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MỐI QUAN HỆ TƯƠNG TÁC GIỮA CHỈ SỐ VN-INDEX VÀ CÁC BIẾN VĨ MÔ LIÊN QUAN TRONG CUỘC XUNG ĐỘT NGA - UCRAINA

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Tóm tắt

Mục tiêu của nghiên cứu là phân tích phản ứng của VN Index trên thị trường chứng khoán Việt Nam do các yếu tố vĩ mô liên quan đến thị trường toàn cầu hoặc được Chính phủ Việt Nam thực hiện trong cuộc chiến tranh Nga-Ukraine. Kết quả của mô hình VAR cung cấp bằng chứng khoa học cho thấy thị trường không phản ứng tiêu cực quá mức trước các sự kiện diễn ra trong chiến tranh và bất ổn chính trị có thể quan sát được từ tác động của giá hợp đồng khí đốt tương lai. Tuy nhiên, thị trường chứng khoán Việt Nam đã chịu những tác động vừa tiêu cực vừa tích cực từ các chính sách kinh tế vĩ mô và tiền tệ của Chính phủ trong quá trình phục hồi kinh tế ngay sau giai đoạn Covid-19, cũng là thời điểm cuộc chiến giữa hai bên bắt đầu diễn ra. Tín dụng tăng trưởng nhưng gặp khó khăn trong việc hướng nguồn cung tiền vào sản xuất, thay vào đó chuyển sang thị trường tài chính, mặc dù có tác động tích cực đến thị trường chứng khoán, buộc Chính phủ phải đưa ra chính sách thắt chặt thị trường chứng khoán, tạo ra những phản ứng trái chiều, cùng với đó là chiến tranh bùng nổ khiến các yếu tố này khó có thể hoạt động độc lập. Nghiên cứu cũng cho thấy, tác động của các yếu tố trên có thể chỉ ra mối tương quan giữa từng yếu tố giúp giải thích một phần sự biến động của giá cổ phiếu, phần lớn sự biến động của chỉ số VN trong ngắn hạn có thể được giải thích bằng chính dữ liệu lịch sử.

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THE INTERRELATIONSHIP BETWEEN VN-INDEX AND RELATED ECONOMIC FACTORS DURING THE RUSSIA - UKRAINE WAR

Abstract

The objective of the study is to analyze the reaction of the VN Index on the Vietnamese stock market due to the macro factors related to the global market or implemented by the Vietnamese government during the Russia-Ukraine war. The results of the VAR model provide scientific evidence that the market does not negatively overreact to events taking place during the war and political turmoil which could be observed from the effect of the gas future contract price. However, the Vietnamese stock market has suffered both negative and positive impacts from the government's macroeconomic and monetary policies during the economic recovery right after the COVID-19 period, which was also when the war between the two sides began to take place. The growth in credit but difficulty in directing money supply into production, instead moving to the financial market, although having a positive impact on the stock market, forced the government to introduce tightening policies to the stock market which have created mixed reactions, along with the outbreak of war made it difficult for these factors to act independently. The study also shows that the effects of the above factors can indicate the correlation between each of them which helps to explain part of stock price volatility, most of the volatility in the VN index in the short-term can be explained by historical data itself.

Keywords: Russia – Ukraine, VN-Index, stock market, economic factors, macro factors

1. Introduction

The global economic landscape has undergone significant changes in recent years due to various events, with the Covid-19 pandemic and the Russia-Ukraine conflict standing out as two of the most impactful. This report delves into the profound repercussions of these events on the Vietnamese economy, with a particular focus on the performance of the VN Index and the interrelated economic factors. The research aims to fill a critical gap in the literature by shedding light on the intricate dynamics between geopolitical events and financial markets in Vietnam.

The Covid-19 pandemic, a global health crisis of unprecedented scale, had far-reaching economic consequences worldwide. Vietnam was not spared, as it experienced disruptions in supply chains, exports, and tourism. According to the World Bank, Vietnam's GDP growth decelerated from 6.8% in 2019 to 4.8% in 2021, reflecting the significant economic impact of the pandemic. However, this report primarily centers on the Russia-Ukraine conflict's influence on Vietnam. The Russia-Ukraine conflict, marked by escalating tensions between the two nations, has had a profound impact on the global economy. This impact extends to the Vietnamese economy, and researchers like Nguyen et al. (2020) have pointed to the significant fluctuations in the VN Index during the conflict period. These fluctuations signify that the Vietnam stock market is susceptible to external geopolitical factors, emphasizing the need to explore this relationship further.

The study employs a mixed-methods approach, combining quantitative and qualitative analyses to provide a comprehensive assessment of the research questions. The quantitative aspect involves data analysis of stock price movements, economic indicators, and political events during the Russia-Ukraine conflict. Qualitative research techniques include interviews with experts, policymakers, and industry leaders to gain deeper insights into the causal relationships between geopolitical events and the Vietnamese economy.

In a world marked by increasing geopolitical volatility and economic uncertainty, understanding the intricate interplay between geopolitical events and financial markets is paramount. Therefore, the researchers decided to choose the topic ***"The interrelationship between VN-Index and related economic factors during the Russia – Ukraine war"*** study aims to unravel this complex web, focusing on the Russia-Ukraine conflict's impact on the Vietnamese economy. By answering the research questions and employing a mixed-methods approach, it aspires to offer actionable insights for investors, businesses, and policymakers while enriching the existing body of knowledge in this critical area.

2. Theoretical basis

2.1 Empirical studies on the relationship between the global financial markets and economic factors

Research on the connection between macroeconomic factors and financial markets is vast and varied. It encompasses the historical exploration of inflation's impact on stock prices, with Fama (1981) proposing a positive link between inflation and real economic activity, while Geske and Roll (1983) found contrasting results. Monetary policy's influence on stock returns is debated, with mixed evidence regarding its effectiveness, as seen in the works of Bernanke and Gertler (1999), Cogley (1999), and Fair (2000).

Foreign exchange rates and their correlation with stock prices have yielded mixed outcomes, as exemplified by studies like Aggarwal (1981) and Soenen and Hennigar (1988). Oil prices consistently show a negative impact on stock returns across economies, documented in works by Jones and Kaul (1996), Papapetrou (2001), and Cigno et al. (2017).

The interplay between crude oil and stock market returns is another area of investigation, with research by Balcilar, Gupta, and Miller (2015), Wen, Bouri, and Cheng (2019), and Aloui and Jammazi (2009) shedding light on this relationship. Studies involving specific stock market indices, like Basdekis et al.'s (2022) work on the Tehran Stock Exchange (TSE) and macroeconomic variables, have also contributed valuable insights. The causal relationship between industrial production and stock market liquidity, as explored by Nwaolisa and Chijindu (2016) and others, reveals a significant impact of industrial production on stock market indices. Credit growth rates have been studied for their influence on stock market returns, with Gandhi (2011) highlighting their relationship, while Johansson and Stelleck (2018) observed a positive correlation in the US, UK, and Sweden.

CAMBA Jr. (2020) examined the causal relationship between the Philippine stock market index volatility and economic variables, showing long-term equilibrium and short-term effects. Lastly, Li (2018) investigated the relationship between monetary policy variables and the stock market in China, finding a one-way causal link, although Huang et al. (2019) presented contrasting findings.

2.2 Empirical studies on the impact of geopolitical events on global financial markets

Previous research indicates that political uncertainty negatively affects financial market performance, leading to decreased stock market returns and increased risk profiles of financial assets. Berkman et al. (2011) and Lehkonen and Heimonen (2015) found an inverse relationship between political risk and stock returns. Recent major political events, like the Brexit referendum and China-Taiwan disputes, significantly impacted financial market uncertainty and stock market returns (Smales, L. A, 2017). Diplomatic and economic blockades, such as the Qatar blockade (Kapar & Buigut, 2020), also resulted in substantial stock market volatility.

The impact of US military engagements on financial markets varies in findings, with some studies (Leigh, Wolfers, and Zitzewitz, 2003; Rigobon and Sack, 2005) showing negative effects and others (Amihud and Wohl, 2004) indicating rising stock prices due to anticipation. Other studies (Choudhry, 2010; Omar, Wisniewski, and Nolte, 2017) explored the impact of structural shifts in returns and volatility associated with WWII and international crisis events, finding negative effects on stock market returns.

Political risk also influences currency carry trade returns, as demonstrated by Dimic et al. (2016). This suggests that political uncertainty significantly impacts foreign exchange markets. Additionally, specific political events, such as the disappearance of Jamal Khashoggi, had severely negative effects on the Saudi Stock Exchange's returns (Bash & Alsaifi, 2019). These findings collectively imply that wars predominantly exert a negative influence on stock markets and other asset categories.

2.3 Studies on the impact of the Russia-Ukraine war on global financial markets

The Russian invasion of Ukraine has triggered a devastating humanitarian crisis and disrupted global geopolitical relations. According to Izzeldin, M., Muradoğlu, Y. G., Pappas, V., Petropoulou, A., & Sivaprasad, S. (2023), financial markets and commodities responded swiftly to the invasion, although the crisis's intensity was lower compared to both the Covid-19 pandemic and the Global Financial Crisis (GFC).

Ahmed, S., Hasan, M. M., & Kamal, M. R. (2022) found that European stock markets reacted negatively to the crisis due to increased political uncertainty, geographic proximity, and sanctions. Notably, on February 21, 2022, when Russia recognized two Ukrainian states as autonomous regions, European stocks experienced a significant negative abnormal return, and these negative reactions persisted in the aftermath. The impact's magnitude varied across industries, countries, and company sizes.

3. Data and Methodology

This section would propose the research framework and detailedly explain the model construction, data collection process and applied methods in assembling and dissecting data.

3.1 Research process

During the study, our research team conducted a full data collection and ran several tests to find out the results considering the interrelationship between chosen variables. The research process consists of five major steps, commencing from March, 2022 to April, 2023 as followed:

Step 1: Determine the research topic, research questions and scope

Step 2: Refer to the previous studies and propose research framework

Step 3: Conduct the main study and collect the official data set

Step 4: Analysis and conclusion

Step 5: Report with proposal

3.2 Data

The authors decided to add a timeline from the beginning of 2020, when the above-mentioned political conflicts along with the Covid-19 epidemic became a political crisis for the major conflict from 2022. Some examples can be mentioned in the case of 110 Ukrainian soldiers who died in clashes with Russia (Madina et al, 2022). At the same time, the end of 2019 is also the time when incumbent President of Ukraine Volodymyr Zelenskyy came to power and vowed to end the tensions taking place in the Donbass region, which began in 2014. Therefore, the study will use daily quantitative data of variables for the period from January 2, 2020 to March 31, 2023, in which

the VN-Index variables will omit weekends and holidays. Data is mainly taken from 2 sources, Vietstock and Investing.com websites.

Table 1. Variables explainations

No.	Variables	Calculation	Brief explanations	Source
	VN-Index	DPVNI: Differences of percentage of change	General index showing price movements of stocks traded on Ho Chi Minh Stock Exchange	Investing.com
	Vietnam interbank offered rate	DVNBOR	The interest rate at which a depository institution, often a bank, lends or borrows money in the overnight market.	Vietstock
	Credit growth	DPTD	The rate at which credit in the economy is expanding.	Vietstock
	Industrial production index	P_IPI	The index measures the actual production output of the manufacturing, mining and utility industries	Vietstock
	Future gas price	DPGAS	The factor gives individual investors a simple and quick method to trade futures contracts practically around-the-clock, six days a week, in a crucial energy market.	Investing.com
	Crude oil price	DPOIL	Market value of unrefined petroleum extracted from the ground.	Investing.com

Source: Compiled by the authors

Descriptive statistics of the variables are shown in the table below:

Variable	Obs	Mean	Std. Dev.	Min	Max
DPVNI	401	-.0009578	.0128765	-.0521084	.0459308
DPGAS	401	-.0028361	.0452691	-.1980089	.1249802
P_IPI	401	3.801995	8.433501	-14.6	22.9
DPTD	401	.1078416	.0284154	.0265	.1418
DVNBOR	401	.0033416	.5159567	-2.52	2.72
DPOIL	399	.0007025	.0701309	-.2076652	.9999999

Figure 1. Variables' descriptive statistics

***Source**: Compiled by the authors*

3.3 Research methodology

After comparing and reviewing previous studies, the authors decided to choose the Vector Autoregression (VAR) model, as well as some other tools such as IRF to conduct the research. VAR offers a significant advantage by considering the simultaneous effects between the stock index variable and relevant macroeconomic variables, aligning with economic theories. Consequently, it enables an assessment of how stock markets respond to sudden shocks from global events and abrupt fluctuations in macroeconomic indicators. First of all, the study is based on the equation drawn from Ahmad et al. (2010), Ha and Tran (2018) and Nguyen and Vo (2019), in order to use interest rates and exchange rates as endogenous variables in the VAR model for general consideration with the VN-Index. The general model indicated in the experimental study of Vietnam can be described as follows:

$$DP\_VNI=f(DPGAS, DTPD, P\_IPI) \quad (1)$$

This empirical estimating model will be employed as a VAR model since the variables in the model described in equation (1) may represent relevant endogenous systems when combined. The following will be a description of the general form unconstrained VAR model.

$$\boldsymbol{Y_t = C + \sum_{i=1}^{p} A_i Y_{t-i} + BD_t + \varepsilon_t}$$

Where: vector Y is the set of endogenous variables Y'= (DPGAS, DTPD, P_IPI). Meanwhile, the remaining exogenous variables such as DVNBOR, DPOIL can be in D.

To determine the relationship between VN-Index and related economic factors, this research adopt to the steps mentioned as follow:

3.3.1 Stationary test

The Dickey and Fuller test (DF) and the expanded Dickey and Fuller test were introduced by Dickey and Fuller in 1981. (ADF). This research solely focuses on the theory of this model because

it employs the ADF test to accomplish the unit root test. Dickey and Fuller (1981) state that the extended unit root test model ADF has the following form:

$$\triangle \boldsymbol{y_t} = \boldsymbol{\alpha_0} + \boldsymbol{\beta Y_{t-1}} + \sum_{j-1}^{k} \boldsymbol{\phi_j \Delta Y_{t-j}} + \boldsymbol{\varepsilon_t} \quad (1)$$

$$\triangle \boldsymbol{y_t} = \boldsymbol{\alpha_0} + \boldsymbol{\delta_t} + \boldsymbol{\beta Y_{t-1}} + \sum_{j-1}^{k} \boldsymbol{\phi_j \Delta Y_{t-j}} + \boldsymbol{\varepsilon_t} \quad (2)$$

Whereas:

$\mathbf{y_t}$: Time series data considered

k : Lag length

$\boldsymbol{\varepsilon_t}$: White noise

Test hypothesis:

H0: β = 0 (Yt is a non-stationary data series)

H1: β < 0 (Yt is a stationary data series)

3.3.2 Lag length criteria

Determining the appropriate lag length in a VAR (Vector Autoregression) model is essential. This choice impacts model estimation and the inclusion of relevant factors. Lag length is often determined using information criteria such as Akaike Information Standard (AIC), Schwarz Information Standard (SC), and Hannan Qiunn Information Standard (HQ).

3.3.3 Cointegration test

To determine the long-term relationship among factors, the Johansen test, developed by Søren Johansen, assesses cointegration in time series data. Unlike some other tests, it can identify multiple cointegrating relationships, making it widely applicable. In this study, both the Johansen test and the Engle-Granger test (based on the Dickey-Fuller test) will be employed concurrently, using two methods: the Trace method and the Maximum Eigenvalue method.

3.3.4 VAR stability condition test

The stability of the VAR system implies Stationarity. In the literature, the stability condition is also referred to as “Stationarity Conditions”. If all inverse roots of the characteristic AR polynomial have modulus less than one and lie inside the unit circle, the estimated VAR is stable. If the VAR is not stable, diverse tests conducted on our VAR model be invalid. Also, impulse response standard errors are not valid.

3.3.5 Granger causality test

The relationship between uncertainties can be determined using the Vector Autoregression (VAR) method, as proposed by Sims (1980), and the Engle & Granger (1987) approach. The

Granger causality test, introduced by Granger (1969), is widely employed in this context for its simplicity in predicting time series using past data.

Granger causality assesses whether one time series, say Xt, can predict future values of another time series, Yt. However, it has limitations, as it tests linear relationships and assumes causes must precede effects, requiring data stationarity. Despite these limitations, it has been used extensively in research, including studies by Atmadja (2005), Sum (2013), and Mohamed and Masih (2017) to evaluate links between stock markets.

Granger causality involves a two-way test between time series Xt and Yt, considering both Xt impacting Yt and Yt impacting Xt. The hypothesis tests, like equation (1) below, help determine if Xt has a Granger influence on Yt, indicating that Xt's past data can predict both current Yt and future Yt values, with control over Yt's past data.

$$Yt = \beta 0 + \Sigma(j=1 \text{ to } p)\ \beta j * Y(t-j) + \Sigma(j=1 \text{ to } p)\ \alpha j * Y(t-j) + \varepsilon t \quad (1)$$

Similarly, this test evaluates whether Yt has a Granger influence on Xt, treating X as the dependent variable in the model..

3.3.6 Impulse response function test

One crucial function within the VAR model is the impulse response function (IRF). The IRF illustrates how other variables in the model respond to a shock in one variable, but interpreting the coefficients can be complex, especially with lagged equations and changing coefficient signs.

3.3.7 Variance decomposition

Variance decomposition, often applied in VAR modeling, dissects the contribution of each variable to the variance of the others. This technique is useful for determining the relative importance of various factors in explaining variations in a target variable, making it valuable for prediction and policymaking.

4. Emperical results

4.1 Stationary test

Augmented Dickey-Fuller test for unit root — Number of obs = 399

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-13.677	-3.448	-2.874	-2.570

MacKinnon approximate p-value for Z(t) = **0.0000**

Augmented Dickey-Fuller test for unit root — Number of obs = 399

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.997	-3.448	-2.874	-2.570

MacKinnon approximate p-value for Z(t) = 0.0352

Augmented Dickey-Fuller test for unit root — Number of obs = 399

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-3.088	-3.448	-2.874	-2.570

MacKinnon approximate p-value for Z(t) = 0.0274

Augmented Dickey-Fuller test for unit root — Number of obs = 399

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-14.594	-3.448	-2.874	-2.570

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 395

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-22.959	-3.448	-2.874	-2.570

MacKinnon approximate p-value for Z(t) = 0.0000

Augmented Dickey-Fuller test for unit root — Number of obs = 399

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-17.628	-3.448	-2.874	-2.570

MacKinnon approximate p-value for Z(t) = 0.0000

Figure 2. Stationary test results

It can be seen that the absolute value of Test statistic in all variables under consideration is larger than the absolute value of threshold at 5% significance level. Therefore, it can be concluded that the series is stationary for all variables under consideration within the same lag. More generally, the model with variables with stationary series will be practical, because the results of the model run can be applied to make predictions as well as future judgments about the correlation between variables, specifically with the macro factor variables.

4.2 Lag length criteria

Selection-order criteria
Sample: 04jan2020 - 20mar2022 Number of obs = 807

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1392.47				.006568	3.48815	3.52165	3.57539
1	-1330.87	123.2	9	0.000	.005766	3.3578	3.41139*	3.49737*
2	-1323.01	15.722	9	0.073	.005782	3.36062	3.43432	3.55254
3	-1300.53	44.956*	9	0.000	.005592*	3.32722*	3.42101	3.57148

Endogenous: DP_VNI DUV DVNBOR
Exogenous: DUR DFFR P_IPI DP_GAS _cons

Figure 3. Choice of lag

Next, the authors will make an error prediction, with the results compared as a series of vector autoregressions through a desired maximum lag were selected using the Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and Hannan and Quinn information criterion (HQIC) lag order selection statistics. As mentioned in the research methods section, the asterisk marked by the software can help identify the optimal lag for the model. Based on the results in the figure above, the model with lag 1 is said to be suitable for HQIC and SBIC. Since then, the authors decided to use lag 1 as the main lag for the model

4.3 Cointegration test

```
. vecrank DVNI DPTD DPGAS P_IPI

                    Johansen tests for cointegration
Trend: constant                                      Number of obs =       399
Sample:  26feb2022 - 31mar2023                             Lags =         2
```

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	20	-130.44037	.	376.5534	47.21
1	27	-37.833767	0.37136	191.3402	29.68
2	32	42.1288	0.33023	31.4151	15.41
3	35	55.657812	0.06557	4.3571	3.76
4	36	57.836352	0.01086		

Figure 4. Johansen test results

In this table, it can be seen that the trace statistic at r=0 of 376.5534 exceeds its critical value of 47.21, we reject the null hypothesis of no cointegrating equations. Similarly, because the trace statistic at r = 2 and r3 give the same results of exceeding the critical value. Johansen's method for estimating r is to accept as r^ the first r for which the null hypothesis is not rejected. Thus, the conclusion drawn is that there is no cointegration between the variables.

4.4 VAR stability condition test

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. varstable, graph
```

Eigenvalue stability condition

Eigenvalue	Modulus
.9923991	.992399
.9165205	.916521
-.1654938	.165494
.1424981	.142498

All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.

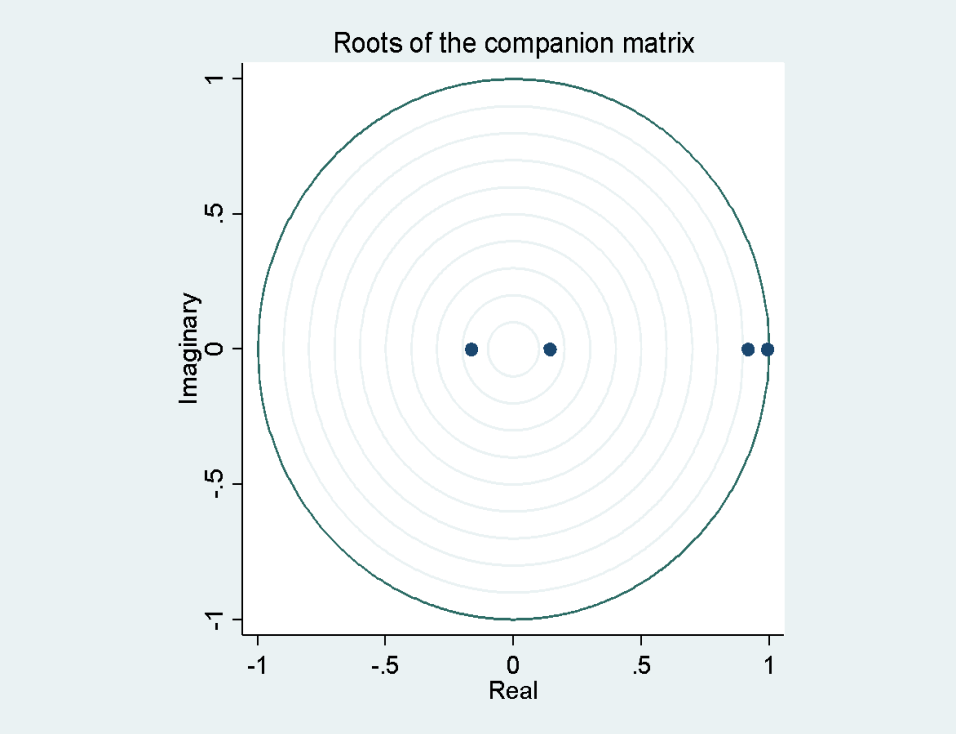


Figure 5. Model stability test results

The stability test of the var model also gives good results when the values are even in the unit circle with a marginal value of 1. Then, the authors take to the next step which is residual diagnostics.

```
. summarize error
```

Variable	Obs	Mean	Std. Dev.	Min	Max
error	398	-1.29e-08	14.44476	-64.44717	55.96111

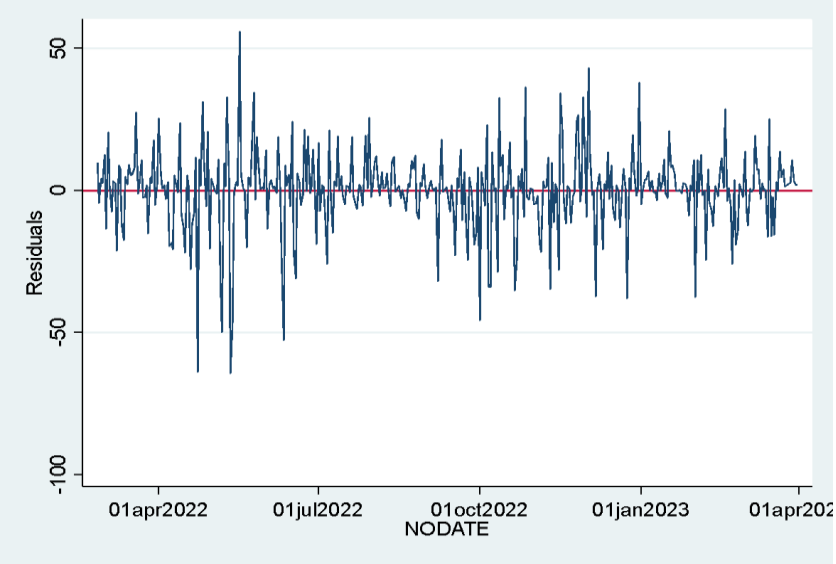


Figure 6. Residual diagnostics

The graph above shows the volatility of residuals during the period under consideration by the model. The y line represents the mean of the error. Since then, the residuals fluctuate around mean values showing the stability of these values.

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	7.1573	16	0.97011
2	8.1713	16	0.94360
3	6.6527	16	0.97939
4	8.2311	16	0.94169
5	12.2509	16	0.72653

H0: no autocorrelation at lag order.

Figure 7. Lagrange-multiplier test results

Due to the value shown on the table, the null hypothesis that there is no autocorrelation in the residuals for any of the five orders tested, this test gives no hint of model misspecification. Therefore, there will be no concerns regarding the fact that the results coming from the research were meaningful

4.5 Granger causality test

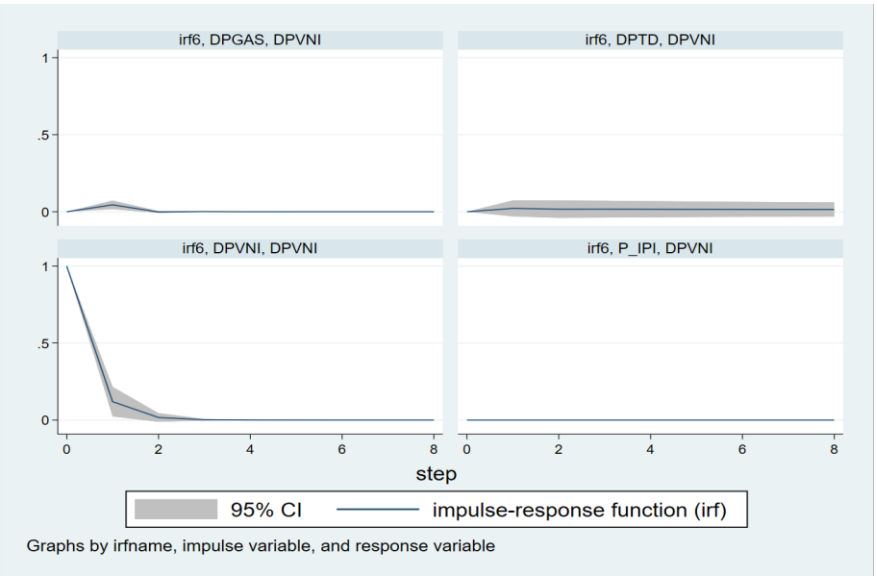
Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
DVNI	DPTD	.79521	1	0.373
DVNI	DPGAS	9.3318	1	0.002
DVNI	P_IPI	.00386	1	0.950
DVNI	ALL	9.8408	3	0.020
DPTD	DVNI	1.25	1	0.264
DPTD	DPGAS	.78682	1	0.375
DPTD	P_IPI	7.289	1	0.007
DPTD	ALL	9.6945	3	0.021
DPGAS	DVNI	.22498	1	0.635
DPGAS	DPTD	2.8571	1	0.091
DPGAS	P_IPI	2.357	1	0.125
DPGAS	ALL	11.147	3	0.011
P_IPI	DVNI	.0806	1	0.776
P_IPI	DPTD	12.759	1	0.000
P_IPI	DPGAS	.02147	1	0.884
P_IPI	ALL	12.97	3	0.005

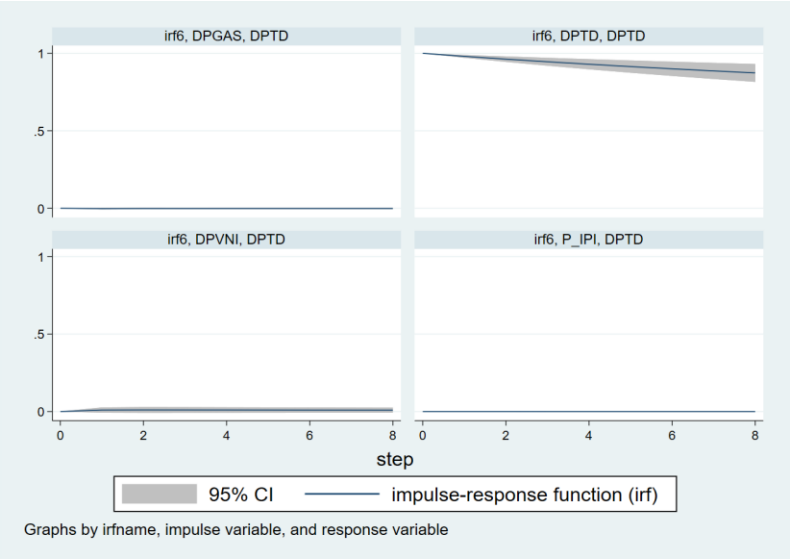
Figure 8. Granger causality test results

The vargranger function was used with the variables DPVNI, DPTD, DPGAS, and P_IPI, and the exogenous variables DPOIL and DVNBOR, with lag 1. The results show the Granger causality Wald tests for each equation. The equation for DPVNI excluded DPTD has a chi-square statistic of 0.66153 with 1 degree of freedom and a p-value of 0.416, indicating that DPTD is not a significant predictor of DPVNI. The equation for DPVNI excluded DPGAS has a chi-square statistic of 10.082 with 1 degree of freedom and a p-value of 0.001, indicating that DPGAS is a significant predictor of DPVNI. The equation for DPVNI excluded P_IPI has a chi-square statistic of 0.00796 with 1 degree of freedom and a p-value of 0.929, indicating that P_IPI is not a significant predictor of DPVNI. The chi-square statistic for the equation with all the variables is 10.469 with 3 degrees of freedom and a p-value of 0.015, indicating that the combination of all variables is a significant predictor of DPVNI. The same interpretation can be made for the Granger causality tests for the other equations.

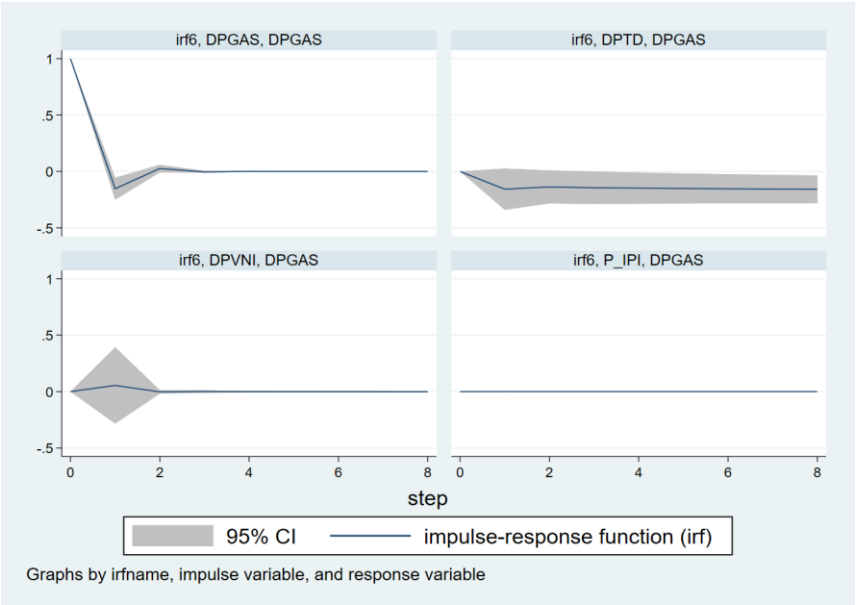
4.6 Impulse response function test



The impulse response function in the impulse response function test showed that: The response of DPVNI in the first day was positively supported by the volatility of gas prices. After that, the impact gradually decreased and remained almost zero for the following days. This is true with the information saturation of the market, after the increase in gas prices made the market excited but investors then calmed down and absorbed the information, weakening the impact of gas price changes. to the change of VN Index in the following days. Besides, the response of DPVNI to changes in P_IPI and Credit Growth Rate is also estimated to be very small in the short run with a lag of 1 of the model. This is also understandable because these are macro variables used to forecast money supply and inflation of the economy, so the immediate impact can be considered almost zero.



For the impulse response function of Credit Growth Rate (DPTD), we can see that the variables have very little impact on DPTD, and even the industrial production index is statistically significant but the impact is also estimated to be very small. .



For gas prices, the estimation shows a strong impulse response on the first day of the change in DPVNI for DPGAS, and similar to the effect of DPGAS on DPVNI, those reactions are fully absorbed in the following days. Besides DPVNI, we also see the Credit growth rate shock effect on Gas Price, although this reaction carries a large volatility, in general, we can see the negative impact of DPTD on DPGAS.

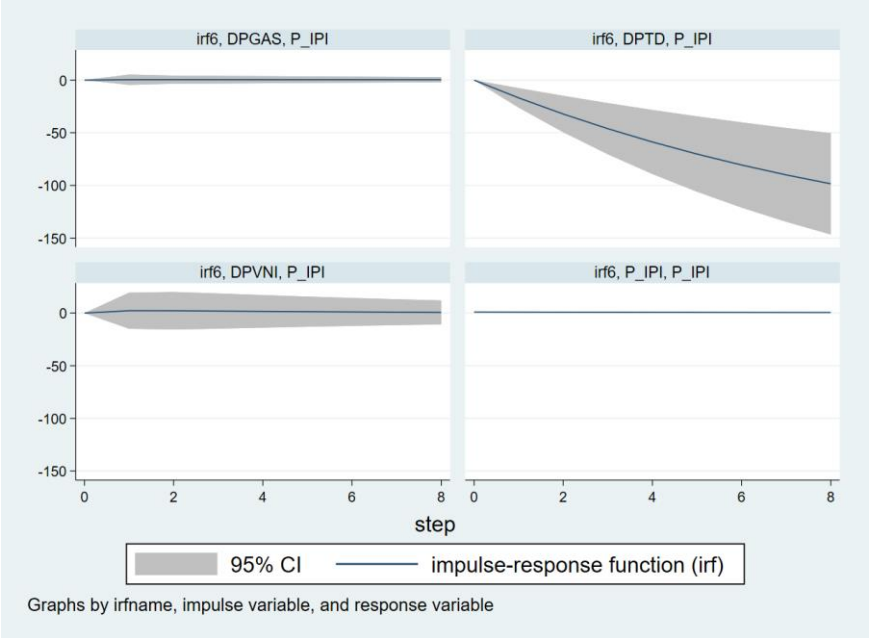


Figure 9. Impulse response function test results

And for the impulse response of P_IPI, we can clearly see the negative impact of DPTD shock on P_IPI from the first day and continuously after days. This is true of the situation of the Vietnamese market in the period of 2022, when the state promotes credit growth to help the economy recover from the COVID pandemic. For now, however, manufacturers are still concerned that the COVID lockdown and the start of war could negatively affect future production. Therefore, the credit growth increased, but the cash flow did not go into production but directed to financial investment products, most notably the stock market and the real estate market, thereby indirectly reducing the industrial production index.

4.7. Variance decomposition

Results from _IRF_

step	(1) fevd	(2) fevd	(3) fevd	(4) fevd
0	0	0	0	0
1	1	0	0	0
2	.976209	.000052	.023738	1.6e-06
3	.976171	.000065	.023758	5.5e-06
4	.976145	.000078	.023769	8.0e-06
5	.976132	.00009	.023768	1.0e-05
6	.97612	.000101	.023768	.000011
7	.976109	.000111	.023768	.000012
8	.9761	.000119	.023768	.000013

(1) irfname = _IRF_, impulse = DPVNI, and response = DPVNI
(2) irfname = _IRF_, impulse = DPTD, and response = DPVNI
(3) irfname = _IRF_, impulse = DPGAS, and response = DPVNI
(4) irfname = _IRF_, impulse = P_IPI, and response = DPVNI

Figure 10. Forecast error variance decomposition results

The results of the impulse response function (IRF) table show the forecast error variance decomposition (FEVD) for each variable at different steps. The IRF table shows that the DPVNI variable is the most important variable in explaining its own variation, as it has the highest FEVD values across all steps. The DPTD, DPGAS, and P_IPI variables have relatively low FEVD values, indicating that they do not have a strong causal relationship with DPVNI. These results suggest that DPVNI is the most influential variable in the system, and its future values can be predicted with a high degree of accuracy using historical data.

5. Conclusion and suggestions

5.1 Resulted compared to literature review

Our findings align with Johansson, E., & Stelleck, P. (2018) finding out a relationship between credit growth rate and the stock market, even though their study focuses on the US, UK, and Sweden markets. Since the correlation between future gas prices and Vn-Index is significant in our

test, gas prices are associated with oil prices in studying the effects of macroeconomic indicators on stock prices, as mentioned by Shaker Ahmed et al. (2022). Lastly, the results on the effect of the consumption index on stock prices, which we referenced based on our literature review (e.g., Aromolaran, A. D., Taiwo, A., Adekoya, A., & Malomo, E. ,2016, Tiryaki, A., Ceylan, R., & Erdoğan, L. ,2019, Tsagkanos, A., & Siriopoulos, C. ,2015) , show that the similarity is similar when considering how it affects the VN- Index of Vietnam stock market.

5.2 Suggestion

Armed conflict and its impact on the market are also demonstrated by the stock market's performance, and should be seen as a good chance for stock purchases and investments. Because a military war has little to no effect on the profitability of corporations or big economies like the United States. In reality, the Dow Jones index increased by more than 50%, or more than 7% annually, between the start of World War 2 and its conclusion. The stock market increased by 115% throughout both world wars.

The adage "Buy when there's blood on the road" is common in the stock market, but it doesn't always mean that every sector or kind of investment hasn't been affected by violent conflicts. When the likelihood of armed conflict increases, stock prices typically decline, but unexpected declines frequently occur when armed conflict "surprise" investors. During actual conflict, the stock market often behaves less erratically than it does at other times.

Several industries will operate better during wartime. For instance, trade restrictions, taxes, and a surge in the cost of raw materials might occur in a big conflict. But, it is currently doubtful that the local war in Ukraine will have any impact whatsoever on the global supply chain.

The market's interpretation of the most recent signals may be seen by individual investors using a variety of techniques. ETF inflows are a very useful indicator. They can be observed coming from nearby countries like Sweden and VanEck Russia ETF (RSX), as well as from Russia itself (EWDs). These ETFs are now down between 4 and 5%. Instead, money is moving into metal and mining ETFs in general as well as funds that are supportive of gold and silver mining, with their NAV rising in step with the fall in funds. ETFs like the one mentioned above have a strong association to geopolitics.

Fears of war and inflation are also being seen in the bond market, with bond mutual funds recording a $30 billion monthly net draw. It has so far been disproven that fixed-income funds offer protection against choppy markets. Actually, there aren't many "secure" fixed-income products available right now because of the state of interest rates. The volatility was not caused by Ukraine, but rather by a confluence of geopolitical pressures, an already precarious interest rate/inflation scenario, and inflation.

The current investing approach emphasizes assets, actual capital/income flow, and defensive play. Infrastructure, beverages, health care, and food fall under this category. Goods with timeless appeal, such as luxury products, have been demonstrated to be extraordinarily robust in times of crisis. There will be many low-cost, even free, high-quality options available in the market. After

all, while many people might mistakenly believe that the likelihood of armed war will be bad for portfolios and investments in the long run, historical evidence shows otherwise.

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