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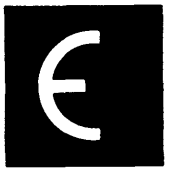
No. 15 June 1983

Monetary assets and inflation induced distortions of the national accounts - conceptual issues and correction of sectoral income flows in 5 EEC countries

Alex CUKIERMAN* and Jorgen MORTENSEN**

Internal paper



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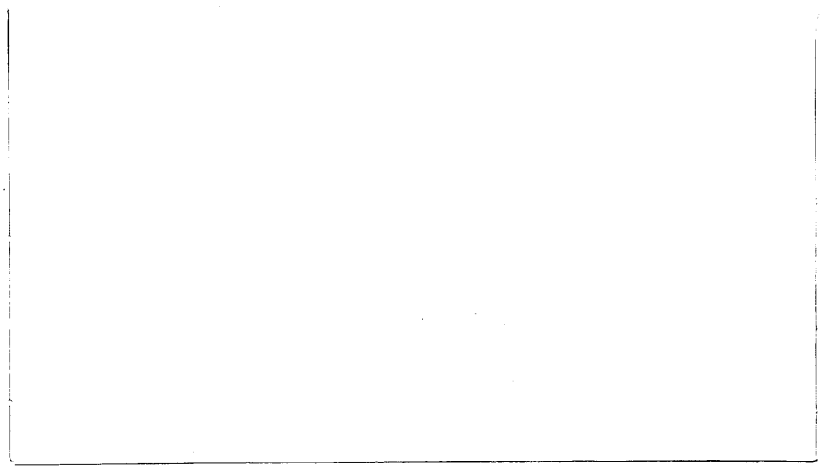

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Alex CUKIERMAN* and Jorgen MORTENSEN**

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* Associate Professor, Tel Aviv University

** Head of division, Directorate for Macroeconomic Analyses and Policies of the Directorate General for Economic and Financial Affairs.

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ABSTRACT

This paper demonstrates that serious distortions may occur as a result of the failure of conventional national accounts to include the inflation induced erosion of monetary assets as a deduction of the income of lenders and an addition to the income of borrowers. Consequently, widely used macroeconomic indicators like the government budget deficit, the personal savings ratio, the current account balance and much used measures of the financial burden of interest payments on national and corporate debt are all biased and for some countries very seriously so. The paper presents a conceptual framework for correcting these distortions, in particular in the context of a discussion of the government budget constraint and the issue of crowding-out. The methodological and statistical problems involved in correcting national accounts for the erosion of the real value of monetary assets are examined in detail. Corrected data for the government budget balance, the household saving ratio, the self-financing ratio of the enterprise sector and the current external account are presented for five EC countries (Belgium, Germany, France, Italy and the United Kingdom). The paper finally identifies the need for additional statistical data for such corrections and points to the need to reconsider some aspects of macroeconomic analysis and policies in the light of the findings of this study.

FOREWORD

This Paper is published as the first of a series of Economic Papers devoted to the problems related to the measurement and analysis of economic phenomena under inflationary conditions. The study arose from a recognition of the fact that the conventional national accounts do not deal appropriately with the effects of general price changes on the real value of assets. Before using the national accounts data for purposes of economic analysis it is therefore necessary to adjust the data for these measurement errors.

As long as the rate of inflation was relatively low, it was probably not too serious to ignore these biases and to base macroeconomic analysis directly on the conventional national accounts data. However, with the acceleration of inflation in most OECD countries since 1969 the potential size of measurement errors and, hence, the risk of drawing false conclusions from the available statistical data has risen to much larger proportions.

In response to this preoccupation, several researchers, in the course of the seventies, tried to identify these "spurious" elements, and in several cases proceeded to undertake partial corrections of the basic national accounts data accordingly. Bach and Stephenson (1974), Buiter (1981, 1982), Bulkley (1981), Caranza and Villani (1981), Cotula and Masera (1980), Jump (1980), Miller (1982), Siegel (1979) and Taylor and Threadgold (1979) have in various ways contributed to the academic discussion and the quantitative research in this field.

In parallel the statistical services of the OECD and the European Communities have undertaken research to clarify the methodological problems related to "inflation accounting" in the macroeconomic area. In 1982 they organised a preliminary debate in their respective national accounts working groups on the basis of a report prepared by a consultant, Mr. Jack Hibbert, engaged in common by the two institutions.

The Directorate General for Economic and Financial Affairs (DG II) has taken a considerable interest in these activities and in the Spring of 1981 Tommaso Padoa-Schioppa, the Director General of DG II (who returned to the Banca d'Italia in March 1983), created an internal task force with the aim of analyzing the theoretical and methodological issues of estimating the measurement errors in conventional national accounts and of correcting the key macroeconomic indicators accordingly. The task force, headed by J. Mortensen, head of division in the Directorate for macro-economic analysis and policies, included the following staff members of DG II: J.P. Baché, B. Connolly, K. Lennan, A. Morisset, A. Reati and H. Wittelsberger. Mr F. Papadia, from the group of economic advisors of the DG II, has contributed importantly to the work of the task force which, furthermore, has been assisted in its work by Mr Alex Cukierman, professor at the University of Tel Aviv, engaged as a consultant for this purpose.

The present Economic Paper, in addition to a general discussion of conceptual issues related to the correction of national accounts data for inflation-induced distortions, presents corrected income flows and sectoral financial balances for the five EC countries for which comprehensive data on monetary assets and liabilities of the various sectors are avaiable (Belgium, Germany, France, Italy and the United Kingdom). Subsequent Economic Papers will contain a more detailed presentation of the findings for the individual countries as well as a paper presenting an analysis of inflation-induced redistribution of income. Other horizontal reports covering special subjects may be published subsequently in the same series, but the details of this programme have not yet been decided upon.

It should be noted that all members of the task force have contributed importantly to the present paper, not only by supplying the quantitative material underlying the section on findings but also, and not least, by taking an active part in a large number of discussions on conceptual and methodological issues within the group. Although a large consensus has emerged from these discussions the views expressed in the Paper are, nevertheless, those of the two authors and may not necessarily on all points be shared by all participants.

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I. INTRODUCTION

In inflationary times the real value of nominally denominated debt like bonds, saving deposits, bills and certificates of deposits is eroded by inflation. If the rate of inflation is perfectly anticipated and if the nominal rate of interest is fully flexible, the latter adjusts so as to make the real return on nominally denominated debt independent of the rate of inflation. If the public makes errors in forecasting inflation or if the nominal rate is not fully flexible the real rate of interest becomes dependent on the rate of inflation. In either case the actual real rate of interest in inflationary times is no longer equal to the nominal rate of interest as is the case under price stability. Instead, the realized ex-post real rate of interest is equal to the nominal rate of interest minus the depreciation in the real value of the debt as a result of inflation. Conventionally measured sectoral income flows in national income statistics include nominal interest payments as an addition to the income of lenders and as a deduction from borrowers' income while disregarding the inflation-induced depreciation in the real value of debt. As a result, conventionally measured sectoral income and expenditure flows incorporate a measurement error whose size is directly related to the rate of inflation and to the extent of net borrowing or lending by the sector in terms of monetary assets or liabilities (1). Measured income of net borrowers is biased downwards and that of net lenders is biased upwards since the depreciation in the real value of monetary claims is not included in measured income of borrowers and is not deducted from the income of lenders (2). This bias may cause serious distortions in the measurement of sectoral incomes and may also affect the aggregate national income for countries with large external net assets or liabilities.

As a result of these biases, widely used macroeconomic indicators like the government budgetary deficit, the personal savings

(1) Monetary assets are defined here as including all financial assets whose current value or whose future cash flows are fixed in terms of currency units.

(2) Note that deflation of nominal income flows by a general price index does not resolve this problem, since the bias is caused by the fact that nominal income of the various sectors is not correctly measured.

ratio, the current account balance and much used measures of the financial burden of interest rate payments on national and corporate debt are all biased (3). In particular, the apparent total income of the household sector, which is normally a net lender, is biased upward and in countries with a positive public debt the conventionally measured budget deficit is also biased upwards. This suggests that before using these economic indicators, in order to evaluate the stance of policy and the position of the economy, they have to be corrected for the biases caused by the depreciation of nominally denominated debt under inflationary conditions.

Attempts to undertake such corrections raise a number of conceptual questions. What are the correct measures of the budget balance for evaluation of the impact of aggregate fiscal policy on potential inflationary pressures and the crowding-out of private capital formation? Is one measure sufficient or is it necessary to produce different measures in order to evaluate the impact on different economic variables? These questions transcend the technical aspects of correcting sectoral income flows for biases but are related to them since, in the final analysis, the nature of the correction used is influenced by the wider set of policy questions to which answers are sought.

At the statistical and computational level, there is a number of conceptual issues. What type of assets should be included in the computation of the corrections? Should market values or face values of monetary assets be used for the purpose of the corrections? Should only changes in the real value of monetary assets that are caused by inflation be incorporated in the correction of sectoral income flows or should the correction incorporate changes in values that are caused by fluctuations in the market values of those assets as well?

(3) Siegel (1979) corrects the private saving ratio and the government deficit for those biases using data from the US economy. A fuller conceptual presentation of some of the issues involved appears in Jump (1980).

The aim of this paper is to purge sectoral income flows from biases that are induced by general price inflation alone and not by changes in relative prices (4). Since these two kinds of price variations can be considered separately (at least at the conceptual level), it is analytically convenient to distinguish between the two. In addition, in a world in which the general price level consistently follows an upward course, biases caused by general inflation are much more important quantitatively and are much less likely to be reversed than those that occur as a result of relative price variation.

The data that are needed to correct sectoral income flows for inflation induced biases include the primary nominal flow data, the rate or rates of inflation and most importantly the value of net monetary claims of the various sectors. While the nominal flow data are readily available from the national accounts, there is no one unified and complete source on the stocks of financial assets by sectors in the different countries. Where such data exist it is not always in a form ideal for the purposes of this paper, so that some adjustments and compromises have to be made. However, sufficient data on stocks of financial assets by sectors in 5 EEC countries was secured to permit the correction of sectoral income flows in those countries throughout the seventies and part of the sixties (5).

Since the rates of inflation and the distribution of nominally denominated assets and liabilities across sectors differ over countries, the correction of sectoral income flows changes appreciably the relative position of those countries with respect to various economic criteria. For example, the ranking of countries according to the stance of fiscal policy is altered. The sectoral distribution of savings in all countries is significantly affected. Moreover, the

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(4) For an attempt to take into account also changes in the relative prices of assets in addition to general inflation, see Hibbert (1981, 1982).

(5) The countries are the UK, France, Germany, Italy and Belgium. More detailed information about the development of financial assets and correction of various sectoral income flows for inflation induced measurement errors in each country appear in individual country papers published in this series.

positive correlation between private saving ratios and inflation often discussed in academic papers proves to be largely of a spurious nature (6).

The determinants of the relationship between conventionally measured economic indicators and the corrected values are discussed conceptually in Section II. The focus of this section is on issues of correct measurement given the conceptual definitions of the magnitudes involved. The consequences of budget deficits for inflation and crowding-out of private expenditure are investigated in Section III. In particular, it is shown that the conventionally measured deficit is largely irrelevant for analysis of both crowding-out and potential inflation. The appropriate deficit concept for each of these purposes is identified. The wider implications of a given mix of deficits and monetary growth for capital formation, output per capita, the national debt and interest rates are illustrated for steady-state situations within a 3-assets growth model. Some implications of the view that governmental debt is not net wealth are also discussed.

The data and the methodology used in correcting sectoral income flows is described in Section IV. This involves issues like the sectoral breakdown, the classification of assets for the purpose of the corrections, the use of market versus face values for the valuation of monetary assets, problems arising from the discontinuity of the data, the choice of price deflator and problems raised by the existence of monetary assets denominated in foreign currency terms. The empirical results of the study are summarised in Section V, presenting the evolution of financial assets in the five countries during the seventies, the depreciation of net monetary assets and liabilities by sector, two measures of the adjusted budget deficit, a correction of private saving ratios and of the current account of the balance of payments as well as of corporate financial capacity measures.

(6) Some of these issues are discussed for the Italian case by Cotula and Masera (1980). Miller (1982), Buiter (1982) and Darby and Lothian (1982) present corrections of the budgetary deficit for the UK. In all cases the corrections decrease the UK deficit very substantially and in most of them transform it into a surplus at least in recent years.

Additional policy issues such as the effects of nominal taxation of interest and the policy implications of unexpected inflation are discussed in Section VI. Section VII reviews shortly unsolved data problems and makes some recommendations for future data collection. The implications for macroeconomic analysis and policy-making are discussed briefly in Section VIII. A series of more technical or special problems are dealt with in an appendix.

II. INFLATION-INDUCED MEASUREMENT ERRORS IN SOME MACROECONOMIC RATIOS

A casual look at magnitudes like the government deficit as a proportion of GDP or at the private savings ratio in disposable income, suggests the existence of a positive relationship between those ratios and the rate of inflation (7). Those relationships seem, for the most part, to be stronger in high inflation countries like Italy and the United Kingdom and to be particularly striking, within a given country, during bursts of high inflation like in 1974. The positive association between conventionally measured deficits and inflation could, it seems, be explained by traditional economic reasoning according to which higher deficits, by leading to higher rates of monetary expansion, fuel higher inflation. However, this positive association can also be the result of a simple bias in the conventionally measured budget deficit. The latter includes net interest payments as an expense of the government but does not include the depreciation in the real value of government debt as a source of income. As a result, the deficit in the government's budget is biased upward and the size of the bias becomes an increasing function of both the rate of inflation and the size of the national debt (8). Hence, before attributing the positive relationship between budget deficits and inflation to permissive aggregate demand policies, it is necessary to purge the conventionally measured budget deficits for the bias induced by inflation.

(7) Detailed time series for those ratios and the rate of inflation during the seventies for each of the five EC countries that entered the sample, appear in the individual countries reports. See also Roveda (undated) for additional evidence on the four large EC countries and Siegel (1979) and Jump (1980) for the US.

(8) Note that there is an upward bias in the conventionally measured deficit whether the nominal interest rate adjusts fully, partially, or not at all.

Similarly, the apparent positive association between the private savings ratio and inflation has been explained on behavioural grounds. Wachtel (1977) claims that savings go up when inflation uncertainty goes up. Since the rate of inflation and its uncertainty are usually positively correlated, those two facts combine together to create a positive relationship between the private savings ratio and the rate of inflation. But as with the government budget deficit an increase in the rate of inflation causes a spurious increase in the conventionally measured savings ratio. This is so because conventionally measured disposable income includes nominal interest receipts by households but does not take into consideration the fact that the real value of their monetary assets depreciates as a result of inflation. As a consequence, disposable income and therefore conventionally measured savings and the private savings ratio are all biased upward. The size of this bias increases with inflation. Hence before interpreting the observed relationship between the private savings ratio and inflation as a behavioural relationship, it is necessary to purge the private savings ratio for its spurious correlation with inflation.

As far as profits are concerned, two concepts exist: the entity concept and the equity concept. According to the entity concept, profit is calculated as value-added less labour cost and, thus, is not influenced by the accounting procedures for interest payments and the change in the real value of monetary assets. The macroeconomic statistics for the functional income distribution (the labour income ratio or the gross operating surplus in relation to value added) can thus be considered as unbiased with respect to the rate of inflation. When calculated according to the equity concept, on the other hand, profits are estimated after nominal interest payments (and tax). The depreciation of the real value of corporate debt - which, in fact, is a capital gains for the firm - is, however, not included in conventionally established corporate profit. As a result, the profit ratio calculated according to the equity concept will contain a downward bias in measuring the yield of equity and the more so, the higher the rate of inflation (9).

(9) An upward bias in profit estimates in commercial accounting may result from the calculation of depreciation on the basis of historical costs. See the review of commercial accounting issues in Annex B.

The main purpose of this section is to identify analytically the determinants of the biases in the ratios mentioned and to show that, at the rates of inflation experienced by the EC countries that entered the sample, those biases may be quite substantial.

a. The government sector (10)

We shall focus here on two measures that are associated with the government budget balance. These are the deficits as a percent of Gross Domestic Product (GDP), and total interest payments on the national debt as a percentage of GDP. Both measures suffer from inflation induced measurement errors and the size of the bias is an increasing function of the rate of inflation. In order to evaluate the dependence of these biases on inflation we shall consider a situation in which all real magnitudes are fixed and in which the only variable that is allowed to change is the rate of inflation.

The government deficit in nominal terms as usually defined in the national accounts is

$$DF = G + n_a L_g - T \qquad (1)$$

where DF, G, L_g and T are respectively the deficit, government expenditure on goods and services, total debt of the government sector (including interest-bearing and non interest-bearing debt) and total tax collections net of subsidies. n_a is the average nominal rate of interest on L_g. Let γ be the ratio of total net monetary government liabilities to GDP. That is

$$\gamma \equiv \frac{L_g}{X} \qquad (2)$$

where X denotes GDP in current prices. Note that L_g includes the stock of high-powered money, H, (normally defined as currency in circulation plus bank reserves deposited with the Central Bank; this is also called the monetary base or outside money). The ratio of government deficit to GDP as currently measured is

(10) The Central Bank is considered as part of the government sector. See the discussion of the sectoral breakdown in Section IV a below. By government budget balance is meant the combined net lending or borrowing of general government and the central bank.

$$f \equiv \frac{DF}{X} = \frac{G + n_a L_g - T}{X} \tag{3}$$

The measured ratio f is a downward biased measure (for $L_g > 0$) of the ratio of the deficit to GDP because the inflation induced depreciation of the debt is not included as part of governmental tax income. Denoting the rate of inflation by π this depreciation is given by (11)

$$\pi L_g \tag{4}$$

and the correct ratio of the deficit to GDP is therefore

$$f' \equiv \frac{G - T + n_a L_g - \pi L_g}{X} = f - \frac{\pi L_g}{X} = f - \pi \gamma \tag{5}$$

from which it follows that

$$f = f' + \pi\gamma \tag{6}$$

In words, the conventionally measured ratio of the deficit to GDP is equal to the true ratio plus a bias term, $\pi\gamma$, which is an increasing function of the rate of inflation and of the size of total net government liabilities in comparison to GDP. The actual ratios of total net government debt to GDP (γ) in the 5 countries investigated, fluctuate significantly during the sixties and the seventies. The 80% mark for γ is exceeded in both the UK and Belgium during the sixties. In Italy this ratio has increased from 31,5% in 1965 to 57,4% in 1980. In France the ratio is around 10%. The German government was actually a net lender for most of the period (12). Table 1 presents theoretical estimates of the conventionally measured deficit figures for $\gamma = 0{,}2$ and $\gamma = 0{,}8$ and for various rates of inflation under the assumption that the true ratio of the deficit to GDP is 0.

(11) Here it is assumed for simplici that government revenues from the inflation tax on H are equa to π H which will be the case in a stationary steady state. A case in which π H differs from the inflation tax is discussed in Section III.

(12) For details see Section V.

Table 1

The conventionally measured deficit as a percent of GDP for various values of π and γ under the assumption that the true deficit is 0 ($f' = 0$) (13)

Rate of inflation (π)	Apparent budget deficit for various values of γ (γ = government net monetary liabilities as % of GDP)	
	$\gamma = 0{,}2$	$\gamma = 0{,}8$
0	0	0
4	0,8	3,2
8	1,6	6,4
12	2,4	9,6
16	3,2	12,8
20	4,0	16,0

It can be seen from the table that although the true deficit is zero the conventionally measured deficit is positive at all positive rates of inflation. It reaches 2,4% of GDP for $\gamma = 0{,}2$ at a 12% rate of inflation and is as sizeable as 9,6% of GDP at the same rate of inflation for $\gamma = 0{,}8$. For $\gamma = 0{,}8$ and a 20% rate of inflation, the measured ratio of the deficit reaches as much as 16% even though the true ratio is zero.

Total measured interest payments on the government debt in proportion to GDP are given by

$$a \equiv n_a \frac{L_g}{X} \tag{7}$$

However this is an upward biased measure of true governmental debt service since the depreciation in the real value of total government liabilities decreases the true burden of the debt service in comparison to the expression in (7). To get the real or true burden of debt service as a percent of GDP it is therefore necessary to use the expression

$$a' \equiv n_a \frac{L_g}{X} - \pi \frac{L_g}{X} \tag{8}$$

(13) The numbers in the table have been calculated by using equation (6) for the case $f' = 0$. Hence the figures in the table are equal to $\gamma\pi$ multiplied by 100 to convert them into percentages.

From (7) and (8) it follows that

$$a = a' + \pi\gamma \tag{9}$$

That is measured debt service as a percent of GDP is equal to true debt service as a percent of GDP plus a bias term that is an increasing function of both inflation and the net monetary position of the government sector. To get a feeling for the orders of magnitude involved, it is convenient to assume that real debt service (a) is equal to zero. For this case it follows from equation (9) that conventionally measured debt service as a fraction of GDP is

$$a = \pi\gamma \tag{9 a}$$

Table 1 actually displays the value of $\gamma\,\pi$ for alternative values of π and γ. Hence the entries in this table can also be interpreted as showing measured debt service as a fraction of GDP at various inflation rates and debt sizes provided true real debt service is zero. It can be seen from the table that the measured debt service as a fraction of GDP increases with both inflation and the size of the debt. For $\gamma = 0{,}8$ and a twelve percent rate of inflation, it reaches almost 10% of GDP although the true burden of the debt service is zero.

As we saw above, the higher the rate of inflation, the larger the size of the depreciation in the real value of total national debt. As a result, even if the real value of the total national debt is constant over time, there will, ceteris paribus, be more new debt issued by the government when inflation is higher. The reason is that with a higher rate of inflation a larger volume of new issues is needed to maintain the real value of the debt at a constant level. Thus a higher rate of inflation forces the government into a higher level of refinancing activity. In order to evaluate the orders of magnitude involved and their dependence on inflation and the size of

the national debt, consider the government budget constraint

$$D + n_a L_g = dL_g \tag{10}$$

where

$$D \equiv G - T \tag{11}$$

and dL_g is the net increase in total government debt. Equation (10) states that total government expenditures, excluding net interest payments on the national debt plus those interest payments minus taxes, have to be financed by either new debt or new outside money. Rearranging (10) and dividing by X yields the following expression

$$\frac{dL_g}{X} = \frac{D + r_a L_g}{X} + \pi \frac{L_g}{X} = \frac{D + r_a L_g}{X} + \pi\gamma \tag{12}$$

where

$$r_a \equiv n_a - \pi \tag{13}$$

is the ex post average real rate of interest on government debt (14). The left-hand side of equation (12) is the total amount of new government liabilities which have to be issued in order to finance the corrected government deficit, $D + r_a L_g$, plus the amount πL_g needed to maintain the sum of high-powered money and government debt at the same real level (15). Suppose now that the first term is zero so that the real government deficit does not require the issue of any new liabilities. In this case equation (12) reduces to

$$\frac{dL_g}{X} = \pi\gamma \tag{12 a}$$

(14) r_a will be equal to the average ex ante real rate of interest if the rate of inflation is perfectly anticipated. However the analysis in the text does not require that to be the case.

(15) This can be seen by considering the middle term of equation (12).

All the volume of new issues of debt undertaken is thus needed just to maintain the real value of total government liabilities in the face of a constant depreciation of these liabilities. In fact no new debt is created in real terms. If all government debt was of the consol type (i.e. perpetuous) and there was no inflation, dL_g would be equal to zero and the new issues department could have closed its doors. However when there is inflation the same real constancy of total liabilities is achieved only with a positive value of dL_g. In addition, as is suggested by (12 a), the proportion of new isues to GDP is in this case equal to $\pi\gamma$ and is an increasing function of both γ and π. The values of $\pi\gamma$ for various values of π and γ can again be found in Table 1 showing that with a 20% inflation and $\gamma = 0{,}8$ the new issues activity (including issues of high-powered money) needed just to maintain the real value of liabilities is 16% of GDP. In the real world the refinancing activity of course is not costless as it binds real resources both in the government sector and in private financial institutions. This is one of the real costs of inflation (16).

b. The household sector

Let S and D I be respectively conventionally measured household saving and disposable income in nominal terms. The conventionally measured private saving ratio is then;

$$s \equiv \frac{S}{D\,I} \tag{14}$$

However, this saving ratio does not take into consideration the fact that the real value of net debt held by households depreciates as a result of inflation. The resulting purchasing power loss is given by

$$\pi\, B^h \tag{15}$$

(16) This amount of real resources probably increases less than in proportion with inflation because of economies of scale in issuing activity.

where B^h is the net debt held by the household sector. Thus true disposable income is equal to $DI - \pi B^h$ and true saving is therefore equal to $S - \pi B^h$. Using the corrected expressions for saving and disposable income instead of the conventionally measured figures we obtain the corrected saving ratio

$$s' \equiv \frac{S - \pi B^h}{DI - \pi B^h} = \frac{\frac{S}{DI} - \pi \frac{B^h}{DI}}{1 - \pi \frac{B^h}{DI}} = \frac{s - \pi\theta}{1 - \pi\theta} \qquad (16)$$

where

$$\theta \equiv \frac{B^h}{DI} \qquad (17)$$

is the ratio of net debt held by households to disposable income. Rearranging (16) if follows that

$$s = s' + \theta(1 - s')\pi \qquad (18)$$

That is, the measured private saving ratio is equal to the true saving ratio s', plus a bias term which is an increasing function of the rate of inflation π and of the ratio θ of net debt held by households to disposable income. Table 2 presents the measured saving ratio as a function of θ and π under the assumption that the true saving ratio is 10% of disposable income.

Table 2

The conventionally measured household saving ratio (s) for various values of π and θ under the assumption that the true saving ratio is 10% (17)

Rate of inflation	Apparent saving ratio for alternative values of θ (net monetary assets of households in relation to disposable income)	
π	$\theta = 0{,}8$	$\theta = 1{,}6$
0	10	10
4	13	16
8	16	22
12	19	27
16	22	33
20	24	38

(17) The figures in the table are calculated from equation (18) and are multiplied by 100 to get percentages.

It is clearly seen from the table that with positive inflation the conventionally measured saving ratio is an upward biased measure of the true saving ratio with the size of the bias being an increasing function of the rate of inflation. For a household sector with net holdings of debt which are equal to a little over one-and-a-half times the level of disposable income and an 8% rate of inflation, the upward bias is over 100% of the true saving ratio. The figures of Table 2 illustrate how at least part of the positive association between inflation and the conventionally measured private savings ratio may be due to the inflation-induced measurement bias.

c. The enterprise sector

As already mentioned, the entity concept of profits is calculated before interest payments and taxes and therefore is unaffected by the measurement biases attributable to changes in the real value of monetary assets and liabilities. The gross saving and net financial balance of the enterprise sector on the other hand are significant indicators of the financial strength of firms and both these statistics are influenced in the same way as government deficits and household saving by the failure of conventional accounting procedures to include changes in the real value of monetary assets and liabilities (17a).

Let Q be the nominal saving of the enterprise sector as conventionally measured, i.e. after deducting interest and tax payments. The conventionally measured ratio of gross saving to investment (the self-financing ratio) is given as

$$q = \frac{Q}{I} \tag{19}$$

where I is gross investment of the enterprise sector. Let B_e be the net debt owed by the enterprise sector. Then true saving of the enterprise sector is given by $Q + \pi B_e$ and the correct ratio between the saving of the enterprise sector and investment is given by

$$q' = \frac{Q + \pi B_e}{I} = q + \pi \beta \tag{20}$$

(17a) It will be recalled that both gross saving and the net financial balance of the enterprise sector are calculated after nominal interest payments.

where

$$\beta \equiv \frac{B_e}{I} \tag{21}$$

is the ratio of the net monetary debt of non-financial enterprises to investment. Rearranging (20) gives

$$q = q' - \pi\beta \tag{22}$$

which states that the conventionally measured ratio is equal to the true ratio minus a bias term which is an increasing function of inflation and of the ratio β. Table 3 presents the measured ratio of saving to enterprises' investment for hypothetical values of β and various rates of inflation under the assumption that the true value of q' is 100% (i.e. the assumption that true gross saving is exactly equal to gross investment).

Table 3

The conventionally measured ratio of corporate saving to investment for various values of π and β under the assumption that the true ratio is 100%

Rate of inflation	Apparent self financing ratio for various values of β (ratio of net debt to investment)	
π	β = 1	β = 2
0	100,0	100,0
4	96,0	92,0
8	92,0	84,0
12	88,0	76,0
16	84,0	68,0
20	80,0	60,0
25	75,0	50,0

The table suggests that the downward bias in the conventionally measured self-financing ratio may actually, under extreme conditions, create the impression of a financial squeeze even though real saving is all the time at 100% of investment. The conventional accounting procedures may thus, in times of inflation, give a downward biased indication of the enterprise sector's capacity for self-financing.

(4)

d. The foreign sector

The inflation induced depreciation of the real value of monetary assets also causes measurement errors in the balances on current accounts of countries which have a net positive or negative monetary position with the rest of the world. This occurs because, as with other national income flows, the net interest flows between countries are normally, in standardised national accounts systems such as the European System of Integrated Economic Accounts (ESA), included in the computation of current account balances whereas the depreciation in the real value of nominal debt is not. As a result, current account deficits of net debtor countries are biased upward and those of net creditor countries are biased downward. The conceptual framework for demonstrating the bias in the conventional national accounts estimates is broadly the same as for the budget deficit and is not repeated here.

Where the foreign sectors holdings of assets and liabilities are denominated in foreign currency terms, an additional methodological problem arises which is dealt with in Section 4 below.

III. SOME WIDER CONCEPTUAL AND POLICY ISSUES REGARDING THE GOVERNMENT BUDGET BALANCE

One of the most important statistics used to measure the impact of government fiscal policy on the economy is the size of the government surplus or deficit. Since, as we saw in the previous section, correction of government's income flows for inflation-induced measurement errors may change the size of the deficit quite substantially, wider conclusions regarding the stance of fiscal policy may have to be revised accordingly. The purpose of this section is to investigate the impact of the budget balance on issues like inflationary pressures, crowding-out, capital formation and output per capita and to identify in each case the concept of the deficit or surplus which is relevant for the evaluation of the impact of fiscal policy. It turns out that in inflationary times the conventionally measured deficit is not appropriate for the evaluation of the effect of fiscal policy on those issues. However, no single alternative concept of the budget deficit or surplus is appropriate for the evaluation of the impact of fiscal policy on all of the abovementioned issues. Different types of corrected deficit concepts have to be considered in order to answer different questions. For some of those questions an inflation corrected budgetary deficit of the type discussed in the previous section is appropriate, but for others a different concept of the deficit is more relevant.

This section is divided into 3 parts. The first part focuses on alternative definitions of the deficit and on the interpretation of each concept in the context of the analysis of a non-growing economy with full employment and no cyclical fluctuations. Most of the arguments here are at the intuitive level. In the second part, the impact of the appropriately defined deficit on the economy, is investigated more formally within the framework of a 3-assets steady-state growth model. The last part contains some remarks about the meaning of the inflation corrected budget deficit when the stock of government bonds is not considered as net wealth by the private sector.

Before proceeding, it is useful to introduce the terminology which will be used throughout this report. We shall designate by the term "financial assets" (or "liabilities") the widest collection of paper assets (or liabilities) possible. This includes conventionally defined money, short- and long-term credits, bills, notes, bonds, bank reserves, certificates of deposits, as well as all types of venture capital like shares. Financial assets or (liabilities) which have a fixed nominal value in terms of legal tender either in the present, or at some date or dates in the future, are referred to as monetary assets (or liabilities) (18). The monetary liabilities of the government sector (including the central bank) are further subdivided into high-powered (or the monetary base) and all other monetary liabilities of the government sector, which will be referred to as government debt (19).

a. The government budget constraint and alternative concepts of the budgetary deficit

The government budget constraint is an accounting identity which states that the excess of government outlays over tax receipts has to be financed either by issuing new high-powered money (H) or by issuing new debt (B_g). More formally

$$D + n B_g = \dot{H} + \dot{B}_g \qquad (23)$$

where D is defined in equation (11) and $\dot{H}$ and $\dot{B}_g$ are respectively the changes in high-powered money and in government debt, here and in the following defined as the net monetary liabilities of the combined government sector (general government plus central bank) and excluding high-powered money. Equation (23) is the continuous analogue of equation (10) of the previous section and is likewise measured in current prices. n is the average interest paid on total monetary

(18) Note that this definition includes, in addition to conventionally defined money, all assets with fixed redemption values as well as consols (perpetuities). It excludes gold, venture capital, participations and indexed bonds.

(19) This debt is mostly interest-bearing while high-powered money usually does not bear interest. However, there are exceptions. For example in Italy some interest is paid on bank reserves which are part of high-powered money. The arguments for including the central bank in the government sector are further expanded below, in Section IV a.

liabilities of the government sector excluding high-powered money (19a). H and B_g are components of total government debt introduced in Section a of Chapter II. More precisely, $L_g = B_g + H$. For the most part B_g corresponds to interest-bearing monetary liabilities and H to non-interest bearing monetary liabilities of the government. Since exceptions to this rule are not very important, quantitatively, we proceed, for simplicity, on the assumption that H bears no interest (19b). Let P be the current price level. Dividing both sides of the budget constraint in (23) by P to express it in real terms and rearranging we obtain

$$\frac{\dot{B}_g}{P} = \frac{D}{P} + n\,b - \theta\,h \tag{24}$$

where

$$b \equiv \frac{B_g}{P} \;;\; \theta \equiv \frac{\dot{H}}{H} \;;\; h \equiv \frac{H}{P} \tag{25}$$

b and h are respectively the real values of government debt and of high-powered money. θ is the rate of growth of the monetary base. Differentiating b in (25) logarithmically gives

$$\frac{\dot{b}}{b} = \frac{\dot{B}_g}{B_g} - \frac{\dot{P}}{P} = \frac{\dot{B}_g}{B_g} - \pi \tag{26}$$

Rearranging (26) we obtain

$$\frac{\dot{B}_g}{P} = \dot{b} + \pi\,b \tag{26 a}$$

(19a) By contrast n_a in Section a of Chapter II is the average interest on total governmental monetary liabilities including high-powered money.

(19b) When an interest n_h is paid on part of high-powered money, equation (13) is replaced by

$$D + nB_g + n_h H_I = \dot{H}_I + \dot{H}_I + \dot{H}_{NI} + \dot{B}_g$$

where H_I and H_{NI} are, respectively, the interest and the non-interest bearing components of H.

Substituting (26 a) into the left-hand side of (24) and rearranging, the government budget constraint can be rewritten

$$\dot{b} + \theta h \equiv \dot{b} + \frac{\dot{H}}{P} = \frac{D}{P} + (n - \pi)\, b \equiv \frac{D}{P} + r\, b \qquad (27)$$

Equation (27) says that the real value of the excess of government expenditures over tax revenues ($\frac{D}{P}$) plus the real value of the inflation adjusted interest payments on the national debt ($(n - \pi)\, b$), is equal to the sum of the change in the real value of government debt ($\dot{b}$) and new high-powered money (θh). This is the content of the expressions around the equality sign in the middle of equation (27). The extreme right-hand side expression expresses $n - \pi$ in terms of the real rate of interest on government debt and the extreme left-hand expression (using the definitions of equations (25)) states that the real resources that government gets from the creation of new high-powered money can be expressed as the product of the rate of growth (θ) of this stock and its real value (h).

It can be seen from equation (27) that the real deficit is zero whenever the real value of $D = G - T$ plus real interest payments on the government debt are equal to zero. In such a case the increase in the real value of government's monetary liabilities which appears on the left-hand side of (27) is zero. However, whenever the sum $\frac{D}{P} + rb$ is positive there is a real deficit and the real value of government's monetary liabilities has to increase in order to finance this real deficit. It is instructive to compare this concept of the deficit to that which is implicit in the conventionally-defined deficit. The latter which is more nearly based on a cashflow concept of the deficit does not consider the depreciation, πb, of the real value of the debt as a source of income because no explicit cashflow is involved. As a result, the conventional definition of the deficit corresponds to equation (27) with πb transferred to the left-hand side as an item which is financing the deficit. Equations (28) reproduce both concepts of the deficit for comparison purposes

$$\text{Conventional deficit;} \quad \frac{D}{P} - n\, b = \dot{b} + \theta h + \pi b \qquad \text{(a)}$$

(28)

$$\text{Deficit on a real accrual basis;} \quad \frac{D}{P} + r\, b = \dot{b} + \theta h \qquad \text{(b)}$$

The implication of the conventional measure in (28 a) is that even if the total increase in the real value of governmental monetary liabilities is zero ($b + \theta h = 0$) there is a deficit whenever $\pi b > 0$. Clearly this does not make too much sense since stock-flow consistency requires that the real value of monetary liabilities of the government increase only if there is a real deficit. Equation (28 b) which defines the deficit as $D/P + rb$ assures that an increase in the real value of monetary liabilities of the government is a necessary and sufficient condition for the existence of a real deficit and is therefore stock-flow consistent. The deficit concept which appears in equation (28 b) measures the contribution of this period's deficit to both current inflation and crowding-out. This is so because this deficit can be either monetized by increasing the term θh or increasing crowding-out of private expenditure by increasing the real level of the national debt which in a stationary economy may cause a decrease in the capital stock and therefore in output per capita. As long as θh can be increased by an increase in the rate of growth of high-powered money, the right-hand side of (28 b) (whose size is determined by the deficit measured on an accrual basis) offers to the government a trade-off between inflating more today and inflating more in the future in order to alleviate the crowding-out which will be caused in the future by the current increase in the real value of the national debt (20). In this sense the deficit as defined in (28 b) is a measure of the marginal contribution of the current deficit to potential inflationary pressures where this last concept refers to both current and future inflation.

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(20) This point is made by Sargent and Wallace (1981) under the assumption that real money demand is insensitive to expected inflation and that there is an abslute upper bound on the amount of real government debt which the public is willing to absorb.

As shown by Cagan (1956) and Bailey (1956), at least in steady states, the range over which θh is an increasing function of θ is limited to relatively low values of θ. Beyond a certain rate of expansion of the monetary base θh actually decreases when θ increases. This range seems to be an inefficient one from the point of view of the tradeoffs which are discussed here since in this range the government can decrease both inflation and crowding-out by slowing down the rate of growth of high-powered money.

In order to evaluate the impact of the budget deficit on crowding-out of private investments and other expenditures, only the increase in the real value of the debt is relevant. The part of the deficit which is financed through an increase in high-powered money in the current period results in current crowding-out but does not cause future crowding-out of private expenditures. Hence the deficit concept which is relevant for evaluation of the impact of today's fiscal stance on future crowding-out is that part of the deficit which causes an increase in the real value of government debt. This leads to a third deficit concept which is

$$\frac{D}{P} + r b - \theta h = \dot{b} \qquad (28\,c)$$

i.e. the inflation adjusted budget deficit less the real increase in high-powered money.

To sum-up, the conventionally measured deficit is given by (28 a) and is reproduced here for convenience as

$$DF_1 = \frac{D}{P} + n b \qquad (29\,a)$$

In order to obtain the deficit concept that is relevant for potential inflationary pressures (current and future) the following adjusted deficit is appropriate

$$DF_2 \equiv DF_1 - \pi b \qquad (29\,b)$$

Finally, in order to evaluate the impact of fiscal policy on future crowding-out alone the concept

$$DF_3 \equiv DF_2 - \theta h = DF_1 - \pi b - \theta h = DF_1 - \pi b - \frac{\dot{H}}{P} \qquad (29c)$$

is appropriate(21). Empirical estimates of DF_2 and DF_3 and a comparison to the conventional measure, DF_1, for the 5 countries that entered the sample, appear in Section V.

b. Evaluation of the effects of the deficit using a three-assets steady-state growth model

The discussion up to now has examined the conceptual framework for analysing the impact of the budget deficit on inflation and private real expenditure in a non-growing economy. This part analyses more closely the circumstances under which crowding-out may occur in a growing economy. Let

$$Y = F(K, L) \qquad (30)$$

be a constant-returns-to-scale private aggregate production function which produces real output Y with real capital K and Labour L. L grows at an exogenously-given rate g. As in Brunner and Meltzer (1976) there are three assets: physical capital, K, government bonds, b, and money whose real value is denoted by m. The demand functions for those three assets are given respectively by

$$K^d = \Phi(r_k, r, r_m)\, Y \qquad (a)$$
$$b^d = \Psi(r_k, r, r_m)\, Y \qquad (b) \qquad (31)$$
$$m^d = \delta(r_k, r, r_m)\, Y \qquad (c)$$

(21) Note that DF_3 and the corrected deficit in equation (5) of Section II are identical when $\theta = \pi$. When $\theta \neq \pi$ DF_3 is the more appropriate concept because the real resources that government obtains by increasing H are equal to θh and not to πh.

where r_k, r and r_m are respectively the real rates of return on capital, government debt and money. It is assumed that all three assets are gross substitutes; that is the effect of an increase in the rate of return on asset j on the demand for asset i for $j \neq i$ is negative. The effect on demand for an asset of an increase in the asset's own rate of return is positive. Money supply is determined via a fixed multiplier on high-powered money (h) such that

$$m^s = a\,h \qquad , a > 0 \tag{32}$$

The real rate of return on capital is equal to the marginal productivity of capital which is given by

$$r_k = f_k(k) \,, \qquad k \equiv \frac{K}{L} \tag{33}$$

where

$$\frac{Y}{L} = f(k) \tag{34}$$

and f_k is the partial derivative of f with respect to k. The real rate of return on money is equal to the rate of inflation with negative sign:

$$r_m = -\pi \tag{35}$$

We ignore for simplicity all the problems of adjustment lags by assuming that assets markets are always in equilibrium and by focusing only on steady state growth. Assuming equilibrium between demand and supply and substituting (32), (33) and (35) into (31) we obtain

$$z_1 \equiv \frac{K}{Y} = \Phi(f_k(k), r, -\pi) \qquad \text{(a)}$$

$$z_2 \equiv \frac{b}{Y} = \Psi(f_k(k), r, -\pi) \qquad \text{(b)} \tag{36}$$

$$z_3 \equiv \frac{h}{Y} = \frac{1}{a}\,\delta(f_k(k), r, -\pi) \qquad \text{(c)}$$

z_1, z_2 and z_3 are respectively the steady state ratios of physical capital, bonds and high-powered money to output.

In steady state the ratio of the real quantity of each asset to output is constant. Hence according to (36 a) capital grows at the same rate as output. But since the production technology is of the constant returns to scale type, this implies that both output and capital grow at the rate of growth of labour (g). Since Y grows at rate g the fixity of z_2 and z_3 in steady state implies that b and h also grow at rate g. In particular since

$$g = \frac{\dot{h}}{h} = \frac{\dot{H}}{H} - \frac{\dot{P}}{P} \equiv \theta - \pi \qquad (37)$$

it follows that

$$\pi = \theta - g \qquad (38)$$

that is the steady state rate of inflation is equal to the rate of growth, θ, of the monetary base minus the rate of growth, g, of the real economy. Since g is exogenous (38) implies that the rate of growth of high-powered money determines the steady state rate of inflation. Using equation (28 b) the government budget constraint can be written

$$\dot{b} = \frac{D}{P} + r\,b - \theta\,h \qquad (39)$$

Since in steady state $\dot{b} = g\,b$ this budget constraint can be rewritten

$$\frac{D}{P} = (g - r)\,b + \theta\,h \qquad (39\,a)$$

Dividing both sides of (39 a) by Y (real output) we obtain

$$d \equiv \frac{D/P}{Y} = (g - r)\,z_2 + \theta\,z_3 \qquad (39\,b)$$

With constant return to scale k is uniquely determined by $z_1 \equiv K/Y$. Let

$$k = v(z_1)\ ; \qquad (40)$$

be the function that relates these two variables. Substituting (38) and (40) into (36) we obtain

$$z_1 = \Phi(f_k(v(z_1)), r, g - \theta) \qquad \text{(a)}$$

$$z_2 = \Psi(f_k(v(z_1)), r, g - \theta) \qquad \text{(b)} \qquad (41)$$

$$z_3 = \frac{1}{a}\delta(f_k(v(z_1)), r, g - \theta) \qquad \text{(c)}$$

Equations (41) together with equation (39 b) constitute a system of four equations which determine the four endogenous variables z_1, z_2, z_3, and r given the two policy variables θ and d. Thus the quantities of capital, government debt and real money balances in relation to output as well as the rate of interest on government debt are determined endogenously in accordance with the values of the government budget balance in real terms, excluding interest payments (d), and the rate of increase of real money balances (θ). Thus in this framework the value of θ and d determine the steady state levels of capital, government debt and money per unit of output as well as the real rate of interest on government debt. Given the ratio of capital per unit of output and the constant returns to scale technology, capital intensity and output per worker are determined as well. In particular, the higher the steady state ratio of capital to output, the higher the capital to labour ratio and the higher, therefore, output per worker (22). This suggests that in the steady state, the government is not free to pick d, θ and the relative size, z_2, of the government debt independently. Once d and θ are chosen, z_2, r and all the other macroeconomic variables are determined. Rearranging the government budget constraint (39 b) and using (38) gives

$$d + r z_2 = g(z_2 + z_3) + \pi z_2 \qquad (39\ c)$$

(22) This statement is proved formally in Part A of the appendix.

which says that the deficit which corresponds to the budget balance DF_2 as presented in part IIIa (equation 29 b), is financed by the seignorage on government debt and on high-powered money that arises because of the fact that the economy is growing (the term $g(z_2 + z_3)$) plus the inflation tax, πz_2, on government debt. Since the economy is growing, the government can continuously run a deficit even without inflation by financing it with continuous increases in governmental monetary liabilities that are just sufficient to maintain the ratios of both types of liabilities to output constant. It is worth noting that although $d + rz_2$ is the correct real measure of the deficit it is not, within the framework of this model, the most appropriate measure of the stance of fiscal policy. The reason is that r and z_2, both of which appear as part of this deficit concept, are both endogenous variables which are determined by the structure of the economy and the two policy variables d and θ. Hence in this case, the most direct measure of the stance of fiscal policy is d - the deficit per unit of output excluding real interest payments on the government debt (22 a). This illustrates the fact that the choice of the appropriate deficit concept depends on the model of the economy used to understand reality.

In order to evaluate the steady state effects of an increase in the government's relative deficit d, it is useful to perform a comparative (steady state) static experiment. That is, we increase the steady-state value of d and inquire what happens as a result of that to the steady-state values of the various assets as well as to the various flows. A key to understanding the effects of such an increase is the budget constraint as formulated in equation (39 b). A steady-state increase in d can be financed, for $g - r > o$ (23) either by an increase in the ratio z_2 of government debt to output or by an increase in z_3 - the ratio of real money balances to output. A third possibility is that r decreases. It is shown in part A of the appendix that z_3 and z_2 cannot both increase in steady state as a result of an increase in d.

(22a) McCallum (1982) shows, within a Sidrauski (1967) type model, that a permanent budget deficit can be maintained without inflation for the concept $d + rz_2$ but not for the concept d. Only positive values of $d + rz_2$ (but not of d) may be consistent with non-inflationary bond financing of deficits.

(23) This restriction means that the rate of growth of the economy is larger than the real rate of interest paid on government debt.

Furthermore if z_2 increases, then r must increase too as a result of an increase in d. Provided an increase in d raises the steady-state ratio of government debt to output, such an increase reduces the capital labour ratio and therefore output per capita. It also raises the rate of interest on government debt and reduces the ratio of real money balance to output causing a fall in the relative share of seignorage on the monetary base in the financing of the new higher relative deficit (24). Hence in this case an increase in government's deficit as measured by d crowds private capital formation out and decreases the long-run level of output per capita. This result rests on the implicit assumption that all the increase in d is used for current government consumption. If all of it is used for public capital formation, the final effect on output per capita depends on the relative productivity of public and private capitals (25).

c. Some implications of the view that government debt is not net wealth

Some economists, inter alia Barro (1974), take the Ricardian view that government debt does not represent net wealth to the public since it implies that future taxes will have to be levied on the public in order to repay this debt and to service the interest. As a result the present discounted value of the stream of payments due on government debt is exactly equal to the stream of future tax liabilities so that the two cancel out. This argument requires that there be no distribution effects and perfect capital markets. It is, thus, in a sense an extreme case. However since part, at least, of the national debt may be discounted as an asset because of the implied future tax liability it is instructive to consider the implications of the strict Ricardian view for the discussion of the budget deficit and its correction.

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(24) These results are established in part A of the Appendix. A necessary, but not sufficient, condition for these results is $g - r > 0$.

(25) For a more formal treatment of this problem see Buiter (1982) who implicitly assumes that private and public capitals are perfect substitutes in production.

It would seem at first sight that an implication of the Ricardian view is that, even if the real value of the national debt is eroded by inflation, it is not necessary to correct the conventionally measured deficit as suggested in the previous sections because inflation also erodes the future tax liability at the same time. However, if the budget deficit is to measure correctly today's excess of total government expenditures over total government income (including πB_g) the correction should be retained since future taxes do not constitute current tax income. Moreover, the correction embodied in the definition DF_2 of the corrected budget deficit is needed precisely in order to evaluate the marginal effect of today's budgetary deficit on future tax liabilities as far as repayment of the principal is concerned.

Within the strict Ricardian view, a bond-financed increase in government expenditures that is perceived to be permanent has different effects on the economy than if such an increase is perceived to be transitory. When the increase is permanent, individuals know that this increases their lifetime tax liabilities. They are, therefore, poorer and will consume less. In this case the increase in government consumption will be mostly matched by a decrease in private consumption without much change in investment and interest rates. By contrast, when the increase is transitory, people know that the increase in government debt does not represent a future tax liability since the current increase is just a deviation from a fixed level of government expenditures. In that case there is no wealth effect on consumption. The necessary decrease in consumption is achieved by a temporary increase in the real rate of interest which induces inter-temporal substitution of present for future consumption. This increase in the real rate also reduces investment expenditures. A permanent increase in government bond financed expenditures, thus, entails mainly a decline in consumption whereas a temporary increase also crowds out some investments.

Finally, note that in a growing economy in which the private demand for government debt is growing at the rate of growth of the economy (as discussed in part III b), the government can increase the real value of its debt at the rate of growth of the economy without implying in the process any new tax liability for the public.

IV. METHODOLOGY AND STATISTICAL PROBLEMS

The basic empirical objective of this report is to correct sectoral income flows for the measurement errors that are caused by the fact that the depreciation in the real value of monetary assets or liabilities is not taken into account in the computation of sectoral income flows in the National Accounts (NA) statistics (26). In order to implement such a correction it is necessary first to identify the monetary assets and liabilities of the various sectors on a basis which is consistent with the sectoral breakdown of the sectoral income flows from the NA as modified for the purpose of this study. Secondly a price index or price indices that are appropriate for the computation of the loss in the real value of monetary assets have to be identified. The correction of sectoral income flows can then be obtained by using the resulting rate or rates of inflation and the net sectoral stocks of monetary assets and liabilities in order to compute the resulting real monetary gains or losses of the various sectors. The corrected sectoral income flows can then be obtained by adding the monetary gains to the NA income of sectors with net negative monetary positions and by subtracting the monetary losses of sectors with net positive monetary positions from the income of such sectors as measured in the NA. The principle is simple and would seem, at first sight, to be straightforwardly applicable provided the statistical data is available. However the application of the general correction principle enunciated above to actual data raises a number of important questions and problems, some of which are conceptual and others which arise because of data limitations. At the conceptual level the following questions arise:

Should market or face values of monetary assets be used for the purpose of the correction?

What is the appropriate statistical definition of high-powered money (base money)?

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(26) This attempt parallels partial attempts to reconciliate traditional accounting principles with real value accounting in inflationary times at the individual firm's level. A short summary of the changes that have been proposed to restore some semblance of real accounting in the face of inflation in various countries appears in part B of the appendix.

What is the appropriate approach for consolidating the accounts of general government and the central bank?

These are important questions that require some discussion and clarification. Other problems arise because of data limitations. Two of the most important problems arise because of the discontinuous nature of the data and because of the fact that subdivisions of monetary assets or liabilities by currency of denomination within the different sectors do not exist. The purpose of the present section is to identify these problems and suggest conceptually acceptable ways for their solution. We also point out the solutions actually adopted in the empirical work whenever these, because of data limitations, differ from the solutions which are preferable from a conceptual point of view. In addition, the sectoral breakdown used, the nature of the available data and the type of assets used are also presented in this section.

a. The sectoral breakdown and the problem of stock-flow consistency

In principle the finer the sectoral breakdown the more information can be obtained on the redistributive effects of inflation across sectors. However, in practice the finest classification of financial assets which is broadly consistent with the income flows in the standardised NA makes it possible to distinguish 5 main sectors;

a) Households	- H
b) Non-financial enterprises	- E
c) Financial enterprises	- F
d) General government	- G
e) The rest of the world	- W

This sectoral breakdown is broadly adapted to the needs of large economic models in which disposable income of households (rather than of the whole of the private sector) is considered to be relevant for determining private consumption and household saving, while private capital formation is considered to take place mostly within the non-financial enterprise sector.

(6)

Given a full matrix of intersectoral monetary claims it is possible, in principle, to compute the inflation-induced intersectoral transfers due to the depreciation of monetary assets. The conceptual form of such a matrix appears below. Let NM_{ij} stand for the net monetary claims of sector i against sector j (i, j = H, E, F, G, W). When NM_{ij} is positive, sector i is a net lender in monetary assets to sector j and when NM_{ij} is negative, sector i is a net monetary borrower from sector j:

Net monetary positions by sectors

Lending sector \ Borrowing sector	H	E	F	G	W	Total net monetary lendings of sector
H	-	NM_{HE}	NM_{HF}	NM_{HG}	NM_{HW}	NM_{H}
E		-	NM_{EF}	NM_{EG}	NM_{EW}	NM_{E}
F			-	NM_{FG}	NM_{FW}	NM_{F}
G				-	NM_{GW}	NM_{G}
W					-	NM_{W}
Total net monetary borrowings of sector						0

The marginal column and row show the total net monetary asset ($NM_i > 0$) or liabilities ($NM_i < 0$) of sector i. Note that either the marginal column or the marginal row is sufficient to give all the information on the total net monetary position of each of the sectors. Similarly, the bottom part of the inner matrix is just a repetition of the top part (27) and has therefore not been filled in. In practice

(27) If gross values of assets and liabilities were entered, the full matrix would of course be required.

for most countries the inner part of the matrix is not available for the whole period. By contrast the marginal column on the total monetary position of each sector is available for each of the five countries on a yearly basis during the sample period. Fortunately, in order to correct the sectoral income flows, only the information on the total monetary position of each sector is needed (28).

The sectoral classification used by the producers of stock statistics is not always consistent with the classification needed for the purposes of this study nor is it always fully consistent with the sectoral classification used in the NA. The specific problems that arise are threefold:

1) In the statistics on the stocks of financial assets, as well as in the flow data in the national accounts, the central bank is usually classified together with financial institutions. As shown in Sections II and III, the increase in the monetary base is one of the ways through which government expenditure is financed. In addition, the behaviour of the central bank is nearer to that of a governmental policy making institution than it is to that of a private financial institution. We therefore aimed at reclassification of the central bank with the government sector (29). Because of problems of consistency between the items that appear in the accounts of the central bank and the items that appear in the stock accounts and in the NA, this reclassification involves a certain amount of qualified estimation.

(28) The individual country reports feature representative full matrices for selected years.

(29) This decision is probably more justifiable for countries in which the central bank decision-making process is strongly influenced by the other branches of government like the Treasury.

2) The classification of sectors in the NA is not always fully consistent with the classification of sectors used to generate the stocks of financial assets. In the standardised national accounts, economic units are classified according to the nature of their economic activity and not according to ownership. Public corporations producing for the market are therefore placed in the enterprise sector and not in the government sector. With respect to financing, however, the behaviour of public corporations may be substantially different from that of private corporations and some countries have therefore chosen to establish special accounts for the public corporations and to calculate a global financial balance for the whole public sector (the "public sector financial balance" or PSFB). Although for the purposes of analysis of financial balances, the PSFB would appear to be more appropriate than general government borrowing requirement, no attempt has been made to calculate PSFB for countries where this is not available from official sources. In the case of the UK, however, the official PSFB figures have been used.

3) The valuation procedures used for the stocks of financial assets reflect at times capital gains and losses as a result of adjustments in rates of exchange while the NA flows do not reflect such items. As a consequence, some discrepancies may arise between the flow of savings of a sector from the NA and the accumulation of assets as measured from the stock accounts.

The last two problems raise the possibility that the stock and NA flow statistics are not fully consistent. However the harmonised NA statistics elaborated by Eurostat make it possible to evaluate the size of the discrepancies between the stock and the flow figures. These accounts show how the net lending or borrowing flows of the main institutional sectors (classified by economic activity rather than by ownership) are reflected in changes in assets and liabilities. This makes it possible to evaluate the size of the bias created by stock-flow inconsistency.

b. Classification of assets and sources of data on assets and liabilities

The principal categories of assets and liabilities which are listed in the harmonised national account statistics of Eurostat are:

- Currency and transferable sight deposits
- Other deposits
- Insurance technical reserves
- Bills and short-term bonds
- Long-term bonds
- Shares and other equities
- Financial gold
- Net allocation of Special Drawing Rights
- Short-term loans
- Medium- and long-term loans
- Unidentified transactions.

Since the focus of our paper is on inflation-induced redistribution through monetary assets, only the assets or liabilities from the above list, which so qualify, should be included for the purpose of the correction. Hence the item "Shares and other equities" as well as "Financial gold" are excluded. The view taken is that the real value of these assets, like that of other real assets, is determined mostly by relative price variability unlike monetary assets whose real value is determined mostly by the general price level. Hence we pick from the above list only those assets which are immediately redeemable into currency units or which promise future nominal flows which are fixed in currency units (30).

While all the assets that appear in the list above can be straightforwardly classified, the treatment of "Insurance technical reserves" deserves special consideration.

(30) Hibbert (1981, 1982) takes a more comprehensive approach by including capital gains and losses caused by relative price changes as well as by inflation. As a consequence, his approach does not make it possible to distinguish distortions in measured sectoral income flows that are caused by relative price variation from those that are induced by general inflation. Note that the first kind of distortions are present even in the absence of inflation so the argument in favour of corrections of income flows for changes in relative prices applies in principle to periods of price stability as well.

The treatment of insurance technical reserves in national accounts is an aspect of a much larger problem of how to express pension (and certain life-insurance) entitlements in the national accounts. As pointed out in a comprehensive analysis of measurement problems with respect to the long-term trend in household savings by the OECD secretariat (31), the introduction of national pension schemes financed through taxes may result in a reduction in that part of private saving, which under the previous system was invested in financial assets with a view to income maintenance after retirement. In the income account of the household sector, transfers to the government will increase while financial saving may decline. The households' claim on a national pension scheme is, however, not recorded as an asset in the households' balance sheet so that a move to a national pension scheme will entail an apparent decline in the savings ratio of households and, in parallel, a slower growth of financial assets of the household sector.

In the case of private or semi-public pension funds (where the pension right is individualised) the premiums are, in the standardised national accounts, counted as household saving and not as current income transfers. The assets of these funds are therefore attributed to the households as "technical reserves".

Whether to classify those liabilities of the pension and insurance sector as monetary assets or not depends to a large extent on whether the assets of the insurance and pension industry are invested in monetary assets or not. In practice since the insurance and pension sector tends to invest a large fraction of its resources in monetary assets and since no breakdown of technical reserves into monetary and non-monetary items was available, the entire item "technical reserves" is counted as a monetary asset of the household sector (in the UK, pension funds and life insurance companies are included in the household sector to start with and the item therefore does not occur).

(31) "International differences and trend changes in saving ratios", Working Party N° 1 of the Economic Policy Committee CPE/WE (81) 9 28 September 1981.

In accordance with the definition of monetary assets as financial assets which have a fixed nominal value, it would be appropriate to exclude all categories of indexed financial claims. In practice, however, the case of index adjustments of financial claims is complicated for both conceptual and statistical reasons:

- the treatment of index adjustments in the national accounts statistics is not clearly determined; in particular it is not known to what extent such adjustments are counted as expenditure for the borrowers and income for the lenders;

- the stock data do not provide a breakdown of financial asset on index-adjusted and non-index-adjusted, nor, indeed, according to rules of indexation. It is thus, in practice, impossible to eliminate indexed financial claims from the analysis.

As it has been impossible to identify the cases of indexed bonds, the procedures followed may lead to adjustment for depreciation of indexed bonds even if the index-adjustments are not classified as expenditure for the borrowers and as income for the lenders in the conventional national accounts statistics. In cases where indexed bonds count for a relatively large part of the total this may be an important source of bias in the results.

Any attempt to correct the existing NA sectoral flows must be based on sectoral stock figures on monetary assets and liabilities which are consistent with the sectoral classification used in the NA. Within the Community, fairly comprehensive data on financial assets and liabilities broadly consistent with the flow accounts exist for Belgium, Germany, France, Italy and the United Kingdom. For the remaining Member States, data either do not exist at all or are not available in a form allowing a full and detailed study of assets and liabilities of the various sectors of the economy. The working group concentrated on the five countries for which comprehensive data on financial assets and liabilities were available. The situation in this respect can be summarised as follows:

Belgium: Annual end-year data on assets and liabilities of eleven institutional sectors have been published by the Banque nationale de Belgique (BNB) since 1957. In the basic data, bond holdings are given in face values, the enterprise and household sectors are not distinguished and the BNB is not classified as a subsector in the financial intermediaries total. Assets and liabilities in foreign currency are recorded in Belgian francs converted at current exchange rates and there is no breakdown of the data by currency of denomination.

Germany: The Deutsche Bundesbank has published data on financial assets and liabilities regularly since 1950. The sectoral breakdowns are broadly the same as in the national accounts statistics. The enterprise sector includes not only companies, but also individual entrepreneurs. The amount of bonds outstanding is recorded both at face value and at market value. Assets and liabilities in foreign currency are recorded in DM converted at current exchange rates and there is no indication of the amount of foreign-currency denominated assets (or of the distribution of claims by currency).

France: The Banque de France established in 1980, on an experimental basis, a comprehensive set of sectoral balance sheets for the years 1971, 1972 and 1976. The balance sheets are consistent with the sectoral breakdown and classification of transactions used in the national accounts. Bonds are counted at face value (redemption value) on the debit side but at market value on the credit side while, like in the case of Germany, assets and liabilities denominated in foreign currency are counted at their value in domestic currency converted at current market rates of exchange. In addition to the published data, the Banque de France, for the purpose of the Commission study on the basis of flow data, produced simplified balance sheets for the years 1973, 1974, 1975 and 1977, 1978, 1979 and 1980.

Italy: Estimates of financial assets and liabilities of the various institutional sectors have been published by the Banca d'Italia since 1964. The sectoral breakdown of assets and liabilities is not complete, leaving thus a set of statistical residuals in the national balance sheet. Bonds are counted at face value, both on the credit and on the debit size of the balance sheets. Monetary assets denominated in foreign exchange are converted into Lire at end-of-year rates of exchange. However, there is no breakdown of the data by currency of denomination.

United Kingdom: Data on financial assets and liabilities have been provided by the UK Central Statistical Office for the period 1966 to 1978. The sectoral breakdown and the classification of assets is consistent with the national accounts. All data are expressed at market values and foreign-currency denominated claims are converted into sterling at current market rates of exchange.

c. Should monetary assets be evaluated at market or at face value for the correction of income flows?

For monetary assets like currency or checking deposits, which are instantaneously redeemable into currency at zero cost, the loss in real purchasing-power as a result of inflation is simply equal to the rate of inflation multiplied by the face value of the asset. This is true for any monetary asset, one unit of which is instantaneously redeemable into one currency unit.

On the other hand, it is intuitively obvious that for monetary assets which can be transformed into money only at some cost, the inflation-induced real depreciation for the current period is smaller than the rate of inflation multiplied by the face value of the asset because the current currency value of the asset is smaller than its face value. This can be seen from a slightly different point of view by considering the case of a long-term bond which is traded on secondary markets. Suppose that at the end of period t, there are still k yearly cash-flows (including interest and principal) to be made on the bond, the first of which is payable at the end of period $t + 1$. Let those (nominal) cash-flows be denoted by C_1 , C_2 , ... C_k . Consider

(7)

now the purchasing-power loss suffered by a holder of the bond as a result of the inflation π_t, that occurs between the beginning and the end of period t. The cash flow C_1 which is fixed in currency units, sustains a loss which is equal to $\pi_t C_1$. However this is a loss on currency units accruing only one year ahead. Its present value is consequently smaller than $\pi_t C_1$ and is given by

$$\frac{\pi_t C_1}{1 + n_t} \quad (42)$$

where n_t is the market yield to maturity of the bond at the end of period t (32). Similarly, the loss in period t prices incurred on cash flow C_i as a result of inflation in period t is $\pi_t C_i$. The present value of this loss in period t prices is similarly

$$\frac{\pi_t C_i}{(1 + n_t)^i} \qquad i = 1, 2, \ldots, k \quad (43)$$

Note that, paradoxically, if the current nominal rate of interest is high because future expected inflation is high, the present value of the loss inflicted by current inflation is actually lower. On reflection this is not surprising. The loss $\pi_t C_i$ will occur in cash-flows terms only in i periods in the future. The higher the rate of inflation expected between the end of t and the end of t + i, the smaller the real value of C_i to start with and the smaller therefore the loss on it as a result of inflation in period t. The present value of the losses caused by inflation in period t on all the cash-flows of the bond is, using (43)

$$\pi_t \left[\frac{C_1}{1 + n_t} + \ldots + \frac{C_k}{(1 + n_t)^k} \right] \quad (44)$$

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(32) Since the loss $\pi_t C_1$ is associated with the cash-flows of this particular bond, it is natural to discount it by using the yield demanded by the market for this bond. A similar argument holds for the later cash-flows as well.

Let the market price of the bond at the end of period t be P_t. Then from the definition of the yield to maturity

$$P_t = \frac{C_1}{1+n_t} + \ldots + \frac{C_k}{(1+n_t)^k} \qquad (45)$$

Substituting (45) into (44) we obtain that the present value of the losses on all cash-flows of the bond as a result of inflation in period t is given by

$$\pi_t P_t \qquad (46)$$

In other words, the loss in present value terms in the purchasing-power of the bond should be calculated as the rate of inflation during period t multiplied by the market value of the bond at the end of period t. Thus the loss in the purchasing-power of all monetary assets that have market values which are different from their respective face values, should be calculated as the rate of inflation during the period multiplied by the market value of the monetary assets at the end of the period. For monetary assets like term deposits which are redeemable only in some future period, but which are not traded on secondary markets and have no market value, the principle is similar. Since the loss occurs only in the future, upon redemption, it should be discounted to the present using the rate of discount that is most appropriate for discounting the cash-flows of the monetary asset under consideration. More generally, two groups of monetary assets for the purpose of computing the inflation-correction should be distinguished: one group which includes all monetary assets which are already in current currency units or which are instantaneously convertible at zero costs into current currency units is referred to as Fully Liquid Monetary Assets (FLMA) or Liabilities (FLML). A second group which can be converted instantaneously into current currency units only by incurring some cost is referred to as Lesser Liquid Monetary Assets (LLMA) or Liabilities (LLML) (32a). The discussion above suggests that for the first group, the rate of inflation should be applied to face values and for the second group it should be applied to the net currency value that is effectively realisable. For assets with market values,

(32a) Note that, although there is some overlap, FLMA and high-powered money, H, are not identical. For example, demand deposits of the public with private banks are FLMA but are not part of H. Conversely, not all components of H are FLMA. See end of subsection e below for an example.

these can be used as proxies for the net realisable currency value. For other assets in the second group, an imputed market value should be used as the base for the calculation of the inflation induced depreciation.

Given that data on the maturity structure of lesser liquid monetary assets, for which a market price does not exist, is not available in the official statistics it is, however, difficult to determine the appropriate imputed market value for this extremely heterogeneous class of monetary assets (covering inter alia term deposits, ordinary bank credits, mortgage credits and many loans granted in the international capital market). In practice the calculation has therefore been performed on the face value of such assets. Under normal circumstances the redistribution figures may not be seriously affected by this procedure. However, during periods of drastic changes in interest rates, such as in 1981-82, the discrepancies between the face value and the (implicit) market value of non-marketable assets may be more substantial.

In addition, an official definition of base money (whether interest bearing or not) was used in practice. The value of B_g was then computed as a residual by subtracting the base money figure from total monetary liabilities of the combined government sector. Thus, although attractive, the procedures outlined in this subsection were not implemented due to data limitations.

d. Problems arising from the discontinuity of the data and their resolution

The data on stocks of monetary assets in all 5 countries are yearly and refer to the stocks outstanding at the end of each year. Most of the detailed sectoral flow data from the national accounts are also yearly. Therefore the corrections of income flows are also made on a yearly basis. Since prices are changing continuously through the year, it is important to ascertain that both the correction and the yearly income flows are measured at the same prices. It is shown in part C of the appendix that the corrected income flows on a full year's basis can be obtained by adding or subtracting to the sectoral income flows in current prices over the entire year (from the NA) an expression

that is equal to the rate of inflation from the beginning to the end of the year multiplied by the market value of monetary assets at the beginning of the year (for FLMA the market value is equal to the face value and for LLMA it is the actual market value or a suitably-estimated market value depending on whether market values exist or not). The resulting expression is equal to corrected income measured in terms of the average price level of the year. The intuitive reason for this result is that the yearly income flows from the NA are really sums of successive nominal income flows each of which is evaluated at the price level of a different small lapse of time. Similarly, the correction as defined above is the sum of the compensations needed to offset the inflation induced depreciations on MA during each small lapse of time cumulated over the year. Both sums are therefore measured at the same average yearly price level.

Another problem arises because of the fact that the market value of MA changes during the year (33). To account for this fact, at least crudely, the averages of beginning and end-of-year market values or total monetary assets are used instead of the beginning-of-year market values only.

e. Some special measurement and conceptual problems of the government sector

Since we consider the government sector inclusive of the central bank, yearly income and expenditure flows of the central bank should in principle be added respectively to the income and expenditure flows of the government as measured in the NA. In other words D in equation (23) should reflect the combined flow deficit of the central government and the central bank before interest payments.

(33) This occurs either because the total quantity of MA changes in face value units or because the market value of a given quantity of MA changes or because of the accumulation of real interest payments during the year.

A similar principle applies to the interest payment nB_g of that equation. They should reflect the combined net interest payments of the government including the central bank. As a result, interest payments by the Treasury to the central bank drop out at least in principle.

The net monetary liabilities of the combined government sector are broken down into high-powered money, H, and into all other monetary liabilities. This is done for two reasons. First because the government can collect seignorage from the public by increasing the total quantity of high-powered money. Second because H is the prime determinant of the quantity of money which in turn is a major determinant of the price level and inflation. The remaining net monetary liabilities, which are not part of H are divided as for all other sectors into FLML and LLML and should, in principle, be treated according to the principles described in subsection c above. However, the gains to the government from issuing new high-powered money are not necessarily equal to the rate of inflation multiplied by the existing stock of high-powered money. As can be seen from equation (24), the amount of real resources that the government sector manages to extract from the economy by increasing H is

$$\frac{\dot{H}}{P} = \frac{\dot{H}}{H}\,\frac{H}{P} \equiv \theta h \qquad (47)$$

where θ is the rate of growth of H and h is the outstanding real value of high-powered money. The inflation tax on high-powered money is πh, and as can be seen by comparing it with the right-hand side of (47) it is different from θh unless $\pi = \theta$. In general, the rate of inflation π may differ from the rate of base money growth because of growth of real output (see Section III-b) or because of institutional changes which change the real demand for high-powered money (34).

(34) For example when the central bank increases the required reserve ratio, this increases the demand for high-powered money by the private banking system.

On the other hand, in line with the discussion of the previous subsections, the loss to the public (35) on its holdings of high-powered money is equal to πh. Thus it would seem that the loss to the public is not equal to the gain θh to the government. This apparent puzzle is resolved by noting that the total seignorage gain to the government is composed of the inflation tax on high-powered money plus (minus) the increase (decrease) in desired real money balances. When real desired high-powered money balances increase, government can extract real resources in excess of the inflation tax since the public is willing to give up resources not only in order to maintain h but also in order to increase it in real terms. This argument stated formally means that

$$\theta h = \pi h + \dot{h} \tag{48}$$

where $\dot{h}$ is the desired increase in real high-powered money balances by the public. Equation (48) can be verified formally by looking at the equilibrium condition in the high-powered money market

$$\frac{H}{P} = h\,(.) \tag{49}$$

where h (.) is the demand function for real base money balances. Differentiating (49) logarithmically with respect to time gives

$$\frac{\dot{H}}{H} = \pi + \frac{\dot{h}}{h} \tag{50}$$

Multiplying (50) by $\frac{H}{P}$ we get

$$\theta h = \frac{\dot{H}}{P} = \frac{H}{P}\left(\pi + \frac{\dot{h}}{h}\right) = \pi h + \dot{h} \tag{51}$$

which yields equation (48).

(35) Assuming for the time that there is no difference between the face value of H and its instantaneously-realisable currency value.

As a first approximation the inflation induced loss to the public on its base money balances is πh. The gain to the government differs by the term $\dot{h}$ which reflects mostly non-inflationary seignorage opportunities to the government (36). At the conceptual level the two components of θh are somewhat different since $\dot{h}$ is not directly related to inflation while πh is.

Before concluding this subsection a remark about private bank reserves which constitute a component of H is in order. Very often the instantaneously realisable currency value of these reserves to the bank is smaller than their face value because of fines and the like on reserve deficiencies. The principles discussed in subsection c above suggest that in such a case the stock of bank reserves should, for the purpose of the inflation correction, be evaluated at an appropriate fraction of the face value of those reserves and the inflation tax should be correspondingly lower. This should not be surprising since if the central bank, by imposing various regulations on private banks, decreases the currently realisable value of their reserves, it thereby creates a loss to banks and a gain to the government sector that is unrelated to inflation. The inflation-related gain to government and loss to private banks applies only to the net cash value that the banks can realise immediately if they try to liquidate their reserves.

Due to data limitations the conceptually-attractive procedures outlined in this subsection were not implemented in the empirical work.

f. The choice of price deflators

In line with the general approach of this study which focuses only on changes in the real value of MA that are caused by changes in the general level of prices, only one deflator is used for all sectors and all assets. An additional advantage of using only one deflator is that inflation induced losses and gains across sectors sum up to zero, so that it is possible to evaluate the redistributive effects of general inflation within a consistent framework.

(36) For example in the model of section III b this term is equal to $g\,h\,Y$ and is entirely induced by the real growth of the economy independently of whether there is or there is no inflation.

The choice of index depends on the real basket of goods in terms of which it is desired to measure the depreciation in the real value of monetary assets. Since this depreciation is then added to or subtracted from the sectoral income flows, it might be considered appropriate to use the price indices for the expenditures of each sector. However this approach is obviously not consistent with the requirement that only one price index be used. We therefore chose to measure the loss in the purchasing power of monetary assets in terms of a general basket of consumer goods. There are basically two candidates: the implicit price deflator of consumption expenditures from the national accounts and the Consumer Price Index (CPI). The CPI was chosen to a large extent because it is available on a monthly basis while the deflator of consumption expenditures is not. In Belgium the longer-term movements of the two indices have shown large systematic differences (due to a different coverage or to the fact that the consumer price index is calculated according to the Laspeyre formula while the deflator is a Paasche index). In order to ensure longer-term consistency with the movements in the deflator for this country, the December-to-December changes in the CPI were adjusted corresponding to the size of the average annual difference between the two price indicators.

g. Foreign currency denominated assets

We saw above that for MA which are denominated in local currency the yearly change in the real value of those assets is

$$\pi B \qquad (52)$$

where π is the rate of inflation from the beginning to the end of the year and B is the adjusted (according to the principle of subsection c and d above) value of MA at the beginning of the year. However when MA are denominated in foreign exchange the real value of those assets in terms of the local consumption basket changes also as a result of changes in the exchange rate. Let E be the rate of exchange (measured as the number of local currency units for one unit of the foreign currency) and let e be the proportional rate of change in E from the

beginning to the end of the year. Let B_f be the appropriately adjusted value of MA which are denominated in foreign exchange in terms of local currency at the beginning of the year. Then the decrease in the real value of those assets that is caused by both inflation and changes in the exchange rate is given by

$$(\pi - e) B_f \qquad (53)$$

In the available statistical data the value of monetary assets denominated in foreign currency has been converted into local currency units. However, due to lack of data on the distribution of MA by currency of denomination, it was not possible to apply the correction in equation (53) when necessary, and the change in the real value of all MA was computed by using equation (52) (37). The resulting biases are probably not too serious for two reasons; first, the bulk of MA in all countries is in local currency. Second, as shown in Cukierman/Lennan/Papadia (1982) for interest-bearing assets, the size of the bias is directly related to deviations from purchasing-power parity, interest-rate parity and equality of the zero inflation real rates across countries. When these three conditions are all satisfied, the bias involved in applying equation (52) instead of (53) to MA that are denominated in foreign exchange disappears.

h. Inflation induced depreciation of foreign debt

As indicated briefly in Section II.e the conceptual framework for inflation-correction is also applicable to the current account of the balance of payments. As this is an issue of some importance for some countries, either as lenders or as borrowers, it may be useful to analyse somewhat further the implications of the corrections for the balance of payments.

(37) Taylor and Threadgold (1979) using internal data of the Bank of England for the UK do manage to apply different correction factors to assets that are denominated in foreign exchange.

Assuming, as will be the case for most - but not all - countries, that foreign debt is denominated in foreign currency, the inflation-adjusted current external account can be estimated by the following expression (combining the conceptual framework presented in section II and equation (53))

$$CA' = X - M - (n - (\pi - e)) B_f = CA + (\pi - e) B_f \qquad (54)$$

where CA and CA' are, respectively, the conventionally measured and the inflation-adjusted current external deficit, X exports of goods and services, M imports of goods and services and B_f net monetary liabilities to foreigners, all in local currency terms; n is the nominal rate of interest on foreign debt and π the domestic rate of inflation.

If the exchange rate is determined by a simple purchasing-power rule, the application of the rule of equation (54) is simply equivalent to estimating the depreciation of the foreign debt by using the foreign rate of inflation.

It should be noted in this context that some analysts have produced estimates of the real value of the external debt of the less developed countries by using, instead of the domestic rate of inflation as adjusted by the change in the exchange rate, the price deflator for the exports of these countries. Using the export price index is equivalent to measuring the real resources released by the decline in the real value of the foreign debt in terms of one type of goods only. As already pointed out in the discussion of the choice of price indicators above, the corrections undertaken in the present work only include the measurement errors due to general inflation and not the gains attributable to changes in relative prices. Terms-of-trade changes being one of the most universal examples of relative price changes, the general domestic price index (which also includes imported goods and non tradeables) appears to be the most appropriate deflator for external debt (see also Long and Veneroso, 1980).

V. FINDINGS

a. Sectoral structure and evolution of net monetary assets

A main finding of the study is that the net monetary assets of the various sectors in proportion to gross domestic product may show both striking differences from one country to another and large changes over time. As shown in Table 4 (which gives the values for the first and the last year of observation as well as for 1970 for each country) net monetary assets of households may be as high as a year's GDP like in Belgium in 1961 and 1979 or may be as low as 40% of GDP as in Germany in 1960 or in France in 1980. Changes may be of large proportions. Large declines in net financial assets of households were seen in the United Kingdom from 1966 to 1978 while a fast building-up of financial assets by households took place in Germany over the whole 1960 to 1980 period and in Italy from 1965 to 1970.

The financial indebtedness of non-financial enterprises show differences between countries which are almost as large as for households with figures ranging from only 13,8% of GDP in the UK in 1978 (38) to as much as 73,2% of GDP in Germany in 1980. A large increase in the indebtedness of enterprises took place also in Belgium: from only 15,3% of GDP in 1961 this measure reached 35,0% of GDP in 1979.

The net financial assets of the financial institutions are generally low in proportion to GDP. This reflects their natural tendency to hedge their position in monetary assets. Yet striking changes also occurred in this item with a large increase in Italy in the 1970 - 1979 period and a marked decline in the United Kingdom. The major counterpart of swings in the financial position of the household sector is found in the development of public debt with large increases in public debt in Germany and Italy. In the United Kingdom the fall in the net position of households was closely matched by a decline in public debt between 1966 and 1978.

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(38) Note, however, that in the UK figures public corporations are included in the public sector.

Table 4 : The sectoral breakdown of net monetary assets (a)
% of GDP

Mid-year figures, % of GDP

	Households	Non-financial prises	Financial insti- (b)	General government (c)	Rest of the world (d)	Statistical discrepancy
Belgium						
1961	92,2	-15,3	2,6	-84,4	0,8	4,2
1970	84,7	-24,6	3,9	-66,0	-0,7	2,7
1979	91,7	-35,0	4,8	-65,6	2,3	1,8
change 1970-1979	+7,0	-10,4	+0,9	+0,4	+3,0	-0,9
Germany						
1960	39,5	-47,1	1,9	10,4	-4,7	-
1970	63,4	-66,9	3,2	5,8	-5,6	-
1980	86,0	-73,2	3,2	-14,0	-2,4	-
change 1970-1980	+22,6	-6,3	0,0	-19,8	+3,2	-
France						
1971	43,1	-33,8	0,2	-7,4	-2,1	-
1980	41,6	-32,6	1,5	-8,7	-1,7	-
change 1971-1980	-1,5	+1,2	+1,3	-1,3	+0,4	-
Italy						
1965	60,3	-25,4	0,9	-31,5	-6,3	-2,0
1970	73,7	-32,4	0,4	-35,0	-11,3	-4,6
1980	74,9	-25,2	5,5	-57,4	-2,9	-5,1
change 1971-1980	+1,2	+7,2	+5,1	-22,4	+8,4	-0,5
United Kingdom (e)						
1966	84,4	-15,0	4,4	-86,5	11,7	-
1970	74,6	-19,2	2,1	-66,4	9,0	-
1978	54,4	-13,6	-0,5	-44,7	4,5	-
change 1970-1978	-20,2	+5,6	-2,6	+21,7	-4,5	-

(a) A plus means the sector has a net positive in monetary assets and a minus that it has a net negative position in monetary assets.
(b) Excluding the Central Bank.
(c) Including the Central Bank.
(d) (+) = net claims of the rest-of-the-world.
(e) Public corporations are included in general government.

b. The depreciation in the value of monetary assets (DVMA) by sectors and countries in the seventies - an overall view

The DVMA in percentages of GDP for the various sectors and countries is presented in Table 5. As explained in the previous section, the DVMA is calculated by multiplying the rate of inflation in the course of the year with the adjusted average amount of MA of the sector during the year (average of end-year values).

As should be clear from the discussion of Section II, the major interest in the DVMA derives from the fact that it represents the amount to be added to the NA income of the borrowers and subtracted from the NA income of the lenders, to yield the inflation-corrected sectoral income flows. Thus the sectoral DVMA's main importance is in its function as a correction factor that is applied to the sectoral income flows. It is tempting to interpret this correction as gains and losses of the sectors that are involved. However, the sectoral DVMA's do not really provide a full picture of inflation-induced redistributions across sectors since nominal rates may have adjusted partially or fully in order to compensate lenders for the inflation-induced losses on their MA. They are, however, equal to the inflation-induced redistributions across sectors in the case in which nominal rates of interest do not adjust to inflation at all. The average (over the seventies) sectoral DVMA as a fraction of GDP in Table 5 show, not surprisingly, "gains" to government and enterprises and "losses" to households (39). Financial institutions also show a small "loss" on average but it is insignificant in comparison to that of the household sector. This reflects their tendency not to take net positions in monetary assets or liabilities since they derive most of their income from the spread between the returns on assets and on liabilities.

(39) "Losses" and "gains" are put in quotation marks in order to remind the reader that the numbers in the Table do not provide a full picture of inflation-induced redistribution. An attempt to take movements in nominal interest rates into consideration appears in Cukierman, Lennan and Papadia (1983).

Table 5 : Depreciation of monetary assets by sector, average 1971-1980, % of GDP (a)

	Belgium 1971-79	Germany 1971-80	France 1971-80	Italy 1979-80	United-Kingdom 1971-78
Households	-6,0	-3,8	-4,3	-11,4	-7,6(f)
Non-financial enterprises	1,9	3,6	3,5	4,8	2,4(b)
Financial institutions(d)	-0,3	0,0	0,0	-0,6	0,0
General government(e)	4,3	-0,2	0,7	7,2	6,2(c)
Rest of the world	0,2	0,4	0,1	0,4	-1,0
Statistical discrepancy	-0,1	-	-	-0,5	-

(a) Depreciation of net assets are entered with a negative sign, depreciation of net liabilities are entered with a positive sign.
(b) Excludes public corporations.
(c) Includes public corporations.
(d) Excluding the Central Bank.
(e) Including the Central Bank
(f) Including pension funds and life insurance companies.

It appears from the table that the size of the downward correction that has to be made in household income in Italy is on average 11,4 percent of GDP while somewhat lower figures are estimated for Belgium and the United Kingdom. Despite the low rate of inflation in Germany, the purchasing power "losses" for the households were (at 3,8%) almost as large as in France - a feature explained by the much higher level of financial assets in the household sector in the former country.

It is striking, however, that both in Germany and France the main counterpart of the "purchasing power loss" for the households is found in the form of a "gain" for the non-financial enterprises. It should be recalled in this respect that the enterprise sector in these countries includes a large number of public and semi-public enterprises which may have financed their investments through the issuing of loans in the market. By contrast, in the case of the United Kingdom, the public corporations are included in the general government - tending thus to reduce the amount of indebtedness of the enterprise sector and to boost government debt (and thus purchasing power gains) as compared with the other countries. The very high figure for the purchasing power gains of general government in the UK in Table 5 (6,2% of GDP) should be interpreted in the light of these comments. On the other hand, the enterprise sector in the other countries includes a very large number of public corporations. Had public corporation in Belgium, Germany, France and Italy been treated as in the case of the UK, the "gains" of government would be higher and those of corporations correspondingly lower in these four countries.

c. The government sector

The year-by-year changes in the value of net governmental monetary liabilities in percentages of GDP for the various countries appear in Table 6. The table shows that with the acceleration of inflation since 1969 and a fast rise in government debt in some countries like Italy, the annual depreciation in the value of monetary liabilities (DVML) of government reached spectacular levels at times. While the depreciation in the value of public monetary liabilities in Italy during the mid-sixties (with a rate of inflation around 3-4% or

Table 6 : The depreciation of general government (a) monetary liabilities (gains (+) or losses (-) as % of GDP)

	Belgium	Germany (b)		France	Italy	United-Kingdom (c)
1960	-	-0,1		-	-	-
1961	2,3	-0,4		-	-	-
1962	0,8	-0,5		-	-	-
1963	6,0	-0,5		-	-	-
1964	3,2	-0,3		-	-	-
1965	3,6	-0,5		-	1,0	-
1966	2,4	-0,3		-	0,8	-
1967	2,2	-0,1		-	1,0	2,3
1968	2,2	-0,2		-	0,3	4,8
1969	2,4	-0,2		-	1,5	3,7
1970	2,0	-0,3		-	1,9	5,0
1971	3,3	-0,4	(-0,2)	0,7	1,8	4,9
1972	4,2	-0,4	(-0,1)	0,7	3,1	4,1
1973	3,8	-0,5	(-0,1)	0,8	5,3	5,0
1974	8,9	-0,3	(0,0)	1,3	10,1	9,3
1975	6,2	-0,1	(0,2)	1,0	5,1	10,3
1976	3,7	0,1	(0,3)	1,1	10,6	6,3
1977	3,7	0,2	(0,3)	1,0	6,6	5,4
1978	2,3	0,2	(0,3)	1,1	6,6	4,1
1979	2,6	0,5	(0,7)	1,4	10,9	-
1980	-	0,7	(0,8)	1,5	12,2	-

(a) Including Central Bank.
(b) 1960-1970 (included): excluding the central bank; figures in paranthesis 1971-1980: including the central bank.
(c) Including public corporations.

less and a government debt below 35% of GDP) amounted to less than 1% of GDP, the combined increase of tne two elements entailed an explosion of the DVML to levels as high as about 10% of GDP in 1974, 1976, 1979 and 1980. In fact, in 1979, the decline in the real value of public debt in Italy was as instrumental as the total amount of indirect taxes in checking the rise in public debt.

In the United Kingdom the public debt was on a high level in the late sixties. Despite the relatively low rate of inflation the total purchasing power loss on public debt was therefore relatively large (3 - 5% of GDP). A very steep increase was seen in 1974 and 1975 followed by a decline as inflation decelerated and as the public debt was brought down. Developments in Belgium to some extent followed the same pattern although the fall in the depreciation of public debt in the late seventies was a result rather of a slowdown of inflation than of a fall in public debt in proportion to GDP.

In France and Germany, with relatively smaller public debts, the impact of a fluctuating inflation rate on the depreciation of governmental monetary liabilities is less dramatic. The German government, which had a small net positive position in MA throughout the period from 1960 to the mid-seventies, suffered a small depreciation in the value of those assets. The difference in the net monetary positions of government between Germany on the one hand and countries like Italy and the UK on the other may be instrumental in explaining why the first country maintained a comparatively lower rate of inflation throughout the sixties and the seventies. Provided nominal rates of interest do not adjust immediately to increased inflation, the German government loses resources as a result of increased inflation whereas the Italian and British government gain resources. This difference between the impact of inflation on the size and direction of the inflation-induced redistribution between government and the public may be a factor contributing to the traditionally strong anti-inflationary policy of the German government.

As shown in section II, the conventionally measured budget deficit does not yield a reliable measure of the impact of fiscal policy on the economy. The further analysis of the budget deficit concepts in section III, however, shows that the simple adjustment for inflation-induced depreciation of monetary assets presented in Section II, while allowing for a calculation of gains and losses of the various sectors, is not entirely appropriate for the analysis of such problems as potential inflationary pressure or potential crowding out. Section III therefore introduced two additional budget balance concepts:

DF2 - defined as the conventionally measured budget balance as adjusted for depreciation of the government's net position in monetary assets or liabilities - excluding the monetary base.

DF3 - defined as DF2, less the actual change in the monetary base.

DF2 can be interpreted as an indicator of the net impact of the government budget on potential inflationary pressures. DF3 for its part can be interpreted as an indicator of real crowding out in the sense that the deficit on the DF3 definition is an indication of the increase in real net claims on private sector saving. (Whether crowding-out actually occurs can only be determined on the basis of wider criteria including estimates of the capacity effects of public expenditure, see section III, part b).

An example of calculation of the various deficit concepts on average over the 'seventies is presented in Table 7, which gives as memo items also the main components of these estimates. Clearly the most striking feature of Table 7 is the fact that the differences between Member States with respect to the various adjusted budget deficits is considerably narrower than for the unadjusted budget balance given in line 1. While for the unadjusted deficit the range is 7.9 points (between Italy and France),

the range for the deficit concept showing potential inflationary pressure (DF2) is 5.2 points (between -3,4% for Italy and +1,8% for the UK), while for the deficit concept showing potential crowding-out, the range is 3.9 points (between a deficit of 1,6% in Germany and a surplus of 2,3% in the UK).

A further analysis of the differences between the various budget deficit concepts for the individual countries shows that the expansion of the monetary base in some cases is larger than the depreciation of the real value of the monetary base. This is the case in Germany and Italy. In Belgium and the United Kingdom, on the other hand, the expansion of the monetary base was marginally lower than the depreciation of the monetary base. Measured in proportion to GDP, the expansion of the monetary base was by far the largest in Italy.

The general picture that emerges is that relatively-high inflation countries like Italy and the UK with large budget deficits as measured by the conventional measure DF_1 (in the period covered by the analysis) manage to show, at times, a budget surplus when their fiscal stance is evaluated by using the corrected deficit measures, DF_1, DF_2 or DF_3 (39 a). Although only an accounting correction is involved in those corrections, the policy conclusions that are reached on the basis of DF_1, may differ widely from those that are reached on the basis of a corrected measure like DF_2. A case in point is the argument that arose between Sargent (1981) and Miller (1982) regarding the fiscal stance in the UK in most recent years. Sargent, looking at the DF_1 figures which indicate the existence of a deficit, concludes that the Thatcher government has a problem of credibility with its announced anti-inflation policy since it was running a deficit. He therefore attributed the poor performance of the British economy to high inflationary expectations. The policy implication - as seen by Sargent - is that the real economy will rebound when credibility is restored by increasing taxes and (or) cutting government expenditure. Miller, by contrast, looking at inflation-corrected figures, observed a surplus and concluded that the reason for the poor performance of the UK economy is insufficient aggregate demand. The policy implication - as seen by Miller - is that government spending should be increased and

(39 a) This result is particularly striking for the UK in which a persistent budget deficit turns after correction into a persistent budget surplus after correction. This is consistent with results obtained for the UK by Darby and Lothian (1982) and Buiter (1982).

Table 7

Government budget balance according to different concepts

	Belgium	Germany	France	Italy	United Kingdom
	1970-79	1971-80	1971-80	1971-80	1969-78
			% of GDP		
General government net lending					
1. Unadjusted (DF1)	-5,1	-2,2	-0,2	-8,1	-3,3
2. DF2 : Adjusted for inflation-induced depreciation of interest-bearing assets	-1,9	-2,3	0,0	-3,4	1,8
3. DF3 : DF2 less the change in the monetary base	-1,0	-1,6	0,8	-0,5	2,3
Memo items :					
4. Depreciation of net monetary debt,	4,0	0,2	1,0	6,9	5,8
of which: high-powered money	0,9	0,4	0,8	2,2	0,7
other monetary debt	3,2	-0,2	0,2	4,7	5,1
5. Change in monetary base (a)	0,9	0,7	0,8	2,9	0,5

(a) Change in currency in circulation plus bank reserves with the Central Bank

(or) taxes decreased. This controversy illustrates the vital importance of looking at the appropriate measure of the budgetary deficit. This controversy indeed raises the possibility that a credibility problem may arise not because there is a real budget deficit, but rather because the public interprets the budgetary figures during inflationary times in a wrong way. This may be yet another example of money illusion.

The figures in Table 7 also show that the uncorrected budget deficit (DF1) may give a dangerously biased indication of the "margin of manoeuvre in fiscal policy" to use a key phrase in the discussion regarding the concerted stimulus to activity undertaken by some OECD countries in 1978. On the basis of the DF1 figures - showing a deficit of 2,5% of GDP - Germany was generally assumed to have a considerable margin of manoeuvre as compared to the United Kingdom (4,1%) and Italy (9,6%). Measured on the basis of DF2 (which may be the most appropriate indicator for the overall stance of fiscal policy) the German deficit in 1978 was (at 2,4%) much larger than the budget deficit of the United Kingdom (1,4%). Even on the DF2 definition the Italian deficit looked relatively high but much less so than on the DF1 definition (See also Table 8 and Graph 1 which give full times series for the budget balance according to the three definitions).

Table 8

Development of the general governement budget balance — % of GDP

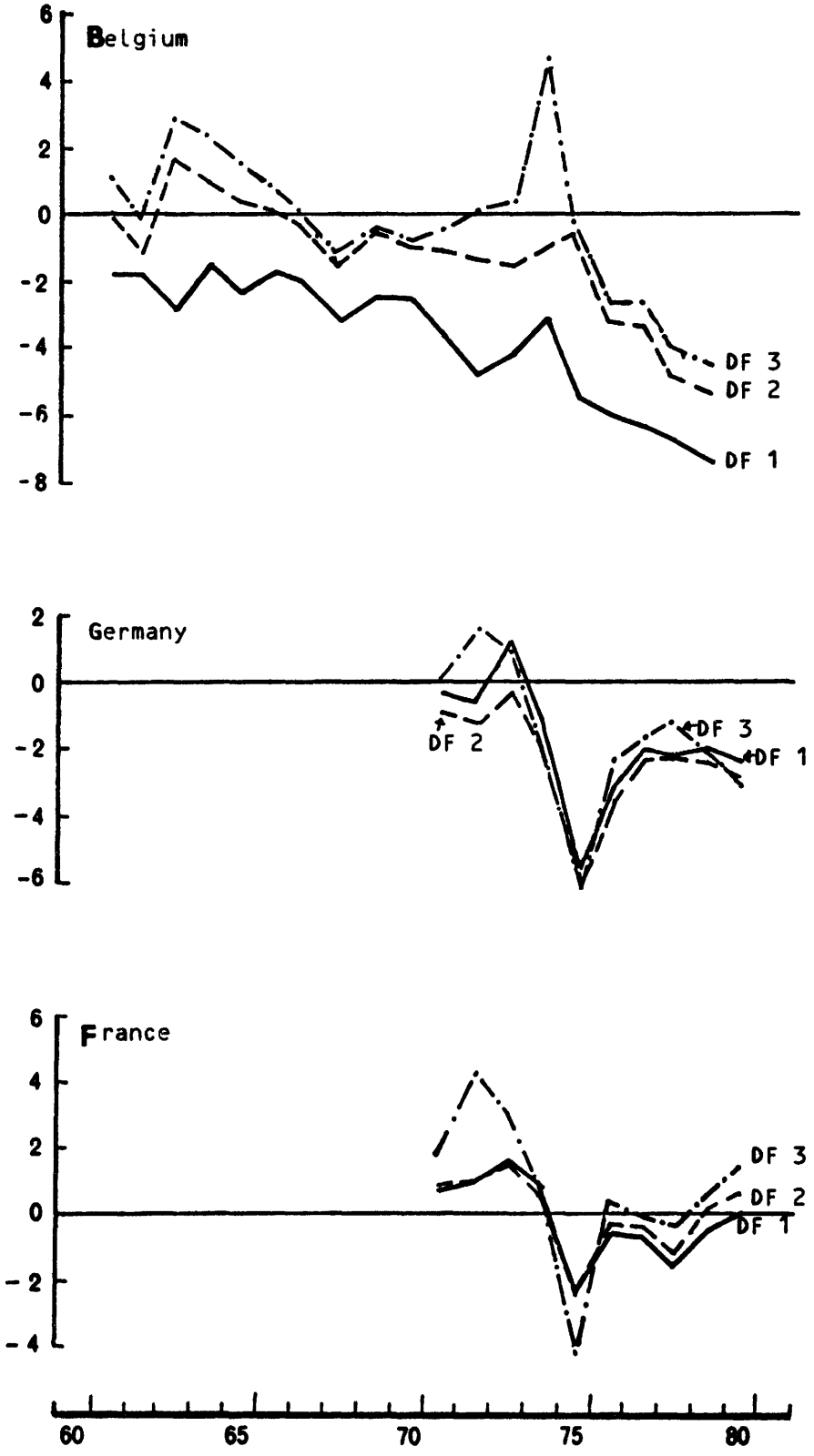
	Belgium			Germany			France			Italy			United-Kingdom		
	DF1	DF2	DF3	DF1	DF2	DF3	DF1	DF2	DF3	DF1	DF2	DF3	DF1	DF2	DF3
1961	-1,8	-0,1	1,1	-	-	-	-	-	-	-	-	-	-	-	-
62	-1,8	-1,2	0,0	-	-	-	-	-	-	-	-	-	-	-	-
63	-2,8	1,7	2,9	-	-	-	-	-	-	-	-	-	-	-	-
64	-1,5	0,9	2,4	-	-	-	-	-	-	-	-	-	-	-	-
1965	-2,3	0,4	1,5	-	-	-	-	-	-	-3,7	-3,1	-	-	-	-
66	-1,7	0,1	0,9	-	-	-	-	-	-	-3,6	-3,2	-1,7	-	-	-
67	-2,0	-0,3	0,1	-	-	-	-	-	-	-2,1	-1,6	-0,1	-3,6	-1,6	-1,3
68	-3,2	-1,6	-1,2	-	-	-	-	-	-	-2,7	-2,5	-1,2	-2,2	2,2	2,5
69	-2,5	-0,7	-0,5	-	-	-	-	-	-	-2,9	-2,1	-0,6	1,0	4,3	4,6
1970	-2,6	-1,0	-0,8	-	-	-	-	-	-	-3,2	-2,2	-0,5	1,3	5,8	6,1
71	-3,7	-1,1	-0,4	-0,4	-0,9	0,1	0,7	0,8	1,8	-5,0	-4,0	-2,2	-0,5	3,8	4,2
72	-4,8	-1,4	0,1	-0,7	-1,3	1,8	1,0	1,0	4,2	-7,3	-5,5	-3,3	-2,4	1,1	1,6
73	-4,2	-1,6	0,4	1,1	0,4	0,9	1,6	1,5	3,0	-7,0	-3,7	-1,3	-3,8	0,6	1,1
74	-3,1	-3,7	4,7	-1,3	-1,9	-1,9	0,8	0,4	0,8	-7,0	-0,7	1,5	-5,7	2,3	3,0
1975	-5,5	-0,6	-0,2	-5,5	-6,0	-6,1	-2,4	-2,4	-4,1	-11,5	-8,3	-4,6	-7,3	1,6	2,3
76	-6,1	-3,2	-2,6	-3,2	-3,5	-2,3	-0,6	-0,3	0,4	-8,7	-2,2	2,2	-6,7	-1,2	0,5
77	-6,4	-3,4	-2,6	-2,1	-2,4	-1,6	-0,7	-0,4	-0,1	-7,9	-3,7	-0,4	-4,1	0,6	1,2
78	-6,8	-4,9	-4,0	-2,2	-2,4	-1,3	-1,6	-1,2	-0,3	-9,6	-5,1	-2,0	-4,9	-1,4	-0,8
79	-7,5	-5,4	-4,8	-2,0	-2,5	-2,1	-0,5	0,1	0,6	-9,3	-1,9	1,3	-	-	-
1980	-	-	-	-2,4	-2,9	-3,2	-0,0	0,6	1,4	-7,3	1,3	3,6	-	-	-
81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE: DF1: Government lending or borrowing as conventionally measured.
DF2: DF1 less the depreciation of all monetary assets other than high-powered money.
DF3: DF2 less the change in outstanding high-powered money.

Graph 1: The government budget balance according to different definitions

% of GDP

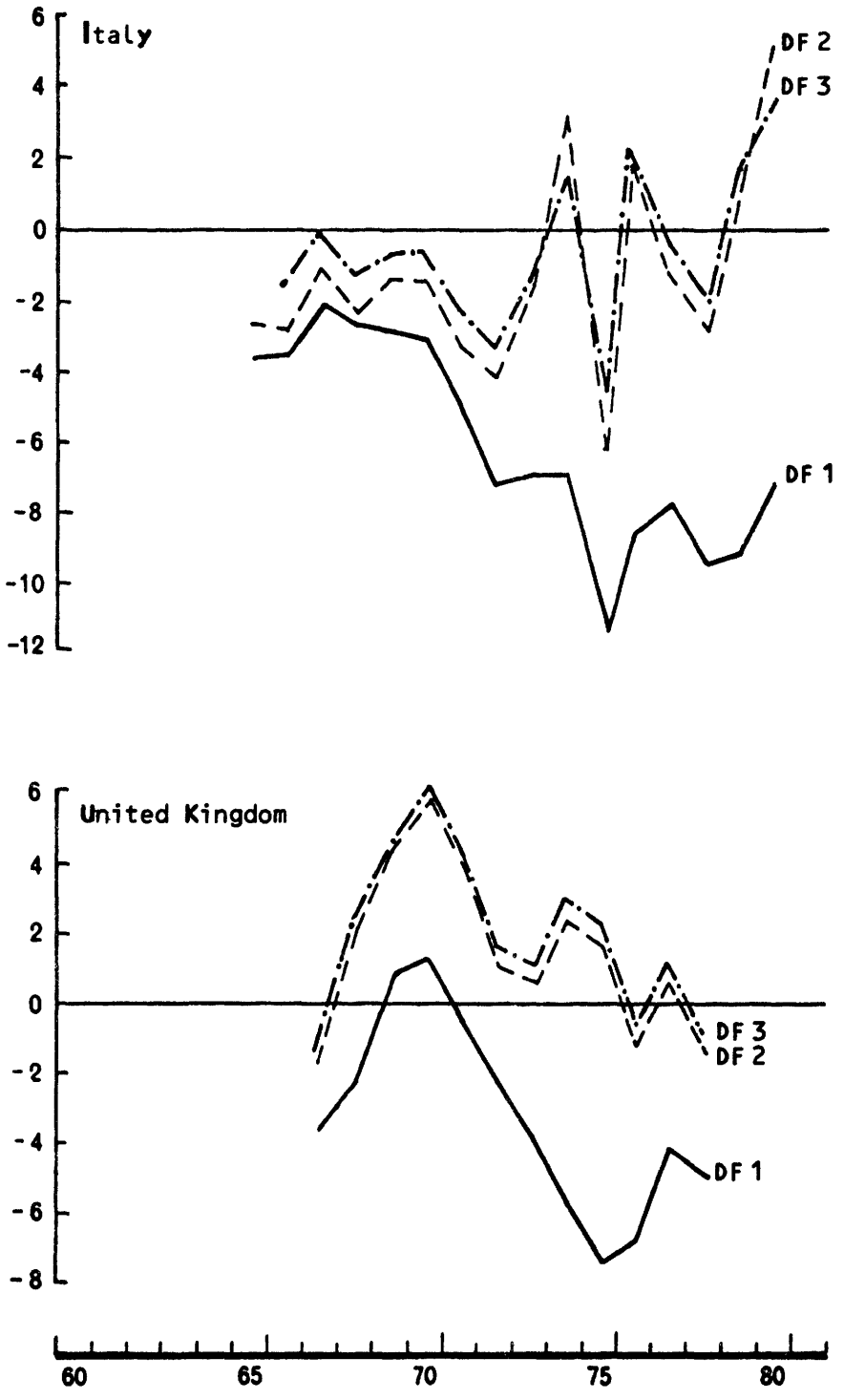
(a) Belgium, Germany, France



Graph 1: The government budget balance according to different definitions

% of GDP

(b) Italy and the United Kingdom



d. The household sector

As can be seen by looking back at Table 4, the household sector in all countries is by far the largest holder of net MA. As a result it is also the sector with the largest measured depreciation of MA. The year-by-year depreciations in the value of MA of this sector for the various countries in relation to GDP appear in Table 9. The annual depreciation varies from almost zero in Germany in 1960 to close to 20% of GDP in Italy in 1974 (40).

Very high levels were also reached temporarily in 1974 and 1975 in Belgium and in the United Kingdom while in Germany the DVMA of households rises from a 1960 low to almost 5% of GDP in 1973 followed by a decline to 2 - 3% in subsequent years - slightly lower than the levels estimated for France. In the latter two countries the figures show a certain stability compared in particular with Italy and the United Kingdom where the sudden bursts of inflation since the first oil shock created a high degree of instability in the estimates of DVMA.

The gradual rise in the relative size of the purchasing power loss on households' financial assets in Germany is attributable, to a significant extent, to the marked increase in the total stock of net monetary assets held by households: from 60% of disposable income in 1960 to 120% in 1980 (See Table 10).

In Belgium, the households' stock of financial assets in proportion to disposable income was very high during the whole of the 'seventies. A high level is also found in Italy. In the United Kingdom, developments contrasted very strongly to those seen in Germany: from a level corresponding to some 130% of disposable income in 1967 households' net holdings of financial assets, declined persistently to 81% in 1978 and, presumably, even lower levels in more recent years.

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(40) It has to be remembered, though, that this transfer of resources is at least partially offset by higher nominal rates which are excluded from the DVMA which appear in Table 9.

Table 9

Depreciation of households' net monetary assets

	Belgium	Germany	France	Italy	United Kingdom
			% of GDP		
1960	-	0,4	-	-	-
1961	2,5	1,2	-	-	-
1962	0,8	1,5	-	-	-
1963	6,5	1,5	-	-	-
1964	3,5	0,9	-	-	-
1965	4,0	1,9	-	2,0	-
1966	2,9	1,5	-	1,5	-
1967	2,6	0,4	-	2,0	2,2
1968	2,7	1,3	-	0,7	4,7
1969	3,0	1,3	-	3,1	3,7
1970	2,6	2,4	-	3,9	5,5
1971	4,4	3,4	2,6	3,6	5,8
1972	5,7	4,0	3,0	6,3	4,9
1973	4,7	5,0	3,6	10,3	6,3
1974	12,5	4,0	6,5	18,6	12,4
1975	8,9	4,0	4,3	8,8	13,1
1976	5,4	2,8	4,3	16,7	7,4
1977	5,4	2,7	4,0	9,6	6,1
1978	3,3	2,0	4,3	9,2	4,8
1979	3,7	4,3	5,1	14,8	-
1980	-	4,6	5,7	16,0	-
1981	-	5,5	-	-	-

Table 10

Net monetary assets of households as a % of disposable income (a)

	Belgium	Germany	France	Italy(b)	United Kingdom
			mid-year figures %		
1960	-	59,9	-	-	-
1961	117,9	60,6	-	-	-
1962	118,7	63,4	-	-	-
1963	119,0	67,4	-	-	-
1964	115,2	71,6	-	-	-
1965	112,6	73,0	-	86,9	-
1966	115,1	79,4	-	91,4	-
1967	117,9	89,2	-	98,0	128,0
1968	119,6	91,1	-	102,6	122,7
1969	116,7	92,1	-	108,4	118,2
1970	113,4	91,1	-	98,7	115,3
1971	114,8	92,1	61,8	103,3	116,9
1972	117,1	93,2	62,1	113,8	106,1
1973	115,9	95,2	62,3	116,8	97,2
1974	107,8	100,8	63,4	123,2	100,5
1975	108,3	104,3	61,2	104,2	93,8
1976	107,5	112,7	62,6	115,9	85,3
1977	113,1	117,7	62,5	104,2	85,9
1978	118,1	122,2	62,6	107,2	81,3
1979	120,1	118,6	63,5	119,4	-
1980	-	119,7	61,4	119,6	-

(a) As adjusted for inflation
(b) Break in series in 1970

As demonstrated in Section II above, an acceleration of inflation should normally be expected to be accompanied by an increase in the apparent saving ratio of households, as the conventional national accounts will record a higher level of interest earnings as an increase in (real) income without counting the depreciation of the corresponding monetary assets as an expenditure.

Therefore, before making any judgements with respect to the saving behaviour of households adjustments to the NA figures on disposable income and saving, should be made in accordance with the methodology developed in Section II.

Unadjusted and adjusted figures for the household saving ratio (Table 11) in fact broadly confirm the a priori view that the apparent increase in the saving ratio accompanying the acceleration of inflation in the 1970s is of a spurious nature. This is clearly the case in Germany (where long series are available) and in the United Kingdom, but also in France and Italy where the inflation adjusted saving ratio shows a declining rather than a rising tendency in the course of the 'seventies.

That the "correlation" between the rate of inflation and the saving ratio of households (often discussed in academic papers on the consumption function and household saving behaviour (40a)) is largely of a spurious nature is also illustrated in the bottom line of Table 11, which gives the coefficient of correlation between, on the one hand the rate of inflation, and on the other, the unadjusted and adjusted saving ratios. For all five countries the correlation with inflation for the adjusted saving ratio is considerably lower than for the un-

(40a) For work which tries to explain this relationship in behavioural terms using the unadjusted saving ratio, see Juster and Wachtel (1972a, 1972b), Deaton (1977) and Roveda (1981).

adjusted saving ratio. In fact while the latter correlation coefficients are positive in four out of five countries, the former ones are negative for all five countries and in most cases strongly so, although not necessarily significant.

The adjusted saving ratio figures suggest that on average over the seventies, the private saving ratio was the highest in Italy and France followed by Belgium and Germany with the UK trailing in last place far behind. Another fact that comes out from the comparison of adjusted and unadjusted saving ratios is that the true saving ratio during the seventies is by and large much less stable than the unadjusted one. This phenomenon can be understood in terms of the permanent income hypothesis (41). When inflation picks up unexpectedly and decreases the adjusted income of households, they consider that as a transitory decrease in income and maintain their consumption at a high level which corresponds to their views about permanent income. As a result the adjusted saving ratio declines reflecting the attempt by households to maintain their consumption. The unadjusted saving ratio, however, does not decrease because of the spurious correlation between this ratio and the rate of inflation. Thus random fluctuations of inflation around its trend can cause wider fluctuations in true adjusted saving ratios than in unadjusted saving ratios.

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(41) See Friedman (1957).

Table 11

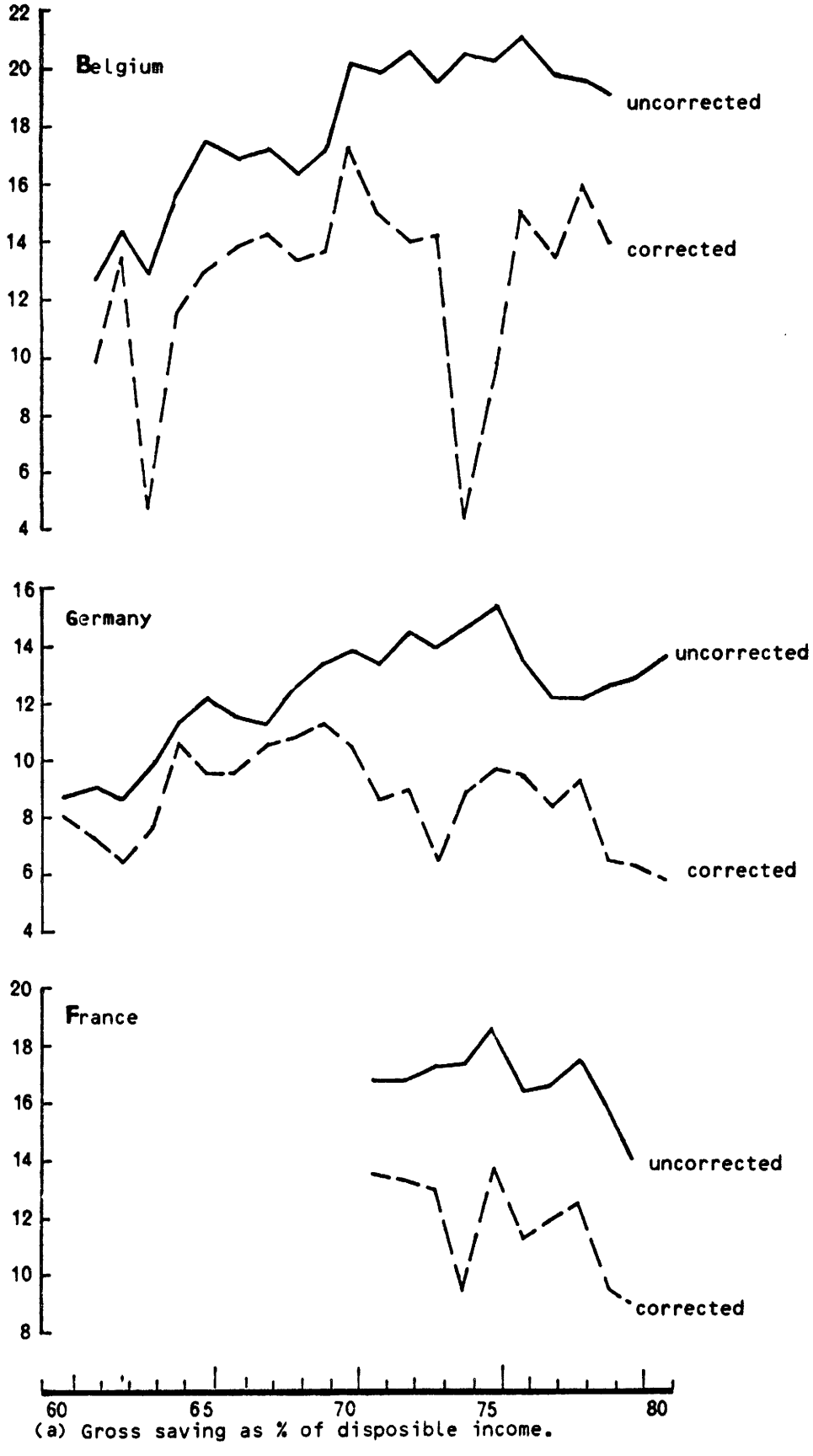
Household saving ratio

	Belgium		Germany		France		Italy		United Kingdom	
	Unadjusted	Adjusted (a)	Unadjusted	Adjusted (a)	Unadjusted	Adjusted (a)	Unadjusted	Adjusted (a)	Unadjusted	Adjusted (a)
	% of disposable income									
1960	-	-	8,6	8,0	-	-	-	-	-	-
1961	12,6	9,7	9,1	7,3	-	-	-	-	-	-
1962	14,2	13,3	8,6	6,4	-	-	-	-	-	-
1963	12,7	4,7	9,9	7,7	-	-	-	-	-	-
1964	15,5	11,4	11,3	10,0	-	-	-	-	-	-
1965	17,3	12,8	12,2	9,5	-	-	-	-	-	-
1966	16,8	13,7	11,6	9,5	-	-	-	-	-	-
1967	17,1	14,1	11,2	10,6	-	-	-	-	8,4	5,4
1968	16,2	13,2	12,5	10,8	-	-	-	-	7,6	0,7
1969	17,0	13,5	13,3	11,5	-	-	-	-	8,1	2,7
1970	20,0	17,1	13,8	10,4	-	-	23,0	19,0	9,3	1,5
1971	19,8	14,8	13,5	8,5	16,8	13,7	24,4	20,8	7,7	-0,9
1972	20,4	13,8	14,4	8,7	16,8	13,3	25,6	19,3	10,1	3,3
1973	19,4	14,0	13,9	6,4	17,3	13,0	25,3	14,4	11,9	3,3
1974	20,3	4,3	14,6	8,8	17,4	9,5	24,7	2,0	12,3	-5,9
1975	20,1	9,7	15,1	9,7	18,6	13,8	27,2	18,7	12,4	-7,7
1976	20,9	14,9	13,3	9,4	16,4	11,3	26,9	8,2	11,6	0,9
1977	19,5	13,4	12,1	8,3	16,6	12,0	26,5	16,7	10,8	1,6
1978	19,4	15,8	12,1	9,2	17,5	12,6	27,7	18,7	13,0	6,6
1979	17,9	13,8	12,6	6,4	15,9	9,7	26,4	9,9	-	-
1980	-	-	12,8	6,2	14,1	7,1	23,7	4,2	-	-
1981	-	-	13,6	5,7	-	-	-	-	-	-
Correlation(b)	0,48	-0,65	0,56	-0,62	-0,32	-0,85	0,15	-0,95	0,71	-0,84

(a) Adjusted saving of households as % of adjusted disposable income.
(b) Simple coefficient of correlation of the respective saving ratio with the rate of inflation.

Graph 2: Household saving ratio (a)

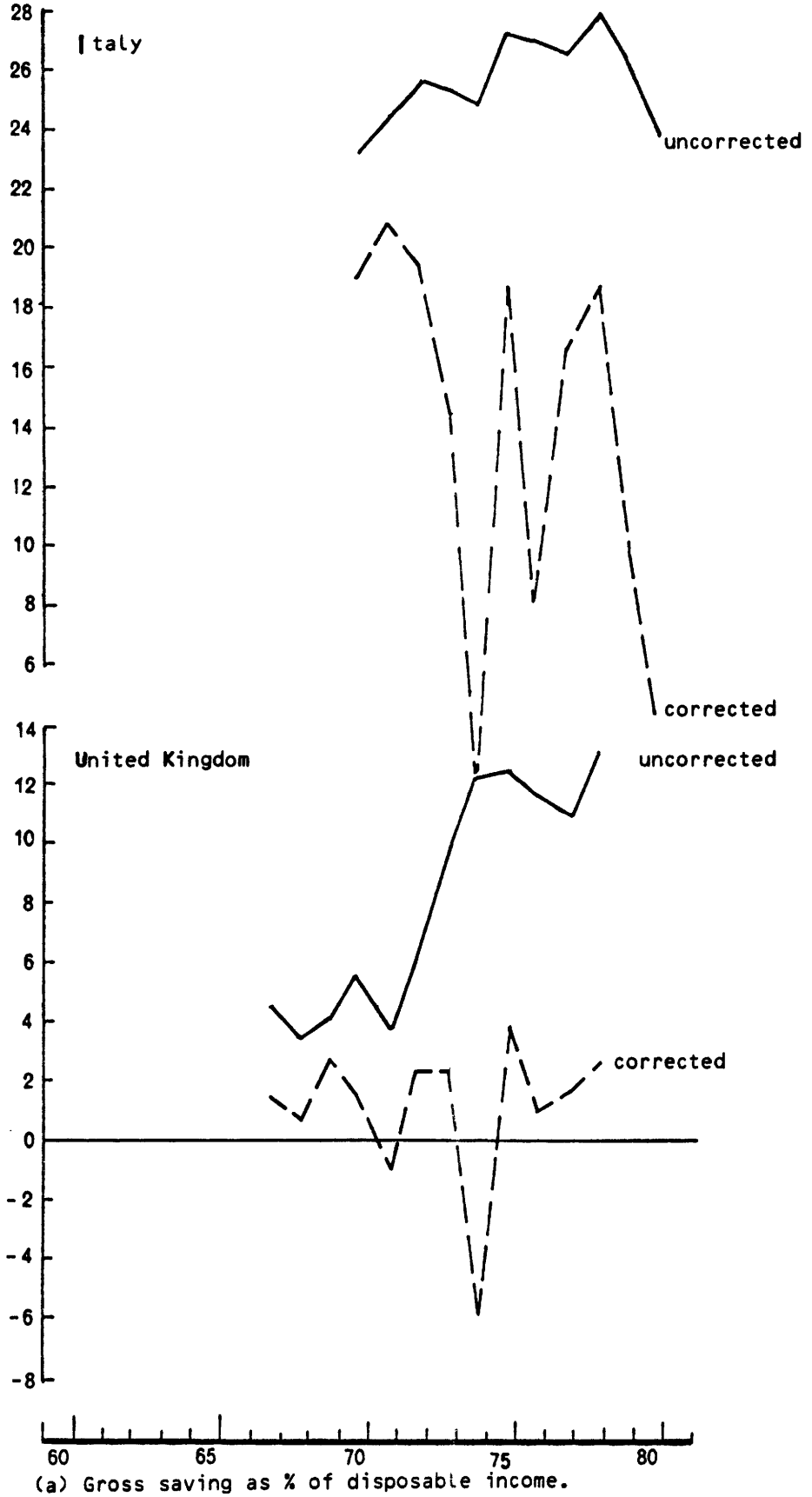
(a) Belgium, Germany, France



(a) Gross saving as % of disposible income.

Graph 2: Household saving ratio (a)

(b) Italy and the United Kingdom



(a) Gross saving as % of disposable income.

e. The enterprise sector

As demonstrated in Section II, certain indicators of the financial strength of firms may be biased due to the failure of conventional national accounts to include the inflation induced depreciation of monetary liabilities of enterprises. The size of the bias is illustrated in Table 12 which presents the value of the annual "gain" for the enterprise sector for the years for which data are available. Measured in proportion to GDP the figures are for some years and countries large enough to influence importantly the financial indicators of the sector.

As shown in Table 13 and Graph 3 the correction for the inflation induced depreciation of monetary liabilities may, in fact, lead to a complete reversal of the picture of self-financing ratios obtained from the national accounts:

- In Belgium the uncorrected self-financing ratio fluctuated in the range of 70 to 85% in the sixties and fell to the 60-75% range in the seventies. The inflation adjusted ratio shows approximate stability during the period with all figures in the range from 70 to 90% depending upon the cyclical position of investment.

- In Germany the uncorrected self-financing ratio shows a declining tendency in the early seventies followed by a return to "normal" levels during the period from 1975 to 1979. The corrected series, on the other hand, shows approximate stability in the period up to 1972/73 and a tendency towards higher figures in the most recent years.

- In France the uncorrected ratio is on a very low level as compared to Belgium and Germany with little change in the trend over time. The corrected series is also relatively low but shows a rising trend in the latter half of the seventies.

- In Italy the difference between the two series is substantially larger than for the three previously-mentioned countries. In fact, while the uncorrected ratio shows as low a figure as for France, the corrected ratio is on about the same level as for Belgium and Germany, suggesting that the inflation induced depreciation of monetary liabilities has been, in the period covered, an important element of the financial sources of Italian firms.

- In the United Kingdom the uncorrected self-financing ratio is on a higher level than for the other countries, presumably to a large extent due to the fact that public corporations are not included in the enterprise sector in the UK statistics. The corrected ratio is often larger than 100%, suggesting that the UK enterprises must have been in a position to undertake substantial financial saving (or to finance direct investment abroad).

The adjusted series thus, on the whole, show that the self-financing ratio of firms has been rising rather than falling in the seventies. As it seems this observation would be more in line with a priori reasoning concerning the financial behaviour of firms in a period marked by a high degree of uncertainty and a decline in the ratio of investment to GDP. While the uncorrected figures indicate that firms in Belgium, Germany and Italy have relied more on borrowed funds to finance their capital formation, the adjusted figures in fact show that firms have increasingly turned to self-financing.

Table 12

Inflation-induced depreciation of net monetary liabilities of non-financial enterprises

	Belgium	Germany	France	Italy	United Kingdom
			% of GDP		
1960	-	0,0	-	-	-
1961	0,4	1,4	-	-	-
1962	0,2	1,8	-	-	-
1963	1,3	1,8	-	-	-
1964	0,7	1,1	-	-	-
1965	0,8	2,3	-	0,8	-
1966	0,6	1,7	-	0,6	-
1967	0,6	0,4	-	0,9	0,4
1968	0,7	1,4	-	0,3	0,9
1969	0,8	1,3	-	1,3	0,8
1970	0,8	2,5	-	1,7	1,3
1971	1,3	3,6	2,0	1,6	1,5
1972	1,7	4,2	2,3	2,6	1,3
1973	1,4	5,2	2,9	4,3	2,0
1974	3,8	4,0	5,4	8,7	4,6
1975	2,8	3,8	3,5	4,3	4,7
1976	1,8	2,5	3,5	7,8	2,4
1977	1,9	2,3	3,2	4,1	1,7
1978	1,2	1,7	3,5	3,6	1,2
1979	1,3	3,5	4,0	5,1	-
1980	-	3,9	4,4	5,4	-
1981		4,7	-	-	-

Table 13

Non-financial enterprises : gross saving as a % of gross domestic capital formation

	Belgium		Germany		France		Italy		United Kingdom	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1960	-	-	67,3	67,4	-	-	-	-	-	-
1961	86,3	90,0	61,0	67,3	-	-	-	-	-	-
1962	78,9	80,2	61,6	69,5	-	-	-	-	-	-
1963	83,5	94,7	62,0	70,5	-	-	-	-	-	-
1964	80,4	86,4	61,1	66,0						
1965	83,7	91,2	58,9	68,7	-	-	-	-	-	-
1966	70,9	75,8	63,3	71,2	-	-	-	-	-	-
1967	71,8	77,2	74,9	77,1	-	-	-	-	90,8	96,8
1968	80,1	86,6	70,2	76,9	-	-	-	-	86,1	97,0
1969	74,1	81,0	56,7	62,6	-	-	-	-	85,3	94,0
1970	72,5	78,4	56,9	67,8	-	-	43,0	58,7	78,1	92,2
1971	64,7	74,8	56,3	72,5	31,0	39,1	49,2	69,0	103,7	123,7
1972	77,3	92,9	54,5	73,5	30,3	39,5	48,8	78,6	118,1	135,6
1973	74,0	86,5	52,5	76,6	27,2	38,4	38,3	73,0	95,1	112,5
1974	59,4	88,4	61,5	83,6	21,6	41,7	27,7	84,3	74,9	106,6
1975	62,3	88,8	68,3	91,8	24,6	39,6	15,8	57,6	101,8	154,0
1976	65,7	84,9	65,4	79,1	24,2	38,7	24,8	94,3	99,3	120,6
1977	73,3	95,1	62,3	75,3	26,0	40,0	28,4	70,1	98,7	115,2
1978	75,4	88,9	69,2	78,5	29,9	45,6	29,6	72,2	104,9	117,5
1979	65,2	79,5	60,9	78,0	30,4	48,0	43,7	97,3	-	-
1980	-	-	56,3	74,7	26,9	46,1	34,2	79,1	-	-
1981	-	-	58,9	82,8	-	-	-	-	-	-

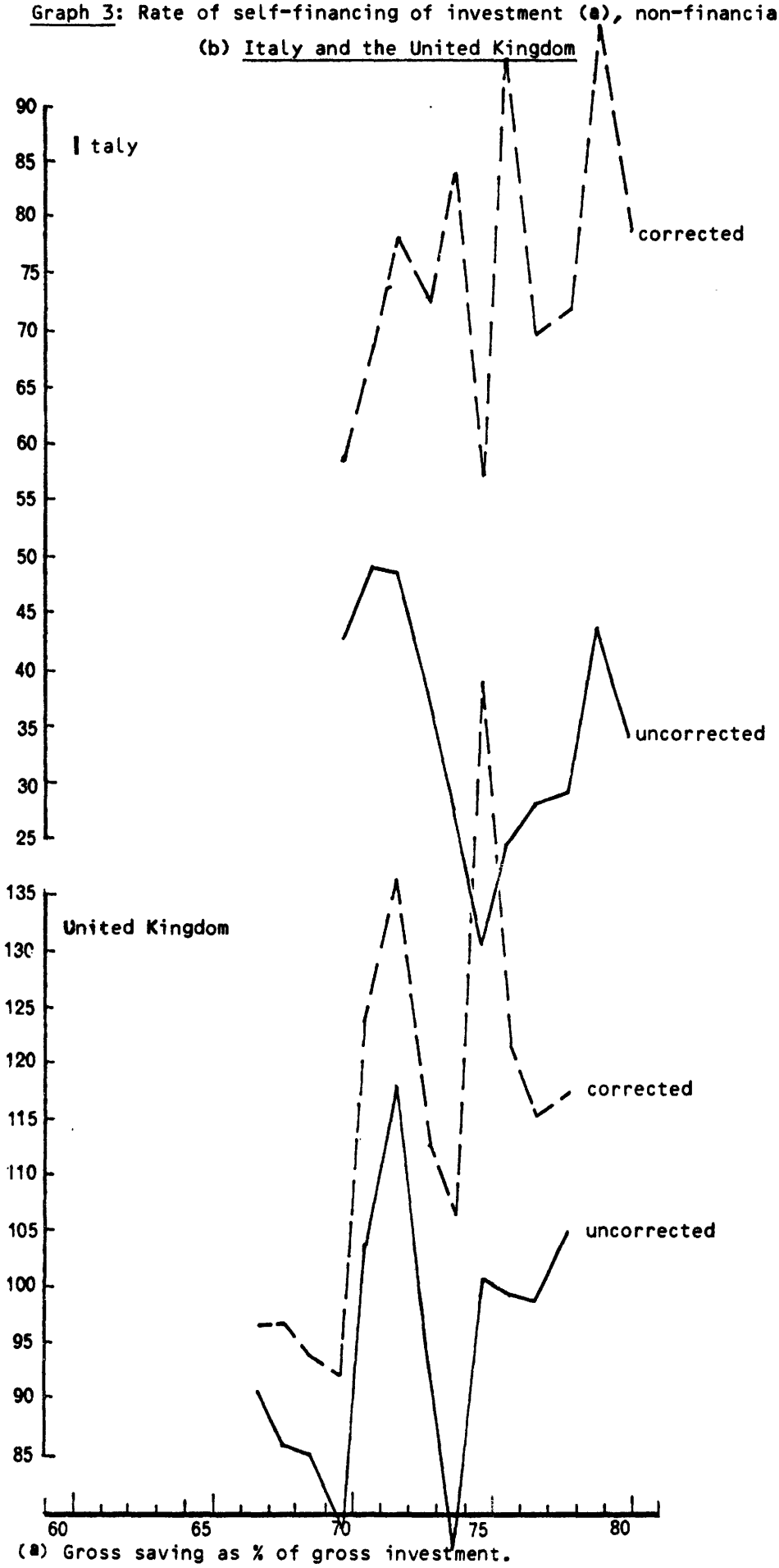
Graph 3: Rate of self-financing of investment (1), non-financial enterprises

(a) Belgium, Germany, France

(1) Gross saving as % of gross investment.

Graph 3: Rate of self-financing of investment (a), non-financial enterprises

(b) Italy and the United Kingdom



(a) Gross saving as % of gross investment.

f. The current external account

As shown in Sections II-d and IV-h measurement errors resulting from inappropriate accounting procedures concerning interest payments may also occur in the rest-of-the-world account.

The size of these measurement errors depends upon the relative size of net monetary claims on the rest-of-the-world. For the five countries concerned, these net positions are not very large in proportion to GDP and the difference between the uncorrected and the corrected figures for the current external account is therefore not so large as to importantly modify the judgement as to the size or trend of an external balance. The largest discrepancies are found in the case of Italy in the early seventies where the corrected current external balance (including inflation induced depreciation of external liabilities) is in a stronger position than the uncorrected. It should be recalled, however, that due to lack of information on currency denomination, the corrections have been made as if the assets and liabilities of the foreign sector were denominated in domestic currency. This may be true for the United Kingdom but is not necessarily true for the other countries. For countries where the net monetary position with abroad is denominated in foreign currency, the results will be biased - with the bias depending upon the sign of the net monetary position and of the relative movements in exchange rates and prices during the period.

The net monetary positions abroad appear in Table 14 and the adjusted versus unadjusted current account balances appear in Table 15. It is apparent that in countries like Italy and Germany which are usually net monetary lenders throughout the period, the conventional measure of current account balances is biased upward. The converse happens in net monetary borrower countries like the United Kingdom, in which unadjusted current account deficits become, in some cases, surpluses after adjustment.

Table 14

Net monetary assets of the nation (a)

	Belgium	Germany	France	Italy	United Kingdom
			% of GDP		
1960	-	4,7	-	-	-
1961	-0,8	4,8	-	-	-
1962	-1,3	4,2	-	-	-
1963	-3,2	4,3	-	-	-
1964	-3,8	3,8	-	-	-
1965	-3,2	2,3	-	6,3	-
1966	-2,9	2,5	-	7,4	-2,7
1967	-2,1	4,4	-	8,7	-12,7
1968	-1,6	5,8	-	10,1	-13,9
1969	-1,0	5,5	-	11,1	-11,2
1970	0,7	5,6	-	11,3	-9,0
1971	2,4	4,0	2,2	11,2	-5,7
1972	3,9	4,5	2,8	11,2	-7,0
1973	4,8	4,6	2,6	8,9	-7,6
1974	4,0	6,3	1,5	4,2	-9,4
1975	4,1	7,3	1,4	1,3	-9,8
1976	3,7	7,2	1,0	-0,8	-9,6
1977	2,8	6,7	0,2	-1,7	-7,5
1978	1,1	7,1	1,0	0,2	-4,5
1979	-2,3	5,0	1,8	2,7	-
1980	-	2,4	1,7	2,9	-
1981	-	1,2	-	-	-

(a) Excluding gold; net monetary assets of the rest-of-the-world appear with negative sign.

Table 15

Current account of balance of payments — % of GDP

	Belgium		Germany		France		Italy		United Kingdom	
	Unad-justed	Adjus-ted	Unad-justed	Adjus-ted	Unad-juste	Adjus-ted	Unad-justed	Adjus-ted	Unad-justed	Adjus-ted
1960	-	-	1,6	1,6	-	-	-	-	-	-
1961	0,2	0,2	1,0	0,8	-	-	-	-	-	-
1962	0,7	0,7	-0,4	-0,6	-	-	-	-	-	-
1963	-0,5	-0,3	0,2	-0,1	-	-	-	-	-	-
1964	0,2	0,4	0,1	0,1	-	-	-	-	-	-
1965	0,6	0,7	-1,3	-1,4	-	-	3,6	3,4	-	-
1966	-0,1	-0,0	0,1	0,0	-	-	3,2	3,0	-	-
1967	1,2	1,3	2,0	2,0	-	-	2,2	2,0	-0,7	-0,3
1968	1,4	1,4	2,2	2,1	-	-	3,3	3,2	-0,6	0,2
1969	1,8	1,8	1,3	1,1	-	-	2,7	2,2	1,1	1,7
1970	3,2	3,2	0,5	0,3	-	-	1,2	0,6	1,6	2,3
1971	2,2	2,1	0,4	0,1	0,5	0,3	1,8	1,3	2,0	2,5
1972	3,9	3,6	0,3	0,1	0,4	0,2	1,6	0,8	0,4	0,8
1973	2,8	2,5	1,3	1,0	-0,2	-0,4	-1,7	-2,9	-1,3	-0,7
1974	1,5	0,9	2,7	2,4	-2,4	-2,6	-4,6	-5,7	-3,9	-2,3
1975	0,5	0,1	1,0	0,6	-0,1	-0,3	-0,2	-0,4	-1,4	0,7
1976	0,2	-0,0	0,9	0,6	-1,6	-1,7	-1,5	-1,3	-0,7	0,7
1977	-0,7	-0,9	0,8	0,6	-0,8	-0,8	1,2	1,4	-0,0	1,0
1978	-0,7	-0,7	1,4	1,2	0,6	0,5	2,4	2,4	0,6	1,1
1979	-1,8	-1,7	-0,8	-1,1	-0,1	-0,3	1,6	1,1	-	-
1980	-	-	-2,0	-2,2	-1,4	-1,5	-2,5	-3,1	-	-
1981	-	-	-1,1	-1,2	-	-	-	-	-	-

VI. SOME REMARKS ON UNANTICIPATED INFLATION, THE MEANING OF THE CORRECTED INCOME FIGURES AND THE EFFECTS OF NOMINAL TAXATION OF INTEREST PAYMENTS

The focus of the discussion up to this point was on measuring the actual depreciation in the real value of monetary assets and liabilities in order to correct actual income flows. The point of view taken was that of national accounting which attempts to measure actually realised income flows without distinguishing between situations in which individuals had perfect advance knowledge of those flows and situations in which these flows were partially unanticipated. However the behavioural, as well as policy, implications of anticipated versus unanticipated flows of income are different. This section discusses the different policy implication of expected versus unexpected inflation induced redistributions, as well as some of the implications of slow adjustment of nominal interest rates to changes in inflationary expectations (42). Another topic that is dealt with is the redistributive and policy implications of nominal taxation and deduction of interest which is prevalent throughout the Community countries. The section is concluded with a general remark about the difference between the concept of income that is approximated by the corrected sectoral incomes obtained in this paper and the Hicksian or permanent concept of income.

a. Some redistributive and policy implications of unanticipated inflation

When part of realised inflation is unanticipated, the DVMA or liabilities is composed of two components. One which both the lender and the borrower were aware of when they agreed on the financial contracts through which the MA or liabilities were created and another which is a surprise redistribution to both sides and is therefore a windfall gain or loss. Assuming for the moment that the nominal rate of interest adjusts fully to compensate lenders for any anticipated inflation, the only redistribution that actually occurs is that which is contained in the unanticipated component of the DVMA. The other part of the DVMA is, by assumption, compensated by an appropriate increase in the nominal rate of interest. Thus in a world in which nominal rates adjust instantaneously to changes in

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(42) An attempt to decompose the depreciation in the real value of monetary assets and liabilities into anticipated and unanticipated components is made in Cukierman, Lennan and Papadia (1983).

expected inflation without any changes in the ex-ante real rate, the only redistribution that occurs between borrowers and lenders is of the windfall type. This type of redistribution cannot be neutralised in advance by an appropriate adjustment of the nominal rate since the unanticipated component of inflation, by its very nature, is not known at the time the loan contract is struck (43).

Deviations of actual from anticipated inflation have important consequences for redistribution of resources between net borrowing and net lending sectors. Since the household sector is invariably a net lender (has a net positive position in monetary assets) and the enterprise and government sectors are almost (44) always net borrowers, (have net negative positions in monetary assets) a higher-than-anticipated rate of inflation redistributes income away from the household sector in favour of government and the enterprise sector. Thus upward bursts of inflation, which usually are at least partly unanticipated, redistribute income away from the household sector in favour of government and enterprises. This has two implications. First, to the extent that consumption of the household sector and the investment activity of the corporate sector are at least somewhat sensitive to the resulting sectoral income redistribution, an upward burst of inflation may decrease consumption expenditure and increase investments. Secondly, and more importantly, a burst of positive unanticipated inflation, by decreasing the real value of national debt, decreases future crowding-out pressures and future consequent political pressure to monetise the debt. In this sense a burst of unanticipated inflation today decreases the pressures to monetise the debt in the future in order to alleviate crowding-out. However, such an alleviation is achieved (when the ex-ante real rate is independent of expected inflation) only to the extent that part of the inflationary burst is unanticipated. When it is fully anticipated the nominal rate adjusts upward and there is no redistribution of income as a result of the inflationary burst. Thus, whenever the national debt reaches levels which are considered "too high" politically or economically because of crowding-out pressures, the government may

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(43) It can be eliminated by inflation-contingent loan instruments or indexed bonds which we exclude from the discussion.

(44) The qualification is needed only to take into consideration the fact that in some years the German government was marginally a net lender.

be tempted to allow unanticipated bursts of inflation as a short-run device. Obviously such a policy cannot be followed systematically since it would sooner or later be recognised by the public in which case it would become self defeating. However governments with very high rates of time preference may, at times, succomb to the temptation of decreasing the income of the household sector through this mechanism. Unanticipated supply shocks, by causing an unanticipated increase in inflation, have a similar redistributive effect. When a government is trying to disinflate and unanticipated inflation is negative (45), the same mechanism redistributes resources in the opposite direction: away from government and enterprises and towards the household sector creating a further difficulty for governments to seriously engage on a disinflationary course. Unexpected inflation may also cause divergences between the ex-ante evaluation or forecast of the corrected budget deficit and between its realisation. Thus, even if the government plans to attain a certain level for the corrected budget deficit, the realisation of this deficit may be different to the extent that the actual rate of inflation differs from the one originally expected by the government.

b. Implications of partial or slow adjustment of nominal rates to expected inflation

If the ex-ante real rate of interest is, even in the long-run, a decreasing function of the expected rate of inflation, an increase in the latter redistributes income away from households to enterprises and government while a decrease works in the opposite direction.

If the nominal interest rate ultimately adjusts to expected inflation in the long-run so as to maintain the ex-ante real rate constant, without achieving this adjustment in the short-run, an increase in expected inflation decreases ex-ante real rates and a decrease in expected inflation increases ex-ante real rates, but only temporarily. In this case an increase in inflationary expectations also redistributes income away from households in favour of government and non-financial enterprises, but only temporarily. Similarly, a decrease in inflationary expectations works in the opposite direction but again only temporarily.

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(45) That is actual inflation turns out lower than what has been anticipated.

There seems to be a tendancy for ex-ante real rates to decrease as inflation becomes more entrenched in the economy. There is not enough evidence to date to judge whether this is a short or a long-run phenomenon. In any case it can be concluded that at least temporarily even increases in expected inflation seem to work in favour of net borrowers and decreases in expected inflation seem to work in favour of net lenders. Those tendencies are probably attenuated by the fact that when ex-ante real rates decrease, net lending by households through monetary assets also decreases (other things being the same).

c. The effects of nominal taxation of interest on redistribution

An additional channel through which even expected inflation redistributes income is created by the tax treatment of interest receipts and expenditure. In most countries, interest receipts are considered as fully taxable income and interest payments as fully deductible costs. In a period with high rates of inflation this tax treatment of interest payments is likely to induce additional demands for credit and a reduction in the supply of loans unless nominal pre-tax interest rates are allowed to increase to such levels as to fix the real post-tax interest at about the same level as before the acceleration of inflation. Even if such an adjustment occurs, the total real volume of loans will be unaffected only if borrowers and lenders face the same tax rate. If tax rates differ an increase in inflation, even if perfectly anticipated and even if there is immediate and full adjustment of nominal rates, will change real rates to both lenders and borrowers and, as a consequence, the total volume of funds that are lent on the capital markets. As a result, the total amount of taxes that the government collects on interest paid to lenders, net of taxes foregone as deductions to borrowers, is affected as well. The nature of the forces that are at work when inflation increases in a capital market with nominal and differential taxation is illustrated by the following equilibrium model of the loan market (46). Let

$$L^d (r_d) = L^s (r_s) \qquad (55)$$

(46) A fuller analysis of those forces in the context of the US bond market can be found in Birati and Cukierman (1979).

be the equilibrium condition in the loan market where $L^d(.)$ and $L^s(.)$ are respectively the real demand and supply functions of loans, r_d is the real after-tax interest rate paid by borrowers and r_s is the real after-tax rate obtained by lenders. We assume that loan demand is a decreasing function of r_d and loan supply an increasing function of r_s. Formally

$$L_r^d \equiv \frac{\partial L^d(r_d)}{\partial r_d} < 0 ; \qquad L_r^s \equiv \frac{\partial L^s(r_s)}{\partial r_s} > 0 \qquad (56)$$

where ∂ is the partial derivative operator. Let T and τ be respectively the tax rates that are applicable to borrowers and lenders, then by definition

$$r_d \equiv n(1-T) - \pi \qquad \text{(a)}$$
$$r_s \equiv n(1-\tau) - \pi \qquad \text{(b)} \qquad (57)$$

where n and π are the nominal rate and the (perfectly forecast) rate of inflation. Substituting (57) into (55) gives

$$L^d(n(1-T) - \pi) = L^s(n(1-\tau) - \pi) = L(\pi) \qquad (58)$$

from which the equilibrium nominal rate n is determined as a function of the tax rates and the rate of inflation. Suppose now that the rate of inflation π, increases. Obviously the equilibrium value of n changes. This change can be obtained by total differentiation of (58) with respect to π which yields

$$\frac{dn}{d\pi} = \frac{L_r^s - L_r^d}{L_r^s(1-\tau) - L_r^d(1-T)} > 1 \qquad (59)$$

from which it is seen that the nominal rate has to increase by more than the rate of inflation to compensate lenders for taxation of the Fisher Premium in n. We can find what happens to real after tax costs to borrowers and returns to lenders by differentiating (57) with respect to π and using (59) to get

$$\frac{dr_d}{d\pi} = \frac{L_r^s(\tau - T)}{L_r^s(1-\tau) - L_r^d(1-T)} \qquad \text{(a)}$$

$$\frac{dr_s}{d\pi} = \frac{L_r^d(\tau - T)}{L_r^s(1-\tau) - L_r^d(1-T)} \qquad \text{(b)} \qquad (60)$$

Note that (using (56)) the denominators in (60) are positive. If $\tau > T$, r_d goes up and r_s goes down so the volume of loans goes down when π goes up. If $\tau < T$, r_d goes down and r_s goes up so the volume of loans goes up. Hence, depending on whether $\tau > T$ or $\tau < T$, an increase in the rate of inflation decreases or increases, the real volume of loans. Note that in the particular case $\tau = T$, real rates do not change at all and therefore the volume of loans does not change either. When $\tau > T$ an increase in inflation is bad for both borrowers and lenders, since r_d goes up and r_s goes down. When, however, $\tau < T$ an increase in inflation is good for both sides of the market since the net real after tax rate paid by borrowers decreases and that which is received by lenders increases. This difference in results arises from the shifts in tax burdens that are triggered by inflation in the presence of a non-neutral tax system. When $\tau < T$ an increase in inflation increases the deductions to corporations by more than it increases the tax on households. The net effect is expansionary and advantageous for both sides of the market. On the other hand when $\tau > T$ an increase in inflation is equivalent to an increase in the tax burden on the margin and both sides of the market share the cost. The net effect on volume in this case is contractionary.

d. Correction of current income versus permanent or Hicksian income

At the risk of restating the obvious, it should be stressed that the purpose of the corrections of income presented in this paper is to obtain correct measures of current income and not of permanent or Hicksian income. Hence it is fundamentally different from that of

the more comprehensive accounting adjustments undertaken in order to produce estimates of "permanent income", "life-cycle income" or other estimates of income in broad accordance with the definition proposed by Hicks: the amount which a person can spend on consumption during a period and still expect to be as well off at the end of the period as at the beginning.

In principle, the net worth of an economic unit should be equivalent to the present discounted value of future earnings. Permanent income may therefore be considered to be directly proportional to the net worth - assuming that the net worth of the economic unit takes into account not only tangible and financal assets, but also investments in human capital, knowhow, goodwill, etc... In practice the statistical problems involved in obtaining a correct measure of permanent income in this way are immense and some attempts at producing estimates of permanent income have therefore proceeded by simply including the effect of asset revaluations in the estimates of current income as obtained in the national accounts (47). In some cases these adjustments include other items which are not normally counted as income in the standardised national accounts. A recent example of a study of this kind is found in Hibbert (1982) which groups a considerable amount of statistical data on wealth in six countries (Canada, Germany, France, Japan, United Kingdom and the United States). (48)

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(47) Note that this approach has to assume that all gains and losses as a result of asset revaluations are permanent, which is not necessarily the case.

(48) A brief summary of the results and some of the methodology of Hibbert's work appears in Part D of the appendix.

VII. IMPLICATIONS FOR THE SUPPLY OF STATISTICS

As the main purpose of this paper has been to identify and analyze an important set of measurement errors in the conventional national accounting, this paper would not be complete without an overview of the implications for the supply of statistics if these measurement errors were to be corrected by the statisticians on a more regular basis and indeed in the context of the current national accounting.

As already pointed out, the key conclusion of the present study is that

- sectoral balance sheets consistent with the income/expenditure accounts are urgently needed.

In addition, however, the more detailed review of the conceptual and, notably, methodological problems has shown that many additional statistical series are required in order to fully satisfy the analytical requirements.

The main additional requirements concern:

- the currency denomination of assets and liabilities;
- the maturity structure of assets and liabilities and the calculation of an imputed market value for non-marketable assets and liabilities;
- the degree of indexation of monetary assets and liabilities;
- the issue prices of bonds;
- the classification of assets and liabilities into interest-bearing and non-interest-bearing, including the definition of the monetary base;
- the classification of the Central Bank in flow statistics and in balance sheets.

Clearly a full set of sectoral balance sheets is required to allow a correction of measurement errors in key macro-economic indicators such as

- the household saving ratio
- the budget balance
- the self-financing of investment
- the current external account.

The present study has demonstrated that the conclusions which can be drawn from the conventional national accounts in some cases are dangerously erroneous. At present, however, a satisfactory set of balance sheets only exists for five of the ten EC countries.

Due to lack of appropriate statistical data, the group was not in a position to study Denmark, Greece, Ireland, Luxembourg and the Netherlands. A considerable improvement of the statistical data supply for these Member States is therefore required, and all the more so since there are strong a priori reasons to expect the typical measurement errors analysed in the present study to be quite large for some of these countries.

The need for statistical information on the currency denomination of assets and liabilities as a regular feature of the compilation of balance sheet data is a general one, but is obviously particularly urgent in cases where countries have a large amount of external assets and liabilities and where the currency denomination may have a large influence on the inflation adjustment and thus on the measurement of such important indicators as the position of the current external account. Where the foreign net position is largely denominated in the domestic currency (as, for example, in the United States), the inflation-induced depreciation should be calculated on the basis of the domestic rate of inflation, while the inflation rate as corrected by the change in the exchange rate should be applied to assets and liabilities denominated in foreign currency.

Knowledge of the maturity structure and of the degree of interest rate flexibility of the various categories of monetary assets and liabilities is required in order to arrive at a correct calculation of the imputed market value for fixed-term/fixed interest rate monetary assets which do not have an explicit market value. The calculations of an imputed market value for non-marketable assets is needed in order to distinguish between on the one hand inflation gains and losses, in the sense used in the present study, and on the other hand the gains and losses attributable to changes in relative prices between various assets - to some extent as a consequence of unanticipated inflation.

The ESA rules do not give a clear indication of the way to treat the changes in the principal of monetary assets resulting from indexation arrangements. It is therefore not known whether these amounts are included or not in the flow accounts (as income or capital transfers). Consequently it is not possible to know whether and how the inflation-induced depreciation of indexed monetary assets should be taken into account in the adjustment for measurement errors.

In case the indexation is classified as current income (and expenditure) in the flow accounts (as a kind of interest payment), the inflation-induced depreciation of the corresponding monetary assets should also be taken into account in the correction of the sectoral financial balances. If, on the other hand, the indexation is not classified as current income or expenditure, the depreciation of the assets should clearly be excluded as well.

A clarification of the ESA rules in this respect is therefore urgently required.

A somewhat similar statistical problem arises with respect to the treatment of bonds issued at prices below par.

In some countries (for example in Denmark) the nominal yield of new bonds is kept substantially below the current market yield and as a result the issue price of bonds may be considerably below the face value. The reimbursement of the bond takes place at face value. Consequently the lender knows already when buying the bond, that a part of his compensation is obtained through appreciation of the price of the bond. The total effective yield of the bond therefore depends on the interest payments as well as on the reimbursement value of the bond. There are, however, no ESA rules for the treatment of this effective bond yield and it is at present not clear whether (and how) the difference between the face value and the issue value of bonds is taken into account in the conventional national accounts. Lacking information on the accounting procedures, it is not possible to know exactly the size of measurement errors.

A first step towards a clarification would therefore require the setting-up of a standard rule for dealing with bonds issued at prices below par in the ESA. It should be noted that the order of magnitude of the amounts involved in some cases may be quite considerable.

Moreover, as explained in Section IVc, a breakdown of monetary assets into fully-liquid and less liquid ones is essential for a correct evaluation of the adjusted sectoral income flows.

With respect to the comparability between countries, the sector classification is, however, by far the largest statistical problem. In the present study the Central Bank has been grouped together with the general government in order to allow an analysis of budget deficit financing according to the conceptual framework developed in Section III. This procedure in some cases required arbitrary correction to the balance sheet statistics as well as to the flow statistics. For the purposes of more regular analysis of deficit financing, it would be preferable if flow and balance sheet data on the Central Bank were either shown separately or grouped with general government. Flow accounts for the Central Bank should, in any case, be made available on a standardised national accounts basis.

A final statistical issue is related to the broader question of whether the sector classification adopted in the ESA statistics for the purposes of analysis of the functioning of the economic system is really appropriate for analysis of the financial relations. In fact the enterprise sector in the ESA system is a complex of individual enterprises, private companies and public corporations with very little in common with respect to financial behaviour.

For the purpose of analysis of saving/investment behaviour and, not least, of the sectoral financial balance (as adjusted for the inflation-induced depreciation of monetary assets), accounts should be established separately for individual enterprises, private companies and public corporations.

For the time being only one Member State produces statistics with a breakdown of the enterprise sector on individual enterprises, private companies and public corporations. There would, however, in the longer run be considerable analytical gains from introducing this distinction in the ESA system and producing harmonised flow and balance balance sheet statistics on this basis.

VIII. IMPLICATIONS FOR MACROECONOMIC ANALYSIS AND POLICY DESIGN

The order of magnitude of the correction of national accounts figures presented in Section V in some cases is so large as to importantly influence the picture of the reality provided by the various macroeconomic statistics. The main findings of the study may be summarised as follows:

- The rise in the household saving ratio seen in many countries in the 'seventies is largely of a spurious nature; the corrected figures on the household saving ratio presented above, in general show stability or a declining trend.

- The corrected financial deficits of the government sector and of the non-financial enterprises on the other hand are in most cases considerably lower than indicated by the conventional national accounts data.

- The size of the correction being very different from country to country, the ranking of countries according to criteria of economic performance (budget deficit, household saving ratio, etc.) depends strongly upon whether corrected or uncorrected figures are used as a basis for cross-country comparison.

The study on the whole suggests that budgetary policy in Italy and the United Kingdom in the 'seventies was much more restrictive than indicated by the uncorrected national accounts figures (although a decline in the budget surplus took place in the UK between 1970 and 1978). The corrected figures also suggest that the German budget, on average for the 'seventies, was in a weaker position than in the UK and Italy. In German - as well as in France - the corrections have relatively little impact on the position of the budget balance while the size of the Belgian budget balance is influenced as strongly as that of Italy and UK. The tendency towards a deterioration of the Belgian budget balance, however, is apparent also in the corrected series.

As far as the evaluation of macroeconomic policy is concerned the present study suggests that:

- more account should be taken of the relative sizes and growth of public debt and the net monetary positions of firms and households.

- longer-term projections of financial balances in real terms must take explicit account of the impact of inflation on the real value of public debt, monetary liabilities of enterprises and monetary assets of households.

- the budget balance excluding interest payments is an important indicator of the long-term financial position of the government and should be used explicitly in budgetary analysis (see Section III b for details).

- the question of budgetary-monetary policy mix can be usefully analysed with the help of the budget balance concepts proposed in Section III.

- the links between the nominal interest rate, the change in high-powered money and the rate of inflation should be made more explicit in the analysis of the problems of crowding-out, the role of nominal taxation and the longer-term trends in public expenditure.

As shown in Section V the net monetary position of the various sectors may vary considerably both over time and between countries. There are, thus, hardly any universally applicable norms for the level of net monetary assets of households or the net monetary liabilities of firms or of government. On the other hand, there is hardly any doubt that a correct evaluation of a given budget balance should take account of the size of existing public debt and of the distribution of its counterparts as between resident and non-resident creditors. It should also be recognised that government debt in a given country may have reached such high proportions that a reduction may be required - implying necessarily that the government budget must be in surplus for

a certain time. The present study shows that the inflation corrected budget balance is the appropriate concept to use in this case and that a reduction in the burden of public debt in proportion to GDP may well take place even if the conventionally measured budget balance shows a deficit. The UK is a case in point here: the government debt was brought down from 65% of GDP in 1970 to 45% in 1978 despite the fact that the conventionally measured government budget balance (DF1) was negative to the tune of more than 3% of GDP on average for the period.

The analysis in this study also suggests that estimates of the impact of budgetary and monetary policy measures cannot be made independently of the impact of possible changes in the rate of inflation. This is the case in particular, when economic policy is used actively to reduce the trend rate of inflation and to influence inflationary expectations in an economy. A move away from unrestricted inflation - with rapid expansion of high-powered money and currency depreciation is likely to lead to a temporary increase in the real rate of interest since the nominal rate of interest may be brought down only gradually as inflation expectations are reduced. If the public debt is large in proportion to GDP the burden of debt servicing may therefore increase in the short term entailing an increase in the apparent government borrowing requirement. As suggested in Section III b, it may in this case be more appropriate to base the judgement on the stance of budget policy on the state of the budget balance excluding interest payments since only this budget balance concept provides an unbiased estimate of the governments net claim on resources in the longer-run.

There would also seem to be a case for analysing questions of international policy coordination and, notably, the problem of defining the appropriate policy mix within the European Monetary System within the conceptual framework presented in this study. For several years it has been broadly assumed that a tightening of the Italian budgetary policy supported by a more stimulatory budgetary policy in Germany would help to strengthen the cohesion of the EMS. The present study suggests that budgetary policy in Italy, as measured by the inflation adjusted budget balance, is already extremely tight and that a more restrictive monetary policy would be more appropriate. In

Germany, on the other hand, there may be a case for adopting a somewhat more accommodative stance in monetary policy coupled with measures to reduce the budget deficit in the longer run.

Ultimately, the impact of budgetary and monetary policy should be assessed in a general macroeconomic framework taking account of the portfolio preferences of the private sector, the relative productivity of public and private fixed asset formation and the objectives with respect to employment, inflation and the balance of payments. Whether the stance of policy is appropriate or not in terms of wider objectives should, however, be assessed on the basis of unbiased data free of the measurement errors now included in the conventional national accounts. It is our hope that this study clears the ground somewhat for the rising number of statisticians and economists, who are conscious of these problems and prepared to undertake the tedious work required in order to ensure that the statistical data allow an unbiased evaluation of macroeconomic relationships under inflationary conditions.

A P P E N D I X

A. Derivation of the effects on the economy of an increase in d - the real deficit excluding interest payments per unit of output (see Section III - b)

We first establish the sign of the relationship between k and z_1 in equation (40). Dividing both sides of the production function in (30) by K and using its constant returns to scale property we obtain

$$\frac{1}{z_1} = F\left(1, \frac{1}{k}\right)$$

from which it follows by implicit differentiation that

$$v'(z_1) \equiv \frac{dk}{dz_1} = \frac{1}{F_L} \frac{Y}{L} > 0 \qquad (A\,1)$$

where F_L is the (positive) marginal productivity of labour. Let

$$f_k(v(z_1)) \equiv \omega(z_1) \qquad (A\,2)$$

Since the marginal productivity of capital is decreasing it follows from (A 1) and (A 2) that

$$\omega' \equiv \frac{df_k(\cdot)}{dz_1} < 0 \qquad (A\,3)$$

To evaluate the effects of an increase in d on the equilibrium of the economy we differentiate equation (39 b) and (41 a - c) totally with respect to d

$$\begin{bmatrix} 1 - \Phi_1\omega' & 0 & 0 & -\Phi_2 \\ -\Psi_1\omega' & 1 & 0 & -\Psi_2 \\ -\delta_1\omega'/a & 0 & 1 & -\delta_2/a \\ 0 & g-r & \theta & -z_2 \end{bmatrix} \begin{bmatrix} \frac{dz_1}{dd} \\ \frac{dz_2}{dd} \\ \frac{dz_3}{dd} \\ \frac{dr}{dd} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} \qquad (A\,4)$$

where Φ_i, ψ_i, δ_i, $i = 1, 2, 3$ designate respectively the partial derivatives of each of those functions with respect to its i ith argument. Solving the system of four linear equations in (A 4) by using Cramer's method we get

$$\frac{dz_1}{dd} = \frac{\Phi_2}{A} \qquad (a)$$

$$\frac{dz_2}{dd} = \frac{1}{A}\left[\Psi_2 (1 - \Phi_1 \omega') - \Psi_1 \omega' \Phi_2\right] \qquad (b) \qquad (A5)$$

$$\frac{dz_3}{dd} = \frac{1}{Aa}\left[\delta_2 (1 - \Phi_1 \omega') + \delta_1 \omega' \Phi_2\right] \qquad (c)$$

$$\frac{dr}{dd} = \frac{1}{A}(1 - \Phi_1 \omega') \qquad (d)$$

where

$$A \equiv (1 - \Phi_1 \omega')\left[\Psi_2 (g - r) + \theta \frac{\delta_2}{a} - z_2\right] + \Phi_2\left[\Psi_1 \omega' (g - r) + \theta \frac{\delta_1}{a} \omega'\right] \qquad (A6)$$

If it is given that $\frac{dz_2}{dd} > 0$ A must be positive since the term in brackets on the right-hand side of (A 5 b) is positive. With a positive A the assumption of gross substitutability together with positive effects of own rates and (A 3) imply

$$\frac{dz_1}{dd} < 0, \quad \frac{dz_3}{dd} < 0, \quad \frac{dr}{dd} > 0, \quad \frac{dk}{dd} < 0$$

and since the capital labour ratio decreases so does output per capita. The same assumptions together with (A 5 - b) and (A 5 - c) also imply that whatever the sign of A, dz_2/dd and dz_3/dd have opposite signs.

Equation (A 6) implies that a necessary, but not sufficient condition for A to be positive is $g - r > 0$.

B. Review of attempts to restore real accounting in various countries at the micro level (1)

As early as the beginning of the seventies, professional accountants identified the most pressing problems created by inflation for traditional accounting as being:

1) The calculation of depreciation of fixed assets and inventories on the basis of historical costs rather than on the basis of replacement costs.

2) The complete failure of conventional accounting procedures to take account of the change in the purchasing power of monetary assets and liabilities.

Our empirical work can be viewed as an attempt to remedy the second problem at the macro level.

The accounting reforms introduced to deal with some aspects of these and other problems are reviewed briefly in what follows;

In the UK an accounting reform (introduced in 1980 on an experimental basis for a three-year period) sets out the following adjustments to the profit calculated on the basis of historical costs:

(i) a provision for depreciation of fixed capital on the basis of replacement value;

(ii) a cost of sales adjustment (counting intermediary consumption at replacement cost rather than at historical costs);

(iii) a monetary working capital adjustment which extends the depreciation adjustment and the cost-of-sales adjustment to the monetary assets and liabilities and

(iv) a so-called gearing adjustment which quantifies the gains or losses to the shareholders which arises during periods of changing prices from the partial financing of the operating assets of the business by borrowing in fixed money terms.

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(1) This review is based on information supplied in the report by Hibbert (1982).

All four categories of accounting adjustments in the UK are based on the specific price indices for tangible assets or intermediary consumption of the company. The concept of general rate of inflation or general purchasing power does not enter into the picture and the perceived "price increases" may therefore be very different from one company to another.

In contrast to the UK reform, an accounting reform in the United States in 1979 introduced an explicit distinction between, on one side, the current cost-accounting and, on the other, the constant-dollar accounting. Adjustments of historic cost-accounts - equivalent to the depreciation-adjustment and the cost-of-sales adjustment in the UK - are made first in constant dollar and second in current cost terms. This leads to three estimates of profit or loss from accounting operations, firstly that measured on the basis of historic costs, secondly that adjusted for general inflation and thirdly that adjusted for changes in specific prices (i.e. measured on the basis of current costs). In contrast to the UK system the US current cost-accounting adjustments are only based on the price of intermediary purchases and does not include allowance for the change in the price of tangible assets.

The Australian system calculates depreciation on the basis of current costs like in the UK system but recommends the calculation of gains and losses on trade debt or credits on the basis of a basket of goods representing the input of the firm while gains and losses on monetary items other than trade debts or credits by reference to movements in a general price index.

A new set of accounting recommendations rather similar to the UK system was issued in Canada in 1979 while New Zealand has introduced a system with features analogous with the US "constant dollar" approach. It may be of interest to add that in the UK a more comprehensive "current purchasing power accounting" (which included adjustments for the change in purchasing power of financial assets)

was originally proposed by the Accountants Association. This proposal did not meet with approval by the authorities presumably because it was felt that the introduction of such a radical reform of accounting would create a conflict with the existing rules of taxation of interest payments.

The various attempts to find more satisfactory formula for company accounting thus do not seem to offer so far a satisfactory and universally applicable solution. In particular, there is a clear split between the US and New Zealand on one side - where the concept of constant purchasing power, based on a general price index, has been admitted - and UK and Canada, on the other side, applying accounting adjustments only on the basis of the specific price indices of the company concerned. This feature of the UK accounting standards has actually met with criticism on the part of managers and accountants who experience considerable practical problems searching for current prices for tangible assets purchased years ago and which, due to technological developments, may no longer have an exact equivalent in the market. Some accountants have, therefore, expressed preference for a simple global adjustment of accounts on the basis of a general price index while others have maintained that the profit estimates based on such a procedure might give a completely erroneous picture of the earnings of the company if prices of the specific inputs or equipments of this company have increased considerably faster or slower than the general price index (such as the consumer price index).

Comparing the issues in company accounting and in national accounting one finds both differences and similarities. In the national accounts depreciation of tangible assets and intermediate consumption is in principle measured at replacement cost. The problems created by historical cost-accounting on the company level are thus not encountered on the level of the national accounts. Like the traditional company accounts the national accounts, however, classify all interest earnings as current income and all interest payments as current expenditure of the various economic sectors without taking into consideration the fact that the real value of monetary assets and liabilities is eroded by inflation.

C. Demonstration that the corrections and the NA Nominal Income Flows are measured at the same current prices

Let A be the market value of a stock of monetary assets at the beginning of the current year. For FLMA this market value is equal to the face value and for LLMA it is equal to either the market value or the appropriately-estimated market value. Let y_τ and x_τ be respectively the momentary flows of real and nominal income at moment τ and let $\pi_{m\tau}$ be the rate of inflation at moment τ. We assume for simplicity and without loss of generality that the real income flow and the rate of inflation occur at a steady rate over the year. That is

$$y_\tau = y \qquad \pi_{m\tau} = \pi_m \qquad 0 \leqslant \tau \leqslant 1 \qquad (A7)$$

where $\tau = 0$ and $\tau = 1$ denote the beginning and the end of the year respectively. By convention real income is measured in constant prices of moment 0. That is

$$x_0 = y \qquad (A8)$$

Nominal income flow at moment τ is therefore given in moment τ's price level by

$$x_\tau = y\, e^{\pi_m \tau} \qquad 0 \leqslant \tau \leqslant 1 \qquad (A9)$$

Let B_τ be the nominal market value that the stock A has to have at moment τ in order to maintain the same real value it has at the beginning of the year. Then

$$B_\tau = A\, e^{\pi_m \tau} \qquad 0 \leqslant \tau \leqslant 1 \qquad (A10)$$

The nominal value, in terms of moment τ prices, of the depreciation in the real value of B_τ at moment τ is

$$\pi_m B_\tau = \pi_m A e^{\pi_m \tau} \qquad 0 \leqslant \tau \leqslant 1 \qquad (A11)$$

Hence it is measured in exactly the same prices as nominal income x_τ in equation (A 9). It follows that the expressions in (A 3) and (A 11) can be added or substracted and the resulting expression

$$x_\tau \pm \pi_m B_\tau = (y + \pi_m A) e^{\pi_m \tau} \qquad 0 \leqslant \tau \leqslant 1 \tag{A 12}$$

is also in moment τ's prices. Integrating (A 12) over the entire year we obtain the yearly corrected income flow

$$\int_0^1 (x_\tau \pm \pi_m B_\tau)\, d\tau = \int_0^1 y\, e^{\pi_m \tau}\, d\tau + \pi_m A \int_0^1 e^{\pi_m \tau}\, d\tau = \tag{A 13}$$
$$= \int_0^1 y e^{\pi_m \tau} d\tau + A\,(e^{\pi_m} - 1)$$

The first term on the extreme right-hand side of (A 13) is the yearly nominal income flow as measured in the NA. The second term is the market value of MA at the beginning of the year multiplied by

$$e^{\pi_m} - 1 \equiv \pi \tag{A 14}$$

which is the rate of inflation over the entire year. This establishes that the corrected yearly income flow defined on the left-hand side of (A 13) can be obtained by taking the yearly nominal income flow and adding or substracting the yearly rate of inflation multiplied by the stock of MA at the beginning of the year. The resulting expression is, as can be seen from the left-hand side of (A 13), equal to the corrected yearly income flow evaluated at the average price level for the year.

D. Summary of Hibbert's (1982) work

This study shows the net levels of assets, transactions and revaluations for (a) land and reproducible assets (b), equity and (c) non-equity financial assets (and liabilities) and provides estimates in both current and constant prices for the main sectors (households, non-financial enterprises, financial institutions, general government and the rest of the world). Financial assets are counted at market prices.

The study, which covers the 1970 - 79 period, reveals that real holding gains on tangible assets in some countries may be quite substantial. Large real gains through revaluations of owner-occupied dwellings are found to have accrued to households in all countries (figures for Canada only concern financial assets) in the 'seventies while the revaluation of other tangible assets have been much more modest except in the United States and France where non-financial enterprises have obtained large gains through revaluation of their fixed capital. As should be expected, the total net gains on financial assets for the nation are insignificant (since the gains and losses within a country tend to cancel each other) but as shown in Hibbert's Table 8 the total net revaluations of tangible assets are not insignificant in relation to total net savings. Moreover large net losses on equity have occurred in the United Kingdom and the United States.

The holding gains on tangible assets (mainly, but not only, dwellings) generally reflect the fact that the market prices of these assets have increased faster than the general "numéraire". While this could be due to many factors (such as restrictions on supply; demographic developments, etc...) a large part of this evolution is probably a reflection of the changes in the inflation expectation in the 'seventies coupled with the decline in real interest rates which accompanied the actual acceleration of inflation. Dwellings thus, in the middle of the decade, appeared as the ideal investment object in some countries - leading to a sharp rise in relative prices of this category of assets. With the increase in the real rate of interest in 1980 and 1981 the attractivity of dwellings as an investment object declined substantially and house prices slumped in many countries - but this is another story which is not revealed by the figures collected by Hibbert.

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