The Academy of Economic Studies Bucharest
Doctoral School of Finance and Banking

Identifying of the fiscal policy shocks

Coordinator
LEC. UNIV. DR. BOGDAN COZMÂNCĂ

MSC Student
Andreea Alina Matache

Dissertation Paper Outline

- Introduction
- Approaches of modern macroeconomics of fiscal policy effects
- Literature review
- Econometric model
- Data and empirical specification
- Empirical results
- Robustness checks
- Conclusions

Introduction

- Fiscal policy relates to the impact of government spending and tax on aggregate demand and the economy.
- Expansionary fiscal policy is an attempt to increase aggregate demand and will involve higher government spending and lower taxes. This expansionary fiscal policy will lead to a larger budget deficit.
- Deflationary fiscal policy is an attempt to reduce aggregate demand and will involve lower spending and higher taxes. This deflationary fiscal policy will help reduce a budget deficit.
- Since 2008, following the crisis that affected most global economies, fiscal policy has become an important tool in trying to counter the it. A high attention was given in Europe, starting with 2010, due to the outbreak of the sovereign debt crisis.

What is a shock?

- The definition of a fiscal policy shock is: an unpredicted change in fiscal policy. Unfortunately, there is no such thing as a fiscal policy shock per se, because the Government announces the fiscal changes before they are made. Fiscal policy encompasses a wide variety of policies: there is an endless list of types of incomes, for which the tax rules could be changed, or categories of government spending, where changes could occur.

What is a shock?

- In the econometric sense, a shock is a random variable, is the deviation of actual value from the estimated value.

Brief Literature Review

- Four main identification approaches have been used to date:
- the recursive approach introduced by Sims (1980) and applied to study the effects of fiscal shocks by Fatas and Mihov (2001);
- the structural VAR approach proposed by Blanchard and Perotti (2002) and extended in Perotti (2005, 2007);
- the sign-restrictions approach developed by Uhlig (2005) and applied to fiscal policy analysis by Mountford and Uhlig (2005);
- the event-study approach introduced by Ramey and Shapiro (1998) to study the effects of large unexpected increases in government defense spending and also used by Edelberg et al. (1999), Eichenbaum and Fisher (2005),Perotti (2007) and Ramey (2007).

Data Description

Variables	Description and calculation	Unit	Source	Treatment
G	Government purchases of goods and services = government consumption + government investment = compensation of public employees + intermediate consumption + government gross fixed capital formation; general government sector	log of real domestic currency	EUROSTAT	each component was seasonal adjusted using Demetra+,TRAMO/SEATS (RSA4), deflated using GDP deflator and divided by the active population
R	Net taxes = government revenues - transfers = indirect taxes + direct taxes + social security contributions – social benefits and social transfers in kind–subsidies; general government sector			
Y	GDP at 2000 market prices		INSSE	
Pi	Quarter to quarter change of the nationally defined consumer price index	%		
I	Short-term interest rate corresponding to the one year interbank offered rate	% per anuum	BNR	

Sample period: 2002Q1:2014Q4; data frequency: quarterly; number of observations: 52

VAR Model Description

- Considering the form of a structural vector autoregressive (SVAR) model:

$$Ay_t = B_1 y_{t-1} + \ldots B_p y_{t-p} + B\,\varepsilon_t$$

yt - n x 1 vector of macroeconomic variables at time t;

A - m x m matrix of contemporaneous effects, represents the impact of lagged effects (matrix lag operator notation),

B_l - n x n matrix of parameters for l = 1, . . . , p , is a m x m structural form parameter matrix

ut -n x 1 vector of structural shocks with $\varepsilon t \sim N(0, BE(\varepsilon t\, \varepsilon t')B')$.

VAR Model Description

- The reduced-form equation is given by:

$$y_t = A^{-1}B_1 y_{t-1} + \cdots + A^{-1}B_p y_{t-p} + A^{-1}B\varepsilon_t$$

Or

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + u_t$$

where $A_l = A^{-1}B_l, u_t = A^{-1}B\varepsilon_t$ şi $E(u_t u_t') = A^{-1}BE(\varepsilon_t \varepsilon_t')B'A'^{-1}$.

Identification scheme

- Using this relation between reduced form residuals and structural shocks, we can now specify the model for innovations Aut=$B\,\varepsilon\,t$ and the identification scheme used by Perotti (2004) as follows:

$$u_t^g = a_{gy}u_t^y + a_{gpi}u_t^{pi} + a_{gi}u_t^i + b_{gr}e_t^r + b_{gg}\varepsilon_t^g$$

$$u_t^r = a_{ry}u_t^y + a_{rpi}u_t^{pi} + a_{ri}u_t^i + b_{rg}e_t^g + b_{rr}\varepsilon_t^r$$

$$u_t^y = a_{yg}u_t^g + a_{yr}u_t^r + b_{yy}\varepsilon_t^y$$

$$u_t^{pi} = a_{pig}u_t^g + a_{piy}u_t^y + a_{pir}u_t^r + b_{pipi}\varepsilon_t^{pi}$$

$$u_t^i = a_{ig}u_t^g + a_{iy}u_t^y + a_{ipi}u_t^{pi} + a_{ir}u_t^r + b_{ii}\varepsilon_t^i$$

Identification scheme

The relation Aut=$B\,\varepsilon\,t$ can be written in the metrical form as:

$$\begin{bmatrix} 1 & 0 & 0{,}47 & 0 & 0 \\ -a_{yg} & 1 & 0 & -a_{yr} & 0 \\ -a_{pig} & -a_{piy} & 1 & -a_{pir} & 0 \\ 0 & -1{,}34 & -0{,}87 & 1 & 0 \\ -a_{ig} & -a_{iy} & -a_{ipi} & -a_{ir} & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^y \\ u_t^{pi} \\ u_t^r \\ u_t^i \end{bmatrix} = \begin{bmatrix} b_{gg} & 0 & 0 & 0 & 0 \\ 0 & b_{yy} & 0 & 0 & 0 \\ 0 & 0 & b_{pipi} & 0 & 0 \\ b_{rg} & 0 & 0 & b_{rr} & 0 \\ 0 & 0 & 0 & 0 & b_{ii} \end{bmatrix} \begin{bmatrix} \varepsilon_t^g \\ \varepsilon_t^y \\ \varepsilon_t^{pi} \\ \varepsilon_t^r \\ \varepsilon_t^i \end{bmatrix}$$

Results

Variables Order

- Following Kaldara and Camps (2005), the endogenous variables order is:
  - Government Expenditure
  - Real GDP
  - Inflation Rate
  - Net Taxes
  - Interest Rate

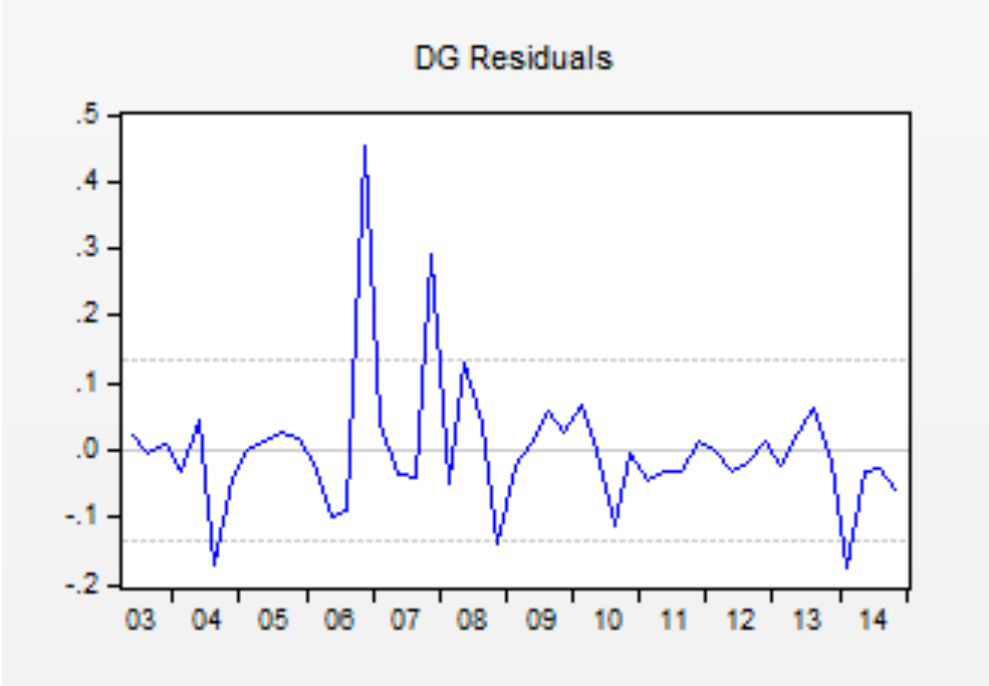
Lag Length Criteria

Lag length criteria suggests a VAR(1) or a VAR(7) model, even though I choose a VAR(4), because the lag between decision and implementation of the fiscal policy changes is a 4 quarter lag.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	386.6536	NA	2.01e-14	-17.34789	-17.14514	-17.27270
1	467.5453	139.7221*	1.60e-15*	-19.88842	-18.67193*	-19.43729*
2	485.5742	27.04333	2.30e-15	-19.57155	-17.34132	-18.74447
3	512.0965	33.75566	2.42e-15	-19.64075	-16.39677	-18.43772
4	532.1867	21.00343	3.87e-15	-19.41758	-15.15985	-17.83861
5	555.0266	18.68716	6.76e-15	-19.31939	-14.04792	-17.36447
6	604.6103	29.29950	5.10e-15	-20.43683	-14.15162	-18.10597
7	659.4843	19.95417	6.59e-15	-21.79474*	-14.49578	-19.08794

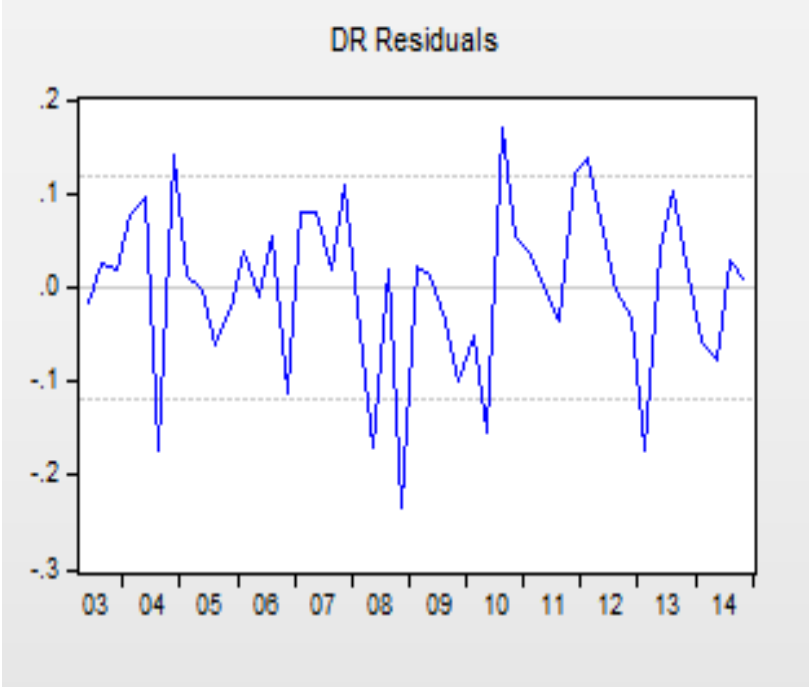
Interpreting the fiscal shocks

We can see that in 2006q4 and 2007q4 there were some large positive shocks, this shocks are caused by large spendings for intermediate consumption and gross fixed capital formation.



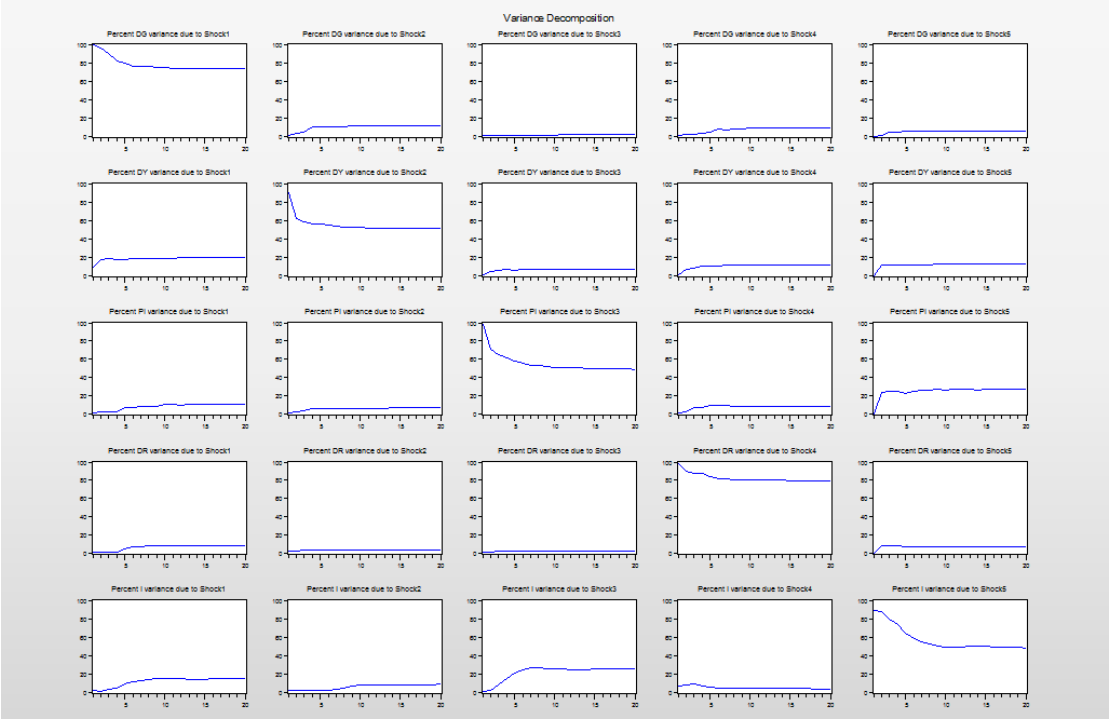
Interpreting the fiscal shocks

The negative large shock from 2008q4 is caused by the decrease of the revenues from direct taxes, decrease caused by the effects of the crises, from indirect taxes, decrease caused by the lower consumption and form the increase of the social benefits, increase caused by the unemployment which increase in that period. The 2013q4 negative shock is caused by the decrease of the indirect taxes, caused most probably by a decrease in private consumption in the first quarter of the year. Also the positive shock from the 2010q3 is caused by a large increase in the indirect taxes revenues, this increase my be caused by the announcement of the VAT increases adopted in 2010 and implemented since 2011.



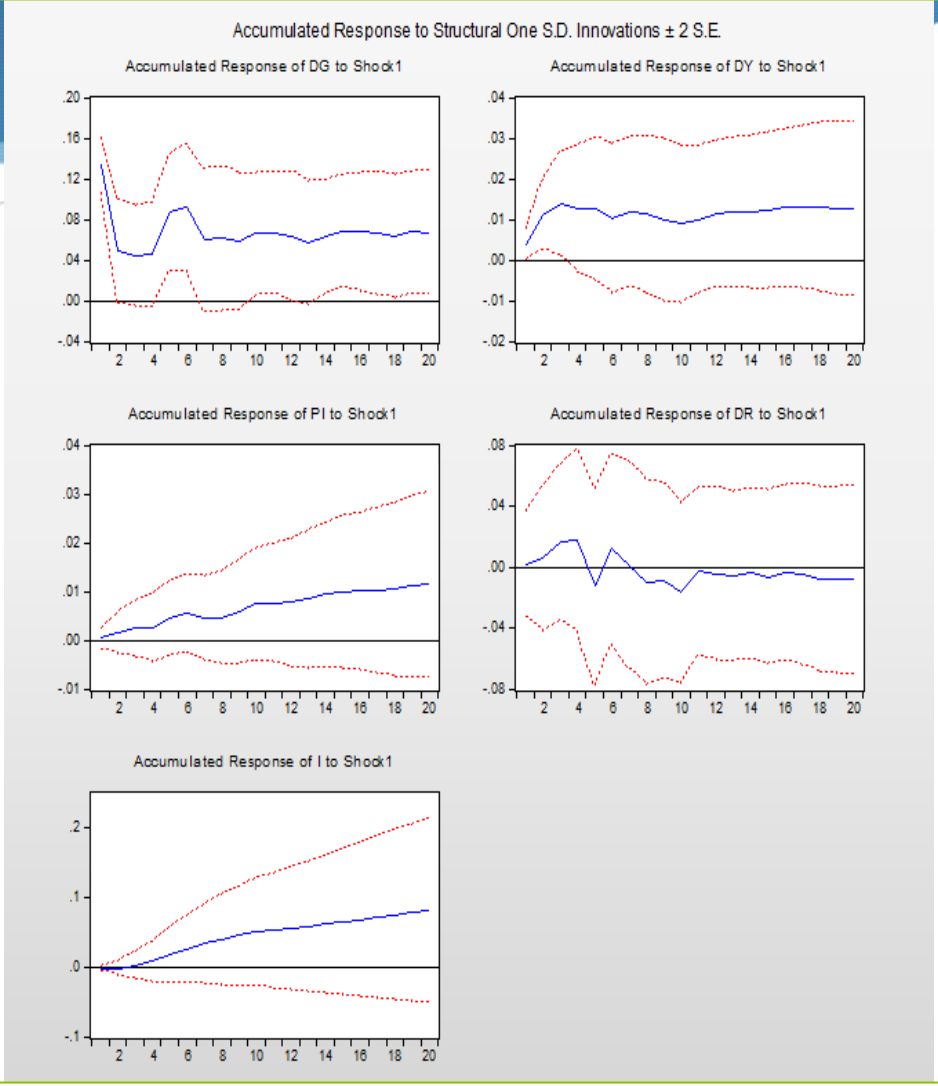
Variance Decomposition

- Variance decomposition indicates to what extent a certain variable can explain the evolution of other variables variance. As we can see the variance of the non fiscal variables in the two fiscal variables is low, under 20% in both cases.



Impulse responses

The real GDP response to a spending shock is weak and has a small magnitude, around 0.012, is significant only for two quarters after the shock.
The level of GDP increases during the first three quarters after the shock.
The response of inflation have an increasing trend during the 20 quarters, reaching the value 0.011 in the 20th quarter.
The interest rate response have also an increasing trend, in the 20th quarter reach the value 0.08.



Impulse responses

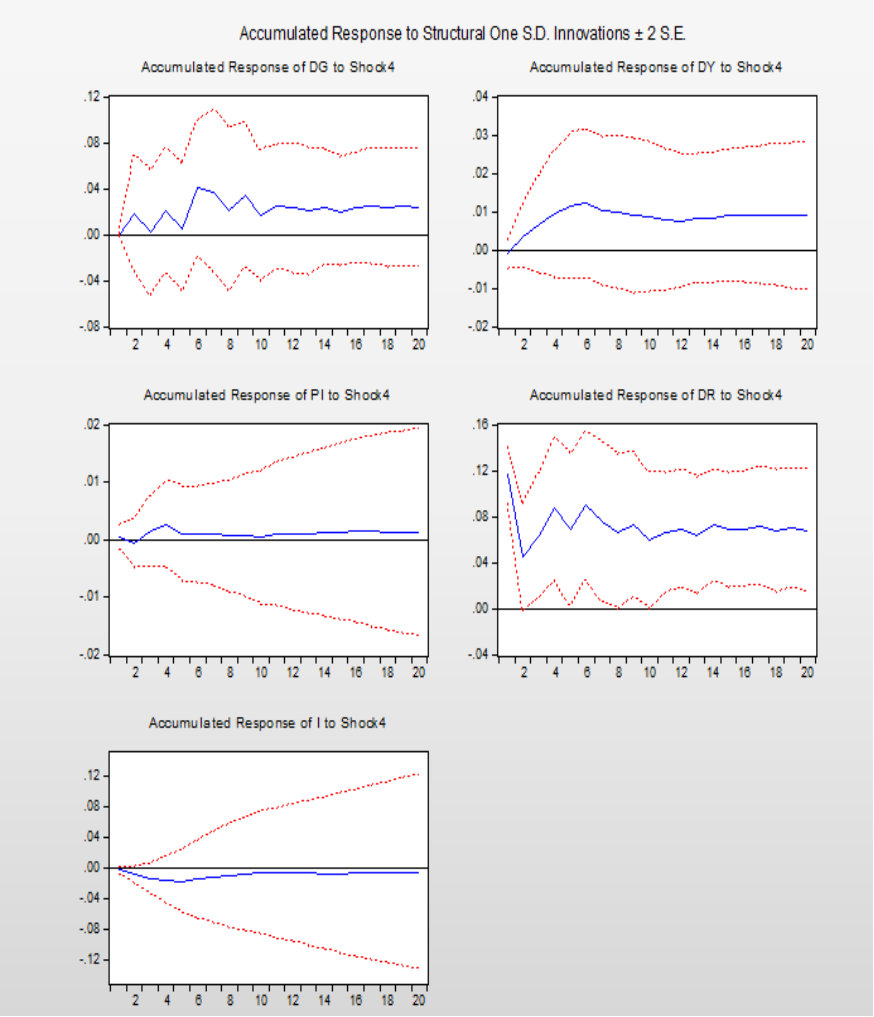
The real GDP response to a revenue shock is positive; an increase in taxes leads to an increase in real GDP

fiscal contraction mitigates concerns about debt sustainability and therefore reduces the impact produced by an increase in taxes on private sector, leading to an increase in demand.

the GDP increases for six quarters till it tends the 0.12 value after the shock and in the long run tends to the value of 0.09.

The inflation and interest rate responses are small either. The inflation decrease in the second quarter after the shock, than increase to the value of 0.003 in the fourth quarter and in the long run tends to the 0.001 value.

Interest rate have a negative response -0.018 after 5 quarters and tends in the long run to -0.007



- The conclusion in this case is that the response of the exogenous variables, GDP, inflation and inters rate in the fiscal variable shocks are very small and insignificant statistically speaking, which proves us that the new-Keynesians and the Mundlle-Fleming model are right in the case of a small open economy with a flexible exchange rate like Romania.

ROBUSTNESS CHECK

- Different assumption on fiscal variables ordering: if government spending decisions come first
- Estimating the model with one lag, as the identification criteria indicate
- Using the Cholesky decomposition
- After all of this changes, the results are similar with the one obtained in the benchmark model so I can conclude that the model is robust

Why are the responses so small?

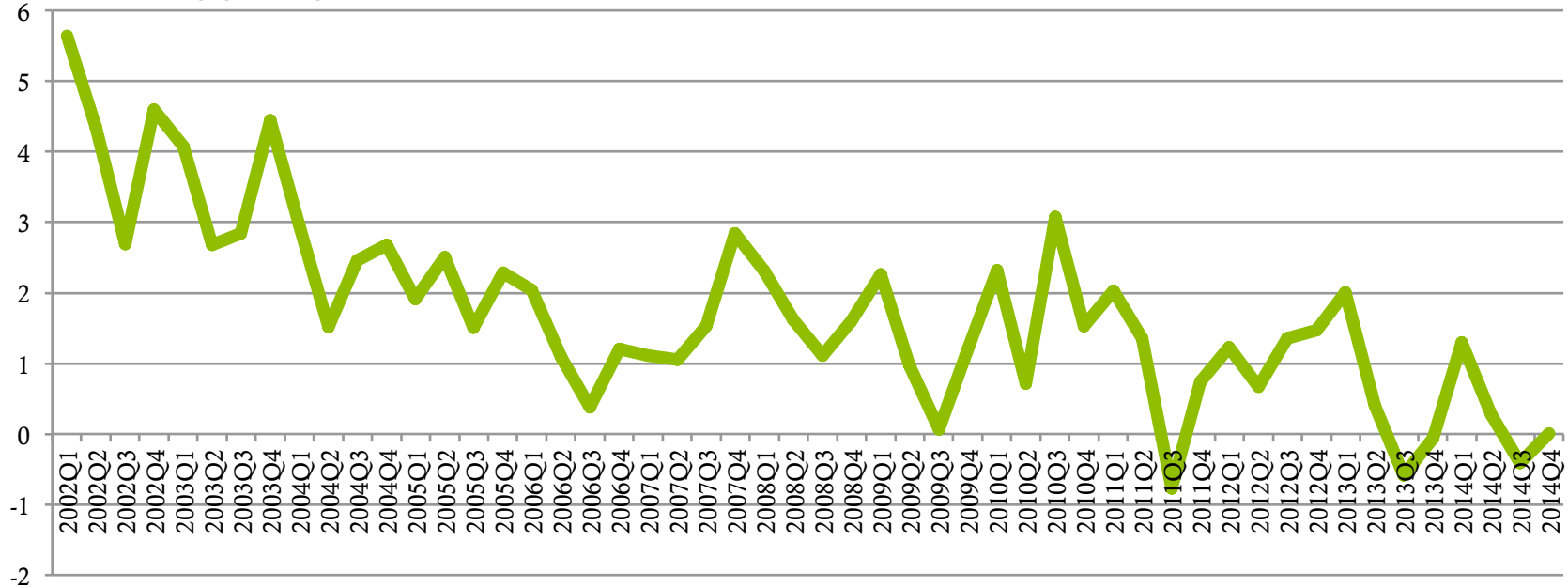
- Exchange rate regime and fiscal policies
  - Romania has a type of flexible exchange rate regime : managed floating regime
  - Capital account liberalization (2005) might have an impact on the fiscal multiplier size
  - Mundell Fleming predicts that fiscal policy is ineffective under flexible exchange rate
  - Expansionary fiscal policy : G ↑ => Interest Rates ↑ => higher interest rates attract inflow of foreign capital => exchange rate appreciation => current account deficit ↑

Why are the responses so small?

- Openness to trade
  - Romania is a small open economy which has an increased dependence on imports.
  - A high propensity to imports means that an expansionary fiscal policy, conducted through an increase in spending or through a tax cut, will ultimately increase the demand for imports

Why are the responses so small?

- Inflationary environment
  - In a high inflationary environment, an increase in spending conducts to a decrease in output. Fiscal expansion increases inflationary expectations and raises the cost of credit offsetting the fiscal stimulus on output growth in the short run.
  - The tables below present the inflation evolution during 2002-2014



Model weaknesses

- After estimating the parameters of the VAR using exogenous information regarding the size of automatic stabilizers, discretionary fiscal policies are supposedly captured by the residual. But the residual contains everything that is not modeled, including not least the models' errors in capturing the relationship being estimated

- Considering the elasticities of fiscal variables to the macro variables constant over the time horizon covered by my analysis or that they are the same, no matter the type of shock affecting the economic activity, is a strong assumption

Conclusions

- The main findings suggest that the impact of government expenditure and revenue shocks on economic growth is nevertheless insignificant and therefore, discretionary policy measures are negligible in a small open economy like Romania.

- However, the results concerning fiscal multipliers show a mixture of both Keynesian and non-Keynesian responses of output to domestic fiscal expansions. Output tends to increase when fiscal policymakers implement a fiscal expansion. These reactions are, however, not very precisely estimated for net taxes and only statistically significant in the first two quarters for spending; therefore they are relatively short-lived.

Conclusions

- There are however several caveats of the analysis: first of all, the time span is relatively short and this aspect may affect the robustness of the results, even that the robustness check show that the model is quite robust. Secondly, Romania is an emerging country affected by structural changes which are easily dealt with in a time varying framework, his being one of the future approaches the paper could be extended with.

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