The Effectiveness of Monetary Policy in the Association of Southeast Asian Nations

Kosal Song[1] and Siphat Lim[2]

Abstract

The aim of this research is to examine how monetary aggregates affect economic growth in the ASEAN region. To achieve this objective, a Panel VAR model is utilized, incorporating five key macroeconomic indicators: gross domestic product, consumer price index, foreign exchange, interest rate, and money supply. The study focuses on nine ASEAN member countries, namely Brunei, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam, spanning from 2012 to 2022. The Generalized Method of Moments (GMM) with the mean-differencing method or Helmert procedure is employed as the estimated method for the model. The findings of this study demonstrate that an increase in money supply by one lag has a significant positive impact on the gross domestic product at a 1% level of significance. This suggests that monetary policy plays a crucial role in promoting economic growth among the member countries of ASEAN. When it comes to the forecast error variance decomposition, the fluctuations in economic growth within ASEAN can mainly be attributed to the fluctuations in the consumer price index (34.85%), interest rate (8.84%), foreign exchange (5.92%), and money supply (2.24%). It is worth noting that the variations in all these variables in the system are primarily explained by the fluctuations in the general price level: 34.85% for gross domestic product, 35.24% for foreign exchange, 34.15% for interest rate, and 34.95% for money supply.

Keywords: *Money Supply, Economic Growth, Monetary Policy, Panel VAR Model*

INTRODUCTION

Monetary policy refers to the central bank's mechanism of regulating the money supply within the economy. The execution of monetary policy can be accomplished using monetary policy instruments such as reserve requirements, open market operations, and the discount rate. The primary goal of the central bank is to implement monetary policy in order to achieve price stability within the nation (Feranika & Haryati, 2020).

Income serves as a crucial economic gauge for assessing the quality of life of individuals within a specific nation. Governments worldwide have endeavored to implement various strategies aimed at boosting domestic income and enhancing the general well-being of their populace. There are several policies available for governments to promote sustainable economic development and growth. Among these policies, monetary policy is widely recognized as a crucial one. Hence, it is imperative to explore the effects of monetary policy on economic growth by means of empirical analysis. In fact, numerous empirical studies have been undertaken to elucidate the impact of monetary policy variables such as monetary aggregate, interest rate, and exchange rate on the growth rate of real gross domestic product (GDP).

The effectiveness of monetary policy in Cambodia was evaluated by employing a Bayesian Tobit model due to small sample size of 19 observation which covering from 2000 to 2018. The Gibbs sampling technique was employed in the Bayesian Tobit model with Markov chain Monte Carlo simulation to extract samples from every conditional posterior distribution. The findings revealed a positive correlation between money supply, regulated by the National Bank of Cambodia, and GDP. Conversely, other macroeconomic indicators such as interest rate, exchange rate, and foreign reserve exhibited a negative influence on GDP (Sean, 2019; Thongtawee, 2016).

A vector autoregressive (VAR) model was employed to analyze a system of equations, incorporating five endogenous variables: real GDP growth, foreign exchange rate (Vietnamese Dong per US dollar), broad money (measured by M2), and interest rate. The analysis was conducted over a ten-year period, spanning from 2009

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[1] CamEd Business School, Cambodia, Email: lsiphat@cam-ed.com

[2] CamEd Business School, Cambodia

to 2018. The findings of this research were derived from the regression outcomes obtained from the VAR model, indicating that broad money had a substantial and positive influence on economic growth. From a policy perspective, implementing monetary expansionary measures would stimulate economic growth. Conversely, raising the interest rate would lead to a decline in GDP growth (Sang, 2019).

In order to achieve the identical research goal as seen in the Vietnam study, which is to assess the influence of monetary policy on the economy, a similar VAR model was utilized for the Laos People's Democratic Republic study. Nevertheless, rather than utilizing yearly time series data, this particular research utilized quarterly data spanning from the initial quarter of 1995 to the final quarter of 2018. Incorporated within the VAR model were five endogenous variables, namely the GDP growth rate, broad money (M2), interest rate on loans, consumer price index (which gauges inflation rate), and the banks' credit growth rate. Notably, the exchange rate was excluded from the model. The study's empirical findings revealed that implementing monetary expansionary policies stimulates economic growth, lowers loan interest rates, boosts total credits, and leads to an increase in the price level (Srithilat et al., 2021).

The autoregressive distributed lag (ARDL) model, which is widely recognized as one of the most renowned single equation models, was utilized to assess the effectiveness of monetary and fiscal policies in promoting real economic growth in Malaysia, Singapore, and Thailand. This evaluation was conducted using quarterly time series data spanning from the first quarter of 1980 to the first quarter of 2017. The central bank and ministry of finance control the money market interest rate and government expenditure, respectively. The estimated results of the ARDL model were verified by comparing them with three other econometric models: canonical cointegration regression (CCR), dynamic ordinary least squares method (DOLS), and fully modified least squares method (FMOLS). The findings of this research indicate that a rise in interest rates across all nations would have a notable impact on diminishing the growth of real GDP. On the contrary, an escalation in government spending would foster economic growth in Thailand, while it would adversely affect Malaysia and Singapore. What is particularly intriguing is that the empirical evidence from all the models employed yielded consistent and strong outcomes (Tan et al., 2020).

A study was conducted using qualitative methods, including case studies and field research, to analyze how macroeconomic policies, particularly fiscal and monetary policies, influence the economic growth of Indonesia. The economic activities in Indonesia were significantly shaped by the government's allocation of funds towards infrastructure development and social programs. However, the strict management of bank regulations and interest rates as part of the monetary policy had a detrimental impact on the country's economic growth (Hanipah et al., 2023).

A research study was carried out within the Association of Southeast Asian Nations (ASEAN), consisting of ten member states including Brunei, Cambodia, Indonesia, Laos People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, and Thailand, in order to evaluate the influence of monetary policy on economic development. This study has categorized the member states into three distinct groups, taking into account the primary objective of monetary policy in each country(Jam, 2016). These groups are as follows: inflation targeting, which includes Indonesia, Philippines, and Thailand; exchange rate targeting, comprising Brunei and Singapore; and mixed targeting, consisting of Cambodia, Laos, Malaysia, Myanmar, and Vietnam. In the analysis of economic growth, four explanatory variables - interest rate, exchange rate, inflation rate, and money supply - were integrated into panel data models. These models encompassed pooled ordinary least square (OLS), fixed effect, and random effect models. The study period covered the years 1996 to 2018. The fixed effect models yielded the most impactful empirical findings, demonstrating a notable positive influence of interest rate and inflation rate on economic growth. Conversely, the exchange rate was found to have a detrimental effect on economic growth in member states that implemented inflation-targeting policies. Both inflation rate and exchange rate are key elements in driving economic growth within the exchange rate targeting group, resulting in differing outcomes from countries in the mixed targeting group. Furthermore, the promotion of economic growth can be attained through the regulation of money supply and interest rates in the mixed target group of countries (Thangthong, 2019).

The assessment of the impact of monetary policy on economic growth, as discussed earlier, is typically carried out in ASEAN countries and certain member states such as Cambodia, Indonesia, Lao, Malaysia, Singapore, Thailand, and Vietnam. These evaluations utilize static and dynamic models, but these models fail to capture the interconnectedness among all variables in the model. To address this research gap, a panel vector autoregressive (PVAR) model, which can be applied with panel data, is proposed.

LITERATURE REVIEW

A study conducted in Vietnam employed a macro-econometric model to examine the implications of a demand-driven economy in the short run and the potential for mitigating external shocks through monetary and fiscal measures. The results demonstrated that as a nation reliant on imports, a rise in the prices of Vietnamese exports had a detrimental effect on domestic production. Moreover, the research suggested that fiscal policies were more successful than monetary policies in fostering economic development in Vietnam. The trade balance suffered from the expansionary monetary policy or the devaluation of the Vietnamese Dong (Minh, 2008).

To alleviate the repercussions of the external shock stemming from the crisis on Thailand's economy, an assessment was conducted on the utilization of monetary and fiscal policies(Jam, 2012). The fiscal policy elements examined were fiscal spending and tax revenue, while the monetary policy elements encompassed policy interest rate and the real effective exchange rate. The efficacy of each policy was appraised based on the target variable, which was output. These elements were all encompassed in a reduced-form VAR model established by Sim (1972 & 1980). The model's projected results were modified based on the business sentiment index to take into consideration investor decision-making on consumption and investment. Bhanupong's (2010) research demonstrated that monetary policy was more impactful than fiscal policy in alleviating external shocks in Thailand during the 2008 Global Financial Crisis. Conversely, Luyna and Ravin (2011) discovered that in Cambodia, fiscal policy had a greater influence on economic activity compared to monetary policy. The study analyzed quarterly time series data on various economic indicators from 1998 to 2008, utilizing a VAR model to evaluate the effects of macroeconomic policies in each country.

A study was carried out utilizing a multiple regression model to investigate the correlation between GDP and money supply, interest rate, exchange rate, and inflation rate in Pakistan. The research made use of monthly data spanning from February 1995 to August 2010 and applied the least square method. The results indicated that all the independent variables combined explained the fluctuations in domestic output (Mughal & Rahim, 2012). A research study was carried out to assess how monetary policy affects the economy in Sri Lanka. The study used variance decomposition and impulse response function analysis of a SVAR model, focusing on two sets of variables: exogenous and endogenous variables. The research utilized monthly time series data from January 1978 to December 2011. The results showed that the interest rate had a notable influence on the country's economic activity, emphasizing its important role in explaining the fluctuations in the economy (Vinayagathasan, 2013).

The economic growth of Croatia was evaluated by employing the SVAR model during the period from 2004 to 2012 in order to analyze the effects of macroeconomic policies. It was discovered that an augmentation in government expenditure had a positive influence on the economic growth. However, this policy also caused the exchange rate to appreciate. Conversely, monetary expansion either stimulated growth in the real domestic output or led to a depreciation of the nominal exchange rate (Ćorić, Šimović, and DeskarŠkrbić, 2015). A comprehensive evaluation of monetary policy in Pakistan from 1973 to 2014 was conducted, employing the ARDL approach to co-integration developed by Pesaran and Shin (1999). This examination focused on the relationship between monetary aggregate, inflation rate, interest rate, and economic growth. The findings underscored the significance of prudently implementing monetary contraction or expansion, as it has a notable impact on the exchange rate. Moreover, the study suggested that ensuring stability in the exchange rate could foster positive economic growth (Ahmad, Afzal, & Ghani, 2016).

In terms of forecast error variance decomposition, it was observed that the impact of the oil price shock on Brunei's economy was not as significant as initially anticipated. Instead, the fluctuations in the economy were primarily attributed to production shocks. To address the volatility in price levels and real exchange rates, the government could consider implementing monetary and fiscal policies. These policies could help stabilize the

economy and mitigate the adverse effects of external shocks, such as fluctuations in oil prices (Koh, 2017). By utilizing the VECM and conducting the Johansen co-integration test, this study provided valuable insights into the relationship between monetary policy and economic growth in Laos PDR. The results indicated that there is a complex interplay between variables such as GDP per capita, broad money, exchange rates, and inflation rate. Understanding these dynamics is crucial for policymakers in Laos to formulate effective strategies that can foster sustainable economic development in the country (Srithilat & Sun, 2017).

The impact of monetary policy on economic growth in Nigeria was examined through a comprehensive study. The study employed a multiple regression analysis, utilizing various variables to determine their influence on the country's gross domestic product (GDP). These variables included the monetary policy rate, money supply, real exchange rate, lending interest rate, and investment. The study spanned over three decades, from 1986 to 2016. The empirical findings, obtained through ordinary least squares (OLS) regression, revealed that the growth rate of Nigeria's domestic output was not significantly affected by two key macroeconomic variables: lending interest rate and monetary policy rate. Surprisingly, the exchange rate had a significantly negative impact on Nigeria's economic activity. However, it was noteworthy that monetary policy explained a substantial 98% of the variation observed in domestic output (Ufoeze, 2018).

Hansen (1999) introduced a non-linear panel threshold regression model that incorporated bootstrapping to replicate the asymptotic distribution of threshold estimates. This particular model was utilized in the analysis of five ASEAN countries, namely Indonesia, Malaysia, Philippines, Singapore, and Thailand, over the period spanning from 1995 to 2015. The research methodology employed in this study closely resembled the one conducted by Tong (1983). The primary aim of this research was to evaluate the effectiveness of macroeconomic policies, specifically monetary and fiscal policies, in stimulating economic growth during the Asian financial crisis in 1997. The fiscal policy variable under scrutiny was government spending, while the monetary policy variables encompassed broad money and real interest rate. The study's empirical results demonstrated that the inflation rate was significantly influenced by the money supply, regardless of whether the crisis was taken into account when measuring output growth. The study's findings also indicated that the economic growth in the five ASEAN countries was greatly impeded during the crisis, highlighting the inefficiency of both monetary and fiscal policies in promoting growth (Ismail & Sek, 2020).

The economic recovery prospects of Brunei Darussalam, Indonesia, Malaysia, the Philippines, and Singapore, which are all members of the ASEAN, were examined using the analytical frameworks of Smets and the New Triffin Dilemma. In order to evaluate the viewpoint of Smets, key factors such as gross domestic product, inflation, exchange rate, non-performing loans, and interest rate were incorporated into the analysis. Conversely, an examination was conducted to assess the potential of the New Triffin Dilemma in facilitating economic revival. This investigation involved establishing a correlation between gross domestic product, exchange rates, and foreign direct investment. The approach adopted in this analysis drew inspiration from the research conducted by Caecilia Wahyu E.R in 2008 and Nugroho, Purnama, and Fauzia in 2018, utilizing the Pool OLS estimated method. The outcomes of this study indicate that the viewpoint of Smets supports the attainment of macroeconomic stability (Utami, 2021).

METHODOLOGY

A conventional VAR methodology involves using a set of equations with a vector of time series variables. In this system, all variables are considered endogenous. To enhance the understanding of the interconnections between variables, Love and Zicchino (2006) introduced the Panel VAR model, which incorporates panel data. This research utilizes this technique to examine the impact of fiscal and monetary policies on the actual economic growth in ASEAN countries. The general structure of the Panel VAR model is outlined below.

$$X_{it} = \Lambda_0 + \Lambda_1 X_{it-1} + \mu_i + d_{c,t} + \epsilon_{it}$$

$$i = (1,2,\dots,9) \text{ and } t = (2012,2013,\dots,2022)$$

Within the vector X_t, there are five endogenous variables: real gross domestic product (GDP), consumer price index (CPI), exchange rate (FX), interest rate (R), and money supply (M). The ASEAN is a regional organization

consisting of ten states, namely Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. However, Myanmar has been omitted from this study due to insufficient data availability. i is used to symbolize the collection of nine countries that form the member states, while t is employed to signify the period of time under consideration. There are a total of nine ASEAN member countries, resulting in nine distinct cross-sectional data or individual heterogeneity denoted as μ_i in the model. To address the correlation between μ_i and the regressors caused by lags of the regressand, the forward mean-differencing method or Helmert procedure is employed. The Generalized Method of Moments (GMM) is used as the estimation method, which shares numerical similarities with the equation-by-equation Two-Stages Least Square (2SLS) approach (Arellano and Bover, 1995).

By incorporating time dummies $(d_{c,t})$ and utilizing the GMM framework, this research aims to control for country-specific effects and provide a comprehensive analysis of the data. The study covers a substantial time span from 2012 to 2022, ensuring a thorough examination of the variables under consideration. With a total of 99 observations resulting from the multiplication of the number of countries and years, the dataset is substantial. The Asian Development Bank database serves as a reliable source for collecting the macroeconomic data of each country. The estimated parameters of GMM enable the generation of the Forecast Error Variance Decomposition (FEVD) and the Impulse Response Function (IRF), which offer valuable insights into the relationships and dynamics within the data. To ensure the accuracy of the IRF, confidence intervals are generated using Monte Carlo Simulation, providing a measure of uncertainty for the standard error estimates.

EMPIRICAL RESULT

This particular section is structured into three parts, namely summary statistics, panel unit root test, and empirical results. The initial part, which is the focus of our discussion, entails the presentation of summary statistics. The dataset utilized for analysis consists of a total of 99 observations. These observations are derived from a combination of data collected from nine cross-sectional countries and eleven time series. To provide a comprehensive understanding of the variables under investigation, Table 1 showcases the descriptive statistics for each variable. This includes key measures such as the mean, standard deviation, 25th percentile, 50th percentile, and 75th percentile.

Table 1. Descriptive Statistics

Variable	Mean	Standard Deviation	25th Percentile	50th Percentile	75th Percentile
GDP	491307.1	898539.3	11546.2	34033.74	34033.74
CPI	110.6454	20.29143	99.3	103.2	119.4667
FX	5001.449	7044.447	3.150909	45.50284	8401.335
R	8.171398	3.661959	5.33	5.764	11.6575
M	868909.8	1985498	12572.98	27246.07	580251

The Levin-Lin-Chu (LLC) unit root test is conducted to determine whether the panel data exhibit unit root or are stationary. The null hypothesis states that the panel data contain unit root, while the alternative hypothesis suggests that the panel data are stationary. According to the findings presented in Table 2, when the LLC test is performed without including time trend, variables such as GDP, R, and M all exhibit unit root as their p-values exceed 5 percent. On the other hand, the null hypotheses of CPI and FX are rejected at a 1 percent significance level. Based on the LLC unit root test that includes time trend, all the panel data used in this study are found to be stationary, as the p-value for each individual variable is below the 1 percent level of significance.

Table 2. Levin-Lin-Chu Unit-Root Test

Variable	Time trend: Not included			Time trend: Included		
	Unadjusted t-statistic	Adjusted t-statistic	p-value	Unadjusted t-statistic	Adjusted t-statistic	p-value
GDP	5.7325	8.6303	0.8471	-9.6249	7.3843	0.0000
CPI	-6.6422	-5.8177	0.0000	-11.9713	-10.2326	0.0000

FX	-8.9804	-7.0173	0.0000	-20.8868	-17.8603	0.0000
R	-3.7011	-1.1680	0.1214	-11.4309	-8.7373	0.0000
M	-0.4758	-0.0270	0.4892	-9.4633	-8.0315	0.0000

The Helmert procedure, also known as forward-mean differencing, is utilized to eliminate the correlation between the specific effects of each country and the dependent variables caused by the lags of the dependent variables. The results obtained from the estimation demonstrate the interrelationship among all variables in the system using the GMM method, and these results are presented in Table 3.

Table 3. GMM VAR Estimated Result

	Coefficient	SE GMM	t GMM
GDP(-1)	1.6462	0.4802	3.4284
CPI(-1)	-10484	5015	-2.0903
FX(-1)	-28.6544	33.2147	-0.8627
R(-1)	-44087	21925	-2.0108
M(-1)	1.1948	0.3952	3.0235

To maintain the loss of the degree of freedom, the model has been estimated using a single lag length. The system of equations consists of five endogenous variables, namely GDP, CPI, FX, R, and M. The order of these variables has been set as GDP, CPI, FX, R, and M. The estimated method used for the model is the Generalized Method of Moment (GMM), which is similar to the equation-by-equation Two-Stages Least Square (2SLS) developed by Arellano and Bover. To address the correlation between each country specific effect and the regressors caused by lags of the regressand, the forward mean-differencing method, known as the Helmer procedure, has been employed. The estimated results of the model are presented in Table 3.

Gross domestic product is positively influenced by its own lag at a significant level of 1 percent, as indicated by the calculated t-value of 3.41284 exceeding the critical t-value of 2.62. Conversely, the Consumer Price Index (CPI) from the previous period shows a statistically negative correlation with domestic output at a 1 percent level, with a slope coefficient of -10484. The t-value for foreign exchange is -0.8627, lower than the critical t-value at a 99 percent confidence level, suggesting that FX does not have a significant impact on GDP. Furthermore, interest rates have a significant negative effect on output at a 5 percent level, indicating that higher interest rates lead to lower domestic output. Notably, money supply plays a crucial role in explaining GDP, with an estimated positive slope coefficient of 1.1948 and high significance at a 1 percent level, supported by a calculated t GMM of 3.0235 exceeding the critical t-value of 2.62.

Table 4. Forecast Error Variance Decomposition

	Step	GDP	CPI	FX	R	M	Total
GDP	10	48.15%	34.85%	5.92%	8.84%	2.24%	100%
CPI	10	43.08%	41.81%	5.13%	8.42%	1.55%	100%
FX	10	38.28%	35.24%	20.61%	3.41%	2.46%	100%
R	10	47.61%	34.15%	6.34%	9.79%	2.11%	100%
M	10	48.01%	34.95%	5.95%	8.96%	2.12%	100%

Over the upcoming ten period, as shown in Table 4, the changes in gross domestic product are influenced by fluctuations in consumer price index, foreign exchange, interest rate, and money supply, resulting in percentages of 34.85%, 5.92%, 8.84%, and 2.24% respectively. Additionally, 48.15% of the variation is attributed to its own changes. The Consumer Price Index (CPI) experienced a 41.81% variation due to its own fluctuations. Additionally, 1.55% of the change in money supply influenced the CPI, whereas the remaining three factors - GDP (43.08%), FX (5.13%), and R (8.42%) - accounted for the changes in the price level. The FX fluctuation of 35.24% is attributed to its own variation. Furthermore, the change in FX is influenced by 38.28% of the GDP variation, while CPI, R, and M account for 35.24%, 3.41%, and 2.46% respectively. The fluctuations in

R can be attributed to 47.61%, 34.15%, 6.34%, and 2.11% of the fluctuations in GDP, CPI, FX, and M, respectively. Additionally, 9.79% of the fluctuations in R are caused by its own variations. The significant alteration in the money supply can be attributed to two variables, namely CPI (34.95%) and GDP (48.01%). Additionally, R (8.96%) and FX (5.95%) also contribute to this change. It is worth noting that only a mere 2.12% can be accounted for by its own variation.
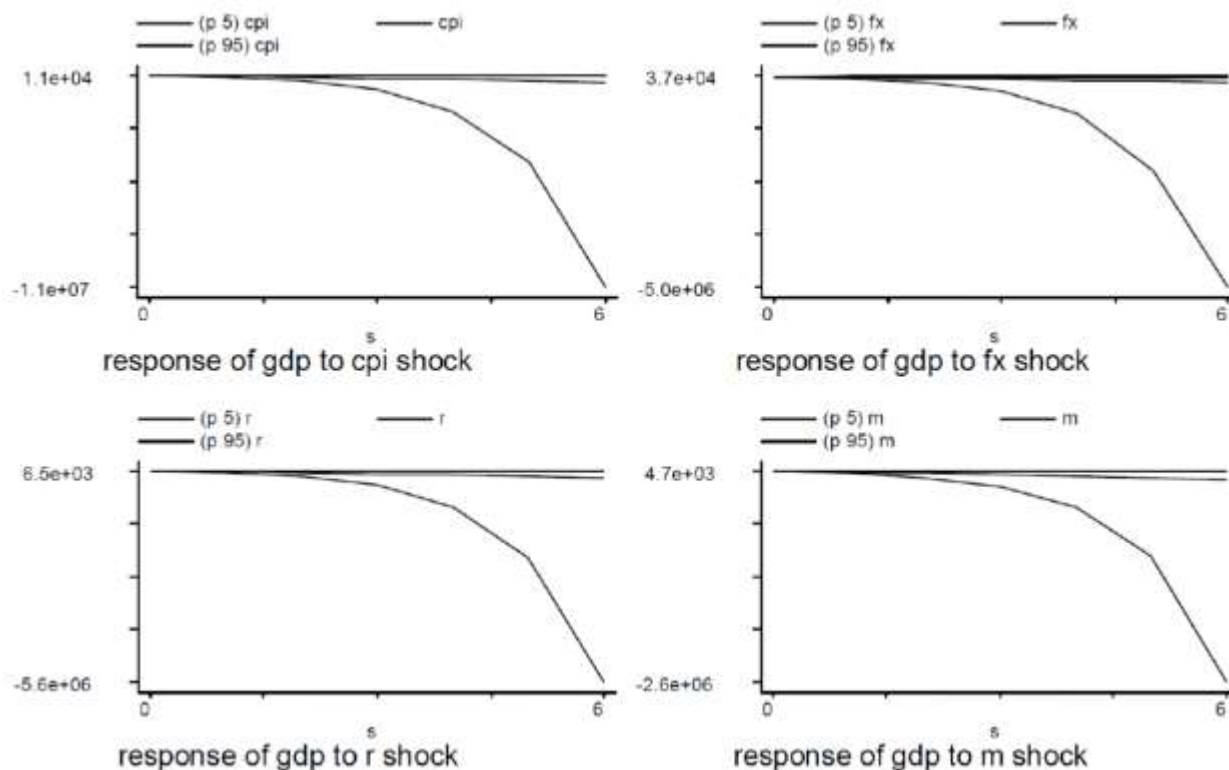

Figure 1. Impulse Response Function (IRF) for 1 Lag VAR, GDP

Errors are 5% on each side generated by Monte-Carlo with 1000 reps

The forecast error variance decomposition illustrates a distinct interconnection among all variables within the system, as demonstrated by the impulse response function presented in Figure 1, however, the reaction of the gross domestic product to the shocks of consumer price index, foreign exchange, interest rate, and money supply all exhibit a minimal response.

CONCLUSION

Monetary policy plays a pivotal role in fostering economic growth and enhancing the development of a nation or a community like the Association of Southeast Asian Nations. The central bank effectively manages the money supply through the implementation of monetary policy. The money supply indicator is regarded as a significant policy variable. To thoroughly examine the interrelation between gross domestic product and money supply, this study has incorporated three additional target variables - consumer price index, foreign exchange, and interest rate - into a Panel VAR model system of equations.

The findings from the empirical analysis indicate that within the dynamic framework of Panel VAR, a one-lag increase in money supply has a statistically significant positive effect on gross domestic product at a 1% level of significance. This outcome implies that monetary policy has a crucial role in fostering economic growth among the ASEAN member countries. Additionally, the consumer price index and interest rate exhibit statistically significant negative effects on domestic output at a 5% level of significance. As the general price level and interest rate rise, the gross domestic product tends to decrease. However, it is worth noting that the foreign exchange indicator does not show any significant impact on GDP.

In relation to the breakdown of forecast error variance, the fluctuations in economic growth within ASEAN are primarily attributed to the fluctuations in the consumer price index (34.85%), interest rate (8.84%), foreign exchange (5.92%), and money supply (2.24%). Additionally, it is important to highlight that the variations in all these variables are predominantly explained by the fluctuations in the general price level: 34.85% for gross domestic product, 35.24% for foreign exchange, 34.15% for interest rate, and 34.95% for money supply. This demonstrates that within the Association of Southeast Asian Nations, the general price level of the member states is considered a critical indicator, as even a slight change in this indicator can significantly impact other variables in the system, including gross domestic product, foreign exchange, interest rate, and even the policy variables controlled by the monetary authority, such as the monetary aggregate.

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