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Abstract

This study assesses how fiscal policy affects the dynamics of asset markets, using Bayesian vector autoregressive models. We use sign restrictions to identify government revenue and government spending shocks, while controlling for generic business cycle and monetary policy shocks. In addition to examining the effects of anticipated and unanticipated revenue and spending shocks, we also analyse three types of fiscal policy scenarios: a deficit-financed spending increase, a balanced budget spending increase (financed with higher taxes), and a deficit-financed tax cut (revenue decreases but government spending stays unchanged). Using South African quarterly data from 1966:Q1 to 2011:Q2, we show that a deficit spending shock does not affect house prices, but temporarily exerts a positive effect on stock prices. With a deficit-financed tax cut shock, house prices increase persistently while stock prices increase quickly, but only temporarily. A balanced budget shock permanently decreases house prices and temporarily reduces stock prices.

Keywords: Bayesian Sign-Restricted VAR, fiscal policy, housing prices, stock prices.

JEL Classification: C32, E62, G10, H62.

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1. Introduction

The recent global financial crisis demonstrates that boom/bust cycles in asset prices can dramatically affect macroeconomic stability, especially output and price stability. With an abrupt economic downturn, and end to the Great Moderation, the business cycle re-emerged as a pressing issue. This current crisis and its aftermath forced macroeconomists to reflect seriously on their understanding of the macroeconomy.

Since the early 1980s, macroeconomists focused on the causes of the Great Moderation. This period experienced the growth in various asset classes, cyclical events such as the Russian and Asian crises, commodity booms, consolidating fiscal balances and successful efforts to control inflationary pressures. Many pundits argued that macroeconomists and policy makers well understood the macroeconomy and, thus, successfully managed its movements. Critics disagreed and attributed the Great Moderation to good luck and/or structural change. Did it reflect good monetary policy, good fortune, structural change, or some other explanation? The financial crisis and the Great Recession proved that many economists and policy makers did not fully understand the mechanisms that drive the macroeconomy or how business cycles work.

The housing and stock markets traditionally lead business cycle movements (Stock and Watson, 2003; Leamer, 2007 and; Gupta and Hartley, forthcoming), although the stock market frequently gives false signals. The onset of recessions in the post-WWII period typically occurred when the central bank ended an expansion by raising interest rates to subdue inflation. Higher interest rates cause a hiccup in the housing and stock markets and they turn down prior to the overall decline in economic activity.

The importance of monetary and fiscal policy in sustaining economic growth during and after the financial crisis became, once again, a dominant area of study. Analysts typically focus on monetary policy to consider the linkages between economic policy and asset

markets.[1] Whilst monetary policy dominated the field of academic and policy discussions on controlling elements of the business cycle, fiscal policy became key when monetary policy reached the zero interest rate lower bound and became ineffective in stimulating demand during the recent recession (Feldstein, 2009). Large and persistent fiscal stimulus, however, can lead to long-term unsustainability of sovereign finances as seen when analysing current government bond markets (Schuknecht *et al.*, 2009). Researchers need to disentangle this effect, however, from the mess left by financial institutions in Europe and the US. Furthermore, this may lead to business cycle de-synchronization (Rafiq and Mallick, 2008; Mallick and Mohsin, 2007, 2010) or negatively affect the nexus between monetary and financial stability (Castro, 2011; Granville and Mallick, 2009; Sousa, 2010a).

The behaviour of asset markets and their prices emerges, once again, as an important factor for the decision making of financial institutions, homeowners and consumers, businesses, and policy makers. The linkages between the financial market and the banking system, the housing sector, and the credit market produced strong and powerful effects in the course of the financial turmoil (Afonso and Sousa 2011). According to the European Central Bank (ECB, 2010), a variety of mechanisms exist through which asset prices can affect consumption spending. For example, a wealth effect working through consumers and a "*q*-effect"[2] working through businesses can affect asset prices. Housing bubbles, which arose in most developed and emerging-market countries prior to the financial crisis, led to unsustainable borrowing by homeowners to finance consumption against "seemingly" permanent increases in their equity holdings. If *q* increases as a result of an increase in equity prices, the firm can raise more capital by issuing new equity. This makes it more attractive for firms to raise new capital, thus increasing investment demand, which may, in turn, lead to

[1] For detailed international literature reviews on studies involving monetary policy and asset prices, see Bjørnland and Leitemo (2009), Iglesias and Haughton (2011), Gupta *et al.*, (2012a, b), and Bjørnland and Jacobsen (forthcoming).

[2] Tobin's *q* equals the ratio of the stock market value of a firm to the replacement cost of its capital.

higher prices for goods and services. Additional effects can stem from residential property prices, which, via higher wage demands by workers, may lead to increases in both the prices of goods and services and, therefore, consumer prices. Finally, movements in asset prices can significantly affect business and consumer confidence. Hence, researchers now focus their attention on the relationship between macroeconomic variables, wealth, and asset returns (see Sousa, 2010b, 2010c; Afonso and Sousa, 2011a, 2011b; Peretti *et al.*, forthcoming; and Simo-Kengne *et al.*, 2012a for detailed literature reviews).

Our understanding of the transmission of fiscal policy innovations to asset markets is limited, however, exists because of the few studies concentrating on US and industrialized European markets (e.g., Afonso and Sousa; 2011a, 2011b and references cited therein). Various channels exist whereby fiscal policy can affect stock and housing markets (Afonso and Sousa; 2011a, 2011b). For instance, fiscal policy can influence stock markets via its effect on sovereign risk spreads. These spreads, in turn, reflect the financing capacity of government as well as investor expectations. When the markets deem that fiscal policy is stable, then an inflow of capital causes the exchange rate to appreciate and subsequently to reduce pressures on central bank authorities to raise interest rates. Since demand for government bonds strengthen, the overall bond yield curve falls, which affects the stock market. Increasing public deficits through the government's wage bill, however, can lead to a deteriorating lending environment, as this could lead to an increase in the demand for credit that pushes interest rates higher. Consequently, the present discounted value of the cash-flows generated by stocks falls, the markets require a higher risk premium, and stock prices shrink. Finally, unsound fiscal policies can prompt a loss in the confidence of home-currency assets and generate a rebalancing of asset portfolio composition away from domestic assets toward foreign assets.

Fiscal policy can also affect housing markets. For example, taxes on housing capital gains and the imputed rental housing value, fiscal subsidies and value added taxes (VAT) on purchases of new houses, and the tax deductibility of mortgage payments and housing rents can importantly affect housing prices via their effects on households' disposable income and the demand of houses. An indirect effect of fiscal spending through the wage bill and government infrastructure spending can lead to both increases and decreases in the demand for homes. More broadly, the deterioration of the fiscal stance and uncertainty about the long-run sustainability of public finances can affect long-term interest rates and negatively impinge on the financing conditions for mortgages, pushing housing prices downwards. Hence, we should not neglect the role of fiscal policy in explaining both housing market developments and stock market dynamics.

Despite the large number of studies analysing the macroeconomic effects of fiscal policy (see Mountford and Uhlig, 2009 and Afonso and Sousa, 2012 for detailed reviews) and the importance of asset markets over the business cycle (Afonso and Sousa, 2011a, 2011b and Iacoviello, 2010, 2011), an important gap in the literature exists regarding the empirical relationship between fiscal policy actions and developments in asset prices, especially in emerging market economies. This study concentrates on South Africa, given our familiarity with the economic structure of the economy. In South Africa, non-housing wealth (housing wealth) equals 49.95 per cent (31.13 per cent) of household's total assets and 61.59 per cent (38.41 per cent) of household's net worth in 2011 (Aye *et al.*, forthcoming). Hence, it is not surprise that recent evidence (Aron and Muellbauer, 2006; Das *et al.*, 2011; Ncube and Ndou, 2011; Simo-Kengne *et al.*, 2012b; Peretti *et al.*, forthcoming; and Aye *et al.*, 2012) of significant spillovers onto consumption and output from not only the stock market, but also the housing market. Also, as highlighted by the time-varying approaches of Peretti *et al.*, (forthcoming) and Aye *et al.*, (2012), the South African economy began slowing by the end

of 2007, as the stock and housing markets entered deep bear markets (Venter, 2011 and Simo-Kengne *et al.*, 2012c).

In spite of declining interest rates since October 2008, the housing market, in particular, remains weak and asset markets, in general, experienced much volatility. This paper analyses fiscal policy shocks on the stock and housing markets, given their importance in the real economy. Given the variables included in our framework (discussed in detail below), however, we also analyse simultaneously the effect of business cycle and monetary policy shocks on stock and house prices, as well as macroeconomic activity, thus contributing to the limited, but growing, literature on the linkages between fiscal policy and asset markets. We model the asset prices in a unified framework, using a parsimoniously restricted multivariate time-series model, where we primarily examine the effects of fiscal policy on both house and stock prices. We consider how stock and house prices respond to the business cycle, and monetary policy and fiscal policy shocks. Moreover, to the extent that we find a link between them, we look at the magnitude and the persistence of these effects.

Authors use various identification schemes to identify monetary policy shocks, fiscal policy shocks, and business cycle shocks. Sims (1972, 1980) promotes the use of a vector autoregressive (VAR) method to capture the monetary and fiscal policy stance. Analysts use the innovations in a monetary aggregate or an interest rate to measure the monetary policy shock. Uhlig (2005) identifies a monetary policy shock by directly imposing sign restrictions on impulse responses of chosen variables for a few periods just after the shock. Mountford and Uhlig (2009) extend Uhlig (2005) and identify fiscal policy shocks as a government revenue or government spending shocks by imposing sign restrictions on the VAR's impulse responses, while controlling for business cycle and monetary policy shocks. Using the method of Mountford and Uhlig (2009), this paper examines the effects of fiscal policy shocks, controlling for business cycle and monetary policy shocks, on stock and house prices,

and macroeconomic activity, for South Africa from 1966:Q1 to 2011Q2. Besides the stock and house prices, we follow Mountford and Uhlig (2009) in choosing the other variables in the VAR, which are namely, real household consumption, real non-residential investment, real GDP, total government expenditure, total government revenue, the real wage, the 3-month Treasury Bill rate, and the consumer price index (CPI).[3] Given the uncertainty, and mostly, unavailability of information about the elasticity of economic activity with respect to fiscal policy variables, we implement the approach of Mountford and Uhlig (2009) over the one taken by Afonso and Sousa (2011), Agnello and Sousa (forthcoming) and Agnello et al., (2012) in identifying the fiscal policy shocks. Further, Mountford and Uhlig's (2009) sign restriction approach allows us to go beyond the standard (anticipated and unanticipated) government revenue and spending shocks and explore fiscal policy scenarios such as deficit spending, a deficit financed tax cut, and balanced budget fiscal spending policy.

A few studies (e.g., Du Plessis *et al.*, 2007, 2008 and Jooste *et al*., 2012) employ structural VARs and vector error-correction (VEC) models, time-varying VARs, and dynamic stochastic general equilibrium (DSGE) models to analyse simultaneously the effects of business cycle, monetary policy, and fiscal policy shocks on output, consumption, inflation, and interest rates in South Africa. To the best of our knowledge, this is the first study to analyse simultaneously the effects of these shocks on South African asset prices. That said, the literature on the effect of monetary policy on asset prices in South Africa includes numerous studies. A number of those studies examine the effects of monetary policy on equity prices (returns) in South Africa (Smal and Jager, 2001; Coetzee, 2002; Prinsloo, 2002; Durham, 2003; Hewson and Bonga-Bonga, 2005; Alam and Uddin, 2009; Chinzara, 2010; Mallick and Sousa 2011; Mangani, 2011; and Muroyiwa, 2011), mainly based on (structural) VAR models and, at times, panel data approaches that include South Africa. On

[3] In addition to these eight variables, Mountford and Uhlig (2009) include consumption and commodity price indexes, replacing our two asset prices.

the other hand, we know of only four studies -- Kasai and Gupta (2010), Gupta *et al.*, (2010), Ncube and Ndou (2011), and Simo-Kengne *et al.*, (2012c) -- that analyse the role played by the housing market in the monetary policy transmission mechanism, using the effect of monetary policy shocks on house prices in structural, factor-augmented, and Markov-switching VAR models. These studies generally show that contractionary monetary policy leads to lower stock and house prices. Our study, thus, extends the literature on business cycle and policy shocks in South Africa by considering the effects of these shocks simultaneously on asset prices, in particular, and the macroeconomy, in general.

The rest of the paper unfolds as follows: Section 2 outlines the identification procedure of Mountford and Uhlig (2009) and describes the data and their sources. Section 3 presents our empirical results. Finally, Section 4 concludes.

2. Identification Procedure and Data Description

The identification of fiscal shocks confronts the researcher with several issues.[4] First, changes in fiscal variables combine the effects of exogenous policy shocks and endogenous responses to shocks in other macroeconomic variables, such as business cycle and monetary policy shocks. To address this issue, we first identify business cycle and monetary policy shocks and then construct the fiscal policy shocks such that they lie orthogonal to the business cycle and monetary policy shocks calculated in the first stage.

Second, fiscal shocks can exert effects on the economy based on the announcement of the change. For example, the announcement of a future tax cut can affect spending decisions now before the actual tax cut goes into effect. We address this issue by considering fiscal policy shocks that do not respond for several quarters after which the fiscal shock actually begins to occur.

[4] The opening discussion in this section relies on similar discussion in Mountford and Uhlig (2009).

Finally, the meaning of a fiscal shock to researchers receives less consensus than a monetary policy shock, which most researchers will concede amounts to an unexpected increase (decrease) in the interest rate. We follow Mountford and Uhlig (2009) and define two types of fiscal shocks – government revenue and government spending shocks – from which we construct the various fiscal experiments in what follows. More specifically, tax revenue includes tax receipts minus transfer payments, whereas government spending excludes transfer payments. Thus, we define government spending and government revenue shocks such that the exogenous shock persists for a certain period of time so as to exclude short-term fiscal shocks.

Table 1 summarizes our identifying sign restrictions on the impulse responses. Following standard practice in VAR models with shocks identified via sign-restrictions, we do not impose any restrictions on how the variables of concern, mainly house and stock prices, respond to shocks. As in Mountford and Uhlig (2009), we define a business cycle shock as a shock that jointly moves output, consumption, non-residential investment, and government revenue in the same direction for four quarters after the shock.[5] This orthogonality assumption on the responses of output and government revenue precludes the possible linkage of unexpected tax cuts, whereby positive co-movements of government revenues and output come from a short-term "Laffer Curve" or "fiscal consolidation" effect from a surprise rise in taxes. That is, the orthogonality assumption prevents a fiscal consolidation that leads to higher government revenue and to an expanding economy from appearing in our analysis as a fiscal shock.[6]

[5] Following Mountford and Uhlig (2009), we identify the business cycle shock by a criterion function, which rewards large impulse responses in the right directions more than small responses and penalizes responses of the wrong sign, since we associate business cycles with the more substantial movements in these variables.

[6] While the financial crisis and Great Recession caused some governments to consider fiscal consolidation as a response, the empirical evidence suggests that successful fiscal consolidations prove few and far between. When success occurs, it comes from idiosyncratic factors. See Miller and Russek (2003) and Guajardo *et al.*, (2011).

A monetary policy shock drives the interest rate up and the price level and the real wage rate down for four quarters after the shock. Uhlig (2005) makes similar identifying restrictions. We also construct the monetary policy shock such that it lies orthogonal to the business cycle shock, which, in turn, allows us to filter out the effects of these shocks on the fiscal variables. That is, we attempt to purge the fiscal shocks of endogenous responses to business cycle and monetary policy shocks.

We identify fiscal policy shocks only through restricting the impulse responses of the fiscal variables, coupled with the requirement that they lie orthogonal to both business cycle and monetary policy shocks. That is, the two basic fiscal shocks, government spending and government revenue shocks, use restrictions only on the government expenditure and revenue variables, with responses restricted for one year after shock.[7]

The data on components of South African national income (consumption, non-residential investment, GDP, total government expenditure and total government revenue) and the nominal compensation of employees (nominal wage income) come from the *Quarterly Bulletins* of the South African Reserve Bank. The data on the 3-month Treasury bill rate, the consumer price index (CPI), and the All Share Stock Index (ALSI) come from the IMF's International Financial Statistics database. The house price index comes from the Amalgamated Bank of South Africa (ABSA). Given that the house price data start in 1966:Q1, our analysis uses data from 1966:Q1 to 2011:Q2, even though the other variables are available from 1960 onwards. We express all components of national income and the compensation of employees in real per capita terms, transforming their nominal values by dividing by the CPI and population (interpolated from their annual values), while we express stock and house prices in real terms by dividing them with the CPI. The population comes from the World Bank's World Development Indicators. For data available at monthly

[7] We refer interested readers to Appendix A of Mountford and Uhlig (2009) for further details on the estimation as well as on the implementation of the identification strategies.

frequencies (interest rate, CPI, ALSI, house price index), we take the arithmetic average of the monthly observations to produce our quarterly observations. We exclude transfer payments from the measure of government expenditure, since we expect the former to vary over the business cycle. Data for the transfer payments comes from the South African Reserve Bank as well.

The Bayesian VAR methodology of Sims and Uhlig (1991) and Uhlig (2005) remains robust in the presence of non-stationarity variables and it does not force the variables to exhibit a long-run relationship (cointegration) between them, but it does not prevent it from occurring. Therefore, this study uses the variables in the VAR model in levels. The VAR system consists of the 10 variables (real per capita GDP, real per capita consumption, real per capita government expenditure, real per capita government revenue, real per capita wages, real per capita investment, the 3-month Treasury bill rate, the real stock market index, the real house price index, and the CPI series) at quarterly frequency from 1966:Q1 to 2011:Q2 with 6 lags (chosen by the Schwartz Bayesian Information Criterion). The VAR specification does not include a constant or time trend and uses the natural logarithm for all variables except the interest rate, where we use the percentage level. We use seasonally adjusted series. This study follows the identification procedure proposed by Mountford and Uhlig (2009) and Uhlig (2005) for determining the shocks with the zero restriction based on the penalty functions for impulse responses of some variables in the benchmark VAR model for some period. We identify the shocks for each draw from the posterior and the 16^{th}, 50^{th}, and 84^{th} quantiles.

3. Empirical Results

3.1 Business Cycle, Monetary, and Fiscal Shocks

Figures 1 to 9 illustrate the results of the response of the series to the shocks. That is, the impulse responses for these fundamental shocks appear in these figures, where we plot the

impulse responses of all 10 variables to each shock.[8] The figures plot the 16th, 50th, and 84th quantiles of these impulse responses, calculated at each horizon between 0 and 24 quarters after the shocks (Mountford and Uhlig, 2009 and Uhlig, 2005). For the fiscal policy shocks, we also report the impulse responses for both anticipated (announced) and unanticipated basic government revenue and expenditure shocks.

3.1.1 Business Cycle Shocks

To begin, we determine the effects of a business cycle shock to provide a benchmark for analysing the effects of various fiscal shocks, the primary focus in this study. To evaluate the effect of the business cycle shock, we report the responses of real per capita GDP, real per capita consumption expenditure, real per capita government revenue, real per capita government spending, real per capita wages, real per capita investment spending, the 3-month Treasury bill rate, the real stock price index, the real house price index, and the CPI for twenty-four periods in Figure 1.

While the real stock price index responds positively and significantly through the first six quarters after the shock, it exhibits a negative and strong response from the 11th to the 17th quarter. Intuitively, during the expansion period, traders expect higher future dividends and lower discount rates. As a result, the real stock price index increases. Whereas about 3 years after the initial business cycle shock, investors must expect lower future dividends and so the risk on equity investment increases. As a result, the real stock price index decreases.

The real house price index also exhibits a positive response to the business cycle shock during the first 12 quarters, although only significant through the first five quarters. In the typical response of a perfect capital market, one initially expects overshooting of house

[8] We also estimate the forecast-error variance decompositions (FEVDs) based on zero restrictions and the experiment with sign restrictions rather than penalty functions. The estimation results obtained for these yield similar results as the zero restriction approach with penalty functions. Therefore, we do not report the estimation results for impulse responses and FEVDs with sign restrictions rather than penalty functions. The results are available upon request from the authors.

prices followed by a gradual adjustment towards the long-run equilibrium level. Although the shock exerts no effect on the real house price index from the 12th to the 18th quarter, it generates a negative, though insignificant, effect after the 18th quarter. In summary, the real house price index shows a significant and positive response to a positive business cycle shocks for 4 quarters.

Note that the response of the real house price index to a business cycle shock differs from that of the CPI. The initial response of the CPI to a positive supply shock is negative and significant for two quarters, as predicted by the standard neoclassical macroeconomic theory. The CPI, however, responds positively and significantly to positive supply shocks from the seventh quarter through the end of the impulse period, probably due to increased demand.

After the business cycle shock, the responses of government revenue, wages, and the Treasury bill rate series remain positive for the entire impulse horizon, although not significantly positive later in that horizon. The response of government revenue probably reflects the effect of automatic stabilisers. A positive business cycle shock improves the various tax bases, in this case GDP, which should associate with an improvement in revenue collection (see Schoeman and Swanepoel, 2003). Also, if a permanent positive supply shock occurs, structural revenue should also increase. A tax elasticity of 1% seems appropriate (Swanepoel, 2007).

Government expenditure responds positively and significantly to the shock in the first eleven periods. While the effect on expenditure weakens after the 11th quarter, it remains positive in some periods and switches to negative in others. Fiscal policy, especially expenditure, exhibited largely procyclical movements prior to 2002 (see Du Plessis *et al.*, 2007). Post 2002, fiscal policy was geared towards more countercyclical outcomes -- debt reductions and running primary surpluses. The business cycle shock to fiscal expenditure

displays this behaviour over time. Thus, this impulse response could change with different sample specifications.

The responses of GDP and consumption to the business cycle shock remain significantly positive in the first 10 quarters, falling to around zero and insignificant from the 15th to the 24th. That is, the significant response of GDP and consumption dissipates after 10 quarters. The impulse response of investment to the shock is positive and statistically significant up to the 11th quarter. After the 14th quarter, the impulse response turns negative, but insignificant, through the 24th quarter.

3.1.2 Monetary Policy Shocks

This subsection examines the effect of the monetary policy shock on the variables considered in this study. The responses of real per capita GDP, real per capita consumption, real per capita government expenditure, real per capita government revenue, real per capita wages, real per capita investment, the 3-month Treasury bill rate, the real stock price index, the real house price index, and the CPI for twenty-four periods appear in Figure 2.

Consistent with theory, the real stock price index exhibits a negative and significant response through the 5th quarter. Intuitively, this response corresponds to the standard present-value evaluation principle. The negative effect on economic activity and, hence, on future cash flows as well as the increase in the discount factor that valuates those flows. After the 5th quarter, the effect on the real stock price index proves insignificant.

The existing literature documents that house prices respond positively to improved credit market conditions, revealing the importance of the relationship between monetary policy, especially its effect on credit conditions, and house prices. In our analysis, the initial response of house prices to monetary policy shocks presents a puzzle. The real house price index responds with a small positive and significant response for the first quarter. The response of the real house price index, however, becomes negative and significant from the

sixth to the 21st quarter. Small-scale VAR models, like ours, commonly produce this so-called *house price-puzzle* (Andre *et al.,* 2011), where house prices respond positively initially following a positive interest rate shock. Kasai and Gupta (2010) and Simo-Kengne *et al.*, (2012c) also observe this outcome for South Africa. Gupta *et al.*, (2010) argue that with house prices depending on large number of factors, small-scale VAR models cannot account for the true dynamics of house price movements. These authors suggest moving to large-scale models like FAVAR models or large-scale Bayesian VAR models, which can incorporate the information from hundreds of variables. In fact, they show that the puzzle no longer exists when one examines monetary policy shocks in a FAVAR model that include 246 variables for the South African economy. Also, more recently, Simo-Kengne *et al.*, (2012c) indicate that the *house price puzzle* probably occurs during a bull-market in house prices while analysing the effects of a contractionary monetary policy using a Markov-switching VAR model. Given that economic agents are pessimistic about the future in a bull market, the initial positive effect possibly reflects a short-lived reluctance of home sellers to realize losses during a downturn due to loss aversion (Genesove and Mayer, 2001).

The Treasury bill rate exhibits a positive and significant response to a monetary policy shock initially through the 8th quarter, and then from the 10th to the 22nd quarter the responses become negative, although generally not significant. After the 22nd quarter, the monetary policy shock appears to exert no effect on the Treasury bill rate.

3.1.3 Government Revenue Shock: Unanticipated

We construct the basic government revenue shock to lie orthogonal to the business cycle and monetary policy shocks. In addition, government revenue continues to rise for a year after the shock. Figure 3 shows the results of the impulse responses analysis of the revenue shock on real per capita GDP, real per capita consumption, real per capita government expenditure,

real per capita government revenue, real per capita wages, real per capita investment, the 3-month Treasury bill rate, the real stock price index, the real house price index, and the CPI.

An unanticipated positive government revenue shock generally creates the expected contractionary effect on the economy. GDP, consumption, investment spending, and wages fall and remain negative over the entire impulse horizon, although significant decreases only occur in the short run (i.e., 10 quarters or less). The revenue shock exerts the largest effect on consumption, followed by GDP. The real house and real stock price indexes fall significantly for about 16 and 4 quarters, respectively. The real house price index continues to remain negative, but not significantly so, through the end of the impulse period, whereas the real stock price index recovers to zero after about 8 quarters, where it generally remains until the end of the impulse period.

The initial positive response of the Treasury bill rate probably translates into a weaker real stock market price index. The contraction in GDP will also cause a persistent decline in stock prices as the overall economic investment environment weakens. Perhaps a more obvious reason for the stock market decline occurs because households substitute saving away from holding equity to paying higher taxes.

The immediate negative response of the real house price index contrasts to the monetary shock, which only affects the real house price index negatively after six quarters. This outcome may occur because banks still give preferential rates to households and businesses even with rising interest rates, whereas no tax breaks exist for future homeowners.

3.1.4 Government Revenue Shock: Anticipated

We also identify an anticipated or year-delayed shock, where we restrict government revenue to rise only after a year. Figure 4 presents the responses to this shock. The anticipated rise in government revenue affects the economy differently because of expectations. GDP, consumption, and investment spending as well as wages, the CPI, and the house price index

do not respond, at least not significantly, to the anticipated positive government revenue shock.

Nonetheless, Figure 4 also shows an immediate fall in stock prices through the 9th quarter with the responses in the 3rd through 6th quarters significantly negative. From the 10th through the 17th quarter, positive responses emerge, although the effects here are small and insignificant. As noted above, the real house price index does not respond significantly to the anticipated government revenue shock.

In sum, the findings for anticipated and unanticipated government revenue shocks generally conform to the rational expectations view of policy. That is, unanticipated policy exerts significant short-run effects, but anticipated policy does not generally produce significant effects.

3.1.5 Government Spending Shock: Unanticipated

We also construct the basic government spending shock to lie orthogonal to the business cycle and monetary policy shocks. In addition, government spending continues to rise for a year after the shock. Figure 5 reports the impulse responses results of our eight variables to the government spending shock.

An unanticipated positive shock to government spending generally produces the expected short-run expansionary effects on the economy. That is, the shock generates significant positive responses in GDP and consumption spending in the short run as well as positive response in the CPI over the entire impulse period. Wages experience a negative, but generally insignificant, response to the unanticipated positive government spending shock. Finally, investment spending falls, as government spending appears to crowd it out.

Similar to Agnello and Sousa (2011), the real house price index hardly responds to an unanticipated government shock for the entire impulse periods. Stock prices initially rise, significantly higher from the 2nd to the 8th quarter, but returns to zero after 11 quarters.

Although the decrease in real wages in response to an increase in government spending over the entire impulse period does not prove significant, Baxter and King (1983), Ramey and Shapiro (1998), and Fatas and Mihov (2001) show that an increase in non-productive government purchases financed by future lump-sum taxes exerts negative wealth effects, raises the quantity of labour supplied at any given wage, and ultimately leads to a lower real wage.

Comparing an unanticipated negative government revenue shock to an unanticipated positive government spending shock, the revenue shock generally exerts a larger and more frequently significant effect on the economy than the spending shock.

3.1.6 Government Spending Shock: Anticipated

We also identify an anticipated or year-delayed shock, where we restrict government spending to rise only after a year. Figure 6 reports the responses to this shock. The findings support Ricardian behaviour, which requires that economic agents, when anticipating an increase in spending, will possess the foresight to see the need to finance this increase in spending in the future. Thus, households save additional income today to finance the future liability caused by the government spending shock, offsetting any stimulate effect of the spending shock on consumption and output.

Consumption and output do not respond. Interest rates and investment spending move little, while wages now respond positively, but not significantly. The CPI does not respond for 7 quarters, but then rises through the end of the impulse period, although this increase is not significant.

An anticipated government spending shock exerts about the same effect as an unanticipated government revenue shock. Generally, no effects exist, since rational expectations and Ricardian equivalence hold. The government revenue shock, however, does significantly reduce the stock price index in the short run.

3.2 Fiscal Policy Analysis

We can use the basic shocks identified in the previous section to analyse the effects of three popular fiscal policies, namely, a deficit spending shock, a deficit financed tax cut, and a balanced budget spending shock.[9]

3.2.1 A Deficit Spending Fiscal Policy Scenario

Figure 7 illustrates the impulse responses for a deficit spending fiscal policy scenario. The policy scenario captures a sequence of basic fiscal shocks that ensures an increase in government spending by 1 per cent with tax revenues remaining unchanged for four quarters following the initial shock.

The deficit spending shock comes closest in design to the unanticipated government spending shock. Thus, we compare Figures 7 and 5. The deficit spending shock generates slightly bigger responses of GDP compared to the government spending shock alone. The rest of the results mirror the findings for an unanticipated fiscal spending shock.

The real stock price index rises significantly in the short run from the second to the ninth quarter. The real house price index, however, does not change significantly.

3.2.2 A Deficit Financed Tax Cut Fiscal Policy Scenario

Figure 8 shows the impulse responses for a deficit financed tax cut fiscal policy scenario. The policy scenario implements a sequence of basic fiscal shocks where government revenue fall by 1 per cent with government spending remaining unchanged for four quarters (including the initial quarter) following the initial shock.

Now, the deficit financed tax cut comes closest in design to the unanticipated government revenue shock, although with the opposite sign. Thus, in comparing the findings in Figures 8 and 3, the results reported move in opposite directions. That is, a positive deficit

[9] Refer to Mountford and Uhlig (2009) for further details on how to generate the impulse responses for these three popular fiscal policies. Note that a large number of possible fiscal policies exist, other than those considered in the text. We can analyse these policies in a similar manner as well.

financed tax cut comes from a reduction in tax revenue. The effects of the deficit financed tax cut generates about the same magnitude and frequency of significance as the unanticipated government revenue shock. The real stock and house price indexes rise significantly in the short run through the 8th and 16th quarters, respectively.

3.2.3 The Balanced Budget Spending Policy Scenario

The balanced budget spending policy scenario restricts government revenue and spending to increase equally for each period in the four-quarter window following the initial shock. For the sake of comparison, we choose a sequence of basic fiscal shocks such that government spending rises by 1% and government revenues rises by 0.872%. Note that, government revenue rises by less than government spending, since over the sample government revenue's share of GDP is 0.249, while that of government spending is 0.217. Thus, we require government revenues to rise by (0.217⁄0.249)%. We must exercise caution in interpreting the results as the shocks here indicate possible procyclical behaviour, where revenue increases at the same time as spending increases. Figure 9 shows the results.

Financing government spending through contemporaneous increases in revenue increases GDP significantly, but weakly, in the short run, whereas both consumption and investment spending fall in the short run and remain negative along with GDP in the long run. The real stock price index does not change significantly, but the real house price index falls significantly in the short run through the 10th quarter.

4. Conclusion

This study evaluates the effects of fiscal policy shocks on house and stock price indexes, while controlling for monetary and business cycle shocks using South Africa's quarterly data on 10 variables (real per capita GDP, real per capita consumption expenditure, real per capita government revenue, real per capita government spending, real per capita wages, real per capita investment, the 3-month Treasury bill rate, the real stock price index, the real house

price index, and the CPI) from 1966:Q1 to 2011:Q2. This study follows the identification procedure proposed by Mountford and Uhlig (2009) and Uhlig (2005) for determining the shocks with the zero restriction based on the penalty functions for impulse responses of some variables in the benchmark VAR model for some period. This method uses only the information in the macroeconomic time series of the VAR model together with minimal assumptions to identify fiscal policy shocks. In particular, it imposes no restrictions on the signs of the responses of the key variables of interest — real house and stock price indexes — to fiscal policy shocks.

We find that a positive business cycle shock significantly increases both real stock and real house price indexes for just over one year. A positive (contractionary) monetary shock temporarily decreases the real stock price index and gradually and persistently decreases the real house price index. An unanticipated positive shock to government revenue also temporarily reduces the real stock price index and persistently decreases the real house price index. An anticipated positive government revenue shock, however, does not significantly affect the real house price index whereas the effect on stock prices remains the same as with the unanticipated shock, although the uncertainty of the effect increases for the anticipated revenue shock. A positive shock to government spending, either anticipated or unanticipated, does not affect the real house price index, but generates a positive and significant effect on the real stock price index, if the spending shock is unanticipated.

We also examined three types of fiscal policy scenarios: a deficit-financed spending increase, a deficit-financed revenue cut, in which revenues increase but government spending stays unchanged, and a balanced budget spending increase (financed with higher revenue),. We find that a deficit spending scenario produces no effect on the real house price index, but a temporarily positive effect on the real stock price index. With the deficit-financed revenue cut scenario, the real house price index rises persistently while the real stock price index rises

quickly, but temporarily. The balanced budget scenario results in a temporary fall in the real house price index and no change in the real stock price index.

The deficit-financed revenue cut generally produces more favourable outcomes for the economy, in general, and asset markets, in particular. The effects of fiscal policy on asset prices provide important implications for risk management practices, monetary policy, and estate and financial securities valuation to ensure stability in the economy and to promote consumer and investor confidence. While our paper focuses on the role of fiscal policy as a driver of asset price dynamics, one may also question whether asset prices influence fiscal policy.

Based on the evidence provided by Das *et al.*, (2011), Peretti *et al.*, (forthcoming), Ncube and Ndou (2011), Simo-Kengne *et al.*, (2012a) and Aye *et al.*, (2012), changes in real stock and real house prices via the wealth effect affect the demand patterns in South Africa. With such adjustments leading to substantial changes in future aggregate demand, the fiscal policymaker could decide to react to such changes for the sake of stability. This argument would justify augmenting the fiscal policy rules, recently estimated for South Africa by Burger et al., (2012), with housing and stock prices, something which we leave for future research.

Our empirical results suggest that fiscal spending shocks affect stock prices more than house prices. Both spending and revenue shocks affect stock prices whereas only revenue shocks affect house prices. Given these results, policy makers will find it difficult to strike the right balance between using various fiscal tools to stabilise asset markets. Fiscal policy shocks only affect stock prices in the short run. In addition, stock prices do not respond in the same way as overall investment spending. Thus, the policy maker should make clear the objectives and understand the economic trade-offs associated with revenue and spending shocks. Monetary policy exerts a more direct effect on asset markets. Contractionary

monetary policy shocks immediately lower the real stock price index, but only temporarily, and lower the real house price index with a delay, but with a longer-lasting effect.

The direct wealth affects from changes in taxes seem far more important in setting house prices than spending shocks. The results presented in the paper consider the entire sample period and does not take into account differences between counter and procyclical policy. Future research will attempt to close this gap, specifically focusing on analysing the effect of fiscal policy shocks on asset prices over time and across different regimes. These analyses will shed further light on the consequences of high debt, procyclical fiscal policy, and uncoordinated fiscal and monetary policy on house prices and equity markets.

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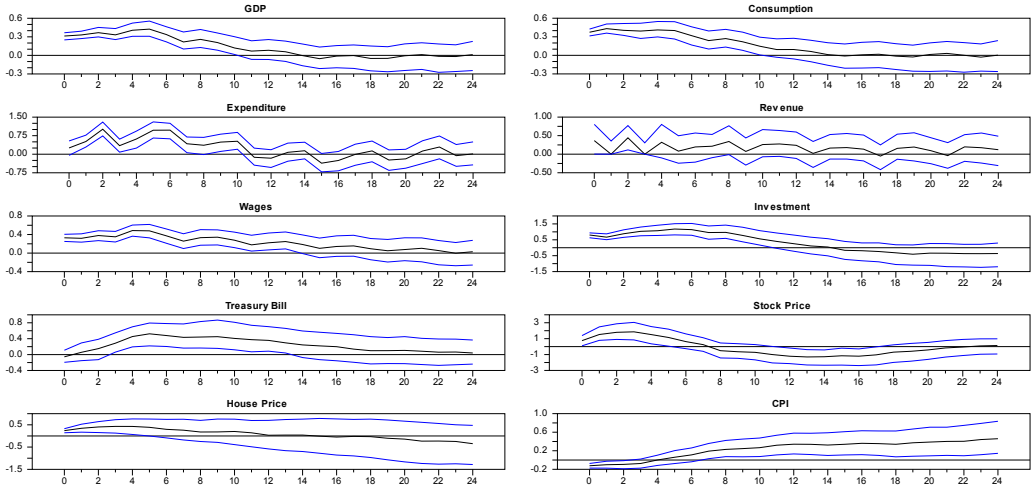
Table 1: Identifying Sign Restrictions

	Gov. Revenue	Gov. Spending	GDP, Cons, Non-Res Inv	Interest Rate	CPI, Real Wage	Asset Prices
Non-Fiscal Shocks						
Business Cycle	+		+			
Monetary Policy				+	-	
Basic Fiscal Policy Shocks						
Government Revenue	+					
Government Spending		+				

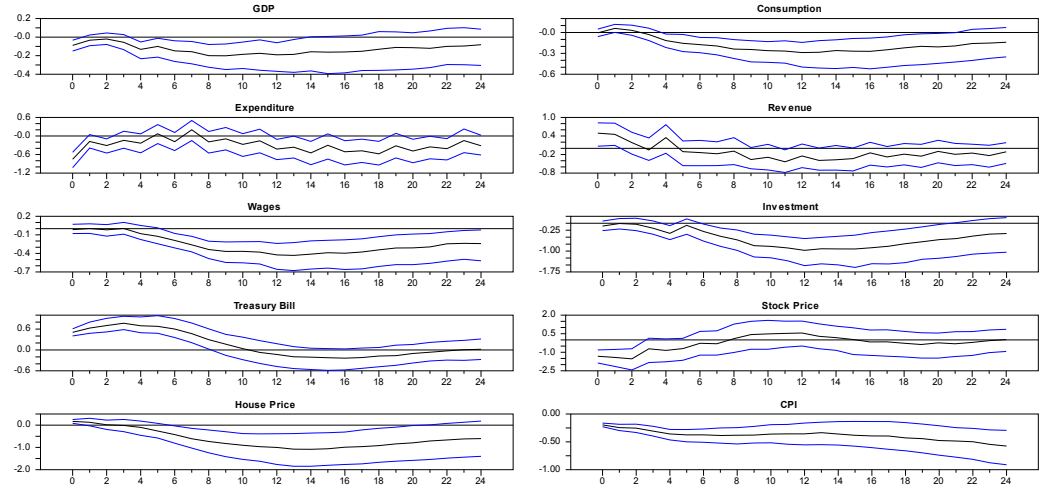
Note: This table shows the sign restrictions on the impulse responses for each identified shock. `Cons' stands for Private Consumption and `Non-Res Inv' stands for Non-Residential Investment. A "+" means that the impulse response of the variable in question is restricted to be positive for four quarters following the shock, including the quarter of impact. Likewise, a "-" indicates a negative response. A blank entry indicates that no restrictions have been imposed.

Figure 1: The effects of business cycle shock on GDP, consumption, expenditure, revenue, wages, investment, Treasury bill rate, stock price, house price, and the CPI



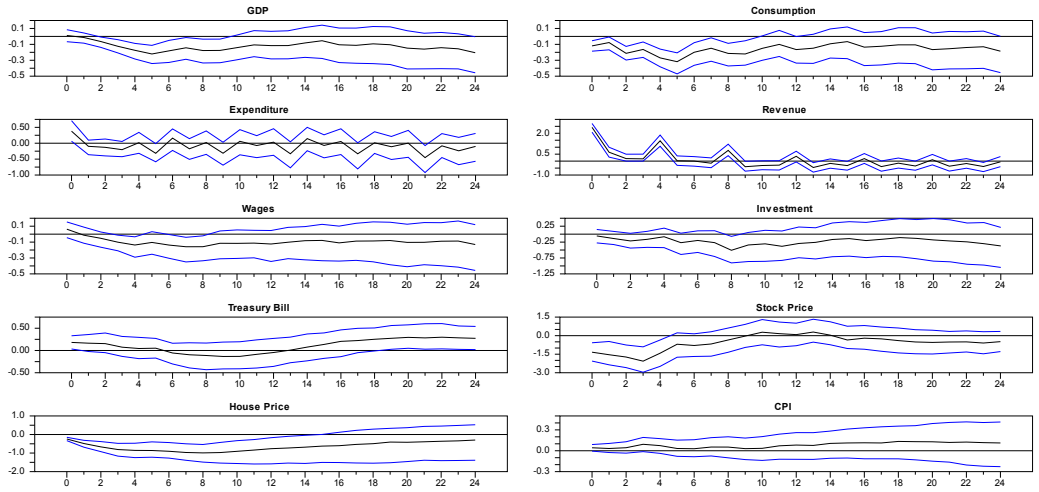
Responses to Business Cycle

Figure 2: The effects of monetary policy shock on GDP, consumption, expenditure, revenue, wages, investment, Treasury bill rate, stock price, house price, and the CPI



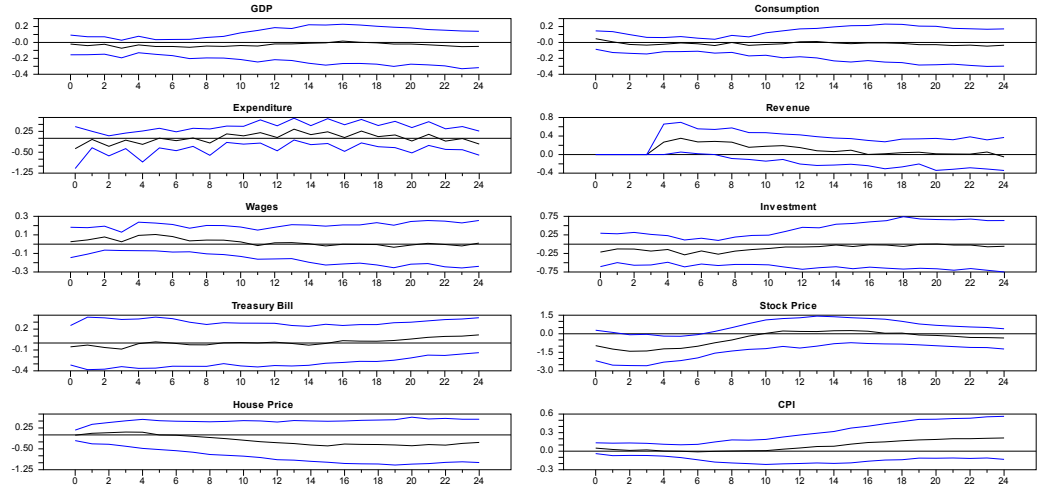
Responses to Monetary Policy

Figure 3: The effects of unanticipated basic government revenue shock



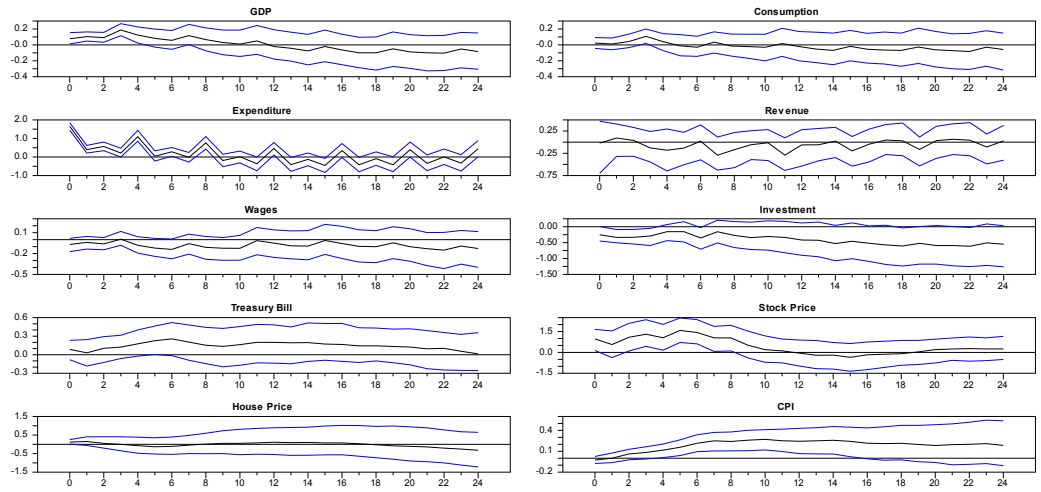
Responses to Revenue

Figure 4: The effects of anticipated basic government revenue shock



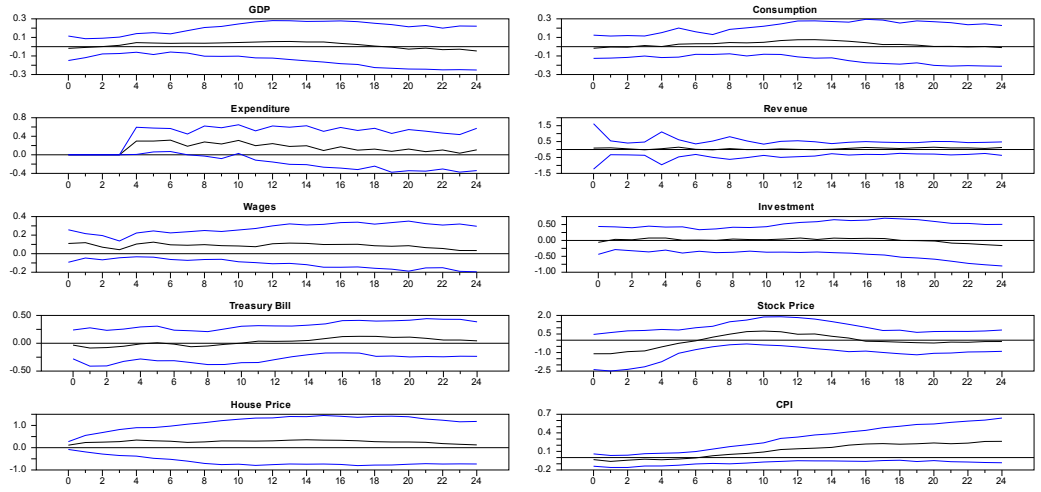
Responses to Revenue (delayed)

Figure 5: The effects of unanticipated basic government spending



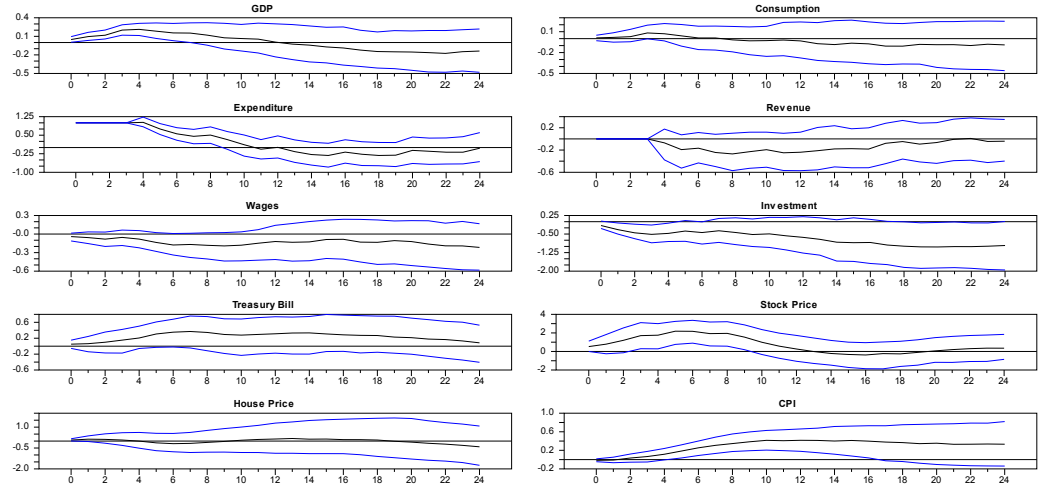
Responses to Spending

Figure 6: The effects of anticipated basic government spending shock



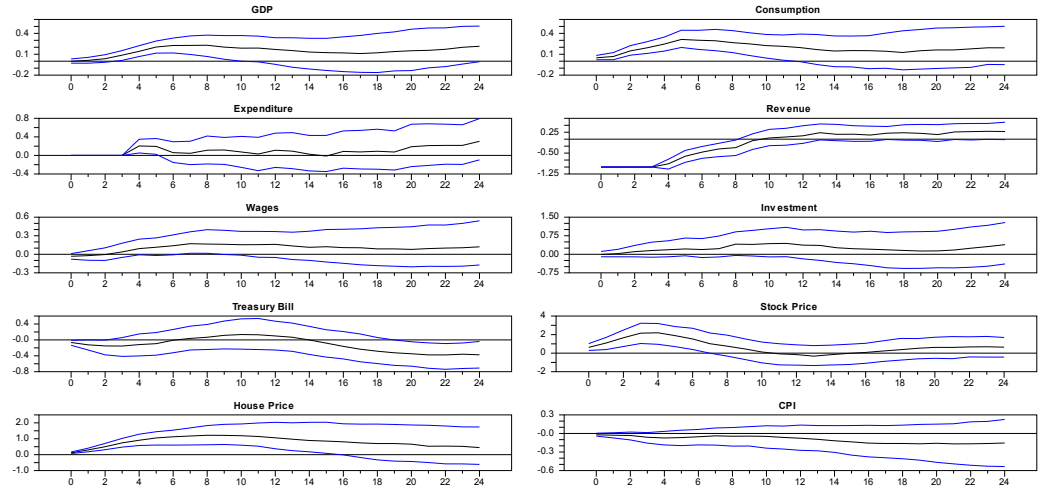
Responses to Spending (delayed)

Figure 7: The deficit spending policy scenario



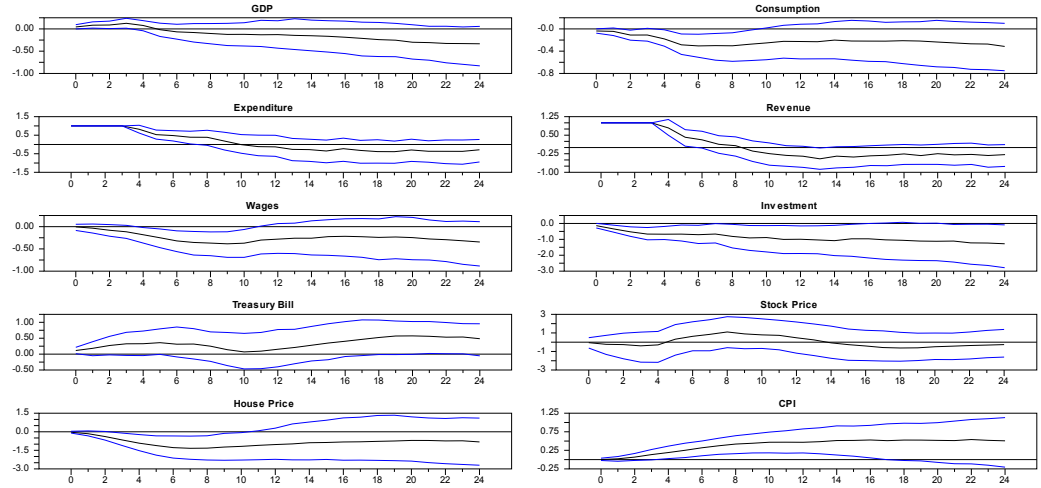
Responses to Deficit Spending

Figure 8: The deficit tax cut policy scenario



Responses to Deficit Tax Cut

Figure 9: The balanced budget policy scenario



Responses to Balanced Budget