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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 converges 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 Vietnamese government's objective of an annual growth rate of 7.0% over 2021-2030 can only be attained during the economic expansion periods.

Keywords: Economic growth, vector autoregression, Vietnam economy

1. Introduction

The steady state economic growth rate of GDP (Gross Domestic Product) plays a central role in economic development. In the neoclassical growth model (Solow, 1956; Swan, 1956), there exists a unique steady state of capital accumulation per effective unit of labor. At that point, the domestic output (GDP) grows with an exogenous rate of technological progress and labor force. Then, the steady state economic growth rate, jointly with the 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, 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 policymakers, to adjust their investment plans. 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's economy. We constructed a time-series econometric model (BSVAR). A vector autoregression (VAR) model with a structural variance-covariance matrix (S - Structural) is estimated with the Bayesian technique (B). This technique is appropriated to a sample of small size with only 47 observations over Q2/2008-Q4/2019 for Vietnam's economy. The structure of the model reflects the Triffin policy trilemma in international finance among the three following 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 the long-term target on the recent economic social strategy of the Vietnamese government.

The paper makes contributions to 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. In the neoclassical growth model, a unique capital per effective unit of labor ratio exists at the steady state. At this equilibrium, the GDP grows with a growth rate as a sum of technological progress and the labor force growth rate. However, the growth rate is exogenous and an ad-hoc assumption in the neoclassical growth model. Extending these models, the endogenous growth model focuses on the source of technological progress. Aghion and Howitt (1992) show that 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 the world technology frontier and the intensity of R&D activities. In other types of endogenous growth models, the economic growth rate also originated from the accumulation of capital (AK model by Frankel (1962)) by the expansion of product varieties (Romer, 1992).

Our paper differs from 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 reveals 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's economy. Besides an updated sample up to Q4/2019, our paper contributes to 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 setup, 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 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 not even mentioned in Nguyen et al. (2017). By our setup, 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 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 results show that past experiences and future expectations of households are crucial to inflation. Additionally, the inflation rate is determined by domestic rather than foreign determinants. Also using a VAR model of Vietnam's economy, Bhattacharya (2014) records that inflation is driven by the fluctuation of the exchange rate in the short-run, by the growth rate of domestic credit in the medium-, and by the GDP growth rate in the long-run. The common feature of these two papers is the lack of foreign capital inflows in the macroeconomic setup.

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 contributes to the cross-border capital flows. Foreign capital has a positive impact on domestic economic growth by financing domestic investment. Gourinchas and Jeanne (2013) construct a small open economy version of the neoclassical growth model to show that an economy with a higher productivity growth rate tends to have a huge investment, rather than receive more capital inflows. Using a large sample of both advanced and developing economies, Alfaro et al. (2014) confirm these results by recording that a higher average growth rate of GDP per capita, a proxy for productivity growth rate, is associated with more net total capital inflows, though 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.

However, a higher economic growth rate can also be associated with larger outflows of capital. Hung (2020) constructs a theoretical model to show that a positive productivity shock can lead to the accumulation of foreign safe assets, rather than the outflows of capital. In a model by Coeurdacier et al. (2015), the young agent borrows to consume with borrowing constraints, and the middle-aged agent works and saves, while the old agent only consumes. When the borrowing constraints 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 constraints, the high growth rate can be associated with larger savings over capital outflows, the difference between domestic savings and investment.

Our paper complements these aforementioned papers by constructing an empirical model to account for the role of foreign capital inflows. The existence of foreign capital is important and considered an endogenous variable contributing to the stability of macroeconomic fundamentals. Then, the foreign capital can affect the economic growth rate at the steady state of an open economy.

The paper follows a standard structure. After the introduction, the second section discusses the literature review. The third section presents the model, method, and data. The fourth section analyzes the estimated result of the steady state economic growth of Vietnam. 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.

In the neoclassical growth model, the steady state is the equilibrium that the capital per effective unit of labor that tends to converge within the long-term. Due to the setup of the model with a concave production function, usually with a labor-augmented technology, the steady state is unique and globally stable (Galor, 1996). There are alternative models in which there exist 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-term capital accumulation. Matsuyama (2004) also builds up an OLG model to analyze the existence of two symmetric steady states, one with a high capital accumulation level and one with a low capital level.

In the extended version of the neoclassical growth model with uncertainty, the steady state is defined as the long-term 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-term equilibrium the deterministic steady state, Coeurdacier et al. (2014) characterize a risky steady state. In particular, the risky steady state is the long-term equilibrium at which state variables stay constant in the presence of expected future shocks, and the innovations for these shocks turn out to be zero. Another method, the associated method is the numerical method, based on a 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 deterministic technological progress on the neoclassical growth model or as stochastic technological 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 technological progress. In other words, the growth rate of output is equal to the growth rate of technological progress, though the source of technological 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 from the endogenous growth models, with a synthesis in Aghion and Howitt (2008). For the AK model (Frankel, 1962), the economic growth rate is determined by the accumulation of capital across firms within the economy. For the product variety model (Romer, 1990), economic growth is attained by the expansion of a new type of product, being new to the existing types of products. 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. From the 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 the world technological frontier multiplied by the frequency of innovation. The first item is exactly the ratio of the technological level of the leading economy compared with the level of an economy; the second item is assumed on the model as an increasing, concave function of R&D expenditure.

However, the computation of the two items is also difficult on data. For the first item, the technological 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 the capital depreciation rate. For the second item, the concave function is an ad-hoc assumption with no consensus on 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 originates from the structural VAR model (Blanchard and Quah, 1989), 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 are 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, where if it raises over (reduces below) the steady state, there is a pressure to push it down (up) to be at the steady state. For the estimation, this approach first constructs a VAR model of economic growth and other variables, secondly estimates the coefficients, and finally computes directly the steady state economic growth rate. Recently, Kohlscheen and Nakajima (2021) employed a stochastic

volatility VAR model to estimate that the economic growth rate of Unites States reduced from 3.0% per year in the 1990s to 2.4% in the 2010s.

In Vietnam, there is currently no research on the steady state economic growth rate. A clue can be found in the recent 10-years economic social development strategy. For the 2011-2020 period, the Vietnamese government proposed a target of 7.0-8.0% economic growth per year. For the future 2021-2030 period, it proposed a target of 7.0% per year. As an implication, the policymakers think that the annual steady state economic growth rate can be around 7.0%. In brief, this lack of studies, especially using the quantitative model, opens a research gap on the steady state growth rate of Vietnam's economy.

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

3. Framework

3.1 Model

The regression equation, t=1,2...T, is in reduced form as the following:

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

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, and A_3 are matrices (4x4) containing estimated coefficients, each of which is varying over time. C, is a matrix (4x1) containing estimated constant coefficients. ε_t is a vector of residuals assumed with multivariate normal distribution as $\varepsilon_t \sim N(0,\Sigma)$. ε_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, Σ 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 the vector autoregression model (BSVAR). In detail, the vector autoregression model (VAR) accounts for the interaction of endogenous variables, reflecting the macroeconomic fundamentals. This class of econometric model estimates one variable by the data or, in other words, allows the data to speak about the steady state. Thus, it complements the structural model which can thereby provide the solution for the steady state based on theoretical equations, such as the Dynamic Stochastic General Equilibrium (DSGE) (Blanchard, 1989).

Furthermore, our VAR model is a structural (S) model capturing the impact of shock from each variable. In particular, we also employ Cholesky for the variance-covariance matrix (Σ). The variable is ordered as inflation, economic growth, exchange rate, and FDI. Our model considers inflation as the most important variable as it affects the three other variables. A low and stable inflation ensures a macroeconomic environment and is considered the main concern of the Vietnamese government. Economic growth is of secondary importance, which affects both the exchange rate, through the domestic demand for foreign currency, and capital inflows, through the difference in rate of return on domestic and foreign investment (Lucas, 1990). The exchange rate is of third importance, determining the capital inflows such as through the valuation effect (Gourinchas and Rey, 2007).

Next, the SVAR model is also estimated by the Bayesian (B) method which is becoming popular in macroeconometrics (Sims, 2007). The choice of variable is based on recent evidence and theory on Vietnam's 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, where 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 the independence of monetary policy. The monetary policy faces a trade-off because an increase in money supply can raise the economic growth rate but also result in a higher inflation rate. Thus, an economy can only choose one of these two objectives: a high growth rate or a low inflation rate. 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).

Our objective is to construct a parsimonious model to explain the economic growth rate. Thus, we only consider the small number of macroeconomic variables related to economic growth. Other economic growth engines such, as the population growth rate (Solow, 1956), technological progress (Aghion and Howitt, 1992), and institutional quality (Acemoglu, 2015), are ready to be incorporated into the extended version of the model, given the availability of data.

3.2 Method

The structure of the 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 the Bayesian method with Minnesota prior which considers the sample to be fixed and the coefficient is random. Then, this 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 increasingly popular employment of the Bayesian method in macroeconometrics.

In the long-term 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:

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

Then, the steady state economic growth rate is the value of ($\overline{VNgdp}$). This is the value that the economy converges without new shocks (Kohlscheen and Nakajima, 2019).

3.3. Data

The data is a quarterly sample including 47 observations from the second quarter of 2007 to the fourth quarter of 2019, where the first four |observations are used to take the 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 the 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. The economic growth rate *(VNgdp)* is the year-on-year growth rate of the real gross domestic product (Real GDP) in percentage. The Real GDP is on the constant 2010 national price, as released by the Vietnam General Statistics Office (2021). The foreign capital inflows are the year-on-year growth rate of disbursed FDI in percentage. The inflation rate *(ycpi)* is the year-on-year change of the consumer price index (CPI) in percentage (%). This variable is computed as the first difference to be stationary and is denoted by *(Dycpi)*. The depreciation rate of the domestic currency (VND) is the year-on-year growth rate of the nominal VND/USD exchange rate in percentage. This variable is used as a proxy for the exchange rate because of its large deviation which can closely illustrate the fluctuation of the financial market. Recently, Bhattacharya (2014) also used 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. Moreover, the exchange rate volatility can be used to capture the exchange rate factor on the Triffin trilemma. Instead of the exchange rate volatility, we employ the change of exchange rate over time since it is close to the objective of the exchange rate policy of Vietnam. In particular, the Vietnam Central Bank sets one central exchange rate as the benchmark rate around which the commercial banks can trade foreign currency within a range of percentages. The Vietnam Central Bank intervenes in the foreign exchange market by adjusting (raising or reducing) the central exchange rate.

Table 1: Descriptive Statistics

Variables	Observations	Mean	Standard Deviation	Min	Max
Inflation Rate (Dycpi) (yoy,%)	47	-0.3	3.16	-8.64	7.4
Economic Growth Rate (VNgdp) (yoy,%)	47	6.03	0.89	3.1	7.46
VND Depreciation Rate (VND) (yoy,%)	47	3.23	3.12	-0.59	9.92
Disbursed Foreign Direct Investment (Gfdi) (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 a lower mean (-0.3%) and a greater deviation (3.16%), while the VND depreciation rate has a lower mean (3.23%) but a larger deviation (3.12%). The FDI also has quite a large standard deviation at 23.00%. Thus, all variables have a large deviation to facilitate the estimation of Vietnam's steady state economic growth.

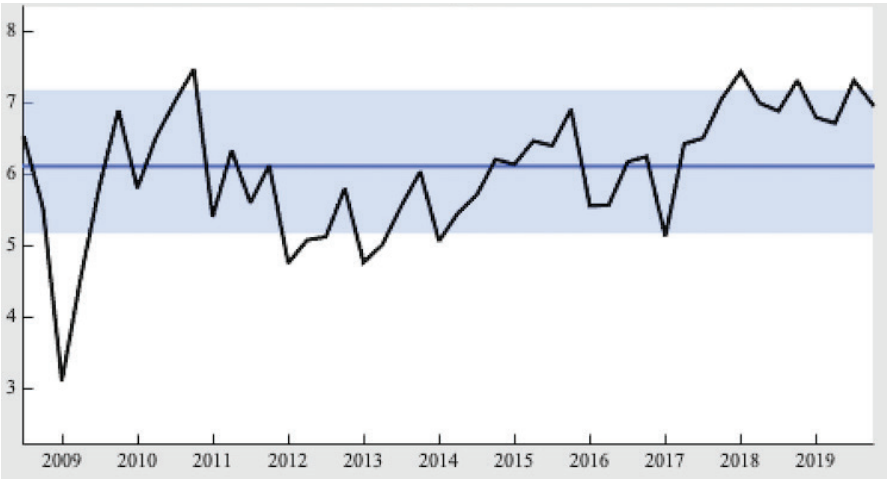
We also note that the 11-year sample is useful to analyze the steady state growth rate of a developing economy like Vietnam. Following Kohlscheen and Nakajima (2019), we define the steady state growth rate as the equilibrium in which the economy converges without new shocks. With this concept, the time period of a sample captures the frequency of shocks. According to an extended time of literature on economic growth (Bloom, 2014), the growth rate of a developing economy tends to fluctuate much more than that of an advanced economy. Bloom (2014) states that the growth rate of a developing economy has a 50 percent higher volatility than the growth rate of an advanced economy. Thus, depending on the data sample, in order to absorb the large variation around the steady state, the analysis of an advanced economy needs a longer time period while the analysis of a developing economy can have a shorter period. This feature is also consistent with the availability of the online database released by the Vietnam General Statistics Office (GSO, 2021) for the real quarterly GDP from the first quarter of 2008. In brief, our sample can still capture the large variation and then the steady state value of the economic growth rate.

4. Evidence

4.1 Steady State Economic Growth

Figure 1 shows the steady state economic growth rate of Vietnam's economy from Q2/2008 to Q4/2019. The estimated growth rate is 6.13%. This value is depicted by the horizontal blue line at 6.13%, while the economic growth rate is expressed by the black line. The economic growth at steady state is attained in Q4/2011, Q1/2015, and Q3/2016. The growth rate is lower than its steady state from Q1/2011 to Q3/2014 and increases to overcome its steady state during 2015 before falling below the steady state during 2016. From Q2/2017 to Q4/2019, the Vietnamese 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

In Figure 1, the economic growth rate is almost within the band +/- 1% of the steady state. The upper bound is 7.1%. The highest growth rate is 7.47% in Q4/2010, which is approximately equal to 7.43% in Q1/2018. Only for two other time periods, 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% in Q1/2009. Only two other time periods, 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 bounds of steady state economic growth rate.

As the literature review shows, empirical evidence does not exist on the steady state growth rate of Vietnam. However, the policymakers proposed a target of the 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 in the policy discussion can be approximately 7%. This value falls within the upper bound of the 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 for the first method and Normal-Wishart for the second method. We compute the average growth rate over time period as the third method.

There is a difference across the Bayesian methods. The Minnesota prior (Litterman, 1986), as our focal method, assumes 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 (β) and the variance-covariance (Σ) are unknown. As an alternative setting, the Normal-Diffuse prior relies on a diffuse (uninformative) prior for the variance-covariance (Σ).

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

$$\overline{VNgdp^1} = \frac{\sum_{Q1/2007}^{Q4/2019} VNgdp_t}{47} \tag{3}$$

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 (Σ)	Coefficients (β) and variance-covariance (Σ) are unknown	47 observations from Q2/2008-Q4/2019

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

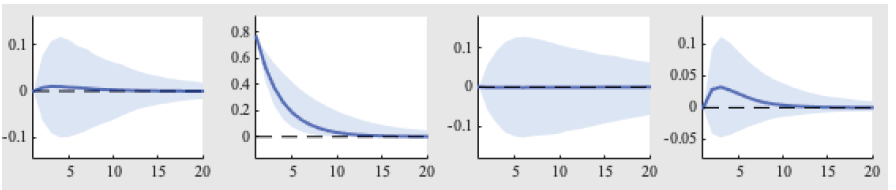
4.3. Further Analysis

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

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 the domestic currency. The impact of inflation on growth shows that a trade-off between output and inflation can exist in Vietnam's economy. As Lucas (1973) and Ball et al. (1988) prove, this trade-off originates from the impact of monetary supply, where an expansion of money raises both the economic growth and the inflation rate. Moreover, the impact of foreign capital inflows on growth is consistent with 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 contribute significantly to the economic growth through international trade by accounting for about 65% of exports and 55% of imports since 2012 (Vietnam General Statistics Office, 2021).

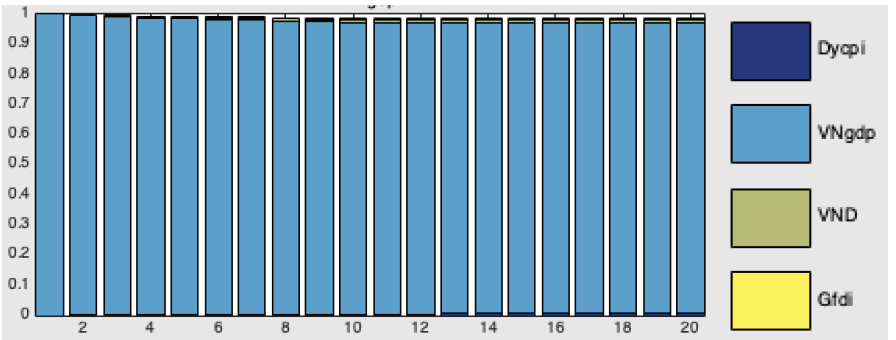
Figure 2: Analysis of the Economic Growth Rate

Panel A: The Impulse Response Function



Shock of Inflation *(Dycpi)* | Shock of Growth *(VNgdp)* | Shock of VND Depreciation *(VND)* | Shock of Foreign Capital *(Gfdi)*

Panel B: The Forecasts Error Variance Decomposition



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

For the factor error variance decomposition (FEVD), shown in Panel B, the exogenous shock of other variables plays a moderate role in explaining the forecast error variance of economic growth. Thus, the forecasted economic growth is accounted for 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 the Q2/2008-Q4/2019 period. The evidence shows that the steady state growth rate of Vietnam is 6.13%. It is close to the results found by other methods, with normal-diffuse prior, normal-wishart prior, and averaged value over time period.

The results provide an important policy. The steady state economic growth rate can be used as a reference to suggest the economic growth rate on the short-term economic social development plan. Recently, the Vietnam government (2020) announced that the target growth rate of 2021 is 6.5%. This number is close to the economic growth rate of 6.13% estimated by our model. Thus, according to our evidence, the target can be achievable.

For future research, 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 constraints in economic growth. Moreover, the BSVAR model can be accompanied by a theoretical model such as the dynamic general equilibrium model as a recent approach in macroeconometrics (Gali and Monacelli, 2005). For this combination, the steady state can be estimated by the empirical model and then used as input for the simulation of the theoretical model.

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