



# Debt policy in euro area countries: Evidence for Germany and Italy using penalized spline smoothing<sup>☆</sup>

Alfred Greiner<sup>\*</sup>, Göran Kauermann

Department of Business Administration and Economics, Bielefeld University, P.O. Box 100131, 33501 Bielefeld, Germany

## ARTICLE INFO

### Article history:

Accepted 25 February 2008

### JEL classification:

H63

E62

### Keywords:

Government debt

Inter-temporal budget constraint

Penalized splines

Semi-parametric estimation

## ABSTRACT

In this paper we test how the primary surplus in two countries of the euro area, Germany and Italy, reacts to changes of public debt. Our theoretical part demonstrates that a positive reaction on average gives strong evidence for a sustainable debt policy. In the empirical part, we perform semi-parametric estimations using penalized spline smoothing. The results suggest that there is evidence for sustainable debt policy in Germany, however, with a declining tendency. Italian public debt does not seem to be sustainable although consolidation efforts in the nineties have stabilized Italian debt. However, the conclusion as regards Italy must be made with caution because the statistical significance is small.

© 2008 Elsevier B.V. All rights reserved.

## 1. Introduction

In the last few years up to 2005, Germany had been continuously violating the 3% deficit criterion of the Maastricht treaty, leading to a debt-GDP ratio of more than 65% in 2005. Italy could considerably reduce its deficits in the mid and late 1990s, when it aspired to enter the euro area, which led to a decline in its debt ratio. Nevertheless, the debt ratio still clearly exceeds 100% due to the excessive deficits in previous periods making it the largest debt ratio of the euro area countries. Further, most recently Italy again shows deficits exceeding 3% of GDP.

In the debate about deficit and debt ratios in countries of the euro area it has been argued that fiscal policy has been threatened to become unsustainable. Thus, a crucial issue about debt and deficits is the sustainability of public debt policy. Empirical studies which help to clarify whether governments pursue sustainable debt policies are indeed desirable and help to answer the question of whether policy makers adequately react to rising debt ratios.

For the United States a great many empirical studies exist beginning with the contribution by [Hamilton and Flavin \(1986\)](#). In their analysis they propose a framework for studying whether governments fulfill the inter-temporal budget constraint and apply the tests to the United States for the time period from 1960–1984. Other papers followed which also investigated this issue for the United States, some of them confirming Hamilton and Flavin's result while others reached different conclusions (see e.g. [Kremers, 1988](#); [Wilcox, 1989](#); [Trehan and Walsh, 1991](#)). For European countries, [Afonso \(2005a\)](#) gives a good survey of the studies about sustainability using time series methods.

However, these tests have been criticized by [Bohn \(1998\)](#) because they make assumptions about future states of nature that are difficult to estimate from a single set of observed time series data. Therefore, [Bohn \(1998\)](#) proposes a different test where he

<sup>☆</sup> We thank Andreas Handl and Chih-Ying Hsiao for helpful comments and Uwe Köller for providing us with the data. We are also thankful to a referee for the helpful and competent comments.

<sup>\*</sup> Corresponding author.

E-mail address: [agreiner@wiwi.uni-bielefeld.de](mailto:agreiner@wiwi.uni-bielefeld.de) (A. Greiner).

suggests to empirically test whether the primary surplus to GDP ratio rises at least linearly with increases in the debt ratio. If the latter holds the inter-temporal budget constraint of the government is fulfilled and public debt is sustainable.

In this paper we apply the test proposed by Bohn to Germany and Italy, the largest and third largest country in the euro area, which have recently been characterized by large deficit and debt ratios as outlined above. Ballabriga and Martinez-Mongay (2005) and Greiner et al. (2007) have performed OLS estimations which study how the primary surplus to GDP ratio reacts to the debt ratio in some countries of the euro area. In Greiner et al. (2004) evidence was found suggesting that the reaction of the primary surplus to variations in the debt ratio in Germany has not been constant over time. In this contribution, we extend these papers both from a theoretical as well as empirical point of view. So, we first derive necessary and sufficient conditions for a sustainable debt path assuming that the debt accumulation process is described by a stochastic differential equation. In a next step, we empirically test whether those conditions are satisfied for Germany and Italy by applying more sophisticated statistical methods.

In statistics a lot of work has been dedicated to the development of non-parametric estimation techniques during the last two decades with the book by Hastie and Tibshirani (1990) representing an initial milestone. Ruppert et al. (2003) give a good summary of the state of the art in this field and Kauermann (2006) presents a concise introduction to non- and semi-parametric estimation. With the software programme R and its estimation tools (see Wood, 2000, 2001) the technique can easily be applied to economics. Surprisingly, there exist only a few economic applications of this estimation technique although it is clearly superior to OLS estimation. Contrary, in other sciences smoothing spline estimation has become somewhat a standard.

The rest of the paper is organized as follows. Section 2 gives some theoretical considerations concerning the primary surplus and the inter-temporal budget constraint of the government. In particular, we consider a continuous time model and derive conditions for sustainability which are less restrictive than the ones in the literature. In Section 3 we present our estimation results for the two countries where we estimate time varying coefficients and where we apply a nonlinear estimation technique. Section 4 discusses and compares the results with the literature and section 5, finally, concludes the paper.

## 2. The primary surplus and the inter-temporal budget constraint

We consider a stochastic economy, where the accounting identity describing the accumulation of public debt in continuous time is given by the following stochastic differential equation:

$$dB_t = (r(t)B_t - S(t))dt + \sigma dW_t, \tag{1}$$

with  $B$  real public debt<sup>1</sup> at time  $t$ ,  $r$  the real interest rate and  $S$  the real government surplus exclusive of interest payments on public debt.  $W$  is a Wiener process with constant volatility  $\sigma$  which is constant and set equal to one,  $\sigma=1$ .

Next assume that the government in our economy chooses the primary surplus to GDP ratio,  $s$  such that it is a positive linear function of the debt to GDP ratio,  $b$  and of a time varying random term (cf. Bohn, 1998). The primary surplus ratio, then, can be written as

$$s(t) = \alpha(t) + \beta(t)b(t), \tag{2}$$

where  $\beta$  is the coefficient determining how strong the primary surplus reacts to changes in the public debt ratio.  $\alpha$  gives a systematic component showing how the level of the primary surplus reacts to a rise in GDP.  $\alpha$  may also contain other economic variables which affect the primary surplus ratio.

At this point, it should also be mentioned that we exclude the possibility that the government builds up a stock of assets, which would be possible if the primary surplus was sufficiently large. In this case, the discounted public debt would become negative. We do this because this possibility seems to be of limited relevance for countries of the euro area.

Multiplying both sides of Eq. (2) by the real GDP, denoted by  $Y$  Eq. (1) can be rewritten as

$$dB_t = (h(t)B_t - \alpha(t)Y(t))dt + dW_t, \tag{3}$$

with  $h(t) \equiv r(t) - \beta(t)$  Solving Eq. (3) yields

$$B_t = e^{\int_0^t h(\tau) d\tau} \left( B_0 - \int_0^t e^{-\int_0^\tau h(u) du} \alpha(\tau) Y(\tau) d\tau + \int_0^t e^{-\int_0^\tau h(u) du} dW_\tau \right), \tag{4}$$

with  $B_0$  public debt at time  $t=0$ .

If the discounted government debt in Eq. (4) goes to zero in the limit, the government does not play a Ponzi game and we call a path of public debt which satisfies this constraint sustainable.

The next proposition gives necessary and sufficient conditions for the discounted value of Eq. (4) to converge to zero, that is for sustainability of public debt.

**Proposition.** Assume that the mean of the realized real interest rate is strictly positive. Then, we have the following result.

- i) For  $\alpha(t) = 0$ ,  $\lim_{t \rightarrow \infty} \int_0^t \beta(\tau) d\tau = \infty$  is necessary and sufficient for  $e^{-\int_0^t r(\tau) d\tau} B_t$  to converge to zero.

<sup>1</sup> Strictly speaking,  $B$  should be real public net debt.

Download English Version:

<https://daneshyari.com/en/article/5056002>

Download Persian Version:

<https://daneshyari.com/article/5056002>

[Daneshyari.com](https://daneshyari.com)