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The Transmission Mechanism of Monetary Policy in Vietnam: A VAR Approach

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Abstract

This paper analyses monetary transmission mechanism in Vietnam by using a Vector Autoregression (VAR), focusing especially on how the economy dynamically responds money demand, interest rate, exchange rate, and asset price shocks. In this paper, we establish identification conditions to uncover the dynamic effects of monetary policy shocks. By using quarterly data over the period 1995-2010, a VAR model is developed to analyze various channels of monetary policy mechanism in a country with a large open and small economy like Vietnam. The empirical results show money demand and interest rates account for a major part of variations in output. And output is affected by monetary tightening in some lags, bottoming out after 5-6 quarters.

1. Introduction

Money policy in Vietnam has undergone considerable changes in the last two decades. Most notably, monetary policy is considered as an important instrument to influence the economy in order to achieve some targets like price stability. Compared to other macroeconomic policies, the impacts of monetary policy appear to be greater on the economy in general and on financial markets in particular, especially in the short-term, through some variables such as money supply, credit, interest rates, and exchange rate. The ultimate target of monetary policy is to influence money markets, economic activities and price levels in the economy.

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Hence, it is necessary for policy makers to investigate and understand how monetary policy mechanisms work in order to implement a proper monetary policy. Kuttner and Mosser (2002) show that the efficiency of monetary policy depends much more on policy makers' ability to identify both point of time and efficiency of monetary policy implementation that affects macroeconomic performance and price stability through its various channels.

Since 1986, through the "***Doi Moi***" (*Renovation*) period, Vietnam has made a shift from a centrally planned economy to a market oriented one. During the twenty-five years of its reform process, Vietnam's economy has experienced rapid growth. The financial sector has also been developing and contributing to the nation's achievements. Vietnam's accession to WTO has created opportunities for its integration into international financial markets. Vietnam's economy is a small economy, which is gradually becoming more and more open. As such, Vietnam is exposed to many external influences. Moreover, monetary policy can be regarded as one of the most important macro-economic policies to influence economic activity in Vietnam. In order to effectively and efficiently implement a monetary policy, the State Bank of Vietnam needs to empirically analyze and assess monetary policy mechanisms in order to propose solutions to enhance the effectiveness of monetary policy implementation and to limit negative effects.

The paper uses a Vector Autoregressive model (VAR) to calibrate a model of the transmission mechanism of monetary policy in Vietnam during the period 2000-2011, focusing especially on how the Vietnamese economy responds to money, interest rate, exchange rate, and asset price shocks. The rest of the paper is organized as follows. Section 2 provides an overview of the theoretical and empirical monetary policy framework. Section 3 presents the transmission mechanism of monetary policy in Vietnam. Section 4 provides the model structure and data. Section 5 presents empirical results and analysis. Section 7 concludes the paper.

2. Literature review

Monetary policy works largely via its influence on aggregate demand in the economy. It has little direct effect on the trend path of supply capacity. Rather, in the long run, monetary policy determines the nominal or money

values of goods and services – that is, the general price level. An equivalent way of making the same point is to say that in the long run, monetary policy in essence determines the value of money – movements in the general price level indicate how much the purchasing power of money has changed over time. Inflation, in this sense, is a monetary phenomenon[2].

2.1. Channels of monetary transmission mechanism

The monetary transmission mechanism is a process in which monetary policy decisions are transmitted to real GDP and inflation (Taylor, 1995). There are basically two methods of carrying out research on monetary transmission:

(i) Identification of the effects of monetary policy shocks: try to identify the exogenous monetary shocks and their following effects on macroeconomic variables.

(ii) Identification of channels through which changes in monetary policy stances affect the economy: investigate which channels of monetary policy transmission are workable.

Most studies focus on one of the two methods. A few studies analyze the monetary policy transmission mechanism by combining the two approaches. The much attention is paid to the channels of the monetary transmission mechanism. However, there is not much focus on identifying the relative strengths of each channel.

There are two phases in the monetary transmission mechanism:

First, the monetary-induced changes in prices and the quantity of money in the financial markets flowing through the following major channels, for example, interest rate channel, exchange rate channel, asset price channel, and credit channel.

Second, the monetary-induced changes in the components of aggregate demand in the goods market. The monetary transmission has many channels through which monetary policy operates. This phase of the transmission mechanism expresses the responses of each component of aggregate demand when aggregate demand fluctuates. A tightening monetary policy causes shocks, reduces investment and consumption as well as aggregate demand and the price level of the economy.

[2] Milton Friedman, Anna J. Schwartz (1963).: A Monetary History of the United States, 1867 - 1960

2.1.1. Interest rate channel

In the traditional Keynesian textbook IS-LM model, the interest rate channel is the key component in the monetary transmission mechanism. It highlights the role of money market equilibrium when interest rates change. A monetary policy change affects money supply and interest rates. In the short term, price and wage are sticky and not adjustable to monetary changes, causing a change in aggregate demand and output.

Ramey (1993) examines the working of the interest rate channel based on two assumptions. First, he argues there are two types of assets in the economy, for example, money and all other assets in the form of bonds. He excludes non-money assets. Thus, the interest rate channel is called a "money view" of the transmission mechanism. His second assumption is that money in the transition mechanism is not substituted by any other means of payment.

Some aspects of his first assumption have been criticized. Theoretically, this view ignores the relationship between output behavior and the existence of the credit market. Moreover, the "financial capacity" of the economy is also emphasized by Gurley and Shaw (1960) who argue that borrowers' ability to absorb debt can be measured without requiring current or future spending to be reduced. Therefore, the transmission mechanisms include the broader credit market and banking system, not only money or bonds. Furthermore, Bernanke and Blinder (1988) demonstrate unequivocally the relationships between banking and macroeconomic behaviors through modeling the balance sheet and cash flow effects on investment and output changes.

Moreover, the influence level and timing of the real effect of the monetary policy-induced interest rates on the macroeconomy cannot be explained comprehensively within the scope of the interest rate channel hypothesis (Bernanke and Gertler, 1995). This suggests the existence of other channels. The influence level of monetary policy induced interest rate changes on macroeconomic variables is wider than the estimated effects of interest rate elasticity on consumption and investment. There is also scant evidence to prove the timing dependence between the changes in interest rates and in some components of spending.

2.1.2. Exchange rate channel

In open economies, monetary policy influences net exports and aggregate output through the exchange rate channel. The role of this channel cannot be denied in the growing internationalization of economies when more attention is being paid to how monetary policy affects exchange rates and how this causes fluctuations in net exports and aggregate output.

In a flexible exchange rate system, a tightening monetary policy initially increases interest rates and domestic asset demand, making the domestic currency appreciate. The demand for domestic goods is changed in the opposite way. It is decreased by the relative price effect and increased by the balance sheet effect. However, which effect is more dominant is unclear. The relative price effect occurs when the increase in exchange rates reduces demand for domestic goods and increases demand for foreign goods while the balance sheet effect occurs when an increase in exchange rates leads to an improved balance sheet position.

In a fixed exchange rate system, with a high degree of capital mobility, the operations of monetary policy are sharply restrained (Taylor, 1995). However, monetary policy can affect the real exchange rate by influencing the price level even in the case that the nominal exchange rate is fixed. The impact of monetary policy on net exports is ineffective despite of longer lags and smaller extension. Moreover, the exchange rate channel is also denoted via the purchasing power parity (PPP). According to Rogoff (1996), in the long run, a country with a depreciating currency should experience a proportional increase in prices and vice versa. The exchange rate changes and the monetary policy induced change in the exchange rate are fully transmitted to CPI.

2.1.3. Credit channel

The credit channel of the monetary transmission mechanism relates to asymmetric information in the financial market and works through effects on bank lending and on the balance sheet of firms and households.

There are two basic channels of the monetary mechanism in credit markets: *the bank lending channel* and *the balance sheet channel*. These two channels explain the link between monetary policy-induced changes and external finance premium. The external premium is determined by the cost of funds

raised externally by issuing equity or debt and the opportunity cost of funds raised internally by retaining earnings. As an external premium volume reflects credit market imperfections, the elements of capital markets are not perfect substitutes for funds from different segments of capital markets that require different costs. Large firms can access to external funding more easily than small and medium sized firms. Because because they have different financial structure and because they react to financial shocks differently, investment spending of small and medium firms is not the same as large firms.

2.1.3.1. The bank lending channel

Bernanke and Blinder (1988) extend the underlying ideas of the IS-LM model to apply to the bank lending channel. In this framework, banks play an important role in the financial system by issuing liabilities such as bank deposits and holding assets such as bank loans. Specifically, theories and models of the bank lending channels emphasize that deposits constitute the principle source of funds for lending in almost all banks and bank loans make up the principle source of funds for investment in many firms.

The work of Gertler and Gilchrist (1993) rests on two assumptions regarding the bank lending channel. The first assumtion is that bank loans and other non-bank assets are imperfect substitutes because of imperfect information in credit markets. The second is that the central bank controls the supply of bank loans through a monetary policy. The tightening monetary policy will reduce bank loans supply and influences real economic activity.

Monetary policy affects the external finance premium through the supply of credit of commercial banks. If the supply of bank loans is disrupted, bank dependent firms cannot obtain credit. However, they may incur costs associated with finding new lenders. Thus, reduction in the supply of loans is likely to increase external finance premium and reduce real economic activity.

2.1.3.2. The balance sheet channel

The balance sheet channel is associated with the effects of a policy induced change in interest rates on cash flows and on the subsequent balance sheet positions of non-financial firms that depend mostly on bank loans (Bernanke and Gertler, 1989). Monetary tightening policy increases interest rates, making non-financial firms' interest expenses increase and reducing their

cash flows, and weakening their balance sheet positions. The value of collateral is reduced due to the falling of asset prices associated with rising interest rates. These effects lead to a reduction of a firm's net worth and raising the external premium of external funds. Bernanke and Gertler (1995) develops the balance sheet channel as a broader credit channel, emphasizing a firm's increasing credit cost in the presence of financial market imperfection and how asymmetric information problems occur.

The balance sheet channel is based on the theory that the external finance premium facing a firm should depend on the firm's financial position. The greater the firm's net worth, the lower the external finance premium should be. Since the firm's financial position affects the external finance premium and then the overall terms of credit, fluctuations in the quality of the firms' balance sheets should similarly affect its investment and spending decisions.

Lower net worth of the firm might cause lower lending, thus, small and medium firms are more likely to face a disproportionately larger external finance premium. Thus, the ability of small and medium firms to access short term credit is limited reaction to a depreciation of balance sheet positions by cutting down investment and inventories.

2.1.4. Asset price channel

Monetarists highlight the role of monetary induced changes in equity prices in affecting consumption and investment spending (Mishkin, 1995). The monetary policy induced changes in equity prices affect the aggregate demand through two channels: *The wealth effect on consumption* and *Tobin's q theory of investment*. Keynesians and Monetarists are in conflict with each other about how monetary policy action affects stock prices but they have similar ideas about how these channels work. According to Keynesians, stock prices fall in the context of monetary tightening because a rise in interest rates make bonds more attractive than equities. Meanwhile, Monetarists argue that equity prices decrease because the demand for equity falls after a monetary policy tightening. Consumers, having less money with given equity supply and lower prices, decrease their spending.

2.1.4.1. The Tobin's q theory

The Tobin's q theory was introduced by James Tobin (1969). The asset price channel operates through the effect of the monetary policy induced changes in equity prices called q, and is expressed by the following formula:

q = market value of firms / replacement cost

The market value in the formula measures the value of firm stock, while the replacement cost is the firm's cost to buy goods and services, in particular durable goods.

If q is greater than one (q > 1), the firm's additional investment would be taken into account because the profit generated exceeds the cost of the firm's assets. If q is less than one (q < 1), the firm would be better off by selling its assets. The ideal state is where q is approximately equal to one denoting that the firm is in equilibrium. In the short run, q fluctuates because of policies or expectations encouraging or discouraging investment. Therefore, q is an indicator for the monetary policy maker to investigate the influence of investment spending.

Tobin's view of this channel works is as follows: A higher stock price following a monetary policy expansionary raises the q ratio, leading to an increase in investment and aggregate demand.

2.1.4.2. The wealth effect on consumption

Life-cycle consumption theory was introduced by Franco Modigliani and Richard Brumberg in the early 1950s. Theoretically, consumers make intelligent choices about how much they want to spend over their lifetimes within available resources. The asset price channel works via the wealth effect of consumption. A major component of financial wealth is common stocks. A decrease in interest rates follows an expansionary monetary policy, encouraging people to reduce their deposits and bonds and buy more stocks, so stock prices increase. A positive wealth effect is created in company with higher consumer spending and output.

2.2. Empirical studies of monetary policy transmission mechanism

The monetary policy transmission mechanism has been studied by two methods. The first method is to measure the effects of monetary policy shocks by identifying the exogenous monetary shocks and their subsequent impacts

on macroeconomic variables. Most studies applying this method rely on SVAR – structural vector auto regression model. The second method is to investigate which channels of monetary policy transmission operate to influence economic activity.

2.2.1. Credit channel

2.2.1.1. Credit channel using aggregate data

One of the first empirical studies on the testing the predictions of the traditional IS-LM model to illustrate the relationship of money view and credit view in the US economy is attributed to King (1986). He argues that bank deposits are superior in statistical significance and variance decomposition while comparing commercial and industrial loans to other bank loans. The model used in this testing is unrestricted VAR with GNP, bank commercial and industrial loans, other bank loans, demand deposits and three-month treasury bill rates. Also, Bernanke (1986) enhances the role of credit shocks. In his structural VAR model, there are six variables including credit, money stock M1, money base, GNP price deflator, real GNP and real spending. He finds that money and credit roles are holding similar importance in the US economy, which is in contradiction with King (1986)'s findings.

Developing the IS-LM model by incorporating the banking sector to explore this issue further, Bernanke and Blinder (1988) develop the logarithmic partial adjustment model with six variables including real GNP, GNP deflator, M1, bank prime rate, credit and three-month treasury bill rates with quarterly US data (1974:1-1985:4) and conclude that a policy aiming at credit is more effective than a policy aiming at money in the case that money demand shocks dominate credit demand shocks.

2.2.1.2. Credit channel using disaggregated data

Using disaggregated data to identify the cross-sectional implications of the lending approach, some researchers attempt to demonstrate clearly the ambiguities when using aggregated data. The main idea of the lending approach is that small firms suffer more problems than larger firms when a tightening monetary policy is applied. Gertler and Gilchrist (1993, 1994) attempt to study how a tightening monetary policy affects small and large manufacturing firms. They find that the effect of a cash flow reduction on behavior depends on firms' adaptability to the decline in cash flows by

borrowing. Higher interest costs of production following monetary policy contraction make the small firms reduce inventories for they have limited access to short term credit. Meanwhile, the large firms can temporarily maintain the production levels and tend to increase their inventories.

Disaggregated data helps to prove the prediction of lending approach. However, Ramey (1992) shows this research method also has some weaknesses. There is no evidence to suggest that the small firms' responses to the tightening monetary policy have an aggregate impact. Moreover, the findings based on data of firms reflect more the balance sheet channel than the bank lending channel.

In regards to the bank lending channel, Angeloni *et al*. (1995) contribute an idea that the portfolio size criterion is appropriate in identifying the balance sheet characteristics that can make loan supply responsive to monetary shocks by using VAR model with disaggregated data of different banks in Italy. They argue that the response to a shock in monetary policy tightens the spread between bond rates and loan rates in the financial market. This increases in all the classes of banks. The large banks' response of spread to monetary shocks is quicker than small banks'.

2.2.2. Empirical studies on other channels

Recent empirical research has provided only weak support for the existence of the consumption-wealth channel of monetary policy transmission. Ludvigson et al. (2002) employ US data from 1966 to 2000 to study the monetary policy transmission to consumption. They measure the changing degree of monetary policy by examining the changes in federal funds rates, affecting consumer spending through the value of household assets. Five variables used in the VAR model include the inflation rate, consumption, a measure of wealth, labor income, and federal funds rates. Their results reveal only a weak role for the wealth channel in transmitting the Federal Reserve's monetary policy changes to consumption demand.

Disyatat and Vongsinsirikul (2003) study the exchange rate and asset price channels of monetary policy transmission in Thailand with seasonally adjusted quarterly data (1993-2001) and VAR models of four variables including GDP, CPI, 14-day repurchase rates (RP14) and real exchange rates. They attempt to quantify the lags associated with monetary policy shocks and

investigate the channels through which these shocks have operated. They find that the exchange rate and asset price channels have less significance by comparison. The interest rate pass-through in Thailand is generally lower than those in developed countries, suggesting that banks respond partly to changing liquidity conditions through the adjustment of both the price and quantity of loans (for example, credit rationing). Thus, interest rates alone do not adequately reflect the links between financial markets and the rest of the economy.

2.2.3. Empirical studies on channels of the second phase of monetary transmission

There is little research on the channels of the second phase of monetary transmission, that is to say monetary policy induced changes in the goods market. The responses of each component of aggregate demand to the changes in the financial market affect the output and price level.

Morsink and Bayoumi (2001) attempt to investigate which components of real private demand are most affected by monetary policy in Japan. They calibrate VAR model using quarterly adjusted data (1980-1998) with two lags. At first, the VAR is identified using a Choleski decomposition which includes private demand, prices, the overnight call rate and broad money. Then, private demand is divided into four components including private consumption, business investment, housing investment and net exports to analyze the sensitivity of those components. They find that the effect of monetary policy on business investment is smaller than that on the real economy.

Similarly, Disyatat and Vongsinsirikul (2003) study which components of real GDP in Thailand are most affected by monetary policy. The real GDP is divided into four components including consumption, investment, imports and exports. They conclude that investment is the component most sensitive to monetary policy shocks. Furthermore, monetary policy contraction leads to a decrease in output after around 4-5 quarters.

2.2.4. Empirical studies in Vietnam

There are some papers addressing the monetary transmission mechanism in Vietnam. In particular, Phan (2003) analyzes the transmission channels of monetary policy in Vietnam by using an SVAR approach that explicitly accounts for endogenous policy reactions in an open economy. He uses

aggregate data from 1991 to 2002 and five variables in the model including real output, domestic consumer price index, broad money aggregate, real short term domestic interest rates (three month-deposit interest rates) and nominal exchange rates. He identifies the magnitude and time that changes in monetary variables impact on inflation and output growth. He finds that the balance sheet channel is not important in the transmission mechanism of monetary policy in Vietnam because of the less developed financial market. The interest rate channel plays important role in the mechanism when rates increase slightly and impact negatively on the price and money supply. In addition to the traditional interest rate channel, his research shows that although the exchange rate channel is quite weak, it still affects price levels with a lag of about ten months. Furthermore, he finds that M2 is used as an intermediate target of monetary policy that will reduce the effectiveness of monetary policy because changes in M2 do not reflect the fluctuation of price level.

Le and Wade (2008) use a VAR approach with quarterly, seasonally adjusted data from 1996 to 2005 to analyze the monetary transmission mechanism in Vietnam. The model includes nine variables including real industrial output, CPI, M2 as broad money, real lending rates, domestic credit, index of the real effective exchange rates, world oil prices, rice price and US Federal Fund rates. They conclude that monetary policy can affect real output but the connection between money and inflation is not clear. Furthermore, the credit and exchange rate channels are more important than the interest rate channel in the transmission mechanism.

3. Monetary policy in Vietnam

3.1. Legal frameworks

The State Bank of Vietnam (SBV) is governed by the SBV Law of December 1997. According to the law, the SBV is a body of the Vietnamese government (Article 1) and its governor is a member of the government (Article 11).

The SBV Law explicitly makes a distinction between the functions of the SBV and functions related to the national monetary policy, which is “a component of economic-financial policies of the State” (Article 2). Decisions regarding monetary policy and its supervision are principal functions of the National Assembly and the government. The government has the specific

function to prepare a plan for monetary policy, including a projection of the annual inflation rate, and to submit it to the National Assembly (Article 3(3)), which then needs to approve the plan (Article 3 (1)). Part of the role of the National Assembly is to set annual targets for the inflation rate in line with the state budget and economic growth objectives. The government is also closely involved in the implementation of monetary policy (Article 3 (3)). It has the function to organise the implementation of monetary policy and to determine the amount of liquidity to be injected in the economy. The National Assembly supervises the implementation of monetary policy, and the government is required to periodically report on the progress on the implementation to a standing committee of the National Assembly.

The functions of the SBV include the preparation of the plan for monetary policy (Article 5) and the implementation of monetary policy, as designed by the government. In addition to that role, the SBV has functions that are stated in Article 1 (2) as follows: "The SBV shall conduct the state's management over monetary and banking activities, is the issuing bank, the bank of credit institutions and the bank providing monetary services for the government". Independently of these functions, the State reserves the right to undertake the unified management of all banking activities.

Based on this reading of the SBV Law, monetary policy is largely the responsibility of the National Assembly and the government, and the SBV is an integrated part of Vietnamese government. The National Assembly, together with the government, sets monetary policy objectives and the stance of monetary policy. Legally, the National Assembly plays an important role in the monetary decision process. Apart from setting policy objectives, it supervises the implementation of monetary policy. This strong position can possibly be explained by the experience of hyperinflation in the 1980s and early 1990s and the resulting determination to avoid similar events. The strong involvement of the government in the implementation of monetary policy, at least legally, suggests that the instrument independence of the SBV is limited.

By comparison, transition economies in central and eastern Europe introduced instrument independence mostly in the early 1990s. With the exception of Poland, where the central bank has to design monetary policy together with the parliament, central banks in the Czech Republic, Hungary, Slovakia and

Slovenia have the exclusive responsibility to design monetary policy. In the Czech Republic, Slovakia and Slovenia, the central bank is formally responsible for the choice of exchange rate regime, while in Hungary and Poland the choice is made jointly by the central bank and the government (Radzyner and Riesinger, 1997).

The goals of monetary policy, which is a component of the economic-financial policies of the state, include stabilising the value of the currency, controlling the inflation rate, facilitating socio-economic development, ensuring national defence, security and improving the living standards of the people (Article 2). The specific annual goal for the inflation rate is set by the National Assembly and the government in line with other principal objectives of economic policy. In addition, the SBV Law states that "the operations of the SBV shall aim at the stabilisation of the value of the currency, contribute to securing the safety of banking activities and the system of credit institutions, facilitate socio-economic development in a manner consistent with socialist orientation" (Article 1(3)). "Stabilisation of the value of the currency" is interpreted here as stabilisation of the exchange rate, as the stabilisation of the currency is mentioned as a separate goal, together with control of the inflation rate, in Article 2 as goals of monetary policy.

The goals of monetary policy in the SBV Law are very broadly defined and a primary objective is not clearly identified. The multiplicity of goals without established hierarchy raises the risk of conflicting objectives. While in the SBV Law a hierarchy of goals is not established, the actual economic policy in Vietnam suggests that economic growth has been the de facto primary goal of the government. For example, the Vietnamese government set for 2005 a target for economic growth of 8.5% and a target inflation rate of 6.5%. Projections prepared in October 2005 indicated that the inflation rate for 2005 would be in the area of 8% and economic growth slightly below the target of 8.5%. Although it was known for several months that the inflation target for 2005 would not be attained, open market operations continued to inject liquidity. The SBV considers it more likely that current inflation in Vietnam is the result of supply shocks. Restrictive monetary policy is seen to constrain economic growth as interest rates would rise without effectively reducing inflation.

3.2. Monetary Policy Strategies

The monetary policy strategy in Vietnam is derived from the banking development strategy that is based from the ten-year Social and Economic Development Strategy, formulated by party congress, which takes place once every five years. The government is then responsible for formulating an action plan for implementing the five-year plan. The SBV, as part of the government, is responsible for the injection of liquidity into the economy, M2, deposits and credits and other financial sector-related measures that will be implemented as part of the government's action plan.

With the amended Law on SBV in 2010, the legal status of SBV became clearer and more transparent in terms of an institution that is more suitable for market mechanisms. Its role is once again confirmed as a governmental agency as well as the central bank of the Socialist Republic of Vietnam, conducting monetary policy and ensuring the safety of banking performance. The new roles of SBV that have been finalized include: (1) SBV's power to use actively and flexibly monetary policy instruments to meet annual inflation targets; (2) more authority for SBV to ensure the financial stability through prudential supervisions; and (3) higher accountability of SBV to the National Assembly, Government and Public.

The principal components of the monetary policy strategy of the SBV can be identified as follows: an annual target for the depreciation of the dong, targets for total liquidity (M2) and credit to the economy, and levels of interest rates. In 2004 and 2005, the Governor of the SBV announced exchange rate targets suggesting that the SBV uses the exchange rate as a nominal anchor. In both years, the target was that the depreciation of the dong with respect to the US dollar would stay below 1%. The target was achieved in 2004 and is likely to be achieved in 2005. For the time being, targets are formulated as annual targets, and the SBV does not appear to have made commitments to continue with the peg in the future. In fact, the SBV stresses in its 2004 Annual Report the flexibility of its exchange rate policy. In the year 2012, the SBV announced that exchange rate is fluctuated within a band of ± 3%.

It addition to exchange rate targets, the SBV announces annual targets for total liquidity and credit to the economy, which are based on the macroeconomic and monetary objectives as defined by the government in its action plan. The latter target is of importance as it is monitored by the IMF

during Article IV consultations. The credit target was set to 25% in 2004 and 2005. Actual credit growth turned out to be 42% in 2004, and estimates for 2005 suggest that the credit target for this year will also be overshot. The fact that SBV has not achieved the target may suggest that the SBV only gives a low weight to the credit target, which is consistent with the view that the ultimate target for the government has been the target for economic growth. In 2012, the credit target is set to the range of 15-17%, and total liquidity 14-16%. The SBV also states the objective of interest rate stability, and in 2011 for example, the SBV injected liquidity through open market operations to stabilize interest rates in order to avoid the negative effect of raising interest rates on economic growth.

3.3. Monetary policy instruments

The SBV began introducing indirect monetary policy tools in the mid-1990s as part of the financial sector reforms. Today, a number of indirect instruments have been introduced and are increasingly used. Apart from reserve requirements, refinancing and discount lending facilities, the SBV uses open market operations and foreign exchange interventions. In addition, the SBV continues to use base interest rates to influence interest rates, and the government uses administrative instruments to control prices.

The SBV has been using required reserves in various forms since the 1990s, and changes of reserve requirements for deposits have been considered as an important instrument of monetary policy in the past. Currently, reserve requirements are differentiated according to the maturity of deposits, the sectoral focus of banks, and whether it is a domestic or foreign currency deposit. Reserve requirements for deposits of less than a year are higher than those for deposits of more than a year, and lower for banks that are active in the agricultural sector and for People's Credit Funds.

The SBV has two lending facilities, a refinancing and a discount facility. Both are collateralised 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. The maximum maturity of the repurchase agreement is 91 days. The refinancing rate is the upper interest rate and the discount rate the lower rate for lending from the SBV. Together they define the band within which the rate for open market operations moves.

Recently, the SBV has actively used both the refinance and discount rates in the process of conducting monetary policy. From January to June 2012, discount rates were adjusted from 13% to 8% while refinancing rates were adjusted from 15% to 10%.

Open market operations, which began 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. Open market operations take the form of outright sales and purchases of securities or repurchase agreements. The purchase or sale of securities may take place in the form of auctions by volume or auction for interest rates. Securities eligible for open market transactions are primarily government securities, State Bank bills or securities that have been selected by the SBV. Initially only short-term securities could be used for open market transactions, but since the amendment of the SBV Law in 2003, securities with a maturity of more than one year are eligible for use

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, as was shown above. The main purpose of foreign exchange interventions has been to achieve the foreign exchange target set by the SBV.

The basic system of lending facilities as well as the open market operations used by the SBV is comparable to monetary policy instruments used, for example, in transition economies in Central Europe and many other central banks. While the SBV now actively uses indirect monetary policy, its use continues to be constrained by the lack of securities and the thinness and segmentation of financial markets.

Apart from indirect monetary policy instruments, the SBV continues to use measures to influence the deposit and lending rates more directly. For example, the SBV continues to announce a base interest rate as the reference rate for interest rates of banks. Initially the base rate was used to specify ceilings for lending rates. The purpose of the base interest rate has been to provide a “basis for the determination by credit institutions of the lending interest rate in Vietnam dong”. And market participants appear to take increases in the base rate as a signal to increase lending rates used by

commercial banks although it might lose its functions as a reference rate for some periods.

4. Building the Model and Data

(a) Basic model

Research on economics, especially on monetary policy using VAR technique has been applied by economists since the 1990s. The use of the VAR technique originally developed by Sims (1980) for modeling an economy's monetary policy framework. This paper applies a VAR model to investigate the transmission mechanism of monetary policy in Vietnam.

VARs are dynamic systems of equations in which the current level of each variable in the system depends on past movements in that variable and all other variables in the system. It has proven to be especially useful for describing the dynamic behavior of economic and financial time series and for forecasting.

Let $\boldsymbol{Y_t} = (y_{1t}, y_{2t}, \dots, y_{nt})'$ denote an $(n \times 1)$ vector of time series variables. The basic p-lag vector autoregressive ($VAR(p)$) model has the form:

$$\boldsymbol{Y_t} = \boldsymbol{c} + \boldsymbol{\Pi}_1 \boldsymbol{Y}_{t-1} + \boldsymbol{\Pi}_2 \boldsymbol{Y}_{t-2} + \cdots + \boldsymbol{\Pi}_p \boldsymbol{Y}_{t-p} + \varepsilon_t, \ t = 1, \dots, T \qquad (1)$$

where **c** is a vector of constants, $\boldsymbol{\Pi}_i$ are $(n \times n)$ coefficient matrices, and ε_t is an $(n \times 1)$ a vector if innovations, that is, serially uncorrelated disturbances that have zero mean and a time invariant covariance matrix Σ. The evolution of the vector $\boldsymbol{Y_t}$, which contains the macroeconomic variables whose behavior we seek to understand, will depend on both unexpected disturbances, ε_t, and on systematic component, $\boldsymbol{c} + \boldsymbol{\Pi}_1 \boldsymbol{Y}_{t-1} + \boldsymbol{\Pi}_2 \boldsymbol{Y}_{t-2} + \cdots + \boldsymbol{\Pi}_p \boldsymbol{Y}_{t-p}$, that determines how the shocks are propagated to the rest of the economy. The estimates of $\boldsymbol{c}, \boldsymbol{\Pi}_1, \boldsymbol{\Pi}_2, \dots, \boldsymbol{\Pi}_p$, are obtained by applying ordinary least squares (OLS) to each part of equation (1) separately, and the estimate of $\sum_\varepsilon$ is given the sample covariance matrix of the OLS residuals.

For example, a bivariate $VAR(2)$ model equation by equation has the form:

$$\begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix} = \begin{pmatrix} c_1 \\ c_1 \end{pmatrix} + \begin{pmatrix} \pi_{11}^1 & \pi_{12}^1 \\ \pi_{21}^1 & \pi_{22}^1 \end{pmatrix} \begin{pmatrix} y_{1t-1} \\ y_{2t-1} \end{pmatrix} + \begin{pmatrix} \pi_{11}^2 & \pi_{12}^2 \\ \pi_{21}^2 & \pi_{22}^2 \end{pmatrix} \begin{pmatrix} y_{1t-2} \\ y_{2t-2} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$$

Or

$$y_{1t} = c_1 + \pi_{11}^1 y_{1t-1} + \pi_{12}^1 y_{2t-1} + \pi_{11}^2 y_{1t-2} + \pi_{12}^2 y_{2t-2} + \varepsilon_{1t}$$

$$y_{2t} = c_2 + \pi_{21}^1 y_{1t-1} + \pi_{22}^1 y_{2t-1} + \pi_{21}^2 y_{1t-2} + \pi_{22}^2 y_{2t-2} + \varepsilon_{2t}$$

In lag operator notation, the $VAR(p)$ is written as:

$$\boldsymbol{\Pi}(\mathrm{L})\boldsymbol{Y}_t = \boldsymbol{c} + \varepsilon_t$$

Where $\boldsymbol{\Pi}(\mathrm{L}) = \boldsymbol{I_n} - \boldsymbol{\Pi}_1 \boldsymbol{L} - \cdots - \boldsymbol{\Pi}_p L^p$. The $VAR(p)$ is stable if the roots of det $\left(I_n - \boldsymbol{\Pi}_1 z - \cdots - \boldsymbol{\Pi}_p z^p\right) = 0$ lie outside the complex unit circle (have modulus greater than one), or, equivalently, if the eigenvalues of the companion matrix

$$F = \begin{pmatrix} \boldsymbol{\Pi}_1 & \boldsymbol{\Pi}_2 & \cdots & \boldsymbol{\Pi}_n \\ \boldsymbol{I}_n & 0 & \cdots & 0 \\ 0 & \ddots & 0 & \vdots \\ 0 & 0 & \boldsymbol{I}_n & 0 \end{pmatrix}$$

have modulus less than one. Assuming that the process has been initialized in the infinite past, then a stable $VAR(p)$ process is stationary and ergodic with time invariant means, variances, and autocovariances.

This paper used the econometric method of unrestricted vector autoregression (unrestricted VAR) to analyze the transmission mechanism of the monetary policy in Vietnam. For the identification of the relationships existing between the variables, we have used the Cholesky impulse-response function, the variance decomposition of the residuals. The Cholesky impulse function shows the evolution of one variable over the period of time that is due to a shock in another variable. The variance decomposition of the residuals indicate the amount of information that each variable contributes with to the explanation of the evolution of other vairables. The Cholesky type identification imposes the restriction that a variable is not contemporaneously impacted by a shock in the variables that follow it in the system.

Given these considerations, we select the ordering [M2/CPI, GDP, INF, LR, EXR, VNI] and investigate Vietnam's monetary transmission mechanism by using the following VAR system:

$$\boldsymbol{M2/CPI_t} = f(GDP_t^*, INF_t, LR_t, EXR_t, VNI_t)$$

(b) The data

The VAR model uses quarterly data of the 12 years in the period from 2000 to 2011. Most data are from the IMF's International Financial Statistics (IFS)

and Vietnam's General Statistical Office (GSO). Vn-Index data is extracted from website of the Hochiminh Stock Exchange. The data sources are seasonally adjusted and and in first difference of natural logarithm except for the domestic interest rate which is expressed in percentage. The following variables are used: the output (GDP), the consumer price index (CPI), a measure of the monetary aggregate for which M2 is used,), the 3-month lending interest rates (LR), the headline inflation (INF), the exchange rates between VND and USD (EXR).

Table 1. Variable definition and data sources

Variable definition	Abbreviation	Period	Source
Output, DLOG	GDP	2000:1 – 2011:4	GSO
M2, DLOG	M2	2000:1 – 2011:4	IFS – IMF
CPI, DLOG	CPI	2000:1 – 2011:4	IFS – IMF
Lending rate, percent	LR	2000:1 – 2011:4	IFS – IMF
Inflation, percent	INF	2000:1 – 2011:4	IFS – IMF
Exchange rate, DLOG	EXR	2000:1 – 2011:4	IFS – IMF
Vn-Index, DLOG	VNI	2000:1 – 2011:4	HNX

(c) Augmented Dickey Fuller - Stationary Test

In this paper, we used Augmented Dickey-Fuller test to check the stationary of all variables. In ADF tests, the lag length was determined by the information criteria (AIC and SC) Table 2 shows that unit roots cannot be rejected for all variables at 5 percent significance level. However, the variables become stationary when first differenced. It should be noted that due to first differencing, the variables should be interpreted as the rate of real output growth**,** the rate of exchange rate depreciation, and the rate of money demand.

Table 2: ADF unit root test results

Variable	ADF test (t-statistics)		Status
	Levels	First Differences	
GDP	-0.772474	-11.97998***	Stationary

CPI	1.992451	-4.348739***	Stationary
LR	-3.039189***	-5.929504***	Stationary
EXR	0.291084	-13.50473***	Stationary
VNI	-2.180989	-6.231766***	Stationary
INF	-2.384347	-5.086886***	Stationary
M2	-0.510656	-5.346048***	Stationary

Notes: **, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively*.

(d) Tests for the lag length

The tests used were determined based on informational criteria - *the Akaike information criterion (AIC), Hannan-Quinn (HQ), and Schwarz information criterion (SC)*, taking into consideration that if the number of lags is too small then the model does not capture all the information while if there are too many lags then the degree of freedom are wasted. Different information criteria suggest different optimal lag lengths for the VAR model, as shown in Table 3. The standard information criteria of Hannan-Quinn (HQ) shows an optimal lag length of 3. However, the lag length identified by the information criteria is found to be adequate to capture the underlying dynamics of the system. Therefore, a common VAR(3) could be used in this analysis (the Akaike information criterion (AIC) shows an optimal lag length of 3).

Table 3. VAR Lag Order Selection Criteria

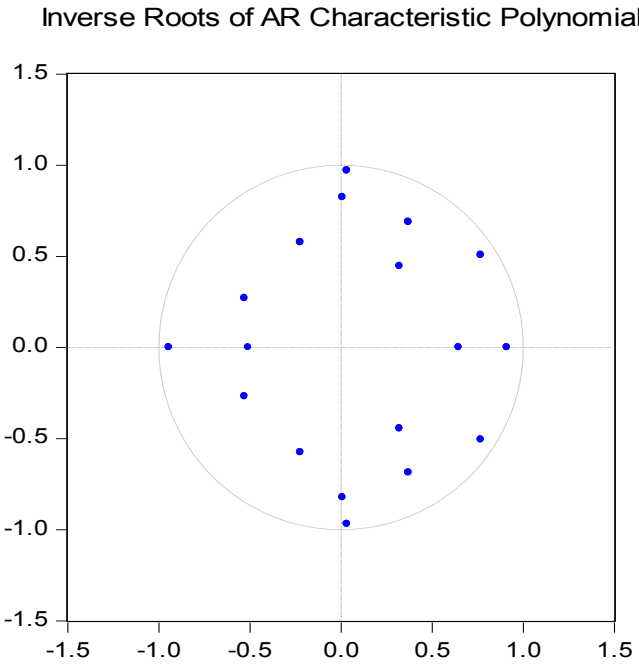
VAR Lag Order Selection Criteria
Endogenous variables: DLOG(M2/CPI) DLOG(GDP) LR D(INF) DLOG(EX) DLOG(VNINDEX)
Exogenous variables: @SEAS(1) @SEAS(2) @SEAS(3)
Sample: 2000Q1 2011Q4
Included observations: 40

Lag	LogL	LR	FPE	AIC	SC	HQ
0	18.36406	NA	3.96e-08	-0.018203	0.741793	0.256587
1	185.8638	259.6246	5.78e-11	-6.593192	-4.313204	-5.768820
2	226.4606	50.74601	5.52e-11	-6.823032	-3.023053	-5.449080
3	326.5587	95.09313*	3.58e-12*	-10.02793*	-4.707964*	-8.104401*

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

The model with lag length of three has not root lies outside the unit circle. So the VAR(3) satisfies the stability condition. This is showed on the Figure 1.

Figure 1. AR roots graph with 03 lag length



5. VAR Results

5.1. Variance decomposition analysis

The forecast error variance decomposition is a useful tool to examine the interactions between variables over the impulse response horizon. This allows evaluating the response of the economy as well as monetary policy to domestic shocks in the short and medium term. The variation proportion of the variables is showed in the below table, and reflects interactions among them. The variance decomposition is reported for forecast horizons of 1, 4, 8, 12 and 16 quarters. While four quarters are equivalent to one year denoting the short run, 8 quarters to 16 quarters present the medium run.

During the period 2000 – 2011, much of the variation in output in both the short and medium term is explained by its own shock followed by the shocks on interest rates and the demand for money. As for prices, in the shorter horizon, the variation is mostly explained by its own shock and the money demand, while in the longer horizon, much of the movements is caused by the demand for money, interest rates and the stock exchange. The variation in money demand is mainly affected by its own shock while in the longer run, exchange rates also account for larger changes except the money demand. With respect to interest rates, much of the variation is explained by its own

shock in the short run, and by the money demand, stock exchange index in longer run.

Table 4. Variance decomposition

Variance Decomposition of DLOG(M2/CPI):

Period	DLOG(M2/CPI)	DLOG(GDP)	LR	D(INF)	DLOG(EX)	DLOG(VNINDEX)
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	60.98691	9.275127	2.735836	7.402795	11.95243	7.646905
8	51.15154	8.613123	4.616006	10.44813	13.46029	11.71090
12	50.00183	8.271608	6.660511	10.58107	12.67771	11.80727
16	48.76130	8.229612	7.566470	10.52325	12.58433	12.33504

Variance Decomposition of DLOG(GDP):

Period	DLOG(M2/CPI)	DLOG(GDP)	LR	D(INF)	DLOG(EX)	DLOG(VNINDEX)
1	14.09993	85.90007	0.000000	0.000000	0.000000	0.000000
4	12.78504	62.10032	18.40479	1.849869	0.201208	4.658763
8	18.46928	54.21012	17.43185	2.451467	1.850218	5.587064
12	17.44636	55.96249	17.57592	2.687416	1.591630	4.736186
16	19.34381	53.82999	17.46854	2.621438	2.100482	4.635735

Variance Decomposition of LR:

Period	DLOG(M2/CPI)	DLOG(GDP)	LR	D(INF)	DLOG(EX)	DLOG(VNINDEX)
1	5.104632	0.186171	94.70920	0.000000	0.000000	0.000000
4	12.29362	1.982750	49.74993	15.96353	3.730554	16.27962
8	14.34579	4.638232	40.04048	14.60899	8.782914	17.58359
12	19.18979	4.279132	36.69003	14.59422	8.292597	16.95422
16	18.23062	4.258887	36.64602	14.25742	8.288585	18.31847

Variance Decomposition of D(INF):

Period	DLOG(M2/CPI)	DLOG(GDP)	LR	D(INF)	DLOG(EX)	DLOG(VNINDEX)
1	26.70631	1.294867	12.94443	59.05439	0.000000	0.000000
4	33.86223	7.940749	5.777567	34.84661	11.97892	5.593920
8	36.41826	5.804426	7.939889	24.67629	10.47962	14.68152
12	33.57583	6.265349	10.65500	23.68095	10.71502	15.10785
16	33.77625	6.065497	11.79651	22.92504	10.32851	15.10819

Variance Decomposition of DLOG(EX):

Period	DLOG(M2/CPI)	DLOG(GDP)	LR	D(INF)	DLOG(EX)	DLOG(VNINDEX)
1	4.581620	45.08612	9.770843	0.253175	40.30824	0.000000
4	7.107600	37.80366	19.45538	1.311826	28.14680	6.174735
8	9.174053	36.89950	18.54782	2.786333	26.56863	6.023664
12	9.660147	35.65746	19.07687	2.726986	25.44980	7.428738
16	9.750458	35.76591	19.33302	2.790196	24.88509	7.475331

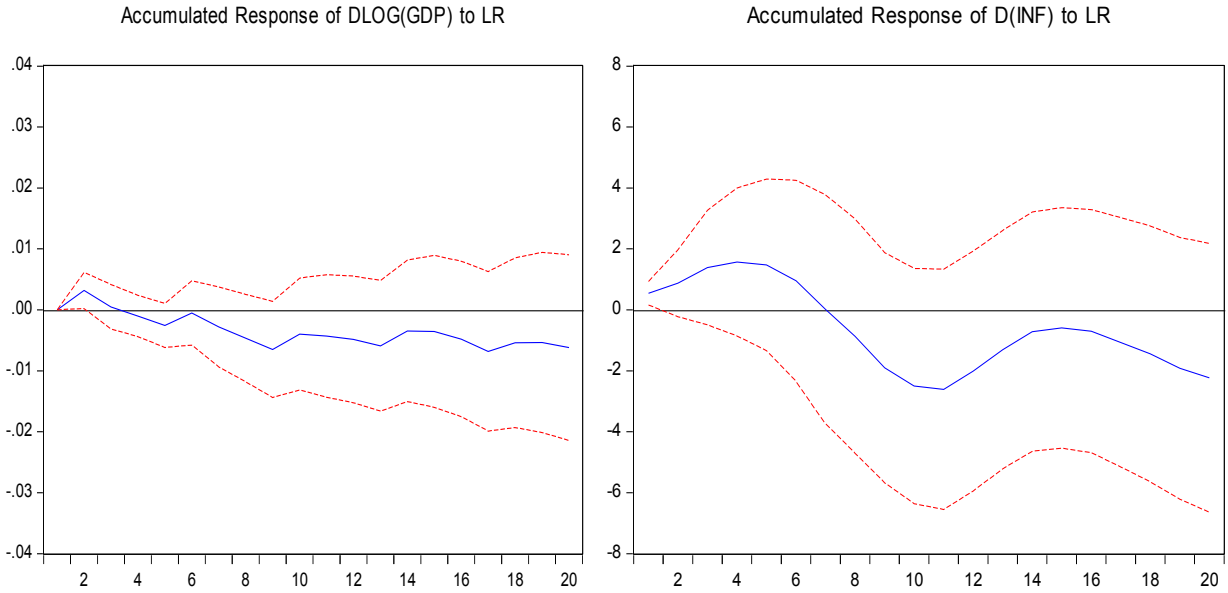
Variance Decomposition of DLOG(VNINDEX):

Period	DLOG(M2/CPI)	DLOG(GDP)	LR	D(INF)	DLOG(EX)	DLOG(VNINDEX)
1	24.55864	0.833962	4.019968	7.297642	0.375435	62.91435
4	23.13171	4.487137	5.302857	10.06554	3.591991	53.42076
8	26.28925	4.605237	4.868414	12.29693	5.262694	46.67747
12	26.20606	5.083325	7.165283	12.08852	6.081811	43.37500
16	26.04097	5.037727	7.909808	12.50326	6.048556	42.45968

5.2. Impulse response analysis

We now turn to the impulse response functions from the model, which are presented in Figure 2. These basically traces out the implied dynamic paths of the endogenous variable in the system following a one-time shock to one of the innovations. They allow us to see the monetary transmission mechanism unfolding by illustrating the response of the system to a shock in our measure of Vietnam's monetary policy. An unexpected tightening of monetary policy has a lag gives a rise to output in a short run, showing that the changes in interest rates has about a two-quarter lag. Then it starts to decline in output after two quarters, which bottoms out after 5-6 quarters (at 0.3% below the baseline). Prices do not begin to decline until about five quarters, but the fall itself is quite large (around 2.1% below the baseline)

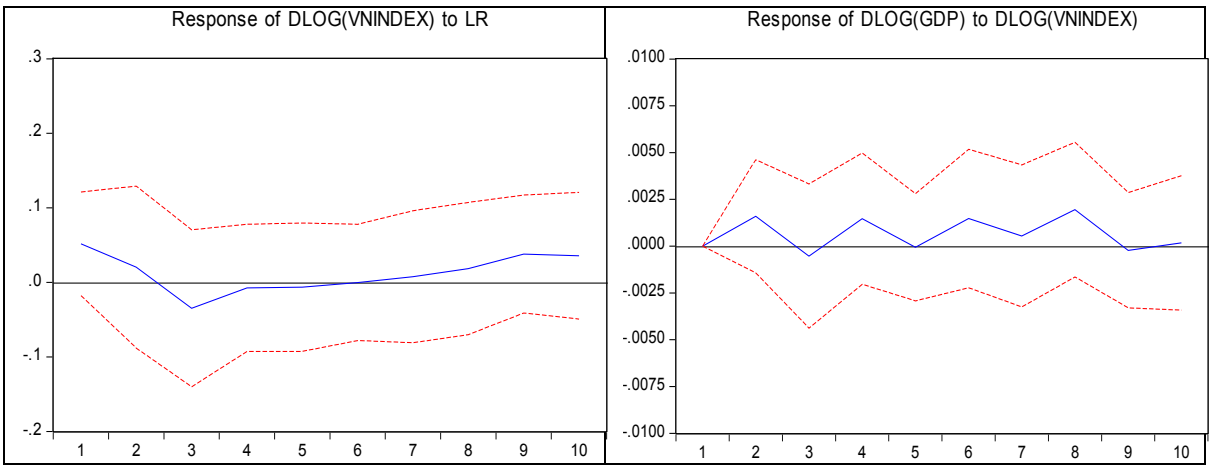
Figure 2. Impulse Responses to Interest Rate Shock



Another potential conduit of monetary shocks are fluctuations in asset prices. A monetary easing can boost equity prices by making equity relatively more attractive to bonds (because interest rates fall) as well as improving the earning outlook for firms (because household spending rises). Higher equity prices can propagate monetary impulses in two main ways. First, higher equity prices increase the market value of firms relative to the replacement cost of capital, also known as Tobin's q, spuring investment. Secondly, increases in stock prices translate into higher financial wealth of households

and there fore higher consumption. Figure 3 shows that a monetary tightening results in an immediate fall in equity price which bottoms after three quarters. In the meanwhile, innovations in asset prices boost output as expected, reaching to nearly 0.2% percent from the baseline.

Figure 3. Impulse Responses to Interest Rate and Asset Price Shock



6. Conclusion

In this paper, we employed the VAR methodology to model and investigate various channels of monetary policy mechanism of a country with a relatively open but small economy like Vietnam. The study also enhance our understanding of Vietnam's monetary policy framework over the period 1995 - 2010. A VAR model and quarterly data from 2000 to 2011 were used to study the Vietnamese monetary policy framework. In light of data constraints and the limited number of studies on the subject in Vietnam, our goal has been relatively modest but at the same time focused. Key findings suggest that Vietnam's economy is a small economy, which has been opened to a large extent and is affected by many external factors as well as internal factors. The empirical results show money demand and interest rates account for a major part of variations in output. Also, output is affected by interest rates some lags, bottoming out after 5-6 quarters before recovering.

Appendix 1: Estimation of VAR

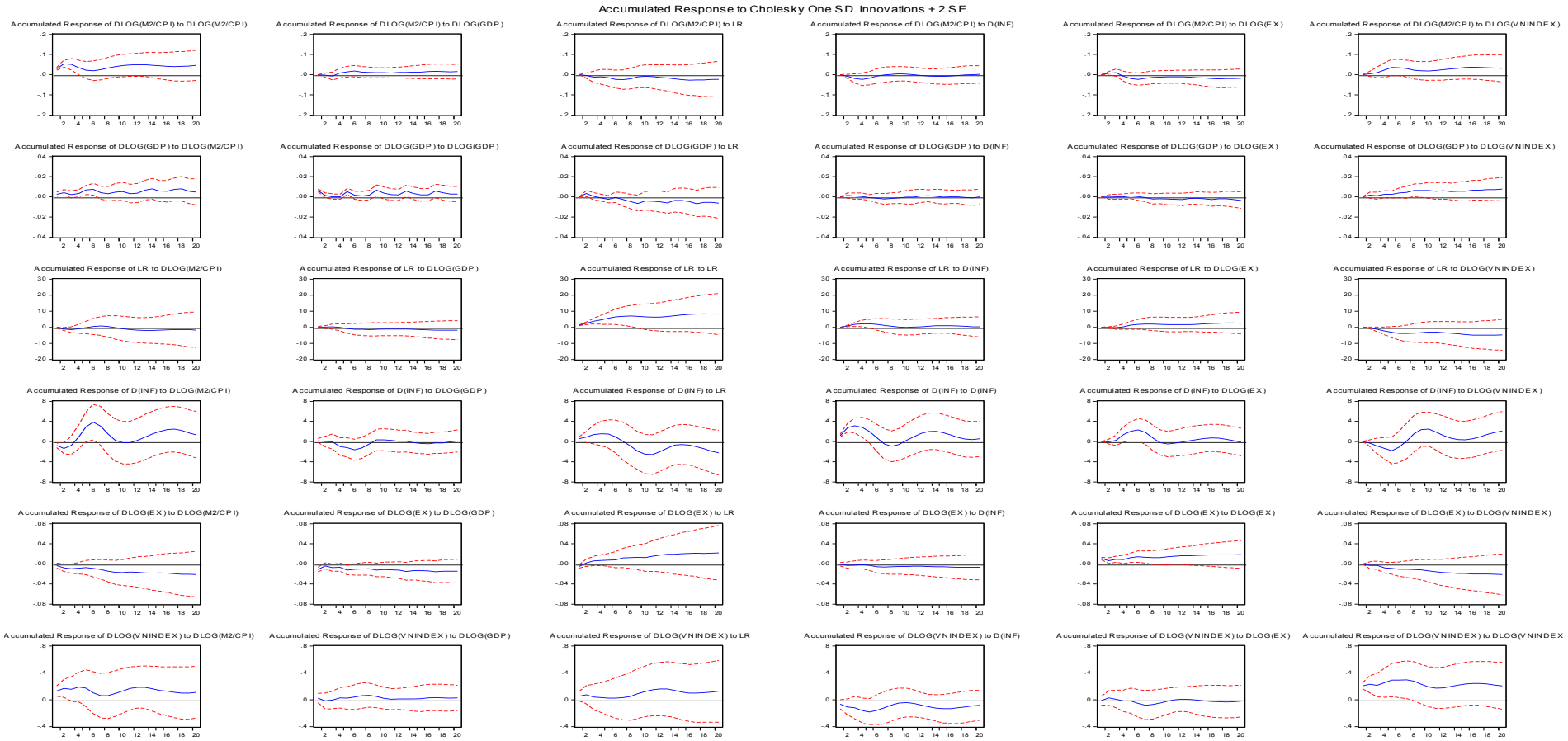
Vector Autoregression Estimates
Sample (adjusted): 2002Q1 2011Q4
Included observations: 40 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DLOG(M2/CPI)	DLOG(GDP)	LR	D(INF)	DLOG(EX)	DLOG(VNINDEX)
DLOG(M2(-1)/CPI(-1))	0.630179	0.154257	2.523603	24.21056	-0.194652	1.122445
	(0.27593)	(0.06520)	(11.4168)	(14.4340)	(0.15959)	(2.46756)
	[2.28384]	[2.36579]	[0.22104]	[1.67733]	[-1.21972]	[0.45488]
DLOG(M2(-2)/CPI(-2))	-0.652990	-0.083252	17.18553	7.984877	0.084498	-0.643789
	(0.29644)	(0.07005)	(12.2655)	(15.5069)	(0.17145)	(2.65099)
	[-2.20276]	[-1.18847]	[1.40113]	[0.51492]	[0.49284]	[-0.24285]
DLOG(M2(-3)/CPI(-3))	-0.192744	0.080577	4.784278	49.28715	-0.010059	-0.134122
	(0.26980)	(0.06375)	(11.1632)	(14.1134)	(0.15604)	(2.41275)
	[-0.71439]	[1.26385]	[0.42858]	[3.49223]	[-0.06447]	[-0.05559]
DLOG(GDP(-1))	0.660402	-0.908590	-38.55533	-65.21492	0.422375	0.373440
	(0.53009)	(0.12526)	(21.9329)	(27.7293)	(0.30659)	(4.74046)
	[1.24582]	[-7.25349]	[-1.75787]	[-2.35184]	[1.37768]	[0.07878]
DLOG(GDP(-2))	-0.461927	-0.872154	30.99856	32.04837	0.633021	-2.439556
	(0.50809)	(0.12006)	(21.0226)	(26.5784)	(0.29386)	(4.54371)
	[-0.90914]	[-7.26412]	[1.47454]	[1.20581]	[2.15416]	[-0.53691]
DLOG(GDP(-3))	-0.143400	-0.957947	6.556631	0.357505	0.472966	-1.235404
	(0.35091)	(0.08292)	(14.5191)	(18.3562)	(0.20295)	(3.13809)
	[-0.40865]	[-11.5525]	[0.45159]	[0.01948]	[2.33042]	[-0.39368]
LR(-1)	0.000657	0.001589	0.917480	-0.277431	0.006489	0.041791
	(0.00579)	(0.00137)	(0.23951)	(0.30280)	(0.00335)	(0.05177)
	[0.11351]	[1.16155]	[3.83069]	[-0.91620]	[1.93812]	[0.80732]
LR(-2)	-0.011614	-0.001697	0.398060	1.361700	-7.69E-05	-0.104924
	(0.00826)	(0.00195)	(0.34161)	(0.43188)	(0.00478)	(0.07383)
	[-1.40671]	[-0.86994]	[1.16526]	[3.15293]	[-0.01611]	[-1.42111]
LR(-3)	0.008254	-0.001572	-0.424797	-1.258987	-0.004119	0.065835
	(0.00614)	(0.00145)	(0.25424)	(0.32143)	(0.00355)	(0.05495)
	[1.34328]	[-1.08282]	[-1.67085]	[-3.91683]	[-1.15915]	[1.19808]
D(INF(-1))	-0.006036	0.001530	0.513985	1.291685	-0.003015	-0.022906
	(0.00439)	(0.00104)	(0.18152)	(0.22949)	(0.00254)	(0.03923)
	[-1.37581]	[1.47545]	[2.83161]	[5.62856]	[-1.18837]	[-0.58386]
D(INF(-2))	0.005815	-0.000957	-0.600258	-1.140282	-0.002268	0.012309
	(0.00592)	(0.00140)	(0.24487)	(0.30958)	(0.00342)	(0.05292)
	[0.98259]	[-0.68446]	[-2.45136]	[-3.68332]	[-0.66272]	[0.23257]
D(INF(-3))	-0.000445	0.002385	0.108113	0.392069	-0.001042	-0.003077
	(0.00374)	(0.00088)	(0.15481)	(0.19573)	(0.00216)	(0.03346)
	[-0.11890]	[2.69698]	[0.69834]	[2.00314]	[-0.48168]	[-0.09195]
DLOG(EX(-1))	0.612020	-0.019937	-15.92623	-5.447318	-0.430464	4.099198
	(0.43362)	(0.10246)	(17.9411)	(22.6826)	(0.25079)	(3.87770)
	[1.41143]	[-0.19458]	[-0.88769]	[-0.24015]	[-1.71645]	[1.05712]

DLOG(EX(-2))	0.110323	-0.094839	-2.975896	10.26797	0.343627	-0.698949
	(0.39622)	(0.09363)	(16.3940)	(20.7265)	(0.22916)	(3.54330)
	[0.27844]	[-1.01293]	[-0.18152]	[0.49540]	[1.49951]	[-0.19726]
DLOG(EX(-3))	-1.486356	-0.049413	56.39806	88.97410	0.344079	-3.597451
	(0.42984)	(0.10157)	(17.7849)	(22.4851)	(0.24860)	(3.84394)
	[-3.45792]	[-0.48648]	[3.17111]	[3.95703]	[1.38405]	[-0.93588]
DLOG(VNINDEX(-1))	0.018429	0.007794	-2.346488	-1.516260	-0.014454	0.110078
	(0.03101)	(0.00733)	(1.28293)	(1.62198)	(0.01793)	(0.27728)
	[0.59437]	[1.06376]	[-1.82901]	[-0.93482]	[-0.80597]	[0.39698]
DLOG(VNINDEX(-2))	0.014151	0.006548	-1.173123	-1.237350	0.005078	0.023052
	(0.02851)	(0.00674)	(1.17941)	(1.49111)	(0.01649)	(0.25491)
	[0.49644]	[0.97206]	[-0.99467]	[-0.82982]	[0.30802]	[0.09043]
DLOG(VNINDEX(-3))	0.028813	0.012296	0.390728	0.006175	-0.002244	0.073201
	(0.02417)	(0.00571)	(1.00013)	(1.26444)	(0.01398)	(0.21616)
	[1.19201]	[2.15277]	[0.39068]	[0.00488]	[-0.16054]	[0.33864]
@SEAS(1)	0.130855	-0.052474	-5.558100	5.928111	-0.824020	1.952176
	(0.62733)	(0.14824)	(25.9560)	(32.8156)	(0.36282)	(5.60999)
	[0.20859]	[-0.35398]	[-0.21414]	[0.18065]	[-2.27115]	[0.34798]
@SEAS(2)	1.361176	0.164855	-73.61343	-114.2177	0.220570	1.924294
	(0.74131)	(0.17517)	(30.6721)	(38.7780)	(0.42874)	(6.62930)
	[1.83618]	[0.94110]	[-2.40001]	[-2.94542]	[0.51446]	[0.29027]
@SEAS(3)	-1.157770	0.183648	79.72894	102.5658	0.445111	-3.739159
	(0.73618)	(0.17396)	(30.4601)	(38.5100)	(0.42578)	(6.58348)
	[-1.57266]	[1.05567]	[2.61749]	[2.66335]	[1.04540]	[-0.56796]
R-squared	0.803470	0.999975	0.918322	0.901541	0.571671	0.331756
Adj. R-squared	0.596596	0.999949	0.832345	0.797900	0.120798	-0.371659
Sum sq. resids	0.015823	0.000884	27.08736	43.29637	0.005293	1.265363
S.E. equation	0.028858	0.006819	1.194006	1.509555	0.016690	0.258066
F-statistic	3.883858	37984.40	10.68103	8.698670	1.267921	0.471636
Log likelihood	99.94641	157.6520	-48.96130	-58.34133	121.8487	12.31287
Akaike AIC	-3.947321	-6.832602	3.498065	3.967066	-5.042433	0.434357
Schwarz SC	-3.060659	-5.945940	4.384727	4.853728	-4.155771	1.321018
Mean dependent	0.036330	0.017306	11.88258	0.440378	0.008067	0.010307
S.D. dependent	0.045435	0.951747	2.916072	3.357882	0.017800	0.220347

Determinant resid covariance (dof adj.)	2.84E-13
Determinant resid covariance	3.27E-15
Log likelihood	326.5587
Akaike information criterion	-10.02793
Schwarz criterion	-4.707964

Appendix 2: Impulse response functions



Appendix 3: VAR lag exclusion tests

VAR Lag Exclusion Wald Tests
Sample: 2000Q1 2011Q4
Included observations: 40

Chi-squared test statistics for lag exclusion:
Numbers in [ ] are p-values

	DLOG(M2/CPI)	DLOG(GDP)	LR	D(INF)	DLOG(EX)	DLOG(VNINDEX)	Joint
Lag 1	30.16276 [3.66e-05]	72.96295 [1.01e-13]	86.55305 [1.11e-16]	54.82347 [5.03e-10]	13.95867 [0.030101]	2.856226 [0.826664]	348.6497 [0.000000]
Lag 2	12.98577 [0.043263]	82.72529 [9.99e-16]	17.81957 [0.006699]	25.95089 [0.000227]	7.016282 [0.319344]	3.071591 [0.799809]	218.6099 [0.000000]
Lag 3	17.52280 [0.007542]	184.2513 [0.000000]	12.30032 [0.055595]	35.55714 [3.36e-06]	7.587433 [0.269913]	2.271419 [0.893121]	451.3655 [0.000000]
df	6	6	6	6	6	6	36

Appendix 4

Monetary Policy Strategy of the State Bank of Vietnam (Vietnam's Central Bank)

1. Vision

The vision of the Vietnamese banking development strategy for the next ten years is to develop a comprehensive, safe and sustainable banking system moving towards a modern banking system operating under the socialist - oriented market mechanism. The system acquires management capacity, technical applicability of advanced technologies, deep international economic integration and full application of the institutions and standards in accordance with the best international practices in banking activities at both state management level and monetary trading and banking activities level.

2. Specific Objectives

Continue to reform and strengthen SBV's institution in 2020: "A modern central bank which is effective in maintaining monetary stability, protecting safety and health of the credit institution system, promoting financial stability based on its independence in operational functions, advanced management methods, a modern information technology base and a streamlined organizational structure in line with best international practices in Central Bank operations".

SBV's institutional development objective is based on five core values, which are considered to be the dominant factor of SBV's development during the strategic period. These values create the overall national interest and consistent with the position of a central bank as a state governance agency in the monetary and banking activities. They include:

Responsibility - As a governmental institution operating based on public interest, SBV must demonstrate the high responsibility towards the public in its policy decisions. Responsibility also demonstrated in the selection of priority to resolve conflicts of interests. In such situations, SBV's responsibility must be to protect public interest even in case urgent measures have to be undertaken to handle short-term problems.

Independence - SBV must be given a certain level of independence in government's short-term measures in order to follow its long-term objective in maintaining monetary stability, ensuring credit institutions system's safety and enhancing finacial stability. Independence is demonstrated in its right to determine the monetary policy's objectives and instruments to maintain monetary stability effectively. In addition, as a security guard for a healthy credit institution system, SBV needs to achieve its independence in making decisions to implement this role. Besides, SBV also needs financial independence in order to mobilize necessary resources to perform their duties.

Accountability - Accountability is demonstrated in the rationality and transparency in proposed policies to achieve the defined objectives, which enhances responsebility towards the National Assembly, Government and Public in decision making processes. Accountability is also demonstrated in the rationality and clarity in using financial resources from the government budget for SBV's activities. This is especially necessary when a central bank reaches a certain level of independence.

Professionalism and effectiveness - In order to conform with the trend of public administration reform, SBV's operation should be aimed to streamline the administrative apparatus. However, effectiveness must be ensured based on its high specialization in operation and professional and dynamic staff.

International integration - International economic integration requires the Vietnamese banking system to be in line with international pratices and standards. The previous socio-economic development strategy proposed to apply international standards in banking activities and for the next stage, the process of global integration will continue to be accelerated. To adapt to this process, the SBV should apply the standards and best international practices in its operating and managing activities.

3. Monetary policy strategy

The specific objective is to "Develop a monetary policy framework in a close relationship with foreign exchange management mechanism and exchange rate policy and to establish a monitoring mechanism based on analyzed and forecasted economic fluctuations to achieve targeted inflation, increase economic growth, enhance the effectiveness in using indirect

instruments and compy with international integration during 2011-2010". Besides, the directive of "transforming into an inflation targeting framework after 2010 stated in the previous strategy paper is also continued. Necessary steps to implement the roadmap for the introduction of inflation targeting framework include:

(i) Define clearly responsibility and power of SBV to pursue inflation targeting framework.

(ii) Establish information sharing mechanism and policy coordination between SBV and Ministry of Finance to ensure harmonization between monetary policy and fiscal policy.

(iii) Prepare necessary technical infrastructure conditions to completely implement inflation targeting framework.

(iv) Develop an official and updated information channel from SBV to market.

(v) Stabilize the financial system and enhance the role of inspection and supervision.

(vi) Reform in foreign exchange rate management and prudent liberalization of financial markets.

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