DEBT NEUTRALITY, FINITE HORIZONS, AND PRIVATE SAVINGS BEHAVIOR*

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Abstract

The paper has two purposes: First, to study the quantitative importance of deviations from debt neutrality in a multiperiod finite-horizon economy. Second, to provide new empirical evidence on the validity of the debt neutrality proposition based on a near-century of time series evidence for the U.S. and the U.K.. The results suggest that the behavior of private savings rates outside war-periods is not consistent with debt neutrality, and that the assumption of finite horizons is unlikely to account for this finding.

Zusammenfassung

Der erste Teil der Arbeit untersucht die Neutralität von Staatsschulden in einer Ökonomie mit finiten Horizonten. Der zweite Teil präsentiert neue empirische Evidenz zur Neutralitätshypothese basierend auf langen Zeitenreihen für die U.S.A. und das Vereinigte Königreich. Die empirischen Ergebnisse sind nicht konsistenz mit Staatsschuldenneutralität. Ferner dürften finite Horizonte keine ausreichende Erklärung für dieses Ergebnis liefern.

1. Introduction

Barro's (1974) restatement of the Ricardian debt neutrality proposition holds that a change in the mix between tax and bond financing of a given public expenditure stream leaves private consumption unaffected. Models assuming debt neutrality provide convenient theoretically tractable bench-marks for analyzing fiscal policy issues. But many economists maintain that deviations from debt neutrality are quantitatively important and that fiscal policy analyses should therefore not be based on models assuming debt neutrality.

Several mechanisms may account for deviations from debt neutrality. Barro (1989) discusses finite horizons, imperfect loan markets, uncertain taxes, and distorting taxes. Among these mechanisms, finite horizons have received a dominant share of attention in the theoretical literature. Many authors investigated the conditions under which intergenerational transfers will reestablish debt neutrality in finite-horizon economies. Influential work by Auerbach and Kotlikoff (1987) and Frenkel and Razin (1987) applied finite-horizon models to shed light on a wide range of fiscal policy issues. And more recently, the OECD (1989) presented empirical indicators of the impact of fiscal policy on aggregate demand based on Blanchard's (1985) finite-horizon model.

Hubbard and Judd (1986) and Poterba and Summers (1987) concluded that finite horizons are not an attractive route for modelling deviations from debt neutrality. Their conclusion is based on numerical simulations of finite-horizon economies which indicate that debt-financed transitory tax cuts lead to negligible consumption responses of private households. Additionally, Hubbard and Judd (1986) report simulation results which show that liquidity constraints may provide a more potent mechanism than finite horizons to negate debt neutrality.

I distinguish between three questions: (A) Do relevant indicators show that deviations from debt neutrality in a finite-horizon economy are negligible? (B) Is there empirical evidence based on estimating proxies for any of the indicators showing that deviations from debt neutrality are substantial? And (C), can finite horizons plausibly account for observed deviations from debt neutrality?

In section 2, I consider question (A) using numerical simulations based on the overlapping generations model pioneered by Auerbach and Kotlikoff (1987). Three indicators are used to characterize deviations from debt neutrality: The portion of public debt perceived as net wealth by private households, the long-run crowding out effect of an increase in public debt, and the short-run response of private savings to bond-financed tax cuts. The simulation exercises show that the answer to question (A) depends critically on the indicator used to measure deviations from the bench-mark case of debt neutrality. In particular, while long-run crowding out effects may be substantial, the short-run response of private savings is close to the response expected under debt neutrality. Section 3 considers a nonlinear regression model to evaluate the empirical response of private savings to movements in public savings. The resulting parameter estimates serve as a crude yardstick to answer questions (B) and (C). The empirical analysis is based on U.S. and U.K. data spanning 1897-1989 and 1900-1986, respectively. The results show that private savings compensate at best for a small amount of the change in public savings outside war-periods. Given that the simulation exercises suggest that the response of private savings to movements in public savings should be large if finite horizons are responsible for deviations from debt neutrality, the empirical results do not support the view that finite horizons are the crucial mechanism causing deviations from debt neutrality.

2. Public Debt Neutrality in a Finite-Horizon Economy

The numerical simulations reported in this section are based on a version of the multiperiod finite-horizon economy introduced by Auerbach and Kotlikoff (1987). The economy is populated by 55 generations. Generations are indexed by $i=0,\dots,54$. At time t, generation i is of age $55-i$, was born at time $t+i-55$, and goes on to live until $t+i$. Each generation supplies inelastically one unit of labor for the first 45 years of its life-span and spends the remaining 10 years of life in retirement.

The consumption and savings patterns of generation i over the life-cycle are determined by maximizing the utility index

$$U_i[C_{i,t},\ldots,C_{i,t+i}] = \sum_{s=t}^{t+i} \frac{C_{i,s}^{[1-1/\beta]}}{(1-1/\beta)} \cdot \frac{1}{(1+\delta)^{(s-t)}}. \qquad (1)$$

$C_{i,t}$ is consumption of generation i in time period t, β is the intertemporal elasticity of substitution, and δ denotes the time preference rate. Equation (1) is maximized subject to the intertemporal wealth constraint of generation i

$$W_{i,t} = (1+r_t)A_{i,t} + \sum_{s=t}^{t+i} \frac{w_s L_{i,s}}{d_{t+1,s}} - \sum_{s=t}^{t+i} \frac{T_{i,s}}{d_{t+1,s}} = \sum_{s=t}^{t+i} \frac{C_{i,s}}{d_{t+1,s}}. \qquad (2)$$

Here, $W_{i,t}$ denotes total wealth as perceived by generation i, r_t is the one-period interest rate, $A_{i,t}$ are accumulated non-human assets of generation i, w_t is the real wage, $L_{i,t}$ is labor supply, and $T_{i,t}$ is the amount of lump-sum taxes paid by generation i. The discount factor is defined as

$$d_{t,s} = \prod_{u=t}^{s} 1+r_u \quad \text{and} \quad d_{t+1,t} = 1.$$

The intertemporal budget constraint (2) is based on the assumption that generations leave no bequests. The solution of the optimization problem gives the "consumption function" of generation i

$$C_{i,t} = \Gamma_{i,t} W_{i,t}, \tag{3}$$

where the proportionality factor $\Gamma_{i,t}$ is defined as

$$\Gamma_{i,t} = \{ \sum_{s=t}^{t+i} [(1+\delta)^{(t-s)\beta} (d_{t+1,s})^{\beta-1}] \}^{-1}.$$

Aggregation across generations gives aggregate consumption, labor supply, and wealth of the private sector. Total private wealth as perceived by the private sector is

$$W_t = (1+r_t) \sum_{i=0}^{54} A_{i,t} + \sum_{i=0}^{54} \sum_{s=t}^{t+i} \frac{w_s L_{i,s}}{d_{t+1,s}} - \sum_{i=0}^{54} \sum_{s=t}^{t+i} \frac{T_{i,s}}{d_{t+1,s}}. \tag{4}$$

Perceived total wealth is the sum of non-human assets and human wealth minus the anticipated tax liability. The non-human assets include the public debt. The extent to which public debt is perceived as net wealth depends on the size of the public debt compared to the anticipated tax liability.

The government raises lump-sum taxes, spends on government consumption G_t, and pays interest on public debt B_t. For the purposes of this section, it is convenient to fix government consumption at zero in all periods. Under this assumption and the assumption that the usual transversality condition holds, the intertemporal government budget constraint is simply

$$B_t = \sum_{s=t}^{\infty} \frac{T_s}{d_{t,s}}, \tag{5}$$

where T_s denotes lump-sum taxes aggregated across generations at time s.

The model is closed by a production sector. The single good of the economy is produced by a Cobb-Douglas technology

$$Y_t = K_t^{\alpha}[L_t(1+g)^t]^{1-\alpha}, \tag{6}$$

where Y_t is output, K_t the non-depreciating capital stock and g the exogenously given rate of Harrod-neutral technical progress. Profit maximization implies that factors are paid their marginal products

$$w_t = (1-\alpha)K_t^{\alpha}[L_t(1+g)^t]^{-\alpha}(1+g)^t \tag{7}$$

$$r_t = \alpha K_t^{\alpha-1}[L_t(1+g)^t]^{1-\alpha}. \tag{8}$$

All markets are assumed to clear in each time period and agents are endowed with perfect foresight. In steady state the economy exhibits balanced growth at the rate g.[1] The only reason for public debt to be perceived as net wealth in this type of economy is the assumption of finite horizons of households. Capital markets are assumed to be perfect, taxes do not distort economic behavior, and there is no uncertainty about future income streams and tax liabilities.

The first indicator to evaluate the quantitative importance of deviations from the bench-mark case of debt neutrality is the portion of public debt perceived as net wealth by private households

$$k_t = [(1+r_t)B_t - \sum_{i=0}^{54} \sum_{s=t}^{t+i} \frac{T_{i,s}}{d_{t+1,s}}]/[(1+r_t)B_t]. \qquad (9)$$

If full debt neutrality holds, k_t is zero.[2] In terms of equation (4) defining total wealth of the private sector, k_t=0 implies that the value of the public debt included among the non-human assets is fully counteracted by a

1 A solution methodology is described by Auerbach and Kotlikoff (1987, chapter 4).

2 Patinkin (1965,p.289) discusses debt neutrality based on a similar measure.

perceived tax liability of the same size.

Table 1 reports values of k and the interest rate in steady state for different parameter configurations. The amount of public debt is fixed at 50.0 percent of output. Different but reasonable initial values for the public debt have negligible effects on the results. The first parameter configuration in table 1 is used as the base case and gives a finite-horizon economy in which about 1/3 of public debt is perceived as net wealth. The remaining parameter configurations show what happens to the value of k and the interest rate if the underlined parameter is varied relative to the base case. The results for the net wealth portion range from large values close to 0.50 to low values around 0.15.

The measure of public debt perceived as net wealth in steady state is supplemented with two further indicators based on dynamic fiscal policy experiments. The experiments are designed as follows: The economy is in an initial steady state. The government announces that lump-sum taxes will be cut such that public savings expressed as percent of output will be 1.0 percent lower compared to the initial steady state for n years. In the year n+1, lump-sum taxes will be increased to fix the ratio of public debt to output at the value reached in year n. The economy is given 100 years to settle down to a new steady state. I define an indicator of the long-run crowding out effect of the tax cut as

$$\phi = \frac{(K/L)_{ISS} - (K/L)_{FSS}}{(B/L)_{FSS} - (B/L)_{ISS}}, \tag{10}$$

where ISS stands for initial steady state and FSS for final steady state. Under public debt neutrality $\phi=0$. The third indicator measures the response of the private savings rate to the change in public savings rate in the period the tax cut takes effect. Debt neutrality implies that private savings should increase by 1.0 percentage point in response to the 1.0 percentage point decrease in public savings. The short-run response of private savings is presumably the only indicator considered here that can at least in principle be evaluated by regression methods. Indeed, the next section discusses a nonlinear regression model designed to estimate a crude empirical proxy for the third indicator.

Table 2 contains the results of the tax cut experiments for the same parameter configurations as in table 1. The length of the tax cut was alternatively fixed at 1, 4, and

12 years. The long-run crowding out effect of increases in public debt are substantial across all parameter configurations, and the size of the effect is insensitive to the length of the tax cut. According to the results for the base parameter configuration, increasing the debt-labor ratio by one unit reduces the capital-labor ratio by 0.63 units in the long run. The results for the other parameter configurations show that the crowding out effect can vary between the extreme cases of 0.92 and 0.44, depending on the values of the preference and technology parameters.

A comparison of the results in table 1 with the results in table 2 reveals that the indicators k and ϕ may lead to contrasting evaluations of the quantitative importance of deviations from debt neutrality. For example, if the intertemporal elasticity of substitution is fixed at 0.20, the portion of public debt perceived as net wealth is smaller than in the base case. But for the same parameter configuration, the finite-horizon economy exhibits a larger crowding out effect than in the base case because private savings are relatively insensitive to changes in interest rates.

Finally, table 2 lists the short-run response of the private savings rate to the change in the public savings rate. According to this indicator, it takes long-lived tax cuts to observe sizeable deviations from the bench-mark case of debt neutrality. Even in the case of a 12-year tax cut, private savings still compensate for about 3/4 of the decrease in public savings. This result replicates the finding by Hubbard and Judd (1986,1987) and Poterba and Summers (1987) that short-run consumption behavior of finite-horizon households facing transitory tax cuts is hard to distinguish from the corresponding behavior of infinite-horizon households. In the model economy considered here, the small initial response of consumption to the transitory tax cut is the result of several forces. First, the tax cut and the anticipated rise in interest rates decrease the expected tax liability for the living generations. Second, for $0<\beta<1$, the propensity to consume out of wealth increases as anticipated interest rates increase. Both forces increase consumption. Third, the expected increases in interest rates and the fall in future wages lowers human wealth. This effect dampens consumption.

The simulation exercises show that the answer to the question whether finite horizons can account for large deviations from debt neutrality depends on the indicator used to measure the deviations. A small deviation according to a short-run indicator does not preclude the possibility that deviations are large according to a long-run indicator. The simulations also illustrate a possible problem with interpreting the results of empirical work that is based on estimating short-run indicators. Even if deviations from debt neutrality according to the estimates look negligible, the conclusion that debt neutrality holds would clearly be misleading.

3. Debt Neutrality and Private Savings Behavior

This section considers a simple nonlinear regression model designed to estimate the response of private savings to changes in public savings. I start with the conventional definitions of disposable household income (YD_t) and public savings (SUR_t)

$$YD_t = r_t(K_t+B_t) + YL_t - T_t, \tag{11}$$

$$SUR_t = T_t - G_t - r_tB_t. \tag{12}$$

Here, K_t denotes non-human assets excluding public debt, B_t

is public debt, r_t is the common rate of return on non-human assets, YL_t is gross labor income, T_t are taxes net of transfers, and G_t are public expenditures. All variables are in real units and per capita. Following Blinder and Deaton (1985), a disposable income concept that nests different degrees of debt neutrality is

$$YD_t^* = YD_t + \theta SUR_t. \qquad (13)$$

The parameter θ is assumed to be constant over time and $0 \leq \theta \leq 1$. If θ is one, perceived disposable income does not depend on debt and taxes but only on the value of government expenditures. To estimate θ, I use the following regression model for consumption

$$\Delta \ln C_t = \alpha_0 + \alpha_1 \Delta \ln YD_t^* + \alpha_2 \ln(C_{t-1}/YD_{t-1}^*) + \epsilon_t, \qquad (14)$$

where C_t denotes private consumption, and ϵ_t is a regression disturbance. Equation (14) represents a version of the error-correction model suggested by Davidson et. al. (1978). While the equation is related to the empirical work on debt neutrality summarized in Bernheim (1987), it imposes the additional long-run restriction that consumption and income as defined in (13) are cointegrated. This restriction and the assumption that the logarithm of consumption and income are stationary after first differencing ensures that the regressors are stationary, thus allowing statistical inference to be based on the usual distributional results.

The error-correction model can be transformed into an equation linking private and public savings where estimates of θ measure the response of the private savings rate with respect to changes in the public savings rate. To see this, first subtract both sides of equation (14) from the growth rate income, $\Delta lnYD_t$. Then, use two approximations for the private and the public savings rate, respectively

$$ln(YD_t/C_t) \approx S_{pt} = (YD_t - C_t)/YD_t$$

$$ln(YD_t + \theta SUR_t) \approx lnYD_t + \theta(SUR_t/YD_t) = lnYD_t + \theta S_{gt}.$$

Rearranging terms gives an equation for the change in the private savings rate

$$\Delta S_{pt} = \beta_0 + \beta_1 \Delta lnYD_t + (\beta_1 - 1)\theta \Delta S_{gt} + \beta_2 S_{pt-1} + \beta_2 \theta S_{gt-1} + \epsilon'_t. \quad (15)$$

The parameters of equations (14) and (15) are related as follows: $\beta_0 = -\alpha_0$, $\beta_1 = (1-\alpha_1)$, and $\beta_2 = \alpha_2$. Assuming that in steady state $\Delta S_{pt}=\Delta S_{gt}=0$ and $\Delta \ln YD_t=g$, the steady state private savings rate is determined as

$$S_p = -[\beta_0+\beta_1 g]/\beta_2 - \theta S_g.$$

Thus, θ measures in percentage points the decrease in the private savings rate if the public savings rate increases by 1.0 percent. The private savings rate equation is nonlinear in parameters and will be estimated by nonlinear least squares with one overidentifying restriction imposed on θ. Because the error term could plausibly be correlated with the contemporaneous regressors, the equation is estimated by instrumental variables as well as by ordinary least squares. Instruments used are the lagged private saving rate, the lagged public saving rate, the lagged growth rate of government expenditures, the lagged difference of a nominal interest rate, and the lagged inflation rate of consumer prices.

The parameter θ is not tightly related to the indicator used to characterize the response of private savings to changes in public savings in the finite-horizon model of section 2. First, the disposable income concept is a crude approximation for the perceived wealth concept relevant in a finite-horizon economy. The subtle but important effects of interest rates are not captured and there is no distinction made between anticipated and unanticipated movements in the regressors. Flavin (1987) argues that the Euler equation approach is a more useful framework for investigating the empirical relevance of debt neutrality than the "informal" consumption function approach. Drawbacks of the Euler approach are, however, that the level as well as the change in consumption may be important for analyzing debt neutrality and that the Euler specification may be rejected for reasons unrelated to the empirical relevance of debt neutrality. Second, other variables might influence private savings behavior.[3] And third, the effect of movements in public savings on private savings may depend on their source (taxes or expenditures, transitory or permanent) and the timing of the policy change.

I use long-term time series data for the United States and the United Kingdom to estimate equation (15). The U.S. data span 1897-1989 and the U.K. data 1900-1986. The data sources are described and the data listed in a data appendix available from the author on request. The length of the time

3 I investigated more general versions of equation (15) that allow for effects of government expenditures and inflation on saving. The estimates of θ were not affected.

series should be valuable for making inferences about the empirical relevance of debt neutrality.

Consumption data for both countries are based on total private consumption. Disposable income for the U.S. is disposable personal income. For the U.K. a more comprehensive income concept which includes the undistributed profits of the corporate sector is used. The public savings series for the U.S. is the national income accounts government surplus, for the U.K. a measure of public savings proper. Eisner (1986) forcefully criticizes the way public sector activities are measured in official statistical publications. Adjusting the long-term series used in this paper to account for his criticism is, however, beyond the scope of the paper. All variables are real and in per capita terms.

The estimation results are collected in table 3. I report results for both countries with war years included as well as excluded. If war years are included, estimates of θ range from 0.74 to 0.51, indicating a strong response of private savings to changes in public savings. But remember from the simulations of section 2 that even large values of θ need not imply that deviations from debt neutrality are negligible. More important, however, the high values for θ are very sensitive to excluding the war data. A majority of economists would probably argue that war-time data on private consumption behavior are not reliable for testing the debt neutrality proposition. Shortages, rationing, and patriotic feelings are more likely to be the source of the compensating movements in private and public savings than tax discounting. If war years are excluded, the estimates for θ in table 3 fall to values between 0.31 and 0.01. Judged by conventional significance levels, the estimates are not significantly different from zero. Reassuringly, the tests for the overidentifying restriction do not reject the null at a level of 5 percent for any of the regressions. The time series evidence supports the conclusion that deviations from debt neutrality are substantial. Further, the small response of private saving rates to movements in public savings outside war-periods is hard to reconcile with that view that finite horizons are the dominant mechanism causing deviations from debt neutrality.

4. Conclusion

Finite horizons provide an a priori plausible and theoretically tractable mechanism to model deviations from public debt neutrality. This paper first studied the quantitative importance of deviations from debt neutrality in the finite-horizon model introduced by Auerbach and Kotlikoff (1987). While the portion of public debt perceived as net wealth by households and long-run crowding out effects can be substantial in this type of economy, the short-run response of private savings to debt-financed tax cuts is close to the response expected for an infinite-horizon economy. The paper also reported empirical evidence on the behavior of private savings rates for the U.S. and the U.K. using long-term time series. The estimates of the response of private savings with respect to movements in public savings outside war-periods provide little support for the debt neutrality proposition. Also, the estimates appear to be too low to be consistent with the view that finite horizons are the dominant mechanism responsible for deviations from debt neutrality.

Table 1: Portion of Public Debt Perceived as Net Wealth in Steady State[a]

Parameter Values	Portion of Debt that is Net Wealth	Interest Rate
$\beta=0.50$, $\delta=0.015$ $\alpha=0.25$, $g=0.015$	0.341	6.54
$\underline{\beta=0.20}$, $\delta=0.015$ $\alpha=0.25$, $g=0.015$	0.158	13.12
$\underline{\beta=0.90}$, $\delta=0.015$ $\alpha=0.25$, $g=0.015$	0.487	4.55
$\beta=0.50$, $\underline{\delta=0.000}$ $\alpha=0.25$, $g=0.015$	0.411	5.44
$\beta=0.50$, $\underline{\delta=0.050}$ $\alpha=0.25$, $g=0.015$	0.222	9.70
$\beta=0.50$, $\delta=0.015$ $\underline{\alpha=0.20}$, $g=0.015$	0.390	5.73
$\beta=0.50$, $\delta=0.015$ $\underline{\alpha=0.30}$, $g=0.015$	0.302	7.32
$\beta=0.50$, $\delta=0.015$ $\alpha=0.25$, $\underline{g=0.000}$	0.358	4.67
$\beta=0.50$, $\delta=0.015$ $\alpha=0.25$, $\underline{g=0.030}$	0.303	8.90

[a]The size of the public debt is fixed at 50 percent of output. Parameters are: β, the intertemporal elasticity of substitution, δ, the time preference rate, α, the capital income share, g, the rate of technological progress.

Table 2: Tax Cut Experiments[a]

Parameter Values	Long-Run Crowding Effect			▲Private Savings/ ▲Public Savings		
	Length of Tax Cut in Years					
	1	4	12	1	4	12
$\beta=0.50$, $\delta=0.015$ $\alpha=0.25$, $g=0.015$	0.63	0.66	0.68	0.94	0.85	0.75
$\underline{\beta=0.20}$, $\delta=0.015$ $\alpha=0.25$, $g=0.015$	0.83	0.83	0.84	0.95	0.88	0.81
$\underline{\beta=0.90}$, $\delta=0.015$ $\alpha=0.25$, $g=0.015$	0.57	0.58	0.58	0.94	0.85	0.74
$\beta=0.50$, $\underline{\delta=0.000}$ $\alpha=0.25$, $g=0.015$	0.77	0.78	0.78	0.94	0.84	0.72
$\beta=0.50$, $\underline{\delta=0.050}$ $\alpha=0.25$, $g=0.015$	0.46	0.45	0.44	0.95	0.88	0.82
$\beta=0.50$, $\delta=0.015$ $\underline{\alpha=0.20}$, $g=0.015$	0.57	0.59	0.60	0.94	0.85	0.73
$\beta=0.50$, $\delta=0.015$ $\underline{\alpha=0.30}$, $g=0.015$	0.75	0.74	0.75	0.95	0.86	0.76
$\beta=0.50$, $\delta=0.015$ $\alpha=0.25$, $\underline{g=0.000}$	0.92	0.91	0.91	0.94	0.84	0.71
$\beta=0.50$, $\delta=0.015$ $\alpha=0.25$, $\underline{g=0.030}$	0.44	0.46	0.47	0.95	0.91	0.86

[a] Lump-sum taxes are reduced such that the public savings rate is decreased by 1.0 percentage point compared to its initial steady state value for n years. In year n+1, taxes are increased to maintain a constant debt-output ratio. The table reports the long-run crowding out effect, measured in labor efficiency units, of increasing the public debt by one unit, and the increase in the private savings rate in response to the 1.0 percentage point decrease in the public savings rate.

Table 3: Empirical Evidence on Debt Neutrality[a]

A. War data included

	β_0	β_1	β_2	θ	Test[b]	SE	DW
U.S.A.,OLS	0.006 (0.01)	0.43 (0.04)	-0.20 (0.05)	0.51 (0.07)	0.78	0.018	2.36
U.K.,OLS	0.004 (0.04)	0.44 (0.07)	-0.11 (0.04)	0.64 (0.10)	0.26	0.017	2.02
U.S.A.,IV	0.013 (0.01)	0.37 (0.23)	-0.29 (0.12)	0.74 (0.17)	0.85	0.027	2.21
U.K.,IV	0.010 (0.01)	0.42 (0.19)	-0.17 (0.06)	0.69 (0.24)	0.22	0.028	2.17

B. War data excluded[c]

	β_0	β_1	β_2	θ	Testb	SE	DW
U.S.A.,OLS	0.012 (0.01)	0.38 (0.04)	-0.28 (0.06)	0.23 (0.17)	0.13	0.017	2.06
U.K.,OLS	0.001 (0.01)	0.51 (0.04)	-0.09 (0.03)	0.17 (0.19)	0.47	0.010	1.45
U.S.A.,IV	0.009 (0.01)	0.47 (0.14)	-0.24 (0.11)	0.01 (0.40)	0.31	0.024	1.96
U.K.,IV	0.002 (0.01)	0.52 (0.24)	-0.08 (0.07)	0.31 (1.56)	0.09	0.017	2.20

[a]Equations are estimated by nonlinear least squares. Instruments are lagged private saving rate, lagged public saving rate, lagged growth rate of government expenditures, lagged difference of nominal interest rate, and lagged inflation rate. Standard errors in parentheses below parameter estimates.

[b]Gives marginal significance level of F-test for overidentifying restriction on the parameter θ.

[c]Excluded years for U.S. data: 1917-1919 and 1941-1946.
Excluded years for U.K. data: 1914-1919 and 1939-1946.

REFERENCES

AUERBACH, Alan J. and Laurence J. KOTLIKOFF, Dynamic Fiscal Policy, Cambridge University Press, 1987.

BARRO, Robert J., "Are Government Bonds Net Wealth?", Journal of Political Economy, 1974, 82, 1095-1117.

BARRO, Robert J., "The Neoclassical Approach to Fiscal Policy", 178-235, in: R.J. Barro (ed.), Modern Business Cycle Theory, Harvard University Press, 1989.

BERNHEIM, Douglas B., "Ricardian Equivalence: An Evaluation of Theory and Evidence", in: Stanley Fischer (ed.): Macroeconomics Annual 1987, 263-304, MIT Press, 1987.

BLANCHARD, Olivier J. "Debt, Deficits and Finite Horizons", Journal of Political Economy, 1985, 93, 223-247.

BLINDER, Alan S. and Angus DEATON, "The Time Series Consumption Function Revisited", Brookings Papers on Economic Activity, 1985, 2, 465-511.

DAVIDSON, James E.H, David F. HENDRY, Frank SRBA, and Stephen YEO, "Econometric Modelling of the Aggregate Time-Series Relationship between Consumers Expenditures and Income in the United Kingdom", Economic Journal, 1978, 88, 661-692.

EISNER, Robert, How Real is the Federal Deficit?, New York: Free Press, 1986.

FLAVIN, Marjorie, Comment on D.B. Bernheim, "Ricardian Equivalence: An Evaluation of Theory and Evidence", in: Stanley Fischer (ed.): Macroeconomics Annual 1987, 304-309, MIT Press, 1987.

FRENKEL, Jacob A. and Assaf RAZIN, Fiscal Policies in the World Economy, 1987, MIT Press.

HUBBARD, Glenn R. and Kenneth L. JUDD, "Liquidity Constraints, fiscal policy, and Consumption", Brookings Papers on Economic Activity, 1986, 1, 1-60.

PATINKIN, Don, Money, Interest and Prices, Second Edition, Harper & Row, 1965.

POTERBA, James, and SUMMERS, Lawrence H., "Finite Lifetimes and the Effects of Budget Deficits on National Saving", Journal of Monetary Economics, September 1987, 20, 369-391.