BIS ECONOMIC PAPERS
No. 29 – October 1990

DEVELOPMENTS IN EXTERNAL AND INTERNAL BALANCES

A selective and eclectic review

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Introduction and overview.

"If Americans saved just two more pennies out of every dollar they earn, they would close the entire (balance of payments) gap and eliminate additional borrowing from foreigners."

M. Darby, Newsweek, January 8, 1990, p.43.

In a nutshell, the above quotation captures the essence of this paper, which attempts to analyse balance of payments developments from an external as well as a domestic perspective, with private sector saving playing a major role within the latter. However, the quotation is also slightly misleading as the relationship referred to exists only in an ex post accounting sense or under very restrictive ex ante conditions. Indeed, as the paper will show, when various interactions are taken into account, the trade-off between saving and the external account is well below unity.

There are essentially four ways of analysing balance-of-payments developments and they may be illustrated using the accounting identity:

$$EX-IM \equiv S-I \equiv Y-D \equiv F^{1}$$

* I am indebted to M. Dealtry, W. Fritz, M. Hutchison, J. Ramalho, M. Takeda, P. Turner and participants in a seminar held at the Institute of Economics, Aarhus University, Denmark for helpful comments on an earlier draft. I also wish to thank S. Arthur for the graphical work and H. Duffy for expert typing.

[1] Notation: EX = Exports of goods and services, IM = imports of goods and services, S = total gross saving, I = total gross investment, Y = total output, D = total domestic demand and F = net capital flows. All variables in current prices.

(i) *the trade approach,* which looks at EX and IM directly or in the form of net exports and takes as the primary determinants relative income and prices, including the real exchange rate;

(ii) *the saving-investment approach,* which analyses developments in domestic saving and investment (and in their components) and uses income, real interest rates, inflation, wealth and – in a few cases – the real exchange rate as the key determinants;

(iii) *the absorption approach,* which views EX-IM as the difference between output and total domestic demand and is implemented using a large-scale macroeconomic model. It can also take the form of analysing reduced-form aggregate supply and demand equations or sectoral developments with particular weight on the distribution between tradable and non-tradable goods;

(iv) *the capital flow approach,* which regards F as an exogenous variable or relates it to changes in the size and composition of international portfolios and then analyses how EX and IM adjust to a given change in F.

In this paper the absorption and capital flow approaches will not be pursued but various versions of the trade and the saving-investment approaches will be tested and then evaluated within a broad framework which attempts to reconcile the empirical results and the transmission channels implied.

The paper is divided into three main parts, under the headings "External approach", "Domestic approach" and "Reconciliation and conclusions" and each part contains several sections and sub-sections. Section A of Part I analyses some simple time series properties of the current external account (measured in % of GNP), using a sample of sixteen countries over the period 1960-89. This analysis serves essentially two purposes: (i) to determine the order of integration of the variable which the two approaches attempt to explain and (ii) to identify trends and/or possible structural shifts which need to be further explored in structural equations.

Section B turns to export and import equations and reconsiders a result already presented some twenty years ago (see Houthakker and Magee (1969)); viz. that the relative size of export and import demand elasticities differs significantly between countries. The extent to which such differences still exist and have affected countries' real growth performance is further explored in Annex I, whereas in sub-section (b) the trade equations and the corresponding empirical estimates are used in evaluating net exports with a view to explaining changes in the external accounts of the sixteen countries. The principal determinants in this sub-section, which constitutes the core of the external approach, are domestic and foreign demand growth and relative prices, measured by changes in real effective exchange rates and in the terms of trade.

Part II of the paper first reviews the main trends in domestic saving and investment along with various ways of linking current-account developments to changes in domestic saving and investment components and then focuses on two of them:

- a model proposed by Roubini (1988) which relates the current account directly to the public sector deficit and total investment. In the extreme case where the underlying assumptions of the model hold, balance-of-payments developments can be explained entirely by the two determinants, and the extent to which this has actually been the case is tested and discussed in sub-section (b);
- a second model (Turner (1986)) which looks at the behaviour of various saving and investment components and then derives balance of payments changes via the national accounting identity. The key determinants in this model are measures of the business cycle, income growth, inflation, interest rates, real effective exchange rates and the public sector borrowing requirement, with the latter serving both as a determinant of private saving and as a component of domestic financial balances. The implementation and evaluation of this model and the evidence can be found in sub-section (c).

Of the two 'domestic' models tested the second proves to be

the more satisfactory one and in Part III of the paper the key parameters and the associated changes in variables are compared with those obtained from the net export equations described above. The evaluation is based on contributions to balance-of-payments changes during 1980-89, with section (A) analysing developments in each of the sixteen countries separately. Section (B) then attempts to summarise the results and draw some general conclusions.

The empirical methodology applied throughout the paper is the two-stage approach recently proposed by Engle and Granger (1987). Essentially this involves estimating a long-run equation based on an underlying hypothesis, supplemented by an adjustment equation which determines the dynamic structure and the extent to which deviations from the long-run path are being corrected. To save space and facilitate the reading of the paper, the detailed estimation results are presented in Annex II, with only the key parameters in the text.[2] For the same reason, the tests undertaken to determine the order of integration of the variables are not given, except for the balance of payments. With a few exceptions, however, all the variables used in estimating the long-run equations were integrated of order 1 and thus satisfied the necessary condition for being co-integrated.[3]

[2] As a general rule variables for which the coefficient had the expected sign and a t-statistic of at least 1 are included in the annex tables. Cases where the coefficient had the "wrong" sign or an insufficient t-statistic are indicated by "–".

[3] The exceptions are the balance of payments for Belgium, which is integrated of order higher than 1, and the real effective exchange rate for Belgium, which is I (O).

I.
External approach

A. Balance-of-payments developments: Trends and adjustment patterns.

Developments in current external accounts (BoP, measured in % of GNP) over the period 1960-89 are shown in Graphs 1–4 in Annex II and Tables 1 and 2 present some statistical tests in an attempt to capture certain features of the time pattern and the convergence or adjustment properties. The model underlying the tables is entirely non-structural and based on three versions of a simple autoregressive relation:[4]

(i) $BoP_t = a + b\,BoP_{t-1}$ or (ia) $dBoP_t = a + (b-1)\,BoP_{t-1}$

(ii) $BoP_t = a + b\,BoP_{t-1} + ct$ or (iia) $dBoP_t = a + (b-1)\,BoP_{t-1} + ct$

(iii) $BoP_t = a + b\,BoP_{t-1} + ct + et^2$ or (iiia) $dBoP_t = a + (b-1)\,BoP_{t-1} + ct + et^2$

where t is time measured in years and d the first difference operator. The parameter b determines whether BoP converges as well as the speed of adjustment in the case of a smooth convergence path. The statistical tests attempt to identify for each country the likely size of b against the following a priori values:

$b > 1$: when BoP is non-stationary or integrated of order higher than 1 as an imbalance in year t-1 is followed by an even larger imbalance in year t;

$b = 1$: which is another case of non-stationarity with integration of order 1 (I(1)) and BoP following a random walk;

$0 < b < 1$: when BoP is stationary, as an imbalance in year t-1 is followed by a smaller imbalance in year t. The speed of convergence can be measured by the average lag (b/(1-b)) and the long-run equilibrium may be a constant (a/(1-b)) or follow a linear or quadratic time trend;

$-1 < b < 0$: where BoP is again stationary, but the adjustment process is one of damped oscillations and not smooth as in the previous case;

$b \leq -1$: when BoP is non-stationary, as the oscillations around the (hypothetical) long-run value are constant ($b = -1$) or continuously widening.

[4] For a similar analysis using trade balance data see Eichengreen (1989). Alternatively, one might use balance of payments data leaving out net interest payments, thereby excluding a trend component for countries with a rising foreign debt.

For the sixteen countries included in the sample a negative value for b was found in only one case (Denmark) and the key issues to be settled by the test were, therefore, whether b was significantly smaller than unity (or (b-1) significantly less than zero in the alternative versions of the equations) and whether the long-run values were stable or changing along a linear or quadratic time trend. The test results are given in Table 1, which for each country shows two lines of t-values for b-1, with the first line presenting the results for equations (ia) – (iiia) and the second line (in italics) those for the same equations estimated in first differences. From the results obtained the sixteen countries may be divided into four groups (see also Table 2):[5]

(a) In France and Spain BoP is a stationary process with average values of 0 and – 0.67 respectively and average adjustment lags of around six months.

(b) In a large group of countries including Australia, Austria, Denmark, Finland, Italy and Switzerland BoP is also stationary but only after including a quadratic trend. BOP for Denmark shows an oscillating adjustment pattern, but b is only marginally below zero. For most of the other countries the average lag falls in the range 0.2–0.3.

(c) In another group of countries comprising the United States, Japan, Germany, the United Kingdom, Canada, the Netherlands and Sweden the estimated t-values exceed the critical levels of the t-distribution but do not satisfy the more stringent requirements of the Dickey-Fuller test. Consequently the hypothesis that BoP follows a random walk or a random walk with drift is difficult to reject for these countries. For the same reason the average lags for the best-fitting equations (see Table 2) are longer than for countries in groups (a) and (b), and range from 0.6–0.7 years in Japan and Sweden to more than a year in

[5] In grouping the countries, we have used the Dickey-Fuller distribution as adjusted in Hylleberg and Mizon (1989).

Table 1
Results of stationarity tests

Countries	DF	ADF	DF*	ADF*	DF**	ADF**
United States	-0.8	-1.4	-2.0	-2.6	-2.2	-3.2
	-3.8	*-3.1*	*-3.8*	*-2.9*		
Japan	-2.1	-2.6	-2.8	-3.0	-2.7	-3.2
	-5.4	*-4.3*	*-5.3*	*-4.2*		
Germany	-1.2	-1.8	-1.9	-2.4	-2.1	-2.7
	-4.3	*-4.7*	*-4.4*	*-4.7*		
France	-4.1	-3.5	-4.1	-3.5	-4.0	-3.5
	-7.2	*-4.7*	*-7.1*	*-4.6*		
United Kingdom	-1.4	-2.3	-1.4	-2.1	-1.7	-2.2
	-4.3	*-3.5*	*-4.4*	*-3.6*		
Italy	-3.0	-3.1	-3.0	-3.1	-3.2	-3.5
	-5.7	*-4.9*	*-5.6*	*-4.8*		
Canada	-2.4	-1.9	-2.4	-1.9	-2.8	-2.3
	-6.1	*-3.9*	*-6.3*	*-4.1*		
Australia	-2.8	-1.7	-3.4	-2.8	-3.9	-2.8
	-8.0	*-5.5*	*-8.0*	*-5.4*		
Austria	-3.1	-3.4	-3.2	-3.4	-3.5	-4.0
	-5.5	*-7.2*	*-5.4*	*-7.1*		
Belgium	-1.6	-1.5	-1.5	-1.5	-1.5	-1.4
	-5.2	*-2.9*	*-5.1*	*-2.8*		
Denmark	-3.8	-2.9	-4.3	-3.4	-4.8	-4.2
	-7.6	*-6.4*	*-7.6*	*-6.3*		
Finland	-3.0	-4.2	-2.9	-4.1	-2.9	-4.2
	-4.5	*-5.1*	*-4.4*	*-5.0*		
Netherlands	-2.2	-2.6	-2.6	-3.2	-2.4	-3.1
	-4.3	*-3.9*	*-4.2*	*-3.8*		
Spain	-3.0	-3.8	-2.9	-3.7	-2.7	-3.7
	-4.1	*-3.4*	*-4.0*	*-3.2*		
Sweden	-2.9	-2.2	-3.4	-2.6	-3.3	-2.5
	-7.0	*-4.5*	*-6.9*	*-4.4*		
Switzerland	-1.7	-2.5	-2.3	-3.4	-3.3	-3.8
	-4.6	*-4.1*	*-4.5*	*-4.1*		

Note: Figures given in the table refer to t-ratios for the parameter (b-1) in the following equations:

DF $dBoP_t = a + (b-1)\, BoP_{t-1}$

DF* $dBoP_t = a + (b-1)\, BoP_{t-1} + ct$

DF** $dBoP_t = a + (b-1)\, BoP_{t-1} + ct + et^2$

with the ADF-ratios corresponding to the same three equations, augmented by the lagged dependent variable.

Germany, the United Kingdom and Canada. Although the equations need to be differenced once before the hypothesis of non-stationarity can be rejected, it is, nevertheless, of interest to

Table 2
Best-fitting level equations
(ranked according to t-ratios of previous table)

Countries	C	BoP_{t-1}	t	t^2	Average lag	Sign change of slope	Sign change of BoP
Denmark	-1.16	-1.06	-0.1647	0.0024	–	–	–
Finland	-1.36	-0.83	-0.1236	0.0038	0.20	1976 (-+)	–
France	–	-0.69	–	–	0.45	–	–
Austria	1.44	-0.86	-0.2497	0.0070	0.16	1978 (-+)	1968 (+-)
Australia	-2.64	-0.83	0.2566	-0.0113	0.20	1971 (+-)	–
Switzerland	-2.26	-0.65	0.3530	-0.0060	0.54	1989 (+-)	1965 (-+)
Spain	-0.44	-0.60	–	–	0.67	–	–
Italy	1.30	-0.77	-0.0937	0.0010	0.30	–	1973 (+-)
Sweden	0.38	-0.62	-0.0550	–	0.61	–	1967 (+-)
Netherlands	-0.28	-0.50	0.0591	–	1.00	–	–
Japan	0.91	-0.58	-0.1220	0.0055	0.72	1971 (-+)	–
United States	–	-0.51	0.0803	-0.0045	0.96	1969 (+-)	1978 (+-)
Canada	-0.66	-0.49	0.0407	-0.0018	1.04	1971 (+-)	–
Germany	0.68	-0.45	-0.0931	0.0042	1.22	1971 (-+)	–
United Kingdom	0.11	-0.40	–	–	1.50	–	–
Belgium	–	-0.17	–	–	4.88	–	–

Note: Dependent variable is $dBoP_t$.

consider the countries ranked according to the best-fitting level equations. From Table 2 three sub-groups can be distinguished:
- the United Kingdom, for which BoP is trendless, with a long-run value near zero, but a slow speed of adjustment;
- the Netherlands and Sweden, where BoP fluctuates around a linear trend, which is positive for the Netherlands and negative for Sweden;
- the United States, Japan, Germany and Canada with the best-fitting equation found for a quadratic time trend. For the United States the slope of the trend becomes negative in 1969 and the long-run value of BoP turns negative in 1978. In Japan and Germany, on the other hand, the long-run value of BoP is positive throughout the period and the slope turns positive as well in 1971. In Canada the slope already becomes negative in 1971 and long-run BoP is negative for all of 1960-89.

(d) Belgium is in a group of its own, with stationarity clearly rejected and even the equation in first differences not yielding particularly high t-values for the ADF-test. Non-stationarity is also indicated by the best-fitting level equation in that the average adjustment lag attains almost five years.

Looking at the results across the four groups of countries and attempting to draw some *tentative* conclusions, it is not too surprising that in no case was b significantly negative, let alone smaller than -1. After all, sudden reversals of external imbalances may be induced by drastic policy changes or external shocks, but the external account rarely displays a regular pattern of sign changes from one year to the next. Looking at Graphs 1-4, it was also to be expected that positive or negative trends would be identified in a number of countries, although the reasons for such trends need to be explained in terms of the determinants of the underlying export and import equations and/or by domestic saving and investment behaviour. At the same time, and particularly considering the policy importance of achieving a balanced external account, it is somewhat surprising to find that for so many countries BoP is only a stationary process in first differences. This could result from very long lags in the underlying export and import functions but could also be due to lags or other special features in the behaviour of saving and investment. These issues as well as the trends in the long-run current account will be further analysed in the following sections, where we turn to more structurally based relationships.

B. Balance-of-payments developments: Structural features.

(a) Trade equations and the 45°-rule.

Most empirical estimates of export and import equations are made on the assumption that exports and imports are imperfect substitutes for domestic goods and services and rely on the

following two equations in describing country i's trade with the rest of the world:[6]

(i) $M_i = f(DD_i, P_i, P_mE)$ and
$X_i = g(DD_w, P_w, P_x/E)$

where M_i = volume of imports by country i
X_i = volume of exports from country i
DD_i = domestic demand in country i, in current prices
DD_w = domestic demand in the rest of the world, in current prices
P_i = domestic demand deflator in country i
P_w = domestic demand deflator in the rest of the world
P_m = import prices measured in the currency of the rest of the world
P_x = export prices measured in the currency of country i
E = exchange rate measured in units of country i's currency and approximated by the effective exchange rate.

Assuming further that the two equations are homogeneous of degree zero in nominal income and prices and can be approximated by a log-linear specification, (i) can be rewritten as:

(ii) $m_i = a_1\, dd_i + a_2\,(p_i - (p_m + e))$
$x_i = a_3\, dd_w + a_4\,(p_w - (p_x - e))$ with $a_i \geq 0$ for $i = 1..4$.

Small letters are used to denote logs and in the case of dd,m and x also denote variables in real terms. Differentiating the two equations with respect to time and denoting percentage rates of change by '^' (ii) becomes:

(iii) $\hat{m}_i = a_1\, \hat{dd}_i + a_2\,(\hat{p}_i - \hat{p}_m - \hat{e})$
$\hat{x}_i = a_3\, \hat{dd}_w + a_4\,(\hat{p}_w - \hat{p}_x + \hat{e})$

If the current external account is initially in equilibrium, maintenance of equilibrium requires $\hat{m}_i + \hat{p}_m = \hat{x}_i + \hat{p}_x - \hat{e}$ or:

(iv) $(a_3\, \hat{dd}_w - a_1\, \hat{dd}_i) = a_2\,(\hat{p}_i - \hat{p}_m - \hat{e}) - a_4\,(\hat{p}_w - \hat{p}_x + \hat{e}) + \hat{p}_m - \hat{p}_x + \hat{e}$

[6] See Goldstein and Khan (1985).

On the further assumption that $\hat{p}_i = \hat{p}_x$ and $\hat{p}_m = \hat{p}_w$, (iv) can be simplified to:

(v) $(a_3 \hat{dd}_w - a_1 \hat{dd}_i) = (a_2 + a_4 - 1)r\hat{e}r$

where REER is the real effective exchange rate measured as $P_i/(P_wE)$ or $P_x/(P_mE)$.[7]

The left-hand side of (v) may be restated as:

(vi) $\hat{dd}_i/\hat{dd}_w = a_3/a_1$ or $\hat{dd}_i = \hat{dd}_w a_3/a_1 = \hat{dd}^*$

with $\hat{dd}^*$ to be interpreted as the "warranted rate" of domestic demand growth, i.e. the rate of 'home' DD growth consistent with external balance and real exchange rate stability. Recalling that a_3 and a_1 are the income elasticities of exports and imports, $a_3 > a_1$ implies that country i can grow faster than the rest of the world without encountering any external problems. By contrast, for $a_3 < a_1$ country i will have to keep domestic demand growth below that of the rest of the world to avoid a rising external deficit and/or a depreciating real exchange rate.[8] In both cases satisfaction of (vi) implies that in a graph with actual and warranted demand growth measured along the two axes, $\hat{dd}_i$ and $\hat{dd}^*$ would be close to the 45°-line (see Krugman op. cit.).

Table 3 shows estimates of the trade elasticities, using national accounts data for the period 1960-89 and the two-step procedure proposed by Engle and Granger (1987). Annex I presents details of the estimates as well as various tests and evaluations of the 45°-rule. The income elasticities largely confirm the main findings of the literature: the United States[9] and the United

[7] I.e. $r\hat{e}r > 0$ implies a deterioration in country i's competitive position; see also Krugman (1988b) and Thirlwall (1979).

[8] Assuming that the Marshall-Lerner condition holds; i.e. that: (i) $a_2 + a_4 \geq 1$, (ii) the supply curves for exports and imports are horizontal, (iii) exchange rate changes are fully reflected in export and import prices, and (iv) the balance of payments is initially in equilibrium (as stated earlier).

[9] One exception to this general finding is Helkie and Hooper (1988), who include measures of relative supplies in US trade equations and find export and import elasticities of about the same size.

Table 3
Long-run trade elasticities[1]

Countries	Relative prices[2]			Domestic demand[3]		
	$e_{X,RP}$	$e_{M,RP}$	Sum	e_{X,DD_w}	$e_{M,DD}$	Ratio
United States . . .	-0.52	-0.15	-0.67 (-0.80)	1.25	2.00	0.63 (0.72)
Japan	-0.69	-0.23	-0.92 (-0.55)	4.00	1.25	3.20 (2.17)
Germany	-0.18	–	-0.18 (-0.29)	1.98	2.00	0.99 (1.04)
France	-0.40	-0.08	-0.48 (-0.65)	2.16	1.89	1.09 (1.17)
United Kingdom .	-0.03	–	-0.03 (-0.35)	1.42	1.83	0.78 (0.73)
Italy	-0.48	-0.32	-0.80 (-0.35)	2.09	1.58	1.32 (1.28)
Canada	-0.24	-0.53	-0.77 (-0.63)	2.00	1.47	1.36 (1.05)
Australia	-0.30	–	-0.30 (-0.52)	1.33	1.23	1.08 (1.61)
Austria	–	-0.34	-0.34 (-0.73)	2.20	1.85	1.19 (1.47)
Belgium	–	–	– (-0.47)	1.89	1.82	1.04 (1.04)
Denmark	-0.58	-0.12	-0.70 (-0.37)	1.49	1.48	1.00 (1.33)
Finland	-0.25	-0.07	-0.32 (-0.59)	1.83	1.37	1.35 n.a.
Netherlands	–	-0.02	-0.02 (-0.45)	1.95	1.78	1.10 (0.89)
Spain	-0.52	-0.25	-0.77 (-0.65)	2.96	1.89	1.57 n.a.
Sweden	-0.45	-0.81	-1.26 (-0.64)	1.55	1.67	0.93 (1.24)
Switzerland	–	-0.95	-0.95 (-0.45)	1.47	1.38	1.07 (0.78)
Average	-0.29	-0.24	-0.53 (-0.54)	1.97	1.66	1.23 (1.25)

[1] For details see Annex I, Table 1.
[2] Figures in brackets are the sum of short-term price elasticities; see Annex I, Table 2.
[3] Figures in brackets are taken from Goldstein and Khan (1985).

Kingdom have low elasticity ratios (in both cases reflecting a low export elasticity combined with a high import elasticity), while Japan is at the other extreme, largely due to a very high export elasticity.[10] For Germany the ratio is estimated near unity, while Canada, France and Italy appear to be more favourably placed. For some of the smaller countries the ratios deviate rather markedly from earlier consensus estimates. Thus for Switzerland and the Netherlands the ratio is estimated at around one, whereas

[10] If foreign trade depends on specialisation combined with increasing returns to scale rather than comparative advantages, the estimated income elasticities or the slopes of the export or import demand curves will be influenced by the number of internationally traded goods. The latter, in turn, may depend on relative growth rates, thus explaining why countries with relatively rapid growth also tend to have a favourable elasticity ratio. For further discussion of this point, see Krugman op. cit.

for Sweden, Australia, Austria and Denmark, our estimates may be on the low side. On average, however, the use of national accounts as opposed to trade data seems to leave only a marginal effect on the ratio.

By contrast, the long-run price elasticities are in many cases sharply different from those reported elsewhere. A common finding in the literature is that the Marshall-Lerner condition is satisfied, whereas in Table 3 it holds for only one of the sixteen countries and in two cases neither exports nor imports appear to be influenced by relative price changes.[11] For some countries with low price elasticities, the short-run coefficients obtained from the error correction (EC) equations are considerably higher but the sum of the elasticities still remains below unity and on average there is virtually no difference between the short and long-run elasticities. Hence the estimates appear to support those theories which state that countries cannot rely on real exchange rate changes to improve their external position.[12]

At the same time, from the evidence given in Annex I, it is difficult to find support for the aforementioned 45°-rule and for using it as a point of departure in explaining short- to medium-term balance of payments developments.

(b) Balance-of-payments equations

Consequently, for the following analysis we have "reversed" the 45°-rule and applied dd and dd_w as variables in explaining

[11] One reason for this result could be that services are less price-sensitive than goods and thus lower the average price elasticity of foreign trade. However, the estimates reported by Barrell and Wren-Lewis (1989) for the G-7 countries do not support this hypothesis.

[12] It cannot be excluded that the relative price variables used are subject to measurement errors and the estimated coefficients therefore biased towards zero. Furthermore, the general lag structure may be too short. Thus in estimating correlations between changes in relative wages and the goods and services balance relative to GNP for seventeen countries over the period 1948–85, Paldam (1990) found for most countries a peak after three to four years.

changes in the external account. Initially, the data given in Annex I, Table 3 were used in regressing changes in BoP on dd-dd*, REER, and the terms of trade (ToT) across countries but except for the 1960s this produced very poor results. The regression was particularly poor for the 1980s and it is evident that cross-country regressions on period averages lose too much information by ignoring dynamic structures.

As a second approach, balance of payments equations were estimated on time series data for each of the sixteen countries, again using the Engle-Granger procedure in identifying long-run trends as well as the short-run adjustment patterns.[13] As regards the choice of explanatory variables, it may be recalled that the export and import equations discussed above were specified (in logs) as:

$$m = a_1\, dd - a_2\,(p_m + e - p) \text{ and}$$
$$x = a_3\, dd_w - a_4\, reer$$

Subtracting m from x and converting into current prices for exports (ex) and imports (im) then gives:[14]

$$ex - im = a_3\, dd_w - a_1\, dd - a_4\, reer + a_2\,(p_m + e - p) + p_x - p_m - e$$

or by setting $p = p_x$:

$$ex - im = a_3 dd_w - a_1\, dd - a_4\, reer + (1 - a_2)tot$$

with $tot = p_x - p_m - e$. On the assumption that the principal determinants of EX/IM are also the principal determinants of

[13] Instead of estimating balance of payments equations directly, the implicit behavioural parameters could be derived from the trade equations plus certain assumptions with respect to firms' price-setting behaviour. On this point see Barrell and Wren-Lewis op. cit. who present trade balance coefficients for the G-7 countries, using elasticities obtained from disaggregated trade volume and price equations.

[14] dd and dd_w could also be combined into one variable as a_1 (dd* – dd), but the implied restriction was only satisfied in a few cases.

BoP, though with proportionally smaller impact coefficients,[15] an equation for BoP may finally be obtained by adding an intercept term and a stochastic error term:

(vii) $BoP_t = a_0' + a_3' dd_{w,t} - a_1' dd_t - a_4' reer_t + (1 - a_2)'tot_t + \varepsilon_t$

with the following expected values for the parameters:

a_0' and $(1-a_2)' \lesseqgtr 0$, and a_1', a_2', a_3' and $a_4' \geq 0$.

Equation (vii) may be interpreted as the long-run path of BoP,[16] but for mainly two reasons[17] it cannot be estimated directly using OLS:

- one condition for using OLS is that the error term is stationary, and this will not be satisfied if the variables included in (vii) do not have the same order of integration. As already shown in Table 1, BoP in most countries is generated by an I(1) process (or an I(O) process with drift) and ε will, therefore, only be stationary if the three explanatory variables are also I(1) (or less) and together with BoP form a set of co-integrated variables.

[15] Differentiating EX/IM gives:

$(dEX\ IM - dIM\ EX)/IM^2 = (dEX - dIM\ (EX/IM))/IM = dBOP/IM$

when the current account (BOP) is approximately in balance. Hence:

$$dBoP = d(BOP/GNP) = \frac{dBOP}{GNP} - \frac{dGNP}{GNP} \cdot \frac{BOP}{GNP} \cong d(EX/IM)\ IM/GNP.$$

Thus the impact coefficients in (vii) will approximate those of the previous equation multiplied by the average trade share.

[16] The long-run path should not be interpreted as an equilibrium or target path; it merely gives the value BoP will eventually attain given current developments in relative demand and prices.

[17] These are not the only problems. In particular, since REER is measured as relative unit labour costs (ULC/ULC_wE), it will be identical to the terms of trade if $P_x = ULC$ and $P_m = ULC_w$. In this case, the two relative price terms may be combined into one variable with the coefficient $-a_4' + (1 - a_2)'$, which will be negative (positive) when the Marshall-Lerner condition is (is not) satisfied. However, the assumptions (one of which is the "law of one price") under which REER = ToT are quite restrictive and usually not satisfied in practice. Hence REER and ToT have been entered as separate variables and, as will be seen below, they were usually not so strongly correlated as to preclude the estimation of individual coefficients.

As a first step the order of integration of the three independent variables was determined, and, except for REER in Belgium, the assumption of an I(1) process could not be rejected. To save space, these tests are not reported and we merely show the outcome of the stationarity test applied to the estimated error term ($\bar{\varepsilon}$) from the co-integration equation;

- secondly, since (vii) is a static equation and does not allow for any short-run dynamics or adjustments, the residuals are likely to be highly autocorrelated so that '$\bar{\varepsilon}$' does not satisfy the conditions for a "white noise" variable. Consequently, as a second step (vii) was estimated in first-difference form, including $\bar{\varepsilon}_{-1}$ from the first-stage equation, to see whether the short-run adjustments contain a correction of deviations from the long-run path:

(viii) $dBoP = a_0'' + a_3'' d(dd_w) - a_1'' d(dd) - a_4'' d\,recr + (1 - a_2)''\,dtot + a_5''\bar{\varepsilon}_{-1} + \gamma.$

The expected signs for the parameters a_1'' to a_4'' are similar to those for the static equation and if the short-run adjustment corrects past deviations a_5'' should be negative, with the absolute size of a_5'' indicating the proportion corrected within one observation period.[18]

The estimate for (vii) (the co-integration or CI equation) are given in Annex II, Table 1, with the last two columns showing the highest t-values for $\bar{\varepsilon}$ subjected to the DF or the ADF-test. The results for equation (viii) (the error correction or EC equation) are presented in Annex II, Table 2, with the error correction term denoted by ECM_{-1}. Finally, Table 4 below combines the key parameters for each country, with the principal results as follows:

- as would be expected the DW-statistics of the CI equations are quite low[19] and the coefficients are of the right sign with relatively high t-statistics, though the latter should be interpreted carefully

[18] Assuming that $a_5'' > -1$. For $-1 > a_5'' > -2$ the adjustment path is one of damped oscillation.

[19] However, in all cases they satisfy the minimum condition proposed in Bhagawa (1986).

Table 4

Balance-of-payments equations: Short and long-term parameters

Countries	DD_w		DD		REER		ToT		ECM_{-1}	R^2
	LT	ST	LT	ST	LT	ST	LT	ST	ST	ST
United States . . .	0.11	0.14	-0.19	-0.20	-0.03	-0.02	0.01	0.04	-0.86	0.82
Japan	0.47	0.41	-0.18	-0.16	-0.10	-0.08	0.03	0.05	-0.98	0.77
Germany	0.47	0.48	-0.47	-0.51	-0.03	-0.03	0.08	0.17	-0.92	0.85
France	0.12	0.26	-0.11	-0.22	-0.04	-0.07	0.05	0.11	-0.23	0.76
United Kingdom .	0.22	0.10	-0.32	-0.25	–	-0.01	0.20	0.24	-0.64	0.78
Italy	0.34	0.31	-0.29	-0.31	-0.13	-0.06	0.12	0.18	-0.46	0.78
Canada	0.23	0.32	-0.20	-0.33	-0.03	-0.04	0.12	0.15	-0.25	0.44
Australia	0.38	0.29	-0.39	-0.35	–	-0.03	0.09	0.10	-0.53	0.67
Austria	0.25	0.15	-0.24	-0.36	-0.05	-0.07	–	0.20	-0.64	0.72
Belgium	0.22	0.25	-0.22	-0.27	-0.04	-0.06	0.36	0.33	-0.39	0.65
Denmark	0.22	0.16	-0.26	-0.26	-0.03	-0.05	0.16	0.19	-0.93	0.73
Finland	0.18	0.15	-0.16	-0.37	-0.03	-0.09	–	–	-0.28	0.57
Netherlands	0.15	0.27	-0.11	-0.26	-0.09	-0.12	0.05	0.19	-0.62	0.40
Spain	0.35	0.43	-0.24	-0.36	-0.10	-0.07	0.08	0.12	-0.43	0.74
Sweden	0.06	0.05	-0.06	-0.05	-0.10	-0.09	0.23	0.20	-0.89	0.69
Switzerland	0.35	0.26	-0.45	-0.52	-0.11	-0.09	0.29	0.27	-0.44	0.71

Note: LT refers to the coefficients given in Annex II, Table 1 and ST to those in Annex II, Table 2.

in an equation of this nature. However, the R^2s and the t-ratios for the stationarity tests are in several cases rather low and according to the minimum criteria for the multi-variate case (see Engle and Yoo (1987)) co-integration at the 1% significance level is accepted for only five countries, with the number of "acceptable cases" increasing to seven for a significance level of 5%. The most satisfactory results are obtained for the three largest countries whereas the CI-equations are rather poor for France, Italy, Canada and Austria. Moreover, for the Netherlands acceptable results could be obtained only by the addition of a dummy variable for the mid-1970s and for Finland and Sweden a dummy variable was added for the 1980s. In the case of the Netherlands the dummy may serve as a proxy for the rise in gas and oil prices,[20] while for the other two countries it is merely an ad hoc correction for unexplained shifts;

[20] Similar problems were encountered in estimating the trade equations (see Annex I).

- all EC-equations produced a negative coefficient for the ECM-term and for thirteen countries it was also statistically significant. The speed of adjustment is highest in Japan, Germany and Denmark, where deviations from the long-run trend are almost entirely corrected within one year. By contrast, with the exception of Austria, the speed of adjustment is rather low in those countries for which the CI-equations were problematic. All in all, the fit of the EC-equations is satisfactory, with eleven countries showing R^2s of .7 or more and only two countries one of less than .5;
- although not shown in the table it is interesting to compare the EC-equations with those obtained when the ECM-term was dropped from the specification. For most countries the parameters were only marginally affected by the addition of the ECM-term, suggesting that the error correction mechanism is largely orthogonal to the other variables. Moreover, including the ECM-term generally produced a more satisfactory residual pattern, underlining the importance of including level variables as opposed to relying on a simple first-difference equation;
- the ratios of the demand coefficients in Table 4,[21] are generally smaller[22] than those shown in Table 3 and in some cases (Japan, Italy, Canada, Finland, Denmark and Switzerland) considerably so. This suggests that certain of the assumptions made in basing the 45°-rule on trade volume elasticities do not hold and that some of the volume changes, which have been associated with changes in demand, are actually due to relative price changes. For some countries (the United Kingdom, Austria, Denmark, Finland and Switzerland) the short-run coefficients with respect to DD_w are relatively small. However, except for Denmark, this

[21] The coefficients are semi-elasticities and thus influenced by the size of BoP. Using average BoP values, the elasticities with respect to changes in DD for the United States, Japan and Germany would be 0.37, 0.51 and 0.39 respectively.

[22] The major exception is the Netherlands, but this may be a result of the problems encountered in finding a satisfactory CI-equation.

may be explained by the inclusion of a positive intercept term (see Annex II, Table 2);[23]

- the REER coefficients all have the expected negative sign and are significant for abour half the countries.[24] The ToT coefficients are all positive and significant for eleven (fourteen in the case of the EC-equations) countries. The impact of terms-of-trade changes is generally largest for the smaller countries, though for Austria and Finland it was difficult to find any significant effect.[25] Looking at the sum of the long-run price coefficients, the Marshall-Lerner condition appears to be satisfied for the United States, Japan, Italy, Austria, Finland, the Netherlands and Spain. Some of these countries also came close to satisfying this condition using the trade elasticities (see Table 3), but the relationship is by no means a close one and the identification of price elasticities remains a fundamental weakness of the whole approach.

Nonetheless, the estimated coefficients together with actual developments in the explanatory variables have been used in calculating contributions to changes in BoP and these are shown in Part III, Table 7, for the 1980s, using the parameters of the EC-equations. We shall discuss these calculations in the context of comparable contributions estimated from domestic factors as discussed below in Part II.

[23] Since in all cases dBoP is an I(O) process, the intercept term may be assumed to capture the effect of trend growth in foreign demand. See also the discussion in Annex I.

[24] The results for Belgium are difficult to explain. As noted earlier BoP for Belgium is highly non-stationary while REER is I(O). Yet REER was only significant when both the current and the lagged values were included.

[25] The absence of significant terms-of-trade effects in both equations for Finland may be related to the large share of barter trade with the Eastern Bloc, for which implicit prices are set with a view to smoothing out bilateral imbalances.

II.
Domestic Approach

A. Saving-investment balances: Overview

There are several approaches to exploiting developments in domestic saving-investment balances in analysing movements in the current external account, which may be illustrated by various decompositions of the accounting identity:

$$BoP \equiv S-I \equiv S_p - I_p + S_g - I_g \equiv S_c - I_c + S_h - I_h + S_g - I_g$$

All variables are measured in percentages of GNP/GDP and the subscripts refer to specific sectors with p = private sector, h = household sector, c = corporate sector and g = government sector. When using the identity for analytical work there are some problems concerning inventories, which belong to I_p but are often treated as a separate item because of their erratic behaviour. It is also debatable whether public enterprises should be included under the corporate or the public sector, and for those countries where the national accounts include a statistical discrepancy one needs to decide whether it should be left as a separate item, distributed among individual components or included entirely in one of the saving or investment components.

The analytical approaches most often encountered in the literature may be grouped as follows:[26]

(a) Linking various components on the domestic side and deriving the implications for BoP:

- S and I (Feldstein and Horioka (1980))

[26] An alternative grouping is found in Helliwell (1990). Some readers might wish to view the issues discussed below in terms of a simple Mundell-Fleming model with flexible exchange rates and capital movements either subject to control or flexible. In the former case, a fiscal expansion would induce a depreciation of the exchange rate large enough to close the import gap, so that the ratio between changes in the current account and in the public sector balance would be zero. By contrast, with perfect capital mobility and static exchange rate expectations, there is a 1:1 ratio between changes in the two balances.

- S_p and I_p (Bayoumi (1989) Artis and Bayoumi (1989) and Summers (1988))
- $(S_g - I_g)$ and $(S_p - I_p)$ or S_g with S_p (Barro (1974 and 1989)).

(b) Linking BoP to domestic components and identifying the main determinants of BoP:

- I (Sachs (1981 and 1983))
- $S_g - I_g - I_p$ (McKinnon (1981) and Roubini (1988))
- $S_g - I_g$ (New Cambridge School and Eichengreen (1989)).

(c) Analysing the behaviour of domestic saving-investment components and deriving BoP changes through the accounting identity:

- S_p, I_p and $(S_g - I_g)$ (Akhtar (1989))
- S_c, I_c, $(S_g - I_g)$ and $(S_h - I_h)$ (Turner (1986) and (1988)).

We shall consider each of these approaches in more detail below, but as a starting point it is useful to look at the broad trends in gross saving and investment (See also Dean at al. (1989), Aghevli et al. (1990) and Bosworth (1990)). These are shown for total saving and investment in Graphs 5–12 and for private saving and investment in Graphs 13–20, with public sector saving and borrowing requirements shown separately. Generally, both saving and investment ratios tended to peak in the early 1970s and for most countries the ratios of the 1980s are below those of the 1960s.[27] There are, however, some notable differences in the relative changes in saving and investment:

- in countries with a negative external account in the 1980s a typical feature has been a steep fall in both saving and investment in the early 1980s, followed by a recovery which was more pronounced for investment than for saving. This pattern can be observed in Canada, Australia, Denmark, Finland and Sweden. In the United States the recovery period was very brief, with saving as well as investment declining from 1984. The United

[27] Measured net of depreciation, the declines have been even sharper. This may be important for potential growth rates, but does not directly affect balance-of-payments developments. The following will rely on gross flows, which are also less influenced by measurement errors.

Kingdom recorded a large external surplus in the early 1980s as a result of very low investment, but subsequently moved substantially into deficit due to a marked rise in investment combined with stagnant or falling saving;

- by contrast, in Japan and Germany, as well as in some continental European countries such as the Netherlands, Belgium and Switzerland, investment initially fell far more than saving, whereas the recovery has been more pronounced for saving than for investment. Until 1987 Spain also belonged to this group, but the recent upturn on investment has clearly outpaced that in saving;
- in France, Italy and Austria saving and investment have largely moved in parallel and thus been neutral with respect to the external balance.

As shown in the lower part of the graphs the fall in national saving in the mid-1970s was to a large extent the result of lower public sector saving. During the 1980s public sector saving generally recovered and by 1989 was negative in only five countries and actually exceeded its earlier peak in Japan. Private sector saving has been relatively stable and far more stable than its two components, suggesting that variations in corporate saving have been more or less offset by opposite movements in household saving (see Dean et al. (1989)).

In analysing these trends we shall ignore a number of issues and confine the discussion to those which are most relevant to explaining balance of payments developments. We shall not deal with measurement problems concerning saving and investment, nor shall we discuss in any detail the various theories of household saving and business fixed investment, but merely take what appears to be generally accepted hypotheses in setting up estimation equations. Saving and investment will also be analysed for the aggregate private sector, and for the public sector we shall take the net borrowing requirement as an exogenous variable, though a very crude attempt will be made to separate induced from discretionary changes. Inventory formation is included in

private sector investment and the statistical discrepancy in private saving, which may introduce some short-run noise. Even with these simplifications there are numerous ways in which saving and investment components may be combined and we shall proceed by exploring in more detail the various approaches mentioned above and whenever relevant present complementary empirical evidence.

B. Saving-investment balances: Principal hypotheses

(a) Saving, investment and international capital flows.

In a recent empirical study Feldstein and Horioka (1980) (see also Feldstein (1983)) regressed total saving on total investment (both measured relative to GNP) across countries and found a coefficient close to unity as well as a high correlation coefficient, leading them to conclude that international capital mobility was very low.[28] Since then numerous regressions have been run on alternative country samples and periods and on cross-country as well as time series data for individual countries. All studies seemed to confirm that almost 90% of investment was financed by domestic saving and that, by implication, the external account was largely balanced. More recently, however, some alternative results and interpretations have appeared (Tesar (1988)). Thus several authors have pointed out that to the extent that I and S are influenced by the same set of exogenous factors – inter alia the growth of real income (Fry (1986)) and the labour force (Obstfeld (1985)) as well as various shocks[29] – they are bound to be positively correlated even in conditions of perfect capital

[28] There are more direct ways of evaluating the degree of capital mobility (such as comparing real rates of return across countries or estimating "trade-off" coefficients in equations for changes in international reserves) but these alternatives will not be discussed.

[29] Both S and I are likely to be positively correlated with productivity shocks (Obstfeld (1985)) and when allowing for the existence of a non-tradable goods sector and a low elasticity of substitution between tradables and non-tradables they are also positively correlated with demand shocks.

mobility.[30] Moreover, as noted by several authors, the regression coefficients tend to fall over time and increase with the size of the country (Murphy (1984))[31] and are lower for less developed than for industrialised countries (Summers (1988)).

Another mechanism, which may lead to a high correlation between saving and investment in conditions of perfect capital mobility, is that of balance-of-payments smoothing government policies.[32] Summers (1988) tests this hypothesis by regressing $S_g - I_g$ (or DEF) on $S_p - I_p$[33] and finds a significant regression coefficient of .72, which, under certain additional assumptions with respect to the governments' reaction function, corresponds to a coefficient in the Feldstein-Horioka equation of around .6.[34] The same hypothesis is advanced and tested in Bayoumi (1989), who finds that the correlation between saving and investment is considerably lower when the analysis is confined to the private sector, suggesting that variations in government net saving are aimed at smoothing BoP. Artis and Bayoumi (1989) go one step further by estimating reaction functions for the monetary and fiscal authorities, concluding that BoP smoothing is mainly achieved by monetary policies. However, in a complementary test

[30] Yet, regressing I on S using instrumental variables does not affect the results reported by Feldstein and Horioka. They also stand up in equations including income growth (Feldstein (1983)).

[31] This last result seems to depend on whether the regression coefficients are estimated from annual or quarterly changes in investment and saving; see Obstfeld (1985 and 1986).

[32] Earlier suggestions along these lines can be found in Fieleke (1982) and Westphal (1983). Darrat (1988), on the other hand, finds that the US government tends to increase spending (and thus the borrowing requirement) in response to a higher trade deficit.

[33] The regression was run on average data for fourteen countries over the period 1973-80.

[34] In a review of earlier results, Feldstein and Bacchetta (1989) recognise the recent fall in the saving-investment regression coefficient (and also note that the fall is even more pronounced for EC countries), but interpret the results by Summers as indicative of fiscal deficits crowding out private investment. To support this view they regress total investment on DEF and S_p and find coefficients of –.86 and .70 respectively.

they regress S_p–I_p on government net saving and from the unusually high and significant coefficients (see Table 5 below) they conclude that fiscal policies have also contributed to BoP smoothing, even if this influence could not be identified in the reaction function.

(b) Linking BoP to selected saving and investment components.

The theory of BoP smoothing is based on a framework where changes in the external account are driven mainly by changes in S_p – I_p, with DEF playing a more passive "mopping up" role. However, as recognised by the authors, the direction of causality in the complementary function mentioned above is not at all clear and might in fact be more indicative of households and firms reacting to changes in fiscal policies and thus actually supporting models which regard changes in fiscal policies as instrumental in causing changes in the external account. One of the earliest models of this kind was that developed by the New Cambridge School, which saw S_p – I_p as largely stable and assigned prime importance to DEF in explaining BoP (i.e. the "twin deficit" hypothesis).[35] Sachs (1981 and 1983), on the other hand, by regressing changes in BoP on changes in total investment for a sample of fourteen countries and finding a significant negative coefficient, took total investment as the principal determinant of the external account,[36] while McKinnon (1981) and Roubini

[35] See also Eichengreen (1989), who regresses the US trade deficit on the US budget deficit and finds a significant coefficient. The same model applied to Canada does not work, which Eichengreen ascribes to offsetting changes in private saving. Abell (1990), applying VAR analysis to US data for the period 1979–85, concludes that the Federal deficit has influenced the trade deficit indirectly with changes in interest rates and exchange rates, while Kearney and Monadjemi (1990), in another VAR-analysis covering eight industrial countries, identify *temporary* twin deficit relationships but also cases of reverse causality.

[36] Most subsequent studies using different time periods and/or country samples (see, for instance, Dooley (1984)) have not confirmed this finding.

(1988) developed models with DEF and I as the major determinants. Roubini's model and empirical results are particularly interesting, as he attempts to evaluate the twin deficit hypothesis as well as the degree of international capital mobility by combining the assumption of inter-temporal utility maximisation (consumption smoothing) with the tax smoothing version of the Ricardian equivalence or debt neutrality hypothesis (see Barro (1974 and 1989)) and derives the following model for empirical estimates:[37]

(ix) $BoP_t = a_1DEF'_t + a_2GAP_t + a_3I_t$ with

$DEF' = I_g - S_g$, measured as changes in net real public debt in % of GNP/GDP,

GAP = deviation between actual and potential output,

I = total investment (including changes in inventories) in % of GNP/GDP

and the following hypothetical values for the parameters: $a_1 = a_3 = -1$ and $0 < a_2 < 1$.

This more general model includes earlier models as special cases. For instance, the Sachs-model requires $a_1 = a_2 = 0$, in the model of the New Cambridge School $a_3 = a_2 = 0$ and in the Feldstein-Horioka model $a_1 = a_2 = a_3 = 0$. In requiring $a_1 = -1$ as a condition for tax smoothing Roubini makes the assumption that *temporary* bond-financed expenditure increases (or tax reductions) are ignored by optimising households and cause an equivalent fall in national saving and in the external account. A *permanent* change, on the other hand, is fully met by higher private saving, and this is the assumption made in most alternative tests of the debt neutrality hypothesis where the

[37] A growing recent literature analyses the relationship between fiscal deficits and external deficits within inter-temporal *disequilibrium* models and frequently derives implications opposite to those of more standard models, such as traditional Keynesian, neo-classical and inter-temporal equilibrium models. Thus Cuddington and Vinals (1986a and b) analyse the external implications of a rise in money-financed public expenditure in Keynesian and classical regimes and find in both cases that a permanently higher fiscal deficit *improves* the current external account. So far, however, these models have not been subjected to empirical tests.

hypothetical value of a_1 is set to 0.[38] In practice it is difficult to distinguish between temporary and permanent changes in DEF[39] and to the extent that both are included (or perceived by households to be included), the hypothetical value for a_1 will lie between 0 and -1.

Roubini's estimates of (ix) cover eighteen industrialised countries and in ten cases he finds significant and negative values for both a_1 and a_3 and for four additional countries one of the two parameters is significant. However, for only three countries (Italy, Ireland and Norway) is a_3 close to -1 and for no country is there any evidence of a 1:1 ratio between DEF and BoP, suggesting that tax smoothing may be a weak link in the model. Nevertheless, judging by the coefficients obtained, the degree of international capital mobility is clearly higher than generally assumed earlier. This also implies that even if the twin-deficit hypothesis does not hold, it is important to include the public sector balance in equations of this kind.

In the following we have tested Roubini's model with four modifications on our country sample:

- while Roubini left out GAP on the grounds that real GNP follows a random walk so that in the long run GAP = 0, we have included GAP since tests of the random walk hypothesis have been almost exclusively confined to the United States and even for this country it is not universally accepted;
- with DEF measured as the rise in the real public net debt, investment (I) should be measured net of public sector investment. The same applies to most other definitions of the net

[38] See for instance Nicoletti (1988), who estimates the sensitivity of private saving to the government deficit and takes a coefficient value of 1 (and thus 0 for national saving and BoP) as supporting the debt neutrality hypothesis.

[39] On this point see also Poterba and Summers (1985), who argue that for the United States a proper test of the hypothesis is only feasible for the post-1981 period. Bernheim (1989) also focuses on permanent and temporary changes in the budget deficit but as distinguishing features of neo-classical and Keynesian analyses of fiscal policy.

borrowing requirement and to the complementary equation with saving rather than BoP as the dependent variable;[40]

- while Roubini's measure of DEF is consistent with his model, it reduces the number of observations available, particularly for the smaller industrialised countries.[41] Consequently, we have measured DEF as general government or public sector net lending, depending on which measure was more readily available for the period 1960–89;[42]
- finally, since Roubini's basic equation is static and does not allow for any dynamic adjustments, estimates of (ix) will be subject to the problems discussed on pages 17–18 and need to be accompanied by a stationarity test of the error term and an error correction equation in first differences.[43]

With these adjustments, the equations used in this preliminary analysis of the influence of domestic factors were:

$$(x) \quad BoP_t = a_0 + a_1 GAP_t + a_2 DEF_t + a_3 I_{p,t} + \varepsilon_t \text{ and}$$

$$(xi) \quad dBoP_t = a_t' + a_1' dGAP_t + a_2' dDEF_t + a_3' dI_{p,t} + a_4' \bar{\varepsilon}_{t-1} + \gamma$$

with GAP measured as the deviation of actual output from a quadratic trend and the other variables as defined above. The hypothetical values for the parameters in (x) are:

[40] Although the correction for I_g in (ix) has only a marginal effect on the time profile of saving and investment relative to GNP, failure to make the correction may explain some of the discrepancies found by Roubini between (ix) and the complementary saving equation.

[41] It is also debatable how changes in the real government debt due to inflation should be treated. Roubini excludes such changes, whereas Koskela and Viren (1983) add inflation-induced debt changes to the net borrowing requirement on the grounds that this constitutes an alternative way of financing government expenditure.

[42] I_p and I_g have been adjusted accordingly, with public enterprise investment included in I_p (I_g) when DEF was measured as the general government (public sector) borrowing requirement. Note also that DEF' as defined by Roubini and DEF usually have the opposite signs.

[43] This procedure also makes it possible to test the role of GAP more explicitly, since the random walk hypothesis does not rule out that GAP or changes in GAP affect the short run adjustments. Equation (xii) was, therefore, estimated with both GAP and dGAP, but the former was only significant for the United States.

$a_0 \gtrless 0$

$1 > a_1$:
- $= 0$ -> GDP/GNP is a random walk
- > 0 -> GDP/GNP follows a deterministic trend with fluctuation dominated by positive external shocks
- < 0 -> GDP/GNP as above, but fluctuations dominated by negative external shocks and/or a strong import propensity

$0 < a_2$:
- $= 1$ -> complete tax smoothing
- < 1 -> partial tax smoothing

$0 > a_3$:
- $= -1$ -> complete consumption smoothing
- > -1 -> partial consumption smoothing

The hypothetical signs of the parameters in (xi) correspond to those of (x) and for a_4' between 0 and -1 convergence is not rejected.

The estimates are presented in Annex II, Table 3, and in summary form in Table 5 below. They largely confirm Roubini's findings, though the coefficients for DEF and I_P in most countries are well below the extreme hypothetical values of 1 and -1 respectively. The average coefficient for the investment coefficient is, at -.58, very close to that reported by Roubini, whereas the DEF coefficient, at .61, is somewhat higher. On the other hand, Roubini was not quite correct in disregarding GAP as the coefficient is significant for ten of the countries. Moreover, while BoP, DEF and I_p satisfy the conditions for a co-integrated set of variables in most countries, (x) should be complemented with an EC-equation to capture the short-run dynamics and the speed of convergence. Annex II, Table 3 shows in all cases a negative coefficient for the ECM-term and an average value of -.43, implying that almost 50% of the deviation from the long-run path is eliminated in one year. The average values for the dDEF and dI_P coefficients are somewhat different from those of the CI-equations and for some individual countries quite large differences are observed.

Table 5

BoP response to changes in government deficit and private investment

Countries	dBoP/dDEF				dBoP/dI		
	Annex II Table 4[1]	Annex II Table 3[2]	Roubini (1988)[3]	Artis and Bayoumi (1989)[4]	Annex II Table 4[5]	Annex II Table 3[2]	Roubini (1988)
United States . . .	0.33	0.80	0.61	-0.07	-0.26	-0.32	-0.51
Japan	0.30	0.19	0.36	-0.05	-0.74	-0.49	-0.33
Germany	0.57	1.02	0.44	0.17	-1.00	-0.97	-0.35
France	0.75	0.36	0.65	0.02	-0.07	-0.17	-0.11
United Kingdom	0.45	0.25	0.14	1.43	-0.50	-0.34	-0.57
Italy	0.34	0.50	0.51	-	-1.00	-0.60	-1.00
Canada	0.21	0.20	0.23	0.01	-0.61	-0.32	-0.57
Australia	0.06	0.52	0.15	0.20	-0.66	-0.90	-1.00
Austria	0.22	0.64	0.37	0.44	-0.59	-0.70	-0.30
Belgium	0.73	0.72	0.51	0.10	-1.00	-0.71	-0.41
Denmark	0.28	0.44	0.27	-	-0.70	0.14	-0.28
Finland	0.01	0.28	0.18	0.00	-1.00	-0.32	-0.62
Netherlands	1.00	0.74	0.51	-	-1.00	-0.96	-0.54
Spain	0.28	1.13	0.89	-	-1.00	-1.08	-0.86
Sweden	0.15	0.45	0.49	0.34	-0.66	-0.18	-0.61
Switzerland	1.00	1.50	-	-	-0.61	-1.03	-
Average	0.42	0.61	0.42	0.23	-0.71	-0.58	-0.54

[1] Calculated as 1 + DEF coefficient, using CI-equation.
[2] Taken from CI-equation.
[3] Coefficient of DEF' with sign reversed.
[4] Calculated from equation where dependent variable is $d(S_p - I_p)$.
[5] Calculated as $(dS/dI_{-1} + dI/dS_{-1}) - 1$, using CI-equation.

When looking at separate country estimates, three groups of countries may be distinguished:

- a group centred around Germany and including Belgium, the Netherlands, Austria and Spain[44] where both DEF and I_p have a major impact on BoP, pointing to a rather high degree of consumption as well as tax smoothing, assuming that changes in DEF are regarded as transitory. However, contrary to this underlying assumption, the DEF coefficients of the CI-equations

[44] Switzerland might also be included in this group, although it is difficult to explain the large coefficient on DEF.

(on average .85) are in most of these countries higher than those of the EC-equations (.61), whereas both equations produce an average investment coefficient of -.89;
- a second group comprising Japan, the United Kingdom, Italy, Canada, Denmark, Finland and Sweden, for which the coefficients of DEF and I_P are below 0.6 in absolute terms, suggesting that in these countries changes in fiscal policies and private sector investment are to a large extent "absorbed" by adjustments in private sector saving;
- a final group with widely different reaction patterns: the United States with a substantial long-run effect of changes in fiscal policy but only a moderate role for investment and very low short-run impacts of both variables; Australia, where changes in I_p appear to be the main influence on BoP, while the coefficient on DEF is relatively small and insignificant in the short run; and France, for which it proved very difficult to estimate an acceptable equation. Given the near-stationarity of BoP, the poor results for the CI-equation were perhaps to be expected, but the EC-equation suggests that, in the very short run as well, BoP changes are not very dependent on domestic factors.

Overall, the results in Table 5 give strong support to an approach based on linking BoP to specific and pre-selected domestic factors, but they also leave some open questions, which may be pursued using an alternative approach:
- since the coefficient on DEF averages only .6, fiscal changes are neither ignored by private households and firms nor fully absorbed by corresponding changes in $S_p - I_p$, thus pointing to an independent role for private sector saving in explaining current account movements;[45]
- with the average coefficient on I_p also close to .6, there is some evidence of interaction between I_p and S_p. One explanation might

[45] If capital markets are not perfect, part of the adjustment may also come through changes in I_p as a rise (fall) in DEF increases (reduces) interest rates and "crowds" out (in) private investment.

be that firms and households are not indifferent between domestic and foreign sources of financing domestic investment, and this again points to an independent role for private saving;
- since I_p cannot be considered an exogenous variable, an evaluation of its influence on BoP should be derived from the determinants of I_p rather than from I_p itself;
- finally, as argued by Baldwin and Krugman (1987), an approach based on linking the external balance to selected domestic balances ignores market-clearing conditions and so is valid only under very restrictive assumptions.[46] Consequently, the coefficients in equations (x) and (xi) are subject to specification biases, which call for the addition of further variables but might also be remedied by including market-clearing conditions in analysing changes in domestic financial balances.

(c) The behaviour of domestic saving and investment.

In attempting to explain developments in domestic saving and investment, we have confined the analysis to the aggregate private sector, assuming that the behavioural equations for households and firms are additive and leaving aside the extent to which household and company saving are substitutable. The aggregation also implies that residential construction and business fixed investment are explained by the same set of variables and that no attempt has been made to identify inventory cycles.

The specification of the saving equation draws upon the life-cycle model for household saving, which suggests that the share of income devoted to saving is a positive function of expected real income growth (dy).[47] The aggregate saving ratio further depends negatively on a number of demographic

[46] The assumptions are that tradables are perfect substitutes or that country i's spending propensity with respect to goods produced in country i equals that of its major trading partners.

[47] It also depends negatively on real wealth, but since it is difficult to find wealth data for all countries over the entire period this variable was not included.

variables such as the population shares of dependants and pensioners and the participation rates of married women and persons above retirement age, but positively on average life expectancy. Most of these variables are likely to change smoothly over time and their separate influences are difficult to capture in a time series analysis.[48] Consequently, we have merely included a time trend (TR), which is likely to capture the influence of the dominant variable, but may, of course, include the effect of other factors as well. The life-cycle model applied in Barro (1974) also includes the public sector borrowing requirement (DEF) with an expected negative sign for permanent changes and the rate of unemployment (UN) or the output gap (GAP) may play a role (Holtham and Kato (1986)), though the a priori sign is ambiguous. The latter also applies to the real interest rate, which was entered allowing separate coefficients for the nominal interest rate (INT) and the expected rate of inflation (dp).

The main determinant of company saving is likely to be profits, which change pro-cyclically but will be negatively affected by the real effective exchange rate (REER) (Turner (1986)), depending on the degree of international competition. To the extent that investment increases the need for depreciation allowances and/or raises profits, lagged private investment ($I_{p,-1}$) would also enter the equation with an expected positive coefficient.

Combining the household and company sectors then gives the following specification for estimating private saving in % of GNP (S_p):

(xii) $S_p = a_0 + a_1 \text{ GAP (or UN)} + a_2 \, dy + a_3 \, dp + a_4 \text{ INT} + a_5 \text{ DEF} + a_6 \text{ REER} + a_7 I_{p,-1} + a_8 \text{ TR} + \varepsilon$

with a_0, a_2 and a_7 expected to be positive, a_5 and a_6 negative and

[48] See, however, Graham (1987), who finds significant coefficients for several demographic variables in cross-country regressions.

a_1, a_3, a_4 and a_8 either positive or negative.[49] a_1 will be positive (negative when cyclical movements are measured by UN) if the share of company saving is large and households do not increase precautionary saving in periods of high unemployment, while for a high share of household saving and precautionary behaviour during recessions, a_1 would be negative (positive for UN).

Even though some of the determinants may affect saving with a lag, equation (xii) is essentially a static relationship and, to capture the short-run adjustments, it was complemented with an equation in first differences, including, in addition to the determinants given above, an error correction term:

$$\text{(xiii)}\quad dS_p = a_8' + a_1' \, dGAP(dUN) + a_2' \, d(dy) + a_3' \, d(dp) + a_4' \, dINT + a_5' \, dDEF + a_6' \, dREER + a_7' \, dI_{p,-1} + a_9 \, \bar{\varepsilon}_{-1} + \eta$$

with a_9 between 0 and −1 if the short-run adjustments converge smoothly towards the long-run path.

Private investment (denoted by I_p and measured in % of GNP) is usually assumed to be pro-cyclical and to be a positive function of real income growth. On the other hand, the real interest rate and the real effective exchange rate are likely to have a negative influence, with the strength of REER again depending on the degree of openness and international competition. To the extent that both companies and households rely on past savings to finance investment, I_p will also be a positive function of $S_{p,-1}$ and the relative investment deflator (RIP) may enter the equation with an expected positive (negative) sign when the price elasticity of investment is below (above) unity. Finally, the rate of inflation can play a separate role, stimulating investment if high inflation makes real debt less burdensome, but discouraging capital

[49] To the extent that saving also depends on the degree of uncertainty (proxied by the rate of inflation), the inflation coefficient will be capturing several influences, including that of the missing real wealth variable. Assuming that dp can be taken as an indicator of inflationary expectations, the real interest rate effect would be measured by a_4 and that of real wealth and uncertainty by $(a_3 - a_4)$.

formation when inflation creates uncertainty or is perceived as presaging a tightening of policies.[50]

Combining these variables, the investment equation was specified as:[51]

(xiv) $I_p = b_0 + b_1 GAP + b_2 dy + b_3 dp + b_4 INT + b_5 REER + b_6 S_{p,-1} + b_7 RIP + \gamma$

with b_0, b_1, b_2 and b_6 expected > 0, b_4 and $b_5 < 0$ and b_3 and $b_7 \gtrless 0$. As for private saving, the basic equation was complemented by an error correction equation ((xv), not shown) containing the variables above in first differences and an error correction term measured as $\bar{\gamma}_{-1}$.

In estimating (xii) to (xv) GAP, y, p and REER were entered as logs and the results (presented in detail in Annex II, Table 4)[52] may be summarised as follows:

- most of the equations show quite high R^2s and generally support the two-step procedure, as the DF (ADF)-test for stationarity is satisfied and – with three exceptions – all the error correction terms are highly significant with the correct sign;[53]
- DEF mostly obtains a negative and highly significant coefficient[54] which in several cases is close to unity. This is a highly surprising result, given the rather mixed support which the debt neutrality hypothesis has received in the literature, but it needs

[50] The above list is not exhaustive with respect to the possible determinants of investment. In particular, it excludes – mainly due to data and measurement problems – measures of profitability, capital costs, taxes and the capital stock.

[51] As for the saving equation, separate inflation effects may be measured by $(b_3 - b_4)$, assuming that inflationary expectations are captured by dp.

[52] Since changes in the net saving balance are of primary interest, a summary of the net coefficients is given in Table 6.

[53] The strong adjustment mechanisms found for both the saving and investment equations are in contrast to the results reported by Feldstein and Bacchetta (1989), who estimate error correction equations on average country data by regressing dS and dI on $(I-S)_{-1}$ and find that only dI responds.

[54] The exceptions are France, the Netherlands and Switzerland, while for Belgium the coefficient is significant but only –.3.

stressing that the coefficients are quite sensitive to the model and specification chosen.[55] As shown in Table 5, the results obtained using the saving-investment approach are in some cases substantially different from those generated by the Roubini model. Moreover, with a few exceptions, the coefficients are well below those found by Artis and Bayoumi, suggesting that their specification is also capturing a crowding-out effect with respect to investment;

- the degree of interaction between private saving and investment is also model-dependent (and very sensitive to specification changes within a given model), as the coefficients using I or S as the dependent variable are generally smaller than those derived from the Roubini model (Table 5).[56] In Germany, Belgium, Finland, the Netherlands and Spain investment and saving appear to be independent of each other and the degree of interaction is typically lower in the EC-equations than in the CI-equations;
- the real effective exchange rate is found to have a significant (and negative) influence on either saving or investment (or both) except in the United States, Australia, Denmark, the Netherlands and Switzerland. Indeed, the adjustment induced via changes in

[55] We have also made the simplifying assumption that the influence of a given change in DEF does not depend on whether it stems from changes in taxes or expenditure, or on the composition of tax and expenditure changes. Furthermore, by disregarding wealth we have not allowed for any specific effects of changes in public debt and the use of real GNP as a measure of private sector income expectations may not fully capture expectations with respect to private sector income growth. Recalling also the earlier distinction between permanent and transitory changes in DEF, our results cannot be taken as a rigorous test of the debt neutrality hypothesis but merely as a strong indication that changes in the public sector borrowing requirement should not be ignored when analysing the determinants of private sector saving. For further discussion of the specific isssues mentioned above see Feldstein (1982), Kormendi (1983), Kormendi and Meguire (1986 and 1990), Modigliani and Sterling (1986 and 1990), Feldstein and Elmendorf (1990), Barth et al. (1986), Kessler et al. (1986) and Genberg (1988).

[56] Roubini (1988) comes to the opposite conclusion, but using total saving and including only DEF on the right-hand side in addition to investment.

the private sector saving-investment balance is in several cases as powerful as or even stronger than the adjustment taking place via changes in exports and imports;

- in ten countries investment is influenced by the long-term interest rate, with relatively high and significant coefficients for Germany, Italy, Austria, Belgium, the Netherlands, Sweden and Switzerland. In the United States, Japan and the United Kingdom investment does not appear to be sensitive to interest rates[57] and in the case of Spain no market rate is available prior to 1978;[58]
- private saving seems to depend positively on long-term interest rates in the United States, Australia, the Netherlands and Switzerland, whereas for France, Austria, Denmark and Sweden relatively large negative coefficients are obtained.The results for Germany suggest that the sign and size of this effect depend on the shares of household and company saving, as the former is positively influenced while the latter has a negative sign;
- the rate of inflation has a positive effect on private saving in ten of the countries, though in several cases the t-ratios are rather low.[59] Except for the United Kingdom and Australia, investment is also positively affected;
- as might be expected, investment was found to be pro-cyclical or positively affected by real income growth in all countries, with both variables entering the equation with positive coefficients in thirteen countries, though in some cases only one of them satisfied the criterion of a t-ratio higher than 2. In Belgium investment does not respond very strongly to the activity variables, as the GAP coefficient is insignificant and the coefficient on dy only .14;
- real output growth has the expected positive influence on

[57] In fact, when the long-term bond rate was included in the US investment equation, the coefficient was *positive* and highly significant.

[58] DEF was included in the investment equation for Spain on the assumption that a higher public sector borrowing requirement lowers bank lending to the private sector. As can be seen from Annex II, Table 4, the coefficient was highly significant.

[59] Again the results for Germany indicate that this effect depends on the composition of private saving as the positive influence is confined to household saving.

saving in all cases, though Germany, France, Australia, Belgium, the Netherlands and Switzerland show t-ratios of less than 2. By contrast, the cyclical response of saving is rather mixed and does not seem to follow any specific geographical pattern. In the United States, the United Kingdom, Canada, Finland and the Netherlands the saving ratio changes counter-cyclically but in Japan, Germany, France, Italy, Australia, Belgium, Denmark, Spain, Switzerland and Sweden it is pro-cyclical (and in several cases quite strongly so), while a very weak cyclical pattern was found for Austria.

III.
Reconciliation and conclusions

A. Contributions to balance-of-payments changes

In discussing individual country coefficients it is useful to compare them with those previously obtained for the BoP equation and in a context based on contributions to changes in financial balances over the period 1980–89.[60] This is done in Table 6, which summarises the principal coefficients and variable changes, and in Table 7, which gives a breakdown of contributions by sector and component.[61]

Starting with the *United States,* the BoP-equation points to the rise in domestic demand relative to that of trading partners as the main cause of the deterioration in the external account.[62] This development, however, is not the result of domestic demand growth exceeding foreign demand growth by a large margin, but

[60] By focusing on the overall change between 1980 and 1989 we may, of course, be ignoring important developments within the period.

[61] Both tables are based on the EC-equations given in Annex II, Tables 2 and 4 and a complementary – and very rudimentary – equation for the public sector, obtained by regressing DEF on GAP (or UN), dy, dp and INT. The REER coefficients in Table 6 and the REER contributions in Table 7 only include the direct effects and disregard additional effects via changes in the terms of trade and the rate of inflation.

[62] By contrast, Helkie and Hooper (1988) find that three-quarters of the fall in US net export volumes during 1980-86 can be ascribed to changes in relative prices.

rather reflects the unfavourable elasticity ratio shown in Table 3. Domestically the rise in demand and the closing of the output gap was accompanied by a fall in net private saving,[63] as investment is more sensitive to income changes than saving. The public sector balance improved in response to the cyclical recovery, but because public sector net income is a positive function of inflation the improvement in the US price performance during the 1980s contributed to an overall rise in the public sector borrowing requirement. The rise, however, was small, pointing to weaker private net saving as the principal cause of the external deterioration. Nonetheless, it might be argued that the *absence* of a more rigorous fiscal policy was also important.[64] Firstly, since exchange rate changes have no direct impact on domestic financial balances a depreciation will only have a lasting effect on the external account if supported by tighter fiscal policies. Secondly, private saving is subject to a negative trend (a cumulative 1% during 1980-89), which calls for a gradual tightening of fiscal policy to maintain a balanced external account. Thirdly, despite powerful adjustment mechanisms, private saving and investment appear to have deviated from historical patterns during the 1980s,[65] thereby generating a fall in net private saving which was much steeper than predicted.

[63] In this section 'net saving' will frequently be used when referring to S-I or the net financial balance and is not to be confused with saving less depreciation.

[64] It could also be argued (see Blinder (1989)) that the rise in the public sector borrowing requirement did not crowd out private investment, as widely feared early in the 1980s, but instead crowded out exports and pulled in imports.

[65] This can be seen in the large contribution of the ECM-term which, in turn, reflects a persistently low private saving ratio combined with relatively strong investment growth. When a Chow-test was applied to the saving and investment adjustment equation, the F-value was only 1.1, and thus well below the level of significance. A dummy variable included for the 1980s was insignificant in the long-run investment equation, but produced a negative and significant coefficient in the saving equation, generating at the same time a more satisfactory t-statistic for the real exchange rate. When the corresponding error correction term was included in the saving adjustment function, its coefficient declined to around 1 and the residual error also fell, but mainly due to a larger and more negative trend term.

Table 6

Net financial balances: Principal coefficients and changes[1]

1980–89

Countries	Financial balance	Demand				Prices	
		GAP/DD		dY/DD_w		dP/ToT[2]	
		Coeff.	Change	Coeff.	Change	Coeff.	Change
United States	S_p-I_p	-0.21	6.5	0.21	3.1	0.07	- 6.4
	Ex-Im	-0.20	30.3	0.14	26.5	0.36	4.5
Japan	S_p-I_p	-0.07	11.1	0.10	0.5	-0.01	- 2.3
	Ex-Im	-0.16	36.1	0.41	25.9	0.48	31.0
Germany	S_p-I_p	-0.24	3.8	0.08	2.6	-0.19	- 2.3
	Ex-Im	-0.51	13.2	0.48	22.5	1.69	10.4
France	S_p-I_p	-0.43	4.6	-0.12	1.8	-0.17	- 8.0
	Ex-Im	-0.22	18.1	0.26	21.9	1.13	8.1
United Kingdom	S_p-I_p	-0.52	7.3	0.24	4.5	0.16	-12.8
	Ex-Im	-0.25	30.1	0.10	21.4	2.42	- 0.4
Italy	S_p-I_p	-0.47	-0.2	-0.45	-1.0	-	-13.5
	Ex-Im	-0.31	21.8	0.31	21.7	1.80	13.0
Canada	S_p-I_p	-0.45	2.8	0.36	1.4	0.15	- 5.8
	Ex-Im	-0.33	31.8	0.32	29.4	1.55	3.1
Australia	S_p-I_p	0.01	6.3	0.20	0.8	0.21	- 4.5
	Ex-Im	-0.35	30.1	0.29	28.9	0.96	5.5
Austria	S_p-I_p	-0.02	1.5	-0.18	0.9	-0.44	- 2.7
	Ex-Im	-0.36	16.6	0.15	19.9	2.00	4.6
Belgium	S_p-I_p	0.24	3.5	-0.05	-0.1	-0.23	0.0
	Ex-Im	-0.27	11.5	0.25	20.2	3.30	2.9
Denmark	S_p-I_p	-0.74	3.4	-0.55	1.5	0.11	- 4.2
	Ex-Im	-0.26	11.1	0.16	21.7	1.90	1.0
Finland	S_p-I_p	-0.45	3.2	0.15	-0.4	0.15	- 2.2
	Ex-Im	-0.37	31.6	0.21	20.6	-	14.2
Netherlands	S_p-I_p	-0.12	5.6	-0.34	-0.4	-0.20	- 4.9
	Ex-Im	-0.26	10.0	0.27	19.9	1.85	3.9
Spain	S_p-I_p	-0.40	14.6	-0.03	3.8	-0.05	- 6.9
	Ex-Im	-0.43	28.9	0.43	21.9	1.20	12.9
Sweden	S_p-I_p	-0.18	0.2	-0.10	5.9	0.10	- 3.9
	Ex-Im	-0.06	10.2	0.06	22.5	2.00	4.6
Switzerland	S_p-I_p	-0.20	10.4	-0.10	-1.6	-0.24	0.7
	Ex-Im	-0.52	20.6	0.26	21.8	2.67	14.3

[1] Changes in GAP, DD, DD_w, ToT and REER measured in logs and changes in dY, dP, INT, DEF and ECM in percentage points. An Okun-coefficient of -3 has been assumed for all countries with U in savings equation.

[2] Coefficient multiplied by 10.

[3]

	Coeff.	Change
Households	-0.47	-0.16
Firms	-0.89	0.28

Table 6 (cont.)

Net financial balances: Principal coefficients and changes[1]

1980–89

Exchange rate		Interest rate		Budget deficit		Error correction			
REER[2]		INT		DEF		ECM(S)/(Ex-Im)		ECM(I)	
Coeff.	Change	Coeff.	Change	Coeff.	Change	Coeff.	Change	Coeff.	Change
–		0.09	-2.7	-0.50	-0.69	-0.99	-1.03	-0.46	1.72
-0.18	-16.0	–	–	–	–	-0.86	0.44	–	–
0.20		–	-3.4	-0.99	7.11	-0.72	-1.33	-0.60	-2.03
-076	41.2	–	–	–	–	-0.98	0.32	–	–
0.50		0.13	-1.7	-0.46	3.09	[3]	[3]	-0.65	2.01
-0.30	3.7	–	–	–	–	-0.92	0.54	–	–
0.39		-0.09	-4.6	-0.33	-1.38	-0.28	0.38	-0.60	1.13
-0.66	-12.9	–	–	–	–	-0.23	-1.65	–	–
0.44		–	-3.7	-0.58	5.45	-0.74	0.99	-0.44	-0.33
-0.11	- 5.5	–	–	–	–	-0.64	3.00	–	–
0.25		-0.19	-3.8	-0.92	-1.60	-0.92	-0.08	-0.12	-1.51
-0.56	15.0	–	–	–	–	-0.46	3.35	–	–
-0.13		–	-2.5	-0.79	-0.55	-0.88	-0.46	-0.54	-1.03
-0.37	19.2	–	–	–	–	-0.25	1.28	–	–
-0.11		–	1.7	-0.88	2.76	-0.52	-1.15	-0.91	0.77
-0.25	4.1	–	–	–	–	-0.53	1.41	–	–
-1.26		0.50	-2.1	-0.74	-1.00	-1.22	-0.21	-0.74	0.12
-0.71	- 7.9	–	–	–	–	-0.64	2.30	–	–
-0.35		0.51	-3.5	-0.33	2.40	-1.32	-0.74	-0.83	-0.89
-0.59	-32.5	–	–	–	–	-0.39	-0.51	–	–
-0.28		-0.27	-8.8	-0.64	2.17	-0.70	-0.62	-0.65	-1.15
-0.46	-14.2	–	–	–	–	-0.93	0.16	–	–
-0.11		0.51	-3.8	-1.10	2.38	-1.46	-0.12	-1.15	-1.10
-0.92	14.0	–	–	–	–	-0.52	0.62	–	–
0.07		0.83	-3.2	-0.23	0.78	-0.64	-0.92	-0.64	0.18
-1.18	-14.9	–	–	–	–	-0.62	2.21	–	–
-0.41		–	-2.2	-1.06	0.42	-0.48	0.91	-0.63	1.53
-0.65	4.8	–	–	–	–	-0.42	-1.43	–	–
-0.72		-0.26	-0.7	-0.73	8.82	-0.68	-0.38	-0.58	-2.63
-1.09	- 5.6	–	–	–	–	-1.09	0.70	–	–
-0.18		0.52	0.4	-0.26	0.64	-0.47	-0.24	-0.85	2.67
-0.89	- 1.9	–	–	–	–	-0.44	2.73	–	–

Note: The product of coefficients and changes may not in all cases produce the figures shown in the following Table 7, since all changes are measured from 1980 to 1989 and do not take account of lags in the independent variables.

Table 7

Changes in financial balances by sector and contributing factor

Countries	Sector	Activity	dP/dToT	dREER	dINT	TR/Res.	dDEF	ECM	Total
		1980–89, in % of GNP							
United States . . .	Private	-0.69	-0.71	–	-0.23	-2.24	0.35	1.77	- 1.75
	Public	1.00	-1.44	–	0.02	-0.27	–	–	- 0.69
	Total	0.31	-2.15	–	-0.21	-2.51	0.35	1.77	- 2.44
	Non-res.	-2.51	0.16	0.29	–	-0.00	–	-0.38	- 2.44
Japan	Private	0.68	-0.09	0.89	–	1.69	-7.00	-0.25	- 4.08
	Public	4.31	–	–	1.25	1.55	–	–	7.11
	Total	4.99	-0.09	0.89	1.25	3.24	-7.00	-0.25	7.11
	Non-res.	4.69	1.49	-3.14	–	0.30	–	-0.31	3.03
Germany	Private	-1.59	3.34	0.15	-0.08	1.64	-1.46	1.13	3.13
	Public	1.25	–	–	0.31	1.53	–	–	3.09
	Total	-0.34	3.34	0.15	0.23	3.17	-1.46	1.13	6.22
	Non-res.	4.02	1.77	-0.11	–	1.04	–	-0.50	6.22
France	Private	-1.64	1.27	-1.54	-0.43	2.92	0.45	0.57	1.60
	Public	0.15	-0.58	–	0.33	-1.28	–	–	- 1.38
	Total	-1.49	0.69	-1.54	-0.10	1.64	0.45	0.57	0.22
	Non-res.	0.72	0.91	0.86	–	-2.66	–	0.39	0.22
United Kingdom	Private	-2.47	-2.33	0.64	–	-3.58	-4.10	0.82	-11.02
	Public	1.27	3.92	–	0.36	-0.10	–	–	5.45
	Total	-1.20	1.59	0.64	0.36	-3.68	-4.10	0.82	- 5.57
	Non-res.	-4.13	-0.10	0.06	–	0.53	–	-1.93	- 5.57
Italy	Private	0.72	–	0.45	0.71	-0.57	1.45	-0.12	2.64
	Public	-0.74	-4.56	–	3.42	0.28	–	–	- 1.60
	Total	-0.02	-4.56	0.45	4.13	-0.29	1.45	-0.12	1.04
	Non-res.	-0.02	1.46	-0.84	–	1.98	–	-1.54	1.04
Canada	Private	-1.17	-0.88	-0.22	–	-0.72	0.43	-0.14	- 2.70
	Public	0.51	-1.16	–	–	0.10	–	–	- 0.55
	Total	-0.66	-2.04	-0.22	–	-0.62	0.43	-0.14	- 3.25
	Non-res.	-1.00	0.48	-0.72	–	-1.68	–	-0.33	- 3.25
Australia	Private	-1.43	-0.95	0.04	–	-3.41	-2.42	1.30	- 6.87
	Public	1.53	0.40	–	-0.48	1.31	–	–	2.76
	Total	0.10	-0.55	0.04	-0.48	-2.10	-2.42	1.30	- 4.11
	Non-res.	-2.14	0.53	-0.12	–	-1.63	–	-0.75	- 4.11
Austria	Private	-0.19	1.19	1.01	-0.42	1.18	0.74	0.34	3.85
	Public	-1.01	-1.46	–	2.12	-0.65	–	–	- 1.00
	Total	-1.20	-0.27	1.01	1.70	0.53	0.74	0.34	2.85
	Non-res.	2.94	0.92	0.55	–	-0.09	–	-1.47	2.85
Belgium	Private	-1.98	-0.24	1.21	-0.53	5.22	-0.81	0.23	3.10
	Public	-0.87	–	–	2.67	0.60	–	–	2.40
	Total	-2.85	-0.24	1.21	2.14	5.82	-0.81	0.23	5.50
	Non-res.	1.96	0.95	2.29	–	0.10	–	0.20	5.50
Denmark	Private	-1.40	-0.45	0.46	2.49	0.60	-1.40	-0.32	- 0.02
	Public	3.13	-2.85	–	4.38	-2.76	–	–	2.17
	Total	1.73	-3.03	0.46	6.87	-2.16	-1.40	-0.32	2.15
	Non-res.	0.72	0.20	–	0.64	0.74	–	-0.15	2.15

Table 7 (cont.)

Changes in financial balances by sector and contributing factor

Countries	Sector	Activity	dP/dToT	dREER	dINT	TR/Res.	dDEF	ECM	Total
		1980–89, in % of GNP							
Finland	Private	-1.78	-0.25	-0.13	-1.14	3.02	-2.68	-0.94	-3.90
	Public	0.62	-0.34	–	2.43	-0.33	–	–	2.38
	Total	-1.16	-0.59	-0.13	1.29	2.69	-2.68	-0.94	-1.52
	Non-res.	-1.84	–	-1.29	–	1.93	–	-0.32	-1.52
Netherlands	Private	-0.88	3.13	-0.10	0.04	0.45	-0.18	0.72	3.88
	Public	1.89	-1.86	–	1.66	-0.91	–	–	0.78
	Total	1.71	1.27	-0.10	1.70	-0.46	-0.18	0.72	4.66
	Non-res.	2.74	0.72	1.76	–	0.81	–	-1.37	4.66
Spain	Private	-3.98	-0.32	0.16	–	3.09	-0.42	0.55	-0.92
	Public	-0.67	–	–	–	1.09	–	–	0.42
	Total	-4.65	-0.32	0.16	–	4.18	-0.42	0.55	-0.50
	Non-res.	-1.41	1.55	-0.31	–	-0.93	–	0.61	-0.50
Sweden	Private	-0.73	-0.40	1.38	0.21	0.28	-7.32	-1.26	-7.84
	Public	5.05	1.13	–	0.34	2.30	–	–	8.82
	Total	4.32	0.73	1.38	0.55	2.58	-7.32	-1.26	0.98
	Non-res.	0.72	0.92	0.58	–	-0.47	–	-0.77	0.98
Switzerland	Private	-1.87	-0.06	-0.02	0.30	2.68	-0.17	2.37	3.23
	Public	0.11	-0.15	–	0.05	0.63	–	–	0.64
	Total	-1.76	-0.21	-0.02	0.35	3.31	-0.17	2.37	3.87
	Non-res.	-0.41	3.83	0.17	–	1.50	–	-1.22	3.87

Notation: Activity = changes in output gap (or unemployment) and real growth for domestic sectors and the difference between growth of foreign and domestic demand for non-residents.
dP = changes in the rate of inflation (output deflator)
dToT = changes in the terms of trade
dREER = changes in the real effective exchange rate
dINT = changes in the long-term bond rate
dDEF = changes in the public sector borrowing requirement
ECM = error correction term
TR/RES = sum of trend and residual components.

Contributions are calculated using the coefficients for the EC-equations shown in Annex II, Tables 2 and 4, and a preliminary equation for the public sector (not shown). The activity effects given for non-residents include a trend in the case of France, the United Kingdom, Austria, Finland and Switzerland; see Annex II, Table 2. Moreover, the price effects include the contributions from changes in profit rates or the relative investment deflator in the case of Germany, the United Kingdom and the Netherlands.

In many respects *Japan* presents the opposite picture to that of the United States. Although domestic demand growth was much faster in Japan than in its major trading partners, a favourable elasticity ratio helped to produce an improvement in the current

external account, which was only partly offset by the net effect of exchange rate and terms of trade movements.[66] Moreover, with saving being more sensitive to income changes than investment, domestic demand growth had a positive effect on net private saving and generated an even stronger decline in the public sector borrowing requirement. Exchange rate movements further boosted net national saving and the net contribution from the error correction terms was much smaller than in the United States, since both saving and investment have been running somewhat below their long-run trends in the 1980s. From the overall figures in Table 7 it appears that the remarkable improvement in the fiscal balance (partly the result of tighter policies as suggested by the positive residual contribution) was the primary cause of the external surplus. However, the general government balance may be a poor indicator of fiscal policies, since it includes a large and rising surplus for the social security sector. In addition, though partly related, most of the fall in the borrowing requirement was offset by lower private saving. On balance, it seems that given the strength of net private saving a relatively restrictive fiscal policy has allowed the 3% improvement in the external account to be smoothly and quickly accommodated domestically.[67]

In *Germany* the public sector borrowing requirement also fell during the 1980s (partly induced by stronger income growth and partly due to tighter policies) and accounted for about one-half of the external improvement. Explaining the steep rise in net private saving is more problematic. The first point to note is that it was

[66] While positive relative demand and negative real exchange rate contributions also characterised Japanese developments during the 1960s and 1970s, the positive terms-of-trade effect is unique to the 1980s. It can be related to the fall in the prices of oil and other raw materials (which constitute the bulk of Japanese imports) combined with some strengthening of profit margins on exports of manufactured goods.

[67] Indeed, by 1989 the error corrections "in store" for this year were about + ½% for both the BoP and the net domestic saving equations.

necessary to disaggregate private saving into company and household saving, as the combined equation yielded an R^2 of only .14. Moreover, the rise in the profit share during the 1980s appears to have played a major role in boosting company saving, so that part of the recorded rise in net private saving is conditional on maintaining the current profit share of income.[68] After accounting for these special factors, the combined contribution of the residual and error correction terms amount to 2¾%, which can be ascribed mainly to a negative trend (1.3% during 1980–89) and some transitory elements in the investment function.[69] In assessing these changes it is, of course, important to bear in mind that Germany started the 1980s with a deficit on the current external account, so that part of the recorded improvement reflects a "return to normal".[70] At the same time, with policies geared to consolidating public sector finances and restoring company profitability, the stage was set for accommodating further improvements, including favourable terms-of-trade changes.

The calculations shown for *France* confirm the earlier impression of an almost stationary process for BoP. During the 1980s BoP has changed by only .2% and except for the residual all contributions are quite small. Despite the poor statistical fit it is worth noting the positive sign on the REER-contribution in the BoP equation (compared with a large and negative contribution in the 1970s), which may be seen as the effect of anti-inflationary policies.[71] On the domestic side the residual contribution is rather large and almost entirely due to a negative residual in the

[68] In Table 7 this effect is included under prices and accounts for most of the contribution. On this point see also Neuthinger (1989).

[69] The ECM-term is rather large but mostly reflects developments in the early 1980s, when investment was relatively low but still exceeded the level predicted by the long-run equation.

[70] Indeed, during 1980–83 the ECM-term contributed some 1¾% to the rise in BoP.

[71] At the same time, the real depreciation weakened net domestic saving by stimulating investment spending more than saving.

investment function. Hence, the recorded rise in net private saving is to a considerable extent the result of underpredicting the fall in investment and may, therefore, be only transitory. Private saving is characterised by an unusually large negative coefficient with respect to the rate of unemployment, which, given the rise in the latter during the 1980s, accounts for the negative activity contribution. By contrast, the built-in budget stabilisers are rather weak and most of the increase in the public sector borrowing requirement appears to reflect a weakening of the underlying balance.

In contrast to the stable picture for France, that of the *United Kingdom* is one of large fluctuations (see Graphs 5 and 13). The rise in Y/Y* has been accompanied by a fall in net private saving and by an even sharper decline in the external account, reflecting (as in the United States) a marked rise in domestic demand growth relative to the warranted rate.[72] Cyclical factors, however, account for only one-fourth of the fall in net private saving, as a strong response to the lower rate of price increases and the improvement in the public sector balance (mostly induced by stronger real income growth and lower inflation) added about 7½% to the deficit, leaving some 3½% (most of which was accounted for by an overprediction of saving) as a residual item. Given the large changes observed during the 1980s, it is natural to ask whether the estimates contain any signs of reversals towards earlier and more stable patterns. However, at current levels of the explanatory variables this appears not to be the case. On the external side, the ECM-contribution is negative, implying that the downward adjustment to the rapidly deteriorating long-run path has been only partly completed. Moreover, while the residual pattern for the early 1980s might indicate a positive influence of supply-side policies, negative residuals for 1988 and

[72] Exchange rate movements have had only a moderate impact, though it is worth noting that net domestic saving is more responsive to exchange rate movements than the current external account.

1989 suggest that such effects were by then largely exhausted. On the domestic side, the main problem is the overprediction of saving, but various attempts at improving the estimates met with no success. By contrast, an ad hoc adjustment to the long-run investment equation[73] succeeded in removing a tendency for the ECM-changes to accumulate, though this adjustment merely serves to identify and quantify a problem and does not provide an explanation.

Looking at graphs 7 and 15 for *Italy,* two features stand out: (i) a marked rise in net private saving but (ii) an even sharper worsening of the public sector balance starting in 1979, which has generated a deterioration in net national saving and in the current external account. The impression of a substantial trade-off between private and public saving is supported by the empirical estimates, as DEF enters the private saving function with a coefficient of -.9 and the rise in DEF accounts for more than one-half of the rise in net private saving. In addition, net private saving has been helped by the fall in demand growth during the 1980s and by the real appreciation of the exchange rate. The latter is unique to the 1980s and reflects a firmer exchange rate policy in conditions of a sluggish response of unit labour cost increases to the new regime. On the whole, the reconciliation of domestic and external financial balances does not pose major problems in the case of Italy. The BoP equation contains a large and negative ECM-term (implying that BoP has been exceeding its long-run value), but it is offset by the residual item and mainly reflects developments in the early 1980s. On the domestic side there are large but offsetting errors (a cumulative 1½–1¾% for both

[73] While the investment adjustment equation easily passed the Chow-test for parameter stability (F-value of 1.4), and the CI-equation was stationary without any intercept shifts, a dummy variable for the 1980s produced a highly significant coefficient (see Annex II, Table 4), pointing to an upward shift in the investment/GDP ratio of 2¼ percentage points. Applying a similar procedure to the saving equation also produced a significant coefficient, but it was necessary to retain the dummy in the EC-equation and its contribution exceeded the residual of the unadjusted equation.

equations) in the saving and investment equations and the small ECM-term reflects a weak adjustment mechanism in the investment equation. More importantly, a continued financing of the public sector borrowing requirement through private saving will eventually cause problems in maintaining investment and real output growth.

Explaining net domestic saving in *Canada* is also unproblematic when relying on the domestic approach. Given the negative elasticity of net saving with respect to cyclical changes, the rise in output and demand growth was accompanied by a fall in net private saving, which was only partly offset by the effect of built-in budget stabilisers. The decline in the rate of inflation also had a negative effect (especially on the fiscal balance) and the appreciation of the exchange rate further weakened net national saving. The error correction and residual items are both small and reflect high R^2s and powerful adjustment mechanisms in the underlying equations. The adjustment of private saving to changes in the budget deficit is also powerful, which is evident in the large "bulges" observed in Graph 18.[74] Consequently, despite the openness of the Canadian economy and the large fluctuations of the real exchange rate it has behaved almost like a closed system: firstly, fiscal policy plays only a minor role in explaining movements in the external balance, but has strong crowding out and crowding in effects on private saving; secondly, even though saving and investment are both very sensitive to exchange rate movements, net saving is not because the two elasticities have the same sign and are about equal in size; and thirdly (and most surprisingly), the BoP equation is very poor and provides very little additional information. Indeed, as can be seen from Annex II, Table 1, the long-run BoP-equation has an R^2 of only .23 and does not satisfy the DF-test for co-integration at the 5%

[74] The "inverse relation" is particularly evident during 1981-85, when the public sector borrowing requirement rose by 5.5 percentage points and private net saving by 5.8 points. Over the next three years the PSBR fell by 4.2 points while the decline in net private saving at 7 points was somewhat larger.

significance level. As a result, the EC-equation, which is used in calculating contributions, has a weak adjustment mechanism and an equally poor fit.[75] An even more surprising result is the virtual absence of exchange rate effects (despite a high elasticity in the long-run export equation) and even the contribution of terms of trade changes looks small in comparison with that of changes in the domestic inflation rate.

Net private saving in *Australia* has been negative during most of the 1960-89 period (see Graph 18) and over the last five years the deficit has grown to around 6% of GNP. Over the same period the public sector borrowing requirement fell by almost 5% of GNP due to cyclical developments and lower inflation but also under the influence of a more restrictive policy stance. This again points to a rather strong trade-off between private and public net saving, which is confirmed by the saving equations, but not by the Roubini model discussed earlier. Another reason for the fall in net private saving was the recovery in income and demand growth as the higher rate of capacity utilisation boosted investment spending and the simultaneous rise in unemployment (reflecting an unusually rapid growth of the labour force) depressed saving. The fall in the rate of inflation added a further 1% to the saving deficit, while neither saving nor investment is very sensitive to exchange rate movements. Hence the Australian economy displays some of the same features noted above for Canada, with the exception that the domestic approach is much less satisfactory than in the case of Canada. About one-half of the fall in net private saving is left as a residual item, of which two-thirds can be ascribed to an underprediction of the fall in gross private saving. In fact, the latter seems to have been one of the principal causes of the weakness in the external account and is highly surprising, particularly in view of a remarkable degree of real wage restraint and the recovery in the profit share, which, at 7 percentage points

[75] The ECM-changes in Table 6 actually understate the weakness of the adjustment mechanism with $\Sigma_{80}^{86}ECM = 4.2\%$ and $\Sigma_{87}^{89}ECM = -3.3$.

between 1983 and 1989, was more pronounced than for any of the other countries included in the sample.[76] Against this background the external approach is more satisfactory, ascribing about one-half of the rise in the external deficit to the strong growth of domestic demand relative to other countries and leaving only 1½% as a residual. The terms-of-trade influence is also significant, while the estimated exchange rate effect looks weak given the large elasticities of the trade equations and the volatility of the exchange rate (50% between peak and trough for the 1980s).

The picture for *Austria* is characterised by a high stability of gross private saving (see Graph 19), which partly explains the relatively low R^2 for the long-run saving equation but also the very strong adjustment mechanism in the EC-equation. Private investment has been more volatile and some of the coefficients in the CI-equation have low t-statistics. The coefficients of the EC-equation are more satisfactory, but the equation underpredicts the fall in the investment/GNP ratio during the 1980s and this accounts for most of the residual term. Otherwise the rise in net private saving can be related mostly to the depreciation of the real exchange rate (which has stimulated saving but not investment), the fall in the inflation rate and the rise in the budget deficit. Lower interest rates, on the other hand, have reduced net private saving by stimulating investment but improved the fiscal balance, whereas the rise in unemployment and the lower inflation rate have both contributed to a worsening of the public sector balance. An interesting feature of the external equations is the very low R^2 for the CI-equation combined with an EC-

[76] When the lagged profit share was added to the long-run saving equation, it obtained a highly significant but *negative* coefficient, contrary to economic theory and relationships found for other countries. On the other hand, when the statistical discrepancy, which rose by 2-2½% of GNP during the 1980s, is ignored rather than combined with saving, the fall in the latter becomes much smaller. For further discussion of this issue see McKibbin and Mosling (1990) and Edey and Britten-Jones (1990).

equation with a strong adjustment mechanism[77] and a high R^2. However, reconciling the corresponding contributions with those obtained from the domestic approach is less straightforward. In the first place, the short-run BoP equation contains a large positive trend, which has been included under the activity contribution but exceeds the trend found in Graph 4. Secondly, the ECM-contributions have opposite signs, pointing to a certain inconsistency between the two approaches, though part of the ECM-change for the BoP equation can be ascribed to developments in the early 1980.

As already mentioned, the BoP equation for *Belgium* poses certain problems, as changes in BoP barely meet the conditions for a stationary series, while REER is close to being stationary. Nonetheless, when the EC-equation is applied in calculating contributions, the results do not appear implausible. With domestic demand restrained, relative demand growth has had a positive influence on the external account and, following the nominal depreciation of 1981 and the adoption of nominal and real wage restraining policies, depreciation of the real exchange rate has strengthened the external account to the tune of 2¼% of GNP. Terms-of-trade improvements have added another 1%, leaving only ¼% as error correction and residual items. By contrast, the domestic approach met with several difficulties. Firstly, it was only possible to obtain a satisfactory long-run investment equation, when the coefficient on the real exchange rate was constrained to zero prior to the devaluation of 1981. Even so, the corresponding EC-equation understates the fall in the investment ratio and accounts for more than two-thirds of the residual.[78] Secondly, the long-run saving equation displays a

[77] As mentioned on page 8, the BoP process for Austria is stationary around a rather flat quadratic trend and the significant adjustment coefficient can be seen as quickly eliminating deviations from this stable path.

[78] When the investment adjustment equation was subjected to the Chow-test it produced an F-value of 1.8, which is relatively high but still below the level of significance.

positive trend of about ⅓% per year, which reappears in the EC-equation and accounts for the remainder of the residual. Various attempts at finding more plausible explanations for the rise in saving were unsuccessful,[79] but it is possible that the trend serves as a correction to the unemployment term.[80] Despite a fall in the output gap and slow labour force growth, unemployment in Belgium rose between 1980 and 1989, suggesting a structural disequilibrium in the labour market and raising some doubts regarding the role of unemployment as a determinant of saving. Thirdly, even though the budget deficit figures prominently in the public debate, private saving reacts only moderately. At the same time, the rudimentary equation for the public sector balance is not implausible, showing a negative impact of the rise in unemployment, a large positive effect of the fall in interest rates and a slight improvement in the underlying balance.

For both Denmark and Finland it was necessary to resort to ad hoc adjustments in order to generate a plausible correction mechanism.[81] In the case of Denmark, the cumulative ECM-terms in the unadjusted equations attained values of up to 5% for the 1980s and for Finland they were even higher for the BoP function. Although the Chow-test did not indicate significant parameter instability,[82] a dummy variable inserted into the CI-equations was highly significant in the Danish investment equation and the Finnish saving function and almost significant

[79] One reason for the rise in saving is likely to have been the increase in the profit share of income, but when profits were included in the saving function the coefficient was insignificant and leaving out the trend term led to a substantial drop in the explanatory power.

[80] Recalculating the contributions in Table 7 on this basis produces an activity effect of +1% and a residual item of 2.4%.

[81] On the other hand, the adjustments were not required to satisfy the co-integration conditions.

[82] For Denmark the Chow-test produced F-values of around 2.4, which are almost significant, whereas for Finland they were much lower but derived from equations with rather high standard errors, which weaken the power of the test.

in the remaining ones.[83] Moreover, in all cases the cumulative ECM-terms declined substantially and helped to generate more plausible contribution figures.

Apart from these corrections, which of course do not provide a better explanation of changes in financial balances but merely more satisfactory statistical properties, developments in *Denmark* (see Graph 17) point to a very strong trade-off between public and private net saving, with the former moving sharply into deficit in the early 1980s and subsequently improving, while the latter shifts from a large surplus to a deficit, with both imbalances shrinking towards the end of the period. The interaction is reflected in a significant and negative DEF-coefficient in the saving equation and saving is also very sensitive to changes in interest rates. On the other hand, exchange rate effects are small and totally absent in the investment function, so that the direct domestic counterpart to exchange rate-induced improvements in the external account is very small. Yet, indirectly, exchange rate policies may have affected the domestic balances, as the move to a firmer exchange rate policy by end-1982 was a precondition for lowering interest rates (more than 10 percentage points between 1982 and 1989) and inflation, which together have raised net national saving by 2% of GNP. Cyclical factors have had a negative effect on net private saving but reduced the public sector borrowing requirement substantially. An even more important element in consolidating the budget has been the fall in interest rates, whereas the large negative residual points to a weakening of the underlying balance, mainly owing to tax reforms and problems in breaking a positive trend in public spending. The contributions derived from the external adjustment equation look relatively small but in several cases this is the net outcome of divergent movements during the 1980s or large year-to-year fluctuations. Relative demand factors generated a negative impact in the early

[83] For the Finnish investment function the most satisfactory results were obtained when – as in Belgium – the dummy variable was combined with the exchange rate.

1980s but this was more than offset by changes later in the period. The exchange rate contribution shows a succession of positive values in years of nominal depreciation followed by negative values in years (such as 1987-88) when unit labour cost growth was too high but the nominal rate was kept stable. The error correction mechanism is quite powerful and the cumulative ECM-terms and residuals are small, which is slightly surprising considering the rise in net foreign debt and in interest payments to abroad.

Private investment has usually exceeded private saving in *Finland* and the saving deficit widened to almost 7% of GNP last year (Graph 20). Moreover, the negative coefficient on the dummy variable in the long-run saving equation suggests that this was not a temporary deviation. Given the stable development in the public sector balance as well as the large offsets to fiscal changes, net private saving appears to be the "driving force" behind balance of payments changes, but reconciling the two approaches is, in fact, fraught with several problems. In the first place, net domestic saving and the external account are both very sensitive to cyclical changes and exchange rate movements (Table 6) and in theory the marked rise in Y/Y^* and DD/DD_W could - after allowing for lags - have been offset by devaluations. However, because of excessive unit labour cost growth in a period when a policy of keeping the nominal effective exchange rate stable was adhered to, the real exchange rate has appreciated by almost 14%, thus aggravating the demand-induced deterioration in domestic and foreign net saving. Secondly, and more importantly, the relatively small ECM-contributions are deceiving, since the dummy variable technique introduces large changes in the long-run BoP and private saving ratios.

During the 1980s the external balance of *the Netherlands* has benefited from a marked rise in foreign demand relative to domestic demand growth, which together with a 15% real depreciation strengthened the current account by 4½% relative to GNP. At first glance it is difficult to identify the counterparts

in the domestic financial balances, as the demand-induced rise in net saving was only 1¾% – and entirely the result of built-in budget stabilisers – and the depreciation actually had a negative effect. However, one common factor has been a successful anti-inflationary policy which was instrumental in improving international competitiveness and thereby company profits and net private saving.[84] Falling interest rates further reduced the public sector borrowing requirement (offsetting most of the adverse revenue effect of lower inflation), but have had only a marginal effect on net private saving. Judging by the residual items and the cumulative ECM-terms the domestic equations provide a better explanation of current account developments than the BoP equation,[85] and the situation by the end of the 1980s appears to be stable. However, the small residual error for net private saving is the net outcome of larger errors, as the rise in both investment and gross private saving is overpredicted. Moreover, part of the recorded increase in net national saving is due to the odd combination of stronger real income growth and higher unemployment (+ 5% during the 1980s). Once this comes to an end and investment catches up with the predicted rate, net private saving will decline and – unless there are offsetting changes in the fiscal balance – so will the current-account surplus.

Turning to *Spain*, it may be seen (Graph 20) that private investment displays a remarkable decline from about 28% in 1974 to only 15% in 1985 and then recovers somewhat over the next four years. During the same period the public sector financial balance deteriorated from +1 to –7% of GNP, while private saving was relatively stable. Against this background it is not too surprising that the empirical estimates reveal a very strong crowding-out effect in the private investment equation, although

[84] As seen in Annex II, Table 4, the profit share has a significant influence on private saving, and the improvement in profits during the 1980s accounts for two-thirds of the change shown for price contribution.

[85] It should also be recalled that a dummy variable was inserted into the BoP equation to satisfy the conditions for co-integration.

the coefficient may be biased by the absence of any indicator of the transmission mechanism.[86] Gross private saving is also influenced by fiscal changes and, in addition, is negatively affected by the exchange rate appreciation and the cyclical developments in the 1980s. However, the latter, and even more so the activity contributions to budgetary changes, may be biased by the use of the rate of unemployment as a cyclical indicator.[87] The residual term is also relatively high and reflects the combined effect of overpredicting the investment ratio as well as the fall in saving. Consequently, and despite the satisfactory statistical properties of the short and long-term domestic equations, the external approach on balance provides a better explanation of developments in net national saving: the residual is small,[88] the error correction mechanism effectively eliminates deviations from the long-run path and there are two interesting changes compared with earlier periods. In the past, the favourable elasticity ratio has produced a positive contribution from relative demand growth but this was reversed in the 1980s because of the exceptionally strong growth of domestic demand. Secondly, relative price changes have usually provided a negative contribution as a rising trend in relative unit labour costs was accompanied by a real appreciation, the effect of which was only partly offset by a rise in export prices relative to import prices. Lately, however, because of a slowdown in unit labour cost

[86] As already mentioned, there is no long-run market interest rate available prior to 1978 but it may be assumed that the crowding-out of private investment has occurred via credit restrictions.

[87] Between 1979 and 1987 the rate of unemployment increased from 7.9 to 20.5%, even though the rate of output growth picked up from -.1 to + 5.5 and the output gap was reduced by 4 percentage points. When the output gap was used as a cyclical indicator, it generated an implausibly large rise in net public sector revenue but a negative coefficient in the savings equation. Estimating the saving equation including an intercept term produced a trend rise of .3% per year and a substantial overprediction of the savings ratio.

[88] The negative sign is likely to be the result of tariff reductions following accession to the European Community.

growth, real exchange rate changes have been much smaller[89] and their impact more than offset by substantial terms of trade gains.

When analysing changes in the external balance for *Sweden* it is natural to turn first to fiscal policies, since the fall in the public sector borrowing requirement (8.8% during the 1980s and from trough to peak amounting to no less than 11% of GNP) was larger than for any of the other countries in the sample. Yet for two reasons it seems inappropriate to regard fiscal changes as an exogenous and causal factor. Firstly, because of a strong trade-off between public and private saving some 75% of the fiscal improvement was offset by lower private saving. Secondly, even though a policy of fiscal consolidation was formally adopted to support the exchange rate devaluation of 1982, most of the fall in the deficit appears to have been induced by built-in stabilisers and by the the fall in inflation and nominal interest rates, leaving only 2¼% as an improvement in the underlying balance. Turning to the private sector, gross saving is strongly pro-cyclical but declines in response to a rise in the real interest rate and the exchange rate. A powerful correction mechanism has kept actual saving close to its long-run path and considering the steep fall in saving (6½% of GNP between 1980 and 1989) the residual error (1%) is small. The investment function generates a cumulation of negative deviations from the long-run path and overpredicts the level of investment by some 1¼% of GNP. On balance, however, the domestic equations provide a better explanation of balance of payments developments than the BoP equation, which had to be augmented by ad hoc adjustments.[90] Another disturbing feature

[89] Until 1988, the real exchange rate was actually below the 1979 level.

[90] When using the standard equation the residual error as well as the cumulative ECMs were rather large and, even though the Chow-test did not identify a high degree of parameter instability, a 1980-89 dummy variable inserted into the CI-equation obtained a significant coefficient and pointed to a deterioration of almost 2%. Moreover, the re-estimated EC-equation produced a more satisfactory adjustment mechanism and a much smaller residual error.

of both BoP equations is the very low coefficients for both domestic and foreign demand. This result is difficult to explain given the much higher elasticities in the trade equations (Annex I, Tables 1 and 2) but proved invariant to various alternative specifications. On the other hand, the elasticity ratio is affected only marginally by this bias and it does not seem to have had any adverse influence on the statistical properties of the equation.

By contrast, the domestic approach contributes very little to understanding balance of payments developments in *Switzerland.* Private saving and investment are both pro-cyclical, with the marked rise in Y/Y* in the 1980s entailing a fall in net saving. The interest elasticity of investment is high, but interest rate changes have been small in Switzerland and exchange rate and fiscal influences have been moderate as well.[91] The combined contribution of the identified factors amounts to a fall in net private saving of almost 2% of GNP, compared with a recorded increase of more than 3%, leaving a rise of about 5% to be "explained" by the residual item and the error correction term. As can be seen from Table 6 the investment equation accounts for most of the ECM-contribution to net saving as actual investment has exceeded the long-run path during most of the 1980s. The saving equation, by contrast, has kept actual saving close to the long-run path but underpredicts the saving rate by more than 2 percentage points.[92] Against this background the external approach is more satisfactory and ascribes a large contribution to terms of trade developments, reflecting the combined effect of a large elasticity and an almost 15% terms-of-trade gain. The exchange rate elasticity is also relatively high, but the contribution is small (especially compared with the two previous

[91] The small influence of fiscal changes on private saving is not surprising in view of the low profile of fiscal policy in Switzerland.

[92] Both equations show signs of parameter instability and the Chow-test applied to the investment function produced an F-value of 2.4, which is almost significant. However, various ad hoc adjustments were unsuccessful in generating a more efficient error correction mechanism.

decades, when contributions of +2.2 and -1.6% respectively were recorded) because of only a moderate change in the exchange rate. The activity impact may be understated as the elasticity with respect to foreign demand is very low compared with the long-run value. More importantly, the error correction mechanism is rather weak, with BoP tending to overshoot the long-run value early in the decade, while an upward correction of nearly 1% is predicted for this year.

B. Summary and conclusions

Although caveats have been spread generously throughout this paper a few more are called for before an attempt is made to summarise the empirical findings and draw some tentative conclusions:

- the two-step estimation procedure has worked quite well and produced plausible results in most cases, but a logical next step would be to specify and estimate the long-run equations in terms of stocks rather than levels of flows. This might help to explain some of the odd results and provide a more appropriate adjustment mechanism as the accumulation of financial imbalances could be included via the error correction terms;[93]
- the paper has attempted to explain balance-of-payments developments from two alternative points of view, but has not integrated the two approaches. In particular, regarding net domestic saving as the dependent variable in both the domestic and the external approach leaves the model with too many degrees of freedom and inter-relationships between the explanatory variables in the domestic and external equations would further reduce the degrees of freedom in the system. In this context the simulation results - based on average values from ten

[93] Alternatively, the accumulation of imbalances may be interpreted as resulting from international portfolio shifts. See Makin (1990), who, using a capital flow approach, explains the rise in the US external deficit by deregulation of international capital flows and strong growth in real wealth outside the United States.

international macro-models – reported in Helliwell (1990) are of interest, as they show that over the medium-term an expenditure-induced rise in the fiscal deficit will be accompanied by a rise in the external deficit which is about half as large.[94] This is somewhat higher than our own calculations shown in Table 5, suggesting that by relying on single-equation estimates and allowing too many degrees of freedom, we overstate the private sector response and understate the external impact of fiscal changes;

– since the equations are based on ex post data which have to satisfy certain accounting rules and identities, the estimated coefficients may not represent behavioural parameters. This is particularly true of the two equations used for the Roubini model which, apart from the GAP term, are equivalent to identities with private saving left out.

As regards the empirical results and particularly the contributions to balance-of-payments changes in the 1980s, the main findings may be summarised as follows:

– a number of the net saving equations contained large positive residuals, particularly in continental Europe and in Japan and mostly as a result of overpredicting investment or underpredicting saving. This suggests that the balance-of-payments surpluses, which were also a typical feature of these countries, may decline if investment and saving return to earlier levels;

– in many cases public and private net saving were strongly and negatively correlated, which has been interpreted by some

[94] The ratio varies across countries, being somewhat higher for smaller than for larger countries. On this point see also Hutchison and Pigott (1987), who estimate the impact of budget deficits (measured as the cyclically corrected public sector balance) on three separate variables: the real interest rate, the real exchange rate and the current-account. The last equation does not allow for induced changes in interest rates and exchange rates, which may explain why their ratios are somewhat lower than those reported by Helliwell and thus closer to the figures shown in Table 5. Their results, however, confirm that the ratio tends to be smaller for larger countries, with that of the United States estimated at 0.25, compared with an average value of 0.43 for other G-10 countries.

authors as reflecting a policy of balance of payments smoothing. The results given in this paper rather suggest that fiscal policy changes have had only a moderate impact on the external accounts but a major influence on private gross saving and in some cases also on private investment. This is particularly striking in the United Kingdom, Australia and the Scandinavian countries, where large improvements in the public sector fiscal balance were accompanied by large declines in private net saving and a worsening of the current external account;[95]

- exchange rate effects were identified in most countries and in the BoP-equations as well as in the net savings equations. However, because the coefficients are low, the contributions of exchange rate movements to explaining changes in net financial balances have in most cases been relatively moderate;[96]
- interest rate effects were also identified in investment as well as saving equations, but they were absent in the investment equations for two of the major countries and, as in the case of exchange rate movements, the contributions were mostly small. Hence, two of the market-clearing mechanisms predicted by theory do not seem to have been of much practical importance;
- on balance the calculations based on the trade equations produce smaller residuals than those derived from the net saving equations, and they also outperform the latter with respect to the contributions of the error correction terms (see Table 7). On the other hand, the saving and investment equations come closer to satisfying the conditions for using the two-step procedure than the trade equations, possibly suggesting that the domestic approach may be more reliable;
- on the whole, the estimates for the smaller countries were less satisfactory than those obtained for the larger countries and not

[95] The trade-off between private and public net saving also implies that evaluating the nature of an imbalance (i.e. a "good" or a "bad" deficit) on the basis of fiscal policy alone is insufficient.

[96] As noted earlier (see page 40), this is in sharp contrast to the results obtained by Helkie and Hooper, op. cit.

only regarding the overall fit but also with respect to the size and significance of the parameters. Given their greater dependence on foreign trade, smaller countries are, of course, more exposed to external shocks than large countries, and the high trade shares also lead to larger balance-of-payments repercussions in conditions of domestic shocks. However, this does not necessarily lead to a more erratic behaviour of BoP.[97]

With respect to policy implications, the exploratory and preliminary nature of this exercise calls for caution and we shall add only a few observations concerning the imbalances of the 1980s.

According to the standard model of balance of payments adjustments (Krugman (1987)), the current-account imbalances have been the result of divergent fiscal policies which, via relative demand effects and real exchange rate movements, led to current-account divergences. Hence, a reversal of these changes calls for a reversal of fiscal policies and a depreciation of the currencies of the deficit countries. However, the empirical results discussed above only lend indirect support to this view:

- because of the strong offsets the influence of fiscal policy on national saving has been relatively small and its principal role has been a failure to make allowances for trends in private saving and investment and to reinforce the influence of exchange rate changes on domestic financial balances;
- due to the low relative price elasticities, only a small role can be assigned to exchange rate adjustments in correcting the imbalances, unless unrealistically large changes are being considered.

This does not mean that we wish to support hypotheses which ignore the role of market-clearing conditions in balance of payments adjustments. What it does mean, however, is that exchange rate changes unaccompanied by fiscal or monetary changes, which redistribute aggregate demand from deficit to

[97] Indeed, it might be argued that with a higher variance for the principal determinants it should be possible to estimate the corresponding parameters with a smaller standard error.

surplus countries, do not provide much scope for reducing the existing imbalances.[98]

To the all-important question of whether the imbalances emerging in the 1980s are sustainable, the model used in this paper makes it possible to identify long-run trends for the BoP of individual countries, but not to say whether these are sustainable. For instance at current values of domestic and foreign demand, real exchange rates and the terms of trade, the long-run external accounts (in % of GNP) for the United States, Japan and Germany are -1.95, 1.35 and 4.35 respectively. However, whether the associated accumulation of foreign assets and liabilities is consistent with optimal portfolio adjustments can only be answered when the empirical approach is extended to include stocks as well as flows.

[98] Even using conventional relative price elasticities it would be difficult to eliminate the current imbalances without redistributing aggregate demand or resorting to unprecedented exchange rate adjustment. More generally, the low relative price elasticities open up a broader theoretical issue regarding the likely size of income and price effects in foreign trade equations. Since international trade typically involves goods and services which can be produced in all countries, one would expect income elasticities close to those found in consumption equations while price elasticities, given the high degree of substitutability between domestic and foreign goods, should be well above unity. However, trade equations usually produce income elasticities between 1.5 and 2 and price elasticities well below unity.

Bibliography

Abell, J. (1990): "Twin deficits during the 1980s: An empirical investigation." *Journal of Macroeconomics,* pp. 81-96.

Aghevli, B., Boughton, J., Montiel, P., Villanueva, D. and Woglom, G. (1990): "The role of national saving in the world economy." IMF. *Occasional Paper,* No. 67.

Akhtar, A. (1989): "Adjustment of US external imbalances." *Annual Report,* Federal Reserve Bank of New York, pp. 7-48.

Artis, M. and Bayoumi, T. (1989): "Saving, investment, financial integration and the balance of payments." *IMF Working Paper,* WP/89/102.

Bairam, E. (1990): "The Harrod foreign trade multiplier revisited." *Applied Economics,* pp. 711-18.

Baldwin, R. and Krugman, P. (1987): "The persistence of the US trade deficit." *Brookings Papers on Economic Activity,* pp. 1-56.

Barrell, R. and Wren-Lewis, S. (1989): "Fundamental equilibrium exchange rates for the G-7." *National Institute for Economic and Social Research Discussion Paper,* No.155.

Barro, R. (1974): "Are government bonds net wealth?" *Journal of Political Economy,* pp. 1095-1117.

_____ (1989): "The Ricardian approach to budget deficits." *Journal of Economic Perspectives,* Spring, pp. 37-54.

Barth, J., Iden, G. and Russek, F. (1986): "Government debt, government spending and private sector behaviour: Comment." *American Economic Review,* pp. 1158-67.

Bayoumi, T. (1989): "Saving-investment correlations: immobile capital, government policy or endogenous behaviour." *IMF Working Paper,* WP/89/66.

Bernheim, D. (1989): "A Neoclassical perspective on budget deficits." *Journal of Economic Perspectives,* Spring, pp. 55-72.

Bhagawa, A. (1986): "On the theory of testing for unit roots in observed time series." *Review of Economic Studies,* pp. 369-84.

Blinder, A. (1989): "The economic myths that the 1980s exploded." *Business Week,* 27th November, p. 15.

Bosworth, B. (1990): "Are we saving too little?" *American Economic Review,* pp. 377-81.

Cuddington, J. and Vinals, J. (1986a): "Budget deficits and the current account in the presence of classical unemployment." *The Economic Journal,* pp. 101-19.

_____ (1986b): "Budget deficits and the current account." *Journal of International Economics,* pp. 1-24.

Darrat, A. (1988): "Have large budget deficits caused rising trade deficits?" *Southern Economic Journal,* pp. 879-87.

Dean, A., Durand, M., Fallon, J. and Hoeller, P. (1989): "Saving trends and behaviour in OECD countries." *OECD Working Paper,* No. 67.

Dooley, M. and Penati, A.(1984): "Current account imbalances and capital formation in industrial countries, 1949-81." *IMF Staff Papers,* pp. 1-24.

Edey, M. and Britten-Jones, M. (1990): "Saving and investment" in *The Australian Macro-Economy in the 1900s,* edited by S. Grenville, Reserve Bank of Australia, pp. 79-158.

Eichengreen, B. (1989): "Trade deficits in the long run", in *US Trade Deficit: Causes, Consequences and Cures,* edited by A.E. Burger, Kleuwer Academic Publication, Boston, pp. 239-79.

Engle, R. and Granger, C. (1987): "Cointegration and error correction: representation, estimation and testing." *Econometrica,* pp. 251-76.

Engle, R. and Yoo, S. (1987): "Forecasting and testing in co-integrated systems." *Journal of Econometrica,* pp. 143-59.

Feldstein, M. (1982): "Government deficits and aggregate demand." *Journal of Monetary Economics,* pp. 1-20.

_____ (1983): "Domestic saving and international capital movements in the long run and the short run." *European Economic Review,* pp. 129-51.

Feldstein, M. and Horioka, C. (1980): "Domestic saving and international capital flows." *Economic Journal,* pp. 314-29.

Feldstein, M. and Bacchetta, P. (1989): "National saving and international investment." *NBER Working Paper,* No. 3164.

Feldstein, M. and Elmsdorf, D. (1990): "Government debt, government spending and private sector behaviour." *American Economic Review,* pp. 589-99.

Fieleke, N. (1983): "National saving and international investment", in *Saving and Government Policy,* Conference Series, No. 25, Federal Reserve Bank of Boston.

Fry, M. (1986): "Terms-of-trade dynamics in Asia: An analysis of national saving and domestic investment responses to terms-of-trade changes in 14 Asian LDCs." *Journal of International Money and Finance,* pp. 57-73.

Genberg, H. (1988): "The fiscal deficit and the current account: Twins or distant relatives." *Research Discussion Paper,* No. 8813, Reserve Bank of Australia.

Goldstein, M. and Khan, M. (1985): "Income and price effects in foreign trade" in *Handbook of International Economics,* Vol. II, edited by R.W. Jones and P.B. Kenen, Elsevier, Amsterdam, Chapter 20.

Graham, J. (1987): "International differences in savings rates and the life cycle hypothesis." *European Economic Review,* pp. 1509-29.

Helkie, W. and Hooper, P. (1988): "An empirical analysis of the external deficit, 1980-86", in *External Deficits and the Dollar: The Pit and the Pendulum,* edited by R. Bryant, G. Holtham and P. Hooper, Brookings Institution, Washington, pp. 10-56.

Helliwell, J. (1990): "Fiscal policy and the external deficit: Siblings, but not twins." *NBER Working Paper,* No. 3313.

Holtham, G. and Kato, H. (1986): "Wealth and inflation effects in the aggregate consumption function." *OECD Working Paper,* No. 35.

Houthakker, H. and Magee, S. (1969): "Income and price elasticities in world trade." *Review of Economics and Statistics,* pp. 111–25.

Hutchison, M. and Pigott, C. (1987): "Real and financial linkages in the macroeconomic response to budget deficits: An empirical investigation", in *Real-Financial Linkages among Open Economies,* edited by S. Arndt and J. Richardson, MIT Press, Cambridge, Mass.: pp. 139–65.

Hylleberg, S. and Mizon, G. (1989): "A note on the distribution of the least squares estimator of a random walk with drift." *Economics Letters,* pp. 225–30.

Iwata, K. (1989): "Comments." *European Economic Review,* pp. 1047–49.

Kearney, C. and Monadjemi, M. (1990): "Fiscal policy and current account performance: International evidence on the twin deficits." *Journal of Macroeconomics,* pp. 197–219.

Kessler, D., Perelman, S. and Pestieau, P. (1986): "L'hypothse d'equivalence entre impôt et emprunt: Un test sur les pays de l'OCDE." *Annales d'conomie et Statistique,* pp. 141–49.

Kormendi, R. (1983): "Government debt, government saving and private sector behaviour." *American Economic Review,* pp. 994–1110.

Kormendi, R. and Meguire, P. (1986): "Government debt, government saving and private sector behaviour: Reply." *American Economic Review,* pp. 1180–87.

_____ (1990): "Government debt, government saving and private sector behaviour: Reply and update." *American Economic Review,* pp. 604–17.

Koskela, E. and Viren, M. (1983): "National debt neutrality: Some international evidence." *Kyklos,* pp. 575–88.

Krugman, P. (1987): "Adjustments in the world economy." *NBER Working Paper,* No. 2424.

_____ (1988a): "Deindustrialisation, reindustrialisation and the real exchange rate." *NBER Working Paper,* No 2586.

_____ (1988b): "Differences in income elasticities and trends in real income rates." *NBER Working Paper,* No. 2761.

Makin, J. (1990): "International 'imbalances': The role of exchange rates", in *Finance and the International Economy,* edited by R. O'Brien and I. Iversen, Oxford University Press.

McCombie, J. (1989): "'Thirlwall's law' and balance of payments constrained growth – a comment on the debate." *Applied Economics,* pp. 611–29.

McKibbin, W. and Morling, S. (1990): "Public sector growth and the current account in Australia: A longer run perspective." *Research Discussion Paper,* No. 9002, Reserve Bank of Australia.

McKinnon, R. (1981): "The exchange rate and economic policy: Changing post war perceptions." *Journal of Economic Literature,* pp. 531–57.

Modigliani, F. and Sterling, A. (1986): "Government debt, government spending and private sector behaviour: Comment." *American Economic Review,* pp. 1168–79.

_____ (1990): "Government debt, government spending and private sector behaviour: A further comment." *American Economic Review,* pp. 600–03.

Murphy, R. (1984): "Capital mobility and the relationship between saving and investment." *Journal of International Money and Finance,* pp. 327–42.

Neuthinger, E. (1989): "Germany's enduring current account surplus." *Intereconomics,* pp. 138–48.

Nicoletti, G. (1988): "A cross-country analysis of private consumption, inflation and the 'debt neutrality hypothesis'." *OECD Economic Studies,* No. 11, pp. 43–87.

Obstfeld, M. (1985): "Capital mobility in the world economy: Theory and measurement." *NBER Working Paper,* No. 1692.

_____ (1986): "How integrated are world capital markets? Some new tests." *NBER Working Paper,* No. 2075.

OECD (1989): *Economic Outlook,* Paris, June.

Paldam, M. (1990): "Wage rises and the balance of payments." Institute of Economics, University of Aarhus, Denmark, *Mimeo.*

Poterba, J. and Summers, L.(1987): "Recent US evidence on budget deficits and national savings." *NBER Working Paper,* No. 2144.

Roubini, N. (1988): "Current account and budget deficits in an intertemporal model of consumption and taxation smoothing: A solution to the 'Feldstein-Horioka puzzle'?" *NBER Working Paper,* No. 2773.

Sachs, J. (1981): "The current account and macroeconomic adjustment in the 1970s." *Brookings Papers on Economic Activity,* pp. 201–67.

_____ (1983): "Aspects of the current account behaviour of OECD countries", in *Recent Issues in the Theory of Flexible Exchange Rates,* edited by E. Claassen and P. Salin, North-Holland, Amsterdam.

Summers, L. (1988): "Tax policy and international competitiveness", in *International Aspects of Fiscal Policies,* edited by J. Frenkel, University of Chicago Press, pp. 349–86.

Tesar, L. (1988): "Savings, investment and international capital flows." *Brookings Discussion Papers,* No. 64.

Thirlwall, A. (1979): "The balance of payments constraint as an explanation of international growth rate differences." *Banca Nazionale del Lavoro Quarterly Review,* pp. 45–53.

Turner, P. (1986): "Savings, investment and the current account: an empirical study of seven major countries 1965–84." *BOJ Monetary and Economic Studies,* pp. 1–58.

_____ (1988): "Savings and investment, exchange rates and international imbalances: a comparison of the United States, Japan and Germany." *Journal of the Japanese and International Economies,* pp. 259–85.

Westphal, U. (1983): "Comments." *European Economic Review,* pp. 157–59.

Annex I

Trade equations and the 45°-rule[99]

A number of recent studies have compared actual demand (or real output) growth with the warranted rate as defined in the text. Thirlwall (1979) uses a rank correlation test between dd_i and dd* and finds a significant value. McCombie (1989) relies on a more indirect test by comparing import elasticities obtained from time series regressions with the import elasticities required to keep the current account in balance. For the period 1954-73 and in a sample of fifteen countries he finds that for most countries the two elasticities are not significantly different.[100] Krugman (1988b) compares the elasticity ratio with dd_i-dd_w in a cross-country regression for thirteen countries over the period 1955–65 and finds an R^2 of .75, with most observations closely clustered around a 45°-line. However, when Krugman repeats this exercise using revised elasticity estimates and a smaller country sample, the R^2 falls to only .32 for the period 1970–86.

This last result suggests that while equations (v) and (vi) are useful as a point of departure and in stating the conditions for balanced growth, they are less useful in describing actual developments, especially under a regime of flexible exchange rates. Indeed, as seen in the first section of Part I, external imbalances in some countries show a distinct time trend and it is well known that real exchange rates have not been constant. Moreover, most of the elasticities presented in the literature are based on merchandise trade only (or confined to manufactured

[99] All equations mentioned in this Annex refer to those discussed in the text on page 12.

[100] The exceptions were Australia, Canada, Japan and Norway, for which the estimated import elasticities were found to be significantly below the conditional ones (i.e. dd_i was well below dd*). Bairam (1990) applies the same test to fifteen low income countries for the period 1961–85 and finds the 45°-rule confirmed except for four oil-exporting countries.

goods), whereas total trade flows include a rising share of services and non-factor payments. The sample used by Krugman is also rather small for statistical tests and some of the earlier results proved very sensitive to the inclusion (or exclusion) of extreme observations, usually the United States and Japan.

To provide a more up-to-date and extensive evaluation of the 45°-rule we estimated export and import equations, using annual national accounts data for the period 1960-89, and then applied the elasticities in calculating warranted growth rates and in assessing changes in countries' external positions for various sub-periods.

However, before discussing the results of the estimates, a few words about the specification used. Since (vi) or the 45°-rule essentially refers to a long-run phenomenon and is unlikely to be satisfied on a year-to-year basis, both export and import elasticities were estimated from the long-term relations given in (ii), complemented by error correction equations to capture the short-run dynamics and the properties of the adjustment process:

$$
\begin{aligned}
&\text{(ii')} \quad m_{i,t} = a_1 dd_{i,t} + a_2 rp_{m,t} + \varepsilon_{m,t} \\
&\qquad\quad x_{i,t} = a_3 dd_{w,t} + a_4 rp_{x,t} + \varepsilon_{x,t} \qquad \text{and} \\
&\text{(ii'')} \quad dm_{i,t} = a_1' d(dd_i)_t + a_2' d(rp_m)_t + a_5 \bar{\varepsilon}_{m,t-1} + \eta_{m,t} \\
&\qquad\quad dx_{i,t} = a_3' d(dd_w)_t + a_4' d(rp_x)_t + a_6 \bar{\varepsilon}_{x,t-1} - \eta_{x,t}
\end{aligned}
$$

where rp is used as a short-hand notation for the relative prices as defined in (ii) and ε denotes a residual error, with $\bar{\varepsilon}_{-1}$ its estimated lagged value. dd_i was measured as total domestic demand in country i and dd_w as a weighted average of domestic demand in the other countries included in the sample using the weights of the BIS export-based exchange rate index. rp_m was measured by the ratio between the import deflator and the domestic demand deflator and rp_x by relative unit labour costs. While the activity variable in the export equation is uncontroversial, rp_x should ideally have been measured by the export price of country i relative to a weighted average of export prices and home market prices in the other countries, and our only excuse for using

relative unit labour costs is that this variable is more readily available.[101] As regards the determinants of the import equation, several alternative specifications might be considered depending on the use of imported goods and services. For final goods the appropriate activity and relative price variables are domestic demand and import prices relative to the deflator for domestic output sold in the domestic market respectively. In the case of intermediate goods a better measure of activity would be total demand (i.e. including exports) while rp_m might be proxied by import prices relative to some measure of domestic costs. A breakdown into imports of final and intermediate goods and services is, however, not available in the national accounts and a further drawback is that the alternative measures of rp_m are not obtained when the homogeneity assumption is imposed on equation (i). dd_i and rp_m were, therefore, measured as mentioned above, with the risk that some coefficients will be severely biased.[102]

In some initial experiments we also tested the hypothesis that very large changes in the real exchange rate or in relative import prices can generate permanent shifts in the export and import demand curves and thus affect the long-run equilibrium exchange rate.[103] This hypothesis was tested in two versions:

- a dummy variable with a value of unity whenever relative prices changed by more than one standard deviation over two consecutive years was included on the assumption that large

[101] Additional tests using relative consumer prices and wholesale prices produced only marginal changes.

[102] When total demand was used in the import equations for Germany and the Netherlands, the income-elasticities were lower than those reported below, but the fall largely corresponded to the faster growth of total demand as compared with domestic demand. Measuring rp_m by import prices relative to the deflator for domestic output sold at home led to a decline in the standard error for both countries and a more significant relative price coefficient for the Netherlands, whereas for Germany it remained insignificant.

changes shift the position of the export (or import) demand curve but do not influence its slope;
- for the export equations the coefficient on the activity variable was pre-multiplied by the inverse of the real effective exchange rate index on the assumption that a depreciation (appreciation) might raise (reduce) the demand elasticity (see OECD (1989)).

Given the unusually large movements in the dollar exchange rate in the 1980s, the tests were confined to the United States and applied to (ii') augmented by the lagged dependent variable but without the ECM-term. Generally, the tests provided only weak support to the hypothesis. For the first version the coefficient on the dummy variables obtained the correct sign, but the t-ratios were rather low (1.4 in the export equation and only 0.4 in the import equation) and the standard errors of other coefficients rose. For the second version the t-value on the demand coefficient declined to 1.6 and the overall standard error increased by nearly 50%. However, the elasticities obtained looked plausible, ranging from 0.85 in 1962 when the real effective exchange rate peaked to 1.65 at the trough in 1988 with an average value (1.38) very close that reported in Table 2 below.

Turning to the estimation results (Tables 1 and 2), all CI-equations yielded very high R^2s, but in a number of cases the DF- or ADF-statistics do not meet the conditions for co-integration. Moreover, while autocorrelated residuals are to be expected in the absence of variables capturing the dynamic structure some of the

[103] These shifts may be related to the existence of large costs associated with entering a foreign market, which, once firms are in, become a "sunk cost". This hypothesis is often referred to as "hysteresis of foreign trade" but a more correct name is "hysteresis of the real exchange rate". Firstly, the discontinuous shifts do not depend on the past history of exports and imports but on discrete jumps in relative prices. Secondly, the new export and import curves are only in equilibrium if the relative price change is not reversed, whereby the equilibrium exchange rate becomes dependent on its own past history. For further discussion of these issues see Baldwin and Krugman (1987) and Krugman (1988a).

Annex I, Table 1

Export and import equations: Co-integration*

Countries	Dep. var.	C	DD	RP	RP_{-1}	DW	Stationarity	
							DF	ADF
United States	X	9.25	1.25	–	-0.52 (4.2)	0.33	–	-1.7
	M	4.50	2.00	–	-0.15 (2.4)	0.52	–	-3.1
Japan	X	2.54	4.00	-0.69 (4.3)	–	0.62	–	-2.3
	M	12.75	1.25	–	-0.23 (2.9)	0.75	-2.6	–
Germany	X	5.00	1.98	-0.53 (2.7)	0.35 (1.8)	0.69	–	-3.2
	M	3.95	2.00	–	–	0.94	–	-2.9
France	X	5.78	2.16	-0.40 (1.3)	–	0.24	–	-0.8
	M	5.54	1.89	–	-0.08 $(1.1)^{-1}$	1.81	-4.5	–
United Kingdom .	X	5.13	1.42	-0.13 $(1.5)^{-1}$	0.09 $(1.1)^{-1}$	0.83	-3.8	–
	M	3.03	1.84	–	–	0.64	-3.5	–
Italy	X	11.60	2.09	-0.48 (3.0)	–	0.97	-2.9	–
	M	13.23	1.58	–	-0.32 (4.5)	0.54	-2.2	–
Canada	X	3.71	2.00	-0.10 (8.7)	-0.15 (1.0)	0.84	-2.4	–
	M	7.36	1.47	-0.53 (5.2)	–	1.19	-3.7	–
Australia	X	5.72	1.33	-0.30 (3.5)	–	1.02	-3.3	–
	M	4.68	1.23	-0.50 (1.7)	0.57 (1.9)	1.52	-4.0	–
Austria	X	2.95	2.20	–	–	0.29	–	-2.1
	M	6.18	1.85	-0.34 (1.8)	–	0.76	-2.6	–
Belgium	X	6.39	1.89	–	–	0.54	-2.9	–
	M	6.69	1.82	–	–	0.66	-2.1	–
Denmark	X	8.00	1.49	-0.58 (9.5)	–	1.15	-3.2	–
	M	6.05	1.48	–	-0.12 (2.5)	1.15	–	-3.7
Finland	X	4.17	1.83	-0.25 (1.0)	–	0.39	–	-2.4
	M	5.51	1.36	–	-0.07 (0.9)	1.46	-3.9	–
Netherlands	X	3.48	1.95	–	–	0.37	–	-2.2
	M	4.26	1.78	–	-0.02 (0.2)	0.32	–	-1.9
Spain	X	4.31	2.96	-0.52 (2.8)	–	0.74	-2.5	–
	M	7.99	1.89	-0.25 (1.8)	–	0.46	-2.8	–
Sweden	X	7.53	1.55	-0.47 (10.0)	–	1.30	-3.6	–
	M	8.52	1.67	-0.81 (4.2)	–	0.47	–	-2.3
Switzerland	X	4.55	1.47	–	–	0.89	–	-3.4
	M	9.28	1.38	-0.95 (4.3)	–	0.74	–	-2.9

* All R^2s $\geq$ 0.98. For C and DD all t-statistics $\geq$ 5, while for RP t-statistics given in brackets.

Notation: X = exports, goods and service, volumes
M = imports, goods and services, volumes
DD = domestic demand for imports and weighted average of domestic demand in major trading partners for exports.
RP = ratio of import deflator to domestic demand deflator for imports and real effective exchange rates (unit labour costs) for exports.
DW = Durbin-Watson statistic
DF and ADF = Dickey-Fuller statistics

Export and import equations: Error correction

Countries	Dep. var.	C	DD	RP	ECM_{-1}	Lagged dep.	R^2	DW(h)	SE
United States . . .	X	-2.48 (1.4)	1.45 (3.7)	-0.34 (3.1)	-0.16 (1.2)	0.36 (2.7)	0.59	(0.25)	3.93
	M	-0.23 (0.3)	2.00 (9.2)	-0.26 (3.0)$^{-1}$	-0.30 (2.4)	–	0.87	1.55	2.58
Japan	X	3.78 (1.3)	1.78 (3.0)	-0.38 (3.0)	-0.30 (2.4)	0.20 (1.3)	0.44	(0.21)	5.74
	M	0.21 (0.1)	1.26 (4.0)	-0.06 (0.7)$^{-1}$	-0.49 (2.9)	–	0.63	1.70	5.29
Germany	X	2.55 (2.6)	1.15 (4.3)	-0.29 (2.3)	-0.46 (3.4)	–	0.57	1.93	2.75
	M	0.71 (1.5)	1.70 (14.1)	–	-0.49 (3.4)	–	0.88	2.04	1.67
France	X	0.75 (0.6)	1.13 (3.9)	-0.28 (2.1)	-0.15 (1.6)	0.31 (2.4)	0.61	(0.35)	2.71
	M	1.99 (2.5)	1.27 (6.0)	-0.25 (*)	-0.52 (2.9)	–	0.85	1.44	2.45
United Kingdom	X	0.93 (1.2)	1.01 (5.2)	-0.14 (2.4)	-0.47 (3.2)	–	0.65	2.20	2.14
	M	0.60 (1.0)	1.45 (8.4)	-0.11 (*)	-0.38 (2.6)	–	0.79	1.96	2.08
Italy	X	2.22 (1.6)	1.38 (3.8)	-0.18 (1.0)	-0.36 (2.2)	–	0.33	1.76	4.05
	M	-1.45 (1.6)	2.07 (11.2)	-0.17 (2.0)	-0.30 (2.2)	–	0.83	2.18	3.05
Canada	X	0.16 (0.2)	1.90 (8.1)	-0.16 (1.5)$^{-1}$	-0.40 (2.2)	–	0.73	1.68	2.71
	M	-3.65 (2.9)	2.02 (9.1)	-0.38 (2.3)	-0.71 (4.0)	0.17 (1.8)	0.82	(2.01)	2.77
Australia	X	1.02 (0.6)	1.04 (2.9)	-0.24 (2.4)	-0.53 (3.0)	–	0.40	2.11	4.26
	M	-5.45 (3.3)	2.28 (7.2)	-0.21 (1.0)	-0.76 (4.2)	0.25 (2.1)	0.77	(1.28)	4.42
Austria	X	3.45 (3.7)	0.94 (3.9)	-0.47 (3.0)	-0.24 (3.4)	–	0.60	2.23	2.67
	M	0.58 (0.7)	1.70 (6.9)	-0.26 (1.3)$^{-1}$	-0.38 (2.4)	–	0.73	2.10	2.67
Belgium	X	0.23 (0.3)	1.70 (7.9)	-0.18 (*)	-0.38 (2.5)	–	0.79	1.46	2.22
	M	0.74 (0.9)	1.55 (6.3)	-0.29 (2.3)	-0.35 (2.2)	–	0.82	2.06	2.38
Denmark	X	2.44 (3.4)	0.77 (4.1)	-0.27 (2.9)	-0.48 (3.3)	–	0.45	1.89	1.93
	M	0.34 (0.8)	1.41 (13.9)	-0.10 (1.2)	-0.59 (2.6)	–	0.89	1.58	1.99
Finland	X	3.24 (1.9)	0.49 (1.0)	-0.58 (*)	-0.21 (1.9)	–	0.24	1.95	5.33
	M	-1.30 (1.5)	1.72 (4.2)	-0.07 (0.6)	-0.66 (3.4)	–	0.83	2.16	2.95
Netherlands	X	0.64 (0.8)	1.66 (7.3)	-0.21 (1.6)	-0.14 (1.2)	–	0.70	1.13	2.33
	M	1.32 (2.1)	1.20 (6.9)	-0.25 (*)	-0.15 (1.6)	–	0.79	1.59	2.23
Spain	X	3.06 (1.9)	1.88 (4.2)	-0.48 (3.1)	-0.42 (2.9)	–	0.48	2.16	4.46
	M	-1.60 (1.3)	2.40 (11.7)	-0.17 (1.7)	-0.33 (3.1)	–	0.85	1.34	4.09
Sweden	X	-0.32 (0.5)	1.66 (9.1)	-0.45 (6.1)	-0.64 (3.3)	–	0.82	1.76	1.83
	M	3.29 (6.5)	0.44 (8.8)	-0.19 (4.5)	-0.12 (2.7)	–	0.75	1.78	2.56
Switzerland	X	0.94 (1.0)	1.10 (4.5)	-0.26 (*)	-0.45 (2.6)	–	0.62	1.69	2.48
	M	0.32 (0.4)	1.67 (10.6)	-0.18 (1.5)	-0.26 (2.8)	–	0.80	1.14	2.79

(*) RP-coefficient determined as follows:

	RP	RP_{-1}	RP_{-2}
France (M)	-0.11 (1.7)	-0.14 (1.2)	–
United Kingdom (M)	–	-0.02 (0.2)	-0.09 (1.3)
Belgium (X)	-0.06 (0.6)	–	-0.12 (1.1)
Finland (X)	-0.30 (1.5)	-0.28 (1.3)	–
Netherlands (M)	-0.09 (1.3)	-0.16 (1.9)	–
Switzerland (X)	-0.15 (1.6)	-0.11 (1.3)	–

Notation (see also Table 1):
ECM_{-1} = Error correction term h = Durbin's h-statistic SE = Standard error of estimate.

DW-statistics are clearly on the low side and thus provide further evidence that the variables are not co-integrated. This applies in particular to the export equations for the United States, France, Austria and the Netherlands and to the import equations for Italy, Belgium, the Netherlands and Sweden. The problems in these equations are also seen in Table 2 since the coefficients of the error correction terms (denoted by ECM_{-1}) are insignificant in five cases and generally rather low in absolute terms. Otherwise the two-step procedure produced acceptable results, though few standard errors are below 2% and for some of the export equations (Japan, Italy, Australia, Denmark and Finland) the R^2s are rather low. A further point of interest regarding the EC-equations is that in countries with significant intercept terms in the export and import equations, the income elasticity ratios differ markedly from those given in Table 3 of the text. For instance, in Japan and Germany the very high intercept term in the export equation may be interpreted as a positive trend, which reduces the income elasticity and the elasticity ratio, and the same may be observed for Italy, Austria, Denmark, Finland and Spain. By contrast, for Italy, Canada and Austria there appears to be a negative trend for imports which, in turn, raises the income elasticity, while for France, the Netherlands and Sweden a positive trend for imports has the effect of lowering the income elasticity.

Generally, the inclusion of trend terms in trade equations may be justified on the assumption that trade flows are affected by shifts in the underlying supply curves due to capacity growth and technical progress. However, because the activity or income variables also contain trends, it is difficult to disentangle demand from supply effects[104] and the results in Table 2 should probably

[104] This was even more evident when trend terms were initially included in the CI-equations.

not be seen as more than a crude way of separating cyclical from more permanent demand changes.[105]

Despite the problems discussed above, the long-run income elasticities were used in calculating warranted growth rates and in setting up Table 3, which is intended as a preliminary test of the above-mentioned 45°-rule. For the 1960–73 period dd and dd* on average differed by 0.8 percentage points and by less than 1 point in all countries except Japan, Italy, Australia and Sweden. In Australia and Sweden the positive growth differentials were accompanied by major improvements in the current account, while in Japan the effect of an even larger growth differential mainly appeared as a real appreciation and in Italy unfavourable relative price changes were the principal offset to the effect of the growth differential. Relatively large differences between dd and dd* were also recorded in Canada, Austria and Finland and in the first two countries these were reflected in the current external accounts. Finland, on the other hand, experienced a deterioration in the current account even though the positive growth differential was accompanied by a depreciating exchange rate and a small improvement in the terms of trade. Other countries with dd and dd* close to the 45°-line nevertheless saw major changes in their external accounts, though partly as a result of extreme positions in either the initial or the final year. Finally, it may be observed that in the United States and partly also in the United Kingdom real depreciations were required to prevent a larger deterioration in the external account, whereas Germany managed to keep the fall in BoP to only 0.2 percentage point despite a real appreciation of almost 3% per year.

[105] This is a valid and useful distinction but tends to complicate the comparison of elasticities across equations and countries. A second cyclical influence and possible source of bias could be that in conditions of excess demand in *domestic* markets firms tend to reduce exports and/or raise export prices. The appropriate way of dealing with this behaviour is, however, to estimate the export demand equations simultaneously with export supply or price equations.

Annex I, Table 3

Actual and warranted demand growth and external developments

Countries	1960–73						1973–80						1980–89					
	DD	DD*	REER	ToT	BoP		DD	DD*	REER	ToT	BoP		DD	DD*	REER	ToT	BoP	
	% change, annual rate				Level	Change	% change, annual rate				Level	Change	% change, annual rate				Level	Change
United States	4.0	3.6	-2.9	-0.1	0.5	-0.0	1.7	1.7	-1.7	-5.1	0.3	-0.2	3.4	2.0	-1.8	0.5	-1.9	-2.4
Japan	9.7	13.7	2.2	-0.3	0.5	-0.5	2.7	6.5	0.5	-8.5	0.1	-1.0	4.1	9.3	4.6	3.5	2.5	3.0
Germany	4.5	4.7	2.9	0.9	0.7	-0.2	2.3	2.0	-0.2	-1.7	0.6	-3.1	1.5	2.4	0.4	1.3	2.4	6.2
France	5.4	5.2	0.6	0.4	0.4	-0.9	2.2	2.3	0.3	-3.5	0.0	-1.2	2.1	2.6	-1.4	0.9	-0.5	0.2
United Kingdom	3.2	3.9	-2.0	-0.2	-0.1	-1.0	0.5	1.9	3.8	0.6	-0.9	3.4	3.4	1.9	-0.7	-0.0	-0.5	-5.6
Italy	5.2	6.3	0.2	-0.4	1.0	-2.1	3.4	2.6	-0.9	-2.3	-0.4	-0.7	2.5	3.8	1.7	1.5	-0.7	1.0
Canada	5.3	6.1	-1.1	0.3	-1.0	2.9	4.1	2.6	-1.3	1.5	-1.9	-0.6	3.6	4.5	2.2	0.3	-1.4	-3.3
Australia	4.8	6.5	0.9	0.4	-1.8	4.9	3.2	3.4	-2.5	-2.2	-2.7	-3.2	3.4	3.5	0.5	0.6	-4.7	-4.1
Austria	4.8	5.7	-0.3	0.3	0.0	0.8	2.8	2.6	0.7	-1.5	-1.6	-2.4	1.9	2.6	-0.9	0.5	-0.1	2.9
Belgium	4.7	5.0	0.8	0.1	1.1	1.8	2.5	2.3	-0.6	-1.1	-1.3	-6.3	1.3	2.5	-3.5	0.2	-0.3	5.5
Denmark	4.6	4.6	0.4	0.4	-1.9	-0.6	0.6	2.2	-0.4	-2.3	-3.5	-2.0	1.2	2.5	-1.6	0.2	-3.3	2.2
Finland	5.0	5.9	-2.3	0.1	-1.4	-1.0	2.6	3.0	0.3	-1.6	-2.5	-0.8	3.6	3.1	1.6	1.6	-1.7	-1.5
Netherlands	5.0	5.1	1.6	0.5	0.6	1.1	2.3	2.4	0.4	-1.2	0.8	-5.3	1.1	2.5	-1.6	0.4	2.9	4.7
Spain	7.7	7.5	3.2	1.9	0.2	-2.7	1.9	3.2	3.9	-2.5	-1.9	-3.2	3.3	3.9	0.5	1.4	-0.6	-0.5
Sweden	2.6	4.4	-0.3	-0.5	0.2	3.3	3.5	1.9	0.8	-2.0	-1.7	-6.4	1.1	2.4	-0.6	0.4	-1.5	1.0
Switzerland	4.8	5.2	-1.7	0.9	-0.0	-0.3	0.8	2.4	1.9	-0.3	3.5	-1.2	2.3	2.6	-0.2	1.6	4.3	3.9
Average*	5.1	5.9	-	0.8	-0.1	0.3	2.3	2.6	-	-2.3	-0.8	-2.1	2.5	3.3	-	0.9	-0.3	0.8

Notation: DD = Domestic demand.
DD* = Domestic demand (trade-weighted average) in major trading partners, multiplied by the elasticity ratios, given in Table 3 of the text.
REER = Real effective exchange rate, based on unit labour costs.
ToT = Terms of trade, national account deflators.
BoP = Current external account in % of GNP; 'level' refers to average for period and 'change' to changes between initial and final year.

*Unweighted and for REER calculated abstracting from the sign.

For the 1973-80 period all countries except the United Kingdom and Canada experienced a deterioration in their terms of trade, and on average the current account declined by 2% relative to GNP. The largest changes were concentrated among the smaller countries but in several cases as a result of real appreciations rather than excessive domestic demand growth, though special factors – including a reversal of earlier extreme positions – also played a role. Among the larger countries, Germany suffered a major deterioration as domestic demand growth outpaced that of major trading partners and in Canada excessive demand growth more than offset the gains from terms of trade and exchange rate movements. The United Kingdom was the only country to achieve an improvement in its current external account and did so mainly by compressing domestic demand growth, thereby offsetting the effects of a large appreciation. In the United States and Japan low domestic demand growth also had a dampening effect on the external account, while in France policies were not sufficiently tight to offset the effects of a large terms-of-trade loss. Italy, on the other hand, by depreciating the exchange rate, managed to more or less stabilise the external account in conditions of rapid domestic demand growth. On the whole, for this period it is difficult to relate balance of payments changes systematically to growth differentials, exchange rate movements and terms-of-trade changes, partly because countries adopted very different policies to cope with the external shocks.

A main feature of the 1980s has, of course, been the marked deterioration in the US current-account position. This can be ascribed entirely to excessive domestic demand growth, as changes in both the real exchange rate and the terms of trade had a favourable influence. Excessive domestic demand growth was also a feature of UK developments and in Finland, too, domestic demand growth exceeded that of trading partners. All other countries benefited from a positive growth differential and in several cases this occurred through a compression of domestic demand growth until late in the period. Particularly large

differentials and associated external gains were recorded for the Netherlands and Belgium while Germany achieved an external gain of more than 6% of GNP despite a relatively small growth differential. As in the previous periods Japan also benefited from rapid growth of external demand, and Spain initially saw an improvement in the current account as a partial reversal of the previous appreciations reinforced the favourable impact of relative demand and terms-of-trade developments, but later in the period BoP fell sharply.

Table 4 shows cross-country regressions for various periods and thus provides a more direct test of the 45°-rule proposed by Krugman. For the overall period regressing dd on dd* yields an R^2 of .8 but a significant and positive intercept term, which is not predicted by the hypothesis. Repeating the regression without Japan raises the coefficient to .9 and produces an insignificant intercept term. There are, however, a few large deviations, as actual growth in the United States has exceeded the predicted rate by more than one standard error, while in Denmark and Sweden the 45°-line overpredicts actual growth.[106]

A second feature of Table 4 is that, while for the overall period the 45°-rule is not rejected, the fit is much less close during the three sub-periods for which the intercept term is also significantly different from 0. In fact, the overall result seems to have been strongly influenced by developments during 1960–73, when nominal exchange rates were largely fixed and the terms of trade stable. dd and dd* were uncorrelated in the 1970s and for the 1980s R^2 is much lower than for the 1960s, with six countries showing rather large deviations between actual and predicted growth rates. Evidence of shifts in the hypothesised relationship between dd and dd* can also be seen from the simple correlation coefficients displayed in Table 5. For the 1960s dd – dd* is

[106] The fact that Denmark is found with dd < dd* already suggests that the 45°-rule only provides a crude approximation. Thus the external account has been in continuous deficit since 1963 and the elasticity ratio applied in calculating dd* is well below that found in the literature.

Annex I, Table 4

Actual and warranted growth of demand

(Cross-country regressions)

Period	C	DD*	R^2	SE	Deviation ≥ 1 SE[1]
1960–73	1.34	0.64	0.81	0.71	FR (+), AU (–), ES (+), SE (–)
	(2.7)	(8.1)			
1973–80	1.74	0.22	0.00	1.00	GB (–), IT (+), CA (+), CH (–),
	(2.6)	(1.0)			DK (–), SE (+)
1980–89	1.44	0.32	0.24	0.92	US (+), GB (+), NL (–), BE (–),
	(2.9)	(2.3)			DK (–), FI (+), SE (–)
1960–89	1.53	0.49	0.80	0.44	CA (+), DK (–), ES (+), SE (–)
	(5.3)	(7.8)			
1960–89[2]	–	0.89	0.86	0.35	US (+), DK (–), SE (–)
		(39.0)			

[1] (+) implies that actual growth rate exceeds the predicted rate.
[2] Without Japan.

uncorrelated with changes in the terms of trade, exchange rates and the external account, implicitly confirming the high R^2 shown in the previous table. Indeed, for this period the only significant correlation is between exchange rate and terms-of-trade movements, with the (positive) sign indicative of largely offsetting effects with respect to the current account. For the 1970s there is a significant positive correlation between terms-of-trade changes and growth differentials, suggesting that countries experiencing large (small) losses were more (less) likely to tighten policies and thus partly explaining the absence of any significant relationship between dd and dd*. The 1980s is the most interesting period as dd-dd* is significantly and negatively correlated with all other variables. One interpretation of this result might be that while countries co-ordinated their monetary policies, they pursued very different fiscal policies, resulting in large differences in demand growth and in the policy mix, which in turn were reflected in movements in the exchange rate,[107] the terms of trade and the external account.

[107] It might be noted in passing that judging by the sign of the partial correlation coefficient excessive domestic demand growth is accompanied by a real depreciation.

Annex I, Table 5
Simple correlation coefficients

	1960–73				1973–80				1980–89			
	DD-DD*	REER	ToT	BoP	DD-DD*	REER	ToT	BoP	DD-DD*	REER	ToT	BoP
DD-DD*	1				1				1			
REER	–0.15	1			–0.35	1			–0.50**	1		
ToT	0.25	0.47*	1		0.61**	0.03	1		–0.63*	0.76**	1	
BoP	–0.26	–0.08	–0.13	1	–0.34	0.23	0.02	1	–0.53*	–0.20	0.25	1

* Significant at 5%.
** Significant at 1%.

Note: Correlation coefficient based on cross-country regression, using the figures in Table 3.

Taken together, the evidence presented in Tables 3–5 clearly shows that the hypothesis of a close relationship between dd and dd* merely holds in the very long run and even then a 1:1 ratio between dd and dd* is only obtained when excluding Japan. In the short to medium term, domestic and foreign demand growth do not appear to be very closely correlated. Moreover, even if dd and dd* were linked in a 1:1 ratio, it cannot be assumed that the current account would remain stable, especially after 1973 when countries were exposed to large external shocks in the form of terms of trade and exchange rate fluctuations. As pointed out in Iwata (1989), the 45°-rule also ignores the influence of changes in domestic saving and investment behaviour which can be independent of dd and dd*. Finally, and particularly in the 1980s, large international capital movements might have affected current external accounts either directly or indirectly via exchange rate movements.

Annex II

Tables:

Graphs:

Annex II, Table 1

Co-integration equations

Countries	C	DD_w	DD	REER	ToT	R^2	DW	t-tests, residual	
								DF	ADF
United States . .	0.43 (7.1)	0.11 (7.7)	−0.19 (11.8)	−0.32 (4.5)$^{-1}$	0.14 (1.5)	0.94	1.34	−4.3	–
Japan	−0.94 (9.6)	0.47 (9.7)	−0.18 (8.2)	−1.00 (8.0)$^{-1}$	0.27 (3.8)	0.84	1.76	−4.6	–
Germany	−0.23 (2.4)	0.47 (12.5)	−0.47 (10.9)	−0.26 (1.7)$^{-1}$	0.79 (4.3)	0.89	1.61	−4.7	–
France	−0.11 (0.5)	0.12 (1.9)	−0.11 (1.9)	−0.40 (1.1)$^{-1}$	0.53 (2.8)	0.34	1.08	−3.0	–
United Kingdom	−0.47 (3.6)	0.22 (9.3)	−0.32 (9.5)	–	2.05 (7.8)	0.82	1.08	−3.3	–
Italy	−0.16 (0.8)	0.34 (3.8)	−0.29 (3.8)	−1.32 (2.4)$^{-1}$	1.16 (2.9)	0.55	0.82	−2.6	–
Canada[1]	−0.55 (1.6)	0.23 (3.0)	−0.20 (3.0)	−0.26 (0.7)	1.16 (1.5)	0.23	0.79	−2.3	–
Australia	−0.39 (2.4)	0.38 (5.7)	−0.39 (5.7)	–	0.89 (3.1)	0.67	1.10	−3.2	–
Austria	0.15 (0.8)	0.25 (3.0)	−0.24 (3.2)	−0.45 (1.1)$^{-1}$	–	0.35	1.22	−4.0	–
Belgium[2]	−1.53 (4.9)	0.22 (2.0)	−0.22 (2.0)	−0.39[2] –	3.65 (4.2)	0.82	0.90	−2.7	–
Denmark	−0.49 (2.7)	0.22 (5.2)	−0.26 (5.6)	−0.27 (1.3)$^{-1}$	1.66 (4.6)	0.63	2.02	−5.6	–
Finland[3]	–	0.36 (4.1)	−0.34 (4.2)	−0.30 (2.2)	–	0.67	1.40	−4.8	–
Netherlands[4] . .	–	0.15 (2.1)	−0.11 (1.4)	−0.92 (2.3)$^{-1}$	0.51 (1.6)	0.77	1.20	−3.4	–
Spain	−0.51 (3.2)	0.35 (6.3)	−0.24 (5.3)	−0.95 (2.9)	0.85 (3.5)	0.61	0.98	−2.9	–
Sweden[3]	−0.24 (1.2)	0.06 (4.2)	−0.06 (4.7)	−1.32 (6.4)	1.83 (5.4)	0.79	2.23	–	−4.8
Switzerland . . .	−0.38 (1.5)	0.35 (6.7)	−0.45 (6.2)	−1.09 (3.5)	2.90 (4.3)	0.85	0.97	–	−3.0

Notation: DD_w = weighted foreign demand
DD = domestic demand
REER = real effective exchange rate (coefficient multiplied by 10)
ToT = terms of trade (-)
R^2 = coefficient of determination
DW = Durbin-Watson statistic
DF = Dicky-Fuller statistic
ADF = adjusted Dicky-Fuller statistic

The specification is given in equation (vii) in the text.

[1] Also includes dlog DD with a coefficient of −0.19 (2.3). [2] Net coefficient of REER (1.35 (3.0)) and $REER_{-1}$ (−1.74 (3.5)). [3] Also includes a dummy variable (1980–89 = 1 and otherwise 0) with a coefficient of 3.35 (3.2) for Finland and −1.82 (3.4) for Sweden [4] Also includes a dummy variable (1972 = 0.5, 1973–1976 = 1 and otherwise 0) with a coefficient of 2.85 (4.8).

Annex II, Table 2

Error correction equations

Countries	C	DD_w	DD	REER	ToT	ECM_{-1}	R^2	DW	SE
	Annual data, 1960–89								
United States . .	–	0.14 (6.7)	–0.20 (9.7)	$-0.18\ (2.3)^{-1}$	0.36 (3.3)	–0.86 (5.2)	0.82	1.45	0.25
Japan	–	0.41 (6.5)	–0.16 (5.2)	$-0.76\ (6.4)^{-1}$	0.48 (4.2)	–0.98 (4.8)	0.77	1.71	0.52
Germany	–	0.48 (10.9)	–0.51 (11.9)	–0.30 (1.4)	1.69 (5.6)	–0.92 (5.2)	0.85	1.84	0.40
France	–0.11 (0.5)	0.26 (3.3)	–0.22 (6.7)	–0.66 (2.3)	1.13 (4.1)	–0.23 (1.3)	0.76	1.39	0.50
United Kingdom	0.15 (0.6)	0.10 (1.6)	–0.25 (4.9)	$-0.11\ (0.6)^{-1}$	2.42 (7.2)	–0.64 (3.3)	0.78	2.20	0.59
Italy	–	0.31 (3.5)	–0.31 (3.9)	$-0.56\ (1.4)^{-1}$	1.80 (4.1)	–0.46 (2.2)	0.78	1.52	0.77
Canada	–	0.32 (3.5)	–0.33 (4.0)	$-0.37\ (1.1)^{-1}$	1.55 (2.4)	–0.25 (1.3)	0.44	1.88	0.81
Australia	–	0.29 (4.1)	–0.35 (5.4)	$-0.25\ (1.0)^{-1}$	0.96 (3.0)	–0.53 (2.9)	0.67	1.84	0.96
Austria	0.66 (2.7)	0.15 (1.7)	–0.36 (4.6)	–0.71 (1.7)	2.00 (2.8)	–0.64 (4.2)	0.72	2.04	0.62
Belgium[1]	–	0.25 (2.1)	–0.27 (2.4)	–0.59 –	3.30 (3.4)	–0.39 (1.9)	0.65	2.03	0.67
Denmark	–	0.16 (2.6)	–0.26 (4.1)	$-0.46\ (1.4)^{-2}$	1.90 (3.5)	–0.93 (3.7)	0.73	1.92	0.76
Finland	0.64 (1.9)	0.21 (2.0)	–0.37 (5.2)	–0.92 (2.0)	–	–0.52 (3.1)	0.66	2.17	1.07
Netherlands . . .	–	0.27 (2.0)	–0.26 (2.1)	$-1.18\ (1.8)^{-1}$	1.85 (1.5)	–0.62 (2.6)	0.40	1.54	1.05
Spain[2]	–	0.43 (5.2)	–0.43 (5.6)	–0.65 (2.2)	1.20 (4.1)	–0.42 (2.3)	0.74	1.68	0.83
Sweden[3]	–	0.06 (4.7)	–0.06 (4.7)	–1.05 (3.7)	2.00 (4.4)	–1.09 (4.6)	0.79	2.25	0.68
Switzerland . . .	0.51 (1.5)	0.26 (2.1)	–0.52 (6.2)	–0.89 (2.2)	2.67 (3.9)	–0.44 (2.1)	0.71	1.51	0.87

Note: The specification is given in equation (viii) of the text. t-ratios are shown in brackets and –1 after the bracket indicates that the variable is entered with a one-year lag. For notations see the previous table.

[1] Net coefficient of dREER (1.23(3.0)) and $dREER_{-1}$ (–1.82(4.0)). [2] Relative demand effect also includes dDD_{-1} with a coefficient of 0.07 (1.2). [3] Relative demand effect estimated as $(dDD\text{-}dDD_w)$.

Annex II, Table 3

Balance-of-payments, government deficits and investment

Countries		C	GAP	DEF
United States	CI	0.06 (2.2)	-0.20 (3.1)	0.80 (5.4)
	EC	–	-0.05 (0.9)$^{-1}$	0.20 (2.1)
Japan	CI	0.14 (7.9)	0.22 (4.5)	0.19 (2.0)
	EC	–	-0.26 (3.7)	0.20 (1.2)
Germany	CI	0.20 (7.6)	0.13 (1.5)	1.02 (6.2)
	EC	–	0.17 (1.3)	0.58 (4.8)
France	CI	0.04 (1.2)	0.16 (1.4)$^{-1}$	0.36 (1.6)
	EC	–	0.19 (1.1)	0.36 (2.3)$^{-1}$
United Kingdom	CI	0.05 (2.3)	-0.29 (3.0)	0.25 (2.4)
	EC	–	–	0.39 (2.5)
Italy	CI	0.16 (7.2)	–	0.50 (7.6)
	EC	-0.20 (1.8)	–	0.30 (3.7)
Canada	CI	0.06 (2.5)	-0.23 (2.5)$^{-1}$	0.20 (2.7)
	EC	–	-0.18 (2.6)$^{-1}$	0.25 (1.9)
Australia	CI	0.17 (3.8)	0.16 (1.3)	0.52 (2.9)
	EC	–	0.41 (3.2)	–
Austria	CI	0.16 (4.3)	0.01 (0.9)	0.64 (4.7)
	EC	–	0.32 (2.6)	0.40 (2.6)
Belgium	CI	0.17 (4.1)	0.24 (2.0)	0.72 (5.5)
	EC	0.06 (0.3)	0.42 (3.1)	0.57 (2.9)
Denmark	CI	–	-0.41 (3.3)	0.44 (4.6)
	EC	-0.20 (1.1)	–	0.30 (2.8)
Finland	CI	0.05 (2.1)	-0.32 (3.0)$^{-1}$	0.28 (2.2)
	EC	–	-0.15 (1.5)$^{-1}$	0.10 (0.7)
Netherlands	CI	0.21 (5.5)	-0.27 (2.3)$^{-1}$	0.74 (3.6)
	EC	–	-0.17 (2.3)$^{-1}$	0.92 (5.1)
Spain	CI	0.24 (4.5)	0.05 (0.6)	1.13 (4.1)
	EC	–	0.16 (1.7)	0.52 (2.2)
Sweden	CI	0.01 (0.8)	-0.31 (2.3)$^{-1}$	0.45 (3.8)
	EC	-0.10 (0.5)	-0.23 (1.5)$^{-1}$	0.36 (3.0)
Switzerland	CI	0.28 (13.6)	0.38 (6.3)	1.50 (7.1)
	EC	–	0.38 (4.3)	0.95 (3.9)
Average	CI	0.12	-0.05	0.61
	EC	-0.02	0.10	0.40

Note: The estimates are based on equations (x) and (xi) in the text, with CI referring to the equation in level form and EC to the corresponding error correction equation.

* Figures in brackets refer to Durbin's h.

INV	ECM_{-1}	$dBoP_{-1}$	R^2	DW*	DF	ADF
-0.32 (2.0)	-	-	0.49	0.77	-2.9	-
-0.11 (1.5)	-0.18 (1.9)	0.40 (2.5)	0.43	(0.60)	-	-
-0.49 (7.4)	-	-	0.66	0.81	-	-3.1
-0.69 (7.0)	-0.31 (1.8)	-	0.67	1.58	-	-
-0.97 (7.4)	-	-	0.65	0.87	-2.8	-
-0.81 (5.1)	-0.30 (1.9)	-	0.62	1.59	-	-
-0.17 (1.2)	-	-	0.04	1.67	4.3	-
-0.52 (2.8)	-0.55 (2.1)	0.35 (1.9)	0.57	(4.11)	-	-
-0.34 (2.5)	-	-	0.55	0.88	-2.8	-
-0.64 (5.8)	-0.40 (2.7)	0.27 (2.1)	0.61	(0.66)	-	-
-0.60 (6.7)	-	-	0.66	0.80	-	-3.7
-0.74 (13.0)	-0.42 (3.1)	0.23 (3.2)	0.88	(2.04)	-	-
-0.32 (2.5)	-	-	0.45	1.10	-3.3	-
-0.59 (4.5)	-0.51 (2.9)	-	0.58	1.80	-	-
-0.90 (4.5)	-	-	0.41	0.80	-2.8	-
-0.93 (7.2)	-0.39 (2.7)	-	0.70	1.90	-	-
-0.70 (4.4)	-	-	0.48	1.08	-3.0	-
-0.79 (6.0)	-0.73 (3.5)	-	0.67	1.92	-	-
-0.71 (3.9)	-	-	0.51	0.67	-2.9	-
-0.87 (4.0)	-0.45 (3.1)	-	0.36	2.09	-	-
-0.14 (12.9)	-	-	0.30	1.37	-3.5	-
-0.64 (5.0)	-0.37 (1.8)	-	0.63	1.48	-	-
-0.32 (3.1)	-	-	0.67	1.33	-3.5	-
-0.44 (5.0)	-0.82 (4.2)	-	0.73	1.93	-	-
-0.96 (5.3)	-	-	0.52	0.64	-2.2	-
-0.91 (7.1)	-0.38 (2.6)	0.26 (2.3)	0.67	(0.39)	-	-
-1.08 (4.7)	-	-	0.46	0.87	-	-3.0
-1.08 (6.7)	-0.31 (1.9)	0.26 (2.3)	0.72	(0.32)	-	-
-0.18 (1.4)	-	-	0.35	1.02	-2.7	-
-0.42 (2.7)	-0.33 (1.5)	-	0.48	1.93	-	-
-1.03 (12.0)	-	-	0.90	1.02	-	-3.2
-1.04 (10.1)	-0.48 (2.7)	-	0.88	1.64	-	-
-0.58						
-0.70	-0.43	0.11				

Annex II, Table 4

Saving and investment equations

Countries	Eq.	C	GAP	dY	dP	INT	REER	DEF
United States	I	0.08	0.08	0.35	0.26	–	–	–
		(3.2)	(1.3)	(3.8)	(3.4)			
	S(U)	1.12	0.24	0.43	0.36	0.21	-0.11	-0.67
		(2.0)	(2.4)	(7.2)	(6.3)	(2.5)	(1.0)	(6.0)
	dI	–	0.23	0.16	0.24	–	–	–
			(3.2)	(3.2)	(3.4)			
	dS(U)	-0.14	0.21	0.38	0.33	0.11	–	-0.62
		(1.8)	(1.4)	(6.9)	(5.2)	(1.3)		(6.2)
Japan	I	0.35	0.25	0.44	0.42	–	-0.27	–
		(5.4)	(5.8)	(5.8)	(7.2)		$(2.2)^{-1}$	
	S	0.31	0.23	0.34	0.17	–	-0.32	-0.70
		(3.6)	(2.5)	(2.8)	(2.8)		$(2.2)^{-1}$	(6.7)
	dI	–	0.35	0.17	0.25	–	-0.61	–
			(6.5)	(3.4)	(6.3)		(5.1)	
	dS	–	0.29	0.19	0.16	–	-0.26	-0.75
			(2.8)	(1.9)	(3.1)		(1.9)	(4.3)
Germany	I	0.61	0.32	0.60	0.31	-0.43	0.91	–
		(10.7)	$(2.6)^{-1}$	(8.9)	(2.4)	$(2.4)^{-2}$	(6.7)	
	S_h	0.05	0.13	0.10	0.12	0.29	–	-0.43
		(5.9)	(2.2)	(1.5)	(1.6)	(2.8)		(6.2)
	S_f	0.05	0.06	–	-0.24	-0.31	–	–
		(1.0)	(1.1)		(2.5)	(2.4)		
	dI	-0.17	0.48	0.11	0.18	-0.17	-0.50	–
		(1.5)	(5.7)	(1.5)	(1.8)	$(1.1)^{-1}$	(1.6)	
	dS_h	–	0.14	0.19	0.14	0.18	–	-0.46
			$(1.7)^{-1}$	(3.2)	(1.6)	(1.9)		(5.7)
	dS_f	–	0.10	–	-0.15	-0.22	–	–
			$(1.4)^{-1}$		(1.4)	(1.9)		

S_{-1}	I_{-1}	TR	ECM	Others	R^2	DW	SE	DF	ADF
0.35 (2.2)	–	–	–	–	0.66	1.38	0.74	-3.9	–
–	0.39 (3.0)	-0.21 (5.5)	–	–	0.87	2.46	0.46	-6.8	–
0.19 (1.3)	–	–	-0.73 (4.4)	–	0.84	1.41	0.52	–	–
–	0.37 (3.9)	–	-1.22 (5.8)	–	0.81	2.00	0.39	–	–
–	–	–	–	–	0.91	1.50	1.05	-3.9	–
–	0.26 (1.9)	0.13 (1.5)	–	–	0.85	1.35	0.76	-3.7	–
–	–	–	-0.68 (5.3)	–	0.90	2.04	0.55	–	–
0.24 (1.6)	0.12 (1.2)	–	-0.55 (2.6)	–	0.67	(0.99)	0.59	–	–
–	–	–	–	–	0.91	1.66	0.68	-4.4	–
–	–	–	–	–	0.79	1.05	0.51	-3.3	–
–	–	–	–	0.07[2] (5.0)	0.81	2.03	0.64	-5.2	–
–	–	–	-0.65 (3.1)	–	0.83	1.66	0.60	–	–
–	–	–	-0.47 (2.1)	–	0.59	1.79	0.45	–	–
–	–	–	-0.89 (4.6)	0.14[2] (4.1)	0.63	2.03	0.50	–	–

Annex II, Table 4 (cont.)

Saving and investment equations

Countries	Eq.	C	GAP	dY	dP	INT	REER	DEF
France	I	0.04	0.30	0.62	0.11	-0.16	–	–
		(1.1)	$(2.0)^{-1}$	(4.2)	$(1.3)^{-1}$	$(1.5)^{-2}$		
	S(U)	0.18	-0.85	0.25	0.13	-0.28	–	-0.25
		(3.5)	$(2.4)^{-1}$	(1.6)	(1.6)	(2.8)		(1.2)
	dI	–	0.81	0.51	0.25	-0.26	-0.94	–
			$(1.2)^{-1}$	(4.6)	(2.3)	$(1.8)^{-1}$	(2.6)	
	dS(U)	–	-0.45	0.30	–	-0.35	-0.32	-0.42
			$(1.7)^{-1}$	(2.2)		(3.2)	(1.1)	(2.9)
United Kingdom . .	I	-0.63	0.66	–	-0.10	–	–	–
		(1.5)	(10.9)		(2.8)			
	S	0.35	-0.29	0.37	–	–	-0.61	-0.55
		(4.5)	(3.1)	(3.7)			$(3.1)^{-1}$	(5.3)
	dI	0.11	0.52	–	-0.16	–	-0.44	–
		(0.8)	(7.2)		(2.7)		(2.1)	
	dS	–	–	0.20	–	–	–	-0.51
				(4.1)				(5.9)
Italy	I	1.10	0.36	0.63	0.20	-0.57	-1.85	–
		(2.7)	$(1.8)^{-1}$	(3.7)	(3.0)	$(3.5)^{-1}$	$(2.2)^{-1}$	
	S	0.74	0.19	0.34	–	–	-1.04	-0.65
		(5.8)	$(1.9)^{-1}$	(3.5)			(3.8)	(6.4)
	dI	-0.23	0.76	0.82	–	–	-0.68	–
		(1.1)	$(4.6)^{-1}$	(7.6)			(1.4)	
	dS	-0.22	0.23	0.29	–	-0.15	-0.34	-0.73
		(1.9)	$(2.8)^{-1}$	(3.6)		(1.9)	(0.9)	(7.4)
Canada	I	0.55	0.35	0.15	0.36	-0.26	-0.74	–
		(3.8)	(4.6)	(1.8)	(5.7)	(3.0)	$(2.3)^{-1}$	
	S	0.34	-0.27	0.55	0.26	–	-0.64	-0.79
		(3.9)	(3.7)	(5.5)	(5.3)		$(3.0)^{-1}$	(13.6)
	dI	–	0.33	0.17	0.24	–	-0.28	–
			(2.7)	(2.2)	(3.2)		(1.0)	
	dS	–	-0.23	0.47	0.31	–	-0.31	-0.79
			(1.6)	(4.3)	(4.1)		(3.1)	(6.0)

S_{-1}	I_{-1}	TR	ECM	Others	R^2	DW	SE	DF	ADF
0.71 (4.4)	–	–	–	–	0.90	1.50	0.81	-4.3	–
–	0.22 (1.1)	0.31 (3.3)	–	–	0.85	1.25	0.66	–	-4.3
0.22 (1.4)	–	–	-0.89 (5.2)	–	0.81	1.10	0.57	–	–
–	0.32 (2.8)	–	-0.36 (1.5)	–	0.56	1.50	0.61	–	–
0.24 (2.6)	–	2.18[4] (6.3)	–	0.15[1] (1.9)	0.85	1.46	0.73	–	-3.9
–	–	0.10 (4.8)	–	–	0.79	0.90	0.93	–	-3.3
–	–	–	-0.44 (2.2)	0.12[1] (1.4)	0.80	2.31	0.63	–	–
0.18 (1.7)	–	–	-0.61 (4.2)	–	0.74	(0.85)	0.59	–	–
–	–	–	–	–	0.77	0.65	1.43	–	-2.4
–	–	-0.17 (3.8)	–	–	0.74	1.09	1.16	–	-5.1
–	–	–	-0.12 (0.7)	–	0.76	1.91	1.09	–	–
0.21 (1.7)	–	–	-0.73 (4.3)	–	0.74	(1.71)	1.09	–	–
–	–	–	–	–	0.85	1.37	0.70	–	-3.7
–	0.39 (3.3)	–	–	–	0.92	1.79	0.60	–	-4.7
–	–	–	-0.82 (3.5)	–	0.81	1.86	0.70	–	–
–	0.34 (2.4)	–	-0.88 (3.8)	–	0.70	1.66	0.57		

Annex II, Table 4 (cont.)

Saving and investment equations

Countries	Eq.	C	GAP	dY	dP	INT	REER	DEF
Australia	I	0.26	0.16	–	-0.23	–	-0.18	–
		(2.5)	(2.0)		(4.4)		$(0.8)^{-1}$	
	S(U)	0.24	-0.93	0.22	0.07	0.31	-0.09	-0.94
		(2.4)	(3.6)	(1.7)	(1.3)	(2.2)	$(0.4)^{-1}$	(5.0)
	dI	–	0.23	–	-0.21	–	–	–
			(1.9)		(4.4)			
	dS(U)	–	-0.72	0.20	–	–	-0.11	-0.88
			(3.5)	(3.1)			(0.5)	(5.2)
Austria	I	0.21	0.09	0.53	0.65	-0.87	–	–
		(4.5)	$(0.9)^{-1}$	(4.9)	(4.9)	$(4.1)^{-1}$		
	S	0.59	0.06	0.34	0.17	-0.48	-0.90	-0.78
		(4.2)	(0.7)	(2.9)	(1.0)	$(2.0)^{-1}$	(2.8)	(4.1)
	dI	–	0.32	0.28	0.54	-0.68	–	–
			(2.7)	(3.3)	(4.7)	(2.6)		
	dS	–	0.30	0.10	0.10	-0.18	-1.26	-0.74
			(2.8)	(1.4)	(1.0)	(0.9)	(3.0)	(4.8)
Belgium	I	0.21	–	0.14	0.14	-0.60	-0.60^{3}	–
		(21.9)		(1.7)	(2.4)	$(5.5)^{-2}$	(4.2)	
	S(U)	0.33	-0.67	0.16	0.16	–	-0.30	-0.27
		(4.6)	(5.6)	(1.7)	$(2.9)^{-1}$		$(2.0)^{-1}$	(2.5)
	dI	–	–	0.20	0.34	-0.51	–	–
				(2.6)	(3.0)	$(2.8)^{-1}$		
	dS(U)	0.33	-0.72	0.15	0.11	–	-0.35	-0.33
		(2.3)	(4.3)	(2.5)	$(1.2)^{-1}$		(1.2)	(2.8)
Denmark	I	0.12	0.60	0.10	0.22	-0.17	–	–
		(7.4)	(6.3)	$(0.9)^{-1}$	(1.7)	(2.1)		
	S(U)	0.18	-0.15	0.22	0.44	-0.45	–	-0.72
		(17.5)	(1.3)	(2.3)	(2.8)	(4.5)		(8.8)
	dI	–	0.74	0.73	0.27	–	–	–
			$(6.9)^{-1}$	(9.7)	(2.6)			
	dS(U)	–	–	0.18	0.37	-0.27	-0.28	-0.63
				(3.4)	(2.8)	(2.9)	$(1.1)^{-1}$	(8.5)
Finland	I	0.20	0.37	0.41	0.31	–	-0.15^{3}	–
		(6.9)	(2.7)	$(2.7)^{-1}$	(4.1)		(1.2)	
	S(U)	0.54	0.35	0.57	0.14	–	-0.78	-0.99
		(3.9)	(2.0)	$(4.8)^{-1}$	(2.0)		$(3.0)^{-1}$	(5.4)
	dI	–	0.35	0.30	–	-0.51	-0.40	–
			$(2.6)^{-1}$	$(2.7)^{-1}$		$(1.5)^{-1}$	$(1.0)^{-1}$	
	dS(U)	–	0.30	0.44	0.16	–	-0.51	-1.10
			(1.3)	$(6.4)^{-1}$	$(3.2)^{-1}$		$(1.5)^{-1}$	(8.3)

S_{-1}	I_{-1}	TR	ECM	Others	R^2	DW	SE	DF	ADF
0.34 (2.3)	–	–	–	–	0.47	1.54	1.12	–4.0	–
–	–	–	–	–	0.60	1.53	0.97	–4.0	–
–	–	–	–0.91 (4.9)	–	0.78	1.98	0.94	–	–
–	–	–	–0.52 (2.5)	–	0.68	2.03	0.86	–	–
0.12 (0.69)	–	–	–	–	0.81	1.18	0.90	–3.8	–
–	0.29 (2.3)	–	–	–	0.50	2.22	0.70	–6.0	–
–	–	–	–0.74 (3.4)	–	0.85	1.84	0.68	–	–
–	–	–	–1.22 (5.6)	–	0.62	1.68	0.57	–	–
–	–	–	–	–	0.92	1.88	0.76	–	–4.7
–	–	0.34 (6.9)	–	–	0.73	2.47	0.69	–	–5.1
–	–	–	–0.83 (2.9)	–	0.63	1.60	0.92	–	–
–	–	–	–1.32 (5.8)	–	0.72	1.76	0.66	–	–
0.30 (2.8)	–	–	–	–2.61[4] (4.4)	0.92	2.08	0.87	–5.6	–
–	–	–	–	–1.14[4] (1.4)	0.81	1.70	1.00	–4.6	–
–	–	–	–0.65 (3.7)	–	0.88	1.67	0.76	–	–
–	–	–	–0.70 (3.5)	–	0.77	1.27	0.76	–	–
–	–	–	–	–	0.70	1.82	1.51	–	–4.7
–	–	–	–	–2.27[4] (3.3)	0.68	2.80	0.96	–	–6.2
–	–	–	–1.15 (7.5)	–	0.82	2.00	1.04	–	–
–	–	–	–1.46 (8.0)	–	0.87	1.87	0.80	–	–

Annex II, Table 4 (cont.)

Saving and investment equations

Countries	Eq.	C	GAP	dY	dP	INT	REER	DEF
Netherlands	I	0.30	0.05	0.64	0.21	-0.70	-0.18	-
		(1.4)	$(0.7)^{-1}$	(5.5)	$(2.0)^{-2}$	$(4.9)^{-2}$	(0.4)	
	S(U)	0.30	0.23	0.17	-	0.33	-0.69	-
		(1.0)	(5.8)	(1.3)		(2.5)	$(1.7)^{-1}$	
	dI	-	0.06	0.52	0.20	-0.60	-0.40	-
			(0.4)	(5.0)	$(2.2)^{-2}$	$(3.1)^{-2}$	$(0.9)^{-1}$	
	dS(U)	-	0.19	0.18	-	0.23	-0.33	-0.23
			(1.4)	(2.5)		(2.0)	$(0.9)^{-1}$	(1.5)
Spain	I	0.22	0.19	0.06	0.07	-	-	0.96
		(15.3)	$(2.0)^{-1}$	(0.5)	(0.7)			(5.5)
	S(U)	0.54	-0.43	0.29	-	-	-0.81	-0.72
		(4.4)	(3.6)	$(2.1)^{-1}$			$(2.4)^{-1}$	(2.9)
	dI	-	0.33	0.22	0.05	-	-	0.41
			$(2.4)^{-1}$	(1.8)	(0.6)			(1.5)
	dS(U)	-	-0.19	0.19	-	-	-0.41	-0.65
			(1.2)	$(2.1)^{-1}$			(1.6)	(2.9)
Sweden	I	0.17	0.30	0.40	0.17	-0.57	-	-
		(8.0)	(2.4)	$(2.1)^{-1}$	(1.9)	(5.3)		
	S	0.68	0.21	0.30	0.24	-0.35	-1.12	-0.85
		(7.3)	(2.2)	(2.6)	(4.0)	(2.1)	$(6.1)^{-1}$	(8.2)
	dI	-	0.42	0.28	0.13	-	-	-
			(3.5)	$(2.6)^{-1}$	(1.5)			
	dS	-	0.27	0.21	0.26	-0.30	-0.82	-0.83
			(2.5)	(2.5)	(4.1)	(2.4)	$(3.0)^{-1}$	(11.1)
Switzerland	I	0.22	0.37	0.25	0.41	-1.48	-	-
		(2.4)	(2.3)	(1.4)	(3.5)	$(3.2)^{-1}$		
	S	0.20	0.21	0.20	-	0.20	-	-
		(6.2)	(3.6)	(1.9)		$(0.8)^{-1}$		
	dI	-	0.53	0.14	0.24	-0.52	-	-
			(5.8)	(1.2)	(2.0)	$(1.6)^{-1}$		
	dS	-	0.33	0.04	-	-	-0.18	-0.26
			(6.2)	(0.6)			$(0.8)^{-1}$	(1.0)

[1] Relative investment goods deflator. [2] Gross profits/GNP. [3] DUM 80-89 x REER, with DUM 80-89 = 1 for 1980-89 and otherwise 0. [4] DUM 80-89.

Notation:

S = private saving/GNP
I = private investment/GNP
S_h = household saving/GNP
S_f = company saving/GNP
C = intercept
GAP = actual to trend output
dP = % change in GDP-deflator
dY = % change in real GDP/GNP
INT = long-term bond rate
REER = real effective exchange rate (coefficient multiplied by 10)
DEF = public sector borrowing requirement
S_{-1} = private saving/GNP, lagged one period
I_{-1} = private investment/GNP, lagged one period

S_{-1}	I_{-1}	TR	ECM	Others	R^2	DW	SE	DF	ADF
–	–	–	–	–	0.84	1.11	1.04	-3.8	–
–	–	–	–	0.60[2] (1.4)	0.80	1.25	0.68	–	-4.7
–	–	–	-0.64 (3.5)	–	0.64	1.80	0.83	–	–
–	–	–	-0.64 (3.2)	0.80[2] (2.4)	0.59	1.58	0.61	–	–
–	–	–	–	–	0.86	1.38	1.17	–	-3.7
–	–	0.38 (3.3)	–	–	0.38	1.08	0.99	–	-3.2
–	–	–	-0.63 (3.0)	–	0.58	1.50	1.00	–	–
–	–	–	-0.48 (2.2)	–	0.39	1.43	0.86	–	–
0.20 (1.4)	–	–	–	–	0.80	1.45	1.13	-3.8	–
–	0.14 (1.1)	-0.19 (3.1)	–	–	0.92	1.62	0.57	-4.7	–
0.12 (1.0)	–	–	-0.58 (3.2)	–	0.70	1.87	0.86	–	–
–	–	–	-0.77 (3.2)	–	0.88	1.31	0.57	–	–
0.20 (0.5)	–	–	–	–	0.87	1.50	1.11	–	-3.9
–	0.19 (2.4)	0.08 (3.4)	–	–	0.87	1.24	0.68	–	-4.2
–	–	–	-0.85 (5.0)	–	0.88	1.86	0.78	–	–
–	–	–	-0.47 (2.2)	–	0.71	1.89	0.57	–	–

Notation: (cont.)

TR = trend
ECM = error correction term
R^2 = coefficient of determination
DW = Durbin-Watson statistic (Durbin's h in brackets)
DF = Dicky-Fuller statistic
ADF = Augmented Dicky-Fuller statistic

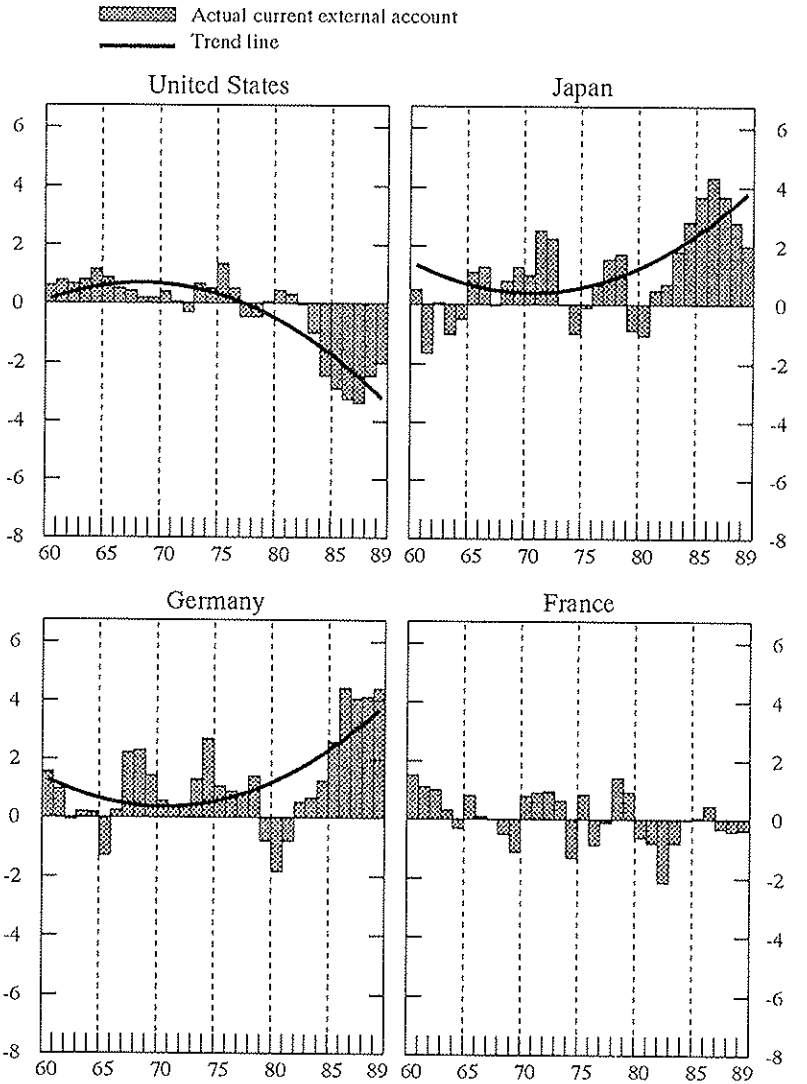
t-statistics are given in brackets below coefficients and -1 (-2) denotes a one (two) year lag.

All estimates are based on equations (xii)-(xv) in the text and a (U) in the saving equation indicates that the rate of unemployment rather than GAP has been used as the cyclical indicator.

Graph 1

Developments in the current external account

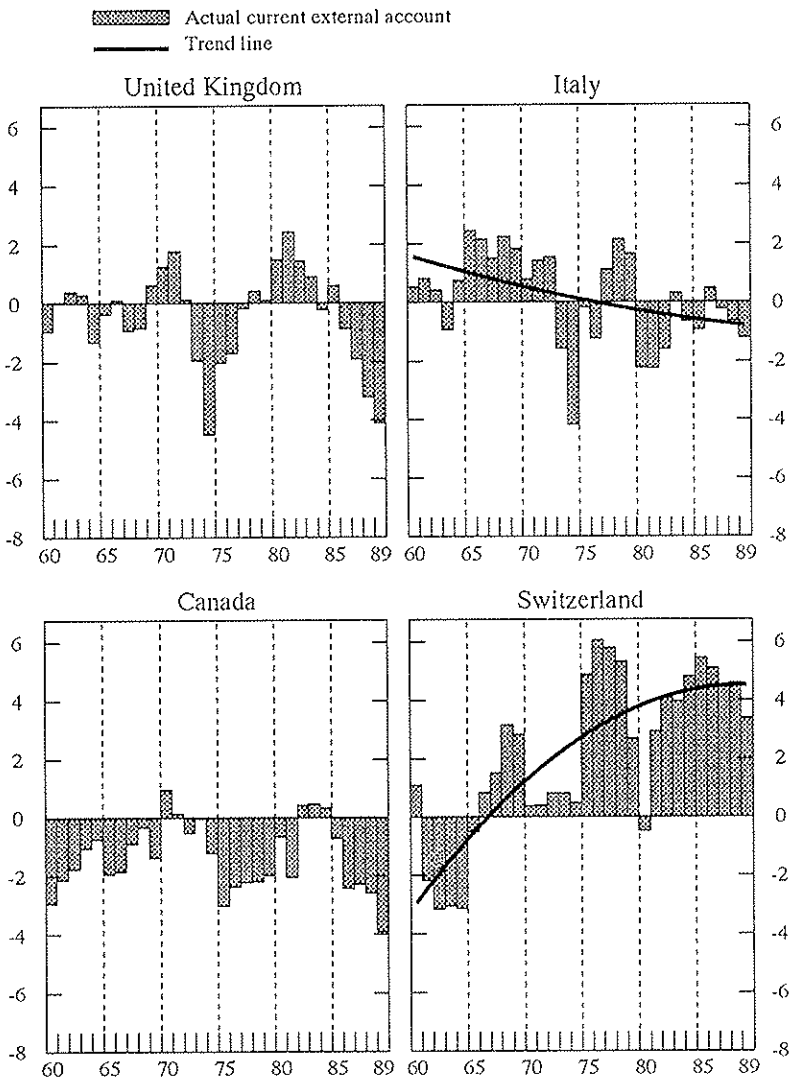
(as a percentage of GNP, annual data)



Graph 2

Developments in the current external account

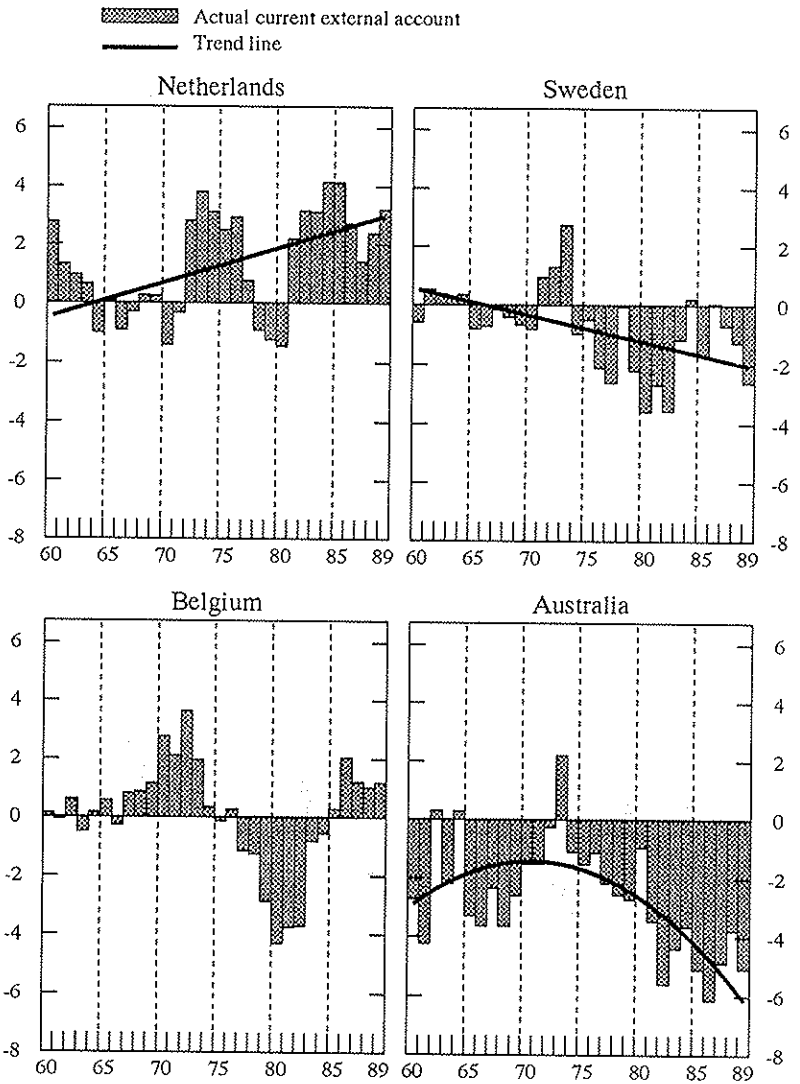
(as a percentage of GNP, annual data)



Graph 3

Developments in the current external account

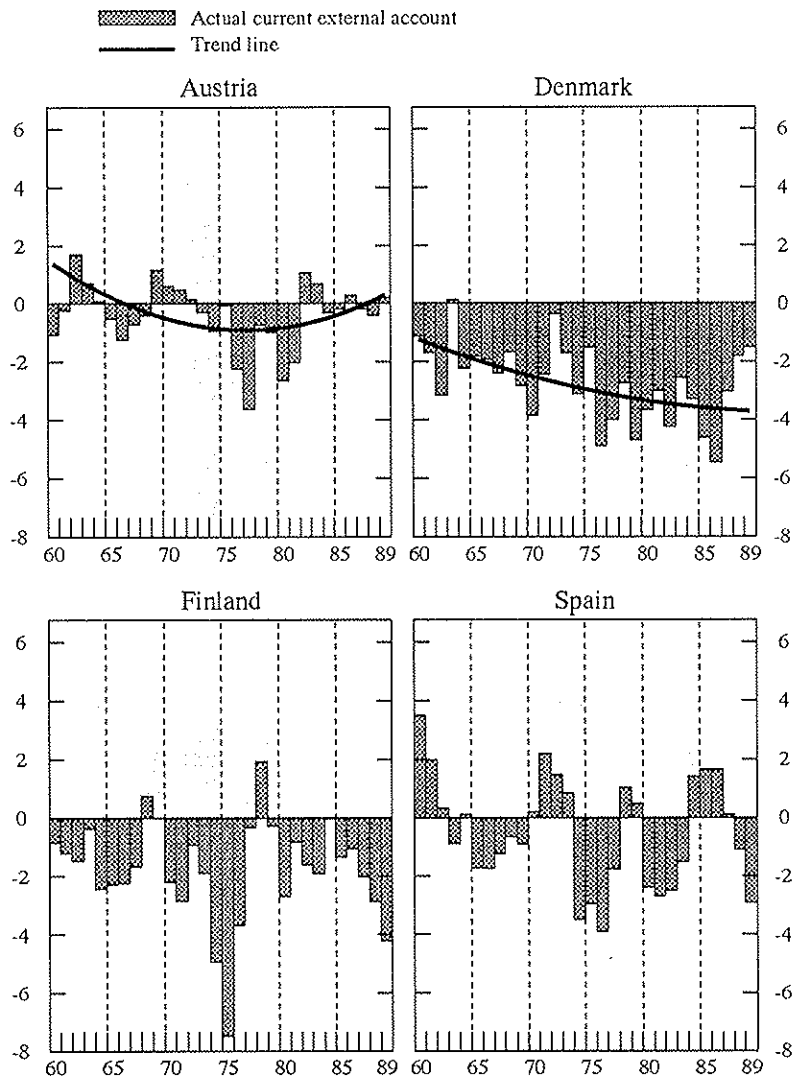
(as a percentage of GNP, annual data)



Graph 4

Developments in the current external account

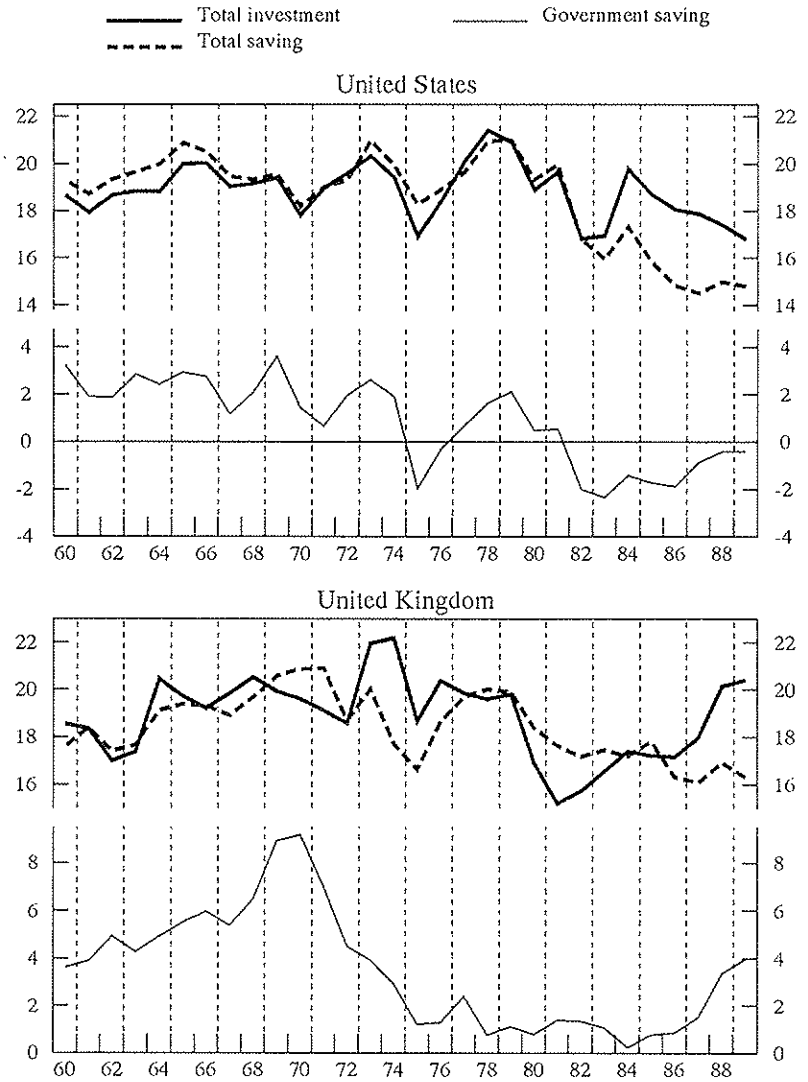
(as a percentage of GNP, annual data)



Graph 5

Developments in domestic saving and investment

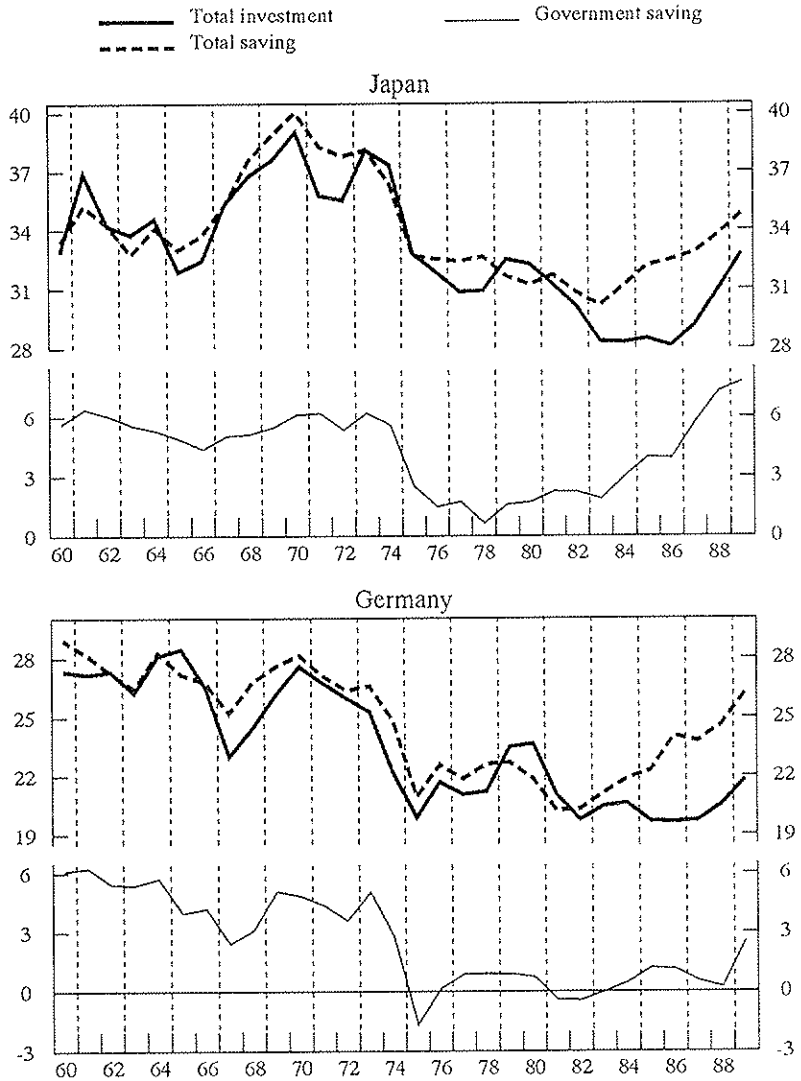
(as a percentage of GNP, in current prices)



Graph 6

Developments in domestic saving and investment

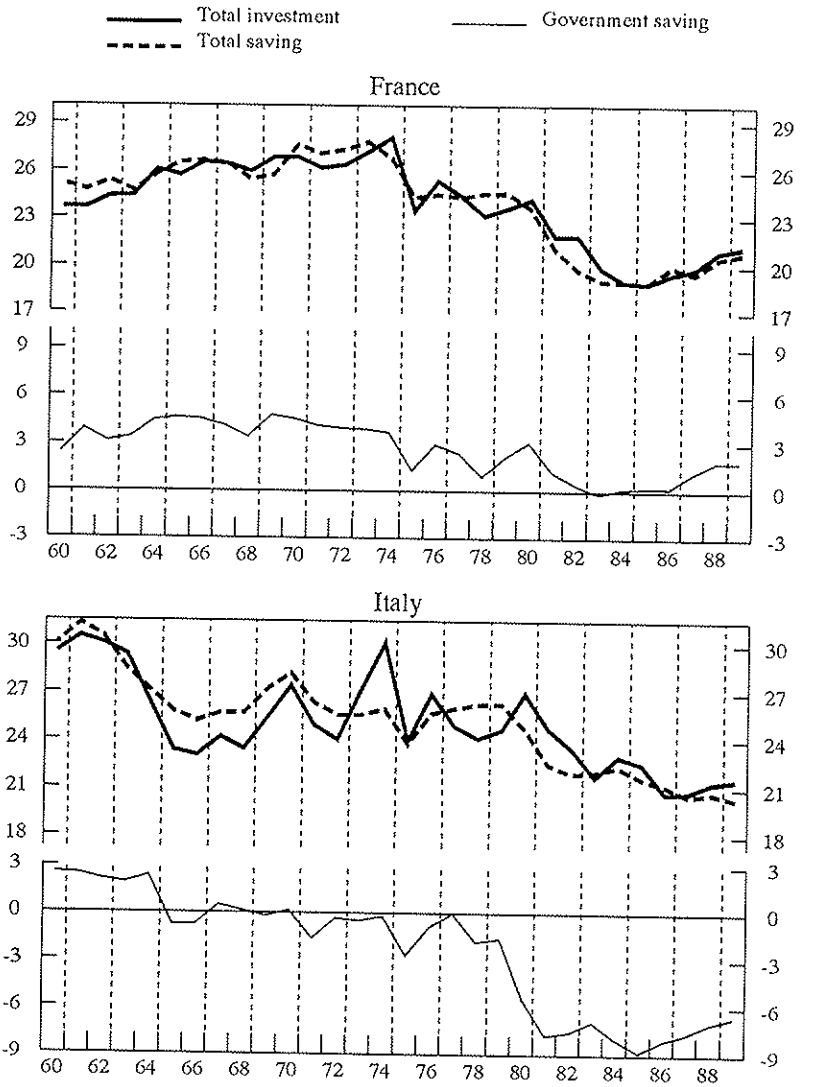
(as a percentage of GNP, in current prices)



Graph 7

Developments in domestic saving and investment

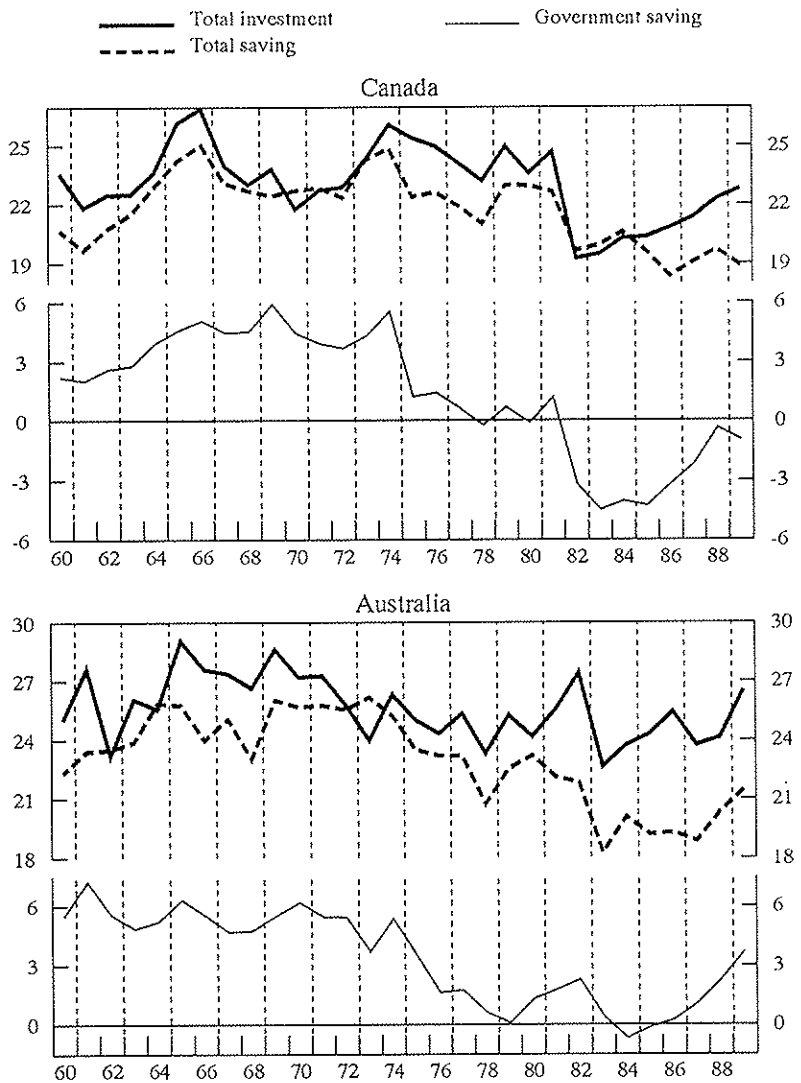
(as a percentage of GNP, in current prices)



Graph 8

Developments in domestic saving and investment

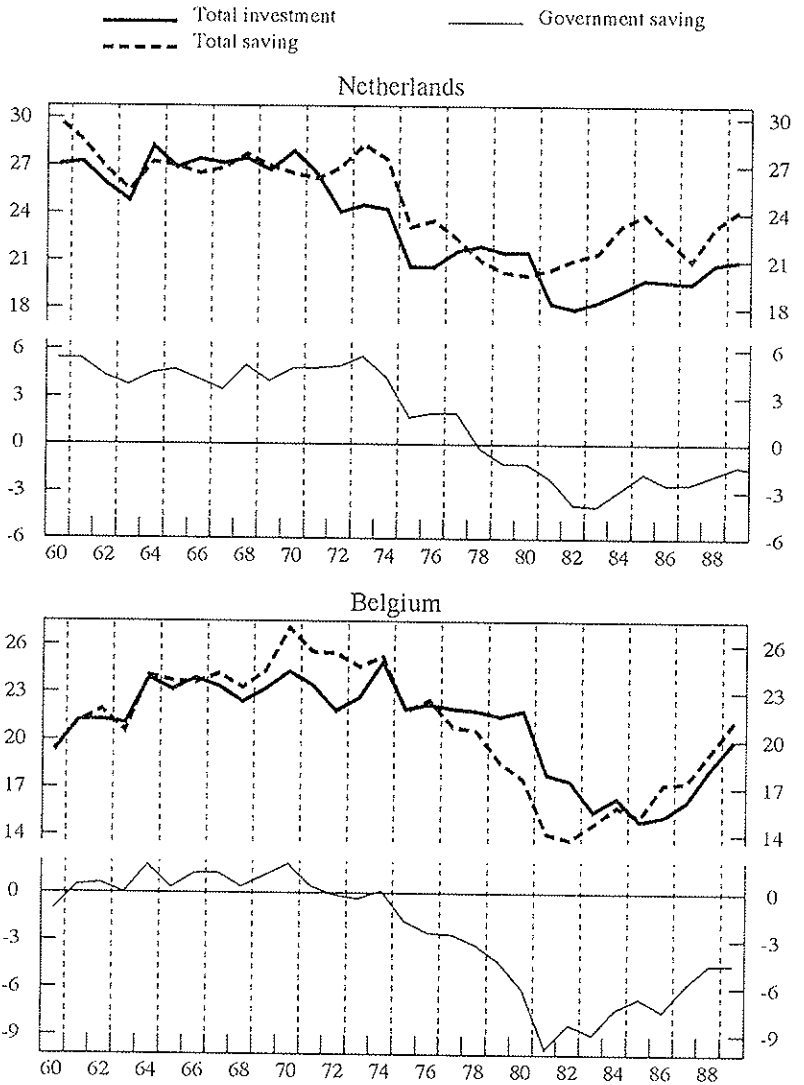
(as a percentage of GNP, in current prices)



Graph 9

Developments in domestic saving and investment

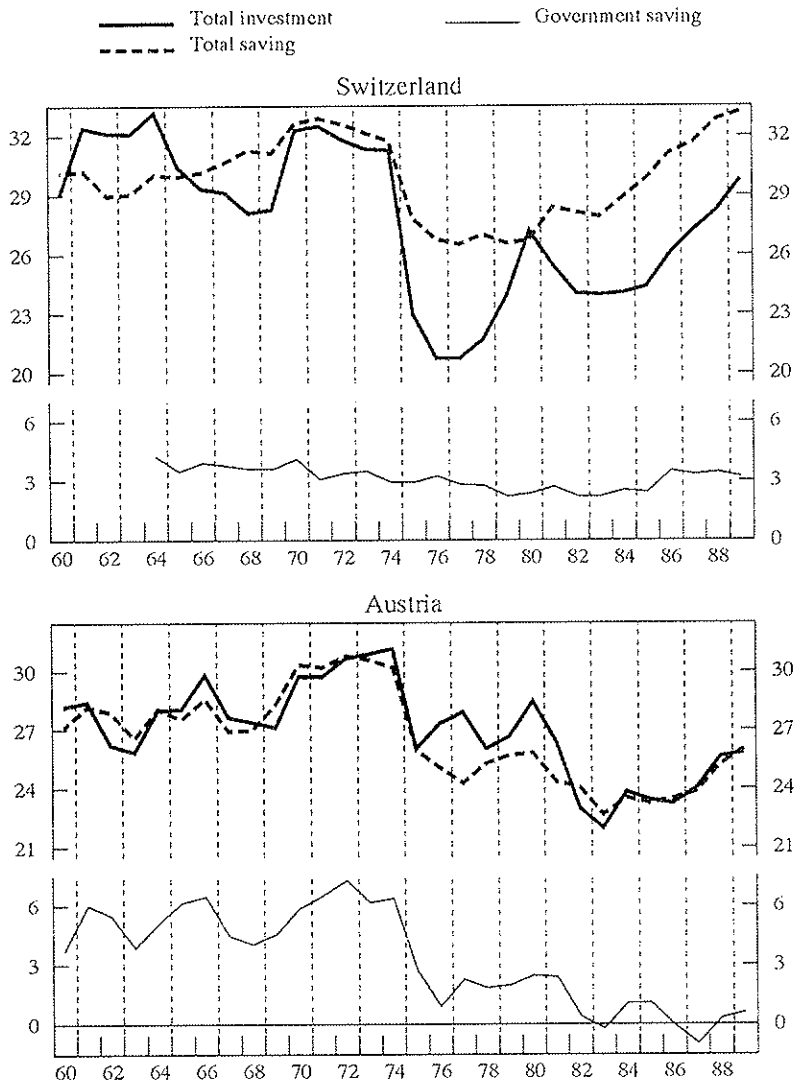
(as a percentage of GNP, in current prices)



Graph 10

Developments in domestic saving and investment

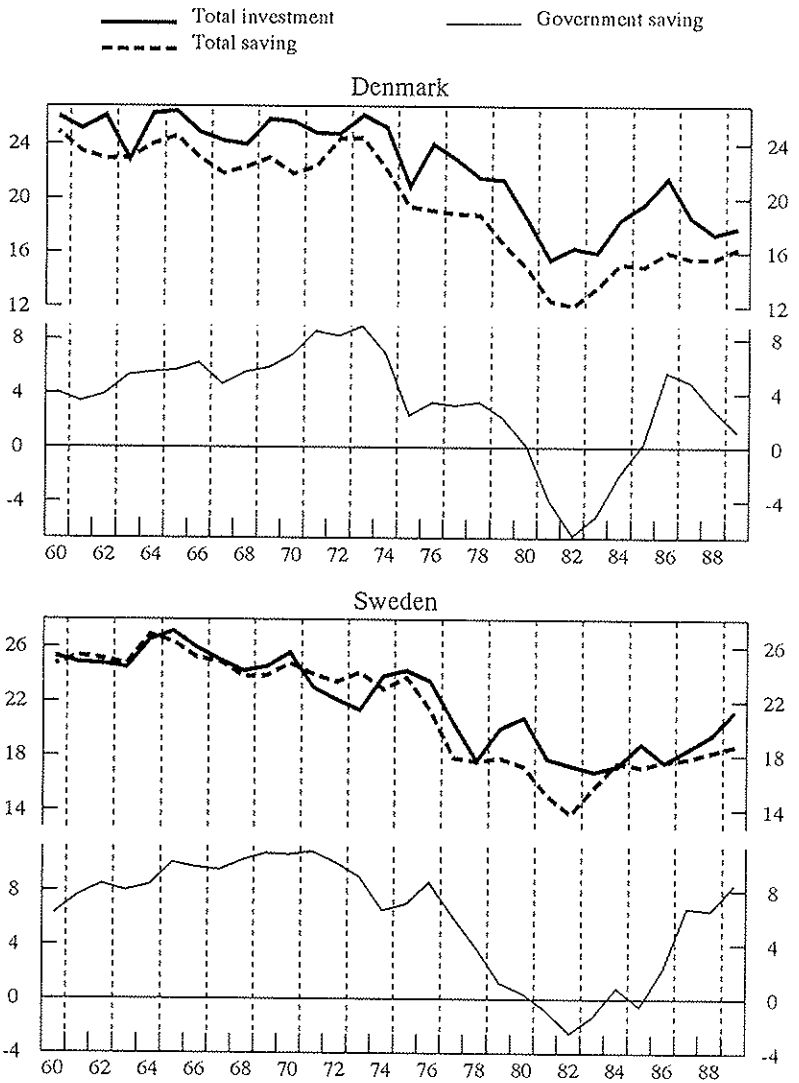
(as a percentage of GNP, in current prices)



Graph 11

Developments in domestic saving and investment

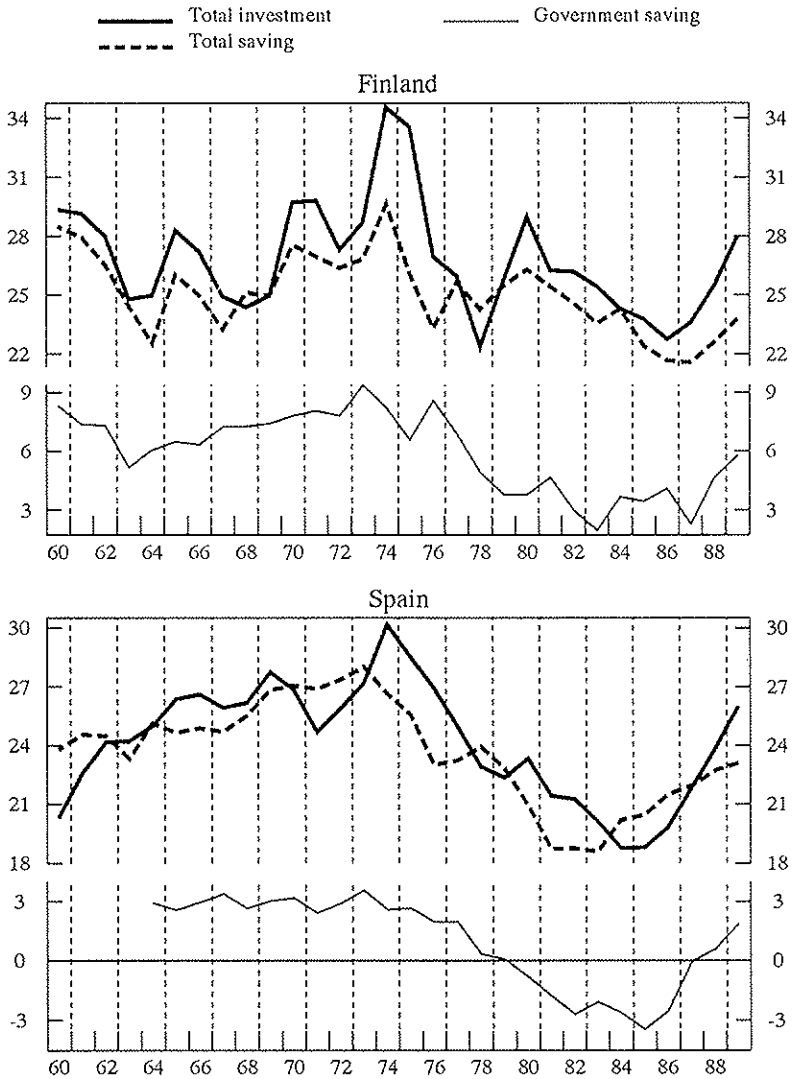
(as a percentage of GNP, in current prices)



Graph 12

Developments in domestic saving and investment

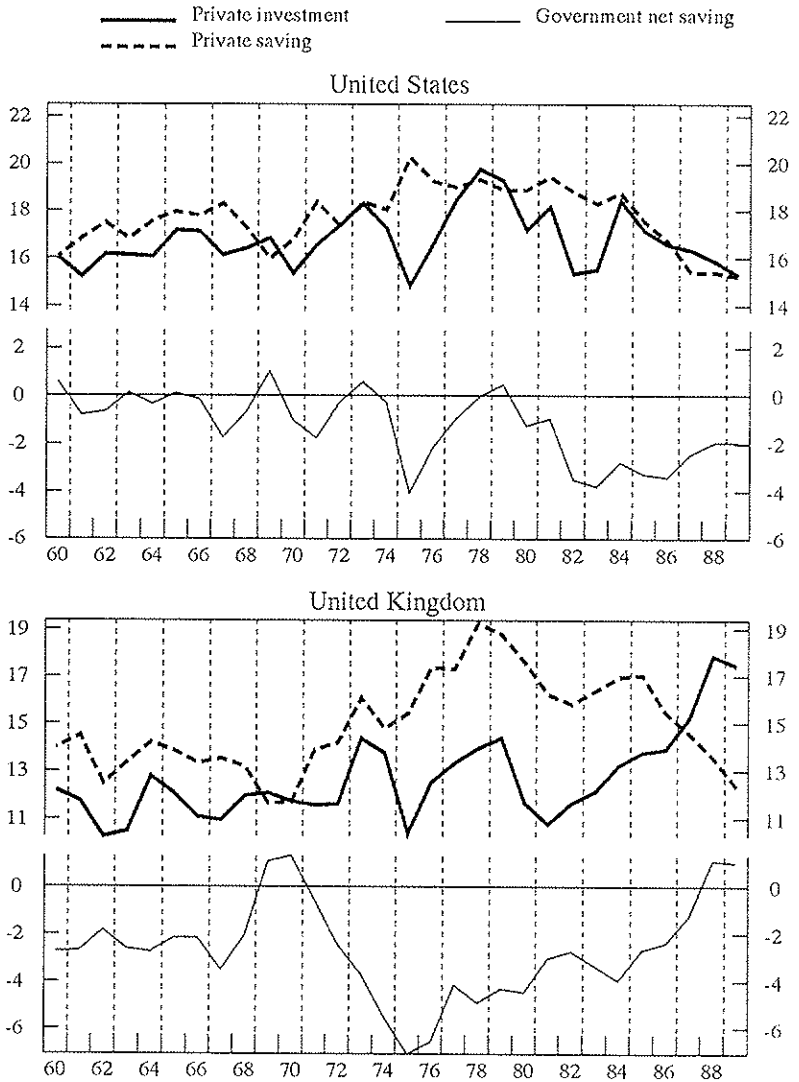
(as a percentage of GNP, in current prices)



Graph 13

Developments in private saving and investment and government net saving

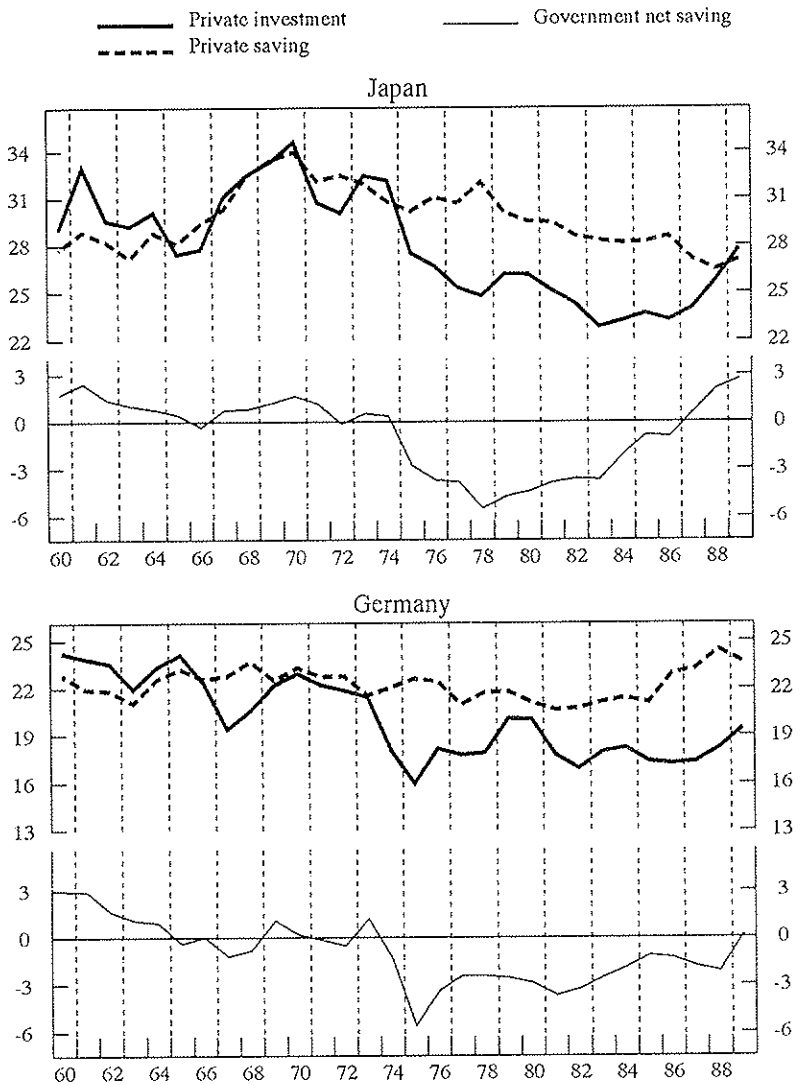
(as a percentage of GNP, in current prices)



Graph 14

Developments in private saving and investment and government net saving

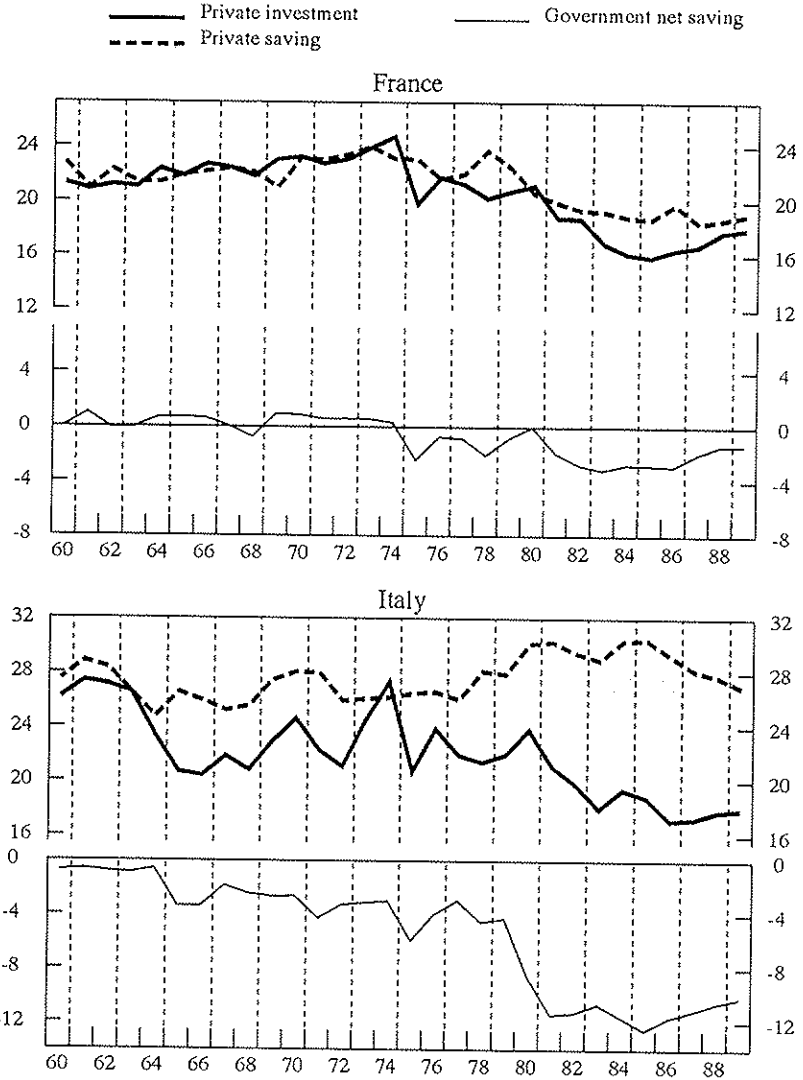
(as a percentage of GNP, in current prices)



Graph 15

Developments in private saving and investment and government net saving

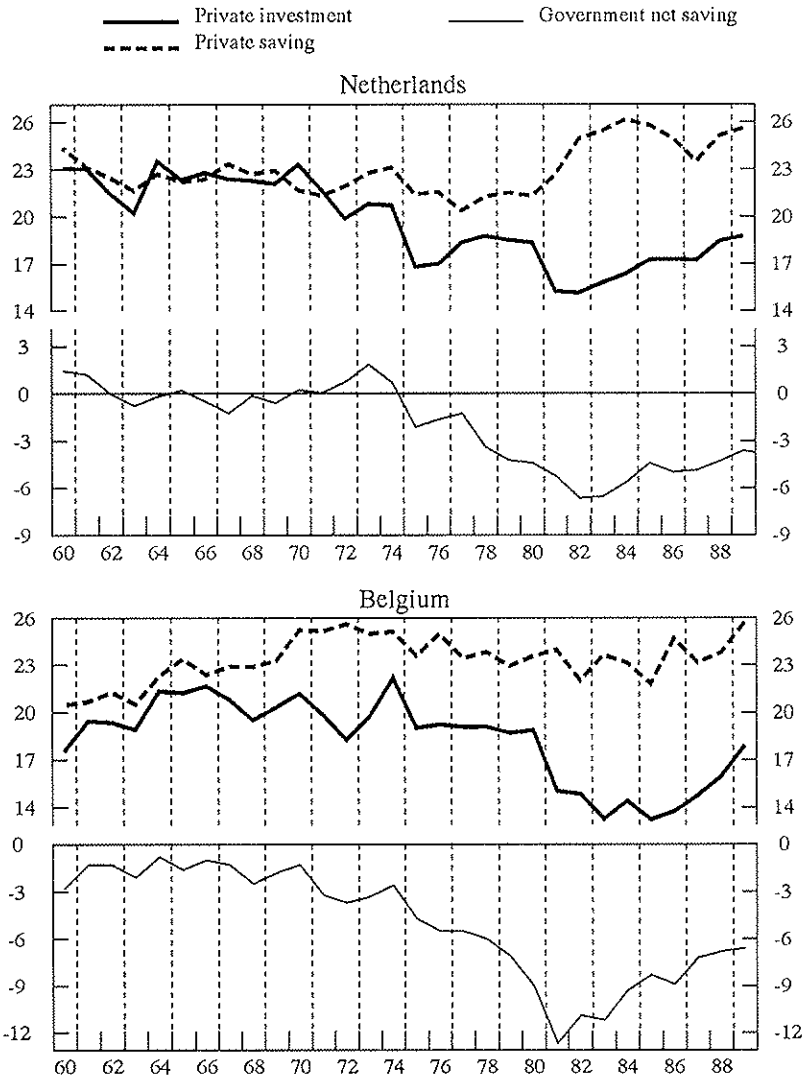
(as a percentage of GNP, in current prices)



Graph 16

Developments in private saving and investment and government net saving

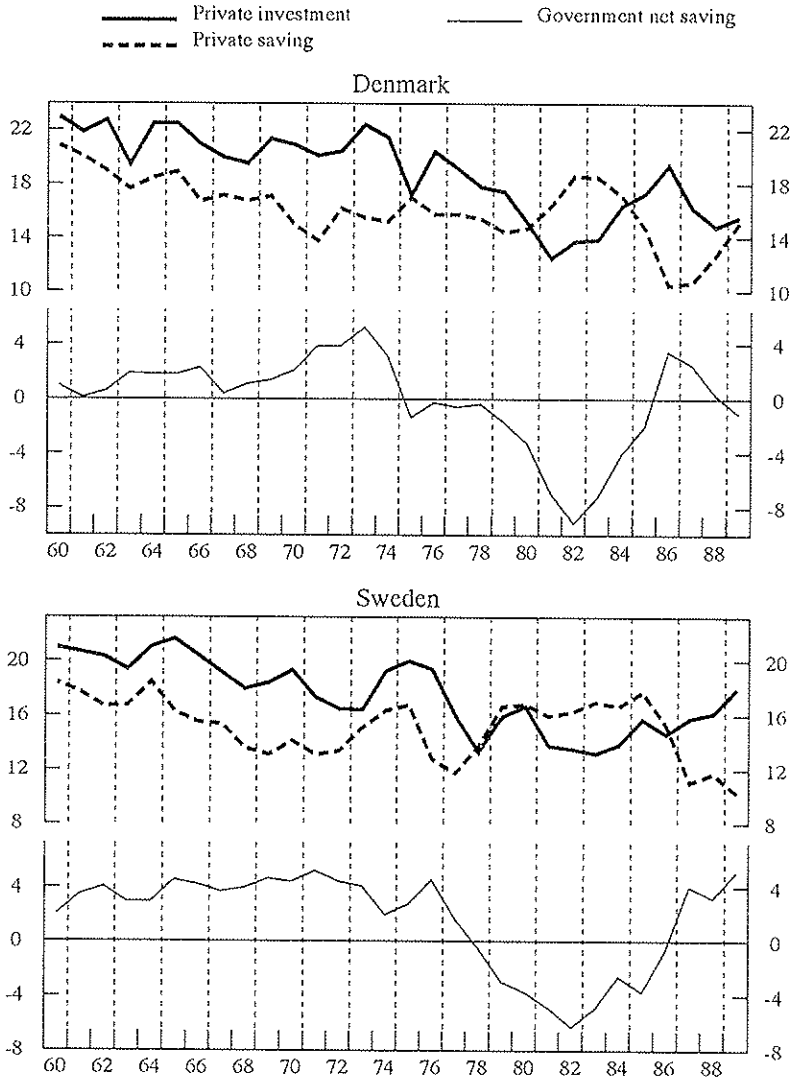
(as a percentage of GNP, in current prices)



Graph 17

Developments in private saving and investment and government net saving

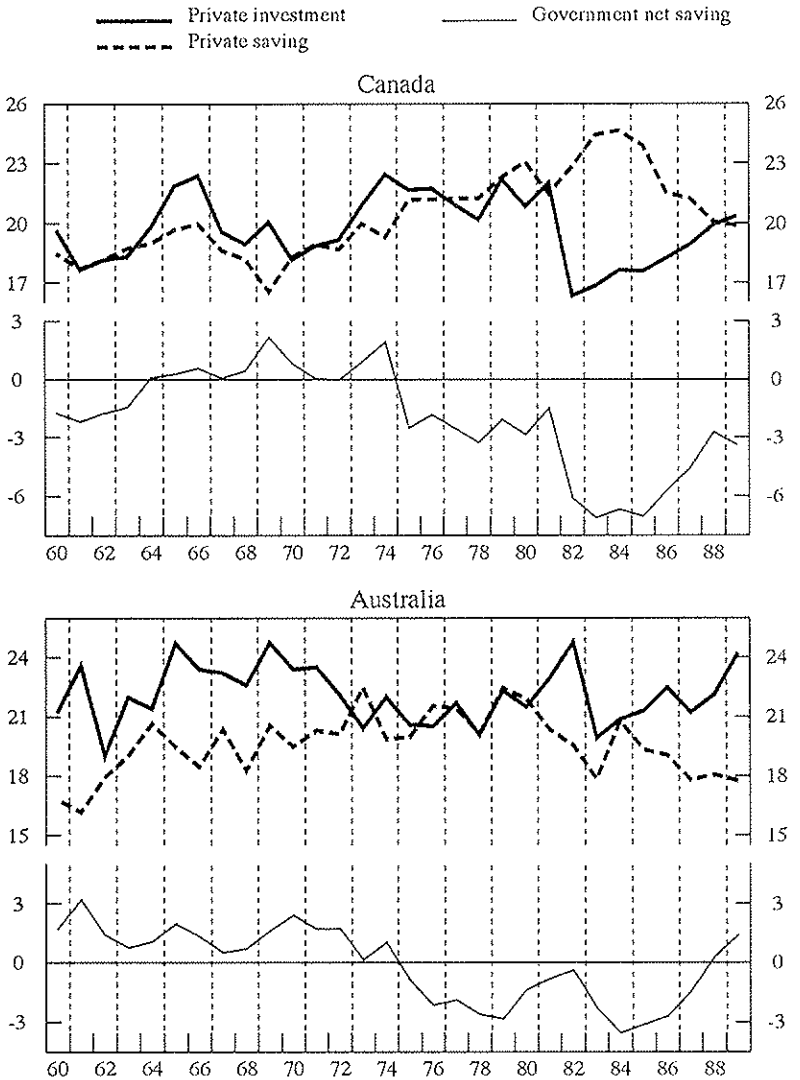
(as a percentage of GNP, in current prices)



Graph 18

Developments in private saving and investment and government net saving

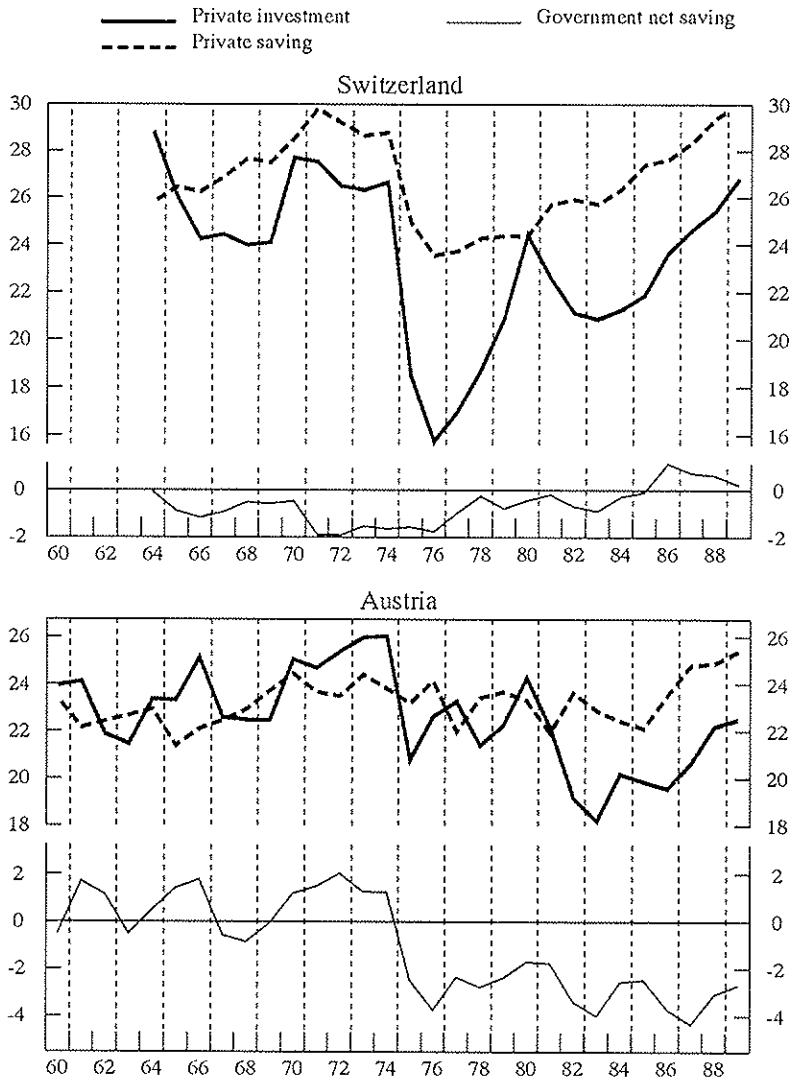
(as a percentage of GNP, in current prices)



Graph 19

Developments in private saving and investment and government net saving

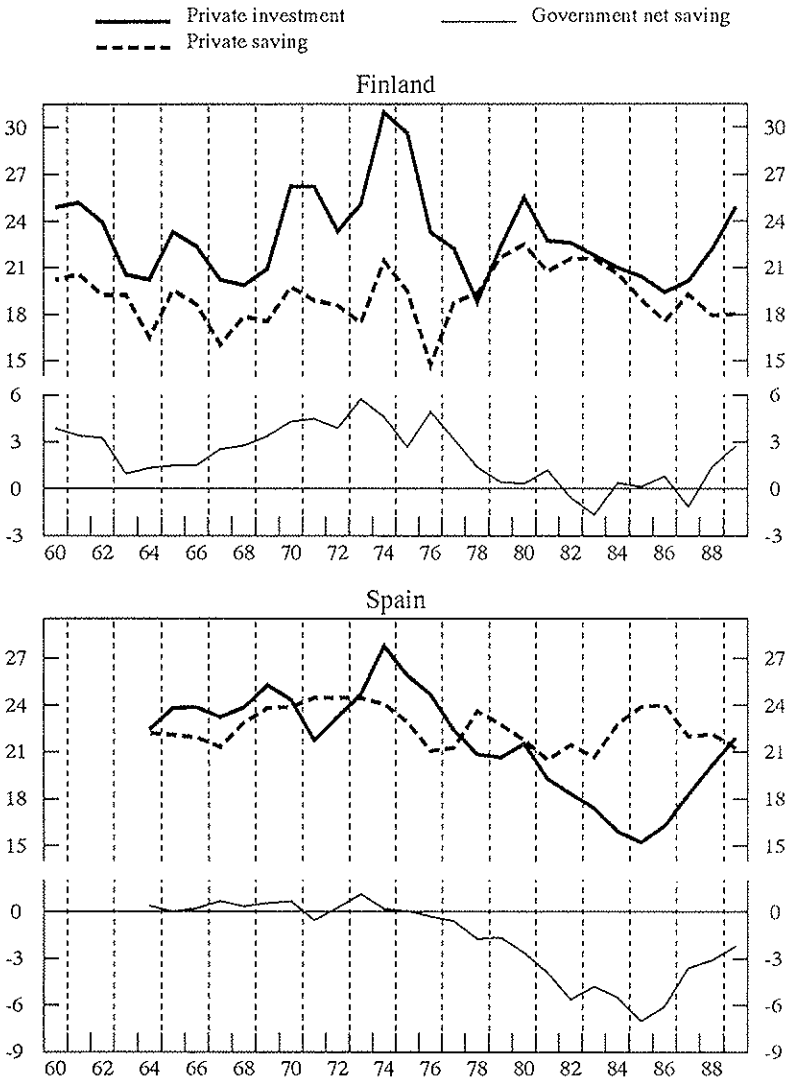
(as a percentage of GNP, in current prices)



Graph 20

Developments in private saving and investment and government net saving

(as a percentage of GNP, in current prices)



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