Effect of Fiscal Policy Shocks in Brazil

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Abstract

This article makes a comprehensive assessment of the effect of a fiscal policy shock in Brazil. I found that gross domestic product does not rise in the short run in response to the fiscal policy shock albeit it rises in the long run. In addition, I found that unlike an advanced economy like the USA, the response of both fiscal and monetary variables estimated in the VAR are very volatile with the stock price index which represents Brazil's financial sector in the VAR model responding negatively (revenue shock) to the policy innovation in the short run while rising and falling below the steady state several times throughout the forecasting horizon. Possible explanations for these results includes weak economic and political institutional frameworks leading to weak transmission mechanisms of fiscal policy innovations. In fact when government expenditure is not used for infrastructure projects, utility-generating economic activities or externalities that gets onto the economic production function, then extra government expenditure ends up taking resources away from the Brazilian economy.

Introduction
Motivation for Research

The global financial crises produced new and distinctive economic challenges for policymakers and demanded extraordinary policy responses. The early stages of the crises called for an exceptional monetary policy response to stabilise the global financial system but the credit channel was found to be uncharacteristically weak thus prompting governments to turn to fiscal policy to enhance aggregate demand and revive economic growth. During the said global economic crises, advanced economies were in recession but growth markets like Brazil continued to grow albeit not as fast as pre 2008 recession levels. In fact while output in advanced economies had fallen from an average of 1.8% to -5%, emerging economies were on average growing at a rate of 1% from a pre-recession high of 7% (Abiad, et al., 2012) prompting analysts to make a case for an economic decoupling of emerging economies from advanced economies (ibid).

The transmission mechanism of a fiscal policy shock is well understood in advanced economies but not so much in emerging economies for two reasons. Firstly, a majority of the research on fiscal policy shocks have been on advanced economies (Caldara & Kamps, 2008; Blanchard & Perotti, 2002; Cimadomo & Bénnasy-Quéré, 2012) and while availability of data may be the reason, it means that our understanding of the response of fiscal and monetary variables to fiscal policy innovations in emerging economies is limited. Secondly, the low incidence of domestic and external shocks as pertains to emerging economies (Abiad, et al., 2012) implies a paucity of qualitative evidence on the response of fiscal and monetary variables to a positive government spending and revenue shock.

To help address the knowledge gap, I studied the effect of a fiscal policy shock in Brazil which is a prototypical and prominent emerging economy. I chose to study Brazil firstly for data purposes and secondly because emerging economies – especially Brazil, Russia, India and China (BRIC) - are the main drivers of global economic growth (Khanna, et al., 2005) whose economic development are likely to eclipse most of the current rich countries in the World by 2050 (Goldman Sachs, 2001). In fact Jim O'Neil who is Chairman of Goldman Sachs Asset Management estimates that BRIC will add $13 trillion to their collective GDP by 2020 while Brazil alone adds $1 trillion to her GDP in the same period ahead of advanced economies like Germany and the UK (University of Surrey School of Economics Alumni

Lecture, 2012) thereby raising crucial economic policy questions linked to the global economic impact of fiscal and monetary policy in the BRIC (Goldman Sachs, 2001) especially in relation to the aggregate demand and subsequent economic growth effects of fiscal policy. Thus, I assessed the effect of fiscal policy shock on Brazil's economy. Specifically, I assessed the impact via changes in Gross Domestic Product (GDP) and via the behaviour of inflation, interest rate and the stock price index after the fiscal policy innovation. The fiscal multiplier which describes the change in GDP that is due to a change in spending or tax policy was also looked at.

I found that for a linear trend analysis, unlike advanced economies, extra government expenditure was not expansionary but tax cuts was expansionary. Revenues and interest rates rose after positive government expenditure shock for both a linear and quadratic trend analysis. And the later causing a short run fall in inflation after policy innovations for both a linear and quadratic trend analysis. For the financial sector of Brazil's economy, the stock price index as specified in the VAR model rose sharply in response to a positive government expenditure shock but falls in response to a revenue shock for both linear and quadratic trend analysis. Overall, unlike the pattern seen for advanced economies, the fiscal and monetary variables are highly volatile in response to the policy innovations.

The conclusion is that the opaque nature of Brazil's economic and political institutions implied that the transmission mechanism is weak offering an explanation for the high volatility of output, inflation, interest rate and stock price index. In terms of the observed negative output, I concluded that expansionary fiscal policy that is not used for infrastructure projects, utility-generating economic activity or positive externalities takes resources away from the Brazilian economy.

Literature Review

Theoretical Literature

Fiscal policy underscores the impact of government spending and taxation on aggregate demand against the backdrop of the microeconomic effects of resource allocation and distribution (Allsopp & Vines., 2005) including the provision of socioeconomic safety nets. At the crux of fiscal policy is *economic welfare* - as an increase in government spending increases or improves public goods and services (discounting the cost of financing a deficit if net tax receipts are less than government expenditure) while low taxes increases real disposable incomes thus increasing the propensity to consume and inducing economic agents to decide between savings and investment or both. Indeed the art of making fiscal policy with its concomitant transmission mechanisms is crucial for governments as voters, public institutions such as the central bank, investors and policymakers need the policy awareness in order to determine whether the fiscal policy regime is effective enough to stimulate and sustain economic growth both in the short and long run without causing a fiscal crisis (Mauro, et al., 2013).

The two competing school of thoughts are that high fiscal deficits threaten to crowd out private spending and significantly undermine market confidence as interest rates rise (neoclassical or real business cycle theory) while the Keynesian outlook makes a strong case for the inoperability of fiscal contraction during a loss in economic output (as the proverbial "*green shoots*" will not be aided) due to model assumptions that both prices and wages are inflexible (sticky) and aggregate supply curve is vertical as prices adjusts to meet aggregate demand at full employment in an open economy. The role of fiscal policy as a macroeconomic tool is even more profound when the interest rate is at the lower zero bound e.g. the current US Federal Reserve policy rate (The Economist, 2012). At the zero bound policy rate ($R_{n,t} \geq 0$), the central banker is unable to stabilise economic output and inflation through the manipulation of interest rate (Cecchetti, 2000) and expansionary fiscal policy therefore becomes an indispensable macroeconomic policy tool for the central government. In fact, recent DSGE studies have emphasised that at the lower zero bound constraint, economic growth is largely dependent on aggregate demand and thus all policies should be geared towards stimulating demand in the short run as spending cuts can actually increase budget deficits at the lower bound constraint (Denes, et al., 2013). This also makes a strong case for tax cuts which stimulate demand and - eventually economic growth - and also increase the economic welfare of the poor. In fact fiscal policy shock can be an increase in government expenditure or tax cuts (Jawadi, et al., 2011).

Table 1: The Effects of a Positive Government Spending Shock using Theoretical Models

Theoretical Framework	GDP	Interest Rate	Inflation	Stock Price Index
Neoclassical RBC	+	+	0	+
DSGE Nominal Frictions	+	__	+	---
DSGE Deep Habits	+	---	----	+

Source: Adapted from Fragetta & Melina, 2011 & Jawadi, et al., 2011.

Table 1 above summarises the expected qualitative results found in the theoretical literature for a positive government spending shock.

Empirical Literature

The VAR literature on impact of fiscal policy shocks have generally shown that positive government spending shocks have a positive impact on gross domestic product and positive tax shocks reduces economic growth *(IS Curve shifts to the left)* while both tax hikes and spending increases reduces private investment in the economy (Caldara & Kamps., 2008; Blanchard & Perrotti., 2002). In fact, the said observation is irrespective of the type of identification approach used (Caldara & Kamps, 2008) and is consistent with both Keynesian and neoclassical theories. Theoretically, expansionary fiscal policy either in the shape of spending increase or tax cut pushes interest rate up and contractionary fiscal policy in the form of spending cuts or tax hikes forces interest rates down (Kirsanova, et al., 2005; Leith, et al., 2003) and this contrasts with the empirical evidence from Malik (2013) wherein a positive spending shock brought an increase in the policy rate albeit Dynamic Stochastic General Equilibrium modelling was used. Furthermore, Chatziantoniou, et al., (2013) in using the VAR framework elucidated that fiscal policy and interest rate were divergent mechanisms and the findings were consistent with those of Sargent & Wallace (1981) and Melitz, (1997) albeit when convergent, fiscal policy and interest rate regimes shared the spoils in controlling inflation and stabilising economic output. Recently, Dell'Erba and Sola (2013) of the IMF's Fiscal Affairs Department have shown that general movements towards fiscal consolidation and low monetary policy rates have led to low long term interest rates and low sovereign spreads while budgets deficits reverses the trend in advanced economies.

A number of the economic literature has also focused on the role of a ballooning government debt on stock prices. And here, the approach has been to look at what effect temporary changes in nominal interest rate might have on prices when the fiscal authorities do not aggressively attempt to stabilise the debt stock. In this instance, the effect of a fiscal policy shock on the stock market may be positive, negative or even negligible depending on whether one chooses a Keynsian, Classical and Ricardian ("tax now or tax later") approach respectively

The response of the stock market to a fiscal policy shock is well documented in the economic literature. Indeed, the extensive literature also makes a distinction between anticipated and unanticipated fiscal policy shocks and their respective transmission mechanisms. Darrat (1988) who used a dynamic stochastic general equilibrium modelling specifically found significant lagged effects of anticipated fiscal policy actions but found significantly negative impact of fiscal deficits on stock price indices. This was consistent with the findings of Agnello & Sousa (2010) who used a panel vector autoregression approach and found an immediate but temporary negative response of stock prices to a fiscal policy shock. Moreover, Afonso and Sousa (2011) in employing a vector autoregression also found government expenditure shock elicits a negative response from stock prices but revenue shocks had a small albeit positive impact on stock price indices. While Jansen, et al. (2008) used a semiparametric analyses and argues that the effect of fiscal policy on stock price indices depends on the presence of other macroeconomic policy tools like interest rate.

Another school of thought has focused on the interactions between fiscal and monetary policies on the stock price index. This view takes into account the effect of the said policies on the output gap and inflation. Specifically, it is widely believed that on the fiscal side the interaction occurs through the effect of fiscal policy on monetary variables such as inflation, interest rate and exchange rate while on the monetary side, it occurs through the government inter-temporal budget constraint wherein the constraint requires that the fiscal authority finances expenditure via taxation, borrowing or seignorage (Chatziantoniou, et al 2013). Furthermore, Bernanke and Kuttner (2005) show that a hypothetical unanticipated 25-basis-point cut in the Federal funds rate target is associated with about a 1% increase in broad stock indexes. And with an independent central bank employing a tight monetary policy regime, it follows on that eventually inflation rises as deficit financing requires an increase in the growth rate of the money supply. That said, it is well known that asset prices are not supposed to stay constant in real terms during the business cycle. And where there is significant appreciation, it is generally thought that this increase in asset prices reflect real economic growth and a comparable growth in earnings or the expected return on assets in equilibrium. However, when adjusted for inflation, nominal and real economic growth, Fatas and Mihov (2013) in excluding factors such as interest rate, expected earnings growth and risk appetite for example elucidate that the record high levels of stock price indices recorded post 2009 financial crisis recovery is not extraordinary as they are comparably low to the prices seen in the 1990s financial bubble. On the bond markets however, deficit financed expansionary fiscal policy could signal markets to weigh the probability that a government default could rob investors of the expected earnings on their loans as ceteris paribus a higher debt burden translates into higher risk of default and this risk is higher when the current account deficit is larger. The resultant downgrade of a government debt brings new information onto the stock market and may affect the way investors behave. From the literature review, it is possible to conclude that expansionary fiscal policy induces a negative reaction from the stock market.

The transmission mechanism of a fiscal policy shock via inflation is well documented in the academic literature. In essence, increases in nominal public debt in the absence of expected increases in taxes or the price level leaves economic agents with nominal disposable incomes until increases in the price level erode their wealth, inducing these agents to scale back their spending. The preceding behavioural mechanism implies that an interest rate hike flows directly through increased nominal government spending. And in the neoclassical model wherein prices are deemed to fully flexible, the central banker loses their authority to affect the price level as interest rate hikes means that government debt increases and this has the potential of reducing economic welfare as interest rate payment is a major part of government spending. However in a new Keynesian model with assumed price stickiness, the central banker maintains the ability to generate a recession or speed up economic growth albeit it loses trend inflation. Duarte and Wolman, (2008) in using a two region general equilibrium model with traded and non-traded goods (for a country in a monetary union) found that lowering income tax rate in response to inflation differentials translated into suppressed inflation differentials leading to a higher volatility in domestic inflation while leaving the volatility of real economic growth roughly unchanged. In addition, where this output volatility induces a “Nash game” style conflict over the size of the output gap, then the policymaker can expect interest and exchange rate volatility (Leitemo, 2004). It is well known in theoretical economics that persistent fiscal deficits are inflationary but showing this to be true empirically has not always been easy or straightforward except for Catao and Terrones (2005) wherein a very large dataset was used and inflation was modelled as non-linearly related to fiscal deficits through the inflation tax base and estimation was then carried out under the assumption of a dynamically intrinsic relationship.

Data

I use quarterly data from the period 1997Q1 to 2008Q4 giving η = 48 observations for baseline variables for Brazil i.e. government expenditure (government expenditure + Gross Investment) (EXPEND), Gross Domestic Product (GDP), Inflation (INF), government revenue (REV) and interest rate (INT) and for the stock price index (STOCKPIX). The components of national income and fiscal series including the stock price index are all in real terms at source. I restrict the estimation of national income and fiscal series to the period up to the last quarter of 2008 as afterwards the data series is likely to have been affected by the 2009 global financial crises and the resultant market mayhem could lead to higher multipliers due to large output gaps. The real stock price index (Stockpix) data was in monthly series and this was aggregated using arithmetic mean. Data on gross government expenditure and gross investment were added up and divided by 2 for each series pair to obtain total gross government expenditure (government expenditure + government investment).

I decided to use the GDP deflator which is an economic metric which gives a satisfactory record and explanation of inflation (price rising to keep up with the increased cost of production which leads to a fall in the purchasing power of money) by converting output measured at current prices to constant dollar GDP. The GDP deflator is preferred to the Consumer Price Index (CPI, based on a representative fixed basket of goods) in this study as it shows how much a change in the base year's GDP relies upon changes in the price level. It also captures changes in consumption patterns or the addition of new goods and services to the macroeconomy. And the importance of this choice is underscored by the fact that Brazil is an emerging market and likely to have a relatively higher number of new services and products being introduced into the economy.

In addition, I transformed the components of the fiscal series and national income into their natural logarithm form with the aim of stabilising the variance of the fiscal series (*see* Lütkepohl & Krätzig, 2004) and reducing heteroscedasticity. The gdp deflator (inflation) and interest rate series were not transformed into their logarithmic format. Furthermore, gross domestic product is in constant prices and percent change, government expenditure, government investment and tax revenue is in percent of GDP while gross domestic product deflator (inflation) is in index form. I sourced the data on gross domestic product, government expenditure and investment, tax revenue, and gross domestic product deflator

(Inflation) from the International Monetary Fund World Economic Outlook Database April 2013 and the data on real interest rate is sourced from The World Bank Open Data website. I sourced the data on real stock price index from Yahoo Finance. I use Eviews 6 Student version to estimate the Recursive Approach.

Econometric Methodology

It is well known that time series data exhibit a variety of behaviour. Thus, there are several steps to be addressed before estimation of the VARs and it is noteworthy that the steps I describe here are not exhaustive. The first of these is the determination of the stationarity or non-stationarity of variables via unit root tests and tests for first difference if variables are found to be non-stationary (Augmented Dickey-Fuller tests). The second is the test of cointegration for non-stationary variables that have to be first differenced to reach stationarity i.e. integrated of order 1 *I (1)*. Then there are other equally important considerations too and these include the optimal number of lags to be employed and the de-trending methods to be used which to a large extent could account for the different qualitative and quantitative results found in the VAR literature on effect of fiscal policy shocks (Caldara & Kamps, 2008)

Economic theory informs the selection of variables while multivariate information criteria informs the selection of optimal lag. An extensive review of the VAR literature elucidates three multivariate information criteria namely the Akaike Information Criterion (AIC), Schwarz Criterion (SC) and Hannan-Quinn Criterion (HQC). From the data used for this study, I provide the values for AIC, SC and HQC in the table below adapted from the Eviews output.

Table 2: VAR Lag Order Selection Criteria

Lag	Akaike Information Criterion	Schwarz criterion	Hannan-Quinn criterion
1	-29.31	-27.59	-28.67
2	-28.24	-25.05	-27.06
3	-28.16	-23.49	-26.43
4	-38.33	-32.18	-36.06
5	-42.46*	-34.84*	-39.65*

* indicates lag order selected by the criterion in Eviews 6 Student Version

As can be seen from the table above the optimal lag for my dataset is 5 but since a review the VAR literature (Burriel, et al., 2010; Caldara & Kamps, 2002; Blanchard & Perotti, 2002) shows a strong preference for 4 lags and the relatively small number of observations (48) I choose the latter with the added benefit of avoiding over-fitting as adding more lags improves the fit but reduces the degrees of freedoms and increases the danger of over-fitting. And this is how the AIC and SC works as they are the measures of the trade-off between fit and loss of degrees of freedom so that the chosen lag length should minimise both AIC and SC.

All five baseline variables namely EXPEND GDP INF REV INT were found to be non – stationary except STOCKPIX and had to be first differenced to achieve stationarity. I then tested all five baseline variables plus STOCKPIX for cointegration (spurious regression) and rejected the null hypothesis of no cointegration and the Eviews values can be found in the tables below. I then proceed to prefer the Vector Error Correction Model and thus choose a rank (number of cointegrating equations) of 1(one) in Eviews when prompted as this is in reference to the first difference terms in the Vector Error Correction.

Table 3: Unit Root and First Difference Tests of Stationarity

	ADF Level & Intercept			ADF Δ First Difference		
	t-Statistic	Probability	Critical Values	t-Statistic	Probability	Critical Values
EXPEND	-1.35	5% level	-2.93	-6.71	5% level	-1.95
GDP	-2.20	5% level	-2.93	-6.71	5% level	-1.95
INF	-0.34	5% level	-2.93	-6.71	5% level	-1.95
REV	-1.82	5% level	-2.93	-6.71	5% level	-1.95
INT	-0.98	5% level	-2.93	-6.71	5% level	-1.95
STOCKPIX	-4.58	5% level	-2.93			

Table 4: Tests for Cointegration

Variable	t-Statistic	5% Critical Value(Eviews)	Probability
E(-1)	-2.88	1.68	0.00
ΔE(-1)	1.73	1.68	0.23

Figure 1: Stationarity of Variables of Interest

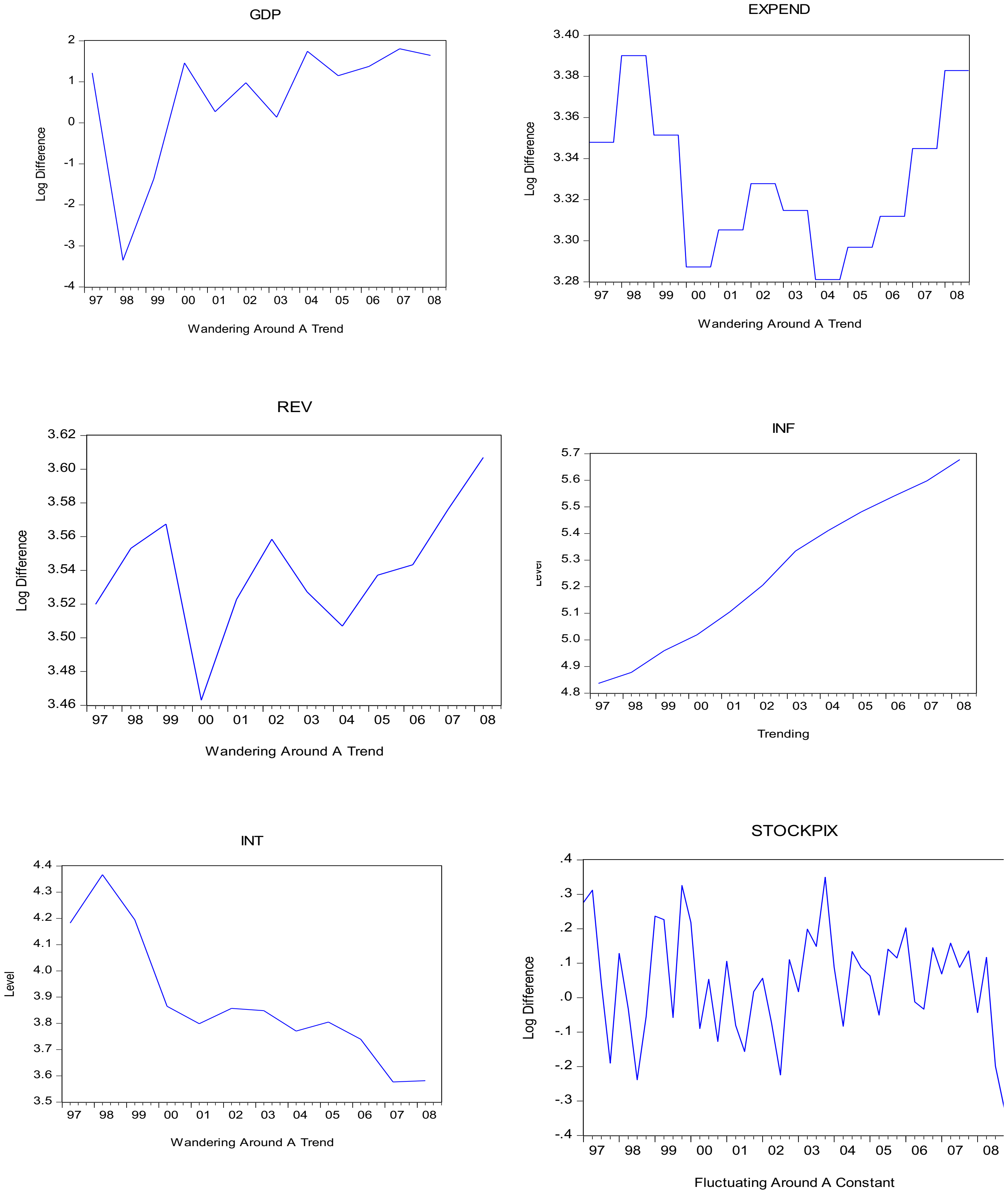

Figure 1 is a graphical representation of the behaviour of both fiscal and monetary series. Indeed, inflation is "trending" and expenditure, gross domestic product, interest rate and revenue (below) are "wandering about a trend". In addition, the series for the real stock price index are fluctuating around a constant. The behaviour of the variables of interest is consistent with the outcome of the tests for stationarity and non-stationarity as non-stationary series display wandering behaviour around a trend and or constant while stationary series display fluctuating behaviour around a trend and or constant (Lütkepohl & Krätzig, 2004) as can be seen from the stockpix series which was found to be stationary.

Recursive Approach

A detailed review of recent academic literature on assessing fiscal policy shocks delineates Vector Autoregressive Models (VAR) as the main econometric tools that have been used (Blanchard & Perotti, 2002; Cimadomo & Bénassy-Quéré., 2012; Caldara & Kamps., 2008; Jawadi, et al., 2011; Burriel, et al., 2010). In a simplified form, VAR is a statistical model that is used to capture linear interdependencies among multiple time series. The VAR literature delineates four different identification approaches. Specifically, these are the recursive approach, Blanchard Perotti approach (Blanchard & Perotti, 2002), event study approach (Ramey & Shapiro, 1998) and sign restrictions approach (Mountford & Uhlig, 2005). I will focus on the recursive approach. Its imperative to note that a detailed review of the VAR literature on fiscal policy shocks have shown that due to the employment of different identification approaches, variables of interest, detrending methods (first difference, linear, quadratic and Hodrick-Prescott Filter), sample periods and number of lags, the empirical results have been somewhat different and sometimes difficult to compare. Thus I briefly describe the qualitative effects of positive government spending shock in the table below.

Table 5: The Qualitative Effects of a Positive Government Shock using Empirical Models

Empirical Models	GDP	Interest Rate	Inflation	Stock Price Index
Recursive	+	+	---	--
Blanchard-Perotti	+	--	+	--
Event Study	+	--	--	--
Sign Restrictions	+	---	+	--

Source: Adapted from Fragetta & Melina, 2011 & Jawadi, et al., 2011.

The macroeconomic impact of fiscal and monetary policy shock will be assessed using the Bayesian Structural Vector Auto-regression (BSVAR) and an estimate will be calculated in the following manner

$$\Gamma(L)\ X_t = \Gamma 0\ X_t = \Gamma 1 + X_{t-1} + \ldots = c + \varepsilon_t \qquad (1)$$

$$V_t = \Gamma 0\text{-}1\ \varepsilon_t, \qquad (2)$$

$\Gamma(L)$ is an nxn matrix and X_t is an nx1 matrix

Where $\varepsilon_t \mid Xs$, $S < t \sim N(0,\Lambda)$, $\Gamma(L)$ is a matrix valued polynomial in positive powers of the lag operator L, n is the number of variables in the system and ε_t are the fundamental economic shocks that span the space of innovations to X_t and V_t is the VAR innovation.

Fiscal policy can then be characterised as

$$gi_t = f\ (\Omega t) + \varepsilon_t^i \qquad (3)$$

where gi_t is the fiscal policy instrument, f is a linear function, (Ω_t) is the information set available to the government at the time of setting the policy and ε_t^i is the shock.
A recursive identification scheme is then considered and consistent with Jawadi, et al., 2011, an assumption is made of the variables in X_t. Specifically, (i) a subset of n1 variables, X_{1t}, which do not respond contemporaneously to the fiscal policy shock; (ii) a subset of n2 variables, X_{2t}, that respond contemporaneously to it; and (iii) the policy instrument in the form of the government spending, gt, or government revenue, t_t. Thus, for the set of variables belonging to X_{1t}, GDP, interest rate and inflation are added (Christiano, et al., 2005) and the stock price index to X_{2t} set of variables.

The principle behind a recursive identification is that the error terms in each regression is formed under the assumption that they are uncorrelated to the error terms of the preceding equation. And this can be achieved by the inclusion of some contemporaneous values as regressors. Thus, for my four variables of interest i.e. output, inflation, interest rate and stock price index, the first equation consists of output as the dependent variable followed by lagged values of all four variables as regressors. The second equation then consists of inflation as the dependent variable followed by lagged values of all four variables plus the current value of output. The third equation then consists of interest rate as the dependent variable followed by lagged values of all four variables plus the current value of output and inflation and the fourth equation will be composed of the stock price index as the dependent variable followed by lagged values of all four variables plus the current values of output, inflation and interest rate.

Contemporaneous assumptions are made due to the fact that there are "k" possible ordering of the variables of interest in total and changing the order affects the results gained. Thus, the order is government expenditure, output, inflation, tax revenue and interest rate respectively with expenditure and revenue serving as the economic policy instruments. Ordering is primarily due to theoretical contemporaneous assumptions that movements in government expenditure, unlike movements in net tax receipts are largely unrelated to the real business cycle. This means that output and inflation are ordered before taxes as the aforesaid affect taxes. Interest rate is then ordered last and ordering interest rate last can be justified on the grounds of a central banker's Stackelberg reaction function – where the central government is the Stackelberg leader – (*see* Kirsanova, et al., 2005) thus implying that interest rate is set as a function of output gap and inflation with revenue and expenditure devoid of interest payments. In fact, the ordering helps capture the effects of the automatic stabilisers which are economic policies and programs that are designed to offset fluctuations in the macro-economy albeit without intervention from central government or policy makers. And automatic stabilisers come in the form of personal and corporate taxes, unemployment insurance/benefits and welfare.

Based on the contemporaneous assumptions, I order EXPEND (Government expenditure + Gross Investment) → GDP (Gross Domestic Product) → INF (Inflation) → REV (Government Revenue) → INT (Real Interest Rate) → STOCKPIX (Stock Price Index). And this means that equation 2 above takes the following matrix form:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ gdp/expend & 1 & 0 & 0 & 0 \\ inf/expend & inf/gdp & 1 & 0 & 0 \\ rev/exp & rev/gdp & rev/inf & 1 & 0 \\ int/exp & int/gdp & int/inf & int/rev & 1 \end{bmatrix} \begin{bmatrix} expend \\ gdp \\ inf \\ Rev \\ int \end{bmatrix} \varepsilon_t = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} expend \\ gdp \\ inf \\ rev \\ int \end{bmatrix} v_t$$

Empirical Results

In this section, I interpret the findings of the recursive approach. I preferred the Vector Error Correction Model (VECM) to the unrestricted vector autoregression model (VAR) as all but one variable became stationary after first differencing and all were subsequently found to be co-integrated of order I(1). I also describe the estimates of the elasticities prevalent in the structural VAR identification scheme for Brazil below as this will help explain the effects of a government spending and revenue shock.

Table 6: Elasticities of Government Spending and Revenue Shock

	Elasticities of Government Spending			Elasticities of Government Revenue		
	ξG,Y	ξG,π	ξG,i	ξT,Y	ξT, π	ξT,i
Brazil	0	-0.5	0	1.85	1.25	0

Sourced from Blanchard & Perotti, 2002 and also cited in Jawadi, et al 2011.

Effects of a Positive Government Spending Shock
Recursive Approach
Linear Trend VECM

For the VECM, I tested for both a linear trend and a quadratic trend for Brazil's economy. For a linear trend; In response to a 1% positive shock in expenditure, output (GDP) fall below the steady state and rises to the reach the steady state in the 4^{th} quarter overshooting the steady state in the 4^{th} quarter and returning to the steady state in the 5^{th} quarter. Meanwhile, inflation falls after a government expenditure shock and fluctuates below the steady state while revenue increases as the government needs to recoup some of the money spent on the economy. However, interest rates rise above the steady state as a rise in expenditure crowds out investment spending and shifting the IS curve to the left in the process. The stock price index which represents Brazil's financial sector in the SVAR model used fluctuate sharply above the steady state in response to a 1% government spending shock. Essentially the BOVESPA (stock price index) rises as the money supply increases as result of a rise in government expenditure and the shock persists throughout the 20 quarter horizon used in this study. However the rise is not sustained over the horizon and appears to fall toward to steady state.

Quadratic Trend VECM

I then turn my attention to the impulse response functions for a quadratic trend VECM. As can be seen from the IRFs from figure 3, output falls in response to a 1% rise in government expenditure and returns and overshoots the steady state. That said, unlike the behaviour seen for the linear trend VECM analyses, output remains and fluctuates above the steady after overshooting it while inflation remains below the steady state until 18th quarter when it begins to rise but interest rate reacts quickly to the expenditure shock but falls and remains below the steady state after 4 quarters in line with the behaviour of inflation. Furthermore, in response to a 1% government expenditure shock, Brazil's BOVESPA rises and fluctuate above the steady state as the market rises to an increase in the money supply.

Effects of a Positive Revenue Shock

Linear Trend VECM

From Figure 2, it can be seen that output (GDP) rises and remains above the steady state for the 20 quarter horizon in response to a 1% cut in taxes as spending patterns increase due to a rise in the marginal propensity to consume. But Brazilian consumers expect taxes to rise in the future or the tax cut to be followed by a spending cut from Brasilia so there is no permanent demand shock and thus as is evident from the IRFs in figure 2, inflation falls and remains below the steady state throughout the time horizon for this study. In the same vein, interest rate rise in the short run but this could be due to fact that the central bank uses the Taylor Principle to raise the real interest rate keeping inflation low in the process and helping postpone aggregate consumption. However the BOVESPA reacts negatively to a 1% tax cut as it falls below the steady state but rise above the steady state in the 2nd quarter and indeed the fluctuating pattern around the steady state continues throughout the forecasting horizon. This could be due to weak transmission mechanisms in the economy which I will elaborate on in the discussion section of this paper.

Quadratic Trend VECM

The IRFs for the quadratic trend are similar to those of the linear trend VECM for a positive revenue shock. For instance in response to a 1% tax cut, output rises as the marginal propensity to consume increase from the disposal income and indeed Brazilians may expect future tax hikes or spending cuts and thus induce them to save instead of spend their disposal incomes on goods and services and thus the tax cut does not cause a permanent demand shock and inflation falls below the steady state and this fall in inflation could have been necessitated the fact the central bank uses the Taylor Principle to increase short term interest rate causing a reduction in the money supply and subsequent postponement of aggregate consumption. And as seen the in previous section, the BOVESPA reacts negatively to a revenue shock even though economic theory suggests that tax cuts information causes stock price indices to rise as investors expect to pay less tax on capital gains and dividends.

Figure 2: IRFs of Linear Trend VECM for Recursive Approach

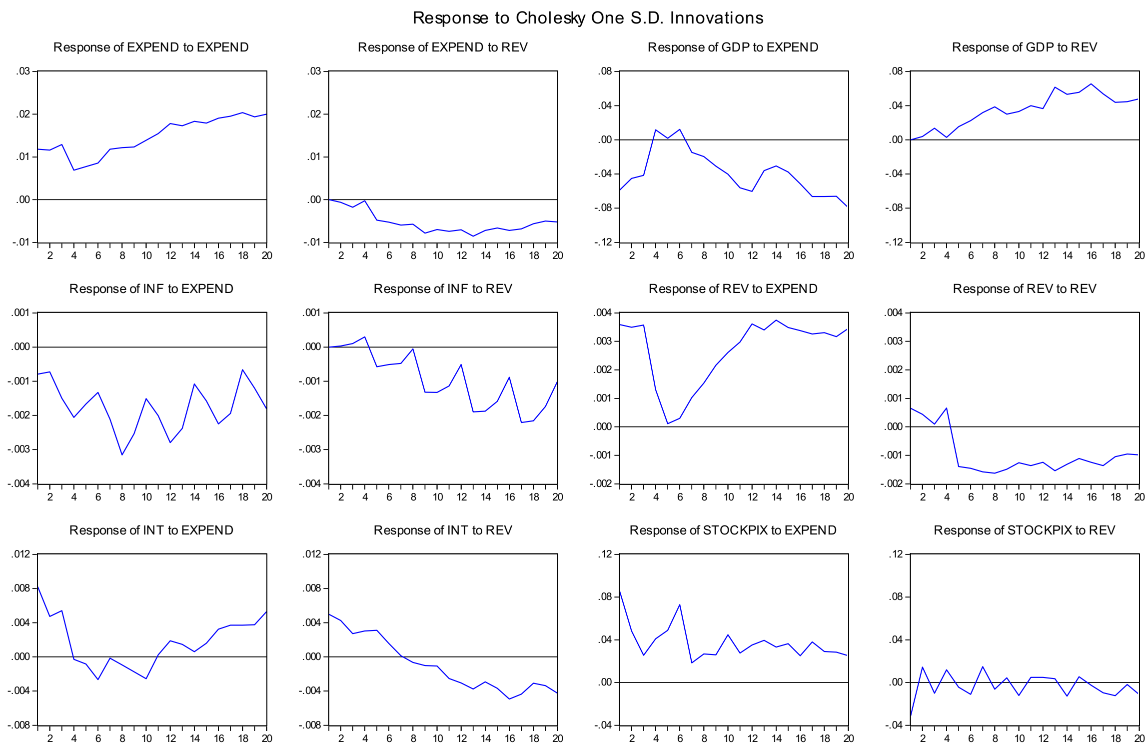

Figure 3: IRFs of Quadratic Trend VECM for Recursive Approach

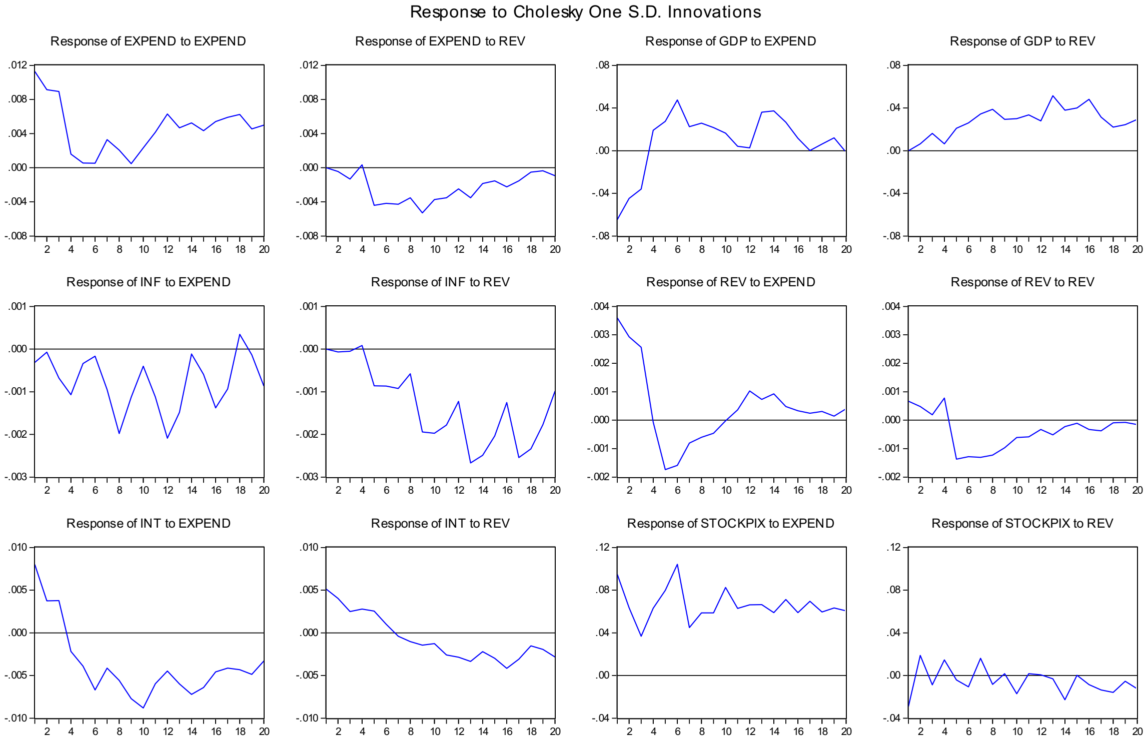

Table 7: Impulse Response to Positive Government Expenditure Shock

Linear Trend	Impact Effect	1 Year	2 Years	3 Years	4 Years	5 Years	Peak
Expenditure	0.01	0.01	0.02	0.02	0.02	0.02	0.02(18)
GDP	-0.06	0.00	-0.02	-0.06	-0.03	-0.06	0.01(6)
Inflation	-0.01	-0.02	-0.03	-0.03	-0.02	-0.03	-0.01(18)
Revenue	0.004	0.003	0.001	0.003	0.004	0.003	0.004(14)
Interest Rate	0.008	0.000	-0.001	0.003	0.003	0.005	0.008(1)
Stock Price Index	0.09	0.04	0.02	0.03	0.02	0.02	0.07(6)

Values in () indicates peak quarter.

Quadratic Trend	Impact Year	1 Year	2 Years	3 Years	4 Years	5 Years	Peak
Expenditure	0.012	0.001	0.002	0.006	0.005	0.005	0.012(1)
GDP	-0.07	0.06	0.03	0.00	0.01	0.00	0.03(8)
Inflation	0.000	-0.001	-0.002	-0.002	-0.001	-0.001	0.000(18)
Revenue	0.003	0.000	-0.001	0.001	0.000	0.000	0.000(1)
Interest Rate	0.008	-0.002	-0.005	-0.004	-0.003	-0.002	0.008(1)
Stock Price Index	0.10	0.05	0.06	0.06	0.05	0.06	0.11(7)

Values in () indicates peak quarter

Table 8: Impulse Response to Positive Revenue Shock

Linear Trend	Impact Year	1 Year	2 Years	3 Years	4 Years	5 Years	Peak
Expenditure	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00(1)
GDP	0.00	0.00	0.04	0.04	0.07	0.05	0.07(16)
Inflation	0.000	0.000	0.000	-0.001	-0.001	-0.001	0.000(4)
Revenue	0.001	0.001	-0.002	-0.001	-0.001	-0.001	0.001(4)
Interest Rate	0.005	0.003	-0.001	-0.003	-0.004	-0.003	0.005(1)
Stock Price Index	-0.04	0.02	-0.01	0.01	0.00	-0.01	0.02(2)

Values in () indicate peak quarter

Quadratic Trend	Impact Year	1 Year	2 Years	3 Years	4 Years	5 Years	Peak
Expenditure	0.000	0.000	-0.003	-0.002	-0.001	0.000	0.000(1)
GDP	0.00	0.01	0.04	0.02	0.05	0.03	0.06(14)
Inflation	0.000	0.000	-0.001	-0.001	-0.001	-0.001	0.000(4)
Revenue	0.001	0.001	-0.001	0.000	-0.001	0.000	0.001(1)
Interest Rate	0.005	0.003	-0.002	-0.003	-0.003	-0.002	0.005(1)
Stock Price Index	-0.04	0.02	-0.02	0.00	-0.01	-0.01	0.02(2)

Values in () indicate peak quarter

De-trending Methods

De-trending methods essentially help pre-process time series for analyses that assume stationarity of variables. In the light of this, I found serial autocorrelation amongst all six variables i.e. expenditure, gross domestic product, inflation, revenue, interest rate and stock price index. I used the Breusch-Godfrey Lagrange Multiplier test and the null hypothesis is that there is no serial autocorrelation up to ρ lags. In fact for the 4 lags chosen for this study the ρ value is 0.00 which is significant. Furthermore, I tested all six variables for non-normality using Lutkepohl's Cholesky of covariance as the orthogonalization method and the null hypothesis of normal distribution (residuals are multivariate normal) based on the skewness and kurtosis of the standardised residuals is accepted.

The portmanteau test for residual correlation is usually employed to test the null hypothesis of no remaining residual autocorrelation at ρ lags but this is essentially used for larger order VARs (Lütkepohl & Krätzig, 2004) so I refrain from testing this on my six variables of interest.

How are Results Different from those of a Prototypical Advanced Economy like USA

There are several observable differences in the behaviour of the fiscal and monetary variables in this study after the policy innovations especially when I consider the outcomes of studies using the VAR framework based on an advanced and open economy like the USA. Since the ordering of variables is important and in fact affects the results in a VAR, I restrict my comparisons to studies that have used the same variables and subsequently the same ordering to study the impact of fiscal policy shock on an advanced economy. That said, I could not find any study that had a similar sample period of η =48 observations.

In an empirical assessment of fiscal policy shocks in the Euro Area and USA, Burriel, et al., 2010 found that output multipliers for a 1% rise in US government expenditure was about 0.76 on impact and increased gradually and only decreased after 12 quarters but remained positive over the 20 quarter horizon. According to the study, the price level and inflation in US responds slightly negative to an expenditure shock on impact but rises and remains above the steady state after 5 quarters. In fact consistent with economic theory, the fall in inflation is precipitated by upward movements in interest rates by the central bank (aimed at reducing the money supply). What is clearly evident here is that apart from the consistent positive output multipliers, the observed behaviour of fiscal and monetary variables are highly stable after the government expenditure and revenue shocks. This is in contrast with the observed behaviour of gross domestic product, inflation, interest rate and the stock price index after the policy innovations in this study. Moreover for both a quadratic and linear trend, the response pattern is highly volatile with the stock price index which represents Brazil’s financial sector in this model rising above and falling below the steady state several times in response to a positive revenue shock.

It is noteworthy that other assessments of the effects of fiscal policy shocks on fiscal and monetary variables (Blanchard & Leigh, 2013; Eyraud & Weber, 2013; Warner, 2013; Mountford & Uhlig, 2005; Caldara & Kamps, 2002; Blanchard & Perotti, 2002) have produced similar results to that of Burrriel, et al., 2010. And this is not unexpected as majority of these studies were based on advanced economies and in theory the findings should be extrapolated to emerging economies. However, there are several factors peculiar to emerging economies that can explain the observed differences in the behaviour of fiscal and monetary variables after fiscal policy innovations.

The first of these factors is the inefficiency debate. The rationale for government spending to stimulate economic activity has its roots in Keynesian economics (Keynes, 2008). In fact economists that adhere to the belief even go on to disregard budget deficits if extra government spending can spur growth in the short run. That said, the literature on optimal fiscal policy strategy points to the fact that Keynesian economics assume that the central government has all the information about which goods and services are not in efficient use (ibid). However, the central government as a matter of fact does not always have all the information about where resources are needed most and indeed if the spending is not on infrastructure projects, utility-generating economic activity or positive externalities then it is unlikely to get onto the production function (Warner, 2013). Where this is the case then government spending will generate negative economic growth - seen in the results - as resources are taken away from the economy.

A second and more specific reason to Brazil and other emerging economies is the institutional debate. The economic and political institutions in emerging economies are generally believed to be weak. And Mishkin (2004) outlines these as weak fiscal institutions, low credibility of monetary institutions, currency substitution and liability dollarization, vulnerability of sudden stops of capital inflows and weak financial institutions including government prudential regulation and supervision. In fact for Brazil, it is well known that the banking sector is weak and not well developed with the last two decades seeing major transformations in the sector during which there was hyperinflation solved by the introduction of the *Real* in 1994. Furthermore, only 15% of Brazilian banks have a sustainability policy (Amigos Da Terra, 2012) - which includes but not limited to boosting and harmonizing prudential regulations in line with international best practices, development and enhancement of financial sector supervision and the establishment of deposit insurance and crisis resolution protocols (Ogawa, et al., 2013) - and this has serious implications for the transmission of fiscal policy innovations. Financial frictions present in Brazil's banking sector magnifies the volatility seen in the response of the stock price index to the fiscal policy innovation. And this volatility could be also due to the fact that Brazil's economy is less diversified and in fact dependent on commodities.

It is generally accepted in macroeconomics that uncertainty about future fiscal policy actions from the central government can cause current fiscal policy innovations to produce awkward results. And this is more relevant in an emerging economy like Brazil where government purchases can be highly volatile. In fact the outcome of policy innovations is highly unpredictable in countries where institutions that provide information on policy actions are opaque (Brandao-Marques, et al., 2013) and this opacity could spur corrupt practices. When fiscal institutions are less transparent, investors, public institutions, the central bank and the private sector do not have the same information horizon and thus are in the dark about current policy initiatives and cannot carry out strategic policy response or investment actions. This imply that there is no optimal response from the central bank and the public lack a well-informed inflation expectation thereby leading to the volatility observed in the fiscal and monetary variables in response to a positive government and revenue shock. Opaque economic and political institutions lacks inclusivity (David & Petri, 2013) and produces inefficient financial markets (Malkiel, 2003) and the observed response of BOVESPA (Brazil's stock price index) which represents the financial sector in the VAR model employed is testament to this assertion. In fact efficient markets driven by a quality and accurate information horizon reduces the incidence of disproportionate reaction of investors to new information and enable prices to reflect all the available information in an efficient manner (ibid), increasing price stability in the process. I hereby present an economic explanation of how the multiplier effect of government expenditure may differ under inclusive and exclusive economic and political institutions.

Let us assume the Brazilian and USA economy is both made up of two representative economic agents i.e. the central government and the consumer both existing and operating under opaque and transparent institutional frameworks respectively. We also assume the government adheres to Keynesian economics and thus in USA decides to spend £200 on providing infrastructure for the consumer. We assume that both agents have a linear marginal propensity to consume (MPC) of 0.65 (65%) implying that they spend/invest 0.65 * 200 = $130 and save £70 and thus the government collects £130 in taxes. The government then spends 0.65 * 130 = $84.5 on externalities for the consumer this time round and collects 0.65 * 84.5 = $54.9 in taxes.

In this model GDP or total output = $200 + 0.65*200 + 0.65^2 * 200 + 0.65^3 * 200 + \ldots$

We can then rewrite this as 200 $(1 + 0.65 + 0.65^2 + 0.65^3 + \ldots 0.65^n)$

Where n is the number of cycles between the central government and the consumers. The multiplier = $\frac{1}{1-0.65}$ = $\frac{1}{0.35}$ =2.86 * 200 = $572 meaning that an extra dollar given an MPC of 0.65 will yield £572 to the economy. So in this model, the linear MPC drives the multiplier and this is stable throughout the cycle because the consumer has credible information about the spending patterns of the central government and due to the inclusive and transparent nature of the economic and political institutions, all the $200 is actually spent on infrastructure projects that benefit the consumer.

However, the central government and the consumer in Brazil do not enjoy the same transparent and inclusive economic and political institutions in USA and thus are not compelled to spend all the $200 earmarked for infrastructure and utility-generating economic activity on the said projects. This means the dollar effect of the multiplier is reduced in nominal terms providing an explanation for the negative output observed after fiscal policy innovations by Brasilia.

Discussion

This thesis presents a detailed and comprehensive assessment of the effect of fiscal policy shock in a prototypical emerging economy like Brazil. I found that unlike the general results seen for advanced economies, a unit rise in government purchases and a unit fall in tax revenue did not lead to economic growth in the short run. Although economic growth occurs at some point in the long run, the economic and political motivations for such policy innovations – based on Keynesian economics – are such that extra expenditure occurs only because the policymaker believes that it will spur economic growth in the very short run while pushing interest rates up and lowering inflation; outcomes desired by the voting public and the policymaker. That said, while the response of fiscal series to an expenditure shock (for both a linear and quadratic VECM) does not fit expectations as per economic theory, it can be seen that the baseline monetary variables behave as expected i.e. rise in interest rates causes a downward pressure on inflation as the money supply reduces. I also explained that the difference seen in the fiscal and monetary variables in response to the fiscal policy innovations could primarily be due to weak transmission mechanisms that arise as a result of opaque and exclusive economic and political institutions in Brazil and the mass protests in Brazil in June 2013 is testament to this.

There are a number of factors that could have affected the results of this thesis. Firstly, the number of data observations η =48 is very small. This is because GDP data on Brazil from the IMF website starts from the mid-1990s and there appeared to be a limit of 5 lags when I was selecting the optimal lag for the SVAR/VECM in Eviews 6 student version. It is well known that results in a VAR framework are affected by the number of lags chosen although the literature seems to point to 4 lags as the optimal. Furthermore, for most central governments, fiscal policy decisions are made yearly with the possibility of making minor adjustments throughout the year. And for the voting public and consumers, the announcement of an intended policy action induces these rational agents to adjust their consumption patterns accordingly before the onset of the policy. Thus the estimates of the impact of a fiscal policy shock presented in this thesis based on quarterly data could be biased (Burriel, et al., 2010). To address this, researchers such as Blanchard and Perotti, 2002 included an indicator of forthcoming fiscal policy actions in their estimation and I could not factor this into the estimation in this thesis due to time constraints. In order to test the validity that fiscal and monetary variables respond differently in an emerging economy due to the many reasons offered in this thesis, future estimations can include Russia, India and China other emerging economies albeit with a higher number of data observations. Furthermore, these results can then be compared to other approaches such as the sign restrictions, event study and the Blanchard Perotti.

In conclusion, expansionary fiscal policy is good but should be aimed at infrastructure projects, utility-generating economic activities and externalities that gets onto the economic production function. Alternatively, Brasilia can choose to support the private sector through government secured loan schemes or funding for lending schemes (as pertains to the UK) from the central bank so that the sector can expand production, employ more workers and generate extra revenue through income tax for the government which then can be used for more government purchases, assuming business leaders in Brazil do not see direct attempts from Brasilia to achieve full employment as undermining their political clout. Last but not least, emerging economies like Brazil should aim at strengthening their economic, financial and political institutions with particular emphasis on making these institutions transparent, communication/information savvy and inclusive for all and sundry.

7,924 Words

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Appendix

Data

Variable	Description/Units	Range	Source
Expend	Log of Government Expenditure + Gross Investment Percent of GDP	1997Q1-2008Q4	IMF WEO
GDP	Log of Real Gross Domestic Product in Constant Prices (Percent Change)	1997Q1-2008Q4	IMF WEO
INF	Difference of Gross Domestic Product Deflator (Index)	1997Q1-2008Q4	IMF WEO
REV	Log of General Government Revenue Percent of GDP	1997Q1-2008Q4	IMF WEO
INT	Real Interest Rate	1997Q1-2008Q4	WB OD
STOCKPIX	Log of Real Stock Price Index (BOVESPA)	1997Q1-2008Q4	Yahoo Finance

IMF WEO = International Monetary Fund World Economic Outlook April 2013
WB OD = World Bank Open Data Website

Eviews Outputs

Unit Root Tests For Stationarity for Expend

Null Hypothesis: EXPEND has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

	t-Statistic	Prob.*

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.348639	0.5989
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXPEND)
Method: Least Squares
Date: 06/20/13 Time: 21:24
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPEND(-1)	-0.103433	0.076694	-1.348639	0.1845
D(EXPEND(-1))	0.060820	0.156492	0.388646	0.6995
C	0.086206	0.063783	1.351556	0.1836

R-squared	0.040586	Mean dependent var	0.000190
Adjusted R-squared	-0.004038	S.D. dependent var	0.004169
S.E. of regression	0.004177	Akaike info criterion	-8.055352
Sum squared resid	0.000750	Schwarz criterion	-7.936093
Log likelihood	188.2731	Hannan-Quinn criter.	-8.010677
F-statistic	0.909513	Durbin-Watson stat	2.005760
Prob(F-statistic)	0.410327		

First Difference of Expend

Null Hypothesis: D(EXPEND) has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.708204	0.0000
Test critical values:	1% level	-2.616203	
	5% level	-1.948140	
	10% level	-1.612320	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXPEND,2)
Method: Least Squares
Date: 06/20/13 Time: 21:30
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXPEND(-1))	-1.000000	0.149071	-6.708204	0.0000

R-squared	0.500000	Mean dependent var	0.000000
Adjusted R-squared	0.500000	S.D. dependent var	0.005902
S.E. of regression	0.004173	Akaike info criterion	-8.098761

Sum squared resid	0.000784	Schwarz criterion	-8.059008
Log likelihood	187.2715	Hannan-Quinn criter.	-8.083870
Durbin-Watson stat	2.000000		

Unit Root Tests for Stationarity of GDP

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.199881	0.2091
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP)
Method: Least Squares
Date: 06/20/13 Time: 21:35
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	-0.206328	0.093790	-2.199881	0.0332
D(GDP(-1))	0.105075	0.152280	0.690012	0.4939
C	0.030533	0.035515	0.859732	0.3947

R-squared	0.101161	Mean dependent var	0.002320
Adjusted R-squared	0.059354	S.D. dependent var	0.231586
S.E. of regression	0.224608	Akaike info criterion	-0.085925
Sum squared resid	2.169300	Schwarz criterion	0.033334
Log likelihood	4.976276	Hannan-Quinn criter.	-0.041250
F-statistic	2.419738	Durbin-Watson stat	2.023692
Prob(F-statistic)	0.100963		

First Difference of GDP

Null Hypothesis: D(GDP) has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.708204	0.0000
Test critical values:	1% level	-2.616203	
	5% level	-1.948140	
	10% level	-1.612320	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 06/20/13 Time: 21:37
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.000000	0.149071	-6.708204	0.0000

R-squared	0.500000	Mean dependent var	-8.39E-18
Adjusted R-squared	0.500000	S.D. dependent var	0.327529
S.E. of regression	0.231598	Akaike info criterion	-0.066128
Sum squared resid	2.413693	Schwarz criterion	-0.026375
Log likelihood	2.520943	Hannan-Quinn criter.	-0.051236
Durbin-Watson stat	2.000000		

Unit Root Test For Stationarity of INF

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.341040	0.9104
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 06/20/13 Time: 21:39
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.006314	0.018514	-0.341040	0.7347
D(INF(-1))	-0.277549	0.146678	-1.892235	0.0652
C	0.014135	0.024301	0.581658	0.5638

R-squared	0.081965	Mean dependent var	0.004572
Adjusted R-squared	0.039266	S.D. dependent var	0.008707
S.E. of regression	0.008534	Akaike info criterion	-6.626526
Sum squared resid	0.003132	Schwarz criterion	-6.507267
Log likelihood	155.4101	Hannan-Quinn criter.	-6.581851
F-statistic	1.919595	Durbin-Watson stat	2.220086
Prob(F-statistic)	0.159027		

First Difference of INF

Null Hypothesis: D(INF) has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.708204	0.0000
Test critical values:	1% level	-2.616203	
	5% level	-1.948140	
	10% level	-1.612320	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 06/20/13 Time: 21:41
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-1.000000	0.149071	-6.708204	0.0000

R-squared	0.500000	Mean dependent var	0.000000
Adjusted R-squared	0.500000	S.D. dependent var	0.013941
S.E. of regression	0.009858	Akaike info criterion	-6.379599
Sum squared resid	0.004373	Schwarz criterion	-6.339846
Log likelihood	147.7308	Hannan-Quinn criter.	-6.364708
Durbin-Watson stat	2.000000		

Unit Root Test For Stationarity of REV

Null Hypothesis: REV has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.827505	0.3629
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REV)
Method: Least Squares
Date: 06/20/13 Time: 21:43
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REV(-1)	-0.180231	0.098621	-1.827505	0.0746

D(REV(-1))	0.100972	0.158485	0.637108	0.5274
C	0.159893	0.087235	1.832894	0.0737

R-squared	0.072127	Mean dependent var	0.000473
Adjusted R-squared	0.028970	S.D. dependent var	0.005434
S.E. of regression	0.005355	Akaike info criterion	-7.558672
Sum squared resid	0.001233	Schwarz criterion	-7.439413
Log likelihood	176.8495	Hannan-Quinn criter.	-7.513997
F-statistic	1.671277	Durbin-Watson stat	2.017896
Prob(F-statistic)	0.199987		

First Difference Test for REV

Null Hypothesis: D(REV) has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.708204	0.0000
Test critical values:	1% level	-2.616203	
	5% level	-1.948140	
	10% level	-1.612320	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REV,2)
Method: Least Squares
Date: 06/20/13 Time: 21:44
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(REV(-1))	-1.000000	0.149071	-6.708204	0.0000

R-squared	0.500000	Mean dependent var	0.000000
Adjusted R-squared	0.500000	S.D. dependent var	0.007715
S.E. of regression	0.005455	Akaike info criterion	-7.563053
Sum squared resid	0.001339	Schwarz criterion	-7.523299
Log likelihood	174.9502	Hannan-Quinn criter.	-7.548161
Durbin-Watson stat	2.000000		

Unit Root Test For Stationarity of INT

Null Hypothesis: INT has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.983320	0.7516
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	

	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INT)
Method: Least Squares
Date: 06/20/13 Time: 21:45
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INT(-1)	-0.044045	0.044792	-0.983320	0.3310
D(INT(-1))	-0.014501	0.152492	-0.095096	0.9247
C	0.039432	0.043626	0.903870	0.3711

R-squared	0.023358	Mean dependent var	-0.003268
Adjusted R-squared	-0.022067	S.D. dependent var	0.017090
S.E. of regression	0.017278	Akaike info criterion	-5.215774
Sum squared resid	0.012837	Schwarz criterion	-5.096514
Log likelihood	122.9628	Hannan-Quinn criter.	-5.171098
F-statistic	0.514212	Durbin-Watson stat	2.003864
Prob(F-statistic)	0.601602		

First Difference Test for INT

Null Hypothesis: D(INT) has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.708204	0.0000
Test critical values:	1% level	-2.616203	
	5% level	-1.948140	
	10% level	-1.612320	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INT,2)
Method: Least Squares
Date: 06/20/13 Time: 21:46
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INT(-1))	-1.000000	0.149071	-6.708204	0.0000

R-squared	0.500000	Mean dependent var	0.000000
Adjusted R-squared	0.500000	S.D. dependent var	0.024617
S.E. of regression	0.017407	Akaike info criterion	-5.242400
Sum squared resid	0.013635	Schwarz criterion	-5.202647
Log likelihood	121.5752	Hannan-Quinn criter.	-5.227509
Durbin-Watson stat	2.000000		

Unit Root Test For Stationarity for STOCKPIX

Null Hypothesis: STOCKPIX has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.584969	0.0006
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(STOCKPIX)
Method: Least Squares
Date: 06/20/13 Time: 21:49
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
STOCKPIX(-1)	-0.948197	0.206806	-4.584969	0.0000
D(STOCKPIX(-1))	0.125896	0.157108	0.801336	0.4273
C	0.035857	0.024944	1.437515	0.1578

R-squared	0.411475	Mean dependent var	-0.013817
Adjusted R-squared	0.384102	S.D. dependent var	0.190421
S.E. of regression	0.149441	Akaike info criterion	-0.900840
Sum squared resid	0.960300	Schwarz criterion	-0.781580
Log likelihood	23.71931	Hannan-Quinn criter.	-0.856164
F-statistic	15.03201	Durbin-Watson stat	1.866649
Prob(F-statistic)	0.000011		

Testing Whether Expend Gdp Inf Rev Int and Stockpix are Cointegrated

Dependent Variable: EXPEND
Method: Least Squares
Date: 06/23/13 Time: 18:25
Sample: 1997Q1 2008Q4
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.316731	0.306231	1.034289	0.3069
GDP	0.000632	0.011862	0.053268	0.9578
INF	-0.153321	0.087401	-1.754225	0.0867
REV	3.473637	0.347413	9.998582	0.0000
INT	0.144011	0.121952	1.180877	0.2443
STOCKPIX	-0.021583	0.015289	-1.411655	0.1654

R-squared	0.811357	Mean dependent var	3.328508
Adjusted R-squared	0.788900	S.D. dependent var	0.034378
S.E. of regression	0.015795	Akaike info criterion	-5.341731
Sum squared resid	0.010479	Schwarz criterion	-5.107831
Log likelihood	134.2015	Hannan-Quinn criter.	-5.253340
F-statistic	36.12867	Durbin-Watson stat	0.503507
Prob(F-statistic)	0.000000		

Dependent Variable: D(E)
Method: Least Squares
Date: 06/23/13 Time: 18:28
Sample (adjusted): 1997Q3 2008Q4
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
E(-1)	-0.310897	0.107960	-2.879733	0.0061
D(E(-1))	0.174596	0.148874	1.172782	0.2472

R-squared	0.158808	Mean dependent var	-1.22E-05
Adjusted R-squared	0.139690	S.D. dependent var	0.010827
S.E. of regression	0.010043	Akaike info criterion	-6.321417
Sum squared resid	0.004438	Schwarz criterion	-6.241911
Log likelihood	147.3926	Hannan-Quinn criter.	-6.291634
Durbin-Watson stat	2.046465		

Var Lag Order Selection

VAR Lag Order Selection Criteria
Endogenous variables: EXPEND GDP INF REV INT STOCKPIX
Exogenous variables: C
Date: 06/23/13 Time: 19:13
Sample: 1997Q1 2008Q4
Included observations: 43

Lag	LogL	LR	FPE	AIC	SC	HQ
0	481.2468	NA	1.01e-17	-22.10450	-21.85875	-22.01388
1	672.1348	319.6265	7.66e-21	-29.30860	-27.58835	-28.67422
2	685.2240	18.26390	2.46e-20	-28.24297	-25.04824	-27.06486
3	719.3368	38.07944	3.53e-20	-28.15520	-23.48597	-26.43333
4	974.0012	213.2074	2.48e-24	-38.32564	-32.18191	-36.06002
5	1098.883	69.70177*	1.41e-25*	-42.45970*	-34.84148*	-39.65034*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Vector Error Correction Estimates
Date: 07/16/13 Time: 20:23
Sample (adjusted): 1998Q2 2008Q4
Included observations: 43 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
EXPEND(-1)	1.000000
GDP(-1)	0.098240 (0.00463) [21.1982]
INF(-1)	0.529094 (0.00646) [81.9414]
REV(-1)	-5.046066 (0.06026) [-83.7344]
INT(-1)	1.064197 (0.02547) [41.7850]
STOCKPIX(-1)	0.006908 (0.00194) [3.55768]
C	-0.597844

Error Correction:	D(EXPEND)	D(GDP)	D(INF)	D(REV)	D(INT)	D(STOCKPIX)
CointEq1	-4.435512	35.43492	-0.347351	-1.664455	-3.891037	68.79204
	(1.91256)	(17.8243)	(0.59538)	(0.64637)	(2.61097)	(25.4224)
	[-2.31915]	[1.98801]	[-0.58341]	[-2.57507]	[-1.49027]	[2.70596]
D(EXPEND(-1))	-1.766941	13.95924	-0.126707	-0.656399	-1.537052	26.11035
	(0.76370)	(7.11736)	(0.23774)	(0.25810)	(1.04258)	(10.1513)
	[-2.31367]	[1.96130]	[-0.53297]	[-2.54320]	[-1.47428]	[2.57211]
D(EXPEND(-2))	-1.411385	11.65635	-0.140233	-0.545152	-1.239571	24.48557
	(0.74693)	(6.96109)	(0.23252)	(0.25243)	(1.01968)	(9.92845)
	[-1.88958]	[1.67450]	[-0.60311]	[-2.15959]	[-1.21564]	[2.46620]
D(EXPEND(-3))	-1.722230	14.05340	-0.176882	-0.660583	-1.388969	18.67772
	(0.72063)	(6.71602)	(0.22433)	(0.24355)	(0.98379)	(9.57891)
	[-2.38988]	[2.09252]	[-0.78848]	[-2.71235]	[-1.41186]	[1.94988]
D(EXPEND(-4))	-0.475023	2.188811	0.041706	-0.303513	-0.946652	22.92363
	(0.71338)	(6.64839)	(0.22207)	(0.24109)	(0.97388)	(9.48245)
	[-0.66588]	[0.32922]	[0.18780]	[-1.25890]	[-0.97204]	[2.41748]
D(GDP(-1))	-0.016109	0.109230	0.001814	-0.004601	-0.020159	0.140435
	(0.01633)	(0.15218)	(0.00508)	(0.00552)	(0.02229)	(0.21706)
	[-0.98649]	[0.71776]	[0.35692]	[-0.83375]	[-0.90432]	[0.64700]
D(GDP(-2))	0.020914	-0.132498	0.001407	0.007417	0.007837	0.013926
	(0.01590)	(0.14817)	(0.00495)	(0.00537)	(0.02170)	(0.21133)
	[1.31549]	[-0.89425]	[0.28435]	[1.38036]	[0.36107]	[0.06590]
D(GDP(-3))	0.002020	0.021117	-0.002393	-0.000107	0.003991	-0.337507
	(0.01620)	(0.15094)	(0.00504)	(0.00547)	(0.02211)	(0.21529)
	[0.12473]	[0.13990]	[-0.47466]	[-0.01958]	[0.18050]	[-1.56770]

D(GDP(-4))	0.022103	-0.657583	8.24E-05	-0.009905	0.015245	-0.280734
	(0.01631)	(0.15204)	(0.00508)	(0.00551)	(0.02227)	(0.21685)
	[1.35488]	[-4.32513]	[0.01623]	[-1.79660]	[0.68450]	[-1.29461]
D(INF(-1))	-12.92004	100.6864	-1.049292	-4.851561	-10.48107	201.1135
	(5.49494)	(51.2107)	(1.71057)	(1.85708)	(7.50152)	(73.0406)
	[-2.35126]	[1.96612]	[-0.61342]	[-2.61247]	[-1.39719]	[2.75345]
D(INF(-2))	-12.56572	98.02079	-0.992439	-4.714612	-10.38629	202.1718
	(5.50884)	(51.3402)	(1.71490)	(1.86177)	(7.52049)	(73.2254)
	[-2.28101]	[1.90924]	[-0.57872]	[-2.53232]	[-1.38107]	[2.76095]
D(INF(-3))	-12.28210	96.63087	-1.064416	-4.642208	-9.950809	201.9276
	(5.44299)	(50.7266)	(1.69440)	(1.83952)	(7.43061)	(72.3502)
	[-2.25650]	[1.90494]	[-0.62820]	[-2.52360]	[-1.33917]	[2.79098]
D(INF(-4))	-12.87575	100.9297	-0.120633	-4.764651	-10.74769	201.4900
	(5.46736)	(50.9537)	(1.70199)	(1.84776)	(7.46387)	(72.6740)
	[-2.35502]	[1.98081]	[-0.07088]	[-2.57862]	[-1.43996]	[2.77252]
D(REV(-1))	-9.072951	72.45275	-0.694760	-3.412348	-8.132153	156.0878
	(4.14016)	(38.5846)	(1.28883)	(1.39921)	(5.65201)	(55.0324)
	[-2.19145]	[1.87776]	[-0.53906]	[-2.43876]	[-1.43881]	[2.83629]
D(REV(-2))	-10.18094	79.88218	-0.802374	-3.804843	-8.447673	145.1672
	(4.28822)	(39.9645)	(1.33492)	(1.44925)	(5.85415)	(57.0005)
	[-2.37416]	[1.99883]	[-0.60106]	[-2.62538]	[-1.44302]	[2.54677]
D(REV(-3))	-9.585930	75.41648	-0.591916	-3.539369	-8.794579	166.3145
	(4.14791)	(38.6569)	(1.29124)	(1.40183)	(5.66259)	(55.1354)
	[-2.31103]	[1.95092]	[-0.45841]	[-2.52482]	[-1.55310]	[3.01647]
D(REV(-4))	-10.36428	95.69661	-0.906733	-4.238356	-8.493786	151.6024
	(4.33315)	(40.3832)	(1.34891)	(1.46444)	(5.91548)	(57.5977)
	[-2.39186]	[2.36971]	[-0.67220]	[-2.89419]	[-1.43586]	[2.63209]
D(INT(-1))	2.941492	-23.15961	0.240730	1.108564	2.459089	-46.34852
	(1.27091)	(11.8443)	(0.39563)	(0.42952)	(1.73500)	(16.8933)
	[2.31448]	[-1.95533]	[0.60847]	[2.58095]	[1.41734]	[-2.74360]
D(INT(-2))	3.094201	-24.11962	0.242363	1.157555	2.540728	-46.43778
	(1.30646)	(12.1757)	(0.40670)	(0.44153)	(1.78354)	(17.3660)
	[2.36838]	[-1.98096]	[0.59592]	[2.62167]	[1.42454]	[-2.67407]
D(INT(-3))	2.882430	-22.65507	0.223481	1.081270	2.450410	-46.06624
	(1.29396)	(12.0592)	(0.40281)	(0.43731)	(1.76647)	(17.1998)
	[2.22760]	[-1.87865]	[0.55481]	[2.47256]	[1.38718]	[-2.67831]
D(INT(-4))	2.269123	-24.99911	0.146678	0.847350	2.525814	-45.23071
	(1.25622)	(11.7075)	(0.39106)	(0.42455)	(1.71496)	(16.6982)
	[1.80631]	[-2.13531]	[0.37508]	[1.99586]	[1.47282]	[-2.70873]
D(STOCKPIX(-1))	0.045183	-0.269791	0.002993	0.016695	0.022006	-1.640244
	(0.03484)	(0.32466)	(0.01084)	(0.01177)	(0.04756)	(0.46305)
	[1.29703]	[-0.83100]	[0.27595]	[1.41809]	[0.46273]	[-3.54225]
D(STOCKPIX(-2))	0.090708	-0.545441	0.000752	0.030586	0.056687	-1.512402
	(0.03957)	(0.36876)	(0.01232)	(0.01337)	(0.05402)	(0.52596)
	[2.29243]	[-1.47911]	[0.06103]	[2.28721]	[1.04941]	[-2.87551]
D(STOCKPIX(-3))	0.036122	-0.147874	-0.005311	0.010246	0.031920	-1.360380
	(0.03512)	(0.32726)	(0.01093)	(0.01187)	(0.04794)	(0.46676)

	[1.02867]	[-0.45186]	[-0.48582]	[0.86340]	[0.66586]	[-2.91451]
D(STOCKPIX(-4))	-0.003138	0.058584	0.002261	-0.000589	-0.021595	-0.314117
	(0.02478)	(0.23091)	(0.00771)	(0.00837)	(0.03383)	(0.32935)
	[-0.12663]	[0.25370]	[0.29312]	[-0.07038]	[-0.63842]	[-0.95376]
C	0.302695	-2.371244	0.025041	0.113965	0.247684	-4.856616
	(0.13189)	(1.22920)	(0.04106)	(0.04458)	(0.18006)	(1.75318)
	[2.29498]	[-1.92909]	[0.60989]	[2.55668]	[1.37558]	[-2.77017]
R-squared	0.779522	0.807928	0.931075	0.786008	0.583622	0.702277
Adj. R-squared	0.455290	0.525469	0.829715	0.471313	-0.028700	0.264449
Sum sq. resids	0.002372	0.206054	0.000230	0.000271	0.004421	0.419170
S.E. equation	0.011813	0.110095	0.003677	0.003992	0.016127	0.157026
F-statistic	2.404208	2.860338	9.185792	2.497687	0.953130	1.604003
Log likelihood	149.7944	53.81318	199.9754	196.4418	136.4094	38.54526
Akaike AIC	-5.757877	-1.293636	-8.091878	-7.927526	-5.135321	-0.583501
Schwarz SC	-4.692966	-0.228725	-7.026966	-6.862614	-4.070409	0.481411
Mean dependent	-0.000169	0.029045	0.004650	0.000313	-0.004567	-0.010506
S.D. dependent	0.016006	0.159821	0.008912	0.005491	0.015901	0.183090

Determinant resid covariance (dof adj.)	6.20E-27
Determinant resid covariance	2.37E-29
Log likelihood	1051.056
Akaike information criterion	-41.35146
Schwarz criterion	-34.71624

Vector Error Correction Estimates
Date: 07/16/13 Time: 20:31
Sample (adjusted): 1998Q2 2008Q4
Included observations: 43 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
EXPEND(-1)	1.000000
GDP(-1)	0.093262
	(0.00369)
	[25.2906]
INF(-1)	0.449706
	(0.03094)
	[14.5332]
REV(-1)	-5.101659
	(0.05468)
	[-93.2980]
INT(-1)	1.023870
	(0.02021)
	[50.6531]
STOCKPIX(-1)	0.006561
	(0.00178)
	[3.67750]
@TREND(97Q1)	0.001161
C	-0.434386

Error Correction:	D(EXPEND)	D(GDP)	D(INF)	D(REV)	D(INT)	D(STOCKPIX)
CointEq1	-5.236020 (2.35832) [-2.22023]	48.59354 (23.3604) [2.08017]	-0.553447 (0.74103) [-0.74687]	-2.037872 (0.83635) [-2.43663]	-5.708162 (3.38111) [-1.68825]	93.65453 (33.0020) [2.83784]
D(EXPEND(-1))	-2.101140 (0.84566) [-2.48463]	17.26710 (8.37665) [2.06134]	-0.129150 (0.26572) [-0.48604]	-0.774962 (0.29990) [-2.58407]	-2.099448 (1.21241) [-1.73163]	32.22397 (11.8340) [2.72301]
D(EXPEND(-2))	-1.761794 (0.82801) [-2.12776]	14.88839 (8.20182) [1.81525]	-0.136321 (0.26017) [-0.52396]	-0.666375 (0.29364) [-2.26935]	-1.796751 (1.18710) [-1.51356]	30.45134 (11.5870) [2.62807]
D(EXPEND(-3))	-2.072434 (0.80133) [-2.58625]	17.22279 (7.93757) [2.16978]	-0.172079 (0.25179) [-0.68342]	-0.781225 (0.28418) [-2.74905]	-1.934064 (1.14886) [-1.68347]	24.53075 (11.2137) [2.18758]
D(EXPEND(-4))	-0.807570 (0.79008) [-1.02214]	5.294325 (7.82614) [0.67649]	0.043298 (0.24826) [0.17441]	-0.419452 (0.28019) [-1.49702]	-1.475959 (1.13273) [-1.30301]	28.66421 (11.0562) [2.59258]
D(GDP(-1))	-0.031308 (0.01741) [-1.79801]	0.183743 (0.17248) [1.06529]	0.003138 (0.00547) [0.57358]	-0.009238 (0.00618) [-1.49603]	-0.032451 (0.02496) [-1.29989]	0.279892 (0.24367) [1.14865]
D(GDP(-2))	0.003015 (0.01671) [0.18039]	-0.056528 (0.16556) [-0.34144]	0.003187 (0.00525) [0.60684]	0.002073 (0.00593) [0.34966]	-0.004568 (0.02396) [-0.19065]	0.156666 (0.23389) [0.66982]
D(GDP(-3))	-0.017005 (0.01631) [-1.04289]	0.100829 (0.16152) [0.62426]	-0.000652 (0.00512) [-0.12726]	-0.005840 (0.00578) [-1.00992]	-0.008264 (0.02338) [-0.35350]	-0.186566 (0.22818) [-0.81762]
D(GDP(-4))	0.002729 (0.01635) [0.16687]	-0.572131 (0.16199) [-3.53196]	0.001679 (0.00514) [0.32678]	-0.015821 (0.00580) [-2.72804]	0.002437 (0.02345) [0.10394]	-0.118591 (0.22884) [-0.51822]
D(INF(-1))	-14.88002 (6.58366) [-2.26014]	134.6441 (65.2146) [2.06463]	-1.578888 (2.06870) [-0.76323]	-5.780241 (2.33481) [-2.47568]	-15.26937 (9.43894) [-1.61770]	265.1115 (92.1307) [2.87756]
D(INF(-2))	-14.44931 (6.55389) [-2.20469]	131.1185 (64.9196) [2.01970]	-1.507113 (2.05935) [-0.73184]	-5.610588 (2.32425) [-2.41394]	-15.08247 (9.39625) [-1.60516]	264.5016 (91.7141) [2.88398]
D(INF(-3))	-14.09761 (6.45092) [-2.18536]	128.8250 (63.8997) [2.01605]	-1.564596 (2.02699) [-0.77188]	-5.508184 (2.28773) [-2.40771]	-14.53473 (9.24863) [-1.57156]	262.5294 (90.2731) [2.90817]
D(INF(-4))	-14.60876 (6.42729) [-2.27293]	132.2036 (63.6656) [2.07653]	-0.604653 (2.01956) [-0.29940]	-5.595312 (2.27935) [-2.45478]	-15.23454 (9.21474) [-1.65328]	260.3046 (89.9424) [2.89413]
D(REV(-1))	-10.67888 (5.12991) [-2.08169]	101.4549 (50.8144) [1.99658]	-1.198454 (1.61191) [-0.74350]	-4.202504 (1.81925) [-2.31001]	-12.05260 (7.35471) [-1.63876]	210.9871 (71.7872) [2.93906]
D(REV(-2))	-11.66170 (5.27413) [-2.21111]	109.0164 (52.2430) [2.08672]	-1.336427 (1.65722) [-0.80643]	-4.566206 (1.87040) [-2.44130]	-12.37378 (7.56148) [-1.63642]	200.3143 (73.8053) [2.71409]

D(REV(-3))	-11.12965	104.3183	-1.107742	-4.313628	-12.68800	221.0351
	(5.13444)	(50.8593)	(1.61333)	(1.82086)	(7.36121)	(71.8506)
	[-2.16764]	[2.05112]	[-0.68662]	[-2.36901]	[-1.72363]	[3.07632]
D(REV(-4))	-11.86828	124.7358	-1.428326	-5.002340	-12.43066	206.5387
	(5.30733)	(52.5719)	(1.66766)	(1.88217)	(7.60908)	(74.2700)
	[-2.23620]	[2.37267]	[-0.85649]	[-2.65775]	[-1.63366]	[2.78092]
D(INT(-1))	3.242619	-29.64347	0.349544	1.265137	3.400953	-58.51602
	(1.45535)	(14.4160)	(0.45730)	(0.51612)	(2.08653)	(20.3660)
	[2.22806]	[-2.05629]	[0.76437]	[2.45124]	[1.62996]	[-2.87322]
D(INT(-2))	3.357531	-30.49624	0.354905	1.302991	3.470258	-58.39416
	(1.48281)	(14.6880)	(0.46593)	(0.52586)	(2.12590)	(20.7503)
	[2.26430]	[-2.07626]	[0.76172]	[2.47783]	[1.63237]	[-2.81414]
D(INT(-3))	3.140037	-28.85506	0.331165	1.222542	3.360538	-57.68224
	(1.46273)	(14.4891)	(0.45962)	(0.51874)	(2.09711)	(20.4693)
	[2.14669]	[-1.99150]	[0.72052]	[2.35676]	[1.60246]	[-2.81799]
D(INT(-4))	2.525252	-31.02733	0.249985	0.986020	3.412104	-56.52372
	(1.42032)	(14.0690)	(0.44629)	(0.50370)	(2.03631)	(19.8758)
	[1.77794]	[-2.20536]	[0.56014]	[1.95756]	[1.67563]	[-2.84385]
D(STOCKPIX(-1))	0.043675	-0.350158	0.004903	0.017153	0.035613	-1.787383
	(0.03522)	(0.34885)	(0.01107)	(0.01249)	(0.05049)	(0.49283)
	[1.24016]	[-1.00376]	[0.44308]	[1.37338]	[0.70533]	[-3.62679]
D(STOCKPIX(-2))	0.084019	-0.614458	0.003417	0.029616	0.068396	-1.637894
	(0.03920)	(0.38825)	(0.01232)	(0.01390)	(0.05619)	(0.54849)
	[2.14360]	[-1.58264]	[0.27742]	[2.13067]	[1.21715]	[-2.98618]
D(STOCKPIX(-3))	0.029137	-0.197115	-0.003128	0.008945	0.040895	-1.448652
	(0.03429)	(0.33965)	(0.01077)	(0.01216)	(0.04916)	(0.47983)
	[0.84975]	[-0.58035]	[-0.29032]	[0.73557]	[0.83189]	[-3.01909]
D(STOCKPIX(-4))	-0.009004	0.033237	0.003913	-0.001797	-0.017393	-0.359826
	(0.02402)	(0.23792)	(0.00755)	(0.00852)	(0.03444)	(0.33612)
	[-0.37487]	[0.13970]	[0.51848]	[-0.21098]	[-0.50509]	[-1.07052]
C	0.233680	-2.201690	0.029187	0.092725	0.243670	-4.498403
	(0.11082)	(1.09770)	(0.03482)	(0.03930)	(0.15888)	(1.55076)
	[2.10870]	[-2.00573]	[0.83821]	[2.35942]	[1.53370]	[-2.90078]
@TREND(97Q1)	0.004305	-0.036298	0.000308	0.001610	0.004395	-0.069823
	(0.00176)	(0.01745)	(0.00055)	(0.00062)	(0.00253)	(0.02466)
	[2.44303]	[-2.07964]	[0.55702]	[2.57724]	[1.73988]	[-2.83166]
R-squared	0.810817	0.813817	0.939744	0.797816	0.605957	0.716861
Adj. R-squared	0.503395	0.511270	0.841829	0.469267	-0.034362	0.256761
Sum sq. resids	0.002036	0.199736	0.000201	0.000256	0.004184	0.398636
S.E. equation	0.011280	0.111730	0.003544	0.004000	0.016171	0.157844
F-statistic	2.637472	2.689887	9.597522	2.428299	0.946336	1.558055
Log likelihood	153.0857	54.48273	202.8655	197.6621	137.5948	39.62513
Akaike AIC	-5.864450	-1.278266	-8.179790	-7.937774	-5.143945	-0.587216
Schwarz SC	-4.758580	-0.172397	-7.073921	-6.831905	-4.038075	0.518654
Mean dependent	-0.000169	0.029045	0.004650	0.000313	-0.004567	-0.010506
S.D. dependent	0.016006	0.159821	0.008912	0.005491	0.015901	0.183090

Determinant resid covariance (dof adj.)	5.68E-27
Determinant resid covariance	1.51E-29

Log likelihood	1060.739
Akaike information criterion	-41.52274
Schwarz criterion	-34.64178

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 07/22/13 Time: 19:52
Sample: 1997Q1 2008Q4
Included observations: 43

Lags	LM-Stat	Prob
1	12.95622	0.9999
2	26.79216	0.8674
3	31.71051	0.6728
4	132.9666	0.0000

Probs from chi-square with 36 df.

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 07/22/13 Time: 20:21
Sample: 1997Q1 2008Q4
Included observations: 43

Component	Skewness	Chi-sq	df	Prob.
1	-0.077990	0.043591	1	0.8346
2	1.098125	8.642133	1	0.0033
3	0.005016	0.000180	1	0.9893
4	-1.459764	15.27154	1	0.0001
5	-0.290463	0.604642	1	0.4368
6	0.100612	0.072546	1	0.7877
Joint		24.63463	6	0.0004

Component	Kurtosis	Chi-sq	df	Prob.
1	2.537186	0.383770	1	0.5356
2	9.714914	80.78638	1	0.0000
3	4.196018	2.562904	1	0.1094
4	14.64262	242.8616	1	0.0000
5	4.478904	3.918658	1	0.0478
6	2.648363	0.221537	1	0.6379
Joint		330.7349	6	0.0000

Component	Jarque-Bera	df	Prob.
1	0.427361	2	0.8076
2	89.42851	2	0.0000
3	2.563084	2	0.2776
4	258.1332	2	0.0000

5	4.523301	2	0.1042
6	0.294082	2	0.8633
Joint	355.3695	12	0.0000