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The Impact of Fiscal Policy on the U.S. Stock Market Return

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ABSTRACT

In this study, I analyze the impact of the aggregate, income, corporate and social security tax revenues on both the U.S. output and the stock market return in a structural vector autoregression (SVAR) framework between 1960:Q1 and 2015:Q4. Unlike some of the other studies, I use aggregate and disaggregated tax revenue variables to examine the impact of fiscal policy. Results show that an increase in aggregate tax revenue reduces output and market return. In addition, an increase in income, corporate, and social security tax revenues reduces output and the market return significantly at varying degrees.

KEYWORDS

Fiscal Policy; Monetary Policy; Stock Market Return; Taxation; Financial Economics

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1. Introduction

Fiscal policy is the implementation of government spending and taxation to influence the economy. The implementation of fiscal policy could be discretionary or operate through automatic stabilizers. The discretionary policy entails changes in fiscal policy in response to economic conditions, whereas automatic stabilizers automatically expand fiscal policy during recessions and contract it during booms. The government could not change the fiscal policy continuously due to the requirement to satisfy its long-run budget constraint. Nonetheless, having a budget constraint does not imply that the government has a fiscal discipline.

Policymakers have preferred using monetary policy over fiscal policy until the 2008 financial crisis for two reasons: first, it takes some time to change the fiscal policy in response to changes in economic conditions, which is called *decision lags* (Blanchard and Perotti, 2002). Second, it takes some time to implement policy changes, called *implementation lags* (Blanchard and Perotti, 2002). On the other hand, as a government plans to implement fiscal policy, the public adjusts its future expectations in response to the expected policy change. Hence, the impact of policy change would not be as practical as expected by policymakers. The academic scrutiny of the fiscal policy increased as the U.S. government enacted a stimulus package to mitigate the unemployment and economic downturn in 2008. Most previous recessions began after the Federal Reserve raised the interest rate to decrease inflation. However, the downturn was not due to high interest rates this time.[1] This downturn started following a sharp rise in defaults on subprime mortgages, alerting market participants that risk is under-measured. Hence, it was not entirely fixed by a reversal of the Fed policy. Therefore, the U.S. government intervened by stimulating the economy to improve the market outcome. The U.S. and other countries increased government spending to stimulate their economy (i.e., Japan, Germany, the U.K., China, and South Korea).

Three different theories - Keynesian, Neoclassical, and Ricardian - examine the impact of fiscal policy on macroeconomic variables. According to Keynesian theory, increases in government spending raise aggregate demand, which increases economic activity and output. In contrast, in the neoclassical theory, discretionary increases in government spending crowd out private investment, which would harm the output. According to Ricardian theory, implementing fiscal policy has neither a negative nor positive impact on the macroeconomic variables because spending and taxes would have an equivalent effect on the economy. On the other hand, when there is a tax cut, consumers would expect higher taxes. Hence, any tax cut is going to be financed with borrowing, and consumers would save the tax cut to pay higher taxes in the future.

In this study, I analyze the effects of an exogenous change in aggregate, income, corporate, and social security tax revenues on the U.S. output and the stock market return in a structural vector autoregression (SVAR) framework. Previous studies mainly focus on either the impact of the aggregate or disaggregated tax revenues. However, I analyze the effects of both aggregate and disaggregated tax revenue variables. Moreover, most of the previous studies use a five-variable vector autoregression (VAR) model, which does not include the stock market, to analyze the impact of fiscal policy on macroeconomic variables.[2] By contrast, I use a six-variable SVAR model in which I include a stock market index to analyze the impact of fiscal policy on the macroeconomic variables. Arin et al. (2009) use a 6-variable VAR model to measure the effects of fiscal policy. However, they only examine the impact of disaggregated tax revenues.[3] In addition, I use both Standard and Poor (S&P) 500 and Dow Jones Composite stock market indexes to test the sensitivity of the market return to a shock to fiscal variables. Table A1 summarizes models, methodologies, and variables in similar studies. As I summarize Table A1, most previous studies do not focus on the stock market return and components of tax revenue.

As the government increases the aggregate tax revenue, output and the market return decrease significantly. I obtain similar results from a change in disaggregated tax revenue variables. An exogenous increase in income, corporate, and social security tax revenues reduces output and market returns at varying degrees. These results support the Keynesian view of the economy.

The rest of the paper is organized as follows. Section 2 summarizes the related literature, Section 3 describes the data, Section 4 describes the model and the identification method, Section 5 discusses the empirical results, Section 6 describes the sensitivity analysis, and Section 7 concludes.

[1] The recession which started in 2008.

[2] 5-variable VAR models include government spending, aggregate tax revenue, output, inflation rate, and interest rate.

[3] Arin et al. (2009) use the Cholesky identification method.

2. Related Literature

Most of the previous studies focus on the impact of monetary policy rather than fiscal policy due to the two main problems mentioned above: decision and implementation lags.

Darrat (1988) finds that fiscal policy significantly impacts Canadian stock returns. However, monetary policy is not effective in determining Canadian stock returns. Using the U.S. data, Tavares and Valkanov (2001) find that an increase in taxes reduces the return on stocks, corporate bonds, and government bonds, whereas an increase in government spending increases returns. However, they find that the impact of a change in government spending is less effective than taxes.

In the literature, researchers mostly build a model using at least five variables. However, Blanchard and Perotti (2002) created a VAR model using three variables: output, government spending, and aggregate tax revenue. They find that increasing government spending increases output, whereas an exogenous rise in tax revenue reduces output. Furthermore, they find that investment decreases when the government increases spending and taxes. To identify structural shocks, they use institutional information to compute some of the elasticity values, which are used as identification restrictions.

Using 12 European countries data, Van Aarle et al. (2003) find a positive relationship between government spending and output. Moreover, they found a negative correlation between tax revenue and output and a positive relationship between fiscal deficit and stock prices. Using Spanish data, De Castro and de Cos (2008) find that increasing government spending increases output. Moreover, they found that the initial response of the production to a tax increase was positive. However, it becomes negative in the medium term. Parallel to the net taxes, direct and social security taxes reduce output. Furthermore, they found that an exogenous change in indirect taxes had no impact on Spain's economic activity.

Using Italian data, Giordano et al. (2007) find that government expenditures increase output. The increase in public wages does not have any significant impact on output. Furthermore, they found a positive relationship between net tax revenue and output, although the positive output response was small.[4] By using G-3 countries data, Arin et al. (2009) analyze the impact of different tax components on the stock market return. They find a negative relationship between market return and indirect and labor taxes. Interestingly, they find that market returns do not respond significantly to corporate tax changes. They conclude that observing an insignificant response of market return to a shock to corporate tax would be due to the financing method of corporations. That is, firms prefer debt financing, not equity financing, due to being able to deduct interest payments.

Mountford and Uhlig (2009) analyze the impact of fiscal policy on the U.S. macroeconomic variables using the sign restriction identification method. They find that a tax increase reduces output. Furthermore, an output is almost irresponsive to the rise in government spending. Afonso and Sousa (2012) include not only stock prices but also housing prices into their model to analyze the economic data of the U.S., the U.K., Germany, and Italy by using a fully simultaneous system approach in the Bayesian framework.[5] They find a positive relationship between increased government spending and output, whereas a negative correlation between government revenue shocks and output. In addition, an increase in expenditures reduces stock prices. Lastly, they find that tax revenue shock increases stock prices. Chatziantoniou et al. (2013) analyze the impact of fiscal policy by using the U.S., the U.K., and Germany data. They find that fiscal policy does not affect the U.S. stock market return.

3. Data

I use quarterly data between 1960:Q1 and 2015:Q4. Variables are government spending (g_t), output (y_t), inflation rate (π_t), aggregate tax revenue (τ_t), interest rate (r_t), and excess stock market return (s_t).

I use the log growth value of government spending, the sum of government consumption, and gross public investment. Aggregate tax revenue is the sum of personal current taxes, taxes on production and imports, taxes on corporate income, taxes from the rest of the world, and contributions for government social insurance. Also, I analyze disaggregated tax revenue variables. To do so, I use income tax (τ_{inct}), corporate tax (τ_{ct}), and social

[4] Giordano et al. (2007) use private GDP, which is GDP minus government consumption, to measure output.

[5] Afonso and Sousa (2012) use neither general government spending nor general government tax revenue data. They use federal government spending and federal tax revenue data.

security tax(τ_{sect}) revenues. I use the log growth value of both aggregate and disaggregated tax revenues. Table A2 shows the definition of fiscal variables in the related studies.

There needs to be a consensus in the literature for which variable to adopt as a fiscal policy instrument to determine fiscal policy (Chatziantoniou et al., 2013). However, there is a strong agreement that one should include both government spending and tax variables in the model to analyze the impact of fiscal policy (Arin et al., 2009; Tavares and Valkanov, 2001). Hence, I use both government spending and tax revenue variables to examine the impact of fiscal policy. Even though industrial production does not represent the entire GDP, one could use industrial production to measure economic activity since industrial production is susceptible to interest rates and demand. Therefore, following Bjørnland and Leitemo (2009); Mbanga et al. (2019), I use the log growth value of industrial production to measure output.

I use the log growth value of the S&P 500 stock market index to compute the one-period stock market return. Following Tavares and Valkanov (2001); Arin et al. (2009), I compute excess market return (s_t) as one-period log stock return minus the 3-month treasury bill rate.

$$s_t = log[1 + R_t] - TBill \tag{1}$$

where R_t is one period log stock return.

I adopt the spread as a monetary policy indicator, the difference between the 6-month treasury bill and federal funds rates. Moreover, I use the log growth value of the consumer price index to measure the inflation rate. All the variables are real, seasonally adjusted, and in logs, except spread.[6]

I obtain aggregate tax revenue, disaggregated tax revenue variables, government spending, and industrial output data from the Bureau of Economic Analysis website. I extracted stock market data from the Bloomberg financial website. I obtain the Treasury bill rate and consumer price index data from St.Louis FRED.

Table A3 displays the unit root test results. According to the Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) unit root test results, all variables are stationary at a 5% significance level except for the S&P 500 and the Dow Jones Composite stock market indexes. Following Sims (1980); Sims et al. (1990), I will not first-difference the stock market variables to preserve the information about the co-movements in the data. Therefore, I use the level form of the stock market variables in this study.

4. Methodology

Following Gunduz (2021), the structural representation of the Vector AutoRegressive (VAR) model is

$$\Gamma_0 X_t = B_0 + B_1 X_{t-1} + B\varepsilon_t \tag{2}$$

Where X_t is a $[g_t, y_t, \pi_t, \tau_t, r_t, s_t]$ vector of endogenous variables: g_t: government spending, y_t: output, π_t: inflation rate, τ_t: aggregate tax revenue, r_t: interest rate, s_t: excess stock market return, Γ_0 is a 6×6 contemporaneous coefficients matrix, B_0 is a 6×1 vector of constants, B_1 are 6×6 autoregressive coefficient matrices, B is a (6×6) matrix that captures the linear relations between structural disturbances and reduced disturbances, ε_t is a 6×1 vector of structural disturbances, equation (2) is called unrestricted VAR since each endogenous variable is contemporaneously affected by other endogenous variables, this is also called the Primitive System. Therefore, ε_t is a primitive system's error term. We need to get the reduced form of VAR to identify the shocks from the structural VAR. To do so, multiply both sides of equation (2) by Γ_0^{-1}.

$$X_t = \Gamma_0^{-1} B_0 + \Gamma_0^{-1} B_1 X_{t-1} + \Gamma_0^{-1} B\varepsilon_t \tag{3}$$

Hence, I can write down the reduced form VAR as

$$X_t = C(L) X_{t-1} + U_t \tag{4}$$

Where, $C(L) = \Gamma_0^{-1} B_1$, and $U_t = \Gamma_0^{-1} B\varepsilon_t$

[6] If the source does not seasonally adjust the variable, I use Tramo Seats to make a seasonal adjustment. I use Tramo seats because one can make seasonal adjustments even if the series contains some negative values.

C(L) is an autoregressive lag polynomial, and U_t contains reduced form errors. We assume that disturbances have zero covariance and constant variance. I use the Ordinary Least Square (OLS) estimation method to estimate equation (4).[7]

To run a VAR model, one has to determine the optimal number of lags that will be included in the model. In this study, I use different specifications of the benchmark model. In addition, I compare the results between the models. To have comparable results, one should use the same optimal lags for different model specifications. I determine the optimal number of lags to 1 using the Hannan Quinn Information Criteria (HQIC) and Schwartz Information Criteria (SBIC). Table A4 shows the lag selection criteria.

Since VAR processes are the suitable model class for describing the data-generating process of a small or moderate set of time series variables, many researchers prefer to use a VAR model to measure the effect of fiscal policy on macroeconomic variables. There are four approaches to identifying the effects of fiscal policy shocks on the macroeconomic variables in a VAR literature. Sims (1980) introduces the Cholesky decomposition method to identify structural shocks, which is the oldest identification method in VAR analysis. Although this method has been criticized by most of the researchers due to being order dependent on analyzing the effect of shocks, Fatás et al. (2001); Tavares and Valkanov (2001); Arin et al. (2009) use this recursive approach.[8]

Ramey and Shapiro (1998) introduce the Narrative Event Study identification method in which they use dummy variables to capture the effect of unanticipated fiscal events such as the Korean War, the Vietnam War, the Carter Reagan Military buildup, and the September 11 terrorist attack. Edelberg et al. (1999) use this method as well. Mountford and Uhlig (2009) introduce sign restriction identification method in which they impose sign restrictions on impulse responses. This identification method does not require the number of shocks to be equal to the number of variables. The last identification method is Blanchard and Perotti (2002) method, which relies on institutional information about tax and transfer systems to identify the automatic response of taxes and government spending to economic activity. Van Aarle et al. (2003); Perotti (2005); Giordano et al. (2007); De Castro and de Cos (2008); Chatziantoniou et al. (2013) use this identification method. In this study, I adopt the latter approach to identify shocks to macroeconomic variables.

I assume the relationship between reduced form residuals u_t and the structural shocks ε_t.

$$\Gamma u_t = B\varepsilon_t \tag{5}$$

where $\Gamma = \begin{bmatrix} \gamma_g^g & 0 & -\gamma_g^\pi & 0 & -\gamma_g^r & 0 \\ -\gamma_y^g & \gamma_y^y & 0 & 0 & 0 & 0 \\ -\gamma_\pi^g & -\gamma_\pi^y & \gamma_\pi^\pi & 0 & 0 & 0 \\ -\gamma_\tau^g & -\gamma_\tau^y & -\gamma_\tau^\pi & \gamma_\tau^\tau & -\gamma_\tau^r & 0 \\ -\gamma_r^g & -\gamma_r^y & -\gamma_r^\pi & -\gamma_r^\tau & \gamma_r^r & 0 \\ -\gamma_s^g & -\gamma_s^y & -\gamma_s^\pi & -\gamma_s^\tau & -\gamma_s^r & \gamma_s^s \end{bmatrix}, u_t = \begin{bmatrix} u_t^g \\ u_t^y \\ u_t^\pi \\ u_t^\tau \\ u_t^r \\ u_t^s \end{bmatrix}, B = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}, \varepsilon_t = \begin{bmatrix} \varepsilon_t^g \\ \varepsilon_t^y \\ \varepsilon_t^\pi \\ \varepsilon_t^\tau \\ \varepsilon_t^r \\ \varepsilon_t^s \end{bmatrix}$

To identify the model, I recover structural shocks from the reduced residuals. To do so, I impose restrictions on both Γ and B matrixes using economic theory, economic reasoning, and empirical research. To identify the model exactly, we should impose restrictions. The number of restrictions depends on constructing both Γ and B matrixes. When you have neither Γ nor B matrix as an identity matrix, the order condition requires imposing *at least* $K^2 + \frac{K(K-1)}{2}$ restrictions on both Γ and B matrices to identify the structural shocks (Lütkepohl et al., 2004), where K is the number of endogenous variables. Therefore, the order condition requires imposing *at least* $\frac{K(K-1)}{2}$ restrictions on the Γ matrix.

I impose the following restrictions on the Γ matrix.

In the first row of the Γ matrix, the inflation and interest rates contemporaneously affect government spending. Following Perotti (2005); De Castro and de Cos (2008); Afonso and Sousa (2011), I set the price elasticity of government spending γ_g^π to 0.5. Following (De Castro and de Cos, 2008), I set γ_g^r equal to zero since government spending does not include the interest rate on government debt.

[7] OLS estimates are consistent and asymptotically efficient.

[8] Cholesky decomposition method has been criticized since inappropriate ordering induces major distortions in the results of the model.

In the second row of the Γ matrix, government spending has a contemporaneous impact on output (Arin et al., 2009). Furthermore, tax revenue shocks do not have a contemporary impact on output (Van Aarle et al., 2003). In addition, the inflation rate, interest rate, and stock market do not contemporaneously influence GDP (Chatziantoniou et al., 2013; Kim and Roubini, 2000). In the third row of the Γ matrix, government spending, and output have a contemporary impact on the inflation rate (Fatás et al., 2001). In the fourth row of the Γ matrix, government spending, output, and inflation rate have a contemporaneous impact on government revenue (Fatás et al., 2001). In addition, following (De Castro and de Cos, 2008), I set γ_τ^r equal to zero since tax revenue does not include the interest rate on the government debt. In the fifth row of the Γ matrix, monetary policymakers adjust the policy variable in response to changes in economic conditions (Arin et al., 2009). Hence, government spending, output, the inflation rate, and tax revenue contemporaneously affect the interest rate. Moreover, interest rate reacts with a lag to stock market news (Arin et al., 2009).[9] In the last row of the Γ matrix, the stock market responds to all the variables contemporaneously due to the stock market efficiency hypothesis (Bjørnland and Leitemo, 2009; Darrat, 1988).

5. Discussion of Results

In this study, I use impulse responses to report the impact of fiscal policy shocks on the variables. Following Blanchard and Perotti (2002); Perotti (2005); Giordano et al. (2007); De Castro and de Cos (2008),;Bjørnland and Leitemo (2009); Afonso and Sousa (2011); Afonso and Sousa (2012); Chatziantoniou et al. (2013), confidence intervals are one-standard deviation error bands.

In this section, I discuss the impact of estimation results of the aggregate and different tax revenue components on both output and the market return.

According to Keynesian theory, a tax change would impact the aggregate demand and other economic variables. An increase in tax revenue would reduce the aggregate demand, which deteriorates the economy. Hence, both output and the stock market return decrease.

According to Ricardian theory, fiscal policy does not impact aggregate demand and other economic variables. Hence, a change in tax revenue would not impact either output or the stock market return.

As the government increases tax revenue to finance its expenses, government debt decreases, which leads to a decrease in the supply of government bonds. Therefore, government bond prices would increase, which makes bonds and other assets less attractive. Hence, the increase in taxes would lead to lower asset returns (Tavares and Valkanov, 2001).

Figure A1 displays the output response and the market return to a shock to aggregate, income, corporate, and social security tax revenues.

The first row of Figure A1 displays the impulse responses of output and the market return to a shock to the aggregate tax revenue. In contrast to Tavares and Valkanov (2001); Van Aarle et al. (2003); Giordano et al. (2007); Romer and Romer (2010), an increase in the aggregate tax revenue reduces output not only significantly but also persistently. The results are in line with other studies in the literature.[10] Results support the Keynesian view of the economy.

Now, I examine the impact of an exogenous increase in the aggregate tax revenue on the stock market return. In contrast to Afonso and Sousa (2011); Afonso and Sousa (2012), I find that an increase in the aggregate tax revenue reduces market return significantly and persistently. In other words, the result aligns with Tavares and Valkanov (2001).

The second row of Figure A1 displays the impulse responses of variables to a shock to income tax revenue. As the government raises income tax revenue, output decreases significantly for up to two years. Furthermore, the market return decreases in response to increased tax revenue.

The third row of Figure A1 displays the impulse responses of variables to a shock to corporate tax revenue. In contrast to Arin et al. (2009), implementing corporate tax reduces output, which bottoms out in the first quarter.

[9] I test this last identification condition by letting the correlation between the interest rate and the stock market return. I report the results of this test in the appendix.

[10] Blanchard and Perotti (2002); Perotti (2005); De Castro and de Cos (2008); Mountford and Uhlig (2009); Afonso and Sousa (2011); Afonso and Sousa (2012) find that implementing new tax reduces output.

The response of the market return to an increase in corporate tax revenue is negative, which is in line with Arin et al. (2009). However, Arin et al. (2009) result is insignificant.

The last row of Figure A1 displays the impulse responses of variables to a shock to the social security tax revenue. A shock to social security taxes reduces output. In line with the results, De Castro and de Cos (2008) find a transitory decrease in output as the government increases social security tax revenue. Indeed, there is a negative relationship between social security taxes and market returns.

A shock to aggregate tax revenue and its components reduces output and the market return significantly at varying degrees. Also, the market return's response to a shock to income tax revenue is the weakest since the result is not always significant.

6. Robustness Check

I adopt three different estimation methods to check the robustness of the benchmark results.[11] First, I use the Dow Jones Composite Index to test the sensitivity of the choice of the stock market variable to a shock to fiscal variables. Second, I test the sensitivity of the benchmark results by adopting different price elasticities of government spending. To do so, I estimate the benchmark model by replacing 0.5 price elasticity of government spending with 1. Lastly, I adopt the Tax Reduction Act of 1975 as a structural breakpoint since 1975:Q2 tax rebate leads to $100 billion increase in disposable income at 1987 prices (Blanchard and Perotti, 2002). To account for the impact of the 1975 tax rebate, I estimate the model by using the 1975:Q2 - 2015:Q4 data period. I use the subsample period for the structural breakpoint and robustness check of the entire period result.

6.1. Using Dow Jones composite index to measure stock market return

To test the sensitivity of the stock market return to a shock to aggregate tax revenue and components of tax revenue, I use the Dow Jones composite index to measure the stock market return. To do so, I replace the S&P 500 stock index with the Dow Jones composite index without changing other variables in the benchmark model.

Figure A2 displays the results that I obtained from this method. The responses of both output and the market return to a shock to aggregate tax revenue, and its components are similar to the benchmark results. Results show that using different stock market indexes does not impact the benchmark results. Hence, the choice of the stock market index variable does not affect the results.

6.2. Sensitivity of Price Elasticity of Government Spending

Following Perotti (2005); De Castro and de Cos (2008); Afonso and Sousa (2011), I adopt the price elasticity of government spending as 0.5 in the benchmark model. However, there are two criticisms of the choice of elasticity values. First, the elasticity value representing different data periods might not fit every data period. In other words, adopting an elasticity value computed using data periods different from this study might create spurious results. Second, elasticity values for different countries might only apply to some countries. (e.g., the elasticity value for Italy might not be useful for analyzing the German data). Hence, I replace the price elasticity of government spending with 1 to test the sensitivity of the benchmark model results.

Figure A3 displays the results that I observed from this method. The results are identical to the benchmark model results. In addition, I estimate the model using the price elasticity of government spending, which is equal to 1.5. The results are identical to using either 0.5 or 1.[12] Therefore, using different price elasticity of government spending has no impact on the benchmark results.

[11] As another robustness check, I want to test the sensitivity of the choice of the fiscal variables on the benchmark results by changing the measurement of fiscal variables. To do so, I compute government spending, aggregate tax revenue, and the components of tax revenues as a share of GDP. I rerun a VAR model. However, the VAR model becomes unstable due to observing multicollinearity.

[12] I provide the results of using price elasticity of government spending equal to 1.5 in the appendix.

6.3. The impact of the Tax Reduction Act of 1975

The U.S. economy was in recession, output growth decreased, and unemployment increased. President Gerald Ford signed the Tax Reduction Act to stimulate the U.S. economy, which provided a 10% rebate on individual income tax and raised the investment tax credit to 10% Substantial changes in the variables(s) of the model would impact the results. Following Blanchard and Perotti (2002), I adopt 1975:Q2 as a break date to capture the effect of the Tax Reduction Act 1975. Therefore, I estimate the model by using data from 1975:Q2 to 2015:Q4.

Figure A4 depicts the output response and the market return to a shock to aggregate tax revenue and components of tax revenue. The response of the market return to a shock to aggregate and components of tax revenue is almost identical to the benchmark results.

The output response to a shock to aggregate tax and income tax is similar to the benchmark model. Also, the insignificant initial increase in output is followed by a significant decrease in response to a shock to both corporate and social security taxes. In sum, the benchmark model results are supported by the subsample results.

These results overall support the Keynesian view that an increase in aggregate tax revenue reduces output and market return. (In line with Blanchard and Perotti (2002); Perotti (2005); De Castro and de Cos (2008); Mountford and Uhlig (2009); Afonso and Sousa (2011); Afonso and Sousa (2012), exogenous increase in aggregate tax revenue reduces output. In addition, an increase in aggregate tax revenue reduces market return, which aligns with Tavares and Valkanov (2001).

7. Conclusion

In this study, I analyze the impact of an exogenous change in aggregate, income, corporate, and social security tax revenues on output and the stock market return.

In line with Blanchard and Perotti (2002); Perotti (2005); De Castro and de Cos (2008); Mountford and Uhlig (2009); Afonso and Sousa (2011); Afonso and Sousa (2012), I find that an increase in the aggregate tax revenue reduces output significantly. Hence, the output response to an exogenous change in the aggregate tax revenue supports the Keynesian view of the economy.

In line with Tavares and Valkanov (2001), an exogenous increase in the aggregate tax revenue reduces market return persistently, which supports the Keynesian view.

Breaking down the components of tax revenue results shows that an exogenous change in income, corporate, and social security tax revenues significantly negatively impacts output and the market return. Income tax revenue has the weakest impact on the market return since the result is insignificant for all the periods.

I also conduct various sensitivity tests:

The results show that the choice of the numerical value of the price elasticity of government spending has no major impact on the benchmark results since I observed identical results using a different price elasticity of government spending.

I also test the sensitivity of the results of the choice of the stock market variable. The choice of the stock market variable has no impact on the results since I observed similar results by using different stock market variables. In addition, I test the validity of the benchmark results by estimating the model by adopting the Tax Reduction Act of 1975 as a break date. Although responses of some of the variables differ from the benchmark results, there are no significant differences between the benchmark and subsample model results.

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Conflict of interest

The author claims that the manuscript is completely original. The author also declares no conflict of interest.

Author contributions

The author was solely responsible for all aspects of the research, including conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, writing –original draft, and writing –review & editing.

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Appendix

A1. Additional Robustness Check

In this section, I add three additional sensitivity analyses to test the validity of the benchmark results. First, I estimate the benchmark model by replacing the price elasticity of government spending with 1.5. Second, I estimate the benchmark model by letting the correlation between the interest rate and the stock market return. Lastly, I estimate the benchmark model from 1960:Q1 to 2007:Q4, the last financial crisis, to test the validity of the structural breakpoint.

As aforementioned, the choice of price elasticity of government spending might be criticized due to data period or country differences. To avoid this criticism, I will conduct a sensitivity analysis of the price elasticity of government spending by adopting different values. To do so, I reestimate the benchmark model adopting price elasticity of government spending as 1.5.

Figure A5 shows the impulse responses of output and market return when the price elasticity of government spending is equal to 1.5. The results are identical to either the benchmark results or adopting the price elasticity of government spending as 1.

Following Arin et al. (2009), one of the identification restrictions I set is that the interest rate reacts with a lag to stock market news. To test the sensitivity of this choice, I allow the correlation between the interest rate and the market return.

Figure A6 displays the impulse responses of output and the market return when the interest rate correlated with the market return. The results are identical to the benchmark results. Therefore, allowing a correlation between the interest rate and the market return does not impact the results.

President Gerald Ford signs the Tax Reduction Act. To account for the effect of this policy change, I adopt the second quarter of 1975 as a structural breakpoint. Thereby, I estimate the model from 1975:Q2 to 2015:Q4 not only as a subsample period but also as a robustness check of the entire period results.

To test the validity of the choice of this structural breakpoint, I also adopt another structural point, which is the 2007 financial crisis. To account for the impact of the 2007 financial crisis on the benchmark results, I rerun the benchmark model from 1960:Q1 to 2007:Q4.

Figure A7 displays the impulse responses of output and the market return as I estimate the model using data from 1960:Q1 to 2007:Q4. There are no significant differences between the results when I estimate the model using data from 1975:Q2 to 2015:Q4 and from 1960:Q1 to 2007:Q4. The only difference is the output response to corporate tax shock, which is improved.

A2. Tables and Figures

Table A1. Models, identification methods, and included variables in the related studies. BP= Blanchard and Perotti identification method. Some researchers use budget deficit (Def) to measure fiscal policy.

Study	Model	Identification	Def	g_t	τ_t	y_t	π_t	r_t	s_t	Inc_t	C_t	Ind_t	Sec_t
		Variable List											
Darrat (1988)	OLS	NA	+	-	-	+	-	+	+	-	-	-	-
Tavares and Valkanov (2001)	VAR	Cholesky	-	+	+	+	+	+	+	-	-	-	-
Fatás et al. (2001)	VAR	Cholesky	+	+	+	+	+	+	-	-	-	-	-
Blanchard and Perotti (2002)	VAR	BP	-	+	+	+	-	-	-	-	-	-	-
Van Aarle et al. (2003)	SVAR	BP	+	+	+	+	+	+	+	-	-	-	-
Perotti (2005)	SVAR	BP	-	+	+	+	+	+	-	-	-	-	-
Giordano et al. (2007)	SVAR	BP	-	+	+	+	+	+	-	-	-	-	-
De Castro and de Cos (2008)	SVAR	BP	-	+	+	+	+	+	-	+	-	+	+
Arin et al. (2009)	VAR	Cholesky	-	+	-	+	+	+	+	+	+	+	-
Mountford and Uhlig (2009)	VAR	Sign Restriction	-	+	+	+	+	+	-	-	-	-	-
Afonso and Sousa (2011)	F-VAR	Bayesian	-	+	+	+	+	+	+	-	-	-	-
Chatziantoniou et al. (2013)	SVAR	BP	-	+	-	+	+	+	+	-	-	-	-
Afonso and Sousa (2012)	Bayesian VAR	Bayesian	-	+	+	+	+	+	+	-	-	-	-

Table A2. Definition of government spending and aggregate tax variables in the related studies.

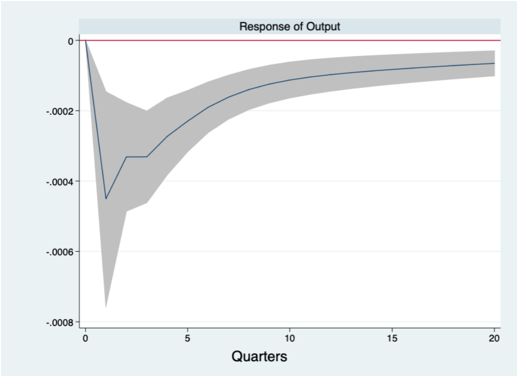
	Variables	
Study	Government spending	Aggregate tax
Tavares and Valkanov (2001)	Government purchases as a share of GDP	Tax revenues as a share of GDP
Fatás et al. (2001)	Total government spending	Total tax revenue
Blanchard and Perotti (2002)	Purchases of goods and services	Aggregate tax revenue
Van Aarle et al. (2003)	Total government spending	Total government revenue
Perotti (2005)	Government spending on goods and services	Tax revenues
Giordano et al. (2007)	Government spending on goods and services	Tax revenues
De Castro and de Cos (2008)	Sum of public consumption and investment	Public revenues
Arin et al. (2009)	Government spending	None
Mountford and Uhlig (2009)	Total government expenditure	Total government revenue
Afonso and Sousa (2011)	Federal government spending	Federal tax revenue
Chatziantoniou et al. (2013)	Government expenditures	None
Afonso and Sousa (2012)	Federal government spending	Federal tax revenue

Table A3. Unit Root test results. * An asterisk indicates that the result is significant at 1%. ADF and PP critical values are 1%: -3.47; 5%: -2.88; 10%: -2.57.

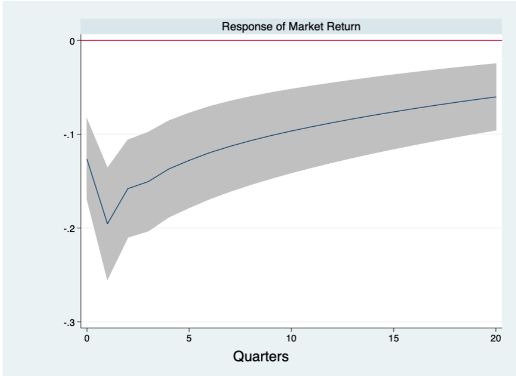
	Unit Root Tests	
Variable	Augmented Dickey-Fuller (ADF)	Phillips Perron (PP)
1960:Q1 - 2015:Q4		
Aggregate tax revenue	-13.29*	-48.91*
Income tax revenue	-11.76*	-32.07*
Corporate tax revenue	-19.06*	-19.12*
Social Security tax revenue	-13.32*	-36.73*
Government spending	-4.16*	-13.25*
Industrial Production	-6.57*	-6.57*
Inflation rate	-14.06*	-38.50*
Spread	-4.24*	-4.43*
S&P 500 Index	-1.53	-1.90
Dow Jones Index	-1.33	-1.81
1975:Q2 - 2015:Q4		
Aggregate tax revenue	-9.63*	-48.84*
Income tax revenue	-13.79*	-29.30*
Corporate tax revenue	-16.64*	-16.70*
Social Security tax revenue	-11.99*	-51.76*
Government spending	-3.53*	-11.36*
Industrial Production	-5.05*	-6.11*
Inflation rate	-12.09*	-38.41*
Spread	-4.09*	-3.54*
S&P 500 Index	-1.08	-1.39
Dow Jones Index	-1.91	-1.36

Table A4. Lag Selection Criteria. * An asterisk indicates the optimal number of lag chosen by that model.

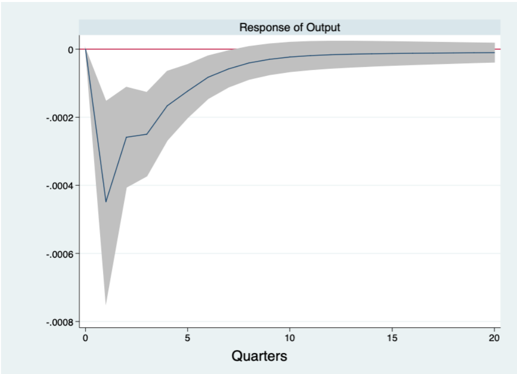
Lag Selection Criteria								
Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	2006.04				-3.1e-16	-18.692	-18.6538	-18.5976
1	2555.54	1099	36	0.000	2.5e-18	-23.491	-23.2241*	-22.8304*
2	2612.45	113.83	36	0.000	2.1e-18	-23.6865	-23.1907	-22.4596
3	2647.15	69.381	36	0.001	2.1e-18	-23.6743	-22.9497	-21.8812
4	2690.15	86.017	36	0.000	2.0e-18	-23.7398	-22.7864	-21.3804
5	2727.12	73.927	36	0.000	2.0e-18*	-23.7488*	-22.5666	-20.8232
6	2760.55	66.861	36	0.001	2.0E-18	-23.7247	-22.3137	-20.2329
7	2791.5	61.908	36	0.005	2.2e-18	-23.6776	-22.0378	-19.6195
8	2825.01	67.011	36	0.001	2.3e-18	-23.6543	-21.7857	-19.03
9	2851	52.946*	36	0.034	2.5e-18	-23.5652	-21.4678	-18.3747



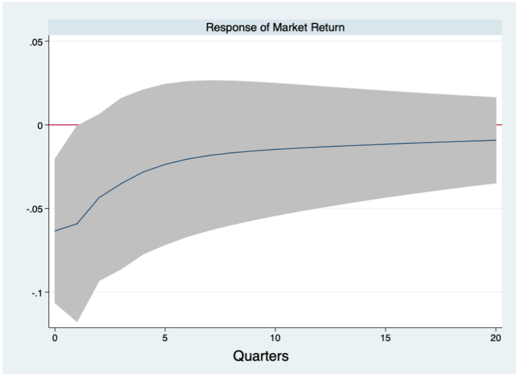
(a) Response of Output to 1 standard deviation shock to Aggregate tax.



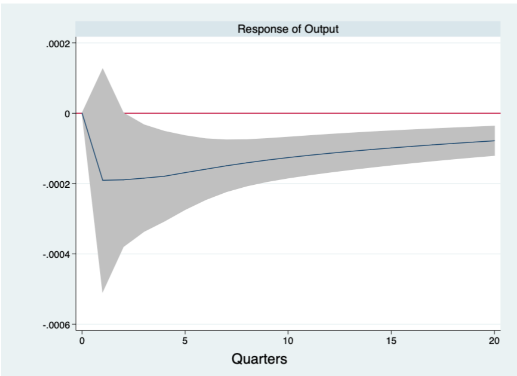
(b) Response of Market Return to 1 standard deviation shock to Aggregate tax.



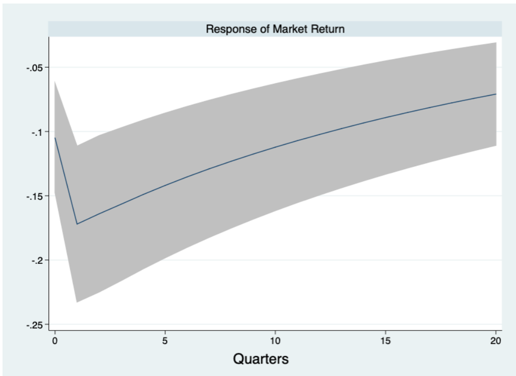
(c) Response of Output to 1 standard deviation shock to Income tax.



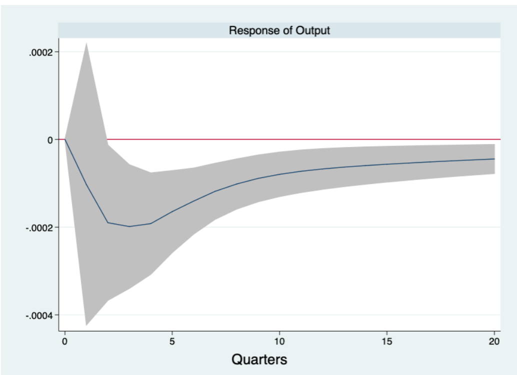
(d) Response of Market Return to 1 standard deviation shock to Income tax.



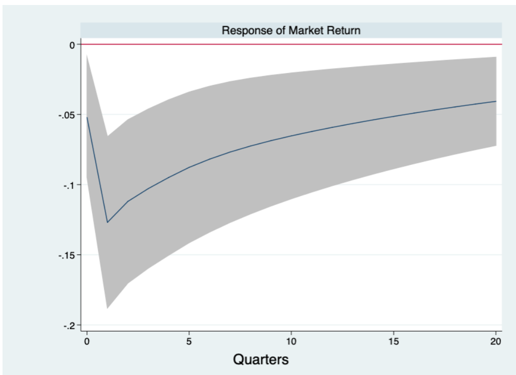
(e) Response of Output to 1 standard deviation shock to Corporate tax.



(f) Response of Market Return to 1 standard deviation shock to Corporate tax.

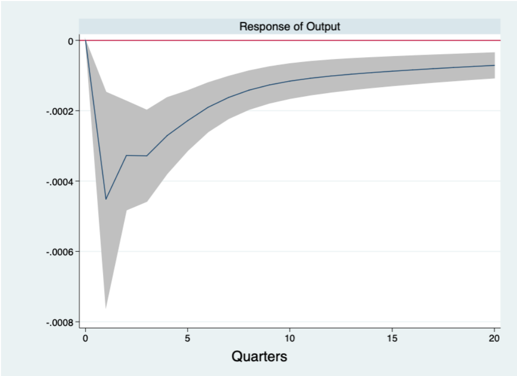


(g) Response of Output to 1 standard deviation shock to Social Security tax.

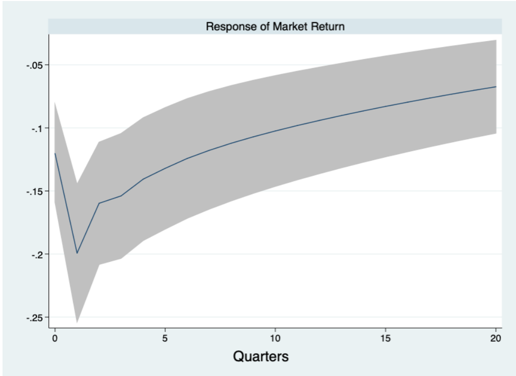


(h) Response of Market Return to 1 standard deviation shock to Social Security tax.

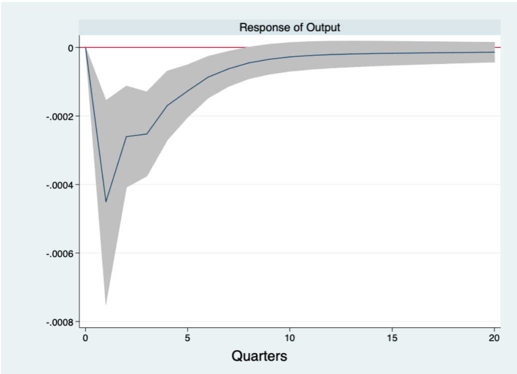
Figure A1. Impulse responses of output and the market return. The confidence intervals are one-standard deviation error bands.



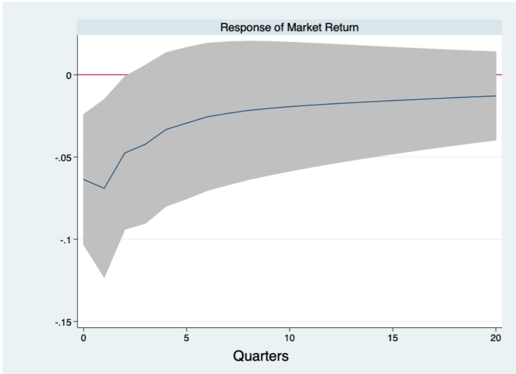
(a) Response of Output to 1 standard deviation shock to Aggregate tax.



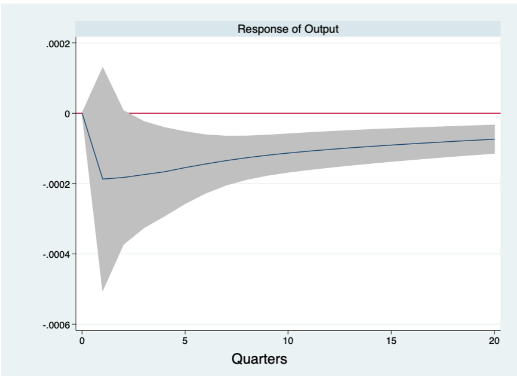
(b) Response of Market Return to 1 standard deviation shock to Aggregate tax.



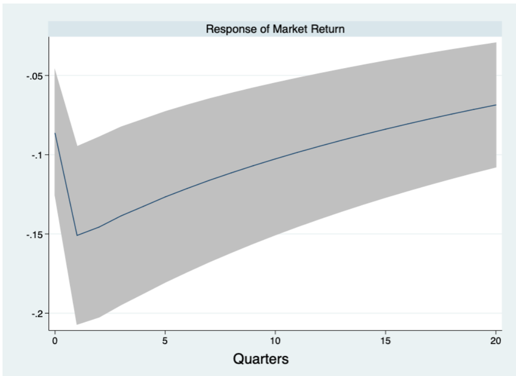
(c) Response of Output to 1 standard deviation shock to Income tax.



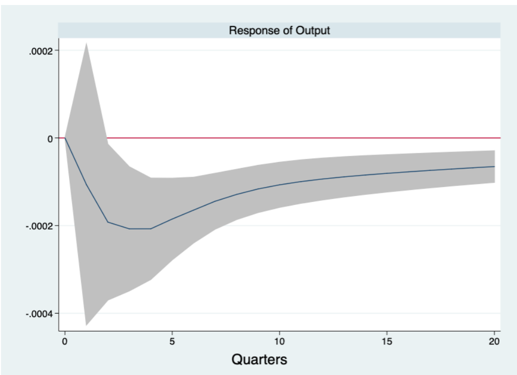
(d) Response of Market Return to 1 standard deviation shock to Income tax.



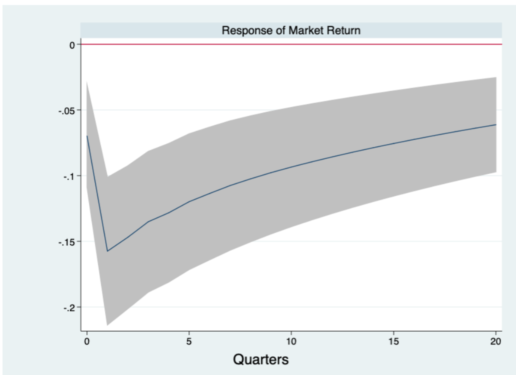
(e) Response of Output to 1 standard deviation shock to Corporate tax.



(f) Response of Market Return to 1 standard deviation shock to Corporate tax.

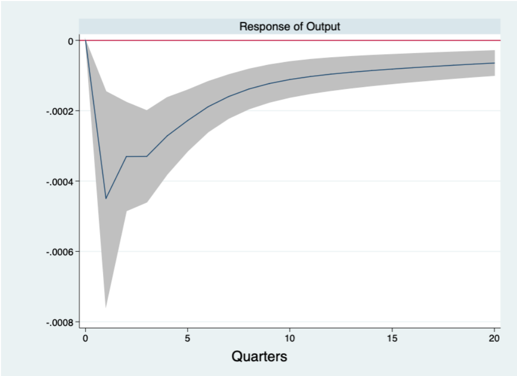


(g) Response of Output to 1 standard deviation shock to Social Security tax.

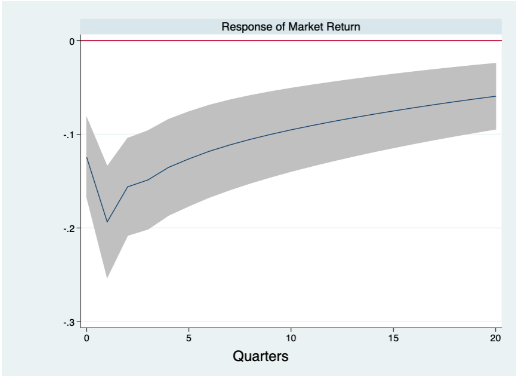


(h) Response of Market Return to 1 standard deviation shock to Social Security tax.

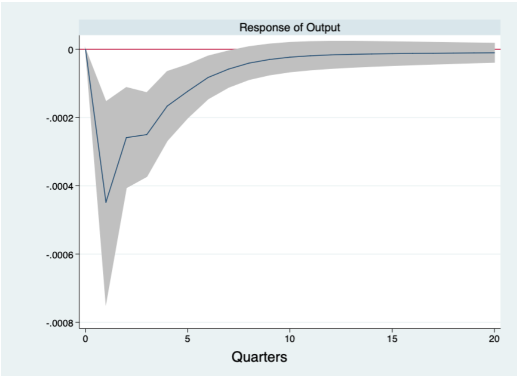
Figure A2. Impulse responses of output and the market return when I use the Dow Jones index to measure the stock market return. The confidence intervals are one-standard deviation error bands.



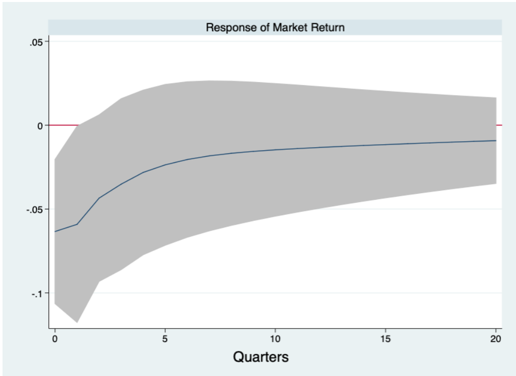
(a) Response of Output to 1 standard deviation shock to Aggregate tax.



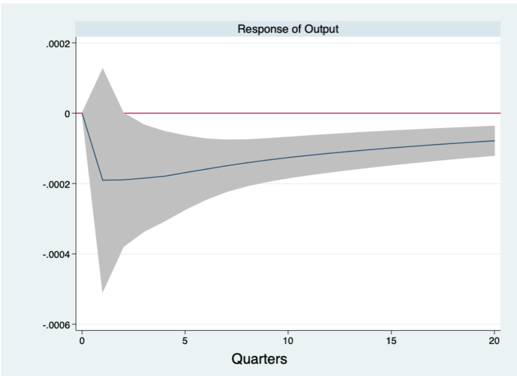
(b) Response of Market Return to 1 standard deviation shock to Aggregate tax.



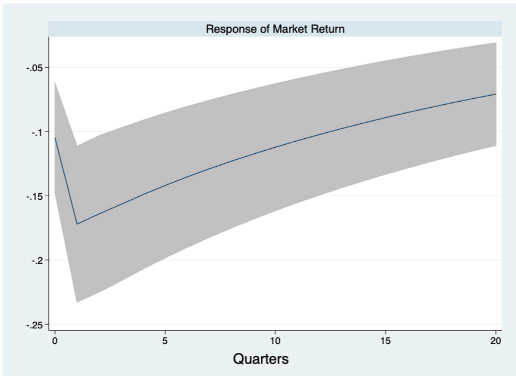
(c) Response of Output to 1 standard deviation shock to Income tax.



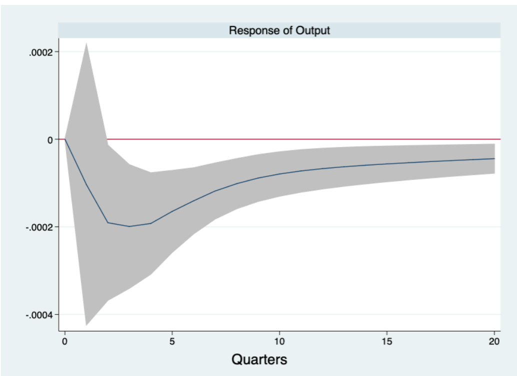
(d) Response of Market Return to 1 standard deviation shock to Income tax.



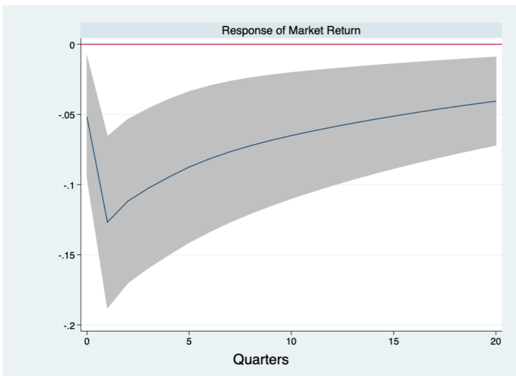
(e) Response of Output to 1 standard deviation shock to Corporate tax.



(f) Response of Market Return to 1 standard deviation shock to Corporate tax.

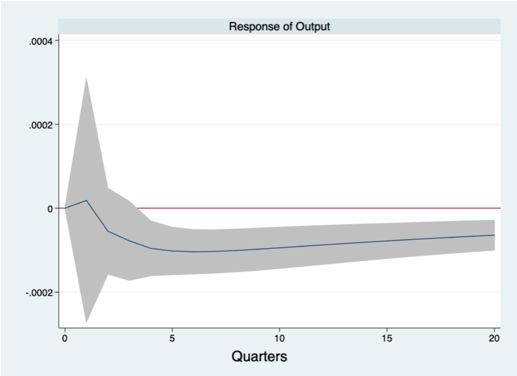


(g) Response of Output to 1 standard deviation shock to Social Security tax.

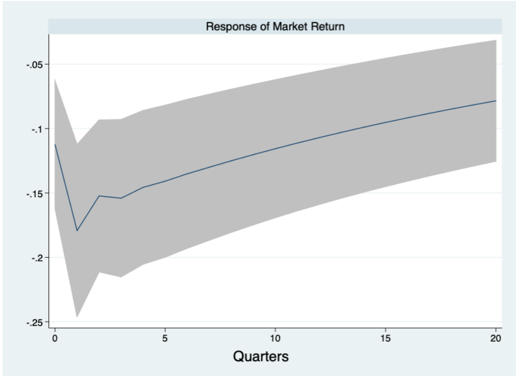


(h) Response of Market Return to 1 standard deviation shock to Social Security tax.

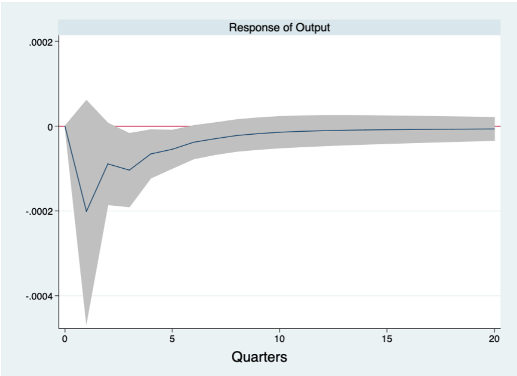
Figure A3. Impulse responses of output and the market return when price elasticity of government spending equals 1. The confidence intervals are one-standard deviation error bands.



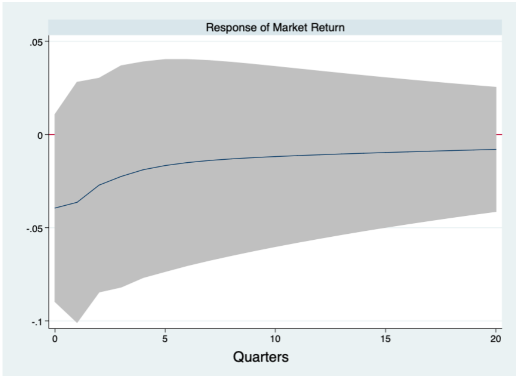
(a) Response of Output to 1 standard deviation shock to Aggregate tax.



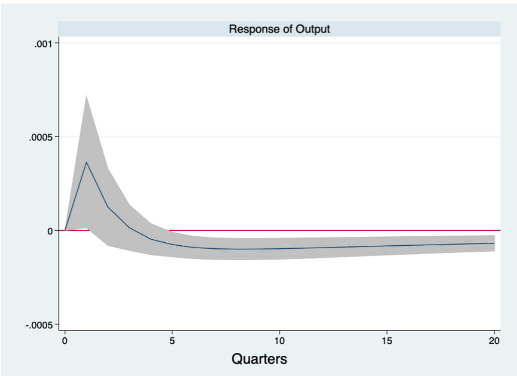
(b) Response of Market Return to 1 standard deviation shock to Aggregate tax.



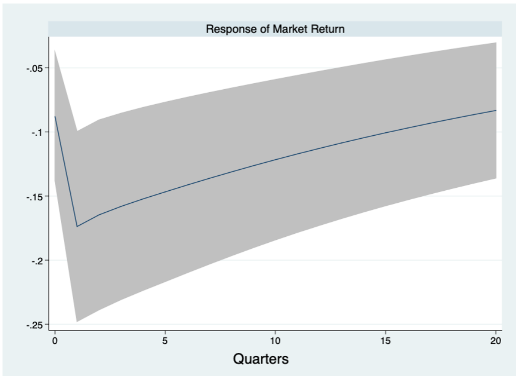
(c) Response of Output to 1 standard deviation shock to Income tax.



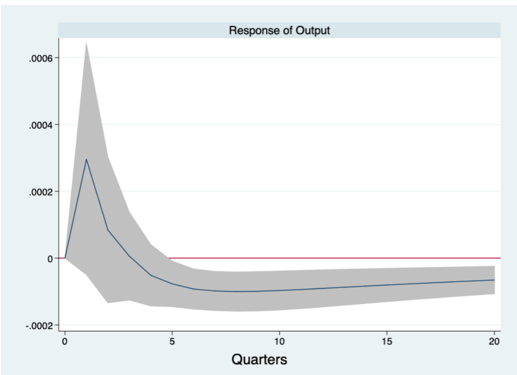
(d) Response of Market Return to 1 standard deviation shock to Income tax.



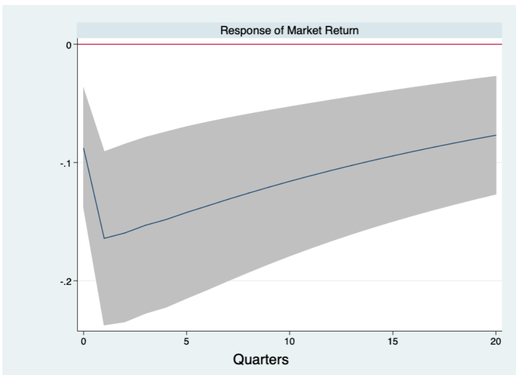
(e) Response of Output to 1 standard deviation shock to Corporate tax.



(f) Response of Market Return to 1 standard deviation shock to Corporate tax.

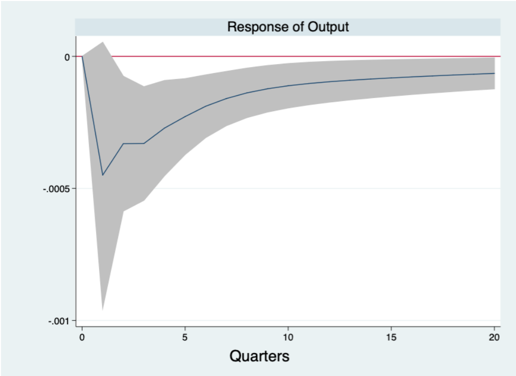


(g) Response of Output to 1 standard deviation shock to Social Security tax.

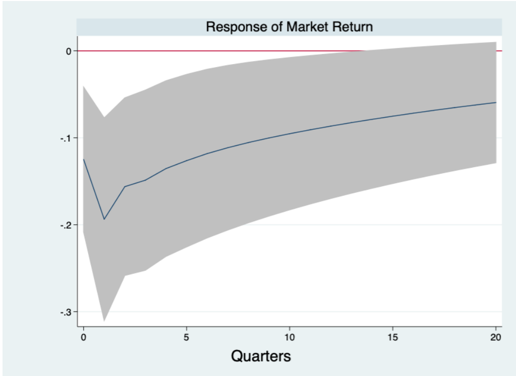


(h) Response of Market Return to 1 standard deviation shock to Social Security tax.

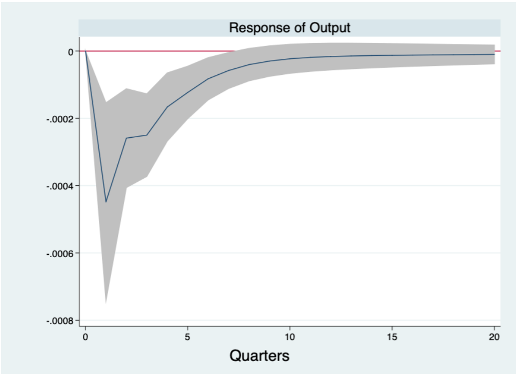
Figure A4. Impulse responses of output and the market return when I estimate the subsample from 1975:Q2 to 2015:Q4. The confidence intervals are one-standard deviation error bands.



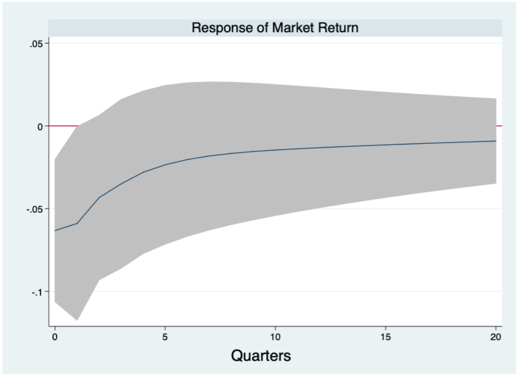
(a) Response of Output to 1 standard deviation shock to Aggregate tax.



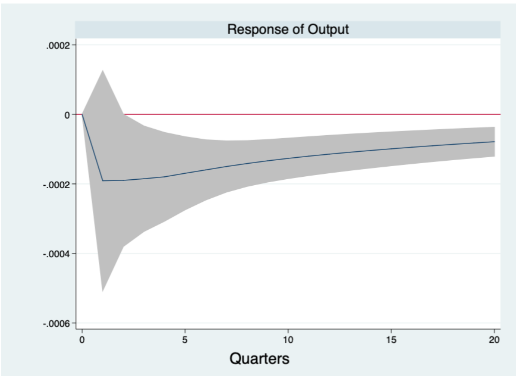
(b) Response of Market Return to 1 standard deviation shock to Aggregate tax.



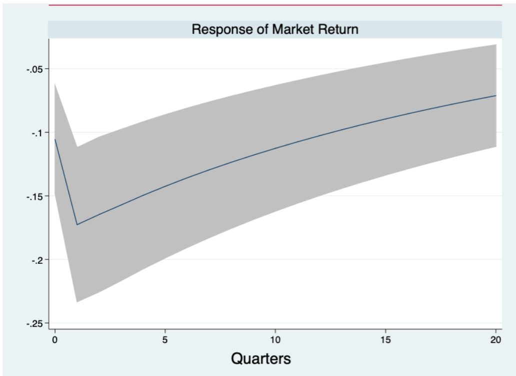
(c) Response of Output to 1 standard deviation shock to Income tax.



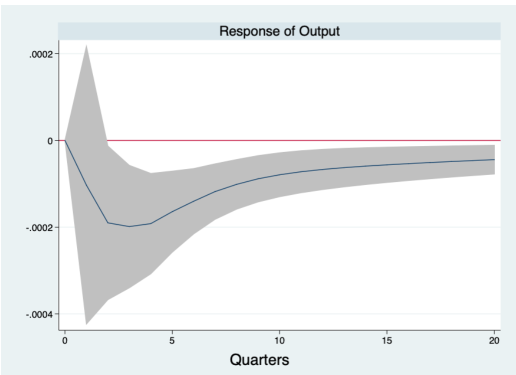
(d) Response of Market Return to 1 standard deviation shock to Income tax.



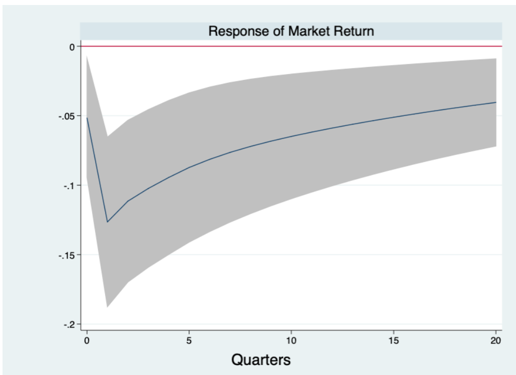
(e) Response of Output to 1 standard deviation shock to Corporate tax.



(f) Response of Market Return to 1 standard deviation shock to Corporate tax.

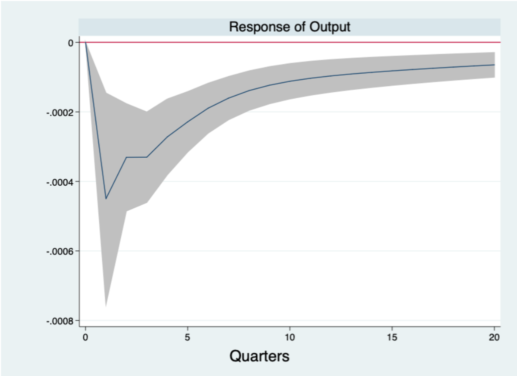


(g) Response of Output to 1 standard deviation shock to Social Security tax.



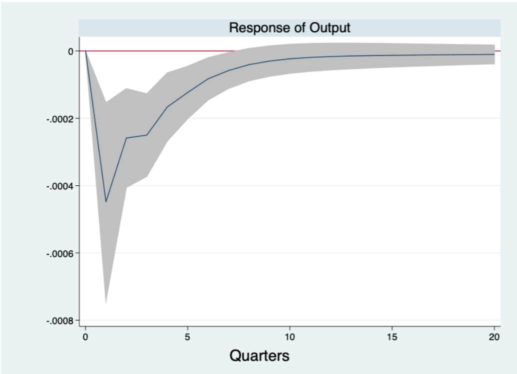
(h) Response of Market Return to 1 standard deviation shock to Social Security tax.

Figure A5. Impulse responses of output and the market return when price elasticity of government spending equals 1.5. The confidence intervals are one-standard deviation error bands.

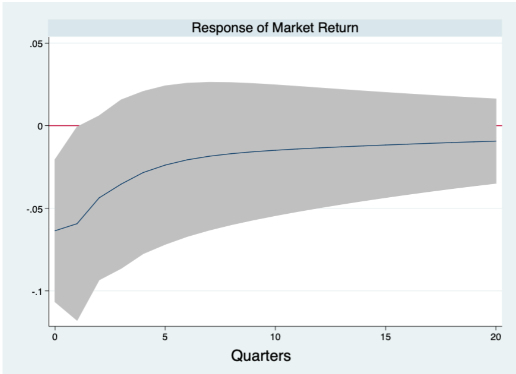


(a) Response of Output to 1 standard deviation shock to Aggregate tax.

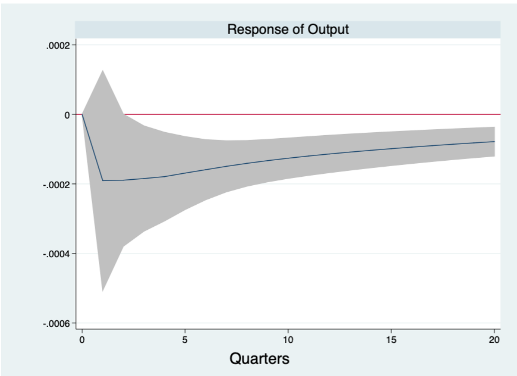
(b) Response of Market Return to 1 standard deviation shock to Aggregate tax.



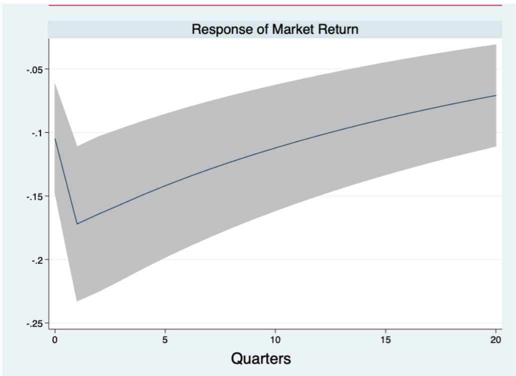
(c) Response of Output to 1 standard deviation shock to Income tax.



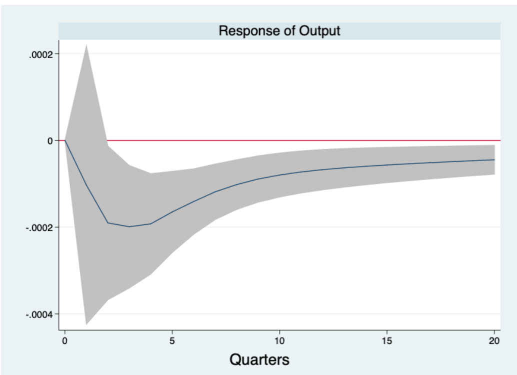
(d) Response of Market Return to 1 standard deviation shock to Income tax.



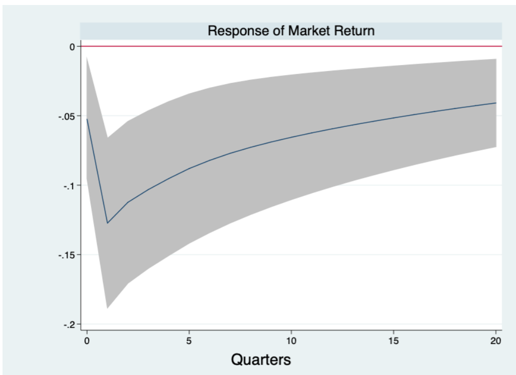
(e) Response of Output to 1 standard deviation shock to Corporate tax.



(f) Response of Market Return to 1 standard deviation shock to Corporate tax.

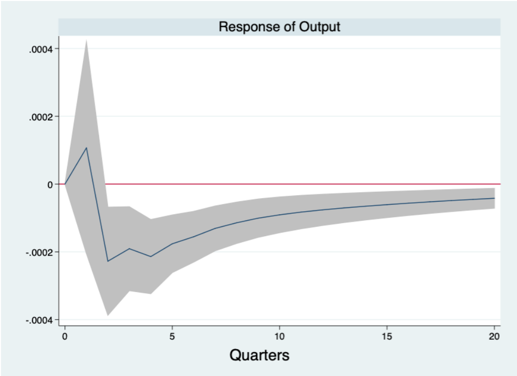


(g) Response of Output to 1 standard deviation shock to Social Security tax.

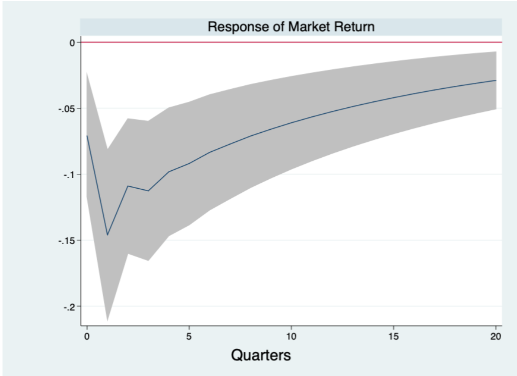


(h) Response of Market Return to 1 standard deviation shock to Social Security tax.

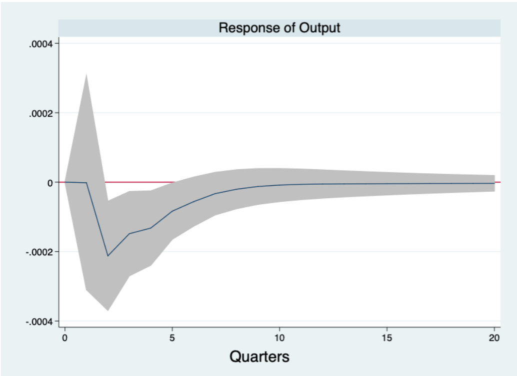
Figure A6. Impulse responses of output and the market return when there is a correlation between market return and interest rate. The confidence intervals are one-standard deviation error bands.



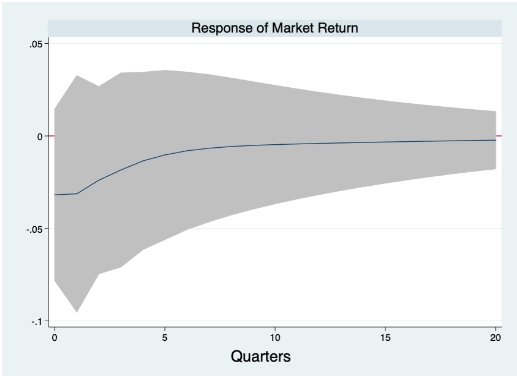
(a) Response of Output to 1 standard deviation shock to Aggregate tax.



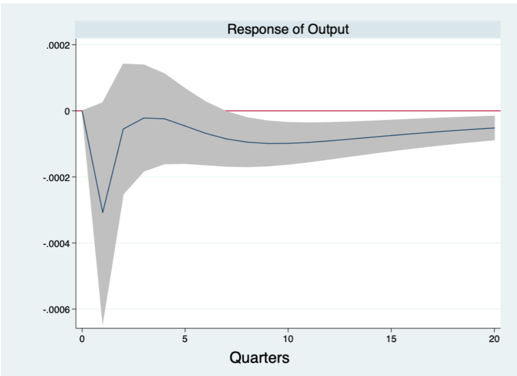
(b) Response of Market Return to 1 standard deviation shock to Aggregate tax.



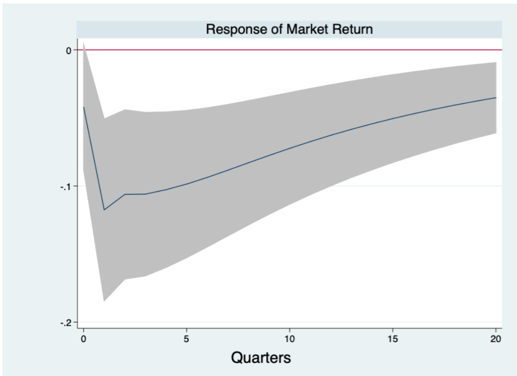
(c) Response of Output to 1 standard deviation shock to Income tax.



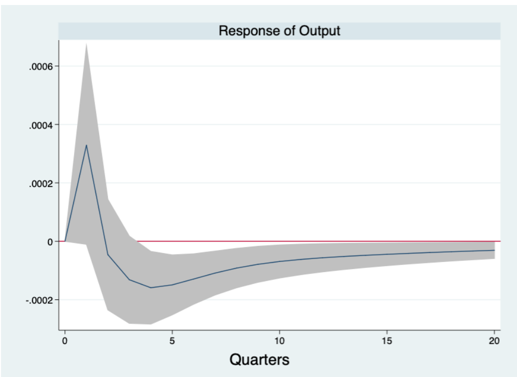
(d) Response of Market Return to 1 standard deviation shock to Income tax.



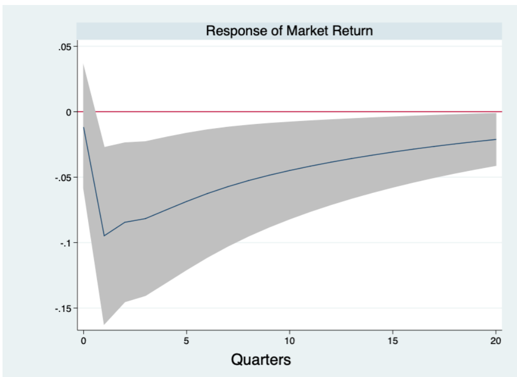
(e) Response of Output to 1 standard deviation shock to Corporate tax.



(f) Response of Market Return to 1 standard deviation shock to Corporate tax.



(g) Response of Output to 1 standard deviation shock to Social Security tax.



(h) Response of Market Return to 1 standard deviation shock to Social Security tax.

Figure A7. Impulse responses of output and the market return when I run the benchmark model from 1960:Q1 to 2007:Q4. The confidence intervals are one-standard deviation error bands.