IS REAL DEPRECIATION EXPANSIONARY? THE CASE OF THE SLOVAK REPUBLIC

HSING, Yu[*]

Abstract. Applying aggregate demand/aggregate supply analysis and based on a quarterly sample during 2004.Q1 – 2015.Q4, this paper finds that Slovakia's aggregate output is positively associated with real appreciation of the euro, the real stock price and percent change in labor productivity and negatively influenced by the real lending rate, the real oil price, percent change in labor cost and the expected inflation rate. In addition, real GDP and government debt as a percent of GDP have a negative relationship during 2004.Q1 – 2009.Q2 and a positive relationship during 2009.Q3 – 2015.Q4.

1. Introduction

Slovakia's economy shows strengths and weaknesses. The economic growth rate of 3.6% in 2015 was better than the average growth rate of 2.0% in the European Union. Employment grew 2.40% from 2.376 million in 2014.Q4 to 2.433 million in 2015.Q4. Improved international trade was evidenced by a trade surplus of 1,708 million euro in 2015 from a recent trade deficit of 9 million euro in 2011, suggesting that Slovakia's export sector became more competitive globally. The inflation rate of -0.3% in 2015 preserved the value of the euro and consumer buying power. Recent depreciation of the euro from US$1.4708 per euro in 2008 to US$1.1095 per euro in 2015 is expected to stimulate exports but raise import costs. The relatively low interest rate of 2.3938% in 2015.Q4 for new business loans of nonfinancial corporations made borrowings less costly. The 0.3% government budget deficit as a percent of GDP and the 52.9% government debt as percent of GDP in 2015 indicate that both the government deficit and debt as a percent of GDP are well below the 3% and 60% Maastricht criteria and that government spending showed fiscal prudence and would not crowd out too much private spending. The unemployment rate of 11.5% in 2015 was higher than the average unemployment rate of 9.4% in the European Union, suggesting that there was slack in the labor market. (National Bank of Slovakia, Eurostat, International Financial Statistics). The International Monetary Fund (2016) provides an assessment of Slovakia's economic performance and macroeconomic policy.

There have been several studies on the impact of real depreciation on Slovakia's output (Mitchell and Pentecost, 2001; Mills and Pentecost, 2001; Bahmani-Oskooee and Miteza, 2003; Miteza, 2006; Bahmani-Oskooee and Kutan, 2008). This paper reexamines whether real depreciation of the euro is expansionary or contractionary for the Slovak Republic. To the author's best knowledge, few of the previous studies have applied the aggregate demand and aggregate supply model to examine the impact of

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[*] Yu Hsing, Ph.D. Charles Blackwell Endowed Professor in Economics. Department of Management & Business Administration. College of Business. Southeastern Louisiana University, Hammond, LA 70402, USA. Email: yhsing@selu.edu

real depreciation of the euro on aggregate output in the Slovak Republic. Other relevant variables such as government debt, the real interest rate, the real stock price, etc. will be considered in the model as well.

2. The Model

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

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

$$Y^s = g(\pi, P, L, E, \pi^e) \tag{2}$$

where

Y^d = aggregate demand,

π = the inflation rate,

G = government spending,

T = government tax revenue,

R = the real interest rate,

S = the real stock price,

ε = the real effective exchange rate,

Y^s = short-run aggregate supply,

P = labor productivity,

L = labor cost,

E = the real oil price, and

π^e = the expected inflation rate.

In equilibrium, $Y^d = Y^s$. Solving for the two endogenous variables, Y and π, we have the equilibrium real GDP:

$$\overline{Y} = h(\varepsilon, G - T, R, S, P, L, E, \pi^e) \tag{3}$$

Because government debt is an accumulation of the government deficit and because government debt is a more concerned subject, we replace the government deficit ($G - T$) with government debt (D):

$$\overline{Y} = z(\varepsilon, D, R, S, E, P, L, \pi^e) \tag{4}$$
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We expect that real GDP has a positive relationship with the real stock price and labor productivity and a negative relationship with the real interest rate, the real oil price, labor cost and the expected inflation rate.

Whether real exchange rate depreciation would increase or reduce aggregate output has been investigated extensively. Real depreciation tends to make domestic-made goods and services cheaper and more competitive globally, increase exports, and shift aggregate demand upward. On the other hand, real depreciation tends to make imports more costly, raise domestic inflation, and shift the short-run aggregate supply curve leftward. The net effect on aggregate output is uncertain.

Mitchell and Pentecost (2001) show that devaluations reduce aggregate output in four accession countries including the Slovak Republic in the short and long run and that decrease in output is alleviated by an increase in output one year later. Mills and Pentecost (2001) find that real appreciation results in persistent output increase in Slovakia and continual output decrease in Poland and that devaluations have a neutral impact on output in the Czech Republic and Hungary in the long run.

Bahmani-Oskooee and Miteza (2003) review previous studies. They indicate that early studies based on the aggregate demand model overlook the aggregate supply side and that applying the aggregate demand-aggregate supply model is the right approach. They conclude that real currency depreciation may be contractionary or expansionary depending upon model specifications, methodologies employed in empirical work, countries under study, sample periods, and other factors.

Using a sample of five transition economies including the Slovak Republic during 1993-2000, Miteza (2006) finds that time series variables have a long-term relationship and that devaluations reduce aggregate output in the long run.

Based on a sample of nine emerging economies in the Eastern Europe including Slovakia, Bahmani-Oskooee and Kutan (2008) reveal that real depreciation is expansionary in Slovakia in the short run and has no effect in the long run.

Empirical studies on the impact of the government deficit/debt on real output are inconclusive. The Ricardian equivalence hypothesis (Barro, 1974, 1987, 1989) suggests that debt- or deficit-financed government spending has a neutral effect in the long run. Feldstein (1982), Hoelscher (1986), Cebula (1997), Cebula and Cuellar (2010), Cebula (2014a, 2014b), Cebula, Angjellari-Dajci, and Foley (2014) and others maintain 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 argue that more government deficit/debt would not raise the interest rate.

3. Empirical Results

The data were collected from the National Bank of Slovakia, the *Eurostat* by the European Commission and IMF's *International Financial Statistics*. Real GDP is measured in million euro. The real effective exchange rate is derived from the

consumer price index. An increase in the real effective exchange rate means real appreciation, and vice versa. Government debt is expressed as percent of GDP. The real lending rate is the difference between the nominal lending rate and the expected inflation rate. The real stock price is calculated as the equity price adjusted for the consumer price index. Labor productivity is measured as real GDP in euro per worker. Labor cost is an index with a base year in 2012. To avoid potential multicollinearity problems, labor productivity and labor cost are expressed as percent changes. The real oil price is the average crude oil price measured in the euro and adjusted for the CPI. The expected inflation rate is estimated as the average inflation rate of the past four quarters. Except for the real lending rate, the expected inflate rate, and percent changes in labor productivity and labor cost with negative values, other variables are measured on a log scale. The sample ranges from 2004.Q1 to 2015.Q4. The data for the lending rate are not available before 2004.Q1.

An analysis of the data (Figure 1) shows that the relationship between *real GDP* and *government debt as percent of GDP* exhibit a negative relationship during 2004.Q1 – 2009.Q2 and a positive relationship during 2009.Q3 – 2015.Q4. Hence, a binary variable is created with a value of one during 2009.Q3 – 2015.Q4 and zero otherwise. An interactive term and an intercept binary variable are added to the estimated regression.

Figure 1. Scatter Diagram between Real GDP (REALGDP) and the
Government Debt/GDP Ratio (DEBTGDP)
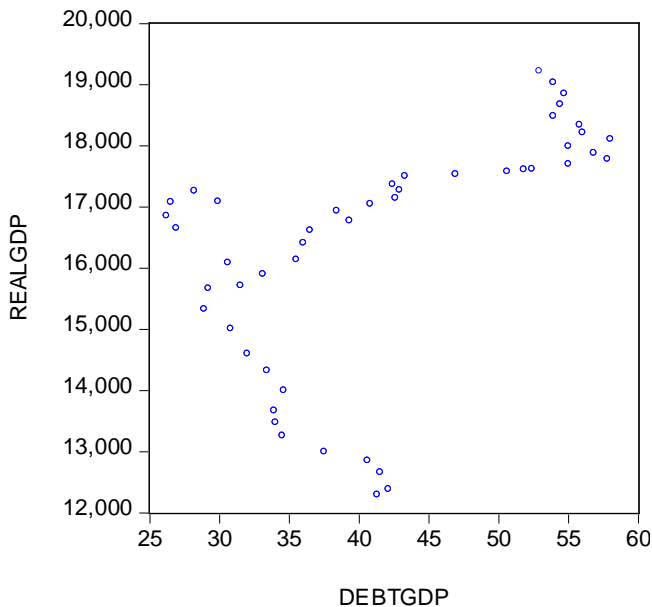
The ADF test on the regression residuals is applied to determine whether these time series variables are cointegrated. In the test equation with a trend and an intercept, the value of the test statistic is estimated to be -6.3901, which is greater than the critical value of -4.1706 at the 1% level in absolute values. Therefore, these time series variables have a long-term stable relationship.

Table 1 presents the estimated regression and relevant statistics. The EGARCH method is employed to estimate the variance equation and regression parameters. The right-hand side variables can explain approximately 97.99% of the variation in Slovakia's real GDP. All the estimated coefficients are significant at the 1% level. Real GDP in Slovakia has a positive relationship with real appreciation of the euro, government debt as a percent of GDP during 2009.Q3 – 2015.Q4, the real stock price, and percent change in labor productivity and a negative relationship with government debt as a percent of GDP during 2004.Q1 – 2009.Q2, the real lending rate, the real oil price, percent change in labor cost and the expected inflation rate. In percent terms and absolute values, the real effective exchange rate has the largest impact. The relatively low mean absolute percent error of 1.3482% suggests that the estimated regression performs relatively well in forecasting.

Table 1. Estimated Regression of Log(Real GDP) in the Slovak Republic

Variable	Coefficient	z-Statistic
Intercept	6.030002	13579.01
Log(real effective exchange rate)	0.795973	10089.26
Log(government debt/GDP ratio)	-0.124845	-34.36503
Log(government debt/GDP ratio) x binary variable	0.367863	107.1179
Binary variable	-1.285356	-94.87710
Real lending rate	-0.014019	-23.13542
Log(real stock price)	0.092797	36.29497
Log(real oil price)	-0.040526	-12.51048
Percent change in productivity	0.004548	9.832906
Percent change in labor cost	-0.001847	-4.318967
Expected inflation rate	-0.009639	-23.79999
R-squared	0.979930	
Adjusted R-squared	0.974506	
Akaike information criterion	-5.300606	
Schwarz criterion	-4.793823	
MAPE	1.348182%	
Sample period	2004Q1 – 2015.Q4	
Number of observations	48	
Methodology	EGARCH	

Notes: The binary variable has a value of one during 2009.Q3 – 2015.Q4 and zero otherwise. All the coefficients are significant at the 1% level. MAPE is the mean absolute percent error. EGARCH stands for the exponential GARCH model.

The positive significant coefficient of the real effective exchange rate implies that recent real depreciation of the euro would reduce Slovakia's aggregate output. The positive relationship of government debt as percent of GDP during 2009.Q3 – 2015.Q4 suggests that during financial crises, more debt-financed government spending would

be helpful in economic recovery and growth. The positive significant coefficient of the real stock price shows that an increase in real stock values would raise household wealth, household consumption spending, and real GDP. The negative significant coefficient of the real oil price shows that a negative supply shock would shift the short-run aggregate supply curve to the left and reduce real GDP.

Several other explanatory variables are considered. When the real effective exchange rate derived from unit labor costs is used, its positive coefficient of 0.5987 is significant at the 1% level and smaller than the coefficient of 0.7960 when the real effective exchange rate is derived from the consumer price index. The value of R-squared is estimated to be 0.9581, which is smaller than the value of R-squared of 0.9799 reported in Table 1. Other results are similar. When percent change in real wages replaces percent change in labor cost, its negative coefficient is insignificant at the 10% level mainly because labor cost includes other related costs that are not captured by real wages.

4. Summary and Conclusions

This paper has examined the effect of real depreciation of the euro and other relevant variables on Slovakia's aggregate output based on aggregate demand/aggregate supply analysis. A reduced form equation is estimated. Real appreciation of the euro tends to raise real GDP. Real GDP and government debt as a percent of GDP exhibit a negative relationship during 2004.Q1 – 2009.Q2 and a positive relationship after 2009.Q2. In addition, a lower real lending rate, a higher real stock price, a lower real oil price, a higher labor productivity, a lower labor cost or a lower expected inflation rate would increase real GDP.

There are policy implications. To promote economic growth, the Slovak government needs to pursue real appreciation of the euro, continue to engage in fiscal prudence, hold the real interest rate low, maintain a healthy financial and stock market, enhance labor productivity, control labor cost, and reduce inflation expectations.

References

Bahmani-Oskooee, M. and Kutan, A.M. (2008). Are Devaluations Contractionary in Emerging Economies of Eastern Europe? *Economic Change and Restructuring*, 41, 61-74.

Bahmani-Oskooee, M. and Miteza, I. (2003). Are Devaluations Expansionary or Contractionary? A Survey Article. *Economic Issues*, 8, 1-28.

Barro, R.J. (1974). Are Government Bonds Net Wealth? *Journal of Political Economy*, 82, 1095-1117.

Barro, R.J. (1989). The Ricardian Approach to Budget Deficits. *Journal of Economic Perspectives*, 3, 37-54.

Buchanan, J.M. (1976). Perceived Wealth in Bonds and Social Security: A Comment. *Journal of Political Economy*, 84, 337–342.

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, 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, 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, 3483-3493.

Cebula, R. J. and Cuellar, P. (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, 301-307.

Cebula, R.J., Angjellari-Dajci, F. and Foley, M. (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, 712-720.

Darrat, A.F. (1989). Fiscal Deficits and Long-Term Interest Rates: Further Evidence from Annual Data. *Southern Economic Journal*, 56, 363-373.

Darrat, A.F. (1990). Structural Federal Deficits and Interest Rates: Some Causality and Cointegration Tests. *Southern Economic Journal*, Vol. 56, No. 3, pp. 752-759.

Feldstein, M. (1976). Perceived Wealth in Bonds and Social Security: A Comment. *Journal of Political Economy*, 84, 331–336.

Feldstein, M. (1982). Government Deficits and Aggregate Demand. *Journal of Monetary Economics*, 9, 1-20.

Findlay, D.W. (1990). Budget Deficits, Expected Inflation and Short-Term Real Interest Rates: Evidence for the US. *International Economic Journal*, 4, 41-53.

Gupta, K.L. (1989). Budget Deficits and Interest Rates in the US. *Public Choice*, 60, 87-92.

Hoelscher, G. (1986). New Evidence on Deficits and Interest Rates. *Journal of Money, Credit and Banking*, 18, 1-17.

International Monetary Fund (2016). Slovak Republic: 2015 Article IV Consultation-Press Release; Staff Report; and Statement by the Executive Director for Slovak Republic. Series: Country Report No. 16/13, January 14.

McMillin, W.D. (1986). Federal Deficits and Short-Term Interest Rates. *Journal of Macroeconomics*, 8, 403-422.

Mills, T.C. and Pentecost, E.J. (2001). The Real Exchange Rate and the Output Response in Four EU Accession Countries. *Emerging Markets Review*. 2, 418-430.

Mitchell, A. and Pentecost, E.J. (2001). The Real Exchange Rate and the Output Response in Four Transition Economies: A Panel Data Study. In *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, 77-86.

Morley, S.A. (1992). On the Effect of Devaluation during Stabilization Programs in LDCs. *Review of Economics and Statistics*, 74, 21-27.

Ostrosky, A.L. (1990). Federal Government Budget Deficits and Interest Rates: Comment. *Southern Economic Journal*, 56, 802-803.