NBER WORKING PAPER SERIES

THE PROPER MEASUREMENT OF GOVERNMENT BUDGET DEFICITS: COMPREHENSIVE WEALTH ACCOUNTING OR PERMANENT INCOME ACCOUNTING FOR THE PUBLIC SECTOR: ITS IMPLICATIONS FOR POLICY EVALUATION AND DESIGN

Willem H. Buiter

Working Paper No. 1013

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge MA 02138

November 1982

NBER Working Paper #1013
November 1982

The Proper Measurement of Government Budget Deficits: Comprehensive Wealth Accounting or Permanent Income Accounting for the Public Sector: Its Implications for Policy Evaluation and Design

ABSTRACT

The paper studies budgetary, financial and monetary policy evaluation and design using a comprehensive wealth or permanent income accounting framework. A set of stylized balance sheets and permanent income accounts is constructed for the public, private and overseas sectors. These are then contrasted with the conventionally measured balance sheet and flow of funds accounts. This permits a new look at the issues of "crowding out" and the "eventual monetization of fiscal deficits."

The conventionally measured public sector financial surplus, even when evaluated at constant prices or as a proportion of GNP, presents a potentially very misleading picture of the change in the real net worth of the public sector. One reason is that capital gains and losses on outstanding stocks of marketable financial assets and liabilities are not included in the flow of funds. This includes changes in the real value of nominally denominated public sector debt due to inflation. A second reason is the omission of revaluations in non-marketable (and often merely implicit) assets and liabilities such as the future stream of tax receipts and the future stream of benefit payments.

The paper then proposes some general rules for the design of stabilization policy--policies to facilitate expenditure smoothing by avoiding or minimizing the incidence of capital market imperfections. Both national governments and international agencies should design fiscal, financial and budgetary policies so as to induce an evolution of the conventionally measured balance sheet and flow of funds accounts that permits private agents and national economies, respectively, to approximate the behavior that would be adopted if comprehensive wealth or permanent income were the only binding constraint on economic behavior. This can be achieved by keeping disposable income in line with permanent income and by ensuring an adequate share of disposable financial wealth in total wealth.

Professor Willem H. Buiter
Department of Economics
London School of Economics
Houghton Street
London, WC2A 2AE
England

(01) 405 7686

The Proper Measurement of Government Budget Deficits: Comprehensive Wealth Accounting or Permanent Income Accounting for the Public Sector: Its Implications for Policy Evaluation and Design*

Willem H Buiter,

London School of Economics
and NBER
September , 1982

I. Introduction

This paper studies budgetary, financial, and monetary policy evaluation and design using a comprehensive wealth and income accounting framework. The focus is on the public sector accounts, but inevitably some attention is paid to the private and overseas sectors. After constructing a stylized comprehensive balance sheet for the public sector and its "flow" counterpart--the change in real public sector net worth--they are compared with the conventionally measured balance sheet and flow of funds accounts.

---

*This paper was written while I was a visiting scholar in the Fiscal Affairs Department of the International Monetary Fund during August-September 1982. I would like to thank Vito Tanzi, Sheetal Chand, Andrew Feltenstein, Menachem Katz, Oystein Pettersen, and Arigapudi Premchand for helpful discussions. Comments made during a Fiscal Affairs Department seminar by Alan Tait, Morris Goldstein, George von Furstenberg, Mohsin Khan, and John Makin were most useful. I am indebted to Marcus Miller for unscrambling my thinking on this subject on numerous occasions. All views expressed are strictly my own.

This research is part of the NBER's Programs in International Studies and Financial Markets and Monetary Economics. The views expressed are those of the author and not necessarily those of the NBER, Inc.

The conventionally measured public sector balance sheet typically contains only marketable financial assets and liabilities. On the asset side it omits such items as the value of the stock of social overhead capital, the value of government-owned land and mineral rights, and the present value of future planned tax revenues. On the liability side it omits the present value of social insurance and other entitlement programs.

The conventionally measured public sector financial surplus, even when evaluated at constant prices, presents a potentially very misleading picture of the change in the real net worth of the public sector. One reason is that capital gains and losses on outstanding stocks of government assets and liabilities are not included in the flow of funds. These include capital gains or losses due to relative price changes (e.g., changes in the real value of mineral rights), changes in the real value of nominally denominated public sector debt due to inflation, and changes in the real value of foreign-currency-denominated assets and liabilities caused by exchange rate changes.

A second reason is that changes in tax and entitlement programs, in the future revenue base and in discount rates, etc., may significantly alter the planned or expected future streams of taxes and benefits and their present value. Capital gains and losses on such implicit, non-marketable assets and liabilities are part of the Hicks-Simon concept of permanent income but are excluded from the flow of funds accounts.

The differences between the conventionally measured and the comprehensive accounts can be very large. In inflationary periods large conventionally measured public sector deficits may be more than offset by

the inflation-induced reduction in the real value of the government's nominal liabilities. Changes in the conventionally measured current account deficit of the balance of payments may be offset or enhanced by changes in the value of external assets and liabilities associated with exchange rate changes. Changes in social security legislation may alter the future flows of benefits and contributions. With efficient, forward-looking financial markets such policy changes will not mearly alter future rates or return--when the financial implications of current legislation become visible and directly measurable, say through changes in the amount of public sector borrowing. They will have an effect on current financial asset prices and rates of return; larger anticipated future deficits may raise current interest rates.

After presenting the comprehensive and conventionally measured accounts for the public sector, the private sector, and the overseas sector, I propose some very general rules for policy design. I believe that these rules derive from a not unreasonable policy norm or objective and from rather minimal and uncontroversial assumptions about private sector behavior. To translate these general (and, indeed, perhaps rather vague) rules into concrete policies is a task that is well beyond the scope of this paper. A wealth of country-specific knowledge will be required in each case.

The essence of the argument is that in a first-best world, private agents, governments, and international organizations would decide on their spending, saving, lending, production, and portfolio allocation programs constrained only by comprehensive wealth or permanent income.

Single-period or other short-run "budget constraints" would not represent further effective or binding constraints on economic behavior. The perfect internal and external capital markets required to implement the first-best solution do not exist. Private agents are constrained by the illiquidity and nonmarketability of certain assets (e.g., pension rights, human capital, and expected future tax cuts). Dearth of suitable collateral often renders infeasible the borrowing required to spend in line with permanent income. These cash flow constraints, illiquidity, credit rationing, lack of collateral, the nonmarketability of certain assets and liabilities, and a host of other capital market imperfections force the actions of private agents and national governments to depart from the behavior that would be optimal if only comprehensive net worth or permanent income constraints had to be taken into account.

Flow of funds accounting on a cash or transactions basis and the analysis of balance sheets consisting only of marketable claims is useful precisely because it will help identify the conditions under which the behavior of economic agents is likely to be constrained by factors other than comprehensive net worth.

Within a national economy, conventional accounting helps to decide when and how the national authorities, through appropriate fiscal, financial, and monetary measures, can help private agents to avoid or overcome obstacles to spending and saving in line with permanent income (in the case of households) and impediments to production in pursuit of long-run profit or social net benefit (in the case of enterprises). Within the international economy it serves to identify the conditions

under which international organizations should extend or restrict credit to nation states to enable them to develop in line with their long-run potential. Financial evaluation exercises such as the IMF's financial programing should, therefore, start from two sets of accounts. The first contains the conventional cash-based flow of funds accounts, the SNA income expenditure accounts, and the conventional balance sheets of marketable assets and liabilities. The second set of accounts contains the comprehensive balance sheets or wealth accounts outlined in the paper and their "flow" counterparts describing the changes in real sectoral net worth over time and thus permanent income--the ultimate accrual-based accounts.

Both national governments and international agencies should design fiscal, financial, and monetary policies so as to induce an evolution of the conventionnally measured balance sheet and flow of funds accounts that permits private agents, respectively national economies, to approximate the behavior that would be adopted if comprehensive wealth or permanent income were the only binding constraint on economic behavior.

Conventional financial planning is, therefore, an essential input into optimal (or even merely sensible) policy design. Without a set of comprehensive wealth and permanent income accounts, however, financial analysis does not possess the minimal data base required for proper policy evaluation and design. Conversely, without the conventional accounts, analyses based just on the comprehensive wealth and permanent income accounts will fail to take into account many of the actually binding constraints on economic behavior.

"Stabilization policy" as viewed in this paper is potentially useful and effective even if goods and factor markets clear continuously. The existence of capital market imperfections that prevent private agents from spending in line with permanent private disposable income and nations from spending in line with national permanent income is necessary for there to be scope for stabilization policy--policy actions or rules designed to permit consumption smoothing over time by removing or neutralizing constraints on spending other than permanent income. Successful stabilization policy keeps disposable income in line with permanent income and ensures an adequate share of disposable financial wealth in comprehensive wealth. Another necessary condition for potentially desirable stabilization policy is that governments have access to capital markets on terms that are more favorable than those faced by private agents, or more generally that governments have financial options that are not available to private agents. Mutatis mutandis the same applies in an international setting for certain international agencies vis-à-vis national governments. The existence of Keynesian effective demand failures due to disequilibria in goods and factor markets would, of course, strengthen the case for stabilization policy.

This view of stabilization policy implies that it is the government's financing policies—changes in its tax-transfer-borrowing and money creation mix—that should be used rather than variations in its spending program on goods and services. The latter should aim to achieve the best feasible public-private consumption mix out of national permanent income.

II. A Stylized Set of Public Sector Accounts

Table 1 contains a stylized and simplified "comprehensive" balance sheet for the public sector. Many definitional problems are ignored: throughout this paper the terms "government" and "public sector" are used interchangeably. 1/ It is assumed that a very heterogenous set of assets and liabilities can somehow be expressed in common value terms. This in spite of the fact that some of the assets are not marketable (K^{SOC}) or, even if potentially marketable, may lack a current observable market price (K^{G}). Some assets and liabilities are neither marketable nor tangible and merely represent implicit, noncontractual (and reversible) political commitments (T and N).

Referring to T, N, and A^{M} as present discounted values of future streams of payments or receipts involves a rather cavalier use of certainty equivalence: the conditional mathematical expectations of the uncertain future revenues or outlays are discounted using "risk adjusted" discount rates. If, for example, future tax revenues are highly uncertain, T would be correspondingly small. The relevant horizon is, in principle, infinite.

For many purposes it is better not to try and reduce marketable and nonmarketable, implicit and explicit claims to a common balance sheet measure of value. Instead each of the items in the balance sheet would be modeled as having potentially distinct behavioral effects. The proper way of handing this will depend on the specifics of the model and application under consideration.

1/ See Boskin (1982).

Table 1. The Comprehensive Consolidated Public Sector Balance Sheet at Current (Market or Implicit) Prices

Assets		Liabilities	
$p_{K^{soc}} K^{soc}$:	Social overhead capital (nonmarketable)	B^H:	Net interest-bearing debt denominated in domestic currency, held by residents
$p_G K^G$:	Equity in public enterprises (partly potentially marketable)	B^F:	Net interest-bearing debt denominated in domestic currency, held by nonresidents
$p_R R^G$:	Land and mineral assets (marketable)	eB^{*H}:	Net interest-bearing debt denominated in foreign exchange, held by residents
eE^*:	Net foreign exchange reserves	eB^{*F}:	Net interest-bearing debt denominated in foreign exchange, held by nonresidents
T:	Present value of future tax program, including social security contributions, tariff revenue, etc. (implicit asset)	$\tilde{pB}^H$:	Net interest-bearing index-linked debt held by residents
pA^M:	Imputed net value of the government's cash monopoly	$\tilde{pB}^F$:	Net interest-bearing index-linked debt held by nonresidents
		H:	Stock of high powered money
		N:	Present value of social insurance and other entitlement programs (implicit liability)
		W^G:	Public sector net worth

For a first pass at the problem of comprehensive wealth and income accounting in the public sector, the heroic balance sheet of Table 1 does, however, have its uses.

Most of the items in the balance sheet are self-explanatory. Public sector overhead capital is assumed to yield an implicit rental $r^{soc} p_{K^{soc}} K^{soc}$ which corresponds to the item pG^{soc}, public sector consumption of social overhead capital services, on the debit side of the public sector current account. $p_G K^G$ is the balance sheet counterpart of the operating surplus of the public enterprise sector in the public sector current account. This may well be a negative item for some of the secular public enterprise loss makers, in which case it should be moved to the liability side of the balance sheet. The present value of current and capital grants is not entered separately; it can be viewed as subsumed under N or T. Net foreign exchange reserves E* are entered separately as an asset rather than netting them out against B^{*F} or $B^{*F} + \frac{B^F}{e} + \tilde{B}^F \frac{p}{e}$ For simplicity only nominal capital-certain bonds, and real capital-certain bonds are considered. 1/

The treatment of money in this exposition of the comprehensive wealth accounting framework is somewhat nonstandard. The reason for adopting this approach is that it represents the simplest way of introducing a nontrivial role for money. Specifically, it avoids the economy from becoming isomorphic to a barter economy when, in Section VI, we consolidate the accounts of the public and private sectors in our investigation of

---

1/ See Marcus Miller (1982).

debt neutrality: money as a social asset producing liquidity and convenience services does not disappear when private and public sector assets and liabilities are netted out. The usefulness of the comprehensive wealth accounting framework does not depend on the acceptability of this approach to modeling money.

Money has value to the private sector because it yields a flow of imputed, nonpecuniary liquidity and convenience services. Let ρ^M be the nonpecuniary rate of return on money. The value to the private sector of their money holdings is given by V^M in equation (1):

$$V^M(t) = \frac{1}{p(t)} \int_t^\infty H(t)\, \hat{\rho}^M(u,t) e^{-\int_t^u \hat{i}(s,t)\, ds}\, du \quad \underline{1/} \qquad (1)$$

Assuming that the pecuniary and nonpecuniary yields on money and bonds are equalized at the margin, we also have:

$$\rho^M = i = r + \frac{\hat{\dot{p}}}{p} \qquad (2)$$

Equations (1) and (2) imply that:

$$V^M = \frac{H}{P} \qquad (3)$$

Let Π^M be present discounted value of the expected future flow of profits to the government from operating the printing presses. Assuming that cash can be produced costlessly, this is given by:

1/ Or, equivalently, by:

$$V^M(t) = \int_t^\infty \frac{H(t)}{\hat{p}(u,t)}\, \hat{\rho}^M(u,t) e^{-\int_t^u \hat{r}(s,t)\, ds}\, du$$

For any variable x, $\hat{x}(s,t)$ is the value of x expected at time t to prevail at time s.

$$\Pi^M(t) = \frac{1}{p(t)} \int_t^\infty \dot{\hat{H}}(u,t) e^{-\int_t^u \hat{i}(s,t)ds} du \quad \underline{1/} \tag{4}$$

Integrating (4) by parts we get:

$$\Pi^M(T) = -\frac{H(t)}{p(t)} + A^M(t) \quad \underline{2/} \tag{4'}$$

where

$$A^M(t) = \frac{1}{p(t)} \int_t^\infty \hat{i}(u,t)\, \hat{H}(u,t) e^{-\int_t^u \hat{i}(s,t)ds} du \tag{5}$$

Thus $A^M(t)$, the net value of the government's cash monopoly, can be interpreted as the present discounted value of the interest income the central bank expects to earn at each future date on a portfolio of government bonds equal in value to the stock of high-powered money at that date.

The conventionally measured public sector balance sheet typically omits from Table 1 all nonmarketable and nonfinancial assets and liabilities, i.e., K^{soc}, K^G, R^G, T, N, and A^M.

The current and capital accounts of the public sector whose balance sheet is given in Table 1 are represented in Table 2. 3/ They are

---

1/ Or, equivalently,

$$\Pi^M(t) = \int_t^\infty \frac{\dot{\hat{H}}(u,t)}{\hat{p}(u,t)} e^{-\int_t^u \hat{r}(s,t)ds} du$$

2/ It is assumed that for any variable x, $\hat{x}(t_1, t_2) = x(t_1)$ for $t_1 \leq t_2$: the past and present are assumed known.

3/ See Ott and Yoo (1982).

Table 2. Public Sector Income and Expenditure and Capital Finance Accounts

(At current (market or implicit) prices)

Debit		Credit	
Current account			
$p(G^C+G^{soc})$	: Government consumption including imputed rental from social overhead capital	τ	: tax receipts (including social security contributions)
$\delta(p_{Ksoc}K^{soc}+p_GK^G)$	: capital consumption	$r^Gp_GK^G+r^Rp_RR^G$	: profits from public enterprises and ownership of natural resources
n	: transfer and benefit payments	ei^*E^*	: interest received
$i(B^H+B^F)+ei^*(B^{*H}+B^{*F})+rp(\hat{B}^H+\hat{B}^F)$	: interest paid	$r^{soc}p_{Ksoc}K^{soc}$	: imputed return from social overhead capital
S^G	: surplus on current account		
Capital account			
$p_{Ksoc}(\dot{K}^{soc}+\delta K^{soc})+p_G(\dot{K}^G+\delta K^G)$	: gross investment in structures and equipment	S^G	: surplus on current account
$-\left[\dot{B}^H+\dot{B}^F+e(\dot{B}^{*H}+\dot{B}^{*F}-\dot{E}^*)+p(\dot{\hat{B}}^H+\dot{\hat{B}}^F)+\dot{H}\right]$	: net financial investment	$\delta(p_{Ksoc}K^{soc}+p_GK^G)$	: capital consumption
$p_R\dot{R}^G$	: net purchases of existing assets		

stylized SNA accounts and have a number of significant shortcomings when used uncritically as a guide to the changes over time in the balance sheet--especially as regards the evolution of real public sector comprehensive net worth and its components.

For simplicity I have assumed that government consumption G^c and the imputed rental services from social overhead capital have the same price, p. 1/ A uniform depreciation rate δ for different types of capital is also imposed. Foreign exchange reserves are assumed to pay the same interest rate as other foreign-currency-denominated financial claims. All these assumptions are for illustrative purposes only.

The "public sector budget constraint" rediscovered by macroeconomic theorists in the early 1970s is obtained by consolidating the current and capital accounts of Table 2. Imputed income and consumption are netted out. Deflating by the general price level yields the conventionally measured public sector financial surplus (at constant prices) given in equation (6):

$$\frac{\tau}{n} - \frac{n}{p} - G^c - \frac{p_K^{soc}}{p}\delta K^{soc} - \frac{P_G}{p}\delta K^G - i\left(\frac{B^H + B^F}{p}\right)$$

$$- \frac{e}{p} i^*(B^{*H} + B^{*F} - E^*) - r(\tilde{B}^H + \tilde{B}^F) + r^G \frac{P_G}{p} K^G$$

$$+ r^R \frac{P_R}{p} R^G \equiv \frac{p_K^{soc}}{p}\dot{K}^{soc} + \frac{P_G}{p}\dot{K}^G + \frac{p_R}{p}\dot{R}^G - \frac{1}{p}(\dot{B}^H + \dot{B}^F)$$

$$- \frac{e}{p}(\dot{B}^{*H} + \dot{B}^{*F} - \dot{E}^*) - (\dot{\tilde{B}}^H + \dot{\tilde{B}}^F) - \frac{\dot{H}}{p} \qquad (6)$$

1/ Consumption of the imputed services from social overhead capital can be viewed as a transfer (in kind) from the public sector to the private sector rather than as an item of public sector consumption. Alternatively, the services from the stock of public sector overhead capital could be an input into private production.

Even this "real" surplus, however, is likely to be a poor indicator of the change in the real net worth of the public sector, as defined from the balance sheet in Table 1. This change in the real net worth of the government is given in equation (7):

$$\begin{aligned}\frac{d}{dt}\left(\frac{W^G}{p}\right) \equiv\ & \frac{P_K^{soc}}{p}\dot{K}^{soc} + \frac{P_G}{p}\dot{K}^G + \frac{P_R}{p}\dot{R}^G \\ & - \frac{1}{p}\left(\dot{B}^H + \dot{B}^F\right) - \frac{e}{p}\left(\dot{B}^{*H} + \dot{B}^{*F} - \dot{E}^*\right) \\ & - \left(\dot{\tilde{B}}^H + \dot{\tilde{B}}^F\right) - \frac{\dot{H}}{p} + \frac{1}{p}\left(\dot{T} - \dot{N}\right) + \dot{A}^M \\ & + \left(\frac{\dot{P}_K^{soc}}{P_K^{soc}} - \frac{\dot{p}}{p}\right)\frac{P_K^{soc}}{p}K^{soc} + \left(\frac{\dot{P}_G}{P_G} - \frac{\dot{p}}{p}\right)\frac{P_G}{p}K^G \\ & + \left(\frac{\dot{P}_R}{P_R} - \frac{\dot{p}}{p}\right)\frac{P_R}{p}R^G + \frac{\dot{p}}{p}\left(\frac{B^H + B^F + H}{p}\right) \\ & - \left(\frac{\dot{e}}{e} - \frac{\dot{p}}{p}\right)\frac{e}{p}\left(B^{*H} + B^{*F} - E^*\right) \\ & - \frac{\dot{p}}{p}\left(T - N\right) \text{ 1/}\end{aligned} \tag{7}$$

Comparing the right-hand sides of equations (6) and (7), we observe that the difference between the "real" or constant price surplus and the change in real net worth is due to capital gains and losses, Ω, and to changes in the value of the implicit assets and liabilities, Δ, where

$$\begin{aligned}\Omega = & \left(\frac{\dot{P}_K^{soc}}{P_K^{soc}} - \frac{\dot{p}}{p}\right)\frac{P_K^{soc}}{p}K^{soc} + \left(\frac{\dot{P}_G}{P_G} - \frac{\dot{p}}{p}\right)\frac{P_G}{p}K^G + \left(\frac{\dot{P}_R}{P_R} - \frac{\dot{p}}{p}\right)\frac{P_R}{p}R^G \\ & + \frac{\dot{p}}{p}\left(\frac{B^H + B^F + H}{p}\right) - \left(\frac{\dot{e}}{e} - \frac{\dot{p}}{p}\right)\frac{e}{p}\left(B^{*H} + B^{*F} - E^*\right) - \frac{\dot{p}}{p}\left(T - N\right)\end{aligned} \tag{8a}$$

and

$$\Delta = \frac{1}{p}\left(\dot{T} - \dot{N}\right) + \dot{A}^M \tag{8b}$$

1/ No behavioral significance should be attached to the specification of T and N in nominal terms.

As regards Ω, the statement that the change in wealth or net worth equals saving plus capital gains will not come as a surprise to anyone. The importance of accounting fully for capital gains and losses on existing government assets and liabilities in order to obtain a correct understanding of the short-run and long-run implications of past, present, and prospective budgetary, monetary, and financial policies has not, however, been universally appreciated.

Considerable interest attaches to behavior by an economic agent, sector, or group of sectors that leaves real comprehensive net worth unchanged. Such agents or sectors consume their permanent income and their behavior is (ex ante) permanently sustainable. For policy design, policies aimed at keeping total national (public plus private) consumption in line with national permanent income, i.e., policies focusing on the consolidated public and private sector comprehensive balance sheet accounts, are of special relevance. These are considered in Section VI. While there certainly exist valid reasons for optimal consumption to depart from permanent income, such divergences must necessarily be temporary, with overshooting and undershooting of the permanent income benchmark canceling in present value terms. Focusing on spending behavior consistent with constant real comprehensive net worth should, therefore, come naturally in policy evaluation and design. Note that equations (7), (8a), and (8b) represent ex post or realized measures only. For planning, including consumption planning, the ex ante measures are relevant. They are obtained by replacing actual changes in prices by anticipated changes in prices in equations (7) and (8a), and by substituting anticipated

changes in the value of implicit assets and liabilities for actual changes in equations (7) and (8b). In what follows, anticipated capital gains and losses replace the ex post measures whenever planned private or public sector behavior is discussed.

III. Amortization of Public Debt Through Inflation and Currency Appreciation

Consider first changes in the public sector balance sheet due to "pure" or general inflation. This is defined as a situation in which all money prices (including the prices of real capital assets) change at the same rate, i.e.,

$$\frac{\dot{p}_K^{soc}}{p_K^{soc}} = \frac{\dot{p}_G}{p_G} = \frac{\dot{p}_R}{p_R} = \frac{\dot{p}}{p}$$

For reasons of space we ignore capital gains or losses on the implicit assets and liabilities T and N due to inflation.

Inflation-induced changes in real public sector net worth Ω' are given by:

$$\Omega' = \frac{\dot{p}}{p}\left(\frac{B^H + B^F + H}{p}\right) + \left(\frac{\dot{p}}{p} - \frac{\dot{e}}{e}\right)\left(B^{*H} + B^{*F} - E^*\right)\frac{e}{p} \qquad (9a)$$

1. The closed economy

In a closed economy the last term on the right-hand side can be ignored and the reduction in the real value of the outstanding stock of nominally denominated government liabilities is given by Ω'. 1/

1/ Note that $B^F = 0$ here.

$$\Omega'' = \frac{\dot{p}}{p}\left(\frac{B^H + H}{p}\right) \tag{9b}$$

Proper wealth accountinng requires that the amortization of public debt through inflation should be put "below the line" in measuring the financing of the government's net "real" borrowing. 1/ Above the line, a higher rate of inflation will (if interest rates are free) swell the measured deficit as nominal interest rates rise with the rate of inflation. If the Fischer hypothesis holds and real interest rates are invariant with respect to the rate of inflation, the increased nominal interest payments associated with a higher rate of inflation will be matched exactly by the reduction in the real value of the government's stock of nominally denominated, interest-bearing debt, Ω''', defined by

$$\Omega''' = \frac{\dot{p}}{p}\frac{B^H}{p} \tag{9c}$$

Subtracting Ω''' from the conventionally measured deficit gives the deficit "at real interest rates"--what the conventionally measured deficit would have been had all interest-bearing debt been index-linked. In models that do not exhibit "pre-Ricardian' debt neutrality, changes in the real value of the stock of government interest-bearing debt are the major proximate determinant of "financial crowding out"--the displacement of private capital formation by government borrowing, holding constant the size and composition of the government's real spending program. The exact nature (degree, scope, and time pattern) of financial crowding out will, of course, be "model-specific". A number of simple examples will

---

1/ Clear statements of this proposition can be found in Siegel (1979) and in Taylor and Threadgold (1979). See also Buiter and Miller (1982) and Buiter (1982b).

be analyzed in a sequel to this paper. 1/ The central (and obvious) point is that ceteris paribus private agents (whose portfolio demands are for real stocks of assets if agents are free from money illusion) will absorb additional issues of nominal government bonds equal to the erosion in the real value of their existing holdings due to (anticipated) inflation, without requiring any increase in the real rate of interest. Such government borrowing, therefore, does not raise the degree to which the public sector competes with the private sector for real investible resources.

The ceteris paribus clause of the previous paragraph includes a given stock of real money balances. Additional monetary financing equal to the inflation tax on existing money balances $(\frac{\dot{p}}{p}\frac{H}{P})$ leaves real money balances unchanged. A conventionally measured deficit equal to Ω" financed by borrowing an amount $\frac{\dot{p}}{p}\frac{B^H}{P}$ and by money creation equal to $\frac{\dot{p}}{p}\frac{H}{P}$ is, therefore, consistent with constant real interest rates and a constant degree of aggregate financial crowding out pressure. 2/ Note that subtracting Ω" from the conventionally measured deficit yields a somewhat wider concept of the deficit at "real interest rates" since the real rate of return (ignoring nonpecuniary liquidity and convenience services) on high-powered money bearing a zero nominal interest rate is minus the the rate of inflation. 3/

The argument for public sector inflation accounting in the closed economy can be summarized succintly using a simplified version of equations

---

1/ See Buiter (1982c).

2/ It is assumed that borrowing and money creation per se do not affect determinants of the demand for public debt other than expected real rates of return.

3/ This is the ex post measure. The ex ante real yields are defined in terms of the expected rate of inflation.

(1) and (2). We ignore G^{soc}, K^{soc}, and R^G, assume that $P_G = p$ and define $G^I = \dot{K}^G$ (net investment by public sector enterprises) and $\tilde{\tau} = \frac{\tau - n}{p}$ (real taxes net of transfers and other benefits). If we assume in addition that $r = i - \frac{\dot{p}}{p}$, then the conventionally measured government budget constraint is given by:

$$\frac{\dot{M} + \dot{B}^H}{p} + \dot{\tilde{B}}^H \equiv G^c + G^I + \delta K^G - \tilde{\tau} + (r + \frac{\dot{p}}{p}) \frac{B^H}{p} + r\tilde{B}^H - r^G K^G \qquad (10)$$

The change in the real value of the stock of interest-bearing debt is given by:

$$\frac{d}{dt}(\frac{B^H}{p} + \tilde{B}^H) \equiv G^c + G^I + \delta K^G - \tilde{\tau} + r(\frac{B^H}{p} + \tilde{B}^H) - r^G K^G - \frac{\dot{H}}{p} \qquad (11)$$

The deficit measure relevant for aggregate financial crowding out pressure on private capital formation given in equation (11) will, of course, depend on the amount of monetary financing the authorities are permitting. Useful benchmarks are (a) monetary financing sufficient to keep the real money stock constant: $\frac{\dot{H}}{p} = \frac{\dot{p}}{p}\frac{H}{p}$; and (b) monetary financing consistent with a zero trend rate of inflation: $\frac{\dot{H}}{p} = \gamma \frac{H}{p}$ where γ is the natural rate of growth. 1/

Equation (11) answers the questions as to whether the fiscal stance (defined by G^c, G^I, and $\tilde{\tau}$) and the monetary target (defined by $\frac{\dot{H}}{p}$) imply aggregate financial crowding-out pressure ($\frac{d}{dt}(\frac{B^H}{p} + \tilde{B}^H) > 0$) or crowding in pressure ($\frac{d}{dt}(\frac{B^H}{p} + \tilde{B}^H) < 0$). This issue can be addressed in the short

---

1/ Money demand is assumed to be unit elastic in income and wealth.

run (for a single period), in the medium term (by applying (11) sequentially for as many periods as one is interested in) or in the steady state. Note that inflation-induced capital gains or losses on nonindexed bonds cancel the inflation premium in the nominal interest payments: in (11) all debt service is evaluated at real rates of interest. 1/

For aggregate crowding-out pressure on total national (private plus public sector) capital formation, a useful simple measure is (noting that $_{G}I = \dot{K}^{G}$):

$$\frac{d}{dt}\left(\frac{B^H}{p} + \tilde{B}^H - K^G\right) = G^C - \tilde{\tau} + r\left(\frac{B^H}{p} + \tilde{B}^H - K^G\right) + \left(r - \left(r^G - \delta\right)\right) K^G - \frac{\dot{H}}{p} \qquad (12)$$

The conventional deficit measure is further modified in (12) by subtracting out net investment by public sector enterprises. Interest payments on net nonmonetary liabilities ($B^H + B^H - K^G$) are evaluated at the real interest rate r. If the net rate of return on public enterprise capital ($r^G - \delta$) exceeds the opportunity cost of borrowing (r) the "corrected" deficit is further reduced. If the opposite prevails, the "corrected" deficit is larger by an amount $(r - (r^G - \delta))\, K^G$.

The decline in the real value of total public sector tangible net worth is given by:

$$\frac{d}{dt}\left(\frac{H + B^H}{p} + \tilde{B}^H - K^G\right) = G^C - \tilde{\tau} + r\left(\frac{B^H}{p} + \tilde{B}^H - K^G\right) + \left(r - \left(r^G - \delta\right)\right) K^G - \frac{\dot{p}}{p}\frac{H}{p} \qquad (13)$$

1/ The accounting framework says nothing about whether or not the real interest rate varies with the inflation rate.

This could be called the inflation-corrected government current account deficit. Debt service payments and receipts on all assets and liabilities (including money) are evaluated at real rates of return. 1/

Some idea of the magnitude of the overstatement of the government's true borrowing by the conventionally measured deficit under inflationary circumstances is provided by Table 3a for the United Kingdom and Table 3b for the United States.

In 1981 the public sector borrowing requirement in the United Kingdom was £10.6 billion and the public sector financial deficit £7.5 billion. The inflation correction in that year amounts to about £11 billion, using a variety of estimates. The inflation-corrected deficit was actually a surplus. If one notes that during 1981 the United Kingdom economy was also experiencing the worst recession since the 1930s, there can be no doubt that the inflation-corrected and cyclically adjusted (trend or permanent) deficit was actually a very sizeable surplus. It is a matter of some practical importance whether that constitutes wise countercyclical fiscal policy. The United States during the period 1979-81 also had an inflation-corrected balanced Federal budget. Any reasonable cyclical correction for

---

1/ For certain purposes, crowding-out pressure per unit of capacity output or crowding-out pressure per unit of efficiency labor is of interest (see, e.g. Sargent and Wallace (1981)). This would involve replacing (11) by:

$$\frac{d}{dt}\left(\frac{\tilde{B} + B^H p^{-1}}{Y}\right) = \frac{G^c + G^I + \delta K^G - \tilde{\tau}}{Y} + (r - \gamma)\left(\frac{B^H}{pY} + \frac{\tilde{B}^H}{Y}\right)$$

$$- \frac{r^{G_K} G}{Y} - \frac{\dot{H}}{pY}$$

Table 3a. Correcting the U.K. Public Sector Deficit for Inflation

Year	Public Sector Debt (MV) / GDP %	PSBR / £ Billion	PSBR / GDP %	PSFD / £ Billion	PSFD / GDP %	Inflation Correction (1) / £ Billion	Inflation Correction (2) / £ Billion	Inflation Correction (3) / £ Billion
1967	81	1.9	4.6	1.5	3.8	0.5	0.6	1.0
1968	77	1.3	3.0	0.9	2.0	1.4	2.0	1.2
1969	70	-0.4	-1.0	-0.5	-1.1	1.2	2.0	1.3
1970	67	0.0	0.0	-0.7	-1.3	2.1	2.7	1.4
1971	59	1.4	2.4	0.3	0.53	3.0	3.2	1.5
1972	58	2.1	3.2	1.5	2.4	3.3	3.2	1.7
1973	49	4.2	5.8	2.8	3.8	3.0	4.0	2.3
1974	43	6.4	7.7	4.7	5.7	7.0	9.3	3.3
1975	41	10.5	9.9	7.7	7.3	10.3	11.9	3.9
1976	43	9.1	7.3	8.3	6.6	7.5	7.4	5.0
1977	47	6.0	4.2	5.9	4.1	10.1	9.3	5.8
1978	44	8.4	5.1	8.1	4.9	6.2	6.4	6.5
1979	42	12.6	6.6	8.1	4.2	12.3	13.8	8.2
1980	36	12.2	5.4	9.7	4.3	9.6	12.1	10.5
1981	38	10.6	4.1	7.5	2.9	10.8	11.7	11.8

Source: Marcus Miller (1982).

MV: market value.
PSBR: public sector borrowing requirement.
PSFD: public sector financial deficit.
Inflation correction (1): annual rate of inflation x market value of public sector debt (mid-year).
Inflation correction (2): annual rate of inflation x nominal value of public sector debt.
Inflation correction (3): based on assumption of a 2 per cent long-run real interest rate.

Table 3b. U.S. Federal Deficits and Debt Since 1967

Year	Total Federal Budget and Off-budget Deficit Fiscal Year (1)	Par Value of Public Debt Securities Held by Private Investors End of Fiscal Year (2)	Par Value of Public Debt Securities Held by Private Investors End of Fiscal Year; 1967 Prices (3)	Inflation Correction (4)	Public Debt GNP Ratio (5)
	(in billions of U.S. dollars)				
1967	8.7	204.4	204.4	5.9	.26
1968	25.2	217.0	208.3	9.1	.25
1969	-3.2	214.0	194.9	11.6	.23
1970	2.8	217.2	186.8	12.8	.22
1971	23.0	228.9	188.7	9.8	.21
1972	23.4	243.6	194.4	8.0	.21
1973	14.9	258.9	194.5	16.1	.20
1974	6.1	255.6	173.1	28.1	.18
1975	53.2	303.2	188.1	27.6	.20
1976	73.7	376.4	220.8	21.8	.22
1977	53.6	438.6	241.7	28.5	.23
1978	59.2	488.3	249.9	37.6	.23
1979	40.2	523.4	240.8	59.1	.22
1980	73.8	589.2	238.7	79.5	.22
1981	78.9	665.4	244.3	69.2	.23

Source: Economic Report of the President; 1982.

Column (3) = Column (2) deflated by c.p.i.
Column (4) = Column (2) x proportional rate of change of c.p.i.

1981 produces a large inflation-corrected, cyclically adjusted surplus. High U.S. real interest rates in 1981 can only be explained by the fiscal stance if large anticipated future inflation-corrected cyclically adjusted deficits are postulated.

2. The open economy

In an open economy, governments can borrow and lend domestically or abroad. Their financial assets and liabilities can be denominated in foreign or domestic currency or be index-linked. Consider equation (9a). The real value of public sector debt denominated in domestic currency is reduced by domestic inflation whether this debt is owned by the private sector or the rest of the world. While ceteris paribus inflation also reduces the real value of foreign-currency-denominated financial claims, exchange rate depreciation increases it. If purchasing power parity holds ($\frac{\dot{p}}{p} - \frac{\dot{e}}{e} = \frac{\dot{p}^*}{p^*}$ and through choice of units, $ep^* = p$), equation (9a) becomes

$$\Omega' = \frac{\dot{p}}{p}\left(\frac{B^H + B^F + H}{p}\right) + \frac{\dot{p}^*}{p^*}\left(\frac{B^{*H} + B^{*F} - E^*}{p^*}\right) \qquad (9a')$$

With p.p.p. reductions in the real value of foreign-currency-denominated public sector debt can be calculated by multiplying the foreign rate of inflation into the real value of net foreign-currency-denominated liabilities.

Consider the following stylized representation of the position of a number of small, open developing countries that lack a significant domestic capital market. Government debt is largely placed abroad and tends to be denominated in foreign currency (typically U.S. dollars). In such countries $B^H = B^F = \tilde{B}^H = \tilde{B}^F = B^{*H} = 0$. The conventionally measured public sector deficit is: 1/

1/ We continue to make the further simplifying assumptions about the public sector accounts made earlier in this section of the paper.

$$\frac{\dot{H}}{p} + \frac{e}{p}(\dot{B^*F} - \dot{E^*}) = G^c + G^I + \delta K^G - \tau + \frac{e}{p} i^*(B^*F - E^*) - r^G K^G \quad (14)$$

If, in addition, only the government borrows overseas, $\frac{d}{dt}(B^*F - E^*)$ equals the current account deficit (in terms of foreign currency) of the balance of payments:

$$\frac{e}{p}(\dot{B^*F} - \dot{E^*}) = - X + \frac{e}{p} i^*(B^*F - E^*) \quad (15)$$

Here X denotes real net exports of goods and services (excluding debt service) plus net transfers and grants from abroad.

Compare the current account balances of two countries, identical in real terms but facing different rates of world inflation. If r* is the world world real rate of interest, $i^* = r^* + \frac{\dot{p^*}}{p^*}$, i.e.,

$$\frac{e}{p}(\dot{B^*F} - \dot{E^*}) = -X + \frac{e}{p}(r^* + \frac{\dot{p^*}}{p^*})(B^*F - E^*) \quad (15')$$

If the world real rate of interest is independent of the inflation rate and if p.p.p. prevails, the current account deficit of the country facing the higher rate of world inflation $(\frac{\dot{p^*}}{p^*})1$, will exceed that of the country facing the lower rate of world inflation $(\frac{\dot{p^*}}{p^*})2$ by an amount

$((\frac{\dot{p^*}}{p^*})1 - (\frac{\dot{p^*}}{p^*})2) e(\frac{B^*F - E^*}{p})$, equal to the difference in external debt service payments. This difference in current account balances should, however, have no real consequences since the higher debt service item above the line is matched below the line by the larger reduction in the real value of its external liabilities: higher world inflation means faster amortization

of external indebtedness. Thus $\frac{d}{dt}\left(\frac{e}{p}(B^*F - E^*)\right)$, the change in net real external liabilities, is the same in the two economies. The country facing the larger current account deficit owing to higher world inflation should be able to borrow to finance its higher external interest payments. 1/

What we have seen in recent years, of course, is an increase in world real interest rates (r^*). This does require adjustment rather than, or in addition to, merely financing, with the relative weights on adjustment versus financing depending on the extent to which the increase in world real interest rates is perceived as permanent rather than transitory. Also, to the extent that countries have borrowed long-term rather than short-term (or at variable interest rates), unanticipated changes in interest rates will result in (once and for all) real capital gains or losses on external debt. Finally, significant departures from p.p.p. have been the rule, especially since the breakdown of Bretton Woods. Thus, even with a given world real interest rate r^*, a country's real external indebtedness will increase whenever $\frac{\dot{p}^*}{p^*} - \left(\frac{\dot{p}}{p} - \frac{\dot{e}}{e}\right)$, the excess of the world rate of inflation over the domestic rate of inflation minus the percentage depreciation of the exchange rate, increases.

Many other kinds of open economies can be analyzed starting from the general framework of equations (6), (7), and (9a), but the general principles should be clear from the simple example just analyzed.

1/ For a discussion of these issues see Sachs (1981).

IV. Budgetary Policy and Monetary Growth: The Eventual Monetization of Deficits

If bond financing of deficits causes concern about crowding out of private capital formation and, in the open economy, about possible adverse consequences for external indebtedness, monetization of deficits is a source of concern because of its inflationary implications. We saw that it was necessary to correct the conventionally measured budget deficit for the effects of inflation and exchange rate appreciation on the real value of outstanding stocks of public sector financial assets and liabilities in order to assess (changes in) the extent to which the public sector competes for investible resources with the private and overseas sectors.

Similar adjustments are required to understand the monetary implications of the deficit, as will be shown in this section.

1. The closed economy

From the simplified government budget constraint in equation (10), we obtain the following expression for the proportional rate of growth of the nominal money stock. 1/

$$\frac{\dot{H}}{H} = V\left[\frac{G^C + G^I + \delta K^G - \tilde{\tau}}{Y} + \left(r + \frac{\dot{P}}{p}\right)\frac{B^H}{pY} + r\,\frac{\tilde{B}^H}{Y} - r^G\,\frac{K^G}{Y} - \frac{\dot{B}^H}{pY} - \frac{\dot{\tilde{B}}^H}{Y}\right] \tag{16}$$

$V \equiv \frac{pY}{H}$ is the income velocity of circulation of money. To evaluate the implications of the fiscal stance for monetary growth, we must specify paths both for public spending and taxation and for nonmoney financing.

1/ The money stock throughout this paper is the high-powered money stock. Adding a private banking sector will, in general, be required for practical applications but does not alter significantly the conceptual framework outlined here.

A particularly useful benchmark financing policy is one which keeps constant the real values of all government assets and liabilities (other than money) per unit of output. This would be a policy of constant crowding out pressure per unit of output. These constant liability- (or asset-) output ratios need not be the historically inherited ones. The exercise can be applied to evaluating the longer-run implications for monetary growth after the debt-output ratios have achieved some desired long-run (or even steady state) values. Given this rule, $\frac{G^I}{K^G} = \frac{\dot{\tilde{B}}^H}{\tilde{B}^H} = \gamma$ and $\frac{\dot{B}^H}{B^H} = \gamma + \frac{\dot{p}}{p}$. Equation (16) then becomes:

$$\frac{\dot{H}}{H} \equiv V\left[\frac{G^c - \tilde{\tau}}{Y} + (r - \gamma)\left[\frac{B^H}{pY} + \frac{\tilde{B}^H}{Y} - \frac{K^G}{Y}\right] + (r - (r^G - \delta))\frac{K^G}{Y}\right] \quad (17)$$

Defining the longer-run fiscal stance by given constant values of $\frac{B^H}{pY}$, $\frac{\tilde{B}^H}{Y}$, and $\frac{K^G}{Y}$ and by given, but not necessarily constant, paths of $\frac{G^c}{Y}$ and $\frac{\tilde{\tau}}{Y}$, we can see from (17) that longer-run monetary growth is governed by a deficit concept that differs from the conventionally measured deficit in a number of ways. First, the reduction in the real value of the stock of nominal government bonds due to inflation is subtracted from the conventional measure. Second, in a growing economy the real stocks of government assets and liabilities can grow at the natural rate γ while leaving the asset-output or debt-output ratios constant. The net debt service term

in (17), therefore, involves the real, growth-adjusted interest rate $r - \gamma$. Under inflationary conditions this can be significantly less than $i = r + \frac{\dot{p}}{p}$, the nominal interest rate. Note that in order to infer the long-term implications for monetary growth (and thus for inflation) of the fiscal stance, an inflation correction is applied only to the interest-bearing component of the government's nominal liabilities. The conventionally measured deficit should not also be reduced by the erosion of the real value of the nominal stock of high-powered money balances, $\frac{\dot{p}}{p}\frac{H}{p}$. The reason is that constancy of the real value of all (monetary and nonmonetary) government debt per unit of output is consistent with any deficit and any rate of inflation.

Large conventionally measured (even if cyclically adjusted) deficits that correspond to small inflation-corrected deficits (or even surpluses) 1/ reflect current high inflation. They do not indicate the inevitability of high crowding out pressure or high rates of monetary growth in the future. Even without correcting for real growth, an inflation-corrected (trend) surplus means that (a) even with zero money financing, there would be (aggregate) crowding in and (b) with a bond-financing policy of zero (aggregate) crowding in, there would be negative monetary base growth.

Equation (17) by itself does not permit one to draw conclusions about the effects of say, changes in fiscal stance on monetary growth. Positive economic models are required to incorporate the effect of any parameter changes on endogenous variables such as velocity, V, real rates

---

1/ That is, deficits corrected for the reduction due to inflation in the real value of the stock of nominal government bonds.

of interest, r and r^G, and even the natural rate of growth γ. Such analysis is simplest in very classical monetarist models such as Sargent and Wallace's (1981) in which velocity, the real interest rate, and the natural rate of growth are constants, but (17) can be incorporated in models of any hue. (See also Buiter (1982a and 1982b).)

2. The open economy

From the simplified open economy budget constraint we obtain the expression for the percentage growth rate of the nominal money stock given in equation (18):

$$\frac{\dot{H}}{H} = V[\frac{G^c + \delta K^G - \tilde{\tau}}{Y} + (r + \frac{\dot{P}^e}{p}) (\frac{B^H + B^F}{pY}) + r (\frac{\tilde{B}^H + \tilde{B}^F}{Y})$$

$$+ \frac{i^* e}{pY} (B^{*H} + B^{*F} - E^*) - r^G \frac{K^G}{Y} + \frac{\dot{K}^G}{Y} - \frac{1}{p} (\frac{\dot{B}^H + \dot{B}^F}{Y}) - (\frac{\dot{\tilde{B}}^H + \dot{\tilde{B}}^F}{Y})$$

$$- \frac{e}{p} (\frac{\dot{B}^{*H} + \dot{B}^{*F} - \dot{E}^*}{Y})] \qquad (18)$$

To evaluate the longer-run monetary implications of the fiscal stance, we again assume that all stock-flow ratios on the right-hand side of (18) are kept constant. Equation (18) then reduces to:

$$\frac{\dot{H}}{H} = V[\frac{G^c - \tilde{\tau}}{Y} + (r - \gamma) (\frac{B^H + B^F}{pY} + \frac{\tilde{B}^H + \tilde{B}^F}{Y} - \frac{K^G}{Y})$$

$$+ (i^* - (\frac{\dot{P}}{p} - \frac{\dot{e}}{e}) - \gamma) (\frac{B^{*H} + B^{*F} - E^*}{pY})e + (r - (r^G - \delta)) \frac{K^G}{Y}] \qquad (19)$$

With p.p.p. this simplifies to:

$$\frac{\dot{H}}{H} = V[\frac{G^c - \tilde{T}}{Y} + (r - \gamma)\ (\frac{B^H + B^F}{pY} + \frac{\tilde{B}^H + \tilde{B}^F}{Y} - \frac{K^G}{Y})$$

$$+ (r^* - \gamma)\ (\frac{B^{*H} + B^{*F} - E^*}{p^*Y}) + (r - (r^G - \delta))\ \frac{K^G}{Y}] \qquad (19')$$

The evaluation of the long-term monetization implied by the fiscal stance requires the consideration of a deficit measure which has nominal debt service payments "corrected" for the effects of domestic inflation, exchange rate appreciation, and real growth.

In any particular period the economy may well be far removed from the long-run trend captured in equations (17) and (19) or (19'). Actual monetary growth in the short run will be given by equations (16) or (18). If current inflation is a function only of current monetary growth, as would, for example, be the case if velocity were constant, the price level were perfectly flexible, and output grew at its exogenously given trend rate γ, then $\frac{\dot{p}}{p} = \frac{\dot{H}}{H} - \gamma$. Authorities concerned with inflation in the short run may not be much comforted by the knowledge that the long-run rate of inflation implied by their fiscal stance is low, if current monetary growth and inflation are high. If, as seems more likely, current inflation is a function of current and past monetary growth and a fortiori if current inflation depends also on anticipated future monetary growth (as it does in models with forward-looking rational expectations) then the long-run monetary growth expressions in (17), (19), and (19') become the relevant ones even for short- and medium-term policy.

V. The Role of Implicit Assets and Liabilities

On the asset side of the public sector balance sheet we included T, the present value of future planned or anticipated tax revenues and A^M, the imputed value of the government's cash monopoly. On the liability side was N, the present value of future transfers and benefits under various entitlement programs. In this section I shall consider how the value of these implicit assets and liabilities changes over time. I shall focus on N. The treatment of T, A^M, and (in Section VI) of private sector human wealth is analytically identical. N is defined in equation (20): 1/

$$N(t) \equiv \int_t^{\infty} e^{-\int_t^u \hat{i}(s,\, t)ds} \hat{n}(u,\, t)du \tag{20}$$

The change in the present discounted value of expected future benefits is given by:

$$\frac{d}{dt} N(t) = i(t)\, N(t) - n(t) + \int_t^{\infty} e^{-\int_t^u \hat{i}(s,\, t)ds} \left[\frac{\partial}{\partial t} \hat{n}(u,\, t) - \hat{n}(u,t) \int_t^u \frac{\partial}{\partial t} \hat{i}(s,\, t)ds\right] du \tag{21}$$

The first two terms on the right-hand side of (21) show how the present value of future benefits changes if all expectations concerning the future flow of benefits and future interest rates remain the same. The last term shows the effect of changes (at time t) in expectations concerning future benefits ($\frac{\partial}{\partial t} \hat{n}(u,\, t)$ and future interest rates

---

1/ The appropriate discount rate may include a risk premium.

$(\frac{\partial}{\partial t}\hat{i}(s, t)_{)}$. As expected, upward revisions in future benefit entitlements raise N while higher future expected interest rates lower it.

The only item on the right-hand side of (21) that appears in the cash-based public sector deficit or flow of funds accounts is n(t), current benefit payments. i(t)N(t) does not appear because future entitlements are not a marketable interest-bearing liability of the authorities. Changes in planned or expected future benefit entitlements will only appear in the accounts if and when they actually become payable in the future. Yet such "revaluations" of N are of considerably policy interest. Even if financial markets are not "forward-looking," i.e., even if government borrowing affects market rates of return only when it actually occurs, increases in N unmatched by increases in T (or by cuts in other spending programs) imply increased future borrowing or money issues and thus store up trouble for the future. Financial markets do, furthermore, appear to be linked intertemporally (as formalized, e.g., by models of efficient asset market equilibrium incorporating forward-looking rational expectations). A larger anticipated future borrowing requirement will, therefore, affect asset prices and rates of return today. An unanticipated increase in future expected (inflation-corrected) deficits will crowd out private spending today. The intangible items in the public sector balance sheet must be taken into account.

VI. The Public Sector Accounts and Private Behavior

1. The private and overseas sectors' accounts

Comprehensive balance sheets analogous to the public sector balance sheet of Table 1 are drawn up for the private sector and the overseas sector in Tables 4 and 5, respectively. For reasons of space, the private sector balance sheet consolidates the household sector, the corporate sector, and the private financial sector. For practical applications, further sectoral disaggregation will often be required. The balance sheets require little further explanation. Consumer durables and private residential housing can be viewed as included in K^p, and their imputed service flows as subsumed under private income and consumption in the budget connstraint.

For simplicity it is assumed that all claims on or debts to the rest of the world take the form of interest-bearing financial claims. Direct foreign ownership of domestic real capital or of domestic resources is not considered but could be added without difficulty. Human wealth, L, the present discounted value of future expected labor income, is a (nonmarketable) asset in the household balance sheet. The total national stock of land and mineral rights is assumed to be given by $\bar{R}$. 1/

1/ If Table 4 represents the balance sheet of those private agents currently alive, the horizons involved in N, T, and L would be finite if operative intergenerational bequest motives are absent. N and T in the private balance sheet would, therefore, be smaller than the corresponding items in the public sector balance sheet, even if public sector and private sector discount rates were identical. If there are operative intergenerational bequest motives, or if the private sector is viewed abstractly as containing both current and future generations, an infinite horizong for T, N, and L in Table 4 is appropriate. Even with common horizons, different discount rates as between the public and private sectors could lead to changes in private net worth resulting from changes in the public sector balance sheet that leave public sector net worth unchanged. These issues are discussed further in Section VI.2.

Table 4. Private Sector Balance Sheet

(At current prices)

Assets			Liabilities		
B^H	:	net interest-bearing government debt denominated in domestic currency held by residents	T	:	present value of future taxes
eB^{*H}	:	net interest-bearing government debt denominated in foreign currency held by residents	W^P	:	private sector net worth
$p\tilde{B}^H$	:	net interest-bearing index-linked government debt held by residents			
H	:	stock of high-powered money			
N	:	present value of social insurance and other entitlement programmes			
F^H	:	net interest-bearing claims on the foreign sector denominated in domestic currency			
eF^{*H}	:	net interest-bearing claims on the foreign sector denominated in foreign currency			
$p_{K^P}K^P$	:	value of claims on real reproducible capital (including inventories)			
$p_R(R-R^G)$	:	land and mineral assets			
L	:	present value of future expected labor income			

Table 5. Overseas Sector Balance Sheet

(At current prices)

Assets			Liabilities		
$_{B}F$	:	overseas holdings of nominal domestic-currency-denominated government bonds	eE^{*}	:	net foreign exchange reserves of the government
eB^{*F}	:	overseas holdings of foreign-currency-denominated government bonds	$_{F}H$	:	net interest-bearing debt to the domestic private sector denominated in domestic currency
$p\tilde{B}^{F}$	:	overseas holdings of index-linked government debt	eF^{*H}	:	net interest-bearing debt to the domestic private sector denominated in foreign currency
			W^{F}	:	overseas sector net worth

The conventionally measured private sector financial surplus (at constant prices) and the change in real private net worth are given in equations (22) and (23), respectively:

$$\frac{\ell}{p} + r^P \frac{P_{K^P}}{p} K^P + r^R \frac{P_R}{p} R^P + (r + \frac{\dot{p}}{p}) (\frac{B^H}{p} + \frac{F^H}{p}) + \frac{ei^*}{p} (B^{*H} + F^{*H})$$

$$+ r\tilde{B}^H + \frac{n}{p} - \frac{\tau}{p} - C - \delta K^P \equiv (\frac{\dot{B}^H + \dot{F}^H}{p}) + \dot{\tilde{B}}^H + \frac{e}{p} (\dot{B}^{*H} + \dot{F}^{*H}) + \frac{\dot{H}}{p}$$

$$+ \frac{P_{K^P}}{p} \dot{K}^P - \frac{P_R}{p} \dot{R}^G \qquad (22)$$

$$\frac{d}{dt} (\frac{W^P}{p}) \equiv (\frac{\dot{B}^H + \dot{F}^H}{p}) + \dot{\tilde{B}}^H + \frac{e}{p} (\dot{B}^{*H} + \dot{F}^{*H}) + \frac{\dot{H}}{p} + \frac{P_{K^P}}{p} \dot{K}^P$$

$$- \frac{P_R}{p} \dot{R}^G + \frac{1}{p} (\dot{L} + \dot{N} - \dot{T}) + (\frac{\dot{P}_{K^P}}{P_{K^P}} - \frac{\dot{p}}{p}) K^P$$

$$+ (\frac{\dot{P}_R}{P_R} - \frac{\dot{p}}{p}) (\bar{R} - R^G) - \frac{\dot{p}}{p} (\frac{B^H + F^H + H}{p})$$

$$+ (\frac{\dot{e}}{e} - \frac{\dot{p}}{p}) \frac{e}{p} (B^{*H} + F^{*H}) - \frac{\dot{p}}{p} (L + N - T) \qquad (23)$$

The conventionally measured overseas sector financial surplus (at constant prices) and the change in the real net worth of the overseas sector are given in equations (24) and (25), respectively:

$$-X + \frac{e}{p} i^*(B^{*F} - F^{*H} - E^*) + (r + \frac{\dot{p}}{p}) (\frac{B^F - F^H}{p}) + r\tilde{B}^F$$

$$\equiv \frac{e}{p} (\dot{B}^{*F} - \dot{F}^{*H} - \dot{E}^*) + (\frac{\dot{B}^F - \dot{F}^H}{p}) + \dot{\tilde{B}}^F \qquad (24)$$

$$\frac{d}{dt}\left(\frac{W^F}{p}\right) \equiv \frac{e}{p}\left(\dot{B}^{*F} - \dot{F}^{*H} - \dot{E}^{*}\right) + \left(\frac{\dot{B}^F - \dot{F}^H}{p}\right) + \tilde{\dot{B}}^F - \frac{\dot{p}}{p}\left(\frac{B^F - F^H}{p}\right)$$

$$+ \left(\frac{\dot{e}}{p} - \frac{\dot{p}}{p}\right)\frac{e}{p}\left(B^{*F} - F^{*H} - E^{*}\right) \qquad (25)$$

These flow of funds and change in real net worth equations require little explanation. In the case of the private sector, the difference between the financial surplus (at constant prices) and the change in real net worth reflects capital gains and losses on existing marketable assets and liabilities (including capital gains and losses due to inflation and exchange rate changes) and changes in the value of the intangible and nonmarketable items L, N, and T. On the left-hand side of equation (22) we have omitted, because only cash transactions are included, the implicit liquidity and convenience yield on money balances, $\rho^M \frac{H}{p} = i \frac{H}{p}$, as an item of private consumption and of private income.

2. The positive irrelevance and normative relevance of debt neutrality

The simplest theory of the interaction of the private and public sectors is based on the so-called (pre-) Ricardian debt-neutrality hypothesis (see Barro (1974), Carmichael (1979), Buiter (1980), Buiter and Tobin (1979), and Tobin and Buiter (1980)). This hypothesis holds that, given the level and composition of the public sector's real spending program on goods and services, private sector behavior will be invariant with respect to changes in the taxation-borrowing mix that finances this spending. Most of the formal models dealing with this issue concern closed barter economies and the formal invariance propositions tend to be stated in terms of borrowing versus taxing without explicit consideration

of monetary financing. The informal lore on the subject does, however, assert the irrelevance for real outcomes of the way in which governments finance their spending, for all three financing modes. The argument underlying this Modigliani-Miller theorem for the public sector vis-à-vis the private sector runs as follows. Spending must be financed (in a closed economy) by taxation, borrowing, or printing money. Borrowing is merely deferred taxation. A switch between taxation and borrowing should, therefore, not affect the permanent income and consumption behavior of rational, well-informed private agents. Monetary financing implies the imposition of an inflation tax which (under suitably restrictive conditions) has the same effect on permanent income as explicit taxes. 1/

With debt neutrality, private sector spending behavior, for a given program of public spending on good and services, is constrained only by the consolidated national balance sheet shown in Table 6. The distribution of the ownership of the nation's resources between the public and private sectors is irrelevant. The national flow of funds account (including nonmarketable imputed income and consumption streams) is given in equation (26):

1/ The Modigliani-Miller theorem for money financing has been established formally for models in which money serves as a store of value only. Such "money" has only the name in common with what economists have always meant by money, that is, a means of payment or medium of exchange. See Wallace (1981).

Table 6. Consolidated Public and Private Sector Balance Sheet

Assets	Liabilities
$p_{Ksoc}\ K^{soc}$ $p_G\ K^G$ $p_{Kp}\ K^p$ $p_R\ \bar{R}$	$W^p + W^G$
$e(E^* + F^{*H} - B^{*F})$ $+ F^H - B^F - p\tilde{B}^F$	
L pA^M	

$$\frac{1}{p}\{\ell + r^{soc}p_{K^{soc}}K^{soc} + r^{G}p_{G}K^{G} + r^{p}p_{K^{p}}K^{p} + r^{R}p_{R}\bar{R} + i^{*}e(E^{*} + F^{*H} - B^{*F})$$

$$+ i(F^{H} - B^{F}) - rp\tilde{B}^{F} + i\,H\} - \{G^{c} + G^{soc} + C$$

$$+ \frac{\delta}{p}(p_{K^{soc}}K^{soc} + p_{G}K^{G} + p_{Kp}K^{p}) + \rho^{M}\frac{H}{p}\} \equiv \frac{1}{p}\{p_{K^{soc}}\dot{K}^{soc}$$

$$+ p_{G}\dot{K}^{G} + p_{K^{p}}\dot{K}^{p} + e\,(\dot{E}^{*} + \dot{F}^{*H} - \dot{B}^{*F}) + \dot{F}^{H} - \dot{B}^{F} - p\dot{\tilde{B}}^{F}\} \equiv \frac{S}{p} \qquad (26)$$

The first bracketed term on the left-hand side of equation (26) contains current income, including the imputed return from the government's cash monopoly $i\frac{H}{p}$. This item is matched in the second bracketed term, containing current consumption, by $\rho^{M}\frac{H}{p}$, the imputed value of the nonpecuniary services of money consumed by the private sector. Those unhappy with our treatment of money can omit both items. The change in real national comprehensive net worth is given by:

$$\frac{d}{dt}\left(\frac{W}{p}\right) \equiv \frac{d}{dt}\left(\frac{W^{p} + W^{G}}{p}\right) \equiv \frac{S}{p} + \left(\frac{\dot{p}_{K^{soc}}}{p_{K^{soc}}} - \frac{\dot{p}}{p}\right)\frac{p_{K^{soc}}K^{soc}}{p} + \left(\frac{\dot{p}_{G}}{p_{G}} - \frac{\dot{p}}{p}\right)\frac{p_{G}}{p}K^{G}$$

$$+ \left(\frac{\dot{p}_{K^{p}}}{p_{K^{p}}} - \frac{\dot{p}}{p}\right)\frac{p_{K^{p}}}{p}K^{p} + \left(\frac{p_{R}}{p_{R}} - \frac{\dot{p}}{p}\right)\frac{p_{R}}{p}\bar{R} + \left(\frac{\dot{e}}{e} - \frac{\dot{p}}{p}\right)\frac{e}{p}(E^{*} + F^{*H} - B^{*F})$$

$$-\frac{\dot{p}}{p}\{F^{H} - B^{F}\} + (\dot{L}/p) + \dot{A}^{M} \qquad (27)$$

The change in real net worth equals saving, $\underset{p}{S}$, plus capital gains on marketable assets plus changes in the imputed or implicit value of non-marketable items of wealth. A program of total national consumption in line with permanent national income means choosing the value of the second bracketed terms in (26) such that the expected value of $\frac{d}{dt}(\underset{p}{W}) = 0$. Such a consumption program is ex ante indefinitely sustainable and serves as a useful benchmark for consumption planning in this debt-neutral economy.

Debt neutrality is bad positive economics. It requires private agents to be infinite-lived or to have operative intergenerational bequest and child-to-parent gift motives in every generation. Perfect capital markets are another necessary condition: future labor income is a source of current spending power on a par with current disposable income and current holdings of government debt. 1/

The economic behavior that would be generated under debt neutrality is, however, a useful guide to what policy should try to achieve in a world in which a variety of capital market imperfections prevent the "unaided" private sector from acting according to permanent income principles.

1/ Debt neutrality, i.e., invariance of the solution trajectories of real economic variables under changes in the borrowing-taxation mix of the government also requires the taxes to be lump-sum. With nonlump-sum (distortionary) taxes, transfers and subsidies, public sector claims on the private sector and private sector claims on the public sector still are netted out in the balance sheet. Real behavior will be altered when the borrowing-taxation mix changes because the familiar allocative effects of nonlump-sum taxes, etc., will alter equilibrium prices and rates of return.

It is, for example, well-known that, in the absence of operative private intergenerational transfer motives, changes in the borrowing-taxation mix can redistribute the burden of financing a given government spending programme between generations, even without the existence of capital market imperfections. If government is motivated by a concern for the utility (i.e., the lifetime consumption patterns) of future generations as well as of the current generation, it can use the budgetary and financial mechanism to induce the current generation to act as if it were constrained by permanent private sector income rather than merely by the present value of its own lifetime resources.

The endowments listed on the asset side of Table 6, the nation's technology (broadly defined) and the international trading and lending or borrowing conditions it faces, represent the unavoidable constraints on the nation's intertemporal transformation of resources. 1/ The purpose of financing policy, i.e., the choice of the tax, transfer, borrowing, and money creation mix for a given real public spending programme on

---

1/ While it might, for example, be possible for an individual to consume today by borrowing against the present value of future labor income, a closed economic system cannot effect intertemporal shifts of future labor endowments. In an ideal market economy these and other technological constraints will be reflected in the sequence of demands and supplies over time and thus in equilibrium prices (including the asset prices entering the balance sheets) at each point in time. In an ideal planned economy, material balances programming and the use of shadow prices would ensure the same outcomes.

Consider, e.g., a simple two-period economy. The intertemporal consumption possibility frontier trading off c_1, consumption in period 1, for c_2, consumption in period, 2, is given by AA in Figure A. It is defined by the initial endowment of capital, K_1, the labor endowments in periods 1 and 2 (L_1 and L_2), the well-behaved production functions in the two periods $f^1(K_1,L_1)$ and $f^2(K_2,L_2)$ and the constraint:

$o \leq c_1 \leq f^1 + K_1$, $o \leq c_2 \leq f^2 + K^2$, $c_1 = f^1(K_1,L_1) + K_1 - K_2$.

goods and services, should be to avoid additional constraints--cash flow shortfalls, inadequate liquidity, insufficient collateral, nonmarketability

1/ (Continnued from p. 43.)

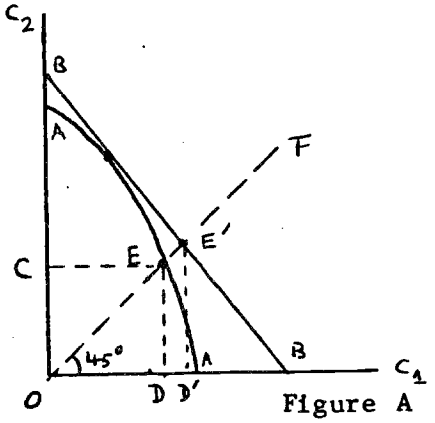

Figure A

The permanent income at his closed system is given by OD = OC, determined by the intersection of the consumption possibility frontier with the 45° line OF. The opportunity for international lending and borrowing at a rate r would raise the permanent income of this system unless the slope of the international capital market constraint BB (given by -(1+r)) equals the slope of the closed economy locus at E. For the figure we show how a low external interest rate raises permanent income to OD'. Figure B shows when a closed economy should not consume its permanent income in each period. Very favorable intertemporal transformation possibilities (Figures B1 and B2) suggest consuming in excess of permanent income in period 2. The opposite applies in Figures B3 and B4. It is still the comprehensive balance sheet that matters for consumption, but constant net worth is unlikely to be optimal. Even with international lending and borrowing, the presence of nontraded goods whose production can only be augmented slowly and at considerable cost, can make a programme of consumptioon equal to permanent income infeasible or suboptimal. (I am indebted to Morris Goldstein for this observation.)

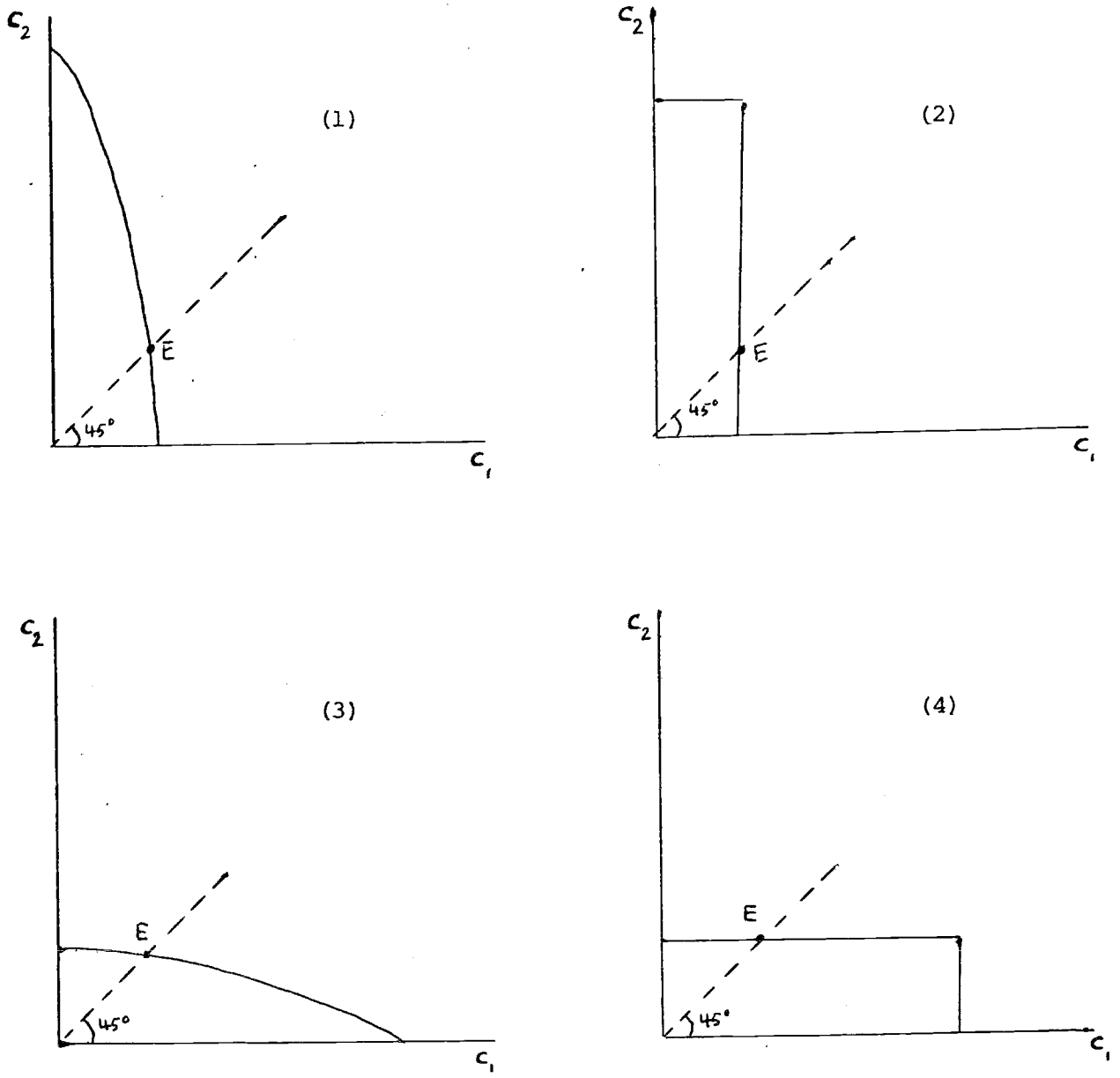

FIGURE B

of assets, credit rationing, etc.--becoming binding or, failing that, to minimize their incidence and consequences. 1/

Through their budgetary and financing policies, governments (within a national economy) and international organizations (with the international economic system) can act as a superior financial intermediary, changing the composition of private sector portfolios (respectively nation state portfolios). Well-designed policy interventions of this kind can minimize the extent to which disposable income, current cash flow and the portfolio of liquid, marketable financial assets become binding constraints on consumption, investment, production and portfolio allocation, enforcing undesirable departures from behavior according to permanent income principles. Governments, through their unique ability to impose taxes, through their monopoly of legal tender and through the superior quality of their debts, have a "comparative advantage" over the private sector in borrowing to smooth out income streams. 2/ The same

---

1/ The first-best policy of eliminating capital market imperfections as far as possible, should of course be pursued to the full. Budgetary policies should aim to neutralize those imperfections that cannot be eliminated.

2/ Because governments have the unique power to impose taxes (unrequited transfers to itself) and because of their ability to declare certain of their liabilities legal tender, the risk of default on government bonds is les than that on private debt. Total current and future natural income is in a sense the collateral for government borrowing. National income tends to be much less variable and uncertain than the incomes of individual private agents. Governments effectively pool individual risks and thus eliminate diversifiable risk. An obvious question is why this risk-sharing cannot be done equally well through private insurance markets. One answer is that even if this were possible, it would be more costly than making minor alterations to a tax structure that is required in any case.

A second answer relies on familiar moral hazard problems in insurance markets. It may be possible to devise efficient private insurance schemes for "bad-luck" default. Private insurance markets will operate inefficiently (or may not exist at all) if there is frequent "voluntary" or

though perhaps to a lesser extent, holds for certain international organizations vis-á-vis nation states.

I shall now illustrate with a few examples this role of the government as the natural borrower and its unique ability to restructure the conventionally measured sectoral balance sheets, flow of funds and income expenditure accounts so as to permit the economy as a whole to approximate more closely bahavior constrained only be comprehensive wealth or permanent income.

Fiscal aspects of a natural resource discovery

Consider the effects on public sector and private sector balance sheets of an oil discovery. We can represent this by an unexpected increase in p_R, the value of property rights in land and mineral assets by, say, $dp_R > 0$. To the extent that these property rights are privately owned and marketable, disposable private net worth increase by $(\overline{R}-R^G)dp_R$. Following permanent income principles, private agents would consume the perpetuity equivalent of this capital gain in each period. If spending was constrained by a dearth of marketable financial wealth to begin with, a temporarily larger increase in private consumption spending would result. The value of public sector assetsincreased by $R^G dp_R$. The government could choose to increase its own consumption spending in line

---

1/ (Continued from p. 45.) "dishonest" default and if lenders and insurers cannot differentiate between dishonest and honest borrowers. If it is easier and less costly for the government to levy taxes on reluctant taxpayers than it is for private lenders and insurers to compel performance by dishonest borrowers, then governments have a role as financial intermediaries and government debt will not be "neutral". (See Webb [1981, 1982].)

with the permanent income equivalent of this capital gain. If it chooses not to do so, it faces the problem of enabling the private sector to raise its spending by the perpetuity equivalent of $R^G dp_R$.

One way to approach this would be to distribute to the private sector (in the form of tax cuts or increased transfer payments) the stream of actual additional oil revenues $r^R(t)R^G(t)dp_R(t)$ as and when they accrue. The present value of such future anticipated tax cuts (or transfer payment increases) is, however, a nonmarketable, highly illiquid asset which is singularly poor collateral for private borrowing. If there is a gestation period before the new oil comes on stream and a fortiori if development costs have to be incurred before the oil starts to flow, the additional cash flow to the government (and thus to the private sector) may well be negative for a number of years.

Private agents whose current spending is constrained by current disposable income or other forms of illiquidity will therefore be unable to raise their spending in line with their permanent income. A superior fiscal option is for the government to cut taxes (raise transfers) as soon as the new oil wealth is discovered, by an amountt equal to the perpetuity equivalent or annuity value of the discovery. 1/ This will require additional government borrowing until the moment that actual revenues exceed their permanent value, at which time the authorities will be able to retire the temporary debt issues whose function is merely to relax the spending limits on cash-flow constrained households. With

---

1/ See Flemming (1982).

this transformation of future tax cuts into present tax cuts the nation can consume in line with its new, higher permanent income: the government has transformed future tax cuts into disposable income.

An alternative proposal to handle the same problem has been made by Sam Brittan of the Financial Times. His proposal amounts to a capital gift to the private sector by the public sector: the equity in the newly discovered oil riches is transferred to the private sector. If this newly privatized wealth takes the form of marketable financial claims, private spending in line with permanent income is again likely to be encouraged relative to a policy of cutting taxes in line with current oil revenues: the government has transformed future tax cuts into disposable financial wealth.

In this paper I have used the same symbol T for the present value of the (uncertain) expected stream of future tax payments and receipts $\{r\}$, both where the present value to households of expected future tax payments and where the present value to the government of expected future tax receipts was concerned. Similarly N represented both the household asset and the government liability corresponding to the stream of future benefits $\{n\}$.

The presence of an impact on private spending of offsetting changes in say T, N and B^H that would prima facie appear to leave household net worth unchanged was then attributed, in a rather ad hoc manner, to differences in the liquidity, marketability and usefulness as collateral of T, N, and B^H. An alternative, but still ad hoc, way of avoiding the debt-neutrality conundrum is to assume that households discount future

taxes and benefits at a higher rate than the market rate of return on bonds (and at a higher rate than the government discounts its tax revenues and benefit payments). This approach was not adopted here to avoid further growth in the list of symbols and notation. A truly satisfactory treatment of these issues requires the tools of the new microeconomics of credit rationing, collateral and other capital market imperfections whose beginnings can be found e.g., in the work of Jaffee and Russell (1976), Benjamin (1978), Webb (1981, 1982) and Stiglitz and Weiss (1981).

"Cyclical" corrections to the public sector deficit

Consider an economy in which the level of economic activity, as measured e.g., by output and employment, cycles around a trend. We do not at this stage assume that these cycles represent Keynesian departures from full employment and normal capacity utilization. They could be regular swings in the natural rate of unemployment.

If we simplify the economy represented by equation (10) even further by ignoring public sector capital and index-linked bonds, the government budget constraint becomes

$$(28)\quad \frac{\dot{H}+\dot{B}^{H}}{p} \equiv G^{C} - \tilde{T} + (r + \frac{\dot{\bar{p}}}{\bar{p}}) \frac{B^{H}}{p}$$

$\bar{Y}$, the trend level of output grows at a proportional rate γ. Actual output Y, cycles steadily around this trend. If the demand for debt is a demand for real debt per capita, and if population (in efficiency units) and $\bar{Y}$ grow at the same rate, then government financing will tend to exercise upward pressure on the real interest rate when $\frac{d}{dt}\left(\frac{B^{H}}{p\bar{Y}}\right) > 0$ at the

given real interest rate and the given real per capita stock of money balances. From (28) we see that

$$(29)\quad \frac{d}{dt}\left(\frac{B^H}{p\bar{Y}}\right) = \frac{G^c - \tilde{\tau}}{\bar{Y}} + (r - \gamma)\frac{B^H}{p\bar{Y}} - \frac{\dot{H}}{p\bar{Y}}$$

It is a stylized empirical fact that while exhaustive public spending (G^c) tends to grow in line with trend output, taxes net of transfers ($\tilde{\tau}$) tend to vary positively with the current level of economic activity. These two relationships can be summarized by

$$(30a)\quad G^c = g^c\bar{Y} \qquad 1 > g^c > 0$$

$$(30b)\quad \tilde{\tau} = \theta Y\, 1 \qquad 1 > \theta > 0$$

Substituting (30a,b) into (29) yields

$$(31)\quad \frac{d}{dt}\left(\frac{B^H}{p\bar{Y}}\right) = g^c - \frac{\theta Y}{\bar{Y}} + (r-\delta)\frac{B^H}{p\bar{Y}} - \frac{\dot{H}}{p\bar{Y}}$$

Similarly, the proportional rate of growth of the money stock, assuming that the authorities keep constant the stock of real bonds per capita or per unit of trend output, is given by

$$(32)\quad \frac{\dot{H}}{H} = V\left\{g^c\frac{\bar{Y}}{Y} - \theta + (r-\delta)\frac{B^H}{p\bar{Y}}\right\}$$

Thus the current change in $\frac{B^H}{p\bar{Y}}$ overstates (understates) its trend or

long-run average rate of change and the current rate of growth of the nominal money stock overstates (understates) its trend or long-run average rate of growth whenever output is below (above) its trend value.

Even if it is only the current values of $\frac{d}{dt}\left(\frac{B}{p\bar{Y}}^{H}\right)$ and $\frac{\dot{H}}{H}$ that matter for current crowding out and current inflation respectively, the trend or long-run behavior of $\frac{d}{dt}\left(\frac{B}{p\bar{Y}}^{H}\right)$ and $\frac{\dot{H}}{H}$, obtained by evaluating (31) and (32) with output at its trend value $\bar{Y}$, will still be of interest to all but the most short-sighted governments.

Furthermore, if current crowding out is a function of anticipated future changes in $\frac{B}{p\bar{Y}}^{H}$ and current inflation depends on anticipated future monetary growth (as well as possibly on past monetary growth) current $\frac{d}{dt}\left(\frac{B}{p\bar{Y}}\right)$ and $\frac{\dot{H}}{H}$ will be a poor proxy for the future developments if there are transitory swings in the deficit. From this perspective cyclical corrections are a simple, if ad hoc, way of approximating the long-run implications of the fiscal stance for crowding out and monetary growth, i.e., a short-hand way of calculating the permanent deficit.

Evaluating Y at $\bar{Y}$ in (31) and (32) will yield a reasonable approximation to the long-run averages only if the positive and negative deviations of Y from $\bar{Y}$ cancel each other out in the long run, as would, e.g., be the case if output followed a regular sinusoidal motion about trend such as $\frac{Y(t)}{\bar{Y}(t)} = 1 + A\cos(\omega t + \varepsilon)$. If positive and negative

deviations of Y from $\bar{Y}$ do not balance on average, the simple cyclical correction will give a biased estimate of the long-run crowding out pressure and monetary growth implications of the deficit. They will have to be replaced by an explicit averaging of (31) and (32) over long periods of time.

There are good reasons for letting taxes net of transfers vary with the current level of economic activity rather than making them functions of long-run or permanent income. Assume, as seems reasonable, that during the downswing a significant number of private agents are constrained in their spending by current disposable income. 1/ By reducing taxes and increasing borrowing during the downswing, public spending during the downswing will be financed to a larger extent by private agents who are not constrained by current disposable income (the purchasers of the bonds). Total consumption will, therefore, decline by less than if taxes (which we assume to fall equally on disposable-income-constrained and permanent-income-constrained private agents) had been kept constant. In the upswing, the additional debt incurred during the downswing can be repaid out of higher than normal taxes. 2/ The net result is that consumption is smoothed out over the cycle. This would be desirable on grounds of intertemporal allocative efficiency even if product and factor

---

1/ One may wish to replace the phrase "spending constrained by current disposable income" by the following: the effect of current disposable income on spending exceeds that of permanent income multiplied by the share of current disposable income in permanent income (allowing for the effect of changes in current income on expectations about future income streams).

2/ These higher taxes during the upswing fall on a population which, on average, is likely to be less constrained by current disposable income than it was during the downswing.

markets cleared continuously. If there is wage or price stickiness, Keynesian problems of effective demand failure can occur in addition. Exogenous shocks to demand can set in motion contractionary or expansionary multiplier processes if (some) private agents are constrained in their spending by current disposable income. The usefulness of automatic stabilizers and of countercyclical budget deficits derives from current-disposable-income-constrained private spending and other capital market imperfections. It is reinforced by output and labor market disequilibrium.

Current disposable income constraints on private consumption need not be absolute. Regular, anticipated cycles in real income do not, of course, imply corresponding cycles in consumption even for individuals who can only borrow on very unfavorable terms in order to consume in excess of their current disposable income. They have the option of accumulating a stock of liquid savings which can be run down and built up again procyclically. Even with uncertain, stochastic swings in the level of economic activity, a buffer stock of liquid financial assets may permit a measure of income smoothing. Such private saving strategies are, however, likely to be inferior substitutes for access to borrowing on the terms available to the government.

A further option available to the government is to choose (partial) money financing of cyclical deficit increases rather than borrowing. This option will be more attractive the smaller the number and wealth of private agents that are not constrained by current disposable income and liquidity. The more inelastic the demand for government bonds, the larger

the increase in interest rates required to unload additional bond issues on the private sector. (Access to international capital markets may make the total demand for domestic government bonds considerably more interest-elastic than private domestic demand alone.) Such counter-cyclical money issues and withdrawals need not imply any increase in the trend rate of growth of the money stock.

Note that this view of stabilization policy suggests that taxes and transfers rather than "exhaustive" public spending on goods and services should be used to dampen fluctuations in economic activity. Public consumption spending, like all consumption spending, should be smoothed over time in line with permanent income. Public sector capital formation should have its time profile determined largely by the optimal public sector consumption programme. Public works and other public spending on goods and services can be effective in regulating the overall level of demand and of economic activity, but are likely to distort the optimal private sector-public sector consumption mix, unlike well-designed changes in the taxation, borrowing, and money financing mix.

Public sector asset sales and cosmetic changes in the PSBR

Sales of existing public sector financial assets do not appear in the SNA public sector financial surplus but do appear in the public sector borrowing requirement (PSBR) and similar transactions records. A "stock-shift" sale of government-owned natural resources rights $-dR^G$ or of claims to public enterprise capital $-dK^G$ to the private sector would not by itself alter public sector or private sector net worth. Assuming the government wishes neither to reduce the level of the money

stock nor to acquire private sector capital, the counterpart of a reduction in R^G or in K^G would be a reduction in B^H, B^{*H} or $\tilde{B}^H$ with $p_R dR^G + p_G dK^G = dB^H + e dB^{*H} + p d\tilde{B}^H$.

There may, of course, be efficiency reasons for wishing to nationalize or denationalize. Total national net worth will be altered by such ownership transfers if the efficiency with which the resources are managed differs between sectors. The financial consequences, however, are virtually nil: bonds in private portfolios are replaced by other financial claims. If the government sells its assets gradually to finance a flow of spending ($p_G \frac{d}{dt} R^G + p_G \frac{d}{dt} K^G < 0$) the difference between this policy and one of conventional financing by borrowing is also largely cosmetic. 1/ When it borrows, the government incurs an obligation to service the additional debt. When it sells assets it loses the future income from the assets it sells. It makes little sense, therefore, to attribute economic significance to the distinction between sales of public debt (below the line) and sales of government financial assets (above the line) as is done with the PSBR in the United Kingdom..

Conclusion

The general conclusions have been stated in the introduction. In this concluding section I shall confine myself to some more specific and, I hope, practical remarks.

Comprehensive wealth and permanent income accounting requires explicit judgments concerning expectations about the future. This arises from the need to evaluate nonmarketable and often intangible and merely

1/ The earlier caveat about differences in the efficiency with which the assets are managed applies here again.

implicit assets and liabilities such as future tax and benefit streams. I consider this to be a salutory aspect of comprehensive wealth accounting. It brings out the distinction between mechanistic bookkeeping and recording of transactions, on the one hand, and, on the other hand, accounring for economic policy evaluation and design.

Inflation accounting in the public sector is long overdue. Money illusion in the public sector should cease to be an obstacle to sensible budgetary policy. By themselves, the public sector financial deficit and the public sector borrowing requirement (at current or constant prices or as as proportion of GNP), are not very informative statistics. They must be corrected for the change in the real value of the outstanding stocks of interest-bearing public debt to evaluate either the implications of the deficit for financial crowding out or the "eventual monetization" implied by the government's fiscal stance. Analogous corrections should be made to the conventionally measured external current account deficit or surplus: changes in the real value of external assets and liabilities due to changes in the price level and the nominal exchange rate have to be allowed for.

To omit government-owned capital and public sector property rights in land and natural resources from the public sector balance sheet can give a very misleading picture of the net worth of the public sector and of its present and future fiscal and financial options. This holds true especially for countries where the government owns significant mineral rights (e.g., Norway, the United Kingdom, the United States, and many of

the oil-producing nations) and countries in which the nationalized sector accounts for a large share of economic activity (e.g., the United Kingdom and many developing countries). The sign of the effect on public sector net worth of including publicly-owned capital is not self-evident: virtually open-ended commitments to subsidize loss-making public enterprises depress net worth.

The implicit assets and liabilities of the public sector represented by the streams of future tax revenues and of future benefits and transfer payments may well dwarf the marketable financial assets and liabilities in the government balance sheet.

Transitory (e.g., cyclical) deficits and surpluses are a mechanism enabling current-disposable-income-constrained private agents to smooth out consumption and keep it more closely in line with permanent income. By permitting consumption to be maintained in the face of a transitory decline in income they also mitigate unemployment and exces capacity if price and wage rigidities prevent an instantaneous market-clearing response to demand shocks. For governments to borrow in the downswing "on behalf of" private agents with less favored access to capital markets and to retire these countercyclical debt increases during the upswing, is sound fiscal management, regardless of what the rate of inflation happens to be. Alternatively, cyclical increases in the deficit could be financed (partly or wholly) by money creation, to be reversed during the upswing. The optimal financing mix of cyclical (i.e., transitory and reversible) deficits need not be the same as that of permanent deficits. A consideration of this important issue would require the

analysis of specific, detailed models. It is, therefore, well beyond the scope of this paper which has tried to focus on general propositions that rely on as few detailed, model-specific properties as possible.

List of symbols used

p_{K}^{soc}	price of social overhead capital
p_G	price of public enterprise capital
p_{KP}	price of private capital
p_R	price of land and natural resource property rights
p	domestic general price level
p^*	foreign general price level
e	nominal exchange rate (domestic currency price of foreign exchange)
i	nominal interest rate on bonds denominated in domestic currency
r	domestic real interest rate
r^G	rate of return on public enterprise capital
ρ^M	non-pecuniary rate of return on money balances
r^R	rate of return from ownership of land and natural resources
r^p	rate of return on private capital
r^{soc}	rate of return on social overhead capital
i^*	nominal interest rate on bonds denominated in foreign currency
r^*	foreign real interest rate
K^{soc}	stock of social overhead capital
K^G	stock of public enterprise capital
R^G	government-owned land and natural resource rights
R^P	privately owned land and natural resource rights

$\bar{R}$	total natural resource rights
B^H	domestically held nominal government bonds
B^F	foreign-held nominal government bonds
B^{*H}	domestically held foreign currency denominated government bonds
B^{*F}	foreign-held foreign currency denominated government bonds
$\mathcal{B}^H$	domestically held index-linked government bonds
$\mathcal{B}^F$	foreign-held index-linked government bonds
H	stock of high-powered money
E^*	stock of foreign exchange reserves
N	present value of entitlement programmes
T	present value of tax programmes
L	present value of future expected labor income
W^G	public sector net worth
W^P	private sector net worth
W^F	overseas sector net worth
W	$W^G + W^P = W$
F^H	home-currency-denominated private claims on the overseas sector
F^{*H}	foreign-currency-denominated private claims on the overseas sector
KP	private capital stock
A^M	net value of the government's cash monopoly
G^{soc}	government consumption of services of social overhead capital
G^c	government consumption spending (excluding capital consumption and consumption of imputed services of social overhead capital)

$_{G}I$	$\frac{d}{dt} K^{G}$: net investment in public enterprise capital
τ	current taxes
n	current transfer and benefit payments
γ	$(\tau-n)/p$
C	private consumption
X	trade balance surplus, including net international transfer receipts
Y	real output
$\overline{Y}$	capacity or trend output
ℓ	current labor income
S	total national saving
γ	natural rate of growth
δ	proportional rate of depreciation
V	income velocity of circulation of money

$\dot{x} = \frac{d}{dt} x$

$\hat{x}(s,t)$ - value of x expected at t to prevail at s.

References

R. J. Barro (1974), "Are government bonds net wealth," Journal of Political Economy, 182, pp. 1095-1117.

D. K. Benjamin (1978), "The Use of Collateral to Enforce Debt Contracts," Economic Inquiry, 16, pp. 333-59.

M. J. Boskin (1982), "Federal Government Deficits: Some Myths and Realities," American Economic Review, Papers and Proceedings, 72, May, pp. 296-303.

W. H. Buiter (1980), "Crowding out of private capital formation by government borrowing in the presence of intergenerational gifts and bequests," Greek Economic Review, 2, August, pp. 111-42.

_____ (1982a), "Comment on T. J. Sargent and N. Wallace: Some Unpleasant Monetarist Arithmetic," NBER Working Paper No. 867, March.

_____ (1982b), "Money, Deficits, Crowding Out and Inflation: The Economic Foundations of the MTFS," paper presented at the Conference on Monetary Policy, Financial Markets and the Real Economy, International Center for Monetary and Banking Studies, Geneva, June, 1982.

_____ (1982c), "Deficits, Crowding Out and Inflation," unpublished paper, September.

W. H. Buiter and M. Miller (1981), "The Thatcher Experiment: The First Two Years," Brookings Papers on Economic Activity, 2, pp. 315-67.

W. H. Buiter and J. Tobin (1979), "Debt neutrality: A brief review of doctrine and evidence," in G. M. von Furstenberg, ed. Social Security versus Private Saving, Ballinger.

J. Carmichael (1979), The Role of Government Financial Policy in Economic Growth, unpublished Ph.D. Thesis, Princeton University.

J. S. Flemming (1982), "U.K. Macro-Policy Response to Oil Price Shocks of 1974-75 and 1979-80," European Economic Review, 18, May/June, pp. 651-66.

D. M. Jaffee and T. Russell (1976), "Imperfect Information, Uncertainty and Credit Rationing," Quarterly Journal of Economics, 90, pp. 651-66.

M. Miller (1982), "Inflation-adjusting the Public Sector Financial Deficit: Measurement and Implications for Policy" in T. Kay ed., The 1982 Budget, Blackwell.

A. F. Ott and J. H. Yoo (1980), "The Measurement of Government Saving," in G. von Furstenberg," ed., The Government and Capital Formation, pp. 177-241, Ballinger.

J. D. Sachs (1981), "The Current Account and Macroeconomic Adjustment in the 1970's," Brookings Papers on Economic Activity, 1, 1981.

T. J. Sargent and N. Wallace (1981), "Some Unpleasant Monetarist Arithmetic," unpublished, October.

J. Siegel (1979), "Inflation-induced distortions in government and private saving statistics," The Review of Economics and Statistics, February, pp. 83-90.

J. Stiglitz and A. Weiss (1981), "Credit-Rationing in Markets with Imperfect Information," American Economic Review, 71, June, pp. 393-410.

C. T. Taylor and A. R. Threadgold (1979), "'Real' National Saving and Its Sectoral Composition," Bank of England Discussion Paper No. 6, October.

J. Tobin and W. H. Buiter (1980), "Fiscal and Monetary Policies, Capital Formation and Economic Activity," in G. M. von Furstenberg ed. The Government and Capital Formation.

N. Wallace (1981), "A Modigliani-Miller Theorem for Open Market Operations," American Economic Review, 71, June, pp. 267-74.

D. C. Webb (1981), "The net wealth effects of government bonds when credit markets are imperfect," Economic Journal, 91, pp. 405-14.

_____ (1982), "Default risk in a model of corporate and government finance," Journal of Public Economics, 17, April, pp. 289-306.