Assessing the Sustainability of French Public Debt *

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Abstract

In France, government debt steadily rose from just below 20% of the GDP in 1980 to more than 60% today. This raises concerns about the sustainability of public finances (i.e. whether the government's intertemporal budget constraint can be satisfied without a drastic change in the orientation of fiscal policy). We find that the situation in France between 1978 and 2002 is one of "weak sustainability". Contrary to a "strong sustainability" situation, where, in the long run, government revenues and spending are equal, in France, there has been a persistent gap between public spending and revenues. To apprehend the dynamics of public debt more precisely, we break down government debt and analyze public revenue, primary spending, the interest burden and the growth of the economy within a cointegrated VAR (vector autoregressive) model framework. This enables us to identify the trends that explain the strong persistence in the growth of public debt, such as a weak response of revenues to spending or a snowball effect.

Keywords: government debt, intertemporal budget constraint, sustainability, cointegrated VAR model.

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"No borrowing, your majesty, because, after a while, too much borrowing either calls for bankruptcy or an increase of taxes."
Turgot to Louis XVI

1 Introduction

Over the past thirty years, the OECD countries have exhibited a pattern of persistent public deficits along with a strong increase in public indebtedness. This episode raises the question of the sustainability of fiscal policies. The debate took a new turn with the creation of the Economic Monetary Union (EMU) in Europe and in particular with that of the Stability and Growth Pact (SGP) that strictly constrains the conduct of fiscal policy in EMU member states. More recently, many European countries, namely Germany since the year 2001 and France since 2002, have crossed the 3% "reference value" set for the public deficit/GDP ratio. Government debt has kept increasing, sometimes going beyond the 60% limit set for the debt/GDP ratio by the SGP.

When faced with downturns in economic activity, using public deficits boosts spending in the short run and therefore helps smooth fluctuations and limit slowdowns. However, when these deficits lead to an accumulation of debt in the long run, public indebtedness can reduce domestic investment, thereby weakening growth. Although increasing aggregate demand and evicting domestic investment in the short run are probably the main effects of an increase in government debt, other unfavorable effects exist (upward pressure on long term interest rates that accentuate the eviction of domestic investment, inflationary and default risks). Furthermore, the increase in public debt goes hand in hand with an increase in the interest burden, which reduces future latitude in government fiscal policy.

A fiscal policy is said to be sustainable if no drastic policy shift is needed to satisfy the government's intertemporal budget constraint. This constraint requires that current debt be covered by future primary surpluses. It also raises the question of whether the different components of public finances can keep increasing indefinitely on the basis of past trends or whether a change in the orientation of fiscal policy will be necessary. Finally, it calls for the analysis of the macroeconomic context. Indeed, a non-sustainable fiscal policy leads to an increase in public indebtedness whose effects on investment, interest rates, inflation and, *in fine*, on growth are not neutral.

Moreover, achieving fiscal sustainability and, in the case of EMU, satisfying the SGP requirements (in particular the public debt/GDP ratio criterium), could require adjustments in order to correct fiscal imbalances. Studying the joint evolution, interdependences and causal relationships between public spending and revenues and public debt can help grasp with more precision how the budget constraint is satisfied and, should it not be satisfied, why not. Analyzing the dynamics of public finances is thus necessary for a complete sustainability diagnosis.

In this paper, we address two issues concerning the debate on fiscal policy sustainability: evaluating past fiscal policy sustainability, analyzing the dynamics of public finances[1].

First, as regards sustainability assessment, economic literature adopts two main approaches. Earlier tests, following the works of Hamilton and Flavin [1986] and Wilcox [1989], focus of the order of integration of the public debt and deficit processes and characterizes the sustainability of fiscal policy by the stationarity of the first difference of public debt or deficit. The second approach, taken by Trehan and Walsh [1988, 1991] and Hakkio and Rush [1991], consists in analyzing cointegration between public revenues and spending. More recently, (see for instance Quintos [1995] and Martin [2000], particular attention has been given to detecting regime shifts in the conduct of fiscal policy. Our paper applies these tests to data for France and analyzes the sustainability of public finances over the 1978-2002 period.

Second, as regards dynamics analysis, we break down the government debt and estimate the dynamics of public finances using a cointegrated VAR (vector autoregressive) model with public revenue, primary spending, the interest burden and the growth of the economy. This aims to characterize the stochastic trends determining the dynamics of public finances and to analyze the interdependences between government spending and revenues. In this paper, we address these issues by identifying the VAR model's response to public finance shocks. We also attempt to detect any regimes shifts by carrying out stability tests on our estimated model.And finally, based on our estimations, we quantify the medium-term impact of the current fiscal stance and economic situation.

The remaining of the paper is organized as follows. Section 2 describes the history of government debt in France over the 1978-2002 period. Section 3 presents the government's intertemporal budget constraint, derives

[1]This analysis is completed by an estimation of the medium-term impact of the current fiscal situation.

fiscal sustainability conditions and discusses the different concepts used to characterize the sustainability of public finances. The results of common sustainability tests applied to French data are then presented. In section 4, we model the dynamics of public finances and analyze the main trends at work. Section 5 concludes.

2 An Almost Continuous Increase of Public Debt Over the Past 25 Years

In this paper, the concept used to describe public debt is that defined by the Maastricht treaty. It corresponds to the public administrations' financial liabilities (public debt as defined by the French national accounts), to which three main corrections are brought: the different public administrations are consolidated, public debt is expressed in nominal terms and certain types of indebtedness are excluded, such as commercial borrowing (see Appendix 1). More precisely, public debt as defined by the Maastricht treaty is a gross debt, which therefore does not include the government's assets. Since these assets may be sold in order to reimburse public debt, a net debt might have been a more accurate definition. However, this latter definition requires calculating the value of the assets, in particular that of public unlisted firms and properties. Furthermore, the deterioration of the net value of the public administrations' possessions (difference between assets and liabilities) reflects the increase in public indebtedness. Between 1980 and 2002, the government debt/GDP ratio rose from 19 % to 59%. Over the same period, the value of financial and non-financial public assets dropped slightly from 115% of the GDP in 1980 to 95% of the GDP in 2002. Finally, the variations in public debt are directly linked to the main components of public accounts, namely public revenues and spending.

[insert Fig. 1 about here]

In order to understand the dynamics of public finances, it is necessary to consider the government's financial constraint for each period. An accounting identity gives the public deficit (difference between public revenues (R_t) and public expenditures, including the debt service ($G_t + \rho_t B_{t-1}$) as equal to the first difference of the outstanding public debt (δB_t). The public deficit can be rewritten as the sum of the primary deficit and the debt service:

$$\Delta B_t = (G_t - R_t) + \rho_t B_{t-1} \tag{1}$$

This equation can be read in three different ways:

- in nominal terms: ρ_t represents the nominal interest rate on the public debt

- in real terms: ρ_t represents the real interest rate on the public debt

- as a ratio to GDP: ρ_t represents the nominal interest rate minus the growth rate of the nominal GDP.

In the rest of the paper, we will reason in terms of GDP. This approach seems more pertinent and legible.

Equation (1) thus describes the evolution of the indebtedness ratio over the past twenty years. Three main variables explain the rise in the public debt ratio by 40% since 1978:

- the primary balance $(G_t - R_t)$ directly contributed to this rise. Between 1986 and 1991, primary surpluses checked the increase in the debt. The continuous deficit reduction between 1996 and 2000 and the primary surplus achieved between 1999 and 2001 quite obviously explain the stabilization of the debt/GDP ratio slightly below the 60% level. On the contrary, the deterioration of the fiscal stance in the 1981-1982 period and later between 1992 and 1996 strongly contributed to the increase of indebtedness over the period. Note that these movements are quite sensitive to the economic situation, through automatic stabililizer mechanisms. Thus the deterioration of the fiscal stance in the mid-1990's and the following improvement are greatly determined by the macroeconomic context.

- the variations in the interest rate also have an impact on the dynamics of the debt/GDP ratio. Thus, from 1981 on to the mid 1990's, even if nominal interest rates sometimes fell, the difference between the interest rate and the growth rate of the economy was quite high, compared to the previous periods.

- finally, periods of strong growth, besides having an impact on the fiscal stance, reduce the debt/GDP ratio simply by increasing its denominator.

During this twenty-year period, we can therefore distinguish five different phases in the rise of the public debt:

- Between 1978 and 1986, the public administrations' debt ratio increased by 3.7% per year on average. Over this period, public spending increased strongly. The French government carried out numerous reforms (retirement age set to 60, work week reduced to 39 hours, grant of a fifth week of paid holidays, nationalization of banking and industrial groups).

- The growth of public indebtedness slowed down between 1987 and 1991. Economic growth was stronger and inflation weaker, which put downward pressure on interest rates and therefore relieved the interest burden of the public debt. Successive governments strived to control public spending and generate fiscal surpluses.

- Then, between 1992 and 1997, the debt/GDP ratio grew once again at a particularly high rate (5.3% of the GDP per year). The government's anticyclical reaction caused public spending, and more particularly social security administrations' deficits, to increase strongly. Public deficit thus reached 6% of GDP in 1993. Higher interest rates in the beginning of the period accentuated the burden of the public debt.

- Since 1997, the debt/GDP ratio has stabilized just under the 60% threshold. In order to satisfy the requirements for participation in EMU from 1999 defined in the Maastricht treaty[2], the French government launched, in 1995, a public deficit reduction program, called "convergence program". The acceleration of economic growth and lower inflation and interest rates also contributed to the alleviation of the public debt burden.

- in 2002 came an increase in the public debt/GDP ratio by 3.8%, despite particularly low interest rates. The government must cope with the global economic slowdown and social spending is increasingly high. The risk that the debt dynamics become self-fulfilling (the "snowball effect") has become disturbing.

[2]In order to qualify for entry into EMU, the convergence criteria defined during the 1992 Maastricht treaty in particular required States to maintain public deficit below 3% of GDP and to significantly reduce the public debt/GDP ratio, bringing it under the 60% limit. These criteria were made official in 1997 in the Stability and Growth Pact (SGP). The rationale for these criteria was found in two main points. First, within a monetary union, the convergence criteria aim to prevent free-riding: one State's public spending can have an individual direct positive effect, but can entail more diffuse costs, such as an increase in inflation that penalizes the entire monetary union. Second, these criteria tend to encourage a healthy management of public finances, in particular in anticipation of spending to come due to the ageing of the European population.

Figure 2 represents the variations of public debt over a given year as well as the different elements that contribute to this growth. The first difference of the public debt is, in theory, equal to the sum of the primary deficit and the debt's interest burden (public deficit). In practice, we observe a difference between the debt variation and the public deficit. This "accounting adjustment" is due to the acquisition of financial assets and other changes in volume (see Appendix 1). Thus, in 1982, nationalizations led to an increase in the gross public debt greater than the public deficit. In the same way, in 1995, the elimination of the one-month discrepancy for consumption tax reimbursements led to a greater increase in public debt.

[insert Fig. 2 about here]

3 Assessing Public Debt Sustainability in France

A sustainable fiscal policy should be sustained forever without leading to "excessive" debt accumulation, *i.e.* to a level of debt that cannot be covered by futur surplus, thus ruling out "Ponzi games", defaults and major shifts in the fiscal stance (tax increase and/or budgetary cuts). While sustainability primarily qualifies a given fiscal policy and its futur consequences, in a broader sense, we use this concept to qualify the observed fiscal developments over the last 25 years.

Sustainability should be distinguished from solvency. Solvency characterizes the ability of a state to meet its commitments, regardless of the way this is achieved. Thus, concluding that a state is not solvent immediately leads to a public finances crisis, usually ending with a default on public debt and/or hyper inflation.

On the contrary, sustainability characterizes to a state which is solvent but without this requiring any fiscal ajustement. Concluding that public finances are not on a sustainable path does not mean that debt crisis is inevitable but rather that, sooner or later, fiscal shifts would be necessary to ensure solvency.Thus whereas solvency concerns government "financial health", sustainability rather concerns the coherence of its current fiscal policy.

3.1 Public Finances Arithmetic and Sustainability Criteria

The intuition of sustainability is rather clear, yet defining sustainability and deriving testable criteria is less straightforward. As stated in the introduction, the definition of sustainability employed here refers to the fulfillment of the government's intertemporal budget constraint. In period t, the budget constraint can be expressed as follows, in nominal or real terms :

$$\Delta B_t = (G_t - R_t) + i_t B_{t-1} \tag{2}$$

with B_t being the stock of debt at the end of period t, G_t the primary public expenditure (public expenditure excluding interest payments), R_t the public revenues and i_t the interest rate on debt. Since all these variables show an upward trend if the economy shows a similar pattern, we should control for GDP growth and perform the analysis in GDP terms. Thus, (2) becomes :

$$\Delta b_t = (g_t - r_t) + \rho_t b_{t-1} \tag{3}$$

where lower case letters represent the corresponding variable as a ratio to GDP and where

$$\rho_t = \frac{i_t - y_t}{1 + y_t} \approx i_t - y_t$$

can be understood as the addition to debt due to the excess of interest rate over the GDP growth rate, responsible for the snowball effect.

Assuming that ρ_t is constant and positive[3,4] and solving (3) forward, the intertemporal budget constraint can be written as :

$$b_t = \sum_{s=0}^{\infty} \frac{r_t - g_t}{(1+\rho)^{t+s}} + \lim_{s\to\infty} \frac{b_{t+s+1}}{(1+\rho)^{t+s}} \tag{4}$$

Equations (3) and (4) cannot be subject to controversy for they only summarize an accounting identity. Following Hamilton and Flavin [1986], we focus on the expected behavior of the "bubble term" in (4). Taking expectations in this equation gives :

$$b_t = E_t \sum_{s=0}^{\infty} \frac{r_t - g_t}{(1+\rho)^{t+s}} + E_t \lim_{s\to\infty} \frac{b_{t+s+1}}{(1+\rho)^{t+s}} \tag{5}$$

[3] If ρ_t were negative, the deficit process would be sustainable and the analysis would not be of much relevance.

[4] This can be extended to the case where ρ_t is stationary with positive expectation, see Quintos [1995] for further details.

Sustainability is satisfied if, and only if, current debt is expected to be covered by futur primary surpluses, *i.e.*

$$b_t = E_t \sum_{s=0}^{\infty} \frac{r_t - g_t}{(1+\rho)^{t+s}} \tag{6}$$

which is mathematically equivalent to the transversality condition :

$$\lim_{s \to \infty} E_t \frac{b_{t+s+1}}{(1+\rho)^{t+s}} = 0 \tag{7}$$

From these sustainability criteria, relevant economic literature provides two main types of sustainability tests, unit root tests and cointegration tests.

From (7), it is clear that debt/GDP ratio being stationary is a sufficient condition for sustainability. Such a condition insures the respect of the transversality condition. Among others, Hamilton and Flavin [1986] and Wilcox [1986] assess sustainability by testing the stationary of ΔB_t. Similarly, one can test the order of integration of outstanding public debt (which must be at most I(1)), or of public deficit (which must be stationary).

The stationary condition used above is only a sufficient condition for sustainability, and not a necessary and sufficient one. Hakkio and Rush [1991] and Quintos [1995] give less restrictive sustainability tests. Following Quintos [1995], we can define two concepts, "strong sustainability" and "weak sustainability", based on the relationship between public revenues and expenditures (see (6)).

For both strong and weak sustainability, public revenues and expenditures must be cointegrated. Consider the following relationship between revenues and expenditures:

$$r_t = \alpha + \beta g_t^T + \varepsilon_t \tag{8}$$

where g^T represents total public expenditures, *i.e.* the sum of both primary expenditures and debt service, and where ε_t is a random term of expectation zero presenting no persistence. Three situations are then possible:

- strong sustainability: revenues and expenditures are cointegrated with cointegrating vector $((1, -\beta) = (1, 1))$. This is a necessary condition for sustainability, which corresponds to the condition on the order of integration of debt or deficit described above.

- weak sustainability: revenues and expenditures are cointegrated, but the cointegrating vector is $(1, -\beta)$, with $0 < \beta < 1$. Public spending increases faster than revenues but since Δb_t is $I(1)$, $\Delta b_t = Op(T^{0.5})$ and

$$\lim_{s \to \infty} E_t \frac{b_{t+s+1}}{(1+\rho)^{t+s}} = 0$$

  The transversality condition is thus verified since the discounting term decreases faster than the increase of Δb_t.

- no sustainability: if revenues and expenditures are not cointegrated and if the growth rate of the debt is higher than ρ_t, public debt is not sustainable.

It is important to note that these notions remain theoretical. Thus, the weak sustainability concept supposes that the debt/GDP ratio does not influence the macroeconomic context. However, strong indebtedeness can put upward pressure on interest rates and have unfavorable effects on growth. Therefore, it can be more prudent to use the more restrictive stability constraint when assessing fiscal sustainability.

3.2 Preliminary Assessment

We begin by testing the "strong sustainability" of fiscal policy in France over the 1978-2000 period using unit root tests (see Appendix 3).

According to these tests, the primary deficit series is I(1), which leads us to reject the strong sustainability hypothesis. Identical tests carried out on Δb_t generally also lead to the rejection of the hypothesis. Note however that theses two tests, although conceptually equivalent, correspond, in practice, to two different series (due to the presence of the accounting adjustment term). Conclusions based on the behavior of Δb_t are thus not perfectly reliable: these tests do not characterize fiscal policy *stricto sensu*, but the movements in public debt, including purely financial ones. Therefore, although the tests allow us to conclude without doubt that the debt series is non stationary, conclusions concerning sustainability are less accurate. These results still tend to reject the strong sustainability constraint. Indeed, even if financial flows can have an influence on outstanding public debt, the main cause for non-sustainability seems to be the non-stationarity of public deficit.

3.3 Assessing Sustainability using a Simple Bivariate Model

Cointegration tests are also carried out on the same data. We model two variables, "public revenues" (r_t) and "total public expenditures" (g_t^T) in a simple VAR bivariate setup, estimated with the Johansen method. On the basis of common tests, we estimate a VAR with three lags and a constant in the first difference series, which reflects the increase in public revenues and expenditures over the past twenty years.

The analysis shows that fiscal policy in France has been, at best "weakly sustainable". The two variables are cointegrated and the value for the cointegrating coefficient beta is 0.24. The constraint test always rejects strong sustainability. Moreover, a recursive estimation of the cointegrating vector over successively longer periods shows a decrease in the coefficient beta starting in 1992, and then a rise from 1995. Efforts made to increase public revenues only start to pay in 1996.

[insert Fig. 3 about here]

Fiscal policy in France over the past twenty years was therefore not consistent with strong sustainability. The value for β is particularly low, compared to that obtained for the United States (0.6-0.8 in Quintos [1995] and Crowder [1997]) or for other European countries (0.7 in Spain according to De Castro, Gonzàles-Parmo and Hernadès De Cos [2001]). Note however the importance of the estimation period for these results. For instance, De Castro et al. carry out their estimation on the 1964-1998 period. During our estimation period (1978-2000) in France, public deficits increased, whereas it was previously common to periodically witness public surpluses. We can thus assume that the long-run relationship between public revenues and expenditures has deteriorated in the recent past.

4 What Has Driven the Dynamics of French Public Debt in the Past Two Decades?

The tests of the previous section lead to conclude that the dynamics of French public debt in France is not consistent with strong sustainability. However, they do not allow us either to understand why the debt ratio deviates from the sustainable path or to evaluate the efforts achieved in order to rein in public finances, in particular in the run up to the accession to EMU in the second half of the 1990s. To provide some answers to these

questions, we use a more comprehensive model of public debt dynamics. This model helps to identify the trends that lead to the drift of public finance and to assess the consequences of these past trends in the medium run.

4.1 Model Specification

Six variables are considered: b_t the government debt as defined in the notification to the European Commission, r_t the total revenues of the government, g_t the primary expenditures of the government, id_t the debt service, res_t the effect of growth on debt outstanding and adj_t the adjustment term due to changes in the financial account of the government. All theses variables are expressed as a ratio to GDP. Definitions and descriptions of the various data manipulations are detailed in Appendix 1. We chose to model these variables in a VAR setup, as it allows both to take into account the order of integration of the variables as well as any possible long-run relation between them.

The variables are linked by the following identity equation:

$$\Delta b_t = g_t + id_t - r_t - res_t + adj_t \tag{9}$$

Univariate tests tend to imply that the debt ratio is presumably a I(2) process. This hypothesis is confirmed by multivariate tests, when all variables (except the adjustement term) are encompassed in a VAR model. For these reasons, we choose to focus on variables which are presumably I(1), from which the variation of debt is deduced using the relation (9). The full model is thus given by the following vector:

$$(g_t, id_t, r_t, res_t, adj_t)$$

The long-run cointegrating relationships are estimated following Johansen (1991, 1994). We subject our VAR model to a number of specification tests. The regression features a constant term in the long-run relations but no linear trend. The constant is restricted to belong to the cointegration space and has no influence on the growth of the variables. Indeed, such a constant would imply an exogenous deterministic drift of the level of all variables, which would hamper our understanding of the very trends that lead to the drift of public finances.

The lag length used to whiten the residuals is chosen on the basis of a battery of information criteria: the Scharwz Bayesian information criteria (BIC) as well as the criteria of Akaike (AIC) and Hannan-Quinn (AH) (see

Appendix 4). These tests, however, offer conflicting results on the optimal lag length. Eventually, based on other properties of the VAR model, we choose a lag-length of 6 (hence 5 lags for the VAR in difference). This reflects the quarterly nature of our series and is consistent with the expected dynamics of public finances (in particular yearly budgeting).

Eventually, we check that the residuals obtained by this model pass the Box-Pierce test for autocorrelation and the Bera-Jarque white noise test. Both tests are satisfied when adding a single dummy for the third quarter of 1983 (see Appendix 4).

4.2 Cointegrating Relations and Stochastic Trends

The next step consists in identifying the number d of cointegrating relations. The results of the trace and eigenvalue tests are reported in Appendix 4. These tests suggest the existence of two cointegrating relations in the system. This result is particularly robust to changes in the lag length of the VAR as the tests return the same number of long-run relations when restricting the number of lags down to three or expanding it up to seven. The VAR model presents two cointegrating relations and three stochastic trends. The cointegrating relations correspond to a vectorial basis of the cointegrating space and cannot be interpreted directly in terms of economic significance unless further restrictions are imposed on the model.

Interpreting directly the long-run relations however turn out to be challenging. We found that none of the variables can be excluded from the long-run cointegration space and none could be considered stationary over the sample period. These results are in line with those of univariate tests. However, we could not impose further restriction on the model.

To interpret the nature of the three stochastic trends present in the model, we therefore study the impulse response functions of the model. To identify the shocks, we assume a recursive structure for these shocks. The order in which an unexpected shock on one variable influences the other is the following:

$$res_t \Rightarrow r_t \Rightarrow g_t \Rightarrow id_t \Rightarrow adj_t$$

Let us consider for example a negative unexpected output shock. We assume that this shock on output (measured indirectly by the term res_t which combines the level of the debt and the growth of GDP) is not influenced contemporaneously by any other variables but influence all the other

variables in the model. Through the effect of automatic stabilizer, a negative unexpected shock on output contributes to a decline in government revenues. Besides, it may lead the government to raise expenditures in order to provide an buffer against the recession. The decrease in revenues and the increase in expenditures then feed into fiscal deficit and public debt and may raise debt service if the interest rate is constant. A contracyclical monetary policy (leading to a decline in the interest rate) should have a more limited impact. Eventually, we decide to assign the last position in our structural interpretation of the VAR to the adjustment term.

Appendix 4 provides figures of the effect of a shock of one standard deviation in the recursive VAR. To make the interpretation of the impulse response clearer, we reconstructed a debt series, which was use to analyze a shock on res_t as a shock on the rate of growth of GDP and a shock on id_t as a shock on the interest rate.

This analysis allows us to distinguish three main trends that drive the increase of French public debt.

- The model presents a bias towards fiscal deficit, as a shock on expenditure does not lead to an offsetting rise of revenues of the same amplitude. Indeed, a shock of 1 point of GDP of primary expenditures leads, after five years, to a rise of 3 points of GDP. This may be explained by the progressivness in the effective enforcement of a particular measure. The effect on revenues is not significant during the first three years. Moreover, after five years, the rise of revenues only offsets half of the effect of the initial expenditure shocks: the deviation of revenues is only of 1.5 point of GDP. This persistent imbalance leads to increasing fiscal deficit and rising debt services. All in all, the overall effect on the debt level is of 12 points over a five year horizon. When comparing a standard expenditure shock to a revenue shock, the results are strikingly dissimilar. The impacts of revenue shocks have a more limited time span and seem to give rise to a small albeit less significant decline in debt service. The dynamics of debt is partly driven by this bias towards persistent fiscal deficits.

- Shocks on the interest rate (measured by a shock on debt service) also seems to be persistent and self-sustained. A 100 basis point rise in interest rate leads to a 7 points increase of the debt to GDP ratio over five years. This effect is however less significant than the autonomous drift in expenditures presented above. Furthermore, this effect is present in

the model even though the interest rate has declined substantially over the past two decades.

- Eventually the debt ratio is also influenced by specific one-off operations on the financial account of the government. One should note however that the accounting adjustment term tends to be positive on average over the period and is sometimes reasonably high. Hence, it provides a further cause of the drift of public debt. A rise of 1 point of GDP in the adjustment term leads, after five years, to a rise in the debt level of 10 point of GDP.

4.3 A Simple Forecasting Exercise

We use the VAR model to produce a forecast of public debt over the next five years given the current fiscal conditions. We start our forecasting exercise in 2002 Q4 and the simulation runs up to 2007 Q4. The modest rise in expenditures is almost offset by a similar rise in revenues. The dynamics of interest payments is more buoyant. This, combined with an already high level of debt, significantly contributes to a further increase of the debt level. The role of the adjustment term is also positive and in the range of 0.5 point of GDP every year. All in all, the debt ratio should rise by 20 points, up to 80% at the end of 2007.

Two important caveats should apply to these results. The VAR reflects the average behavior of the data over the past 25 years. Thus it does not account for possible changes in behavior in the most recent period. It does not account, either, for foreseeable changes that may occur in the near future. Note however that the effect of demographic change should be limited over this horizon, as the decline in labor force in France only starts around 2008 and that the rise in dependency ratio should also remain limited until 2006.

5 Concluding Remarks

In this paper, we address two issues, the sustainability of public finances and the underlying causes of the drift of public debt. First, we attempt to ascertain whether the fiscal policy over the past twenty-five years in France is consistent with the requirement of the government's intertemporal budget constraint. Second, we try to ascertain what drive the dynamics of the public debt. Our findings can be summarized as follows.

Since 1980, the dynamics of public debt was at best weakly sustainable. Three main reasons stand out to explain this result. First, expenditure shocks only give rise to a smaller offsetting rise in revenues in the long run. This result is confirmed by both impulse response functions of the VAR model and by the bivariate analysis of the cointegration between revenues and primary expenditures. Second, any rise in the debt level tends to be persistent, in particular because of a snowball effect through the debt interest burden. Third, the discrepancy between the first difference of the debt and the fiscal deficit tend to be persistent and sometimes quite large.

This situation of weak sustainability can become worrying as the debt level can affect the macroeconomic environment. Weak sustainability assumes that this very environment is not affected by the level of debt, a somehow heroic hypothesis for very high levels of debt. In particular, a rising debt level may depress growth or may feed up into a rising cost of borrowing. Interest rate hikes would have a further downward effect on growth.

This situation may become all the more problematic given the current constraints on policymaking. In particular, the SGP restricts fiscal policy while the devolution of monetary policy to the ECB forbids debt monetization, the previously favored solution to get rid of the debt overhang. With this in mind, the only way to solve the debt problem is the "virtuous" path of fiscal consolidation. This requires scaling down expenditures or matching them with offsetting revenues.

Any conclusions derived from these results should bear in mind the limitation of the analysis. The model reflects the average behavior of the data considered over the past 25 years although this behavior may have changed during the period. Besides, the evolution of some structural factors such as demographic trends and their impact on public finances are not taken into account. However, these added pressures on public finances should make fiscal consolidation all the more urgent in the near future.

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Appendix 1: Definition and Description of the Data

Definitions

Fiscal deficit is (theoretically) equal to the first difference of outstanding public debt. It is also equal to the difference between public revenues R_t and total public expenditures (equal to primary expenditures G_t and debt service $i_t B_{t-1}$. The debt accumulation equation can thus be written as follows:

$$\Delta B_t = (G_t + i_t B_{t-1}) - R_t = (G_t - R_t) + i_t B_{t-1})$$

Government Debt as defined in the notification to the European Commission consists in *gross government debt*. In particular, government assets such as the assets of the Treasury deposits at the Central Bank, public ownership of corporate firms and other equity items are not included. As these assets can be sold in order to reimburse the debt, a net measurement of public debt may reflect more accurately the situation of public finances. However, it is also difficult properly evaluate the value of these assets (see in particular the case of corporate firms which shares are not present on stock markets or of public buildings belonging to the national heritage).

Government debt notified to the European Commission is distinct from government debt as published in the National Accounts for three reasons:

- the debt is netted out between different sections of the general government, such as the central government, the central bank or local government.
- the level of debt is measured at its book value and not at its market value. The accounting principle is justified inasmuch as it allows to match the level of debt to its value at time of repayment. It also simplifies the comparison between stocks and flows as it does not require to account for a change in prices from one year to another.
- some form of borrowing such as commercial borrowing are excluding. All countries do not have reliable data on such items.

Fiscal deficit is the balance of the non-financial account of the government sector.

Debt service includes interest payments on negotiable debt, which accounts for 90% of French public debt, interest payments on non-negotiable debt, as well as administrative costs related to the management of public

debt. Debt service and the level of debt outstanding enable the calculation of the average level of interest rate served on the debt.

Accounting adjustments are made. In practice, the fiscal deficit is not absolutely equal to the first difference of the outstanding public debt. This discrepancy, which can be quite large, can be explained by some changes in the size of the government sector (such as the nationalization of a number of French banks in 1982), by some one-off adjustements (such as the end of the delay of one month for repaying VAT to the retail and wholesale sector in 1995) or more frequently, though on a smaller scale, by public transactions in financial assets (for example, the government can issue more debt than needed to finance its fiscal deficit, which would lead to an increase of the stock of debt). This adjustment is integrated of order 1 and on average positive. Its impact on the evolution of the debt may not be negligible.

Construction of the Database

Most data have been derived from the National Accounts either on an annual or on a quarterly basis. The period covered ranges from 1978Q1 to 2002Q4.

All variables used in the VAR model are measured as a ratio to GDP. This enables the cancelling out of the effect of the growth of GDP. We also consider that a debt/GDP ratio makes more sense for assessing the sustainability of public finances as the level of debt is scaled by the capacity of the nation to produce wealth. The variables of interest are the followings:

- b_t the government debt as defined in the notification to the European Commission,
- r_t the total revenues of the governement,
- g_t the primary expenditures of the government,
- id_t the debt service,
- res_t the effect of growth on debt outstanding,
- adj_t the adjustment term due to changes in the financial account of the government.

Total revenues and primary expenditures are constructed by aggregating quarterly data from the national accounts. Our aggregates are consistent with those published on an annual basis by the European Commission.

The outstanding public debt is only available on an annual basis. Furthermore, the debt service is available on a quarterly basis but this time series reflects more national accountants construction hypothesis than the real impact of economic variables. Indeed it linearly increases from the first to the last quarter of the year. For this reasons, both series have been reconstructed using an iterative procedure.

In a first step, new data for debt service are constructed using the method proposed by Chow and Lin [1976]. The indicator we consider is the long run (10 year) interest rate, itself a weighted average. The new time series then allow us to construct new data for the fiscal balance and eventually a first estimate of outstanding debt. In a second step, a second series for debt service is constructed, using as indicator the long run interest rate times outstanding debt. A second estimate of the fiscal balance and of the debt outstanding can finally be deduced from these new data.

res_t and adj_t are finally deduced from the above variables.