Who's Afraid of the Public Debt?

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There are four reasons why a rising burden of the public debt may cause concern. The first is financial crowding out. If there is no debt neutrality or Ricardian equivalence, the substitution of government borrowing and future (lump-sum) taxation of labor income for current (lump-sum) taxation of labor income will tend to be associated with redistributions of lifetime resources among heterogeneous consumers that raise aggregate consumption. In an economy with fully utilized and inelastically supplied resources, this will lead either to the displacement of private investment or to an increase in the deficit on the current account of the balance of payments. In an economy with idle resources, the boost to consumption need not be at the expense of investment, even in a closed economy. The body of this paper deals with the intergenerational redistribution and risk-sharing associated with deficit financing, that is, with the financial crowding-out issue. In the remainder of this introduction, we refer very briefly to the other three concerns.

The second reason why the option of running deficits may be of interest relates to "tax smoothing." Even if there is "first-order" debt neutrality (as will be the case, for instance, in all representative-agent models), the option of departing from a balanced budget may be valuable for efficiency reasons if there are no lump-sum, nondistortionary tax-transfer schemes available. Deficits and surpluses permit changes in the time-profile of the excess burden associated with non-lump-sum taxes and transfers. Strictly convex tax administration and collection costs provide a similar efficiency motive for departures of current outlays from current revenues. Under rather restrictive separability and homogeneity assumptions, a strict tax-smoothing prescription emerges (see e.g., Robert Barro, 1979). The proposition that balanced budgets are suboptimal is, however, more robust than the tax-smoothing result.

A third concern with deficits stems from the argument that public-sector deficits eventually are monetized and thus lead to inflation. Consider the budget identity of the integrated treasury and central bank of a closed economy, given in the following equation:

$$(1)\qquad H_t - H_{t-1} + B_t - B_{t-1} \equiv D_t + i_{t-1}B_{t-1}.$$

All stocks are end-of-period. H is the stock of nominal base money, B is the stock of one-period nominal public debt, D is the nominal primary (noninterest) deficit (including public-sector capital formation on the debit side and cash revenues from the public-sector capital stock on the credit side); and i is the one-period nominal interest rate. We can rewrite the identity in (1) as the following:

$$(2)\qquad \sigma_t \equiv d_t - b_t + b_{t-1}\left(\frac{1+r_{t-1}}{1+n_{t-1}}\right).$$

Lowercase symbols denote the ratio of the real value of the corresponding uppercase variables for stock or flow to real GDP, Y; r is the one-period real interest rate, n is the growth rate of real GDP, and σ seigniorage

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as a fraction of GDP ($\sigma_t \equiv [H_t - H_{t-1}]/[P_t Y_t]$); and P is the general price level.

The eventual-monetization-of-deficits argument assumes that there is some upper bound to the public-debt:GDP ratio, $\bar{b}$, say, and that this upper bound has been reached. Equation (2) then becomes

$$(3) \qquad \sigma_t = d_t + \left(\frac{r_{t-1} - n_{t-1}}{1+n_{t-1}}\right)\bar{b}$$

Let $\mu_t \equiv (H_t - H_{t-1})/H_{t-1}$ be the proportional rate of growth of base money and let $V_t \equiv P_t Y_t / H_{t-1}$ be the income velocity of circulation of base money. Equation (3) can be rewritten as

$$(4) \qquad \mu_t = V_t\left[d_t + \left(\frac{r_{t-1} - n_{t-1}}{1+n_{t-1}}\right)\bar{b}\right].$$

Note that the deficit driving "eventual monetary growth" for a given value of velocity is

$$d_t + \left(\frac{r_{t-1} - n_{t-1}}{1+n_{t-1}}\right)\bar{b}$$

which is the *inflation- and real growth-corrected* deficit as a proportion of GDP. Note also that, even if we assume that the primary deficit:GDP ratio, the long-run real interest rate and the real growth rate are independent of the base money growth rate and of the rate of inflation, velocity is unlikely to be invariant under changes in expected inflation and associated changes in the nominal rate of interest.

A convenient steady-state benchmark is obtained by assuming that the steady-state rate of inflation π is given by $1+\pi = (1+\mu)/(1+n)$ and that velocity increases with the (expected) rate of inflation. If, for instance, the inverse of velocity is a linear or log-linear decreasing function of the rate of inflation, the well-known steady-state seigniorage Laffer curve emerges (see e.g., Buiter and Urjit R. Patel, 1992). Such back-of-the-envelope calculations are helpful in countries experiencing or drifting toward hyperinflations but are unlikely to be terribly relevant to the conduct of monetary, fiscal, and financial policy in the United States today.

The final reason why public-sector debt and deficits matter relates to the possibility of bankruptcy of the exchequer. Solving the budget identity forward in time we get the government's present-value budget constraint (6), provided we impose the "no Ponzi game" terminal condition given in (5):

$$(5) \qquad \lim_{j\to\infty} \prod_{\ell=0}^{j}\left(\frac{1}{1+i_{t-1+\ell}}\right) B_{t+j} \le 0$$

$$(6) \qquad B_{t-1} \le \sum_{j=0}^{\infty}\prod_{\ell=0}^{j}\left(\frac{1}{1+i_{t-1-\ell}}\right) \times (-D_{t+j} + H_{t+j} - H_{t+j-1}).$$

Condition (5) says that the nominal public debt cannot forever grow faster than the nominal rate of interest.[1] Equation (6) states that the value of the public debt is no greater than the sum of the present discounted value of future primary surpluses and the present discounted value of future seigniorage. If projected future nominal primary surpluses, monetary growth, and nominal interest rates violate (6), there is an inconsistency in the fiscal-financial-monetary scenario, which will have to be eliminated by some combination of revisions in expenditure and revenue plans, revisions in planned future recourse to seigniorage, changes in the projected interest-rate path, and partial or complete repudiation of the public debt.

In Buiter and Kletzer (1991), we argue that the rationale for (5) is not overwhelming. It is supposed to be the infinite-horizon analog of the finite-horizon solvency

[1]Equivalently, equation (5) can be phrased in terms of the real value of the debt discounted at the real rate of interest or the debt:GDP ratio discounted at the real interest rate net of the growth rate of real GDP. This is not to be confused with the substantively different terminal condition we propose below, involving the discounting of the real debt by the sum of the real interest rate and the real growth rate.

constraint that, at the known fixed terminal date, an economic agent cannot have negative net worth. There has been remarkably little discussion of the appropriate specification of the intertemporal budget constraint or solvency constraint of an infinite-lived government capable of selling debt to and of levying taxes on a growing population of private agents in an economy without a finite terminal date. In the case of a dynamically inefficient world, it is generally recognized that public debt can grow faster than the interest rate forever. Also, under the standard solvency criterion given in (5), debt can of course grow faster than GDP forever, even in a dynamically efficient world, as long as the growth rate of the debt does not exceed the interest rate forever.

However, even in a dynamically efficient world, it should be possible for the real debt to grow faster than the real interest rate forever, as long as it does not indefinitely grow faster than the sum of the real interest rate and the real growth rate. In a dynamically efficient static economy (i.e., one without real growth) real debt should not permanently grow faster than the real interest rate. With real growth, however, one is effectively replicating economies in each one of which debt cannot grow faster than the rate of interest but in the sum total of which debt can grow faster than the interest rate.

I. The Redundancy and Usefulness of Public Debt

We now state two propositions for a two-period overlapping-generations (OLG) model of a closed economy. Formal proofs and a more extensive discussion of the results can be found in Buiter and Kletzer (1991; see also Buiter and Kletzer, 1990).

PROPOSITION 1: *Given initial values of the capital stock and the stock of public debt, any equilibrium solutions for the capital stock and for consumption by all generations supported by arbitrary paths of public debt and of lump-sum taxes and transfers can be replicated without debt and deficits merely by using balanced-budget lump-sum taxes and transfers.*

This means that, in a deterministic economy, any intergenerational redistribution that can be supported by debt and taxes can also be supported just with taxes and without debt. In a stochastic economy it is true in addition that any intergenerational insurance supported with public debt, unbalanced budgets, and age-dependent lump-sum taxes can also be provided with age-dependent taxes, a balanced budget, and without public debt.

The redundancy of public debt stated in Proposition 1 is a generalization of the well-known proposition that an equilibrium with positive public debt financed by taxes on the young is equivalent to a balanced-budget, pay-as-you-go (or unfunded) social-security retirement scheme in which lump-sum taxes on the young are paid out as lump-sum transfers to the old. Proposition 2 below, which is a generalization of a point made by Guillermo A. Calvo and Maurice Obstfeld (1988), demonstrates the usefulness of public debt when there are restrictions on the government's tax-transfer instrumentarium.

PROPOSITION 2: *Given an initial value of the capital stock, any equilibrium for the capital stock and for the consumption of all generations supported by age- and time-dependent lump-sum taxes and transfers but without public debt and with balanced public-sector budgets, can also be supported with age-independent (although time-dependent) lump-sum taxes and transfers, provided unbalanced public-sector budgets and nonzero public debt are allowed.*

This means that any intergenerational redistribution or intergenerational insurance supported with balanced-budget age-dependent lump-sum taxes and transfers, can also be supported with age-independent lump-sum taxes and transfers but with unbalanced public-sector budgets.

As part of the proof of Proposition 2 we argue that the standard government-solvency criterion given in (5) (the value of the real debt discounted at the real rate of interest must ultimately become nonpositive) should be modified in two ways.

First, the infinite sequence whose behavior is relevant for government solvency is government debt discounted at the sum of the interest rate and the population growth rate, not the debt discounted at the interest rate. That is, we impose (7a) rather than (5) or, equivalently, rather than (7b):

$$\text{(7a)} \quad \lim_{j\to\infty} \prod_{\ell=0}^{j} \left(\frac{1}{1+r_{t-1+\ell}} \right) b_{t+j} \leq 0$$

$$\text{(7b)} \quad \lim_{j\to\infty} \prod_{\ell=0}^{j} \left(\frac{1+n_{n-1+\ell}}{1+r_{t-1+\ell}} \right) b_{t+j} \leq 0.$$

The motivation for (7a) is the following. Solvency requires that, *for each holder of public debt*, the government ultimately services the interest on the debt held by that debt holder by means other than further borrowing (that is, by running primary surpluses). Public debt per member of the population therefore should not, in the limit, grow faster than the rate of interest. Total debt can grow faster than the rate of interest if the size of the population (the number of potential public-debt holders) is growing over time.

Second, even if the infinite sequence of (properly discounted) public debt is not a convergent sequence, we call a government solvent if the sequence possesses a convergent infinite subsequence such that in the limit the discounted debt along this subsequence is nonpositive. In the two-period OLG model of Buiter and Kletzer (1991), elements of the sequence of discounted per capita debt two periods (or positive integer multiples of two periods) apart are candidates for such a convergent subsequence. That is, discounted *generational* debt should converge to a nonpositive limiting value.

Proposition 2 has implications for the empirical approaches to testing for government solvency (see e.g., James D. Hamilton and Marjorie A. Flavin, 1986; David W. Wilcox, 1989; Buiter and Patel, 1992). All these papers used variants of the conventional solvency criterion. While the conventional solvency criterion is sufficient for our modified criterion, it is not necessary.

II. Conclusion

For financial crowding out, what matters is how the government's total tax-transfer and borrowing program redistributes resources between private agents who are heterogeneous as regards their marginal propensities to consume (see e.g., Buiter, 1991). In simple finite-lifetime OLG models like the one analyzed in Buiter and Kletzer (1991) and discussed in the previous section, there are two kinds of heterogeneity: the young versus the old and those currently alive versus future generations.[2] In the real world, many more relevant kinds of heterogeneity occur, even among agents of the same generation.

Merely looking at the stock of public debt, without attempting to evaluate the total impact of the fiscal-financial structure on what Alan J. Auerbach et al. (1991) have called the "generational accounts" can be very misleading, even if there are no complications due to the presence of a public-sector capital stock or other nonfinancial assets and liabilities. Given a sufficiently rich tax-transfer menu, the government could achieve any desired redistribution with public debt, without it, or indeed with public credit. It is when tax-transfer options are constrained that the option of public borrowing or lending becomes valuable. The tax-smoothing proposition demonstrated how public debt can be useful for efficiency reasons in the absence of nondistortionary taxes and transfers. We complement this by showing how public debt can be useful in the pursuit of distributional objectives if there is a restricted menu of lump-sum taxes and transfers.

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[2]In the Yaari-Blanchard "uncertain-lifetimes" OLG model (see Olivier J. Blanchard, 1985) all agents currently alive have the same marginal propensity to consume; the only relevant heterogeneity is between those currently alive and those yet to be born.

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