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Monetary and Fiscal Policy Shocks on the Stock Market Performance in the United States: Evidence from the SVAR Framework

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Abstract

Evidence from studies of monetary and fiscal policy shocks on the stock market is still arguable not only for researchers but also for central banks and governments. In addition, the interaction between the two policies is very crucial; however, very few studies are available on this topic. In this regard, we examined the impact of monetary and fiscal policies shock on the stock market in the United States by utilising the annual data of the U.S. economy from the Federal Reserve, World Bank, and International Monetary Fund from 1980 until 2018. More specifically, we used the Structural Vector Autoregression (SVAR) framework to examine the dynamic relationship between fiscal and monetary policies and the stock market performance. Our results confirm that the interaction between both policies is crucial in understanding the stock market movements and both policies have a direct impact on the U.S. stock market. In the interpretation of stock market performance, the incorporation of the fiscal policy parameter does not add any significant values, suggesting that there is no significant difference when fiscal policy is removed from the model.

Disciplinary: Financial Economics.

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1 Introduction

The argument that macroeconomic variables influence the stock market has long been theoretically confirmed (Afonso & Sousa, 2012; Gan et al., 2006). This indicates a significant concern among scholars, stockholders, and policymakers. Scholars have devoted increasing efforts in this area to evaluate this relationship, since Fama's attempts in 1981. However, the association of monetary policy and fiscal policy with the stock market, as one of the essential parts of financial

economics research, still brings noticeable attention not only for policymakers in central banks and governments but also for shareholders around the world .

For instance, Laopodis (2009) estimated the complex relationship between monetary policy and stock markets proxy by the S&P500 index for the period 1970-2004 and concluded that interest rate decisions reflect market conditions which mean monetary policy is essential to the equity market. In the case of thirteen OECD countries, the relationship between monetary policy and stock returns was investigated by Ioannidis and Kontonikas (2006) over the period 1972-2002. They reported that any movement in monetary policy has a significant impact on stock returns; and thus, it supports the monetary policy transmission theory through the stock market .

A study by Bjornland (2009) indicated significant autocorrelation between real stock prices and the setting of interest rates. Bjornland concluded that negative and an immediate effect on stock prices is a monetary policy shock, which initially raises the rate of interest and compensates for fluctuations in the stock prices. Thus, because of the stock market and economic interaction, the Federal Reserve should make sure that the stock market is performing well because poor performance will significantly damage the economy. One of the reasons is that stock price changes affect real activities such as consumption and investment .

According to Chatziantoniou et al. (2013), if the Federal Reserve implements expansionary policy while the government participates in contractionary policy, the consequences may vary considerably from the desired one, and it might make the economic situation more complex and unsolved .

On the other hand, one of the functions of fiscal policy is referring to government activities to control the path of the economy by adjustments in taxation. It is a neutral economic strategy since government spending is equivalent to tax revenue. Reducing tax revenue is an expansionary fiscal policy and expanding is a contractionary fiscal policy that ends in a deficit in the budget and budget surplus, respectively, to ensure price stability (Wang, 2010) .

Thus, identifying how the development of the stock market impacts tax revenues and vice versa is an important key to performing fiscal policies. Shareholders can take advantage of the results which might help them to learn economic situations as well as enhance their investment choices .

While most of the literature ignores the importance of interaction between the two policies on stock market performance still there are few studies that jointly focus on both policies such as Chatziantoniou et al. (2013) and Lawal et al .(2018) .

It is important to understand how tax revenue can affect the stock market in the U.S. while considering the interaction between the two policies. For example, Gurdal et al. (2020) found that an important financial mechanism with the ability to fulfil the economic goals to be accomplished is the taxation policies to be adopted on the economic framework of the G7 nations .

The tax policy is a significant strategy that could impact on investment whether positively or negatively. However, the weak and complicated tax system can increase uncertainty as shareholder are discouraged to invest .

On the other hand, as income is impacted by an exogenous foreign exchange shock simultaneously, we take the real effective exchange rate into account as an exogenous variable into the model in order to capture the real effect on the U.S. stock market performance.

2 Literature Review

Chatziantoniou et al. (2013) explain that the interest rate channel brings an explanation for why the expected association between interest rates and stocks prices is negative. According to them, fluctuations in interest rates can affect the costs of company funds (known as the cost of capital) that ultimately impact the present value of future net cash flows of companies. Finally, interest rates increase, resulting in a reduction in present values of future net cash flows that, in turn, decreases stock market prices .

On the other hand, the monetary transmission mechanism has an indirect channel; that is, the credit channel which is related to interest rate adjustments. This channel indicates that by changing interest rates, the Federal Reserve could also affect the amount of investment that takes place in the United States, so the amount of corporate investment can impact firm market value .

This assertion is based on the present value of its future cash flows that affect firm market value. Thus, higher corporate investment in this scenario will contribute to increased future cash flows and thereby raise the stock value of the company .

In the case of the exchange rate channel, Lawal et al. (2018) remark that the influence of interest rate on the exchange rate system determines the effect of monetary policy on the stock market. In fact, rising interest rates generate domestic exchange rate appreciation which lowers net export and consequently decreases gross domestic product and stock prices .

Mishkin (2001) classifies different sorts of transmission mechanisms through which expansionary monetary policy influences the stock market :

1. Stock market effects on investment: Expansionary monetary policy that mostly raises stock prices, reduces capital costs, and therefore, causes investment and output to rise ;
2. Firm balance-sheet effects or "credit view": Expansionary monetary policy increasing stock prices by the effect balance-sheet channel, raising the net worth of firms, and reducing moral hazard and adverse selection problems which lead to higher lending, and therefore, investment, and aggregate spending rises
3. Household wealth effects: Although this effect plays an important role in America, there is still an argument about the size of this effect. It explains that higher stock prices, because of expansionary policy, raise household wealth value and lead to higher consumption .

Theoretically, the relationship between the stock market and fiscal policy can be positive, negative, or unrelated. for example, the Keynesian Positive Effect Hypothesis posits that the influence of the fiscal policy on the stock market is positive because fiscal policymakers mostly use

budget deficits as well as taxes to change interest rates and thus boost the performance of the stock market. Additionally, the Classical Crowding out Effect Hypothesis centres on the negative effects of tax revenue and government expenditure, known as a fiscal tool. It explains that fiscal tools can crowd out market-based loanable funds resulting in a considerable rise in the interest rate and damaging the free economy which, in turn, causes a reduction in investment and stock price thereby negatively affecting stock market prices. Finally, the Ricardian Neutrality Hypothesis explains a moderate view of fiscal policy function in which fiscal policy alone cannot impact the stock market without monetary policy instrument.

Empirical research findings are available in this area. For instance, Gan and Lee (2006) studied the relationship between the New Zealand Stock index and some macroeconomic variables from 1990 to 2003. They used the causality test to assess if the index was an important indicator for macroeconomic factors. The answer to this question was negative, which Gan and Lee (2006) attributed to the fact that the index was comparatively low as opposed to other foreign stock markets. However, they found that the inflation rate and money supply had opposite correlations in stock prices.

AL-Naif (2017) investigated the relationship between the interest rate and the Arab Monetary Fund index using monthly data from 2014 to 2016 in five Arab nations. This researcher reported significantly negative correlations in Egypt and significantly positive correlations in Jordan and Oman.

In a similar study, Wongbampo and Sharma (2002) studied the relationship between interest rates and stock prices in several Asian countries and found an indirect relationship for the Philippines, Thailand, and Singapore while a negative relationship in Malaysia and Indonesia.

As the reviews of the current theory and empirical research on the efficacy of activist fiscal policy show, a more optimistic perspective of fiscal intervention seems to have emerged recently and estimated decision rules indicate that policy activism has risen. As an example, Puonti (2016) investigated the impact of fiscal policy shocks on GDP in the U.S. and concluded that a deficit financing shock which government spends a greater proportion of money than revenue gained has a small negative impact on output, while tax rises in the government expenditure budget have a positive influence on GDP.

For the case of fiscal policy and the stock market, Afonso and Sousa (2011) observe that fiscal policy shocks have a small effect on the stock in the U.S. and Germany. However, both spending and revenue shocks tend to have a major impact on Britain's financial markets. They provide an explanation that the shocks in government revenues have an early negative impact on gross domestic product, but they eventually become positive that can lead to a small and positive effect on stock prices.

Emamian and Mazlan (2021) shows that the U.S. stock market heavily depends on the Tax Revenue in the short run and any changes in TR can impact the U.S. stock market considerably.

Duy-Tung (2018) examined the bidirectional relationship between fiscal policy and stock market behaviour of twelve developing economies in Asia using panel data from 1990 to 2015. Their findings indicate that in these countries fiscal policies seem to be pro-cyclical in response to changes in the stock markets.

Using a survey of 137 countries in the period of 2011-2017, Gamze Oz-Yalaman (2019) reported a strong and positive connection between tax revenue movement and financial inclusion movement (such as loan and equity) and a positive correlation between inflation and tax revenue.

However, past studies indicate that the impact of macroeconomic policies on the stock market has been ignored when the two policies interact. Thus, in this study, we focus on the response of stock market in the U.S. when the two policies interact, and we divide the model into two parts which are fiscal-inclusive and fiscal-exclusive.

3 Methodology

3.1 Data

Annual data from 1980 until 2018 from the U.S. is used in this study. The variables under consideration are the Real Effective Exchange Rate (REXCH), Gross Domestic Product in real terms (RGDP), Consumer Price Index (CPI), public revenue as a proxy for fiscal policy stance (TR), money supply (M2), real interest rate (RINT), and the total share index (ASI).

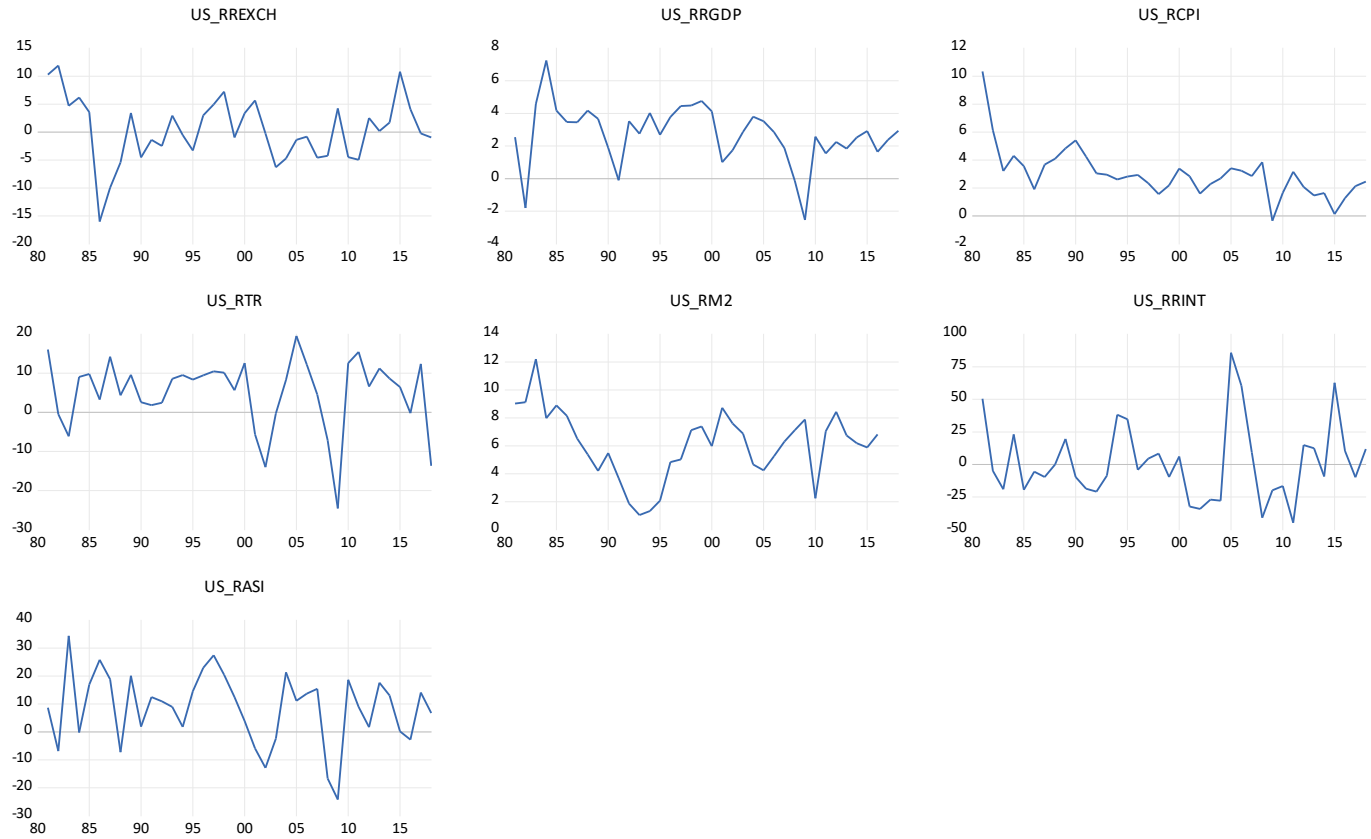

Figure 1: The line charts of the series which is Growth rates of variables for the US.

The exogenous shock, which is approximated by the REXCH, due to the globalization impact and economic growth, the exchange rate can influence many firms through foreign direct

investment, import-export, etc. In order to estimate the strength of the U.S. dollar against a basket of other currencies, this study selected the Real Effective Exchange Rate (2010 = 100). It is a measure of a currency's value against a weighted mean of other foreign currencies especially the euro area divided by cost index or price deflator. A decrease in REER means that exports are becoming cheaper while imports are becoming more expensive. On the other hand, an increase in REER leads to a loss in trade competitiveness (IMF, 2020). All variables are expressed in growth rates.

3.2 Data Analysis

Structural Vector Autoregression (SVAR) framework is used to estimate the dynamic relationship between macroeconomic policies and the stock market development. Based on Chatziantoniou et al. (2013), RGDP and CPI will be incorporated into the model to estimate the monetary and fiscal policy impulse mechanisms as a full dynamic. Furthermore, REXCH is used as an exogenous indicator, measuring the relations between the U.S. and the global market, and events of relative price.

The SVAR model of order p is commonly expressed as below:

$$A_0 y_t = c_0 + \sum_{i=1}^{p} A_i y_{t-i} + \varepsilon_t \quad (1)$$

where A_0 is the 7×7 contemporaneous matrix and y_t = [$REXCH_t$, $RGDP_t$, CPI_t, TR_t, $M2_t$, $RINT_t$, ASI_t] , A_i is 7×7 autoregressive coefficient matrices, ε_t is a 7×1 vector of structural disturbances, which is considered to obtain zero covariance that can be formed as $E[\varepsilon_t \varepsilon_t']$ =**D** ≡ $[\sigma_1^2\ \sigma_2^2\ \sigma_3^2\ \sigma_4^2\ \sigma_5^2\ \sigma_6^2\ \sigma_7^2]$ x **I**. In this study, in order to have a better version of the structural model in (1), both parts of the equation were multiplied by A_0^{-1}, and the new equation is as follow:

$$y_t = a_0 + \sum_{i=1}^{p} B_i y_{t-i} + \varepsilon_t \quad (2)$$

Thus, $a_0 = A_0^{-1c_0}$, $b_0 = A_0^{-1}A_i$ and $\varepsilon_t = A_0^{-1\varepsilon_t}$, $\mathbf{e}_t$ are linear combinations of the structural errors ε_t, with a covariance matrix of the form $E[e_{te_t'}] = A_0^{-1DA_0^{-1}}$

By placing adequate and appropriate restrictions on A_0, we can obtain the structural disturbances and the short-run restrictions represented as

$$\begin{bmatrix} \varepsilon_{1,t}^{fes} \\ \varepsilon_{2,t}^{is} \\ \varepsilon_{3,t}^{ps} \\ \varepsilon_{4,t}^{rs} \\ \varepsilon_{5,t}^{mss} \\ \varepsilon_{6,t}^{irt} \\ \varepsilon_{7,t}^{ss} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 & 0 & 0 \\ 0 & a_{42} & a_{43} & a_{44} & 0 & 0 & 0 \\ 0 & a_{52} & a_{53} & a_{54} & a_{55} & 0 & 0 \\ a_{61} & 0 & 0 & a_{64} & a_{65} & a_{66} & a_{67} \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & a_{77} \end{bmatrix} \text{x} \begin{bmatrix} \varepsilon_{1,t}^{rexch} \\ \varepsilon_{2,t}^{gdp} \\ \varepsilon_{3,t}^{cpi} \\ \varepsilon_{4,t}^{tr} \\ \varepsilon_{5,t}^{m2} \\ \varepsilon_{6,t}^{rint} \\ \varepsilon_{7,t}^{asi} \end{bmatrix} \quad (3),$$

where, fes = foreign exchange shocks, is = income shock, ps = price shock, rs = public revenue shock, mss = money supply shock, irt = interest rate shock, and ss = stock market shock.

Regarding the interaction between fiscal and monetary policies in their relationship with the stock market performance in this study, the restrictions are described as below:

1-Income is only contemporaneously affected by an exogenous foreign exchange shock (REEX).

2-Inflation responds contemporaneously only to an income shock and a foreign exchange shock (mostly when the cost of imported products rises considerably).

3-The response of macroeconomic policy tools is contemporaneous to income and price shocks; however, monetary policy is additionally influenced contemporaneously by the tax revenue shock because of the monetary-fiscal policies interaction in response to income and price shocks. (In this case, we make the assumption that public expenditures by the U.S. Government are proportionate with their tax revenue.)

4-Interest rates are affected contemporaneously by the foreign exchange shock, the shocks in tax revenue shock (i.e., we allow for contemporaneous crowding out effects), money supply and stock market.

5- stock market is affected contemporaneously by all variables.

4 Result and Discussion

Before testing the model (1), the stationary existence of the variables was identified. We used Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests to check for stationarity of variables. As shown in Table 1, PP and ADF test results indicate that all the variables are stationary in I .(0)

In this study, A VAR model of order two was recognized by Akaike Information Criterion (AIC) .

As the serial autocorrelation Lagrange Multiplier (LM) test and White heteroscedasticity test showed, no autocorrelation or heteroscedasticity was observed in this model. Tables 2-5 demonstrate the lag length criterion and diagnostic test results in this study.

Table 1: Unit root test results

	ADF	p-values	PP	p-values
REXCH	-4.0060	0.0037	-3.8787	0.0051
RGDP	-4.1261	0.0026	-4.0567	0.0032
CPI	-5.7080	0.0000	-5.6542	0.0000
TR	-4.7158	0.0005	-4.5552	0.0008
M2	-2.7087	0.0827	-2.6291	0.0969
RINT	-4.9094	0.0003	-4.8972	0.0003
ASI	-5.3510	0.0001	-5.3371	0.0001

Table 2: Optimal lag length – AIC

Lags	
0	41.05553
1	39.33865
2	38.83297*

Table 3: VAR residual serial correlation LM test results

Lags	LM – stat	p-values
1	53.71308	0.2986
2	40.71945	0.794
3	48.46879	0.4946
4	61.24214	0.1126
5	89.04105	0.0004
6	35.58458	0.9243

Table 4: White heteroscedasticity test results

Chi-square	796.2975
df	784
p-values	0.3723

Table 5: SVAR results — contemporaneous coefficients

Coefficients	
a_{11}	4.27***
a_{21}	-0.11**
a_{22}	1.31***
a_{31}	0.04
a_{32}	-0.18
a_{33}	0.92***
a_{42}	-2.32***
a_{43}	-1.51
a_{44}	5.73***
a_{52}	-0.05
a_{53}	-0.11
a_{54}	0.08**
a_{55}	1.37***
a_{61}	-0.62
a_{64}	2.40
a_{65}	5.80
a_{66}	39.50 ***
a_{67}	-2.71
a_{71}	-0.27
a_{72}	-1.14
a_{73}	7.47***
a_{74}	-1.94***
a_{75}	-0.76
a_{76}	0.26***
a_{77}	5.04***

***Significant at 1% level, ** Significant at 5% level, * Significant at 10% level

4.1 Contemporaneous relationships

The U.S. stock market is positively predicted by price and interest rate, while negatively affected by public revenue contemporaneously. Meanwhile, there is no evidence of any contemporaneous interaction between fiscal and monetary policy .

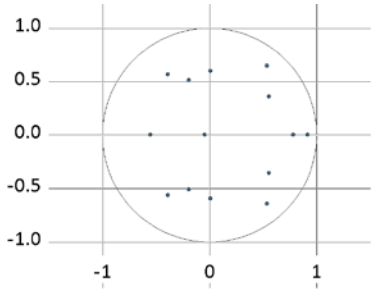

Figure 2: Inverse Roots of AR Characteristics Polynomial

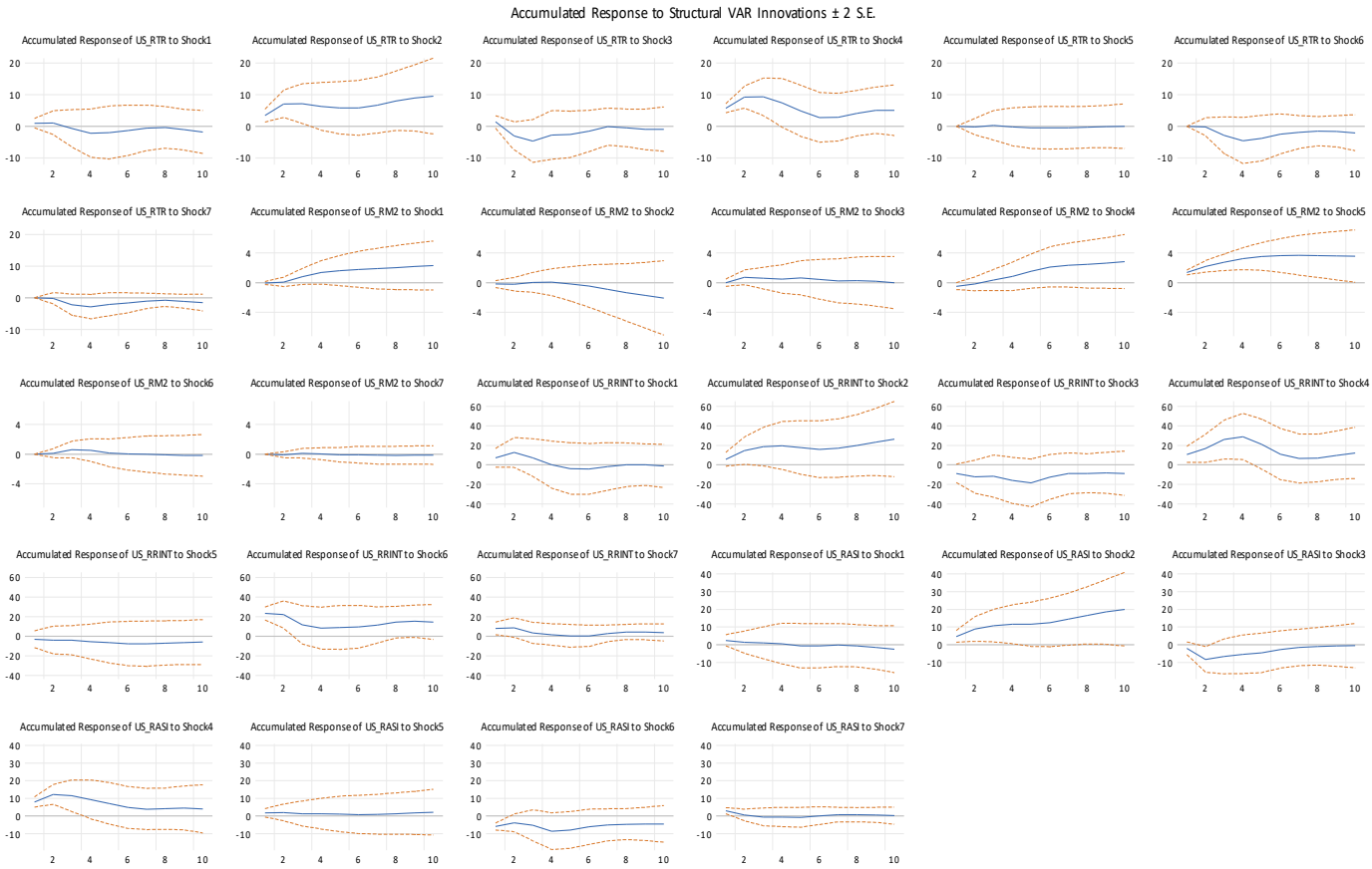

Figure 3: Accumulated impulse responses — fiscal-inclusive model

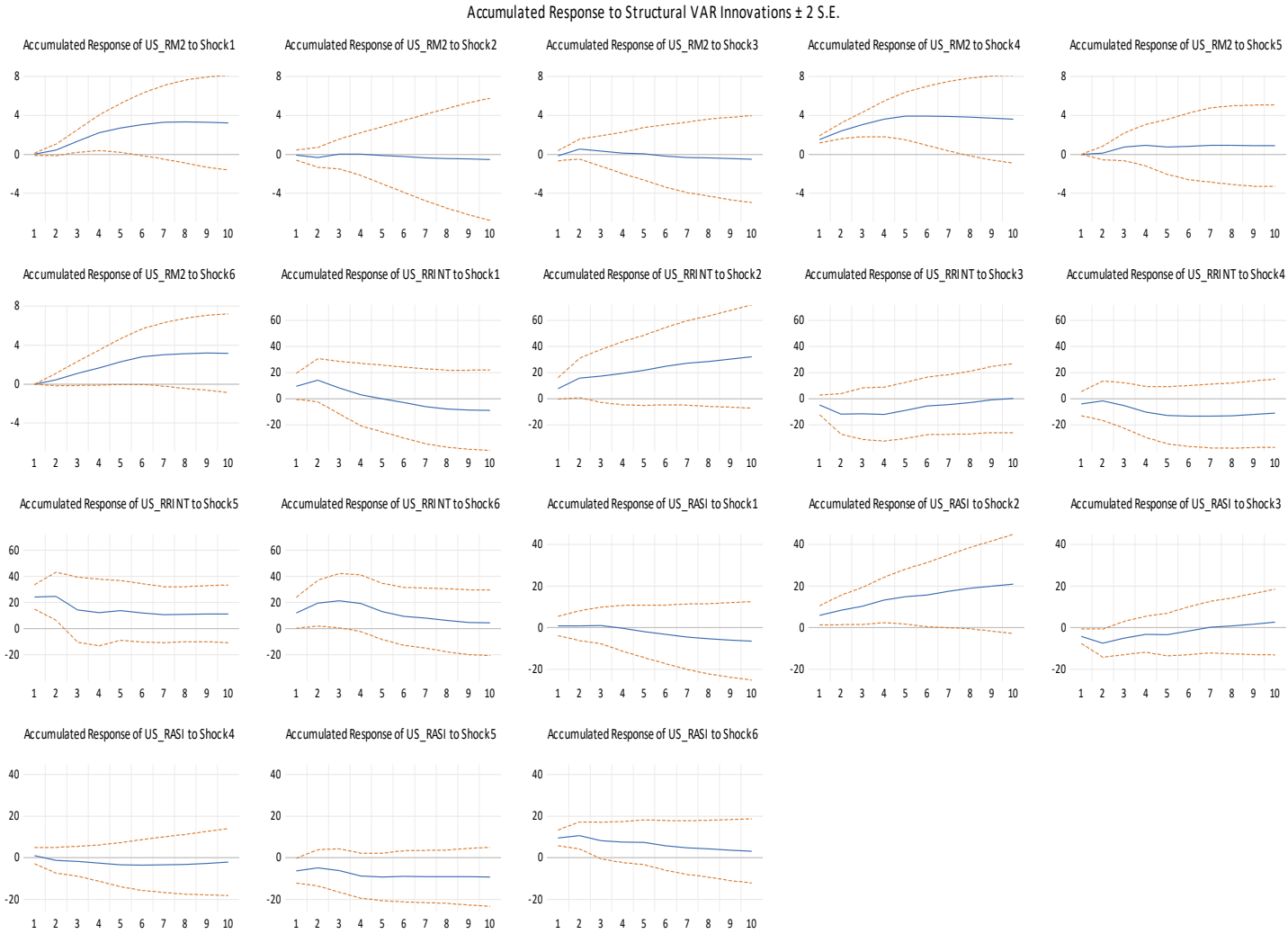

Figure 4: Accumulated impulse responses — fiscal-exclusive model

4.2 Accumulated Impulse Responses

It can be concluded from Figure 3 that both fiscal and monetary policies influence the U.S. stock market noticeably. A positive public revenue shock results in an increase in the stock market. This result is in line with Ilievski's (2015). In testing models of tax-to-GDP, Ilievski (2015) found a positive effect of stock on tax using panel data from 96 countries including the United States as a group of high-level income and the result is consistent with this study.

As we can see from the impulse response function, GDP, inflation and interest rate can impact on U.S. stock market. For example, the U.S. stock market responds to income shock positively and a direct relationship exists between them whereas the U.S. stock market reacts negatively to price shock. Furthermore, a reduction of stock market due to an increase in interest rate is observed on the monetary policy side.

4.3 Significance of fiscal policy as a predictor

The SVAR model was estimated as in (1) and (2) with the exclusion of the fiscal policy variable (fiscal-exclusive model) in order to confirm that the integration of the fiscal policy in (1) and (2) adds considerable value to the interpretation of stock market innovations. Therefore, the short-run restrictions are as below :

$$\begin{bmatrix} \varepsilon_{1,t}^{fes} \\ \varepsilon_{2,t}^{is} \\ \varepsilon_{3,t}^{ps} \\ \varepsilon_{4,t}^{mss} \\ \varepsilon_{5,t}^{irt} \\ \varepsilon_{6,t}^{ss} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 & 0 \\ 0 & a_{42} & a_{43} & a_{44} & 0 & 0 \\ a_{51} & 0 & 0 & a_{54} & a_{55} & a_{56} \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} \end{bmatrix} \text{x} \begin{bmatrix} e_{1,t}^{rexch} \\ e_{2,t}^{gdp} \\ e_{3,t}^{cpi} \\ e_{4,t}^{m2} \\ e_{5,t}^{rint} \\ e_{6,t}^{asi} \end{bmatrix} \quad (4).$$

Several important observations could be made in terms of interactions between variables such as RINT and ASI as well as attempting to compare them with our initial model's results that included the fiscal policy tool .

The results for fiscal-exclusive model show that interest rates affect U.S. stock market developments negatively and the result is significant. Moreover, in line with fiscal-inclusive model, shocks in stock market impact interest rates positively (see Figure 2) .

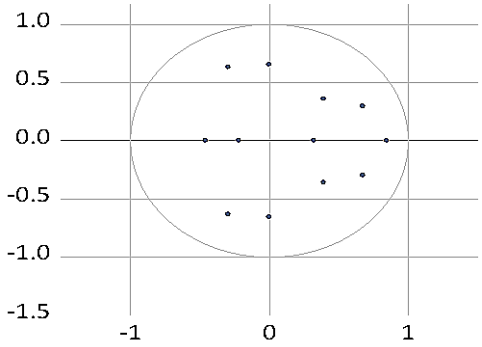

Figure 5: Fiscal exclusive Dispersion

5 Conclusion

We used SVAR to analyse data sourced from 1980 to 2018 in the U.S., and observed that both policies respond to the price level in a countercyclical manner but react positively to a GDP shock. The usual countercyclical reaction to the price shock of the two policies illustrates that both policies are used in a complementary manner .

The results show that interest rate responds slightly to shocks through money supply, and as predicted, the interest rate's response to fiscal policy is in the same direction which means that interest rate responds to fiscal shock positively, and it is inconsistent with the crowding-out hypothesis. This could be because of the variables chosen in this study since we preferred using tax revenue instead of public borrowing. This result could be described as an additional indirect channel in which fiscal policy influences the stock market .

This study offers evidence that not only both policies have a significant effect on the effectiveness of stock market directly but also the interaction between the two policies is essential in understanding the U.S. stock market performance. Moreover, both models (fiscal-exclusive and fiscal-inclusive models) show that either interest rates or the stock market responds negatively to a price shock. This paper concludes that the incorporation of the fiscal policy component has not added significant value to the interpretation of stock market performance, given that there are no considerable changes when the fiscal variables are removed from the model .

6 Availability of Data and Material

Data can be made available by contacting the corresponding authors.

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8 Compliance with Ethical Standard

Disclosure of potential conflicts of interest/funding: we (Aref Emamian, Nur Syazwani Mazlan) declare that we have no conflict of interest and no funding from anywhere, we have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript. We declare that we have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper or the following financial interests/personal relationships which may be considered as potential competing interests

Ethical Statements: Hereby, I consciously assure that for the manuscript "Monetary and Fiscal Policy Shocks on the Stock Market Performance in the United States: Evidence from the SVAR Framework" the following is fulfilled:

1) This material is the authors' own original work, which has not been previously published elsewhere.

2)The paper is not currently being considered for publication elsewhere.

3)The paper reflects the authors' own research and analysis in a truthful and complete manner.

4) The paper properly credits the meaningful contributions of co-authors and co-researchers.

5)The results are appropriately placed in the context of prior and existing research.

6)All sources used are properly disclosed (correct citation). Literally copying of text must be indicated as such by using quotation marks and giving proper reference.

7) All authors have been personally and actively involved in substantial work leading to the paper and will take public responsibility for its content.

Authors agree with the above statements and declare that this submission follows the policies as outlined in the Guide for Authors and in the Ethical Statement.

Ethical approval: This article does not contain any studies with human participants or animals performed by any of authors.

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