

Is more government debt or currency depreciation expansionary? The case of Poland

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Abstract. *This paper finds that Poland's aggregate output is positively associated with the government debt-to-GDP ratio, the real effective exchange rate during 2002.Q4-2007.Q3, the real stock price and the real oil price and negatively impacted by the real effective exchange rate during 2007.Q4-2016.Q4, the real interest rate and the expected inflation rate. Hence, the current level of the debt-to-GDP ratio is sustainable, and real depreciation may be contractionary or expansionary depending upon the time period under consideration.*

Keywords: government debt, real appreciation or depreciation, stock prices, oil prices.

JEL Classification: E62, F31.

1. Introduction

After the global financial crisis, Poland has shown faster economic recovery than most of other EU countries. In 2015, its 3.9% growth rate of real GDP ranked 6th among 28 EU countries. The price level was stable as evidenced by a negative inflation rate of 0.7%. The value of the zloty had declined as the exchange rate of the zloty versus the U.S. dollar changed from an average of 3.1551 in 2014 and 3.7701 in 2015 to 3.9487 on October 28, 2016. Whether the depreciation of the zloty would be beneficial to the economy remains to be seen. The 2.6% budget deficit as a percent of GDP was the lowest since 2008 and close to the EU's average of 2.4%. The 51.1% of general government gross debt as a percent of GDP was much lower than the average of 85.0% for 28 EU countries. The government bond yield of 2.70% was higher than EU's average of 1.45%, suggesting that it cost more for Poland to finance its deficits. Improvement in fiscal consolidation has led to early exit out of EU's Excessive Deficit Procedure program. The banking sector was profitable, liquid, and sufficiently capitalized. The unemployment rate of 7.5% was lower than the EU average of 9.4% but higher than 5.4% in the U.S. The lending rate of 8.4% for household consumption loans was higher than many other EU countries and expected to reduce demand for loans and household spending.

This paper focuses on the impacts of more government debt and real appreciation or depreciation on aggregate output in Poland and has several different aspects. First, a simultaneous-equation model consisting of aggregate demand and short-run aggregate supply is applied in formulating the theoretical model. Second, in short-run aggregate supply, supply shocks such as the real oil price will be considered. Third, other relevant variables such as the real interest rate, the real stock price and the expected inflation rate will be incorporated in the model.

2. The model

Extending Agenor (1990), Moreno (1999), Romer (2000, 2010) and other studies, we can specify that aggregate demand is a function of the inflation rate, government spending, government tax revenue, the real interest rate, the real stock price and the real effective exchange rate and that in the short-run aggregate supply function, the inflation rate is determined by the expected inflation rate, real GDP supplied, the real oil price and the real effective exchange rate. We can express aggregate demand and short-run aggregate supply as:

$$Y^d = f(\pi, G, T, R, S, \varepsilon) \quad (1)$$

$$\pi = g(\pi^e, Y^s, E, \varepsilon) \quad (2)$$

where:

Y^d – aggregate demand;

π – the inflation rate;

G – government spending;
 T – government tax revenue;
 R – the real interest rate;
 ε – the real effective exchange rate (an increase means real appreciation);
 π^e – the expected inflation rate;
 Y^s – short-run aggregate supply, and
 E – the real oil price.

In equilibrium, $Y^d = Y^s$. Solving for the two endogenous variables Y and π simultaneously, we find equilibrium real GDP \bar{Y} as:

$$\bar{Y} = h(G - T, \varepsilon, R, S, E, \pi^e) \quad (3)$$

In empirical work, we substitute government debt D for the government deficit $G - T$ as the former is the sum of the latter:

$$\bar{Y} = h(D, \varepsilon, R, S, E, \pi^e) \quad (4)$$

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We expect that equilibrium real GDP has a positive relationship with the real stock price, a negative relationship with the real interest rate and the expected inflation rate, and an unclear relationship with the government debt, the real effective exchange rate and the real oil price.

Whether more government debt as a percent of GDP may affect equilibrium real GDP depends on whether the debt/GDP ratio is relatively small or large. If the debt/GDP ratio is relatively small, an increase in the government debt to stimulate the economy and improve infrastructures may not affect the interest rate and private spending. However, when the debt/GDP ratio is relatively high and unsustainable, a further increase in the debt/GDP ratio may raise the interest rate, crowd out private spending completely, cause the zloty to appreciate, and reduce net exports. Recent studies for Poland and other related countries generally show that more government debt or deficit as a percent of GDP tends to raise interest rates in different degrees or under certain conditions and tends to reduce aggregate output (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) and Cebula, Angjellari-Dajci, and Foley (2014) find that more government deficit raises real interest rates in the U.S. On the other hand, the Ricardian Equivalence hypothesis (Barro, 1974, 1989) suggests that debt or deficit-financed government spending has a neutral effect on output in the long run.

Real depreciation tends to increase net exports and shift aggregate demand upward, but it increases import prices and domestic inflation and shift short-run aggregate supply leftward (Cheikh and Rault, 2016). Therefore, whether the net impact would be positive, negative

or neutral is an empirical question. Findings of previous studies including Poland and other related countries are inconclusive. Depreciation of the zloty is found to be expansionary in the short run (Bahmani-Oskooee and Kutan, 2008), contractionary in the long run (Miteza, 2006; Kalyoncu et al., 2008), expansionary in the long-run (Nusair, 2014), and neutral in the long run (Bahmani-Oskooee and Kutan, 2008).

For oil importing countries, a higher real oil price tends to shift short-run aggregate supply to the left and reduce real GDP. However, if a higher real oil price is driven by a strong aggregate demand, it would shift aggregate demand to the right. Hence, the net impact is unclear (Hamilton, 1996; Kilian, 2014a, 2014b).

3. Empirical results

The data were collected from the *International Financial Statistics* published by the International Monetary Fund and the *Eurostat* published by the European Commission. Real GDP is measured in million zlotys. The government debt as a percent of GDP is selected to represent fiscal policy. The real effective exchange rate is a trade-weighted index, and an increase means real appreciation of the zloty versus a basket of major currencies of its trading partners. The government bond yield minus the inflation rate is used to represent the real interest rate. The nominal equity price is adjusted by the CPI to derive the real stock price. To derive the real oil price, the average crude oil price per barrel is adjusted by the CPI and measured in the zloty. The expected inflation rate is estimated as the average inflation rate of the past four quarters. The sample ranges from 2002.Q4 to 2016.Q4. The data for the government debt-to-GDP ratio are not available before 2002.Q4.

According to the DF-GLS test, each of the variables has a unit root in level and is stationary in first difference. The test on the regression residuals shows that the test statistic of -5.7681 is greater than the critical value of -2.6077 in absolute values at the 1% level. Therefore, these time series variables are cointegrated.

The scatter diagram in Figure 1 seems to show that the government debt-to-GDP ratio had a positive impact on real GDP. The scatter diagram in Figure 2 seems to indicate that the real effective exchange rate affected real GDP positively in the early stage and negatively in the latter stage. Hence, a binary variable with a value of 0 during 2002.Q4-2007.Q3 and 1 during 2007.Q4-2016.Q4 is generated to test whether the slope of the real effective exchange rate and the intercept may have changed.

Table 1 reports estimated parameters and relevant statistics. As shown, approximately 97.74% of the change in equilibrium real GDP can be explained by the eight exogenous variables. Equilibrium real GDP is positively affected by the debt-to-GDP ratio, the real effective exchange rate during 2002.Q4-2007.Q3, the real stock price and the real oil price and negatively influenced by the real effective exchange rate during 2007.Q4-2016.Q4, the real interest rate and the expected inflation rate. If government debt as a percent of GDP

rises 1%, equilibrium real GDP would rise by 0.0647%. A 1% real appreciation of the zloty would lead to a 0.4786% increase in equilibrium real GDP during 2002.Q4-2007.Q3 and a 0.5851% decline in equilibrium real GDP during 2007.Q4-2016.Q4. The mean absolute percent error of 1.6148% suggests that the forecast error is relatively small.

Figure 1. Scatter Diagram between Real GDP and the Government Debt-to-GDP Ratio (DEBTY) in Poland

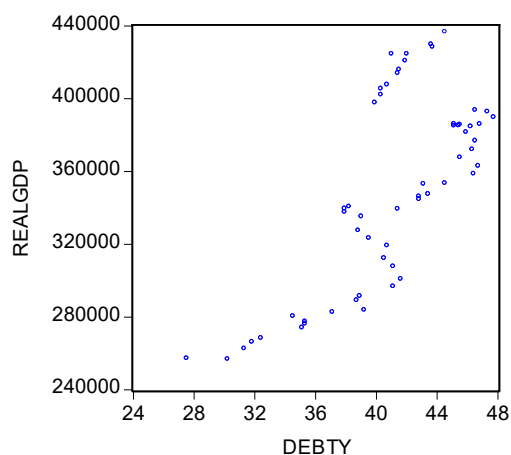


Figure 2. Scatter Diagram between Real GDP and the Real Effective Exchange Rate (REERFRBB) in Poland

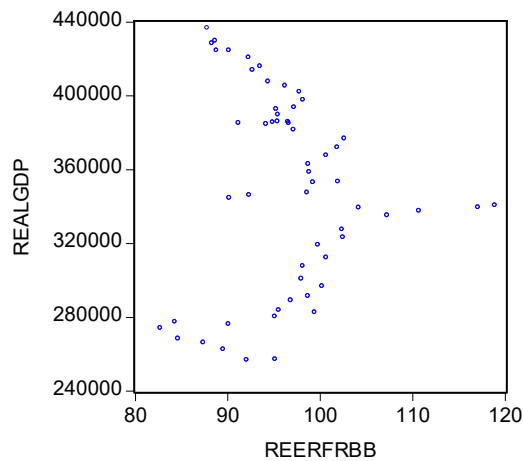


Table 1. *Estimated Regression of Log(Real GDP) in Poland*

Variable	Coefficient	z-Statistic
C	9.696444	155.0437
Log(government debt/GDP ratio)	0.064739	3.174142
Log(real effective exchange rate)	0.478636	22.71971
Log(real effective exchange rate) x binary variable	-1.063694	-24.16641
Binary variable	5.093651	25.14061
Real interest rate	-0.016011	-5.691551
Log(real stock price)	0.064172	8.383433
Log(real oil price)	0.057232	5.351225
Expected inflation rate	-0.030329	-11.86533
R-squared	0.977410	
Adjusted R-squared	0.973645	
Akaike information criterion	-4.939817	
Schwarz criterion	-4.545544	
Mean absolute percent error	1.614767%	
Methodology	GARCH	
Sample period	2002.Q4 – 2016.Q4	
Number of observations	57	

Note: All the coefficients are significant at the 1% level.

4. Summary and conclusions

This paper has examined whether more government debt or real depreciation/appreciation would affect aggregate output in Poland. Empirical results show that more government debt as a percent of GDP raises real GDP and that real appreciation of the zloty increased real GDP during 2002.Q4-2007.Q3 and reduced real GDP during 2007.Q4-2016.Q4. These results suggest that expansionary fiscal policy seems to be effective and that real appreciation was effective during 2002.Q4-2007.Q3 whereas real depreciation was effective during 2007.Q4-2016.Q4. Other results indicate that a lower real interest rate, a higher real stock price, a higher real oil price or a lower expected inflation rate would increase real GDP.

Although real GDP and the government debt-to-GDP ratio have a positive relationship, in interpretation of the results, caution should to be exercised. In Figure 1, the correlation between real GDP and the debt-to-GDP ratio seemed to be negative in some of the periods, suggesting that a higher debt-to-GDP ratio would reduce real GDP. In Figure 2, real GDP and the real effective exchange rate seemed to move in different directions in some of the periods. Hence, once more new data are available, a periodic assessment of their relationships is needed.

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