

# *Impacts of Government Debt, the Exchange Rate and Other Macroeconomic Variables on Aggregate Output in Croatia*

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Applying aggregate demand/aggregate supply analysis and based on a quarterly sample during 2000.Q4–2015.Q4, this paper finds that Croatia's aggregate output is positively associated with government debt as percent of GDP during 2000.Q4–2008.Q4, real appreciation of the kuna, the real stock price, German real GDP, the real oil price and real wages and negatively influenced by government debt as percent of GDP during 2009.Q1–2015.Q4, the real lending rate and the expected inflation rate. The dynamic relationships between real GDP and government debt as percent of GDP suggest that fiscal discipline needs to be exercised in pursuing expansionary macroeconomic policy in the future.

*Key Words:* exchange rates, government debt, stock prices, oil prices, real wages

*JEL Classification:* F31, E62

## **Introduction**

Croatia's economy shows strengths and weaknesses. Employment grew 2.06% from 1.552 million in 2014.Q4 to 1.584 million in 2015.Q4. The inflation rate of -0.3% in 2015 preserved the value of the kuna and consumer buying power. Recent depreciation of the kuna from a low of 4.65 kuna per US dollar in 2008.Q2 to 6.96 kuna per US dollar in 2015.Q4 is expected to stimulate exports but raise import costs. Improved international trade was evidenced by a trade surplus of 24,843.5 million kuna in 2015.Q3, suggesting that Croatia's export sector became more competitive globally. The economic growth rate of 1.6% in 2015 was slightly lower than the average growth rate of 2.0% in the European Union. The central government debt as percent of GDP rose from a recent low of 34.2% in 2008.Q3 to 85.1% in 2015.Q4, which was greater than the 60% Maastricht criterion. The rapid rise in the government debt as percent of GDP is expected to raise the long-term interest rate and crowd out private spending. The long-term government bond yield of 3.92% in 2015.M12 was

higher than the EU average of 1.47%. The unemployment rate of 16.3% in 2015 was higher than the average unemployment rate of 9.4% in the European Union, suggesting that there was labor market slack (The Croatian National Bank, Eurostat, International Financial Statistics). The International Monetary Fund (2016) provides an assessment of Croatia's economic performance and macroeconomic policy.

This paper examines the impacts of government debt, real depreciation and other relevant macroeconomic variables on aggregate output in Croatia. To the author's best knowledge, few of the previous studies have applied the aggregate demand and aggregate supply model to examine the relationships between aggregate output and relevant macroeconomic variables. Other relevant macroeconomic variables such as the real interest rate, the real stock price, the real oil price, real wages, etc. will be considered in the model as well.

### The Model

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

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

$$y^s = z(\pi, W, E, \pi^e), \quad (2)$$

where  $Y^d$  is aggregate demand,  $\pi$  is the inflation rate,  $G$  is government spending,  $T$  is government tax revenue,  $R$  is the real interest rate,  $S$  is the real stock price,  $Y^f$  is foreign income,  $\varepsilon$  is the real effective exchange rate,  $Y^s$  is short-run aggregate supply,  $W$  are real wages,  $E$  is the real oil price, and  $\pi^e$  is the expected inflation rate.

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

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

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

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

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We expect that real GDP has a positive relationship with the real stock price and foreign income and a negative relationship with the real interest rate and the expected inflation rate.

Empirical studies on the impact of the government deficit/debt on real output are inconclusive. The Ricardian equivalence hypothesis (Barro 1974; 1989) suggests that debt- or deficit-financed government spending has a neutral effect in the long run. Feldstein (1976), 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.

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 depending upon model specifications, methodologies employed in empirical work, countries under study, sample periods, and other factors (Bahmani-Oskooee and Miteza 2003).

In studying selected transition economies in the Central or Eastern European countries, Mitchell and Pentecost (2001) show that devaluations are contractionary in the short run and long run. Mills and Pentecost (2001) reveal that real appreciation may have a positive, negative or neutral impact on output in different countries in the long run. Miteza (2006) reports that devaluations are contractionary in the long run. Bahmani-Oskooee and Kutan (2008) find that real depreciation may be expansionary, contractionary or neutral in different countries in the short run and has no long-term effect on output.

A higher real crude 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).

Rising real wages increase the production cost, shift the short-run aggregate supply curve to the left, and reduce the equilibrium real GDP. On the other hand, rising real wages tend to increase labor productivity, personal consumption spending, and shift the short-run aggregate supply and aggregate demand curves to the right. Hence, the net impact is unclear (Mills and Pentecost 2001; Miteza 2006; Narayan and Smyth 2009; Spencer 2015).

### **Empirical Results**

The data were collected from IMF's International Financial Statistics, the Croatian National Bank, and the Eurostat by the European Commission and. Real GDP is measured in million kuna. 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. Central 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. Real wages are average monthly net wages measured in the kuna adjusted for the consumer price index. The real oil price is the average crude oil price measured in the kuna 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 inflation rate and the binary variable, other variables are measured on a log scale. The sample ranges from 2000.Q4 to 2015.Q4. The data for central government debt as percent of GDP are not available before 2000.Q4.

An analysis of the data (figure 1) shows that the relationship between real GDP and government debt as percent of GDP seem to exhibit a slightly positive relationship during 2000.Q4–2008.Q4 and a negative relationship during 2009.Q1–2015.Q4. Hence, a binary variable is created with a value of one during 2009.Q1–2015.Q4 and zero otherwise. An interactive term and an intercept binary variable are added to the estimated regression. Figure 2 reveals that the relationship between real GDP and the real effective exchange rate seem to exhibit a positive relationship during the sample period.

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

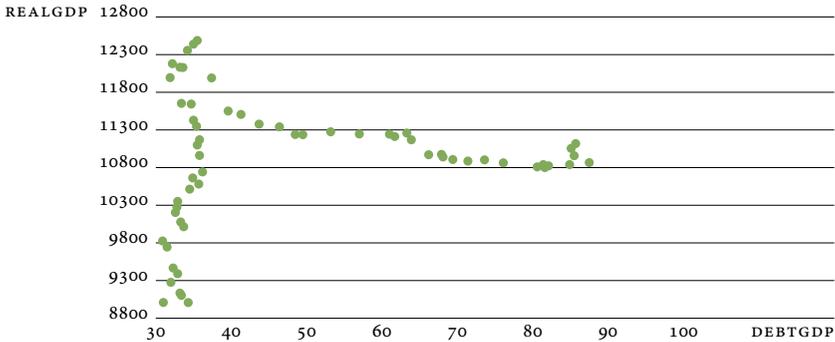


FIGURE 1 Scatter Diagram between Real GDP (REALGDP) and the Government Debt/GDP Ratio (DEBTGDP)

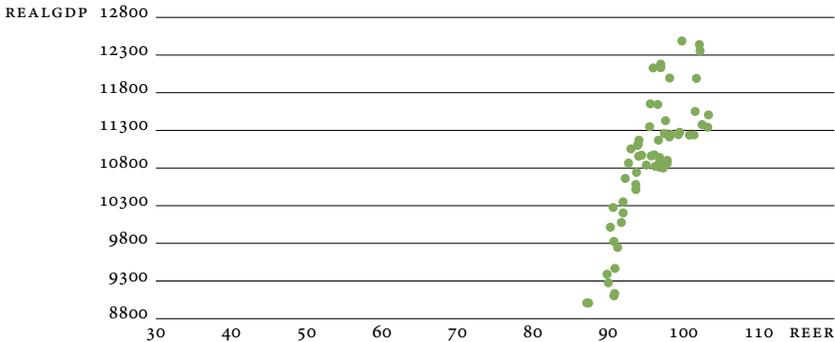


FIGURE 2 Scatter Diagram between Real GDP (REALGDP) and the Real Effective Exchange Rate (REER)

-5.5409, which is greater than the critical value of -4.1184 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 GARCH method is employed to estimate the variance equation and regression parameters. The ten right-hand side variables can explain approximately 96.44% of the variation in Croatia’s real GDP. All the estimated coefficients are significant at the 1% level. Real GDP in Croatia has a positive relationship with real appreciation of the kuna, government debt as a percent of GDP during 2000.Q4–2008.Q4, the real stock price, German real GDP, the real oil price and real wages and a negative relationship with government debt as a percent of GDP during 2009.Q1–2015.Q4, the real lending rate and the expected inflation rate. The reason for the positive relationship between real GDP and govern-

TABLE 1 Estimated Regression of Log(Real GDP) in Croatia

Variable	Coefficient	z-Statistic
Intercept	1.315085	1.260485
Log(government debt/GDP ratio)	0.278429	2.434923
Log(government debt/GDP ratio) × binary variable	-0.459831	-3.999393
Binary variable	1.699925	4.145467
Log(real effective exchange rate)	0.262907	2.112595
Real lending rate	-0.019608	-4.163282
Log(real stock price)	0.090499	5.281643
Log(German real GDP)	0.388291	4.833830
Log(real oil price)	0.012917	1.024101
Log(real wages)	0.032462	0.977410
Expected inflation rate	-0.021758	-4.181163
R-squared		0.964421
Adjusted R-squared		0.957305
Akaike information criterion		-5.528989
Schwarz criterion		-5.079131
Mean absolute percent error		1.134225%
Sample period	2000.Q4–2015.Q4	
Number of observations		61
Methodology		GARCH

NOTES The binary variable has a value of one during 2009.Q1–2015.Q4 and zero otherwise. All the coefficients are significant at the 1% level.

ment debt as a percent of GDP during 2000.Q4–2008.Q4 is that a relatively low government debt as a percent of GDP raises aggregate expenditure, increases real GDP through the multiplier effect, and is less likely to increase the real interest rate and cause a crowding-out effect. The cause for the negative relationship after 2008.Q4 is that a relatively high government debt as a percent of GDP tends to raise the real interest rate, cause a negative crowding-out effect to be greater than a positive effect due to debt-financed government spending, and reduce real GDP (Cebula 2014a; 2014b).

In percent terms and absolute values, the real effective exchange rate has the largest impact. The relatively low mean absolute percent error of 1.1342% suggests that the estimated regression performs relatively well in forecasting. Specifically, a 1% increase in government debt as percent of

GDP would increase real GDP by 0.2784% during 2000.Q4–2008.Q4 and reduce real GDP by 0.1814% during 2009.Q1–2015.Q4. A 1% real appreciation of the kuna would cause real GDP to rise by 0.2629%. If German real GDP rises 1%, Croatia's real GDP would increase by 0.3883%.

The negative relationship of government debt as percent of GDP during 2009.Q1–2015.Q4 suggests that recent rapid rise of debt-financed government spending would be harmful to economic growth. The positive significant coefficient of the real effective exchange rate implies that recent real depreciation of the kuna would reduce Croatia's aggregate output. 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 positive significant coefficient of the real oil price shows that the demand-driven effect is greater than the supply-driven effect.

Several other explanatory variables are considered. When US real GDP is used to represent foreign income, its positive coefficient of 0.8721 is significant at the 1% level and greater than the coefficient of 0.3883 when German real GDP is used in table 1. However, the positive coefficients of government debt as percent of GDP and the real oil price become insignificant at the 10% level due to a high degree of multicollinearity. When government deficit as percent of GDP replaces government debt as percent of GDP, its negative coefficient is insignificant at the 10% level. Thus, the choice of a variable representing fiscal policy may yield different conclusions.

### **Summary and Conclusions**

This paper has examined the effects of government debt as percent of GDP, real depreciation, and other relevant macroeconomic variables on Croatia's aggregate output based on aggregate demand/aggregate supply analysis. A reduced form equation is estimated. Real GDP and government debt as a percent of GDP exhibit a positive relationship during 2000.Q4–2008.Q4 and a positive relationship after 2008.Q4. In addition, real appreciation of the kuna, a lower real lending rate, a higher real stock price, a higher foreign income, a higher real oil price, a higher real wage or a lower expected inflation rate would increase real GDP.

There are policy implications. To promote economic growth, Croatia needs to continue to engage in fiscal prudence, pursue real appreciation of the kuna, hold the real interest rate low, maintain a healthy financial and stock market, raise workers' real wages, and reduce inflation expectations.

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