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The impact of exogenous shocks on exchange rates in Vietnam

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Abstract: This paper investigates how exogenous shocks, including inflation, interest rates, energy prices, and crisis factors, are transmitted to the exchange rate and subsequently impact the economy. The transmission process is analyzed through the lens of the SBV's exchange rate management responses. Furthermore, the objective of this study is to evaluate the capacity of Vietnamese exchange rate system to sustain shocks. The article measures the effect of non-systematic shocks using a Dummy variable, where 0 represents normal conditions and 1 represents the time when shocks occur with the use of the monthly data from January 2009 to December 2022, compiled from data sources of the State Bank, GSO, IMF, and WB. The results show that the trend of exogenous shocks in the market over the past time is relatively favorable for exchange rate management in Vietnam, when the transmission reaction from market supply-demand shocks has a limited impact on the exchange rate and inflation. However, as the domestic economy and finance become more and more deeply integrated with the world, exogenous shocks may have a stronger impact. These findings have important policy implications for improving the SBV's exchange rate management efficiency in relation to other variables to optimize the achieved target.

Keywords: *Exchange rate, External shock, Center bank.*
JEL Classifications: *E43; E52; E58.*

1. Introduction

Since the 2008 global financial crisis and the Covid-19 pandemic, Asian countries have faced numerous external shocks stemming from changes in US interest rates. These shocks have affected exchange rates against domestic currencies, leading to fluctuations in state foreign exchange reserves and central bank policy responses. This raises important questions about the transmission of US monetary policy shocks to the reactions of countries through interest rates and exchange rates. Given the characteristics of being a small, highly open economy (according to data from the General Statistics Office (2023), Vietnam's import-export turnover reached about 220% of GDP by the end of 2022, ranking among the top 10 economies with the highest degree of openness in the world), external shocks can significantly impact the exchange rate in Vietnam. However, there is still limited research focused on external shocks concerning monetary policy and exchange rates in Vietnam. Most studies have concentrated on the management of the State Bank of Vietnam's exchange rate tool or the transmission mechanism of exchange rates to the economy (Hong *et al.*, 2022; Tho and Trang, 2016). Further research is needed to identify the transmission channels and propose optimization measures for the State Bank of Vietnam's exchange rate management. Meanwhile, in recent years, emerging and developing countries have been particularly concerned about the impact of external shocks, especially the spillover effects of US monetary policy shocks on exchange rates and the overall exchange rate mechanism through interest rates or commodity prices related to exports and imports (Klein and Linnemann, 2021; Minesso and Gräb, 2022; Akinci and Queralto, 2024). Therefore, researching the impact of external

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shocks on exchange rates and the real economy is essential to provide recommendations for the State Bank of Vietnam to enhance the effectiveness of exchange rate management, absorb the negative impacts of external shocks, and maintain exchange rate stability and a stable foreign exchange market. Accordingly, section 2 of the article will provide concise assessments of the impact of external shocks on exchange rates and the policy responses of central banks. Section 3 will present the dataset and methodology, while the experimental results will be discussed in Section 4. Finally, Section 5 will conclude our study.

2. Literature Review

The transmission of impacts of external shocks on the national economy has garnered the interest of several scholars (Kim *et al.*, 2020). Chileshe *et al.* (2018) have compiled a list of 8 factors that contribute to the increased transmission capacity of external shocks to the domestic economy. In that list, according to Chileshe *et al.* (2018), preserving exchange rate flexibility is the first and foremost option to assist the economy in confronting external shocks. The correlation between exchange rates and the present economic shock is elucidated by two conflicting perspectives. Contrary to the viewpoint of Chileshe *et al.* (2018), Farrant and Peersman (2006), and Peersman (2011) represent a school of study that asserts exchange rate changes as the reasons for external economic shocks. Farrant and Peersman (2006) provided a definition of an exchange rate shock as a deviation from usual behaviour in the foreign exchange market that cannot be accounted for by underlying economic factors, such as investor psychology or herd behaviour. According to De and Sun (2020), these disruptions are the cause of conveying exchange rate shocks to the economy. Thus, under this scenario, the exchange rate will be unable to function as a buffer for the economy. Nevertheless, this theory integrates both external and internal disturbances into a unified framework, as it is unable to distinguish the factors contributing to "usual behaviour in the foreign exchange market".

Therefore, this research work will employ the viewpoints of Amisano *et al.* (2009), Audzei and Brázdik (2012), and Chileshe *et al.* (2018) to support the assumption that when a shock transpires, the exchange rate will serve as the mechanism to mitigate the adverse effects of the shock on the domestic economy.

Numerous research papers consistently indicate that the effect of external shocks on currency exchange rates varies based on the foreign exchange rate management approach adopted by each country. Put simply, various exchange rate mechanisms will react differently to economic shocks (Obstfeld, 2002). Bailliu *et al.* (2003) contend that a highly flexible exchange rate mechanism facilitates the absorption of shocks. This is because flexible exchange rates enable countries to implement independent monetary policies, as supported by Frankel *et al.* (2001) and Di Giovanni and Shambaugh (2008). Thus, nations have at their disposal a variety of instruments to mitigate the effects of external shocks. In addition, Bailliu *et al.* (2003) contend that implementing a flexible exchange rate mechanism will effectively mitigate distortions in the foreign currency market, therefore preempting the occurrence of economic crises in their early stages. Nevertheless, Bailliu *et al.* (2003) acknowledge that there is no explicit correlation between the fixed exchange rate system and currency shocks. Based on IMF data on 116 instances of currency shocks between 1975 and 1996, Bailliu *et al.* (2003) concluded that over half of the countries affected by these shocks are utilising floating or controlled floating exchange rate regime.

Flexible exchange rate mechanisms demonstrate superiority in effectively managing the adverse effects of real shocks (Ferrari-Filho and De Paula, 2008; Guzman *et al.*, 2018). Researchers contend that adhering to a fixed exchange rate system will compel the central bank to interfere in the economy using additional measures, thereby amplifying the expenses associated with addressing unexpected disturbances. The findings align with and Johnson (1994) and Johnson (2013) that implementing a floating exchange rate policy would enhance the resilience of foreign economies to external currency-related shocks, while also assuring the attainment of macroeconomic objectives. Put simply, when faced

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with real shocks, economies that can alter relative prices more quickly would see smaller and more gradual changes in production. The objective is to analyse external disturbances such as shocks in terms of trade, fluctuations in nominal interest rates in other nations, and variances in certain economic indicators among 33 countries in Asia. Chia *et al.* (2012) have arrived at similar results on the capacity of the floating exchange rate mechanism to absorb shocks.

However, according to Gabaix and Maggiori (2015), current exchange rates are more responsive to fluctuations in both domestic and international financial markets. Thus, the capacity to function as a shock absorber is progressively becoming indistinct under the present economic circumstances. Consequently, floating exchange rates are ineffective in mitigating shocks but do enhance the transmission of shocks. Several studies have highlighted the significance of fixed or controlled floating exchange rate mechanisms, where the Central Bank has a prominent role in intervening in exchange rates. Fornaro (2015) conducted a study on the impact of the 2008 global economic crisis on small economies with limited collateral and experiencing Fisher deflation. The study concluded that during times of crisis, small countries can benefit their domestic economy by intervening in exchange rates, particularly by reducing them. Fornaro (2015) states that a reduction in the exchange rate will lead to an increase in the value of the domestic currency. This will benefit the country by preserving the worth of domestic assets and collateral, thus expanding its ability to access international credit markets.

According to Di Giovanni and Shambaugh (2008), the impact of foreign currency shocks on real gross domestic product (GDP) growth is only significant in nations with fixed exchange rates. Countries that have fully floating exchange rate regimes have no correlation between the growth of their real GDP and the level of their base interest rates. The researchers determined that the primary method of transmitting economic changes is through interest rates. Specifically, nations with fixed exchange rates adjust their interest rates to match those of the base country, but countries with flexible exchange rates do not. Frankel *et al.* (2004) examined the transmission of global interest rates to local interest rates based on the chosen exchange rate system. The researchers determine that complete transmission of domestic interest rates takes place over time, independent of the exchange rate system. However, the immediate effect would differ depending on the specific exchange rate regime. In addition, it was shown that nations with exchange rate regimes that are more adaptable have slower adjustments in their interest rates in response to changes in international interest rates. This suggests a reliance on central bank independence. In addition, Daly (2007) discovered that a fixed exchange rate regime is particularly efficient in mitigating spillover effects of domestic monetary shocks, which are mostly produced by alterations in money supply or changes in money turnover. The stabilising function of money seems to mitigate the effects of higher demand for foreign goods resulting from increasing need for money.

In less developed economies, the regulated floating exchange rate mechanism can help mitigate the negative effects of external shocks. This is particularly true when the central bank intervenes in the foreign exchange market to counteract the natural trend of the economy, a strategy known as leaning against the managed exchange rate policy. However, it is important to note that not all underdeveloped countries have the capacity to implement such measures. Ali and Anwar (2010) provided empirical support for the notion that nations with inflexible wage systems do not properly adjust salaries in response to market changes caused by shocks. In such cases, implementing a fixed exchange rate mechanism is considered a more secure choice for these countries.

Overall, the selection of an exchange rate regime in response to external shocks yields varying outcomes based on the specific characteristics of each country under examination. Hence, while analysing the influence of external disturbances on currency exchange rates, it is crucial to define the extent of the research in order to precisely identify pertinent macroeconomic factors, thus enabling accurate conclusion for the researched contexts. However, there is a lack of study on this problem in the specific context of Vietnam, which is a developing country with a small and open economy (Jenkins,

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2004; Nguyen *et al.*, 2022). In order to fill this research gap, this article will employ models specifically developed for open economies. Furthermore, the used model will determine the effects of external shocks on the exchange rates. This objective aligns with the recommendation made by Audzei and Brázdik (2012) that the main emphasis on this topic should be on examining the relationship between shocks and exchange rates.

3. Data And Methodology

3.1. Research Methodology

In order to assess the impact mechanism of exchange rate management during periods with external shocks, the Bayesian Vector Autoregression (BVAR) model will be utilised. The model, which is proposed by Litterman (1985), is commonly used for quantitative economic models and other time series techniques. This method has gained popularity in evaluating the effects of macroeconomic shocks (such as Litterman, 1986; Sims and Zha, 1998; Uhlig, 2005; Caldara and Kamps, 2008; Mountford and Uhlig, 2009). Unlike standard VAR models that use fixed parameter values, the BVAR model assigns probability distributions to estimated parameters based on prior information. This reduces parameter uncertainty.

The research model investigates the effects of external disturbances on the exchange rate management of the State Bank of Vietnam (SBV), while accounting for government-controlled prices for critical commodities such as petroleum, electricity, and tuition fees, and central rate management by the SBV. In regard to the impact of disruptions on exchange rates, the Balassa-Samuelson principle can be assumed. In particular, developing nations characterized by small, open economies, such as Vietnam, observe a propensity for short-term depreciation in exchange rates (NEER). Over time, as the economy progresses and disparities in prices diminish, there is a tendency for the real effective exchange rate (REER) to appreciate. As a result, the long-term trend of the REER remains unaffected by the SBV, given that real inflation generally declines in tandem with economic progress, thereby contributing to the equilibrium of price levels between domestic and international markets.

The nominal exchange rate guarantees conditions of interest parity. When the risk compensation condition for the interest rate differential between the domestic and international markets is satisfied by the market exchange rate, this occurs. The central exchange rate VND/USD, which is determined by the SBV and is based on the volatility of foreign currency exchange rates comprising nations with substantial trade and investment ties with Vietnam, is primarily pegged to the USD. In order to evaluate the impact of this interest rate differential, our research employs the overnight interest rate differential between Vietnam and the US (R_DIFF).

Additionally, the model needs to account for exchange rate fluctuations during crises or post-economic recession periods. It allows for setting conditions to study the variability of expected variables used in the model, including (1) Industrial Production Index (IIP); (2) Average buying and selling exchange rates of USD/VND by the Joint Stock Commercial Bank for Foreign Trade of Vietnam (VCB mid); (3) Consumer Price Index (CPI); (4) VND liquidity (measured by M2 money supply); (5) Nominal Effective Exchange Rate (NEER) of USD/VND; (6) Brent crude oil price; (7) Overnight interest rate differential (O/N) between USD in Vietnam and the US (R_DIFF); (8) Central exchange rate of USD/VND published by the State Bank of Vietnam (TGTT). The BVAR system model allows for analyzing the fluctuations of variables, especially in cases where the time series data length is not extensive. We plan to apply quantitative analysis using the model over the period from 2009 to 2022 with monthly data frequency.

The VAR(p) model is written as follows:

$$Y_t = \beta_0 + \sum_{j=1}^{p} \beta_j Y_{t-j} + U_t \quad (1)$$

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Where Y_t, T = 1,...,T is a Mx1 vector of endogenous variables with M time series variables (in our case, M=8). U_t is an Mx1 vector of errors and assumed to be i.i.d. N(0,Σ). β_0 is an Mx1 vector of intercepts and β_j is an MxM matrix of coefficients. This simple notation of the VAR(p) is derived from Sims (1980) and any exogeneous and/or determinstic series can be added to (1).

Following the steps of stacking matrices similar to Koop and Korobilis (2010), the VAR model in (1) can be rewritten as:

$$Y = XA + E \quad (2)$$

Or

$$y=(I_M \otimes X)\alpha + \varepsilon \quad \text{while } \varepsilon \sim N(0, \Sigma \otimes I_t) \quad (3)$$

Consequently, the sampling density $p(y|\alpha,\sum)$, an be incorporated into the coefficient in order to derive two distribution equations for α based on the conditions of ∑ and ∑-1 using the Wishart allocation method. These equations are as follows:

$$\alpha|\sum, y \sim N(\hat{\alpha}, \Sigma \otimes (X'X)^{-1}) \quad (4)$$

and

$$\sum\text{-}1 \,|\, y \sim W(S^{-1}, T - K - M - 1), \quad (5)$$

In which, Â= $(X'X)^{-1}X'Y$ is the OLS estimation result of A, $\alpha\hat{} = vec(A\hat{})$,

và $S=(Y-X\hat{A})'(Y-X\hat{A})$.

With the use of BVAR model, the choice of priors and hyperparameters is critical. As a result, we intend to estimate the priors in accordance with Minnesota/Litterman (2010) and Sims-Zha (1998) suggestions to to estimate the angle parameter. The process of determining and implementing hyperparameters and priors has been systematically established in accordance with the works of Brandt and Freedman (2006), Sims-Zha (1998), and Geldman (2006).

The transmission mechanism depicted in Figure 1 illustrates how exogenous shocks will influence the central bank's exchange rate. *(i)* Exchange rate shocks in the market enable the examination of the effects of domestic exchange rate shocks and the aggregate repercussions of multilateral exchange rate developments between the domestic market and certain markets with trade relations. These effects are denoted by the variables VCB and NEER, respectively; *(ii)* Economic and price shocks are represented by variables such as CPI, IIP, and BRENT, enabling the analysis of multidimensional impacts between exchange rates and cyclical economic fluctuations; *(iii)* In addition, the variables R_DIFF, M2, and TGTT represent the State Bank's monetary policy management.

Table 1.
The definitions of used variables.

No.	Variable	Definition
1	IIP	Industrial production index
2	BRENT_OIL	Price of brent crude oil
3	VCB_MID	Average exchange rate of buying and selling at Foreign Trade Bank, the biggest commercial bank in Vietnam
3	CPI	Consumer price index. Used to describe the inflation situation
4	M2	Money supply M2
5	NEER	Nominal effective exchange rate
6	R_DIFF	Overnight lending interest rate difference between Vietnam and the US
7	TGTT	Central rate
8	ES	External shocks. It is a dummy variable, with 0 being normal conditions and 1 being the period when shocks arise

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3.2. Statistical Description

Monthly data from domestic and international electronic information portals (SBV, GSO, Fed, etc.) were collected from January 2009 and December 2022; a total of 167 variables were collected. During this period, Vietnam's economy was impacted by non-systematic shocks, including foreign currency retention and exchange rate expectations, as well as significant shocks caused by unanticipated natural factors, including the 2008-2009 economic crisis, the Covid-19 pandemic, and geopolitical tensions in major countries.

Table 2.
Statistical description (Log-difference).

	D_IIP_ YOY	DL_BRENT_ OIL	DL_VCB_ MID	DL_ CPI	DL_ M2	DL_ NEER	D_R_ DIFF	DL_ TGTT
Mean	0.077904	0.003451	0.001801	0.003922	0.013137	-0.001230	-0.029369	0.001985
Median	0.100000	0.014949	0.000220	0.002901	0.012514	0.000100	-0.017476	0.000178
Maximum	30.30000	0.229479	0.052135	0.033387	0.047349	0.033794	2.789502	0.071546
Minimum	-31.20000	-0.497635	-0.043354	-0.015549	-0.030695	-0.065159	-3.256340	-0.003524
Std. Dev.	7.871028	0.090535	0.007719	0.006242	0.009814	0.013144	0.974695	0.007117
Skewness	-0.271231	-1.259714	1.219502	1.145954	0.202720	-0.848419	-0.210750	7.152269
Kurtosis	7.870045	8.165623	20.66400	6.652012	6.872755	6.663137	4.038165	63.69892
Jarque-Bera	167.0807	229.8419	2212.512	129.3557	105.5065	113.4057	8.735823	27060.81
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.012678	0.000000
Sum	13.01000	0.576321	0.300799	0.654899	2.193882	-0.205427	-4.904706	0.331502
Sum sq. dev.	10284.21	1.360638	0.009891	0.006467	0.015989	0.028679	157.7049	0.008408
Observations	167	167	167	167	167	167	167	167

In order to mitigate the potential for non-stationarity, log-difference variables are utilized to express other variables but interest rates. While stationarity of the data series is not a prerequisite for estimating the BVAR model, guaranteeing stationarity enables the elimination of structural break effects when utilizing the method to estimate priors. OLS method, thus conducting a comprehensive evaluation of the subject's trauma impact. Additionally, values such as IIP and M2 are modified to account for strong seasonal variations. As such, the data series utilized in the research is illustrated in Figure 1.

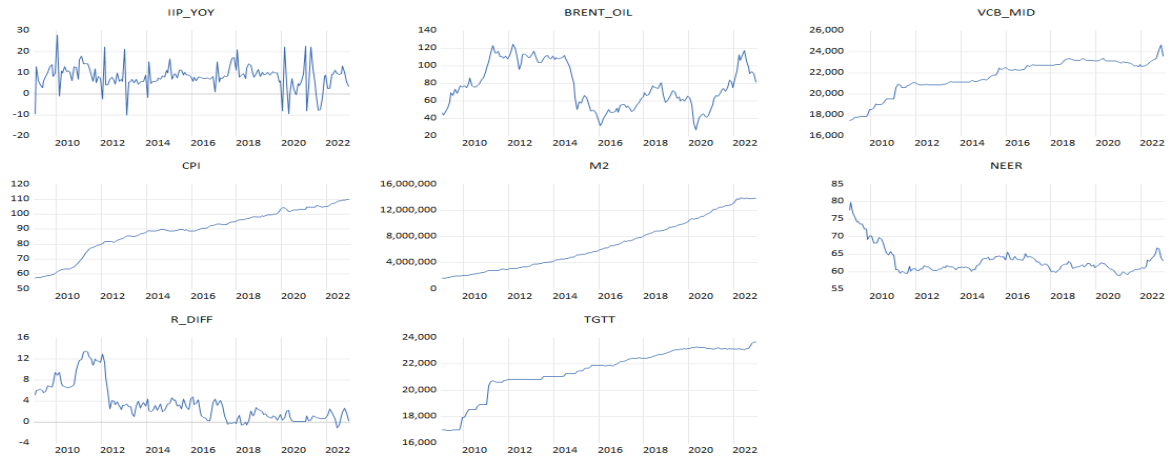

Figure 1.
Time series variables in the model from 2009-2022.

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The findings presented in Figure 1 indicate that the M2 money supply and the inflation index have a substantial impact on the VND exchange rate. This demonstrates the degree of adaptability in management during periods of exchange rate volatility driven by market forces. NEER data is constructed on the principle that an increase in NEER causes the exchange rate to depreciate, and conversely, a decrease in NEER indicates the exchange rate's recent relative stability. Furthermore, recent inflation and exchange rate fluctuations have been comparatively stable, supported in part by the interest rate differential between the Vietnamese Dong and the United States Dollar.

4. Empirical Results

In contrast to the simple or structural VAR model, the BVAR model employs the prefix distribution estimation method. Thus, it allows for limited number of variables in the model. However, forecasting based on the IRF results and the estimated coefficients from the aforementioned model may be susceptible to instability or misinterpretation of the systematic changes reflected in the data (exchange rate framework, currency, etc.) as a unique shock. While it is not required to use a stationary data series when the suffix distribution is identical in both instances, we opt to do so in order to evaluate certain effects to overcome the aforementioned considerations in order to analyse the impacts from the model using the slope coefficient.

The examination is therefore conducted utilizing the extended Dickey Fuller (ADF) method. Upon attaining stationarity subsequent to performing a difference of order d, a set of data referred to as an integrated series of order d (denoted as I(d)) is produced. An initial stationary string is also referred to as a stationary string at zero difference, denoted as I (0).

- **Model validation:** Using the Schwarz information criterion (SIC) delayed selection method and a constant c in the test equation, the outcomes of ADF testing indicate that the model's variables remain stable subsequent to the initial stationary transformation at D (1). Despite both the trend and constant components (c) in the ADF test equation, the data series continues to attain stationarity at D (1). Only IIP_YOY and NEER fail to attain stationarity.

Table 3.
ADF testing results.

Series	Prob.	Lag	Max. lag	Obs.
D_IIP_YOY	0.0000	2	13	164
DL_BRENT_OIL	0.0000	1	13	165
DL_VCB_MID	0.0000	1	13	165
DL_CPI	0.0000	0	13	166
DL_M2	0.0000	0	13	166
DL_NEER	0.0000	0	13	166
D_R_DIFF	0.0000	0	13	166
DL_TGTT	0.0000	0	13	166

- **Determine the most effective delay for the model:** As shown in Table 3, the optimal delay is one month, as determined by the outcomes of testing FPE, AIC, and HQ.

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Table 4.
Determine the most effective delay for the model (log- 1st difference).

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2164.766	NA	2.28e-22	-27.12913	-26.97472*	-27.06642
1	2303.152	261.1068	8.96e-23*	-28.06481*	-26.67512	-27.50047*
2	2366.789	113.6664	9.05e-23	-28.06025	-25.43527	-26.99427
3	2413.675	79.02699	1.14e-22	-27.84497	-23.98471	-26.27736
4	2449.514	56.80153	1.67e-22	-27.49074	-22.39520	-25.42150
5	2488.297	57.56496	2.40e-22	-27.17355	-20.84273	-24.60267
6	2551.286	87.15388	2.61e-22	-27.16083	-19.59472	-24.08831
7	2618.995	86.87274*	2.75e-22	-27.20749	-18.40610	-23.63334
8	2661.886	50.71363	4.13e-22	-26.94196	-16.90529	-22.86618

Note: * Indicates optimal lag selections.

- **The results of the model**: The authoring team employed quantitative analysis via the BVAR model, utilizing data processing as the basis. The prefix allocation method selected was Independent-Normal Wishhart, with a one-month latency. Specifically, 150,000 samples were selected in accordance with the Gibbs method, incorporating a 10% burn-in level. Consequently, the prefix solution chain is constructed by utilizing the estimated outcomes derived from 150,000 solution outcomes. After 150 estimated outcomes, the prefix distribution attains equilibrium and eliminates one draw.

Table 5.
The results of the model.

	D_IIP_YOY	DL_BRENT_OIL	DL_VCB_MID	DL_CPI	DL_M2	DL_NEER	D_R_DIFF	DL_TGTT
D_IIP_YOY(-1)	-0.499396	-0.001043	-3.59E-05	8.20E-05	-0.000165	-0.000190	0.030222	4.49E-05
	(0.06649)	(0.00091)	(0.00027)	(0.00026)	(0.00027)	(0.00029)	(0.00953)	(0.00027)
DL_BRENT_OIL(-1)	1.857003	0.327143	0.000322	0.018247	0.006327	-0.007131	-0.477608	-0.003564
	(2.77197)	(0.08401)	(0.02525)	(0.02453)	(0.02554)	(0.02711)	(0.80267)	(0.02508)
DL_VCB_MID(-1)	0.034103	-0.910492	0.043465	-0.014447	0.010580	-0.293842	1.020223	0.038184
	(3.15947)	(1.38168)	(0.48256)	(0.46943)	(0.48815)	(0.51654)	(3.04138)	(0.47960)
DL_CPI(-1)	-0.008441	-0.676362	0.105150	0.464794	0.044900	-0.118274	-0.418150	0.147246
	(3.16000)	(1.13970)	(0.36657)	(0.35642)	(0.37090)	(0.39323)	(3.06597)	(0.36428)
DL_M2(-1)	0.470342	1.144161	0.048213	-0.005192	0.255418	-0.201494	1.437819	0.021620
	(3.15631)	(0.68931)	(0.21085)	(0.20495)	(0.21335)	(0.22645)	(2.91472)	(0.20950)
DL_NEER(-1)	0.244809	-0.760467	0.071855	-0.039734	-0.189285	-0.055024	-0.301403	-0.072435
	(3.15226)	(0.56327)	(0.17138)	(0.16657)	(0.17341)	(0.18407)	(2.77691)	(0.17028)
D_R_DIFF(-1)	-0.059756	0.006613	0.000500	0.001091	-0.001356	-0.000627	0.131704	0.000464
	(0.53351)	(0.00741)	(0.00221)	(0.00215)	(0.00224)	(0.00237)	(0.07775)	(0.00219)
DL_TGTT(-1)	0.142672	1.230341	0.125019	0.129229	-0.298405	0.194666	0.833299	0.065127
	(3.15927)	(1.37681)	(0.48250)	(0.46938)	(0.48809)	(0.51644)	(3.03349)	(0.47955)
C	-0.024842	-0.011301	0.000504	0.001772	0.009707	0.001907	-0.054158	0.000857
	(0.51170)	(0.01211)	(0.00368)	(0.00358)	(0.00373)	(0.00396)	(0.08430)	(0.00366)

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5. Discussion

5.1. The BVAR Analysis Elucidates a Number of Significant Discoveries Concerning the Influence of Exchange Rates and Additional Variables on The Industrial Production Index (IIP), Which Measures Economic Activity in Vietnam.

- IIP Calculation: There is a positive correlation between exchange rate fluctuations and economic activity. Economic theory posits that a depreciation of the NEER is conducive to the expansion of economic production. IIP increases by 0.24% for every 1% decline in NEER, which is comparable to Trinh's (2014) estimate of 0.2 percent for REER. Furthermore, the influence of M2 (liquidity in VND) on IIP is substantial, suggesting that monetary policy interventions contribute positively to economic expansion.
- Additionally, oil costs have a substantial impact on economic expansion. Nevertheless, Vietnam's limited capacity to exert direct control over global energy prices as a small open economy runs counter to initial theoretical projections. Inflationary pressures on oil prices frequently occur concurrently with robust expansionary periods, an indication of robust international demand that subsequently influences tangible economic development. It is critical to acknowledge that domestic oil prices are not entirely influenced by global oil price fluctuations, as the former is subject to government regulation, as are petroleum and oil.

5.2. Analysis of the Impulse Response Function (IRF)

The study incorporates the Cholesky variance decomposition technique, following the sequence indicated in the table, in order to isolate the effects of supply-demand, monetary policy, and exchange rate disturbances. Analyses of the responses of macroeconomic variables, including inflation, exchange rates, and IIP, VCB mid rate, and CPI, to shocks are feasible due to the observed frequent fluctuations in these metrics. To capture the impact of exchange rate transmission on inflation at a later time, the VCB mid-rate variable is positioned prior to inflation. Positioned last, the R_DIFF and TGTT variables symbolize the SBV's exchange rate management and are indicative of policy stance adjustments in response to macroeconomic developments.

The estimation of the slope coefficients is utilized to calculate the impulse response function (IRF) through the implementation of the Gibbs sampling method. This involves 10,000 iterations and a 10% burn-in period. The IRF results reveal the following observations:

- Exchange rate fluctuations serve to partially alleviate the impact of long-term economic disruptions.
- The NEER exhibits a tendency to appreciate around the 20th month during periods of strong growth, thereby mitigating the impact of positive demand shocks.
- Positive growth shocks elicit a modest short-term positive response from the NEER, but the effect is not significant.
- Conversely, the VCB mid-rate and the IIP both trend in the same direction, indicating a depreciation in the market exchange rate. This depreciation fails to completely counterbalance the IIP's positive jolt.

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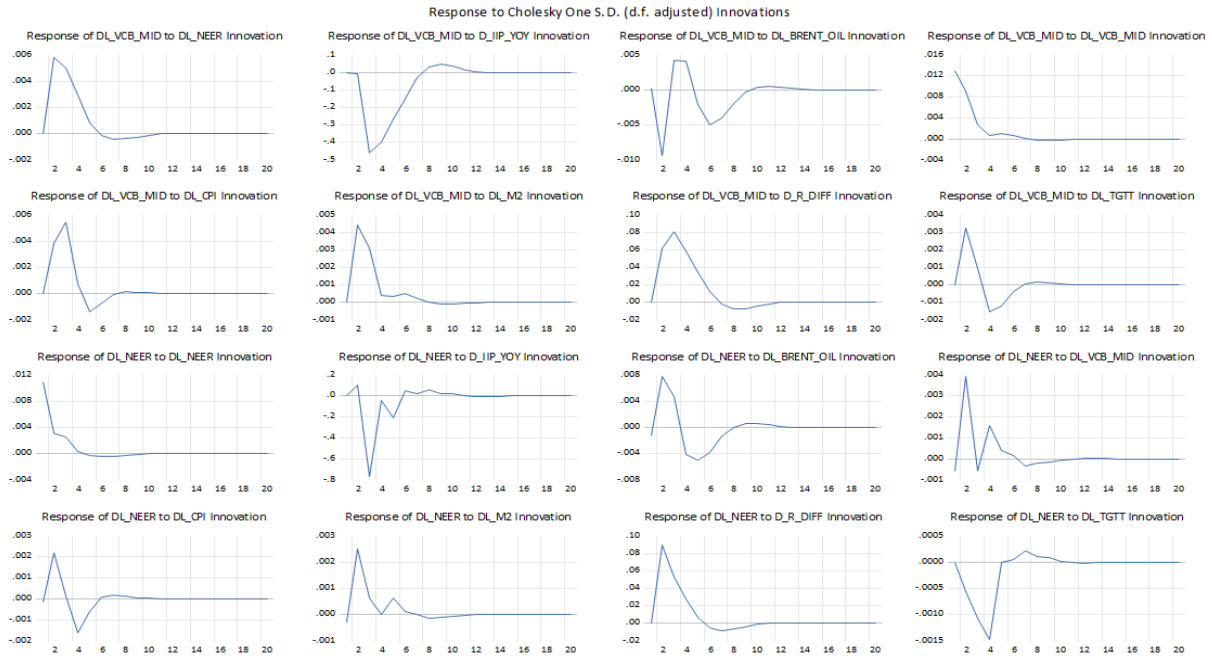

Figure 2.
Response of VCB_mid and NEER to shocks.

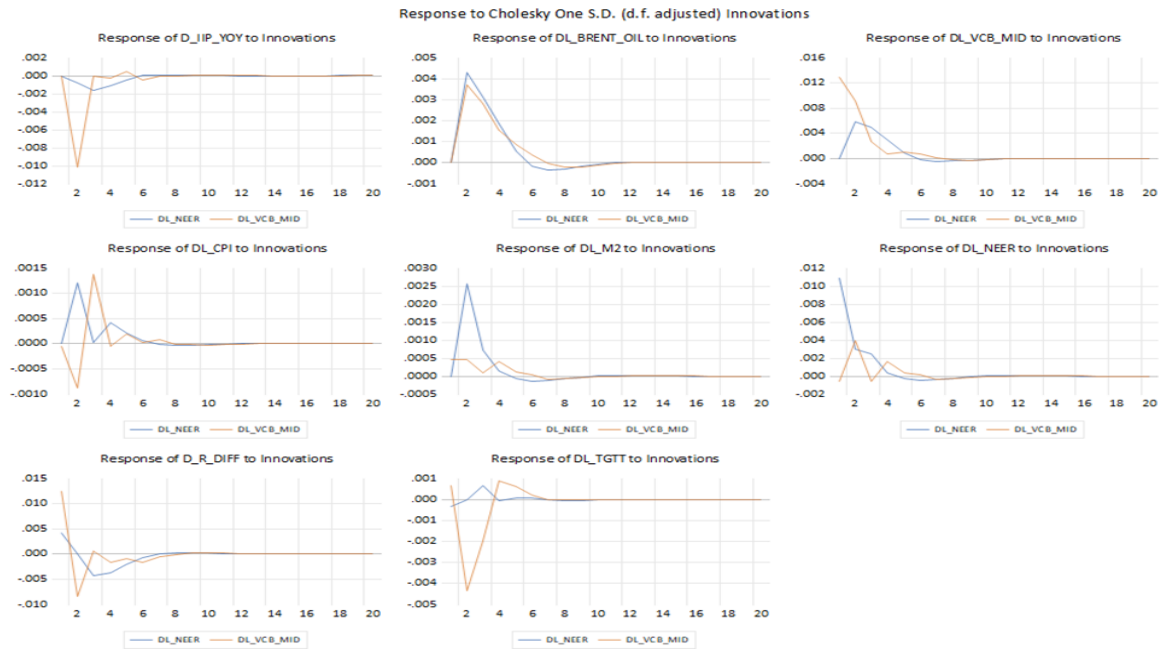

Figure 3.
Resonse to VCB_mid_rate and NEER shocks (01 STD).

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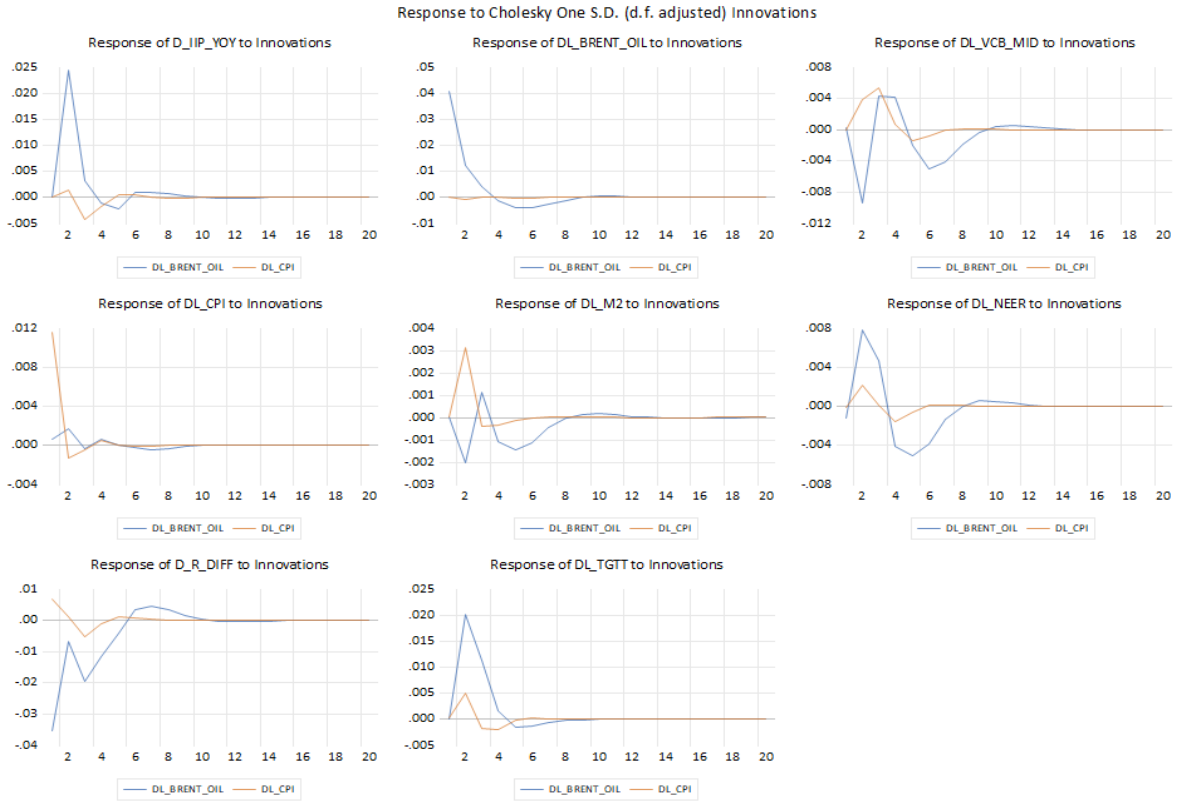

Figure 4.
Responses to Brent and CPI shocks (01 STD).

- **Testing the stability of the model:** With roots values ranging from -1 to 1 (Figure 3.9), the BVAR model results have achieved stability, ensuring the meaning of the model's results.

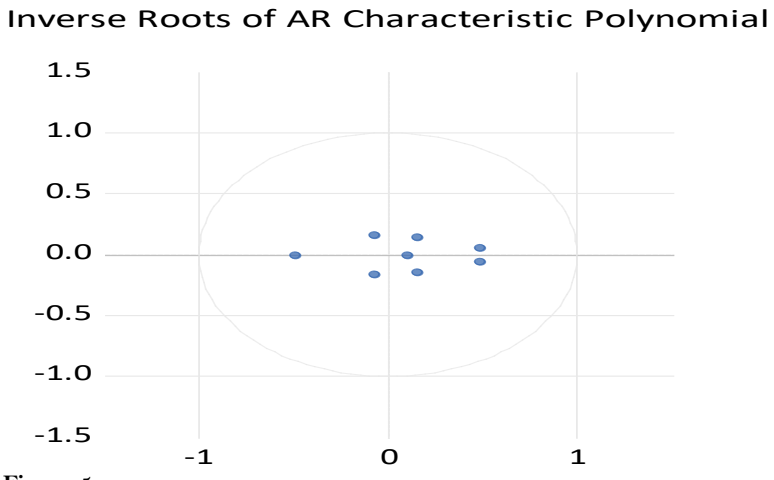

Figure 5.
Model inverse roots test.

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6. Conclusion

In recent times, Vietnam's economy has gradually developed, positioning the country as a crucial link in global production and supply chains. With a rich resource base [or other specific resources] and a plentiful labor force, Vietnam, coupled with favorable geographical and political conditions, has become an attractive destination for foreign investment, supporting domestic modernization and economic development. However, as the market continues to evolve and integration between domestic and international markets deepens, effective management and operation of capital, financial, and monetary markets are increasingly necessary to meet market demands.

In this context, managing the exchange rate and monetary policy by the State Bank of Vietnam (SBV) plays a crucial role in shaping investment trends. It also helps cushion the impact of negative shocks from foreign exchange and financial markets, thereby supporting real growth. This concern echoes the experiences of many countries, especially during the late 1990s Asian financial crisis, which affected nations like Thailand, Indonesia, and Japan, with lingering effects still felt today.

The reseach evaluates the SBV's ability to manage exchange rates by assessing the transmission effects of external shocks on exchange rates and the exchange rate's capacity to absorb shocks.
The BVAR model results reveal several key points:

- The State Bank of Vietnam's (SBV) exchange rate management is relatively flexible, allowing exchange rate fluctuations to absorb external shocks. This study outcome aligns with previous studies by Rodney (2007), Ferrari Filho and De Paula (2008), and Guzman *et al.* (2018). Additionally, the model demonstrates that the transmission effects from exchange rates to economic production are relatively effective. Vietnam's economy, characterized by high trade openness, enables the Nominal Effective Exchange Rate (NEER) to efficiently absorb external price shocks, contributing to exchange rate stability.
- Oil prices strongly impact the Industrial Production Index (IIP), reflecting shocks during economic growth cycles, while the impact on inflation is relatively muted.
- The model indicates a positive relationship between exchange rates and economic activity. However, maintaining a strong exchange rate can lead to inflation pressures. This finding contrasts with Fornaro's (2015) conclusion that small countries often choose to devalue their currency to enhance domestic value and cope with economic shocks. The discrepancy can be explained by Vietnam's export dependence, where a stronger exchange rate encourages exports and overall economic activity.

In summary, current market volatility creates a favorable environment for Vietnam's exchange rate management, as the transmission effects from supply-demand shocks have a limited impact on both exchange rates and inflation. However, the evolving market conditions necessitate the development of a more sophisticated foreign exchange market to ensure consistency and coherence in the mechanism.

Moving forward, Vietnam should gradually upgrade its foreign exchange market to modernize and enhance its ability to regulate markets during crises and unpredictable shocks—such as those caused by the COVID-19 pandemic. One potential avenue is adopting an Integrated Policy Framework (IPF), as proposed by the IMF. However, continued study and appropriate implementation are essential, considering that Vietnam's market conditions differ from others. The process of reform and modernization in the framework of governance requires in-depth research and an appropriate roadmap to ensure effectiveness in economic development and market management while safeguarding the interests of the national currency.

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