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IS REAL DEPRECIATION OR MORE GOVERNMENT DEBT CONTRACTIONARY? THE CASE OF ROMANIA

ABSTRACT

Applying the aggregate demand and aggregate supply model, this paper finds that Romania's real GDP is positively associated with real appreciation of the leu during 2005.Q2 – 2013.Q4, the real oil price and real wages and negatively influenced by real appreciation of the leu during 2014.Q1 – 2016.Q3, government debt as a percent of GDP, the real interest rate and the expected inflation rate. These results suggest that recent real depreciation of the leu would help raise real GDP, whereas recent rising government debt as a percent of GDP would be harmful to real GDP.

Keywords: Exchange Rates, Government Debt, Interest Rates, Oil Prices, Wages

Jel Classification: F31, E62

RIASSUNTO

Il deprezzamento del cambio reale o un maggior debito pubblico hanno effetti contrattivi?

Il caso della Romania

Applicando il modello della domanda e dell'offerta aggregate questo studio presenta evidenze che il PIL reale rumeno è positivamente associato all'apprezzamento reale del leu nel periodo 2° trimestre 2005 – 4° trimestre 2013, con il prezzo reale del petrolio e con i salari reali, mentre risulta negativamente influenzato dall'apprezzamento reale del leu nel periodo 1° trimestre 2014 – 3° trimestre 2016, dal debito pubblico come percentuale del PIL, dal tasso di interesse reale e dal tasso di inflazione attesa. Questi risultati suggeriscono che la recente svalutazione del leu potrebbe favorire il PIL reale, mentre l'aumento del debito pubblico in percentuale del PIL verificatosi recentemente potrebbe essere dannoso per il PIL reale.

1. INTRODUCTION

The Romanian economy shows both strengths and weaknesses. The economic growth rate of 3.9% in 2015 was higher than the EU average of 2.2%. Employment grew from 8,052,000 in 2011

to 8,136,000 in 2015. The unemployment rate continued to decline from a recent high of 7.2% in 2011 to a low of 6.8% in 2015, which was lower than the EU average of 9.4%. The 0.8% government budget deficit as a percent of GDP in 2015 was lower than the EU average of 2.4% and met the 3.0% Maastricht criterion. The 26.5% central government debt as a percent of GDP in 2015 was well below the EU average of 64.4% and the Maastricht criterion of 60%. The Romanian leu depreciated 64.3% from 2.44 lei per U.S. dollar in 2007 to 4.01 lei per U.S. dollar in 2015. The negative inflation rate of -0.4% in 2015 preserved the value of the leu and consumer buying power. The relatively low government bond yield of 1.27% in 2015 was slightly lower than the EU average of 1.44% and reduced the cost of government borrowing. There was a slight trade deficit of 0.6% of GDP in 2015 (Eurostat, 2017; International Financial Statistics, 2017). The International Monetary Fund (2016) provides an assessment of Romania's macroeconomic policy and economic performance.

The significant depreciation of the leu is expected to affect exports, imports, the cost of imports, domestic inflation and international capital flows. The rising government debt as a percent of GDP may raise the interest rate and crowd out consumption and investment expenditures. This paper attempts to analyze whether real depreciation of the leu or more government debt is contractionary or expansionary for Romania. To the author's best knowledge, few of the previous studies have applied the aggregate demand and aggregate supply model to examine the subjects for Romania. Other relevant variables such as the real interest rate, real wages, etc. will be considered in the model as well.

2. THE MODEL

Suppose that aggregate demand in Romania is determined by the inflation rate, government spending, government tax revenue, the real interest rate and the real effective exchange rate and that short-run aggregate supply is a function of the inflation rate, the real oil price, real wages and the expected inflation rate. We can express the aggregate demand and short-run aggregate supply functions as:

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

$$Y^s = h(\pi, E, W, \pi^e) \quad (2)$$

Where

- Y^d = aggregate demand,
 π = the inflation rate,
 G = government spending,
 T = government taxes,
 R = the real interest rate,
 ε = the real effective exchange rate (An increase means real appreciation.),
 Y^s = short-run aggregate supply,
 E = the real oil price,
 W = real wages, and
 π^e = the expected inflation rate.

Solving for the two endogenous variables Y and π simultaneously, we find the equilibrium real GDP:

$$\bar{Y} = w(\varepsilon, D, R, E, W, \pi^e) \quad (3)$$

where D stands for the government deficit. In empirical work, we will use government debt as a percent of GDP to represent fiscal policy because government debt is an accumulation of the government deficit.

We expect that equilibrium real GDP has a negative relationship with the real interest rate and the expected inflation rate and an unclear relationship with other exogenous variables¹¹.

Whether real depreciation of the leu would increase or reduce aggregate output has been investigated extensively. Real depreciation tends to make Romanian-made goods and services cheaper and more competitive globally, increase exports, and shift the aggregate demand curve to the right. On the other hand, real depreciation of the leu tends to make imported goods and services more expensive, raise domestic inflation, and shift the short-run aggregate supply curve to the left. The net effect of real depreciation on aggregate output is unclear and needs to be tested empirically. There have been several studies on the impact of real depreciation on aggregate output in selected Eastern and Southeastern European countries. Mills and Pentecost (2001) show that devaluation has a long-run neutral impact on output in the Czech Republic and

¹¹ When the expected inflation rate rises, the short-run aggregate supply curve shifts to the left, causing equilibrium real GDP to decline and the equilibrium inflation rate to rise (Mishkin, 2012, p. 287). Hence, equilibrium real GDP is a decreasing function of the expected inflation rate, and the equilibrium inflation rate is an increasing function of the expected inflation rate.

Hungary and that real appreciation raises output in Slovakia but reduces output in Poland. Mitchell and Pentecost (2001) reveal that devaluations reduce output in the short run and long run. Miteza (2006) finds that devaluations cause output to decline in the long run. Bahmani-Oskooee and Kutun (2008) report that real depreciation may increase, reduce or not affect output in different countries in the short run and has no long-term effect on output.

Empirical findings of the impact of the government deficit/debt on real output are inconclusive. The Ricardian equivalence hypothesis suggests that the effect of deficit- or debt-financed government spending is neutral in the long run (Barro, 1974, 1989). Feldstein (1982), Hoelscher (1986), Cebula (1997), Cebula and Cuellar (2010), Cebula (2014a, 2014b), Cebula, Angjellari-Dajci, and Foley (2014) and others argue that more government deficit/debt raises real interest rates and tends to crowd out spending by households and businesses. However, studies by McMillin (1986), Gupta (1989), Darrat (1989, 1990), Findlay (1990), Ostrosky (1990) and others maintain that more government deficit/debt would not raise the interest rate.

A higher real oil price due to a negative supply shock would shift the short-run aggregate supply curve to the left. On the other hand, if a higher real crude oil price is caused by a demand shock, it would shift the aggregate demand curve to the right. Hence, the net impact is uncertain (Hamilton, 1996; Kilian, 2008a, 2008b).

Higher real wages are expected to shift short-run aggregate supply to the left due to a higher production cost. On the other hand, higher real wages tend to increase labor productivity, consumption spending, aggregate demand and real GDP. Hence, the sign of real wages is unclear (Abraham and Haltiwanger, 1995; Mills and Pentecost, 2001; Miteza, 2006; Narayan and Smyth, 2009; Castle and Hendry, 2014; Spencer, 2015).

3. EMPIRICAL RESULTS

The data were collected from the *Eurostat* published by the European Commission and IMF's *International Financial Statistics*. Real GDP is measured in million leu². The real effective exchange rate is used because it is weighted by the volume of international trade with major trading countries. An increase in the real effective exchange rate means real appreciation, and vice versa. Central government debt as a percent of GDP is used to represent fiscal policy. The

² In order to estimate the elasticity of real GDP with respect to an independent variable, which is defined as the percent change in real GDP divided by the percent change in the independent variable, real GDP and independent variables with positive values are measured on a log scale (Chiang and Wainwright, 2005, p. 289). Hence, there is no need to express real GDP as the percent change.

real interest rate is the difference between the government bond yield and the inflation rate. Real wages are estimated by nominal wages divided by the consumer price index to adjust for inflation. The expected inflation rate is calculated as the average inflation rate of the past four quarters. The sample ranges from 2005.Q2 to 2016.Q3. The data for the government bond yield are not available before 2005.Q2.

An analysis of the data shows that real GDP and the real effective exchange rate seem to have a positive relationship during 2005.Q2–2013.Q4 and a negative relationship during 2014.Q1–2016.Q3. Therefore, a slope binary variable and an intercept binary variable are included in the estimated regression.

The ADF test on the regression residuals is applied to determine whether these time series variables are cointegrated. The value of the test statistic is estimated to be -3.3349, which is greater than the critical value of -2.9281 at the 5% level in absolute values. Therefore, these time series variables have a long-term stable relationship.

The estimated regression and relevant statistics are presented in Table 1. Except for the real interest rate, the expected inflation rate and the binary variable with zero or negative values, other variables are measured on a log scale. The EGARCH method is employed to estimate the variance equation and regression parameters³. The right-hand side variables can explain approximately 95.73% of the variation in Romania's real GDP. All the coefficients are significant at the 1% level. Real GDP in Romania has a positive relationship with real appreciation of the leu during 2005.Q2–2013.Q4, the real oil price and real wages and a negative relationship with real appreciation of the leu during 2014.Q1–2016.Q3, the government debt/GDP ratio, the real interest rate and the expected inflation rate. The relatively low mean absolute percent error (MAPE) of 1.1724% suggests that the estimated regression performs relatively well in forecasting.

The negative significant coefficient of the real effective exchange rate during 2014.Q1–2016.Q3 implies that recent real depreciation of the leu would help raise Romania's aggregate output. The negative and significant coefficient of the government debt as a percent of GDP suggests that an increase in the government debt as a percent of GDP would be harmful to economic growth. The positive and significant coefficient of real wages indicates that the positive effect of higher real

³ Regression residuals in time series data may exhibit autoregressive conditional heteroscedasticity. The EGARCH model addresses this issue by imposing no restrictions on the parameters and allowing the conditional variance to be an asymmetric function of lagged disturbances (Nelson, 1991).

wages such as higher labor productivity or more consumption spending outweighs the negative effect.

Several other explanatory variables are considered. When the government deficit as a percent of GDP replaces central government debt as a percent of GDP, its negative coefficient is significant at the 2.5% level. The R-squared value of 89.62% is lowered than that reported in Table 1. When the expected inflation rate is estimated as a weighted average inflation rate in the past four quarters, its negative coefficient is significant at the 1% level. The R-squared value of 95.68% is very close to the one reported in Table 1.

TABLE 1 - *Estimated Regression of Log(Real GDP) in Romania*

Variable	Coefficient	z-Statistic
Intercept	8.975127	59847.93
Log(real effective exchange rate)	0.142050	1351.970
Log(real effective exchange rate) x Binary variable	-0.464659	-4.531702
Binary variable	2.196063	4.668512
Log(central government debt as a percent of GDP)	-0.048912	-22.61484
Real interest rate	-0.003422	-8.393653
Log(real oil price)	0.038985	35.18719
Log(real wages)	0.471629	14634.88
Expected inflation rate	-0.001371	-2.931688
R-squared	0.957308	
Adjusted R-squared	0.948077	
Akaike information criterion	-5.430008	
Schwarz criterion	-4.952971	
MAPE	1.172364%	
Sample period	2005.Q2 - 2016.Q3	
Number of observations	46	
Methodology	EGARCH	

Notes: All other coefficients are significant at the 1% level.

The binary variable has a value of 0 during 2005.Q2 – 2013.Q4 and 1 during 2014.Q1 – 2016.Q3.

MAPE stands for the mean absolute percent error.

4. SUMMARY AND CONCLUSIONS

This paper has examined the effects of real depreciation of the leu, central government debt as a percent of GDP and other relevant variables on Romania's aggregate output based on the aggregate demand and aggregate supply model. A reduced form equation is estimated. Real appreciation of the leu raised real GDP during 2005.Q2–2013.Q4 but reduced real GDP during 2014.Q1–2016.Q3. More central government debt as a percent of GDP reduces real GDP. In addition, a lower real interest rate, higher real wages, a higher real oil price or a lower expected inflation rate would increase real GDP.

There are policy implications. To promote economic growth, the Romanian government may need to pursue real depreciation of the leu, engage in fiscal prudence, adopt a relatively low real interest rate, and reduce inflation expectations. Higher real wages increase household real income, consumption spending, and aggregate demand. Real GDP and the real effective exchange rate had a positive and a negative relationship during the sample period. Hence, a periodic assessment of their relationship is crucial.

REFERENCES

- Abraham, K.G. and J.C. Haltiwanger (1995), "Real Wages and the Business Cycle", *Journal of Economic Literature*, 33(3), 1215-1264.
- Bahmani-Oskooee, M. and A.M. Kutan (2008), "Are Devaluations Contractionary in Emerging Economies of Eastern Europe?", *Economic Change and Restructuring*, 41(1), 61-74.
- Barro, R.J. (1974), "Are Government Bonds Net Wealth?", *Journal of Political Economy*, 82(6), 1095-1117.
- Barro, R.J. (1989), "The Ricardian Approach to Budget Deficits", *Journal of Economic Perspectives*, 3(2), 37-54.
- Castle, J.L. and D.F. Hendry (2014), "The Real Wage-Productivity Nexus", VOX CPER's Policy Portal, January 13, <<http://voxeu.org/article/real-wage-productivity-nexus>>
- Cebula, R.J. (1997), "An Empirical Note on the Impact of the Federal Budget Deficit on Ex Ante Real Long Term Interest Rates, 1973-1995", *Southern Economic Journal*, 63(4), 1094-1099.

- Cebula, R.J. (2014a), "Impact of Federal Government Budget Deficits on the Longer-Term Real Interest Rate in the US: Evidence Using Annual and Quarterly Data, 1960-2013", *Applied Economics Quarterly*, 60(1), 23-40.
- Cebula, R.J. (2014b), "An Empirical Investigation into the Impact of US Federal Government Budget Deficits on the Real Interest Rate Yield on Intermediate-Term Treasury Issues. 1972-2012", *Applied Economics*, 46(28), 3483-3493.
- Cebula, R.J. and P. Cuellar (2010), "Recent Evidence on the Impact of Government Budget Deficits on the Ex Ante Real Interest Rate Yield on Moody's Baa-Rated Corporate Bonds", *Journal of Economics and Finance*, 34(3), 301-307.
- Cebula, R.J., F. Angjellari-Dajci and M. Foley (2014), "An Exploratory Empirical Inquiry into The Impact of Federal Budget Deficits on the Ex Post Real Interest Rate Yield on Ten Year Treasury Notes over the Last Half Century", *Journal of Economics and Finance*, 38(4), 712-720.
- Chiang, A.C. and K. Wainwright (2005), *Fundamental Methods of Mathematical Economics*, McGraw-Hill, Irwin Economics: Boston.
- Darrat, A.F. (1989), "Fiscal Deficits and Long-Term Interest Rates: Further Evidence from Annual Data", *Southern Economic Journal*, 56(2), 363-373.
- Darrat, A.F. (1990), "Structural Federal Deficits and Interest Rates: Some Causality and Cointegration Tests", *Southern Economic Journal*, 56(3), 752-759.
- Eurostat (2017), European Commission, Brussels, Belgium.
- Feldstein, M. (1982), "Government Deficits and Aggregate Demand", *Journal of Monetary Economics*, 9(1), 1-20.
- Findlay, D. W. (1990), "Budget Deficits, Expected Inflation and Short-Term Real Interest Rates: Evidence for the US", *International Economic Journal*, 4(3), 41-53.
- Gupta, K.L. (1989), "Budget Deficits and Interest Rates in the US", *Public Choice*, 60(1), 87-92.
- Hamilton, J.D. (1996), "This is what Happened to the Oil Price-Macroeconomy Relationship", *Journal of Monetary Economics*, 38(2), 215-220.
- Hoelscher, G. (1986), "New Evidence on Deficits and Interest Rates", *Journal of Money, Credit and Banking*, 18(1), 1-17.
- IMF (2016), "Romania: 2016 Article IV Consultation-Press Release; Staff Report; Informational Annex; and Statement by the Executive Director for Romania", International Monetary Fund Country Report No. 16/113, May 16.

- International Financial Statistics (2017), International Monetary Fund: Washington, DC.
- Kilian, L. (2008a), "The Economic Effects of Energy Price Shocks", *Journal of Economic Literature*, 46(4), 871-909.
- Kilian, L. (2008b), "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market", CEPR Discussion Paper No. 5994.
- McMillin, W.D. (1986), "Federal Deficits and Short-Term Interest Rates", *Journal of Macroeconomics*, 8(4), 403-422.
- Mills, T.C. and E.J. Pentecost (2001), "The Real Exchange Rate and the Output Response in Four EU Accession Countries", *Emerging Markets Review*, 2(4), 418-430.
- Mishkin, F.S. (2012), *Macroeconomics: Policy and Practice*, Addison-Wesley: Boston.
- Mitchell, A. and E.J. Pentecost (2001), *The Real Exchange Rate and the Output Response in Four Transition Economies: A Panel Data Study*, in: C. Papazoglou, E.J. Pentecost (Eds), "Exchange Rate Policies, Prices and Supply-Side Response", pp. 68-77, Palgrave Macmillan: UK.
- Miteza, I. (2006), "Devaluation and Output in Five Transition Economies: A Panel Cointegration Approach of Poland, Hungary, Czech Republic, Slovakia and Romania, 1993-2000", *Applied Econometrics and International Development*, 6(1), 77-86.
- Narayan, P.K. and R. Smyth (2009), "The Effect of Inflation and Real Wages on Productivity: New Evidence from A Panel of G7 Countries", *Applied Economics*, 41(10), 1285-1291.
- Nelson, D.B. (1991), "Conditional Heteroskedasticity in Asset Returns: A New Approach", *Econometrica*, 59(2), 347-370.
- Ostrosky, A.L. (1990), "Federal Government Budget Deficits and Interest Rates: Comment", *Southern Economic Journal*, 56(3), 802-803.
- Spencer, D. (2015), "Higher Real Wages Would Raise Productivity and Boost Demand", The London School of Economics and Political Science.
<<http://blogs.lse.ac.uk/politicsandpolicy/higher-real-wages-for-workers-in-britain-would-raise-productivity-and-boost-demand/>>.

