DYNAMIC SAVINGS BEHAVIOUR IN AN OIL DEPENDENT ECONOMY: THE CASE OF TRINIDAD AND TOBAGO

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INTRODUCTION

Trinidad and Tobago can be described as an open economy where the petroleum sector is the engine of economic growth. The economy benefitted tremendously from the dramatic rise in international oil prices in 1974 and 1979/80. Through government taxation of the oil sector and consequent government spending in the non-oil sector, more jobs were created and the standard of living of the populace improved. The balance of payments recorded healthy surpluses and the country prospered. However, with the fall in oil prices in 1983 the economy contracted, unemployment rose, the balance of payments deteriorated exhibiting repeated deficits, and the debt burden expanded. Despite a drastic fall-off in government revenues as oil-based tax receipts declined, government found it difficult to cut recurrent expenditure substantially and the government account went from a surplus to a deficit position. The non-oil export sector failed to fill the vacuum left by the fall in the export value of petroleum and hence the need for adjustment became apparent[1].

The growing international indebtedness of Trinidad and Tobago and the sharp reduction in the flow of external capital into the country has caused administrators and other commentators to emphasise the pressing need for the country to generate higher levels of domestic savings to finance investment and general development projects. Given the close nexus of savings, capital accumulation, economic growth and the balance of payments, the importance of understanding and empirically identifying the determinants of the savings rate in Trinidad and Tobago, in particular, and developing countries in general, cannot be sufficiently stressed.

Forde (1988) has made an initial attempt to quantify the effect of income and money balances on private consumption and savings decision in Trinidad and Tobago[2]. The aim of this paper is to expand upon such previous work in two ways:-

(i) by testing for the influence of other factors such as changing age structure, terms of trade, export orientation and real interest rates on consumption behaviour; and

(ii) by allowing consumption to short run movements in its determinants.

On the latter point, this paper makes use of recent developments in econometric modelling. Specifically, an 'error correction' model is formulated and tested. Such a model permits the estimation of both the short-run and the long-run effects of regressors and avoids the potential spurious regression problem inherent in running the consumption function only in levels as in Forde (1988), Gafar (1977) and Persad (1975). Equations in levels ignore short-run dynamics while the practice of using only differences ignore all long-run information and provides no mechanism for disequilibrium between the level of the variables to affect the time path of the dependent variable (see Hendry *et al* (1984) for a detailed discussion and references). The 'error correction' model encompasses models in both differences and levels and is compatible with proportional long-run behaviour.

The paper proceeds as follows. Section II looks at the historical behaviour of savings rates and related variables in the Trinidad and Tobago economy over the 1955-87 period. Section III outlines the basic empirical framework and methodology to be adopted. The empirical tests and findings are reported in Section IV. Finally, conclusions are made.

II. HISTORICAL REVIEW OF SAVINGS BEHAVIOUR

This section briefly reviews the behaviour of savings and related variables over the past few decades and touches upon some

issues pertinent to a study of savings behaviour[3].

As Table 1 shows, the savings rate has exhibited considerable variation over the past three decades. The average propensity to save (APS) rose from an average of 7.2% (1955-65) to a mean of 18.4% in the 1973-82 boom period, peaking at 31% in 1975. However, during the recessionary period of 1983-87, the APS declined dramatically to an average of 9%.

Growth and changing demographic structure are the two main determinants of the savings rate in the life-cycle approach, influencing aggregate savings by making young savers more numerous and more wealthy than older dissavers across overlapping generations[4]. Trinidad and Tobago has experienced several distinct periods of economic growth since 1955. Between 1956 and 1961, real *per capita* GDP grew at an average year-to-year rate of some 6%; in the 1967-73 period growth was a more modest 2.2%. However, during the 1974-82 oil boom period, real *per capita* income grew at a mean year-to-year rate of change of 5%. Since 1982, as the international oil market softened, Trinidad and Tobago has experienced a continuous decline in output with real *per capita* GDP declining at a compound rate of 9.7% per year between 1982 and 1987.

Overall population growth in Trinidad and Tobago has been substantial over the observation period: total population has increased by an annual compound rate of almost 2% (1987 relative to 1955), representing a virtual doubling of the population in three decades. As Table 1 shows, there has however been some decrease in the dependency ratio over the past three decades. Leff (1969, 1980) has found a significant inverse relationship between dependency rates and savings rates within the context of LDCs. However, Bilsborrow (1980) and Ram (1982), *inter alia*, has challenged such conclusions on the grounds of specification and sample selection biases. Rossi (1989) questions the theoretical framework upon which the existing evidence on dependency rates and saving behavior is based.

The interest rate sensitivity of savings has been a subject of much debate in the LDC literature. At the theoretical level, two period life cycle models indicate the existence of potentially offsetting income and substitution effects. A rise in the real rate of return decreases the present cost of purchasing a dollar of future consumption, making it attractive to substitute for present consumption and to save more. At the same time, it is no longer necessary to save as much in order to achieve a given level of income in the future. It is possible to save less now and consume more, both in the present and in the future. The

income effect causes a reduction in saving. Given the theoretical ambiguity, whether or not savings behaviour is interest elastic is a matter for empirical analysis[5].

Most of the variability in real interest rates in the Trinidad and Tobago economy has been due to variability in inflation rates (see Table 2, below)[6]. Since 1973 real interest rates have been consistently negative, coinciding with a falling savings rate after 1982.

In 1973-74 and again in 1979-80, Trinidad and Tobago benefitted from sharp increases in the international price of oil. There was a corresponding improvement in the international terms of trade facing the country. However, since 1982, the terms of trade have declined, especially in the 1985-87 period when it fell to an average of 66.5%. Given the huge contribution of the oil sector to the economy of Trinidad and Tobago, such terms of trade fluctuations, associated with oil price changes, have had profound consequences for the Trinidad and Tobago economy.

Theoretically, a change in the terms of trade can have three different but inter-related effects on consumption and savings activity. Firstly, there is a direct effect through revaluation of exports and imports; secondly, a wealth (income) effect, as for example, increased export prices imply, *ceteris paribus*, an increase in income in exporting countries. Thirdly, there is a pure substitution effect from relative price changes within and between periods. The reduction in the savings rate pursuant to a deterioration in the terms of trade is commonly referred to in the literature as the Laursen - Metzler - Harberger effect. Svensson and Razin (1983) and Persson and Svennson (1985) have however shown the ambiguous nature of the effect of changes in the terms of trade on the savings rate.

Maizels (1968) and Lee (1971) have argued that export orientation - proxied by the proportion of exports in GDP - may affect the private savings rate in LDCs as economic agents in the export sector supposedly exhibit a high propensity to save relative to the general populace. The assertion here is the higher the degree of export orientation, the higher the savings rate.

The Trinidad and Tobago economy has undergone substantial change over the 1955-87 observation period. Sharp fluctuations in the rate of growth, shifts in the terms of trade and large negative interest rates have been some of the salient aspects of the transformation of the Trinidad and Tobago economy over the past three decades[7].

Identifying the different factors involved in the process of savings mobilisation in Caribbean countries is an important aspect of understanding the structure of such economies and in determining

policy mechanisms for encouraging domestic savings flows for investment purposes. This present study on the effects of growth, terms of trade, export orientation, real interest rates and demographic factors on the rate of growth of savings is a preliminary effort in this direction.

III. EMPIRICAL SPECIFICATION

This section develops the basic framework for estimating the saving functions. As in Lahiri (1989), we begin by illustrating the dependence of the savings rate on growth and demography using Diamond (1965) overlapping generation model. Imagine, for example, a perfectly competitive world characterised by perfect foresight with one composite commodity and overlapping generations of economic agents who live for two periods - working and accumulating during the first and decumulating (in retirement) during the latter. With constant returns to scale, Cobb-Douglas type utility and production functions, no bequest motive, constant population growth (ξ) and labour-augmenting technology progressing at α per period, it can be shown that

$$(S/Y)_t = (1 - \psi)\ (1 - \gamma)\ (\Delta Y/Y)_t \qquad (1)$$

where Y is total output, Δ is the difference operator so that $(\Delta Y/Y)_t$ equals output growth, S is the level of savings, ψ is the marginal product of capital and γ is the rate of time preference. In the steady state, $(\Delta Y/Y)_t = 1 - 1/(1 + \alpha)(1 + \xi)$. The equilibrium savings rate $(S/Y)_t$ therefore depends, in this highly stylised world, solely on productivity, time preference, technical progress and population growth. Productivity enhancement and technical progress act to raise the savings rate by making young savers more affluent than their counterparts of the last period who now constitute the older dissavers. The age-dependency ratio, defined as the ratio of old to young, is $(1 + \xi)^{-1}$. As inspection of Equation (1) shows, an increase in ξ implies a decrease in the age-dependency ratio, increasing the proportion of savers in the economy, thereby increasing the APS.

Equation (1) still fails to explicitly highlight the dependence of the savings rate on the age profile of the population. To show this, the evolution of the savings rate must be derived from an initial (arbitrary) configuration. It can be shown, given the assumptions adopted here and by approximating $\ln(1 - Z)$ by $-Z$ where ln refers to the natural logarithm of a variable, that

$$(S/Y)_t = (1 - \psi)^2\ (1 - \gamma)\ \ln[(1 + \alpha)(1 + \xi)] + \psi(S/Y)_{t-1} \qquad (2)$$

Now, replacing (S/Y) by $-\ln[1-(S/Y)] = -\ln(C/Y)$ we obtain

$$\ln(C/Y)_t = -(1 - \psi)^2\ (1 - \gamma)\ \ln[(1 + \alpha)(1 + \xi)] + \psi \ln(C/Y)_{t-1} \qquad (3)$$

as a complete description of consumption (savings) behaviour. Equation (3) can be rewritten as

$$\ln C_t = -(1 - \psi)^2 (1 - \gamma) \ln[(1 + \alpha)(1 + \xi)] + \ln Y_t + \psi \ln C_{t-1} - \psi \ln Y_{t-1} \quad (4)$$

Transforming Equation (4) to *per capita* terms, denoting the logarithm of *per capita* magnitudes by lower case letters, we get

$$\Delta c_t = \theta_0 + \theta_1 c_{t-1} + \theta_2 y_t + \theta_3 y_{t-1} + \theta_4 \xi \quad (5)$$

where $\theta_0 = -(1 - \psi)^2 (1 - \gamma) \ln(1 + \alpha)$

$\theta_1 = -(1 - \psi)$

$\theta_2 = 1$

$\theta_3 = - \psi$

$\theta_4 = -(1 - \psi)^2 (1 - \gamma)$

In this very simple economy, there is a direct one-to-one correspondence between population growth and the age-dependency ratio as population growth unambiguously augments the proportion of young savers relative to old dissavers. In the real world, the relationship between dependency and growth in the population is much more complex, being influenced by such demographic factors as age-specific mortality rates (the evolution of health care) and life expectancies.

If we allow for an adjustment period of two years, $\theta_4 \xi$ in Equation (5) can be replaced by $\theta_4 DR_t + \theta_5 \Delta DR_t$ - a linear combination of the 'working age' population (DR_t) and the change in that percentage (ΔDR_t).

For purposes of testing for the influence of other, theoretically meaningful variables, Equations (5) is expanded to allow for the impact of real interest rates (r_t), the degree of export orientation (X_t) and the terms of trade (τ_t). A white noise error component, ϵ_t, is also attached for estimation purposes. This more general specification is given below as

$$\Delta c_t = \theta_0 + \theta_1 c_{t-1} + \theta_2 y_t + \theta_3 y_{t-1} + \theta_4 DR_t + \theta_5 \Delta DR_t + \theta_6 r_t + \theta_7 \tau_t + \theta_8 X_t + \epsilon_t \quad (6$$

An 'error correction' model can be derived from Equation (6) by imposing the parameter restriction $\Sigma_{i=1}^{3} \theta_i = 0$ and by simple addition and subtraction of the relevant terms[8]. As mentioned earlier, the 'error correction' model, introduced into the literature by Sargan (1964) and popularised in a series of papers by David Hendry encompasses models in both levels and differences, and is compatible with proportional long-run equilibrium behaviour. It therefore circumvents the fundamental 'spurious' regression problem inherent in running the consumption function only in levels through the use of appropriate differenced variables in the model

but without losing long-run information due to using differenced data only. More support for the use of 'error correction' models come from the recently developed theory of cointegration. Cointegration theory allows estimation and inference to be possible when economic variables do not satisfy the classical assumptions of constant mean and variance. If there exists a linear combination of these non-stationary variables that is stationary then these variables are said to be cointegrable. Engle and Granger (1987) proved that if a set of variables are cointegrated then there exists a corresponding error correction form of those variables[9].

A representation of the 'error correction' model in this context is given by [10]

$$\begin{aligned}\Delta c_t = {} & \theta_0 + \theta_2 \Delta y_t + \theta_1(c_{t-1} - y_{t-1}) + \theta_4 DR_t + \theta_5 \Delta DR_t \\ & + \theta_6 \Delta r_t + \theta^*_6 r_{t-1} + \theta_7 \Delta \tau_t + \theta^*_7 \tau_{t-1} \\ & + \theta_8 \Delta X_t + \theta^*_8 X_{t-1} + \epsilon_t \end{aligned} \qquad (7)$$

The 'error correction' model has attractive dynamic properties: the savings (consumption) rate is constant in the long-run and any short-run divergence of this ratio is corrected over time to ensure constancy of the ratio in the steady state. If ϵ_t is restricted to its expected value in Equation (7), $\Delta c_t = \Delta y_t = \mu$, $X_t = X$ and $\Delta r_t = \Delta \tau_t = 0$ in the steady state and there is no change in the demographic structure, then

$$(C/Y) = \exp\{(1/\theta_1)[-\theta_0 + (1-\theta_2)\mu - \theta_4 DR - \theta^*_6 r - \theta^*_7 \tau - \theta^*_8 X]\} \qquad (8)$$

Thus, the long-run APS rises with growth and DR provided that $\theta_1 < 0$, $\theta_4 < 0$ and $0 < \theta_2 < 1$. In the empirical analysis that follows, first of all, Equation (6) is run. The results of this estimation allow us to determine the appropriateness of imposing the parameter restriction that $\sum_{i=1}^{2} \theta_i = -\theta_3$, that is, that the 'error correction' model is consonant with the data. We then estimate an unrestricted form of Equation (7), the 'error correction' model before using a series of F-tests to arrive at a parsimonious representation of the consumption relation.

IV. DATA AND EMPIRICAL RESULTS

Data Considerations

Data employed in this study were obtained from the Central Bank of Trinidad and Tobago's *Handbook of Key Economic Statistics*. Data used are annual observations of GDP and total private consumption expenditure, all in *per capita* terms and deflated by a consumer price index. A real interest rate variable - derived from the three month savings deposit rate - and defined as one plus the nominal rate of interest minus the (actual) rate of inflation was also

constructed. Ideally, the consumption function should be empirically estimated using a flow measure of consumption - expenditure on non-durables plus service flows from the existing stock of durables - rather than total consumption expenditures. As in practice it is very difficult, if not nigh impossible, to accurately determine service flows from durables. Most researchers, particularly in developed countries, have compromised by using expenditures on non-durables alone to proxy flow consumption, although this approach too is flawed when durables and non-durables are non-separable in utility. The Trinidad and Tobago data do not readily permit this breakdown, and so we work with total expenditures[11].

GDP is preferred over disposable income as the income construct for the following reason: the life-cycle approach stresses the importance of wealth for consumption decisions. Where separate wealth measures are unavailable - as in the present case - a broad measure of income is preferred[12]. The unadjusted GDP variable has some advantages over the disposable income variable in this regard. Bilson (1981) argues that undistributed corporate profits are a useful substitute for stock prices as signals of future income growth. As the GDP variable includes undistributed corporate profits, it may be a more appropriate measure than disposable income in the absence of a wealth measure [see also Zuehlke and Payne (1989)]. In any case, preliminary investigations using disposable income indicated that the choice of income variable was relatively unimportant.

The age-dependency variable is defined as the proportion of persons between the ages of twenty and fifty-nine in the mid-year population. The available population statistics did not afford the derivation of the age-dependency variable as the more traditional proportion of fifteen to sixty-four year olds in the population. The terms of trade data (1980 = 100) is defined as the ratio of the relative prices of exports and imports. X_t is the ratio of nominal exports to nominal GDP. All data were available for the 1955-87 period.

Empirical Tests and Results

Equation (6) was run first of all using Ordinary Least Squares (OLS)[13]. This is presented below as Equation R1. Equation R2 which omits the terms of trade, τ_t, (see footnote 9) is also reported. All computations were done using DATAFIT - now MICROFIT.

Equation R1

$$\Delta c_t = \underset{(1.78)}{0.83} - \underset{(5.47)}{0.74}\, c_{t-1} + \underset{(5.19)}{0.80}\, y_t - \underset{(0.23)}{0.04}\, y_{t-1} - \underset{(1.52)}{0.01}\, DR_t + \underset{(0.004)}{0.0002}\, \Delta DR_t$$

$$+ \underset{(2.71)}{0.83}\, r_t - \underset{(0.78)}{0.10}\, \tau_t - \underset{(2.45)}{0.33}\, X_t$$

$\bar{R}^2 = 0.77$ DW = 2.19 SER=0.05 LM[F(1,22)] = 0.31

RR[F(3,20)] = 0.53 NRM[χ^2(2)] = 0.29 HET[F(1,30)] = 0.003

ARCH[χ^2(1)] = 0.18

Equation R2

$$\Delta c_t = \underset{(1.64)}{0.62} - \underset{(5.46)}{0.72}\, c_{t-1} + \underset{(5.24)}{0.76}\, y_t - \underset{(0.38)}{0.07}\, y_{t-1} - \underset{(2.20)}{0.02}\, DR_t + \underset{(0.33)}{0.01}\, \Delta DR_t$$

$$- \underset{(2.49)}{0.33}\, X_t + \underset{(2.92)}{0.87}\, r_t$$

$\bar{R}^2 = 0.78$ DW = 2.23 SER=0.05 LM[F(1,23)] = 0.51

RR[F(3,21)] = 0.48 NRM[χ^2(2)] = 0.59 HET[F(1,30)] = 0.06

ARCH[χ^2(1)] = 0.01

$\bar{R}^2$ is the adjusted coefficient of multiple determination, RR[ ] is Ramsey (1969) Reset test for functional misspecification, LM[ ] is a Lagrange Multiplier test of first order linear serial correlation, NRM[ ] is the Bera-Jarque (1980) test of normality of the residuals, HET[ ] is a variant of White (1980) test of heteroscedasticity while D.W. is the Durbin Watson "d" statistic. ARCH[ ] is Engle (1982) autoregressive conditional heteroscedasticity test. SER is the standard error of regression.

As comparison of Equation R1 and Equation R2 shows, parameter values change little consequent to the omission of τ_t. Both equations satisfy the diagnostic checks, including tests for stability (not reported). Lahiri (1989) suggests that a straightforward manner of testing the appropriateness of the 'error correction' model in the context of Equation (6) is to judge whether the long-run income elasticity is significantly different from unity[14]. It can be seen from Equation R2 (and Equation R1) that the long-run income elasticity falls in the relevant range and that the hypothesis that $\Sigma_{i=2}^{3}\, \theta_i = -\theta_1$ cannot be rejected by the data. The 'error correction' model is therefore supported by the coinciding of coefficient values in Equation R1 and Equation R2 with prior reasoning.

Consequently, the 'error correction' model - Equation (7) - was estimated using OLS. From Equation R3 it is seen that the terms of trade variable is statistically insignificant[15], lending

support to the 'no cointegration' result alluded to in footnote 9. For this reason, we only report results with τ excluded from here on. Furthermore we drop the insignificant ΔDR variable. The resultant model was then run without imposing the restriction that the coefficients on the lagged consumption and income variables are equal in absolute value (see again Equation 4). As Equation R4 shows, the data do not reject equality of the coefficients of y_{t-1} and c_{t-1} (in absolute value), thus the model was re-ran using the lagged consumption ratio. As shown, coefficient values varied only marginally, attesting to their robustness (see Equation R5 below).

Equation R3

$$\Delta c_t = \underset{(1.60)}{1.03} - \underset{(4.23)}{(c_{t-1} - y_{t-1})\ 0.89} + \underset{(4.60)}{0.76\Delta y_t} + \underset{(0.24)}{0.01\Delta DR_t}$$

$$\underset{(1.57)}{-0.02 DR_t} + \underset{(2.09)}{0.80\ \Delta r_t} + \underset{(1.95)}{0.97\ r_{t-1}} - \underset{(1.88)}{0.30\ \Delta X_t}$$

$$- \underset{(2.09)}{0.43 X_{t-1}} \underset{(0.55)}{-0.08\ \Delta\ r_t} - \underset{(0.65)}{0.08\ r_{t-1}}$$

$\bar{R}^2 = 0.76$ DW = 1.96 SER=0.05 LM[FC,19)] = 0.03

RR[F(3,17)] = 0.78 NRM[χ^2(2)] = 0.53 HET[F(1,29)] = 0.34

ARCH[χ^2(1)] = 0.17

Equation R4

$$\Delta c_t = \underset{(1.42)}{0.78} - \underset{(4.47)}{0.86\ c_{t-1}} + \underset{(4.79)}{0.73\ \Delta y_t} + \underset{(4.66)}{0.84\ y_{t-1}}$$

$$- \underset{(1.89)}{0.02\ DR_t} + \underset{(2.52)}{0.80\ \Delta r_t} + \underset{(2.53)}{1.07 r_{t-1}}$$

$$- \underset{(1.90)}{0.28\Delta X_t} - \underset{(2.04)}{0.39\ X_{t-1}}$$

$\bar{R}^2 = 0.77$ DW = 1.98 SER=0.05 LM[F(1,21)] = 0.005

RR[F(3,19)] = 0.85 NRM[χ^2(2)] = 0.65 HET[F(1,29)] = 0.72

ARCH[χ^2(1)] = 0.15

Equation R5

$$\Delta c_t = \underset{(1.48)}{0.79} - \underset{(4.75)}{0.84\ (c_{t-1} - y_{t-1})} + \underset{(5.00)}{0.71\ \Delta y_t} - \underset{(1.98)}{0.02\ DR_t}$$

$$+ \underset{(2.92)}{0.83\ \Delta r_t} + \underset{(3.05)}{1.12\ r_{t-1}} - \underset{(1.94)}{0.27\ \Delta X_t} - \underset{(2.07)}{0.39\ X_{t-1}}$$

$\bar{R}^2 = 0.78$ DW = 1.99 SER=0.05 LM[F(1,22)] = 0.001

RR[F(3,20)] = 1.09 NRM[χ^2(2)] = 0.45 HET[F(1,29)] = 0.79

ARCH[χ^2(1)] = 0.10

Equation R5 satisfies the battery of diagnostic tests and as Chart 1 and 2 show, is parametrically stable[16,17]. Equation R5 can therefore be accepted as a tentatively adequate representation of the data generation process and can be used to consistently explain the behaviour of savings and consumption in the Trinidad and Tobago economy. The growth of savings is seen to depend positively on income growth and negatively on the real interest rate (positively to inflation) in both the short-and long-run. The Maizels-Lee hypothesis that increased export orientation induces a rise in savings levels is not rejected by the data evidence. This positive effect of export orientation on savings growth shows up in both the short-and the long-run. Given the recent slump in exports relative to GDP in Trinidad and Tobago, this result is potentially cause for concern as the country struggles to generate domestic capital to finance its development. The results would seem to confirm that exporters exhibit a higher propensity to save than the general population.

Given the lack of significant short-run variation in the age-dependency ratio, it is not at all surprising that no significant effect on savings shows up in the regression results in the short-run. The results show, however, that in the long-run, the higher the proportion of 'working age' persons in the total population - that is, the lower the dependency rate - the higher is savings growth.

We use the coefficient values from Equation R5 and the equation for the consumption to income ratio (Equation (8)) to derive the steady-state average propensity to consume (APC) and the concomitant implied APS. The steady-state APC was computed under the assumption that the growth in real *per capita* income was a constant equal to the average growth of 1.5% over our 1955-87 period. Again the period averages were used to determine the steady-state values of the age-dependency and export orientation variables. Thus, we assume DR = 44% and X = 0.53. It was also assumed that the large negative real interest rates which have persisted since 1973 were not sustainable in the steady-rate. Instead a real interest rate of 5% was adopted[18]. In line with the empirical findings, θ^*, was restricted to zero in Equation (8) when we compute the steady state APC. The corresponding steady state APS is computed as one minus the steady state APC. On the basis of the above assumptions and the relevant coefficient values from Equation R5, a steady state APC of 0.73 was estimated, implying a steady state APS of 0.27[19]. This value for the Trinidad and Tobago case is quite similar to values derived by Lahiri (1989) who found values between 0.2 - 0.4 for several Asian countries.

CONCLUSION

The results of the empirical tests point toward a positive impact of growth in *per capita* income and lower dependency rates on private savings. Thus, the negative income growth in Trinidad & Tobago over the latter part of the sample would clearly have served to depress that country's savings rate, a correlation that shows up quite clearly in Table 1 below.

Real interest rates (inflation) was found to affect savings rate as was export orientation. The data evidence would tend to confirm the Maizels-Lee hypothesis, although no evidence was found to support a Laursen-Metzler-Harberger terms of trade effect.

In the short-run, shifts in the savings rate can be attributed to the adjustment lags present in savings behaviour. The adjustment of savings to an economic stimulus is not instantaneous and may differ between the short-run and the long-run. This differential adjustment pattern is supported by the findings of the 'error correction' model. Although there is clear evidence of procyclical behaviour of the savings rate over the short-run, the results are consonant with long-run constancy of the savings rate within the 'error correction' framework.

How do our findings compare with those of other researchers? Lahiri (1989), using data for eight Asian countries find strong support for demographic variables and growth in explaining variations in savings rate between countries. Terms of trade movements and export orientation were also important, though not in every case. Rossi (1989) could not find a consistently important role for demographic variables in his tests of 49 LDCs using pooled data. Relative to Forde (1988), Gafar (1977) and Persad (1975), our findings indicate the need to employ a much richer specification of the consumption relation in which such variables as inflation, interest rates and age-dependency rates play an important part. The results also challenge the static approach taken by these studies and highlight the differential impact of changes in the determinants of consumption when the long-run and the short-run effects are isolated.

Changes in savings rates are of great interest to policymakers and economists alike given the close relationship between savings and the current account of the balance of payments and the close nexus between savings, growth and investment. This paper showed that just as savings can lead to higher future growth through capital accumulation, higher current growth encourages savings by making young savers more affluent than the more aged dissavers. Thus, even in a case where physical factors of production are limited, technical progress and a more efficient resource allocation can foster growth. This growth in turn brings about a

augmentation in savings which itself leads to further growth. At least this is the reasoning behind the self-generation growth theory. In any case, the importance of implementing appropriate policies aimed at encouraging greater economic efficiency and improved technology development, transfer and adoption is self-evident.

FOOTNOTES

1. For a discussion of the developments in the Trinidad and Tobago economy since the first oil-shock in 1974, see Ramkissoon (1990).

2. There has been two other studies on Trinidad and Tobago, - Persad (1975) and Gafar (1977) - but their concern was not solely one of estimating a consumption function, but moreso that of developing macro models for the overall economy. Thus the consumption/saving function may not have received its due attention.

3. Government savings is taken to be an exogenously determined policy variable; we therefore focus only on the determination of private savings.

4. Franco Modigliani (1970) was one of the first to provide evidence in support of a significant role for growth and demographic factors in explaining cross-country differences in savings rates. More recently, Graham (1987) found that demography and growth explain almost two-thirds of the observed variation in savings rates of major industralised countries during the 1970's. Also see Lahiri (1989).

5. This literature is also quite controversial. For a brief survey see Rossi (1989).

6. Besides reducing the real rate of return, inflation may also affect savings-consumption behaviour through several other channels. In particular, with a fixed real rate of return, personal saving may rise in an inflationary setting if consumers mistake nominal for real price increases [see, for example, Deaton (1977)]. Furthermore, when inflation raises uncertainty regarding future incomes, risk averse households may save more [see, for example, Sandmo (1970)].

7. Our analysis ignores the potentially important issue of forced (contractual) savings such as the National Insurance Scheme introduced in 1972. The relevant data were not available.

8. By decomposing variables in Equation (6) into expected and 'innovation' terms, it can be seen that Equation (6) nests both the Hall (1978) rational expectations - permanent income model and the 'error correction' formulation as per Equation (7) once it is shown that actual magnitudes can replace the expected/'innovation' dichotomy. We checked for the admissibility of the 'error correction' model by dividing the income, real interest rate and terms of trade variables into expected and 'surprise' terms using the Barro two-step procedure and then conducting the appropriate joint F-test of restrictions to see whether actual variables could replace such generated terms. The F-test of restrictions supported the use of actual magnitudes thus lending validity to the 'error correction' approach. See also Craigwell and Rock (1990).

9. Tests for cointegration were carried out to give an indication of whether the variables in Equation (6) - c_t, y_t, DR_t, r_t, τ_t and X_t - move together in the long-run and hence can appropriately be modelled together. The Dickey-Fuller test for cointegration indicated that consumption, income, real interest rates, the age-dependency and the proportion of exports in GDP formed a cointegrated set of variables. With the terms of trade included, the evidence is not so clear-cut as no critical values are available for more than five variables. However casual extrapolation of the Engle and Yoo (1987) tables would imply that cointegration is not guaranteed if the terms of trade variable is included. Due to the uncertain nature of the tests, two sets of equations are initially reported, one including the terms of trade and the other excluding that variable.

10. Both r_t and τ_t are in logs. Conceivably they can be entered in levels. A log specification however avoids having to include a number of 'interaction terms'. X_t and DR_t are unadjusted levels.

11. Forde runs tests using both total consumption spending and spending on non-durables as her consumption proxies. Non-durable consumption spending was derived for the period 1966-85 by extrapolating survey data showing the breakdown between spending on durables and non-durables for three survey years. Forde's results did not seem to hinge crucially on the precise measure of consumption used.

12. Data on wealth are not available for Trinidad and Tobago. Forde (1988) used average money balances as a proxy for (financial) wealth but this proved unsucessful in her regressions.

13. The models were estimated using nominal interest rates and inflation as separate regressors. The results however supported using the real interest rate variable as the coefficients on the nominal interest rate and inflation variables were almost identical with opposite signs.

14. Note that the 'error correction' model does not require "that the *data* satisfy a unit elasticity restriction", but only "that the *model* satisfy this restriction and the data is consonant with the model" [Davidson *et al* (1978; p 681)]. As income grows, the average propensity to consume can fall in the short-run due to an initial disequilibrium effect but a long-run average propensity to consume of less than unity implies that the average propensity to save can increase boundlessly in the steady state with growth in income, a result which is counter intuitive.

15. One possible reason for this may be correlation between the export orientation variable and the terms of trade. Since both may have been significantly influenced by events in the international oil market we experimented with omitting the export construct from the model and incorporating the terms of trade. However, even in this case the terms of trade proved insignificant; moreover, tests for non-nested models employing the Akaike Information Criterion strongly supported the use of the export orientation variable over the terms of trade.

16. The value of the predictive failure test [see Davidson et al (1978)] is 0.7994 which is compared with an F distribution, in particular, F(5,18) = 2.77 at the 5% significance level. Experiments over a shorter period - 1974 to 1987 - also reveal that the predictions are quite accurate although less so for the shorter period. This result is self explanatory.

17. The Wu-Hansman test for weak exogeneity was also carried out using a subset of instruments ΔX_t ΔR_t and ΔY_t each corresponding to regressors in the model, rather than instruments for all regressors. This was necessary because of the lack of degrees of freedom. Based on this procedure, the null hypothesis of 'exogeneity' cannot be rejected at the conventional significance level. Although they are indirect methods of evaluation, the CHOW and cusum square statistics also tests weak exogeneity and, thereby valid conditioning, which is not rejected by the data.

18. Recall that the real interest rate construct is ln (1 + nominal interest rate - inflation rate).

19. The value of the steady-state APC (and APS) is susceptible to omitted variable bias if the empirical analysis has indeed left out important determinants. The results of the diagnostic tests and the quite credible predictive performance of the model would tend to suggest that such bias may be minuscule.

Table 1

Savings Rate and Related Variables, Selected Years

Variable (averages for period)	1955-65	1973-82	1983-87
Savings rate (percent of GDP)	7.2	18.4	9.0
Government savings (percent of GDP)	2.4	11.7	-0.3
Real *per capita* GDP (TT$: 1970 = 100)	1341.6	2194.2	1986.8
Percentage of population aged 20-59 years	42.3	44.1	48.0
Consumer price index (1975 = 100)	39.4	138.6	328.6
Terms of Trade (1980 = 100)	55.0	83.3	83.6
Ratio of exports to GDP	0.52	0.63	0.29

Notes: The savings rate is defined as one minus the consumption to income ratio, i.e. (1-C/Y) x 100%. Government savings is derived as the current account surplus. Real *per capita* gross domestic product before 1966, referred to nominal GDP deflated by a consumer price index (and population). A real GDP series is available only after 1965. All variables are taken from *Handbook of Key Economic Statistics*, Central Bank of Trinidad and Tobago except the terms of trade data which is taken from the *United Nations Handbook of International Trade and Development Statistics*.

TABLE 2

Real Interest Rate Behaviour, Selected Years

Year	Nominal Rate	Inflation Rate	Real Rate
1960	3.00	1.8	1.20
1965	3.50	1.6	1.90
1970	4.88	2.7	2.18
1975	3.06	15.9	-12.84
1980	3.25	16.1	-12.85
1981	3.75	13.4	-9.65
1982	3.38	10.8	-7.42
1983	3.38	15.6	-12.22
1984	3.50	12.4	-8.90
1985	3.50	7.5	-4.00
1986	2.75	7.4	-4.65
1987	3.25	10.2	-6.95

Notes: Data taken from *Handbook of Key Economic Statistics*, Central Bank of Trinidad & Tobago. The nominal interest rate is the median 3-months saving deposit rate. Inflation is measured as the rate of change in the consumer price index, base year 1975. All variables are expressed as percentages.

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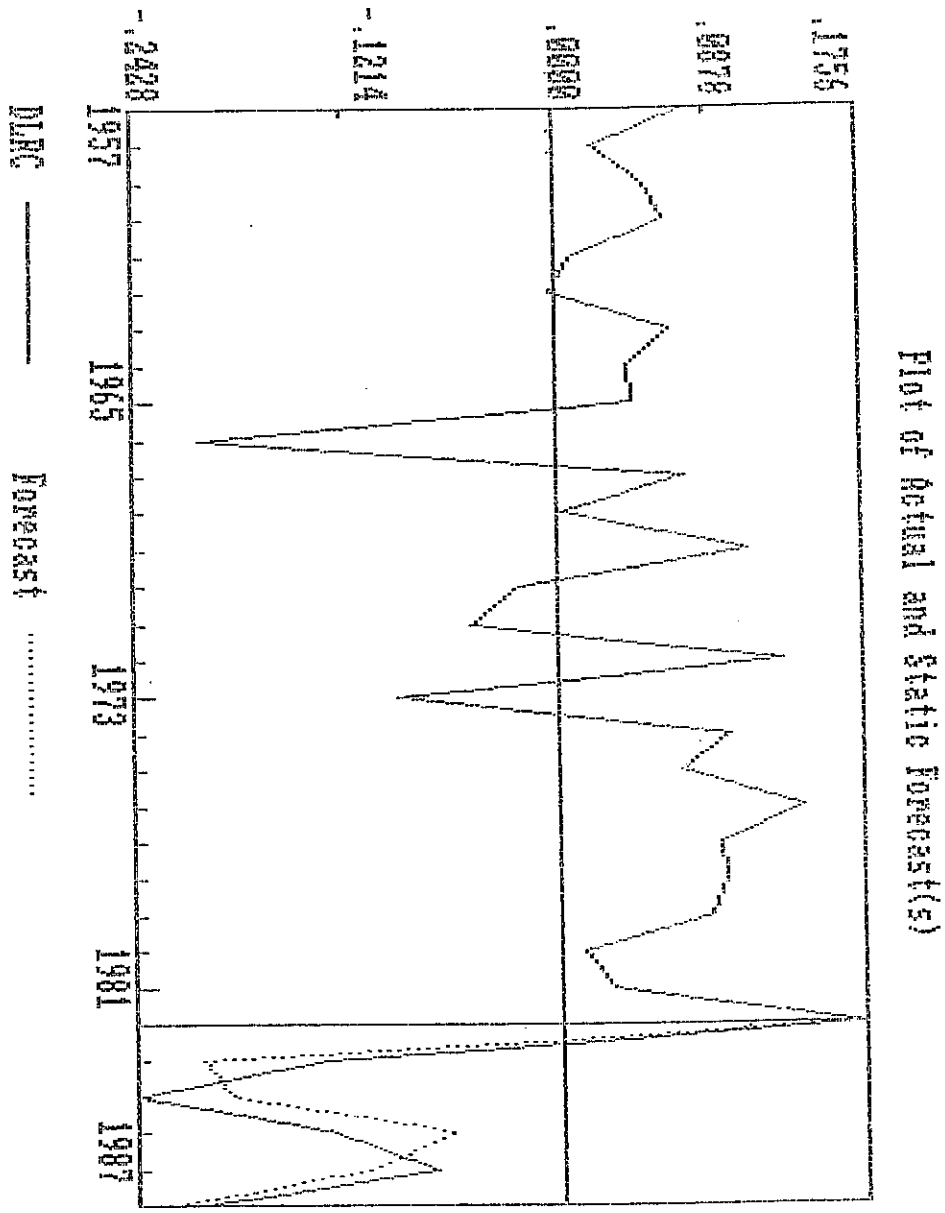
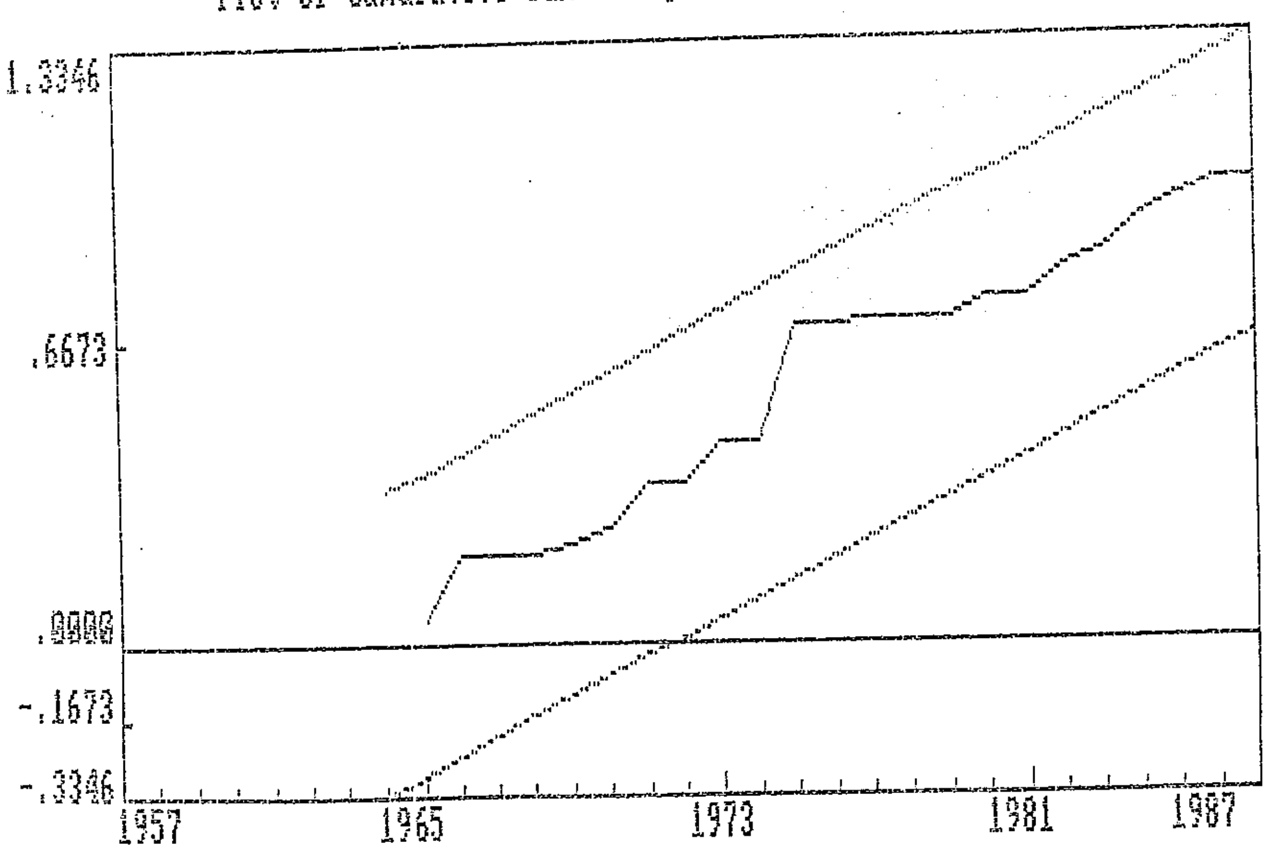


Plot of actual and static forecast(s)

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level