The dynamics of Spanish public debt and sustainable paths for fiscal consolidation

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The Dynamics of Spanish Public Debt and

Sustainable Paths for Fiscal Consolidation

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Abstract

This paper analyses possible patterns for the Spain debt-to-GDP ratio with a small macroeconomic model. The role of international macroeconomic variables (such as the US and French GDP growth rates, prices of raw materials, ECB monetary policy stance) and domestic policy instruments is analyzed in the debt dynamics. We find that external conditions, together with policies aimed to stimulate the growth and fulfilling Maastricht restrictions on deficit, play a fundamental role for fiscal consolidation in Spain and help to reach a sustainable pattern.

Keywords: Debt to GDP Ratio, Spain Economy, International Factors, SUR.

JEL: E62, H63, H68, C30

1. Introduction

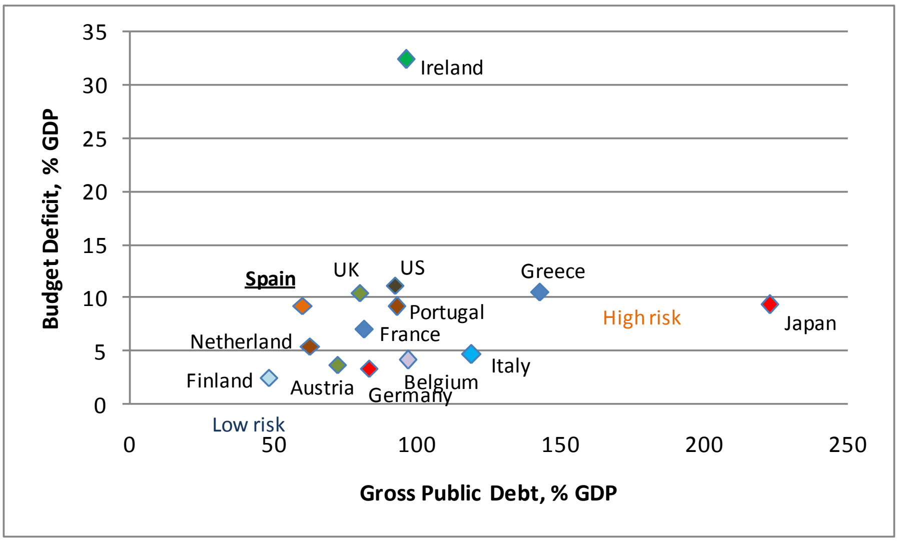
The impact of the recession on the Spanish fiscal balances has worsened the debt situation. Its budget deficit rose significantly to 9.2 % of GDP and the general government debt reached to 60% of its GDP in 2010. For these reasons and the turbulence in the European financial markets, a fiscal consolidation plan is necessary to place Spain's public finances on a sustainable path. Spain must now focus on this objective under the Stability Pact of reducing the overall fiscal deficit-to-GDP-ratio to 3% to anchor the expectations and avoid an unsustainable debt dynamics.

This paper analyses the dynamics of the Spanish government debt-to-GDP ratio using a small-scale econometric model. Our approach follows earlier works of Favero (2002), Favero and Marcellino (2005), Hasko (2007), and Casadio *et al.* (2011). Adopting various scenarios for the exogenous variables viz., US and French GDP growth, oil price changes and short-term interest rates, we predict that the debt-to-GDP ratio can reach, under international favorable conditions and policy interventions on growth and fiscal consolidation, a sustainable path in the next ten years. Section 2 shows the public debt problem in Europe and Spain. Section 3 presents the basic arithmetic of debt accounting. Section 4 presents a brief description of the model and its structure. Empirical results are in Section 5. Section 6 shows that under plausible assumptions debt-to-GDP-ratio can achieve sustainable patterns. Section 7 concludes.

2. Sovereign debt problem in Europe and Spain

The chart below shows the sovereign debt problem in Europe and some non-Euro-Area countries. The horizontal axis is the gross public debt-to-GDP-ratio and the vertical axis is the budget deficit-to-GDP-ratio. Generally, the European Union Stability Pact implies that it is desirable for the debt-to-GDP ratio to be below 60% and in order to keep this stable the budget deficit should be around 3% of GDP. Many countries are above these levels as a consequence of the current global economic crisis and the lack of a strong fiscal discipline; see Beetsma and Debrun (2005). Spain, compared to other Euro countries, does not have a very high debt-to-GDP-ratio, but it is running large budget deficits. Therefore, its debt-to-GDP ratio passed from 36% in 2007 to 60% in 2010. This unfavorable dynamics, raising doubts about Spain's ability to undertake the necessary adjustments, and the serious sovereign debt crises in the Euro-zone, focused the market's attention on Spain's economy. As a consequence, Spain's sovereign bond yields are very high at near to 6% in July of this year.

Figure 1: The public debt problem (2010 data)



Source: EUROSTAT data.

There are other important reasons why the interest yields on Spain's government paper are high. Spain is a relatively large economy and it accounts for the 12% of the Euro-zone economic activity against 6% for Greece, Ireland and Portugal, which are the other Euro-countries with higher risk of debt default. In addition, Spain accounts for 8% of Euro-zone public debt, compared to just 8% for these three high risk countries considered together.[1] For this reason it is important to examine the dynamic of Spanish public debt to analyse policies needed to contain and reduce the sovereign debt default risk.

3. Arithmetic of debt accounting

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

$$B_t = B_{t-1} + i_t B_{t-1} - PB_t \qquad (1)$$

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 net

[1] Another country with high risk is Italy. Its economy accounts for 17% of Euro-zone activity and for 23% of public debt.

of the interests paid on debt ($T - G$). 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 dynamic is written in the form of a change in the ratio of public debt-to-GDP (b):

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

where $\pi =$ inflation rate, $g =$ real GDP growth; variables in lower case denote the same variables expressed as ratios to GDP. According to (2), for a given *pb*, a stronger real GDP growth, a lower nominal interest rate, and higher inflation rate will reduce the debt growth dynamics. The following condition is needed to guarantee the solvency and debt reduction:

$$pb^* \geq (i^* - \pi^* - g^*) \cdot b^* \qquad (3)$$

Where the variables denoted by * indicate the average value over the time span period under investigation.

4. 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. In this context, recently Favero and Marcellino (2005), Hasko (2007), and Casadio *et al.* (2011) estimated small-scale simultaneous equations models and we follow their approach. Our model consists of five equations and the endogenous variables are driven by four international variables (US and France GDP growth, Oil price dynamics, and domestic short-term Central Bank monetary policy rate).The model is as follows:

$$g_t = \alpha_1 + \alpha_2 g_{t-1} + \alpha_3 i_t^L + \alpha_4 i_{t-1}^L + \alpha_5 pb_t + \alpha_6 pb_{t-1} + \alpha_7 g_t^{FR} + \alpha_8 g_{t-1}^{US} + \varepsilon_t^y \qquad (4)$$

(Output equation)

$$pb_t = \alpha_9 + \alpha_{10} pb_{t-1} + \alpha_{11} pb_{t-2} + \alpha_{12} (i_{t-1}^L - i_{t-1}) + \alpha_{13} b_{t-1} + \alpha_{14} g_t + \varepsilon_t^{pribal} \qquad (5)$$

(Fiscal rule)

$$b_t = \alpha_{15} + \alpha_{16} b_{t-1} + \alpha_{17} g_t + \alpha_{18} pb_{t-1} + \alpha_{19} \pi_{t-1} + \alpha_{20} \pi_{t-2} + \alpha_{21} b_{t-2} \cdot i_{t-1}^L + \varepsilon_t^b \quad (6)$$

(Public debt equation)

$$\pi_t = \alpha_{22} + \alpha_{23} \pi_{t-1} + \alpha_{24} g_{t-1} + \alpha_{25} oil_t + \alpha_{26} oil_{t-1} + \varepsilon_t^{\pi} \quad (7)$$

(Inflation equation)

$$i_t^L = \alpha_{27} + \alpha_{28} i_{t-1}^L + \alpha_{29} i_{t-2}^L + \alpha_{30} i_t + \alpha_{31} \pi_t + \alpha_{32} b_t + \varepsilon_t^i \quad (8)$$

(Long-term interest rate equation)

The output equation is explained by international business cycle effects ($\alpha_7 > 0$) captured by US (g^{US}) and French (g^{FR}) GDP growth rate, and by primary balance (*pb*). A fiscal consolidation (a rise of primary balance due to an increase in government revenues or a cut in government spending) has in general a negative impact on economic growth. However, Rohn (2010) considers that the direct negative effect on aggregate demand could be potentially counterbalanced by a positive indirect effect if fiscal consolidation signals lower future public debt and taxes, as well as decreasing precautionary savings. In particular, this effect can be large if public debt is high. For Spain the overall effect is slightly positive ($\alpha_5 + \alpha_6 > 0$) indicating that the indirect effect seems to be historically larger. The long-term interest rate has a negative overall effect on growth ($\alpha_3 + \alpha_4 < 0$) as expected.

The primary balance depends positively on output ($\alpha_{14} > 0$), debt-to-GDP-ratio ($\alpha_{13} > 0$) and the spread between long-term and short-term interest rate (α_{12}). Higher rates on long-term government bonds imply higher costs of public debt services, forcing an increase in government revenues (or a cut in government spending) in order to contain public debt growth. We consider the long term interest rate as a proxy for the average cost of debt because the Spanish government debt duration is getting longer and closer to the duration of long-term bonds. Figure A1 in Appendix confirms our view, as the deficit-to-GDP ratio calculated using the long-term bond interest rate as a proxy of the average cost of debt follows closely the official debt series.

The debt-to-GDP ratio is explained by GDP growth, inflation, primary balance, and debt service payments. All signs in the equation are as expected (i.e., $\alpha_{17} < 0$, $\alpha_{19} + \alpha_{20} < 0$, $\alpha_{18} < 0$, $\alpha_{21} > 0$) according to our analysis in Section 3.

Inflation in equation (7) depends positively on oil price growth ($\alpha_{25} + \alpha_{26} > 0$) and output growth ($\alpha_{24} > 0$)[2].

In the last equation (8) the long-term interest rate depends positively on the short-term interest rate ($\alpha_{30} > 0$), on inflation ($\alpha_{31} > 0$), and on debt-to-GDP-ratio ($\alpha_{32} > 0$). High government debt, particularly if combined with uncertainties relating to the pace of economic activity, could also raise concerns about the government's ability to service its debts. This would raise credit risk-premia and government bond yield.

5. Empirical results

The system of equations (4) – (8) is estimated as a simultaneous equation model using the Seemingly Unrelated Regression method (SUR) with annual data for the period 1980 – 2011.[3] The results are in Table 1. The residual diagnostic tests for absence of serial correlation (Portmanteau) of the residuals do not reject the null hypotheses; the normality test (Jarque-Bera), fails only for the inflation equation. As we can see from Table 1, the non-normality is caused by outliers who produce an excessive kurtosis. Favero and Marcellino (2005) posit that the use of dummies could improve the diagnostic tests of the model, but it could weaken its forecasting performance. Since forecast is our main goal, we prefer not to introduce such dummies.

In order to test the prediction properties of the model we estimated the model from 1980 to 2004 and then forecasted for the next five years, comparing the out-of-sample forecasted values with the historically recorded ones[4]. Considering that the aim of the paper is not a punctual forecasting but

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

[3] The choice of this range of time is based on the fact that data on long-time interest rates are available only from 1980. In addition, it is our interest to analyze the fiscal aspects of Spain form the advent of democracy.

[4] Since that sample period is not very long, an out-of-sample forecast exercise for ten years basing upon only 20 observations has not a solid basic statistic. For this reason we prefer to use the additional five observations for having a

predicting the dynamics, the results are satisfactory: our model predicts a decrease of debt-to-GDP-ratio until 2007 and then an increase, as effectively happened. We report in appendix the plot of the historical debt-to-GDP-ratio versus the debt-to-GDP-ratio forecasted (Figure A2).

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more solid estimation to produce an out-of-sample forecast for five years. We are confident that if the forecast is good the projections for additional five years will not biased.

Table 1: SUR Estimates of Spain Debt Dynamics (1980 – 2010)

$g_t = \alpha_1 + \alpha_2 g_{t-1} + \alpha_3 i_t^L + \alpha_4 i_{t-1}^L + \alpha_5 pb_t + \alpha_6 pb_{t-1} + \alpha_7 g_t^{FR} + \alpha_8 g_{t-1}^{US} + \varepsilon_t^y$ (Output equation)

α_1	α_2	α_3	α_4	α_5	α_6	α_7	α_8	$\bar{R}^2$	JB p-value
0.0086 (0.003) [3.190]	0.2052 (0.077) [2.656]	0.0014 (0.001) [1.746]	-0.0015 (0.001) [1.962]	0.4208 (0.057) [7.429]	-0.3002 (0.071) [4.230]	0.6214 (0.095) [6.565]	0.1553 (0.054) [2.896]	0.911	0.932

$pb_t = \alpha_9 + \alpha_{10} pb_{t-1} + \alpha_{11} pb_{t-2} + \alpha_{12}\ i_{t-1}^L - i_{t-1}\ + \alpha_{13} b_{t-1} + \alpha_{14} g_t + \varepsilon_t^{pribal}$ (Fiscal rule)

α_9	α_{10}	α_{11}	α_{12}	α_{13}	α_{14}		$\bar{R}^2$	JB p-value
-3.6934 (0.853) [4.332]	0.7491 (0.144) [5.198]	-0.1980 (0.162) [1.216]	0.1491 (0.149) [1.001]	0.0300 (0.018) [1.625]	0.6778 (0.148) [4.579]		0.852	0.254

$b_t = \alpha_{15} + \alpha_{16} b_{t-1} + \alpha_{17} g_t + \alpha_{18} pb_{t-1} + \alpha_{19} \pi_{t-1} + \alpha_{20} \pi_{t-2} + \alpha_{21} b_{t-2} \cdot i_{t-1}^L + \varepsilon_t^b$ (Public debt equation)

α_{15}	α_{16}	α_{17}	α_{18}	α_{19}	α_{20}	α_{21}	$\bar{R}^2$	JB p-value
6.153 (2.275) [2.704]	0.9479 (0.043) [22.257]	-1.6383 (0.173) [9.458]	-0.5341 (0.142) [3.756]	0.3416 (0.229) [1.489]	-0.4519 (0.239) [1.890]	0.0065 (0.002) [3.069]	0.979	0.637

$\pi_t = \alpha_{22} + \alpha_{23} \pi_{t-1} + \alpha_{24} g_{t-1} + \alpha_{25} oil_t + \alpha_{26} oil_{t-1} + \varepsilon_t^{\pi}$ (Inflation equation)

α_{22}	α_{23}	α_{24}	α_{25}	α_{26}	$\bar{R}^2$	Skewness p-value	Kurtosis p-value	JB p-value
-0.0038 (0.005) [0.769]	0.8904 (0.050) [17.650]	0.0016 (0.001) [1.510]	0.0163 (0.007) [2.263]	0.0029 (0.007) [0.385]	0.904	0.479	0.000	0.000

$i_t^L = \alpha_{27} + \alpha_{28} i_{t-1}^L + \alpha_{29} i_{t-2}^L + \alpha_{30} i_t + \alpha_{31} \pi_t + \alpha_{32} b_t + \varepsilon_t^i$ (Long-term interest rate equation)

α_{27}	α_{28}	α_{29}	α_{30}	α_{31}	α_{32}		$\bar{R}^2$	JB p-value
-0.3955 (0.984) [0.402]	0.4984 (0.116) [4.280]	-0.1894 (0.100) [1.890]	0.4842 (0.064) [7.508]	0.1894 (0.087) [2.171]	0.0300 (0.018) [1.664]		0.974	0.201

System residual Portmanteau tests for autocorrelations

Q-Stat (Lag 1) (Prob. value)	Q-Stat (Lag 2) (Prob. value)	Q-Stat (Lag 4) (Prob. value)	Q-Stat (Lag 6) (Prob. value)	
0.089	0.122	0.595	0.433	

Notes: Standard errors and t-ratios are in the parentheses and square brackets respectively

6. Scenarios and debt-to-GDP dynamic forecasts

Table 2 summarizes the assumptions of three scenarios considered for the exogenous variables (a base, a downward/risky scenario, and a policy intervention scenario) together with the results for the endogenous variables. In the baseline scenario we assume that US and France GDP growth will increase at an average rate of 1.8 and 1.3 percent, respectively, and oil prices grow well above

US$200 per barrel.[5] The first two columns assume no policy intervention while in the last column the outcome of a realistic policy intervention, in accordance with favorable international and monetary policy conditions is shown.

Table 2: Scenarios and Macroeconomic Analysis for 2011 - 2020

	Downside scenario	**Baseline scenario**	**Policy intervention Scenario** †
Nominal short-term interest rate	3.5%	4%	3.5%
2020 Oil price in US dollar and Euro	Nominal 206$ (155€)	Nominal 247$ (186€)	Nominal 247$ (186€)
	Real 184$ (139€)	Real 202$ (152€)	Real 202$ (152€)
Real US GDP growth	1.8%	1.6%	1.8%
Real FRA GDP growth	1.3%	1.1%	1.3%
2020 Public Debt (% of GDP)	71%	68%	54%
Primary balance (% of GDP) *	0.02%	0.20%	1.15%
Nominal long-term interest rate*	5.18%	5.50%	4.90%
Inflation*	1.95%	2.22%	2.47%
Real GDP growth*	2.65%	2.43%	3.17%
General Government balance in % of GDP*	3.28% (3.27%)	3.19% (3.25%)	1.54% (1.68%)
$pb^* - \ i^* - \pi^* - g^* \ d^* \geq 0$	-0.51	-0.19	1.55

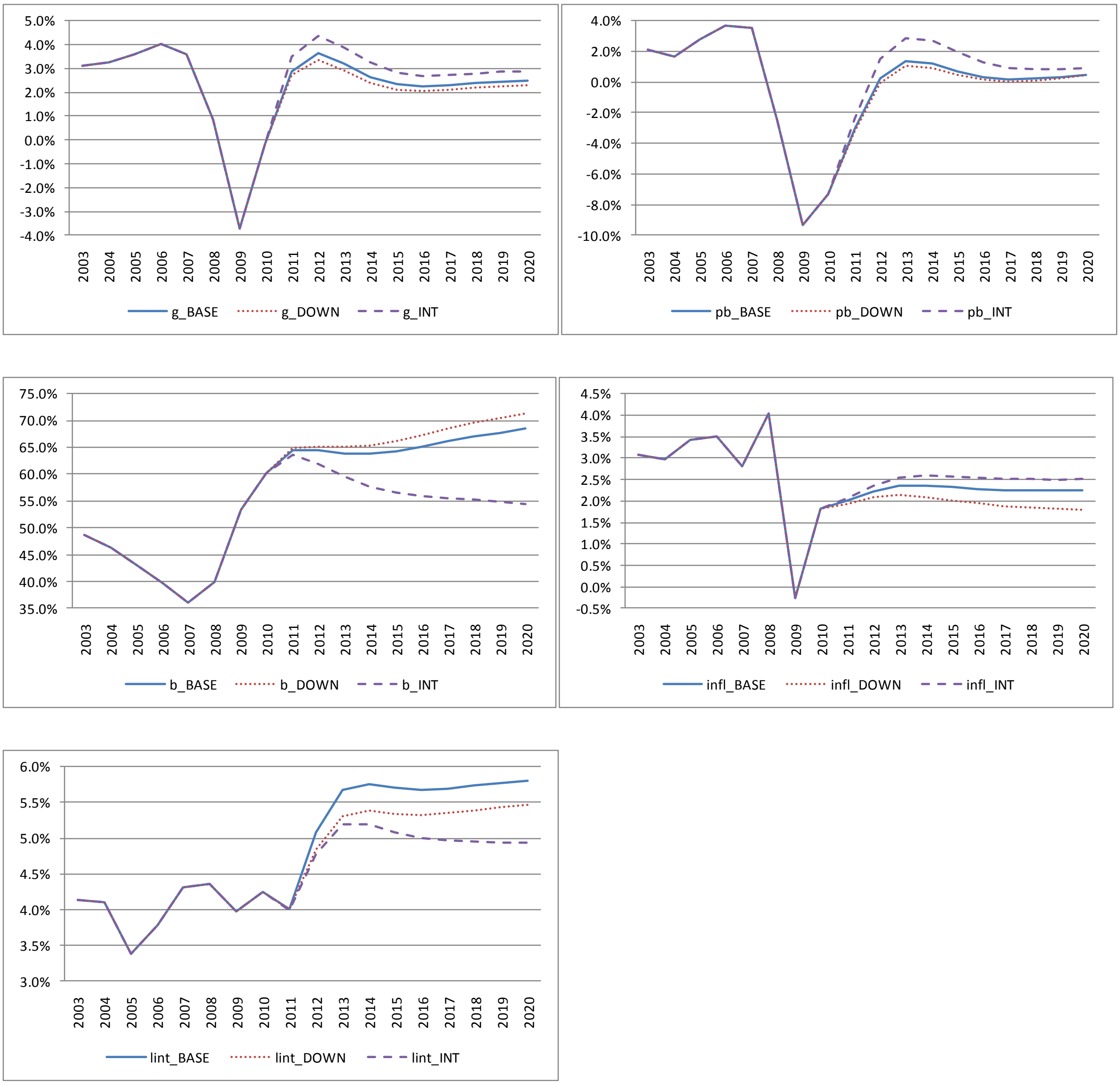
Note: Real values for Oil price change are calculated assuming an international average inflation of 2.2% for period 2011 – 2020. * Average values over the period. In parentheses the last value of government balance in 2020. † In the policy intervention scenario we assume that Spain government increases the GDP growth of 0.3% through growth policies and government surplus of 0.3% for all the forecast period 2011 – 2020.

We simulate accommodating monetary policy (3.5%, below the 4% assumed in the baseline scenario) in the baseline international scenario (1.3% of French and 1.8% of US GDP growth until 2020). In this situation, we assume the Spanish government to raise its surplus by 0.3% and increase

[5] Charles Maxwell of Weeden and Co., a renowned expert in the energy markets, predicts an oil price at US$300 in 2020. This value could be too high, but if the world economy will recover from the recession and economies such as India and China will continue to experience near double-digit growth, then a value well above US$200 is feasible.

the baseline GDP growth by 0.3% every year from 2011 to 2020. With these policy mixes the GDP growth is, more or less, in line with the average growth of last ten years excluding the last two years of recession,[6] inflation will increase slightly because of increased growth and, most importantly, the debt-to-GDP ratio will decrease below the 55% mark in 2020. These two measures permit Spain to take a sustainable downward pattern for debt-to-GDP-ratio and the stability condition is satisfied as shown in the last row of Table 2.

Figure 1: Forecasts of macroeconomic variables for period 2011 – 2020.



[6] The average growth rate for period 1998-2008 is 3.5.

Notes: BASE = Baseline scenario, DOWN = Downside scenario, INT = Policy intervention scenario.

7. Conclusions

In this paper we used a small-scale econometric model for Spain in order to study possible patterns of debt-to-GDP-ratio in the next ten years. Our results show that, even in the presence of positive external scenarios, the debt-to-GDP ratio unlikely to take a sustainable pattern. Our simulation showed that a policy intervention aimed at both pushing up the GDP growth rate above the pre-crisis levels (above 3%) and implementing the Maastricht restrictions (government deficit below 3%) are needed to bring the debt-to-GDP ratio to a sustainable pattern.

Data Appendix

Definitions and Data Source: 1970 - 2010

Variable	Definition	Source
b	Debt-to GDP ratio	AMECO - EUROSTAT (A-E)
π	Percentage change of Consumer Price Index	OECD Statistics (OCED-S)
g	Real GDP growth	A-E
g^{FR}	Real France GDP growth	A-E
pb	Primary balance (Total government revenues minus government spending excluding interest payments).	A-E
i	Nominal short-term interest rate	OCED-S
i^L	Nominal long-term interest rate	OECD-S
oil	Oil price (WTI - expressed in Euro) percentage change	Federal Reserve Economic DATA

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Appendix A

Figure A1: Official deficit-to-GDP-ratio versus our calculated deficit-to-GDP-ratio

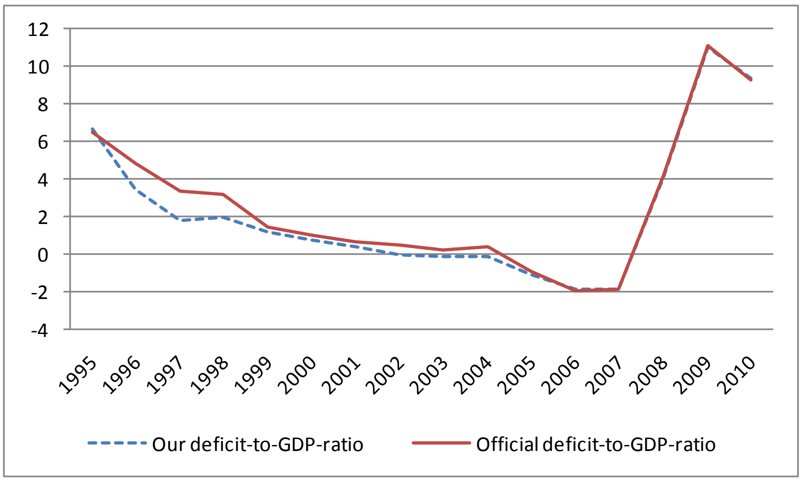

Figure A2: Historical debt-to-GDP-ratio versus forecasted debt-to_GDP-ratio