NBER WORKING PAPER SERIES

CONSUMPTION AND GOVERNMENT-BUDGET FINANCE IN A HIGH-DEFICIT ECONOMY

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Working Paper No. 2032

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
September 1986

This paper was completed during the summer of 1986 while Mr. Leiderman was a visiting scholar at the Fiscal Affairs Department of the International Monetary Fund, and Mr. Razin was at the Research Department of the World Bank. The views expressed in the paper are the sole responsibility of the authors and should not be attributed to these organizations. The research reported here is part of the NBER's research program in International Studies. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

This paper characterizes empirically how government budget variables, such as spending, taxes, and deficits, affected private-sector consumption in the high-budget-deficit economy of Israel during the first half of the 1980s. The paper develops and estimates an intertemporal optimizing model of consumption choice by finite-lived individuals. The evidence supports this formulation against the Ricardian infinite-horizon case, but it does not support it when compared to the unrestricted relations in the data.

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1. Introduction

The impact of government budget variables on private-sector consumption is a key issue in assessing the implications of fiscal and monetary policy on the real side of the economy. In fact there are sharp controversies on this topic, most of which center around the Ricardian-Equivalence proposition 1/. The main purpose of this paper is to provide empirical evidence on this key issue for the case of Israel in the first half of the 1980s. This case is of particular interest because of the high volatility of movements in the budget deficit, government spending, and private consumption in an economy with unusually high government budget deficit; the deficit amounting to 15% of output, on average, during this period. These characteristics differ from those of the more stable environments studied in previous empirical works, and thus enable a more powerful test of the comovements of private-sector consumption and public-sector spending and financing variables.

The standard approach in empirical studies of these comovements has been based on directly specifying regression equations linking consumption to disposable income, measures of wealth, government spending, taxes, etc. (See e.g., Kochin (1974), Tanner (1979), Feldstein (1982), Seater (1982), Kormendi (1983), Reid (1985)). While the results from applying this approach are informative, a limitation, which makes the interpretation of the results ambiguous, is that the connection between the estimated equations and the underlying theoretical model is not made explicit. In contrast, the present study adopts an intertemporal optimizing framework whose implications, derived explicitly in the analysis, are the subject of empirical tests.

Since the seminal contribution of Hall (1978), numerous studies have applied the intertemporal optimizing approach to examine consumption behavior. However, almost none of these studies focus on the comovements of consumption and government-budget variables. [2/] Moreover, these studies typically assume an infinite-horizon consumer. This assumption severely restricts the economic channels through which government-budget finance exerts its effects on consumption, resulting in an extreme case where the model exhibits Ricardian properties. To move away from this extreme case, Blanchard (1985) extended the intertemporal framework by relaxing the infinite-horizon assumption. His formulation allows for a richer set of interactions between government-budget-deficit variables and consumption, with Ricardian implications emerging only as a special case. [3/]

In this investigation, we develop a version of Blanchard's model and implement it to monthly time series data for Israel covering the 1980-1985 period. Section 2 outlines the model and derives the equations to be estimated. Empirical results are reported in Section 3, and Section 4 contains concluding remarks.

2. The Model

We assume that there are overlapping generations of rational agents that, due to mortality, have finite horizons. Specifically, there is a probability γ, smaller than unity, that individuals will survive to the next period. A small open economy is considered, one that takes as given the world interest rate.

Aggregating the budget constraints of all age groups yields the following economy-wide budget constraint:

$$C_t = B_t^P - RB_{t-1}^P + Y_t - T_t \quad , \tag{1}$$

where C denotes consumption; B_t^P is new private-sector debt at t; RB_{t-1}^P represents the repayment of old debt at t (with R denoting one plus the riskless world real interest rate) 4/; Y denotes real income and T the value of taxes. All variables are expressed in units of the all-purpose consumption good.

Under the assumptions that individuals maximize expected lifetime utility and that utility exhibits a constant intertemporal elasticity of substitution, σ, the aggregative consumption function can be written (in per-capita terms) as:

$$C_t = (1-s)W_t \quad , \tag{2}$$

where W_t is wealth and s is the savings/wealth ratio, expressed as $s = \gamma\delta^\sigma R^{1-\sigma}$, and where δ is the subjective discount factor. Wealth is equal to the difference between the present value of future disposable income, H_t, and the value of past debt commitment RB_{t-1}^P. Accordingly,

$$W_t = H_t - RB_{t-1}^P, \tag{3}$$

and, in turn,

$$H_t = \Sigma_{\tau=0}^{\infty} (\frac{\gamma}{R})^\tau (Y_{t+\tau} - T_{t+\tau}). \tag{4}$$

Note that the discount factor used in computing the present value of future incomes is the effective (risk adjusted) factor, γ/R.

Substituting (2) into the budget constraint (1) yields

$$B_t^P = RB_{t-1}^P + (1-s)(H_t - RB_{t-1}^P) - Y_{t-1} + T_{t-1}, \qquad (5)$$

which in turn can be written as

$$B_t^P = -s(H_t - RB_{t-1}^P) + \frac{\gamma}{R} H_{t+1} . \qquad (6)$$

Using a similar expression for B_{t-1}^P and the definition of W_t we can now express consumption as follows:

$$C_t = (1-s)(1-\gamma)H_t + sRC_{t-1} . \qquad (7)$$

Notice that H_t includes current and future taxes that are imposed on the private sector. From the intertemporal government budget constraint, the present value of taxes is given by

$$\sum_{\tau=0}^{\infty} R^{-\tau} T_{t+\tau} = \sum_{\tau=0}^{\infty} R^{-\tau}(G_{t+\tau} - D_{t+\tau}) + RB_{t-1}^G, \qquad (8)$$

where G is the real value of government spending, D is the real value of the change in the monetary base induced by the budget deficit, and B^G is government debt 5/. Substituting this expression into H_t and into eq. (7) yields

$$C_t = (1-s)(1-\gamma)\Big[\sum_{\tau=0}^{\infty} (\tfrac{\gamma}{R})^{\tau} Y_{t+\tau} - \sum_{\tau=0}^{\infty} (\tfrac{1}{R})^{\tau}(G_{t+\tau} - D_{t+\tau})$$

$$+ \sum_{\tau=0}^{\infty} \big((\tfrac{1}{R})^{\tau} - (\tfrac{\gamma}{R})^{\tau}\big)T_{t+\tau} - RB_{t-1}^G\Big] + sRC_{t-1} . \qquad (9)$$

Eq. (9) summarizes the implications of the model for the comovements of consumption and government-budget variables and thus constitutes the focal relation for our empirical work. Note that the present formulation is general enough to encompass both Ricardian and non-Ricardian systems as special cases. The key parameter, in this context, is γ. When $\gamma = 1$ the system possesses Ricardian neutrality, and eq. (9) indicates that only C_{t-1} can be used to predict C_t (as in Hall (1978)). However, when $\gamma < 1$, the variable H_t affects current consumption over and beyond the impact of C_{t-1}. For example, a current-period cut in taxes will result in an increase in perceived wealth (through an increase in H_t). The reason is that the future tax increases that are needed in order to balance the intertemporal budget constraint of government are given a smaller weight, by the finite-horizon consumers, than the weight they attach to the current cut in taxes.

3. Empirical Results

To implement eq. (9) it is necessary to specify a tractable empirical counterpart for the infinite forward-looking sums in this equation. The specification that we adopt assumes that all individuals alive at time t expect future values of the components of H_t to remain at their current (time t) levels. It is further assumed that the econometrician observes individuals' H_t up to an error term ε_t, which is orthogonal to presently known information at time t. Imposing these assumptions yields

$$C_t = (1-s)(1-\gamma)\left[\left(\frac{R}{R-\gamma}\right)Y_t - \left(\frac{R}{R-1}\right)(G_t-D_t) + \frac{(1-\gamma)R}{(R-1)(R-\gamma)}T_t - RB^G_{t-1}\right] + sRC_{t-1} + \varepsilon_t. \tag{10}$$

Several versions of this equation are estimated on the basis of Israeli monthly data for the period 1980-1985. The use of monthly data clearly limits our choices of the actual time series that serve as counterparts for the variables in the model. For consumption we use two indices: one of total purchases within the organized retail trade, C_t, and another one, C_t^n, which excludes purchases of consumer durables from the total. Total wage bill is used for Y; for G we use public-sector outlays (excluding debt service); for T we use government tax receipts; and for D we use the amount of money financing of the government-budget deficit. Since no data are available on the stock of government debt, on a monthly basis, we construct a proxy for this variable by using the accounting relation $B_t^G = RB_{t-1}^G + G_t - T_t - D_t$. Accordingly, we obtain

$$B_{t-1}^G = \sum_{\tau=0}^{t=1} R^{t-\tau-1}(G_t - T_t - D_t) + R^{t-1}(R_{-1}B_{-1}^G) \; . \qquad (11)$$

Substituting Eq. (11) into (10) yields the following equation

$$C_t = (1-s)(1-\gamma)\Big[(\frac{R}{R-\gamma})Y_t - (\frac{R}{R-1})(G_t - D_t) + \frac{(1-\gamma)\, R}{(R-1)(R-\gamma)}T_t$$

$$- B_{t-1}^{1G} - (R_{-1}B_{-1}^G)B_{t-1}^{2G}\Big] + \varepsilon_t \quad , \qquad (12)$$

where B^{1G} is the summation term on the right hand side of (11), and $B_{t-1}^{2G} = R^{t-1}$. The data source is Bank of Israel's publication Recent Economic Developments (various issues).

Tables 1 and 2 give the estimated equations [6/]. Row 1 in the tables reports estimates of the unrestricted version of (12). With the exception of D_t, all the coefficients on the government budget variables are statistically significant, but only those of G_t and T_t obtain the hypothesized signs. Row 2 imposes the Ricardian-neutrality restriction $\gamma = 1$. Comparing the fits of these equations with the fits of the unrestricted equation yields the statistics $F(6, 62) = 12.71$ and 9.50 for Tables 1 and 2 respectively. This indicates rejection of the neutrality hypothesis at standard significance levels. Row 3 reports estimates of (12) under the restrictions that are implied by the model. To get parameter estimates we set the interest factor at $R = 1.002$ and thus obtain the values of γ and s reported in the tables. (These estimates are quite insensitive to the choice of alternative, plausible, values of R). For both tables, the annualized value of the probability of survival turns out to be 0.988. The estimates for s are more difficult to interpret because this parameter depends on two unknown parameters, the subjective discount factor δ and the intertemporal elasticity of substitution σ, as follows: $s = (\gamma/\delta)(\delta R)^{\sigma-1}$. For example, if $\sigma = 0$ then $s = (\gamma/R)$ and from this perspective our estimated values for s appear to be too low. However, if $\delta R < 1$, which is the case of a net borrower, large values of σ yield low values of s, and from this perspective our estimates are too high. Comparing the fits of Rows 2 and 3 yields the statistics $F(1, 67) = 21.67$ and 17.22, which are statistically significant at the 5% level. These results support relaxing the $\gamma = 1$ restriction in the manner specified by the model. However, comparing the fits of rows 1 and 3 yields the statistics $F(5, 62) = 8.49$ and 6.53 for tables 1 and 2 respectively, indicating rejection of the restricted version against the unrestricted one at standard significance levels. This amounts to rejection of the joint hypothesis consisting of eq. (9) and the auxiliary assumptions made in order to implement it (as in eq. (12)). Relaxing and refining these assumptions seems to us a promising task for further work, one that may result in a more general version of the intertemporal model which will conform more closely to the data.

4. Concluding Remarks

This paper has shown that government budget variables, such as spending, taxes, and deficits, have strong effects on private consumption in the high-budget-deficit economy of Israel during the first half of the 1980s. These effects are shown to be at variance with the Ricardian implications of an intertemporal optimization model with infinite-horizon consumers. We developed a finite-horizon version of the intertemporal model, which results in a richer set of potential channels through which government budget variables affect consumption than in the infinite-horizon formulation. The evidence supports the finite-horizon version over the infinite-horizon one. However, the present finite-horizon version does not conform sufficiently well with the unrestricted relations in the data, suggesting the need for further refinements of the model and its auxiliary assumptions, as well as the need for incorporating additional channels through which government affects private consumption.

Table 1:

Consumption and Government-Budget Variables
(Israel, Monthly Data, 1980:4-1985:12)

1. Unrestricted

$$C_t = \underset{(0.019)}{0.027}\, Y_t - \underset{(0.167)}{0.445}\, G_t + \underset{(0.114)}{0.121}\, D_t + \underset{(0.199)}{0.790}\, T_t$$

$$+ \underset{(0.009)}{0.038}\, B^{1G}_{t-1} + \underset{(5.840)}{25.691}\, B^{2G}_{t-1} + \underset{(0.113)}{0.103}\, C_{t-1}$$

$\bar{R}^2 = 0.781$ SER = 3.444

2. Under the $\gamma = 1$ restriction

$$C_t = \underset{(0.009)}{1.003}\, C_{t-1}$$

$\bar{R}^2 = 0.554$ SER = 4.912

3. Under the Restrictions in Eq. (12), with R = 1.002

$\gamma = \underset{(0.0001)}{0.999}$ $s = \underset{(0.098)}{0.551}$

$\bar{R}^2 = 0.653$ SER = 4.330

Note: Figures in parentheses are estimated standard errors. $\bar{R}^2$ is the adjusted coefficient of determination and SER is the standard error of the regression. Rows 1 and 2 were estimated by ordinary least squares, and row 3 by nonlinear least squares.

Table 2:

Consumption, Excluding Durables, and Government-Budget Variables
(Israel, Monthly Data, 1980:4 - 1985:12)

1. Unrestricted

$$C^n_t = \underset{(0.017)}{0.015}\, Y_t - \underset{(0.145)}{0.257}\, G_t + \underset{(0.099)}{0.059}\, D_t + \underset{(0.174)}{0.405}\, T_t$$

$$+ \underset{(0.009)}{0.041}\, B^{1G}_{t-1} + \underset{(5.591)}{23.972}\, B^{2G}_{t-1} + \underset{(0.124)}{0.140}\, C^n_{t-1}$$

$\bar{R}^2 = 0.796$ SER = 3.027

2. Under the $\gamma = 1$ restriction

$$C^n_t = \underset{(0.009)}{1.003}\, C^n_{t-1}$$

$\bar{R}^2 = 0.642$ SER = 4.012

3. Under the Restrictions in Eq. (12), with R = 1.002

$\gamma = \underset{(0.0001)}{0.999}$ $s = \underset{(0.091)}{0.632}$

$\bar{R}^2 = 0.708$ SER = 3.629

Note: See note to Table 1.

FOOTNOTES

1/ See Barro (1974).

2/ For an exception, see Aschauer (1985).

3/ For analysis of effects of fiscal policy in open economies using this type of model, see Frenkel and Razin (1986).

4/ Throughout we use the assumption of a constant real rate. While this is a restrictive assumption, it need not be very unrealistic in an economy with widespread indexation in financial markets.

5/ In this formulation the discount factor is (1/R), while it is (γ/R) for private (finite-lived) agents. For a related analysis and test of equality of these discount factors, see van Wijnbergen (1985).

6/ The term $R_{-1}B^G_{-1}$ was treated as a constant in the estimations.

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