RESEARCH ARTICLE

How Does the Thai Stock Market Respond to Monetary and Fiscal Policy Shocks?

Suthawan Prukumpai
Kasetsart University, Bangkok, Thailand
fbusswp@ku.ac.th

Yuthana Sethapramote
National Institute of Development Administration, Bangkok, Thailand

Abstract: This study examines the impacts of monetary and fiscal policy on the Thai stock market using the structural vector autoregressive (SVAR) model. In addition to the data on the market aggregate level, we also consider the response of stock prices at the sectoral level. The empirical results show that the Thai stock market significantly responds to both monetary policy and fiscal policy. However, monetary policy has stronger effects on both real output and stock prices than those of fiscal policy. Fiscal policy shocks affect the stock market only for the next two to three quarters. In addition, sector indices were used in place of the overall stock market and the results revealed that different sectors appeared to react heterogeneously to shocks in monetary policy and fiscal policy.

Keywords: Monetary policy, Fiscal policy, Thai stock market, Structural VAR

JEL Classifications: E44, E52, E62

The linkages between financial markets, the real economy, and economic policy are important aspects for the proper understanding of the macroeconomy. In the context of the business cycle, monetary policy and fiscal policy have an important role in stabilizing inflation and output gaps. Through monetary policy, the central bank uses open market operations (e.g., buying or selling government bonds; lending or borrowing in money markets) to control money supply or short-term interest rates. In terms of fiscal policy, the government uses tax cuts or government spending to stimulate aggregated demand using the multiplier effect.

Currently, the stock market is not only a crucial part of the financial market but it also plays important roles in the macroeconomy since it enables the optimal allocation of scarce capital resources. Moreover, any mistakes will possibly lead to the disruption of financial markets, which eventually will link to the entire economy. This explains why financial market stability and resilience are the ultimate goals in the economic development of each nation. In the other direction, stock prices are also sensitive to changes in the economic fundamentals that affect a firm' cash flows. Moreover, according to Flannery and Protopapadakis (2002), riskadjusted discount rates in asset pricing are also related to changes in macroeconomic conditions.

Hence, the associations between the stock market, the macroeconomy, and economic policy are also emphasized in the literature. At the early stage of empirical work, most studies concentrated on the long-term relationship between economic growth and stock market development (e.g., Goldsmith, 1969; McKinnon, 1973). Specifically, economic policy has been generally used to promote the long-term sustainable growth of the real sector, which is a fundamental of financial markets. In addition, the good functioning of financial markets will enhance economic growth by enabling firms to acquire capital at a reasonable cost. Recently, several studies have turned their focus to the short-term response of stock markets to economic policy. Interestingly, most of the empirical studies in this area have been primarily concerned with monetary policy (e.g., Jensen & Johnson, 1995; Thorbecke, 1997; Conover, Jensen, Johnson, & Mercer, 1999). However, only a few studies (e.g., Darrat, 1988) have explored the response of stock markets to fiscal policy. Besides investigating the effect of monetary policy and fiscal policy on stock markets individually, many studies have been interested in the combined effect of these policies on the stock markets, for example, Chatziantoniou, Duffy, and Filis (2013), Hsing (2013), and Thanh, Thuy, Anh, Thi, and Truong (2017).

In Thailand, the stock market was established in 1975. Since then, the Stock Exchange of Thailand (SET) has become one of the most attractive exchanges in ASEAN. However, compared with developed markets such as the United States and the United Kingdom, the SET is still relatively small and has limited numbers of listed companies. In addition, both the Thai economy and the SET are sensitive to both internal and external shocks. Therefore, the SET may react to economic policy shocks differently to those of the developed markets. The objective of this paper is then to examine the effects of monetary and fiscal policy shocks on the stock markets. Using data from the SET, both at the market aggregated level and at the sectoral level, an intensive study will not only enrich previous research in this field but also offer a reference for related research on developing countries, which thus will present possible valuable applications for both academia and practitioners.

Literature Review

Linkages Between Financial Sector and Real Economy

The linkages between the financial sector and the real economy are emphasized in macroeconomic theory. There are several studies on the relationship between the real sector, economic policy, and the stock market. At the early stage of empirical work, most studies were concentrated on the long-term relationship between economic growth and stock market development, for example, Goldsmith (1969) and McKinnon (1973). Specifically, they showed a strong positive empirical link between the degree of financial market development and the rate of economic growth. However, that literature did not provide any theoretical framework to explain the linkage between the real economy and the financial sector. Recently, a formal linkage has been cited between financial intermediation and growth. Levine (1997), for example, emphasized the role of financial institutions in enhancing resource allocation efficiency and eventually promote economic growth. In addition, Luintel and Khan (1999) reported the bi-directionally relationship between financial development and economic growth.

In addition to the linkage via financial intermediation, the transmission mechanism of monetary policy provides another transmission channel between the financial sector and the real economy. Specifically, the central bank will use open market operations (e.g., buy or sell government bonds; lending or borrowing in money markets – interbank or repurchase ones) to control money supply or interest rates. This implies that there must be some links between financial variables (e.g., quantities of money, interest, and exchange rates) and macroeconomic variables (e.g., unemployment, GDP, asset prices). Mishkin (1996) summarized that there are five channels of monetary policy transmission: the interest rate channel, the credit channel, the exchange rate channel, the asset price channel (wealth effect), and the expectation channel (monetary channel).

In sum, there is bi-directional causality between the financial sector and the real economy. The financial sector contributes to economic growth by facilitating savings and allocating those funds efficiently to the most productive users in the real economy. In turn, the real economy, once it gets funding, generates financial activity by employing people (who will eventually have the residual income to saving or investing in financial markets).

Recently, several studies have turned their focus to the short-term response of the stock markets to economic policy. According to the semi-strong form market efficiency hypothesis, asset prices must fully reflect all available relevant public information such as firms' announcements, financial statements, and news, including policy actions (Fama, 1970). Therefore, stock prices should react to shocks in economic policy that not only affect a firm's cash flows but also influences time-varying discount factors. Even though significant literature has focused on the relationship between the stock market and monetary policy (e.g., Jensen & Johnson, 1995; Thorbecke, 1997; Conover et al., 1999), only a few have studied the effects of fiscal policy on stock markets. Darrat (1988) found that fiscal policy plays an important role in determining stock returns. In addition, many studies have demonstrated an interest in the combined effect of these policies on stock markets, for example, Chatziantoniou et al. (2013), Hsing (2013), and Thanh et al. (2017). Therefore, the next section will summarize the literature on the stock market and economic policy: monetary policy and fiscal policy, respectively.

Stock Market and Monetary Policy

The stock market is affected by innovations in monetary policy through several channels. Via the main channel—the interest rate channel—a change in the interest rate has an impact of the cost of capital, which eventually lowers the present value of a firm's expected cash flows or stock prices. This channel represents the Keynesian view of interest rate transmission. The changes in interest rate have an influence on a firm's investment, which is called the credit channel. High (low) investment activity leads to high (low) cash flows for the firm in the future and in turn, higher (lower) current stock prices. High interest rates also destroy the value of long-lived assets, which is called the wealth effect, through the asset price channel. In addition, increases in the interest rate also lead to an appreciation of the domestic currency, resulting in lower exports. Production will eventually be cut due to lower exports, hence, leading to lower asset prices. Lastly, higher interest rates will lower stock prices since investors will transfer funds from the stock market to the bond market—assuming that only two asset markets exist, as indicated by Tobin (1969).

Several studies have investigated the effects of monetary policy on financial markets. Jensen and Johnson (1995), using data from the US from 1962 to 1991, found that stock returns were higher after interest rates decreased and were less volatile than returns when interest rates increased. Similarly, Thorbecke (1997) concluded that expansionary monetary policy via decreased interest rates would increase the stock returns. A study using international data by Conover et al. (1999) also revealed that international stock market returns are higher in the expansive US and local monetary environments than they are in tight monetary policy. In a more recent study, Chevapatrakul (2015) investigated the relationship between international stock market returns and monetary environments by applying the quantile regression technique. He found the asymmetric response of the stock market to monetary policy. In addition, when returns are high, stock markets significantly respond to the US monetary policy, while for some countries, local monetary policy is effective only when returns are low.

The stock market condition can have a significant impact on the macroeconomy and is, therefore, likely to be an input for policy actions. Because of the simultaneous response from the stock market to policy actions, Rigobon and Sack (2003) used an identification technique based on the heteroskedasticity of stock market returns to measure the reaction of monetary policy to the stock market. They concluded that there as a significant monetary policy response to stock market returns. Specifically, there was the likelihood to increase (decrease) the interest rate when the S&P500 index increased (decreased). Bjornland and Leitemo (2009) provided evidence of simultaneous interaction between monetary policy and stock market returns. They found that interest rate increases have a negative impact on stock market returns, whereas increases in stock market returns have a positive impact on interest rates.

Despite the vast empirical studies from developed markets, the literature from developing countries remains limited. In addition, many papers have examined the effect of foreign (the U.S. and U.K.) monetary policy rather than domestic monetary policy. Wongswan (2009) found, for example, that the stock markets of Indonesia, the Republic of Korea, and Malaysia, not Thailand, responded to U.S. monetary policy. Kim and Nguyen (2009) also found a negative response of the 12 Asian stock markets to U.S. and E.U. monetary policy shocks. Nevertheless, Vithessonthi and Techarongrojwong (2013) applied an event study approach to investigate the stock market's reaction to the Bank of Thailand's monetary policy announcement. Using firm-level stock prices, they found that stock prices are affected by expected change rather than an unexpected change in interest rates. Moreover, the response of stock prices was found to be asymmetric, depending on the direction of the changes in the interest rate.

Stock Market and Fiscal Policy

In addition to monetary policy, the government can use tax cuts and increased government spending to stimulate the entire economy—aggregated demand in particular. The effects of fiscal policy on the economy are the subject of a long-lasting debate in economic theory. Specifically, such effects depend on whether we take the Keynesian, classical, or Richardian views. Keynesian theory states that the government can stabilize the economy by influencing the production level by increasing or decreasing the tax level or public spending. Contrary to Keynesian theory, the Richardian view suggests that fiscal policy has no impact on the economy as public borrowing will be offset by private savings. In addition, according to the classical theory, government spending will crowd out private sector activity and, thus, its effects will be less important.

Turning to the empirical evidence on the relationship between fiscal policy and stock markets, as mentioned before, there is relatively less evidence on fiscal policy than monetary policy. In an early study by Darrat (1988), he found that the lag of fiscal policy, rather than the lag of monetary policy, has a significant effect on Canadian stock returns. Using U.S. data, Laopodis and Sawhney (2002) found a negative correlation between fiscal deficits and stock returns, and Ardagna (2009) found that cutting government spending when there is high level of government deficit and lower public debt will follow by a large decrease in interest rate and an increase in stock market price. Employing a VAR analysis, Afonso and Sousa (2011) examined the linkage between fiscal policy and asset markets. They reported that spending shocks have a negative impact on stock prices while the government's revenues have a small and positive effect. Recently, Foresti and Napolitano (2017) examined the effects of fiscal policy on 11 stock markets in the Eurozone. Their study revealed that increases (decreases) in public deficits would be followed by decreases (increases) in stock markets. Moreover, the impact of fiscal policy is time-varying and depends on the macroeconomic scenario.

Stock Market and the Interaction of Monetary and Fiscal Policies

There is substantial interest in understanding the interaction between monetary and fiscal policies. Specifically, many studies have focused on the complementariness and substitutability of those policies. Melitz (1997) analyzed the data in 19 countries of the OECD from 1960 to 1995 and found that monetary policy moves in the opposite direction to fiscal policy (mutual substitution effect). This is reflected in the fact that the expansion of fiscal policy has led to a contraction in monetary policy in particular. Interestingly, Muscatelli, Tirelli, and Trecroci (2004) examined U.S. monetary and fiscal policies from 1970 to 2001 and concluded that the policies were independent from 1970 to 1990, but after 1990, the policies were complementary.

Afonso and Sousa (2011), together with Chatziantoniou et al. (2013), emphasized the importance of combining both monetary and fiscal policies into one framework. Specifically, they found that the interaction between those policies was very crucial in explaining stock market development. Thanh et al. (2017) concluded that monetary and fiscal policy not only affects the Vietnam stock market individually but also impacts the Vietnam stock market through their interaction. In addition, Hu, Tirelli, and Trecroci (2018) have pointed out that the interaction between monetary and fiscal policies has played a significant role in explaining the development of Chinese stock markets.

In conclusion, the empirical studies on economic policy and stock market returns have received a great deal of attention in the literature. However, there have been only a few studies on the impact of both policies, especially fiscal policy, on the Thai stock market. Therefore, in addition to evaluating the effect of monetary policy and fiscal policy on the stock market individually, this study incorporates both policies into the VAR framework. The detailed econometric methodology is provided in the next section.

Data and Methodology

Data

In this study, we set up the VAR model, which included the following variables: world import volume

(IMW), real GDP (GDPR), real government spending (GTR), short-term interest rate (INTS), long-term government bond yield (INTL), and stock market indices (SET). We used the real GDP and the SET index to represent the real output and stock market, respectively. In Thailand, increases in government spending rather than tax cutting are typically used as a fiscal policy mechanism. The short-term interest rate is represented by the 1-day repurchase rate, which is used as an instrument of monetary policy in Thailand. The long-term interest rate (10-year government bond yield) was included in the model to represent the transmission channel of monetary policy and the crowding out effect of fiscal policy. Finally, the world import value was included to represent the external factor because the international trade channel is important for ASEAN economies. All data were collected from the CEIC database at a quarterly frequency ranging from 1996 to 2017.

Econometric Methodology

Earlier, we discussed the complexity of the interaction between the financial market, the real economy, and economic policy. Therefore, the VAR model is commonly employed to investigate the dynamic relationships among real output, the stock market, and monetary and fiscal policies. In the VAR framework, the identification of shocks is crucial in estimating the pattern of response of key variables to shocks. Typically, the recursive method proposed by Sims (1980) and the generalized method of Pesaran and Shin (1998) are applied. However, in the case of fiscal policy, a shock is defined as the changes in government expenditures (or taxes) that are not due to the business cycle.

While no consensus on the impact of fiscal policy on economic activity has been concluded, researchers generally agree on the linkage between fiscal and economic activity. Besides the fiscal policy mechanism, business cycle shocks also impact economic activity. To handle these challenges, two main approaches are applied: the narrative approach developed by Ramey and Shapiro (1998) and the SVAR approach introduced by Blanchard and Perotti (2002). The former assumes that government spending is exogenous and orthogonal to other information available at that time (Ramey & Shapiro, 1998). The latter characterizes the dynamic effects of shock in fiscal policy on economic activity by using institutional features, that is, fiscal policy does not respond to shocks that occur within the quarter when using the quarterly data to achieve identification (Blanchard & Perotti, 2002).

In this study, we followed the SVAR model. In addition, the standard VAR models (reduced-form VAR) with generalized impulse responses were also estimated to check the robustness of the results. The details on the econometric methodology are outlined as follows.

The structural VAR model. In this section, we applied the structural VAR (SVAR) using the restrictions suggested by Blanchard and Perotti (2002) and Chatziantoniou et al. (2013). The representation of the SVAR model of order has the following general form:

$$\boldsymbol{A}_0\boldsymbol{y}_t = \boldsymbol{c}_0 + \sum_{i=1}^{p}\boldsymbol{A}_i\boldsymbol{y}_{t-i} + \boldsymbol{\varepsilon}_t, \qquad (1)$$

where $\boldsymbol{y}_t$ is a 6×1 vector of the endogenous variables, that is, $\boldsymbol{y}_t$ = [IMW, GDPR, GTR, INTS, INTL, SET], $\boldsymbol{A}_0$ represents the 6×1 contemporaneous matrix, $\boldsymbol{A}_i$ is the 6×6 autoregressive coefficient matrix, $\boldsymbol{\varepsilon}_t$ is the 6×1 vector of structural disturbance, assumed to have zero covariance. The covariance matrix of the structural disturbances takes the following form: $E[\varepsilon_t\varepsilon_t^{'}] = D \equiv [\sigma_1^2 \quad \sigma_2^2 \quad \sigma_3^2 \quad \sigma_4^2 \quad \sigma_5^2 \quad \sigma_6^2]$. In order to estimate the SVAR model, the reduced form was determined by multiplying both sides with $\boldsymbol{A}_0^{-1}$,

$$\boldsymbol{y}_t = \boldsymbol{a}_0 + \sum_{i=1}^{p}\boldsymbol{B}_i\boldsymbol{y}_{t-i} + \boldsymbol{e}_t \qquad (2)$$

where $\boldsymbol{a}_0 = \boldsymbol{A}_0^{-1}\boldsymbol{c}_0, \boldsymbol{B}_i = \boldsymbol{A}_0^{-1}\boldsymbol{A}_i$, and $\boldsymbol{e}_t = \boldsymbol{A}_0^{-1}\boldsymbol{\varepsilon}_t$. The reduced form has the covariance matrix of the form $E[e_te_t^{'}] = \boldsymbol{A}_0^{-1}\boldsymbol{D}\boldsymbol{A}_0^{-1}$.

The structural disturbances can be derived by imposing suitable restrictions on 0. In this study, the short-run restrictions were set up as follows:

$$\begin{bmatrix}\varepsilon_{1,t}\\ \varepsilon_{2,t}\\ \varepsilon_{3,t}\\ \varepsilon_{4,t}\\ \varepsilon_{5,t}\\ \varepsilon_{6,t}\end{bmatrix} = \begin{bmatrix}a_{11} & 0 & 0 & 0 & 0 & 0\\ a_{21} & a_{22} & 0 & 0 & 0 & 0\\ 0 & 0 & a_{33} & 0 & 0 & 0\\ 0 & 0 & a_{43} & a_{44} & 0 & 0\\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & 0\\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66}\end{bmatrix} x \begin{bmatrix}e_{1,t}^{IMW}\\ e_{2,t}^{GDPR}\\ e_{3,t}^{GTR}\\ e_{4,t}^{INTS}\\ e_{5,t}^{INTL}\\ e_{6,t}^{SET}\end{bmatrix} \qquad (3)$$

The restrictions in the SVAR model were imposed based on several principles. First, income contemporaneously reacts to external shocks but is not concurrently influenced by other factors in the model. However, the GDP is the important factor that affects the long-term interest rate and the stock market. Regarding the policy variables, we assumed that both fiscal policy and monetary policy are not influenced contemporaneously by the GDP. This assumption was used to distinguish policy shocks from business cycle shock. Next, monetary policy contemporaneously reacts to fiscal policy. Finally, we assumed that the stock market instantly responds to all macroeconomic, financial, and policy variables.

The reduced-form VAR model. Next, we estimated the reduced-form VAR model and computed the generalized impulse response function to check for the sensitivity of the results from the SVAR model. The reduced-form VAR model can be written as follow,

$$Y_t = a_0 + \sum_{i=1}^{p} B_i Y_{t-i} + \varepsilon_t \qquad (4)$$

where Y = [IMW, GDPR, GTR, INTS, INTL, SET]. The number of lags included in the model was determined using the Schwartz information criteria (SIC).

To investigate the response of real output and the stock market to policy shocks, we used two main methods. First, a causality test was performed to provide information on the direction of the relationships among economic policies, real output, and the stock market. Second, impulse response functions (IRFs) analysis was applied based on shocks in short-term interest rates (INTS) and government spending (GTR). The comparison between the generalized impulse response functions (GIRFs) from the reduced-form VAR model and the IRFs from the SVAR model would provide information on the validity of the restrictions imposed in the SVAR model.

Empirical Results

Unit Root Test

Prior to checking for a causality relationship, it is necessary to test the stationary property of the data. The augmented Dickey-Fuller (ADF) test was performed to test the null hypothesis of the unit root with constant and time trend as well as the unit root with constant without the time trend. As can be seen in Table 1, all of the variables were non-stationary (except for the long-term interest rate) at the level but they were stationary at the first difference. Therefore, we then proceeded to estimate the VAR model based on the first difference variables in order to perform the Granger causality test.

Table 1
Unit Root Tests

	IMW	GDPR	GTR	INTS	INTL	SET
			At level			
constant	-1.4931 (0.5329)	-0.8166 (0.8098)	-1.0746 (0.7234)	-1.4504 (0.5545)	-3.0915** (0.0306)	-1.9191 (0.3222)
constant & trend	-1.2748 (0.8880)	-2.2209 (0.4726)	-1.6585 (0.7621)	-3.6925** (0.0274)	-3.7881** (0.0215)	-3.4233* (0.0550)
			At first difference			
constant	-5.412*** (0.0000)	-9.7353*** (0.0000)	-10.2185*** (0.0000)	-12.6986*** (0.0000)	-7.0969*** (0.0000)	-5.5959*** (0.0000)
constant & trend	-5.5495*** (0.0001)	-9.7051*** (0.0000)	-10.2792*** (0.0000)	-12.6598*** (0.0000)	-7.0581*** (0.0000)	-5.5677*** (0.0001)

Note: *, **, and *** represent significance at 10%, 5%, and 1%, respectively as compared with the critical values tabulated by MacKinnon (1990). The first line presents the ADF t-statistics while the second line presents the corresponding p-value.

Granger Causality Test

As shown in Table 2, five main findings were observed. First, the monetary policy variable (short-term interest rate) had bi-directional causalities with real output and a significant effect on the SET. However, the SET had no feedback causality in relation to monetary policy. These results emphasize the complicated role of monetary policy mentioned in previous studies. Second, fiscal policy was seen to have no significant effect on either the real economy or the stock market. We also found no evidence of a crowding out effect since the long-term interest rate was not influenced by fiscal policy. Thirdly, the world import volume (IMW) had no effect to either the real or financial sectors. Fourth, the interaction between monetary policy and fiscal policy were found as the short-term interest rate significantly reacted to government spending. Lastly, a causality relationship from the financial sector to the real sector was strongly significant at 1%; however, a feedback relationship from the real sector to the financial sector was not found.

Even though the results from the causality test indicated that fiscal policy had no direct effect on either real output or the stock market, fiscal policy may have an effect to stock prices in short-run (1–3 quarters). In addition, fiscal policy could provide effects via the changes in interest rates. We then further investigated the linkages between real output, stock market, monetary policy, and fiscal policy using an impulse response analysis.

Structural VAR Model and Impulse Response Analysis

The SVAR model with one lag based on minimized SIC criteria was estimated using the data in level. To reveal how the variable in question responded to the shock over several periods of time, the IRF of the expansionary shocks to monetary policy and fiscal policy was calculated and shown in Figures 1 and 2, respectively. Because the IRF is a conditional forecast, it is necessary to report a confidence interval, period by period, to go with the IRF. The blue line represents the response to one standard deviation shock while the red line represents a 95% confidence interval. The response is significantly different from zero when the confident interval does not contain the zero-horizontal axis.

Table 2

Granger Causality Relationship Based on the VAR Model

Dependent variable	**Short-run causality, chi-squared statistics**					
	IMW	**GDPR**	**GTR**	**INTS**	**INTL**	**SET**
IMW	–	0.5408	2.2394	1.3681	4.6951*	7.6467**
		(0.7631)	(0.3264)	(0.5046)	(0.0956)	(0.0219)
GDPR	0.4632	–	1.1007	7.8939**	0.1395	12.1364***
	(0.7893)		(0.5767)	(0.0193)	(0.9326)	(0.0023)
GTR	1.3870	6.01267**	–	2.5674	5.4544*	3.0383
	(0.4998)	(0.0495)		(0.2770)	(0.0654)	(0.2189)
INTS	2.9266	6.0195**	7.1934**	–	6.9261**	1.8403
	(0.2315)	(0.0493)	(0.0274)		(0.0313)	(0.3985)
INTL	0.1807	5.2140*	3.0133	32.4136***	–	10.5312***
	(0.9136)	(0.0738)	(0.2217)	(0.0000)		(0.0052)
SET	3.3734	2.8808	1.3629	19.8397***	4.6954*	–
	(0.1851)	(0.2368)	(0.5059)	(0.0000)	(0.0956)	

Note: *, **, and *** represent significance at 10%, 5%, and 1%, respectively. The first line presents the chi-squared statistics while the second line presents the corresponding p-value. All of the variables were in natural logarithm.

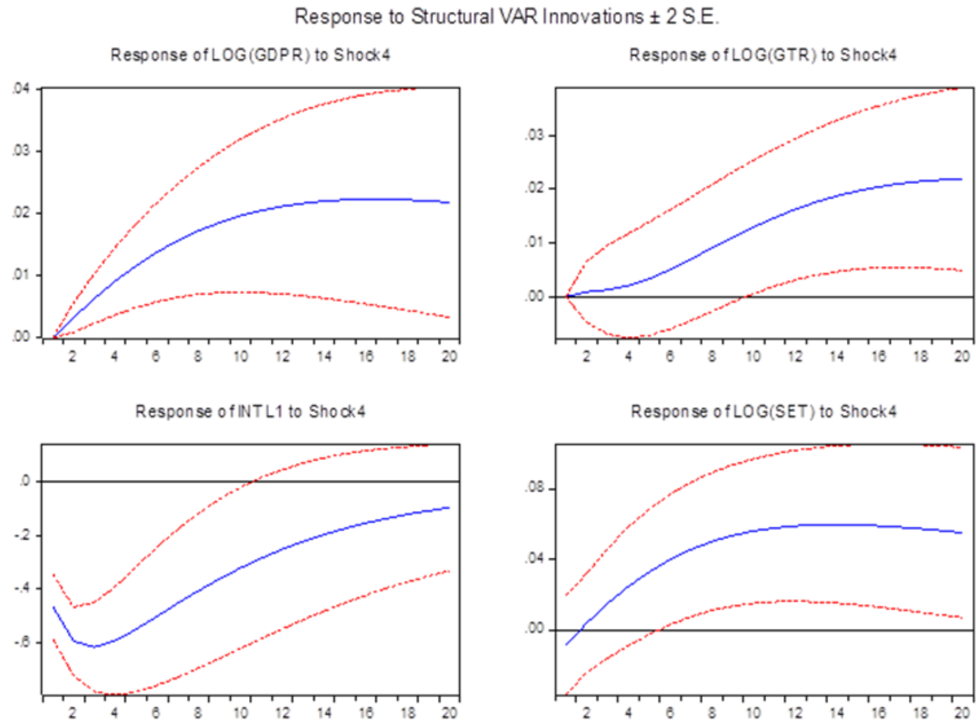

Figure 1. Impulse-response function. Y-axis, percent response to 1 standard deviation monetary policy shock (shock 4, particularly); X-axis, quarters after shock. Blue and red lines – response and 95% confidence interval, respectively.

Figure 1 presents the responses of four variables (GDP, government spending, long-term interest rate, and stock market) to a decrease in interest rate. As can be seen, real GDP significantly responds negatively to monetary policy and the impacts reach the maximum level within two to three years. In addition, the expansionary monetary policy shock (decrease in interest rate) not only stimulates real output but also has a positive impact on the stock market. Unlike the real GDP, the stock market significantly responded to monetary policy after six quarters and most of the impacts were realized within two years. Moreover, the long-term interest rate immediately moved in the same direction as the shock in the monetary policy interest rate. This result provides details on the interest rate channel in the monetary policy transmission mechanism.

Next, we considered the effect of fiscal policy shock on the real and financial sector. As presented in Figure 2, the stock market responded significantly to expansionary fiscal policy shocks in a positive direction; however, the effect lasted only a few quarters. The fiscal policy insignificantly affected output growth. These results show that fiscal policy has only a short-term effect on the stock market. In sum, monetary policy and fiscal policy provide a significant impact on the stock market.

The Reduced-Form VAR With Generalized Impulse Response Function

Similar to the previous section, we used the data in level to estimate the reduced-form VAR model with one lag based on minimized SIC criteria. The GIRFs to monetary and fiscal policy shocks are presented in Figures 3 and 4, respectively. The interpretation of the GIRFs is similar to that of the previous section.

Figure 3 presents the responses of the variables to a decrease in interest rate. As can be seen, the results are similar to those for the SVAR model, as the real GDP

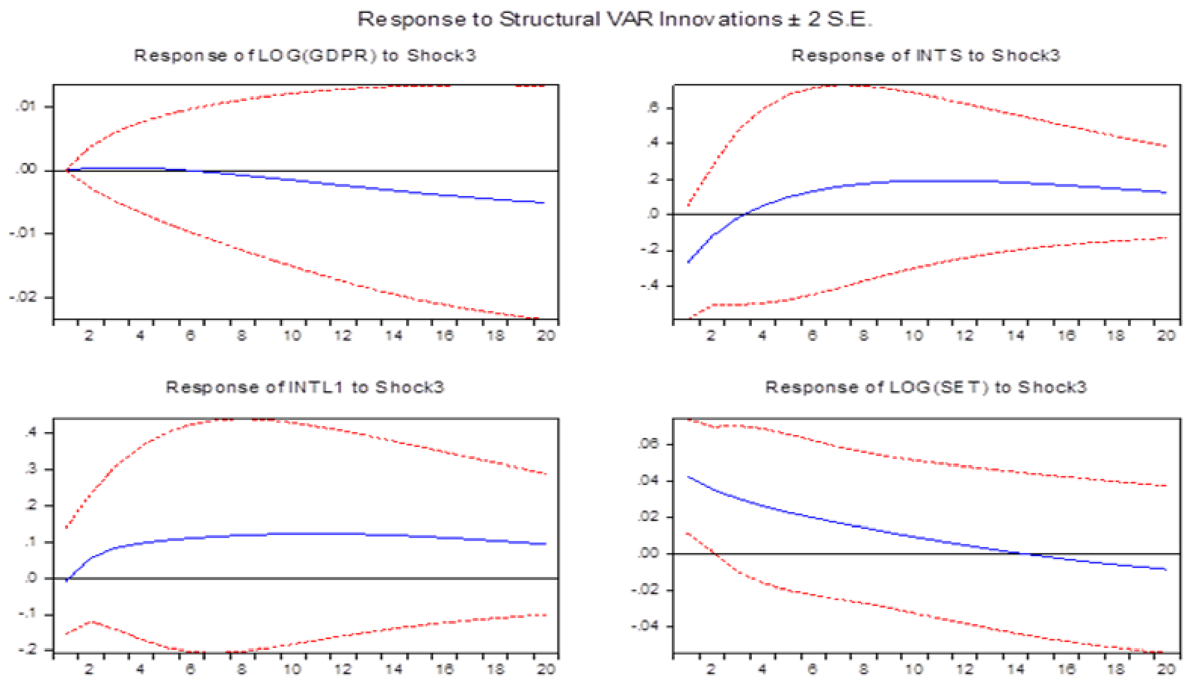

Figure 2. Impulse-response function. Note: Y-axis, percent response to 1 standard deviation fiscal policy shock (shock 3, particularly); X-axis, quarters after shock. Blue and red lines – response and 95% confidence interval, respectively.

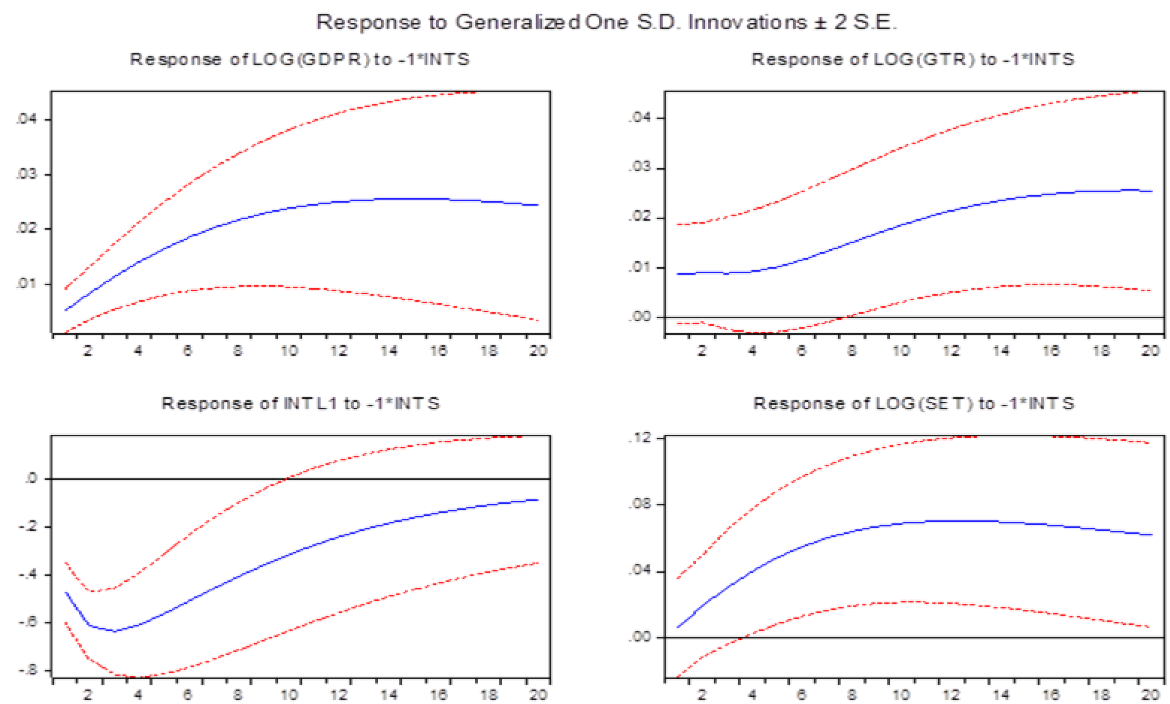

Figure 3. Impulse-response function. Note: Y-axis, percent response to 1 standard deviation monetary policy shock (short-run interest rate shock, particularly); X-axis, quarters after shock. Blue and red lines – response and 95% confidence interval, respectively.

and stock market significantly responded negatively to monetary policy. In the case of fiscal policy, as presented in Figure 4, fiscal policy shocks not only affected the stock market but also had a significant effect on the output growth in the first two quarters. This result shows that fiscal policy has only a short-term effect on real output and the stock market. \

In summary, based on the reduced-form VAR model and the GIRFs, monetary policy and fiscal policy had a significant impact on both real GDP and the stock market. Comparing the results based on the SVAR model, the conclusion is similar—the real sector and financial sector responded positively to expansionary monetary policy. In addition, the financial market responded to the fiscal policy under both the SVAR model and the reduced-form VAR model. This confirms the significant impact of fiscal and monetary policy on the financial sector.

How Do the Sector Indices Respond to Monetary Policy and Fiscal Policy?

Several papers have examined the impact of monetary and fiscal policy on stock markets, notably Afonso and Sousa (2011), Chatziantoniou et al. (2013), Thanh et al. (2017), and Hu et al. (2018). None of these papers has addressed the issues examined here, namely, the effects of monetary and fiscal policy on stock markets at the sectoral level. The closest to our study is that of Guerin and Leon (2017). However, they investigated how changes in sectoral connectedness will affect the response of the stock market to monetary policy. Guerin and Leon (2017) found that highly interconnected stock market is more likely to respond to monetary policy. Additionally, the industry that is more related to an aggregated market tends to react relatively more to monetary policy shocks. Therefore, in our study, we hypothesized that different sectors may

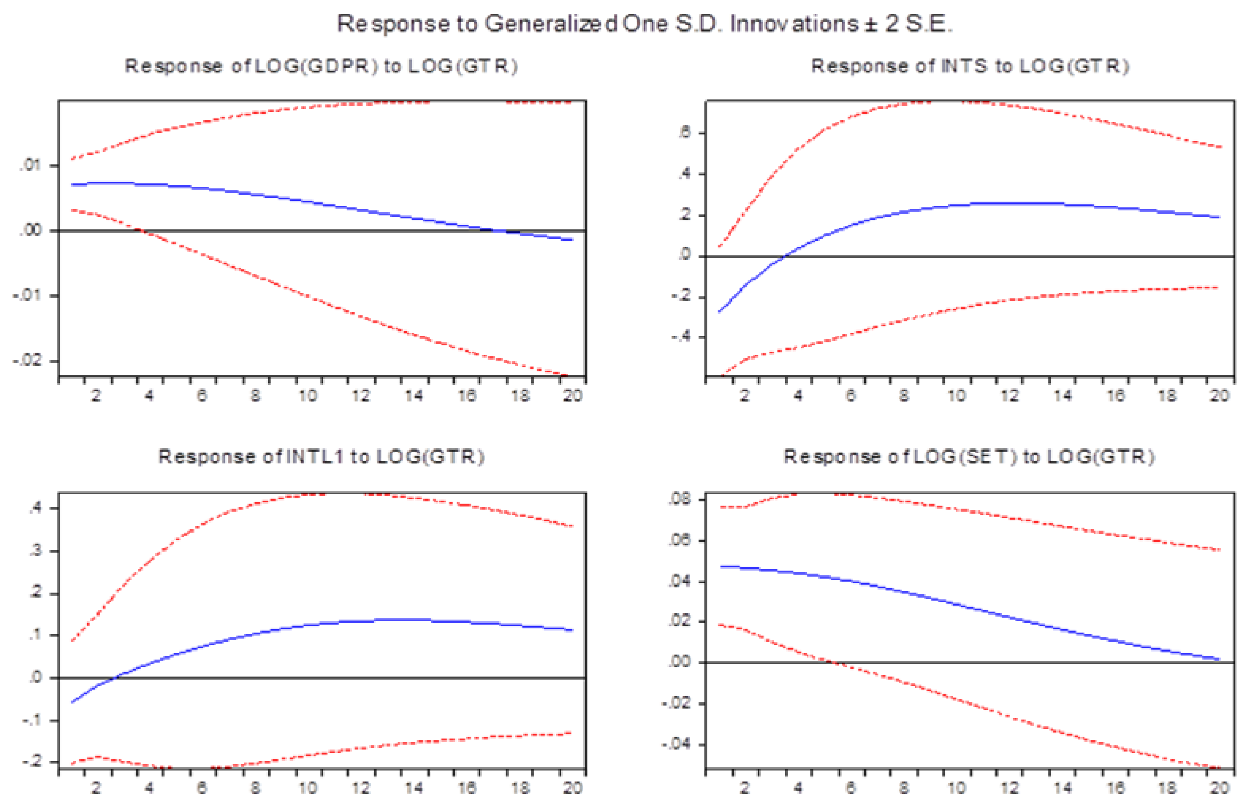

Figure 4. Impulse-response function. Note: Y-axis, percent response to 1 standard deviation fiscal policy shock (spending shock, particularly); X-axis, quarters after shock. Blue and red lines – response and 95% confidence interval, respectively.

respond to monetary and fiscal policy differently. Due to regularly adjusted components of sector indices by the SET, only 18 sectors with completed data during our study period (1996 to 2017) were included in our analysis. The list of the sectors and their abbreviation is shown in Table 3. All of the data were collected from the CEIC database at a quarterly frequency.

The structural VAR model using the 18 sector indices in place of the SET index was first estimated. The impulse responses of stock prices at the sectoral level were calculated for the shocks in monetary policy and fiscal policy. The results are shown in Figures 5 and 6, respectively. Figure 5 shows that all of the sectors reacted negatively to monetary policy, similar to how the overall market did. Unlike the monetary policy, as presented in Figure 6, most sectors, except for the professional service sector, positively responded to fiscal policy.

Next, we summarized the maximum response value for each sector to policy shocks over the first 20 quarters. The response value and response duration for each sector are presented in Table 4. Additionally, Figure 7 shows the sectoral response to both fiscal and monetary policies.

As can be seen in Figure 7, three sectors in the first quadrant, namely PETROCHEM, AGRI, and FINSEC, tended to respond to both monetary and fiscal policy more than the overall market. While two sectors in the third quadrant—ENERGY and FOODS—were less likely to respond to either monetary or fiscal policy than the market average.

Table 3
Abbreviation of Sector Indices

Sector index	Abbreviation	Sector index	Abbreviation
Commerce	COMMERCE	Petrochemicals& Chemicals	PETROCHEM
Banking	BANK	Electronic Components	ELECTRONICS
Finance & Securities	FINSEC	Energy & Utilities	ENERGY
Insurance	INSUR	Property Development	PROP
Construction materials	CONMAT	Mining	MINING
Agribusiness	AGRI	Paper & Printing Materials	PAPER
Personal Products & Pharmaceuticals	PERSONAL	Packaging	PACKAGING
Food and beverage	FOODS	Health Care Services	HEALTH
Automotive	AUTO	Professional Services	PROFSERVICE

Source: Retrieved from https://www.set.or.th/en/products/index/setindex_p2.html

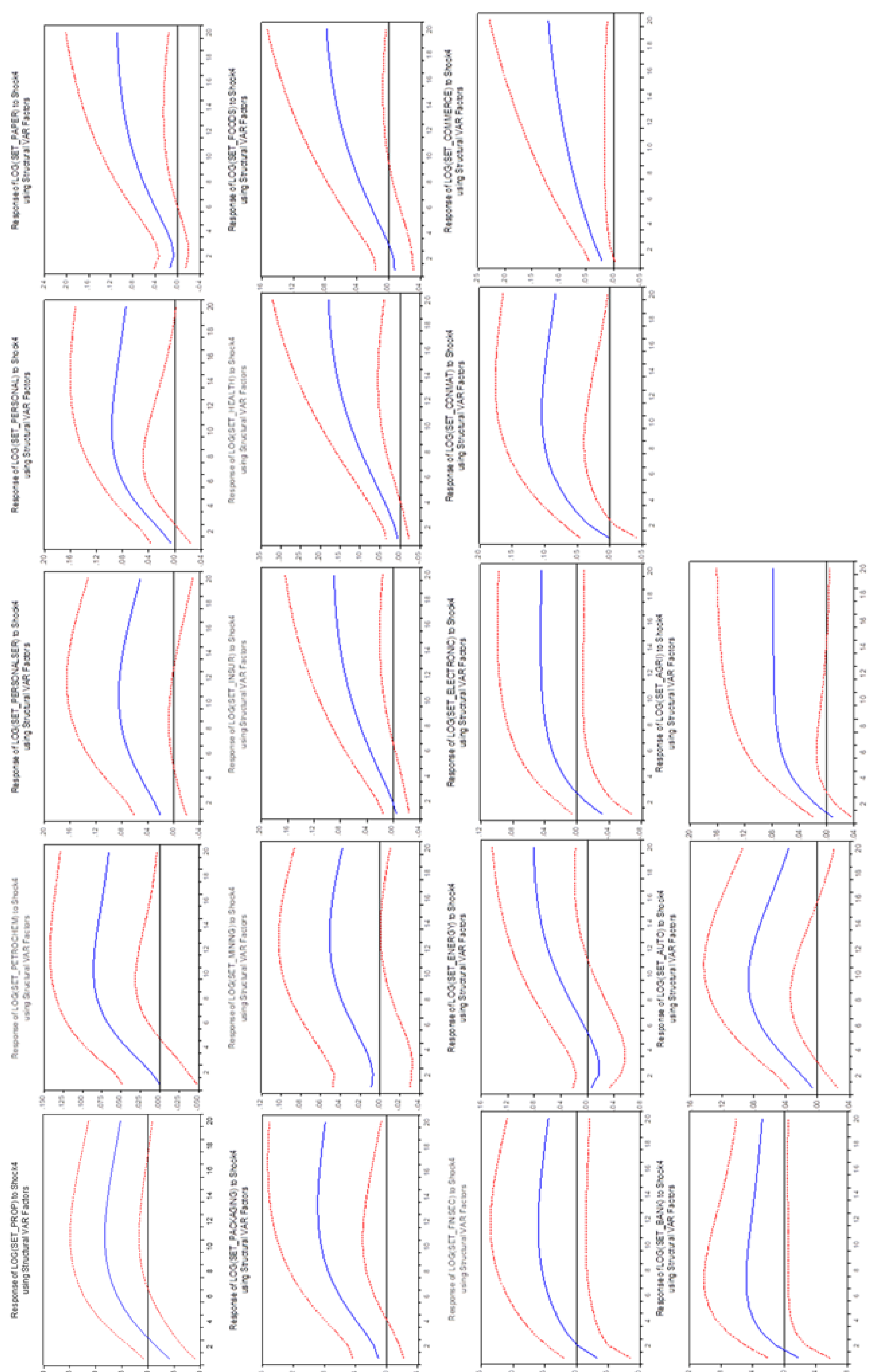

Figure 5. . Impulse-response function by sector. Note: Y-axis, percent response to 1 standard deviation monetary policy shock (shock 4, particularly); X-axis, quarters after shock. Blue and red lines – response and 95% confidence interval, respectively. Sector indices' abbreviations are shown in Table 3.

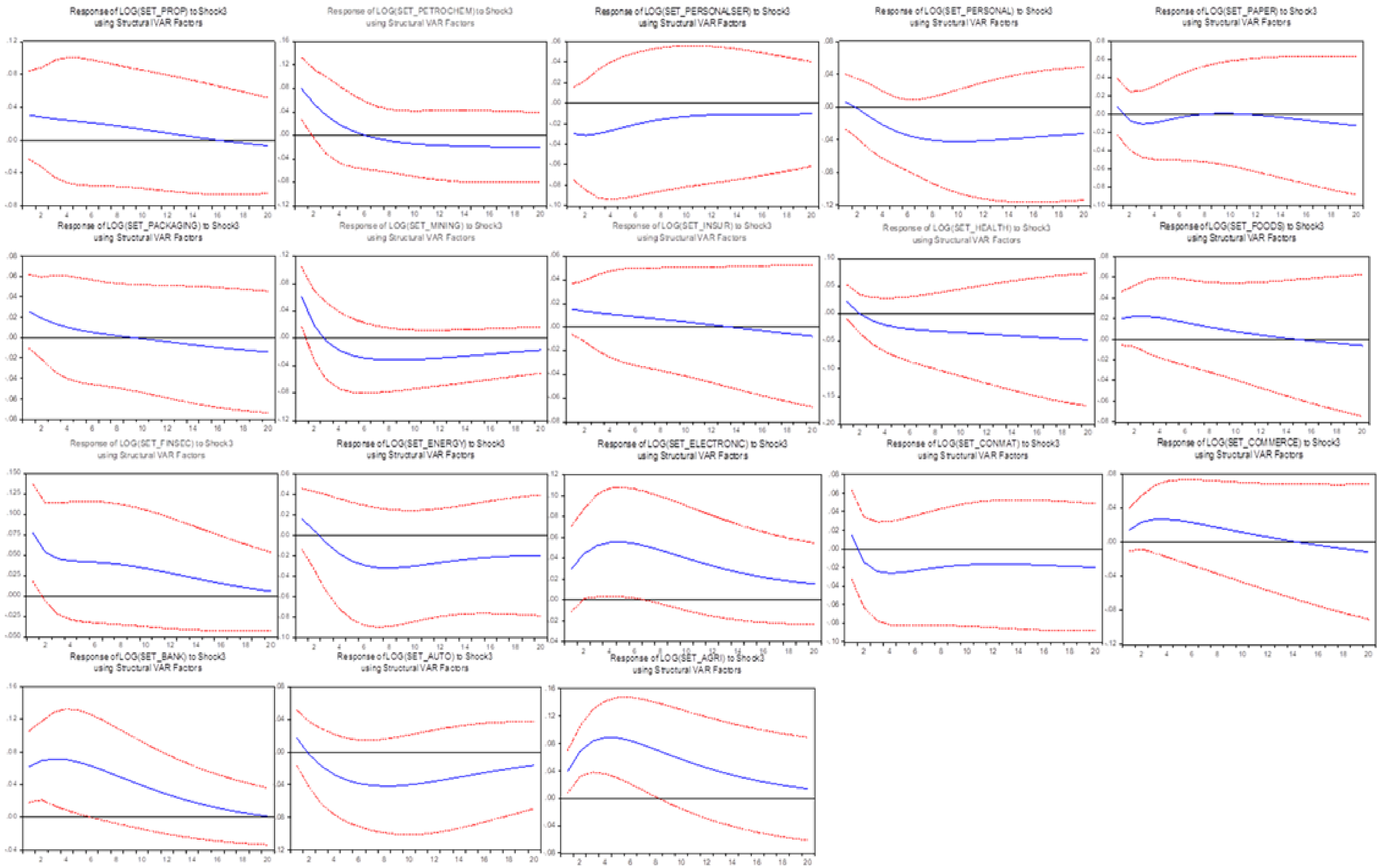

Figure 6. . Impulse-response function by sector. Note: Y-axis, percent response to 1 standard deviation fiscal policy shock (shock 3, particularly); X-axis, quarters after shock. Blue and red lines – response and 95% confidence interval, respectively. Sector indices' abbreviations are shown in Table 3.

Table 4
Sectoral response value and response duration

Sector	Response to monetary policy		Response to fiscal policy	
	Max value	Duration	Max value	Duration
Overall	0.0500	8	0.0426	1
AGRI	0.0735	8	0.0888	4
FOODS	0.0372	8	0.0223	2
BANK	0.0476	8	0.0718	3
COMMERCE	0.0749	8	0.0268	4
CONMAT	0.0998	8	0.0156	1
AUTO	0.0844	8	0.0177	1
ELEC	0.0395	8	0.0553	4
ENERGY	0.0268	8	0.0162	1
FINSEC	0.0550	8	0.0771	1
INSUR	0.0508	8	0.0154	1
MINING	0.0395	8	0.0605	1
PACK	0.0756	8	0.0255	1
PAPER	0.0623	8	0.0082	1
PERSONAL	0.0926	8	0.0063	1
PROFSERVICE	0.0806	8	-0.0298	1
HEALTH	0.0995	8	0.0219	1
PETROCHEM	0.0818	8	0.0795	1
PROP	0.0759	8	0.0304	1

Note: The max value represents the maximum percent response to 1 standard deviation of policy shock while duration refers to the quarter in which the percent response reached the maximum value.

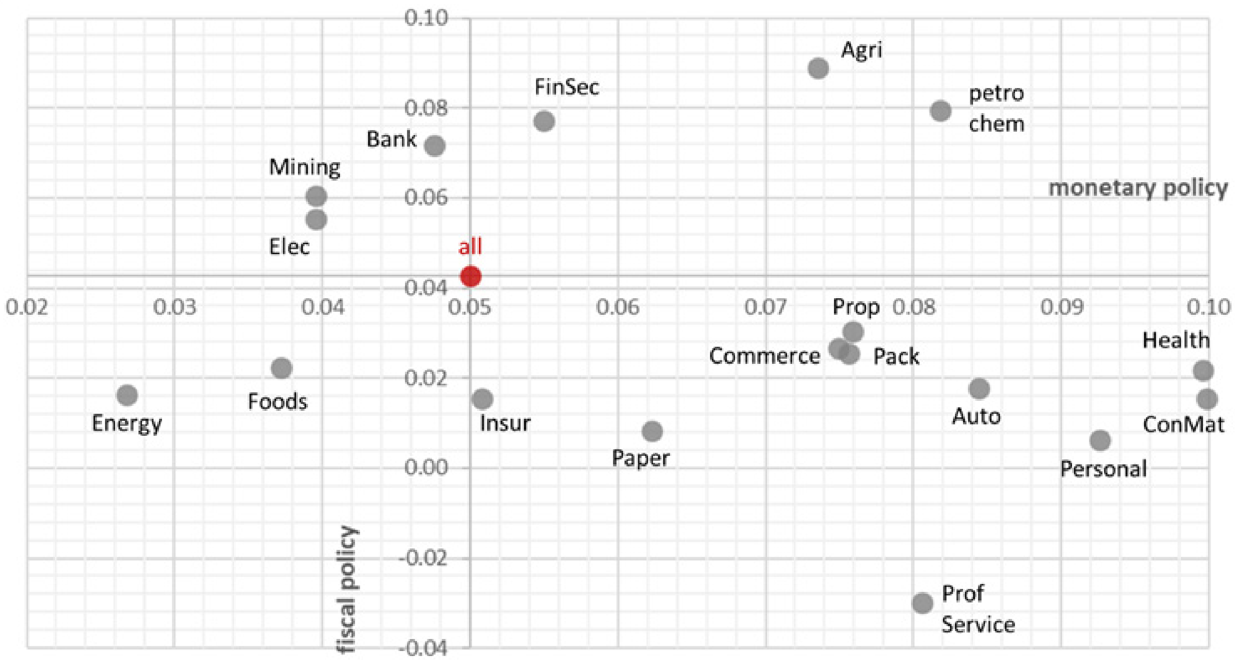

Figure 7. Sector index response to policies shocks. Note: Y-axis, percent response to 1 standard deviation fiscal policy shock (spending shock, particularly); X-axis, percent response to 1 standard deviation monetary policy shock (short-run interest rate shock, particularly).

When the government decided to implement monetary policy by increasing the short-term interest rate, the largest impact was on HEALTH, CONMAT, and PERSONAL. One possible reason was that the price-to-earnings (P/E) ratio of these sectors was higher than the overall market—HEALTH's P/E was 36.02 and PERSONAL's P/E was 19.39—compared to the overall market P/E at 19.33.[1] Specifically, when prices are high, they are more sensitive to interest rate changes. ELECTRONICS, FOODS, ENERGY, and MINING were less affected by monetary policy. These sectors' P/E were lower than the overall market, and the P/E ranged from 7.69 to 20.24.

AGRI and PETROCHEM responded to fiscal policy, changes in government spending in particular, more than the others did. This was not surprising because most Thai government spending programs were related to agricultural products and infrastructure construction and maintenance.

Conclusion

Comparing the empirical evidence on the effects of monetary policy on the real and financial economy, that of fiscal policy has received less attention. With the recent economic downturn, fiscal policy has been implemented more since it was expected to be effective in terms of economic recovery. This is not the first paper to study the effects of monetary and fiscal policies; however, most of the existing literature uses data from developed countries. The biggest contribution of this study is in analyzing the impact of Thai monetary and fiscal policies on the stock market, both at the market aggregate level and at the sectoral level. The findings can provide a reference point for research in this field using developing country data.

This study used quarterly data from 1996 to 2017 to study how the Thai Stock Market responds to monetary and fiscal policy. The structural VAR model with six variables—world import volume (IMW), real GDP (GDPR), real government spending (GTR), short-term interest rate (INTS), long-term government bond yield (INTL), and stock market indices (SET)—was estimated and the following conclusions were drawn. First, based on the causality test, monetary policy was seen to have a bi-directional causal relationship with the real sector but not with the stock market. No significant causal relationship between fiscal policy and either the real sector or the stock market was found. In addition, we found no evidence of the crowding out effect but we did find a causal relationship from fiscal policy to monetary policy.

Second, according to the impulse response analysis, when comparing the results based on the SVAR model and the reduced-form VAR model, the conclusion was similar where the real sector and financial sector responded positively to expansionary monetary policy. The impact of the fiscal policy was faster but lasted a shorter length of time than that of monetary policy. Our results reveal that the financial market responds to fiscal policy under both the SVAR model and the reduced-form VAR model. This implies that investors should consider both monetary and fiscal policy when making investment decisions.

Exploring the response of the stock market to policy shocks at the sectoral level, we found that different sectors appear to react heterogeneously to monetary and fiscal policy. Particularly, the high P/E ratio sectors, such as healthcare and personal service, were seen to be more sensitive to changes in interest rates and vice versa. Moreover, changes in government expenditure had the largest impact on the agribusiness and petrochemical sectors. This is because most monetary policy programs are related to the promotion of agricultural product prices and the investment in infrastructure construction and maintenance. The heterogeneity responses of each sector to economic policy imply that policymakers need to customize their policies to meet the specific needs of the sectors.

Endnote

[1] The P/E ratio was retrieved from http://siamchart.com/stock/SECTOR. October 27, 2018.

References

Afonso, A., & Sousa, R. M. (2011). What are the effects of fiscal policy on asset markets? *Economics Modelling, 28,* 1871–1890.

Ardagna, S. (2009). Financial markets' behavior around episodes of large changes in the fiscal stance. *European Economic Review, 53*, 37–55.

Bjornland, H., & Leitemo, K. (2009). Identifying the interdependence between US monetary policy and the stock market. *Journal of Monetary Economics, 56*, 275–282.

Blanchard, O., & Perotti, R. (2002). An empirical characterization of the dynamic effects of changes in government spending and taxes on output. *Quarterly Journal of Economics, 117*, 1329-1368.

Chatziantoniou, I., Duffy, D., & Filis, G. (2013). Stock market response to monetary and fiscal policy shocks: Multi-country evidence. *Economic Modelling, 30*, 754–769.

Chevapatrakul, T. (2015). Monetary environments and stock returns: International evidence based on the quantile regression technique. *International Review of Financial Analysis, 38,* 83–108.

Conover, C. M., Jensen, G. R., Johnson, R. R., & Mercer, J. M. (1999). Monetary environments and international stock returns. *Journal of Banking and Finance, 23,* 1357–1381.

Darrat, A. (1988). On fiscal policy and the stock market. *Journal of Money Credit and Banking, 20,* 353–363.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance, 25*, 383–417.

Flannery, M. J., & Protopapadakis, A. A. (2002). Macroeconomic factors do influence aggregate stock returns, *Review of Financial Studies, 15*, 751–782.

Foresti, P., & Napolitano, O. (2017). On the stock market reactions to fiscal policies. *International Journal of Finance and Economics, 22,* 296–303.

Goldsmith, R. (1969). *Financial structure and development.* New Haven: Yale University Press.

Guerin, P., & Leon, D. L. (2017). *Monetary policy, stock market and sectoral comovement* (Documentos de Trabajo No. 1731). Madrid: Banco de Espana.

Hsing, Y. (2013). Effects of fiscal policy and monetary policy on the stock market in Poland. *Economies*, *1*, 19–25.

Hu, L., Han, J., & Zhang, Q. (2018). The impact of monetary and fiscal policy shocks on stock markets: Evidence from China. *Emerging Markets Finance and Trade, 54,* 1856–1871.

Jensen, G. R., & Johnson, R. R. (1995). Discount rate changes and security return in the U.S., 1962–1991. *Journal of Banking and Finance, 19,* 79–95.

Kim, S.-J., & Nguyen, T. (2009). The spillover effects of target interest rate news from the U.S. Fed and the European Central Bank on the Asia-Pacific stock markets. *Journal of International Financial Markets, Institutions and Money, 19,* 415–431.

Levine, R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature, 35*, 688–726.

Laopodis, N. T., & Sawhney, B. L. (2002). Dynamic interactions between Main Street and Wall Street. *Quarterly Review of Economics and Finance, 42,* 803–815.

Luintel, B. K., & Khan, M. (1999). A quantitative re-assessment of the finance-growth nexus: Evidence from a multivariate VAR. *Journal of Development Economics, 60,* 381–405.

MacKinnon, J. G. (1990). *Critical values for cointegration tests* (Queen's Economics Department Working Paper No. 1227) Ontario: Queen's University.

McKinnon, R. I. (1973). Money and capital in economic development. Washington, D.C.: Brookings Institution.

Melitz, J. (1997). *Some cross-country evidence about debt, deficits and the behavior of monetary and fiscal authorities* (CEPR Discussion Paper No. 1653). London: CEPR.

Mishkin, F. S. (1996). *The channels of monetary transmission: Lessons for monetary policy* (NBER Working Paper No. 5464). Massachusetts: National Bureau of Economic Research.

Muscatelli, V. A., Tirelli, P., & Trecroci, C. (2004). Fiscal and monetary policy interactions: Empirical evidence and optimal policy using a structural New-Keynesian model. *Journal of Macroeconomics, 26,* 257–280.

Pesaran, M. H., & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. *Economics Letters*, *58*, 17–29.

Ramey, V. A., & Shapiro, M. D. (1998). Costly capital reallocation and the effects of government spending. *Carnegie-Rochester Conference Series on Public Policy, 48*, 145–194.

Rigobon, R., & Sack, B. (2003). Measuring the reaction of monetary policy to the stock market. *Quarterly Journal of Economics, 118,* 639–669.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: Journal of the Econometric Society*, *48,* 1–48.

Thanh, T. T., Thuy, L. P., Anh, T. N., Thi, T. D., & Truong, T. H. (2017). Empirical test on impact of monetary policy and fiscal policy on Vietnam stock market. *International Journal of Financial Research, 8,* 135–144.

Thorbecke, W. (1997). On stock market returns and monetary policy. *Journal of Finance, 52*, 635–654.

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money Credit and Banking, 1,* 15–29.

Vithessonthi, C., & Techarongrojwong, Y. (2013). Do monetary policy announcements affect stock prices in emerging market countries? The case of Thailand. *Journal of Multinational Financial Management, 23,* 446–469.

Wongswan, J. (2009). The response of global equity indexes to U.S. monetary policy announcements. *Journal of International Money and Finance, 28,* 344–365.