MONETARY TRANSMISSION MECHANISM IN THAILAND: AN SVECM ANALYSIS

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ABSTRACT

From May, 2000 up to the present, Thailand has implemented a monetary policy of inflation targeting for price stability, with its central bank (the Bank of Thailand) using a short-term interest rate as the key policy instrument. The core question arises as to whether monetary instruments (i.e. the policy interest rate and monetary aggregate) remain valid and effective in monetary transmission mechanism under inflation targeting in Thailand. This paper investigates the dynamic interrelations among key macroeconomic variables, namely, interest rate, money, prices, output and exchange rate. The empirical investigation is based on structural vector error correction model (SVECM) with contemporaneous and long run restrictions. A five-variable SVECM is developed and estimated using quarterly data over the period 2000q2 -2016q3**.** The empirical results suggest the presence of feedback relations among all variables in the specified SVECM. The findings reveal that the policy interest rate remains valid and effective in transmission of Thailand monetary policy. One policy implication drawn is that the Bank of Thailand could opt for monetary aggregate and exchange rates, as alternative monetary instruments, to support the conduct of monetary policy for price stability in Thailand.

Keywords: 1) Monetary Transmission Mechanism 2) Monetary Policy 3) SVECM 4) Thailand

1. Introduction

The role of monetary policy for price stability[2] in Thailand has been increased following the East Asian financial crisis of 1997- 1998. Given an institutional reform of monetary policy, Thailand adopted monetary targeting from 2000 to April 2002**.** Then, in May 2000, Thailand switched to a flexible form of inflation targeting with a mandate of price stability**.**

Under the inflation targeting, understanding the directions and strengths of the monetary transmission mechanism of an economy is key to the successful conduct of monetary policy for price stability. The effect of monetary policy will be substantial if the transmission mechanism of monetary policy is completely passed- through to the target sections of the economy especially price level and economic growth. It is therefore worth noting that an instrument of monetary policy becomes more effective when the monetary policy transmission mechanism is the well-understood and well-developed (Charoenseang & Manakit, 2007). In the case of Thailand, the Bank of Thailand (BOT) has deployed a short- term interest rate, i.e. the 1- day repurchase rate, as the key policy instrument to control inflation and adjust aggregate demand. The core question arises as to whether monetary instruments (i.e. the policy interest rate and monetary aggregate) remain valid

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[2] Price stability is a condition of low and stable inflation

and effective in monetary transmission mechanism under inflation targeting in Thailand. For empirical investigation of monetary transmission mechanism, this paper develops the structural vector error correction model (SVECM) with quarterly data for Thailand from 2000q2 to 2016q3 to investigate dynamic interrelation among key macroeconomic variables, namely interest rate, money, prices, real output and exchange rate. The analysis of the impulse responses and forecast error-correction decompositions are then made to draw the empirical findings.

The remainder of the paper is organized as follow. Section 2 provide a brief literature review. Section 3 outline the SVECM methodology. Section 4 reports the empirical results. Section 5 concludes.

2. Literature Review

Since the East Asian financial crisis of 1997-1998, the issue on monetary transmission mechanism has received considerable attention in both developed and developing countries. In Thailand, several researches have addressed this monetary issue; however, it is somewhat limited. In Thailand, a number of monetary literature has extensively used vector autoregression (VAR) and structural VAR (SVAR) to investigate the transmission mechanism of monetary policy. Examples of SVAR literature for Thailand include the studies of Arwatchanakarn (2017, 2018); Charoenseang & Manakit (2007); Disyatat & Vongsinsirikul (2003); Hesse (2007); and Hossain & Arwatchanakarn (2017). Relatively few studies on monetary-policy issues in Thailand has been conducted by deploying the structural vector error correction model (SVECM). This remains a gap that needs to investigate by other advanced techniques.

The SVECM, originally developed by King, Plosser, Stock and Watson (1991), is different from the SVAR model as it allows the incorporation of nonstationary variables that establish cointegral relations. The deployment of nonstationary time series, along with stationary variables, can generate misleading effects and puzzles. To remove such problems, a SVECM has emerged as the new analytic tool for analyzing the transmission mechanisms of monetary policy. The SVECM has two advantages as follows. First, it allows the use of cointegration restrictions, which impose constraints on the long-run effects of permanent shocks (Ivrendi & Guloglu, 2010). It also allows the imposition of restrictions on both short-run and long-run relationships. Second, SVECM allows us to incorporate both the mixed *I(0)* and *I(1)* nature of the data. To fill the Thailand's monetary literature, this study aims to develop an SVECM for analyzing monetary transmission mechanism in Thailand under inflation targeting period.

3. Research Methodology

To investigate the dynamic interrelations among variables of interest, this study employs a five structural vector error correction model (SVECM) with contemporaneous and long run restrictions. The model is then estimated using quarterly data for Thailand. The estimation period, starting with the implementation of inflation targeting, ranges from 2000q2 to 2016q3.

3.1 Interrelations among interest rate, money, price, output and exchange rate

Figure 1 reveals a macroeconomic modelling approach for investigation of the monetary policy transmission mechanisms under inflation targeting in the presence of two external shocks. Within such modelling framework, the objective of this paper is to investigate how the monetary policy instrument (e.g., a short-term policy interest rate, a

monetary aggregate or an exchange rate) responds to external shocks and how a change in the monetary policy instrument transmits throughout the economy, contemporaneously and dynamically. The key variables of interest are interest rate *(R)*, monetary aggregate *(M)*, prices *(P)*, real output *(Y)*, prices, and exchange rate *(ER)*[3].

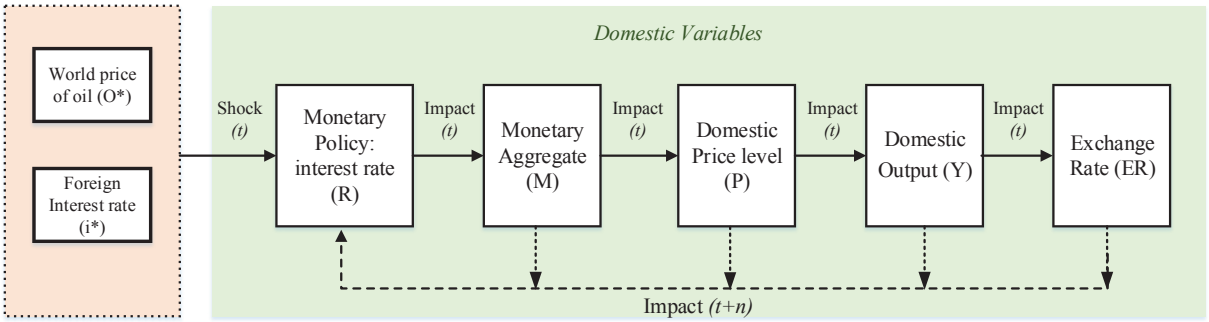

Figure 1*:* The 5-variables SVEC model: The interrelation among real output, price level, the interest rate, monetary aggregate and the nominal exchange rate with shocks originating from external sources
(e.g., the world price of oil and changes in the foreign interest rate).

In the SVECM analysis, it is necessary to determine the number of the cointegration vector and the Johansen cointegration approach (1990) is deployed. The result obtained by Johansen cointegration shows that the trace and maximum eigenvalue (λ_{max}) statistics suggest one or two cointegrating relations among all five variables[4].

3.2 The identification of monetary policy shocks

This study uses the SVEC model with long-run and short-run (contemporaneous) restrictions. Although the Johansen cointegration test suggests the existence of one or two cointegrating relationships, this study considers only one cointegrating relationship. The reason behind this consideration is that we emphasize a monetary policy shock as only one transitory shock. Identifying the long-run impact is also based on the assumption of money neutrality, implying that monetary policy does not permanently affect real variables in the long run. This study follows the identification scheme of Ivrendi & Guloglu (2010) and Raghavan & Dungey (2015) with some modification. This SVEC model, therefore, considers a monetary policy shock transitory while the other shocks are permanent.

Local just-identification of the model requires a total of $n(n-1)/2 = 10$ restrictions. The long run and contemporaneous restrictions are shown in the next two matrices. The policy interest rate is assumed to be transitory, and this variable undertakes the adjustment required for the cointegrating relationship to hold.

The transitory shock is assigned by a zero column in the long-run matrix[5](ΞB) as follows:

[3] For these variables used, policy interest rate *(R)* is measured by the Bank of Thailand policy rate; monetary aggregate *(M)* is measured by the log of narrow money; price level *(P)* is measured by the log of the consumer price index (2010 = 100); real output *(Y)* is measured by the log of GDP at the 1988 constant price; and exchange rate *(ER)* is measured by the nominal effective exchange rate Also, the world price of oil *(O*)* and the U.S. Federal Funds Rate *(i*)* are exogenous to the system. Data for these variables are obtained from various issues of IMF's International Financial Statistics and Bank of Thailand.

[4] To conserve space, the Johansen cointegration test results are not reported.

[5] The zeros are the restricted elements and the asterisks are unrestricted elements.

$$\Xi B = \begin{bmatrix} 0 & * & * & * & * \\ 0 & * & * & * & * \\ 0 & * & * & * & * \\ 0 & * & * & * & * \\ 0 & * & * & * & * \end{bmatrix}.$$

Assuming there is a cointegrating rank $r = 1$, there are one transitory shock and four permanent shocks. The transitory shock is identified without the additional restrictions, $(r(r-1)/2 = 0)$. However, the permanent shocks are identified by requiring at least $\big((n-r)\big((n-r)-1\big)/2 = 6\big)$ further restrictions which are imposed on contemporaneous restrictions of matrix B.

In this study, the contemporaneous restrictions are imposed in the following matrix:

$$B = \begin{bmatrix} * & * & 0 & 0 & 0 \\ * & * & * & * & 0 \\ * & * & * & 0 & 0 \\ * & * & * & * & 0 \\ * & * & * & * & * \end{bmatrix} \begin{bmatrix} u_R \\ u_M \\ u_P \\ u_Y \\ u_{NEER} \end{bmatrix}.$$

The first row represents the monetary policy reaction function. In this study, we assume that the bank of Thailand (BOT) sets the policy interest rate after observing the current monetary aggregate *(M)*. However, the BOT is assumed to react to real output *(Y)*, price level *(P)* and exchange rate *(NEER)* with lags. The second row stands for conventional real money demand, which is assumed to respond contemporaneously to the policy interest rate *(R)*, price level *(P)* and real output *(Y)*. The third row stands for the price level equation, which is contemporaneously affected by interest rate *(R)* and money *(M)*. The fourth row stands for real output, which is contemporaneously influenced by the interest rate *(R)*, money *(M)* and price level *(P)*. The last row describes the exchange rate equation. The exchange rate is contemporaneously affected by all variables in the system.

4. Results

This section reports the estimation results of the SVECM for investigating the dynamics of the economy and monetary transmission mechanism in Thailand.

4.1 The Impulse responses function

Figure 2 presents the estimated impulse responses to a positive monetary policy shock (an increase in interest rate, i.e., tightening monetary policy), together with the upper and lower confidence intervals. Some interesting fiondings are reported as follows. The impulse response of price level, monetary aggregate and output are significantly negative. These results are also consistent with theoretical expectations. In response to a tightening monetary policy, the price level, monetary aggregate and output initially decline, and their effects are persistent over time. Importantly, the SVECM does not produce the liquidity, output and price puzzles. However, a tightening monetary policy initially makes an exchange rate decrease or depreciate, and this negative response seems to be persistent, showing that an exchange rate puzzle still exists.

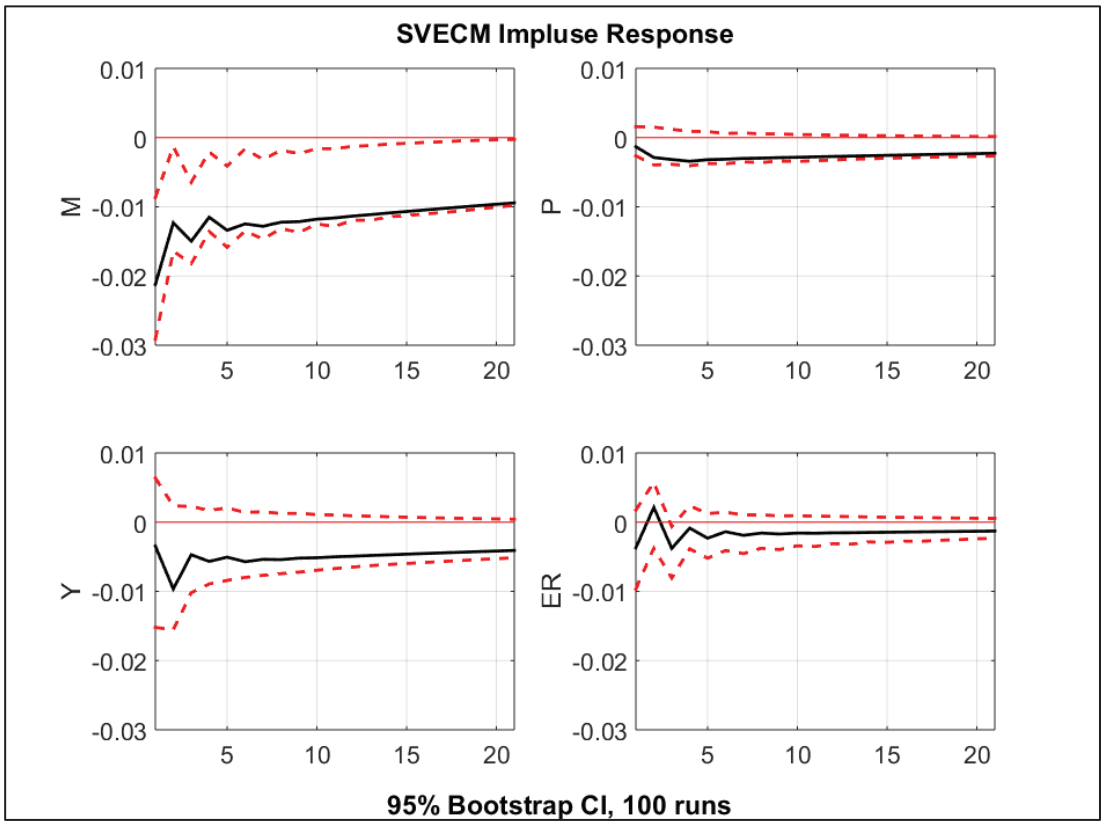

Figure 2*:* Impulse responses of Thai variables to an interest rate shock.

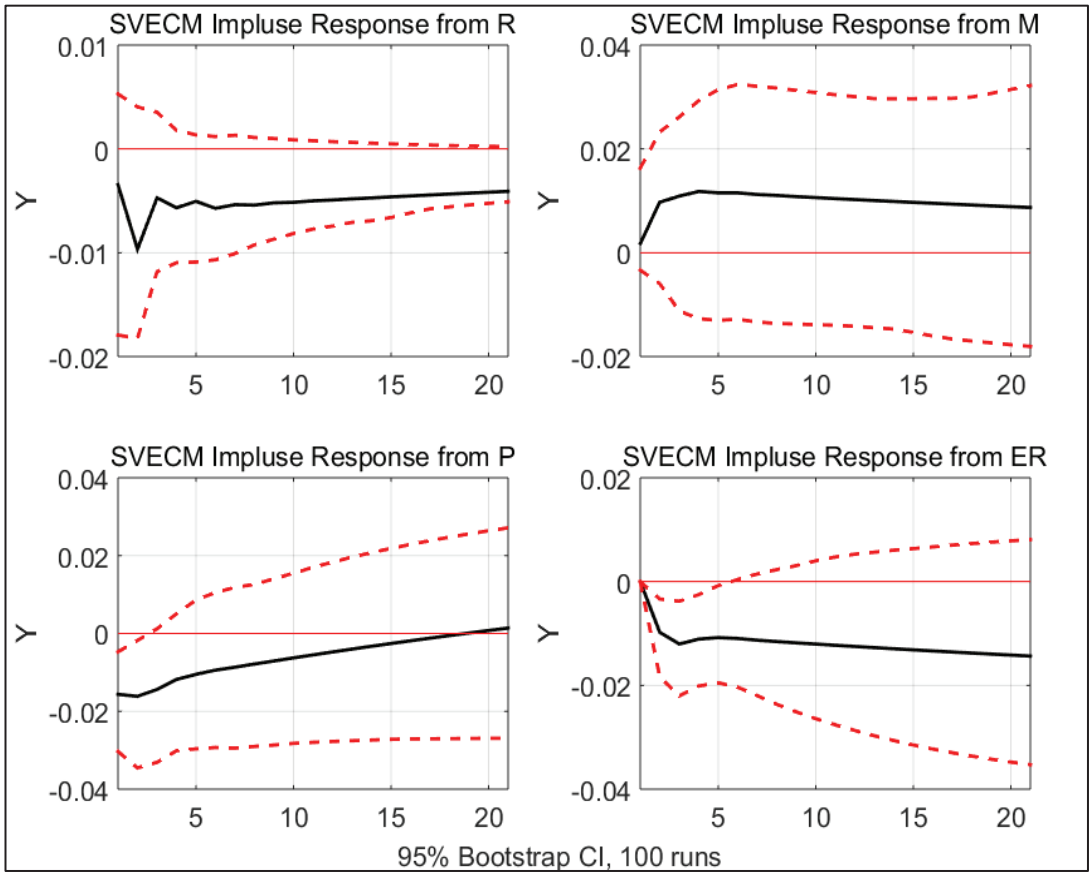

Figure 3*:* Impulse responses of output to other shocks.

These results are indicative, given the simple transmission mechanism imposed for illustrative purposes. Figure 3 shows the responses of output to various shocks (other than an interest rate shock). The real output has a sudden decrease following an interest rate shock, and its negative adjustment remains persistent as theory expectation. Both shocks to price level and exchange rate seem to adversely affect output, and they make output decrease promptly with their negative effects persistence over time. Also, the results imply that price stability is important for sustained output and that appreciation in the exchange rate could dampen output. Conversely, a shock to money that is an increased monetary aggregate makes output increasing. Notice that the policy interest rate and monetary aggregate could act as monetary instruments to stimulate or sustain output. Also, a devaluation of exchange rate could be considered an alternative policy to raising output through the channel of international trade.

Figure 4 shows the responses of price level to various shocks. The price level has a sudden decrease following an interest rate shock, and its impact is persistent as theory suggests. This result indicates that the policy interest rate is effective in controlling inflation. In response to a monetary shock, the price level suddenly rises, and its positive adjustment remains over time. As theory expect, when there is a monetary expansion or increased monetary aggregate, it drives the price level goes up or vice versa. This outcome implies that money is a source of inflation and that money could be used as an alternative instrument to control inflation. However, the responses of price level to output shock remain positive and persistent. In response to a positive exchange rate shock or an appreciation, the price level immediately increases before falling to the baseline the long run. This adjustment is made through the trade channel. An appreciation in the exchange rate makes foreign goods and services cheaper, and, as a result, their import is more in demand, and the tradable prices are higher. Then, the increasing tradable prices induce higher price level.

Figure 5 shows the responses of two monetary instruments (the policy interest rate and money) to target variables (output and price level). The first response is the policy rate, which promptly increases in response to a positive price level and output shock. This outcome provides a clear support that, under inflation targeting, the bank of Thailand (BOT) has the primary objective to maintain price stability and serves as an inflation fighter. It also implies that the BOT pursues an objective of sustained output. When there is a positive shock to output (or an overheated economy), the BOT could slow down the economy by raising the policy rate and vice versa. Therefore, adjusting the policy rate is a key strategy of monetary policy in controlling inflation and sustained output.

The second responses are of money. In response to a positive output shock, money increases suddenly, and its positive adjustment remains over time. This outcome is also in line with the quantity theory of money (QTM) and money market equilibrium. In addition, when there is a surprise shock to price level, money has an instant decline and remains in the short run. In the long run, the money increases gradually and remains a positive adjustment. Its long-run adjustment is consistent with the QTM that an increasing price level drives a money increase, when and if the velocity of circulation and output are constant. A key finding drawn from these results is that monetary aggregate could be an optional instrument for controlling inflation and stimulate output in the long run.

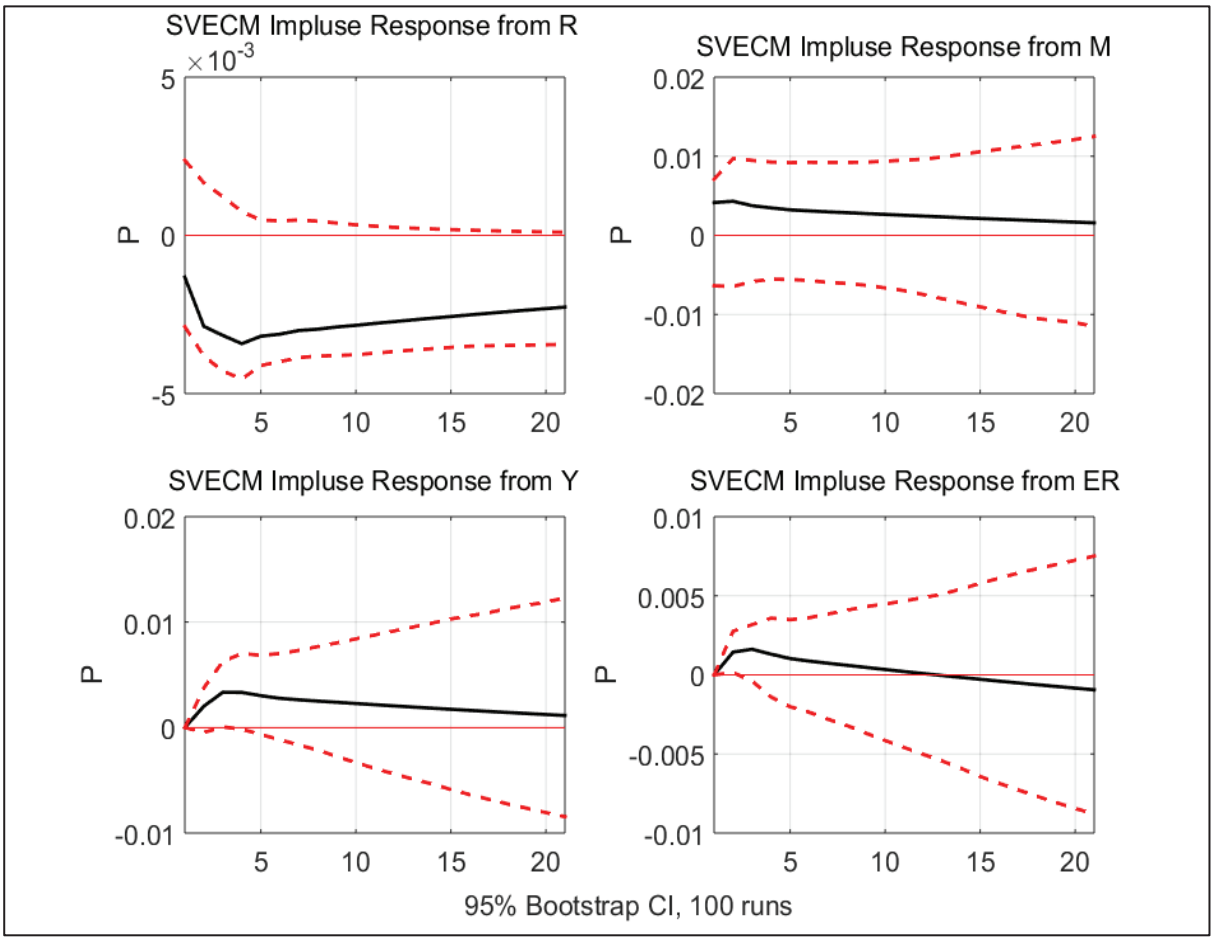

Figure 4*:* Impulse responses of price level to other shocks.

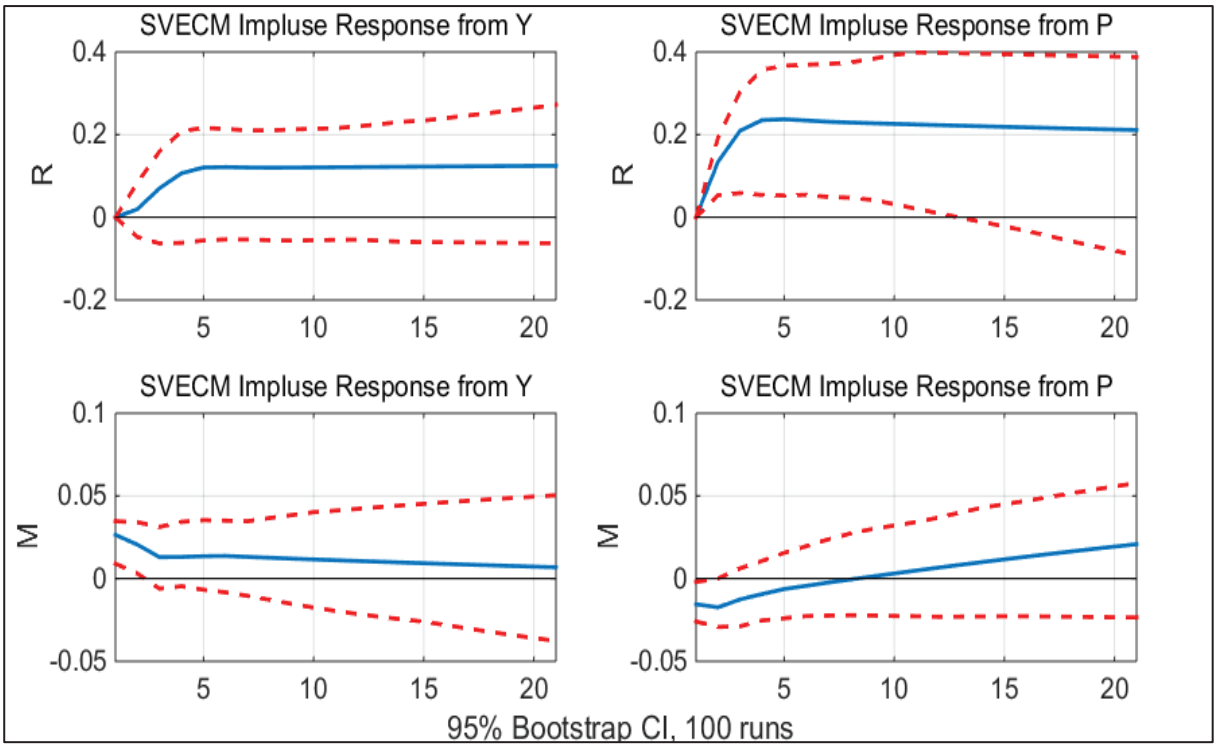

Figure 5: Impulse responses of the interest rate and money to output and inflation shock.

4.2 Forecast error variance decomposition

The forecast error- variance decompositions for the SVEC model are reported in Figure 6. The focus of interest is on forecast error variances of output and price level. Most output fluctuations are explained by the output's shock on itself, accounting for about 70 percent of that fluctuation. The money and exchange rate play a minor role in adding output over time; they jointly contribute about 20 percent to output fluctuation. However, a shock to price level has a decreasing role in that fluctuation. In case of price level, most of its fluctuation is substantially explained by price level's own shock on itself, which has an increasing role over time, accounting for about 78–92 percent of its fluctuation. However, other variables play a minor role.

Also, we can draw some interesting conclusions about money, interest rate and exchange rate. For fluctuation of money, the shock from the output is a dominant source of that fluctuation in the short run; however, it has a decreasing role over time. Meanwhile, the exchange rate shock makes an increasing contribution and becomes a dominating source of that fluctuation in the long run. The shocks from money on itself, interest rate and price level also have a significant role in adding to the fluctuation of money; they jointly account for 50 percent of that fluctuation. In the case of interest rate, the dominant sources of its fluctuation are money and price level shocks that contribute about 80 and 15 percent, respectively, over time. In the case of the exchange rate, the dominant source of it fluctuation is explained by the exchange rate's shock on itself over time. It makes a strong contribution to about two-thirds of that fluctuation. Also, output plays a significant role and contributes around a quarter of that fluctuation.

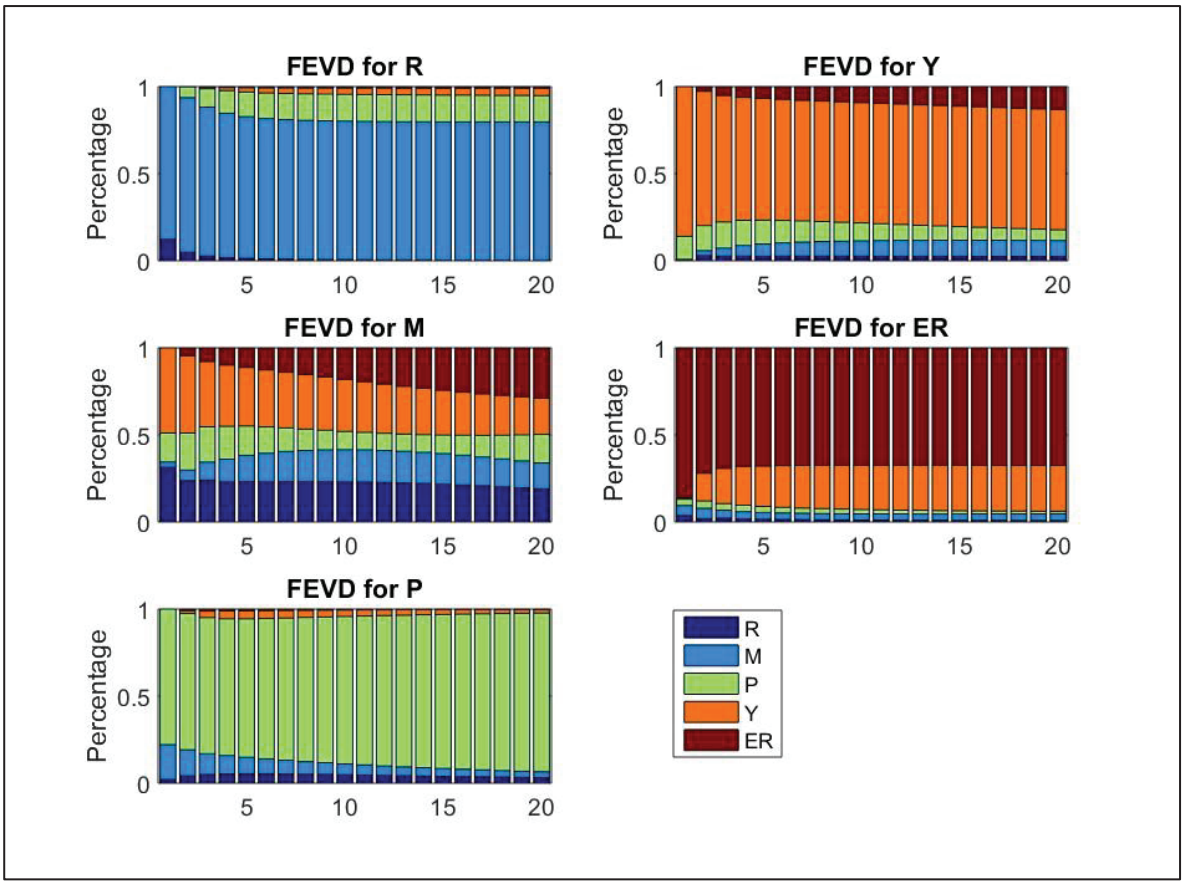

Figure 6: Forecast error variance decomposition for the specified SVECM.

5. Conclusions

From May, 2000 up to the present, Thailand has implemented a monetary policy of inflation targeting, with its central bank (Bank of Thailand) using a short-term interest rate as the key policy instrument. The core question arises as to whether monetary instruments (i.e. the policy interest rate and monetary aggregate) remain valid and effective in monetary transmission mechanism under inflation targeting in Thailand.

This paper investigates the dynamic interrelations among some key macroeconomic variables, namely, interest rate, money, prices, output and exchange rats with a new analytical technique. For empirical investigation, the paper develops a five-variable model, within the structural vector error-correction (SVEC) modelling framework, to examine the contributions of monetary instruments (i.e. the interest rate and monetary aggregate) to target variables (i.e. real output and prices). The model is estimated using quarterly data over the period 2000Q2-2016Q3. Overall, the empirical results show significant feedback relationships among all variables in the specified SVECM. Price stability seems to be important condition for sustaining economic growth. Importantly, the policy interest rate and monetary aggregate remains valid and effective in transmission of Thailand monetary policy. One policy implication drawn is that the Bank of Thailand could opt for monetary aggregate and exchange rates, as alternative monetary instruments, to support the conduct of monetary policy for price stability in Thailand.

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