was highly volatile and continued to increase. This phenomenon was caused by the conflict between Russia and Ukraine in the war that began in early 2022. Naturally, this condition triggers global economic uncertainty as it has the potential to cause a third world war, including the uncontrolled movement of world oil prices.

Russia, being one of the largest energy producers globally, undoubtedly exerts considerable influence on the global economy, including the movement of world oil prices. On the other hand, the soaring world oil price of WTI during that period was a result of Russia selling crude oil at a price below the WTI crude oil price, with the currency used in the transaction no longer being the US Dollar.

Figure 2. Trend of Russian Stock Exchange (IMOEX) and US dollar during 2021-2022



Source: Yahoo finance (2022)

Figure 2 above illustrates the trends of the Russian stock exchange (IMOEX) and the US Dollar's exchange rate against the Russian Ruble. The variable examined in this study is the Russian Stock Exchange (IMOEX), an active market in Russia encompassing various sectors, including the influential energy sector. The Russian energy sector plays a significant role in shaping energy supplies in Europe and Africa, thereby impacting global oil prices. The IMOEX trend exhibited high volatility from January 2021 to December 2022, with a notable shift following the Russian conflict with Ukraine.

Before the Russian-Ukrainian conflicts, spanning from January 2021 to December 2021, the IMOEX trend remained relatively stagnant. However, significant changes emerged from January 2022 to December 2022 in the aftermath of the conflict. This dynamic situation is poised to have both positive and negative effects on world oil prices, given Russia's status as one of the largest global crude oil producers. Consequently, the Russian influence on world oil prices diverges from the benchmarks set by WTI.

The US Dollar serves as a key international trade instrument utilized by nearly all countries globally, exerting considerable influence on WTI's world oil prices. In Figure 2, the exchange rate of the US Dollar against the Russian Ruble demonstrates substantial volatility. From January 2021 to December 2021, the trend remained relatively stable, indicating the continued prominence of the US Dollar in influencing the Ruble. However, from January 2022 to December 2022, the trend became highly volatile, coinciding with the onset of the conflict between Russia and Ukraine.

In the post-conflict period, there was a strengthening of the Russian Ruble, in contrast to the period preceding the conflict. This phenomenon suggests a diminishing influence of the US Dollar on the Russian currency, with indications that Russia may be reducing its reliance on the US Dollar in international trade transactions. This shift has contributed to uncertainties in the global economy and has certainly impacted WTI's world oil prices.

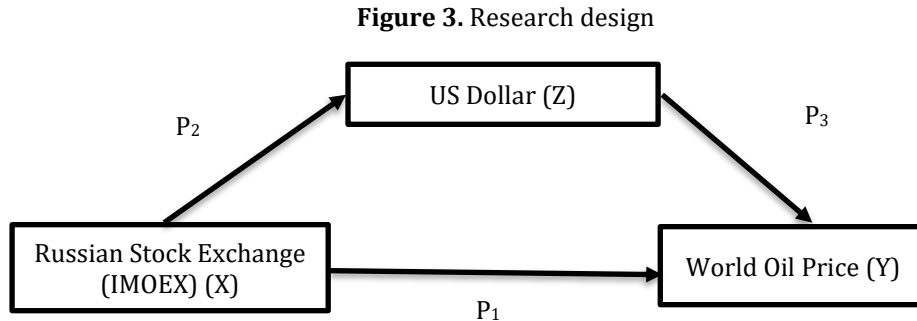
This study draws on several prior works as references, including stock exchange variables from (Pamungkas et al., 2022), (Afdhal et al., 2022), (Erison et al., 2023), (Heinlein et al., 2021), (Stefan & Robiyanto, 2019), and (Yilmaz & İlhan, 2022). Additionally, the reference variable for the US Dollar as an exchange rate is based on (Halisa & Annisa, 2020), (Wati & Puspitaningtyas, 2023), (Yudianto et al., 2023), (Agustina & Barus, 2023), (Sampe, 2023), and (Dias et al., 2021). The world oil price variables are referenced from (Abubakirova, 2021), (Dias et al., 2021), (Pamungkas et al., 2022), (Sampe, 2023), and (Erison et al., 2023). To the best of the researchers' knowledge, no prior research has employed the mediating variable of the US Dollar as the Ruble/USD exchange rate. This aspect constitutes a novel contribution in the context of this study. Therefore, this study aims to examine how the variables of the Russian Stock Exchange (IMOEX) influence global oil prices (WTI), while considering the US Dollar variable as a mediator in the exchange rate between the US Dollar and the Russian currency (Ruble).

METHOD

This research adopts an associative causality approach, a quantitative method aimed at identifying relationships among two or more variables (Arikunto, 2019). The study focuses on the global stock exchange, specifically the Russian stock exchange (IMOEX) (X), along with macroeconomic factors such as WTI world oil prices (Y), and the US Dollar acting as the Ruble-USD exchange rate (Z) in a mediating role. The population for this investigation encompasses data from the worldwide stock exchange. Secondary data for the research spans a two-year period, from 2021 to 2022, and consists of 96 samples collected from various sources, including the internet, papers, books, and other relevant references that support the research.

The data analysis method employed in testing the research variables is the path analysis technique. Path analysis, an extension of multiple linear regression analysis, estimates causal relationships between predetermined variables (causal models) based on theory (Ghozali, 2019). In light of this information, path analysis is constructed to examine the direct relationship

between the Russian stock exchange variable (IMOEX) (X) and WTI world oil prices (Y). Additionally, it explores the indirect relationship between the Russian stock exchange (IMOEX) (X) and WTI world oil prices (Y) mediated by the US Dollar (Z).



Source: Developed by the authors (2023)

In the context of the path analysis concept utilized in this study, the directional components are defined as follows: P1 represents the direct relationship from the Russian stock exchange variable (IMOEX) (X) to the WTI world oil price variable (Y). P2 denotes the direct relationship from the Russian stock exchange (IMOEX) (X) to the US Dollar (Z). Lastly, P3 signifies the direction of the indirect relationship from the Russian stock exchange (IMOEX) (X) to the WTI world oil price (Y) through the mediating influence of the US Dollar (Z).

Hypotheses development

Russian Stock Exchange (IMOEX) and US dollar

Smirnov et al. (2021) elucidated that following the commencement of the Russian-Ukrainian war in early 2022, the influence of the US Dollar, recognized as the world's strongest currency, ceased to impact the volatility of the Russian stock exchange. Consequently, the movements of the Russian stock exchange (IMOEX) gained the ability to mitigate fluctuations originating from the US Dollar. Afdhal et al. (2022) further expounded on these circumstances, attributing them to Russia's departure from the US Dollar in international transactions, prompted by numerous economic sanctions imposed on Russia in response to the outbreak of the Russian-Ukrainian war. Consequently, when the Russian stock market experienced periods of weakening and strengthening, the Ruble currency maintained stability against the US Dollar (Yudianto et al., 2023).

H1: The Russian Stock Exchange (IMOEX) affects the US Dollar

US dollar and world oil prices

World crude oil is a commodity that serves as one of several interconnected indicators in today's global economy, impacted by the inherent volatility following economic and political events within a country (Erison et al., 2023). Dias et al. (2021) elucidate that crude oil prices fluctuate due to the robust demand from the United States, China, India, and the Middle East. The world crude oil price, as determined by West Texas Intermediate (WTI), is traded in US Dollars across most OPEC member countries, thus highlighting the influence of the US Dollar on global oil prices (Halisa & Annisa, 2020).

H2: The US dollar exerts a significant influence on world oil prices

Russian Stock Exchange (IMOEX) and world oil prices with US dollar as the mediating variable

Yilmaz and İlhan (2022) assert that the ongoing Russia-Ukraine conflict has led to a significant surge in global oil prices, gold prices, and various other commodities. This escalation in prices is anticipated to result in a worldwide increase in fuel oil (BBM) prices (Yudianto et al., 2023). The consequent rise in fuel prices across nations holds substantial implications for both life and the economy. This critical scenario has far-reaching effects, impacting companies, the stock market, and contributing to an overall increase in stock market indices (Afdhal et al., 2022).

H3: The Russian Stock Exchange (IMOEX) influences world oil prices through the US dollar

RESULT AND DISCUSSION**Results of model feasibility testing**

At this stage, the research data undergoes a feasibility assessment to ascertain its viability before subjecting it to the regression test conducted in the preceding model. The model feasibility test comprises evaluations such as the data normality test, multicollinearity test, and heteroscedasticity test.

Table 1. Results of normality, multicollinearity, and heteroscedasticity test

Testing	Variable	Asymp. Sig. (2-tailed)	Tolerance	VIF	Sig.
Normality		0.200			
Multicollinearity	IMOEX		0.766	1.305	
	US Dollar		0.766	1.305	
	a. Dependent Variable: Crude Oil WTI				
Heteroscedasticity	IMOEX				.055
	US Dollar				.245
	a. Dependent Variable: RES2				

Source: Processed data (2023)

Based on the results of the first model feasibility test for data normality in Table 1, it is observed that the Asymp. Sig. (2-tailed) for the data normality test is 0.200. Since 0.200 is greater than the 5% alpha standard (0.05), it suggests that the data in the study follow a typical distribution, supporting its continuation to the next stage. Moving on to the second model feasibility test, which assesses multicollinearity in the research data, the tolerance values for the IMOEX and US Dollar variables are 0.766, exceeding the alpha value of 10% (0.10). Additionally, the VIF values for these variables are 1.305, which is less than 10. These outcomes suggest that multicollinearity is not indicated in the research data, supporting its continuation to the next stage. The third model feasibility test focuses on heteroscedasticity. The significance values for the IMOEX and US Dollar variables are 0.055 and 0.245, respectively. Since both values exceed the 5% alpha, it is indicated that the research data is not affected by heteroscedasticity, making it feasible to proceed with regression testing and path analysis.

Result of regression test*Equation 1*

Equation 1 represents the outcome of regression with path analysis, specifically illustrating the direct impact of the Russian stock exchange variable (IMOEX) on the US dollar variable, representing the exchange rate of the US dollar to the Russian currency (Rubel).

Table 2. Result of equation 1

Coefficients^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	50.643	4.034		12.555	.000
	IMOEX	.007	.001	.484	5.355	.000

a. Dependent Variable: US Dollar

Source: Processed data (2023)

The data presented in Table 2 pertains to the partial results of regression equation 1. Notably, the significant value associated with the Russian stock exchange variable (IMOEX) is recorded as 0.000, which is less than the 0.05 threshold. This finding suggests that, in partial terms, the Russian stock exchange variable (IMOEX) exerts a statistically significant influence on the US Dollar, the exchange rate against the Russian currency (Rubel). The coefficient (B) associated with this effect is 0.007, indicating a positive direction for the impact of the Russian stock exchange (IMOEX) on the US Dollar.

Equation 2

Equation 2 represents the outcome of regression with path analysis, specifically illustrating the direct relationship between the Russian stock exchange variable (IMOEX) and the US dollar variable, serving as a mediating variable for the world oil price variable (WTI).

Table 3. Result of equation 2

Coefficients^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	128.646	9.566		13.448	.000
	IMOEX	-.016	.002	-.692	-7.923	.000
	US Dollar	.063	.150	.037	.420	.675

a. Dependent Variable: Crude Oil WTI

Source: Processed data (2023)

The data presented in Table 3 pertains to the partial results of regression equation 2. Specifically, the significant value associated with the US Dollar variable is recorded as 0.675, which exceeds the 0.05 threshold. These findings suggest that, in partial terms, the US Dollar variable does not exert a statistically significant influence on the world oil price.

Sobel test

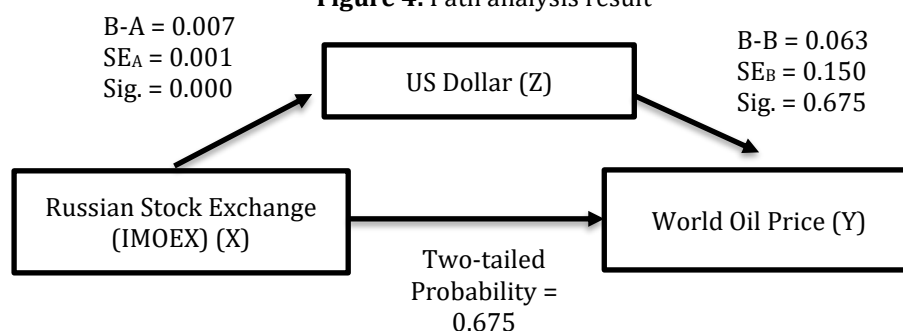
Following the completion of the equation test, the subsequent step involves conducting the Sobel test. This test is implemented to assess and quantify the relationship and impact of the Russian stock exchange variable (IMOEX) on world oil prices (WTI) when considering the US Dollar as a mediating variable.

Table 4. Sobel test result

B - A (IMOEX)	0.007
SE _A	0.001
B - B (US Dollar)	0.063
SE _B	0.150
Sobel Test Statistic	0.419
One-tailed Probability	0.337
Two-tailed Probability	0.675

Source: Processed data (2023)

According to the Sobel test outcomes presented in Table 4, the Two-tailed Probability value is determined to be 0.675. Since this value is greater than the 5% alpha threshold (0.05), it suggests that, indirectly, the influence of the Russian stock exchange variable (IMOEX) on world oil prices, mediated by the US Dollar variable, does not exhibit a statistically significant connection in the path analysis of the research data.

Figure 4. Path analysis result

Source: Processed data (2023)

Table 5. Hypotheses test result

Variable	Description	Results
IMOEX → US Dollar	Direct	(+) Significant
US Dollar → World Oil Price	Direct	No effect
IMOEX → World Oil Price	Indirect	No effect

Source: Processed data (2023)

The data presented in both Figure 4 and Table 5 collectively summarize the research hypotheses. The outcomes of the first hypothesis test, examining the direct impact of the Russian stock exchange (IMOEX) on the US dollar as an exchange rate against the Russian currency (Ruble), indicate a positive directional effect. Meanwhile, the results of the second hypothesis, assessing the direct influence of the US Dollar on world oil prices, reveal no significant effect. Additionally, the third hypothesis, which explores the indirect influence of the Russian stock exchange (IMOEX) on world oil prices through the US Dollar, indicates that this mediation does not exhibit a significant effect on the two variables.

Discussion

Direct effect of Russian Stock Exchange on US dollar

The results of empirical testing show that the Russian stock exchange (IMOEX) directly has a significantly positive effect on the US Dollar as an exchange rate against the Russian currency

(Ruble). The significant positive effect explains that the movement of the Russian stock exchange has a positive impact on the US Dollar-Ruble exchange rate. This condition can be observed in the period before the Russian-Ukrainian war, namely in 2021, during the observation period of this study. When the Ruble currency strengthened, the Russian stock exchange (IMOEX) showed a positive movement throughout 2021. However, after the start of the Russian-Ukrainian war in 2022, the movement of the Russian stock exchange (IMOEX) and the US Dollar-Ruble exchange rate became uncertain. It seemed as if the influence of the US Dollar began not to affect the Russian stock market. This is evidenced by the fact that the strengthening or weakening of the US Dollar currency exchange rate against the Ruble did not affect the movement of the Russian stock exchange (IMOEX) throughout the observation period, namely 2022.

After the Russian-Ukrainian war, most countries issued economic sanctions against Russia. This led to a halt in international cooperation, including international trade, global politics, and international security, against Russia. Under these conditions, Russia slowly shifted from using the U.S. dollar exchange rate, which was previously a tool for economic transactions in international trade. Consequently, all transactions from any country that imposed economic sanctions had to be paid using the Ruble currency. Russia, as the third-largest oil and gas exporter in the world after the United States and Saudi Arabia, became one of the most significant contributors of oil and gas to Europe and other countries. This support from the energy sector allowed the Russian stock exchange (IMOEX) to remain stable and unaffected by the U.S. Dollar because the energy sector supported it. The loss of the influence of the U.S. dollar exchange rate on any Russian economic or international trade transactions resulted in the movement of the Russian stock exchange (IMOEX) positively affecting the U.S. dollar. Therefore, when the Rubel-U.S. Dollar exchange rate weakened, it had no impact on the weakening of the Russian stock exchange (IMOEX). The results of this study align with the findings of (Halisa & Annisa, 2020), (Wati & Puspitaningtyas, 2023), (Erison et al., 2023), (Abubakirova, 2021), and (Yılmaz & İlhan, 2022) that the stock exchange has a positive effect on the U.S. Dollar exchange rate after the Russian-Ukrainian conflict.

Direct effect of US dollar on world oil price

The results of empirical testing indicate that the U.S. Dollar exchange rate does not directly affect world oil prices. The world oil price of WTI serves as a reference for the global price of crude oil in U.S. Dollar currency; every WTI world oil transaction must utilize the U.S. Dollar as the international transaction tool. In the study, the Rubel-U.S. Dollar exchange rate does not influence the world price of WTI oil. This is because Russia produces and exports crude oil with its state currency (Ruble) instead of the U.S. dollar. The change in the mechanism of Russian international trade began with the onset of the Russian-Ukrainian conflict in early 2022. Consequently, all forms of Russian international trade have employed the currencies of partner countries that remain friendly, excluding countries that impose economic sanctions due to Russian attacks on Ukraine, primarily European countries.

The beginning of 2022 marked the initiation of the Russian-Iranian war and the first period when Russia discontinued the use of the U.S. Dollar currency in domestic and foreign economic activities. As a result, the value of the US Dollar against the Russian currency Rubel did not have a significant effect, considering that the WTI world oil price still adheres to the standard world oil price with the US Dollar / USD currency. During this period, the movement of the United States currency (USD) did not impact the movement of the Russian currency (Ruble). While the US Dollar is indeed one of the strongest currencies globally, its influence may diminish in conditions where the currency is no longer used in international trade transactions by most countries worldwide. Consequently, the Rubel exchange rate converted to the US Dollar does not significantly affect the world price of WTI oil. This condition would differ if most countries imported crude oil from Russia with their respective currencies, bypassing the use of the US Dollar exchange rate. The results of this study align with the findings of (Heinlein et al., 2021), (Abubakirova, 2021), and (Revez et al., 2022) indicating that the USD exchange rate does not impact world oil prices.

Indirect effect of Russian Stock Exchange on world oil price through US dollar

The results of empirical testing reveal that the Russian stock exchange (IMOEX), indirectly through the US Dollar as the USD/Rubel exchange rate, does not influence world oil prices. Before the Russian-Ukrainian war in 2021, the movements of the Russian stock exchange (IMOEX) were still affected by fluctuations in the USD/Rubel exchange rate, given that the entire Russian international reserve transaction continued to use the US Dollar exchange rate. Consequently, the energy sector on the Russian stock exchange (IMOEX) was susceptible to fluctuations in the world oil price, particularly WTI, which is denominated in US Dollars.

The diminished influence of the Russian stock exchange (IMOEX) on WTI world oil prices through the US dollar is a post-Russo-Ukrainian war phenomenon that began in early 2022. This shift resulted from Russia's reduced dependence on the US dollar in global transactions. The Russian-Ukrainian war prompted the United States and many other countries to impose massive sanctions on Russia. These economic sanctions commenced with the termination of financial access services (SWIFT) to financial institutions, including Russian banks involved in international transactions. In 2020, Russia accounted for around 40% of natural gas imports and exported more than 2.5 million barrels of crude oil to the European Union. The value of EU energy imports from Russia in 2021 amounted to 108 billion USD, highlighting Europe's significant dependence on Russia for oil and gas. As a result, Russia plays a crucial role in the global supply chain, particularly for the United States and the European Union. The consequential impact allows Russia to grow without the influence of the US Dollar, and the movement of WTI world oil prices no longer affects the Russian stock exchange (IMOEX).

These findings align with the theories proposed by (Pamungkas et al., 2022), (Yilmaz & İlhan, 2022), and (Abubakirova, 2021), suggesting that the influence of the US Dollar diminishes when trade transactions are no longer conducted with this currency. Consequently, movements in world oil prices do not significantly impact the stock exchanges of countries that have shifted away from the US Dollar.

CONCLUSION

This study aims to analyze the impact of the Russian stock exchange (IMOEX) on WTI world oil prices, with the US Dollar/Ruble exchange rate as a mediating variable. The research spanned two years, from 2021 to 2022, using weekly data sampled from relevant secondary sources.

The results of testing the first hypothesis indicate that the Russian stock exchange variable (IMOEX) has a positive impact on the US Dollar/Ruble exchange rate. The movement of the Russian stock exchange (IMOEX) remains unaffected by fluctuations in the US Dollar currency. Therefore, even when the Ruble/US Dollar weakens, the volatility of the Russian stock exchange is not influenced, especially after the conditions of the Russian-Ukrainian war. The results of testing the second hypothesis reveal that the US Dollar variable does not directly impact world oil prices. Since the Ruble is Russia's national exchange rate and not an international exchange tool, it does not influence the world oil price of WTI in transactions involving the US Dollar. Testing the third hypothesis finds that the Russian stock exchange (IMOEX) does not have an indirect effect on world oil prices through the US Dollar as a mediating variable. The US Dollar, acting as a mediation variable in this study, does not serve as a link between the Russian stock exchange (IMOEX) and the price of WTI world oil. The movement of world oil prices continues to be influenced by the United States economy, which controls the USD currency as a means of international transactions.

These findings can serve as a scientific reference for academics, stakeholders, investors, corporations, and economists. For future research, it is recommended that scholars explore other global stock exchange variables, such as the Dow Jones Industrial Average (DJIA), Shanghai Composite Index (SSEC), and other macroeconomic variables related to world oil price volatility.

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