Assessing Sustainability of the Irish Public Debt

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Abstract

This paper utilizes a small-scale econometric model to study the dynamics of the Irish debt-to-GDP ratio. The role of world GDP growth, domestic GDP growth, real effective exchange rate, interest rate and primary balance is analyzed in the debt dynamics. We find that the Irish economy will recover to its normal path by 2015. Policy interventions for higher primary balance and output growth, and the external positive scenarios for variables such as the world GDP growth, rate of interest and real effective exchange rate are desirable to help further reduce the debt path.

Keywords: Debt to GDP ratio; Irish economy; Sustainability

JEL: E62; H63; H68; C30

1. Introduction

Economic conditions in Ireland during the last three years has been catastrophic, notably the unprecedented fiscal balances and debts. In early 2008 the Irish economy was the first in the Eurozone to enter a recession. As a small open economy, Ireland is always susceptible to the exogenous shocks and the global downturn acted to exacerbate the overall recessionary momentum. The Irish government has set up the stability programme for economic recovery and budgetary consolidation, however its effects on the credibility of government's fiscal policies are not yet visible although the effects are anticipated to be positive. This paper attempts to analyze the dynamics of the debt-to-GDP ratio for Ireland using a small-scale econometric model. In doing so, we perform simulations on the debt sustainability for the period 2012 to 2020 to determine the debt reduction strategies. Section 2 details the logic structure of the model. Section 3 presents our empirical results, and Section 4 concludes.

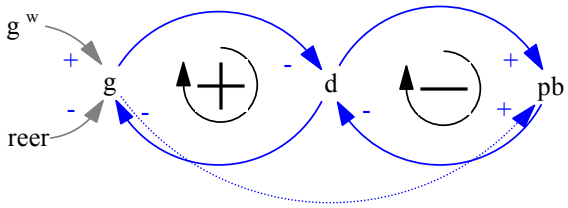
2. Logic Structure of the Model

We first present the logic structure of the public debt model; see Figure 1. The variables of interest in the model are real output growth (g), debt (% GDP) (d), primary balance (pb = government revenue less government expenditure excluding interest payments, in % GDP), real effective exchange rate (in natural log) (*reer*) and real world GDP growth (g^w). The exogenous variables (i.e. *reer* and g^w) are indicated with grey arrows in Figure 1 and they play a prominent role in the model. The fact that Ireland is one of the most open economies in the OECD implies that its output is sensitive to any potential external demand shifts (measured by g^w), as well as to the *reer*. The latter is an indicator of competitiveness which considers both export and import competitiveness. To this end, a fall in the *reer* indicates improvement in competitive position.

The debt dynamic has two causal loops: positive (+) and negative (-). Generally, positive loops portray self-reinforcing processes wherein an action generates an outcome that generates more of the action, and hence more of the outcome. Negative feedback loops, on the other hand, describe goal-seeking processes that create actions to keep a system at the desired state. The sustainability of public debt depends on which loop is dominating. The

positive loop comprises output growth and public debt. In this context, an increase in the rate of GDP growth makes affordable a higher debt level, however a high debt level negatively affects economic growth through the effect of debt overhang hypothesis and liquidity constraint (Hofman and Reisen, 1990). Moreover, a positive effect is observed from growth to the primary balance: in the case of negative economic growth (for example) there are lower tax revenues and higher government spending on unemployment benefits. The negative loop includes public debt and primary balance. As it is known from debt accounting rule, higher primary advance reduces the public debt accumulated. Further, a rise in debt will persuade the government to increase (reduce) taxes (spending). The debt will be sustainable if negative loop dominates; certainly the government will have to take difficult choices in controlling public debt.

Figure 1: Feedback loop structure of public debt model



3. Empirical Results

A small-scale macroeconomic model for modeling debt

In order to analyze the dynamics of debt-to-GDP ratio for Ireland, we consider a small-scale macroeconomic model[1] which entails estimating the following equations:

$$g_t = \alpha_1 + \alpha_2 g_t^w + \alpha_3 reer_t + \alpha_4 d_t + \alpha_5 d_{t-1} + \varepsilon_t^g \qquad \text{(Output equation)} \qquad (1)$$

$$d_t = \alpha_6 + \alpha_7 d_{t-1} + \alpha_8 g_t + \alpha_9 pb_{t-1} + \varepsilon_t^b \qquad \text{(Public debt equation)} \qquad (2)$$

$$pb_t = \alpha_{10} + \alpha_{11} pb_{t-1} + \alpha_{12} g_{t-1} + \alpha_{13} d_{t-1} + \varepsilon_t^{pb} \qquad \text{(Fiscal rule equation)} \qquad (3)$$

[1] We follow Favero and Marcellino (2005), Hasko (2007) and Casadio et al. (2011). Hasko (2007) in particular estimated the public debt instead of computing it as an accounting identity. Due to stock-flow-adjustments and statistical discrepancies, usually real data does not support the accounting identity.

Equations (1) to (3) are estimated using the Seemingly Unrelated Regression (SUR) method with annual data for the period 1970 – 2011. Applying the SUR method will account for the disturbance correlation across equations. It does not however, take account of any simultaneity bias, as in three stage least squares (3SLS), another systems estimator. The advantage of using SUR, compared to 3SLS, is that it does not require any instruments. In the absence of simultaneity bias with the endogenous variables, SUR gives fairly same results as 3SLS and yields both consistent and correct standard errors. Further, SUR provides more efficient estimates compared to the OLS. The SUR estimates for equations (1) to (3) are reported in Table 1.

Table 1: SUR Estimates of Irish Debt Dynamics (1970 – 2011)

$g_t = \alpha_1 + \alpha_2 g_t^w + \alpha_3 reer_t + \alpha_4 d_t + \alpha_5 d_{t-1} + \varepsilon_t^g$ (Output equation)					
α_1	α_2	α_3	α_4	α_5	$\bar{R}^2$
0.539	0.332	-0.098	-0.311	0.305	0.736
(0.143)	(0.139)	(0.030)	(0.033)	(0.034)	
[3.596]***	[2.389]**	[3.277]***	[9.410]***	[9.007]***	
$d_t = \alpha_6 + \alpha_7 d_{t-1} + \alpha_8 g_t + \alpha_9 pb_{t-1} + \varepsilon_t^b$ (Public debt equation)					
α_6	α_7	α_8	α_9		$\bar{R}^2$
10.951	0.972	-1.759	-0.350		0.975
(1.794)	(0.024)	(0.137)	(0.0932)		
[6.106]***	[40.355]***	[12.822]***	[-3.799]***		
$pb_t = \alpha_{10} + \alpha_{11} pb_{t-1} + \alpha_{12} g_{t-1} + \alpha_{13} d_{t-1} + \varepsilon_t^{pb}$ (Fiscal rule equation)					
α_{10}	α_{11}	α_{12}	α_{13}		$\bar{R}^2$
-7.259	0.495	0.061	0.628		0.650
(1.677)	(0.100)	(0.021)	(0.143)		
[4.329]***	[4.941]***	[2.968]**	[4.411]***		
Wald Coefficient test ($\alpha_4 = -\alpha_5$)					
(Prob. Value) 0.548					
System residual normality test (Jarque-Bera)					
(Prob. Value) 0.109					
System residual Portmanteau tests for autocorrelations					
Q-Stat (Lag 1)	Q-Stat (Lag 2)	Q-Stat (Lag 4)	Q-Stat (Lag 6)		
(Prob. value)	(Prob. value)	(Prob. value)	(Prob. value)		
0.473	0.701	0.284	0.697		

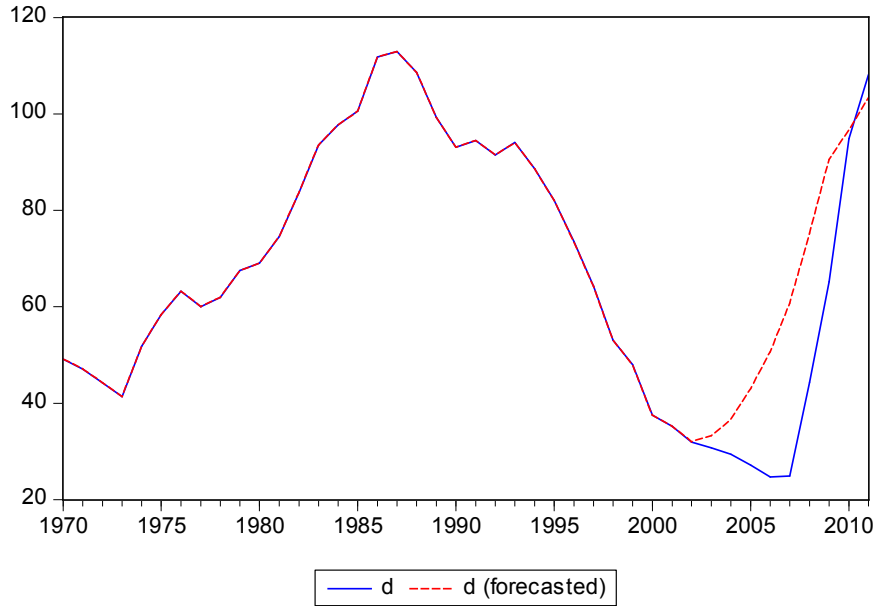
Notes: Standard errors and t-ratios are in the parentheses and square brackets respectively. *reer* in estimation is expressed in natural log. *** and ** denotes significance at 1% and 5% levels, respectively.

Results show that all the variables have the expected signs and are statistically significant at the 5%. The residual diagnostic tests for absence of serial correlation (Portmanteau) and normality (Jarque-Bera) of the residuals do not reject the null hypotheses. Interestingly, the coefficients of d_t and d_{t-1} in the output equation are close and opposite in sign. This

suggests that probably output growth reacts to the first difference of debt which corresponds to the deficit (in % GDP) inclusive of the interest payments. While the world GDP growth influences domestic GDP growth in a positive manner, the real effective exchange rate has a negative effect. The implied elasticities with respect to primary balance and GDP growth (GDP growth and public debt) in public debt (fiscal rule) equations are also reasonable.

To determine the predictive properties of the model we estimated the model from 1970 to 2001 and then generated forecasts for the next ten years (2002-2011), comparing the out-of-sample forecasted values with the historically recorded ones. Figure 2 illustrates the debt forecast.[2] Our model predicts a decrease in the debt-to-GDP-ratio from 2002 to 2006 and then a rapid increase is observed from 2007 to 2011; consistent with the past data. Since the aim of this paper is not to derive the punctual forecasts but to predict the dynamics, therefore the results are satisfactory.

Figure 2: Historical debt-to-GDP-ratio versus forecasted debt-to-GDP-ratio



[2] To conserve space, we report only the forecast for debt.

Macroeconomic scenarios and debt stability condition

To investigate the debt stability condition, we perform a projection exercise for the period 2012 to 2020 using results from the previous section. For measuring stability we need a scenario for the real interest rate paid on public debt (r). Table 2 presents these results. The forecast plots for GDP growth, primary balance, debt and interest rate (fiscal sustainability condition) are illustrated in Figure 3 (Figure 4).[3] The forecasts are purely mechanical and based on scenarios regarding the exogenous variables. The two variables r and $reer$ are projected using the unobserved component model (UCM)[4] , whereas g^w projections are based on the assumption that their future values are same as their average growth rate for the last 5 years ($g^w = \mu_{g^w_{02-20}} = 0.024$).

Table 2: Scenarios and Macroeconomic Analysis for 2012 - 2020

	Macroeconomic Assumptions		
	World GDP growth (g^w)	Real effective exchange rate ($reer$)	Interest rate in % of previous year's debt (r)
Initial value (2011)	2.4%	122.5	5.5%
Final value (2020)	2.4%	122.9	5.4%
Average value (2012-2020)	2.4%	123.8	5.6%
	Forecast Results		
	Public debt (d)	Primary balance (pb)	GDP growth (g)
Initial value (2011)	108.1%	-6.7%	1.1%
Final value (2020)	108.3%	5.3%	5.1%
Average value (2012-2020)	115.9%	2.9%	4.0%
	Fiscal Sustainability ($pb_t - (r_t - g_t)d_{t-1} \geq 0$)		
Initial value (2011)		-10.9%	
Final value (2020)		4.9%	
Average value (2012-2020)		1.2%	

Results suggest that the economy will recover to its 'normal' path (growth rate over 4% is consistent with the previous periods) only after 2015. Further, it is also after this period the debt will start to decline. Moreover, to test for the sustainability of the debt pattern for the period 2012 to 2020, we have computed the well-known sustainability condition i.e. $pb_t - (r_t - g_t)d_{t-1} \geq 0$. Interestingly, the debt-GDP ratio path is stable after 2014,

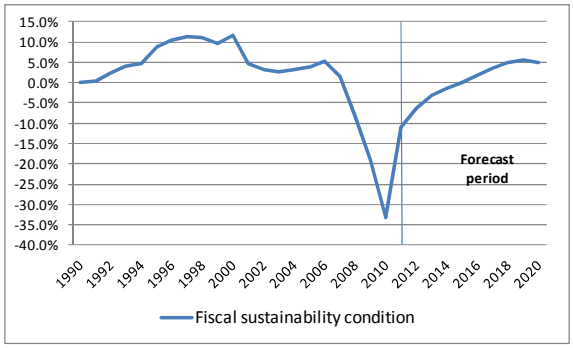
[3] The forecasts are consistent with the projections presented recently (4th November 2011) by the Irish Department of Finance.

[4] Andrews (1994) found that the UCMs perform quite well especially for long forecasting horizons. The *r* and *reer* are estimated using a local level model with a stochastic (trigonometric) cycle.

however at the average level it is stable over the period 2012 to 2020. Some favorable patterns in the rate of interest (for example low rates) are desired to achieve fiscal sustainability. To this end, given the average forecast values as $\mu_{g_{02-20}} = 0.040$, $\mu_{pb_{02-20}} = 0.029$ and $\mu_{d_{02-20}} = 1.159$, this implies that we need to pursue an average value of $r \leq 0.066$ (6.6% equivalent). The forecasts for real interest rate show that this could be attainable.

Figure 3: Forecasts of GDP growth, primary balance, debt and interest rate 2012-2020

Figure 4: Forecasts of fiscal sustainability condition 2012-2020



4. Conclusions

In this paper we have used a small-scale econometric model to analyze the dynamics of the Irish debt-to-GDP ratio. In doing so, we have estimated the output, public debt and fiscal rule equations, and then investigated the debt stability condition over the period 2012 to 2020. Our results revealed that the Irish economy will recover to its normal path by 2015. The most vital variables in the debt-to-GDP reduction process are domestic output growth and primary balance. To this end, policy interventions are desirable to achieve primary balance and output growth rate of around 5% by 2020. Furthermore, our results suggest that external positive scenarios for the following variables viz. world GDP growth, rate of interest and real effective exchange rate are desirable for future debt sustainability.

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Appendix A

Table A1. Definitions and Data Source: 1970 - 2011

Variable	Definition	Source
d	Debt-to-GDP ratio	AMECO - EUROSTAT (A-E)
g	Real GDP growth	A-E
g^w	Real World GDP growth	IMF (International Monetary Fund)
pb	Primary balance (Total government revenues minus government spending excluding interest payments).	A-E
r	Interest rate (% of previous year's debt) adjusted for inflation as measured by the GDP deflator.	A-E
$reer$	Real Effective Exchange Rate	A-E