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The Growth of Public Debt: Sustainability, Fiscal Rules, and Monetary Rules

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Abstract

The paper addresses first the question of sustainability of debt growth by examining the behavior of taxation implied by fiscal rules respecting a government's intertemporal budget constraint. Sustainable debt growth may require the tax burden to rise above some socially acceptable level. In this case, while drastic remedies may prove ineffective, a more relevant choice regards the degree of monetary financing of the deficit (as distinct from monetization of the debt), which affects the dynamics of taxation implied by the constraint. Monetary financing is then introduced in a model by Blanchard, and its effects on the interest rate and capital intensity are examined. Some policy implications are finally considered.

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Summary

This paper addresses the question of the sustainability of debt accumulation in the context of the historical experience of fast growth of public debt. It considers the effects of fiscal rules on the growth of debt and of the growth of debt on the dynamics of taxation; it then examines the effects of monetary financing of the deficit on the dynamics of debt and taxation, as well as on the interest rate and capital intensity.

In its widest notion, sustainability requires that, when the interest rate exceeds the growth rate of the economy, the government's fiscal policy should observe an intertemporal budget constraint (IBC) to the degree that the debt growth rate is less than the interest rate. This requirement is compatible with a rise to very high levels of the debt to gross domestic product (GDP) ratio. Observation of the IBC when public expenditure is inflexible, however, has drastic implications for the dynamics of the tax burden: taxes must rise together with the debt stock. There is, indeed, no limit to this rise if debt growth is unchecked.

Sustainability of debt growth is then synonymous with sustainability in the rise of the tax burden required by any fiscal rule to achieve the IBC. Society is not indifferent to the level and dynamics of taxation necessary to match the level and dynamics of interest payments. Keynes, referring to the experiences of the 1920s, considers situations in which "the claims of the bondholders are more than the taxpayer can support." His two remedies to obtain a once-and-for-all reduction of the real value of the debt were either a capital levy or a currency depreciation. Neither of these two remedies, it is argued, would be effective under present conditions; indeed they may be counterproductive.

The paper draws a sharp distinction between monetization of the debt by a sudden jump in the price level and a simultaneous fall in the real value of outstanding debt, and its monetary financing of the deficit through different steady inflation rates. The effects on taxation of different degrees of monetary financing are examined.

Some tentative policy conclusions are drawn from the preceding analysis. First, even if there are no limits to the tax burden, or if such limits are neglected, the IBC is insufficient to establish a condition of sustainable debt accumulation when the size of the debt affects the real interest rate in the medium run. Second, observing the IBC determines the behavior of taxation, but limits on the burden that taxpayers are willing to bear may make fiscal policy unsustainable.

I. Introduction

"Probably more uninformed statements have been made on the issue of public sector debt and deficits than over any other topic in macroeconomics" is the parting shot with which Willem Buiter (1985) concludes his "A Guide to Public Sector Debt and Deficits." It may be an extreme view, but it certainly rests on the great variety of professional and nonprofessional views on the issue. The latter, in turn, may find some justification in the no less remarkable variety of historical experiences.

In the United Kingdom, the ratio of public debt to gross domestic product (GDP) exceeded one for nearly a century, declining to lower levels only after 1860. The debt ratio reached very high levels in many countries after the two world wars. There was then a generalized increase in the 1930s, in connection with the Great Depression. The last decade has been another period of fast growth of debt almost everywhere: between 1972 and 1983, the increase in the debt ratio was of over 70 points in Denmark and Ireland, of over 44 in Belgium, of 40 in Japan, and of 35 in Italy. The growth continues unabated in Italy, where the ratio is nearing 100 percent, and is now fast in the United States. The remarkable feature of these recent experiences is that they have occurred in peacetime, though during a period of severe supply shocks and of decline in the trend growth rate.

Past experiences of debt accumulation are varied in their eventual outcome. 1/ There are important cases of painless re-entry to a more normal situation—mostly in Anglo-Saxon countries; cases in which the overhang of a high debt stock became a primary cause of financial instability, leading eventually to inflation which in turn provided a drastic remedy to the original problem by curtailing the real value of the outstanding debt--as in France in the 1920s; cases in which a high debt stock was one of many factors producing conditions of hyperinflation--as in Germany and other countries after the first world war; cases of forced loans, wealth taxes, or forced consolidation--as in Piedmont in the early nineteenth century or in Mussolini's Italy in the 1920s. The one safe lesson we can draw from both facts and theory is that it is meaningless to look for a critical value of the debt to GDP ratio beyond which the system breaks down and traumatic solutions become necessary: after all, the ratio was lower in France in the 1920s than in the United Kingdom between 1790 and 1840.

1/ On past experiences see, among others, Kindleberger (1984, Chapter 9 and part four); Nurkse (1946); Bresciani-Turroni (1931); and Marconi (1981). Surveys of recent experiences are in OECD (1984 and 1986), de Larosière (1984), Tanzi (1985); on the recent Italian experience Spaventa (1984), and Camera dei Deputati (1985).

As far as the economic theory of public debt is concerned, much was said in old strands of literature that has subsequently been rediscovered in very modern contributions; 1/ and much has been added since. But a large and growing body of literature offers few certainties on many crucial issues regarding the short- and medium-run effects of debt; and the most crucial is perhaps the one on which there is least certainty--how fast and how far can debt grow before causing a change of regime in one of the forms experienced in history.

This paper has no ambition to fill such a gap, its purposes being more modest. I shall first consider the widest notion of sustainability of debt growth: the one requiring that a transversality condition or intertemporal budget constraint be respected by the government. I shall introduce a notion of fiscal rule and examine when a fiscal rule causing a permanent deficit fulfills this condition (Section II). The constraint does not require that debt growth be bounded; even if it is, the debt ratio may rise to very high levels. The taxonomy of fiscal rules is more interesting if the implied behavior of the tax burden is considered: this is done in Section III. Those implications may be irrelevant as long as the analysis is kept at a very high level of abstraction; not so, if allowance is made for the distributional effects of the concomitant rise in interest payments and taxes. As pointed out with force by Keynes (1923) in his A Tract on Monetary Reform, the ability or the willingness of a government to collect a rising amount of taxes is likely to set a limit to sustainable debt growth. Keynes' "two remedies"--a capital levy or monetization for the purpose of reducing the real value of debt--are examined, to show that their success depends on very stringent conditions, unlikely to be met in present day cases. A sharp distinction is then drawn between what is normally referred to as monetization and different degrees of monetary financing of the deficit. In Section IV, I examine how the dynamics of debt and taxation are affected by monetary financing and I argue that, when there are perceived limits to the enforceable level of the tax burden, lax fiscal rules, even though they are not of necessity directly responsible for

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1/ The obvious reference is to Ricardo (1951); the less obvious one is to De Viti de Marco (1934, 1938, and 1953) and more in general to the Italian School of Public Finance in the 1930s. For Buchanan (1958), who gives an exhaustive account of the Italian debate, "the basic Ricardian proposition concerning the fundamental equivalence between extraordinary taxes and public loans . . . has been discussed to such greater length in Italian works that it may properly be said to belong to the Italian rather than to the English tradition." It may perhaps be added that the Italian debate displays less analytical elegance than modern contributions which have redebated the same issues, but often shows a far greater sense of reality.

inflation, are bound to to be associated with a higher propensity to inflation. The long-run effects of monetary financing on the real interest rate strengthen this conclusion and I examine such effects by explicitly introducing money creation in a well-known model by Olivier Blanchard.

II. Fiscal Rules and the Intertemporal Constraint

We start from the budget identity which, in nominal terms is

$$F_t = \dot{B}_t + \dot{M}_t \tag{1}$$

where F is the government's borrowing requirement, B is the stock of one-period bonds issued at par, M is the stock of high-powered money issued for the Treasury, and dots denote changes over time. Further,

$$F = G + iB - T \tag{2}$$

where G is nominal public expenditure net of transfers and of interest payments, i is the nominal rate of interest, and T are taxes net of transfers other than interest payments.

If we now consider ratios to GDP and denote such ratios by lower-case letters, we have

$$\dot{b}_t = f_t - \dot{M}_t/Y_t - (n_t+p_t)b_t \tag{3}$$

where Y is nominal income, n is its real growth rate, and p the rate of inflation, and

$$f_t = g_t + ib_t - \tau_t \tag{4}$$

from which,

$$\begin{aligned}\dot{b}_t &= g_t - \tau_t + (i_t-n_t-p_t)b_t - \dot{M}_t/Y_t \\ &= g_t - \tau_t + (r_t-n_t)b_t - \dot{M}_t/Y_t \end{aligned} \tag{5}$$

where $r = i-p$ is the real rate of interest and $\tau = T/y$. Equation (5) describes how the ratio of the stock of debt to GDP grows over time.

Note that $\dot{b}_t + \dot{M}_t/Y_t$ is the deficit (as a ratio to GDP) after correction for inflation and for the effects of real growth. 1/

To examine the problem of sustainability of debt growth, as described by equation (5), we shall only consider cases in which the fiscal authorities run a permanent deficit. We shall suppose that they follow a fiscal rule constant over time and we describe a set of possible fiscal rules with

$$f_t = a + \alpha b_t > 0 \qquad (6)$$

The borrowing requirement as a ratio to GDP will remain constant over time, if $a > 0$, $\alpha = 0$, or will change with the size of debt, if $\alpha > 0$.

The widest notion of sustainability of debt growth is the one requiring that the public sector respects an intertemporal budget constraint, which is also a transversality condition. 2/

Consider first the case $n = p = 0$: there is neither real growth nor inflation. Then, over an infinite horizon, we have from equation (5):

$$b_t = \int_t^\infty \tau_s e^{-r(s-t)}\, ds - \int_t^\infty g_s e^{-r(s-t)}\, ds + \lim_{s\to\infty} b_s e^{-r(s-t)} \qquad (7)$$

1/ The literature on inflation correction has grown pari passu with the growth of deficits and debt. See, for instance, Miller (1983); Miller and Babbs (1983); Cukierman and Mortensen (1983); and Eisner and Pieper (1984). Objections to inflation-accounting, especially from official agencies, often stem from the belief that higher nominal figures help to keep up the pressure for fiscal adjustment. This argument can be easily turned on its head: when inflation declines, nominal interest payments as a ratio to GDP fall even if the real interest rate, and hence real interest payments, rise, as often happens. In this case, it is not inflation-accounting, but the lack of it which may delude the authorities into thinking that their budget problem is on the way of being solved, while instead there has been no deceleration of debt growth.

2/ See Blanchard (1984 and 1985); Buiter (1984 and 1985); Blanchard, Dornbusch, and Buiter (1985); and McCallum (1984), who clearly specifies that boundedness of debt growth is not necessary for meeting the intertemporal budget constraint.

The intertemporal budget constraint imposes the condition that debt cannot be serviced indefinitely by borrowing. This requirement is satisfied if

$$\lim_{s\to\infty} b_s e^{-r(s-t)} = 0 \tag{8}$$

and therefore

$$b_t + \int_t^{\infty} g_s e^{-r(s-t)}\, ds = \int_t^{\infty} \tau_s e^{-r(s-t)}\, ds \tag{9}$$

The economic meaning of equation (9) is that, if we start with a positive stock of debt, at some time in the future there must be primary surpluses to service the debt.

Equation (8), as shown by McCallum (1984), does not imply either that the growth of debt is bounded or that there exists a finite stationary state value for b: if a stationary state value exists, equations (8) and (9) are certainly satisfied; but the condition can be satisfied also if b grows indefinitely, provided that its growth rate is less than the interest rate, as can be seen from equation (8).

For any fiscal rule included in equation (6), we have $b_t = b_o e^{\alpha t} + (a/\alpha)(e^{\alpha t} - 1)$. Hence, provided that $\alpha < r$, the intertemporal budget constraint shown in equation (8) is satisfied and so is equation (9). If $\alpha > 0$, however, or if $\alpha = 0$ but $a > 0$, debt grows indefinitely over time. Suppose $\alpha = 0$, $a > 0$; then $\dot{b} = a = f$ and $b_t = b_o + tf$; the growth of debt is unbounded, but equation (8) is satisfied. If $r > \alpha > 0$, equation (8) is satisfied, while not only debt but also the borrowing requirement grow forever. In a stationary economy with zero rate of money creation, boundedness of the debt requires $\alpha < 0$, $a > 0$.

If, on the other hand, $\alpha = r$, with $a \gtreqless 0$, the constraint is not respected. Even if the government runs a <u>constant</u> primary surplus (a positive difference between tax revenues and noninterest payments), the intertemporal budget constraint is not met, as the government would have to borrow all that is needed to service the debt. Respect of the constraint requires a <u>growing</u> primary surplus, even when, or rather because, debt grows forever.

Let us now consider a more general case, in which the growth rate of the economy can be positive, and in which part of the deficit may be financed by the issue of monetary base. Real growth and/or monetary financing of the deficit affect the dynamics of debt associated with any given fiscal rule by reducing the speed of debt accumulation and by increasing the possibility of bounded growth of the debt ratio.

We now have:

$$\dot{b}_t = a - \lambda m(p) + (\alpha-\lambda)b_t \qquad (10)$$

and

$$b_t = b_0 e^{(\alpha-\lambda)t} + \frac{a-\lambda m}{\lambda-\alpha}\left(1-e^{(\alpha-\lambda)t}\right) \qquad (11)$$

The intertemporal budget constraint becomes

$$\lim_{s\to\infty} b_s e^{-(r-n)(s-t)} = 0 \qquad (8')$$

A positive inflation rate does not alter (8) or (8') if the real interest rate is independent of the rate of inflation in the long run. Equation (7) and hence equation (9) must, however, be modified to allow for both real growth and monetary financing of the deficit. Equation (9) now becomes

$$b_t + \int_t^\infty g_s e^{-(r-n)(s-t)}\, ds = \int_t^\infty \tau_s e^{-(r-n)(s-t)}\, ds + \int_t^\infty \lambda_s m_s e^{-(r-n)(s-t)}\, ds \qquad (9')$$

We suppose that monetary financing of the deficit is the only source of increase of base money which we assume to grow at the constant rate $\lambda = n + p$, the sum of the real growth rate and the inflation rate.

Hence, $\dot{M}/Y = \lambda m(p)$, where $m(p)$ is the ratio of base money to nominal income, a decreasing function of the inflation rate.

If the growth rate exceeds the interest rate, the constraint given by equation (8') loses its meaning. Governments can service their debt by borrowing and are thus allowed, as Buiter (1985) puts it, to conduct "honest Ponzi games."

If, however, the real interest rate exceeds the real growth rate, as we shall assume in most of what follows, fulfillment of the intertemporal budget constraint with the set of fiscal rules given by equation (6) now requires that $\alpha - p < r = i - p$, a less stringent requirement than in the previous case. The growth rate of debt implied by the given fiscal rule must not exceed the nominal (rather than the real) interest rate. Further, positive real growth and/or monetary financing of the deficit set a limit to the growth of debt for a wide variety of fiscal rules for which growth was unbounded with $n = p = 0$. In general, as can be seen from equations (8') and (11), the intertemporal budget constraint is met, but growth is unbounded if $\lambda < \alpha < i$; *debt growth is instead bounded if* $\alpha < \lambda < i$. *In this latter case*

$$\lim_{t\to\infty} b_t = \frac{a-\lambda m}{\lambda-\alpha}$$

which becomes $f/\lambda - m$, if $\alpha = 0$ and $a = f$.

If $\alpha = i$, the constraint is not satisfied. When the fiscal rule is so lax that α equals the nominal interest rate, monetary financing can help satisfy the constraint only if it takes place at a growing rate, and hence with accelerating inflation. In this case, a constant share of the total deficit must be financed with base money; but as total deficit grows over time at a rate (r-n), also pm(p) must grow at the same rate, and p will have to grow faster if m falls as inflation accelerates. In this undesirable, but perhaps, not implausible case, there may also exist, at least on paper, a steady-state value for b. 1/

If the growth rate exceeds the interest rate, the intertemporal budget constraint, as can be seen from equation (8'), loses its meaning.

1/ Thus, suppose that $\alpha = i$, but that a constant share μ, of the (growing) borrowing requirement is financed with money creation. Debt growth is, in this case, given by $\dot{b}_t = (a+i_t b_t)(1-\mu) - \lambda_t b_t$, with the nominal interest rate and the nominal growth rate rising together with the rate of inflation and the rate of money creation. The intertemporal budget constraint is now met and there may exist a steady-state value for b.

As long as $\alpha - p$ is less than the real growth rate, there exists a steady state value of b, and the government, as Buiter (1985) puts it, is allowed to conduct "honest Ponzi games."

Thus, for all sets of fiscal rules that are not intrinsically explosive, positive real growth and monetary financing reduce the speed of debt accumulation and limit the possibility of unbounded growth of the debt ratio.

This brief survey of fiscal rules in view of their compatibility with the intertemporal budget constraint also shows, however, that the latter provides a very weak criterion of sustainability of protracted deficits and debt growth. Its fulfillment is ensured also by rules that make the debt, and possibly the borrowing, requirement grow forever; even when the growth of debt is bounded, the limit may be very high and debt may grow at very high rates for a long time.

The taxonomy of sustainable and unsustainable fiscal rules according to the criterion of the intertemporal budget constraint, and, among the former, to the existence of limiting steady-state values, is thus by itself not very interesting either for theory or for policy. Its implications for the taxing or spending behavior of the government are, however, more relevant.

Let us suppose that g, the ratio to GDP of government expenditure net of transfers, is given. We shall still assume that the real rate of interest is constant (an assumption which we shall attempt to remove later). With a constant rate of inflation, $i = r + p$, and we obtain from equations (4), (6), and (11) the taxing behavior of the government implied by each fiscal rule:

$$\tau_t = g-a + (i-\alpha)b_t = g-a + (i-\alpha)\frac{a-\lambda m}{\lambda-\alpha}$$

$$+ (i-\alpha)(b_o - \frac{a-\lambda m}{\lambda-\alpha})e^{-(\lambda-\alpha)t} \qquad (12)$$

Fulfillment of the intertemporal budget constraint requires that $\alpha < i$. Hence it also requires that the tax burden net of transfers other than interest payments must grow together with the stock of debt: without limit, if the growth of the latter is unbounded, or, if it is bounded, toward a limit which can conceivably be quite high. Is a situation of unlimited or very fast growth of the tax burden admissible? In principle it is, if the analysis is kept at an abstract level.

First, as McCallum (1984) has shown, a fiscal rule such that the intertemporal budget constraint given in equations (8) or (8') is met, is compatible with optimal equilibrium in a model of rational agents with perfect foresight and infinite horizons, even if it causes unbounded growth of debt and hence of taxation. Consider further that the growing tax burden does not affect total disposable income, as growing taxation is offset by rising interest payments on the growing debt stock.

Next, let us perform the following experiment. Suppose that at $t = 0$ the fiscal rule is such that $\dot{b}_0 = a - \lambda m + (\alpha-\lambda)b_0 > 0$, because $a > (\lambda m - (\alpha-\lambda)b_0)$.

The prospect thus is one of growing debt, without bounds or tending toward a limit according to whether α exceeds or falls short of λ. The choice is between keeping the fiscal rule unchanged, with debt growing over time, and changing the fiscal rule now so as to stop the increase in the debt ratio, with $\dot{b}_0 = 0$. If g is given, the choice is between raising or not raising taxation now. The increase in taxes necessary to ensure constancy of the debt ratio at $t = 0$ is $a - \lambda m + (\alpha-\lambda)b_0$: taxes would thus rise from $\tau_0 = g-a + (i-\alpha)b_0$ to $\tau_0' = g + (r-n)b_0 + \lambda m$.

Note first that, if the (constant) growth rate exceeds the (constant) interest rate, a problem of choice does not even arise. If $i \leq \alpha$ (there is now no constraint), the tax burden will decrease below, or remain constant at, the level τ_0, as appears from equation (12). If $\alpha < i < \lambda$, with an unchanged fiscal rule taxes will rise toward a steady-state level $\tau^* = g-a + (i-\alpha)b^* = g-a + (i-\alpha)\frac{a-\lambda m}{\lambda-\alpha}$. As, however, $\tau^* - \tau' = (n-r)(b_0-b^*) < 0$, for $n > r$, with an unchanged fiscal rule the tax burden, though rising, will never reach the level that would be necessary to stop the growth of debt immediately. In either case, if the only worry is the effect of debt on the overall tax burden, there is no reason why debt growth should be stopped.

Consider next the case in which the interest rate exceeds the growth rate. As we assume that the intertemporal budget constraint is met and since b_0 and g are given, any possible time profile of taxation satisfies equation (9'). If also the agents' discount factor is (r-n), the discounted flow of future taxes must always equal the value of the existing debt stock plus the discounted flow of government expenditures minus the discounted flow of money creation, irrespective of whether taxes are increased now and then kept constant or are kept lower now and rise gradually with time to even higher levels. Thus, it is immediately verified that

$$\int_t^{\infty} \tau_s \, e^{-(r-n)(s-t)} \, ds = \int_t^{\infty} \tau'_s \, e^{-(r-n)(s-t)} ds.$$

It is a known conclusion 1/: if agents have infinite horizons, they are indifferent as to the time profile of taxation. More generally, and perhaps more significantly, there is indifference, if the rate at which agents discount future taxes is the same as that used to establish sustainability of debt growth in the government's intertemporal budget constraint.

Suppose instead that agents have myopic preferences, so that their rate of discount exceeds (r-n) by some factor π, while the rate of discount used in equation (8') remains the same. In this case, higher future taxes, even if the tax burden must grow forever, are always preferred to a tax increase now which would keep the debt ratio and hence the tax burden constant in the future. 2/ As we shall see later, however, if we introduce myopic preferences, we must allow for the effects of debt on the real interest rate.

III. Sustainability and Taxation

Can we really presume that fulfillment of the intertemporal budget constraint is all that is needed to establish the sustainability of the growth of debt caused by a given fiscal rule? More precisely, if we start with a given fiscal rule meeting the constraint (hence with α ® i), can we presume that the associated behavior of the fiscal burden, as given by equation (12), is always sustainable? Such presumption requires that there are no limits to the levels of taxation which society is ready to accept: for, if there are, a fiscal rule initially meeting the constraint may become unsustainable in the longer run. There are at least two conditions needed to rule out the existence of a limit to the sustainable level of taxation. First, a continuously rising tax burden must be without consequences on the individuals' incentive to work and on the tax base. Second and more important, the individual distribution of income must not be affected by the simultaneous rise in the tax burden and in interest payments on the growing debt: if it is, as will be the

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1/ In the Ricardo-De Viti de Marco-Barro line; see Barro (1974 and 1978).

2/ The difference between the two flows, τ', a level of taxation higher now but constant in the future, and τ_s, the growing level of taxes implied by the given fiscal rule, both discounted at the rate $(r-n+\pi)$, is always positive.

case unless very restrictive assumptions on the initial distribution of income and wealth hold, the required increase in taxation may become unsustainable because of the social and political reactions it raises.

The problem of the distributional effects arising from the need to service a growing stock of debt was well understood by De Viti de Marco 1/ and especially by Keynes. In A Tract on Monetary Reform, Keynes stated with the greatest clarity the political problem arising "when the State's contractual liabilities . . . have reached an excessive proportion of the national income. The active and working elements in no community, ancient or modern, will consent to hand over to the rentier or bond-holding class more than a certain proportion of the fruits of their work." 2/

Considering the French situation in the early 1920s, Keynes (1971, p. 58) observed that in that country "the service of debt will shortly absorb . . . almost the entire yield of taxation" 2/ and concluded that "France must come in due course to some compromise between increasing taxation, and diminishing expenditure, and reducing what they owe their rentiers" (p. 59). What Keynes had in mind was the sustainability of the behavior of taxation implicit in a fiscal rule respecting the intertemporal budget constraint: when "the claims of the bond-holder are more than the taxpayer can support" (p. 55), further growth of the debt service, and hence of debt, becomes impossible and some relief must be sought elsewhere.

For a situation in which such limit has been reached and "the piled-up debt demands more than a tolerable proportion" (p. 54) of income, Keynes, ruling out debt repudiation, considered two possible remedies. He favored a capital levy as "the scientific . . . expedient . . . the rational, the deliberate method," but he doubted that it was feasible, because "it is difficult to explain, and it provokes violent prejudice by coming into conflict with the deep instincts by which the love of money protects itself" (p. 55). The other remedy was "currency depreciation."

1/ In what follows, I shall be quoting from Keynes' A Tract on Monetary Reform. But De Viti de Marco had perceived the problem with equal clarity when he considered the increase in taxation which the State has to impose to pay the interests on a loan: "The State is unaffected by this transaction, but the economic budget of the community is not. . . . The community is not a homogeneous entity, which pays 50 million worth of taxes and perceives 50 million worth of interests; the State receives 50 million of taxes from some, and pays 50 million of interests to others." (De Viti de Marco, 1953, p. 402 (1961 reprint)).

2/ Keynes (1971, p. 54).

In the conditions of debt accumulation prevailing nowadays in many countries, Keynes would perhaps place less faith in a capital levy as the decisive and sufficient remedy. Such conditions are not those of a debt overhang due to a succession of past deficits incurred during war, in which the growth of debt is only a heritage of the past and is no longer due to primary deficits. When, as is often the case nowadays, the fiscal rules that started the process of debt accumulation are still being followed by the authorities, a capital tax levied with the purpose of retiring part of the outstanding debt may be worse than useless unless the rule is changed. Thus, suppose that $(a-\lambda m)$ is positive and exceeds $(\lambda-\alpha)b$, so that debt is growing. If the rule is not altered, a reduction in the stock of outstanding debt obtained by means of a capital levy would not affect the long-run dynamics of the debt; the reduced stock would grow at a higher rate until the previous value is reached again.

This is, of course, an extreme assumption as it does not allow for a reduction of the deficit due to lower interest payments on the smaller stock (though the temptation to use the reduction in interest payments to make more room for other expenditures may be strong). But even if we let the deficit decline by the full amount of the reduction of interest payments, the capital levy and the ensuing reduction of the stock of debt will not stop further debt growth unless there is already (or unless the authorities take measures to enforce) a primary surplus net of monetary financing. From the budget identity, debt grows as long as $(g-\tau_t-\lambda m) > (\lambda-i)b$; with $i > \lambda$, constancy of the debt ratio at a lower level of the debt stock requires that the first term be negative. If the fiscal rule is not, or is not made, consistent with the constancy of the debt ratio at the lower level attained after the capital levy, placement of the new debt may become difficult or impossible as a result of a confidence crisis. Thus, a capital levy becomes a useful remedy only after conditions of fiscal virtue in terms of the budget net of interest payments have been established.

We next come to "currency depreciation," which Keynes considered the only feasible remedy for the French plight. "If we look ahead," he wrote, "the level of the franc is going to be settled in the long run . . . by the proportion of his earned income which the French taxpayer will permit to be taken from him to pay the claims of the French rentier" and "will continue to fall until the commodity value of the francs due to the rentier has fallen to a proportion of the national income which accords with the habit and mentality of the country." 1/ In his open letter to the French Minister of Finance in 1926, Keynes reiterated his view that there was "one Exit only--a rise of internal prices," observing

1/ Keynes (1971, pp. 59-60).

that "if internal prices had risen as fast as the exchange has fallen, the real burden of the national debt service would be reduced by at least a third." 1/

What Keynes meant by currency depreciation was not a permanent rise of a steady rate of inflation, but a once-and-for-all operation of increase in the price level, which would be tantamount to a capital levy for its effects on debt. Though the wealth tax implicit in a sudden price rise is more unfairly distributed than a capital levy, it is a fact that the "owners of small savings suffer quietly . . . these enormous depredations, when they would have thrown down a government which had taken from them a fraction of the amount by more deliberate but juster instruments. . . . It is, so to speak, nature's remedy, which comes into silent operation when the body politic has shrunk from curing itself." 2/

The conditions for the success of Keynes' second remedy in taking care of a debt problem are at least two. Remember that the problem in this context does not arise from the formal requirements of intertemporal sustainability, which are assumed to be initially respected, but from the fact that the increase in taxation required to meet rising interest payments proves to be politically unsustainable beyond a certain level: whence the need to somehow cut interest payments so as to respect the intertemporal constraint. The first condition is the same as that necessary for the success of a capital levy: a reduction in the real stock of debt obtained by means of a once-and-for-all price rise will succeed in preventing further debt growth only if revenues already exceed expenditures net of interest payments and monetary financing; only, that is, if the stage has already been reached in which interest payments are the sole remaining cause of the debt problem and a "sound" budget situation has otherwise been re-established. The second condition is that a large share of the outstanding debt consists of fixed-coupon long-term bonds, so that real interest payments can fall roughly in proportion with the real value of the stock of debt. Both conditions were verified in the French situation with which Keynes was concerned; either or both are lacking in present day cases. As in most recent experiences the acceleration of debt growth has followed closely a period of high (and initially unexpected) inflation, savers have sought protection from further real losses by requiring shorter-term instruments (as shown by the decrease in the average life of debt in all countries)

1/ Keynes (1932, pp. 107 and 109).
2/ Keynes (1971, pp. 54-55).

or formal indexation to prices or to short-term interest rates. 1/ This feature is explicitly introduced in our earlier presentation, as we have assumed that all bonds issued are one-period bonds and we have so far taken the real interest rate as given. Lacking those two conditions, a sudden rise in the price level, as recommended by Keynes for France, would have no effect whatever on debt growth and on the rise in taxation required to meet the intertemporal budget constraint. Even worse, if the deliberate operation of curtailing the real value of the debt outstanding fails its purpose of arresting further debt growth, there would arise conditions of financial instability, as savers would learn from experience and new bonds could be placed only at much higher real rates.

IV. Monetary Financing

We must, at this stage, draw a sharp distinction between a sudden jump in the price level necessary to a once-and-for-all reduction of the real value of the debt outstanding, which was the "second remedy" considered by Keynes and is normally referred to as "monetization of the debt," and the choice between different degrees of monetary financing of the deficit and hence between different steady rates of inflation. Keynes' remedy is in the nature of a surgical operation, the success of which depends on the existence of healthy conditions of the primary budget and on the possibility of removing the abcess that causes the pathology by inflicting real losses upon the bondholders. We instead make no assumptions as to the state of the primary budget and explicitly assume that bondholders are immune from inflationary losses. Thus, a choice as to the degree of monetary financing of the deficit and the rate of inflation cannot affect the real value of the outstanding debt and has therefore nothing in common with monetization in Keynes' sense.

1/ On the relevance of the average maturity of the debt for the success of monetization and on its shortening in recent times, see Blanchard, Dornbusch, and Buiter (1985). Among the industrial countries, Italy provides a perhaps extreme example of the impossibility of solving the debt problem through monetization in Keynes' sense. The average maturity of the interest-bearing debt on the market is of less than four years. Further, and more important, at the end of 1984, Treasury bills (with a maximum duration of one year) accounted for *almost 40 percent of total public debt, while more than 45 percent* was in the form of Treasury certificates, with a yield indexed on that of the six-month or (for a smaller fraction) of the one-year Treasury bills. Finally, Italy still has a large primary deficit, while interest payments have reached about the level of the revenues from the personal income tax.

What, however, such a choice does affect, for any given fiscal rule respecting the intertemporal constraint, is the dynamics of debt and its steady-state level, if any; hence, the dynamics of the tax burden and its steady-state level, if any. The latter will be affected on the one hand, by the different debt dynamics associated to different degrees of monetary financing, and on the other, by the different nominal interest rates associated to different rates of inflation. The choice arises and acquires relevance when there is a limit to the level of the tax burden that is socially or politically acceptable, and the authorities embark upon a fiscal rule that would drive taxation beyond that limit. Conditions in which drastic surgery is both possible and feasible are indeed less frequent than cases in which remedies allowing the patient to survive with a chronic illness are sought. 1/

We shall now turn to examining how debt growth and taxation are affected if we let the degree of monetary financing, and hence pm, vary. We shall at first take the real interest rate as given; we shall then add monetary financing to a recent model by Blanchard (1984 and 1985), to examine its effects on the real interest rate.

The way in which the financing of the deficit through money creation affects the dynamics of interest-bearing debt is readily seen from equations (10) and (11): for plausible values of the price elasticity of demand for money 2/ both the growth and the level of debt diminish unambiguously. A higher rate of inflation has two opposite effects on the level of debt service and hence of taxation, which, in the sustainable case, must grow with debt service: on the one hand, it lowers the level of the interest-bearing debt, on the other hand, it raises the nominal interest rate which, under our assumption, fully reflects the rate of inflation. Suppose, however, that $\alpha < \lambda$, so that there exists a steady-state level b^* of b and an associated value of τ, $\tau^* = g-a + (i-\alpha)b^*$. We then have

$$d\tau^*/dp = -(\lambda-\alpha)^{-1} [(i-a)d(\lambda m)/dp + (r-n)b^*]$$

1/ The case of "normal" monetary financing, as distinguished from drastic and sudden monetization aimed at reducing the real value of debt, was explicitly considered by Keynes: The "conveniences of using money in daily life are so great that the public are prepared, rather than forgo them, to pay the inflationary tax, provided it is not raised to a prohibitive level. Like other conveniences of life the use of money is taxable, and . . . a government can get resources by a continuous practice of inflation, even when this is foreseen by the public generally, unless the sums they seek to raise in this way are grossly excessive" (1971, p. 43).

2/ It is sufficient (but not necessary) that λm does not fall as the rate of inflation rises.

which again is negative for reasonable values of the price elasticity of demand for money (in particular, as $\lambda m = (i-r+n)m$, with a unit elasticity of the demand for money with respect to the nominal interest rate, $d(\lambda m)/dp = -(r-n)dm/dp > 0$.

To see how different rates of monetary financing affect the flows of future taxes compatible with respect of the intertemporal budget constraint, consider for the same initial values of the debt ratio, b_o, and of the ratio to income of expenditure net of interests, g, and for the same real growth rate, n, two different rates of creation of base money $\lambda = n+p$ and $\lambda' = n+p > \lambda$. The monetary financing of the deficit as a ratio to income will be in the two cases, respectively, λm and $\lambda' m'$, with $m' < m$. Let the two streams of taxes associated with λm and $\lambda' m'$ be, respectively, τ_s and τ'_s. Then, from equation (9') we have:

$$\int_o^\infty \tau_s \, e^{-(r-n)(s-t)} \, ds - \int_o^\infty \tau'_s \, e^{-(r-n)(s-t)} \, ds = \frac{\lambda' m' - \lambda m}{r-n} \qquad (13)$$

To a higher rate of money creation there will correspond a lower discounted flow of future taxes, if $r > n$ and provided that $\lambda' m' > \lambda m$. This last condition is observed if the price elasticity of demand for money is less than $p/(p+n)$. If the interest elasticity of demand for money is unit, this is always the case: the difference between the two discounted streams of taxes associated to different rates of inflation then becomes simply $m-m' > 0$.

To derive the same result in another way, suppose that at $t = 0$ debt is growing, because with a rate of money creation λ (and a rate of inflation p), $a-\lambda m > (\lambda-\alpha)b_o$. The rate of money creation necessary to keep the level of debt constant at b_o with an unchanged fiscal rule will be λ', such that $a-\lambda' m' = (\lambda'-\alpha)b_o$. With a rate of inflation p, taxes would have grown with b_t, according to equations (11) and (12). With the new rate of inflation p', they will rise initially to $\tau'_o = g-a + (i'-\alpha)b_o$ and then remain at that level forever. The difference between the two streams of taxes discounted at (r-n) will be $\frac{a-\lambda m}{r-n} + (1 - \frac{i'-\alpha}{r-n})b_o$, which will be equal to $(\lambda' m' - \lambda m)/(r-n)$. 1/

1/ For b_o to remain stationary, λ' must be such that $\frac{a-\lambda' m'}{\lambda'-\alpha} = b_o$ so that $(1 - \frac{i'-\alpha}{r-n})b_o = -\frac{a - \lambda' m'}{r-n}$.

While, however, to different rates of money creation there corresponds a different level of the tax burden, different rates of inflation also entail a different cost of holding base money. If this cost is measured by the rate of inflation times the amount of money held--pm and p'm' in the two cases--the difference between the discounted flows including both the taxes collected by the fiscal authorities and that silently enforced by the monetary authorities becomes, as can be easily verified, $n(m'-m)/(r-n) < 0$, as long as $r > n$. Thus, the discounted stream of taxes plus the inflation tax is higher for a higher rate of inflation. If, however, the cost of holding money at different inflation rates is more correctly measured by the nominal interest foregone because money rather than an interest-bearing asset is being held, we are back to our previous result: if we add to τ and to τ', respectively, im and i'm', the difference between the two discounted flows is $m-m' > 0$.

Whatever the correct measure of the cost of inflation, a continuous rise of taxation is likely to meet more vociferous objections than a steadily higher inflation tax as measured by higher rate of inflation. To bring out this point let us explicitly consider the existence of a limit to the amount of resources that "the active and working elements" of the community "will consent to hand over to the . . . bond-holding class" 1/: in this case, if the authorities are unable or unwilling to cut expenditures, the choice is not whether to have a higher inflation rate but when and to what extent to step up monetary financing of the deficit.

Suppose that there is a limit, $\bar{\tau}$, to the tax burden which citizens are ready to bear or which the government is able to impose without political risks. Suppose that with a given sustainable fiscal rule and a rate of money creation λ such limit is reached at $t = T$, when the level of debt, b_T, is such that $\tau_T = \bar{\tau}$. With that fiscal rule and that rate of money creation, debt would increase further after T; but as taxes cannot be increased above τ_T, debt growth must be stopped at T in order to prevent a further increase of interest payments which would now be incompatible with the intertemporal constraint. Hence, unless noninterest expenditures are cut, the monetary financing of the deficit, and with it the inflation rate, must be increased by an amount sufficient to keep b constant at b_T and τ constant at $\bar{\tau}_T = \tau$, allowing for the increase in nominal interest payments due to the higher inflation rate.

1/ Keynes (1971, p. 54).

The new rate of money creation, λ^+, must then be such that the associated ratio to income of the monetary financing of the deficit, λ^+m^+, fulfills the condition $\lambda^+m^+ = g + i^+b_T - \tau_T - \lambda^+b_T = a - (i-\alpha)b_T + (i^+-\lambda^+)b_T$, where $i = r+p$ and $i^+ = r+p^+$ are the nominal interest rates associated, respectively, with rates of money creation λ and λ^+. Thus, $\lambda^+m^+ = a - (\lambda-\alpha)b_T$.

The required jump in the rate of inflation may be considerable if the fiscal rule is lax, or when the limit to a further increase in taxation is met at a low level of b. It is further unlikely that the jump to higher inflation may occur precisely when it becomes impossible to collect more taxes or without affecting the confidence of the financial markets. If the government is aware of the limit to the rise in the tax burden and the market anticipates its decision, the rate of inflation will start rising immediately. 1/ If instead the government realizes too late its inability to service the additional debt by raising more taxes, the markets may be quicker to perceive a situation of unease. An expectation that the budget constraint will not be respected may cause fears of repudiation--as in a model by Masson (1985)--and make the public unwilling even to renew the debt coming due for redemption, except perhaps at much higher interest rates. The outcome may be a financial crisis and eventually a much higher rate of inflation than the one required on paper to stop the growth of debt at T.

What are the alternatives? Given the fiscal rule, they belong to the Sargeant and Wallace (1981) variety: except that, while in the Sargeant and Wallace exposition the intertemporal constraint is not respected from the very beginning and the limit to debt growth is set by the maximum amount of government bond agents are ready to hold in their portfolios, here the constraint is respected initially, but there is a limit to the required increase in taxation. The authorities may choose not to wait for T to increase monetary financing, but to increase it as from now.

One such possibility is an immediate increase of monetary financing, not at $t = T$, but at $t = 0$, such that the maximum permissible level of taxation, $\bar{\tau}$, instead of being reached at T, becomes the limiting (steady-state) value of a bounded process of debt growth. We must then have $\tau^* = g-a + (i'-\alpha)b^* = g-a + (i-\alpha)b_T = \bar{\tau}$ and $\lambda'm' = a - (\lambda'-\alpha)b^*$, where b^* and τ^* are the steady-state levels of taxation and debt, λ' is the new rate of money creation associated with those levels and the given fiscal rule, and $i' = r+p'$ is the corresponding nominal interest

1/ As in Sargeant and Wallace (1981) and in a model by Nicoletti (1986).

rate. From the first condition, constraining the level of taxation, we obtain the value of b* as a function of b_T; from the second, we obtain the level of monetary financing compatible with b*.

It is easily checked that $\lambda'm'$ is higher than λm, which cannot, however, be sustained after T. It is, however, lower than λ^+m^+, 1/ the rate which would otherwise prevail after T. The choice of $\lambda'm'$ as from now is then one of a rate of inflation higher from now until T, but lower afterward. Taxes would be higher at the beginning because of the higher nominal debt service, but would then become lower than under the first possibility, as they would never reach $\bar{\tau}$, the critical value. This latter fact may make the choice attractive to the authorities as it would remove the dangers of instability. 2/ Alternative time profiles of inflation and taxation can, of course, be imagined that answer the same requirement of allowing the intertemporal constraint to be respected without approaching an unenforceable level of taxation.

When one considers the limits to the taxing ability of a government, it is thus not surprising that lax fiscal rules, even if not directly responsible for inflation, are associated with a higher propensity to inflation. This conclusion is strengthened if the analysis is extended to consider the effects on the real interest rate of the level of debt on the one hand, and of monetary financing on the other. To this we now turn by introducing monetary financing in a model by Olivier Blanchard.

Blanchard (1984 and 1985), 3/ following Yaari (1965), models individual and aggregate consumer behavior in a framework of uncertain lifetime. Consumption, as derived from utility maximization subject to a budget constraint, is proportional to human and nonhuman wealth. Uncertainty as to lifetime affects the rates at which future consumption and the stream of future earned income net of taxes are discounted. If π is the individuals' probability of death, individuals will discount future consumption at the rate $\theta + \rho$, where θ is the rate of time preference. Future incomes net of taxes will be discounted at the rate $r+\pi$. In the government's intertemporal budget constraint, future expenditures and taxes are, however, discounted at the rate r. It follows, as shown by Blanchard, that, with given output, the size of public debt affects r, the real interest rate, which is higher than the debt. If the model is completed with a production function, it is also shown dynamically that the size of debt affects capital intensity and the long-run level of consumption.

1/ The difference between the two rates of monetary financing is $\lambda^+m^+ - \lambda'm' = b_T(\lambda'i - \lambda i')/(i'-\alpha) \approx b_T(r-n)(p'-p)/(i'-\alpha)$.

2/ This point seems to be disregarded in the criticisms by Blanchard, Dornbusch, and Buiter (1985, p. 17) against the plausibility of a Sargeant and Wallace (1981) outcome.

3/ See also Blanchard and Summers (1985) and Buiter (1984).

Blanchard's model only has interest-bearing debt and does not allow for any monetary financing of the deficit. This additional feature is easily introduced. Buiter claims that, in this case, "if all non-money assets are index-linked money is a veil" and "real interest rates are unaffected by monetary policy." 1/ It can instead be shown that the degree of monetary financing of the deficit, by affecting the growth and the level of debt, and hence the associated level of taxation, does indeed have those real effects denied by Buiter.

For reasons of simplicity, in what follows we shall assume that the economy is stationary, so that $n = 0$ and $\lambda = p$; the results are, however, easily extended to the case of a steady positive real growth rate. We shall also assume that the fiscal rule is such that $\alpha = 0$, so that there exists a steady-state level of interest-bearing debt $(a/p)-m$, a/p being the level of total monetary and nonmonetary debt. All variables are expressed in real per capita terms. The symbols that have so far been used to denote ratios to income will be written with a cap, to show that they are real per capita magnitudes: thus the per capita level of real interest-bearing debt will be $\hat{b} = b\hat{y}$, where $\hat{y}$ is per capita income.

Money finds its place in the utility function because of the liquidity services it yields to agents. We assume an instantaneous utility function of Cobb-Douglas form:

$$u(c,\hat{m}) = c^{\beta}\hat{m}^{(1-\beta)} \tag{14}$$

where c is per capita consumption. Each agent maximizes

$$\int_t^{\infty} \ln u(c,\hat{m})\, e^{-(\theta+\pi)(s-t)}\, ds \tag{15}$$

subject to the budget constraint. The solution for the aggregate 2/ is

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1/ Buiter (1984, p. 60). Another model in which "contrary to what a superficial reader of Barro might be led to infer, the money-bonds mixture 'matters'" is in Calvo (1985).

2/ It is crucial for aggregation and for the results that "whereas individual wealth accumulates, for those alive, at rate $r+\pi$, aggregate wealth accumulates at rate r." This depends on the Yaari assumption that agents contract to return their wealth to life insurance companies when they die: as insurance companies pay w to the agents who are alive, πw is only a transfer.

$$c = \beta(\theta+\pi)(w+h) \tag{16}$$

$$\hat{m} = \frac{1-\beta}{\beta i}\, c = \frac{1-\beta}{i}\,(\theta+\pi)(w+h) \tag{17}$$

$$\dot{w} = \dot{k} + \dot{\hat{b}} + \dot{\hat{m}}. \tag{18}$$

In equations (16)-(18), w is nonhuman wealth, composed of physical capital, k, bonds and money, and h is human capital, defined as the stream of future labor income net of taxes discounted at the rate $(r+\pi)$:

$$h = \int_t^{\infty} (z-\hat{\tau}_s)\, e^{-(r+\pi)}\, ds \tag{19}$$

where z is earned income. Further, from the income-expenditure equality we have

$$\hat{y} = z+rk = c+\dot{k}+\hat{g}. \tag{20}$$

The accumulation of real per capita nonhuman wealth equals disposable income net of the inflationary losses on assets:

$$\dot{w} = z + r(\hat{b}+k) - p\hat{m} - \hat{\tau} - c. \tag{21}$$

In steady state, $\dot{\hat{b}} = \dot{k} = \dot{\hat{m}} = \dot{h} = 0$. Hence, the steady-state levels of w and h, w* and h*, are

$$w^* = k^*+\hat{b}^*+m^* = (\hat{a}/p) + k^* \tag{22}$$

$$h^* = \frac{z-\hat{\tau}}{r+\pi} = \frac{z-\hat{g}-i\hat{b}^*-\hat{a}}{r+\pi} \tag{23}$$

where the steady-state level of taxation is that obtained from equation (12) above. By using equations (17) and (20) we obtain

$$-w^*+h^* = [r- \theta + \beta(\theta + \pi)]^{-1} (\hat{y}-\hat{g} + k^*+\frac{\hat{a}}{p})$$

Substitution of equations (16) and (20) yields finally:

$$r = \theta + \beta\pi(\theta+\pi) \frac{k+\hat{a}/p}{\hat{y}-\hat{g}}. \qquad (24)$$

Thus, given capital per man, k, and per capita output, $\hat{y}$, the real interest rate, which exceeds the rate of time discount if $\pi > 0$, depends on the steady-state level of total public debt. As the latter depends on the rate of money creation, the real rate of interest also comes to depend on the rate of money creation. Given the fiscal rule, the higher the degree of monetary financing of the deficit, the lower the stock of debt and the lower the steady-state real interest rate.

The intuition behind this result is the following. With given per capita output and per capita expenditure, also per capita consumption is given. Hence, also total, human and nonhuman wealth, on which consumption depends, must be given. To a different degree of monetary financing (and a different rate of inflation) there does, however, correspond a different composition of total wealth: the higher the rate of money creation, the lower is nonhuman wealth, because of a lower public debt, and the higher is human wealth, because of lower taxation. The rate of interest must move so as to insure that these two changes offset each other and the total remains unchanged.

As to a lower rate of money creation, there corresponds not only a higher stock of interest-bearing debt but also a higher real interest rate, the inverse relationship between level of taxation and rate of money creation is strengthened. To exemplify in our simple case with $n = 0$, $\alpha = 0$, compare the two steady-state levels of taxation corresponding to two rates of money creation, p and $p' > p$. With a unit *elasticity of the demand for money with respect to the nominal interest* rate, as in equation (17), the difference between the two levels will be $(\hat{a}/p)[r(p'-p)/p']$, if r is constant. If, however, to the two different levels of total debt $(\hat{a}/p)$ and $(\hat{a}/p')$ there correspond two different real interest rates, r and $r' < r$, the difference between the two levels of taxation will be $(\hat{a}/p)[rp'-r'p)/p']$, greater than in the previous case. Further, if there is a critical level beyond

which taxation cannot be increased, such limit will now correspond to a level of interest-bearing debt lower than in the case of a constant real interest rate. When an additional attraction for stepping up monetary financing, and hence inflation, at an earlier date.

If we now remove the assumption of given capital and output per man, we can, again following Blanchard, examine the effects of different degrees of monetary financing on capital intensity and the steady-state level of consumption. Suppose that (in a one-commodity world) $\hat{y} = f(k)$, $f' > 0$, $f'' < 0$. Then equation (20) becomes

$$f(k) = c + \dot{k} + \hat{g}. \tag{20'}$$

If $\dot{k} = 0$,

$$c = f(k) - \hat{g}. \tag{25}$$

From equation (16), we have

$$\dot{c} = \beta(\theta+\pi)(\dot{w}+\dot{h}). \tag{26}$$

Differentiation of equation (19) yields

$$\dot{h} = (r+\pi)h - z + \hat{\tau}. \tag{27}$$

By using equations (16), (17), (21), (26), and (27), we obtain:

$$\dot{c} = (r-\theta)c - \pi\beta(\theta + \pi)w \tag{28}$$

Consumption thus reaches a stationary level, with $\dot{c} = 0$, when

$$c = \frac{\beta\pi(\theta + \pi)}{r - \theta}w = \frac{\beta\pi(\theta + \pi)}{r - \theta}\left(k+\frac{a}{p}\right) \tag{29}$$

for the steady-state value of the debt. The locus $\dot{k} = 0$ is given by equation (25), the traditional production function diminished by g.

The locus $\dot{c} = 0$ is given by equation (29) and it is a function of k and of total debt. On the c-k plane, it is thus an increasing function of k, tending to infinity for that value of k which is chosen when $r = \theta$. The two locuses will normally intersect at values of k corresponding to a real interest rate such that $0 < r < \theta$, and their intersection determines the steady-state values of per capita consumption and capital per man.

The position of the $\dot{c} = 0$ locus depends on the size of total debt, which in turn depends on the rate of monetary financing: the lower the latter, the higher the size of the debt, the higher the level of c corresponding to any given level of k on the locus (because total non-human wealth is higher), the greater therefore the slope of the locus.

For a greater slope of the $\dot{c} = 0$ locus, however, the intersection with the $\dot{k} = 0$ locus occurs at a lower steady-state level of both per capita capital and consumption. Thus, consider two economies with the same fiscal rule and the same level of government spending: the one with the lower level of monetary financing will have a higher level of debt, a higher real interest rate, and lower levels of steady-state consumption and capital. A reduction in the rate of monetary financing will increase consumption in the short run; but higher consumption at the initial level of output will cause capital decumulation and a reduction in the steady-state level of capital stock and consumption.

These possible long-run effects of debt growth on capital intensity and consumption may lend additional attraction to higher rates of monetary financing and of inflation when governments are unable or unwilling to modify their lax fiscal rules and wish at the same time to avoid the damaging consequences of fast debt growth.

V. Conclusions

The notion that a fiscal rule is sustainable if it respects the intertemporal budget constraint provides an unsafe criterion for assessing the financial situation of the public sector.

First, even if there are no limits to the tax burden which the community is ready to bear for servicing the debt, or if such limits are neglected, the constraint is not sufficient to establish a condition of sustainability when the size of the debt affects the real interest rate in the medium run. When it does, as is probable in the case of finite horizons, a given fiscal rule may become less sustainable with time, and eventually turn out to be unsustainable even in the widest sense of the budget constraint. This outcome becomes more likely if the perception of approaching unsustainability causes a risk premium to

be demanded on state bonds. It follows that, even when initially the real growth rate exceeds the real interest rate, so that a problem of sustainability does not even arise, it would be unwise to rely on an indefinite perpetuation of this favorable situation to justify fiscal rules causing debt to grow to high levels. Exogenous shocks may lower the trend growth rate and/or raise the real cost of debt. Fiscal rules, moreover, are not easily reversible, so that it may prove difficult and painful to adapt a formerly acceptable rule to changing circumstances.

Second, given the fiscal rule, respect of the intertemporal budget constraint determines the behavior of taxation. The existence of a limit to the tax burden may make the rule unsustainable after a certain point in time, because from that point onward neither can the rule be followed nor the constraint be respected. It is difficult to define in principle and to perceive in practice the maximum level of the fiscal burden a government can enforce on society without causing strong political opposition and/or without damaging growth prospects: such a level depends on several economic and noneconomic factors, among which the distribution of income, wealth, and the tax burden is of paramount importance. Again, a change of external conditions may set the behavior of the tax burden required by the constraint onto an unsustainable path.

Consideration of these two points may help to explain both the cases of painless re-entry from a situation of very high levels of debt, and the more recent experience of the last decade in some countries. The former are associated with periods of fast growth of the product and the tax base with relatively low real interest rates. The latter find some explanation in the sudden transition from a period in which the excess of the growth rate over the interest rate made primary deficits compatible with stationary or slowly growing debt ratios to one, still lasting, of much lower growth and much higher interest rates. Fiscal rules which caused no problems in good times later become the source of present or future troubles, as they now imply a much faster growth of interest payments, and of the tax burden if the constraint is to be respected.

Starting with a potentially lax fiscal rule, when an unfavorable change of conditions has occurred and debt has started growing fast, an orthodox path to re-entry may prove extremely difficult. We have neglected any effect of changes in the fiscal rule on real growth. There may be no such effects in the long run. It is, however, difficult to accept that such changes have no consequences on demand and output in the short run, especially if the economy is below full employment. If there occurs an unfavorable change in the external conditions, which depresses growth or raises interest rates, an attempt to curb debt growth by means of drastic cuts in expenditure or tax increases will prove unattractive, for the justified fear that what is gained by changing the fiscal rule is lost by lowering growth.

We thus come to a third reason why the intertemporal budget constraint is unable to provide a well-defined criterion for policy. Respect of the constraint for a given fiscal rule and the tax implications of a rule respecting the constraint both depend on the degree of monetary financing of the deficit and thus on a choice as to the inflation rate. I have argued that capital levies and monetization are not likely to be successful shortcuts for the solution of a debt problem. A choice regarding the degree of monetary financing is different from these two remedies in its nature and its effects. Though not a solution to the basic fiscal problem, it may become the only way out if the authorities let themselves get trapped in the impossible alternative between raising taxes above the socially acceptable level, and financial instability due to unsustainable debt growth.

One may, however, look at the degree of freedom allowed by the choice as to the extent of monetary financing of the deficit in a less negative way. When a less favorable external situation causes a sudden acceleration of debt growth and originates a debt problem, monetary financing may become a policy variable to be used to make a re-entry plan more feasible, because more gradual, and to cushion the possible negative effects on demand and growth. The alternative between "bonds only" and "money only" in the financing of the deficit neglects intermediate and less dramatic combinations, leaving an impossible choice between hyperinflation and unsustainable debt growth.

In a situation of high debt stock inherited from the past, it is perhaps a paradox that parliament, by deciding on current fiscal policy, actually determines the future inflation tax which, in principle, falls outside its competence; while the decisions by the monetary authorities on the current inflation tax affect the future tax burden beyond the decisions of parliament. Unfortunately, parliaments do not care very much about the future inflation tax, while monetary authorities care little about the future tax burden. This causes the risk of a conflict with potentially dangerous outcomes: a conflict that would be best to avoid with some mutual concession on both parts.

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