ISSN 0265-8003

# MEASURING ASPECTS OF FISCAL AND FINANCIAL POLICY

W. H. BUITER

Discussion Paper No. 13
April 1984

Centre for Economic Policy Research
6 Duke of York Street
London SW1Y 6LA

Tel: 01 930 2963

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ABSTRACT*

The paper develops a forward-looking comprehensive accounting framework for the public sector. By integrating the public sector budget constraint forward in time the government's present value budget constraint (PVBC) is obtained. In addition to the familiar financial assets and liabilities, comprehensive public sector net worth contains the following items: the value of the public sector capital stock; the value of public sector property rights in land and natural resources; the present value of future seigniorage, the present value of future taxes net of transfers and subsidies and the present value of future planned public sector capital formation, privatization or nationalization programmes.

From the "stock" PVBC a number of different "flow" deficit concepts are derived; each one emphasizes a different aspect of the "sustainability" of current and/or prospective fiscal and financial plans. Together they provide a framework for organizing facts and plans about fiscal, financial and monetary policy and for evaluating the consistency of spending and revenue projections or scenarios, public sector debt objectives and monetary targets.

JEL classification: 113, 224, 320

W. H. Buiter
London School of Economics
Houghton Street
London
WC2A 2AE
01 405 7686

* Paper prepared for the International Seminar in Public Economics held in February 1984 at the University of California at Santa Cruz. Financial support from the Leverhulme Trust is gratefully acknowledged. Comments from the participants at the ISPE Conference and especially from Stanley Fischer are gratefully acknowledged.

**SUMMARY**

The paper analyses at greater length and in more detail some of the propositions and ideas contained in Section IV of my "Allocative and Stabilization Aspects of Budgetary and Financial Policy" (CEPR Discussion Paper No. 2, January 1984). Central is the development of a forward-looking, comprehensive accounting framework for the public sector. By taking both sides of the public sector budget constraint forward in time, the "present value budget constraint" (PVBC) of the public sector is obtained. This contains, in addition to the familiar financial assets and liabilities, the following items: the value of the public sector capital stock (valued in terms of the future revenues - if any - it is expected to yield); the value of public sector property rights in land and natural resources; the present value of expected future seigniorage from government money creation; the present value of future taxes net of transfers and subsidies, and the present value of future planned public sector capital formation, privatization or nationalization programmes. Future public sector investment and nationalization (on market terms) only increase public sector net worth (or wealth) to the extent that the public sector uses the resources involved more efficiently than the private sector. Conversely, privatization (on market terms) only augments public sector net worth to the extent that the private sector manages the resources more efficiently than the public sector.

The fundamental consistency constraint on the government's fiscal and financial plans is that the present value of its future planned spending programme should not exceed public sector comprehensive net worth. This is the PVBC.

From this "stock" PVBC a number of different "flow" deficit concepts are derived; each one emphasizes a different aspect of the "sustainability" of current and prospective fiscal, financial and monetary plans. Together they provide a framework for organizing facts and plans about fiscal, financial and monetary policy and for evaluating the consistency of spending and revenue

projections or scenarios, public sector debt objectives and monetary targets. Some strictly illustrative, back of the envelope figures for a "permanent deficit" measure for the UK between 1978 and 1982 are provided. They show a gradual move from "permanent deficit" to "permanent surplus". In 1983 and in the current year the recent relaxation of fiscal policy has probably largely eliminated these surpluses.

# Measuring aspects of fiscal and financial policy

## I. Introduction

A sufficient reason for sending one's students to read Blinder and Solow's "Analytical Foundations of Fiscal Policy" (Blinder and Solow [1974]) is that it contains the clearest and most accessible statement of the proposition that informative measures of the impact of fiscal and financial policy actions or rules on the economy are "model-dependent". "Model-free" budget measures of varying ilk may ... "supply a number summarizing the congeries of taxation and expenditure programs ....." (Blinder and Solow [1974, p. 12]); they are uninformative about the effects of these programs on the economy. This holds for the uncorrected or "raw" public sector financial deficit (level, change, percentage of GDP, at current or at constant prices), for the cyclically corrected (full - or high - employment deficit), for the inflation-corrected deficit and also for the new budget measures I have proposed recently (Buiter [1983a, b ; 1984]), the "permanent deficit", the "constant net worth deficit" and the constant permanent income deficit, which are discussed in Section II.

Fiscal and financial policy impact measures summarize the effect of the whole range of budgetary and/or financing decisions on the economy. Such measures are, of course, functions of the model of the economy whose "multipliers" are used in its construction. Examples are the "weighted standardized surplus" proposed by Blinder and Solow [1974, p.23] and the very similar demand weighted (i.e. adjusted for differences in marginal propensities to spend on domestic output) and cyclically corrected deficit measures calculated e.g. in the U.K. by the National Institute of Economic

and Social Research. The models that generate these particular measures of the GDP effect of fiscal policy are static and Old-Keynesian; output is always demand-determined and the treatment of expectations ranges between the mechanical and the non-existent. Any particular measure itself may therefore not be of great interest. The iron law: no model - no fiscal and financial impact measures, is or should be of interest.

Conceptually there is no problem. Those fortunate enough to work with very small models solve them analytically; all others simulate numerically their preferred model(s) of the economy under different values for the fiscal and financial policy parameters. The differences between the solution trajectories under alternative policy instrument values or alternative policy rules, or the differences between the statistics that characterize the solution trajectories, are one's measures of fiscal impact. Such measures of fiscal and financial impact will therefore be model-dependent. They will vary over time, as represented e.g. by a complete series of dynamic multipliers, from impact to steady state. If forward-looking expectations are important, these measures will be functions of the date on which a particular policy action (or rule change) was first anticipated, of its anticipated degree of permanence and, with risk-averse behaviour, of the degree of confidence with which these expectations are held.

The practical problems in implementing this approach are almost overwhelming.[1/] The purpose of this paper is therefore much more modest. It does not aim to develop measures of fiscal stance or of fiscal impact. Instead it outlines a forward-looking accounting framework for the public sector, organized around this sector's present value budget constraint. It represents a useful framework for organizing facts, plans, expectations and scenarios about fiscal and financial (including monetary) policy and for performing consistency checks between the various components of the fiscal and financial programme. Section II sets out the accounting framework. Section III relates some deficit concepts suggested by the accounting framework to the conventional public sector deficit measures. Section IV contains a few illustrations of the uses to which the approach can be put and Section V discusses some further issues and complications.

## II. Measuring sustainability and consistency : a framework for fiscal and financial planning.

The starting point for the analysis is the conventional public sector budget constraint given in equation (1). It consolidates the accounts of the budgetary and monetary authorities (the Treasury and the Central Bank) and of the nationalized industries.

$$(1)\quad g + \dot{K} - \tau + \frac{iB}{p} + \frac{C}{p} - \frac{i^{*}\epsilon F^{*}}{p} - \rho_K K - \rho_N N + p_N \dot{N} \equiv \frac{\dot{M} + \dot{B} + p_C \dot{C} - \epsilon \dot{F}^{*}}{p}$$

1. Blanchard [1983a,b] develops relatively simple measures of fiscal impact on aggregate demand for a model with forward-looking rational expectations.

g is public sector consumption; K the public sector capital stock; $\tau$ taxes net of transfers; i the instantaneous nominal interest rate on government bonds; B the stock of fixed nominal market value, variable nominal interest rate bonds; p the general price level; C the number of consols paying a coupon of one unit of currency; i* the foreign nominal interest rate on fixed foreign currency market value bonds; $\varepsilon$ the spot price of foreign exchange; F* the stock of foreign currency denominated assets of the government; $\rho_K$ the real net rental (after depreciation) per unit of public sector capital; $\rho_N$ the real return on a share in public sector natural resource property rights; N the number of public sector shares in natural resource property rights; $p_N$ the real price of a unit of R; M the nominal stock of non-interest bearing high-powered money and $p_c$ the price of a consol. For any variable x, $\dot{x} \equiv \frac{d}{dt} x$ . The R.H.S. of equation (1) corresponds to the British public sector borrowing requirement (PSBR) which puts asset sales ( $-\dot{N}$ ) above the line rather than below it, when these asset sales involved the loss of a controlling interest by the government.

We also establish the further notation: W, real public sector comprehensive net worth; $p_K$, real value of a unit of public sector capital if it stays in the public sector; T, present value of future expected taxes net of transfers; $\Pi$ the real capital value of the state's note issue monopoly; Z, the present value of the government's future planned investment programme; G, the present value of the government's future planned consumption programme and r, the instantaneous real rate of interest.

It is assumed that anticipated real rates of return on non-money assets are equalized. Anticipations of the future are single-valued and held with complete subjective certainty. For any variable $x$, $x(s,t)$ is the value of $x$ at time $s$, anticipated as of time $t$, i.e. $x(s,t) \equiv E_t x(s)$ where $E_t$ is the expectation operator conditional on information available at time $t$. We assume that $x(s,t) = x(s)$ $s \leq t$, i.e. the past and present are known with certainty.

$$(2) \quad r(t) = i(t) - \frac{\dot{p}(t,t)}{p(t)} = \frac{1}{p_c(t)} + \frac{\dot{p}_c(t,t)}{p_c(t)} - \frac{\dot{p}(t,t)}{p(t)}$$

$$= i^*(t) + \frac{\dot{\varepsilon}(t,t)}{\varepsilon(t)} - \frac{\dot{p}(t,t)}{p(t)} = \frac{\rho_N(t)}{p_N(t)} + \frac{\dot{p}_N(t,t)}{p_N(t)} = \frac{\rho_K(t)}{p_K(t)} + \frac{\dot{p}_K(t,t)}{p_K(t)}$$

From equations (1) and (2) we can derive, after some rearranging of terms, by forward integration, the present value budget constraint (PVBC) or comprehensive balance sheet constraint of the public sector.[2/]

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2. We could of course integrate the budget constraint "at current prices" to get an equivalent expression to (3) but involving discounting future nominal flows using nominal interest rates. E.g. the simplified budget constraint $g + i\frac{B}{p} - \tau = \frac{\dot{M} + \dot{B}}{p}$ can be integrated forward to yield :

$$M(t) + B(t) = -\int_t^{\infty} p(s,t)(g(s,t) - \tau(s,t))e^{-\int_t^s i(u,t)du} ds + \int_t^{\infty} i(s,t)\, M(s,t) e^{-\int_t^s i(u,t)du} ds$$

$$+ \lim_{s \to \infty} [M(s,t) + B(s,t)] e^{-\int_t^s i(u,t)du}$$

$$(3) \qquad G(t) \equiv p_K(t)\,K(t) + p_N(t)\,N(t) - \left\{ \frac{M(t) + B(t) + p_c(t)C(t) - c(t)F^*(t)}{p(t)} \right\}$$

$$+ T(t) + \Pi(t) + Z(t) + \Omega(t)$$

$$(4a) \qquad G(t) \equiv \int_t^\infty g(s,t)\, e^{-\int_t^s r(u,t)\,du}\, ds$$

$$(4b) \qquad T(t) \equiv \int_t^\infty \tau(s,t)\, e^{-\int_t^s r(u,t)\,du}\, ds$$

$$(4c) \qquad \Pi(t) \equiv \int_t^\infty i(s,t)\, \frac{M(s,t)}{p(s,t)}\, e^{-\int_t^s r(u,t)\,du}\, ds.$$

$$(4d) \qquad Z(t) \equiv \int_t^\infty (p_K(s,t) - 1)\, \dot{K}(s,t)\, e^{-\int_t^s r(u,t)\,du}\, ds.$$

$$(4e) \qquad p_K(t) \equiv \int_t^\infty \rho_K(s,t)\, e^{-\int_t^s r(u,t)\,du}\, ds$$

$$(4f) \qquad p_N(t) \equiv \int_t^\infty \rho_N(s,t)\, e^{-\int_t^s r(u,t)\,du}\, ds.$$

$$(4g) \qquad p_c(t) \equiv \int_t^\infty e^{-\int_t^s i(u,t)\,du}\, ds = p(t) \int_t^\infty \frac{1}{p(s,t)}\, e^{-\int_t^s r(u,t)\,du}\, ds.$$

$$(4h) \qquad \Omega(t) = \lim_{s\to\infty} \left[ \frac{M(s,t) + B(s,t) + p_c(s,t)\, C(s,t) - \varepsilon(s,t)F^*(s,t)}{p(s,t)} - p_K(s,t)K(s,t) - p_N(s,t)N(s,t) \right] e^{-\int_t^s r(u,t)\,du}$$

$\Omega(t)$ is determined by the terminal boundary condition in the solution of the first-order linear differential equation that yields (3). It is conventionally set equal to zero.

If the real interest rate $r$ exceeds the natural rate of growth of output, $n$, this terminal condition is implied by the weak requirement that the ratio of marketable public sector wealth $\left( p_K K + p_N N - \frac{M + B + p_c C - \varepsilon F^*}{p} \right)$ to trend output remains bounded. If the real interest rate lies below the natural growth rate, however, honest Ponzi games (servicing existing debt through further borrowing) are feasible and the condition $\Omega(t) = 0$ is arbitrary and ad-hoc. $r < n$ is possible as the competitive equilibrium outcome in an overlapping generations model without intergenerational gift and bequest motives (Diamond [1965]). If a child-to-parent gift motive is operative in a stationary equilibrium of a Diamond-type overlapping generations model with gifts and bequests, then this stationary equilibrium must be characterized by dynamic inefficiency, i.e. $r < n$ (Buiter [1980], Carmichael [1982]).

In what follows I assume, with a somewhat uneasy conscience, that $\Omega(t) = 0$.[3]

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1. See page 8.

Footnote 3

Consider the simplified budget constraint $g(t) + r(t)\,b(t) - \tau(t) = \dot{b}(t)$. Bonds are short and index-linked. Let $\tilde{g} \equiv \frac{g}{y}$, $\tilde{b} \equiv \frac{b}{y}$, $\tilde{\tau} \equiv \frac{\tau}{y}$; $\tilde{g}$, $\tilde{\tau}$ and $r$ are constant while $y$ grows at the exogenously given rate $n$. The foward-looking present value budget constraint doesn't exist if $n > r$ as can be seen by inspecting

$$\tilde{b}(t) = \lim_{T \to \infty} \left\{ \int_t^T (\tilde{\tau} - \tilde{g}) e^{(r-n)(t-s)}\, ds + \tilde{b}(T) e^{(r-n)(t-T)} \right\}.$$ It is however clear that since $$\tilde{b}(t) = \tilde{b}(t_o) e^{(r-n)(t-t_o)} + \left(\frac{\tilde{g} - \tilde{\tau}}{n - r}\right)\left[1 - e^{(r-n)(t-t_o)}\right],$$

the debt-output ratio is perfectly well-behaved for any finite "fundamental" deficit $\tilde{g} - \tilde{\tau}$, with a steady-state value of $\frac{\tilde{g} - \tilde{\tau}}{n - r}$. One obvious "physical" constraint is $0 \leq \tilde{g} \leq 1$. The choice of borrowing vs. taxes depends exclusively on distributional criteria and on the relative efficiency costs of debt vs. tax financing. Taxes need never be levied and may indeed be negative forever. Stanley Fischer provided me with the example and the insights it contains.

$\Pi(t)$ is the present value of the profits earned by the central bank by investing its entire expected portfolio at each future date (the counterpart of its liability M) in interest-bearing assets. Integrating (4c) by parts we find that

$$(5a) \quad \Pi(t) = S(t) + \frac{M(t)}{p(t)}$$

$$(5b) \quad S(t) \equiv \int_t^\infty \frac{\dot{M}(s,t)}{p(s,t)} e^{-\int_t^s r(u,t)du} ds = \int_t^\infty \frac{\dot{M}(s,t)}{M(s,t)} \frac{M(s,t)}{p(s,t)} e^{-\int_t^s r(u,t)du} ds$$

$S(t)$ is the present value of current and future seigniorage. It follows that (3) can be rewritten as

$$(6a) \quad G(t) \equiv W(t)$$

$$(6b) \quad W(t) \equiv p_K(t)\, K(t) + p_N(t)\, N(t) - \frac{(B(t) + p_c(t)C(t) - \varepsilon(t)F^*(t))}{p(t)} + T(t) + S(t) + Z(t)$$

Equations (6a, b) characterize consistent fiscal and financial plans. By analogy with the present value budget constraint of a private agent, we arrange the public sector P.V.B.C. so that, in present value terms, the government's consumption programme, G, must be equal in value to its comprehensive net worth, W. The question whether it makes any sense to speak of a net worth <u>constraint</u> for the public sector, is addressed below.

Tangible assets, K, R and F*, tangible liabilities M, B, and C and intangible assets T, Π and Z make up public sector net worth, W. Note, from the definition of Z in (4d) that government wealth is a function of the future public sector capital formation programme only to the extent that the shadow price of public sector capital, $p_K$, differs from its opportunity cost, 1.[4/] If public and private sectors use capital with equal inefficiency, public sector capital formation does not alter public sector net worth. Also, privatization of public sector assets or nationalization of private assets (both at market prices) affect public sector net worth only to the extent that the assets are used with differing degrees of efficiency in the public and private sectors.

Equations (6a, b) make clear how a government can finance a planned increase in the present value of its consumption programme. It can raise the present value of planned future taxes net of transfers T or the present value of its future seigniorage, S (the "inflation tax"). This higher inflation tax will require a higher proportional rate of money growth (in a stationary equilibrium) unless the inflation elasticity of the demand for real money balances is negative and greater than unity in absolute value. With K and R predetermined, an increase in $p_K$ (say brought about by an increase in the efficiency with which public sector capital is operated) or in $p_R$ (say through an oil discovery or an increase in the price of oil) can raise $p_K K$ and $p_R R$ respectively.

W can further be increased discontinuously at a point in time by

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4. Note that $p_K$ could be negative, e.g. if the public sector enterprises operating the public capital are secular loss makers. $p_K$ is only the net cash return to the public sector.

completely or partially defaulting on the financial liabilities M, B and C, either formally or de facto by engineering an upward jump in the price level (which is possible in new classical flex-price models) or a downward jump in $p_c$, through current announcements of future policy actions. Revaluation of foreign currency-denominated assets (if a change in the real exchange rate can be engineered) is another mechanism for altering W discontinuously, as is the announcement, if $p_K \neq 1$, of a change in the future public sector capital formation programme or in future planned privatization or nationalization.

Equations (6a, b) are a convenient accounting framework for evaluating the consistency of current and future spending, tax and transfer plans with the monetary targets, the future capital formation programme, and the inherited stocks of tangible real and financial assets and liabilities. They represent a feasibility or consistency check on alternative fiscal and financial scenarios.

Note that there are likely to be behavioural relationships linking together the various items in equations (6a, b). E.g. in a Keynesian world a cut in the spending programme G(t) may lower effective demand and output, reduce the tax base and thus T, even at given tax rates. In an economy characterized by financial crowding out (the displacement of private capital by public sector interest-bearing debt) an increase in $\frac{B + p_c C}{p}$ may reduce T etc.

Sustainable or consistent fiscal and financial plans

The government comprehensive balance sheet constraint or present value budget constraint contains all the information required for an evaluation of the sustainability of fiscal and financial plans, the consistency of spending, revenue raising and monetization objectives, etc. Almost the same information that is contained in this stock constraint, however, can be expressed in the form of "flow" budget constraints.

First consider an infeasible or inconsistent plan. This will be characterized by $G - W \neq 0$. Such an excess or shortfall of spending over resources will of course not be observed. Something will adjust to re-establish equality, whether this takes the form of changing G or W or both.

Some interest attaches to the perpetuity equivalent or annuity value of this present value deficit or surplus. This is given by the "permanent deficit", D.

$$D(t) \equiv R(t)\,[G(t) - W(t)] \tag{7}$$

where

$$R(t) \equiv \left[\int_t^{\infty} e^{-\int_t^s r(u,t)\,du}\, ds\right]^{-1} \tag{8}$$

R(t) is the coupon yield on an index-linked ("real") consol or the long real rate of interest.

$\bar{D}$, the permanent share deficit, gives the constant proportion of capacity output, $\bar{y}$, represented by the present value deficit or surplus. It is given by

$$(9) \quad \bar{D}(t) \equiv \bar{R}(t)\,[G(t) - W(t)]$$

where

$$(10a) \quad \bar{R}(t) = \left[\int_t^{\infty} e^{-\int_t^s [r(u,t) - n(u,t)]\,du}\, ds\right]^{-1}$$

and

$$(10b) \quad n(t) = \dot{\bar{y}}(t)/\bar{y}(t)$$

The expression "permanent deficit" involves a mild abuse of language as this deficit will not materialize, let alone be permanent. It does however represent the permanent adjustment that must be made, either to spending or to receipts.[5/]

There are two other informative and convenient measures of fiscal and financial plans: the constant net worth deficit and the constant permanent income deficit.

It is easily checked that the expected rate of change of public sector

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5. I am indebted to Stanley Fischer for clarifying these issues.

net worth is given by :

$$(11) \qquad \dot{W}(t,t) = r(t)\ W(t) - g(t)$$

The current level of public sector consumption can be said to be sustainable if it keeps comprehensive net worth constant ex-ante. This will be the case when current public consumption equals the short real interest rate times comprehensive net worth, i.e. when $g(t) = r(t)\ W(t)$. The constant net worth deficit is then given by

$$(12) \qquad D^{W}(t) \equiv - \dot{W}(t,t) = g(t) - r(t)\ W(t)$$

If one's criterion of the sustainability of current consumption involves a constant (ex-ante) ratio of net worth to capacity output, the sustainable consumption level is given by $g(t) = \bar{r}(t)\ W(t)$ where $\bar{r} = r - n$. The constant net worth share deficit can then be defined as

$$(13) \qquad \bar{D}^{W}(t) = g(t) - \bar{r}(t)\ W(t).$$

The level (share) of consumption consistent with constant net worth (a constant net worth share) will of course be subject to anticipated fluctuations over time if the short real interest rate varies over time. An alternative permanent income approach to defining sustainability therefore suggests itself (see Miller [1982], Miller and Babbs [1983]). The highest indefinitely sustainable constant level of public sector consumption (or permanent income) is given by multiplying net worth by the long real interest rate:

(14) $g^P(t) \equiv R(t)\ W(t)$ .

The anticipated rate of change of permanent income is

(15) $\dot{g}^P(t,t) = R(t)\ (g^P(t) - g(t))$

The constant permanent income deficit is then defined as

(16) $D^P(t) = g(t) - g^P(t) = g(t) - R(t)\ W(t)$

Finally, if a constant sustainable share of public sector consumption in capacity output is taken as one's criterion for the sustainability of current consumption, the constant permanent income share deficit $\bar{D}^P(t)$ suggests itself:

(17) $\bar{D}^P(t) = g(t) - \bar{R}(t)\ W(t)$

If $D^W(t)$ $(\bar{D}^W(t))$ is positive, comprehensive net worth $W$ is falling (the ratio of public sector comprehensive net worth to capacity output $\frac{W}{\bar{y}}$ is falling). This decline in $W$ $\left(\frac{W}{\bar{y}}\right)$ can manifest itself in different ways. If $p_K K$, $p_R R$, $\frac{\varepsilon F^*}{p}$, $T$, $S$ and $Z$ all remained constant (continued to grow at the natural rate $n(t)$), the decline in $W$ $(\text{in } \frac{W}{\bar{y}})$ would come about through an increase in the real stock of interest bearing public sector debt $\frac{B + p_c C}{p}$ (an increase in the ratio of interest-bearing debt to capacity GNP). In

most models that do not exhibit debt neutrality, such an increase in the real debt burden causes financial crowding out. The degree and time pattern of such financial crowding out is of course model-specific.

If $D^P(t)$ $(\bar{D}^P(t))$ is positive, government permanent income (the ratio of government permanent income to capacity output) is declining. If e.g. $R[p_K K + p_R R + \frac{\varepsilon F^*}{p} + T + S + Z]$ were constant (if $\bar{R}[p_K K + p_R R + \frac{\varepsilon F^*}{p} + T + S + Z]$ were constant) the unsustainability would show up through an increase in the real cost of debt service $R\frac{(B + p_c C)}{p}$ (through an increase in the real cost of debt service as a proportion of capacity output).

Note that $D^P$ will coincide with $D^W$ if $R = r$ and that $\bar{D}^P$ will be the same as $\bar{D}^W$ if $\bar{R} = \bar{r}$.

To construct these various deficit concepts (except for the permanent deficit in (7) and the permanent share deficit in (9), government current spending on goods and services was singled out from all other outlays and receipts. This reflects the view that the path of public sector consumption spending over time is one of the four central concerns of fiscal policy. Two of the other three - distribution of income and wealth between agents, groups or classes and the efficiency losses associated with non-lump sum taxes, transfers and subsidies - cannot be addressed within a highly aggregative accounting framework. The last - fiscal and financial stabilization policy - may make use of this accounting framework, but only as one input among many. It should be clear

however that the sustainability of any spending programme can be evaluated simply by transferring the present value of the relevant outlays (e.g. transfers plus subsidies) to the left-hand-side of the PVBC in (6a). The augmented present value of spending aggregate $\tilde{G}$, say, and the correspondingly augmented comprehensive wealth aggregate $\tilde{W}$, say, can then be put through their paces as in equations (12), (13), (16) and (17).

## III "Deficit corrections"

One instructive way of looking at these new proposed deficit measures is by listing the "corrections" required to go from the conventional PSBR to the new measures. In equations (18a, b) I list the steps to go from the PSBR to $\bar{D}^P(t)$ and $\bar{D}^W(t)$ respectively. To get to $D^P$ or $D^W$ instead, simply replace $\bar{R}$ by $R$ (18a) and $\bar{r}$ by $r$ in (18b) and omit $n(t)$ in (18b). To obtain $\bar{D}$, the permanent share deficit given in (9) simply add $\bar{R}(t)G(t) - g(t)$ on the right-hand side of (18a). This substitutes the perpetuity value of the future consumption programme (corrected for trend output growth) for current consumption. To get D, the permanent deficit given in (7), from (18a) replace $\bar{R}$ by R in (18a) and add $R(t)G(t) - g(t)$ on the right-hand-side. Since government consumption spending in the U.K. has tended to grow in recent decades at the trend rate of growth of output, $\bar{D}$ and $\bar{D}^P$ should not be too different from each other.

$$(18a)\quad \bar{D}^{P}(t) = PSBR(t) - p_N(t)\,\dot{N}(t) - p_K(t)\,\dot{K}(t) + [\bar{R}(t) - i(t)]\,\frac{B(t)}{p(t)}$$

$$+ \left[\bar{R}(t) - \frac{1}{p_c(t)}\right]\frac{p_c(t)\,C(t)}{p(t)} - (\bar{R}(t) - i^*(t))\,\frac{\varepsilon(t)F^*(t)}{p(t)}$$

$$- \left(\bar{R}(t) - \frac{\dot{\rho}_K(t)}{p_K(t)}\right) p_K(t)\,N(t)$$

$$- \left(\bar{R}(t) - \frac{\rho_N(t)}{p_N(t)}\right) p_N(t)\,N(t) - (\bar{R}(t)\,T(t) - \tau(t)) - \bar{R}(t)\,S(t).$$

$$- [\bar{R}(t)\,Z(t) - (p_K(t) - 1)\,\dot{K}(t)]$$

$$(18b)\quad \bar{D}^{W}(t) = PSBR(t) - p_N(t)\,\dot{N}(t) - p_K\,\dot{K} - \left(\frac{\dot{p}(t,t)}{p(t)} + n(t)\right)\frac{B(t)}{p(t)}$$

$$+ \left(\bar{r}(t) - \frac{1}{p_c(t)}\right)\frac{p_c(t)C(t)}{p(t)} + \left[n(t) + \frac{\dot{p}(t,t)}{p(t)} - \frac{\dot{\varepsilon}(t,t)}{\varepsilon(t)}\right]\frac{\varepsilon(t)F^*(t)}{p(t)}$$

$$- \left(\bar{r}(t) - \frac{\rho_K(t)}{p_K(t)}\right) p_K(t)\,K(t)$$

$$- \left(\bar{r}(t) - \frac{\rho_N(t)}{p_N(t)}\right) p_N(t)\,N(t) - (\bar{r}(t)\,T(t) - \tau(t)) - \bar{r}(t)\,S(t).$$

$$- [\bar{r}(t)\,Z(t) - (p_K(t) - 1)\,\dot{K}(t)]$$

Since $\bar{D}^{P}(t)$ is probably the more interesting of the two measures, we shall concentrate on it. The figures are strictly back-of-the envelope and are for illustrative purposes only. Taking the corrections to the PSBR in (18a) in turn:

$-p_N\dot{N}$ : This is a proxy for t-ose net sales of existing public sector assets that should be added to the PSBR to get the public sector financial deficit (PSFD) on a national accounts basis.

$- p_g \dot{g}$ : $g(t)$ in (19a, b) is public sector consumption spending. Many categories of exhaustive public spending possess characteristics both of consumption and capital formation. In the illustrative figures for the U.K. given in Table 1 I finesse these problems by following standard national income accounting conventions. On this basis, estimates of public sector net capital formation (at replacement cost) which should be subtracted from the PSBR and PSFD as one of the steps to get to $\bar{D}^p$, are available in the U.K.

$+ (\bar{R} - i) \frac{B}{p} + (\bar{R} - \frac{1}{p_c}) \frac{p_c C}{p}$ : this is not merely an inflation and real growth correction but also involves the permanent income smoothing reflected in the use of the long real interest rate.[6/] (This last step is omitted in (19b).) In public sector permanent income, debt service on the bond debt should be evaluated by multiplying the real long run (consol) rate of interest net of the natural growth rate, $\bar{R}(t)$, into the market value of all bonds. Estimates for this correction for the U.K. and a discussion of its methodological foundations are given in Miller [1982] and in Miller and Babbs [1983]. They are reproduced here in Table I.

$- (\bar{R} - i^*) \frac{\epsilon F^*}{p}$ : This corrects for changes in the domestic currency value of foreign currency denominated assets and liabilities as well as for domestic inflation, real growth and permanent income smoothing. It is very important for a number of LDC's which have borrowed externally in dollars or other hard currencies. (See Buiter [1983].) Its significance for the U.K. and U.S. is likely to be quite minor.

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6. For conventional inflation corrections see Siegel [1979], Threadgold and Taylor [1979] and Cukierman and Mortensen [1983].

$- (\bar{R} - \frac{r_K}{p_K}) p_K K$ : It is difficult to assess the size and magnitude of the excess of current income from public capital over permanent income and I do not attempt to do so. It is likely to be strongly procyclical.

$- (\bar{R} - \frac{r_N}{p_N}) p_N N$ : North Sea oil revenues are currently at or near their expected peak value. While in the mid and late seventies current oil revenue fell short of its permanent value (as perceived at the time) this situation is now reversed. The figures in Table 1 are merely illustrative but are quite conservative, in the sense that they are more likely to understate permanent oil revenue.

$- (\bar{R}T - \tau)$ : It should be clear that current taxes net of transfers $\tau(t)$ is likely to be a poor proxy for $\bar{R}(t)\ T(t)$. The most important "corrections" to $\tau(t)$ required to obtain a better approximation to $\bar{R}(t)\ T(t)$ are the following:

(a) "Cyclical" corrections to tax receipts and transfer payments. The yield from several major taxes (income taxes, national insurance contributions, VAT, corporation tax) varies inversely with cyclical deviations of economic activity from its full employment, trend or natural level. The opposite correlation holds for such transfer payments as unemployment benefits. Cyclical corrections to the conventionally measured deficit are, from this perspective, desirable not because they provide a better approximation to the short-run demand effect of the budget, but as one step towards the calculation of public sector permanent income or of the permanent deficit.

In Table 1 I use the IMF's estimates of the cyclical correction.[7] These are very conservative in that they do not assign a zero cyclical correction to 1979 but instead assume the cyclically corrected deficit to be 2.3% of GDP larger than the actual deficit in 1979 and 1.4% of GDP in 1980.

This seems to indicate an expectation of a normal unemployment rate in the U.K. of 8 or 9 per cent. The Institute of Fiscal Studies,[8] on the other hand, while coming up with very similar year-to-year changes in the cyclical correction, puts its level 2 to 2½ percentage points of GDP higher. What matters for the sustainability calculation is that a reasonable proxy for the expected average future levels of capacity utilization and unemployment be used. These levels may well be functions of the fiscal policies adopted by the authorities and need not be equal to any "natural" or "full employment" values.

(b) There may be planned, projected or expected changes in the scale and scope of certain tax and benefit programmes. E.g. under existing legislation governing contributions and benefits, the greying of the U.K. population implies a growing excess of pension payments over contributions. Similar concerns have been voiced in the U.S. While one could try to make some further rough structural or demographic corrections to the "cyclically corrected" tax and transfer total, I have not done so in Table I.

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7. IMF World Economic Outlook.

8. John Kay [1983]

$-\bar{R}S$ : The perpetuity value of future seigniorage revenue is not so easily determined. Following the definition of S(t) given in (8b) one must estimate future government plans for monetary base growth $\frac{\dot{M}}{M}$ and future demands for real high-powered money balances $\frac{M}{p}$.

Note that

$$\bar{R}(t)\ \frac{S(t)}{\bar{y}(t)} = \bar{R}(t) \int_t^{\infty} \frac{\dot{M}(s,t)}{M(s,t)}\ \frac{M(S,t)}{p(s,t)\ \bar{y}(s,t)}\ e^{-\int_t^s [r(u,t) - n(u,t)]du}\ ds.$$

If both the rate of monetary growth and the income velocity of circulation of money are expected to be constant, then

$\bar{R}(t)\ S(t) = \frac{\dot{M}(t)}{p(t)}$ ... permanent seigniorage income relative to trend output equals its current value. I will make this assumption, but the overall outcome is not very dependent on it as the amounts involved are fairly small.

$-(\bar{R}Z - (p_K - 1)\dot{K})$ : This corrects for the excess of the current efficiency loss associated with public sector capital formation over its permanent value. I have not tried to put a figure on it.

TABLE 1

Calculation of the Permanent Deficit

| | PSBR | PSFD | Net Public Sector Capital Formation Correction $\dot{K}$ | Permanent Debt Service and exchange rate correction $+[\bar{R}-i]\frac{B}{p} + [\bar{R} - \frac{1}{p_c}]\frac{p_c C}{p}$ $-[\bar{R}-i^*]\frac{\varepsilon F^*}{p}$ | North Sea Oil Correction $-(\bar{R} - \frac{\rho_R}{p_R})\, p_R R$ | Cyclical Correction $-(\bar{R}\,T - \tau)$ | Structural and Demographic Tax-Transfer Correction. | Permanent Seigniorage Correction $-\bar{R}S$ | Perm.capital formation effic. correction $-(\bar{R}Z - (p_K{}^{-1})K)$ | Permanent Deficit | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | % of GDP |
| 1978 | 8354 | 7949 | - 2844 | - 5017 | - 1700 | + 4700 | | - 187 | | 2901 | 1.8 |
| 1979 | 12636 | 8271 | - 3006 | - 6461 | - 1400 | + 3900 | | - 210 | | 1040 | .6 |
| 1980 | 12180 | 9869 | - 2625 | - 8215 | - 900 | + 2700 | | - 227 | | 602 | .3 |
| 1981 | 10584 | 8023 | - 883 | - 9653 | 900 | - 2100 | | - 240 | | - 3953 | - 1.7 |
| 1982 | 5419 | 6734 | 0[a] | - 9851 | 1900 | - 5000 | | - 283 | | - 6500 | - 2.5 |

a estimate

SOURCES:

- PSBR, PSFD : ET May 1983, 56

- $\dot{K}$ : Blue Book 1982 ed. 1.7 for 1978-1981.
  1982 own estimate.

- Permanent Debt Service Correction: Miller and Babbs [1983].

- North Sea Oil Correction: Own calculations based on NIER, May 1983.
  F.J. Atkinson, S.J. Brook and S.G.F. Hall,
  "The Economic Effects of North Sea Oil", pp 38-44;
  IFS, John Kay ed., The Economy and the 1983 Budget;
  M.P. Devereux, "Changes in the Taxation of North Sea
  Oil", pp. 75-79.

- Cyclical Correction: IMF World Economic Outlook, 1982, Table 49, p.187.

- Permanent Seigniorage Correction: Monetary base x long-run real rate;
  Source: Miller & Babbs [1983]

Adopting the IFS cyclical correction instead of the one calculated by the IMF would lower the permanent deficit by 2 to 2½ per cent of GDP compared to the figures in the last column of Figure II. Together with a slightly more generous estimate of the permanent income from North Sea oil this would generate a 5 or 6 per cent of GDP permanent surplus in 1982. This would leave room for a sizeable sustainable increase in the share of public consumption spending in trend GDP over its current level and/or a cut in taxes or increase in transfer payments. Alternatively the government could choose to indulge in a bout of financial "crowding in", using its "permanent" surplus to reduce the real stock of interest-bearing debt. The U.K. economy, unlike the USA, would appear to have had a lot of fiscal elbow room in 1981 and 1982.

One advantage of the PVBC approach and of the various deficit measures I have derived from it, is that they permit one to make sense of many of the corrections to the conventionally measured deficit that have been proposed in a more ad-hoc manner in the literature. Among these are "inflation corrections" (Siegel [1979], Taylor and Threadgold [1979]; Jump [1980]; Boskin [1982]; Buiter [1982a,b ; 1983]; Miller [1982]; Miller and Babbs [1983]; Cukierman and Mortensen [1983] ) , permanent cost of debt service corrections (Miller [1982], Miller and Babbs [1983]), corrections for public sector capital formation (Buiter [1982 (a, b), 1983], Boskin [1982], Hills [1984]), corrections for certain intangible assets and liabilities (Boskin [1982], Hills [1984]) and cyclical corrections.

## IV Some applications

### Eventual Monetization

The apparatus developed here can be applied to the calculation of the "long-run" monetary growth rate implied by the fiscal stance.

From (6a, b) and (5b) it follows that

$$S(t) \equiv \int_t^{\infty} \frac{\dot{M}(s,t)}{M(s,t)} \quad \frac{M(s,t)}{p(s,t)} \, e^{-\int_t^s r(u,t)du} \, ds = G(t)$$

$$- \left[ p_K(t)\, K(t) + p_R(t)\, R(t) + T(t) - \frac{(B(t) + p_c(t)C(t) - \varepsilon(t)F^*(t))}{p(t)} + Z(t) \right]$$

This tells us what the amount of revenue to be raised through seigniorage (the "inflation tax") is (in present value terms) given the spending programme and the government's tangible and intangible non-monetary assets and liabilities. Solving this for a constant rate of monetary growth $\frac{\dot{M}}{M}$ and a constant income velocity of circulation $V \equiv \frac{\bar{pY}}{M}$ yields

$$(19)\qquad \frac{\dot{M}}{M} = V\bar{R}(t)\left\{\frac{G(t)-T(t)}{\bar{y}(t)} - \left[\frac{p_K(t)K(t)+p_R(t)R(t)}{\bar{y}(t)}\right] - \frac{Z(t)}{\bar{y}(t)} + \frac{B(t)+p_c(t)C(t)-\varepsilon(t)F^*(t)}{p(t)\bar{y}(t)}\right\}$$

If the long-run inflation rate is governed by the rate of growth of the money supply, say $\frac{\dot{p}}{p} = \frac{\dot{M}}{M} - n$, and if the inflation elasticity of velocity is less than unity, a higher monetary growth rate and a higher rate of inflation are implied by a higher present value of public spending relative to non-monetary assets and liabilities. Only if the public sector's consumption and tax programmes, together with its non-monetary assets and liabilities, imply a high value of $\frac{\dot{M}}{M}$ in (19), is a fiscal correction a necessary condition for achieving credibility for an anti-inflationary policy. If we consider only stationary long-run equilibria, (19) becomes

$$(19')\qquad \frac{\dot{M}}{M} = V\left[\frac{g-\tau}{\bar{y}} - (r-n)\left(\frac{p_K K + p_R R + Z}{\bar{y}} - \frac{(B+p_c C-\varepsilon F^*)}{p\bar{y}}\right) + \frac{(1-p_K)nK}{\bar{y}}\right]$$

Eventual monetary growth is governed in steady state by the trend public sector current account (or consumption account) deficit, with debt service evaluated at the real interest rate net of the natural rate of growth. This deficit measure can differ dramatically from the conventionally measured public sector financial deficit or PSBR, which is often and erroneously

taken as an indicator to eventual monetization. (See Sargent [1981], Sargent and Wallace [1981] and Buiter [1982a, b] and Buiter [1983].

Financial crowding out pressure

The change in the real stock of interest-bearing debt or in the interest-bearing debt output ratio is often considered to be important, because in many macromodels such changes are the proximate determinants of changes in the degree of financial crowding out pressure - the degree to which the public sector competes with the private sector for investible resources. Following Sargent and Wallace [1981] we may ask what governs the behaviour of $\dot{\delta} \equiv \frac{B + p_C C}{p\bar{y}}$, on the assumption that $p_K \frac{K}{\bar{y}}$, $p_N \frac{N}{\bar{y}}$ and $\frac{\varepsilon F^*}{py}$ are all kept constant. The answer is given in (20).

$$(20) \qquad \dot{\delta}(t,t) = \frac{g - \tau}{\bar{y}} + (r - n)\left[\frac{(B + p_C C - \varepsilon F^*)p^{-1} - p_K K - p_N N}{\bar{y}}\right] - \frac{\dot{M}}{M}\frac{M}{py}$$

The change in the real "burden" of government interest-bearing debt is given by the non-monetized part of the government's current, inflation - and real growth - corrected deficit as a proportion of trend GDP. Clearly, the anticipated future path of $\dot{\delta}$ can be evaluated for any set of assumptions concerning future behaviour of

public sector capital formation, asset sales and external debt accumulation. Equation (20) is merely a convenient benchmark.

## V Conclusion

There remain three loose ends to be tied up. First, how should one view the partial balance sheets, often including only the tangible, explicit and/or potentially marketable assets and liabilities of the public sector? Second, there is the related question as to whether the concept of public sector net worth makes sense. Third, what discount rates should be used in the present value calculations when there are non-lump sum taxes?

### Tangible or potentially marketable public sector net worth

Frequently analysts focus on a subset of the items in the PVBC. A recent example is Hills [1984] who considers a U.K. government balance sheet consisting mainly of physical and financial assets and liabilities, although future oil revenues, corporations' deferred tax, state pension rights and unfunded public service pensions are included. In terms of the PVBC in (6a, b) Hills omits most but not all of $T(t)$, the present value of taxes net of transfers, subsidies, etc., all of $S(t)$, the present value of future seigniorage and all of $Z(t)$, the present value of future public sector capital accumulation. There is no harm in principle in focussing on the tangible and/or (potentially) marketable items in the comprehensive public sector balance

sheet. Indeed, it is not hard to think of behavioural models in which the impact of explicit, tangible assets and liabilities differs significantly from that of implicit, intangible assets and liabilities that often reflect no more than the uncertain and reversible plans or promises of current and past and anticipated future governments.

Nevertheless, the omission of T, S and Z may give a distorted perspective on the fiscal and financial options actually open to the government; great care should be taken when making projections of a restricted public sector net worth concept, that the omitted balancing items aren't implicitly asked to behave in an impossible or implausible manner.

Does the concept of public sector net worth make sense?

It has been argued by several economists that the notion of "net worth" of the public sector makes no sense. 9/ I believe that any disagreement on this matter is largely semantic. If the discount rate exceeds the natural rate of growth and if the certainty equivalence assumption we make is acceptable, then equations (6a, b) , the PVBC, makes sense. The only issue is whether W should be called public sector net worth or something else. T, S and Z are the present discounted values of expected or planned future taxes net of transfers, seigniorage and capital formation. That means that W is to a large extent a choice variable of the government.

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9. Richard Musgrave made this point forcefully at the February 1984 meeting of the ISPE in Santa Cruz.

When applied in a private sector context, net worth has the connotation of something that is predetermined from the point of view of the individual agent, i.e. something parametric in the short run.[10] Net worth is defined as the sum of non-human capital and human capital. Human capital is the present discounted value of the future stream of labour endowments. If employment is a choice variable, and if we define human capital as the present discounted value of future labour income (as is done occasionally) rather than of future labour endowments (labour time plus leisure time), then the private net worth concept would be perfectly analogous to our W. The counterpart to the private endowment of labour is the public sector's maximum tax yield, i.e. its capacity to levy taxes rather than the taxes it actually expects or plans to levy.[11] We could have entered the maximal present discounted value of future potential tax receipts in the P.V.B.C. on the asset side and the excess of this maximal present value over the actual planned or expected present value on the liability side as a present value transfer (analogous to the present value of leisure time in the private sector case). Netting out the maximal present value of future taxes from the PVBC as is done in this paper, is misleading only if planned future taxes violate the taxable capacity constraint.

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10. Note that through the possibility of deliberate (dishonest) default, even private net worth will be to some extent a choice variable at a point in time.

11. The upper bound on the capacity to tax is certain to be less than the physical upper bound of 100% of private income and is likely to be political in nature.

The discount rate for the present value calculations

Assume there is a tax at a proportional rate $v_i$ on interest income, a capital gains tax (with full loss offset) at a proportional rate $v_c$ and taxes on natural resource income and capital income at rates $v_N$ and $v_K$ respectively. Capital gains or losses due to general inflation are not taxed. $\tilde{\rho}_K$ and $\tilde{\rho}_N$ are now the nominal rentals and $\tilde{p}_N$ and $\tilde{p}_K$ the price of resource rights and capital in money terms.

The arbitrage conditions in (2) now become :

$$(21)\quad \hat{r}(t) = i(t)(1-v_i) - \frac{\dot{p}(t,t)}{p(t)} = \frac{1}{p_c(t)}(1-v_i) + \frac{\dot{p}_c(t,t)}{p_c(t)}(1-v_c) - \frac{\dot{p}(t,t)}{p(t)}$$

$$= i^*(1-v_i) + \frac{\dot{\varepsilon}(t,t)}{\varepsilon(t)}(1-v_c) - \frac{\dot{p}(t,t)}{p(t)}$$

$$= \frac{\tilde{\rho}_N(t)}{\tilde{p}_N(t)}(1-v_N) + \frac{\dot{\tilde{p}}_N(t,t)}{\tilde{p}_N(t)}(1-v_c) - \frac{\dot{p}(t,t)}{p(t)}$$

$$= \frac{\tilde{\rho}_K(t)}{\tilde{p}_K(t)}(1-v_K) + \frac{\dot{\tilde{p}}_K(t,t)}{\tilde{p}_K(t)}(1-v_c) - \frac{\dot{p}(t,t)}{p(t)}$$

The budget constraint (1) is of course still valid; taxes on interest are included in $\tau$ and interest payments or receipts are entered gross of tax.

It is easily checked that the PVBC (6a, b) still holds, provided the following changes are made.

1) The instantaneous discount rate is $\hat{r}(t)$ defined in (21) rather than $r(t)$.

2) The present value of central bank profits is no longer $\Pi(t)$ as in (4c) but $\hat{\Pi}(t)$ which is defined by

$$\hat{\Pi}(t) \equiv \int_t^\infty i(s,t)(1-v_i)\frac{M(s,t)}{p(s,t)} e^{-\int_t^s \hat{r}(u,t)du} ds.$$

Note that this makes no difference to $S(t)$, other than the replacement of $r(u,t)$ by $\hat{r}(u,t)$ in (5b).

3) The stream of total taxes net of transfers $\tau$ that is discounted to yield $T$ in (6a, b) is replaced by

$$\hat{\tau} = \tau - \left\{ v_i \left( \frac{iB + C - i^*\varepsilon F^*}{p} \right) + v_c \left( \frac{\dot{p}_C C - \dot{\tilde{p}}_N N - \dot{\tilde{p}}_K K - \dot{\varepsilon} F^*}{p} \right) \right.$$

$$\left. - \frac{v_N \tilde{\rho}_N N}{p} - \frac{v_K \tilde{\rho}_K K}{p} \right\}$$

Thus gross taxes $\tau$ are replaced by taxes net of any receipts from income and capital gains taxes on the assets and liabilities appearing in the budget constraint.

The main implication is that after-tax rate of interest should be

used to discount future flows of revenue and expenditure.

It should be clear that neither the PVBC in (6a, b) nor the permanent deficit, the constant net worth deficit or the constant permanent income deficit are measures of fiscal stance or fiscal impact. They provide a useful framework for organizing facts and plans about fiscal, financial and monetary policy and for evaluating the consistency of spending and revenue projections, public sector debt objectives and monetary targets. Its weakest feature is its cavalier (heroic?) use of certainty equivalence. Even that strong assumption does not purchase us any information on short-term, medium-term or long-term fiscal impact. For that we need a specific macro-economic model.

The construction of informative measures of fiscal impact very soon requires an amount of effort and calculation that renders it observationally equivalent to performing policy evaluation exercises on complete sequential general equilibrium models. While the simple "model-free" balance sheet and budget measures proposed in this paper are essential for consistent fiscal and financial planning, the PVBC and its associated deficit concepts are prone to be misused as measures of fiscal impact on economic activity. It is unfortunately a fact that "model-free" measures become the natural habitat of implicit theorizing. They should perhaps be made to carry an official health warning.

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