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# Steady State Growth of Vietnam Economy

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## Abstract

The paper estimates the steady state economic growth rate of Vietnam, defined as the equilibrium that the economy converge without new shocks. The method employs a bayesian structural vector autoregressive model (BSVAR) which captures the Triffin policy trilemma at international financial integration. On a quarterly sample over Q2/2008-Q4/2019, the evidence records that the steady state growth based on Minnesota prior is 6.13%. This result is robust by normal-diffuse prior, normal-wishart prior and timely average method. For policy implication, the Vietnam government's objective of annual growth rate at 7% over 2021-2030 can only be attained for economic expansion periods.

*Key words:* Economic Growth; Vector Autoregression; Vietnam Economy.

JEL classification: E52; F21; F41.

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## 1. Introduction.

The steady state economic growth rate of GDP (Gross Domestic Products) plays a central role on economic development. On the neoclassical growth model (Solow, 1956; Swan, 1956), there exist an unique steady state of capital accumulation per effective unit of labor. At that point, the domestic output (GDP) grows with an exogenous rate of technology progress and labor force. Then, the steady state economic growth rate jointly with population growth rate determines the GDP per capita, a measure of living standard. Over the business cycle (Plosser, 1989), the steady state is the point that the economy would converge without new shock, thus, generating the balancing force to adjust the expansion and recession. Thus, the steady state economic growth rate is a signal for the market participants, such as investors and policy makers, to adjust their investment plan. In brief, the steady state economic growth rate is important for both academic research and policy discussion.

*The paper employs a quantitative model to estimate the steady state growth rate of Vietnam economy.*

We construct a time-series econometric model (BSVAR). A vector autoregression (VAR) model with a structural variance-covariance matrix (S - Structural) is estimated with Bayesian technique (B). This technique is appropriated to a sample of small size with only 47 observations over Q2/2008-Q4/2019 for Vietnam economy. The structure of model reflects the Triffin policy trilemma in the international finance among three objectives: independent monetary policy through the relationship between output growth and inflation, free capital mobility through the foreign direct investment (FDI) capital inflows and exchange rate management through the exchange rate fluctuation.

The evidence records that the steady state growth rate of Vietnam is 6.13%. This result, based on the Minnesota prior, is closed to the evidence by other methods, including normal-diffuse prior (6.09%), normal-wishart prior (6.06%) and averaged growth rate over time period (6.04%). Moreover, the fluctuation of economic growth is almost within the band +/- 1% of the steady state growth rate. For policy implication, the result can be a reference to assessing the feasibility of long-term target on recent economic social strategy of Vietnam government.

*The paper makes contributions on three important lines of research, including economic growth, macroeconomic fluctuations and international capital flows.*

Our paper belongs to the literature on the economic growth rate. On the neoclassical growth model, there exists an unique capital per effective unit of labor ratio at the steady state. At this equilibrium, the GDP grows with a growth rate as sum of technology progress and labor force growth rate. But the growth rate is exogenous, and is an ad-hoc assumption in the

neoclassical growth model. Extending these model, the endogenous growth model focuses on the source of technology progress. Aghion and Howitt (1992) shows that the economic growth is driven by the probability of successful innovation, which, in turn, is based on the research and development (R&D) expenditure. At the steady state, the economic growth is jointly determined by the distance to world technology frontier and the intensity of R&D activities. On other types of endogenous growth model, the economic growth rate is also originated by the accumulation of capital (AK model by Frankel (1962)), by the expansion of product varieties (Romer, 1992).

Our paper differs these papers by providing an alternative determination of steady state economic growth rate. We estimate the economic growth rate by a time-series model which captures the macroeconomic fundamentals of an open economy. Our evidence records that the economic growth rate is determined by the inflation rate, exchange rate and foreign capital inflows.

The paper is closely related to the literature on the macroeconomic fluctuations of Vietnam economy. Beside an updated sample up to Q4/2019, our paper contributes on the literature by including the exchange rate and foreign capital inflows.

Thanh et al (2000) employ a VAR model of three endogenous variables including economic growth, inflation rate and monetary supply to analyze the exchange rate (VND/USD). They show that the exchange rate affects the interaction of three endogenous variables. According to this set-up, the exchange rate is an exogenous variable, and is given outside the model. This approach is also employed by Nguyen et al (2017). These authors construct a VEC (Vector Error Correction) model with six endogenous variables including output, FDI, export, import, inflation and public investment. Their evidence records the existence of interrelationship across these macroeconomic variables.

Our paper complements to these papers by accounting for the role of exchange rate fluctuation on the economic growth rate. The exchange rate is endogenous within our model while it is exogenous in Thanh et al (2010) and even not mentioned in Nguyen et al (2017). By our set-up, the exchange rate is a macroeconomic fundamental variable. Then, their interaction with other fundamental variables determines the steady state economic growth rate.

The exchange rate is also mentioned in some other papers. Hang and Thanh (2010) use a VAR model of six endogenous variables, including inflation, output, money supply, interest rate, exchange rate and world oil price to access the determinants of inflation in Vietnam. Their result shows that the past experience and future expectation of households are crucial for the inflation. And the inflation rate is also determined by domestic rather than foreign

determinants. Also using a VAR model of Vietnam economy, Bhattacharya (2014) records that the inflation is driven by the fluctuation of exchange rate in the short-run, by the growth rate of domestic credit in the median-run and by the GDP growth rate in the long-run. The common feature of these two papers is the lack of foreign capital inflows on the macroeconomic set-up.

Our paper differs these two papers by showing that the foreign capital inflows are a key macroeconomic fundamental variable of Vietnam economy. This feature is grounded on the finding by Thanh et al (2019). Accordingly, the FDI can substitute for the trade openness on affecting the economic growth rate. Recently, Hung (2021) on the trade-off between the output and inflation in Vietnam. By a time-varying-coefficient (TVC-VAR) model, the author proves that the output growth rate is largely determined by the foreign capital inflows while the inflation rate is mostly driven by the domestic credit supply.

The paper also makes contribution on the cross-border capital flows. The foreign capital has a positive impact on the domestic economic growth by financing the domestic investment. Gourinchas and Jeanne (2013) construct a small open economy version of neoclassical growth model to show that an economy with a higher productivity growth rate tends to have a huge investment, then, to receive more capital inflows. By a large sample of both advanced and developing economies, Alfaro et al (2014) confirms this results by recording that a higher averaged growth rate of GDP per capita, a proxy for productivity growth rate, is associated with more net total capital inflows. But the positive impact of foreign capital inflows on the economic growth does not necessarily hold. For developing economies, this impact only works if the domestic economy has a high financial development level (Prasad et al, 2007). Only when the credit supply per GDP ratio is higher than its median level, the positive impact of foreign capital would be kicked off. But a higher economic growth rate can also be associated with huge outflows of capital. Hung (2020) constructs a theoretical model to show that a positive productivity shock can lead to accumulation of foreign safe assets, then, the outflows of capital. In another model by Coeurdacier et al (2015), the young agent borrows to consume with borrowing constraints, the middle-age agent works and saves, while the old agent only consumes. When the borrowing constraint become tighter, the borrowing by young agents reduces while the savings by middle-aged agents raises. For developing economies with a high economic growth rate combined with tight borrowing constraint, the high growth rate can be associated with huge savings, then, great capital outflows, which are difference between domestic savings and investment.

Our paper complements to these aforementioned papers by constructing an empirical model to account for the role of foreign capital inflows. The existence of foreign capital is

important so that it is considered as an endogenous variable which contributes to the stability of macroeconomic fundamentals. Then, the foreign capital can even affect the economic growth rate at the steady state of an open economy.

The paper is structured as following. After the introduction, the second section discusses the literature review. The third section presents the model, method and data. Then, the fourth section analyzes the estimated result on the steady state economic growth of Vietnam. And the fifth section concludes and discusses the policy.

## **2. Literature Review.**

The steady state economic growth rate can be quantified by various theoretical and empirical methods.

On the neoclassical growth model, the steady state is the equilibrium that the capital per effective unit of labor tends to converge at the long-run. Due to the set-up of model with concave production function, usually with a labor-augmented technology, the steady state is unique and globally stable (Galor, 1996). There are also alternative models in which there exists multiple equilibria at the steady state. Among them, the overlapping generations model (OLG), postulated by Samuelson (1958), exhibits the heterogeneity of age across agents. Diamond (1965) employs this class of model to prove the potential inefficiency of long-run capital accumulation. Matsuyama (2004) also builds up an OLG model to analyze the existence of two symmetric steady states, one with high capital accumulation level and one with low capital level. On the extended version of neoclassical growth model with uncertainty, the steady state is defined as the long-run equilibrium in which agents do not anticipate the effect of future shocks. This steady state can be solved by assuming small enough shocks, then taking first-order Taylor approximation of perfect-foresight path (Plosser, 1989). Recently, calling this long-run equilibrium as the deterministic steady state, Coeurdacier et al (2014) characterize a risky steady state. In particular, the risky steady state is the long-run equilibrium at which state variables stay constant in presence of expected future shocks and the innovations for these shocks turn out to be zero. And the associated method is numerical method, based on an system of equations formed by second-order Taylor expansion around expected future variables. This method is closed related to the one employed by Tille and Wincoop (2010) and Devereux and Sutherland (2010) on solving the dynamic stochastic general equilibrium (DSGE) model with portfolio choice.

The common feature of these models is that the economic growth rate is exogenous given outside the model. The growth rate can be introduced as a deterministic technology progress on the neoclassical growth model or as a stochastic technology progress on the DSGE

model. At steady state, the ratio of endogenous variables, such as output, consumption and capital, over total efficient units of labor grow with the same rate of technology progress. On other words, the growth rate of output is equal to the growth rate of technology progress. But the source of technology progress is unknown. This indetermination issue underlines the difficulty of computing the steady state economic growth rate.

The steady state economic growth rate can also be derived by the endogenous growth models, with a synthesis in Aghion and Howitt (2008). For AK model (Frankel, 1962), the economic growth rate is determined by the accumulation of capital across firms within the economy. For product variety model (Romer, 1990), the economic growth is attained by the expansion of new type of product which is new to the existing types of products. And for the Schumpeterian model, based on the principle of creative destruction, the economic growth rate is determined by the innovation process, including both invention of new technology and imitation of existing advanced technology. For macroeconomic perspective, the third model can be used to estimate the steady state economic growth rate. In particular, the steady state economic growth rate of an economy is its distance to world technology frontier multiplied by the frequency of innovation. The first item is exactly the ratio of technology level of leading economy compared with the level of an economy. And the second item is assumed on the model as an increasing, concave function of R&D expenditure.

But the computation of two items is also difficult on data. For the first item, the technology level can only be estimated indirectly such as by the method of Solow residual. This method, in turn, suffers from various issues such as the choice of initial capital stock, the share of capital over output, and the value of capital depreciation rate. For the second item, the concave function is an ah-hoc assumption, so that, there is not a consensus of function form in the data. Thus, the estimation of steady state economic growth based on theory is not so promising.

An alternative method for the steady state growth rate can be based on the data. This line of research is originated from the structural VAR model (Blanchard and Quah, 1989), which is based on the VAR model postulated by Sims (1980). Each macroeconomic variable can be affected by exogenous shocks from other variables. At the same time, these variables also interact with each other to form a structural model. When there is no new shocks, each macroeconomic variable tends to converge to its steady state. The fluctuation of each variable tends to be around the steady state: if it raises over (reduces below) the steady state, there is a pressure to push it down (up) to be at steady state. For the estimation, this approach first constructs a VAR model of economic growth and other variables, then, estimates the

coefficients, and finally, computes directly the steady state economic growth rate. Recently, Kohlscheen and Nakajima (2021) employs a stochastic volatility VAR model to estimate that the economic growth rate of Unites States reduces from 3.0% per year in the 1990s to 2.4% in the 2010s.

In Vietnam, there is currently not any research on the steady state economic growth rate. A clue can be found on recent 10-years economic social development strategy. For the 2011-2020, the Vietnam government proposes a target of 7.0-8.0% on the economic growth per year. And for the future 2021-2030 period, it proposes a target of 7.0% per year. As an implication, the annual steady state economic growth rate that the policy makers think can be around 7.0%. In brief, this lack of studies, especially the quantitive model, opens a research gap on the steady state growth rate of Vietnam economy.

On the next sections, we construct a VAR model to fill in this research gap.

### 3. Framework.

#### 3.1. Model.

The regression equation, with  $t=1,2,\dots,T$ , is on reduced-form as following:

$$Y_t = A_1 \cdot Y_{t-1} + A_2 \cdot Y_{t-2} + A_3 \cdot Y_{t-3} + C + \varepsilon_t \quad (1)$$

Whereby,

- $Y_t = (Dycpi, VNgdp, VND, Gfdi)$ , is a vector (4x1) of 4 endogenous variables, including: inflation ( $Dycpi$ ), economic growth ( $VNgdp$ ), VND depreciation rate ( $VND$ ), and foreign direct investment ( $Gfdi$ ).

- $A_1, A_2, A_3$ , is matrix (4x4) containing estimated coefficients, each of which is varying over time.

- $C$ , is a matrix (4x1) containing estimated constant coefficients.

- $\varepsilon_t$  is a vector of residuals assumed with multivariate normal distribution as

$$\varepsilon_t \sim \mathcal{N}(0, \Sigma)$$

$\varepsilon_t$  is assumed to be non-autocorrelated, thus, the unconditional expectation satisfies  $E(\varepsilon_t, \varepsilon_t') = \Sigma$ , and  $E(\varepsilon_t, \varepsilon_s') = 0$ , for  $t \neq s$ . Moreover,  $\Sigma$  is a symmetric positive definite variance-covariance matrix, with variance being at diagonal and covariance being off diagonal.

The model belongs to a class of vector autoregression model (BSVAR). In details, the vector autregression model (VAR) accounts for the interaction of endogenous variables, reflecting the macroeconomic fundamentals. This model is a structural (S) model capturing the impact of shock from each variable. We also employ Cholesky for the variance-covariance matrix ( $\Sigma$ ). And the variable is ordered as inflation, economic growth, exchange rate and FDI.

Finally, the SVAR model is estimated by Bayesian (B) method which is becoming popular in macroeconometrics (Sims, 2007).

The choice of variable is based on recent evidence and theory on Vietnam economy. For evidence, the role of each variable is recorded by recent empirical analysis, such as Hang and Thanh (2010) on the inflation rate, Nguyen et al (2017) on the economic growth, Bhattacharya (2014) on the exchange rate, and Hung (2021) on the FDI. For theory, the interaction of variables illustrates the Triffin policy trilemma in the international finance that a typical economy faces. The nominal exchange rate (VND/USD) captures the foreign exchange rate management, the disbursed FDI presents the cross-border capital flows, and the interaction between inflation and economic growth rate illustrates independence of monetary policy. Recent authors stress the role of policy trilemma on the macroeconomic stability (Farhi and Werning, 2014) for both advanced economies (Rey, 2015) and emerging and developing economies (Obstfeld et al, 2005; Obstfeld et al, 2019).

### 3.2. *Method.*

The structure of model has 15=5x3 estimated coefficients for each endogenous variable. With 4 variables, there are 60=15x4 coefficients for the BSVAR model.

The estimation is based on Bayesian method with Minnesota prior which considers the sample to be fixed and the coefficient is random. Then, the method is useful to capture the small sample of Vietnam with only 47 observations. This feature is also emphasized by Sims (2007) as a reason for the increasing popular employment of Bayesian method in macroeconometrics.

At the long-run equilibrium, the endogenous variables are constant. Then, with the estimated coefficients ( $\hat{A}_1, \hat{A}_2, \hat{A}_3$ ), the steady state economic growth is the solution for the following equation:

$$\begin{bmatrix} \overline{Dy\%} \\ \overline{VNgdp} \\ \overline{VND} \\ \overline{Gfdi} \end{bmatrix} = (I - \hat{A}_1 - \hat{A}_2 - \hat{A}_3)^{-1} \hat{C} \quad (2)$$

Then, the steady state economic growth rate is the value of  $\overline{VNgdp}$ . This value is the rate of growth that the economy would converge in the absence of new shocks.

### 3.3. *Data.*

The data is a quarterly sample including 47 observations from second quarter of 2007 to fourth quarter of 2019 (the first four observations is used to take first difference and growth rate of variables). The economic growth rate, inflation rate and disbursed foreign direct

investment (FDI) are from the Vietnam General Statistics Office (GSO); the nominal exchange rate (VND/USD) is from Bloomberg database.

Each variable is computed from the raw data to attain stationary data, such as by taking the growth rate (year on year) of the exchange rate to have the depreciation rate of domestic currency, or by taking the first difference of the inflation rate. In particular, the inflation rate (*ycpi*) is the year-on-year change of consumer price index (CPI), on percentage (%). This variable is computed as first difference to be stationary, and is denoted by (*Dycpi*). The economic growth rate (*VNgdp*) is the year-on-year growth rate of gross domestic product (GDP) on percentage. Similarly, the depreciation rate of domestic currency (*VND*) is the year-on-year growth rate of nominal VND/USD exchange rate on percentage. This variable is used as a proxy for the exchange rate because of its large deviation which can illustrate closely the fluctuation of financial market. Recently, Bhattacharya (2014) also use the nominal VND/USD exchange rate in a vector autoregression model (VAR) to analyze the impact of monetary policy on the inflation rate in Vietnam. Finally, the foreign capital inflows are the year-on-year growth rate of disbursed FDI on percentage.

Table 1: Descriptive Statistics

Variables	Observations	Mean	Standard Deviation	Min	Max
Inflation Rate ( <i>Dycpi</i> ) (yoy,%)	47	-0.3	3.16	-8.64	7.4
Economic Growth Rate ( <i>VNgdp</i> ) (yoy,%)	47	6.03	0.89	3.1	7.46
VND Depreciation Rate ( <i>VND</i> ) (yoy,%)	47	3.23	3.12	-0.59	9.92
Disbursed Foreign Direct Investment ( <i>Gfdi</i> ) (yoy,%)	47	7.54	23.00	-57.65	78.88

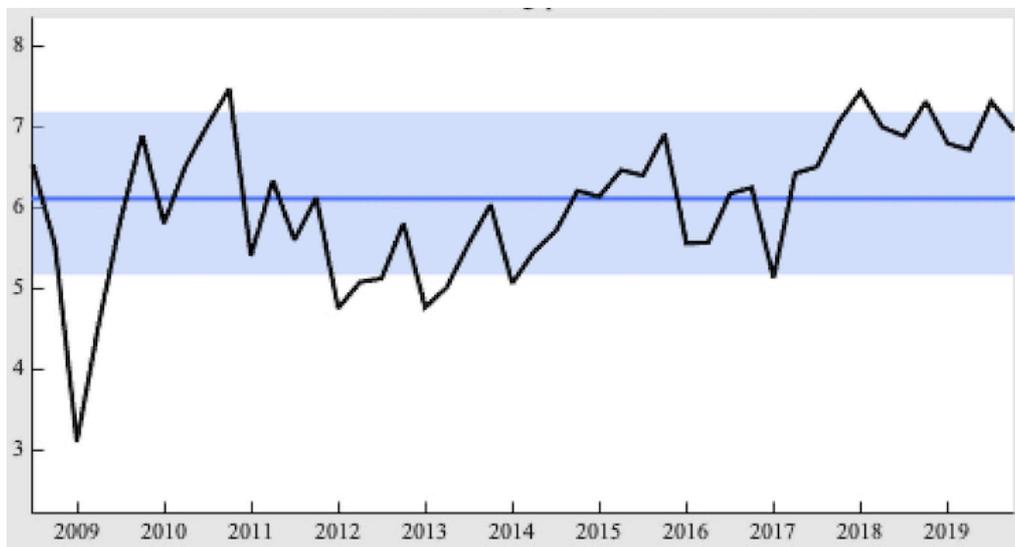
Table 1 illustrates the data description of variables in the model. The economic growth rate has a mean of 6.03%, with a standard deviation of 0.89%. Compared with this variable, the inflation rate has lower mean (-0.3%) and greater deviation (3.16%), while the VND depreciation rate has a lower mean (3.23%) but larger deviation (3.12%). The FDI also has quite large standard deviation at 23.00%. Thus, all variables have large deviation to facilitate the estimation of Vietnam steady state economic growth.

#### 4. Evidence.

##### 4.1. Steady State Economic Growth.

Figure 1 shows the steady state economic growth rate of Vietnam economy over Q2/2007 to Q4/2019. The estimated growth rate is 6.13%. This value is depicted as the horizontal blue line at 6.13%, while the economic growth is expressed by the black line. The economic growth at steady state is attained at Q4/2011, Q1/2015 and Q3/2016. The growth rate is lower than its steady state from Q1/2011 to Q3/2014, increases to overcome its steady state during 2015 before falling below the steady state during 2016. From Q2/2017 to Q4/2019, the Vietnam economy maintains a higher growth rate than the steady state. In brief, the economic growth rate tends to fluctuate around the steady state value.

Figure 1: Steady State Economic Growth of Vietnam



Source: Estimated results from BSVAR model.

On the Figure 1, the economic growth rate is almost within the band  $\pm 1\%$  of the steady state. The upper bound is 7.1%. The highest growth rate is 7.47% at Q4/2010, which is approximately equal to 7.43% at Q1/2018. And only for two other time periods, including Q4/2018 and Q3/2019, the growth rate is higher than the upper bound. The lower bound is 5.1%. The lowest growth rate is 3.10% at Q1/2009. And only two other time periods, including Q1/2012 and Q1/2013, have a lower economic growth rate than the lower bound. In brief, the fluctuation of economic growth falls almost within the upper and lower bound of steady state economic growth rate.

As literature review shows, there does not exist an empirical evidence on the steady state growth rate of Vietnam. But the policy makers usually proposes a target of economic growth rate on the recent 10-years economic social strategy: 7-8% over 2011-2020 and 7%

over 2021-2030. Thus, the steady state economic growth rate mentioned on the policy discussion can be approximatedly 7%. This value falls within the upper bound of estimated economic growth by our BSVAR model. As a result, the target can only be achieved if the economy experiences an expansion.

#### 4.2. Robustness Analysis.

The steady state economic growth can be estimated by three other methods. The BSVAR model can be estimated by different priors, with Normal-Diffuse by the first method and with Normal-Wishart by the second method. Moreover, we also compute the average growth rate over time period as the third method.

There is difference across Bayesian methods. The Minnesota prior (Litterman, 1986), as our focal method, assume that the VAR residual variance-covariance matrix is known. The Normal-Wishart (Karlsson, 2013) prior relaxes the Minnesota prior by assuming that both the coefficients ( $\beta$ ) and the variance-covariance ( $\Sigma$ ) are unknown. As an alternative setting, the Normal-Diffuse prior relies on a diffuse (uninformative) prior for the variance-covariance ( $\Sigma$ ).

For the first and second method, the model is also presented as the equation (1), and the associated steady state economic growth is computed as the equation (2). And for the third method, the steady state economic growth rate is the average value of quarterly growth rate from the second quarter of 2008 to fourth quarter of 2019, covering 47 quarters:

$$\overline{VNgdp}_1 = \frac{\sum_{Q1/2007}^{Q4/2019} VNgdp_t}{47} \quad (3)$$

Table 2: Estimation Results by Different Methods

Method	Normal-Diffuse	Normal-Wishart	Time Average
Quarterly Economic Growth Rate	6.09 %	6.06 %	6.04 %
Notes	Diffuse prior for variance-covariance ( $\Sigma$ )	Coefficients ( $\beta$ ) and variance-covariance ( $\Sigma$ ) are unknown	47 observations from Q2/2008-Q4/2019

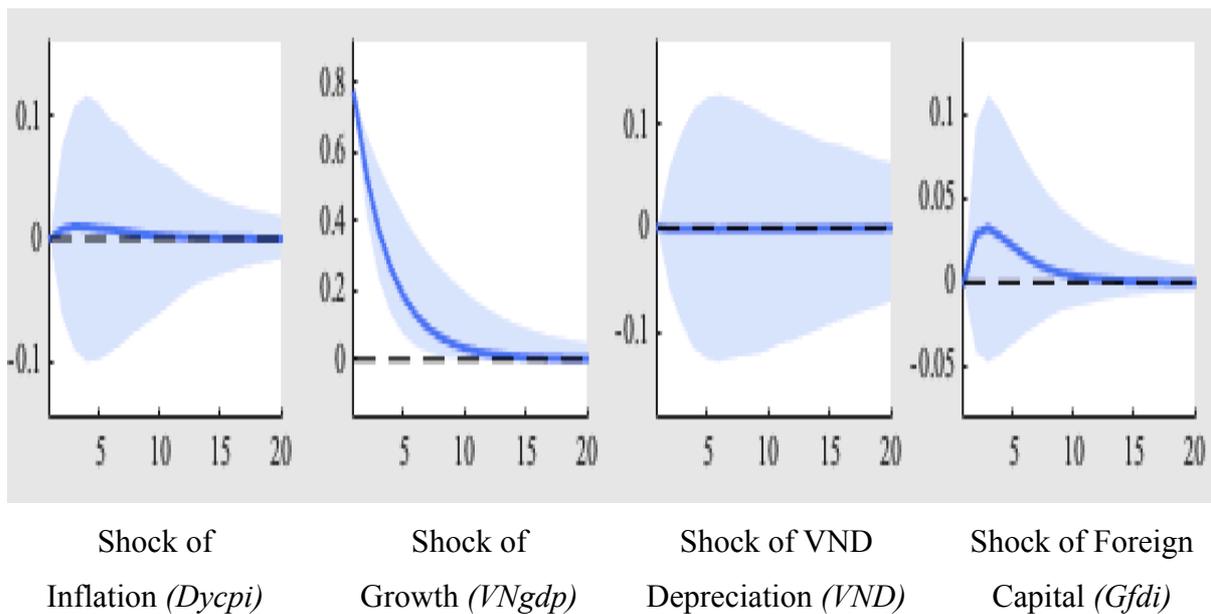
Table 2 presents the estimated steady state growth by different methods. On the first column, when the BSVAR model is estimated with the normal-diffuse prior, the growth rate is 6.09%. On the second column, with the normal-wishart prior, the growth rate is 6.06%. On the third column, the steady state growth rate is 6.04%. These number are closed to the result of 6.13% by the main result based on BSVAR model with the Minnesota prior.

### 4.3. Further Analysis.

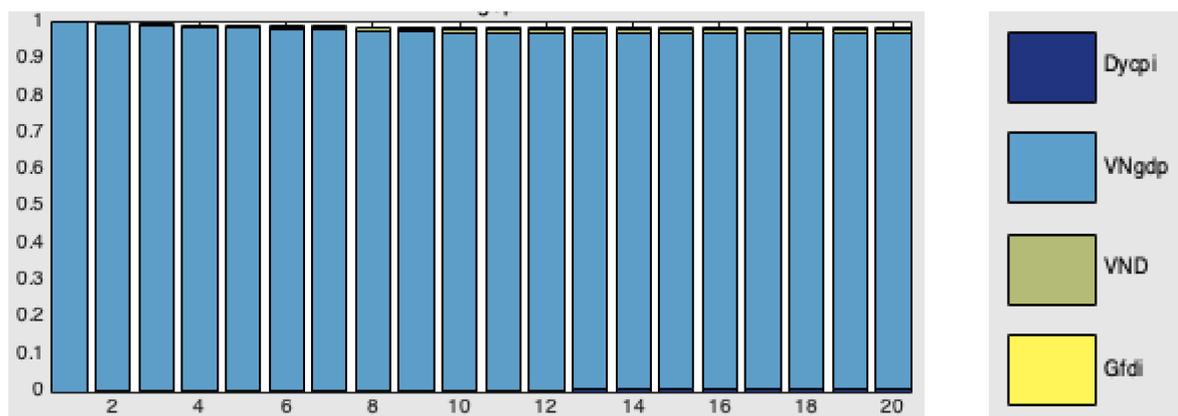
The estimation of BSVAR model also provides some relevant results to the steady state economic growth rate. We focus on two main evidence, including the impulse response function (IRF) and forecasts error variance decomposition (FEVD). The IRF shows the change of economic growth rate for a shock on other endogenous variables. And the FEVD records the share of other endogenous variables on forecasting the economic growth rate.

Figure 2: Analysis of Economic Growth Rate

Panel A: The Impulse Response Function



Panel B: The Forecasts Error Variance Decomposition



Source: The estimation result from the BSVAR model with Minnesota prior

For the impulse response function (IRF), shown in Panel A, the economic growth rate raises for a shock on the inflation and foreign capital inflows while it is quite neutral for a

shock on the depreciation rate of domestic currency. The impact of inflation on growth shows that there can exist a trade-off between output and inflation in the Vietnam economy. As Lucas (1973), Ball et al (1988) prove, this trade-off originates from the impact of monetary supply: an expansion of money raises both economic growth and inflation rate. Moreover, the impact of foreign capital inflows on growth is consistent to the theory (Gourinchas and Jeanne, 2013) and evidence (Prasad et al, 2007) which show that the foreign capital inflows provide external finance for domestic investment. Moreover, the FDI firms also contributes significantly on the economic growth through international trade by accounting for about 65% of exports and 55% of imports since 2012 (Vietnam General Statistics Office, 2021).

For the factor error variance decomposition (FEVD), shown in Panel B, the exogenous shock of other variables plays a moderate role on explaining the forecast error variance of economic growth. Thus, the forecasted economic growth is accounted mostly by itself.

## **5. Conclusion.**

The paper employs a quantitative model with a quarterly sample to estimate the steady state economic growth of Vietnam. The Bayesian structural vector autoregression (BSVAR) model with Minnesota prior is employed on 47 observations over Q2/2008-Q4/2019. The evidence records that the steady state growth rate of Vietnam is 6.13%. It is closed to the results by other methods, with normal-diffuse prior, normal-wishart prior and averaged value over time period.

The result provides an important policy. The steady state economic growth rate can be used as reference to suggest the economic growth rate on the short-run economic social development plan. Recently, Vietnam government (2020) announces the target growth rate of 2021 is 6.5%. This number is closed to the economic growth rate at 6.13% estimated by our model. Thus, according to our evidence, the target can be attainable.

For future research revenue, the model can be extended to account for additional variables. Accounting for liquidity supply can be a potential future extension. Recently, Brunnermeier and Yunnikov (2014) stress the role of liquidity constraint for the economic growth. Moreover, the BSVAR model can be accompanied by a theoretical model such as dynamic general equilibrium model as recent approach in macroeconometrics (Gali and Monacelli, 2005). For this combination, the steady state can be estimated by the empirical model, then, used as input for the simulation of theoretical model.

## **Reference.**

Aghion, P., & Howitt, P. (1992). A Model of Growth Through Creative Destruction. *Econometrica: Journal of the Econometric Society*, 323-351.

- Aghion, P., & Howitt, P. W. (2008). *The Economics of Growth*. MIT University Press.
- Alfaro, L., Kalemli-Ozcan, S., & Volosovych, V. (2014). Sovereigns, upstream capital flows, and global imbalances. *Journal of the European Economic Association*, 12(5), 1240-1284.
- Ball, L., Mankiw, N. G., Romer, D., Akerlof, G. A., Rose, A., Yellen, J., & Sims, C. A. (1988). The new Keynesian economics and the output-inflation trade-off. *The Brookings Papers on Economic Activity*, 1988(1), 1-82.
- Bhattacharya, R. (2014). Inflation dynamics and monetary policy transmission in Vietnam and emerging Asia. *Journal of Asian Economics*, 34, 16-26.
- Blanchard, O. J., & Quah, D. (1989). The Dynamic Effects of Aggregate Demand and Supply Disturbances. *The American Economic Review*, 79(4), 655-673.
- Brunnermeier, M. K., & Sannikov, Y. (2014). A macroeconomic model with a financial sector. *The American Economic Review*, 104(2), 379-421.
- Coeurdacier, N., Guibaud, S., & Jin, K. (2015). Credit constraints and growth in a global economy. *American Economic Review*, 105(9), 2838-81.
- Coeurdacier, N., Rey, H., & Winant, P. (2011). The risky steady state. *American Economic Review*, 101(3), 398-401.
- Diamond, P. A. (1965). National debt in a neoclassical growth model. *The American Economic Review*, 55(5), 1126-1150.
- Devereux, M. B., & Sutherland, A. (2011). Country portfolios in open economy macro-models. *Journal of the European Economic Association*, 9(2), 337-369.
- Farhi, E., & Werning, I. (2014). Dilemma not trilemma? Capital controls and exchange rates with volatile capital flows. *IMF Economic Review*, 62(4), 569-605.
- Frankel, M. (1962). The production function in allocation and growth: a synthesis. *The American Economic Review*, 996-1022.
- Gali, J., & Monacelli, T. (2005). Monetary policy and exchange rate volatility in a small open economy. *The Review of Economic Studies*, 72(3), 707-734.
- Galor, O. (1996). Convergence? Inferences from theoretical models. *The Economic Journal*, 106(437), 1056-1069.
- Gourinchas, P. O., & Jeanne, O. (2013). Capital flows to developing countries: The allocation puzzle. *Review of Economic Studies*, 80(4), 1484-1515.
- Hang, N. T. T., & Thanh, N. D. (2010). Macroeconomic Determinants of Vietnam's Inflation 2000-2010: Evidence and Analysis. *VEPR working paper*, No.wp-09, Vietnam Centre for Economic and Policy Research (VEPR).

- Hung, L. D. (2021). Output-inflation trade-off in the presence of foreign capital: evidence for Vietnam. *South Asian Journal of Macroeconomics and Public Finance*, 2277978720979890.
- Hung, L.D. (2020). International capital flows with safe assets accumulation. *Journal of Economic Studies*. <https://doi.org/10.1108/JES-05-2020-0250>.
- Karlsson, S. (2013). Forecasting with Bayesian vector autoregression. *Handbook of Economic Forecasting*, 2, 791-897.
- Kohlscheen, E., & Nakajima, J. (2019). Steady-state growth. *International Finance*, 24(1), 40-52.
- Litterman, R. B. (1986). Forecasting with Bayesian vector autoregressions—five years of experience. *Journal of Business & Economic Statistics*, 4(1), 25-38.
- Lucas, R. E. (1973). Some international evidence on output-inflation tradeoffs. *The American Economic Review*, 326-334.
- Matsuyama, K. (2004). Financial market globalization, symmetry-breaking, and endogenous inequality of nations. *Econometrica*, 72(3), 853-884.
- Nguyen, D. T. H., Sun, S., & Anwar, S. (2017). A long-run and short-run analysis of the macroeconomic interrelationships in Vietnam. *Economic Analysis and Policy*, 54, 15-25. doi: 10.1016/j.eap.2017.01.006.
- Obstfeld, M., Shambaugh, J. C., & Taylor, A. M. (2005). The trilemma in history: tradeoffs among exchange rates, monetary policies, and capital mobility. *Review of Economics and Statistics*, 87(3), 423-438.
- Obstfeld, M., Ostry, J. D., & Qureshi, M. S. (2019). A tie that binds: Revisiting the trilemma in emerging market economies. *Review of Economics and Statistics*, 101(2), 279-293.
- Prasad, E., Rajan, R., & Subramanian, A. (2007). Foreign Capital and Economic Growth. *Brookings Papers on Economic Activity*, 38(1), 153-230.
- Plosser, C. I. (1989). Understanding real business cycles. *Journal of Economic Perspectives*, 3(3), 51-77.
- Rey, H. (2015). *Dilemma not trilemma: the global financial cycle and monetary policy independence* (No. w21162). National Bureau of Economic Research.
- Romer, P. M. (1990). Endogenous technological change. *Journal of political Economy*, 98(5, Part 2), S71-S102.

Samuelson, P. A. (1958). An exact consumption-loan model of interest with or without the social contrivance of money. *The Journal of Political Economy*, 66(6), 467-482.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica*, 48(1), 1-48. doi: 10.2307/1912017.

Sims, C. A. (2007). Bayesian methods in applied econometrics, or, why econometrics should always and everywhere be Bayesian. *Hotelling lecture*, presented June, 29, 2007.

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1), 65-94.

Swan, T. W. (1956). Economic growth and capital accumulation. *Economic Record*, 32(2), 334-361.

Thanh, V. T., Minh, D. H., Truong, D. X., Van Thanh, H., & Quang, P. C. (2000). Exchange rate arrangement in Vietnam: Information content and policy options. *Exchange*, 2(2).

Tille, C., & Van Wincoop, E. (2010). International capital flows. *Journal of International Economics*, 80(2), 157-175.

Thanh, S.D., Nguyen, P. C., & Christophe, S. (2019). Impact of foreign direct investment, trade openness and economic institutions on growth in emerging countries: The case of Vietnam. *Journal of International Studies*, 12(3).

The Online Journal of Vietnam Communist Party (2021). *The Economic Social Development Strategy for 2021-2030*. Retrieved on 03/03/2021 from <https://tulieuvankien.dangcongsan.vn/ban-chap-hanh-trung-uong-dang/dai-hoi-dang/lan-thu-xiii/chien-luoc-phan-trien-kinh-te-xa-hoi-10-nam-2021-2030-3671>.

The Online Journal of Vietnam Communist Party (2021). *The Economic Social Development Strategy for 2011-2020*. Retrieved on 03/03/2021 from <https://tulieuvankien.dangcongsan.vn/ban-chap-hanh-trung-uong-dang/dai-hoi-dang/lan-thu-xi/chien-luoc-phan-trien-kinh-te-xa-hoi-2011-2020-1527>.

Vietnam General Statistics Office. (2021). *Online Database*. Retrieved on 03/03/2021 from <http://gso.gov.vn>.