

THE TRANSMISSION CHANNELS OF MONETARY POLICY IN VIETNA

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Abstract

This paper investigates the mechanism of monetary transmission in Vietnam through four major channels namely interest rate channel, exchange rate channel, asset channel and credit channel for the period of 1995 - 2009. The paper applies LA-VAR technique to examine the effectiveness of monetary policy framework by analyzing the causal relationships of each monetary channel on objective variables. The study shows that the impact of the channels on output and price is as expected. Among them, exchange rate channel has impact on both output and price; in there its impact on output is larger. While equity price channel was not effective to transfer the impact of monetary policy on output and price because of the lack of established and well-functioning stock market. The study finds that lending rate and domestic credit are controlled directly to enhance economic growth in Vietnam.

Key words: *Monetary transmission channel, Output, Price level, Vietnam.*

1. Introduction

Most economists would agree that monetary policy can significantly affect the course of the real economy, at least in the short run. Therefore it is crucial to have a good understanding of the channels through which monetary policy is transmitted. Of course, conventional views of how monetary policy works are readily available. According to many textbooks, an increase in the money supply should lead to a decrease in short-term interest rate which influences spending on investment and consumption. In turn, changes in aggregate demand affect the level of production and price. Monetary transmission is also implemented through the other channel such as exchange rate channel, equity price channel, credit channel. However, the effectiveness of monetary transmission



differs substantially across countries, especially transition economies where market economy mechanism still does not work.

Characteristic of Vietnam, the same as many other transition economies is the existent of institutional and structural factors that have not been properly formed and then can inhibit

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Bảng 1: Kim ngạch và tốc độ tăng trưởng xuất nhập khẩu

Năm	Tăng trưởng GDP	Xuất khẩu			Nhập khẩu			Xuất siêu
		Kim ngạch	Tăng	Tăng do lượng	Kim ngạch	Tăng	Tăng do lượng	
2007	8,5%	48,6	22,1%	14,8%	62,8	39,8%	36,0%	-14,2
2008	6,18%	62,7	29,0%	4,2%	80,7	28,6%	23,5%	-18,0
2009	5,32%	57,1	-8,9%	3,0%	69,9	-23,3%	-41,5%	-12,8
2010	6,78%	72,2	26,4%	19,2%	84,8	21,2%	15,6%	-12,6
2011	5,89%	96,9	34,2%	14,6%	105,8	24,7%	4,5%	-9,5
2012	5,03%	114,6	18,3%	18,9%	114,3	7,1%	7,4%	0,2

Nguồn: Tính toán từ số liệu của Tổng cục Thống kê, www.gso.gov.v.v...

monetary transmission. However, monetary transmission mechanism remains a “black box” to monetary policymakers in Vietnam. There are very few studies investigating this mechanism quantitatively. Therefore, an empirical study of the monetary transmission mechanism is timely and useful for conducting consistent policies.

We study this issue by applying the vector autoregression (VAR) approach to estimate Granger causality focusing on the relationship between monetary policy and output using a small number of variables such as real output, price level, money supply, interest rate, exchange rate, stock price, and domestic credit in the economy. First, we estimate a core model to show the overall impact of money supply on the economy. Then, we incorporate different transmission channels for monetary policy to isolate their individual roles in terms of how money impacts the channel, how the channel impacts real output and inflation, and how the impact of money on real output and inflation is changed after controlling for the effects of the channel.

The paper is organized as follows. Section 2 discusses the channels of monetary transmission and reviews previous empirical works. Section

3 presents the monetary instrument which is applied in Vietnam. Section 4 describes methodology and data. Section 5 presents results and discussions. We conclude the study in Section 6.

2. Literature Review on Monetary Transmission Mechanism

2.1 Monetary Transmission Channels

The monetary transmission mechanism refers to the process through which changes in monetary policy instrument (such as aggregate money or short-term policy interest rates) affect the rest of the economy and, in particular, output and inflation. Monetary impulse shocks transmit through various channels, affecting different variables and different markets, and at various speeds and intensities. There are four major channels of transmission of monetary policy which have been identified in modern financial systems. The first is through the direct interest rate effects - which affect not only the cost of credit but also the cash flows of debtors and creditors. The second channel is through the exchange rate. The third channel is through the impact of monetary policy on domestic asset prices – including bond, stock market and real estate prices. Credit availability is the fourth

major channel.

Traditional interest rate channel

The traditional Keynesian IS-LM view of the monetary transmission mechanism can be characterized by the following schematic showing the effect of monetary expansion:

$M \uparrow \rightarrow \text{Real interest rate}(r) \downarrow \rightarrow \text{Investment spending} \uparrow \rightarrow \text{Output} \uparrow$

Although Keynes originally emphasizes this channel as operating through business's decisions about investment spending, later studies recognized that consumer's decisions about housing and consumer durable expenditure also are investment decisions. Thus, the interest channel of monetary transmission outlined in the schematic above applies equally to consumer spending.

In industrial countries the interest rate channel generally plays an important role in the transmission of monetary shocks. For instance, according to research done by the European Central Bank (2002), direct and indirect effects of interest rate changes (including wealth and exchange rate effects) on investment explain about 80% of the total response of output to monetary shocks after a lag of three years. In emerging markets, during the 1980s and 1990s there were several impediments to the operation of the interest rate channel. The lack of developed money and bond markets and frequent shifts in the risk premium are examples of such impediments. In some cases, binding interest rate controls combined with non-price mechanisms for allocating credit reduced the pass-through of the policy rate to other interest rates. This may have also reduced the macroeconomic effects of policy rate changes. A greater dependence of firms on the internal cash surplus for financing capital projects lowered the

response of investment to interest rate changes. Limited possibilities for household borrowing restricted the impact of interest rate changes on households as well. As noted above, several of these constraints have eased over the past decade (Mohanty and Turner, 2008).

Exchange rate channel

For countries operating in an international environment, the exchange rate channel may also play an important role in transmitting the effects of monetary policy. Monetary policy can influence the exchange rate through interest rates (via the risk-adjusted uncovered interest rate parity), direct intervention in the foreign exchange market, or inflationary expectations.

An increase in the money supply causes the domestic interest rate to fall. Therefore, assets which are denominated in the domestic currency are less attractive than assets denominated in foreign currencies, resulting in a depreciation of domestic currency. The depreciation of the domestic currency makes domestic goods relatively cheaper than foreign goods, thereby causing net exports and output to rise.

$M \uparrow \rightarrow \text{Interest rate} \downarrow \rightarrow \text{Exchange rate depreciation} \rightarrow \text{Net export} \uparrow \rightarrow \text{Output} \uparrow$

In addition to changes in the short-term interest rate, monetary authorities may also influence short-run exchange rate movements by directly intervening on the foreign exchange markets. The unsterilized interventions affect the exchange rate by altering relative money supplies.

In small open economies with flexible exchange rates, the exchange rate channel is likely to be particularly important because, in contrast to the other channels, it affects not only aggregate demand but also aggregate supply. A loosening of monetary policy, for example,

may lead to a depreciation of the exchange rate, an increase in domestic currency import costs, and hence induce firms to raise their domestic producer prices even in the absence of any expansion of aggregate demand. Because exchange rate changes are viewed as a signal of future price movements in many countries, particularly those with a history of high and variable inflation, wages and prices may change even before movements in import costs have worked their way through the cost structure. When the exchange rate is fixed or heavily managed, the effectiveness of monetary policy is reduced but not entirely eliminated. Often relatively wide margins exist within which the exchange rate can fluctuate. Moreover, if domestic and foreign assets are only imperfectly substitutable, there is some scope for domestic interest rates to deviate from international levels. Therefore, even if the nominal exchange rate is fixed, monetary policy may be able to affect the real exchange rate by acting on the price level. In this manner, monetary policy retains its ability to affect net exports, although to a much lesser degree and with much longer lags. However, where domestic and financial assets are close to perfect substitutes, as they may be under currency board arrangements (e.g. in Argentina and Hong Kong) or where there is a long tradition of dollarization (e.g. in Argentina and Peru), the scope for monetary policy is severely limited (Kamin et al., 1998)

The importance of the exchange rate channel may also depend on the share of domestic value added in tradable good. If this is high, exchange rate changes have a large effect on output and on demand. But if import content

is very high, then the exchange rate will have a more limited impact on domestic product and a large direct impact on inflation instead. In many developing countries - particularly those with only rudimentary markets for bonds, equities and real estate - the exchange rate is probably the most important asset price affected by monetary policy.

Equity price channel

In addition to interest rates and exchange rates, other asset price channels may also play a role. Policy-induced monetary supply changes also affect the level of asset prices-principally those of bonds, equities and the real estate- in the economy in accordance with Tobin's q theory of investment and through wealth effects on consumption (Mishkin, 1996). With an easier monetary policy stance, equity prices may rise, increasing the market price of firms relative to the replacement cost of their capital. This will lower the effective cost of capital, as newly issued equity can command a higher price relative to the cost of real plant and equipment. Hence, even if bank loan rates react little to the policy easing, monetary policy can still affect the cost of capital and hence investment spending. Policy-induced changes in asset prices may also affect demand by altering the net worth of households and enterprises. Such changes may trigger a revision in income expectations and cause households to adjust consumption

$M \uparrow \rightarrow \text{Price of equities} \uparrow \rightarrow q \uparrow \rightarrow \text{Investment} \uparrow \rightarrow \text{Output} \uparrow$

q is defined as the market value of firms divided by the replacement cost of capital.

$M \uparrow \rightarrow \text{Price of equities} \uparrow \rightarrow \text{Wealth} \uparrow \rightarrow \text{Consumption} \uparrow \rightarrow \text{Output} \uparrow$

² Monthly report of the Ministry of Industry and Trade, 11/2012, <http://www.moit.gov.vn/vn/Pages/Thongke.aspx?Machuyende=TK&ChudeID=52>

Credit channel

Finally, the credit channel of monetary policy may also be important. In countries with either poorly developed or tightly controlled financial systems, interest rates may not move to clear the market. Aggregate demand is often influenced by the *quantity* of credit rather than its *price*. Even in liberalized, highly developed markets, credit changes operating in addition to interest rate changes have been identified as important factors influencing economic activity. An increasing body of research has found that the financial condition of households, firms and financial institutions can play a key role in the propagation of monetary policy actions (Kamin et al., 1998).

This channel mainly involves agency problems arising from asymmetric information and costly enforcement of contracts in the financial market. The credit channel operates via two main components, including the bank lending channel and the balance-sheet channel.

For bank lending, a decrease in the money supply leads to a decrease in bank deposits, which further decreases the volume of money that banks have to loan out. This, in turn, decreases investment and, ultimately, aggregate demand. This channel allows monetary policy to operate without consideration of the interest rate, meaning that decreasing interest rates may not be sufficient to increase investment. Meanwhile, the balance-sheet channel operates through the net worth of firms. Contractionary monetary policy can reduce the value of assets and raise business costs through higher interest rates, which reduce the net worth of firms. A decrease in the firm's net worth means that lenders must accept less collateral for their loans, which raises the problem of adverse selection

and reduces lending for investment spending. Lower net worth also results in the problem of moral hazard because business owners have a lower equity stake in the firm and, therefore, have an incentive to take part in risky projects. As a result, lending and investment spending decreases (Mishkin, 1995).

In countries where private markets for credit either are poorly developed or are prevented by government regulation from operating freely, monetary policy is likely to affect aggregate demand more by altering the quantity or availability of credit than through the direct or indirect effects of changes in the price of credit. This will be true especially when binding controls or guidelines on the quantity of credit itself are present, as is the case in several major developing countries. In addition, binding ceilings on interest rates will force banks to use non-price means of rationing loans and thus enhance the importance of credit availability effects. Finally, direct government involvement in the loan market, either through official development banks or through fiscal subsidies of commercial bank loans, will have a similar effect (Kamin et al., 1998)

2.2 Empirical Works on Monetary Transmission Channel

The empirical studies on the monetary transmission mechanism are numerous and controversial. The efficiency of monetary transmission channels is differential country to country. Taylor (1995) has a survey of the research on interest channels and he takes the position that there is strong empirical evidence for substantial interest rate effects on consumer and investment spending. In the other way, the interest rate channel is a strong channel of monetary transmission. However his position

is highly controversial one, because some researchers, for example Bernanke and Gertler (1995), have an alternative view that empirical studies have had great difficulty in identifying significant effects of interest rate through the cost of capital. Indeed these researchers see the empirical failure of interest-rate. In Singapore, Chow (2004) uses the real effective exchange rate as a measure for monetary policy and finds that output reacts immediately and significantly to a contractionary monetary policy shock. He also finds that the exchange rate channel was more effective in transmitting monetary policy to the economy than was the interest rate channel. Kamin et al. (1998) investigates this issue for the emerging market economies and find that in many countries, interest rate channel is inoperative. However, recently, monetary policy frameworks have become more credible, and central banks more flexible in their operations than interest rate channel have been strengthened (Mohanty and Turner, 2008)

Empirical evidence for transition economies has shown that, although the interest rate channel is the most important transmission channel in industrial countries with developed financial markets, the exchange rate channel is generally the dominant channel of monetary policy transmission in transition economies (Ganev et al., 2002; Egert and MacDonald, 2006; Dabla-Norris and Floerkemeier, 2006). Ganev et al. (2002) attempted to conduct empirical analysis for 10 transition economies using analogous methodology for the same sample period 1995-2000. In this comparative framework a series of Granger causality tests and impulse response analysis were carried out to assess the strength of two major transmission channels: interest rate and exchange rate channel. Also in the empirical part, they tried to look for the existence of

long-run relationships between the basic set of macroeconomic variables in the countries under investigation. Conventional Granger causality tests show that for most countries exchange rate channel is much more stable than the interest rate channel. Domestic currency depreciation can be considered a Granger-cause for core inflation in Bulgaria, Czech Republic, Estonia and Romania and influence output more often than did the interest rate change. The evidence of long run relationship is found for all of countries with exception of Estonia and Slovenia. Long run relationship between depreciation and growth turned out positive and significant in many countries while impacts of interest rate on output are not significant in most cases. Impulse response functions show that responses of inflation are consistent with the theory. Investigating the monetary transmission channels in America, Dabla-Norris and Floerkemeier (2006) find that the interest rate channel remains weak, even though there is some evidence for a transmission of shocks to the repo rate to CPI inflation. As in many emerging and transition economies with a high degree of dollarization, the exchange rate channel appears to have a stronger impact on prices. The empirical analysis has shown that the central bank's means to influence economic activity and inflation are still limited.

In developing economies where most of projects are financed by bank loan, the bank lending channel is more effective in explaining the variation in output. Aleem (2010) examines three channels of monetary transmission in India: the bank lending channel, the asset price channel and the exchange rate channel using VAR model in levels. First, the paper propose a benchmark VAR model in order to estimate the dynamic responses of GDP, prices and interest rates to an

unanticipated monetary policy tightening. After that, the channels are augmented to examine the transmission channels of monetary policy and examine the robustness of our results. Empirical estimates in the augmented VAR model support the importance of the bank lending channel in the transmission of monetary policy shocks to the real sector and suggest that the exchange rate and asset price channels are not important in India. Tsangarides (2010) investigates the transmission mechanism of monetary policy in Mauritius using a VAR framework and suggests that overall the transmission channel is weak, particularly for output. There is evidence that a shock to repo rate (the primary policy instrument) as well as a shock to the other two policy variables (exchange rate and money supply) results in statistically significant changes of the headline CPI and there is a transmission of exchange rate and money supply shocks, but not shocks to the repo rate, on core CPI. These results suggest the possibility that different monetary policy rules could be considered depending on whether headline or core CPI is targeted: for headline CPI where the interest rate channel is stronger, "Taylor-type" rules may be more applicable, while for core CPI, alternative "McCallum-type" rules that target money supply could be more appropriate.

3. Instruments of Monetary Policy in Vietnam

Similar to India and China, Vietnam uses a mix of market-based instruments and changes in reserve requirements to carry out monetary policy. The State Bank of Vietnam (SBV) is reducing its reliance on direct instrument, preferring to use indirect instruments. However, given the current level of financial market development and weakness in the monetary transmission mechanism, Vietnamese monetary

authorities have no qualms about employing direct instruments to get the job done.

The SBV began introducing indirect monetary policy tools in the mid-1990s as part of financial sector reforms. Today, a number of indirect instruments have been introduced and are increasingly used. The indirect instruments of the SBV consist of reserve requirements, open market operation and central bank lending facilities (refinancing and discount). Open market operations and central bank lending facilities have been used gradually because of underdeveloped stock market. The SBV uses reserve requirements as the first instrument to implement monetary policy, when inflationary pressures are modest. For example, in response to inflation in 2004, the SBV, at first, raised reserve requirement ratio in July. After 6 months, because inflationary situation was not improved, the SBV had to raise rediscount and refinancing rate three times in 2005 and then the base interest rate. Inflation showed a trend of sharp increase since the middle of 2007. SBV adjusted reserve requirement ratios to increase by 1.5- 2 times (effective since June 2007) in order to withdraw money and control total liquidity growth. Reserve requirement also was employed as one of the effective tools to curb inflation during 2008.

The SBV has two lending facilities, a refinancing and a discount facility. Both are collateralized and the latter gives commercial banks access to funds subject to quotas. Discount operations can take the form of an outright purchase of securities or a repurchase agreement. Recently, the SBV has actively used both the refinance and discount rates in the process of tightening monetary policy to fight high inflation in early months of 2008.

Apart from reserve requirements, refinancing and discount lending facilities, the SBV uses open market operations and foreign exchange interventions. Open market operations, which started in July 2000, had to be developed from scratch. Over the years they have gained in importance and have by now become the single most important monetary instrument for controlling liquidity. The SBV also employs interventions in the foreign exchange market through purchases and sales of foreign currency or foreign exchange swaps. These interventions have been substantial at times of recession or inflation pressures. The main purpose of foreign exchange interventions has been to achieve the foreign exchange target set by the SBV. The exchange rate policy aims at promoting exports, limiting imports, attracting capital inflows and accumulating foreign exchange reserves. The SBV has always announced paid much attention to maintain a favorable exchange rate for exporters because the economic growth is led by export.

Beside indirect monetary policy instruments, the SBV continues to use measures to influence interest rate and credit more directly. For example, in March 2008, to realize inflation control targets, the SBV issued VND 20,300 billion of compulsory SBV bills with 364 - day maturity at 7.8% per annual and instructed credit institutions not to use them in refinancing operations with the SBV. As of October 1, 2008, however, to support liquidity of credit institutions in the context of the global financial crisis, the SBV allowed credit institutions to use compulsory SBV bills in applying for refinancing loans and allow prepayment for those bills at the same time. Furthermore, in the early of 2008, commercial banks' lending interest rate was rather high (about 18.5-19% in March

2008). SBV issued an interest rate regulating mechanism requiring that the maximum VND lending rate is 150 percent of the base interest rate. From December 31, generally, VND lending rate remained at 10.8-11.5%, 12-12.75% and 8.5-10% per annual for short- term, medium and long-term and preferential loans, respectively (SBV, 2008). In 2009, SBV implements a strong expansionary policy with interest rate support lending policy where cutting - off 4% interest rate applied for short-term and medium-and long term loans from banks for certain sectors which cover mainly non-stated own enterprises (69%). Then the borrowers gain benefit directly by decrease cost of capital.

4. Methodology and Data

Because many of the variables taken in levels may be non-stationary then we apply LA-VAR (Lag-Augmented VAR) technique developed by Toda-Yamamoto (1995) for testing Granger causality. The standard VAR or VECM (vector error correction model) relies on the prior test of integration or cointegration order. If there are flaws in these results, the coefficient restrictions test based on the VAR or VECM will presumably be subject to pre-test biases. This method has advantage of testing the coefficient restrictions in a level VAR without paying attention to the properties in the economic time series such as unit root and cointegration.

The method proceeds, briefly, as follows. Let the following equation generate $\{y_t\}$, the n -dimensional vector constituting the level of the variables in the study:

$$y_t = a_0 + a_1 + J_1 y_{t-1} + J_2 y_{t-2} + \dots + J_k y_{t-k} + \varepsilon_t \quad (1)$$

$t = 1, 2, \dots, T.$

where t is the time trend; k is the lag length; $a_0, a_1, J_1, J_2, \dots, J_k$ are the vectors or matrices

of coefficients; and ε_t is an i.i.d. sequence of n -dimensional random vectors with zero mean and covariance matrix $\Sigma\varepsilon$.

Suppose that our interest is to test restrictions on a subset of parameters in the model, formulated as:

$$H_0 : f(\Phi) = 0 \quad (2)$$

The test can be conducted with the following VAR model, in level form, estimated by ordinary least squares (OLS):

$$y_t = \hat{a}_0 + \hat{a}_1 + \hat{J}_1 y_{t-1} + \hat{J}_2 y_{t-2} + \dots + \hat{J}_p y_{t-p} + \hat{\varepsilon}_t \quad (3)$$

where circumflex (\wedge) indicates an estimation by OLS and $p=k+d_{max}$ represents the true lag length k augmented by a suspected maximum integration order d_{max} ($k \geq d_{max}$). The null hypothesis of Granger non-causality are tested using the Wald test which has a chi-square distribution with degrees of freedom equal to number of excluded lagged variables regardless of the integration order of the process or the existence of cointegrating relation.

First, we estimate a core VAR model with three endogenous variables: money supply, price (*CPI*) and output (*IO*). We use the broad money variable *M2* as a proxy for monetary policy shocks because the growth rate of *M2* is considered as an operating target in formulating and implementing monetary policy at the State Bank of Vietnam (Le and Pfau, 2009).

For interest rate channel, we note that the prime interest rate that the State Bank frequently announces does not reflect the supply of and demand for money in the money market. Rather, it serves as a reference rate for commercial banks in setting their own deposit and lending rates. Therefore, prime interest rates

do not seem to be a suitable representative of the monetary policy stance in Vietnam. Then we use real lending rate (*LR_R*) to investigate the effectiveness of monetary policy through interest rate channel. To explore the monetary transmission mechanism through exchange rate channel, previous studies use both nominal and real exchange rate variables. Then, this study applies nominal and real effective exchange rate (*NEER* and *REER*) to investigate whether exchange rate channel is really stronger than the others in transition economies as results of previous studies.

For exchange rate channel, first, we investigate this channel without considering impact of interest rate on change in exchange rate because there is existence of capital controls in Vietnam which means that the exchange rate was not sensitive to interest rate. After that, we revisit exchange rate channel by incorporating interest rate as the channel to transmit the effect of money supply on exchange rate to examine the role of interest rate and robustness of our results. In the model with *NEER*, we use nominal lending rate (*LR*) according to the uncovered interest rate parity theory while real interest rate (*LR_R*) is incorporated in the model with *REER*.

The role of equity channel is investigated through stock price index (*VNI*). Finally, domestic credit level (*CREDIT*) is used to recognize the position of credit channel in Vietnam economy.

Monetary policy transmission channels in Vietnam is investigated by using monthly data for the period from 1995 January to 2009 October with the exception of asset channel starting from 2000 July and interest rate channel due to available data. Data of real industrial output is collected from GSO. Data of money

supply and stock market price is obtained from SBV. Nominal and real effective exchange rate is calculated based on relative price and trade-weighted with 20 largest trading partners using data of IMF (IFS and DOT). The data of other variables is collected from IFS of IMF.

All data are expressed in natural logs and seasonally adjusted with the exception of the lending rates, which is in levels and not seasonally adjusted.

5. Results and Discussions

Unit root test

Individual time series properties of the data are tested using Augmented Dickey-Fuller unit root tests. As Tables 1 shows, at 5 percent level of significance, all series are nonstationary in the cases of *constant* and *constant & trend* with exception of real lending rate which is stationary in the case of *constant & trend*. However, these series are stationary after taking first differences. In the other words, all of variables are the same integrated order one, i.e. $I(1)$. Then we investigate whether these variables are cointegration by using Johansen's cointegration test.

Table 1. ADF Tests for Unit Root

Variables	Levels		First differences	
	<i>Constant</i>	<i>Constant&trend</i>	<i>Constant</i>	<i>Constant&trend</i>
<i>M2</i>	0.09	-2.69	-5.83	-5.81
<i>CPI</i>	2.30	0.53	-3.33	-4.06
<i>IO</i>	0.35	-1.48	-7.30	-7.30
<i>LR</i>	-2.56	-2.15	-6.15	-5.62
<i>LR_R</i>	-1.14	-3.83	-3.92	-3.95
<i>NEER</i>	0.14	-2.35	-10.31	-10.51
<i>REER</i>	-2.21	-2.26	-10.11	-10.09
<i>VNI</i>	-2.04	-3.28	-6.36	-6.37
<i>CREDIT</i>	2.34	-2.43	-7.28	-7.31

Note: At the 5% level of significance, the critical value for each test with constant is -2.88 and with constant & trend is -3.44.

Granger Causality Tests using LA-VAR

The Table 2 shows the results of Granger causality tests using LA-VAR technique. The result of core model shows that there is Granger causality from *M2* to *output* but no Granger causality from *M2* to *price*. These relationships are consistent in all of models augmented monetary transmission channels with exception to asset price channel. The model with asset price channel suggests that the money supply is transmitted to price than output via this channel.

Investigating impact of each of monetary transmission channels on output and price, Granger causality tests show that the changes of both *NEER* and *REER* do Granger cause both output and price while lending rate and stock price does not Granger-cause output and price. The increase in domestic credit does Granger-cause price but not output. Causality tests clearly confirm previous results on the relative importance of interest rate and exchange rate channels in transition economies. The impact on economy of exchange rate is stronger than that of interest rate.

Table 2 also shows that there is no Granger causality from money supply to the channels. In contrast, the changes in lending rate and domestic credit can affect M2. It means that to implement monetary policy, SBV has to use the instruments which affect directly the channels than the changes in money supply. The changes

in lending rate and credit domestic can affect output of economy through their effects on M2.

Revisiting Exchange Rate Channel with Impact of Interest Rate

As above explanation, to investigate the role of interest rate in monetary transmission through exchange rate channel as well as to

Table 2. Granger Causality Test: P-values of Chi-square

Dependent Variable	Excluded Variable			
	<i>M2</i>	<i>Channel</i>	<i>CPI</i>	<i>IO</i>
Core Model				
<i>M2</i>	---		0.06	0.19
<i>CPI</i>	0.83		---	0.42
<i>IO</i>	0.00		0.02	---
Interest rate channel				
<i>M2</i>	---	0.02	0.26	0.08
<i>LR_R</i>	0.11	---	0.00	0.28
<i>CPI</i>	0.92	0.27	---	0.16
<i>IO</i>	0.00	0.89	0.07	---
Exchange rate channel				
<i>M2</i>	---	0.87	0.09	0.21
<i>NEER</i>	0.67	---	0.65	0.04
<i>CPI</i>	0.65	0.12	---	0.64
<i>IO</i>	0.00	0.02	0.00	---
<i>M2</i>	---	0.86	0.08	0.28
<i>REER</i>	0.57	---	0.07	0.06
<i>CPI</i>	0.69	0.06	---	0.74
<i>IO</i>	0.00	0.02	0.01	---
Asset price channel				
<i>M2</i>	---	0.44	0.79	0.32
<i>VNI</i>	0.76	---	0.02	0.01
<i>CPI</i>	0.01	0.20	---	0.50
<i>IO</i>	0.17	0.69	0.01	---
Credit channel				
<i>M2</i>	---	0.00	0.34	0.02
<i>CREDIT</i>	0.20	---	0.92	0.32
<i>CPI</i>	0.41	0.05	---	0.84
<i>IO</i>	0.01	0.90	0.09	---

Table 3. Granger Causality Test: P-values of Chi-square Exchange Rate Channel with Interest Rate

Dependent Variable	Excluded Variable				
	<i>M2</i>	<i>Interest rate</i>	<i>Exchange rate</i>	<i>CPI</i>	<i>IO</i>
<i>M2</i>		0.09	0.03	0.03	0.20
<i>LR</i>	0.07		0.40	0.00	0.20
<i>NEER</i>	0.49	0.00		0.43	0.08
<i>CPI</i>	0.70	0.80	0.05		0.34
<i>IO</i>	0.00	0.84	0.00	0.01	
<i>M2</i>		0.02	0.20	0.38	0.34
<i>LR R</i>	0.62		0.22	0.00	0.82
<i>REER</i>	0.60	0.00		0.01	0.63
<i>CPI</i>	0.60	0.44	0.04		0.31
<i>IO</i>	0.00	0.81	0.00	0.05	

check the robustness of the results of exchange rate channel, we add interest rate variable to the models of exchange rate channel because we consider interest rate as the channel transmitting the impact of money supply to exchange rate.

Table 3 presents the causality relationships using LA-VAR. There are Granger causality from interest rate to exchange rate and from exchange rate to output and price. The mechanism of monetary transmission seems to be more clearly in the model with nominal lending rate and NEER. There are Granger causalities from money supply to nominal lending rate and next from nominal lending rate to NEER, and finally from NEER to output and price.

6. Conclusion

This paper investigates the mechanism of monetary transmission in Vietnam through four major channels namely interest rate channel, exchange rate channel, asset channel and credit channel for the period of 1995-2009 with monthly data. This study applies LA-VAR technique to examine the effectiveness of monetary policy framework by analyzing the causal relationships

of each monetary channel on output and price.

The study shows that the impact of the channels on output and price is as expected. Among them, exchange rate channel has impact on both output and price; in there its impact on output is larger. The linkage between money supply and exchange rate is revealed after considering interest rate as a transmission channel from money supply to exchange rate even though capital controls still exist in Vietnam. This can be explained that it results from the existence of dollarization in the economy. However the existent of dollarization lead to the higher exchange rate pass-through then decline efficiency of exchange rate channel due to the appreciation of real exchange rate. Therefore dedollarization is necessary to improve efficiency of exchange rate channel.

While equity price channel was not effective to transfer the impact of monetary policy on output and price because of the lack of established and well-functioning stock market. The study finds that lending rate and domestic credit were controlled directly to enhance economic growth in Vietnam for the period of 1995 - 2009. □

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