

# Is Real Depreciation Expansionary? The Case of Ireland

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## Abstract

Applying aggregate demand and aggregate supply model and based on a quarterly sample during 2003.Q1 – 2015.Q1, this paper finds that Ireland's aggregate output is positively associated with real appreciation, German real GDP, the real stock price and labor productivity and negatively influenced by government debt as a percent of GDP, the real lending rate and the expected inflation rate. The insignificant coefficient of the real oil price indicates that Ireland is energy efficient and that a higher real oil price would not impact its aggregate output negatively. Recent euro depreciation would not help Ireland's aggregate output, and recent decrease in government debt as a percent of GDP would help increase aggregate output.

**JEL classification numbers:** F31, E62

**Keywords:** Exchange rates; Government debt; Oil prices; Stock prices; Productivity

## 1 Introduction

Ireland's economy exhibits both strengths and weaknesses. During the recent banking and real estate crisis, its real GDP had declined more than 11% in 2008 and 2009. However, as the "eurozone comeback kid" (Barley, 2015b), Ireland has recovered much faster than most of the other EU countries. Its Real GDP grew 4.78% in 2014 and is expected to reach 7% in 2015. Part of the reasons for the strong economy was due to a trade surplus of 39.709 billion in 2014. Net operating balance declined from 10.7627 billion in 2013 to 6.97661 billion in 2014. Its government net borrowing as a percent of GDP declined from 14.7% in 2013 to 4.3% in 2014. Employment rose to 1.9139 million in 2014 from 1.8812 million in 2013. The CPI inflation rate rose only 0.2% in 2014. The stock market index rose 19.60% in 2014. The borrowing cost is relatively low as evidenced by the 2.77%

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lending rate for household loans over 5 years and the 2.37% government bond yield in 2014. Its general government debt as a percent of GDP had declined from 120% in 2013 to 107.5% in 2014 but was still higher than the average debt/GDP ratio of 92.1% among the 19 euro countries. Due to expected further improvement in the debt/GDP ratio, Standard & Poors upgraded its sovereign bond rating to A+ in 2015. The 9.4% unemployment rate in 2015 was lower than the average unemployment rate of 10.9% in the euro area but was higher than the 5.0% unemployment rate in the U.S. Aggregate household debt was more than 180% of family disposable income and was among the highest in the EU. (Barley, 2015a, 2015b; International Financial Statistics, 2015)

There have been extensive studies on Ireland's economy in the area of the real estate market and bubble (McQuinn, 2014; Kitchin, Hearne and O'Callaghan, 2015; Ryan and Branigan, 2015; Wachter, 2015), the economic and banking crisis (Clarke and Hardiman, 2012; Whelan, 2013; Centozne, 2014; Lucey, Larkin and Gurdgiev, 2014; Moutos, 2014; van Aarle, Tielens and Van Hove, 2015; Everett, Kelly and McCann 2015), government debt and fiscal policy (Sakellariadis, 2012; Creedon, Fitzpatrick and Gaffney, 2012; Keane, 2015; McQuinn, 2015; Pepino, 2015; Honohan, 2016), industrial policy (Gray, 2015; Bailey and Lenihan, 2015), SMEs (Lawless, McCann and McIndoe Calder, 2014), the role of FDI in economic growth (Testaiuti, 2015), the labor market (Barrett and McGuinness, 2012), unemployment and inflation (Gerlach and Stuart, 2013), overview and assessment (McHale, 2012; Byrne and McQuinn, 2014), future prospects (Bradley and Untiedt, 2012), etc. To the author's best knowledge, few of the previous studies have applied aggregate demand and aggregate supply model to examine the impact of real depreciation on aggregate output in Ireland.

This paper attempts to analyze whether real depreciation is expansionary or contractionary for Ireland. Other relevant variables such as government debt, foreign income, the oil price, etc. will be considered in the model as well.

## 2 The Model

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

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

$$\pi = g(\pi^e, Y^s, O, P) \quad (2)$$

where

- $Y^d$  = aggregate demand,
- $\pi$  = the inflation rate,
- $G$  = government spending,
- $T$  = government tax revenue,
- $R$  = the real interest rate,
- $S$  = real stock price,
- $Y^f$  = foreign income,
- $E$  = the real effective exchange rate,
- $O$  = the real oil price,
- $\pi^e$  = the expected inflation rate,
- $Y^s$  = aggregate supply, and
- $P$  = labor productivity.

In equilibrium, Solving for the two endogenous variables,  $Y$  and  $P$ , we have the equilibrium real GDP:

$$\bar{Y} = h(E, G - T, O, Y^f, S, R, P, \pi^e) \tag{3}$$

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Due to lack of complete data for government budget deficits,  $G - T$ , we use government debt as a percent of GDP ( $D$ ) as a proxy for fiscal policy:

$$\bar{Y} = w(E, D, O, Y^f, S, R, P, \pi^e) \tag{4}$$

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We expect that real GDP has a positive relationship with foreign income, the real stock price and labor productivity and a negative relationship with the real interest rate 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 cheaper and more competitively 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.

Krugman and Taylor (1978) provide a theoretical analysis of the effect of devaluations on economic activities. Currency devaluations tend to have an income distribution effect from a lower to a higher marginal propensity to save and reduce aggregate demand. Net exports may decrease measured in the domestic currency due to low import and export elasticities, reducing aggregate demand. Devaluations tend to raise domestic prices and wages, reducing aggregate supply. Due to higher prices, the demand for money increases, raising the interest rate and reducing output.

Gylfason and Risager (1984) study the impact of devaluation on output and the current account for 8 developing countries and 7 industrialized countries. For Ireland, in the general case, a 10% currency devaluation would reduce output by 0.1% but increase the current account by 3.3%. Kalyoncu, Artan, Tezekici and Ozturk (2008) investigate the relationship between currency devaluation and aggregate output for 23 selected OECD countries. According to their findings, in the long run, currency devaluation has a negative effect on aggregate output in Austria, Hungary, Poland, Portugal, Switzerland and Turkey and a positive impact in Finland, Germany and Sweden. In the short run, currency devaluation is contractionary in Finland, Germany and Turkey, expansionary in Hungary and Switzerland, and neutral in other remaining countries.

Spadaro, Carré, Piccoli and Magnani (2013) show that a 10% depreciation of the euro would increase aggregate demand, stimulate exports, reduce imports, increase production, and reduce poverty and unemployment in France. Kim, An and Kim (2015) analyze the relationship between the exchange rate and output and capital flows for 6 developed countries and 7 developing countries. According to their findings, currency devaluation tends to be contractionary in developing economies but expansionary in developed nations. The current account is likely to improve in countries with currency depreciation. Capital inflows would not affect output in developed nations and would increase output in developing nations. The effect of the government debt/deficit as a percent of GDP is unclear. In his seminal works, Barro (1974, 1987, 1989) proposes the Ricardian equivalence hypothesis that debt- or deficit-financed government spending has a neutral effect on real output because people tend to save more in anticipation of more taxes in the future to pay off the debt. Studies by McMillin (1986), Gupta (1989), Darrat (1989, 1990), Findlay (1990), Ostrosky (1990) and others indicate that more government deficit/debt would not raise the interest rate. However, Feldstein (1982), Hoelscher (1986), Cebula (1997), Cebula and Cuellar (2010), Cebula (2014a, 2014b), Cebula, Angjellari-Dajci, and Foley (2014) and others show that more government deficit/debt raises real interest rates and tends to crowd out spending by households and businesses. For a large oil importing country, a higher oil price tends to shift aggregate supply to the left and aggregate demand to the left, causing aggregate output to decline (Hamilton, 1996). However, a higher oil price driven by strong aggregate demand may generate a positive impact in the short run and a negative impact in the long run (Kilian, 2008b). For a country committing to renewable energy or producing self-sufficient energy, the impact of a higher oil price may be small or insignificant.

### **3 Empirical Results**

The data were collected from the Eurostat by the European Commission and IMF's International Financial Statistics. Real GDP is measured in millions. An increase in the real effective exchange rate means real appreciation, and vice versa. The debt variable is measured as general government debt a 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 equal to the share price adjusted for the consumer price index. Foreign income is represented by German real GDP lagged one period due to a lag in response and information. The real oil price is calculated as the nominal oil price times the exchange

rate (units of the euro per U.S. dollar) and divided by the consumer price index. The expected inflation rate is measured as the average inflation rate of the past four quarters. Except for the real lending rate and the expected inflation rate with actual or possible negative values before or after transformation to the log scale, other variables are measured in the log scale. The sample ranges from 2003.Q1 to 2015.Q1. The data for the lending rate are not available before 2003.Q1.

The ADF test on the regression residuals is applied to determine whether these time series variables are cointegrated. In the test equation with the trend and intercept, the value of the test statistic is estimated to be -4.4787, which is greater than the critical value of -4.1611 at the 1% level in absolute values. Therefore, these time series variables have a long-term stable relationship. The estimated regression and relevant statistics are reported in Table 1. The GARCH method is employed to estimate the variance equation and regression parameters. The right-hand side variables can explain approximately 95.34% of the variation in Ireland's real GDP. The F-statistic of 68.7647 suggests that the regression is statistically significant at the 1% level. Except for the insignificant coefficient of the real oil price at the 10% level, other estimated coefficients are significant at the 1% level. Real GDP in Ireland has a positive relationship with real appreciation, lagged German real GDP, the real stock price and labor productivity and a negative relationship with government debt as a percent of GDP, the real lending rate and the expected inflation rate. In percent terms and absolute values, lagged German real GDP has the largest impact followed by labor productivity and the real effective exchange rate. The relatively low mean absolute percent error suggests that the estimated regression performs well in forecasting.

Table 1: Estimated regression of log(real GDP) in Ireland

	Coefficient	z-Statistic
Intercept	-8.6650	-14.3569
Log(real effective exchange rate)	0.4790	5.4237
Log(government debt/GDP ratio)	-0.1194	-8.3589
Log(real oil price)	0.0085	0.7367
Log(lagged German real GDP)	1.5300	8.8634
Log(real stock price)	0.0192	2.5581
Real lending rate	-0.0395	-5.5695
Log(labor productivity)	0.7714	10.3892
Expected inflation rate	-0.0419	-6.5062
R-squared	0.9534	
Adjusted R-squared	0.9395	
Akaike info criterion	-5.2244	
Schwarz criterion	-4.7611	
F-statistic	68.7647	
MAPE	1.2519%	
Sample period	2003.Q1 – 2015.Q1	
Number of observations	49	
Methodology	GARCH	

The positive significant coefficient of the real effective exchange rate implies that recent real depreciation of the euro would reduce Ireland's aggregate output. The negative relationship between real output and real depreciation may be explained by the role of the valuation channel of exchange rate adjustments, which is substantial, not rapidly reversed, and may involve significant wealth redistributions (Lane and Shambaugh, 2010; Lane, 2012; Bénétrix, Lane and Shambaugh, 2015). The negative and significant coefficient of government debt as a percent of GDP suggests that a rising debt level is harmful to economic growth. The positive significant coefficient of the real stock price shows that an increase in real stock values would affect household consumption spending and real GDP. A higher real income in Germany causes Germans to buy more from Ireland, leading to more exports. The insignificant coefficient of the real oil price suggests that Ireland's use of renewable energy is effective in avoiding a negative impact of a higher real oil price on aggregate output.

When lagged German real GDP is replaced by lagged real GDP in the U.K., the positive coefficient of lagged real GDP in the U.K. is significant at the 1% level. However, the coefficients of the real lending rate and the expected inflation rate become positive and significant at the 1% level. Theoretically, the sign of these two coefficients should be negative. When lagged U.S. real GDP replaces lagged German real GDP, its positive coefficient is significant at the 1% level. However, the coefficients of the real stock price, the real lending rate and the expected inflation rate have the wrong signs due to a high degree of multicollinearity.

## 4 Summary and Conclusions

This paper has examined Ireland's aggregate output based on aggregate demand and aggregate supply analysis. A reduced form equation is estimated. Real GDP and the real effective exchange rate exhibit a positive relationship, suggesting that real appreciation instead of real depreciation would help real GDP. In addition, a lower government debt as a percent of GDP, a higher lagged German output, a higher real stock price, a lower real lending rate or a lower expected inflation rate would increase real GDP. The real oil price does not affect Ireland's aggregate output mainly because of its commitment to the use of renewable energy.

There are policy implications. To promote economic growth, the Irish government needs to pursue fiscal responsibility and further reduce government debt as a percent of GDP, keep the real interest rate low, preserve a healthy financial and stock market, and reduce inflation expectations. The real exchange rate and foreign income need to be monitored as they affect Ireland's aggregate output.

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