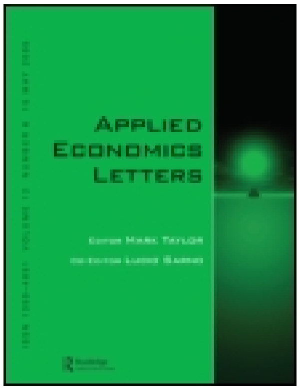

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The dynamics of Italian public debt: alternative paths for fiscal consolidation

Paolo Casadio [a] , Antonio Paradiso [b] & B. Bhaskara Rao [c]

[a] Intesa Sanpaolo Bank Group, Risk Management, Rome, Italy

[b] Department of Economics, University of Rome La Sapienza, Rome, Italy

[c] School of Economics and Finance, University of Western Sydney, Sydney, Australia

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The dynamics of Italian public debt: alternative paths for fiscal consolidation

Paolo Casadio[a], Antonio Paradiso[b,*] and B. Bhaskara Rao[c]

[a]*Intesa Sanpaolo Bank Group, Risk Management, Rome, Italy*
[b]*Department of Economics, University of Rome La Sapienza, Rome, Italy*
[c]*School of Economics and Finance, University of Western Sydney, Sydney, Australia*

This article analyses possible targets for the Italian debt-to-GDP ratio with a small macroeconomic model. The role of international macroeconomic variables such as the US GDP growth, prices of raw materials, EUR/USD exchange rate and European Central Bank (ECB) monetary policy stance and domestic policy instruments is analysed in the debt dynamics. We find that external conditions play a fundamental role for the Italian fiscal consolidation. To reach a target of 100% of debt-to-GDP ratio by 2020, a further growth-sustaining policy has to be implemented.

Keywords: debt-to-GDP ratio; Italian economy; SUR

JEL Classification: E62; H63; H68; C30

I. Introduction

This article analyses the dynamics of the Italian government debt-to-GDP ratio using a small-scale model. Our approach follows earlier works of Favero (2002), Favero and Marcellino (2005) and Hasko (2007). Adopting various scenarios for the exogenous variables, namely US GDP growth, oil price change, long-term interest rates and euro versus dollar exchange rate, we predict that the debt ratio can reach a target of 100% by 2020 for fiscal consolidation and sustainability. Section II presents the basic arithmetic of debt accounting. Section III presents a brief description of the model and its structure. Section IV presents the empirical results. Section V shows that under plausible assumptions our target of 100% ratio for debt to GDP can be achieved. Section VI concludes.

II. Arithmetic of Debt Accounting

The dynamics of debt accumulation can be described with the identities in Equations 1 and 2:

$$B_t = B_{t-1} + i_t B_{t-1} - PB_t \tag{1}$$

where B_t = nominal general government debt at the end of year t, i = the nominal interest paid on government debt, PB = primary advance which equals tax revenue less government expenditure (T–G). The same relation holds if the variables are measured in real terms assuming that inflation rate is measured with the GDP deflator and we shall use this assumption in our estimation. Normally the budget dynamics is written in the form of a change in the ratio of public debt-to-GDP (b):

$$\Delta b_t = (i_t - \pi_t - g_t) \cdot b_{t-1} - pb_t \tag{2}$$

*Corresponding author. E-mail: anto_paradiso@hotmail.com

where variables in lower case denote the same variables expressed as ratios to GDP, π = inflation rate, g = real GDP growth. According to Equation 2, for a given pb, a stronger real GDP growth, a lower nominal interest rate and a higher inflation rate will reduce the debt growth dynamics.

III. Modelling Debt: A Small Macroeconomic Model

Identity 2 can be used in two different ways: as a single residual equation, incorporating the scenarios for primary balance, growth, inflation and interest rate, determining the debt-to-GDP dynamics, or as an equation in a more complex model to account for interactions among the key variables. More recently, Favero and Marcellino (2005) and Hasko (2007) estimated small-scale simultaneous equation models for this purpose and we follow their approach. Our model consists of five equations and the endogenous variables are driven by three international variables (US GDP growth, oil price dynamics, EUR/USD exchange rate and domestic short-term Central Bank monetary policy rate). The model is as follows:

$$g_t = \alpha_1 + \alpha_2 pb_{t-1} + \alpha_3 g_t^{US} + \alpha_4 i_t + \alpha_5 i_{t-1} + \varepsilon_t^g \quad \text{(output equation)} \tag{3}$$

$$pb_t = \alpha_6 + \alpha_7 pb_{t-1} + \alpha_8 g_t + \alpha_9 b_{t-1} + \varepsilon_t^{pb} \quad \text{(fiscal rule)} \tag{4}$$

$$b_t = \alpha_{10} + \alpha_{11} b_{t-1} + \alpha_{12} b_{t-2} + \alpha_{13} g_t + \alpha_{14} b_{t-2} \cdot i_{t-1}^L + \alpha_{15}\pi_t + \varepsilon_t^b \quad \text{(public debt equation)} \tag{5}$$

$$\pi_t = \alpha_{16} + \alpha_{17}\pi_{t-1} + \alpha_{18} g_{t-1} + \alpha_{19} pb_{t-1} + \alpha_{20} oil_t + \varepsilon_t^{\pi} \quad \text{(inflation equation)} \tag{6}$$

$$i_t^L = \alpha_{21} + \alpha_{22} i_{t-1}^L + \alpha_{23} i_{t-2}^L + \alpha_{24} i_t + \alpha_{25}\pi_t + \alpha_{26} b_t + \alpha_{27} euro_{t-1} + \varepsilon_t^i \quad \text{(long-term interest rate equation)} \tag{7}$$

where g = real GDP growth, g^{US} = real US GDP growth, oil = oil price percentage change (expressed in euro), i^L = nominal long-term interest rate, b = debt-to-GDP ratio, i = nominal short-term interest rate, π = Consumer Price Index (CPI) inflation rate, $euro$ = euro versus dollar exchange rate and pb = primary balance as percent of GDP. Data are yearly and the estimation period is from 1970 to 2010. Details of data definition and sources are cited in the Appendix.

A brief explanation of the structure of the model is as follows: The output equation (Equation 3) embodies three effects – a restrictive fiscal policy effect ($\alpha_2 < 0$) captured by an increase in the primary balance, a monetary policy effect ($\alpha_4 + \alpha_5 < 0$) measured as the European Central Bank (ECB) monetary policy rate and an international business cycle effect ($\alpha_3 > 0$) captured by US GDP growth rate. The fiscal policy effect is negative ($\alpha_2 < 0$) due to the high tax rates in Italy. The short-term interest rate has also a negative overall effect on growth.[1] The primary balance Equation 4 depends on both output growth and debt-to-GDP ratio in a positive way ($\alpha_8 > 0$ and $\alpha_9 > 0$). Similar results are also found for Italy by Favero and Marcellino (2005). The debt-to-GDP ratio is explained in Equation 5. We consider the long-term interest rate as a proxy for the average cost of debt because the Italian government debt duration is getting longer and closer to the duration of long-term bonds. All signs in the equation are as expected, that is $\alpha_{13} < 0$, $\alpha_{14} > 0$ and $\alpha_{15} < 0$. Inflation in Equation 6 depends positively on oil price growth and output growth ($\alpha_{20} > 0$ and $\alpha_{18} > 0$).[2] The primary balance exerts a negative effect on inflation ($\alpha_{19} < 0$). Two offsetting effects are to be accounted when considering the inflation response to the primary balances: a stimulus to inflation acting via costs (usually linked to an increase in indirect taxation) and a depressive effect due to the decrease of private spending due to the tax burden. We expect the latter effect to dominate. In Equation 7 the long-term interest rate depends positively on the short-term interest rate ($\alpha_{24} > 0$), on inflation ($\alpha_{25} > 0$), on debt-to-GDP ratio ($\alpha_{26} > 0$) and on the euro exchange rate versus dollar ($\alpha_{27} > 0$). Finally, the higher the level of Italian debt the higher is the long-term interest rate due to higher risk premiums attached to the Italian long-term bonds.

IV. Empirical Results

The system of Equations 3–7 is estimated as a simultaneous equation model using Seemingly Unrelated Regression (SUR) method with annual data for the period 1970 to 2011. The results are in Table 1. The results are impressive. All the coefficients have the expected signs and are statistically significant. The residual diagnostic tests for no serial correlation (Portmanteau tests) and normality (Jarque–Bera (JB)) of residuals do not reject the null hypotheses. To check the reliability of the model to perform 10

[1] We used the long-term interest rate and also the real interest rate in the output equation, but the results were poor. Similar results were reported for Italy by Favero and Marcellino (2005).

[2] Output growth is preferred as indicator for the overall level of activity instead of unemployment rate or output gap (Hasko, 2007).

Table 1. SUR method estimates of Italian debt dynamics (1970–2010)

$g_t = \alpha_1 + \alpha_2 pb_{t-1} + \alpha_3 g_t^{\mathrm{US}} + \alpha_4 i_t + \alpha_5 i_{t-1} + \varepsilon_t^y$ (output equation)

α_1	α_2	α_3	α_4	α_5	$\bar{R}^2$	JB (p-value)
0.0049	–0.2122	0.6260	0.5415	–0.5713	0.715	0.600
(0.005)	(0.080)	(0.086)	(0.093)	(0.083)		
[0.921]	[2.645]	[7.315]	[5.829]	[6.901]		

$pb_t = \alpha_6 + \alpha_7 pb_{t-1} + \alpha_8 g_t + \alpha_9 b_{t-1} + \varepsilon_t^{pb}$ (fiscal rule)

α_6	α_7	α_8	α_9	$\bar{R}^2$	JB (p-value)
–5.4804	0.6700	0.3427	0.0539	0.889	0.363
(1.054)	(0.089)	(0.087)	(0.011)		
[5.200]	[7.521]	[3.960]	[4.708]		

$b_t = \alpha_{10} + \alpha_{11} b_{t-1} + \alpha_{12} b_{t-2} + \alpha_{13} g_t + \alpha_{14} b_{t-2} \cdot i_{t-1}^L + \alpha_{15} \pi_t + \varepsilon_t^b$ (public debt equation)

α_{10}	α_{11}	α_{12}	α_{13}	α_{14}	α_{15}	$\bar{R}^2$	JB (p-value)
15.8360	1.3554	–0.5056	–1.0594	0.4223	–0.3612	0.956	0.263
(2.187)	(0.082)	(0.074)	(0.119)	(0.092)	(0.078)		
[7.240]	[16.442]	[6.872]	[8.889]	[4.589]	[4.643]		

$\pi_t = \alpha_{16} + \alpha_{17} \pi_{t-1} + \alpha_{18} g_{t-1} + \alpha_{19} pb_{t-1} + \alpha_{20} oil_t + \varepsilon_t^{\pi}$ (inflation equation)

α_{16}	α_{17}	α_{18}	α_{19}	α_{20}	$\bar{R}^2$	JB (p-value)
0.0023	0.7904	0.2585	–0.2054	0.0432	0.926	0.157
(0.001)	(0.059)	(0.124)	(0.109)	(0.007)		
[0.427]	[13.390]	[2.079]	[1.892]	[5.822]		

$i_t^L = \alpha_{21} + \alpha_{22} i_{t-1}^L + \alpha_{23} i_{t-2}^L + \alpha_{24} i_t + \alpha_{25} \pi_t + \alpha_{26} b_t + \alpha_{27} euro_{t-1} + \varepsilon_t^i$ (long-term interest rate equation)

α_{21}	α_{22}	α_{23}	α_{24}	α_{25}	α_{26}	α_{27}	$\bar{R}^2$	JB (p-value)
–0.0506	0.8567	–0.2977	0.2625	0.2189	0.0464	0.0066	0.966	0.242
(0.020)	(0.108)	(0.089)	(0.059)	(0.050)	(0.014)	(0.004)		
[2.555]	[7.895]	[3.331]	[4.420]	[4.352]	[3.319]	[1.898]		

System residual Portmanteau tests for autocorrelations

Q-stat. (Lag 1) (p-value)	Q-stat. (Lag 2) (p-value)	Q-stat. (Lag 4) (p-value)	Q-stat. (Lag 6) (p-value)
0.399	0.551	0.556	0.134

Notes: SUR, Seemingly Unrelated Regression; JB, Jarque–Bera. SEs and t-ratios are in parentheses and brackets, respectively.

years of horizon forecasts, we also conducted the following exercise. We estimated the model from 1970 to 1999 and then forecasted for the next 10 years, comparing the out-of-sample forecasted values with the historically recorded ones. The results are very satisfactory but not reported to conserve space.

V. Scenarios and Debt-to-GDP Dynamic Forecasts

Table 2 summarizes the outcomes of three scenarios considered for the exogenous variables (baseline, an upward/optimistic and a downward/risky scenario) together with the results of endogenous variables. The first three columns assume no policy intervention and in the final column the outcome of a realistic policy intervention is shown.

In Table 2 the debt-to-GDP ratio ranges from 102% to 109% depending on the scenario. The main mechanism behind the debt-to-GDP reduction relies on growth of Italian economy. The positive effect of growth is only partially offset by the increase in the long-term interest rates. The Italian growth performance depends heavily on the international scenario, so that the best performance in terms of debt dynamics is conditioned by international business cycle and a favourable oil prices. An important role is played by the ECB monetary policy.

In the last column of Table 2 we conducted a policy intervention exercise with the aim to reach a 100% of debt-to-GDP ratio compatible with 3% deficit limit of Maastricht. In the most optimistic scenario, we calibrate a mix of interventions needed to reduce debt-to-GDP ratio of 2% in order to reach a target value of 100% of debt-to-GDP ratio in 2020. From 2011 to 2020 if the Italian government increases the GDP growth to 0.15% and cuts taxes to 0.12% of GDP, then the debt-to-GDP ratio will reach the 100% in 2020 (Fig. 1) and the Maastricht restriction of 3% will also hold.

VI. Conclusions

In this article we used a small-scale econometric model for Italy to find a reasonable policy to reduce the debt ratio to 100% of GDP within 10 years. Our simulation results indicate that an external positive scenario is

Table 2. Scenarios and macroeconomic analysis for 2011–2020

	Baseline scenario	Upside scenario	Downside scenario	Policy intervention scenario
Nominal short-term interest rate (%)	4	3.5	3	3.5
2020 Oil price in US dollar and euro	Nominal $200 (€165) Real $161 (€124)	Nominal $180 (€138) Real $144 (€111)	Nominal $165 (€126) Real $132 (€101)	Nominal $180 (€138) Real $144 (€111)
Real US GDP growth (%)	2.2	2.6	1.6	2.6
EUR/USD Exchange rate	1.3	1.3	1.3	1.3
2020 Public debt (% of GDP)*	106	102	109	100
Primary balance (% of GDP)*	2.38	2.44	2.30	2.2
Nominal long-term interest rate* (%)	5.0	5.2	4.8	5.1
Inflation* (%)	2.3	2.7	2.0	2.9
Real GDP growth* (%)	1.5	1.8	1.1	2.0
General Government balance in % of GDP*	2.67	2.88	2.44	3.0

Notes: Real values for oil price change are calculated assuming an international average inflation of 2.2% for the period 2011 to 2020.
*Average values over the period.

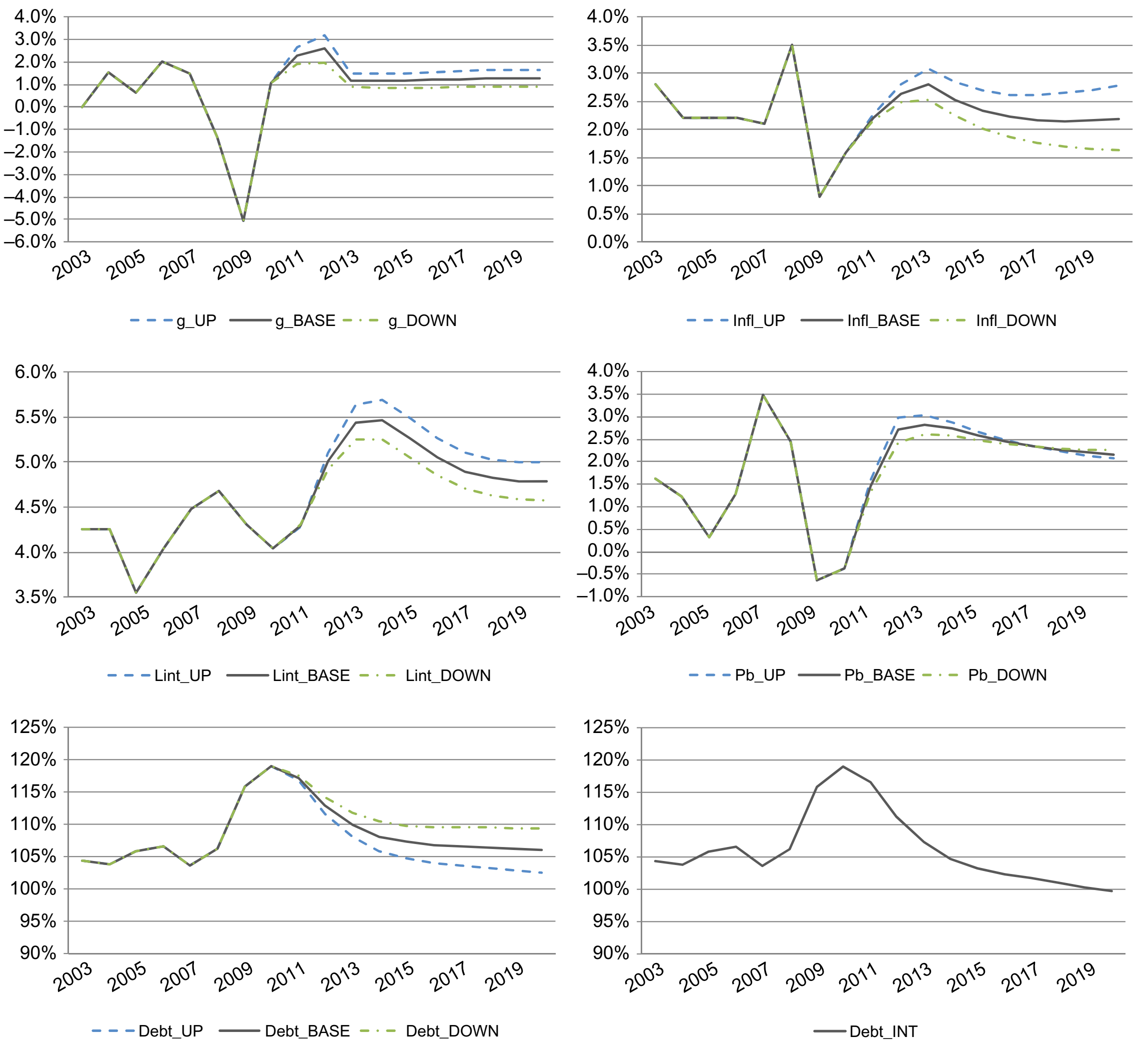

Fig. 1. Forecasts of macroeconomic variables for the period 2011 to 2020
Note: BASE, Base scenario; UP, Upside scenario; DOWN, Downside scenario; INT, Policy intervention scenario.

necessary for the international variables to bring down the debt-to-GDP ratio under 105%. A dynamic international economy together with favourable oil prices and not too strong euro are essential requirements. Furthermore, an expansive stance by ECB monetary policy helps to reach fiscal targets, reducing Italian interest payments. The most important domestic variable in the debt-to-GDP reduction process is the growth of domestic output. We showed that a policy intervention aimed to stimulate the GDP growth over 1.8% allows to reach the target 100% debt-to-GDP ratio.

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Appendix: Data Definition and Source: 1970–2010

Variable	Definition	Source
b	Debt-to-GDP ratio	AMECO–EUROSTAT
π	Percentage change of CPI	OECD Statistics
g	Real GDP growth	AMECO–EUROSTAT
g^{US}	Real US GDP growth	Federal Reserve Economic Data (FRED)
pb	Primary balance (total government revenues minus government spending excluding interest payments)	AMECO–EUROSTAT
i	Nominal short-term interest rate	OECD statistics
i^L	Nominal long-term interest rate	OECD statistics
oil	West Texas Intermediate (WTI) crude oil (expressed in euro) percentage change	FRED
euro	EUR/USD exchange rate	DATASTREAM (USEURFT)