Oil, stock, and foreign exchange markets in ASEAN countries: Evidence in Covid-19 pandemic and Russia - Ukraine war

Nhung Thi Hong Vu[1], Phuc Thien Nguyen[1*]

[1]Eastern International University, Binh Duong, Vietnam
[*]Corresponding author: phuc.nguyenthien.bbs19@eiu.edu.vn

ARTICLE INFO

DOI:10.46223/HCMCOUJS.econ.en.15.3.3688.2025

Received: August 23th, 2024
Revised: October 30th, 2024
Accepted: November 19th, 2024

JEL classification code:
G11; G12; F31

Keywords:
ASEAN region; Covid-19 pandemic; oil price volatility; Russia - Ukraine war

ABSTRACT

This study investigates the trilateral relationship among the stock, oil, and foreign exchange markets across nine ASEAN countries from January 2019 to February 2023. The sample is divided into three periods: before and after the announcement of Covid-19 and the period of the Russia - Ukraine war. The analysis is conducted through various techniques, including Granger causality testing, impulse response function, and forecast error variance decomposition. The results are consistent with various panel analysis techniques. The findings show the independence of these three variables before the pandemic and during the Russia - Ukraine war. Yet after the pandemic, shocks in oil and foreign exchange markets significantly cause stock market volatility. Additionally, oil price fluctuation appears to have a more profound impact on stock returns than changes in exchange rates. These results suggest diversification opportunities for investors to neighbouring areas beyond China, the study of oil price risk management before making investments in oil-related businesses, and the need for policymakers to monitor exchange rates to mitigate the effect on the stock market.

1. Introduction

Energy is crucial for the economy (Creti et al., 2013). Energy is a necessary material in various economic activities and is also an impactful factor in political issues (Hussain et al., 2021). Oil is the world's primary energy source. It is the primary supply of raw materials for modern society, including the transportation, chemical, and fertilizer sectors. Therefore, crude oil price movements influence the energy industry and other sectors, and ultimately, an oil price shock will directly affect the global financial markets (Lin et al., 2014). The recent oil shocks caused by Covid-19 and the Russia - Ukraine war are worth studying.

To cope with the spread of the Covid-19 pandemic, the globe enacted social distancing restrictions that include limitations and prohibitions on both domestic and international scope. As a result, businesses in the tourism, import-export, and transportation sectors were severely disrupted, causing the demand for crude oil to fall significantly.

Meanwhile, stock markets around the world are confronted with challenges due to abnormal volatility in unrefined oil prices. The global stock market recorded a significant downturn in early 2020, specifically in developed markets, with the US, UK, and Italian stock markets falling by 32%, 27.9%, and 39.3%, respectively.

The next event occurred on February 24th, 2022, when Russia initiated special military operations against Ukraine. Since these two countries have a significant role in the supply chain of energy, food, and other natural resources globally, the conflict between these nations has led to a significant rise in global commodity prices, marking it as a critical event in international politics (Prisecaru, 2022). As a consequence, this war is believed to slow the economic growth of nations that depend on Russia and Ukraine's commodity imports and exports.

Furthermore, oil trade is regarded as one of the most considerable international exchange transactions, so the oil price movement will affect the exchange rate between the currencies used in payments (Gencer & Kilic, 2014). Since oil is priced in USD, a recent USD appreciation because of a rising inflation rate in the US would cause oil to be more expensive around the world. Numerous previous studies confirmed a linkage between oil price shocks and exchange rates in different markets (Candila et al., 2021; Devpura, 2021; Yeoh et al., 2022).

The research is conducted in ASEAN countries for several reasons. First, the ASEAN economy is ranked fifth in the world and aims to become the fourth-largest economy by 2030. With an overall population of almost 700 million people, of whom 61% are under the age of 35 and the majority of youth use digital technology in their everyday lives, this market has great potential. Second, FDI inflows into ASEAN increased by 41%, or $147 billion, in 2021, reversing the fall caused by Covid-19 in 2020. This historic rise demonstrated ASEAN's tenacity and appeal to global investors. Finally, businesses linked to Chinese firms have been experiencing economic disruptions due to the three-year lockdown in China. This has raised concerns about diversifying investment in China's neighbouring areas, such as Southeast Asia.

This study explores the connection among oil, stock, and foreign exchange markets in ASEAN nations through three periods: before and after the Covid-19 announcement and after Russia's encroachment on Ukraine. We aim to contribute to the existing literature using panel Vector Autoregressive (panel VAR) models to identify the multi-directional causality between oil prices, stock prices, exchange rates, and their lagged values. This model is appropriate when the variables simultaneously respond to one another and change into other observable and unobservable factors. Additionally, the Impulse Response Functions (IRF) and Forecast Error Variance Decomposition (FEVD) methods are used to examine the response of each variable to shocks in other variables. Previous studies, such as Atif et al. (2022) and Kumeka et al. (2022), have explored the trilateral associations among these variables. Still, their samples were limited to developing and oil-exporting countries. Furthermore, while these studies covered the Covid-19 period, no empirical studies to date examine the impact of the Russia - Ukraine war on the trilateral connection among crude oil prices, stock returns, and exchange rates. Finally, as most of the past research has been conducted in major oil-producing and exporting countries (Kumeka et al., 2022) and developing markets (Atif et al., 2022), there has been limited research on the ASEAN region. This paper aims to bridge these gaps in the literature.

The remainder of the article proceeds as follows: Section 2 demonstrates a literature review; Section 3 describes data; Section 4 presents the methodology used in this study; Section 5 presents results and discussion; and Section 6 concludes the study.

2. Theoretical basis

Numerous studies have used various techniques to explore the relationship between three distinct financial factors: oil prices, stock returns, and exchange rates in multiple markets. Cifarelli and Paladino (2010) showed a negative association between oil price volatility and stock and foreign exchange markets using multivariate GARCH-M. Employing structural VAR,

Basher and Sadorsky (2012) confirm the dynamic relationship among oil prices, emerging stock market returns, and the USD exchange rate. Expanding to other markets, Bai and Koong (2018) studied China and the US using SVAR and BEKK-GARCH, Delgado et al. (2018) investigated Mexico with a VAR model, Chkir et al. (2020) explored oil-importing and exporting economies. They have the same result of a positive linkage between oil prices and stock market returns but an inverse relationship between oil and foreign exchange markets. Focusing on the Pakistani market, Hashami et al. (2022) discovered that oil prices and exchange rates had varying effects on stock prices during different market periods.

Regarding the study on the Covid-19 pandemic, Atif et al. (2022) found an inverse influence of oil price fluctuation on the foreign exchange markets in developing countries. However, they argued a positive correlation between oil price volatility and stock returns. Conversely, by studying twelve oil-exporting countries, Kumeka et al. (2022) confirmed that changes in crude oil price volatility had adverse effects on these nations' exchange rates and stock market activities simultaneously.

For ASEAN economies, Koh (2015) examined the effect of oil price volatility and exchange rate fluctuations on stock prices in ASEAN-5 by using a monthly structural VAR model. Al-Hajj et al. (2018) also used ARDL to investigate the Malaysian market. Both studies found a significant impact of oil price shocks on stock and foreign exchange markets.

Recent research has studied the impact of the Russia - Ukraine war on the global economy, particularly on the spillover between oil, exchange rates, and stock markets. Bagchi and Paul (2023) claimed that the tension between Russia and Ukraine caused significant long-term effects from Brent crude oil prices to stock returns and currency exchange rates across all G7 countries. Similarly, Khan (2024) showed the impact of oil price fluctuations on the US and Chinese stock markets during the Russia - Ukraine war. The author also indicated that the US stock market was more responsive to oil price shocks than the Chinese market, highlighting regional differences in sensitivity to oil volatility. On the other hand, although Behera (2023) confirmed the spillover between crude oil prices and stock returns in selected East Asian countries, the Russia - Ukraine war has no impact on this spillover.

In summary, the discussion is still controversial. Moreover, there have been few studies that compare the trilateral relationship between oil, stock, and foreign exchange markets with a consideration of the Covid-19 pandemic and the Russia - Ukraine war in ASEAN countries. Especially studies on the consequences of the Russian and Ukrainian war on the relationship are extremely limited. Moreover, although previous studies have considered the effect of Covid-19 in developing countries and oil-exporting economies, the study in ASEAN nations remains untouched. This study will fill those gaps by exploring the connection between oil, stock, and foreign exchange markets in ASEAN nations during three stages: before and after the Covid-19 announcement and post - Russian - Ukrainian war.

3. Methodology

3.1. Data

The daily data utilized in this study spans from January 2nd, 2019, to February 28th, 2023. Firstly, stock index series were gathered from nine ASEAN countries, namely Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. Secondly, the exchange rates of these countries' currencies against the USD were used. The USD was selected due to its dominance in the international market, particularly in the global oil trade.

The final data source was the daily Brent oil price. Data was sourced from the Bloomberg Terminal. The return series was computed using the $r_{it} = \ln(p_{it} / p_{it-1})$ where r_{it} is defined as daily returns for stocks, oil, and exchange rates of the country i at time t and p_{it} and p_{it-1} are the stock prices, oil prices, and exchange rates of the country i at time t and time $t-1$, respectively.

The original data sample is then divided into three sub-periods, each defined by notable world events. The first sub-period, named pre-Covid-19, ranges from January 02nd, 2019, to March 10th, 2020, the date on which the WHO announced the Covid-19 pandemic. The second sub-period, named post-Covid-19, ranges from March 11th, 2020, to February 23rd, 2022, the date when Russia invaded and occupied parts of Ukraine in a major escalation of the Russia - Ukraine War. The final sub-period, named the Russia - Ukraine war, covers February 24th, 2022, to February 28th, 2023. Dividing the data into distinct periods based on significant events allows us to analyse the impact of these events on the relationships between oil prices, exchange rates, and stock markets in the ASEAN countries.

Table 1 displays the descriptive statistics for returns in the oil and stock markets. The average stock returns were negative before and after the pandemic periods, and the returns were higher after the pandemic in all markets except Laos and Malaysia. These results are consistent with the results of Salisu et al. (2020). During the Russia - Ukraine war, market average returns also experienced a negative value. Regarding the measure of risk, the standard deviation of stock returns increased over time. Therefore, the impact of the Covid-19 pandemic and the Russia - Ukraine war on stock returns is recorded in the data. These findings contradict results from Kumeka et al. (2022).

Table 1

Descriptive Statistics: Stock and Oil Returns

	CSX	JKSE	LSX	KLSE	YSX	PSE	FTSE	SET	VNI	Brent
Pre-Covid-19 (2 January, 2019 - 10 March, 2020)										
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	0.12	6.91	0.14	4.60	0.01	0.03	0.01	0.02	0.02	0.11
Minimum	-0.07	-6.90	-0.15	-4.60	-0.03	-0.06	-0.04	-0.07	-0.06	-0.24
Std. Dev.	0.01	0.57	0.01	0.38	0.00	0.01	0.00	0.00	0.00	0.02
Obs.	292	292	292	292	292	292	292	292	292	292
Post-Covid-19 (11 March, 2020 - 23 February, 2022)										
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Median	-0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	0.07	0.11	0.05	0.06	0.05	0.07	0.06	0.08	0.10	0.41
Minimum	-0.08	-0.05	-0.05	-0.05	-0.05	-0.11	-0.07	-0.11	-0.09	-0.64
Std. Dev.	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05
Obs.	464	464	464	464	464	464	464	464	462	464
Russia - Ukraine War (24 February, 2022 - 28 February, 2023)										
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	CSX	JKSE	LSX	KLSE	YSX	PSE	FTSE	SET	VNI	Brent
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	0.16	0.05	0.26	0.08	0.12	0.16	0.04	0.03	0.22	0.12
Minimum	-0.16	-0.06	-0.29	-0.08	-0.11	-0.16	-0.05	-0.04	-0.22	-0.13
Std. Dev.	0.02	0.01	0.03	0.01	0.02	0.02	0.01	0.01	0.03	0.03
Obs.	218	218	218	218	218	218	218	218	218	218

Note. The stock index series in nine ASEAN nations are Cambodia (CSX), Indonesia (JKSE), Laos (LSX), Malaysia (KLSE), Myanmar (YSX), the Philippines (PSE), Singapore (FTSE), Thailand (SET), and Vietnam (VNI)
Source. Authors' calculation

Table 2 describes exchange rate returns. Similar to the finding by Kumeka et al. (2022), the average returns and the standard deviations of returns vary among the markets. The trend of exchange rates and their returns' movement in ASEAN countries is inconclusive.

Table 2

Descriptive Statistics for Exchange Rate Returns

	KHR/USD	IDR/USD	LAK/USD	MYR/USD	MML/USD	PHP/USD	SGD/USD	THB/USD	VND/USD
Pre-Covid-19 (2 January, 2019 - 10 March, 2020)									
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Median	0	0.00	0	0	0	0.00	0.00	0.00	0.00
Maximum	0.01	0.04	0.01	0.01	0.02	0.01	0.00	0.02	0.00
Mini-mum	-0.01	-0.01	0.00	0.00	-0.02	0.00	0.00	0.01	0.00
Std. Dev.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Obs.	292	292	292	292	292	292	292	292	292
Post-Covid-19 (11 March, 2020 - 23 February, 2022)									
Mean	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Median	0	0	0	0	0	0	0.00	0	0
Maximum	0.01	6.21	0.02	0.02	0.10	0.01	0.01	0.01	0.00
Mini-mum	-0.01	-6.21	-0.02	-0.02	-0.05	-0.01	-0.01	-0.01	0.00
Std. Dev.	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Obs	464	464	464	464	464	464	464	464	464
Russia - Ukraine War (24 February, 2022 - 28 February, 2023)									
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Median	0	0.00	0	0	0	0.00	0.00	0.00	0.00
Maximum	0.01	9.60	0.31	0.07	0.16	0.10	0.04	0.11	0.03
Mini-mum	-0.01	-9.60	-0.29	-0.06	-0.16	-0.09	-0.04	-0.11	-0.06
Std. Dev.	0.00	0.92	0.04	0.00	0.02	0.01	0.00	0.01	0.00
Obs	218	218	218	218	218	218	218	218	218

Note. The exchange rates of nine ASEAN countries' currency against the USD are Cambodia (KHR/USD), Indonesia (IDR/USD), Laos (LAK/USD), Malaysia (MYR/USD), Myanmar (MML/USD), the Philippines (PHP/USD), Singapore (SGD/USD), Thailand (THB/USD), and Vietnam (VND/USD)
Source. Authors' calculation

Next, to justify the validity of the panel VAR used in this paper, the panel unit root test needs to be conducted to ensure all variables in the panel VAR are stationary. Four tests were performed, including the Levin, Lim and Chu (LLC), Im, Pesaran and Shin (IPS), Augmented Dickey-Fuller (ADF), and Phillips-Perron test (PP). It is confirmed that stock returns, oil price returns, and return on exchange rates are stationary in all three periods. This makes the choice of the panel VAR validated in this study.

3.2. Methodology

Following Salisu et al. (2020) and Kumeka et al. (2022), a panel VAR approach is utilized to investigate the interconnections between oil, stock, and foreign exchange markets in nine ASEAN countries. A VAR model treats all variables as endogenous and considers their mutual dependencies. It incorporates multiple lagged values for each variable, enabling the analysis of their dynamic interrelationships. By applying panel VARs, the traditional VAR models are extended to handle panel data, introducing a cross-sectional dimension to the representation. This approach provides deeper insights into the underlying relationships, especially by accounting for potential heterogeneities among different units within the panel.

According to Abrigo and Love (2016), panel VARs offer several benefits compared to other modelling approaches. They can capture both static and dynamic interdependencies among variables, handling the connections across units in an unrestricted way. Furthermore, they are well-suited for analyzing relationship changes over time, as they allow for time variations in both the coefficients and the variance of the shocks. Given that oil prices, stock markets, and exchange rates are highly correlated in financial markets, panel VAR enables us to examine the simultaneous, bidirectional effects that these variables have on each other.

Moreover, panel VAR is appropriate for this study as it captures cross-sectional dynamic heterogeneities. This technique can be used to analyse transmissions of idiosyncratic shocks across units and time (Canova & Ciccarelli, 2013). Therefore, it can be used to analyze how shocks, like the Covid-19 pandemic and the Russia - Ukraine war, are transmitted across ASEAN countries, affecting each country's markets in potentially distinct ways.

The panel VAR is presented as:

$$\Delta RSMI_{it} = \alpha_{1i} + \sum_{j=1}^{p} \beta_{1i} \Delta RSMI_{it-j} + \sum_{j=1}^{p} \gamma_{1i} \Delta ROIL_{it-j} + \sum_{j=1}^{p} \delta_{1i} \Delta REXR_{it-j} + \omega_{1t} + \varepsilon_{1it} \dots (1)$$

$$\Delta ROIL_{it} = \alpha_{2i} + \sum_{j=1}^{p} \beta_{2i} \Delta RSMI_{it-j} + \sum_{j=1}^{p} \gamma_{2i} \Delta ROIL_{it-j} + \sum_{j=1}^{p} \delta_{2i} \Delta REXR_{it-j} + \omega_{2t} + \varepsilon_{2it} \dots (2)$$

$$\Delta REXR_{it} = \alpha_{3i} + \sum_{j=1}^{p} \beta_{3i} \Delta RSMI_{it-j} + \sum_{j=1}^{p} \gamma_{3i} \Delta ROIL_{it-j} + \sum_{j=1}^{p} \delta_{3i} \Delta REXR_{it-j} + \omega_{3t} + \varepsilon_{3it} \dots (3)$$

Where $RSMI_{it}$, $ROIL_{it}$, and $REXR_{it}$ are returns of stock, oil, and exchange rate, respectively. $\beta, \gamma,$ and δ are parameters. α_i, ω_t, and ε_{it} determine the country-specific effects, the time-specific effects, and the residuals, respectively. These equations are repeated for the three periods.

Then, the Granger causality test is used to detect the forecasting ability of a variable using another variable. However, this test neither indicates the direction of the relationship

between the variables nor the amount of time it takes for stock returns to fully capture the effects of changes in oil prices. Hence, the IFR and FEVD are utilized because IRFs describe how an endogenous variable's response changes over time due to a shock in another variable within the system.

The IRF, derived from the Cholesky decomposition of the variance-covariance matrix residues, is utilized. This technique provides insight into the duration and intensity of each market's response to specific shocks from other markets, allowing us to understand how disruptions in oil prices, for example, propagate through the financial system of each ASEAN nation. In this study, 200 Monte Carlo simulations of a Gaussian approximation were used to determine the confidence intervals of the IRFs, following Abrigo and Love's (2016) methodology. These impulse responses are not unique and depend on the specific ordering of the variables in the VAR (Pesaran, 2015). The Cholesky decomposition, used to calculate the IRFs, assumes that the variables listed first in the VAR contemporaneously affect the other variables. In contrast, the variables listed later only affect the earlier ones with a lag. Consequently, the variables that appear earlier in the VAR order are considered more exogenous. Additionally, the FEVD is employed to assess the contributions of each shock source to the variance of each endogenous variable's forecast error over a specified forecast horizon. Due to the dynamic nature of VAR, shocks to one variable impact its future values and influence the future values of other variables. Thus, the FEVD is valuable in determining the degree of interdependence among oil, stock, and exchange rate movements over time.

4. Result and discussion

Firstly, the optimal lag length is determined using the Schwarz information criterion. In the pre-Covid-19 period, the optimal number of lags is five, meaning that the model includes data from the five most recent periods to forecast each variable. In the subsequent two periods, the optimal lag is two, indicating that two previous time periods' values of a variable are included in the model to predict the current value. Once all the coefficients of the panel VAR are estimated, we proceed with the panel Granger causality test, IRF, and FEVD.

Table 3 displays the results from the panel Granger causality examination. The analysis reveals no statistically significant causal linkages among the variables before the pandemic onset and during the Russia - Ukraine conflict, as indicated by p-values exceeding 0.05 in the final column. This finding contradicts the assertions made by Atif et al. (2022) and Kumeka et al. (2022), who identified multiple causal relationships in developing markets and oil-exporting countries before the pandemic.

In contrast, there is unidirectional Granger causality from oil returns, exchange rate returns, and both stock returns in the post-Covid-19 period, as the p-values are less than 0.05. The result implies that variations in the oil and foreign exchange markets influenced the stock market after the pandemic. This argument is supported by Bagchi and Paul (2023), Candila et al. (2021), Devpura, (2021), Koh (2015), who also found the impact of oil prices and exchange rates on stock returns in G7 countries, oil import and export nations, the EU, and ASEAN region, respectively. Our finding also confirms Atif et al. (2022), Kumeka et al. (2022), who claimed that exchange rate returns Granger cause stock returns. Yet they found insignificant causality from oil returns to stock returns. Moreover, comparing the Chi-squares, it is shown that the value of the combination is 28.23, which is greater than the sum of individual factors of 28 (the sum of 15.92 and 12.08). It indicates that the causality when the impact of oil and exchange rate returns are combined is stronger than that of individual factors.

Table 3

Panel Granger Causality Test

	Dependent	Excluded		Df	Prob.
Pre-Covid-19					
	RSMI	REXR	4.61	4	0.33
		ROIL	0.06	4	1
		ALL	4.68	8	0.79
	REXR	RSMI	0.06	4	1
		ROIL	2.54	4	0.64
		ALL	2.63	8	0.96
	ROIL	RSMI	3.46	4	0.49
		REXR	0.09	4	1
		ALL	3.55	8	0.90
Post-Covid-19					
	RSMI	REXR	15.92***	2	0.0003
		ROIL	12.08***	2	0.002
		ALL	28.23***	4	0
	REXR	RSMI	0.22	2	0.89
		ROIL	0.87	2	0.65
		ALL	1.03	4	0.91
	ROIL	RSMI	0.36	2	0.83
		REXR	4.03	2	0.13
		ALL	4.37	4	0.36
Russia - Ukraine war					
	RSMI	REXR	3.66	2	0.16
		ROIL	0.87	2	0.65
		ALL	4.54	4	0.34
	REXR	RSMI	1.17	2	0.56
		ROIL	0.32	2	0.85
		ALL	1.46	4	0.83
	ROIL	RSMI	3.66	2	0.16
		REXR	0.87	2	0.65
		ALL	4.54	4	0.34

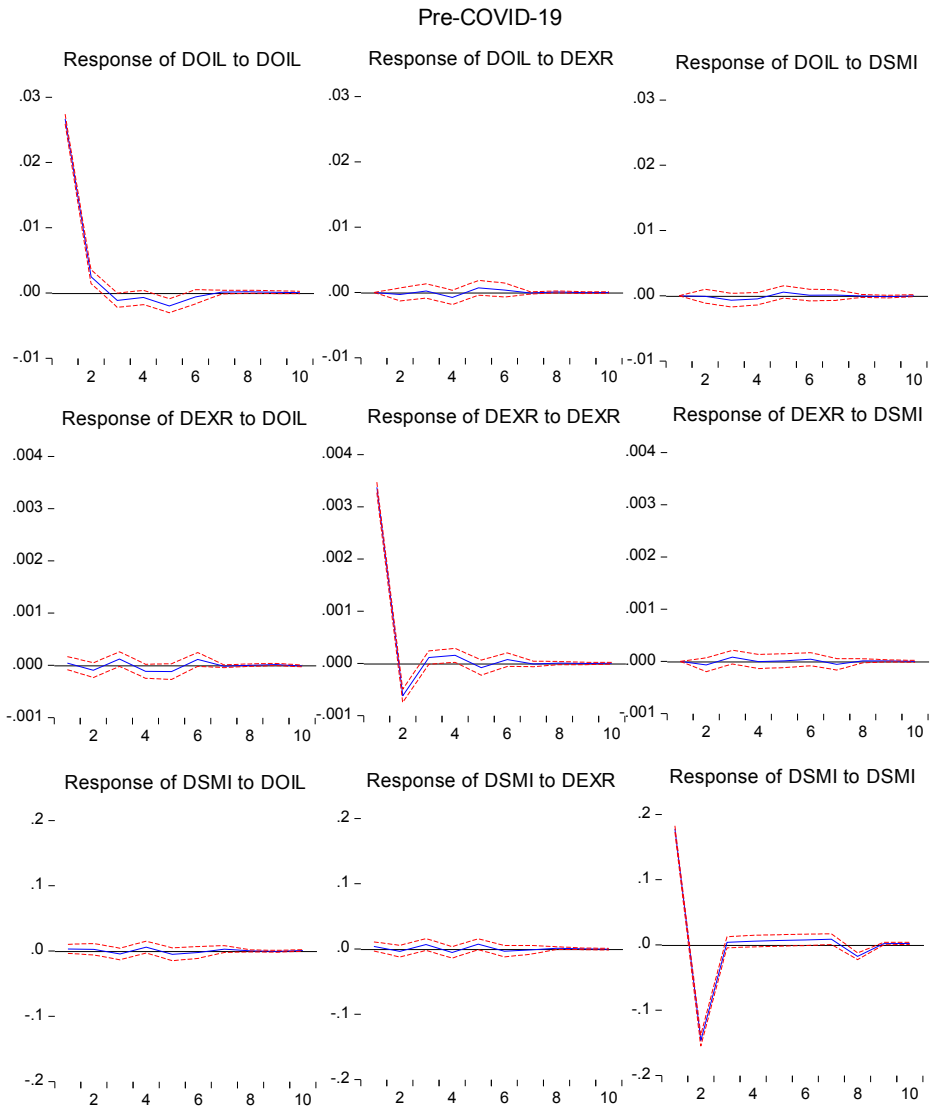
Note. *** denotes 1% significant level
Source. Authors' calculation

Following the IRF analysis, we now present the outcomes. Initially, determining the variable order is crucial in IRF analysis. Our findings indicate the sequence for IRF and FEVD as follows: firstly, oil price returns; secondly, changes in exchange rates; and finally, stock returns. This sequence affirms the significant causality observed in the Granger causality test, particularly from oil prices and exchange rates to stock markets. Furthermore, this sequence aligns with the findings of Salisu et al. (2020), Atif et al. (2022), Kumeka et al. (2022).

The findings depicted in Figure 1 indicate that following the shocks, all series eventually stabilize at a zero steady state, thereby confirming the data's stationarity. The pronounced reactions of each variable to its respective shock, illustrated by the graphs "Response of DOIL to DOIL," "Response of DEXR to DEXR," and "Response of DSMI to DSMI," highlight the issue of autoregression. During the pre-Covid-19 and Russia - Ukraine war periods, apart from the graphs depicting responses to their own shocks, other graphs show confidence intervals with the zero line lying between the lower and upper bounds, indicating insignificance in other relationships. This finding aligns with the outcomes of the Granger causality test, which also found no significant relationships between variables during this period.

Figure 1

Impulse Response Functions



Source. Authors

Following the declaration of Covid-19, the stock market's reactions to shocks in oil prices ("Response of DSMI to DOIL") and exchange rates ("Response of DSMI to DEXR") are notably robust compared to others. The graph indicates a positive correlation between oil prices and stock returns in the first two periods. The impact of the shock diminishes after the second period, where the lower bound of the confidence interval reaches zero. In contrast, a shock to exchange rates initially results in a contemporaneous inverse effect on stock returns in the first

two periods. This effect shifts to a positive response in periods three and four before stabilizing at equilibrium thereafter. Consequently, during this period, the stock market's responses to oil price and exchange rate shocks endure longer than the effects of oil price fluctuations on the stock market, which last for three periods.

Table 4

Forecast Error Variance Decomposition

Response Variable	Forecast Horizon	ROIL	REXR	RSMI
Pre-Covid-19				
ROIL	1	100	0	0
	5	99.8620	0.0034	0.1346
	10	99.8576	0.0034	0.1390
REXR	1	0.0096	99.9904	0
	5	0.1132	99.8846	0.0022
	10	0.1139	99.8837	0.0023
RSMI	1	0.0417	0.0016	99.9567
	5	0.1730	0.0010	99.8260
	10	0.1797	0.0010	99.8193
Post-Covid-19				
ROIL	1	100	0	0
	5	99.8983	0.01001	0.0917
	10	99.8982	0.01002	0.0918
REXR	1	99.8982	0.0100	0
	5	0.0047	99.9747	0.0206
	10	0.0047	99.9746	0.0206
RSMI	1	1.2206	0.0077	98.7717
	5	1.4658	0.3184	98.2158
	10	1.4660	0.3184	98.2156
Russia - Ukraine war				
ROIL	1	100	0	0
	5	99.5096	0.0589	0.4315
	10	99.5090	0.0590	0.4320
REXR	1	0.0543	99.9457	0
	5	0.1170	99.8643	0.0186
	10	0.1173	99.8641	0.0186
RSMI	1	0.0442	0.2158	99.7400
	5	0.3325	0.3047	99.3628
	10	0.3332	0.3047	99.3621

Note. *** denotes 1% significant level

Source. Authors' calculation

While the IRF shows the effect of shocks in one variable on another variable, the FEVD produces information about the effect of shocks on combined variables. Table 4 presents the results. Before the announcement of the pandemic, the own shocks explained more than 99.8% of the variations in each variable. Regarding the impacts on stock markets, oil prices can explain 0.0417% of the changes in stock returns on the 1st date and around 0.18% on day 10. These values are higher than the contributions of exchange rates, which are 0.0016% on the 1st day and 0.001% on the 5th and 10th dates. Therefore, similar to the findings in the IRF, the results of this technique imply that most parts of the variance decomposition are attributed to own shocks.

Following the declaration of the pandemic, the effects of stock and oil price shocks on exchange rates, as well as on stock returns and exchange rates on oil price fluctuations, remain minimal. However, the influence of oil prices and exchange rates on stock return fluctuations is more pronounced. Specifically, innovations in oil prices explain approximately 1.22% on the first date and around 1.47% on the fifth and tenth dates. In contrast, the explanatory power of exchange rates starts near zero on the first day but increases to approximately 0.32% by the fifth and tenth dates. Conversely, responses of oil prices and exchange rates to stock price shocks are slower, with speeds around 0.09% and 0.02%, respectively. These findings align with Atif et al. (2022) and Kumeka et al. (2022), indicating that shocks in oil prices and exchange rates contribute more significantly to stock market fluctuations than vice versa. Moreover, the impact of oil prices and exchange rates on the stock market is more pronounced following the pandemic declaration.

During the Russia - Ukraine war period, own shocks were predominant in the variance decomposition, accounting for over 99.5% of the total attribution in all instances. Regarding stock returns, exchange rates explain around 0.22% of the variations on the first day and 0.3% on days five and ten. Meanwhile, oil prices account for approximately 0.04% of the fluctuations in stock returns on day one and increase to 0.33% on days five and ten. This result is consistent with the findings of Behera (2023) in the sense of the minimal impact of the Russia and Ukraine war on the spillover between oil and stock markets in Asian nations.

Across the three tests conducted in this study - the Granger causality test, IRF, and FEVD - the relationship between stock returns, oil prices, and exchange rates in ASEAN countries remains ambiguous, except for the post-Covid-19 period when the influence of oil prices and exchange rates on stock returns becomes more pronounced. Moreover, the limited impact of the Russia - Ukraine war on the spillovers between financial markets could be attributed to governmental policies in ASEAN nations. According to a report from the Asia Development Bank (ADB) analyzing the policy trilemma and financial stability in Asia, developing economies in the region have aimed to maintain moderate levels of monetary independence and financial openness while prioritizing exchange rate stability. Therefore, ASEAN countries typically adjust their interest rates rather than exchange rates to attract foreign investment and manage inflation. Furthermore, since ASEAN countries are not major producers or importers of oil and are not directly involved in the Russia - Ukraine conflict, the energy crisis affecting other regions does not directly impact the economies of ASEAN countries.

5. Conclusion

This study examines the correlation between oil prices, exchange rates, and stock returns across nine ASEAN nations during three distinct periods: pre-Covid-19, post-Covid-19, and during the Russia - Ukraine war. A panel VAR analysis was employed alongside the panel Granger causality test, IRF, and FEVD. Consistently across all three methods, the results indicate no significant interdependence among the assets before Covid-19. The Russia - Ukraine war also

shows a minimal effect on ASEAN nations, as the linkages between assets are insignificant. However, Covid-19 is an economic disruptor that causes spillovers from oil and exchange rate shocks into stock markets. Furthermore, the influence of oil price variations on the stock market is stronger than the influence of exchange rates during this period.

Several implications are derived from these findings. Firstly, the interdependence of variables throughout the health and political events in ASEAN countries suggests a diversification option for investors seeking alternatives to China, especially after recent events such as Covid-19 and the US-China trade war. The geographic advantage and similar culture between the ASEAN region and China offer opportunities for entrepreneurs and investors. Besides that, the diverse results between Covid-19 and the Russia - Ukraine war underscore the unique nature of each crisis. This contrast requires policymakers and investors to implement different policies and hedging strategies to cope with the nature of the crisis. Additionally, this evidence could support investors in seeking diversification opportunities, especially in a region with stable foreign exchange policies and minimal oil reliance impacts.

Furthermore, although oil prices explain only a small portion of the volatility in the stock market during the pandemic, they have a significant positive impact. Therefore, investors should study a firm's oil price risk management when investing in firms whose performance relies heavily on oil prices. Lastly, the effect of exchange rates on the stock market in the post-Covid-19 pandemic suggests that policymakers closely monitor the exchange rates, particularly when the US attempts to control inflation after the pandemic, to mitigate the negative consequences on the stock market. Future research may cover the period from 2023 to 2024, when inflation, interest rates, and exchange rates become crucial around the world due to the long-term impact of the pandemic.

ACKNOWLEDGEMENTS

Conflict of Interest: The authors declare no conflict of interest.

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