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## **Government deficit sustainability, and monetary versus fiscal dominance: the case of Spain, 1850-2000**

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## **GOVERNMENT DEFICIT SUSTAINABILITY, AND MONETARY VERSUS FISCAL DOMINANCE: THE CASE OF SPAIN, 1850- 2000**

### **ABSTRACT**

In this paper, we provide a test of the sustainability of the Spanish government deficit over the period 1850-2000, emphasizing the role played by monetary and fiscal dominance in order to get fiscal solvency. Since the condition of fiscal solvency was satisfied, government deficit would have been sustainable along the sample period. In addition, the whole period can be characterized as one of fiscal dominance.

**Key words:** Fiscal policy, Sustainability, Fiscal Theory of the Price Level, Monetary dominance, Fiscal dominance.

### **RESUMEN**

En este artículo, ofrecemos un test de la sostenibilidad del déficit público español durante el periodo 1850-2000, haciendo hincapié en el papel desempeñado por la dominancia monetaria y fiscal con el fin de obtener la solvencia fiscal. Puesto que la condición de la solvencia fiscal estaba satisfecha, el déficit público habría sido sostenible a lo largo del período de la muestra. Además, todo el período puede ser caracterizado como uno de dominancia fiscal.

**Palabras clave:** política fiscal, sostenibilidad, Teoría fiscal del nivel de precios, dominio monetario, dominancia fiscal.

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## 1. INTRODUCTION

The role of fiscal policy goes beyond the traditional stabilization function. Questions such as the balancing of budget deficits, the interactions between monetary and fiscal policies, and the fiscal discipline required in monetary unions, have been also intensively discussed in the last decades. In particular, one of the main problems concerning fiscal authorities is the sustainability of government deficits, which is related to the issue of long-run solvency. A fiscal policy is regarded as sustainable when, if maintained in the indefinite future, it does not violate the solvency constraint; and a government is said to be solvent if the present-value budget constraint, i.e., its intertemporal budget constraint (IBC) holds. In other words, the public deficit can be sustainable if the government can borrow. However, if the interest rate on the government debt exceeds the growth rate of the economy, debt dynamics would lead to an ever-increasing ratio of debt to GDP. The dynamics of debt accumulation could be stopped only if the ratio of the budget deficit to GDP would turn to be a surplus, or if seigniorage were allowed for.

As noticed before, the usual procedure in most of the empirical contributions on the long-run sustainability of budget deficits consists of testing the government's IBC; a non exhaustive list would include, among others, Hamilton and Flavin (1986), Trehan and Walsh (1988, 1991), Haug (1995), Quintos (1995), Martin (2000) or Bajo-Rubio, Díaz-Roldán and Esteve (2008). The results, however, are sometimes inconclusive due to differences in the econometric methodology, the particular specification of the transversality condition, and the sample period used. A common criticism to most of the available literature is that the econometric procedures used require a large number of observations, which is not usually the case in most tests of the IBC.

On the other hand, the traditional macroeconomic analysis assumes that the fiscal authority sets primary surpluses in order to assure fiscal solvency, for any path the price level could take. In this way, the monetary authority is expected to set the price level, without facing any constraint; whereas fiscal authority would adjust, so that the budget surplus path would be endogenous. This scenario is referred in the literature as the Ricardian or "monetary dominant" (MD) regime. However, a new approach has emerged in the 1990s, which assumes that fiscal authorities are able to set primary surpluses that follow an arbitrary process, not necessarily compatible with solvency. In such a context, the budget surplus would be exogenous, and the endogenous adjustment of the price level would be required in order to achieve fiscal solvency. Hence, in this case the monetary authority could only control the timing of inflation. This is the so-called non-Ricardian or "fiscal dominant" (FD) regime, and the literature developed on these assumptions is referred as the Fiscal Theory of the Price Level (FTPL).

The FTPL builds on the contributions of, among others, Leeper (1991), Sims (1994), Woodford (1994, 1995, 2001), and Cochrane (2001, 2005); a survey is provided in Carlstrom and Fuerst (2000), and some critical appraisals of the theory can be found, e.g., in McCallum (2001) or Buiter (2002). The empirical evidence regarding the FTPL, however, is not too abundant; see, e.g., Bajo-Rubio, Díaz-Roldán and Esteve (2009) and the references therein.

In this paper, we will try to explore the interactions between monetary and fiscal policies in order to get fiscal solvency, for the case of Spain over the period 1850-2000. The Spanish economy, characterized by chronic government deficits, seems to be an interesting case of study to investigate how budget deficits were financed, which will allow us to determine the prevailing policy regime along the period of analysis, i.e., MD or FD. In a previous paper (Bajo-Rubio, Díaz-Roldán and Esteve, 2010) we investigated this issue through the estimation of a cointegration relationship between government expenditures and revenues derived from the IBC, and then analyzed the possibility of non-linear behaviour of fiscal authorities through the estimation of a threshold cointegration model. In the present paper, however, we will first analyze whether public finances are sustainable by examining instead the relationship between primary surplus and debt, and then investigate how this fiscal sustainability is achieved: i.e., through the endogenous adjustment of the primary budget surplus (in an MD regime), or through the endogenous adjustment of the price level (in an FD regime).

A recent paper by Escario, Gadea and Sabaté (2012) analyzes the same topic for mostly the same sample period, using a different methodology, namely, multicointegration (see Granger and Lee, 1990). In particular, they find the presence of multicointegration between government expenditures and revenues (the latter augmented with the monetary base growth due to the public sector), with the estimates of the parameters that represent the first and second level cointegration relation suggesting, respectively, the predominance of deficits, and their sustainability over the long run. The authors interpret these findings as supporting the view that the monetary financing of deficits has played a key role in guaranteeing Spanish fiscal sustainability<sup>1</sup>. These results, in turn, would be in line with those previously obtained, using a different approach (i.e., from the estimation of a stationary VAR model), in Sabaté, Gadea and Escario (2006) for the shorter period 1874-1935.

Hence, this paper is intended to provide some additional evidence on the sustainability of the Spanish government deficit over the long run, in a complementary way to the above mentioned papers, focusing more

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<sup>1</sup> Notice that the approach followed by Escario et al. is a forward-looking one, while ours is backward-looking. In the last part of this paper we present, though, some additional results using the forward-looking approach of Canzoneri, Cumby and Diba (2001); see below.

specifically on the role played by monetary and fiscal dominance in order to get fiscal solvency, and using a different empirical methodology. In particular, we will analyze the relationship between primary surplus and debt in the line of Bohn (1998), but incorporating the later critique to previous tests on sustainability using cointegration techniques, recently developed by this same author in Bohn (2007). In addition, we will also perform Granger-causality tests between these two variables, since the above method might not be able to distinguish properly between an FD and an MD regime (see below). Finally, in order to check the robustness of our results, we will present the impulse-response functions of debt to innovations in the primary surplus, following the approach of Canzoneri, Cumby and Diba (2001).

As mentioned before, the empirical analysis will be performed for the case of Spain over the period 1850-2000. Recall that a common criticism to most tests of the IBC is that the econometric procedures used require a large number of observations. Accordingly, the longer than usual span of the data (i.e., 150 years) should allow us to obtain some more robust results than in most of previous analyses. On the other hand, the Spanish case can be of interest given the permanent difficulties experienced when balancing the government budget across those years. For most of this period, and until the fiscal reform of 1978, public revenues proved insufficient to finance even small amounts of public expenditures, so deficits became chronic, leading the government to a continuous resource to seigniorage.

In section 2, we describe the underlying theoretical framework. Next, in section 3 we introduce the empirical methodology, and discuss our dataset and the underlying economic background. We present the empirical results in section 4. Finally, the main conclusions are summarized in section 5.

## 2. THEORETICAL FRAMEWORK

**A**s we have seen, according to the traditional analysis, prices would be determined by monetary policy. On the contrary, the FTPL develops the idea that sometimes, in order to guarantee fiscal solvency, monetary policy would be addressed to accommodate the path of expenditures and revenues chosen by the government, even at the cost of generating inflation. An antecedent of this claim can be found in Sargent and Wallace's (1981) contribution, where the interaction of fiscal and monetary variables in the financing of deficits, through taxes and seigniorage, was already analyzed. In this way, fiscal solvency can act as a restriction on the policy followed by a central bank.

In order to describe the two possible ways of achieving fiscal sustainability, we will make use of the government's IBC, written in terms of GDP shares:

$$b_t = \sum_{j=0}^{\infty} \left( \frac{1+x}{1+r} \right)^{j+1} E_t s_{t+j+1} + \lim_{j \rightarrow \infty} \left( \frac{1+x}{1+r} \right)^{j+1} E_t b_{t+j+1} \quad (1)$$

where  $b$  and  $s$  denote, respectively, the public debt and primary surplus, both as ratios to GDP;  $E$  is the expectations operator; and  $x$  and  $r$  stand, respectively, for the rate of growth of real GDP and the real interest rate, both assumed to be constant for simplicity. The condition for fiscal sustainability is:

$$\lim_{j \rightarrow \infty} \left( \frac{1+x}{1+r} \right)^{j+1} E_t b_{t+j+1} = 0 \quad (2)$$

i.e., the transversality condition; or, equivalently:

$$b_t = \sum_{j=0}^{\infty} \left( \frac{1+x}{1+r} \right)^{j+1} E_t s_{t+j+1} \quad (3)$$

i.e., solvency requires that the government must run expected future budget surpluses equal, in present-value terms, to the current value of its outstanding debt.

Notice that, in equilibrium, the fiscal solvency condition holds under both the MD and FD regimes; the difference between the two regimes lies in how solvency is achieved. According to the MD regime approach, the price level would be determined in the money market, following the quantity theory of money, and the primary surplus would adjust endogenously to satisfy the IBC. In terms of equation (3),  $s$  would be set to meet a given  $b$ , independently of the price level.

On the other hand, when the FD regime prevails, the primary surplus is set exogenously by the government, regardless of the level of public debt. In this framework, the price level would adjust in order to assure the fulfilment of the IBC. And the main implication for fiscal policy would be that government solvency turns to be a sufficient condition for price stability.

In terms of equation (3), we can write this latter equation as:

$$\frac{B_t}{P_t y_t} = \sum_{j=0}^{\infty} \left( \frac{1+x}{1+r} \right)^{j+1} E_t s_{t+j+1} \quad (3')$$



where  $B$ ,  $P$ , and  $y$  denote, respectively, the nominal value of public debt, the price level, and real GDP. Then, given  $B$ ,  $y$ , and  $s$ ,  $P$  would “jump” to satisfy (3'). In other words, if the market believes the government's commitment when setting  $s$ , a value of  $P$  will be set so that  $B$  was not excessive and (3') could be satisfied.

The underlying assumption of the FTPL is that there are interactions between monetary and fiscal policies. In this line, Carlstrom and Fuerst (2000) show the restrictions that the government's budget may place on monetary policy. If the policy regime can be qualified as an MD or as an FD regime, depends on the particular role played by either the monetary or the fiscal authority. So, whether monetary or fiscal policy determines prices involves an assumption about which policymaker will move first, i.e., the central bank or the fiscal authority. In terms of the game theory approach, the solution would be given by the leader-follower model but, in practice, this is an empirical question.

### 3. EMPIRICAL METHODOLOGY, DATA AND ECONOMIC BACKGROUND

As shown in Bajo-Rubio, Díaz-Roldán and Esteve (2009), the empirical literature has usually made use of two approaches to test for the prevalence of monetary dominance versus fiscal dominance:

- (i) The *backward-looking* approach (e.g., Bohn, 1998), so that, in a Ricardian regime, an increase in the previous level of debt would result in a larger primary surplus today; i.e.,  $\Delta b_{t-1} \rightarrow \Delta s_t$ .
- (ii) The *forward-looking* approach (e.g., Canzoneri, Cumby and Diba, 2001), so that, in a Ricardian regime, a larger primary surplus today would lead to a reduction in the future level of debt; i.e.,  $\Delta s_t \rightarrow \nabla b_{t+1}$ .

According to the first approach, one should estimate a cointegration relationship between the primary surplus and the (lagged) level of debt, both as ratios to GDP:

$$s_t = \alpha + \beta b_{t-1} + v_t \quad (4)$$

where  $v_t$  denotes an error term. In this equation, a positive and significant estimate of  $\beta$  would be a sufficient condition for solvency, indicating that the government satisfies its present-value budget constraint; that is, in terms of the transversality condition,  $s$  would be set to meet a given  $b$ , independently of the price level. Furthermore, in accordance with the backward-looking approach, an estimated  $\beta > 0$

would indicate the prevalence of an MD regime, and an estimated  $\beta \leq 0$  the prevalence of an FD regime.

Testing whether  $\beta > 0$  from the estimation of (4) or, alternatively, whether  $\beta' = 1$  from the estimation of a cointegration relationship such as:

$$rev_t = \alpha' + \beta' exp_t + \varepsilon_t \quad (5)$$

where  $exp_t$  and  $rev_t$  denote the ratios of the government's total expenditures and revenues to GDP, and  $\varepsilon_t$  is an error term, are customary approaches to test for the sustainability of public finances. However, this kind of assessments of fiscal sustainability based on unit root and cointegration tests have been recently criticized by Bohn (2007), on the grounds that such tests are incapable of rejecting sustainability. Specifically, Bohn derives the following three propositions, related to the order of integration of debt, primary surplus, expenditures, and revenues, in order to verify under which conditions the transversality condition and the IBC hold (see Bohn (2007) for details):

- (i) If  $b_t$  is integrated of order  $m$ , being  $m$  positive, then  $b_t$  satisfies the transversality condition, and  $b_t$  and  $s_t$  satisfy the IBC.
- (ii) If  $exp_t$  and  $rev_t$  are integrated of order  $m_G$  and  $m_T$ , respectively, where  $\Delta b_t = exp_t - rev_t$ ; then  $b_t$  is integrated of order  $m$  with  $m \leq \max(m_G, m_T) + 1$ , so the transversality condition and the IBC hold.
- (iii) If  $b_t$  and  $s_t$  follow an error-correction specification of the form  $s_t - \rho b_{t-1} = z_t$ , and  $z_t$  is integrated of order  $m$  for some  $\rho < 0$  such that  $|\rho| \in (0, 1+r]$  where  $r$  is a constant interest rate, then  $b_t$  satisfies the transversality condition and the IBC holds.

We use data on primary (i.e., excluding interest payments) budget surplus, and total gross debt, as well as on total revenues and expenditures, all of them as percentages of GDP, for the Spanish central government (i.e., excluding social security and local and regional governments) over the period 1850-2000. Notice that only data for the central government are available for the whole period; in particular, data on local governments are unavailable until 1958, regional governments were just established after the approval of the current Constitution in 1978, and social security only began to expand after 1967.

The data on the public sector variables come from Comín and Díaz (2005), who provide a compilation of a large amount of government statistics for the period 1850-2000. As pointed out by these authors, the quantitative sources for the Spanish public sector are in general both abundant and reliable. From 1850 onwards, after the issuing of a law on public accountancy in that year, all the revenues and expenditures of the Spanish central government have been registered

until 1957 into the *Estadísticas de las Cuentas Generales del Estado* (Statistics of General Accounts of the State). After 1958, these *Estadísticas* collect information about the activities of the general government (i.e., also including local and –since the 1980s– regional, governments, as well as the social security), and are available through the *Cuentas de las Administraciones Públicas* (Accounts of the General Government), published by the Ministry of Finance. Finally, the data on GDP have been taken from Prados de la Escosura (2003), who has constructed series for the main macroeconomic variables of the Spanish economy over the period 1850-2000.

The time evolution of the total and primary government surplus ( $rev-exp$  and  $s$ , respectively) is shown in Figure 1, and that of the total gross debt ( $b$ ) in Figure 2. In the rest of this section, we will provide a brief summary of the main developments of Spain's public finances between 1850 and 2000. A more detailed account of the evolution of the Spanish public sector over this one-and-a-half-century period can be found in Comín (1995, 1996) or Tortella (2000).

In general, the traditional perception among economic historians on the role of the Spanish public sector since the beginning of industrialization in the early 19th century is rather negative. The continuous difficulties experienced by the Spanish public finances to balance the budget have been blamed of restricting the capital market for the industry, as well as distorting the allocation of resources (as shown, e.g., in the development of the railway network); see, for instance, Nadal (1975) or Tortella (1973). In fact, Spain had to wait until the restoration of democracy after 1977, and especially the integration in the now European Union (EU) in 1986, to enjoy a public sector comparable to that of the rest of Western Europe.

The end of the Old Regime in Spain was characterized by a deep crisis in public finances. The answer to this situation was the 1845 reform, which meant the first attempt to build a modern tax system in Spain. The tax system that arises from the 1845 reform was based on the prevalence of indirect taxes, falling on specific consumption goods, and the setting of non-personal or product taxes, proportional and not progressive. The advantage of such a system was the simplicity of tax collection, but at the cost of an easy tax evasion. The tax system established by this reform was long lasting, despite some minor reforms. Only after the fiscal reform of 1978, at the time of the approval of a new democratic Constitution, the Spanish fiscal system can be thought to be comparable to that of the rest of Western Europe. The main pillar of this reform was the creation of a modern personal income tax, together with a corporate income tax, which was completed in 1986 with the introduction of the value added tax at the time of the integration into the EU.

As stressed by Comín (1996), over most of the period analyzed the Spanish public sector was more concerned with providing a high degree

of protection and regulation, in order to favour some particular groups and sectors, rather than satisfying collective needs (such as infrastructures, or social expenditures). Government expenditure was kept at a minimum over the 19th century, and most of the budget was assigned to the interest payments on the public debt (see below), as well as to paying for the salaries of the civil servants and the military. Government expenditure as a ratio to GDP only began to increase in the mid-1960s, due to higher spending on education, housing, and social security; however, a modern welfare state was not developed due to the lack of revenues. The process of modernization of the Spanish public sector, coupled with an increase in the functions performed by the state, can be dated at the end of the 1970s, in the aftermath of the economic crisis of that period, the restoration of democracy and, later on, the integration into the EU. As a result, the next years contemplated the building of a welfare state on European standards, and the development of modern and improved infrastructure. Even so, the ratio of government expenditure to GDP is still lower than the EU average.

On the other hand, though both revenues and expenditures remained at low levels, the former were insufficient to finance even small amounts of the latter, so budget deficits dominated over most of the period. The immediate consequence of budget deficits was a huge increase in public debt. The maximum levels of government debt can be found at the mid 1870s, following a period of political instability after the so-called "Glorious Revolution", when it amounted to more than 150% of GDP; and at the beginning of the 20th century, following the last wars in Cuba and the Philippines, reaching more than 125% of GDP. Later on, only at the end of the Spanish Civil War and in the mid 1990s (just before the fiscal consolidation that allowed Spain to join the European monetary union) the ratio debt-GDP reached significant, though lower, levels, of around 70% and 60%, respectively. As a by-product of the massive levels of public debt, their interest payments represented a substantial share of the budget, which can be seen, e.g., in the large difference between total and primary government surplus in Figure 1.

After 1850, once the initial effects of the 1845 reform came to an end, the growing public deficit was financed by debt issuing, which accumulated to that previously existing. This situation made worse from the last 1860s, so that at the mid-1870s debt service amounted to nearly 40% of total public spending.

It is in this context that the granting to the Bank of Spain of a monopoly on the issuance of bank notes in March 1874 can be understood. In exchange of this monopoly, the Bank of Spain was compelled to finance the public Treasury through discounts and advances; and, as a counterpart to these assets, the Bank of Spain will issue bank notes. In other words, government debt was directly monetized.

As a consequence, budget deficits were directly monetized through the sales of government bonds to the Bank of Spain. A change in the way in which monetization of budget deficits took place was implemented in 1917. According to the new system, government bonds were sold instead to private buyers (mostly private banks), but with the particular feature that these bonds could be automatically pledged at the Bank of Spain at a lower interest rate than the yield on these bonds paid to their owners. As a result, the effect of this procedure on the monetization of the deficit was not significantly different.

The situation did not change significantly until 1957, when the system of indirect monetization was abolished. Although budget deficits were not large after that year, the new way of financing the existing debt was introducing mandatory quotas (*coeficiente de inversión*) through which banks were obliged to invest in government bonds. However, budget deficits reappeared during the period of transition to democracy after the mid 1970s, following the first attempts of building a modern welfare state, and the increase in social transfers addressed to alleviate the economic crisis of that period. As a result, rising budget deficits between 1977 and 1982 led to an ever-increasing indebtedness of the public sector, which was financed again via direct monetization by the Bank of Spain as before 1917.

Only after 1982, budget deficits were progressively financed in a more orthodox way, that is, through the issuing of public debt; and, despite the accumulation of debt along the 1980s, this did not prove to be too troublesome thanks to the remarkable economic growth experienced after joining the EU. Finally, from 1993 on government deficit financing by the central bank was explicitly forbidden according to the provisions of Article 104a of the Maastricht Treaty, which paved the way for the Economic and Monetary Union in the EU.

#### 4. EMPIRICAL RESULTS

**W**e have seen in the previous section how the budget deficits registered in the Spanish economy had been highly persistent. In addition, when looking into how these deficits were financed, the key role (whether directly or indirectly) played by the Bank of Spain could lead us to presume that monetary policy had been subordinated to the evolution of fiscal policy during most of the period of analysis; for a summary and discussion of this issue, see Comín (1996, pp. 157-158). In this section, we will provide a formal test of the sustainability of the Spanish government deficit over the period 1850-2000 following the methodology presented at the beginning of section 3; and, more importantly, we will analyze the role played by monetary and fiscal dominance in order to get fiscal solvency along the period.

In order to examine the three Bohn's propositions, we begin by testing for the order of integration of the variables  $b_t$ ,  $exp_t$ , and  $rev_t$ , using the tests of Ng and Perron (2001). These authors proposed using the tests statistics  $MZ_\alpha^{GLS}$  and  $MZ_t^{GLS}$ , which are modified versions of the  $Z_\alpha$  and  $Z_t$  Phillips-Perron tests; and  $ADF^{GLS}$ , a modified version of the Augmented Dickey-Fuller test. Such modifications improve the tests with regard to both size distortions and power. According to the results in Table 1, the null hypothesis of no stationarity cannot be rejected, independently of the test, for the three series in levels; and the presence of two unit roots is clearly rejected at the 1% significance level. Therefore, the three series would be concluded to be non-stationary, and the first two propositions of Bohn (2007) would hold.

Next, we estimate the error-correction specification analogue to (4):

$$\Delta s_t = \omega + \delta(L)\Delta b_{t-1} + \rho(s_{t-1} - \alpha - \beta b_{t-2}) + \gamma(L)\Delta s_{t-1} + \eta_t \quad (6)$$

where  $\eta_t$  is an error term. Phillips and Loretan (1991) suggest that the simultaneous estimation of a cointegrating vector and an error-correction mechanism as in equation (6) should be done using non-linear least squares (NLS) methods, which provide estimates that are asymptotically consistent, normally distributed, and efficient. Accordingly, equation (6) has been estimated using one-step NLS.

The results are shown in Table 2 and, as can be seen, the error-correction coefficient is estimated at  $-0.21$ , and the long-run coefficient  $\beta$  at  $0.02$ . The two estimates are significant at the 1% level. Accordingly, the third proposition of Bohn (2007) would hold, and public finances would have been sustainable over the long run. In particular, the adjustment of the primary surplus-GDP ratio to a given change in the debt-GDP ratio would have had an average half-life of about three years<sup>2</sup>. These results would confirm those found using the more traditional approach, i.e., from the estimation of a cointegration equation such as (5), in Bajo-Rubio, Díaz-Roldán and Esteve (2010).

Recall that, in addition to implying fiscal solvency, a positive estimate of  $\beta$  in equation (6) would indicate, according to the *backward-looking* approach, the prevalence of an MD regime. However, there is a possible ambiguity here since, as stressed by Canzoneri, Cumby and Diba (2001), a positive estimate of  $\beta$  is strictly compatible with the presence of both an MD and an FD regime. That is, in an MD regime we would observe that an increase in debt in period  $t$  would lead to a larger primary surplus *ex-post*; i.e.:  $\Delta b_t \rightarrow \Delta s_{t+1}$ , which implies an estimated  $\beta > 0$ . Yet, in an FD regime, a decrease in the expected primary surplus would lead to a fall in the current debt ratio, through a price increase;

<sup>2</sup> Computed as  $\log(0.5)/\log(1 - |\hat{\rho}|)$ , where  $\hat{\rho}$  is the estimate of  $\rho$  in equation (6); in our case,  $-0.21$ .



i.e.:  $\nabla E_t s_{t+1} \rightarrow \nabla b_t$ , which also implies an estimated  $\beta > 0$ . For that reason, we will complement the above analysis with Granger-causality tests between the primary surplus and debt to GDP ratios.

In particular, according to Sims, Stock and Watson (1990), if two I(1) series  $X_t$  and  $Y_t$  are cointegrated, the relevant regression is the following:

$$X_t = \alpha_0 + \delta_1 X_{t-1} + \gamma_1 (X_{t-1} - \beta Y_{t-1}) + \sum_{i=1}^m \alpha_{1i} \Delta X_{t-i} + \sum_{i=1}^m \alpha_{2i} \Delta Y_{t-i} + \zeta_t \quad (7)$$

with an analogous representation holding for  $Y_t$  as dependent variable. Then, to testing for Granger-causality, the null hypotheses would be: (i)  $\gamma_1 = 0$ , for the absence of long-run causality; and (ii)  $\alpha_{2i} = 0$ , for the absence of short-run causality. And the standard  $F$  test can be used to test for Granger-causality in the short and in the long run.

The results of the Granger-causality test for the variables primary budget surplus and government gross debt are presented in Table 3. We report  $F$  statistics on the null hypotheses  $\gamma_1 = 0$  and  $\alpha_{2i} = 0$ , from the estimation of equation (7) with  $s_t$  and  $b_{t-1}$  alternatively as dependent variables. Up to three lags of the first difference of each of these variables have been included, and the number of lags has been chosen using the Akaike information criterion. The results in Table 3 indicate the presence of both long-run and short-run Granger-causality from primary surplus to debt, which would point to the prevalence of an FD regime over the period of analysis.

Finally, in order to offer a more complete picture, we present the results from applying the so-called *forward-looking* approach, following Canzoneri, Cumby and Diba (2001). According to these authors, in an MD regime a positive innovation in the primary surplus pays off some of the debt, so the future level of debt would fall. In turn, in an FD regime a positive innovation in the primary surplus should lead to a higher future level of debt, via a lower price level. Notice, however, that a possible ambiguity can also emerge here since, even if a positive innovation in the primary surplus leads to a reduction in the future level of debt, this could be compatible with an FD regime. In particular, if innovations in the primary surplus were negatively correlated with future surpluses, the future level of debt would fall through a rise in the price level; and such a case could be justified since a higher surplus today might reduce the need of future surpluses.

The impulse-response function of the debt-GDP ratio to innovations in the primary surplus-GDP ratio, from an estimated VAR in these two variables, is shown in Figure 3 together with  $\pm 2$  standard errors, over a 10-year horizon. The VAR was estimated with one lag and a constant; up to five lags were tested, and the optimal lag order was selected using the Akaike information criterion. As can be seen in the figure, the debt-GDP ratio exhibits a small, but positive, response following an

innovation in the surplus-GDP ratio, and then decreases to move gradually toward zero. Accordingly, this approach would also indicate that an FD regime would have prevailed over the period of analysis.

## 5. CONCLUSIONS

Summarizing our findings, the Spanish government deficit would have been sustainable along the period 1850-2000, since the condition of fiscal solvency was satisfied, and the whole period can be characterized as one of fiscal dominance. In other words, fiscal authorities would have set budget deficits exogenously, and the endogenous adjustment of the price level was required in order to achieve fiscal solvency, so that monetary policy was subordinated to the needs of financing the budget deficit. Nevertheless, as shown in Bajo-Rubio, Díaz-Roldán and Esteve (2010), if the deficit was above a certain threshold (estimated at around 4.5% of GDP), budget deficits would have been cut in order to assure their long-run sustainability.

Our results would support, using an alternative methodology, those of Escario, Gadea and Sabaté (2012). These results would also confirm the informal evidence provided by economic historians; see, e.g., Tortella (2000) or Comín (1995, 1996). The Spanish case seems to be an example of how an FD regime is compatible with a sustainable fiscal policy; or, from a different point of view, we might conclude that an independent monetary policy (or, equivalently, an MD regime) is not a necessary condition for achieving fiscal sustainability.

In a related paper (Bajo-Rubio, Díaz-Roldán and Esteve, 2009), no clear evidence on the prevalence of a MD or FD regime was found, for the case of the EMU countries over the period 1970-2005. On the contrary, the evidence in this paper shows that the assertions of the FTPL (or, in other words, the prevalence of an FD regime) would be more appropriate for a less developed country, with a rather undisciplined public sector, unable to collect revenues enough to finance even small amounts of expenditure, and compelled to engage in inflationary financing of the deficit. This was the case of Spain over most of this period, since the development of a public sector comparable to that of the rest of Western Europe can be dated only following the restoration of democracy after 1977, and especially after joining the EU in 1986.

To conclude, despite our data set ends in 2000, we can derive from our results some implications for the current policy debate in Spain. As is well known, the combination of several factors, such as the conduct of the Fed's monetary stance, credit market distortions, and an apparently boundless financial innovation led to the current financial crisis, started in the United States and then transmitted to the rest of the world (Catte et al., 2011). Regarding Spain, the global financial crisis, together with



some distinctive features in the Spanish case (such as the development in previous years of a large real estate bubble), turned into a deep recession that ended a period of more than ten years of steady growth. As a result, the Spanish government deficit, which had been lower than the EU average until 2007 and became even a surplus between 2005 and 2007, soared dramatically after 2008, reaching 9.4% of GDP at the end of 2011. However, government debt levels (68.5% of GDP in 2011) are still below the EU average.

Faced to this situation, the Spanish government is currently embarked on a policy of strong spending cuts and (to a lower extent) tax increases, in order to curb the budget deficit. The results of this and our previous paper (Bajo-Rubio, Díaz-Roldán and Esteve, 2010) would suggest that, in the long run and even under a FD regime (more typical of a less developed country), budget deficits would have been sustainable; and they showed a mean-reverting dynamic behavior after a certain threshold was reached, which in turn would have assured their long-run sustainability. In principle, restoring the sustainability of public finances would be constrained by the EMU common monetary policy, the lack of nominal exchange rate policy, and the fiscal discipline required at the EU level. But an independent monetary policy (or a MD regime), on imposing a greater discipline to policymakers, should help to achieve fiscal sustainability; in fact, in Spain last years were characterized by a MD regime, and this did not prove to be harmful to achieve fiscal sustainability (Bajo-Rubio, Díaz-Roldán and Esteve, 2009). Moreover, the current Spanish fiscal consolidation program for the period 2012-2014, aims at a target of 4.5% of GDP in 2013 for the budget deficit, i.e., the threshold value obtained in Bajo-Rubio, Díaz-Roldán and Esteve (2010). However, the risks of pursuing a hard consolidation strategy when the economy is under recession should not be overlooked. As recently noted by the International Monetary Fund (IMF, 2012), such policies could deepen the current recession, which in turn means an additional obstacle for decreasing the government deficit.

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## TABLES AND FIGURES

Figure 1

**Total and primary government surplus: Spain, 1850-2000**

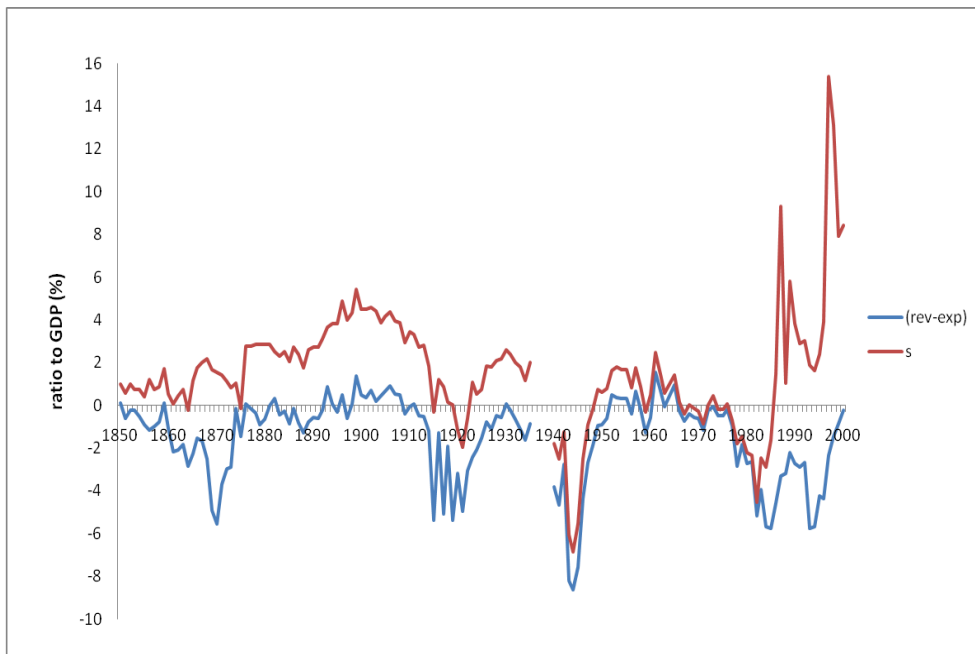


Figure 2

**Total gross debt: Spain, 1850-2000**

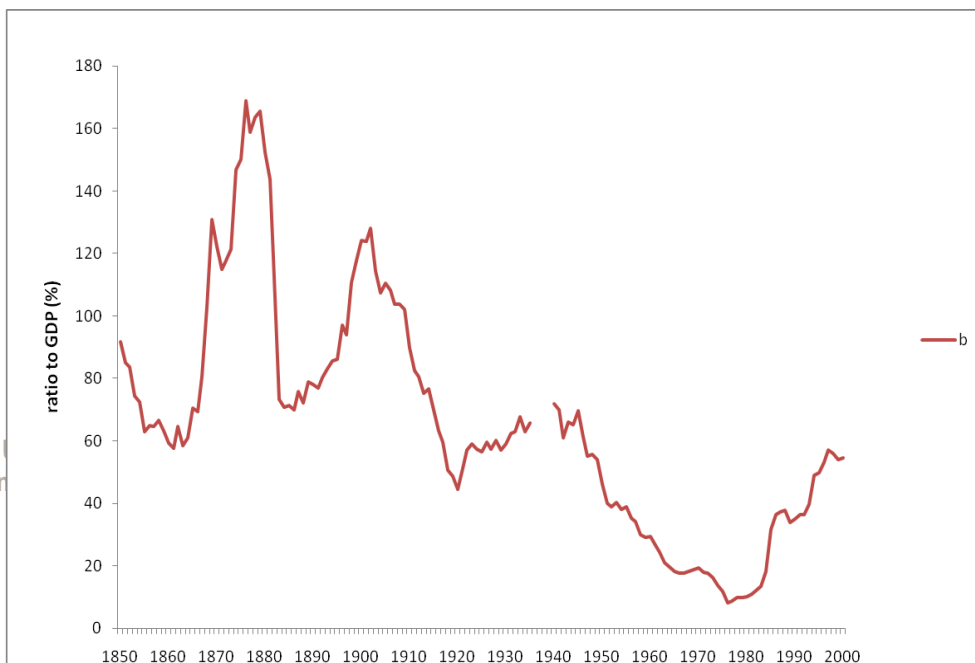


Figure 3  
Response of debt/GDP to primary surplus/GDP from an estimated VAR

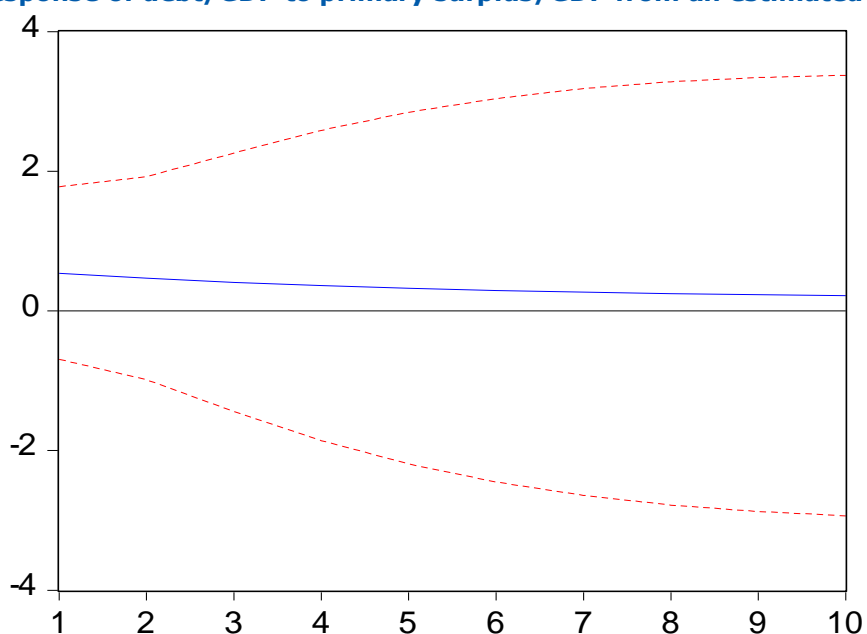


Table 1  
Ng-Perron tests for unit roots

I(2) vs. I(1)

	$MZ_{\alpha}^{GLS}$	$MZ_t^{GLS}$	$ADF^{GLS}$
$\Delta b_t$	-32.66*	-4.03*	-4.58*
$\Delta exp_t$	-62.46*	-5.58*	-8.54*
$\Delta rev_t$	-72.03*	-6.00*	-13.03*

I(1) vs. I(0)

	$MZ_{\alpha}^{GLS}$	$MZ_t^{GLS}$	$ADF^{GLS}$
$b_t$	-11.62	-2.37	-2.40
$exp_t$	-7.59	-1.85	-1.87

$rev_t$	-8.18	-1.82	-1.83
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Notes:

\* denotes significance at the 1% level. The critical values are taken from Ng and Perron (2001), Table 1.

The autoregressive truncation lag has been selected using the modified Akaike information criterion, as proposed by Perron and Ng (1996).

Table 2

**Estimation of a long-run relationship between  $s_t$  and  $b_{t-1}$**

Error-correction coefficient	-0.21* (-3.84)
Long-run coefficient	0.02* (2.75)

Notes:

(i) t-statistics in parentheses.

(ii) \* denotes significance at the 1% level.

Table 3

**Sims-Stock-Watson tests for Granger-causality**

$H_0$	$s_t \rightarrow b_{t-1}$	$b_{t-1} \rightarrow s_t$
$\gamma_1 = 0$	77.46*	1.45
$\alpha_{2j} = 0$	3.26**	1.13

Notes:

(i) The reported values are F-statistics on the null hypotheses  $\gamma_1 = 0$  and  $\alpha_{2j} = 0$ , from the estimation of equation (7) in the text using  $s_t$  and  $b_{t-1}$  alternatively as dependent variables.

(ii) \* and \*\* denote significance at the 1% and 5% levels, respectively.

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