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The dynamics of French public debt: Paths for fiscal consolidations

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Abstract

We analyze possible targets for the French debt-to-GDP ratio with a small model. The role of the US and German GDP growth, prices of raw materials, ECB monetary policy, and domestic policy is analyzed in the debt dynamics. We find that external conditions, together with policies to stimulate growth and to generate a government surplus, play a fundamental role in the French fiscal consolidation.

Keywords: Debt to GDP Ratio, French Economy, International Factors.

JEL: E62, H63, H68

1. Introduction

The 2009 recession has worsened the French fiscal balances and its debt situation. Government deficit rose significantly to 7 % of GDP and the government debt ratio reached about 82% of GDP in 2010. Therefore, a fiscal consolidation plan is needed to place France's public finances on a sustainable path. This paper analyses the dynamics of the French government debt-to-GDP ratio (debt ratio hereafter) using a small-scale model based on Favero and Marcellino (2005) and Hasko (2007). Adopting various scenarios for the exogenous variables viz., US GDP growth, German GDP growth, oil price changes and short-term interest rates, we predict that France's debt ratio can reach a target of 80% by 2020. Section 2 presents the basic arithmetics of debt accounting. Section 3 gives a description of the model. Empirical results are in Section 4. Section 5 shows that under plausible assumptions our target of 80% for the debt ratio can be achieved. Section 6 concludes.

2. 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 of the interests paid on debt ($T - G$). The above holds if the variables are measured in real terms if inflation is measured with the GDP deflator. Normally the budget dynamics is written in the form of a change in the debt ratio (*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 their ratios to GDP. According to (2) a stronger real GDP growth, a lower nominal interest rate, and a higher inflation will reduce the debt growth. The following condition is needed to guarantee solvency and debt reduction:

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

where the variables with * are their sample averages.

3. A small macroeconomic model

Identity (2) is used by Favero and Marcellino (2005) and Hasko (2007) in a simultaneous equations model to account for interactions among the key variables and we follow their approach. Our model consists of five equations in which the endogenous variables are driven by four international variables viz., US GDP growth, German GDP growth, Oil price dynamics, and domestic short-term Central Bank monetary policy rate. Our model is as follows:

$$g_t = \alpha_1 + \alpha_2 pb_t + \alpha_3 g_t^{US} + \alpha_4 g_t^{GER} + \alpha_5 g_{t-1}^{GER} + \varepsilon_t^y \quad \text{(4) (Output equation)}$$

$$pb_t = \alpha_6 + \alpha_7 pb_{t-1} + \alpha_8 \; i_{t-1}^L - i_{t-1} \; + \alpha_9 g_{t-1} + \alpha_{10} DUM09 + \varepsilon_t^{pribal} \quad \text{(5) (Fiscal rule)}$$

$$b_t = \alpha_{11} + \alpha_{12} b_{t-1} + \alpha_{13} g_t + \alpha_{14} pb_{t-1} + \alpha_{15} \pi_t + \alpha_{16} g_t^{GER} + \varepsilon_t^b \quad \text{(6) (Public debt equation)}$$

$$\pi_t = \alpha_{17} + \alpha_{18} \pi_{t-1} + \alpha_{19} \pi_{t-2} + \alpha_{20} g_{t-1} + \alpha_{21} oil_t + \alpha_{22} oil_{t-1} + \varepsilon_t^\pi \quad \text{(7) (Inflation equation)}$$

$$i_t^L = \alpha_{23} + \alpha_{24} i_{t-1}^L + \alpha_{25} i_t + \alpha_{26} \pi_{t-1} + \alpha_{27} g_t + \varepsilon_t^i \quad \text{(8) (Long-term interest rate equation)}$$

The output equation is explained by international business cycle effects ($\alpha_3 > 0, \; \alpha_4 + \alpha_5 \; > 0$) captured by US ($g^{US}$) and German ($g^{GER}$) GDP growth rates and by primary balance (*pb*). A fiscal consolidation (a rise of the primary balance due to either 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 France the indirect effect seems to be historically larger as one can see in figure A2 in the Appendix. The relationship between GDP growth and primary balance is strongly positive with a highly positive cross-correlation (0.63). Then, we expect a positive coefficient for the primary balance in the output equation (α_2). The primary balance depends positively on both output and the spread between long-term and short-term interest rates ($\alpha_8 > 0$ and $\alpha_9 > 0$). Higher rates on long-term government bonds imply higher costs of public debt service, 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 French government's debt duration is getting closer to the duration of long-term bonds; see Figure A3 in the Appendix. A dummy (DUM09) is added to capture the financial crisis of 2009. The debt ratio is explained by GDP growth, inflation and an international business cycle indicator (g^{GER}). All signs in the equation are as expected, i.e. $\alpha_{13} < 0$, $\alpha_{15} < 0$, and $\alpha_{16} < 0$. Inflation in equation (7) depends positively on oil price growth and output growth ($\alpha_{20} > 0$ and $\alpha_{21} + \alpha_{22} > 0$).[1] In the last equation the long-term interest rate depends positively on the short-term one ($\alpha_{25} > 0$), on inflation ($\alpha_{26} > 0$) and on output growth ($\alpha_{27} > 0$).

4. Empirical results

The system of equations (4) – (8) is estimated simultaneously with the Seemingly Unrelated Regression method (SUR) with annual data for the period 1970 - 2011. The results are in Table 1 and are impressive. All the coefficients have the expected signs and are significant. The residual diagnostic test for absence of serial correlation (Portmanteau test) does not reject the null hypotheses and the normality test (Jarque-Bera), fails only for the long-term interest rate equation. This non-normality is perhaps caused by outliers which produce an excessive kurtosis. Favero and Marcellino (2005) posit that the use of dummies could improve diagnostic tests but it could weaken its forecasting performance. Since forecasting is our main goal, we prefer not to introduce such dummies.

In order to test the forecasting properties, we estimated the model from 1970 to 1999 and then forecasted for the next ten years, comparing the forecasted values with the historically recorded ones. The results are very satisfactory. To conserve space we report in appendix only the plot of the historical debt ratio versus the forecasted debt ratio (Figure A1).

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

Table 1: SUR Estimates of French Debt Dynamics (1970 – 2010)								
$g_t = \alpha_1 + \alpha_2 pb_t + \alpha_3 g_t^{US} + \alpha_4 g_t^{GER} + \alpha_5 g_{t-1}^{GER} + \varepsilon_t^y$ (Output equation)								
α_1	α_2	α_3	α_4	α_5	$\bar{R}^2$	JB p-value		
0.0147 (0.003) [4.273]	0.4430 (0.118) [3.741]	0.1876 (0.077) [2.424]	0.3920 (0.080) [4.907]	-0.2806 (0.083) [3.375]	0.660	0.385		
$pb_t = \alpha_6 + \alpha_7 pb_{t-1} + \alpha_8 \; i_{t-1}^L - i_{t-1} \; + \alpha_9 g_{t-1} + \alpha_{10} DUM09 + \varepsilon_t^{pribal}$ (Fiscal rule)								
α_6	α_7	α_8	α_9	α_{10}	$\bar{R}^2$	JB p-value		
-1.5159 (0.236) [6.424]	0.3647 (0.094) [3.869]	0.2332 (0.082) [2.849]	0.4911 (0.084) [5.813]	-3.190 (0.529) [6.031]	0.849	0.832		
$b_t = \alpha_{11} + \alpha_{12} b_{t-1} + \alpha_{13} g_t + \alpha_{14} pb_{t-1} + \alpha_{15} \pi_t + \alpha_{16} g_t^{GER} + \varepsilon_t^b$ (Public debt equation)								
α_{11}	α_{12}	α_{13}	α_{14}	α_{15}	α_{16}	$\bar{R}^2$	JB p-value	
7.7448 (1.172) [6.609]	0.9438 (0.018) [52.846]	-0.8448 (0.190) [4.495]	-0.7064 (0.156) [4.483]	-0.2664 (0.077) [3.450]	-0.500 (0.140) [3.547]	0.993	0.156	
$\pi_t = \alpha_{17} + \alpha_{18} \pi_{t-1} + \alpha_{19} \pi_{t-2} + \alpha_{20} g_{t-1} + \alpha_{21} oil_t + \alpha_{22} oil_{t-1} + \varepsilon_t^{\pi}$ (Inflation equation)								
α_{17}	α_{18}	α_{19}	α_{20}	α_{21}	α_{22}	$\bar{R}^2$	JB p-value	
-0.3983 (0.251) [1.590]	1.2255 (0.137) [8.910]	0.3010 (0.127) [2.377]	0.2391 (0.076) [3.160]	0.0272 (0.003) [8.051]	-0.0165 (0.010) [2.951]	0.963	0.925	
$i_t^L = \alpha_{23} + \alpha_{24} i_{t-1}^L + \alpha_{25} i_t + \alpha_{26} \pi_{t-1} + \alpha_{27} g_t + \varepsilon_t^i$ (Long-term interest rate equation)								
α_{23}	α_{24}	α_{25}	α_{26}	α_{27}	$\bar{R}^2$	JB p-value	Skewness p-value	Kurtosis p-value
0.8003 (0.277) [2.888]	0.4123 (0.062) [6.645]	0.4070 (0.048) [8.383]	0.1840 (0.038) [4.887]	0.0643 (0.048) [1.326]	0.972	0.000	0.124	0.00
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)		
0.727		0.436		0.248		0.180		
Notes: Standard errors and t-ratios are in parentheses and brackets respectively								

5. Scenarios and debt-to-GDP dynamic forecasts

Table 2 summarizes the assumptions of three scenarios (baseline, upward/optimistic, and downward/risky) for the exogenous variables together with the results for the endogenous variables. In an upside scenario in which both the domestic and global economies are stronger than expected, oil prices could grow well above US$200 per barrel.[2] The first three 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

	Baseline scenario	**Upside scenario**	**Downside scenario**	**Policy intervention Scenario**
Nominal short-term interest rate	3.5%	4%	3%	3.5%
2020 Oil price in US dollar and Euro	Nominal 206$ (155€)	Nominal 247$ (186€)	Nominal 171$ (129€)	Nominal 247$ (186€)
	Real 184$ (139€)	Real 202$ (152€)	Real 139$ (105€)	Real 202$ (152€)
Real US GDP growth	2%	2.4%	1.6%	2.4%
Real GER GDP growth	1.8%	2.2%	1.4%	2.2%
2020 Public Debt (% of GDP)	94%	90%	97%	78%
Primary balance (% of GDP) *	-1.06%	-1.00%	-1.13%	0.16%
Nominal long-term interest rate*	4.12%	4.49%	3.75%	4.43%
Inflation*	1.24%	1.55%	0.92%	2.26%
Real GDP growth*	1.53%	1.70%	1.38%	2.40%
General Government balance in % of GDP*	4.67% (4.72%)	4.86% (4.47%)	4.35% (4.28%)	3.37% (2.91%)
$pb^* - \; i^* - \pi^* - g^* \;\; d^* \geq 0$	-2.29	-2.11	-2.33	0.340

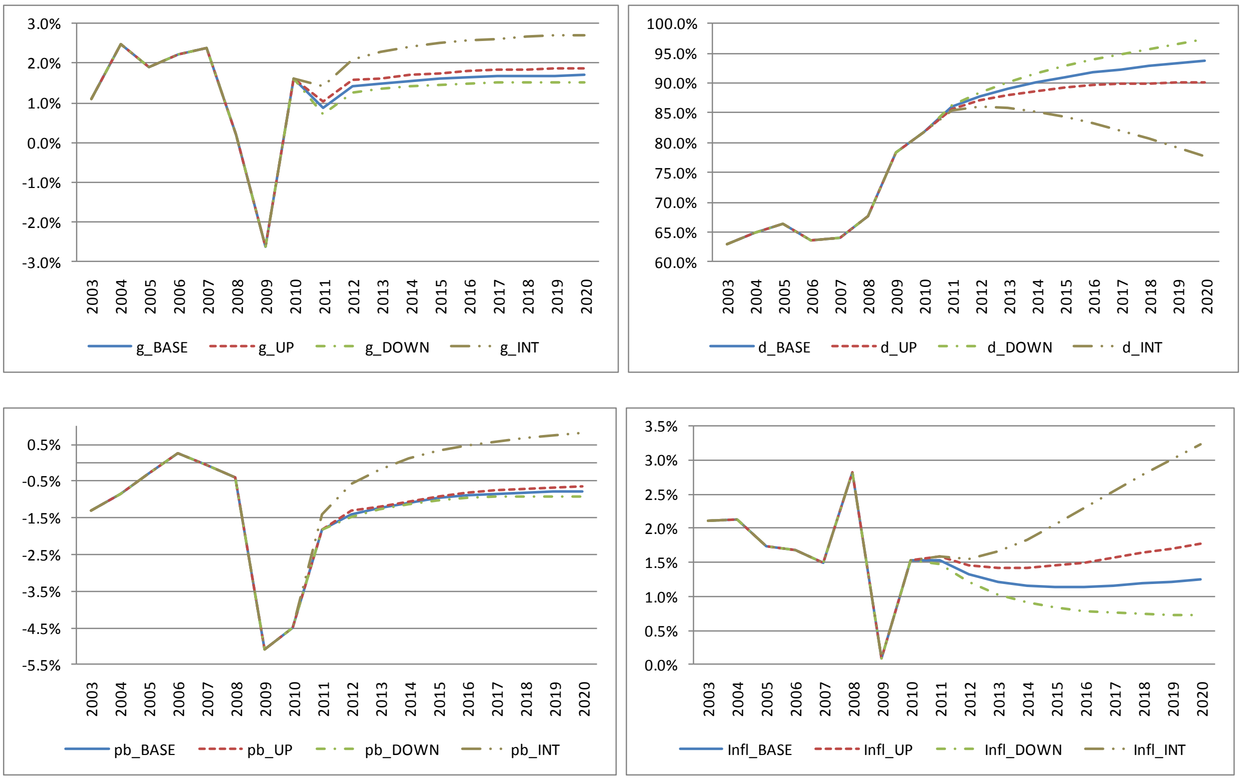
Note: Real values for Oil price change are calculated assuming an international average inflation of 2.2% for the period 2011 – 2020. * Average values over the period. In parentheses the last government balance value in 2020.

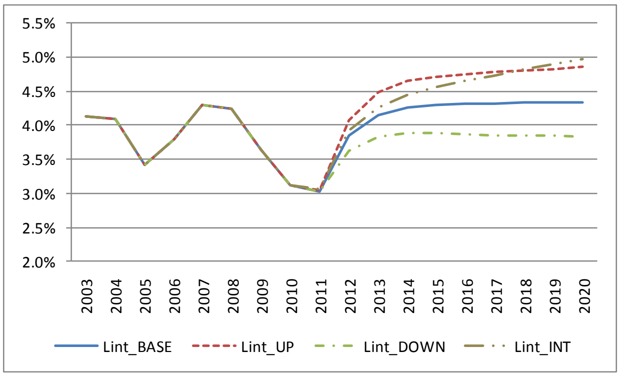
We simulate accommodating monetary policy (3.5%, below the 4% assumed in the upside scenario) in a positive international scenario (2.4% of US GDP growth and 2.2% for German GDP growth until 2020). In this situation, we assume the French government to raise its surplus by 0.4% and increase the baseline GDP growth by 0.2% every year from 2011 to 2020. With these policy mixes

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

the GDP growth is in line with US GDP growth (2.4%), inflation will increase to above 2% (because of sustained growth) and, most importantly, the debt ratio will decrease below 80% in 2020, fulfilling the Maastricht restrictions (below 3% of GDP) from 2017 (the deficit ratio in 2020 is 2.91%). Without the implementation of this policy, the debt ratio ranges from 90% to 97%, depending on the scenario. The patterns of the variables in various scenarios are depicted in Figure 1.

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





Notes: BASE = Base scenario, UP = Upside scenario, Down = Downside scenario, INT = Policy intervention scenario.

6. Conclusions

In this paper we used a small-scale econometric model in order to study possible patterns of the French debt ratio in the next ten years. Our results show that, even in presence of external positive scenarios, the debt ratio will not decrease to less than 90%. Our simulation showed that a policy intervention aimed at both pushing the GDP growth rate not below 2.3% and generating little government surplus is needed to bring the debt-to-GDP ratio below the 80% threshold.

Data Appendix

Definitions and Data Source: 1970 - 2010

Variable	Definition	Source
b	Debt-to GDP ratio	AMECO - EUROSTAT (AE)
π	Percentage change of Consumer Price Index	OECD Statistics (OCED)
g	Real GDP growth	AE
g^{US}	Real US GDP growth	Federal Reserve Economic DATA (FRED)

g^{GER}	Real German GDP growth	AE
pb	Primary balance (Total government revenues minus government spending excluding interest payments).	AE
i	Nominal short-term interest rate	OCEDS
i^{L}	Nominal long-term interest rate	OECDS
oil	Oil price (WTI - expressed in Euro) percentage change	FRED

References

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Appendix A

Figure A1: Historical debt-to-GDP-ratio versus forecasted debt-to-GDP-ratio

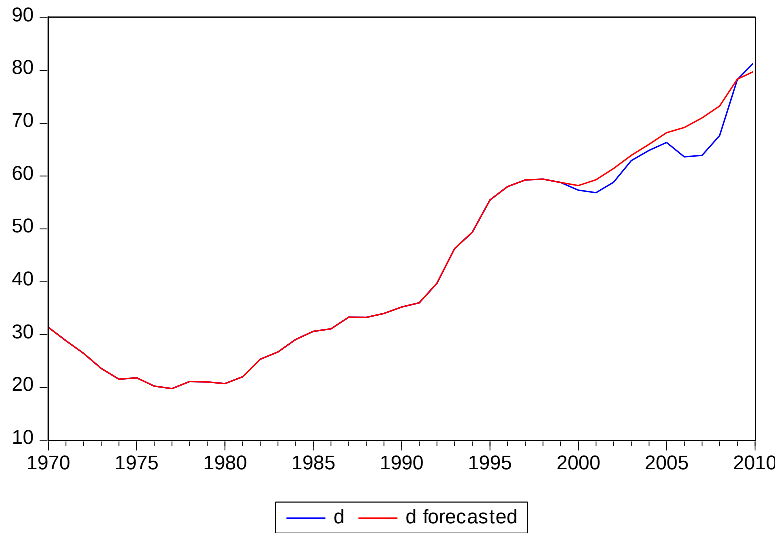
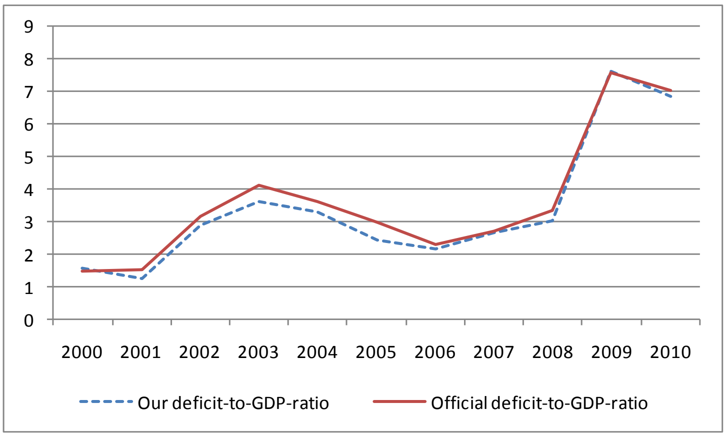


Figure A2: GDP growth (g) versus primary balance (pb)

Figure A3: Official deficit-to-GDP-ratio versus our calculated deficit-to-GDP-ratio



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Our deficit-to-GDP-ratio
Official deficit-to-GDP-ratio