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INVESTIGATING PRIVATE AND PUBLIC SAVING-INVESTMENT GAPS IN EC COUNTRIES

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ABSTRACT

Investigating Private and Public Saving-Investment Gaps in EC Countries*

This paper uses cointegration techniques to assess the extent to which the behaviour of private- and public-sector savings and investment and those of the nation as a whole have been consistent with long-term solvency over the last three decades. In addition, an attempt is made to analyse whether excessive budget deficits might have undermined the nation's long-run external solvency. We find evidence that a number of countries violate both domestic intertemporal budget constraints, but nevertheless satisfy the nation's budget constraint. In most cases this has occurred because changes in government deficits have been offset by changes in private savings and investment and by the use of capital controls.

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NON-TECHNICAL SUMMARY

The issue of whether government budget deficits are too large has received considerable attention. In the case of EC countries, for example, the Delors Report has emphasized the desirability of setting guidelines for national fiscal policies as part of the transition to a monetary union in Europe.

It is argued that such guidelines will ensure that the medium-term fiscal policies of member countries remain financially sustainable and thus pose no problem of either default or debt monetization. In addition, the guidelines will help ensure that EC countries' fiscal policy stance is consistent with the pursuit of medium-term non-inflationary growth.

The purpose of this paper is twofold. First, we address the issue of identifying 'excessive' deficits by examining potential violations of the government's intertemporal budget constraint. As in most of the recent literature on this topic, we use cointegration techniques to assess whether the observed paths of budget deficits in ten EC countries over the last three decades, are consistent with long-term solvency. Second, since the solvency of the government and of the private sector affect the overall solvency of the country, we attempt to assess the extent to which excessive budget deficits might have undermined the long-run external solvency of the nation.

We set out the open-economy intertemporal budget constraints for the private and public sectors and (as a residual) for the nation as a whole. Our test for solvency rules out financing debt via explosive bubbles (Ponzi games) in which debt can be continually rolled over. At this stage we highlight a property which will be explored at length in the empirical part of the paper: if the national intertemporal budget constraint is not satisfied, this can be traced to one (or both) of its components. It remains possible, however, for the nation's intertemporal constraint to hold, even though neither the public nor the private sector constraint is satisfied.

We examine the present value of the three intertemporal budget constraints in terms of the savings-investment gaps of each domestic sector and the current account. Solvency requires that each gap equals the expected decline of the present discounted value of the respective sectoral primary surpluses. In contrast to some earlier results in this literature, Ricardian equivalence is not necessarily embodied in the model, given that the relevant primary surplus of the private sector is measured net of taxes instead of government expenditure.

The econometric implications of solvency are then analysed. Various tests are applied under different assumptions about expected interest rates (adjusted for real growth). We find that stationarity of the inclusive-of-interest deficits (perhaps around deterministic components) is a necessary and sufficient condition for

solvency when the interest rate is expected to be positive and constant, and sufficient only when it varies but remains positive. The evidence favours the hypothesis of varying interest rates. The private sector appears to be solvent in Belgium, France, Greece, Ireland and Italy. The public sector appears to be solvent in Denmark, France and Germany but not in Belgium, Greece or Italy. The results for the remaining countries are inconclusive. Finally, the current account seems to be stationary in the case of Denmark (with a negative drift), France, Italy, the Netherlands, Spain and, to a lesser extent, Belgium. Germany shows some signs of supersolvency.

In the light of the previous evidence, we analyse the long-run causality directions between the private- and public-sector gaps in the framework of a cointegrated system where the current account plays the role of the error correction term. There are at least two theoretical arguments which could underpin this approach. One states that government policy responds to shifts in private behaviour to maintain a target level in the current account. An alternative interpretation incorporates the Ricardian view of private and government saving.

The analysis presented in the paper suggests that a large number of EC countries violate both the government and private-sector intertemporal budget constraints, but they do not violate the nation's budget constraint. The evidence also seems to indicate that in most cases national solvency has been achieved because changes in government deficits have been matched by offsetting changes in private savings and investment, and by the use of capital controls imposed when the current account exceeds some targeted level. Evidence that government policy responds to shifts in private behaviour in order to target the current account is weaker. Given that in the process of transition to EMU monetary and exchange rate policies will become less effective, our results suggest that the decline in government savings will probably have to be reversed.

An important qualification to these results is that the tests carried out in the paper are conditional on the assumptions that fiscal policy would be maintained in the indefinite future and that the macroeconomic structure would remain stable. The results must therefore be interpreted very carefully. First, countries may take future fiscal actions which would correct excessive budget deficits. Second, some of the countries examined will suppress capital controls in the near future and all of them will become more financially integrated as a result of the free movement of financial services throughout the Community. Since these changes provide new opportunities for the private sector to internationally diversify its portfolios, domestic savers may no longer finance excessive domestic budget deficits, either through higher saving (Ricardian equivalence) or lower investment (crowding out). Under these circumstances, even countries whose public finances have not led to external solvency problems in the past may find their external solvency compromised in the future, thus creating a negative externality for the Community as a whole.

1. Introduction

Given the decline of saving and investment in most OECD economics the issue of whether the government's budget deficit is too large has received a great amount of public attention[1]. In particular, for the case of EC countries, the Delors Report has emphasised the convenience of setting guidelines for fiscal policies. The basic reasons for this concern are mainly two. First, to ensure that the medium term fiscal policies of member countries remain financially sustainable and, thus, pose no problem of either default or debt monetisation. Secondly, to avoid the aggregate monetary and fiscal policy stance of EC countries being mutually incompatible as regards to the pursuit of medium-term non-inflationary growth.

The present paper approaches the issue of identifying excessive deficits by examining possible violations of the government intertemporal budget constraint. Specifically, as in most of the recent literature on this topic, use is made of cointegration analysis to assess whether the observed paths of budget deficits in EC countries are consistent with long-term solvency[2]. In addition, since the solvency of the government and that of the private sector configurate the overall solvency of the country, an attempt is also made to assess the extent to which excessive budget deficits might have undermined the long-run external solvency of the nation[3].

In particular, the ability of governments to run smaller or larger deficits over a prolonged period of time without deteriorating external solvency critically depends on the saving and investment patterns of the private sector.

To illustrate this issue, consider the case of Italy, a country which has often been classified among the Member States whose

budget deficit needs an inmediate reduction. According to recent EC Commission calculations (see Table 1), the Italian actual primary budget balance was in 1989 4.5 percentage points of GDP above the debt-stabilising primary budget balance, whilst its three-year tax gap, calculated as in Blanchard (1990), amounts roughly to the same figure. A simple calculation using these two figures enables a three-year government expenditure gap of zero percentage points of GDP to be computed. This means that the Italian authorities should either aim to confine their average expenditure over the next three years at the same level (as a % of GDP) as in 1989 or they should raise substantially the fiscal burden. Given the rigidity on non-interest expenditures in an economy in need of major structural reforms and in view of the recent steep increase in the overall tax burden (see Giovannini and Spaventa (1990)), there may be little scope for both actions. However, as shown in Figure 1, which depicts the current account and the government's and the private sector's net saving in several EC economies over the last three decades, the apparently unsustainable position of the Italian budget deficit, does not seem to have jeopardised its external accounts. This means that the domestic private sector has been financing the public sector deficit.

In contrast, things seem to be different in the case of Greece, the other country identified as having a large excessive budget deficit in Table 1 on the basis of the primary gap and the tax gap (respectively of 11.9 and 9.1 p.p. of GDP). As illustrated in Figure 1, net private sector saving has been insufficient to finance the increase in the budget deficit in the last ten years, thus leading to continous significant current account deficits.

In addition to the suggestive casual evidence discussed above, there are various theoretical frameworks that support the existence of a relationship between the sectoral net saving gaps. These explanations range from the well known implications of the Mundell-Flemming model, both with and without Ricardian Equivalence, to the existence of current account targets by the government.

Foreshadowing the results in the paper, we find evidence indicating that a large number of EC countries violate both the government and private sector intertemporal budget constraints, but they do not violate the nation's budget constraint. The evidence also seems to point out than in most cases this is achieved through changes in government deficits being matched by offsetting changes in private savings and investment and the use of capital controls that governments impose to when the current account exceeds some targetted level. However, the evidence on government policy responding to shifts in private behaviour, in order to target the current account, is weaker. Given that, in the process of transition to EMU, monetary and exchange rate policies will become less effective, that means that the decline in government savings will probably have to be reversed.

In the meantime, the results also have econometric implications in the sense that the government and private sectoral gaps form a cointegrated system where the error correction term is the current account. This can be used, for example, to forecast fiscal policies compatible with current account targets for a given private sector net saving path.

An important caveat to be aware of is that given that the tests carried out in the paper are conditional on the assumptions that fiscal policy would be maintained in the indefinite future and that the macroeconomics structure would remain stable, the results need to be interpreted very carefully. First, countries may take future fiscal actions which would correct excessive budget deficits. Second, some of the countries examined will suppress capital controls in the near future and all of them will become financially more integrated as a result of the free provision of financial services through the Community. Since these changes provide new oportunities for the private sector to internationally diversify its portfolios, it may not be longer the case that domestic savers finance excessive domestic budget deficits, either through higher saving (Ricardian Equivalence)

or lower investment (crowding out). Under these circunstances, even countries whose innappropiate public finances have not led to external solvency problems in the past may find their external solvency compromised in the future, thus creating a negative externality for the Community as a whole.

The paper is organised as follows. Section 2 establishes the conceptual relationship between the intertemporal budget constraints of the public sector, the private sector and the overall economy. Section 3 shows the equilibrium conditions needed to correctly assess empirically the solvency of the public and the private sectors and of the overall economy. Section 4 and 5 detail the econometric methodology employed and outline the main results as well as tests on the direction of causality between public and private sector behaviour. Finally, Section 6 briefly summarises the main conclusions.

2. The Arithmetic of the Intertemporal Budget Constraints in the Open Economy

If a country faces solvency problems then this may be because either the government's or the private sector's intertemporal budget constraint is violated. The connection among the three intertemporal budget constraints in a open economy can be derived from the national income identity and can be written in real terms as

$$[SP_{pt} + \rho_t A_{pt-1}] + [SP_{gt} + \bar{\rho}_t A_{gt-1}] = [SP_{ft} + \tilde{\rho}_t A_{ft-1}] \quad (1)$$

That is, the sum of the private and public sector surpluses (defined as the primary surplus plus the net income received from net assets held) equals the nation's surplus (defined as the primary current account surplus plus net income received from net foreign assets held by the country plus net current transfers from abroad plus

net labour payments from abroad), where SP_p = private sector's primary surplus; SP_g = government's primary surplus; SP_f: country's primary surplus; A_p = private sector's net assets (end of period); A_g = government's net assets; A_f = net foreign assets; ρ = expected real of return on private sector's net assets; $\bar{\rho}$ = expected real rate of return on government's net assets; $\tilde{\rho}$ = expected real rate of return on net foreign assets.

In terms of net asset accumulation (NA), identity (1) can be rewritten as

$$NA_{pt} + NA_{gt} = NA_{ft} \quad (1')$$

where $NA_p = \Delta A_p$, $NA_g = \Delta A_g$ and $NA_f = \Delta A_f$

Following Hamilton and Flavin (1986), we can reformulate (1) and (1') in terms of the evolution of assets in the private and government sectors. Solving forwards yields the following intertemporal relationships in stock terms

$$A_{pt-1} = -\beta \sum_{s=0}^{\infty} E_t \beta^s SP_{pt+s} + \lim_{n\to\infty} \beta^n E_t A_{pt+n} \quad (2)$$

$$A_{gt-1} = -\beta \sum_{s=0}^{\infty} E_t \beta^s SP_{gt+s} + \lim_{n\to\infty} \beta^n E_t A_{gt+n} \quad (2')$$

where β is the discount rate defined as $\beta=(1+\rho)^{-1}$ and expectations are conditional on information at time t. Note that it has been assumed for convenience that, in expectation, $\rho=\rho=\rho$ and $\beta>0$. We will come back to the implications of relaxing such a hypothesis below. The behaviour of the limiting terms in (2) and (2') as n tends to infinity are crucial for characterising the behaviour of the private and public sectors. We call a budget process sustainable

if those limits are zero, i.e. Ponzi games, in which debt is continually rolled over, are excluded. In this case, the outstanding stock of the private sector (government) assets equal the present discounted value of future deficits. Under these circumstances, each sector will be intertemporally balanced. If solvency is rejected, this may be either because of insolvency (i.e. an excessive deficit or an insufficient surplus) or supersolvency (i.e. an insufficient deficit or an excessive surplus). Evidently, the policy implications would be rather different in each of the two cases.

Note that if the previous intertemporal budget constraints are violated, then it is straightforward to prove that the two limiting terms will behave as two rational bubbles denoted as BB_{it} (i=p,g), such that in order to retrieve (1) and (1') from (2) and (2'), they have to satisfy the property $BB_{it}=\beta \underset{t}{E} BB_{it+1}$ or, in terms of actual values, $BB_{it}= (1/\beta) BB_{it-1} + \xi_{it}$ where ξ_{it} $(= BB_{it} - \underset{t-1}{E} BB_{it})$ is an innovation.

In order to get the remaining intertemporal constraint, corresponding to the overall economy, we can combine (2) and (2'), yielding

$$A_{ft-1}= - \beta \sum_{s=0}^{\infty} \beta^s \underset{t}{E} (SP_{ft+s}) + (BB_{pt} + BB_{gt}) \qquad (3)$$

The economic interpretation of (3) is that at any point in time, in the absence of bubble finance, the stock of net external assets equals the present discounted value of the stream of future income receipts associated with trade balances plus net labour payments and current transfers from abroad.

At this stage it is important to remark a property which will be explored at length in the empirical part of the paper, namely that the intertemporal budget constraints for the government and the private sector will be satisfied if both BB_{pt} and BB_{gt} are zero. However, this is just a sufficient condition for external sustainability since it could be the case that $(BB_{gt}+BB_{pt})$ is zero in spite of each bubble existing. Nevertheless, if just one bubble exists then the intertemporal constraint in (3) will be violated, in the sense of having an explosive bubble. Hence if the national intertemporal budget constraint is not satisfied this can be traced to one (or both) of its components, though it remains possible for the national intertemporal constraint to hold but for neither of the sectoral constraints to be satisfied.

3. Assessing Solvency

This section is devoted to examine the present value representation of the above discussed intertemporal budget constraints in terms of net savings of each sector which, as it was mentioned, is the measure that we have chosen to assess. We rely on methods proposed recently by Trehan and Walsh (1988, 1991), Wickens and Uctum (1990), Ghosh (1990) and Sheffrin and Woo (1990), who extend Campbell's (1987) model of "saving for a rainy day" to a government and to a nation frameworks so as to derive behavioural relationships involving the current account and the net saving of the government and the private sector.

3.1 Public Sector Solvency

Following Trehan and Walsh (1988), to get the intertemporal budget constraint for the government in terms of net asset accumulation, let us add $\rho^{-1} SP_{gt}$ to both sides of (2'), yielding

$$A_{gt-1}+ \rho^{-1} SP_{gt} =-\beta \sum_{s=0}^{\infty} \beta^s \underset{t}{E}(SP_{gt+s}-SP_{gt}) + BB_{gt} \qquad (4)$$

where use has been made of the fact that the sum of the β's on the right hand side of (4) is ρ^{-1}. By further noting that $SP_{gt+s}-SP_{gt}=\Delta SP_{gt+s}+\ldots+\Delta SP_{gt+1}$, and that $NA_{gt}=\rho[A_{gt-1}+\rho^{-1}SP_{gt}]$, we get

$$NA_{gt} = -\sum_{s=1}^{\infty} \beta^{s} \underset{t}{E} \Delta SP_{gt+s} + \rho\, BB_{gt} \qquad (5)$$

If we wish to express the variables in terms of GDP or GNP, assuming a constant growth rate n and denoting the ratios with small letters, then (5) can be rewritten as[4]:

$$na_{gt} = -\sum_{s=1}^{\infty} \tilde{\beta}^{s} \underset{t}{E} \Delta sp_{gt+s} + \tilde{\rho}\, bb_{gt} \qquad (6)$$

where $\beta = (1+\tilde{\rho})^{-1}$ and $\tilde{\rho} = \rho-n$ is the growth adjusted real interest rate. The interpretation of (6) is clear, i.e. the public sector's net saving equals the expected reduction on the present discounted value of future primary surpluses.

3.2. Private Sector Solvency

Following Ghosh (1990) and Sheffrin and Woo (1990), to obtain the private sector's dynamic budget constraint in terms of net saving, we consider a model which takes a representative consumer who can borrow and lend at a given interest rate. This allows consumption decisions to be made independently of production and investment decisions. In addition, and in contrast to some of the papers mentioned above, the Ricardian Equivalence Principle is not necessarily embodied in the model given the way net output is measured i.e., net of taxes instead of government expenditure.

The representative consumer in this economy has the following objective function

$$\underset{0}{E}\left\{\sum_{t=0}^{\infty} \emptyset^{t}\, U(C_{pt})\right\} \qquad (7)$$

with the budget constraint

$$A_{pt} = (1+\rho)\, A_{pt-1} + SP_{pt} = (1+\rho)\, A_{pt-1} + [NO_{t} - C_{pt}] \qquad (8)$$

where NO is net output, defined as $NO = Y + NLP^{*} + NT^{*} - \Gamma - I_{p}$ where Y = GDP, NLP* = net labour payments from abroad, NT* = net current transfers from abroad, Γ = taxes (net of transfers), I_{p} = private sector's investment, C_{p} = private sector's consumption.

Assuming for simplicity no consumption tilting, i.e $\emptyset=\beta$ and a quadratic utility function, it is easy to show that maximization of (7) s.t (8) leads to Hall's (1978) well known "random walk" model, that is

$$C_{pt+1} = C_{pt} + \varepsilon_{t+1} \qquad (9)$$

where ε_{t+1} is the innovation of consumption.

Substituting (9) into (2), which is the integrated intertemporal budget constraint version of (8), we get that optimal consumption is proportional to expected wealth:[5]

$$C_{pt} = \rho[A_{t-1} + \beta \sum_{0}^{\infty} \beta^{s} \underset{t}{E}\, NO_{t+s} - BB_{pt}] \qquad (10)$$

Using (10) and the definition of net asset accumulation by the private sector yields the following expression (with variables in proportion of GDP/GNP)

$$na_{pt} = - \sum_{s=1}^{\infty} \tilde{\beta}^{s} \underset{t}{E} \Delta no_{t+s} + \tilde{\rho}\, bb_{pt} \qquad (11)$$

The equation has the following interpretation: the private sector's net asset adquisition equals the expected decline on the present discounted value of net output, in the absence of bubble financing. The analogy to Campbell's (1987) model is clear: dissaving (saving) anticipates rising (declining) net output in the way defined above. Note that since taxes have not been equated to government's expenditure in the definition of net output, the Ricardian Equivalence Hipothesis has not been imposed.

3.3. External Solvency

Finally, adding equations (6) and (11) ($na_{gt}+na_{pt}=ca_t$) yields the following expression for the equlibrium path of the current account[6]:

$$ca_t = - \sum_{s=1}^{\infty} \tilde{\beta}^{s} \underset{t}{E} \Delta(no_{t+s} + sp_{gt+s}) + \tilde{\rho}\, (bb_{pt}+bb_{gt}) \qquad (12)$$

The analogy to the previous interpretations is straightforward. A country will run a current account surplus only if it expects its primary surplus (trade balance) to be falling in the future. For example, if a country is experiencing a temporary productivity increase, the optimal response is to run a current account surplus.

4. Econometric Implications

Equations (6), (11) and (12) are the empirical analytical basis of the paper. There are various econometric implications of these equations which need to be highlighted at the outset. The first implication is that, in the absence of bubble financing, both sides of the equations need to be balanced, that is if no_t and sp_{gt} are stationary in first differences, then na_{pt}, na_{gt} and ca_t must be also stationary in levels. The second implication relates to the fact that even if the previous condition is verified, the weighted discounted sums in the RHS of (6), (11) and (12) need to be equal to na_{gt}, na_{pt} and ca_t respectively.

There is a large literature investigating the implications of sustainability in terms of the various deficits and their components defined above. In what follows we will directly focus on the processes for the deficits inclusive and exclusive of interest payments which are the variables that we will use in the empirical analysis. To avoid discussion of the three sectors we will use, in what follows, the generic notation na_t and sp_t to denote the two deficits, a_t for net assets and bb_t for a bubble. Two cases will be considered: i) the case in which the expected interest rate is constant $\underset{t}{E}\, \tilde{\rho}_{t+i}=\tilde{\rho}>0$ which is the assumption used above for expositional simplicity, and ii) the case in which the expected interest rate is positive but no longer constant.

Wickens and Uctum (1990) and Trehan and Walsh (1988) have provided a necessary and sufficient condition for sustainability in case i). In brief, this condition states that if sp_t is I(1) (perhaps with deterministic components) then sustainability holds if and only if na_t is I(0) (perhaps with deterministic components).

To understand this condition, let the sp_t process be defined by

$$\Delta sp_t = \mu_1 + \gamma_1 t + A_1(L)\, \epsilon_t \qquad (13)$$

where the moving average lag polynomial, $A_1(L)$, is invertible. Then if sustainability holds, substitution of (13) into expressions like (6), (11) and (12), without the bubbles, yields

$$na_t = -(\tilde{\beta}/1-\tilde{\beta})[\mu_1+\gamma_1+\gamma_1 t]+ B(L)\epsilon_t \quad (14)$$

where B(L) has all its roots outside of the unit circle. Thus, na_t is I(0) around a deterministic component.

Conversely, if na_t follows the process

$$na_t = \mu_2 + \gamma_2 t + A_2(L) \epsilon_t \quad (15)$$

then it is straightfoward to show that

$$bb_t = \lim_{n->\infty} E_t \tilde{\beta}^n[a_t + n \mu_2 + \gamma_2 n(t+0.5) + 0.5 \gamma_2 n^2 + D(L)\epsilon_{t+j}]=0 \quad (16)$$

since D(L) is invertible and $\tilde{\beta}$ is positive and decays exponentially.

An alternative approach to testing present value models is the one developed by Hansen et al (1987) and Campbell (1987). They note that in a VAR representation of maximum lag $m<\infty$ of the joint process $(na_t, \Delta sp_t)$ sustainability in, say, (6) implies the following set of orthogonal restrictions

$$e'_1 + e'_m \tilde{\beta} \Pi (I-\tilde{\beta} \Pi)^{-1} = 0 \quad (17)$$

where Π is (2mx2m) matrix of the VAR expressed in companion form and $e'_i = (0,\ldots, 1^{(i)}, 0,\ldots 0)$ $(i = 1, 2m)$.

Finally, if as in case ii) the expected interest rate is positive but no longer constant, Trehan and Walsh (1991) have shown

that a sufficient condition for sustainability is again na_t being I(0) (perhaps with deterministic components). The argument will be skipped since it is similar to the "sufficiency" part discussed above and relies again on the expected discount rate growing exponentially.

To summarise the results of this section, we have seen that stationarity of the inclusive of interest deficit is necessary and sufficient for intertemporal budget constraint when the expected interest rate is constant and only sufficient when is allowed to vary while it remains positive. One way to test which of the two situations is more likely is to carry out the standard unit root tests on na_t and Δsp_t and then test the VAR cross-equation restrictions implied by cointegration. If the test do not reject na_t and Δsp_t being I(0) but reject the VAR restrictions, then this is a sign that expected interest rates are non constant, whilst if both are accepted then this is a sign of constancy. Finally it is important to note that since deterministic components are allowed in the stochastic representation of the inclusive-of-interest deficits, the solvency criteria can be considered as weak, given that it does not preclude the debt/GNP ratio will have a trend. In this sense, a more strict solvency criterion is to rule out those deterministic components, supporting the common view that only finite values of the debt/GNP ratio are sustainable.

4.1. Stationarity Tests

Ten major EC members (Belgium, Denmark, France, Germany, Greece, Holland, Ireland, Italy, Spain and U.K.) were used in the analysis. The sample period extends from 1960 to 1989 (1964 to 1989 for Spain). The data used are mainly taken from the annual series in the Main Aggregates volume of the National Accounts of OECD countries published by the OECD and are expressed as a proportion to GDP/GNP. For the construction of the variables we refer to Appendix 1.

As it was mentioned above, determining the order of integration of the indeterministic component of an economic time-series is a necessary precursor to any analysis of the stochastic properties of that variable. For the case of a present value relation it is of even greater importance since, as explained, the consistency of the order of integration of the weighted sum and the summands can provide a simple and direct test of the relation. In Table 2 we present unit root tests for the null that nap_t, na_{gt}, ca_t Δno_t and Δsp_{gt} are I(1). Since preliminary results on the computation of standard Augmented Dickey-Fuller tests showed clear signs of heteroskedasticity and non normality, we have computed Phillips's (1987) test which is robust to those problems. Note that the previous tests allow for a non-zero drift under the null hypothesis, since examination of these series indicated that most of the series displayed smooth trends over the sample period. Given the limited available sample size we preferred to control for those trends, since under these circumstances, ignoring the trend will imply that available tests for non stationarity tend to accept the null too often. We are aware that these tests may lack power if there has been structural breaks within the sample. For example Giovannini and Spaventa (1991) point out that the second half of the eighties was a period of fiscal consolidation. However, we believe that our sample size is too small to discriminate among several regimes and that is why we have taken the stability of the data generating process as the maintained hypothesis.

Therefore, the regression model to be estimated is

$$\Delta y_t = \mu + \gamma t + \alpha y_{t-1} + \varepsilon_t \qquad (18)$$

and the null hypothesis of interest is H_o: $\alpha = 0$. This is tested by using $Z(t\alpha)$ based on the t-statistic on α. If non stationarity can be rejected, a deterministic trend and drift can be tested by fitting an appropriate linear ARMA model. If the null is not rejected,

it is also possible to test for the deterministic componentes by using the $Z(\emptyset_2)$ and $Z(\emptyset_3)$ statistics for the nulls H_0: $\alpha = \mu = \gamma = 0$ and H_0: $\alpha = \gamma = 0$ respectively. Further testing for a non-zero drift is possible by using $Z(\emptyset_1)$ for the null H_0: $\mu = \alpha = 0$ in model (18) with $\gamma = 0$.

In order to present a concise summary of the outcome of the tests, the results in Table 2 report the $Z(t\alpha)$ test in the appropiate model, with asterisks denoting significance at 5% and 10% levels. The symbols PC, PT (NC, NT) denote the presence of significant positive (negative) deterministic components (constant, trend).

The results can be summarised as follows. Overall, the evidence with respect to Δno_t and Δsp_{gt} seems to reject the null hypothesis. Therefore, both series seem to be I(0) for all countries considered, with their deterministic components showing up in the processes for the inclusive of interest sectoral gaps. With respect to na_{pt}, there seems to be some indication of stationarity in the cases of Belgium, France, Greece, Ireland and Italy, indicating that for this set of countries the private sector verifies the sufficient condition for solvency. However, in the case of na_{gt} only Denmark, France and Germany reject the null hypothesis. The existence of a positive (negative) drift in the case of Germany (France) may be interpreted as a sign of supersolvency (insolvency). The evidence for Belgium, Greece and Italy, by non rejecting the null hypothesis and showing negative drifts or trends, is clearly against solvency, though the graph for Belgium shows some degree of fiscal adjustment in the late eighties. Holland, Ireland, Spain and the United Kingdom appear as non-stationary with insignificant drifts and in this sense, being conservative, we could say that the evidence for these countries could be interpreted as inconclusive. Note, however, that in the Irish case the evidence against solvency is very large if the second half of the eighties is excluded from the sample[7]. Finally, ca_t seems to be I(0) in the cases of Denmark, with a negative drift, France, Holland,

Italy, Spain and to a lesser extent, Belgium. Noteworthy at this preliminary stage is the case of Italy, where some sort of contradiction seems to be present since being ca_t the sum of an I(1) and I(0) variable it should not behave as I(0).

4.2. Orthogonality Tests

On the previous evidence we proceeded with the test of the orthogonality conditions implied by (17) in those cases where the necessary conditions for the respective sectoral gaps were not rejected. Table 3 (Q_{t-1} statistics) presents the values of both tests based upon likelihood ratio statistics for VAR (3) systems, chosen on the basis of the AIC criterion and clean correlograms of the residuals, on the demeaned (detrended) series for the pairs $(\Delta no_t, na_{pt})$, $(\Delta sp_{gt}, na_{gt})$ and $(\Delta(no_t+sp_{gt}), ca_t)$. To compute the tests we used an estimate of ρ equal to 3% for Belgium, Denmark, France, Holland and Italy and 2.5% for Greece and Spain[8]. The results are easily summarised since in all cases they have the same features: the restrictions are decisively rejected. It could be that due to publication lags, the variables dated at t-1 may not belong to the agents' information set. This seems unlikely in our yearly data, a conjecture which seems to be confirmed when we excluded the first lags in the VAR. As show in Table 3 (Q_{t-2} statistics) the restrictions again fail to be accepted. Hence, the hypothesis of constant growth adjusted interest rates cannot be accepted.

Since some authors (see Sheffrin and Woo (1990)) have argued that in spite of the rejections, equation (17), extended for the present value representations of na_g, na_p and ca, may track the actual values of the variables reasonably well, the last column in Table 3 presents the correlation coefficients (R^2) between the actual and fitted values for the set of countries where the sufficient condition was satisfied. The results corroborate the previous rejections, with, perhaps, the exceptions of Denmark and Holland where

the R^2's are above 0.8. In particular we find that the actual values of the current account tend to be more volatile than the predictions, implying "excess smoothness" in consumption (see Barro (1979) and Deaton (1986)), a result which is also found in this framework by Sheffrin and Woo (1990) and which might be interpreted as the current account having acted as a buffer to smooth consumption. Using this criterion we would argue in favour of the absence capital barriers, but recall that the underlying present value models have been decisevely rejected by the data. To this issue we will turn back in Section 5.

In concluding this section we can summarise the overall evidence by saying that there are several countries for which na_{pt} or ca_t seem to be stationary while only in a few countries the sufficient condition for fiscal sustainability does seem to be non-rejected. In all cases, the expected growth adjusted real interest rates are non-constant. Of course, there are some cases, such as Germany, where the rejection is probably due to insufficient deficits in the sample period and, in this sense, corrective measures are not in such an urgent need. Note, however, that from a purely fiscal standpoint, the situation is more worrying than reflected by primary gap indicators, such as those in Table 1. This reflects the different information used in the diagnosis, namely a single reference value (1989) instead of the average behaviour over three decades as in the present tests.

5. Accounting for the Behaviour of Sectoral Gaps

The previous interesting results about rejection of the present value orthogonality restrictions has led us to use a less structural approach in analysing the relationship among na_{pt} and ca_t in those countries where ca_t is I(0) and the other sectoral gaps are I(1). In this case we know that a cointegration relationship will hold exactly in the long run forecast of $(na_{pt}+na_{gt})$.

Therefore we would say that na_{pt} (na_{gt}) is high enough to finance the unsustainable position of the public (private) sector. In this case the economy will be solvent even if, say, the public sector is not. Among the several theoretical approaches which try to explain these factors there are two prominent ones. One explanation is that government policy responds to shifts in private behaviour to mantain a target level in the current account (Summers (1985)). An alternative interpretation incorporates the Ricardian view of private and government saving (Barro (1974)): the private sector recognises that financing, say, tax cuts by bonds merely alters the time profile of taxation and, therefore, adjust their own behaviour to offset changes in government policy. In a similar way, if na_{pt} is I(0) and ca_t and na_{gt} are I(1), then we will say that the private sector has been sustainable ex-post in the sense that the foreign sector financed the government's debtor position. The implication of the Mundell-Flemming model by which increased government budget deficits appreciate the exchange rate and hence damage the current account, is the traditional explanation associated to the "twin" deficits association. However, this possibility will not be examined in what follows since, for instance, it has been clearly stated in the guidelines to the transition to EMU that neither a Member State nor the Community as a whole may stand behind a fellow Member State's unsustainable position.

There is a also a clear econometric implication in studying the relationship between the domestic gaps when they are I(1): the nation's intertemporal budget balance can be imposed quite easily by estimating a cointegrated VAR model that includes the current account as the error-correction term. Moreover, the direction of the causality between na_{pt} and na_{gt} will throw evidence about the previously discussed interactions between both sectors, as well as on the effectiveness of capital controls as a policy instrument in the different countries during the sample examined here.

5.1. Methodological Issues of Cointegrated Systems

In what follows we lay out briefly the formal framework of cointegrated systems.

Let us consider a VAR representation of the vector Z_t, now defined as the vector (na_{gt}, na_{pt}), in the form

$$Z_t = \Pi(L)\, Z_{t-1} + u_t \qquad (19)$$

where u_t is now assumed to be Gaussian white noise, that is $u_t \sim N(0,\Omega_u)$ for all t. Furthermore, we assume that na_{gt} and na_{pt} are I(1) and that det $(I-\Pi(L))$ has all its roots outside the unit circle except for one root which is unity. In other words, the matrix

$$\tilde{\Pi} = I - \Pi\,(1) \qquad (20)$$

is singular, with rank r = 1.

In that case the (2x2) matrix $\tilde{\Pi}$ can be expressed as a product of a (2x1) vector γ and and a (1x2) vector α', which have both rank 1, that is, $\tilde{\Pi}=\gamma\alpha'$. Here α' is a vector representing the co-integration relations such that $\alpha' Z_t$ is I(0). Commonly $\alpha' Z_t$ is interpreted as the long-run equilibrium between the variables in Z_t. In this case, if ca_t is I(0), then the cointegrating relationship will be (1,1) since $ca_t = na_{pt} + na_{gt}$. In order to test the null hypothesis that ca_t is I(0), we will use the alternative representation of (19), known as error correction representation:

$$\Delta Z_t = \Pi^*(L)\, \Delta Z_{t-1} - \gamma\, \alpha'\, Z_{t-p} + u_t \qquad (21)$$

where $\Pi^*(L)$ is a lag polynominal of order m-1.

Under the assumption that Z_t is a Gaussian process, Johansen (1989) provides a computationally simple expression for the maximum-likelihood estimators of the coefficients in (21). He also develops likelihood ratio statistics for testing hypothesis of the type

$$H_0: r \leq r_0 < 2 \text{ against } H_1: r = r_0 + 1$$

The asymptotic distribution of these LR statistics are nonstandard and critical values are tabulated by Johansen & Juselius (1990)[9]. They depend on the treatment of deterministic terms in the VAR. In the empirical analysis we will always mantain an intercept and a linear trend given the evidence about the individual variables in Table 2, and test whether those terms appear in the cointegrating vector. Johansen (1989) also derives asymptotic chi-square tests for constraints on the cointegrating vector α' which we will use to test the hypothesis $\alpha' = (1,1)$ in the empirical analysis.

Although the preceding tests for stationarity of the individual series offered in Section 4 showed that for some countries either na_{pt} and na_{gt} were I(0) or ca_t was I(1), we have performed the Johansen procedure for all countries, since those tests should be implicit in the Johansen testing scheme. If r=2 the series are stationary in levels whereas they would have a stationary VAR representation in first differences if r=0. Furthermore, if r=1 in a bivariate system as ours, it is possible that just one of the variables needs differencing while the other one is stationary in levels. This may occur if one of the variables enters the cointegration vector with zero coefficient[10].

The results of Johansen's test for cointegration for the EC countries are given in Table 4. There is a set of countries where the tests clearly support a cointegration rank of r=1, that is, one cointegration relation between na_p and na_g is found. The countries for which this property seems to hold are Denmark, France, Holland,

Italy and Spain i.e exactly the same set for which ca_t was found to be I(0) according to the application of unit root tests to the individual series, plus Belgium and Greece.

From the previous analysis we have also tested the restrictions $\alpha_1-\alpha_2= 0$, $\alpha_1(\alpha_2) = 0$, $\alpha_3= 0$ and $\alpha_4= 0$ in the cointegration relation

$$\alpha_1 na_{gt} + \alpha_2 nap_t + \alpha_3 t + \alpha_4 = 0 \qquad (22)$$

Note that α_3 and α_4 appear in this relation because the constant intercept and the linear trend terms have been included in the VAR model. Of course, they may in fact be zero. This is a question of interest since, for example, the linear trends may reflect productivity trends or consumption tilting which would allow a country to have a persistent current account suplus or deficit in the sample.

The results of the previous tests can be summarised as follows: i) The hypothesis $\alpha_1-\alpha_2=0$, is not rejected at the 5%level in the case of Denmark, France, Italy and Spain. In the case of Holland, however, the estimated coefficients are (after normalization) $\alpha_1=1$ $\alpha_2=0.78$ and through the null hypothesis is rejected we considered the coefficients to be close enough as to impose it; ii) The hypothesis $\alpha_1=0$ was not rejected in the cases of Belgium and Greece, which is again consistent with the evidence on individual unit roots tests. Note, however, that this null hypothesis is rejected in the case of France and Italy, in contradiction with the previous tests; iii) The hypothesis $\alpha_2=0$ is rejected in all cases. Again the results for France and Germany seem to contradict the individual time series evidence; iv) The hypothesis $\alpha_3=0$ is always rejected except in the case of Ireland, though this result is not easy to interpret given that cointegration was not found in that country; and v) The hypothesis $\alpha_4=0$ is rejected in the case of Germany,

Greece, United Kingdom, Denmark and Holland. In the first three countries again the evidence is not easy to interpret, although the existence of a positive drift for Germany given its long sequence of surpluses can be interpreted as supersolvency. For the last two countries, where cointegration seems to hold, there seems to be an positive drift in Holland and a negative drift in Denmark, which could be interpreted in terms of productivity trends, stemming from the evolution of no_t.

5.2. Causality Between Sectoral Gaps

Finally, we turn to examine the issue of long-run causality in the cointegrated system. In other words, we want to address the question of whether it is the private sector's net saving that responds to the government's net saving or viceversa, (in order to stabilise the current account). On the one hand it has been noted in the literature (see e.g. Artis and Bayoumi (1989)) that there is the possibility that the government may target the current account, therefore offsetting undesired movements in the private sector's net savings through opposite movements in the government's net asset accumulation. There are several reasons for this sort of government's policy reaction. For example, the government could be interested in the correction of social innefficiencies in the private allocation of investment either abroad or domestically, or in restricting the influence of foreign capital on domestic firms. On the other hand, it could be the case that it is the private sector who offsets the behaviour of the government, say if the Ricardian Equivalence Hypothesis has some ground as if there were full crowding out either through consumption or investment. Furthermore, it is well known (see Feldstein and Horioka (1980)) that the existence and direction of the causality will be influenced by the existence of capital controls[11].

A simple model drawing upon Feldstein (1983) and Argimón and Roldán (1991) can make more precise the main points underlying the

previous discussion in terms of sectoral gaps. First, let us assume that the governments's net assets accumulation has two components

$$na_{gt} = -\alpha\, na_{pt} + \epsilon_{gt} \tag{23}$$

where the first component represents the planned reaction of the public sector to private sectors' net saving and ϵ_g is a permanent component (random walk). Second, the private sector's net saving consists of three components

$$na_{pt} = -\beta\, na_{gt} + b\rho_t + \epsilon_{pt} \tag{24}$$

where the first component represents the planned reaction of the private sector to government's imbalance, the second component is an increasing function of the domestic real interest rate (ρ), given the foreign real interest rate (set to zero), and the third component is another permanent shock (random walk) uncorrelated with ϵ_g.

Capital inflows as a proportion of output, k_t, are modeled so as to reflect the possibility of imperfect mobility. If q is the relevant real exchange rate, then desired capital inflows depend on the difference between the domestic real interest rate ρ and the expected rate of return on foreign investment

$$k_t = f[\rho_t - \underset{t}{E}\, q_{t+1} + q_t] \tag{25}$$

such that when $f = \infty$, the condition which defines perfect capital mobility is approached.

To simplify matters, the current account is modeled as a function of the contemporaneous real exchange rate

$$ca_t = e\, q_t \tag{26}$$

Finally, in equilibrium, any current account imbalance is financed by either net capital flows and/or movements in official reserves as a proportion of output, v_t. The change in official reserves follows a random walk and is indexed by a parameter θ. If $\theta = 0$, it implies that the movements have not been important, whereas if $\theta \neq 1$, they have mattered. Therefore

$$ca_t + k_t = \theta v_t \quad (27)$$

and

$$na_{pt} + na_{gt} = ca_t \quad (28)$$

The system formed by equations (23)-(28) determines ca na_p, na_g and the derivatives of the last two variables with respect to the shocks can be interpreted as the long-run causality directions in the VAR system (see Appendix 2). For example if $\partial na_g/\partial \varepsilon_p = 0$ and $\partial na_p/\partial \varepsilon_g \neq 0$ we would say that there is only causality from na_g to na_p. Straightforward application of the comparative statics show that $\partial na_p/\partial \varepsilon_g \neq 0$ and $\partial na_g/\partial \varepsilon_p = 0$ when $f = 0$, i.e when capital mobility is null due to capital controls, irrespectively of α and/or β being zero. When $f=\infty$, i.e there is perfect capital mobility (capital controls do not operate), then there are four possibilities: i) $\partial na_p/\partial \varepsilon_g = 0$ and $\partial na_g/\partial \varepsilon_p \neq 0$ if $\beta=0$ and $\alpha\neq 0$; ii) $\partial na_p/\partial \varepsilon_g \neq 0$ and $\partial na_g/\partial \varepsilon_p = 0$ if $\alpha=0$ and $\beta \neq 0$; iii) $\partial na_p/\partial \varepsilon_g \neq 0$, $\partial na_g/\partial \varepsilon_p \neq 0$ if $\alpha \neq 0$, $\beta \neq 0$; and iv) $\partial na_p/\partial \varepsilon_g = \partial na_g/\partial \varepsilon_p = 0$ if $\alpha=\beta=0$. Finally note that ca is always I(1) when $f=\infty$ and it is I(0) when $f=0$, except in the case where $\theta\neq 0$; then it also I(1). Therefore, if variations in reserves have been sufficiently large, they could offset the effects of the permanent shocks and thus observe no long-run correlation between the domestic gaps even when capital controls exist. If this is the case, however, we should observe causality going from na_g to na_p in the VAR estimated in first differences.

Thus, there is unidirectional causality from the government's net saving to the private sector's net saving either if there are capital controls or if only the private sector partially offsets the government's net asset accumulation. There is unidirectional causality from the private sector's net saving to the government's net saving if there is perfect capital mobility and if only the government partially offsets the private sector's gap through budgetary policies. Again in the case of perfect capital mobility, there will be bidirectional causality when the two sectors offset each other, and no causality when offsetting is absent.

In order to address empirically this issue we have used a chi-square test suggested by Johansen which tests for the presence of the cointegrating vector in either of the equations of the system. That is, if $\tilde{\Pi}$ has rank r=1 then it can be written as

$$\tilde{\Pi} = \begin{pmatrix} \gamma_1 \\ \gamma_2 \end{pmatrix} (\alpha_1 \ \alpha_2)$$

and the null hypotheses to be tested are $H_0: \gamma_1 = 0$ or $H'_0: \gamma_2 = 0$.

Turning to the empirical results, Table 5 presents tests of the previous restrictions. The restriction $\gamma_1=0$, i.e that na_p does not cause na_g in the long-run, is only marginally rejected by Holland while the restriction $\gamma_2=0$, i.e that na_g does not cause na_p in the long-run, is rejected by Denmark, France, Italy, Spain and Holland. Hence, the evidence for the previous four countries seems to be compatible with the existence of capital controls in the sample period showing that on average budgetary policies have not reacted on average to either the sign or volume of the external imbalance. In contrast the evidence for Holland seems to be more consistent with a higher degree of capital mobility and interactive offsetting actions by both the private and the government sectors. For the remaining five countries where the current account is non stationary, the evidence

seems to be broadly consistent with the absence of the error correction terms. That is $\gamma_1 = \gamma_2 = 0$ except perhaps in the case of Belgium which can be considered as a borderline case between sustainability and unsustainability, recalling that na_p is only I(0) around a linear trend. In this case we tried to obtain indirect evidence of the existence of controls by testing for short-run causality between na_g and na_p. The test involves estimating the VAR in first differences, excluding the linear trend term, and then testing the null hypothesis that the lagged terms of Δna_g (Δna_p) do not appear in the equation of Δna_p (Δna_g). The results are shown in the second block of Table 5.

Two-way causality seems to be present in Germany while no causality seems to hold in the case of the United Kingdom. Finally Belgium, Greece and Ireland show causality going from na_g to na_p. From the comparison of the empirical results with the predictions of the theoretical model, we could be tempted to identify lack of long-run causality with a high degree of international capital mobility. For Germany and United Kingdom, even if in the first case there are signs of short-run two-way offsetting reactions, we think that this interpretation is correct. However, for Ireland, Greece, and, to a lesser extent, Belgium. That evidence is not easily compatible with the absence of capital controls. Rather, the result is more consistent with economies where capital controls have been rather ineffective and movements in official reserves have played a prominent role.

6. Conclusions

6.1. Excessive Budget Deficits

In this paper we have used cointegration techniques to assess whether budget deficits in EC countries are or not excessive.

For this purpose, it has been tested whether the public finances of these countries are consistent with the intertemporal budget constraint of the government on the basis of their evolution in the 1960-89 period. If this constraint is violated there are two possibilities, i.e. either the public sector is on the path towards future insolvence or it is supersolvent in the sense of having lower deficits than would be required to meet the intertemporal budget constraint.

On the basis of the quantitative results of the paper, the conclusions can be drawn that if the fiscal behaviour exhibited by governments in the sample period were to continue in the future there would be potential fiscal unsustainability problems for several EC countries, namely Belgium, Greece, Ireland and Italy exhibit excessive budget deficits whereas Germany shows some signs of excessive surpluses. The evidence for the rest of the countries remains somehow inconclusive.

However, these findings have to be interpreted most carefully before policy conclusions can be drawn.

Firstly, the negative tone of the conclusions may not take fully into account that during recent years some EC countries have pursued strategies of fiscal consolidation aimed towards improving medium-term budgetary positions (e.g., in Belgium, Ireland, Spain and the United Kingdom). In so far as those strategies involve a permanent, and not just a temporary, change in fiscal policy behaviour there would be no fiscal sustainability problems in these countries in the future. On the other hand, those countries which have been singled out as having excessive deficits on the basis of the analysis of the paper and which have not followed similar fiscal consolidation programes in recent years could suffer from fiscal sustainability problems if no shift in budgetary policies takes place in the future. That would be the case of Greece and Italy.

Secondly, German unification has led to significant changes in the public finances of Germany which, if lasting, would eliminate the "supersolvent" behaviour characterising the public sector in the 1960-1989. Indeed, budgetary vigilance should be exercised to avoid deficit problems from arising in the country given its economic size within the EC and its important role in the EMS.

Thirdly, in addition to the issue of fiscal sustainability there is the issue of whether the overall policy stance of the Community should be altered in the future to reduce inflation. To the extent that this is considered as desirable, taking into account the fiscal situation of EC countries (in terms of solvency/supersolvency) could be useful in deciding how to allocate the burden of adjustment.

6.2. Fiscal and External Sustainability

The analysis has been extended to examine the empirical relationship between the intertemporal budget constraints of the private and public sectors and of the overall economy. In this regard, the findings are the following.

There is a group of five countries for which the national budget constraint is satisfied: Denmark, France, Holland, Italy and Spain. Nevertheless, the evidence suggests that, perhaps with the exception of France within the sample, the national constraint holds without neither the public nor the private intertemporal budget constraints being satisfied.

For the rest of the countries a distinction should be made between the external supersolvency of Germany and, perhaps, Holland, on the one hand, and the potential external sustainability problems faced by Greece and Ireland, with Belgium and the United Kingdom not being such a problem cases. Of course, these results should only be interpreted as indicating that if the behaviour of domestic private

and public agents remains in the future as it was during the sample period examined, there would be unsustainable external imbalances within the Community. For this reason, German Unification may reduce the external "supersolvency" of the German economy by reducing current account surpluses; and Ireland's reducing anti-inflationary demand policies of recent years and the significant improvement in the current account be enough, if maintained, to avoid external problems from arising in the future. On the other hand, it is quite clear that unless decisive policy changes are taken in the case of Greece there could be serious external sustainability problems in the future. Finally, since Greece was also a clear-cut case of fiscal unsustainability and the evidence points out that the public sector was mainly to blame for this, solving budgetary problems would also have favourable effects on the external position of the country.

As Ghosh (1990), Wickens and Uctum (1990) and Argimón and Roldán (1991) have pointed, our results regarding the empirical relation between the private, public and external sectoral gaps, also have implication for the Feldstein-Horioka hypothesis of world capital market integration, but now based on correlations between the domestic sectoral gaps instead of the traditional national savings and investment correlations. As the previous authors have pointed out, if the gaps have unit roots then a high correlation is virtually assured. A better test in this case is whether or not the variables are cointegrated and in which equation does the cointegration vector appear. Although the results in this case lack overall uniformity, on average the evidence points out to lack of budgetary policy reactions to the external balance in most countries under study, at least from a long-run perspective. Instead, the evidence suggests that capital controls might have been the main instrument used to target the external balance, thus increasing the effectiveness of monetary policy.

In sum, the results presented in the paper should be taken as highly preliminary, especially in light of the structural changes

involved in Stages One and Two of EMU like free capital mobility and financial integration. However, they suggest that an effort to improve the health of the public finances is still needed in several EC countries, which could also improve their external accounts. Only if suitable medium-term fiscal positions are adopted will it be possible to adequately prepare entrance into Stage Three of EMU.

Clearly much more work needs to be done in several directions. First, the theoretical models should be enriched to account for different sources of wealth, the role of real exchange rates, financial innovation and demographic factors. Second, the power of the statistical tests should be strenghed by increasing the frequency and improving the quality of the data which in its actual state may represent a poor guide of how measured deficits influence both the demand and supply sides of the economy. Third, our analysis here suggest that forecasting procedures of the current account, where intertemporal budget constraint is imposed, can be implemented by estimating a VAR model for the private and public saving gaps, that includes the current account as an error correction term. Similar applications exist when studying government expenditure and investment decision. Our current research goes in this direction.

Footnotes

1. See, for example, Dean et al. (1990) and Chapter 5 in "One Money, One Market" EC. European Economy, 1990.

2. After completing the initial version of the paper, we became aware of the existence of a recent paper by Corsetti and Roubini (1991) who also use cointegration analysis to discuss fiscal sustainability in OECD countries using a different data set. Their data for the government sector is better than ours since they correct both for seignorage and inflation effects on the government interest bill, while we have been forced to ignore partially those corrections on the grounds of consistency between the reported statistics for the net savings of the domestic sectors and the net external balance. However, their sample for most of EC countries is only available since 1970. We have also performed the tests reported below with a data set where seignorage has been accounted for in the definition of private and public savings gaps. The results remain similar and are available on request.

3. A forerunner for this type of analysis in the case of the U.S., can be found in Wickens and Uctum (1990).

4. The choice of variables as a proportion of nominal GNP in the empirical results stems from the stationarity assumption about the interest rate, which will exclude, for example, nominal magnitudes.

5. If there is consumption tilting, wherely a country tilts its consumption towards the present of the future depending upon how its subjective discount rate relates to the interest rate, then $\emptyset \neq \beta$. As Ghosh (1990) has shown, that implies that the factor of proportionality of consumption to wealth in (10), becomes $\theta\rho$,

where θ is a function of β and $\emptyset$ such that when $\beta=\emptyset$ then $\theta=1$. If $\theta\neq1$, the theoretically constructed private saving gap in (11), will have an extra-term which basically represents a trend and which may justify the presence of such a term in some countries.

6. This definition differs from the ordinary definition of the current account in that it excludes capital transfers from abroad. Hence it refers to the net external balance.

7. A further conservative interpretation of the findings is that we are omitting relevant assets from the calculation of net indebtedness. For example, as fas as solvency is concerned, the appropriate measure of the public sector net liabilities should be net of the value of publicily owned real assets.

8. We also tried other values of $\tilde{\rho}$ in the range 2% to 4% without significant alterations in the results.

9. The critical values have been appropriately increased to account for the presence of a linear trend in the VAR.

10. Dolado et al. (1990) prove that unit root test procedures in a multivariate context tend to have higher power than in a univariate context.

11. There is, however, a wide variety of models generating co-movements in savings and investment in response to exogenous disturbances, even under conditions of perfect capital mobility (see Tesar (1991)).

Appendix 1

This Appendix explains the Data used in the tests. All data are yearly and expressed as a proportion of GNP.

na_g: gross saving minus gross investment by the General Government. Hence the data consolidate the accounts of the central government, social security agencies and the state and local agencies.

na_p: gross saving minus gross investment in the private sector.

ca: net external balance. For those countries which report and statistical discrepancy in their balance of payments data, the discrepancy is split equally between savings and investment so that the identify linking na_g, na_p and ca holds exactly across countries.

no: net output = GDP + Net Labour Payments and Current Transfers from abroad - Taxes (net of transfers) + Private Sector's Investment.

sp_g: general government's primary surplus.

The sources of the data are as follows: OECD National Income Accounts for the saving-investment gaps and GNP statistics; International Financial Statistics (IMF, IFS) for the primary surpluses (expenditure and revenue); OECD Main Economic Indicators, OECD Economic Outlook and Cronos' Database for net output.

Remark: It is important to note that given the length of the sample size, certain ambiguities, ommissions and interpolations have been unavoidable.

Appendix 2

Our model is a variant of one used in Argimón and Roldán (1991) and it is formed by equations (23)-(28) in the text plus three independent random walks for ε_g, ε_p and v.

The equilibrium real exchange rate and, hence, ca na_g and na_p can be solved by the usual solution technique for rational expectations models, yielding

$$ca_t = [ef[\varepsilon_g(1-\beta)+\varepsilon_p(1-\alpha)] + e\theta b(1-\alpha)v\}/\Omega \qquad (A.1)$$

$$na_g = [e(b+f)\ \varepsilon_g - \alpha\ e\ f\ \varepsilon_p\ \alpha e\theta bv\}/\Omega \qquad (A.2)$$

$$na_p = [-e(b+f\beta)\ \varepsilon_g + e\ f\ \varepsilon_p + e\theta bv\}/\Omega \qquad (A.3)$$

where $\Omega = eb(1-\alpha) + f\ e\ (1-\alpha\beta)$

When f = 0, we have

$ca = \theta\ v \sim I(1)$ (unless $\theta = 0$)

$na_g = (\varepsilon_g - \alpha\ \theta\ v)/(1-\alpha) \sim I(1)$

$na_p = (-\varepsilon_g+\theta\ v)/(1-\alpha) \sim I(1)$

Hence $na_g \rightarrow na_p$, $na_p \not\rightarrow na_g$.

When f = ∞, there are four cases

i) $\beta = 0$, $\alpha \neq 0$

$ca = \varepsilon_g + (1-\alpha)\ \varepsilon_p \sim I(1)$

$na_g = \varepsilon_g - \alpha\ \varepsilon_p \sim I(1)$

$na_p = \varepsilon_p \sim I(1)$

Hence, $na_p \rightarrow na_g$, $na_g \not\rightarrow na_p$

ii) $\beta \neq 0$, $\alpha = 0$

$ca = \varepsilon_g\ (1-\beta) + \varepsilon_p \sim I(1)$

$na_g = \varepsilon_g \sim I(1)$

$na_p = -\beta\ \varepsilon_g + \varepsilon_p \sim I(1)$

Hence, $na_g \rightarrow na_p$, $na_p \not\rightarrow na_g$

iii) $\beta = 0$, $\alpha = 0$

$ca = \varepsilon_g + \varepsilon_p \sim I(1)$

$na_g = \varepsilon_g \sim I(1)$

$na_p = \varepsilon_p \sim I(1)$

Hence, $na_g \not\rightarrow na_p$, $na_p \not\rightarrow na_g$

iv) $\beta \neq 0$, $\alpha \neq 0$.

This case corresponds to equations (A.1)-(A.3).

Hence, $na_g \rightarrow na_p$, $na_p \rightarrow na_g$

Remark: When ca ~ I(1) the VAR system for na_g and na_p is not cointegrated and Granger causality is tested in its first differenced version.

References

Argimón, I. and J.M. Roldán (1991) "Saving, Investment and International Capital Mobility in EC Countries" Bank of Spain. Research Dept. Working Paper 9110.

Artis, M. and T. Bayoumi (1989) "Saving, Investment, Financial Integration and the Balance of Payments, IMF. Working Paper 89-102.

Barro, R.J. (1974) "Are Government Bonds Net Wealth?" Journal of Political Economy 82, 1095-1117.

Barro, R.J. (1979) "On the Determination of Public Debt" Journal of Political Economy, 87, 940-971.

Blanchard, O.J. (1990) "Suggestions for a New Set of Fiscal Indicators" CPE/WPI (90) 2. OCDE

Campbell, J.Y. (1987) "Does Saving Anticipate Declining Labor Income?" An Alternative Test of the Permanent Income Hypothesis" Econometrica 55, 1249-1274.

Dean, A., Durand, M., Fallon, J. and P. Hoeller (1990) "Saving Trends and Behaviour in OECD Countries" OECD Economic Studies 13, 7-58.

Corsetti, G. and N. Roubini (1991) "Fiscal Deficits, Public Debt and Government Solvency: Evidence from OECD Countries" NBER Working Paper 3658.

Deaton, A. (1986) "Life-Cycle Models of Consumption: is the Evidence Consistent with the Theory? NBER Working Paper 1910.

Dolado, J., Ericsson, N.R. and J.M. Kremers (1990) "The Power of Cointegration Tests: A Comparison of Various Procedures" (mimeo, presented at the 6th World Meeting of the Econometric Society. Barcelona, 1990).

Feldstein, M. and C. Horioka (1980) "Domestic Saving and International Capital Flows" Economic Journal, 90, 314-329.

Feldstein, M. (1983) "Domestic Saving and International Capital Movements in the Long-Run and the Short-Run" European Economic Review 21, 129-151.

Giovannini, A. and L. Spaventa (1991) "Fiscal Rules in the European Monetary Union: A No-Entry Clause. CEPR Discussion Paper 516.

Ghosh, A. (1990) "How Mobile in Capital?: Some Simple Tests" Discussion Paper 50, Princenton University.

Hall, R.E. (1978) "Stochastic Implications of the Life-Cycle Permanent-Income Hypothesis: Theory and Evidence "Journal of Political Economy 86, 971-987.

Hamilton, J.D. and M.A. Flavin (1986) "On the Limitations of Government Borrowing: A Framework for Empirical Testing" American Econmic Review 76, 808-819.

Hansen, L.P., Roberds W. and T.J. Sargent (1987) "Time Series Implications of Present Value Budget Balance and of Martingale Models of Consumption and Taxes" (mimeo, Hoover Institution).

Johansen, S. (1989) "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models" Institute of Math. Stat. University of Copenhagen, working paper 89-3.

Johansen, S. and K. Juselius (1990) "Maximum-Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money" Oxford Bulletin of Economics and Statistics 52, 169-218.

Mc. Kinnon, J. (1990) "Critical Values for Cointegration Tests" University of California, S. Diego, Discussion Paper 90-4.

Phillips, P.C.B. (1987) "Time Series Regression with a Unit Root" Econometrica 55, 277-301.

Sheffrin, S.M. and W.T. Woo (1990) "Present Value Tests of an Intertemporal Model of the Current Account" Journal of International Economics 43, 239-253.

Summers, L.H. (1985) "Tax Policy and International Competitiveness" in J. Frenkel, edl, International Aspects of Fiscal Policies NBER Confrence Report (Chicago University Press).

Tesar L.L. (1991) "Saving, Investment and International Capital Flows" Journal of International Economics 31, 55-78.

Trehan, B. and C.E. Walsh (1988) "Common Trends, the Government Budget Constraint, and Revenuee Smoothing" Journal of Economic Dynamics and Control 12, 425-444.

Trehan, B. and C.E. Walsh (1991) "Testing Intertemporal Budget Constraints: Theory and Applications to U.S. Federal Budget and Current Account Deficits" Journal of Money, Credit and Banking 23, 206-223.

Wickens, M.R. and M. Uctum (1990) "National Insolvency: A Test of the US Intertemporal Budget Constraint" CEPR Discussion Paper 425.

TABLE 1

Traditional Fiscal Imbalance Indicators

	Gross Public Debt/GDP	Debt-Stab Prim. Balance	Gen. Gov Prim. Balance	Primary Gap	Three-Year Tax Gap	Three-Year Exp. Gap.
BL	129.9	4.2	4.2	0.0	-1.2	-1.2
DK	63.3	2.2	6.8	-4.4	-2.7	1.7
FR	36.0	1.3	1.4	-0.1	-0.1	0.0
GE	43.6	0.9	2.9	-2.0	-2.9	-0.9
GR	85.1	1.6	-10.3	11.9	9.1	-2.8
HL	77.6	2.3	0.7	1.6	1.9	0.3
IR	104.7	4.3	5.7	-1.4	-1.7	-0.3
IT	98.9	3.7	-1.1	4.8	4.6	-0.2
SP	45.2	1.5	0.7	0.8	-0.1	-0.9
UK	45.7	2.0	4.6	-2.6	-1.8	0.8

Note: The figures represent percentages of GDP/GNP and are taken from OECD: Economic Outlook, no. 47, June 1990. The three-year expenditure gap is simply calculated as the three-year tax-gap minus the primary gap.

TABLE 2

Unit Root Tests

	na_p	na_g	ca	Δno	Δsp_g
BL	-3.94** (PC, PT)	-0.22 (NC, .)	-1.65* (. , .)	-4.25** (NC, NT)	-3.85** (PC, .)
DK	-1.82 (NC, .)	-1.99** (. , .)	-5.16** (NC, .)	-5.12** (. , .)	-6.36** (. , .)
FR	-5.26** (PC, PT)	-3.91** (NC, NT)	-4.50** (. , .)	-4.38** (NC, NT)	-3.76* (PC, PT)
GE	-1.44 (. , .)	-2.56** (PC, .)	-1.67 (PC, .)	-6.25** (. , .)	-5.12** (NC, .)
GR	-4.05** (NC, PT)	-2.75 (NC, NT)	-2.19 (NC, .)	-4.18** (PC, NT)	-3.73* (PC, PT)
HL	-0.65 (PC, .)	-1.01 (. , .)	-2.62** (PC, .)	-3.94** (. , .)	-3.28* (. , .)
IR	-2.34** (. , .)	-0.76 (. , .)	-1.30 (. , .)	-5.16** (. , .)	-4.27** (. , .)
IT	-4.08** (PC, PT)	0.10 (NC, NT)	-2.77** (. , .)	-5.38** (NC, .)	-3.94** (PC, .)
SP	-1.04 (. , .)	-1.13 (. , .)	-2.26** (. , .)	-6.02** (. , .)	-4.88** (. , .)
UK	-1.85 (. , .)	-1.57 (. , .)	-1.62 (. , .)	-5.12** (. , .)	-3.94** (. , .)

Note: The figures correspond to the $Z(t_\alpha)$ test, using a triangular "window" of length 2 to ensure a positive value of the estimated long-run variance. The notation * (**) denotes significant at 10% (5%) significance level. The notation PC(NC) denotes significant positive (negative) drift. In a similar way, PT(NT) denotes significant positive (negative) trend. The 5% and 10% critical values for models with and without drift and/or trend for a sample of 30 observations have been taken from Mc Kinnon (1990).

TABLE 3

Restrictions Tests for Present Value Models of Net Savings

[VAR (3)]

System/Test	Q_{t-1}	Q_{t-2}	BP (2)		R^2
		(BL)			
$(\Delta no_t, na_{pt})$	25.32	19.28	3.23	4.25	0.53
		(DK)			
$(\Delta(no_t+sp_{gt}), ca_t)$	19.27	15.34	5.15	2.13	0.80
		(FR)			
$(\Delta no_t, na_{pt})$	31.63	30.63	1.63	2.17	0.43
$(\Delta sp_{gt}, na_{gt})$	28.14	25.24	2.23	3.12	0.53
$(\Delta(no_t+sp_{gt}), ca_t)$	21.16	17.28	0.77	1.16	0.64
		(GR)			
$(\Delta(no_t, na_{pt})$	26.32	16.15	6.12	4.23	0.52
		(HL)			
$(\Delta(no_t+sp_t), ca_t)$	18.36	22.12	2.12	1.73	0.83
		(IT)			
$(\Delta no_t, na_{pt})$	33.36	30.27	3.34	3.23	0.43
$(\Delta(no_t+sp_{gt}), ca_t)$	40.15	32.38	4.15	1.21	0.34
		(SP)			
$(\Delta(no_t+sp_{gt}), ca_t)$	17.96	19.38	2.76	3.18	0.71

Note: Q_{t-1} is the likelihood ratio test for the restrictions (2.1) in a VAR (3) model computed as $2(L_1-L_0)$ where L_1 and L_0 are the ln lik for the unrestricted and restricted models respectively; it is distributed as chi-square with 6 d.f. (5% c.v. = 12.6). Q_{t-1} is the same test when the first lags have been excluded from the model; it is distributed as chi-square with 3 d.f. (5% c.v. = 7.8). Finally, BP (2) is the Box-Pierce statistic for autocorrelation of 2nd order in the residuals of the respective equations. R^2 is the correlation coefficient in the regression of actual on fitted values obtained from equation (21') for na_g, na_p, and ca.

TABLE 4

Cointegration between Private and Government Net Savings

(Johansen procedure)

H_0	H_1	BL	DK	FR	GE	GR	HL	IR	IT	SP	UK	CV(5%
r=1	r=2	5.45	3.45	3.39	1.71	6.43	5.43	5.57	6.65	1.35	3.75	9.66
r=0	r=1	17.13	17.79	19.72	11.27	16.65	16.63	8.93	19.33	17.12	13.53	16.52
$\alpha_1=0$	$\alpha_1\neq0$	3.12	4.23	6.66	4.72	1.15	4.73	5.12	5.35	6.43	5.17	3.84
$\alpha_2=0$	$\alpha_2\neq0$	6.45	7.23	4.12	3.96	5.22	6.15	6.23	3.87	5.97	3.98	3.84
$\alpha_1=\alpha_2$	$\alpha_1\neq\alpha_2$	7.15	3.56	2.21	5.18	7.23	4.12	7.06	3.06	1.93	5.12	3.84
$\alpha_3=0$	$\alpha_3\neq0$	6.23	8.15	6.37	5.12	4.93	4.17	3.66	5.52	4.89	4.98	3.84
$\alpha_4=0$	$\alpha_4\neq0$	2.66	4.98	3.68	4.12	6.63	5.73	2.67	3.12	1.96	4.12	3.84

Note: The critical values CV for the first two columns are taken from Johansen and Juselius (1990) and have be upwards corrected for the presence of a trend in the VAR representation; H_0 and H_1 denote the null a the alternative hypothesis.

TABLE 5

Causality Tests

I Long-Run Causality

(All countries)

Direction	H_0	BL	DK	FR	GE	GR	HL	IR	IT	SP	UK	CV(5%)
$na_p \not\rightarrow na_g$	$\Upsilon_1 = 0$	3.42	3.63	3.76	2.12	1.73	4.03	3.53	2.73	3.23	2.12	3.84
$na_g \not\rightarrow na_p$	$\Upsilon_2 = 0$	2.27	4.25	6.76	2.84	1.38	3.88	2.12	4.35	6.36	0.98	3.84

II Short-Run Causality

(Insolvent Countries)

Direction	H_0	BL	GE	GR	IR	UK	CV(5%)
$\Delta na_p \not\rightarrow \Delta na_g$	$\Pi^*_{12i} = 0$	5.88	7.25	5.08	5.11	3.73	5.99
$\Delta na_g \not\rightarrow \Delta na_p$	$\Pi^*_{21i} = 0$	6.33	8.23	7.25	8.16	2.86	5.99

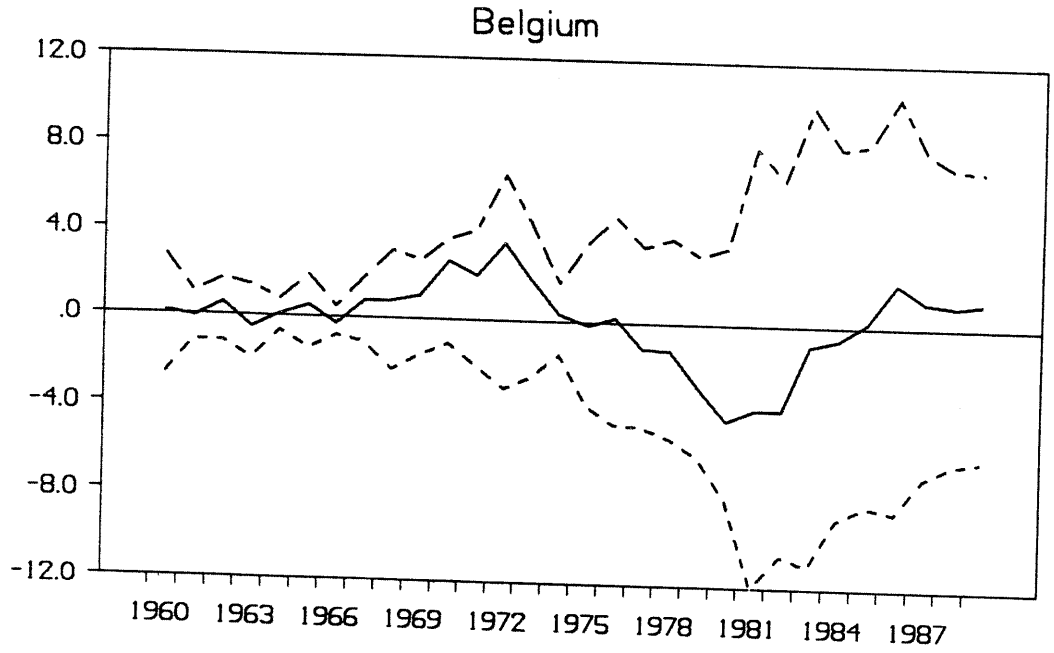
Note: Figures refer to Wald test on the coefficients described in equation (21) in the text for a VAR (3) system.

FIGURE 1

Key: ca ——————

na_g - - - - - - - - -

na_p —— —— - —— ——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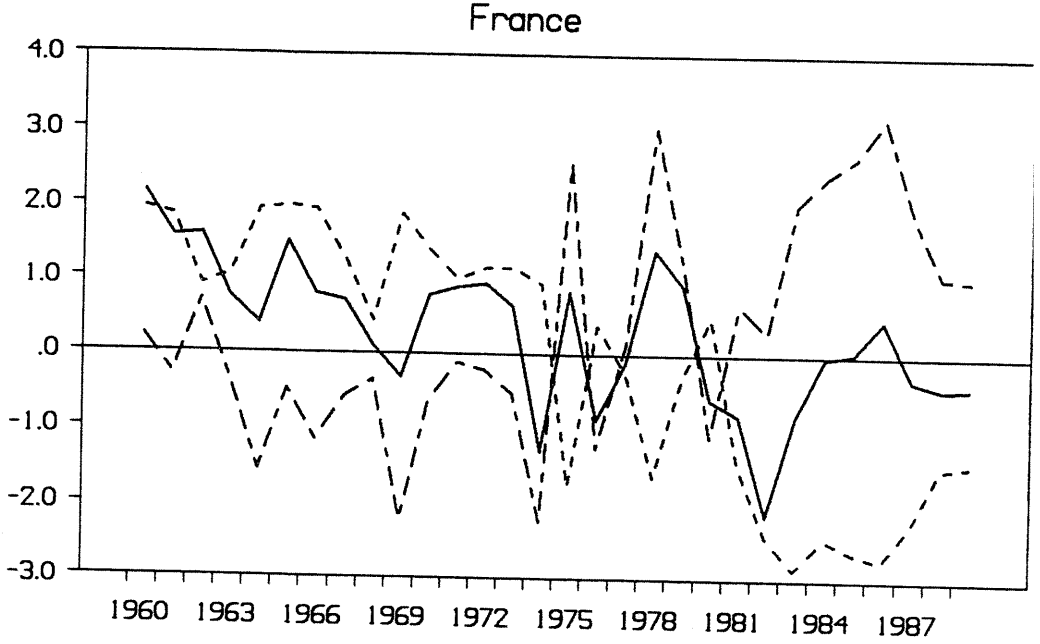
4.0
.0
-4.0
-8.0
-12.0
1960 1963 1966 1969 1972 1975 1978 1981 1984 1987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2.0
1.0
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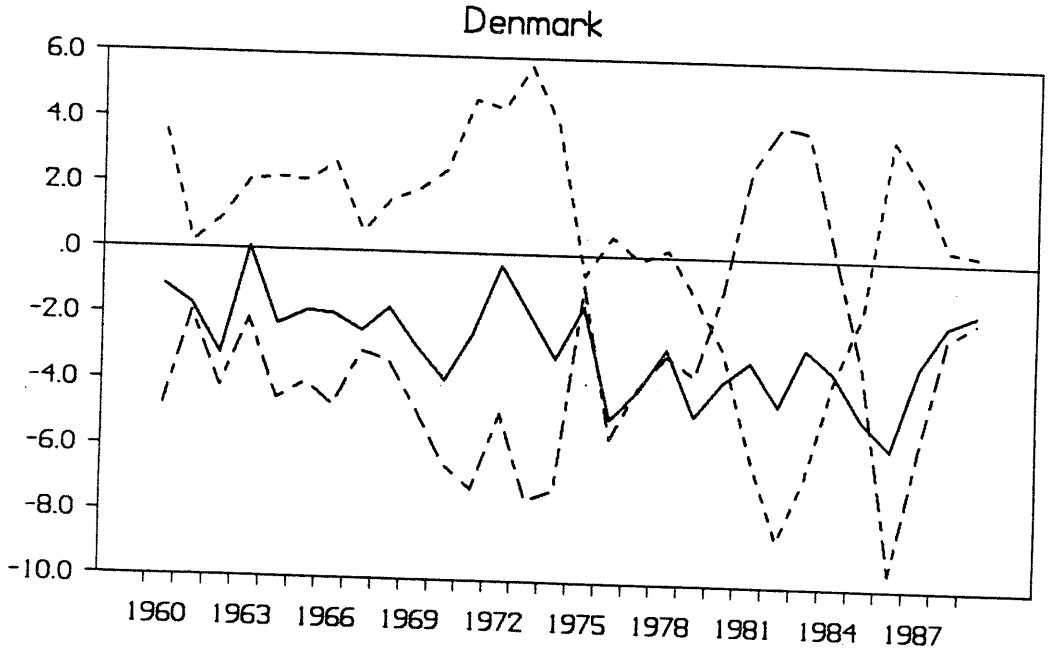
-2.0
-3.0
1960 1963 1966 1969 1972 1975 1978 1981 1984 1987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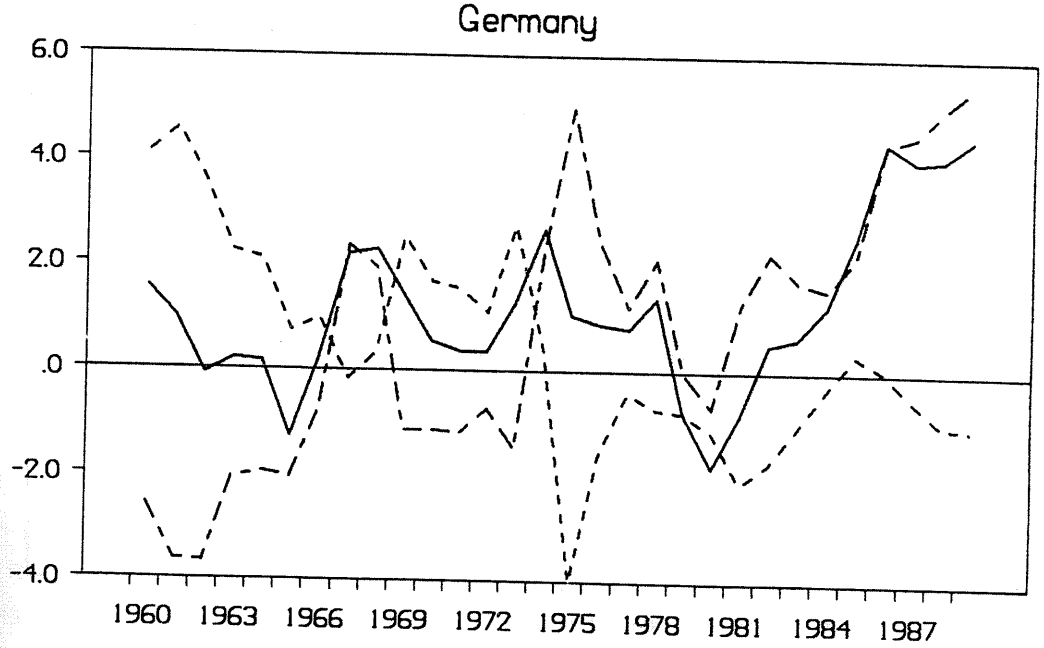
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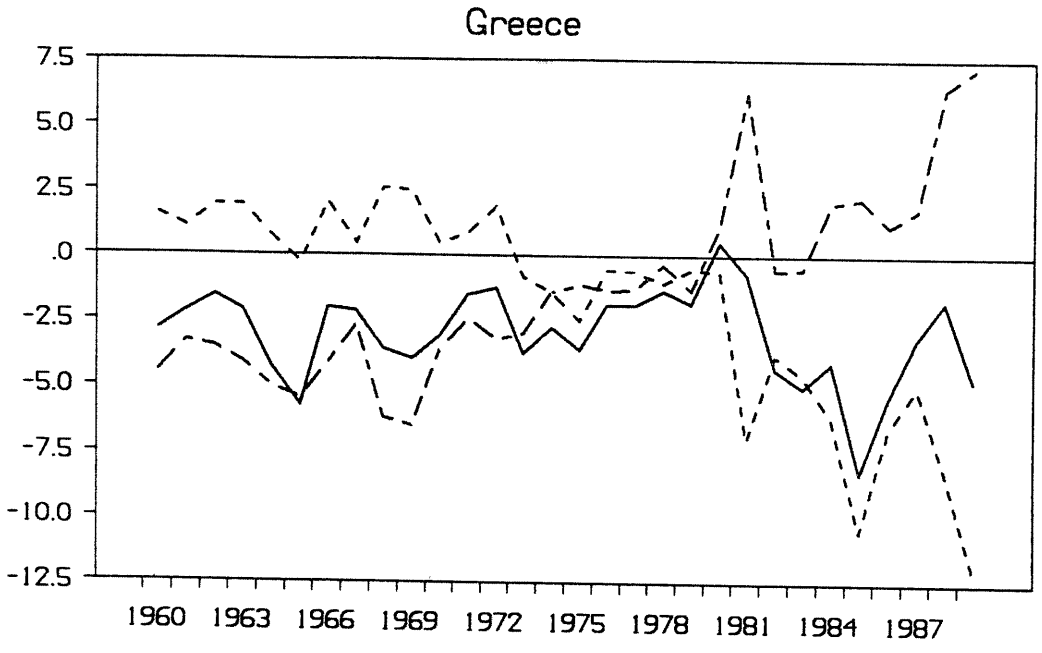
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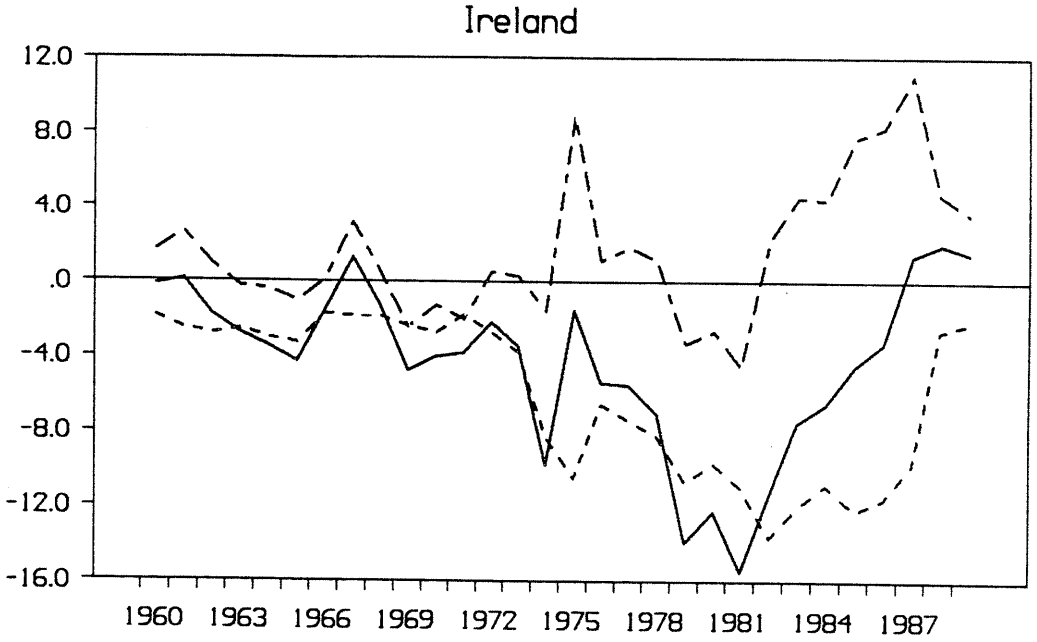
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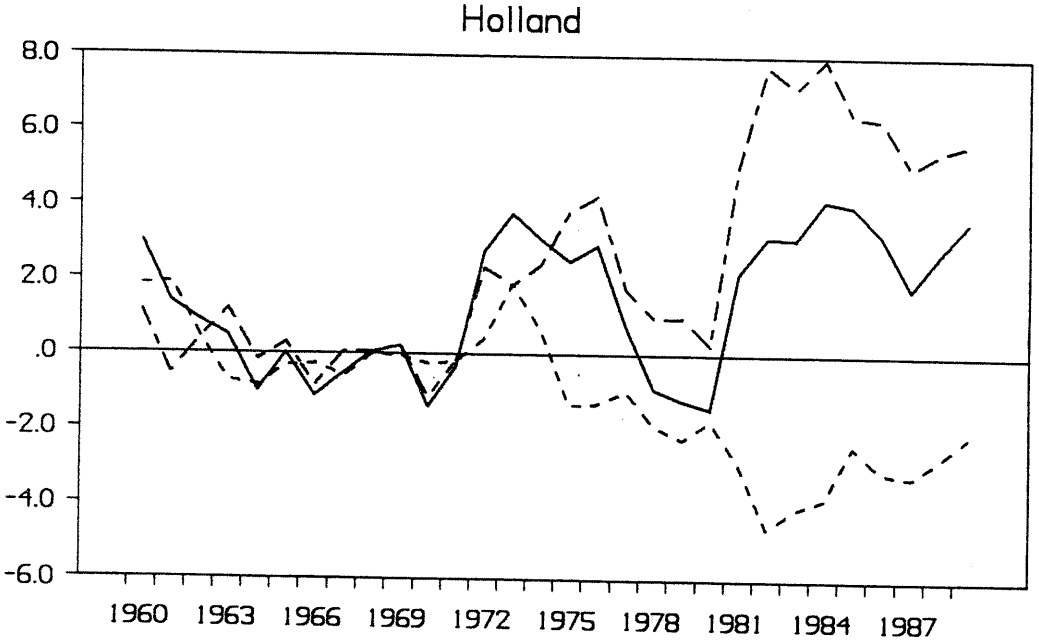
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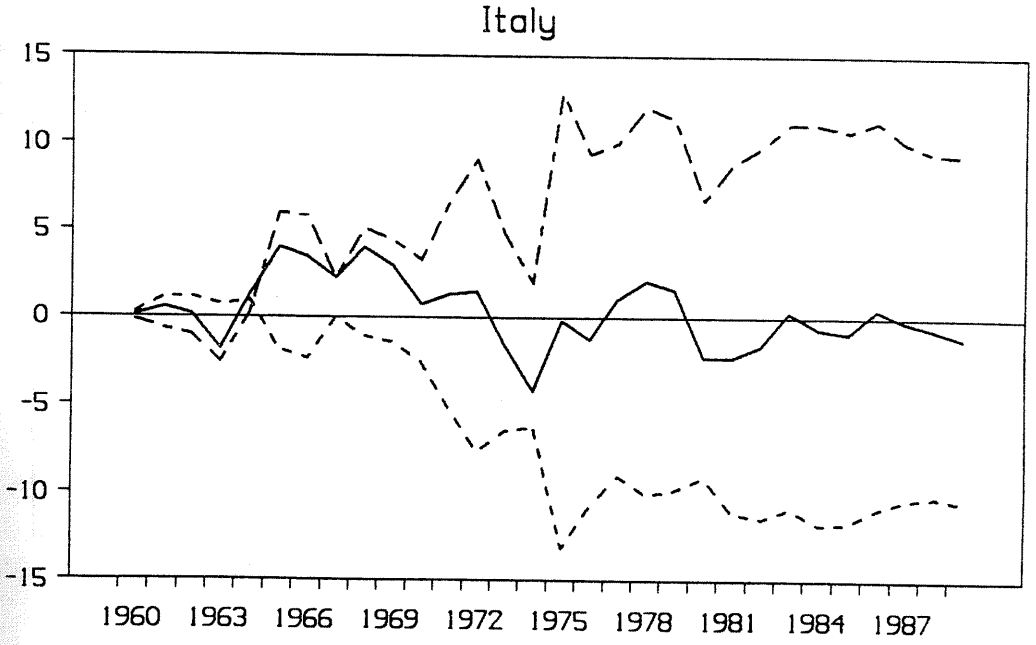
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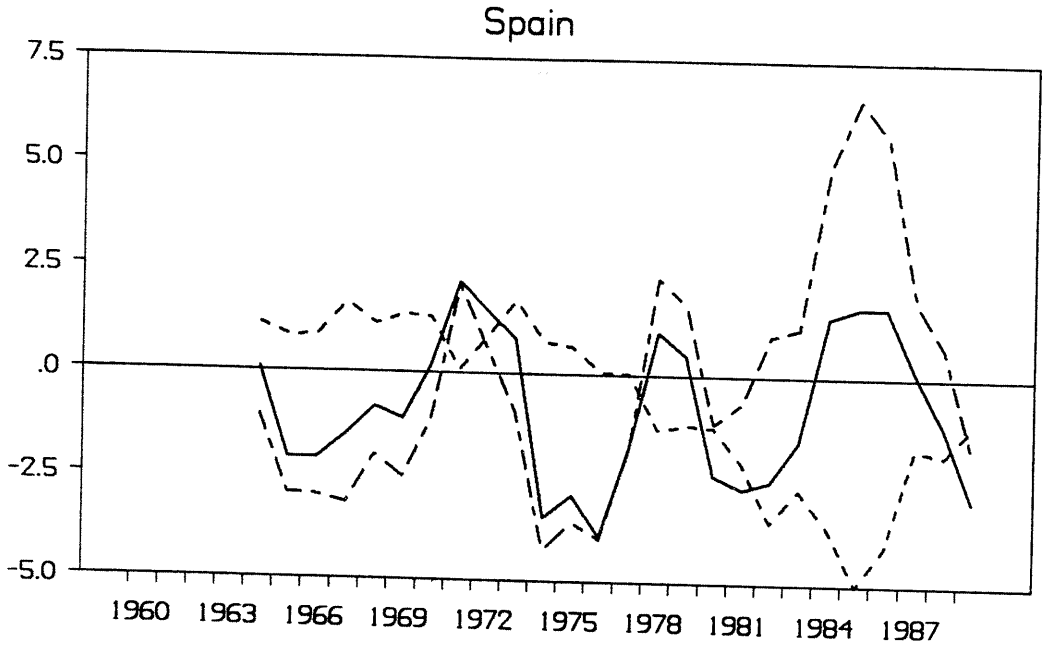
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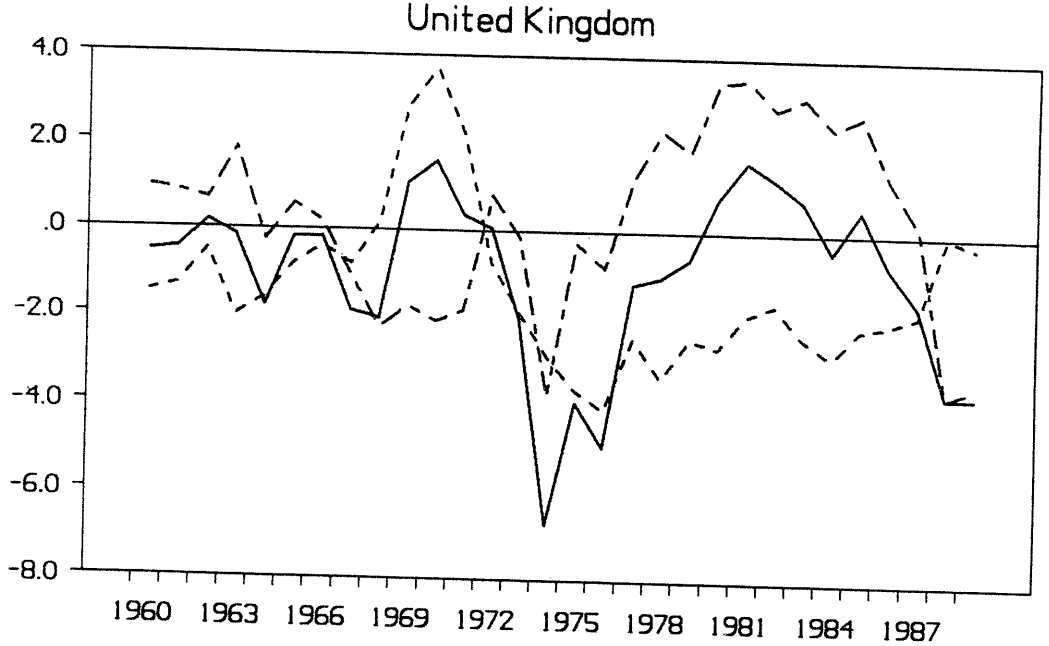
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987


United Kingdom
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1960
1963
1966
1969
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1981
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