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Effects of fiscal policy and exchange rates on aggregate output in Bulgaria

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Abstract: Based on a sample during 2000.Q4 – 2015.Q1, this paper finds that equilibrium aggregate output in Bulgaria is positively associated with the real effective exchange rate, the real oil price, the real stock price and three seasonal dummy variables and negatively affected by government debt as a percent of GDP, the real interest rate and the expected inflation rate. Therefore, a prudent fiscal policy, real currency appreciation, a lower real interest rate, a healthy stock market, and a lower inflation expectation would be conducive to economy growth.

Keywords: government debt, exchange rates, oil prices, stock prices, inflation expectations.

1. Introduction

During the year 2014, Bulgaria's economy performed well in several areas. According to the data from the FocusEconomics (2016), the Eurostat (2016) and the International Financial Statistics (2015a), government budget deficit as a percent of GDP was relatively low and estimated to be 2.8%. Government debt as a percent of GDP was 27.0%, which was much lower than the average 86.8% for the 28 EU countries. The inflation rate of -

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1.41% suggests that the central bank conducted monetary policy properly and protected the value of the lev from erosion by inflation. The real effective exchange rate had been on the rise, meaning that the lev had real appreciation relative to a basket of other currencies. However, there were several weaknesses in Bulgaria's economy. The annual growth rate of real GDP was 1.706%, suggesting that labor, capital and other resources may not operate at full capacity. The average lending rate of 8.28% was higher than most EU countries, making household and business borrowings more costly. The unemployment rate of 11.76% implies that there was labor market slack that needs to be improved. International trade showed trade deficits in recent years including 585.4 million leva. The International Monetary Fund (2015b) provides a detailed assessment of Bulgaria's economy and makes suggestions for improvement.

Many studies have examined Bulgaria's economy in the area of fiscal policy (Economic Policy Institute, 2010; Karagyozova, 2013; Petrevski, Bogoev, and Tevdovski, 2015; Vasilev, 2015; Karagyozova-Markova, Deyanov, and Iliev, 2013), the exchange rate and international trade (Penkova-Pearson, 2011; Němec and Žídek, 2014; Papazoglou and Pentecost, 2016; Papazoglou, 2016), monetary policy (Petrevski, Bogoev, and Tevdovski, 2015; Vladova and Yanchev, 2015), the role of foreign direct investment in economic development (Popa, 2013; Trifonova and Trifonova, 2014), the recent financial crisis or stability (Dimitrova, K., & Fantacci, 2010; Marer, 2010; Furceri and Zdzienicka, 2011; Petkova, 2013), economic growth and fluctuations (Ivanov and Webster, 2010; Benczúr and Rátfai, 2010; Altunc and Aydın, 2013; Shishmanova, 2014), the banking sector (Houbenova-Delisivkova, 2014; Peshev, 2014), the labor market (Raleva, 2014; Maiväli and Stierle, 2015), and the role of education in economic growth (Neycheva, 2013), and other subjects. To the authors' best knowledge, few of the previous studies have applied aggregate demand and aggregate supply model in analyzing aggregate output in Bulgaria.

This paper focuses on the effects of a change in government debt as a percent of GDP and real appreciation or depreciation of the Bulgarian lev on aggregate output. Other relevant economic and business variables such as the real oil price, the real interest rate, the real stock price, and the expected inflation rate will be considered as well.

2. The model

It is postulated that aggregate demand is determined by the inflation rate, government spending, government revenue, the real interest rate, the real oil price and the real exchange rate and that the inflation rate is a function of the expected inflation rate, short-run aggregate supply and the real oil price. We can express the reduced-form equation as:

$$\overline{Y} = f(G - T, EX, OP, IR, SP, \pi^e) \quad (1)$$

where

$\overline{Y}$ = equilibrium real GDP in Bulgaria,
G = government spending,
T = government revenue,
EX = real effective exchange rate,
OP = real oil price,
IR = real interest rate,
SP = real stock price, and
π^e = expected inflation rate.

To measure the impact of fiscal policy on aggregate output, we substitute government debt as a percent of GDP (DY) for budget deficit as measured by G-T mainly because selling of government bonds tends to affect interest rates, which in turn would influence private spending and real GDP.

$$\overline{Y} = w(DY, EX, OP, IR, SP, \pi^e) \quad (2)$$

An analysis of the sample data indicates that real GDP shows seasonal variations. Thus, we include three seasonal dummy variables in the estimated equation:

$$\overline{Y} = z(\underset{?}{DY}, \underset{?}{EX}, \underset{?}{OP}, \underset{-}{IR}, \underset{+}{SP}, \underset{-}{\pi^e}, \underset{+}{Q2}, \underset{+}{Q3}, \underset{+}{Q4}) \quad (3)$$

where *Q2*, *Q3* and *Q4* stand for the second, third and fourth quarters, respectively. We expect that equilibrium real GDP has a negative relationship with the real interest rate and the expected inflation rate, a positive relationship with the real stock price and three seasonal dummy variables, and an unclear relationship with government debt as a percent of GDP, the real effective exchange rate and the real oil price.

Government debt is essential for many countries to improve infrastructures, stimulate economic activities, and make up for the budget shortfall in order to pursue full employment and economic growth. Nonetheless, when government debt is too high and unsustainable, it may cause a financial crisis because inability to pay back the debt may lead to downgrading of government bonds and a higher interest rate premium that investors demand for future loans. Furthermore, a relatively high government debt or deficit is likely to raise interest rates, crowd out private spending, and reduce aggregate demand and real GDP. Several recent studies show that more government debt or deficit raises interest rates in varying degrees or under certain conditions and may reduce private spending (Baldacci and Kumar, 2010; López, Riquelme and Muñoz, 2011; Hauner and Kumar, 2011; Gruber and Kami, 2012; Claeys, Moreno and Suriñach, 2012; Ağca and Celasun, 2012; Aisen and Hauner, 2013; Cebula and Cuellar, 2010; Cebula, 2014a, 2014b; Cebula, Angjellari-Dajci, and Foley, 2014) whereas other studies (Barro, 1989; Darrat, 1989, 1990; Findlay, 1990; Ostrosky, 1990) indicate that more government debt or deficit does not affect real GDP or interest rates.

If there is real currency appreciation, it tends to reduce net exports, shift aggregate demand to the left, reduce import prices and domestic inflation, and shift short-run aggregate supply to the right (Cheikh and Rault, 2014). Hence, the net effect is uncertain and can only be tested empirically. Many previous studies have examined the subject for developed and less developed countries, and the findings are inclusive (Upadhyaya, Mixon and Bhandari, 2004; Miteza, 2006; Bahmani-Oskooee and Kutan, 2008; Kalyoncu, Artan, Tezekici and Ozturk, 2008; Kim, An, and Kim, 2015). Whether these findings may apply to Bulgaria remains to be tested.

Bulgaria is a net oil importing country. A higher oil price tends to shift aggregate demand and short-run aggregate supply to the left and cause real GDP to decline (Hamilton, 1983, 1996; Mork, 1989). However, if a higher oil price is driven by aggregate demand shocks, the effect may be positive in the short run and negative in the long run; and if oil supply shocks cause the oil price to rise, real GDP tends to decline temporarily (Kilian, 2008a). Kilian (2008b) provides a good review of the impacts of oil prices on economic activities.

3. Empirical results

The data were collected from Eurostat published by the European Commission and the International Financial Statistics published by the International Monetary Fund. Real GDP is measured in million leva. The real effective exchange rate is trade-weighted exchange rate, and an increase means real appreciation. The real oil price is derived from the nominal oil price deflated by the consumer price index and measured in the lev per barrel. The real interest rate is represented by the government bond yield minus the expected inflation rate. The real stock price is represented by the share price deflated by the consumer price index. The expected inflation rate is calculated as the average inflation rate of the past four quarters. The estimated regression without the three seasonal dummy variables represents results for the first quarter.

Figure 1 presents scatter diagrams between real GDP and selected explanatory variables. Real GDP and government debt as a percent of GDP seem to show a negative relationship. The relationship between real GDP and the real effective exchange rate or the real oil price seems to be positive. Real appreciation instead of real depreciation would raise real GDP.

The ADF test is applied to determine whether each of the individual variables has a unit root. The critical values are approximately -3.5527, -2.9145 and -2.5950 at the 1%, 5% and 10% levels, respectively. Comparing with the test statistic, each of the time series variables has a unit root at the 5% level. The ADF test on the regression residuals shows that the test statistic of -3.6527 is greater than the critical value of -3.5600 in absolute values at the 1% level, suggesting that these time series variables are cointegrated.

Estimated parameters and other statistics are reported in Table 1. Approximately 97.51% of the change in equilibrium real GDP can be explained by the nine right-hand side variables. The F test shows that the whole regression is significant at the 1% level. The mean absolute percent error (MAPE) of 2.1004% suggests that the forecast error would be relatively small.

All the estimated coefficients are significant at the 1% level. Equilibrium real GDP is negatively influenced by government debt as a percent of GDP, the real interest rate and the expected inflation rate and positively impacted by the real effective exchange rate, the real oil price, the real stock price, and three seasonal dummy variables. In percentage terms and absolute values, the real effective exchange rate has the largest impact on equilibrium real GDP. If the real effective exchange rate rises 1%, equilibrium real GDP would decline 0.6693%. When government debt as a percent of GDP rises 1%, equilibrium real GDP would decrease 0.0927%. A 1% increase in the real oil price leads to a 0.0203% increase in equilibrium real GDP. If the real stock price rises 1%, equilibrium real GDP would rise 0.0188%, suggesting that an increase in the stock price increases household wealth and consumption spending. Other coefficients can be interpreted in a similar manner.

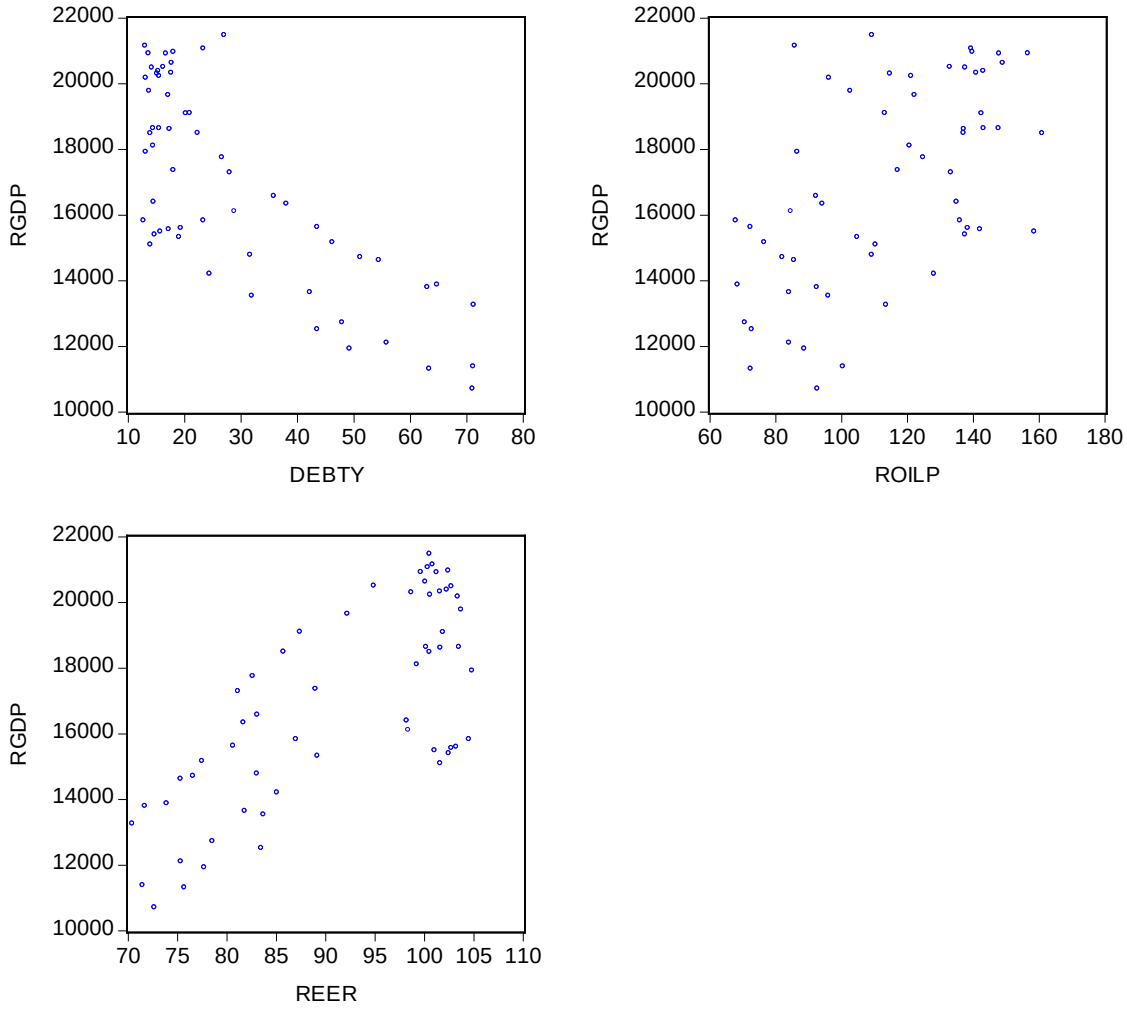

Figure 1. Scatter diagrams

Notes: RGDP, DEBTY, REER and ROIP stand for real GDP, government debt as a percent of GDP, the real effective exchange rate and the real oil price, respectively.

Table 1. Estimated regression of log(equilibrium real GDP) in Bulgaria

Variable	Coefficient	z-Statistic
C	6.720617	698.9434
Log(government debt/GDP ratio)	-0.092702	-87.72116
Log(real effective exchange rate)	0.669273	191.0836
Log(real oil price)	0.020295	4.578116
Real lending rate	-0.014195	-67.72970
Log(real stock price)	0.018824	13.10759
Expected inflation rate	-0.012102	-2926.580
Q2	0.094148	36.86913
Q3	0.249923	86.22402
Q4	0.251642	130.2580
R-squared	0.975094	
Adjusted R-squared	0.968452	
Akaike information criterion	-4.285113	
Schwarz criterion	-3.823290	
F-statistic	146.8134	
Methodology	EGARCH	
Mean absolute percent error (MAPE)	2.1004%	
Sample period	2000.Q4 – 2015.Q1	
Sample size	58	

Notes: All the coefficients are significant at the 1% level. EGARCH stands for the exponential generalized autoregressive conditional heteroscedasticity model.

Several other versions have been considered. If the real exchange rate defined as the units of the lev per U.S. dollar times relative prices in the U.S. and Bulgaria replaces the real effective exchange rate, the negative coefficient of the real exchange rate is significant at the 1% level. However, the coefficient of the real stock price or the real oil price becomes negative and significant at the 1% or 2.5% level mainly due to a high degree of multicollinearity. In comparison, the real effective exchange rate is a trade-weighted measure and is more appropriate as the majority of Bulgaria's trade was outside of the U.S. If the real government bond yield is replaced by the real lending rate, the coefficient of the real lending rate is estimated to be -0.0143 and significant at the 1% level, which is very similar to the coefficient of the real government bond yield. The MAPE of 2.2923% is slightly higher than that in Table 1 when the real government bond yield is used. If lagged German real GDP is included in the regression to represent foreign income, its positive coefficient is significant at the 1% level. However, in the base model without dummy variables, the coefficient of the real effective exchange rate becomes negative and significant at the 1% level due to a high degree of multicollinearity.

4. Summary and conclusions

This paper has examined the relationship between real GDP and government debt, real depreciation or appreciation, and other relevant economic and business variables for Bulgaria. The exponential GARCH model is applied in empirical work. A lower government debt as a percent of GDP, real appreciation of the lev, a higher real oil price, a lower real interest rate, a higher real stock price, or a lower expected inflation rate tends to raise real GDP. Real GDP shows seasonal variations as real GDP in the second, third or fourth quarter is greater than real GDP in the first quarter.

Although Bulgaria has relatively low government debt as a percent of GDP, the result suggests that in order to purse economic growth, the Bulgarian government needs to reduce government debt as a percent of GDP. The positive impact of real appreciation on real GDP implies that the conventional wisdom to pursue real currency depreciation to stimulate exports for an economy would not work for Bulgaria. The Bulgarian authorities also need to maintain a lower real interest rate, a healthy stock market and a lower inflation expectation in order to increase aggregate output.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.14254/2223-3822.2016.14-1.2

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