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Sustainability of National Debt in Europe: Why it Matters in the EMU and How it is Assessed

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Abstract

There are at least two reasons why sustainability of public debt is an issue of increasing importance. First, public choice considerations show the danger of an excessive use of deficit finance in a democracy. Second, the conditions of a European Monetary Union (EMU) imply further incentives for deficit finance. Various approaches to assess sustainability of public debt are presented and partially applied to the EC countries. According to these results, sustainability is as issue of empirical relevance in Europe today and has to be taken seriously on the further way to EMU.

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1. Introduction

Sustainability has not been an aspect which has so far played a dominant role in the economic theory of public debt. Traditionally, the dispute over the burden of debt has been at the centre of discussion. In this context the focus was on modelling the effect of deficit versus tax finance on important economic variables such as interest rates, consumption and capital formation in order to assess the intertemporal consequences.

Underlying this kind of analysis has been the assumption that government debt always has to obey an intertemporal budget constraint, i.e. that deficits of today have to be paid back by surpluses of tomorrow.

There are at least two reasons to question this basic assumption and to ask whether observable debt situations really can be regarded as sustainable and obeying an intertemporal budget constraint. The one arises from a shifting approach in explaining economic policy, in particular with regard to public debt. The other reason concerns the economics of a monetary union, which after the Maastricht treaty will be introduced no later than 1999 in at least some countries of the EC. Such a step will fundamentally change the restrictions and incentives for debt finance, making sustainability of public debt an issue of European actuality. These issues will be discussed in section 2.

After deriving the necessity of evaluating sustainability, the further objective of this study in section 3 is both methodological and empirical. The methodological idea is to give an insight into the philosophy and point of view of very different approaches to sustainability assessment which have so far been developed. Empirically, these methods are, as far as possible, used to evaluate the European debt situation. Conclusions for both the economic sense and chances of realization of the Maastricht rules concerning public debt are drawn.

2. Sustainabilty - Why It Matters

2.1. The Political Economy of Public Debt

Recently, the focus in public debt theory has moved away from the classical questions of burden and intertemporal effects towards the determinants of national debt as it is actually observed today. Two schools deal with this issue from fundamen-

tally different approaches, which may be called the "normative" and the "positive" approach respectively.

The "normative" approach - whose prominent advocate is Robert Barro (1979) - tries to explain observable public indebtedness as the result of social welfare maximizing behaviour. Debt finance is used to minimize the distortionary effects of high marginal tax rates in times of temporarily fluctuating government expenditure or revenue. According to this approach, it is optimal to finance a temporary increase in government expenditure - e.g. in times of war - by debt in order to smooth tax rates over time. Debt finance would be used exactly as it should be from the point of view of a benevolent planner - that is why this approach may be called "normative".

Proponents of the "positive" approach, on the other hand, object to the empirical relevance of the assumption of social welfare maximization (see von Weizsäcker (1992) for a survey of the positive approach). Instead, it is assumed that politicians decide over the finance mix on the grounds of self-interest and the specific restrictions as set by the institutional environment. In so far as deficit finance is politically less costly than tax finance or expenditure cuts, this instrument is used without regard to any social welfare considerations.

The political attractiveness of debt finance in a democracy originates from two sources. Debt finance is a far less noticeable means of finance than taxation. Voters do not react to deficits in the same way as they do to taxes. This even applies to rational voters because of limited lifetime or imperfect capital markets. Apart from that, debt is a device which serves to tie hands of succeeding governments. Debt finance is therefore attractive in countries with unstable governments and a high degree of political polarization (see Roubini and Sachs (1989)).

In their empirical study, Roubini and Sachs (1989) find a more significant support for the positive explanation of public deficits in industrial countries than for the normative. It is obvious that a significant empirical support for the positive approach immediately leads to the issue of sustainability. If debt is politically attractive, it might develop up to and even above the limits of what might be called sustainable.

2.2. Public Deficits and EMU

The interest in sustainability of public debt is fuelled not only by the more general distrust of political behaviour but also by the special conditions which are to characterize the EMU (see Thygesen (1989), Fratianni and von Hagen (1990) for a more detailed discussion of EMU implications for fiscal policy).

The budget constraints of national governments in pre-EMU Europe could be termed "soft" in comparison to the corresponding constraints for households or firms. In contrast to these economic agents the state does not depend on market income; its politicians can claim resources simply by the stroke of a pen signing a tax law. Furthermore, the national governments monopolize the issuance of currencies in which most or all of their debt is denominated; they can create the money which they owe.

The "soft" budget constraint is now hardened both by increasing market integration and by the impending introduction of a single common currency in the EC. The increasing market integration makes it less possible to set taxation independently - at least where the tax base is mobile. In addition, with a single European currency controlled by the European Central Bank, the national governments will loose control over the money supply and so over an often important source of revenue. Athough seigniorage will continue to exist in Europe, it will be controlled and obtained centrally. Neither it will any longer be possible for national governments to create surprise inflation with the intention of reducing the real value of debt.

With constant expenditures and a reduced access to tax revenues and seigniorage, debt finance is bound to fill the gap. Especially in countries where the political strength to cut expenditures is missing, the debt burden will increase.

The fundamental problem with regard to this inherent inclination to debt finance in the EMU is that public debt does not only concern the individual country and its creditors but also the community as a whole. National debt finance has its impact on macroeconomic variables of the whole community, such as the ECU exchange rate, the EMU interest rate or the community's balance of payments. In particular - and that is why the issue of sustainability comes up in this context - unsustainable debt growth in one country harms the whole community: a debt crisis of one member country will put pressure on other nations to pay for this debt. This pressure originates both from political and economic sources. It is difficult to imagine that with the increasing political integration which is behind the move

towards EMU a member country would remain in a debt crisis without any direct or indirect help by the rest of the Community. Also from an economic point of view the Community might be forced to "bail out" a heavily indebted member country because debt repudiation could endanger the stability of the community's financial market and the credibility of an anti-inflationary monetary policy of the European Central Bank.

The EMU therefore needs binding rules in order to avoid externalities caused by excessive national indebtedness. Market discipline is unlikely to work. Because of bail-out pressures, a country with excessive debt is believed to be backed by the whole community and therefore does not have to pay a disciplining risk premium on its debt. Non bail-out clauses in an EMU treaty lack credibility.

3. How to Assess the Sustainability of National Debt

The foregoing considerations show the necessity of specifying the term "sustainability of public debt". For the smooth working of EMU, it will be necessary to prevent national policies from running a country into an unsustainable situation. This insight presumably is behind the Maastricht rules, which restrict gross public debt to 60 percent of GDP and budget deficits to 3 percent of GDP as a precondition to enter EMU. The question is now whether these limits serve as a suitable indicator of sustainability or whether better indicators exist.

In subsection 3.1 a fundamental solvency approach is presented which has economic appeal but lacks empirical applicability. In subsection 3.2 the dynamics of the debt-income ratio are used to draw conclusions about sustainability but also to demonstrate the adjustment needs of the EC countries to meet the Maastricht rules. Finally, in subsection 3.3 time series methods are introduced and applied to some EC countries in order to assess sustainability.

3.1. The Balance Sheet Approach

The most straightforward way to assess the sustainability of a public debt situation is to apply a balance sheet analysis, exactly as it would be done in the case of a firm (see Buiter (1985) for an exposition of this approach).

The starting point is the one period government budget constraint:

$$(1) \qquad D^N_{t+1} - D^N_t = (1+i)\,(G^N_t - R^N_t) + iD^N_t$$

where D denotes net debt, G is government expenditure without interest payments and R is government revenue. i is the nominal interest rate and the superscript N denotes nominal values. G-R is the primary deficit.

From equation (1) the following relation is obtained, where all values are now in real terms and r is the real interest rate:

$$(2) \qquad D_{t+1} - (1+r)\,D_t = (1+r)\,(G_t - R_t)$$

Discounting and adding the corresponding relations for every future period leads to:

$$(3) \qquad D_t = \sum_{j=0}^{\infty} \frac{(R_{t+j} - G_{t+j})}{(1+r)^j} + (1+r)^t \lim_{T\to\infty} \frac{D_T}{(1+r)^T}$$

In order to turn this relation into a meaningful restriction the last term has to obey the following condition:

$$(4) \qquad \lim_{T\to\infty} \frac{D_T}{(1+r)^T} = 0$$

The intuition of this condition is easily seen from a finite time perspective. With a finite time horizon, all debt has to be repaid in the last period; this means that the present value of the final debt has to be equal zero. Condition (4) is nothing but the infinite time analogy. Without it, every debt could be "bubble"-financed by simply rolling it over to the future. This condition does, however, allow for some rolling over, but it requires that real debt does not grow with a rate higher than the real rate of interest.

Splitting the real net debt into real net financial debt B_t and real assets K_t, with $D_t = B_t - K_t$, the public sector balance sheet is obtained:

Assets	Liabilities
$\sum_{j=0}^{\infty} \frac{(R_{t+j} - G_{t+j})}{(1+r)^j}$	B_t
K_t	balancing item: government net worth

In this fundamental approach, a public debt situation is sustainable if public solvency is given and if there is some positive government net worth.

Obviously, insurmountable problems prevent this approach from being perfectly operational. The present value of future primary surpluses is based on expectations. Evaluating real assets of the public sector might be a manageable job for public enterprises, land and claims on natural resources. The evaluation of infrastructure with public good characteristics, which typically are a main component of public real assets, is much more difficult. Quantifying public net financial assets does not seem to be much easier; their value depends for example on the demographic development in a publicly guaranteed pension system using pay-as-you-go schemes. Furthermore, politicians try to hide substantial parts of public debt behind off-budget constructions.

Even if all these difficulties cannot be solved completely, the debt situation should be assessed within this framework (see Chouraqui et al. (1986) for an application of this approach). The Maastricht rule, using gross financial debt in relation to income, is completely unsatisfactory in the light of this approach. No private firm's creditworthiness would ever be checked by simply using a ratio of gross debt to - say - turnover without regard to its assets and equity.

It would therefore be desirable to develop a uniform and comprehensive evaluation of government net worth in the EC, which could provide important information when the decision on who joins the EMU is made.

Since adequate data of government's net worth do not exist, empirical analysis of sustainability in this paper is based on gross financial debt. One should keep in mind that this might give a distorted view of sustainability: behind a rising debt

burden there might be an increasing stock of publicly owned real assets, which leave the net worth constant.

3.2. Stabilizing the Debt-Income Ratio

The sustainability condition (4) which restricts the growth rate of real debt to be smaller than the real interest rate, is still a fairly weak condition. The ratio of debt to income could grow infinitely without violating this condition (with the constellation: growth rate of income < growth rate of debt < real interest rate). Although such a debt evolution can be shown to be consistent with investors preferences in a Ricardian model with lump sum taxation (see McCallum (1984)), the outcome is impossible in a more realistic setting. With an ever rising debt-income ratio, the primary surplus in relation to income has to rise infinitely in order to restrict the debt's growth rate below the interest rate. Where taxes are distortionary, however, they cannot exceed income without bounds.

This argument is behind the intuitively appealing sustainability approach, which focuses on the stabilization of a given debt-income ratio and is applied for example by the European Commission (1990) and which stands in the tradition of Domar (1944).

The dynamics of the debt-income ratio are derived from the one period budget constraint (2) by division through Y_{t+1}:

$$(5) \qquad \frac{D_{t+1}}{Y_{t+1}} - \frac{(1+r)D_t Y_t}{Y_{t+1}Y_t} = \frac{(1+r)(G_t - R_t)Y_t}{Y_{t+1}Y_t}$$

With small letters for ratios to income, $\tau_t = R_t/Y_t$ and w the growth rate of real income, the debt-income ratio evolves according to:

$$(6) \qquad d_{t+1} - \frac{(1+r)}{(1+w)} d_t = \frac{(1+r)}{(1+w)} (g_t - \tau_t)$$

The solution of this difference equation with $s = \tau_t - g_t$, a primary surplus fixed

relative to income, is:

$$(7) \qquad d_t = \left(d_0 - \frac{s(1+r)}{(r-w)} \right) \left(\frac{1+r}{1+w} \right)^t + \frac{s(1+r)}{(r-w)}$$

This equation determines the primary surplus which is necessary, given the initial debt-income ratio d_0, the real interest and growth rate, to stabilize the future debt-income ratio. Assuming $r > w$ (otherwise every primary deficit is sustainable in the sense that the debt-income ratio converges to a finite value) the stabilizing primary surplus is:

$$(8) \qquad s^* = \frac{d_0(r-w)}{(1+r)}$$

The gap between s^* and the actual primary surplus may be used as a sustainability indicator. This indicator has a straightforward interpretation: it gives the magnitude by which either revenue has to be increased or expenditure has to be cut relative to income in order to stop the debt ratio from growing. This indicator, however, does not differentiate between different levels of the debt ratio, as long as they are stabilized.

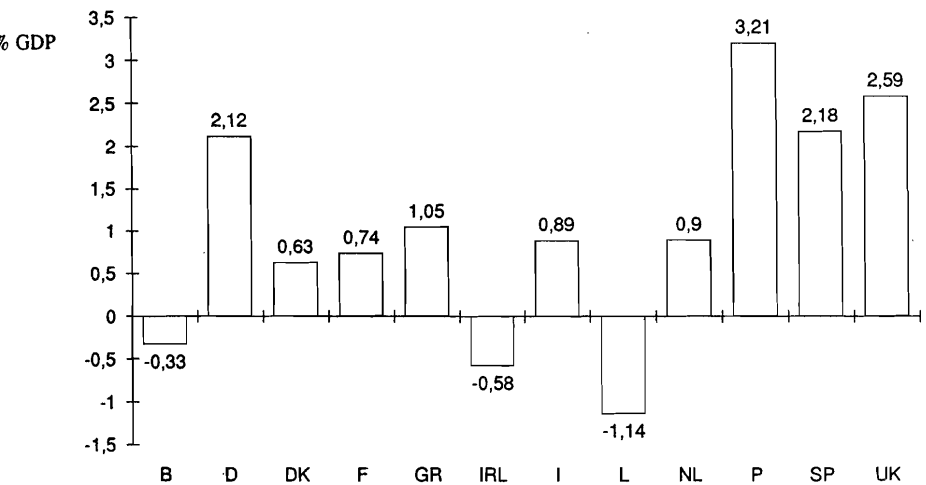
The concept is helpful to assess the European debt situation but also to show whether the Maastricht rule of a limiting ratio of 60 percent is attainable for the EC countries under realistic assumptions.

Results of various calculations are presented here. The quantification of the real interest and growth rate is of crucial importance for the dynamics of debt. Averages over a period from 1984 to 1993 are used (including EC projections) for growth rates and over a period from 1984 to 1991 for real interest rates (data are from European Commission (1991) and IMF, International Financial Statistics). This kind of quantification throws a much more unfavourable light on many EC countries compared to the above mentioned study of the European Commission. In that study real interest rates are assumed to be equal for all countries at alternatively 4 or 5 percent, growth rates are assumed to be 3.5 percent for countries with a low income per capita and 3 percent else. With these assumptions the difference between growth

rate and interest rate (a crucial variable, as can be seen from equation (8)) is 2 percent at a maximum. This is too optimistic as an average difference of 3 or 4 percent is nothing historically extraordinary. Taking into account the national history of real interest and growth rates by using averages as described above seems therefore to be more appropriate.

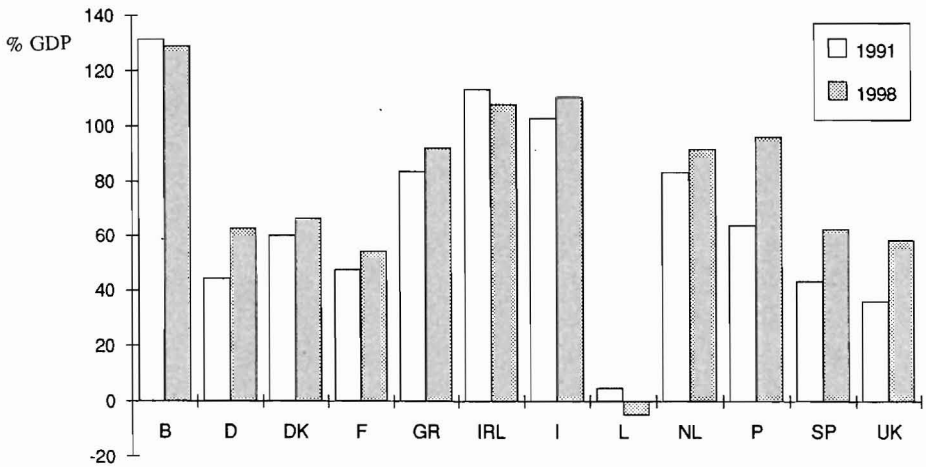
The difference between the debt stabilizing primary surplus, calculated according to equation (8), and those projected by the OECD for 1992 (see OECD (1991)) are in Figure 1. It can be seen that 9 of 12 EC countries are on a course for further rising debt ratios.

Figure 1: Stabilization Gap 1992



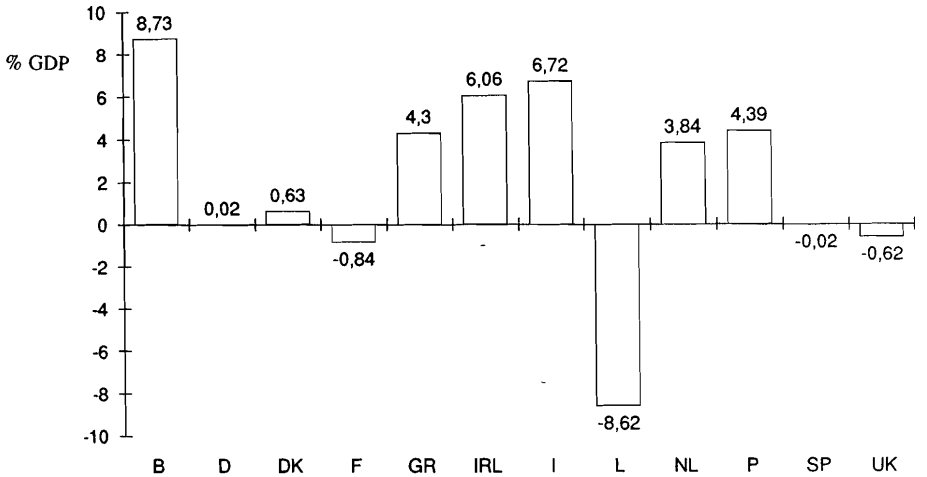
A simple extension of the dynamics to 1998, the year in which the evaluation of who will join EMU is most likely to take place, is presented in Figure 2. This projection is done by calculating the 1998 debt-income ratios from equation (7), using the initial debt-income ratios in 1991 and the above described averages for the real interest and growth rates. It serves to indicate that many of those EC countries which today still would fulfil the 60 percent debt-income criterion are in danger of violating this EMU entry condition in 1998. Of course, this simple projection is no prognosis. It is helpful, however, to demonstrate the arithmetic restrictions and adjustment needs for future budgetary policy.

Figure 2: Debt-Income-Ratio Projection



To give an idea of the magnitude of necessary adjustment, the following calculation is useful. Figure 3 shows the "adjustment gap 1998". Given the target of 60 percent for debt/income in 1998, it is asked which primary surplus would be necessary from 1992 onwards to reach this target. The "adjustment gap 1998" is the difference of this necessary surplus to the one projected by the OECD for 1992. A gap of one percent means that the country would have to increase its primary surplus at once and for the remainig time up to 1998 by one percent of GDP by increasing taxes and/or cutting expenditure. According to this interpretation, the adjustment gap for six countries seems to be beyond reach: three of the southern countries (Portugal, Greece and Italy), but also Ireland, Belgium and the Netherlands face an adjustment which hardly seems politically feasible. The low or even negative adjustment gaps for Germany, France, Spain and Great Britain should not be misinterpreted as an indication of very sound debt dynamics; these gaps are simply due to the fact that present debt ratios in these countries are still significantly below the 60 percent mark so that they can still afford a rising debt ratio.

Figure 3: Adjustment Gap 1998



3.3. Time-Series Methods to Assess Sustainability of Debt

The balance-sheet approach has made it clear that sustainability is essentially an intertemporal concept, since much depends on an unobservable item on the balance sheet, which is the present value of future surpluses. Every temporary deficit is sustainable as long as it is matched by adequate future surpluses. For this reason the long run behaviour of debt and deficits is crucial for the issue of sustainability.

This insight is behind tests on sustainability of public debt which apply time series methods and ask whether the observable characteristics of debt related variables obey those restrictions which can be obtained from the solvency condition (4). These methods were first developed by Hamilton and Flavin (1986) to analyse the US debt situation in the 1980s and can be fruitfully applied for European analysis.

The starting point of Hamilton and Flavin is that creditors form expectations on relation (3):

$$(3)' \qquad D_t = E_t \sum_{j=1}^{\infty} \frac{(R_{t+j} - G_{t+j})}{(1+r)^j} + (1+r)^t E_t \lim_{T\to\infty} \frac{D_T}{(1+r)^T}$$

As a test for sustainability, Hamilton and Flavin propose testing:

$$H_0: \quad A := E_t \lim_{T\to\infty} \frac{D_T}{(1+r)^T} = 0$$

A given debt situation is only sustainable if it is expected to be matched by the present value of future surpluses and if the "bubble-term" A in (3)' is equal to zero.

Hamilton and Flavin test H_0 indirectly (in their paper they also estimate (3)' directly by assuming a certain pattern of expectation formulation and then test for the significance of the A estimate). First they apply unit root tests to find out, whether the real primary surplus (R_t-G_t) is a stationary time-series ("stationarity of the undiscounted surplus being sufficient for stationarity of the sum of expected discounted surpluses, assuming a positive real interest rate", see Wilcox (1989), p.297). Non-stationary behaviour of the real debt D_t can then only originate from a non valid H_0. Therefore in a second step they test real debt for stationarity. If the stationarity of D_t is rejected and the primary surplus is accepted as stationary, the Hamilton-Flavin test indicates unsustainability.

Here this test has been applied to six EC countries with annual data from the IMF's International Financial Statistics (IFS) for a period from the 1950s (the starting year differs among countries) up to the present. The exact time period and so the number of observations are presented in the table. Augmented-Dickey-Fuller tests are used to test for a unit root first in the real primary surplus[1] and second in the real debt (see Table 1).

Only in the case of Germany and France can a unit root be rejected for surpluses, which means that the Hamilton-Flavin test is applicable only to these countries. Since the non-stationary null-hypothesis cannot be rejected for Germany and France with respect to D_t at the conventional 5 percent significance level, the Hamilton-Flavin approach indicates an unsustainable debt growth for both countries.

[1]Since IFS contains only surpluses including interest payments the primary surplus had to be approximated by adding estimated interest payments calculated as debt times a moving average of past interest rates on government bonds.

Table 1: Unit-Root Tests for real primary surplus and debt

country	B	D	F	I	IRL	NL
real primary surplus						
period	60-87	54-88	54-88	54-89	52-89	54-88
ADF(1)[1]	-1,06	-3,19**	-3,36***	-1,05	-0,53	-2,50
ADF(1) with trend[2]	-0,06	-3,23*	-3,31*	-0,21	-0,31	-2,60
real debt						
period	55-88	54-90	53-89	53-90	52-89	54-89
ADF(1)[1]	0,12	2,40	1,81	2,86	0,25	0,47
ADF(1) with trend[2]	-1,23	-0,91	0,41	0,91	-1,77	-0,47

1: t-value of OLS estimate of α in: $\Delta Y_t = c + \alpha Y_{t-1} + \beta \Delta Y_{t-1} + u_t$

2: t-value of OLS estimate of α in: $\Delta Y_t = c + \delta t + \alpha Y_{t-1} + \beta \Delta Y_{t-1} + u_t$

*/**/*** significance level of 10%/5%/2,5% according to Fuller(1976)

The Hamilton-Flavin procedure can be criticized on the grounds that in a growing economy it does not make sense to assume a stationary primary surplus or to demand a stationary real debt series. Trehan and Walsh (1988) suggest a more general approach. They assume the following stochastic behaviour of government expenditure and revenue (actually, they analyse a trivariate process including seigniorage):

$$(9) \qquad \begin{pmatrix} (1-L)G_t \\ (1-L)R_t \end{pmatrix} = \mu + C(L)\,\varepsilon_t$$

where μ is a 2x1 vector and C(L) a 2x2 matrix of polynomials in the lag operator L. Applying the solvency restriction (4) they show that as a consequence expenditure (inclusive of interest payments) and revenues have to be cointegrated with

cointegrating vector (1 1), which is equivalent to stationarity of the secondary (i.e. including interest payments) surplus. In contrast to the Hamilton-Flavin model in this setting the primary surplus can be a non-stationary time-series. It has only to be cointegrated with debt with cointegrating vector (1 r): This linear combination is nothing but the secondary surplus, which has to be stationary.

The test procedure is now the following. First, one tests whether observable revenue and expenditure series obey the restrictions of the stochastic structure (9), whether they have a unit root. Then either the stationarity of the real secondary surplus or the cointegration of revenue and expenditure are tested. Before doing so, surplus and expenditure series have to be adjusted for the effect of inflation on the real value of debt by adding $\pi D_{t-1}/P_t$ to real surpluses and expenditures respectively. This is necessary in order to keep the change in real debt related to the real surplus. Otherwhise, it would for example be possible to have a real deficit and at the same time a decline of the real debt.

Table 2: Unit root tests for real government revenue and expenditure

country	B	D	F	I	IRL	NL
real government revenue						
period	56-86	54-88	52-88	53-89	52-89	54-88
ADF(1)[1]	0,18	-0,09	0,93	3,27	0,84	0,14
ADF(1) with trend[2]	-2,05	-2,19	-1;93	-0,18	-2,23	-2,02
real government expenditure						
period	60-87	55-89	54-88	54-89	53-89	55-88
ADF(1)[1]	-0,09	-0,11	0,76	1,71	-0,64	0,15
ADF(1) with trend[2]	-1,88	-1,86	-1,99	-1,00	-1,99	-1,89

1,2: see table 1

*/**/*** significance level of 10%/5%/2,5% according to Fuller(1976)

Table 2 contains ADF statistics for revenue and expenditure, indicating that the H_0 of a unit root can not be rejected and that therefore (9) seems to be an appropriate stochastic specification. Table 3 shows the results of ADF tests on the stationarity of the real secondary surplus. Of the six countries, Germany and Ireland show statistics, which are for time trend ex- and including ADF tests in the 10% region for rejecting the non-stationary H_0 and therefore are compatible with the sustainability restriction. Italy's statistics are equivocal with contradicting ADF tests, while for Belgium, France and the Netherlands both tests indicate unsustainability.

Table 3: Unit root tests for real secondary surplus

country	B	D	F	I	IRL	NL
period	60-87	55-88	54-88	54-89	53-89	55-88
ADF(1)[1]	-0,50	-2,65*	-2,01	-1,25	-2,77*	-1,38
ADF(1) with trend[2]	-0,93	-3,16	-2,19	-3,33*	-2,90	-2,01

1,2: see table 1

*/**/*** significance level of 10%/5%/2,5% according to Fuller(1976)

Table 4 shows the results of the Engle-Granger testing procedure for cointegration between revenue and expenditure. The estimates of α in the cointegration equation $R_t=\alpha G_t+u_t$ give a first hint on sustainability. For a sustainable relation, α should be equal to one. The stationarity tests for the residuals of the estimated cointegration equations reject cointegration clearly in the case of Belgium and Netherlands, implying a sustainability problem for their long run debt behaviour.

Table 4: Engle-Granger test on cointegration of government revenue and expenditure

country	B	D	F	I	IRL	NL
period	58-86	53-88	52-88	52-89	51-89	53-88
alpha[1]	0,91	0,97	0,97	0,88	0,91	0,96
ADF(1)[2] residuals	-1,57	-3,19	-2,73	-3,31	-3,38	-1,24

1: OLS estimate of α in: $R_t = \alpha G_t + u_t$

2: the critical value for a sample size of 100 is -3,17 (-2,91) at a significance level of 5% (10%), see Rüdel(1989)

The results for Italy seem to be puzzling. Although the α estimate of the cointegration relation is clearly below one, indicating a permanent and substantial shortfall of revenue in relation to expenditure, the statistical criteria, however, hint on sustainability. A clue to this contradiction might be the importance of seigniorage as a means of financing the Italian budget in the past. This seigniorage might not be included comprehensively in the revenue series of the IFS. Official payments of the central bank to the government are only a part of seigniorage. Other parts can hide for example behind cheap central bank credit to the government. If this is the explanation for the Italian results there will be a more acute sustainability problem at the latest in the EMU future without further free control of seigniorage.

4.Conclusion

Both public choice considerations and the specific setting of a European Monetary Union explain the increasing importance of sustainability considerations of public debt.

Sustainability can be analyzed with very different tools. The fundamental balance-sheet approach is theoretically satisfying. However, its deficiency lies in the unsufficient applicability due to serious problems of quantification. Additional information can be obtained from looking into the dynamics of debt evolution. This is helpful because it explicates the importance of economic variables such as the real growth and interest rate. Furthermore it serves to clarify the dynamic restrictions within that any debt adjustment has to take place. Looking into the long-run behaviour of debt using time-series methods seems to be particularly appropriate because it corresponds to the intertemporal character of the sustainability concept which allows temporarily substantial deficits and imposes only a long-term restriction. A drawback of this approach is, however, its backward looking character which makes it difficult to take account of a structural break at the present edge of data.

Behind this methodological background it is difficult to see a relation between the Maastricht criteria for limiting public debt and the concept of sustainability. However, these criteria have the property to be unequivocal which might be a crucial political advantage.

Table 5 shows a synopsis of sustainability indicators (+(-) indicating (un)sustainability). The first two rows relate to the fulfilment of the Maastricht criteria in

1991. The third row reports whether as a result of the projection according to Figure 2 the countries can be expected to fulfil the debt-income ratio criterion in 1998, the year, in which most likely the decisive assessment for EMU participation is done. The last three rows collect the results of the time-series analysis of section 3.3. Two results have to be emphasized. First, sustainability of public debt is an issue which is of high empirical relevance in the EC today. This fact underlines the need to discuss further the consequences of excessive national debt for a satisfying working of EMU. Second, most EC countries are in danger to miss the target of a maximum 60 percent debt-income ratio in 1998 unless there will be further improvement in the national budgets. The possibility of a majority of EC countries violating the criterion casts doubt on the credibility of a serious application of these criterion as a precondition for EMU entry.

Table 5: Synopsis of Sustainability Indicators

	B	D	DK	F	GR	IR	I	L	NL	P	SP	UK
Maastricht deficit<=3%	-	-	+	+	-	-	-	+	-	-	-	+
Maastricht debt <= 60%	-	+	+/-	+	-	-	-	+	-	-	+	+
Maastricht "1998"	-	+/-	-	+	-	-	-	+	-	-	+/-	+
Hamilton/ Flavin		-		-								
Trehan/Walsh (Table 3)	-	+		-		+	+/-		-			
Trehan/Walsh (Table 4)	-	+		-		+	+/-		-			

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