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The Effect of Fiscal Policy on Inflation Rate in Cambodia

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ABSTRACT

A reduced-form VAR model was employed to investigate the inter-relationship between three macroeconomic indicators, consumer price index, nominal exchange rate, and government expenditure. The estimated result of the forecast error variance decomposition indicated that the variation of inflation rates over the period of the study was mainly caused by the variation of itself about 96 percent in the short-run and reduced to around 81.31 percent in the long-run. This claimed that the price was sticky in Cambodia. In the short-run, the percentage change of exchange rate caused no more than 5 percent change of the variation of inflation rate, but the effect was predicted to be two and haft folds in the long run. The variation of inflation rate caused by the percentage change of government expenditure was no greater than 6 percent considered as low as compared to the percentage change of exchange rate. The estimated result of the impulse response function indicated that fiscal expansionary had a positive and negative effect on inflation rate in the short and long run, respectively..

Keywords: Inflation rate; Fiscal policy; VAR model; FEVD; IRF

INTRODUCTION

The explosion of the pandemic of COVID-19 in 2020 had a huge negative impact on the operation of the production of garment textiles, footwear, travel goods, and bicycles, especially the effect on agricultural and tourism sector that determined as the core sources of economic growth in Cambodia. As a result, a real GDP growth rate was projected to be at a negative of 3.1 percent. Despite the economy has rebounded back in 2021, yet the recovery was considered as slow due to the spread of the disease. At the second and third quarter of the year, the rate of growth of the economy was estimated to be 2.2 percent. Due to relaxation of travel restriction set by the Royal Government of Cambodia in 2022, the economic growth rate was predicted to be 4.5 percent (World Bank, 2021).

Prior to the COVID-19 pandemic, in the last ten years (2010-2019), Cambodia's average real output growth rate was about 7 percent. At the same time, the inflation rate was around 3 percent based on year-on-year percentage change of the consumer price index of all consumption goods (Asian Development Bank, 2021). The rate remained stable at 2.9 percent between 2020 and 2021 and expected to decline to 2.7 percent in 2022. This was regarded as low as compared to the ASEAN nations. (Asian Development Bank, 2022). The accomplishment of a sustainable economic growth and price stability is not an easy task to be achieved by the government of a nation. Over the period of more than two decades, Cambodia has made a robust economic performance (International Monetary Fund, 2021). The measurement of macroeconomic stability can be assessed through the stability of economic growth, exchange rate, and price level. Macroeconomic policy is generally implemented by the government in order to boost economic activities, improve social welfare, especially keeping inflation rate as low as possible (United Nations, 2012). Price stability can be achieved via the use of monetary policy, or fiscal policy, or the mixed up of both policies. In a highly dollarized economy, the National Bank of Cambodia (NBC) conducts a monetary policy by mainly using "US Dollar Auction," which is considered as a process of buying or selling US Dollar in the domestic foreign exchange market to manage money supply in the economy, while fiscal policy is carried out by the Ministry of Economy and Finance (MEF) aiming to control government budget, tax revenues, government expenditures, and public debt. The study of the effectiveness of monetary policy on price levels was done by Siphat (2010) using a reduced-form Vector Autoregressive (VAR) model of three variables: narrow based money (M1), nominal exchange rate, and consumer price index. This research paper is an expanded version by employing a Structural VAR (SVAR) model over four key macroeconomic variables, real gross domestic

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product, broad money (M2), foreign exchange, and price level. The objective of this research is to evaluate the performance of monetary policy on output and inflation. The mixed of monetary and fiscal policy was implemented by Luyna and Ravin (2011) to investigate how inflation rate and real GDP response to the shock of money supply and government expenditure by adopting VAR model of five indicators including government purchase, monetary aggregate, exchange rate, price level, and gross domestic product. To analyze further, the short and long run relationship between consumer price index, exchange rate, money supply, and government expenditure, especially to measure the speed of adjustment how fast price level adjust back to equilibrium owning to fiscal and monetary policy shock, a Vector Error Correction Model (VECM) was employed by Siphat and Dash (2021). In the absence of monetary policy, the study of the effectiveness of fiscal policy on inflation rate has not yet been conducted in Cambodia, Thus, the main purpose of this research is to seek an answer to the research question, "Does fiscal expansionary cause general price level to increase in Cambodia?"

LITERATURE REVIEW

A good fiscal management associated with the management of government expenditure, tax revenues and public debt, was one of the key successes in controlling general price level in the country (Sims, 1998). The assumption of fiscal theory was applied to learn about the behavior of fiscal and inflation variable, whether it was a Ricardian or Non-Ricardian behavior. The estimated result of a study created a mixed outcome that the US data were more in line with a non-Ricardian behavior over some period of time as indicated by Cochrane (1998) and Woodford (1998). In contrast, it found to be in line with a Ricardian behavior based on research studied by Canzoneri et al. (2002) and it was consistence with research conducted by Afonso (2002) in European Union.

Five macroeconomic variables, government spending, taxes, real output, price level, and 3-months interest rates of five OECD countries, the United States of America, the United Kingdom, West Germany, Canada and Australia, were integrated in a VAR model to investigate the effect of fiscal policy on price level and output using quarterly time series data between 1961: Q1 and 2002: Q2. The result of the study showed that fiscal expansionary had a positive impact of price level (Perotti, 2002). The model was replicated using US macroeconomic data, private consumption, total government expenditure, total government revenue, private residential investment, private non-residential investment, interest rate, adjusted reserves, producer price index of crude materials, and GDP deflator, over the period between 1955: Q1 and 2000: Q4. During the period of the study, the link between fiscal policy and inflation rate was weak (Mountford & Uhlig, 2002). Research conducted by Fatas and Mihov (2002) figured out the way to close the gap between the empirical research and the theory by integrating a Ricardian equivalence over an overlapping generations model connecting with two main assumption, imperfect competition and sticky prices. The gap was closed and the result of this research was consistence with Perotti.

The measurement of inflation volatility in OECD countries including Austria, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Ireland, Italy, Japan, the Netherlands, Spain, Sweden and the United States was done using the panel data from 1967 to 2001. The volatility of inflation rate was defined to be a function of seven macroeconomic variables. The empirical result based on Fixed Effect (FE) and Generalized Least Squares (GLS) using estimated cross-section residual variances as weights method showed that fiscal shock had a significant positive impact on the standard deviation of inflation rate in six OECD nations (Rother, 2004). As indicated by the estimated result of a VAR model in Spain proofed that the domestic output could be increased by fiscal expansionary, but at higher cost of inflation (Castro & Cos, 2008). Shaheen and Turner (2010) came up with similar research results for Pakistan's fiscal policy. Nonetheless, these authors point out a shortcoming of the SVAR method, stating that the findings from a SVAR model may lose accuracy over longer time horizons and should be regarded with caution. The SVAR technique was also utilized to examine the effects of fiscal policy in certain middle-income and developing nations. One of the most common methodologies in assessing the effectiveness of fiscal policy was developed by Blanchard and Perotti (2002) by employing SVAR model. This technique was replicated by Gnip (2013) to evaluate the stability of fiscal policy in Croatia by integrating seven macroeconomic variables: output, prices, interest rates, private consumption, private investment, employment and wages in a SVAR model. Quarterly time series data were employed between

1996: Q1 and 2011: Q4. The empirical result of this paper showed that government expenditure had a negative impact of price level in Croatia.

The empirical investigation on the effectiveness of fiscal policy in Nigeria using Autoregressive Distributed Lag (ARDL) model over the period between 1980 and 2017 showed that government spending on capital recurring had a negative significant impact on the change in the general price level. Moreover, inflation rate was being affected by exchange rate change (Dikeogu, 2018). The variation of money supply was explained mainly by the variation of exchange rate and inflation rate regarding the empirical result generated from a VECM using quarterly data over the period between 1991 and 2018 of four economic indicators: government expenditures, exchange rate, inflation rate, and broad money (Yasin et al., 2020). The assessment of the mix between monetary and fiscal policy was conducted in Bangladesh. The analysis based on VECM model of five key economic variables: gross domestic product, government purchase, monetary aggregate, interest rate, and price level during the period between 1980 and 2018. As indicated by the estimated result of long-run equation, price stability can be accomplished through a tighten control on government spending and money supply (Ahmmed, 2020).

METHODOLOGY

One of the most famous systems of equation models created by Sims (1980) known as Vector Autoregressive (VAR) model is generally employed in order to study the interrelationship between macroeconomic variables. This research is trying to seek answer to a research question, "Does fiscal expansionary cause general price level to increase in Cambodia?" To fulfill the main objective of the study, three time series variables including consumer price index (CPI), nominal exchange rate (EXC), and government expenditure (GEXP), are integrated together in the VAR model. The model specification is presented in equation (1) below:

$$lnCPI_t = \beta_{10} + \sum_{i=1}^{p} \beta_{11i} lnCPI_{t-i} + \sum_{i=1}^{p} \beta_{12i} lnEXC_{t-i} + \sum_{i=1}^{p} \beta_{13i} lnGEXP_{t-i} + \varepsilon_{1t}$$

$$lnEXC_t = \beta_{20} + \sum_{i=1}^{p} \beta_{21i} lnCPI_{t-i} + \sum_{i=1}^{p} \beta_{22i} lnEXC_{t-i} + \sum_{i=1}^{p} \beta_{23i} lnGEXP_{t-i} + \varepsilon_{2t} \qquad (1)$$

$$lnGEXP_t = \beta_{30} + \sum_{i=1}^{p} \beta_{31i} lnCPI_{t-i} + \sum_{i=1}^{p} \beta_{32i} lnEXC_{t-i} + \sum_{i=1}^{p} \beta_{33i} lnGEXP_{t-i} + \varepsilon_{3t}$$

Where β_{ij} are parameter to be estimated and ε_{it} is a vector of error terms which assumed to be i.i.d. All variables in the system are equipped by natural logarithm to make it become continuous. The first difference of each data series is interpreted as growth rate. Before analyzing the model, the unit root test is performed using Augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1979) test to all data series in the system to check whether it is stationary on non-stationary. If the result of the test shows that the series is non-stationary or has unit root, it will be transformed to be first difference and the test is re-performed again. After solving problem of unit root, the next step is the determination of the optimal lags length of the model using Information Criteria (IC). The lower the IC, the better the model.

The ADF test can be performed by running the following regression:

$$\Delta Y_t = \omega_1 + \omega_2 t + \delta Y_{t-1} + \vartheta_i \sum_{i=1}^{m} \Delta Y_{t-i} + \epsilon_t \qquad (2)$$

where Y_t indicates both dependent and independent variables, t represents time trend, ϵ_t is a pure white noise error term, ΔY_t is the first different, and ω_1, ω_2, δ, ϑ_i are coefficients. If δ=0, the tested variable has a unit root which is non-stationary (Enders, 2004). Then, to avoid the autocorrelation of the error term, ϵ_t, in equation (2); Maximum Likelihood method should be applied to estimate the model. The log-likelihood function can be expressed as follow:

$$log(L) = -\frac{(n-p)m}{2} log(2\pi) - \frac{n-p}{2} log(det(\Omega)) - \frac{1}{2} \sum_{t=p+1}^{n} \left(Y_t - \alpha - \sum_{j=1}^{p} \Phi_j Y_{t-j}\right) \Omega^{-1} \left(Y_t - \alpha - \sum_{j=1}^{p} \Phi_j Y_{t-j}\right) \qquad (3)$$

where Ω is the covariance matrix which can be estimated by $\hat{\Omega} = \frac{1}{n-p} \sum_{t=p+1}^{n} \epsilon_t \epsilon_t'$, n is number of observations, p is the number of lags, m is number of variables, det is determinant. The optimal lags of the model is determined by using Akiake Information Criteria (AIC) (Heij et al., 2004).

$$AIC(p) = log\left(det(\hat{\Omega}_p)\right) + 2\frac{pm^2}{n} \qquad (4)$$

At the same time, before making any future prediction, the stability test is employed.

Consider a simple VAR model with two variables y and z:

$$y_t = a_{11}y_{t-1} + a_{12}z_{t-1} + \varepsilon_{yt} \qquad (5)$$

$$z_t = a_{21}y_{t-1} + a_{22}z_{t-1} + \varepsilon_{zt} \qquad (6)$$

where ϵ_{yt} and ϵ_{zt} are white-noise disturbance that may be correlated with each other and, for simplicity, intercept terms have been ignored. Using lag operators (L), we can write (5) and (6) as

$$(1 - a_{11}L)y_t - a_{12}Lz_t = \varepsilon_{yt} \qquad (7)$$

$$-a_{21}Ly_t + (1 - a_{22}L)z_t = \varepsilon_{zt} \qquad (8)$$

The next step is to solve for y_t and z_t. Writing the system in matrix form we obtain

$$\begin{bmatrix} (1-a_{11}L) & -a_{12}L \\ -a_{21}L & (1-a_{22}L) \end{bmatrix} \begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix} \qquad (9)$$

Using Cramer's Rule or matrix inversion, we can obtain the solutions for y_t and z_t as

$$y_t = \frac{(1-a_{22}L)\varepsilon_{yt} + a_{12}L\varepsilon_{zt}}{(1-a_{11}L)(1-a_{22}L) - a_{12}a_{21}L^2} \qquad (10)$$

$$z_t = \frac{a_{21}L\varepsilon_{yt} + (1-a_{11}L)\varepsilon_{zt}}{(1-a_{11}L)(1-a_{22}L) - a_{12}a_{21}L^2} \qquad (11)$$

Note that both variables have the same inverse characteristic equation:

$(1-a_{11}L)(1-a_{22}L) - a_{12}a_{21}L^2$. Setting $(1-a_{11}L)(1-a_{22}L) - a_{12}a_{21}L^2 = 0$

and solving for L yields the two roots of the inverse characteristic equation. In order to

$$\lambda^2 - (a_{11} + a_{22})\lambda + (a_{11}a_{22} + a_{12}a_{21}) = 0 \qquad (12)$$

work with the characteristic roots (as opposed to the inverse characteristic roots), define $\lambda = 1/L$.

Since the two variables have the same characteristic equation, the characteristic roots of (12) determine the time part of both variables. If both characteristic roots (λ_1, λ_2) lie inside the unit circle, (10) and (11) yield stable solution for y_t and z_t, the system is stable (Enders, 2014).

After that, impulse response function which represents the impact of one variable to another variable is derived. Just as an autoregressive has a moving average representation, a vector autoregression can be written as a vector moving average (VMA). In fact, equation (5) and (6) are the VMA that the variable (i.e., y_t and z_t) are expressed in terms of the current and past values of the two types of shock (i.e., e_{1t} and e_{2t}). The VMA representation is an essential feature of Sim's (1980) methodology in that it allows you to trace out the time path of the various shocks on the variable contained in the VAR system. For illustrative purposes, continue to use the two-variable VAR in matrix form,

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \qquad (13)$$

equation (13) can be written as

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}^i \begin{bmatrix} e_{1t-i} \\ e_{2t-i} \end{bmatrix} \qquad (14)$$

where $\bar{y} = [a_{10}(1-a_{22}) + a_{12}a_{20}]/(1-a_{11})(1-a_{22}) - a_{12}a_{21}$ and

$$\bar{z} = [a_{20}(1-a_{11}) + a_{21}a_{10}]/(1-a_{11})(1-a_{22}) - a_{12}a_{21}$$

Equation (14) expresses y_t and z_t in terms of the {e_{1t}} and {e_{2t}} sequences. However, it is insightful to rewrite (14) in terms of the {ϵ_{yt}} and {ϵ_{zt}} sequences. However, the vector of errors can be written as

$$\begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} = \frac{1}{1 - b_{12}b_{21}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix} \qquad (15)$$

Equation (13) and (14) can be combined to form

$$\begin{bmatrix} y_t \\ z \end{bmatrix} = \begin{bmatrix} \bar{y}_t \\ \bar{z}_t \end{bmatrix} + \frac{1}{1 - b_{12}b_{21}} \sum_{i=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}^i \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{yt-i} \\ \varepsilon_{zt-i} \end{bmatrix} \qquad (16)$$

Since the notation is getting unwieldy, we can simplify by defining the 2.2 matrix ϕ_i with elements $\phi_{jk}(i)$

$$\phi_i = \frac{A_1^i}{1 - b_{12}b_{21}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \qquad (17)$$

Hence, the moving average representation of (14) and (15) can be written in term of the {ϵ_{yt}} and {ϵ_{zt}} sequences:

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} \phi_{11}(i) & \phi_{12}(i) \\ \phi_{21}(i) & \phi_{22}(i) \end{bmatrix} \begin{bmatrix} \varepsilon_{yt-i} \\ \varepsilon_{zt-i} \end{bmatrix} \qquad (18)$$

or, more compactly,

$$x_t = \mu + \sum_{i=0}^{\infty} \phi_i \varepsilon_{t-i} \qquad (19)$$

where $\mu = [\bar{y} \quad \bar{z}]'$.

The moving average representation is an especially useful tool to examine the interaction between the {y_t} and {z_t} sequences. The coefficients of ϕ_i can be used to generate the effects of {ϵ_{yt}} and {ϵ_{zt}} shocks on the entire time paths of the {y_t} and {z_t} sequences.

The notation clears that the four elements $\phi_{jk}(0)$ are impact multipliers. For example, the coefficient $\phi_{12}(0)$ is the instantaneous impact of a one-unit change ϵ_{zt} and y_t. In the same way, the elements $\phi_{11}(0)$ and $\phi_{12}(0)$ are the one-period responses of unit changes in ϵ_{yt-1} and ϵ_{zt-1} on y_t, respectively. Updating by one period indicates that $\phi_{11}(0)$ and $\phi_{12}(0)$ also represent effects of unit changes in ϵ_{yt} and ϵ_{zt} on y_{t+1} .

The accumulated effects of unit impulses in ϵ_{yt} and/or ϵ_{zt} can be obtained by the appropriate summation of the coefficients of the impulse response functions. For example, after n periods, the effect of ϵ_{zt} on the value of y_{t+n} is $\phi_{12}(n)$. Thus, after n periods, the cumulated sum of the effects of ϵ_{zt} on the $\{y_t\}$ sequence is

$$\sum_{i=0}^{n} \phi_{12}(i)$$

Letting n approach infinity yields the long-run multiplier. Since the $\{y_t\}$ and $\{z_t\}$ sequences are assumed to be stationary, it must be the case that for all j and k,

$$\sum_{i=0}^{\infty} \phi_{jk}^2(i) \text{ is finite}$$

The four sets of coefficients $\phi_{11}(i)$, $\phi_{12}(i)$, $\phi_{21}(i)$ and $\phi_{22}(i)$ are called the impulse response functions. Plotting the impulse response functions [i.e., plotting the coefficients of $\phi_{jk}(i)$ against i] is a practical way to visually represent the behavior of the $\{y_t\}$ and $\{z_t\}$ series in response to the various shocks (Enders, 2014).

Given the estimated result of the VAR model, the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) are created to analysis the interrelationship of all variables in the system. The period of the study is between March 2007 and December 2021. All data are collected from the International Financial Statistics (IFS) of the International Monetary Fund (IMF).

EMPIRICAL RESULT

The first part of this section represents descriptive statistics. The Augmented Dickey-Fuller (ADF) Unit Root test of all data series is shown in the second part. The predicted results generated from VAR model, Forecast Error Variance Decomposition (FEVD) and Impulse Response Function (IRF), are conducted in the third part of this section.

Table 1: Descriptive Statistics

	DLNCPI	DLNEXC	DLNGEXP
Mean	0.362361	0.007466	1.897713
Median	0.283494	0.001457	5.021147
Maximum	7.949397	1.856259	167.5309
Minimum	-4.009501	-3.077166	-244.1769
Std. Dev.	1.018660	0.545710	70.90159
Skewness	2.199665	-0.746808	-1.005058
Kurtosis	22.99151	8.396623	5.479566
Jarque-Bera	3107.691	232.5454	75.56704
Probability	0.000000	0.000000	0.000000
Sum	64.50019	1.328922	337.7930
Sum Sq. Dev.	183.6672	52.71047	889785.4
Observations	178	178	178

Over the period of the study, between March 2007 and December 2021, totally, there were 178 observations, monthly average, minimum, maximum, and standard deviation of inflation rate are 0.36 percent, -4.01 percent, 7.95 percent, and 1.02 percent respectively. The average growth rate of exchange rate is 0.007 percent per month with 0.54 percent monthly volatility. The minimum rate change is -3.08 percent, while the maximum growth rate is 1.86 percent. The monthly average growth rate of government expenditure is 1.90 percent. The standard deviation is 70.90 percent. The minimum and maximum monthly growth rate of government expenditure are -244.18 percent and 167.53 percent respectively. Regarding the result of the Jarque-Bera test, the null hypothesis that each data series is normally distributed is highly rejected since the probability of the calculated Jarque-Bera is less than 1 percent.

Table 2: ADF Unit Root Test

Null Hypothesis: The variable has a unit root

		At Level		
		LNCPI	LNEXC	LNGEXP
With Constant	t-Statistic	-3.1470	-2.9045	-1.1155
	Prob.	0.0251	0.0470	0.7092
		**	**	n0
With Constant & Trend	t-Statistic	-8.7572	-3.0133	-2.2342
	Prob.	0.0000	0.1318	0.4672
		***	n0	n0
Without Constant & Trend	t-Statistic	2.8589	0.2155	4.8148

	Prob.	0.9990	0.7477	1.0000
		n0	n0	n0
	At First Difference			
		d(LNCPI)	**d(LNEXC)**	**d(LNGEXP)**
With Constant	t-Statistic	-5.9629	-9.0576	-14.2745
	Prob.	**0.0000**	**0.0000**	**0.0000**
		***	***	***
With Constant & Trend	t-Statistic	-6.2853	-9.0392	-14.2815
	Prob.	**0.0000**	**0.0000**	**0.0000**
		***	***	***
Without Constant & Trend	t-Statistic	-6.5326	-9.0812	-5.2244
	Prob.	**0.0000**	**0.0000**	**0.0000**
		***	***	***

Notes:
a: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values

There are three ADF test models, model with constant, model with constant and trend, and model without constant and trend. At level, for LNCPI, the null hypothesis that the series variable has a unit root is rejected regarding the result of ADF test model with constant and model with constant and trend at 5 percent and 1 percent level of significance respectively. In contrast, the null hypothesis stated that LNCPI is non-stationary is failed to be rejected at 5 percent as indicated by ADF model without constant and trend. LNEXC is stationary based on ADF model with constant at 5 percent level, but LNEXC has a unit root based on the model with constant and trend and without constant and trend. LNEXP is non-stationary because the null hypothesis of all ADF test of the three models are rejected at 5 percent level. However, at first difference, DLNCPI, DLNEXC, and DLNGEXP, are all stationary at highly significant of 1 percent level as indicated by the three models of ADF test in Table 2. In order to avoid spurious regression result, the three endogenous variables are transformed to be first difference before running VAR model. The optimal lag lengths of the model is relied on the estimated result of Akaike Information Criterion (AIC). The lower the AIC, the better the model is.

Table 3: VAR Lag Order Selection Criteria

Endogenous variables: DLNCPI DLNEXC DLNGEXP
Exogenous variables: C
Sample: 2007M03 2021M12
Included observations: 174

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1374.702	NA	1513.256	15.83565	15.89012	15.85774
1	-1288.770	167.9124	625.0122	14.95138	15.16924	15.03976
2	-1249.195	75.96547	439.8538	14.59994	14.98121*	14.75461
3	-1231.519	33.32121	398.2033	14.50021	15.04488	14.72116
4	-1214.403	31.67363*	362.9035*	14.40693*	15.11500	14.69417*

* Indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The estimated result of the VAR lag order selection criteria in Table 3 revealed that the lowest value of AIC is at lag four, thus, the optimal lag length of the VAR model is four. Using Ordinary Least Square (OLS) estimation method, the estimated parameters of the VAR model is presented in Table 4. The main objective of the predicted sample parameters of the model is not for interpretation purpose since all of the endogenous variables in the system explained each other due to its own lags, but the results are employed in order to generate future forecast as such forecast error variance decomposition and impulse response function. The reliability of the model in making future prediction is depend on the level of stability of the model, therefore, the stability test is performed.

Table 4: Vector Autoregression Estimates

Sample (adjusted): 2007M07 2021M12
Included observations: 174 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DLNCPI	DLNEXC	DLNGEXP
DLNCPI(-1)	0.463227	0.019424	-3.850197
	(0.07681)	(0.04949)	(4.31910)
	[6.03045]	[0.39252]	[-0.89143]
DLNCPI(-2)	0.178755	-0.008092	4.293186
	(0.08283)	(0.05336)	(4.65707)
	[2.15821]	[-0.15165]	[0.92186]
DLNCPI(-3)	-0.027765	-0.035074	8.904423
	(0.08170)	(0.05264)	(4.59403)
	[-0.33983]	[-0.66634]	[1.93826]
DLNCPI(-4)	-0.111038	0.081601	2.143486
	(0.07456)	(0.04803)	(4.19216)
	[-1.48930]	[1.69890]	[0.51131]
DLNEXC(-1)	-0.312995	0.361927	-5.147574
	(0.12377)	(0.07973)	(6.95910)

	[-2.52891]	[4.53921]	[-0.73969]
DLNEXC(-2)	0.020866	-0.192733	24.39289
	(0.13328)	(0.08586)	(7.49377)
	[0.15657]	[-2.24475]	[3.25509]
DLNEXC(-3)	-0.159283	0.058208	2.681160
	(0.13631)	(0.08781)	(7.66417)
	[-1.16857]	[0.66287]	[0.34983]
DLNEXC(-4)	-0.357508	-0.050485	-7.119083
	(0.12714)	(0.08191)	(7.14891)
	[-2.81187]	[-0.61636]	[-0.99583]
DLNGEXP(-1)	0.002742	0.001808	-1.113008
	(0.00137)	(0.00088)	(0.07678)
	[2.00768]	[2.05505]	[-14.4961]
DLNGEXP(-2)	0.006512	0.001576	-0.877084
	(0.00195)	(0.00125)	(0.10947)
	[3.34493]	[1.25670]	[-8.01193]
DLNGEXP(-3)	0.005569	-3.64E-05	-0.566652
	(0.00191)	(0.00123)	(0.10739)
	[2.91579]	[-0.02959]	[-5.27676]
DLNGEXP(-4)	0.002287	-0.001331	-0.275203
	(0.00132)	(0.00085)	(0.07397)
	[1.73870]	[-1.57053]	[-3.72068]
C	0.144092	-0.018969	0.885044
	(0.06581)	(0.04239)	(3.70016)
	[2.18962]	[-0.44744]	[0.23919]
R-squared	0.423914	0.214407	0.639526
Adj. R-squared	0.380976	0.155853	0.612659
Sum sq. resids	99.39780	41.25258	314250.3
S.E. equation	0.785734	0.506189	44.17992
F-statistic	9.872668	3.661725	23.80289
Log likelihood	-198.1818	-121.6726	-899.2987
Akaike AIC	2.427377	1.547961	10.48619
Schwarz SC	2.663398	1.783982	10.72221
Mean dependent	0.338240	0.004670	1.525810
S.D. dependent	0.998669	0.550939	70.98688
Determinant resid covariance (dof adj.)		292.3574	
Determinant resid covariance		231.6029	
Log likelihood		-1214.403	
Akaike information criterion		14.40693	
Schwarz criterion		15.11500	

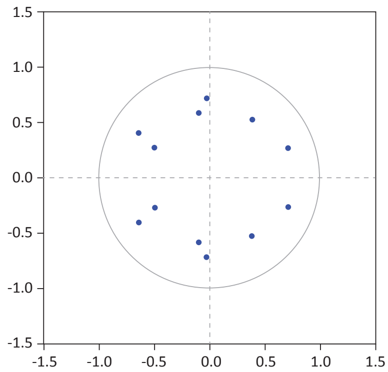

Figure 2: Inverse Roots of AR Characteristic Polynomial

All of the inverse roots of AR characteristic polynomial lie inside the unit circle which can be concluded that the VAR model is stable and the future prediction of all variables in the system are made. The forecast of the variation of one variable which caused by the variation of other variables in the model is conducted using FEVD.

In the first month of the FEVD result, the variation of inflation rate in Cambodia is 100 percent caused by the variation of itself. In the second month, about 2.47 percent and 1.85 percent of the variation of the percentage change of exchange rate and growth rate of government expenditure, respectively, explained the movement of consumer price index. In the third and fourth period, the variation of inflation rate is explained more by the variation of government expenditure than it is caused by the variation of exchange rate change, 5.27 percent of DLNGEXP versus 3.20 percent of DLNEXC in the third month, and 5.56 percent of DLNGEXP versus 4.47 percent of DLNEXC in the fourth month. Between the fifth and twelfth period, the variation of inflation rate caused by the percentage change of exchange rate and the growth rate of government expenditure of no more than 14 percent and 6 percent, respectively. As indicated by this result, it can be summarized that the price is sticky in Cambodia.

Table 5: Forecast Error Variance Decomposition

Variance Decomposition of DLNCPI:				
Period	S.E.	DLNCPI	DLNEXC	DLNGEXP
1	0.785734	100.0000	0.000000	0.000000
2	0.878034	95.67137	2.477724	1.850907
3	0.946872	91.53075	3.203969	5.265284
4	0.969715	89.97049	4.473138	5.556374
5	0.996343	85.34310	9.392652	5.264243
6	1.011030	82.88659	11.94366	5.169751
7	1.018024	81.78219	13.09807	5.119742

8	1.021421	81.33279	13.56015	5.107057
9	1.022567	81.34566	13.55867	5.095672
10	1.023470	81.33414	13.55407	5.111786
11	1.024059	81.31795	13.57214	5.109904
12	1.024476	81.30962	13.58425	5.106125
Cholesky Ordering: DLNCPI DLNEXC DLNGEXP				

In order to have an in-depth study, the response of inflation rate shock to the percentage change of exchange rate and the growth rate of government expenditure, the impulse response function (IRF) is developed from the estimated of the VAR model presented in Table 4 above. The predicted result of the IRF is shown in Figure I below. From the first period to the mid of the third three period in the future, the increase of the growth rate of government expenditure has a positive shock on inflation rate. In contrast, between the mid of the third period and the mid of the fifth period, the response of inflation rate to government expenditure shock become negative and die out and it exhibit a cyclical pattern from the mid of the fifth period onward. At the same period of time, the response of the percentage changes of consumer price index to the percentage changes of exchange rate are negative from the beginning of the first period to the ending of the ninth period and die out, thereafter, the shocks become slightly positive between the tenth and twelfth period. As revealed by these shocks over the period of the study, it could be described that exchange rate depreciation would cause inflation rate to rise.

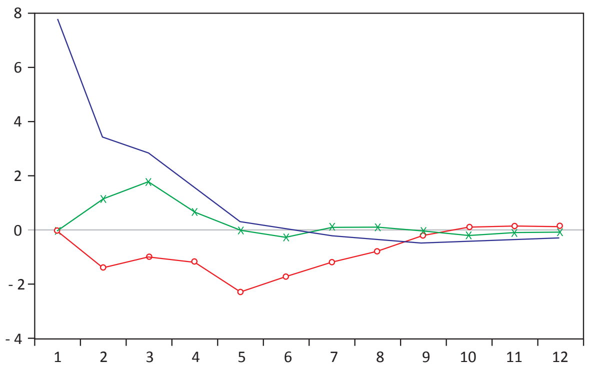

Figure 2: Response of DLNCPI to Cholesky One S.D. Innovations

CONCLUSION

The inter-relationship of three macroeconomic variables, consumer price index, nominal exchange rate, and government expenditure, have been put into analysis in a system of equation known as VAR model. The total number of time period is 178 data point between March 2007 and December 2021. All data series in the system are stationary at first difference since each null hypothesis of ADF test stated that a series has a unit root is highly rejected at 1 percent significance level. The optimal lag length of the model is determined based on the Akaike Information Criterion and the lowest value of the criterion is generate at four lags.

The variation of inflation rates in Cambodia over the period of this research are mainly caused by the variation of itself about 96 percent in the short-run and reduced to around 81.31 percent in the long-run which is the characteristic of sticky price or it can be concluded that the price is sticky in Cambodia. In the short period, the percentage change of exchange rate caused no more than 5 percent of the variation of inflation rate, but in the long-term the effect has reached 13.58 percent. From the short to the long term, the variation of inflation rate caused by the percentage change of government expenditure has no greater than 6 percent considered as low as compare to the percentage change of exchange rate.

The response of inflation rate to the percentage change of government expenditure shock is positive in the short-run, but become negative in the long run. The effect die out in the fifth period and exhibit slightly movement around zero or mean until the last period. In contrast, from the short term to the long-term period, the response of the percentage change of consumer price index to the percentage change of exchange rate is negative. In conclusion, the government has to be careful in executing the budget, especially in the short-run since it has a negative impact on price level in the country, despite the variation of inflation rate is caused less by the variation of government expenditure, but the response of the shock is positive. Since Cambodia is classified as a highly dollarized economy, under the context of macroeconomic policies, price stability might have been accomplished through the stabilization of exchange rate that aim to be under the control of the central bank using monetary policy. One of the best strategies considered as the most effective strategy in controlling exchange rate movement is "US Dollar Auction" which is a process of buying or selling US Dollar in domestic foreign exchange market by the central bank using international reserve. US Dollar will be sold to money exchanger in the way of auction conducted at the central bank, if the policymakers of the monetary policy committee observed that the Riel is deprecate against US Dollar in domestic foreign exchange market, while the buying process is taken place, if the Riel considered to be appreciated a lot and breach the threshold.

This research uses the reduced-form VAR model, which revealed just only the impact of one variable to other variables in the system through the lags of itself, and the lags of other variables, but it does not take into account the contemporaneous impact of the variables in the model which might occur at the same period of time. Therefore, in order to expand this research in more detail in the future, a Structural VAR (SVAR) model should be applied.

REFERENCES

Ahmmed, S. (2020). Cyclical fluctuation, growth, and stabilization: An empirical investigation of dual policy objectives in Bangladesh. *Journal of Economics and Business, 3*(4), 1304-1315.

Asian Development Bank (2021). *Key Indicators for Asia and the Pacific 2021.* Asian Development Bank.

Asian Development Bank (2022, March 3). Economic indicators for Cambodia. https://www.adb.org/countries/cambodia/economy

Afonso, A. (2002). Disturbing the fiscal theory of the price level: Can it fit the EU-15?" Working paper 2002/1, Department of Economics at the School of Economics and Management (ISEG), Technical University of Lisbon.

Blanchard, O., & Perotti, R. (2002). An empirical characterization of the dynamic effects of changes in government spending and taxes on output. *Quarterly Journal of Economics, 117*(4), 1329-68.

Castro, F., & Cos, P. H. (2008). The economic effects of fiscal policy: The case of Spain. *Journal of Macroeconomics,* 30, 1005–28.

Canzoneri, M., Cumby, R. E., & Diba, B. (2002). *Should the European Central Bank and the Federal Reserve be concerned about fiscal policy?* Mimeo, Georgetown University.

Cochrane, J. (1998). A frictionless view of U.S. inflation. *NBER Macroeconomics Annual, 13*, 323–384.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association, 74*, 427-431.

Dikeogu, C.C. (2018). Public spending and inflation in Nigeria. *International Journal of Advanced Academic Research. Social and Management Sciences, 4*(12), 52-66.

Enders, W. (2014). *Applied Econometric Time Series.* 4th Edition. John Wiley.

Fatas, A., & Mihov, I. (2002). *The effects of fiscal policy on consumption and employment: Theory and evidence.* Mimeo, INSEAD.

Gnip, A. G. (2013). *Empirical assessment of stabilization effects of fiscal policy in Croatia.* Working paper series by University of Zagreb.

Heij, C., de Boer, P., Hans Franses, P., Kloek, T., & van Dijk, H. (2004). *Econometric Methods with Applications in Business and Economics.* Oxford University Press.

International Monetary Fund (2021). *Cambodia: 2021 Article IV Consultation-Press Release; and Staff Report*. International Monetary Fund.

Lim, S. (2010). *Money, exchange rate and price level in Cambodia: A Vector Autoregressive analysis.* Master Independent Study, Thammasat University, Thailand.

Lim, S. (2011). Dollarization and the effectiveness of monetary policy in Cambodia. Faculty of Economics, Thammasat University.

Luyna, U., & Ravin, C. (2011). The effectiveness of macroeconomic policies in Cambodia: An empirical investigation. Faculty of Economics, Thammasat University.

Mountford, A., & Uhlig, H. (2002). *What are the effects of fiscal policy shocks?* CEPR discussion paper 3338.

Perotti, R. (2002). Estimating the effects of fiscal policy in OECD countries. Forthcoming in conference volume, International Seminar on Macroeconomics, James Stock and Lars Svensson, eds., NBER.

Rother, Philipp C. (2004). *Fiscal policy and inflation volatility.* European Central Bank Working Paper 317.

Shaheen, R., & Turner, P. (2010). *Measuring the dynamic effects of fiscal policy shocks in Pakistan.* 25th Agm Pide Pakistan.

Sims, C. A. (1980). Macroeconomics and reality, *Econometrica, 48*, 1–48.

Sims C. (1998). Econometric implications of the government budget constraint. *Journal of Econometrics, 83*, 9-19.

Siphat, L., & Dash, T. R. (2021). The Effectiveness of macroeconomic policies on the price level in Cambodia: A Vector Error Correction Model. *International Journal of Economics and Management, 15*(3), 449-462.

United Nations (2012). *Macroeconomic stability, inclusive growth and employment.* United Nations.

World Bank (2021). *Cambodia Country Economic Update,* December 2021: Living with COVID-19. World Bank Group.

Woodford, M. (1998), Comment on 'A frictionless view of U.S. inflation' by John Cochrane." *NBER Macroeconomics Annual*, *13*, 390–419.

Yasin, A., Yasin, A., & Samuel, Olayemi O. (2020). Impact of sub-economic on money supply in Nigeria: An Autoregressive Distribution Lag (ARDL) approach. *Journal of Statistics, 10*(3), 375.