# Channels of monetary policy transmission in Vietnam

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## Abstract

Since the economic reforms launched in 1986, the Vietnamese economy has registered impressive economic growth. While foreign investment is providing much needed capital, through the conduct of monetary policy, the State Bank of Vietnam (SBV), which is an integral part of the government of Vietnam, is also playing an important role in nurturing the economic growth. The aim of this paper is to evaluate the success of the SBV policies. Monetary policy actions affect all sectors of real economies with a significant lag. Without a good understanding of the transmission mechanism, monetary policy actions may not achieve the desired outcomes. Using quarterly data from 1995 to 2010, this paper focuses on monetary policy transmission mechanisms in Vietnam. Specifically, we consider the dynamic response of the Vietnamese economy to interest rate, exchange rate and foreign shocks. The estimated results based on structural vector autoregressive (SVAR) methodology suggest that monetary shocks tend to have a strong influence on Vietnam's output. We find that Vietnam's monetary policy is relatively more susceptible to foreign shocks.
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## 1. Introduction

Monetary policy is a stabilization instrument that is used to (i) control the rate of inflation and (ii) steer the economy towards a sustainable economic growth rate. Monetary policy changes affect both the internal and external balances of an economy. Fluctuations in the interest rate and exchange rate have a direct bearing on financial markets. Financial market fluctuations affect the price level and the level of economic activity within the economy. The task of achieving the objectives of monetary policy requires a clear understanding of the transmission mechanisms on the part of economic policy makers.[1]

The monetary transmission mechanisms include the interest rate, exchange rate and credit channels. In the case of Vietnam, where economic growth is the main priority of the government, the State Bank of Vietnam (SBV) relies heavily on the credit channel, which refers to the decrease in interest rate in response to increase in money supply. The decrease in the interest rate increases investment, which through employment creation increases the real gross domestic product (GDP).

The exchange rate channel refers to the increase in money supply, which due to its negative impact on the interest rate, leads to currency depreciation. Currency depreciation increases the net exports thereby increasing the real GDP. Economic growth of Vietnam can be described as export-led and therefore, like the credit channel, the exchange rate channel is also very important.

The credit channel refers to the increase in bank deposits arising from an increase in money supply. The decrease in money supply induced interest rate increases the bank lending, which contributes to increased investment thereby increasing the real GDP (Mishkin, 1995). The SBV has relied heavily on the credit channel to boost domestic investment. In 2015, the credit growth and GDP growth rates, respectively, were 17.26% and 6.68% (WDI, 2017).

In the current environment, where the world economy is relatively more integrated, the monetary policy choices of an economy are also affected by the foreign shocks. The foreign shocks include, among others, a sharp rise (or fall) in the price of oil and large fluctuations in the US interest rate. It is widely recognized that without the knowledge of the transmission mechanisms on the part of monetary authorities, monetary policy may not achieve all of its aims (Aleem, 2010; Kuttner & Mosser, 2002). A number of studies have examined the issue of monetary policy transmission.[2] For example, using quarterly data from Eritrea over the period of 1996 to 2008, Holmes and Mengesha (2013) examine monetary policy transmission channels in Eritrea. They argue that, in the case of a low-income country, interest rate and exchange rate channels may be inoperative. In this paper, by considering the case of Vietnam, we aim to provide additional evidence on the effectiveness of monetary policy transmission channels.

In this paper, we focus on monetary policy transmission in Vietnam because, since the late 1980s, the SBV is playing an active role in eradicating poverty and improving the standard of living of the Vietnamese people. The introduction of the reform process in 1986 marked the beginning of Vietnam's impressive economic growth. However, due to lack of data only a few studies have considered the case of Vietnam. Early studies on Vietnam include Hung and Pfau (2009). They applied a Vector Auto Regression (VAR) to quarterly data from 1996 to 2005. They conclude

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[1] In a related study, Nojković and Petrović (2015) evaluate the effectiveness of monetary policy rules in six emerging European economies, whereas Patra, Khundrakpam, and Gangadaran (2017) consider the optimal monetary policy rule for India.

[2] An excellent review of the related studies can be found in, among others, Salvatore (1994), Beck, Colciago and Pfajfar (2014) and Jeon and Wu (2014). For a more recent discussion of Vietnam's monetary policy, see Anwar and Alexander (2016) and Nguyen, Sun and Anwar (2017).

that money supply Granger causes real output. Bhattacharya (2014) argues that understanding of the drivers of inflation can help one to understand transmission of monetary policy in Vietnam. Vietnamese economy has experienced rampant inflation in recent years. Bhattacharya suggests that interest rate policy is relatively less effective in combatting inflation in Vietnam. Other important studies that consider the issue of inflation in Vietnam include Goujon (2006). In a recent study, Hai and Trang (2015) utilise a VAR methodology to examine the issue of monetary policy transmission in Vietnam. They argue that money demand and interest rates fluctuations account for a large proportion of variation in aggregate output.

By using quarterly data from January 1995 to December 2010, this paper attempts to empirically examine the effect of monetary policy shocks on Vietnamese output, money supply, interest rate and the exchange rate. We also distinguish between domestic and foreign shocks. The empirical analysis presented in this paper is based on a Structural Vector Auto Regression (SVAR) model, which can accommodate varying relationships among the relevant variables and hence it is possible to not only identify the monetary policy shocks but also measure their impact (Raghavan, Silvapulle, & Athanasopoulos, 2012). Furthermore, SVAR methodology also reduces the severity of the endogeneity problem that invalidates the empirical results based on simple regression (Greene, 2012).[3]

The rest of this paper is organized as follows. Section 2 contains a brief overview of Vietnam's banking sector. Data and methodology are discussed in Section 3. An SVAR model is presented in Section 4. The model is used to consider the dynamic response of aggregate output, money supply, interest rate and exchange rate to monetary policy shocks in Vietnam. Section 5 contains the empirical analysis. Section 5 contains some concluding remarks.

## 2. The banking system and monetary policy in Vietnam

The Vietnamese financial system consists primarily of the banking sector. Prior to the introduction of economic reforms, under the centrally planned economy, the Vietnamese banking system was dominated by the government. Through a vast branch network, the State Bank of Vietnam (SBV) used to provide virtually all domestic banking services. However, international trade and infrastructure finance related issues were managed by two specialized state-owned banks; (1) the Bank for Foreign Trade of Vietnam (VCB) established in 1963 and (2) the Bank for Investment and Development of Vietnam (BIDV) established in 1958. These banks were responsible for, among other things, the financing of foreign trade and public expenditure.

The economic liberalization policy that started in 1986 in part reflected the realization that the banking system of Vietnam was inefficient and uncompetitive. Banking sector reforms were urgently needed to (i) mobilize private sector saving and (ii) attract foreign investment. In 1987, the government of Vietnam introduced additional reforms. This process got a further boost in 1988 when Vietnam's single tier banking system was split into a two-tier banking system. The new system comprised a central bank and four specialized state-owned commercial banks (SOCBs). The central bank was named as the State Bank of Vietnam (SBV). Steps taken by the government of Vietnam since the creation of the two-tiered banking system resulted in improved efficiency of the banking sector. In 1990, there were only four SOCBs and a small number of credit cooperatives in Vietnam. In the aftermath of the reforms, the Vietnamese banking sector grew to include more

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[3] In a very interesting study, using monthly data from January 2003 to December 2013, Vo and Nguyen (2017) provide evidence of the existence of a cost channel of monetary policy in Vietnam.

diversified banking institutions (Harvie & Hoa, 1997). A large number of bank branches were established in the mid-1990s, which contributed to a significant increase in the availability of credit. The bank credit rapidly increased from an annual average of 18% of GDP in 1991 to close to 30% before dropping in recent years. The credit growth, which was viewed as a necessary condition for sustainable economic growth by the SBV, resulted in a significant increase in non-performing loans. However, the non-performing loans dropped to approximately 5.4% in 2013. While the aim of increased availability of credit was achieved, the creation of SOCBs did not contribute to an immediate increase in competition within the banking sector. However, over time, the banking sector efficiency has improved.[4]

In 1995, the ratio of M2 to GDP was 23%. However, banking sector reforms enacted in 1997 contributed to increase in financial deepening and the ratio of M2 to GDP reached 123.3% in 2011. The banking sector reforms enacted in 2000 contributed to significant increase in domestic credit as well as the GDP. In overall terms, domestic credit provided by financial institutions in Vietnam, as a proportion of GDP, increased from 32.57% in 2000 to 128.35% in 2015 (WDI, 2017).

Vietnam started attracting significant FDI from 1988, which contributed to significant economic growth. In the early stages, the contribution of FDI to employment growth was found to be small. However, rapid increase in industrial output and further growth in FDI inflows contributed to significant export growth (Anwar & Nguyen, 2011, 2014). The exports of Vietnam's foreign-invested sector are expected to reach US$13.855 billion in 2014. The foreign-invested sector accounts for at least 65% of the total exports. At the same time, Vietnam's imports, especially imports of foreign-invested sector, which accounts for more than 55% of the total imports, are also expected to grow. The imports of foreign invested sector grow by more than 17% in 2013 (Vietnam Briefings, 2014). As shown in Table 1 and the Appendix, there has been a significant increase in both domestic credit and foreign assets in Vietnam.[5]

The banking reform policies that started in 2000 have also contributed to significant economic growth in Vietnam. The gross domestic credit registered a steep rise from 35.3% of GDP in 2000 to 64.5% in 2007 (IMF, 2008). Starting from 1990, the banking sector has grown dramatically in size. However, the banking sector is still viewed as inefficient compared to banking sectors of a number of regional economies. There has been an increase in nonperforming loans, which can at least partially account for banking sector inefficiency (Vietnam Briefings, 2014). At the end of 1997, the total overdue loans were estimated at US$610 million. Approximately 75% of these loans were issued by the State-Owned Commercial Banks (IMF, 2008). Recent discussion on the state of Vietnam's economy can be found in Mellor, Minh, and Nguyen (2014).

### 2.1. Monetary policy in Vietnam

Since the beginning of the reforms process, the government of Vietnam has taken a keen interest in the development and conduct of the monetary policy. While in most developing and developed economies, government focuses on the fiscal policy, in the case of Vietnam through a law on the SBV, government maintains a control on the monetary policy. The SBV is a body of the Vietnam government and its governor is appointed by the government. The SBV legislation distinguishes

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[4] In 2011, the SOCBs accounted for only 56.03% of the total credit (SBV, 2017).

[5] In recent years, there has been a significant increase in gross capital formation, as a proportion of GDP, from 2.37% in 2012 to 9.04% in 2015 (WDI, 2017).

Table 1
Monetary aggregates of Vietnam (in billion VND).

| | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Money supply (M2) | 52,710 | 222,882 | 279,781 | 329,150 | 411,232 | 532,346 | 690,652 | 922,672 | 1,348,244 | 1,622,130 | 2,092,447 | 2,789,184 | 3,125,961 |
| Foreign assets | 10,851 | 95,692 | 117,615 | 117,418 | 131,402 | 145,910 | 191,077 | 287,925 | 410,414 | 428,929 | 312,264 | 266,567 | 300,046 |
| Domestic credit | 47,055 | 155,236 | 191,204 | 239,921 | 316,872 | 434,572 | 585,559 | 730,330 | 1,096,780 | 1,400,693 | 2,039,686 | 2,689,527 | 3,062,549 |
| Claims on government sector | 4684 | −484 | 2102 | 8843 | 20,135 | 14,527 | 32,461 | 36,496 | 29,051 | 61,430 | 170,431 | 213,991 | 232,356 |
| Claims on private sector | 18,292 | 155,720 | 189,103 | 231,078 | 296,737 | 420,046 | 553,098 | 693,834 | 1,067,729 | 1,339,263 | 1,869,255 | 2,475,535 | 2,830,193 |
| Percentage change in M2 | 22.6 | 56.2 | 25.5 | 17.6 | 24.9 | 29.5 | 29.7 | 33.6 | 46.1 | 20.3 | 29.0 | 33.3 | 12.1 |
| M2 as a percentage of GDP | 23.0 | 50.5 | 58.1 | 61.4 | 67.0 | 74.4 | 82.3 | 94.7 | 117.9 | 109.2 | 126.2 | 140.8 | 123.3 |
| Demand deposits | 7366 | 41,985 | 48,626 | 53,725 | 69,758 | 92,831 | 114,858 | 138,460 | 222,915 | 206,136 | 288,310 | 303,010 | 335,006 |
| Time and savings deposits | 9622 | 47,462 | 60,251 | 77,387 | 132,617 | 182,409 | 261,269 | 382,396 | 597,162 | 791,066 | 1,004,770 | 1,466,950 | 1,683,540 |
| 6 months interest rate in percentage | 12.00 | 4.80 | 6.24 | 7.44 | 6.48 | 6.96 | 7.80 | 7.80 | 8.19 | 13.34 | 10.15 | 11.14 | 13.60 |
| 12 months interest rate in percentage | 12.00 | 6.24 | 6.84 | 7.80 | 7.20 | 7.56 | 8.40 | 8.40 | 8.80 | 13.46 | 10.37 | 11.50 | 13.00 |

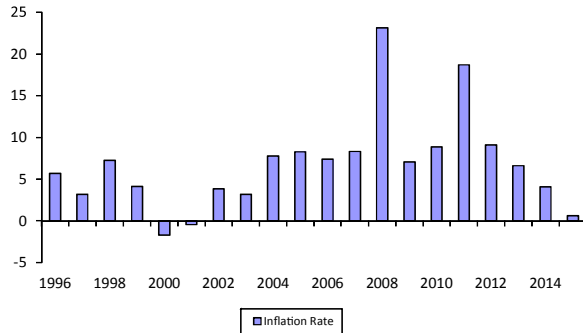Source: ADB (2016) and World Bank (2012).

Fig. 1. Inflation rate in Vietnam (%).
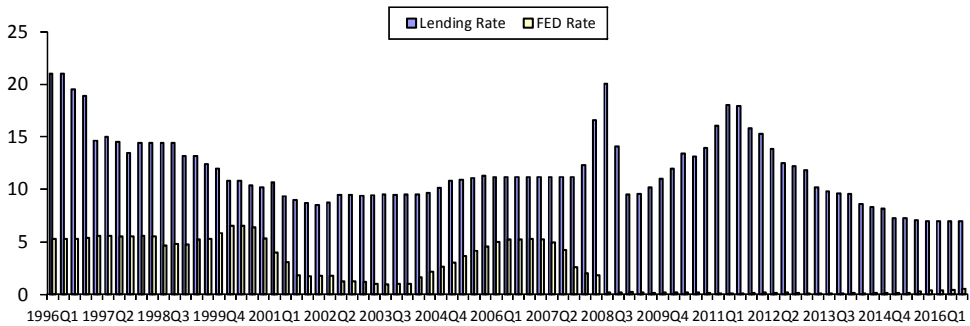
Source: WDI (2017).



Fig. 2. Vietnam's lending rate and the US Fed rate (%).

Source: IMF (2017).

between the functions of SBV and those related to national monetary policy. Decisions regarding the monetary policy and its supervision are principal functions the government. The government is required to develop a monetary policy plan, which includes forecasting of the annual inflation rate. This plan is then submitted to the National Assembly (i.e., the parliament) for approval. Based on the state budget and economic growth objectives, the National Assembly sets the targeted rate of inflation.

The government is also responsible for (i) implementing the monetary policy and (ii) setting the amount of liquidity to be injected into the economy. The National Assembly supervises the implementation of monetary policy and the government is required to report periodically on the implementation to a standing committee of the National Assembly. In other words, Vietnam's monetary policy is largely the responsibility of the National Assembly and the government. The SBV is an integral part of the Vietnamese government. The SBV implements the monetary control mainly through the interest rate, the exchange rate and the reserve requirement ratio.

As indicated earlier, the SBV has relied heavily on credit growth to stimulate economic growth. However, this policy has also resulted in significant inflation over the 2004–2012 period as shown in Fig. 1. In recent years, however, the inflation rate has declined significantly. A comparison of the lending rate in Vietnam and the US Fed rate is shown in Fig. 2. The lending rate in Vietnam is much higher than the comparable rate in the US. The high cost of borrowing is the key reason

Table 2
Variables included in the Vietnamese SVAR model.

| Variable definition | Abbreviation | Period | Source |
|---|---|---|---|
| Foreign block | | | |
| World oil price in logarithm | OP | 1995:Q1-2010:Q4 | IFS-IMF |
| Federal Funds rate (US) in percentage | R_US | 1995:Q1-2010:Q4 | FED |
| Domestic block | | | |
| Real GDP in logarithm | Y | 1995:Q1-2010:Q4 | MPI |
| CPI in logarithm | P | 1995:Q1-2010:Q4 | IFS-IMF |
| M2 in logarithm | M2 | 1995:Q1-2010:Q4 | IFS-IMF |
| Interest rate (short term) in percentage | R | 1995:Q1-2010:Q4 | IFS-IMF |
| Exchange rate in logarithm | XR | 1995:Q1-2010:Q4 | IFS-IMF |

for spiralling inflation in Vietnam. The quarterly data allows one to examine a clearer picture of the trend.

## 3. Methodology and data

Monetary policy transmission channels can be divided in to two groups: domestic and foreign factors. The domestic factors include real output, price level, money supply, short-term interest rate and currency exchange rate. In this paper, we use $M2$ as a proxy for money supply. The world oil price and the US interest rate are included to account for the foreign factors. In order to examine the impact of monetary policy shocks on real output, money supply, interest rate and exchange rate, we utilize the following Structural Vector Auto Regression (SVAR) model.

$$Y_t = AY_{t-1} + BX_t + v_t \tag{1}$$

where $Y_t$ is the vector of endogenous variables; $X_t$ is the vector of exogenous foreign variables; $v_t$ is vector of the error terms.

The matrix $A$ includes unknown population parameters that describe the relationship among all the endogenous variables, whereas the matrix $B$ includes unknown population parameters that describe the relationship among the endogenous and exogenous variables.

Most of the data used in this paper are collected from the General Statistics Office (GSO) of Vietnam and the International Monetary Fund (IMF). Following the existing literature, for example Raghavan et al. (2012), we use seasonally adjusted values of all variables.[6] Furthermore, in our empirical analysis, except for the interest rate, all variables are in logarithms. See Table 2 for variable definition and data sources.

Of the seven variables in the model, two variables – the world oil price ($OP$) and the US Federal Funds rate ($R\_US$) – represent foreign shocks. The US is one of the most important export markets for Vietnamese products, accounting for almost 19.9% of the total exports in 2009 (GSO). Vietnamese economy is significantly affected by fluctuations in the US interest rate. Related studies (such as Fung, 2002; Raghavan et al., 2012) have also used the US interest rate as a proxy for foreign shocks.

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[6] A number of existing studies have considered monetary policy transmission channels in the context of developed and developing countries. A review of related studies can be found in, among others, El-Shagi and Giesen (2013) and Holmes and Mengesha (2013).

Table 3
ADF unit root test results.

| Variable | ADF test (t-statistics) | | Status |
|---|---|---|---|
| | Levels | First differences | |
| $R$ | −2.559191 | −10.04247[***] | Stationary |
| $M2$ | 0.460510 | −6.838720[***] | Stationary |
| $P$ | 2.418678 | −2.693261[**] | Stationary |
| $Y$ | −1.578330 | −2.599788[*] | Stationary |
| $OP$ | −1.265250 | −5.858331[***] | Stationary |
| $R\_US$ | 2.716799 | −5.053472[***] | Stationary |
| $XR$ | −1.477720 | −15.50391[***] | Stationary |

[*] Indicate statistical significance at the 10% level.
[**] Indicate statistical significance at the 5% level.
[***] Indicate statistical significance at the 1% level.

Fluctuations in the world price of oil can have significant impact of Vietnam's economy. Within the Southeast Asian region, Vietnam is regarded as an important oil producing country. The Vietnamese oil production reached 15,200 metric t in 2011 out of which 8200 metric t was exported. Fluctuations in the price of oil affect both the consumers and producers. The world oil price can also account for inflationary expectations.

The domestic variables include the Vietnamese real output or GDP ($Y$), the consumer price index ($P$), money supply as measured by $M2$, interest rate as short term interest rate in 3 months ($R$) and exchange rate between VND and USD ($XR$). $Y$ and $P$ are target variables of monetary policy. The SBV regulates monetary policy based on several instruments including interest rate and exchange rate, thus these variables are integral components in the model.

$M2$ is an intermediate instrument of the Central Bank, which measures money supply of the economy. An increase in $M2$ reflects loosening of the monetary policy, which affects CPI and economic growth and hence $M2$ is chosen instead of $M1$.

We use the Augmented Dickey-Fuller (ADF) test to test for stationary of all variables. The results reported in Table 3 suggest that the null hypothesis of unit roots cannot be rejected for all variables at the 5% significance level. Because we are not interested in estimating the parameters of the model and our focus is on the interactions among the selected variables, we proceed with SVAR estimation.

## 4. Model structure and restrictions

### 4.1. Model structure

In order to investigate the Vietnamese monetary transmission mechanism, we divide foreign and domestic factors into two groups/blocks as follows:

$$Y_t = f\left(Y_{1,t}, Y_{2,t}\right) \tag{2}$$

where $Y_{1,t}$ and $Y_{2,t}$, respectively, represent the foreign and domestic blocks.

As Vietnam is a small open economy, the variables included in the foreign block are assumed to be exogenous. The factors included in the two blocks are as follows:

$$Y_{1,t} = f(OP_t, R\_US_t) \tag{3}$$

Table 4
Restrictions on contemporaneous and lagged dynamics — $A_0$.

| Dependent variables | Explanatory variables | | | | | | |
|---|---|---|---|---|---|---|---|
| | $R$ | $M2$ | $P$ | $Y$ | $OP$ | $R\_US$ | $XR$ |
| $R$ | 1 | $a_{12}$ | 0 | 0 | $a_{15}$ | 0 | $a_{17}$ |
| $M2$ | $a_{21}$ | 1 | $a_{12}$ | $a_{12}$ | 0 | 0 | 0 |
| $P$ | 0 | 0 | 1 | $a_{12}$ | $a_{12}$ | 0 | 0 |
| $Y$ | 0 | 0 | 0 | 1 | $a_{12}$ | 0 | 0 |
| $OP$ | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| $R\_US$ | 0 | 0 | 0 | 0 | $a_{12}$ | 1 | 0 |
| $XR$ | $a_{71}$ | $a_{72}$ | $a_{73}$ | $a_{74}$ | $a_{75}$ | $a_{76}$ | $a_{77}$ |

$$Y_{2,t} = g(R_t, M2_t, P_t, Y_t, XR_t) \tag{4}$$

Using the information provided in the above, the elements of Eq. (1) can be represented as follows:

$$Y_t = \begin{bmatrix} Y_{1,t} \\ Y_{2,t} \end{bmatrix}; \quad A_0 = \begin{bmatrix} A_{0,11} & A_{0,12} \\ A_{0,21} & A_{0,22} \end{bmatrix}$$

$$B(L) = \begin{bmatrix} B_{11}(L) & B_{12}(L) \\ B_{21}(L) & B_{22}(L) \end{bmatrix}; \quad v_t = \begin{bmatrix} v_{1,t} \\ v_{2,t} \end{bmatrix}$$

where the two blocks, $B_{11}(L)$ and $B_{12}(L)$ contain the coefficients that correspond to foreign variables, while $B_{21}(L)$ and $B_{22}(L)$ contain the coefficients that correspond to the domestic economy.[7]

We assume that the domestic variables do not Granger cause the foreign variables. Following the existing literature, we impose block exogeneity restrictions by excluding all domestic variables from the foreign block of equations. This involves imposing two restrictions; $A_{0,12} = 0$ and $B_{12}(L) = 0$. The block exogeneity restrictions not only reduce the number of parameters to be estimated but allow one to also include a larger number of foreign variables in the model (see Raghavan et al., 2012).

### 4.2. Restrictions on contemporaneous and lagged dynamics

In addition to foreign block exogeneity restrictions, we also impose restrictions on the contemporaneous and lagged matrices.[8] The variables that enter each equation of the SVAR system in (1) are presented in Tables 4 and 5. Table 4 shows the restrictions on the contemporaneous relationships among the variables, while Table 5 presents the restrictions on the lag dynamics.

The empirical analysis presented in this paper is based on the so-called "successive relationship". This involves determination of the relationship between variables in a block recursive way (Raghavan & Silvapulle, 2006). We use over-identifying restrictions, which is a common practice. It is, however, interesting to note that most existing studies on Vietnam do not impose any over-identifying restrictions.

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[7] For more information, please refer to Raghavan et al. (2012).
[8] See Fry (2002), Fung (2002), Gali and Monacelli (2005), Raghavan and Silvapulle (2006), and Bhuiyan (2012).

Table 5
Restrictions on the lag structure — B(L).

| Dependent variables | Explanatory variables | | | | | | |
|---|---|---|---|---|---|---|---|
| | $R$ | $M$ | $P$ | $Y$ | $OP$ | $R\_US$ | $XR$ |
| $R$ (shock 1) | $b_{11}$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $M2$ (shock 2) | 0 | $b_{22}$ | 0 | 0 | 0 | 0 | 0 |
| $P$ (shock 3) | 0 | 0 | $b_{33}$ | 0 | 0 | 0 | 0 |
| $Y$ (shock 4) | 0 | 0 | 0 | $b_{44}$ | 0 | 0 | 0 |
| $OP$ (shock 5) | 0 | 0 | 0 | 0 | $b_{55}$ | 0 | 0 |
| $R\_US$ (shock 6) | 0 | 0 | 0 | 0 | 0 | $b_{66}$ | 0 |
| $XR$ (shock 7) | 0 | 0 | 0 | 0 | 0 | 0 | $b_{77}$ |

Table 6
The number of lags in the model.

| Lag | Log likelihood | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 290.8940 | NA | 2.75e−12 | −15.27189 | −14.56810[a] | −15.02625 |
| 1 | 309.7354 | 29.30874 | 2.41e−12 | −15.42974 | −14.02217 | −14.93846 |
| 2 | 347.0927 | 49.80980[a] | 7.94e−13 | −16.61626 | −14.50490 | −15.87934 |
| 3 | 367.9392 | 23.16278 | 7.12e−13[a] | −16.88551[a] | −14.07037 | −15.90295[a] |

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.
[a] Indicates lag order selected by the criterion.

Using some well-known information criteria such as Akaike (AIC), and Hannan-Quinn (HQ), the optimal lag length was found to be three (see Table 6). In other words, using three lags, we attempt to capture the underlying dynamics of the three-equation system (Table 6 ).

## 5. Empirical results

### 5.1. Impulse response analysis

The impulse response analysis allows one to not only evaluate the effectiveness of the monetary policy but also examine the role that transmission channels play in transmitting the policy shocks. In the rest of this paper the impulse response functions and forecast variance decompositions are used.

#### 5.1.1. Impulse response of Vietnamese interest rate to foreign shocks

Fig. 1 shows the impact of foreign shocks namely the world oil price shock (OP) on Vietnamese interest rate (R).

Fig. 3 shows that an increase in the world price of oil leads to an increase in Vietnam's interest rate in the short-run. Interest rate increases dramatically after the oil price shock and then decreases after 3 quarters. Thus, the monetary policy of Vietnam appears to very sensitive and vulnerable to fluctuations in the world price of oil.
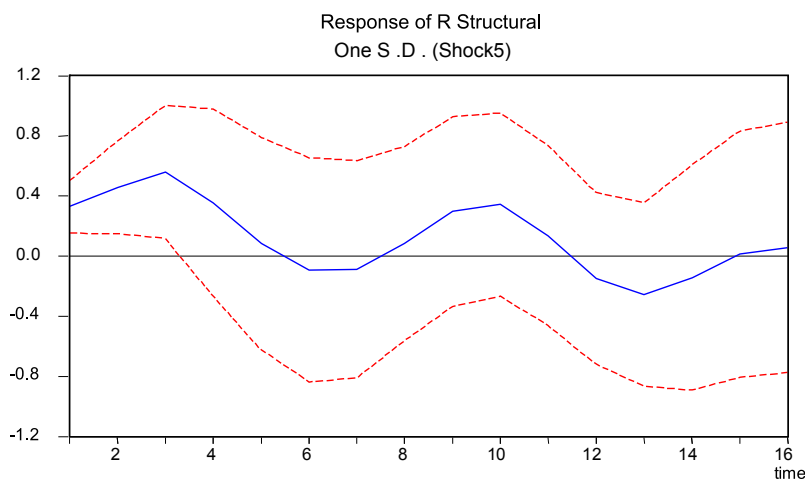
Fig. 3. Impact of an increase in the world price of oil on Vietnamese interest rate.

### 5.1.2. Impulse response of Vietnamese output, price level, and interest rate to the US monetary contraction

Fig. 4 shows the impact of U.S. monetary shock on domestic variables, i.e., the consumer price index of Vietnam in logarithm ($LP$), the Vietnamese real output in logarithm ($LY$) and the interest rate. An increase in the US interest rate ($R\_US$) reflects tightening of the US monetary policy.

Fig. 4 suggests that the domestic variables respond sharply to the U.S. monetary policy contraction. The contraction of the U.S. monetary policy seems to have a negative effect on Vietnamese price level and interest rate in the first 5 quarters. However after quarter 5, both the price level and the interest rates increase dramatically. The medium term effect of this shock on price level and interest rate is positive. In response to increase in the US interest rate, the domestic output increases continuously during the first 12 quarters and then tends to decrease. In summary, foreign shocks have a strong impact on Vietnamese price level, real output and the interest rate.

### 5.1.3. Response of Vietnamese interest rate, monetary supply and price level to domestic output and price shocks

In this section, we focus on the impact of domestic shocks on Vietnamese economy. We start with the impact of a positive real output shock on Vietnamese interest rate, money supply in logarithm ($LM2$) and price level in logarithm ($LP$). The results are shown in Fig. 3.

Fig. 5 shows the impact of a positive shock to domestic output on domestic variables. It is clear that economic growth in Vietnam affects its interest rate, money supply $M2$ as well as the price level. Despite economic growth, the interest rate initially declines but this effect lasts for about one quarter as economic growth starts putting upward pressure on the interest rate. The impact of this shock on interest rate appears to completely disappear in quarter 16. The response of the interest rate is mirrored by fluctuations in $M2$. Around quarter 15, there is no change in $M2$, which explains why there is no further change in the interest rate around quarter sixteen. The response of the price level is initially negative but then it starts to increase. A significant decline in the price level is evident from quarter twelve.

Fig. 6 suggests that a positive shock to Vietnam's price level promotes real output growth in the short-run but over time the domestic output continues to fluctuate around the original level
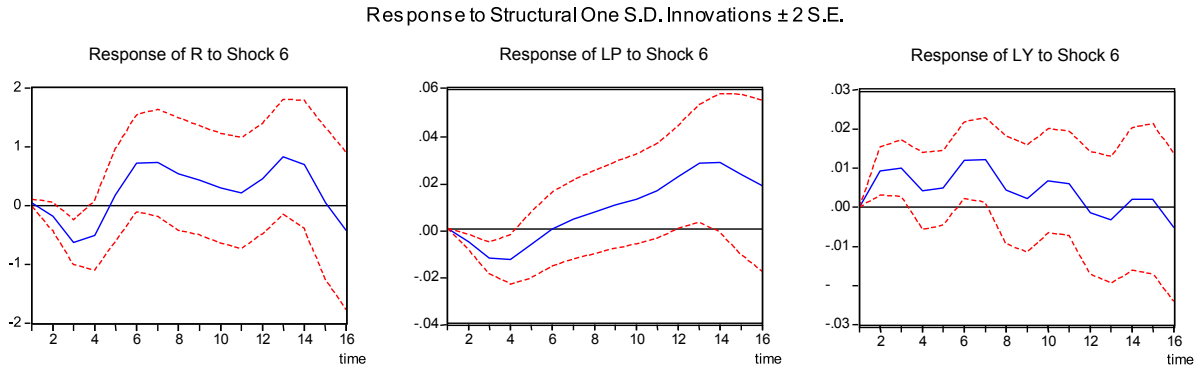
Response to Structural One S.D. Innovations ± 2 S.E.

Response of R to Shock 6

Response of LP to Shock 6

Response of LY to Shock 6

Fig. 4. Impact of an increase in the US interest rate on Vietnamese interest rate, price level and real output.

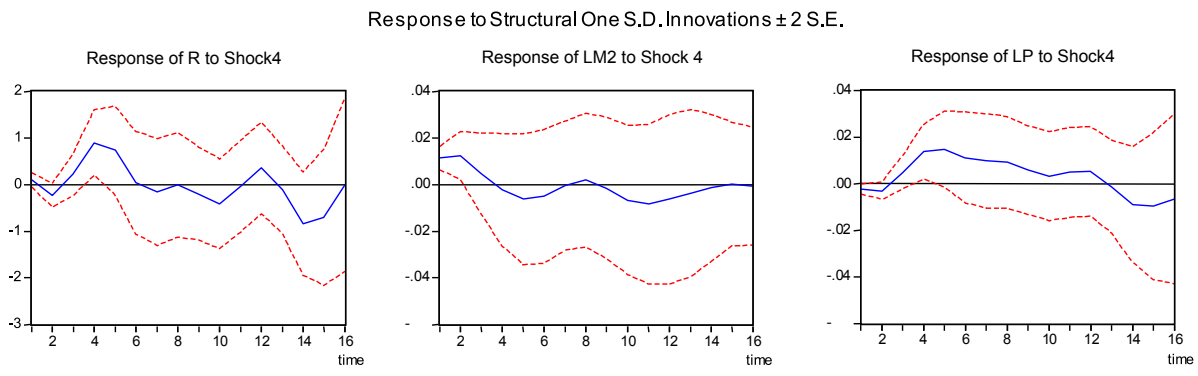Response to Structural One S.D. Innovations ± 2 S.E.

Response of R to Shock4

Response of LM2 to Shock 4

Response of LP to Shock4

Fig. 5. Impact of a positive shock to domestic output on Vietnamese interest rate, *M*2 and price level.

Response to Structural One S.D.Innovations ± 2S.E.

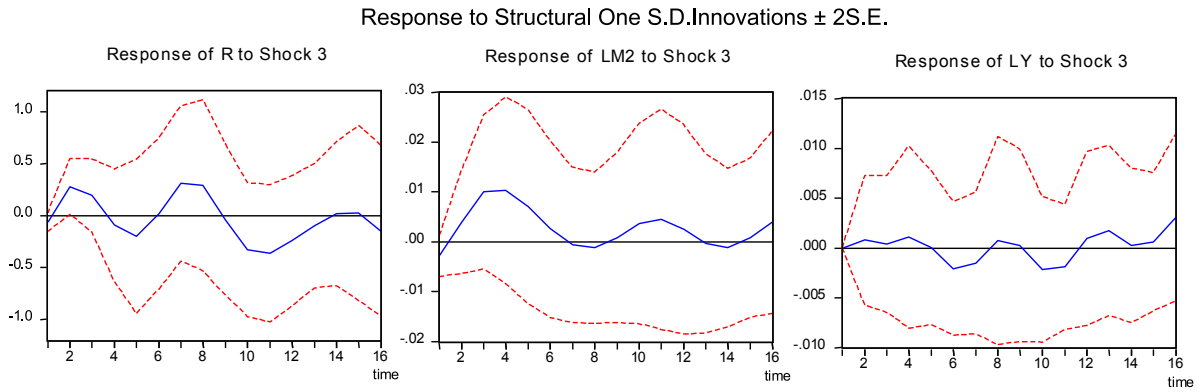Response of R to Shock 3　　　　Response of LM2 to Shock 3　　　　Response of LY to Shock 3

Fig. 6. Impact of a price level shock on Vietnamese interest rate, M2 and real output.

and a larger increase in observable only after several quarters. The monetary policy response is reflected by a sharp increase in the interest rate. To deal with rising inflation, the monetary policy is tightened, which leads to an immediate increase in interest rate. A price level shock is the main explanation for interest rate fluctuations, which are consistent with small adjustments to *M*2.

### 5.1.4. Response of Vietnamese policy variables to money, interest rate and exchange rate shocks

The first panel in the top left land corner of Fig. 7 shows that a positive shock to money supply affects Vietnam's rate. An increase in *M*2, which reflects easing of the monetary policy, leads to an immediate sharp decrease in the interest rate. However, after the initial overreaction, the interest rate increases gradually towards its equilibrium value (in other words, under shooting occurs in the short-term). The bottom right hand panel of Fig. 5 shows that easing of the monetary policy leads to exchange rate depreciation for two quarters. However, this trend is gradually reversed over time. As indicated in the top centre panel of Fig. 5, depreciation of Vietnamese currency coincides with a decrease in its interest rate. There is a strong link between the currency exchange rate and the interest rate. As indicated in the bottom left hand panel of Fig. 7, currency depreciation leads to an increase in money supply in Vietnam, which accounts for a decrease in the interest rate.

### 5.1.5. Responses of the Vietnamese real output and price level to M2, interest rate and exchange rate shocks

Vietnam implements loosening of the monetary policy by increasing its money supply (*M*2), which leads to an increase in real output within the first three quarters as shown in the bottom centre panel of Fig. 8. The real output fluctuates and decreases before another increase is observed in quarter five. This implies that *M*2 increase has a positive effect on economic growth in the short-run. Similarly, Vietnam's price level is affected by the positive *M*2 shock, which appears to support the idea of a demand driven inflationary pressure. The price level, as shown in the top centre panel of Fig. 8, decreases during the first three quarters and then increases dramatically. The top and bottom left hand side panel of Fig. 8 suggest that an increase in Vietnamese interest rate decreases the price level and its impact of real output is almost zero in the first quarter but during quarters two to four the real output declines before a rebound in quarters five and six. Fig. 8 also shows a depreciation of the Vietnamese currency exchange rate leads to increase in real output and a decline in its price level in the short-run.

In general, the three monetary channels of credit, interest rate and exchange rate play significant role in the transmission mechanism of monetary policy in Vietnam. In the next section, we use variance decomposition method to analyze notable changes in Vietnamese economy and its monetary policy.

### 5.2. Variance decomposition analysis

We use variance decomposition because this method allows one to evaluate the response of the economy as well as monetary policy to domestic and foreign shocks in the short as well as the medium-run.

The variation proportion of the five domestic variables including money supply *M*2, price level, real output, interest rate, and exchange rate is shown in Table 7. The information in this table also reflects the interaction between the domestic and foreign variables. The variance decomposition is reported for the forecast horizons of 1, 4, 8, 12 and 16 quarters. While four quarters, which represents one year is viewed as the short-run, 8–16 quarters can be viewed as the medium-run.
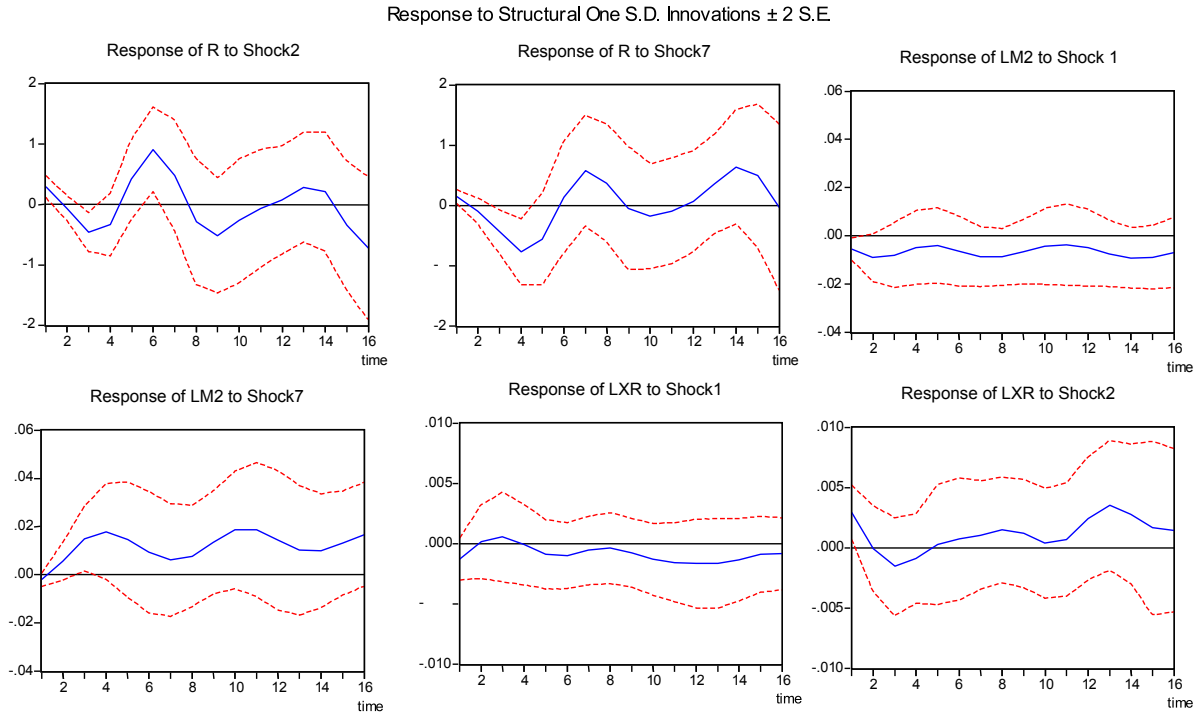
Response to Structural One S.D. Innovations ± 2 S.E.



Fig. 7. Response of Vietnamese policy variables to M2, interest rate and exchange rate shocks.

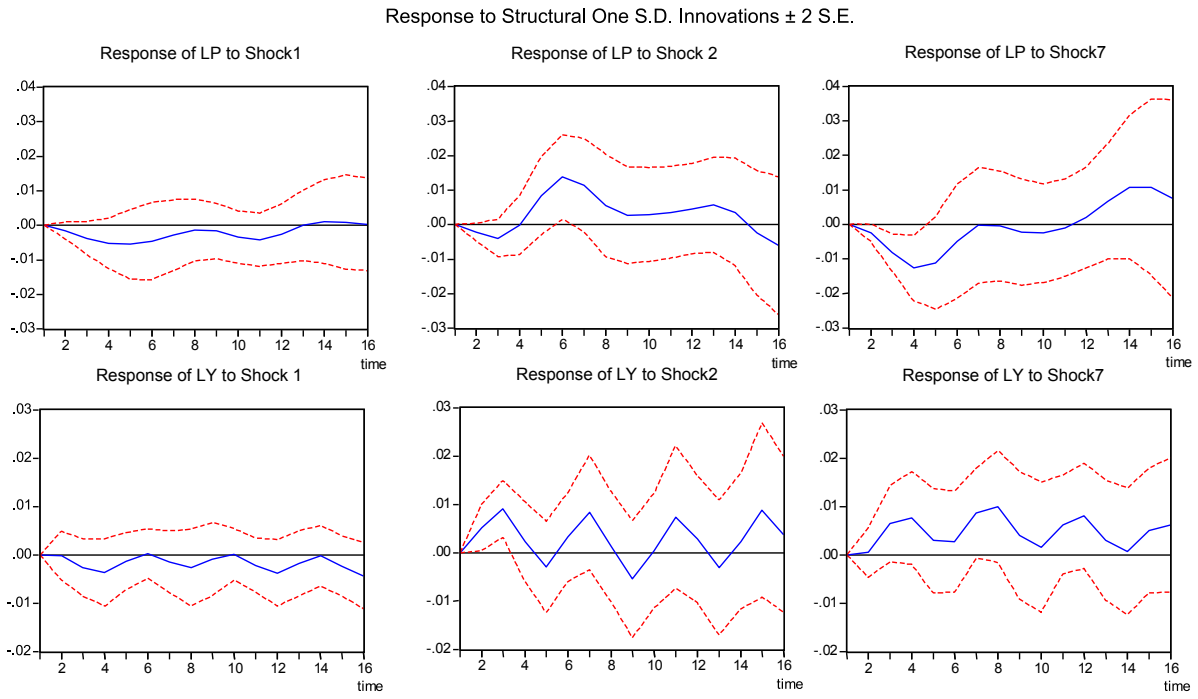Response to Structural One S.D. Innovations ± 2 S.E.



Fig. 8. Response of Vietnam's real output and price level to M2, interest rate and exchange rate shocks.

Table 7
Variance decomposition of domestic variables.

| Horizon | R | M2 | P | Y | OP | R_US | XR |
|---|---|---|---|---|---|---|---|
| **Interest rate** | | | | | | | |
| 1 | 40.06559 | 22.05523 | 1.124056 | 2.734167 | 27.91654 | 0.640958 | 5.463462 |
| 4 | 7.531265 | 10.23914 | 3.205455 | 22.97047 | 18.78093 | 17.08156 | 20.19118 |
| 8 | 4.944018 | 20.56941 | 4.142205 | 17.65819 | 9.327107 | 24.23789 | 19.12118 |
| 12 | 4.863334 | 20.21310 | 6.312510 | 17.67939 | 9.996468 | 24.85078 | 16.08441 |
| 16 | 4.181073 | 19.52282 | 4.668330 | 20.61388 | 7.637968 | 26.70345 | 16.67248 |
| **M2** | | | | | | | |
| 1 | 8.834596 | 46.79833 | 2.385099 | 37.21131 | 3.424617 | 0.141333 | 1.204712 |
| 4 | 5.480719 | 33.25768 | 6.183984 | 8.501543 | 0.427803 | 30.44615 | 15.70212 |
| 8 | 6.163886 | 20.11115 | 4.261135 | 5.714838 | 3.216579 | 45.96420 | 14.56822 |
| 12 | 4.660384 | 15.85353 | 2.946593 | 4.875349 | 2.355053 | 50.77228 | 18.53682 |
| 16 | 5.912253 | 17.00417 | 2.589809 | 4.179782 | 2.245923 | 47.71188 | 20.35618 |
| **Price** | | | | | | | |
| 1 | 0.000000 | 0.000000 | 75.24102 | 10.81888 | 13.94011 | 9.42E−31 | 0.000000 |
| 4 | 3.734023 | 1.728060 | 11.90065 | 19.29908 | 12.97844 | 30.34067 | 20.01909 |
| 8 | 3.872237 | 15.87523 | 13.30362 | 27.14136 | 8.833934 | 17.03111 | 13.94251 |
| 12 | 3.436255 | 11.50256 | 9.480690 | 19.86234 | 11.25998 | 34.98433 | 9.473853 |
| 16 | 1.997006 | 7.805444 | 5.754060 | 14.33235 | 7.345093 | 52.82935 | 9.936698 |
| **Output** | | | | | | | |
| 1 | 0.000000 | 0.000000 | 0.000000 | 94.23333 | 5.766667 | 1.39E−32 | 0.000000 |
| 4 | 2.542780 | 14.54840 | 0.244619 | 41.82096 | 2.554309 | 25.52523 | 12.76369 |
| 8 | 1.784089 | 11.91823 | 0.520747 | 36.44725 | 1.235716 | 31.07600 | 17.01796 |
| 12 | 2.195575 | 13.14206 | 0.803801 | 36.94230 | 1.079249 | 27.49195 | 18.34507 |
| 16 | 2.812689 | 14.82617 | 1.143585 | 37.53321 | 1.224268 | 24.50949 | 17.95059 |
| **Exchange rate** | | | | | | | |
| 1 | 1.826884 | 9.677310 | 0.493209 | 16.69021 | 2.161001 | 7.260831 | 61.89056 |
| 4 | 0.807546 | 4.859737 | 3.081752 | 23.64277 | 11.73765 | 6.804503 | 49.06604 |
| 8 | 1.041711 | 3.927564 | 2.829109 | 16.63569 | 15.87163 | 25.96731 | 33.72699 |
| 12 | 1.825962 | 3.721933 | 4.009503 | 14.74544 | 10.60690 | 41.91608 | 23.17419 |
| 16 | 2.277206 | 6.302848 | 7.303209 | 17.37544 | 9.806056 | 36.60888 | 20.32636 |

Analysis of the variance decomposition suggests that, over a longer horizon, the foreign variables (as proxied by the US interest rate) play an important role in explaining a significant proportion of the variations in Vietnam's domestic variables. Furthermore, the world oil price also appears to have contributed to significant fluctuations in Vietnam's currency exchange rate and interest rate in the short-run. The estimated results are consistent with the impulse response function analysis. From the impulse response analysis, we found that foreign variables tend to have a relatively large impact on Vietnam's domestic variables.

## 6. Conclusion and policy implications

The failure of import substitution based industrialization strategy forced several developing countries (e.g., China and India) to liberalize their economies starting from the late 1970s and early 1980s. Vietnamese government started liberalizing the economy from 1986. The government of Vietnam believes that ownership is not a major determinant of economic efficiency and therefore, despite opening-up of the economy, most domestic industries (and important institutions) remain

under government control. In most developing countries, government uses fiscal policy to promote employment growth and the conduct of monetary policy is left to an autonomous central bank. In the case of Vietnam, to ensure coordination between the monetary and fiscal policies, the government maintains full control of the monetary policy. The State Banks of Vietnam (SBV) is an integral part of the government. The Vietnamese policies have been successful in that the economy registered significant growth over time. From 1995 to 2010, the government introduced significant reforms to the legal and institutional framework for conducting monetary policy. These reformed helped to modernize the economy. However, increased integration with the world economy has also made the Vietnamese economy more vulnerable to foreign shocks. Using quarterly data from 1995 to 2010, this paper focuses on the response of the Vietnamese economy to various domestic and foreign shocks.

The empirical analysis presented in this paper is based on a structural vector auto regression (SVAR) model that allows one to focus on foreign and domestic monetary policy transmission channels. The foreign channels include the world oil price and the US Federal Funds rate. The domestic channels considered in this paper include the Vietnamese real gross domestic product (GDP), the consumer price index, money supply as measured by $M2$, short term (3 months) interest rate and the exchange rate between Vietnamese dong (VND) and the US dollar (USD).

The empirical analysis presented in this paper reveals that the impact of money supply ($M2$) on real output of Vietnam is not as strong as expected. While the money supply and credit has increased over time, the less than expected impact on real output may be attributed to the fact that the available credit was not fully used for business purposes by firms and households. It seems that at least some of the credit was used to finance risky investments such as stocks and/or real estate. However, $M2$ continues to play an important role in economic growth of Vietnam at least in the short-term. Our analysis suggests that fluctuations in the currency exchange rate depend heavily on the monetary policy operating through interest rate tools and cash in circulation. Furthermore, external factors also impact on the exchange rate fluctuations to some extent.

Vietnam's banking system is greatly affected by the external shocks to the economy, particularly the volatility of world commodity prices and signs of recession or recovery of the world economy in general and the U.S. economy, in particular. Fluctuations in the US interest rate have a statistically significant impact on Vietnamese economy. The monetary policy of Vietnam appears to be relatively more sensitive and vulnerable to foreign inflationary and output shocks. Our analysis suggests that the price level tends to increase rapidly while the economy is overheating. However, the price level responds quickly to tightening of the monetary policy. As a result of the tight monetary policy, the price level declines for at least three to four quarters.

In the current era of rapid globalization, the Vietnamese monetary system needs to be further reformed. As a starting point, the state control needs to be further relaxed. With increased competition and transparency in the banking sector, the benefits of the current high level of inward foreign direct investment could be fully exploited. While foreign direct investment is contributing to economic growth, it seems to be also fuelling inflation. A more liberalized monetary system could withstand external shocks in highly desirable. Given that the interest rate channel is usually not very effective in the case of developing countries, the use of reserve requirement ratio may help to control inflation. Furthermore, at some stage, in not so distant future, the government need to focus on fiscal policy and leave the conduct of monetary policy to a truly autonomous central bank.

## Acknowledgements

## Appendix.  Selected economic indicators of Vietnam.

| | 2000 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Urban population growth (annual %) | 3.65 | 3.27 | 3.23 | 3.20 | 3.16 | 3.14 | 3.11 | 3.07 | 3.04 | 3.00 |
| GDP growth (annual %) | 6.79 | 7.13 | 5.66 | 5.40 | 6.42 | 6.24 | 5.25 | 5.42 | 5.98 | 6.68 |
| Inflation, GDP deflator (annual %) | 11.59 | 9.63 | 22.67 | 6.22 | 12.07 | 21.26 | 10.93 | 4.76 | 3.66 | -0.19 |
| Exports of goods and services (% of GDP) | 49.97 | 70.52 | 70.34 | 62.97 | 72.00 | 79.39 | 80.03 | 83.63 | 86.40 | 89.78 |
| Domestic credit provided by financial sector (% of GDP) | 32.57 | 88.23 | 86.86 | 112.76 | 124.66 | 110.22 | 104.91 | 108.23 | 113.77 | 128.35 |
| External debt (billion US$) | 12.8 | 23.1 | 26.4 | 32.7 | 44.9 | 53.9 | 61.6 | 65.5 | 72.4 | 77.8 |
| Foreign direct investment, net inflows (billion US$) | 13.0 | 67.0 | 95.8 | 76.0 | 80.0 | 74.3 | 83.7 | 89.0 | 92.0 | 118.0 |
| GDP per capita (constant 2010 US$) | 787.65 | 1161.47 | 1214.25 | 1266.31 | 1333.58 | 1401.84 | 1459.64 | 1522.49 | 1596.35 | 1684.87 |
| Gross capital formation (annual % growth) | 10.10946 | 26.80 | 6.278257 | 4.312369 | 10.41 | -6.84 | 2.37 | 5.45 | 8.90 | 9.04 |

Source: WDI (2017).

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