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A Note on the Real Federal Deficit

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INTRODUCTION

Recent recalculations of the federal deficit and the federal debt have pointed out two ways of extracting a measure of the real federal deficit from a measure of the nominal federal debt and have suggested several alternatives for measuring the nominal debt itself. The nominal debt, for example, can be the officially reported gross federal debt, the market value of that debt, the privately held federal debt plus the non-interest bearing liabilities of the central bank, any one of these measures net of certain assets, *etc.*.[1]

In this note, I will focus on the two ways of measuring the real deficit once the nominal value of the debt is already agreed upon. The first of these calculations equates the real federal deficit to the change in the real federal debt. The second equates the real federal deficit to the real value of the change in the nominal debt.

By dividing the nominal value of the federal debt (D) by the price level (P), we obtain a measure of the real value of the federal debt. The real federal deficit is equated to the change in the real federal debt in the following calculation.

$$\text{Deficit}(1) = \frac{D}{P} - \frac{D_{-1}}{P_{-1}}. \tag{1}$$

The real federal deficit is equated to the real value of the change in the nominal federal debt when

$$\text{Deficit}(2) = \frac{D - D_{-1}}{P}. \tag{2}$$

This is equivalent to dividing the difference between the current flow of expenditures and receipts by a price index.

The difference between the two measures of the deficit obviously depends upon the rate of inflation. Deficit(1) can be written

$$\begin{aligned} \text{Deficit (1)} &= \frac{D - D_{-1}}{P} - \frac{P_{-1}}{P}\frac{P - P_{-1}}{P_{-1}}\frac{D_{-1}}{P_{-1}} \\ &= \text{Deficit (2)} - \frac{\pi}{1 + \pi}\frac{D_{-1}}{P_{-1}} \end{aligned} \tag{3}$$

where $\pi = (P - P_{-1})/P_{-1}$ is the rate of inflation. The last righthand term in Equation (3) is the inflation tax on the real debt in existence at the end of period $t - 1$.

In Table 1, Deficit(1) is derived by subtracting the inflation tax from the value in 1982 dollars of the official deficit in federal transactions in the National Income and Product Accounts. The latter is Deficit(2).[2] It is evident that inflation makes the history of fiscal policy told by Deficit(1) quite different from the history told by Deficit(2). According to Deficit(2), the budget was in deficit in twenty eight of the thirty five fiscal years from 1951 to 1985. According to Deficit(1), however, the budget was in deficit in only nine of the thirty five years.

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TABLE 1[1]
Federal Real Deficits in National Income and Product Accounts and Real Debt
Fiscal Years 1951–1985, (Billions of 1982 Dollars)

Year	Deficit (1)	Deficit (2)	Real Debt[2]	Price Deflator (1982 = 100)
1951	−19.0	−90.3	1180.1	18.16
1952	−69.9	4.1	1108.3	19.38
1953	−39.8	31.4	1054.6	20.71
1954	5.4	40.2	1048.4	21.41
1955	−28.9	−0.9	1030.0	22.00
1956	−75.0	−27.3	963.3	23.07
1957	−58.9	−20.8	913.5	24.02
1958	−35.5	18.4	886.7	25.53
1959	−12.2	21.8	885.2	26.55
1960	−30.0	−12.6	875.7	27.08
1961	−2.9	11.3	866.8	27.53
1962	−0.9	7.9	893.1	27.81
1963	−28.4	5.9	879.9	28.92
1964	−9.1	5.1	876.1	29.40
1965	−20.5	−4.7	873.8	29.94
1966	−33.8	1.0	849.0	31.18
1967	−0.8	26.7	830.3	32.22
1968	−4.3	36.3	857.9	33.88
1969	−64.5	−14.5	776.8	35.98
1970	−47.3	1.8	741.7	38.41
1971	−1.6	49.7	737.6	41.26
1972	2.3	43.9	740.5	43.72
1973	−12.8	32.6	736.5	46.58
1974	−49.8	13.3	679.2	50.95
1975	10.8	79.9	699.9	56.71
1976	43.5	92.3	787.6	60.97
TQ[3]	...	...	791.3	62.97
1977	35.0	68.2	839.6	65.72
1978	−4.4	50.6	868.6	70.34
1979	−47.5	19.9	845.3	76.26
1980	−23.0	59.6	846.0	84.53
1981	−17.3	62.7	851.0	93.35
1982	56.1	112.6	929.5	100.00
1983	142.7	179.4	1096.8	104.10
1984	111.6	149.6	1217.2	107.83
1985	127.0	168.0	1353.0	111.59

[1]Positive Numbers indicate deficits; negative numbers indicate surpluses.
[2]Gross Federal Debt *minus* debt held by federal government accounts.
[3]Transition Quarter (July 1–September 30, 1976).

Source: See Appendix.

The story told by Deficit(2) is consistent with the popular perception of fiscal policy in those years. The story told by Deficit(1) is more in accord with the behavior of the real value of the federal debt, which, as measured in column (4) of table 1, was lower at the end of fiscal year 1982 than it was at the end of fiscal 1951.

In this note I consider the role of the two deficit measures in three important applications. The first application taken up is concerned with the crowding out of domestic investment or net exports or possibly some of both. A second is concerned with the deficit as an indicator of the tightness or ease of fiscal policy. A third deals with the feasibility of permanent deficits.

THE QUESTION OF CROWDING OUT

Since Deficit(2) is the difference between the current flow of real expenditures and real receipts, it is the deficit that appears in the national income identity,

$$S - I + Imp - Exp = \text{Deficit}(2). \tag{4}$$

Here S, I, Imp, and Exp signify, respectively, the real value of gross saving, gross investment, imports and exports. Deficit(2) in this case should also include expenditures of state and local governments.

The sign of the lefthand side of (4) under various historical or hypothetical conditions has figured prominently in recent discussions of the "deficit crisis." For example, Schultze (1988) warns of a scenario in which a reduction of the difference between imports and exports leads to a crowding out of private investment. See also the discussion of domestic and international crowding out in Stern (1986) and in the *Economic Report of the President,* (1986, pp. 50–52) (or in almost any recent edition of the *Economic Report.*) The sign of the lefthand side of (4) is the sign of Deficit(2) regardless of the sign of Deficit(1).

The reason Deficit(2) matters here is that the GNP *plus* the difference between imports and exports gives the total flow of goods actually available for private and government consumption and investment; and the erosion of the real value of a nominal stock of debt, which may make Deficit(1) show a budget surplus, does nothing directly to change this flow.

The fact that a deficit may actually "crowd in" private investment in periods of less than full employment, if a deficit leads to expansion, is a well known argument. Eisner (1986, pp. 109, 178) argues that theory and empirical evidence show that it is Deficit(1) and not Deficit(2) that is the relevant deficit measure here. In the model he outlines (pp. 182–184), increases in the real value of government debt increase perceived wealth and thereby increase consumption; and increases in consumption increase investment demand. However, the possibility of crowding in does not repeal the national income identity or the fact that a positive value of Deficit(2) means that saving and imports must exceed private investment and exports.

DEFICITS AND FISCAL POLICY

Even the strongest believer in the efficacy of fiscal policy would grant that the effect of a deficit depends upon the way it is created, at least in regard to the magnitude of its effect. Nevertheless, the sign of the deficit is often employed as an indicator of a fiscal policy. This section presents some examples in which an increase in perceived wealth is taken to be synonymous with expansion. Fiscal policy is defined as "... the sequence of current and anticipated taxes, spending, and debt ..." [Blanchard (1985, p. 239)]; and Deficit(1) and Deficit(2) are compared as indicators of fiscal policy.

For this purpose and that of the next section it is useful to write the government debt in terms of the components of the government budget identity,

$$P_t(T_t - G_t) + B_t - (1 + i)B_{t-1} + M_t - M_{t-1} = 0. \quad (5)$$

Here, B_t is the value of bonds issued at time t; i is the nominal interest rate; T_t and G_t are, respectively, real tax receipts and real government purchases of goods and services; M_t is the stock of base money at the end of period t; and P_t is the commodity price level for all transactions during period t.

Taxes are assumed to be set according to a formula employed by Blanchard (1985, p. 239).

$$T_t = \lambda \frac{B_{t-1}}{P_{t-1}} - Z \quad (6)$$

Here λ is a tax parameter and a positive value of Z is interpreted as a transfer payment. The effect of present debt on future taxes is recognized in the calculation of wealth, and so the perceived contribution of government bonds to private wealth is

$$W_t = \frac{B_t}{P_t} - \sum_{h=1}^{h=\infty} \frac{T_{t+h}}{(1 + r + \rho)^h}. \quad (7)$$

Here r is the real rate of interest and ρ is an amount in excess of the real rate of interest at which the private sector discounts future taxes. (Blanchard (1985) explains a value of ρ greater than zero by including the probability of death as a factor in the decision of individual consumers.)

A very simple expression for W_t results under the following assumptions. $M_t = M_{t-1} = M_0$; the real GNP, Y, grows at a constant rate, g, so that $Y_t = (1 + g)Y_{t-1}$; the rate of inflation is related to the growth rate of GNP by $(1 + g)^{-1} = 1 + \pi$, so that the ratio $M_t/(P_tY_t)$ is constant; and the real rate of interest is equal to the growth rate of the economy. Since the nominal and real rates of interest are related by $1 + r = (1 + i)/(1 + \pi)$, the assumption that r = g implies that the nominal rate of interest is equal to zero. Finally, it is assumed that $\lambda > g$. Then it can be shown that, under these conditions,[3]

$$W_t = \frac{\rho}{\rho + \lambda}\left[\frac{B_t}{P_t} + \frac{Z}{\rho + g}\right]. \quad (8)$$

The numerical examples in Table 2 give the value of Deficit(1), Deficit(2), interest bearing government debt, and the perceived contribution of government bonds to private wealth for four time periods and a limiting value as time increases indefinitely. In all of the examples, $G_t = 0$, Z = 10, ρ = .01, and g = .02. The examples differ from one another in the assumed value of the tax parameter, λ, and the initial value of interest bearing debt. However, the lower tax parameter in Example 2 leads to a higher limiting value of perceived wealth and, in that sense, is an easier fiscal policy.

Deficit(2) is an unreliable indicator in both examples. Its sign changes in each example, when we know that there has been no change in fiscal policy. Also, its limiting value shows a higher budget surplus for the easier fiscal policy.

The sign of Deficit(1) naturally always correctly reflects increases in perceived wealth. However, its limiting value of zero in all of the examples fails to distinguish one policy from another in the long run. Since Deficit(1) is a change in real debt, its value in the steady state of

any model is likely to be zero or, in a model of a growing economy, a fixed proportion of the change in GNP; and it is likely to fail to distinguish fiscal policies in steady states. However, as a practical matter, the value of deficits as indicators of fiscal policy is not judged by their usefulness in the comparative static analysis of steady states.

Example 3 can be interpreted as the result of a change in tax policy. We may imagine that the policy in Example 2 was followed until after the debt was determined in period 60. Then period 60 becomes period 0 of a new tax policy, and the tax parameter is raised so that at time 61 (time 1 of the new tax policy) real taxes are a greater proportion of the previous period's ending debt. Judging by what happens to the limiting value of perceived wealth, we now have a tighter fiscal policy.

The behavior of Deficit(1) in this example sheds some light on an exchange of views by Milbourne and Richards (1986) and Eisner and Pieper (1986). Milbourne and Richards recognize the importance of wealth effects and supply a formulation in which changes in real GNP depend significantly on Deficit(1). They grant the value of Deficit(1) as an indicator of past fiscal policy, but they question its value as an indicator of discretionary changes in policy. In this example, the tighter policy is introduced at a value of existing debt that is below the limiting value of debt in the new policy. The sign of Deficit(1) continues to show that perceived wealth is increasing as a result of past and current actions; but it fails to note that policy became tighter after period 60.

If an increase in the perceived wealth content of government debt means an increase in demand, Deficit(1) can be taken as a measure of at least the short run influence of fiscal policy on aggregate demand even when, as in Example 3, Deficit(2) happens to have the sign that one might expect following a tax increase. For, as we have seen in Examples 1 and 2, Deficit(2) is not always reliable and might indicate a change from deficit to surplus when we know that there has been no change in tax rules. But one might also question the use of Deficit(1) as the sole indicator of fiscal policy. In particular, if the object of the tax increase in Example 3 is to reduce

TABLE 2[1]
Deficits, Debt, and Wealth

Time	1	10	60	70	Limit
		Example 1 (λ = .04, Initial Debt = 0)			
Deficit (1)	10.00	8.34	3.04	2.48	0.00
Deficit (2)	10.00	6.67	−3.93	−5.04	−10.00
Debt	10.00	91.46	351.22	378.44	500.00
Wealth	68.67	84.96	136.91	142.35	166.67
		Example 2 (λ = .03, Initial Debt = 0)			
Deficit (1)	10.00	9.14	5.53	5.00	0.00
Deficit (2)	10.00	7.41	−3.42	−5.00	−20.00
Debt	10.00	95.62	452.84	505.16	1000.00
Wealth	85.83	107.24	196.54	209.62	333.33
		Example 3 (λ = .04, Initial Debt = 452.84)			
Deficit (1)	0.94	0.79	0.29	0.23	0.00
Deficit (2)	−8.11	−8.43	−9.43	−9.53	−10.00
Debt	453.78	461.47	485.97	488.53	500.00
Wealth	157.42	158.96	163.86	164.37	166.67

[1]Regarding Deficit (1) and Deficit (2), positive numbers indicate deficits; negative numbers indicate surpluses.

the limiting value of the debt to 500 real dollars, it would be wrong to take the continued deficits shown by Deficit(1) as a signal that taxes are not high enough.

THE FEASIBILITY OF PERMANENT DEFICITS

Further manipulations of the budget identity in Equation (5) together with the definition of the real rate of interest and the growth rate of GNP (with r not restricted to be necessarily equal to g) give the well known difference equation[4]

$$b_t = \frac{1+r}{1+g} b_{t-1} + n_t,$$

where

$$b_t = \frac{B_t}{P_t Y_t}, \qquad n_t = \frac{N_t}{Y_t},$$

and

$$N_t = G_t - T_t - \frac{M_t - M_{t-1}}{P_t}.$$

N_t is the non-monetized portion of the real primary deficit. When r, g, and n_t are constant and $g \neq r$, the solution to the difference equation is

$$b_t = \left(\frac{1+r}{1+g}\right)^t (b_0 - b^*) + b^*,$$

where

$$b^* = \left(\frac{1+g}{g-r}\right) n.$$

The lesson to be drawn from this well known result in the present paper is, first, that, since the measurement of N does not depend upon the rate of inflation itself, we do not have to choose between Deficit(1) and Deficit(2) to discuss the feasibility of permanent deficits. On a deeper level, the more important point is that we cannot merely rely on inflation to remedy an infeasible deficit policy when the nominal rate of interest adjusts to the rate of inflation to keep the real rate of interest roughly constant in the long run. In the long run, if forces such as the productivity of capital determine the real rate of interest while the nominal rate of interest adjusts to the rate of inflation, no rate of inflation can compensate for a situation in which $r > g$ (or $r = g$) and $n > 0$.

CONCLUSION

The excess of real saving and real imports over real investment and real exports is identically equal to Deficit(2) regardless of the sign of Deficit(1). But Deficit(2) can be a misleading indicator of fiscal policy. A change in the sign of Deficit(2) can occur when we know that discretionary fiscal policy (the tax rate in the example in Section 3) has not changed. It is also possible for the sign of Deficit(1) to miss a change in fiscal policy. But Deficit(1) will always measure the change in real government indebtedness and, to the extent that government debt is net wealth, will indicate the direction of fiscal influence on aggregate demand.

Regarding the feasibility of permanent deficits, a value of Deficit(1) that is on balance negative (i.e. shows a government surplus) over a period of time (as Table 1 shows to be the case from fiscal 1951 to fiscal 1982) means that we are obviously not headed for an infeasible ratio of debt to GNP during that period. But from a long run point of view Deficit(1) is an effect rather than a fundamental force. If on the average in the long run, the real primary deficit and the relation of the real rate of interest to the growth rate of GNP is not feasible, then on the average in the long run Deficit(1) will not show a surplus. The real primary deficit is a flow that does not take account of the erosion of the real value of existing debt.

These results are neither exhaustive nor conclusive; and each of the applications would benefit by continuing the discussion in the framework of a relatively complete model. But they are sufficient to show that Deficit(1) and Deficit(2) are distinct measures; and neither is merely the wrong way to calculate the other. Focusing only on Deficit(2) can, in the view of Eisner (1986, p. 2), lead to policy errors and "... court future disaster." But the solution is not merely to substitute concern for Deficit(1) in place of concern for Deficit(2).

APPENDIX

The source of data employed in calculating the entries in Table 1 is *Historical Tables, Budget of the United States Government,* Fiscal Year, 1988.

The *price deflator* in column (5) is the Composite Deflator, table 1.3, p. 1.3(1) of *Historical Tables.* For the transition quarter a price deflator was estimated from table 6.1, p. 6.1(7) of *Historical Tables* as

$$P = \frac{\text{(total outlays in current prices in TQ)}}{\text{(total outlays in fiscal year 1982 prices in TQ)}} \times 100.$$

The *nominal debt* deflated to get *real debt* in column (4) is "Debt Held by the Public," table 7.2, pp. 7.1(1)–7.1(2) of *Historical Tables.* This is Gross Federal Debt *minus* debt held by federal government accounts. It includes debt held by the Federal Reserve. Since Deficit(2) is government spending *plus* interest on the debt *minus* tax receipts all divided by the price level, the budget identity in (5) (with debt held by the Federal Reserve equated to the monetary base) implies that this is the measure of nominal debt relevant to Section 2.

Deficit(2) is calculated from Table 16.1 pp. 16.1(1)–16.1(6) of *Historical Tables* by deflating "Excess of Expenditures over Receipts" in Federal Transactions in the National Income and Product Accounts. Then *Deficit(1)* is calculated as

$$\text{Deficit}(1) = \text{Deficit}(2) - \frac{\pi_t}{1+\pi_t} \frac{D_{t-1}}{P_{t-1}}.$$

D_t is "real debt" from column (4) of Table 1. π_t is $(P_t - P_{t-1})/P_{t-1}$. In calculating Deficit(1) in fiscal year 1977, the inflation tax on the real debt at the end of the transition quarter was subtracted from Deficit(2).

FOOTNOTES

*I am indebted to two referees for helpful comments.

1. See Dwyer (1982), Eisner and Pieper (1984), Barro (1986, 385–388), Eisner (1986), Hamilton and Flavin (1986).

2. This is true in principle. However, Federal accounting rules do not result in an exact correspondence between nominal deficits in the National Income and Product Accounts (or, for that matter, nominal deficits in any budget concept) and changes in the nominal debt. For this reason, changes in the real debt in column (4) of Table 1 will not be equal to the real deficit in column (2).
3. The author will send the derivation of Equation (8) to anyone requesting it.
4. For example, see Barth, Iden, and Russek (1986), Darby (1984), Sargent and Wallace (1981). The relevant real interest rate here is the after tax real interest rate, but, since a formulation that explicitly recognizes this will not be needed to make the limited point of this section, I have omitted it in the interest of simplicity.

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