ON THE DETERMINATION OF THE EXTERNAL PUBLIC DEBT: THE CASE OF BARBADOS

by

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ABSTRACT

This paper examines the factors influencing the external debt formation process in Barbados. The empirical evidence indicates that disturbances in real output, real government spending and the state of the balance of payments are significant variables.

Paper Prepared for Presentation at the Regional Monetary Studies Conference in Belize, November 1987

November 1987

Introduction

The substantial rise in the external indebtedness of Lesser Developed Countries (LDC's) has become one of the hottest economic and political issues in these countries over the last five years. This paper attempts to empirically determine the major factors influencing the growth of the external public debt of Barbados[1]. Using data for the years 1959-86, growth in the foreign debt is related to short-falls in real economic activity, unusually large government expenditure, movements in the relative prices facing Barbados in its international trade, the balance of trade and a cost of credit variable. The paper begins with a brief descriptive statistical overview of the historical evolution of Barbados' external debt. Section III presents a theoretical discussion of the various reasons why a LDC may accumulate foreign debt liabilities. Section IV outlines and empirically evaluates a model of external public debt accumulation based on the discussion in the previous section. Our conclusions are presented in Section V.

II. The Behaviour of The External Debt of Barbados: 1955-1986

After a lengthy period characterised by little or no growth in the level of outstanding external debt, Barbados first contracted significant amounts of foreign debt during the late 1950's and early 1960's as the central government engaged in major infrastructural projects (See Table 1, column 1). These projects were largely financed by the issuance of debentures on the London capital market. Nominal external debt rose from $0.75 million in 1955 to $25.7 million by the last year of the colonial administration (1965). The external debt then grew slowly before the maturing of earlier debt prompted increased borrowing for debt servicing purposes in the 1972-74 period. Growth in the foreign debt during the 1970's was also associated with the financing of specific projects under the 1973-77 Development Plan (Zephirin (1980) and Saunders and Worrell (1981)). As the trade balance deteriorated in the late 1970's and the 1980's, external debt liabilities were again contracted to support the balance of payments. Between 1978 and 1986, external debt grew at a compound rate of some 23% annually. Over this period, the ratio of external to internal debt rose from 0.28 in 1977 to 0.91 in 1986 (See Table 1, column 2).

External debt as a ratio to domestic exports rose to 0.54 by 1965, remaining stable for the next few years before declining to 0.25 in 1975. The ratio has, however, trended sharply upward in the period since 1975, reaching as high as 1.33 in 1986 (See Table 1, column 3). The ratio of external debt to nominal gross domestic product averaged approximately 0.10 in the 1960-76 period but has risen dramatically since then to reach 0.24 by 1986 (See table 1, column 4). The real external debt - measured as the ratio of nominal debt to the terms of trade - increased from $0.4 million in 1955 to $17 million in 1965. After remaining around $20 million for the next few years, the real debt shot up to $49 million in 1973. The real external debt then resumed its dramatic climb, going from $80 million in 1977 to $710 million in 1986. While this expansion in real external

indebtedness reflects higher levels of nominal borrowing; it also reflects a deterioration of the terms of trade which has fallen from 1.88 in 1955 to 0.78 in 1986 (See Table 1, column 5)[2].

The pattern of increasing real external indebtedness is mirrored in the behaviour of debt servicing. Amortisation, interest payments and sinking funds for external debt have risen from 4.4 percent of exports (1968) to 24.1 percent (1986)

III. Factors Influencing External Debt Accumulation

External borrowing allows a country to finance its expenditures without (immediately) displacing spending by domestic economic agents for consumption and investment purposes. The availability of external credit permits the domestic country to spend more than it earns from exports to finance foreign dollar expenditures[3]. It has been argued - and with some plausibility - that external debt accumulation is justified in the early stages of a country's development when it tends to embark on large infrastructural and other development projects aimed at promoting accelerated rates of growth and development (See, for example, Goode (1984)). During such periods of expanding (real) government expenditures, and as the tax base of LDC's tends to be weak and opportunities for domestic borrowing are severely constrained by the lack of well organised domestic capital markets, the governments of these countries look towards external sources to finance the widening gap between fiscal revenues and expenditures. As the foreign capital requirements of such infrastructural projects are generally substantial, and as the currencies of most LDC's are not generally accepted as international means of payment, LDC's have little alternative (in the absence of foreign grants) but to borrow from international creditors. If the expected cost of borrowing external funds is exceeded by the expected rate of return on these developmental projects in a cost-benefit sense, then such borrowing is warranted. If foreign funds are efficiently invested and promote sufficient future growth, then the debt can be serviced without undue difficulty out of future higher incomes (exports).

Another argument for external public debt accumulation assumes that the government enjoys a significant technical advantage over the private sector in conducting external credit market operations. This argument is felt to be especially relevant to the case of developing countries[4]. Now, consider an open economy faced with given real rates of interest (cost of credit) on international money and capital markets. Specifically, suppose that there are two rates - r_g, the "riskless" rate of discount and r_p, the discount rate facing "high risk" borrowers. Here, r_p exceeds r_g by a risk premium which reflects the differential in perceived riskiness. We assume further that there are only two types of debtors; "low risk" and "high risk". Suppose that the domestic private sector in our LDC desires to borrow abroad to finance investment projects but is faced with borrowing at the high discount rate[5]. The government can, however, borrow at the riskless rate, r_g. If the government now borrows abroad and onlends to the domestic private sector at concessional rates, i.e. at r_c where r_c is

below r_p, then the public views such external debt as an additional to its net wealth. To the extent that the costs of administering and monitoring the loan to the private sector by government do not cancel such gains and provided that the private sector projects are well conceived and executed, then the country is made better off by such external borrowing[6].

The cost of foreign credit has a dual effect on debt contraction. If the real rate of interest is "low", reflecting the "easy" availability of funds, then countries are induced to increase borrowing as the low rate of interest may now mean that more projects exhibit expected rates of return above the cost of borrowing external funds (Tanzi and Blejer(1986))[7]. However, high real rates of interest, while dampening the demand for credit to some extent, may mean that our debtor country is forced to extend its external indebtedness simply to finance interest payments for previous loans contracted with variable rates of interest.

LDC's have also tended to borrow externally when their current real income falls substantially below their expected "permanent" income without a concomitant fall in aggregate demand (Barro (1979) and Hercowitz (1986)). Creditors remain willing to extend credit to the extent that they consider this fall in real income to be a temporary condition. Such supply shocks may be due to natural disasters, failed harvests and so on. Relatedly, adverse movements in the terms of trade and international demand for domestic exports may compel our small open economy to extend their foreign indebtedness to finance continued growth, service existing debt and to support a weakening balance of payments position.

Governments in many LDC's have also borrowed abroad to support current expenditures (i.e., for consumption purposes as opposed to capital expenditure purposes). Often, this type of spending occurs in periods leading up to elections when government is tempted to score short-run political gains by augmenting expenditures on public employment without raising tax revenues. In any case, both domestic and external debt tend to increase in periods of unusually high real government expenditures.

LDC's have also found themselves having to borrow more to pay off maturing debt and to support the balance of payments as the demand for and prices of the major exports of LDC's declined especially since the early 1980's.

IV EMPIRICAL MODEL AND RESULTS

In this section, we attempt to econometrically isolate the major determinants of the change in the external debt of Barbados. Based on the discussion in the previous sections we postulate an empirical model of the generalised functional form (1):

$$DED_t = DED\ (constant,\ DBOP_t,\ TRY_t,\ TGX_t,\ DR_{t-1},\ DTT_t,\ e_t) \quad (1)$$

DED_t is the change in government's nominal external debt holdings. We measure shortfall in real output (TRY_t) and unusually large (temporary) real government's expenditures (TGX_t) as current deviations from their respective trend values. Our cost of foreign credit variable (DR_{t-1}) is defined as the change

in the ratio of external interest payments to domestic exports. This proxy is similar to that used by Kremers (1987) where total interest payments and total output are replaced by external interest payments and domestic exports respectively. The balance of payments variable employed is $DBOP_t$, defined as the change in the balance of trade; DTT_t reflects variations in the international trade prices faced by Barbados and is measured by changes in the terms of trade. e_t is assumed to be a white noise error term.

For the purpose of actual estimation, we posit a linear form of (1)[8]. Ordinary Least Squares is employed using data for the period 1959-86. Our estimated equation was:

$$DED = \underset{(-2.28)}{-13.07} \underset{(-2.29)}{- 0.01\ DBOP} + \underset{(6.10)}{0.49\ TRY} + \underset{(1.86)}{17.49\ TGX}$$

$$\underset{(-0.08)}{- 21.75\ DR_{t-1}} + \underset{(0.29)}{0.04\ DTT} \qquad (2)$$

$\bar{R}^2 = 0.71$ D.W. = 2.28 $LMN[X^2(2)] = 0.52$ $RESET[F(3,24)] = 1.12$

$HT1[X^2(1)] = 2.4 \times 10^{-4}$ $SC1[X^2(1)] = 0.81$ $CHOW\ [F(2,22)] = 1.11$

The t-statistics are in parenthesis; LMN is the Jargue-Bera (1980) normality test; RESET is Ramsey's (1969) specification error test; HT1 is Engle's (1982) ARCH test for heteroskedasticity; SC1 is a Lagrange multiplier test for first order linear serial correlation, and CHOW is CHOW's (1960) test for structural change (stability).

The coefficients of TRY, DBOP and TGX have the expected signs and are significant at the conventional levels (TRY and DBOP are significant at the 5% level and TGX at the 10% level). The coefficients of the interest rate and international price variables were not significant, even when they were replaced by or included with their respective lagged terms. The diagnostic tests suggest that the residuals do not violate the classical assumptions. Furthermore, the correlation matrix shows that the regressors are nearly orthogonal, suggesting that multicollinearity is not a problem.

Correlation Matrix

DBOP	TRY	TGX	DR_{t-1}	DTT
1				
-0.374	1			
-0.231	0.008	1		
-0.195	0.060	0.042	1	
-0.009	0.081	-0.271	0.346	1

Several other variables were also examined in this study. The effective interest rate - interest payments in year t divided by the average of debt outstanding between year t and t-1 - suggested by Tanzi and Blejer (1986) was tried with no appreciable improvement over our foreign credit variable. The world inflation index when substituted for the terms of trade

proved statistically insignificant and did not raise the explanatory power of the equation as shown in (2). The model also suggest that the beginning period level of debt was irrelevant for current debt issue. This proposition was tested by including the lagged external debt as an explanatory variable in (2). The estimated coefficient of this variable, -0.009 (-0.118), was statistically insignificant. This result is at variance with Hercowitz (1986) findings for Israel's external debt process.

Equation (2) was transformed into a restricted equation [equation (3)] by substituting the real interest rate, DFR, defined as the nominal interest rate (DR) minus the expected rate of international inflation (proxied by DTT_{t-1}). Our empirical results for this formulation were

$$DED = \underset{(-2.47)}{-13.17} \; \underset{(-2.51)}{-0.01} \; DBOP + \underset{(6.51)}{0.49} \; TRY + \underset{(2.06)}{17.40} \; TGX - \underset{(-1.45)}{0.09} \; DFR \qquad (3)$$

$\bar{R}^2 = 0.74$ D.W. = 2.17 $LMN[X^2(2)] = 1.28$ $RESET[F(3,24)] = 1.29$
$HT1[X^2(1)] = 0.054$ $SC1[X^2(1)] = 0.27$ $CHOW[F(2,23)] = 0.88$

The coefficient of the real interest rate variable was statistically insignificant although the restriction was accepted by an F test, with the calculated F value 0.16 less than the 5% level tabulated F value of 4.28. Again the 'catch all' disturbance term satisfied all the diagnostic tests. Estimation of equation (3) was also carried out using the instrumental variable technique to allow for any simultaneity in the variables.

$$DED = \underset{(-2.66)}{-14.68} \; \underset{(-2.47)}{-0.01} \; DBOP + \underset{(6.60)}{0.51} \; TRY + \underset{(2.14)}{18.12} \; TGX = \underset{(-1.42)}{0.09} \; DFK \qquad (4)$$

$\bar{R}^2 = 0.75$ D.W = 2.26 $LMN[X^2(2)] = 1.39$ $RESET[F(3,24)] = 1.07$
$HT1[X^2(1)] = 0.052$ $SC1[X^2(1)] = 0.78$ $CHOW F(2,22)] = 0.94$
$INVR[X^2(5)] = 3.24$

The results of this equation (4)indicated no serious simultaneity bias as evidenced by the small changes in the estimated coefficients when compared with the Ordinary Least Squares model. The largest change in the coefficients was 0.8 in the TGX variable. The instrumental variables include the current and lagged exogeneous variables and the lagged endogeneous variable. The Sargan's test of the validity of the instrument set (INVR) revealed that the instruments used were valid.

The general pattern of the results reported above seem to confirm the importance of unusually high (temporary) real government expenditures, deviation of real output away from its trend value and the balance of payments position in the process explaining the changes in the evolution of external debt in Barbados. Changes in international prices and changes in the interest on foreign credit do not appear to have affected the change in the absolute level of debt. Transforming equation (4) into a standard regession equation (equation 5), the beta coefficients support the t-statistics results by showing that the unusually high real government spending variable has the strongest effect on the external debt process.

$$DED = -0.17 - 4.01 \times 10^{-6}\ DBOP + 0.002\ TRY + 9.24\ TGX \qquad (5)$$
$$- 0.0004\ DFR$$

Shortfalls in real output and the balance of trade play a secondary role. The small coefficient on the balance of payment variable is not too surprising since balance of payments support loans have only become prominent in the late 1970's and the 1980's (See Section II above).

Conclusion

This paper has attempted to model and empirically test the external public debt process in Barbados. The results from both the Ordinary Least Squares and Instrumental Variable procedures indicated that unusually high real government spending, shortfalls in real output and the state of the balance of payments are pertinent factors to the determination of foreign debt. In particular, the paper highlights the importance of fiscal management in the evolution of foreign debt.

TABLE 1

EXTERNAL DEBT ACCUMULATION, 1955-1986

Year	ED	EIDR	EDXR	EDYR	EDTTR
1955	0.8	0.18	0.020	0.007	0.004
1960	13.2	0.89	0.376	0.105	0.081
1965	25.7	1.32	0.541	0.163	0.172
1970	30.2	0.74	0.486	0.104	0.209
1975	44.1	0.34	0.247	0.063	0.245
1980	163.9	0.68	0.485	0.107	1.844
1986	553.5	0.91	1.326	0.238	7.096

Notes -

ED: External Debt. Figures do not include private sector external debt guaranteed by government.

EIDR: Ratio of external debt to internal debt. Internal debt (DD) do not include private sector domestic debt guaranteed by government but foreign currency denominated debt held by residents of Barbados is counted in the available statistics.

EDXR: Ratio of external debt to domestic exports.

EDYR: Ratio of external debt to Gross Domestic Product (GDP) at factor cost. GDP in current prices.

EDTTR: Ratio of external debt to terms of trade. The terms of trade calculated as the ratio of the export price index (1974=100) to the import price index (1974=100)

Sources: The debt series ED and DD came from various issues of the Accountant General reports and the Central Bank of Barbados, Annual Statistical Digest. Exports was also taken from the Central Bank of Barbados Annual Statistical Digest. The GDP series came from various issues of Barbados Statistical Service Annual Abstract of Statistics and the Central Bank of Barbados Annual Statistical Digest. Data for the exort and import price indicies were Gafar and Joefield-Napier, ISER, 1978, and the Central Bank of Barbados, Annual Statistical Digest, various issues.

FOOTNOTES

1. Barbados is a small open economy, historically, the ratio of Barbados' imports to gross domestic product has been as high as 65-80%.

2. A rise in the terms of trade can cause a reduction in the real value of the external debt even in the absence of international inflation. Also, world inflation not altering the relative prices of exports and imports of the domestic country will not change the burden of the debt in real terms or alter the ability of the country to pay its debt (See Tanzi and Blezer (1986)).

3. We assume here that foreign grants are not sufficient to bridge the gap between export earnings and desired foreign dollar expenditures.

4. In fact, the majority of foreign borrowing by LDC's is done by the public sector or through public sector guarantees.

5. In fact rp may be infinitely high for some private sector firms due to (moral hazard) reasons associated with their small size, risk of default, lack of economies of scale in administering and transacting relatively small loans and in determining the solvency of such firms, many of which are going to be unknown outside of the domestic economy and whose stock would hardly be internationally traded.

6. This argument implicitly assumes that the domestic government can perform the credit market intermediation better than the international creditors in terms of administering and monitoring direct loans to the domestic private sector. It also assumes that uncertainty about the country's ability to service the loan out of uncertainty future export earnings is not sufficient to obviate or reverse such net wealth gains (Barro (1974) and (1984)).

7. This may explain the sharp increase in external borrowing by Brazil, Argentina, Mexico and other LDC's during the 1970s during the large OPEC surpluses.

8. A log-linear specification was anticipated given the interrelationship of some of the explanatory variables, but this was not permissable on account of the negative values in the regressors.

REFERENCES

Barro, R.J. (1974) Are Government Bonds Net Wealth? Journal of Political Economy, 82, 1095-1117.

Barro, R.J.(1979) On the Determination of the Public Debt, Journal of Political Economy, 87, 940 - 971.

Barro, R.J. (1984) Macroeconomics, John Wiley and Sons, New York.

Chow, G.C. (1960) Tests for equality between sets of coefficients in two linear regressions, Econometrica, 28, 591-605.

Engle, R.F. (1982) Auto-regressive Conditional Heteroscedasticity with estimates of the Variance of the United Kingdom Inflation, Econometrica, 50, 987-1008.

Gafar, J. and W. Joefield-Napier (1978) Trends and Patterns of Commonwealth Caribbean Trade 1954-1970, Institute of Social and Economic Research, Mona.

Goode, R. (1984) Government Financing in Developing Countries, Brookings Institute, Washington.

Hercowitz, Z (1986) On the Determination of the External Debt: The Case of Israel, Journal of International Money and Finance, 5, 315-334.

Jargue, C.J., and A.K. Bera (1980) Efficient Tests for Normality, Homoskedasticity and Serial Independence of Regression Residuals, Economics Letters, 6, 255-259.

Kremers, J.J.M. (1987) U.S. Federal Deficits and Debt Service, International Monetary Fund, Working Paper No. 27.

Tanzi, V. and M.I. Blezer (1986) Public Debt and Fiscal Policy in Developing Countries, International Monetary Fund, Working Paper, No. 5.

Ramsey, J.B. (1969) Tests of Specification Error in the General Linear Model, Journal of the Royal Statistical Society, B, 250-271.

Saunders, M. and D. Worrell (1981) Government Expenditure in Barbados, 1946-1979, Central Bank of Barbados Quarterly Review, viii(2), 30-79.

Zephirin, M.G. (1980) The External Debt of Barbados, Central Bank of Barbados Quarterly Review, vii (4), 24-67.