SAVINGS AND THE RATE OF INTEREST IN TRINIDAD & TOBAGO

AN EMPIRICAL ANALYSIS

by

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ABSTRACT

This paper examines the effect interest rates have on the formation of domestic savings in Trinidad & Tobago. A Cointegration approach is employed using data over the period 1965-1987. This is supplemented by Granger-causal testing procedures. We conclude that interest rates do indeed have an important impact on the savings process although this is more marked in the long rather than in the short run. Other variables - income and foreign savings- are also found to be important determinants of domestic savings and, indeed, foreign savings seem to be the most influential explanatory variable in the short run.

INTRODUCTION

Caribbean and many other developing countries have traditionally placed greater reliance on foreign capital inflows than on indigenous savings as the key element in capital accumulation. Yet even Lewis [26], whose name is often associated with this "outward looking" policy, recognized the importance of national savings in the growth process. Today, too, when such inflows are drying up for a host of different reasons - see Bourne [4]- Caribbean economists and policy makers alike are more than ever before turning their attention to the encouragement of national savings. The Caribbean state of Trinidad & Tobago is no exception as is evidenced by a recent statement by the Governor of its Central Bank (Demas [8]).

There are perhaps other (though related) reasons for this. A healthy level of national savings is almost synonymous with the chances of success of the current structural adjustment efforts being pursued by the Trinidad & Tobago government. Its potential for easing the debt burden and correcting current account imbalances, in particular, are almost too obvious to mention.

In this moment of greatest need, however, the entire world is witnessing a decline in the savings ratio (ratio of aggregate savings to GNP). According to Aghevli and Boughton [2], between the early 70's and early 80's, this ratio fell by 6% in industrial countries and by 8% in developing countries and has not risen since. This trend is also confirmed in the Caribbean - see Bourne [4], p.xxvii. No doubt, therefore, especially with today's exigencies, policy makers would not only want to arrest but also to reverse this process, and the potential policy instruments to achieve this objective must come into focus.

It has long been recognized that interest rates might have such potential. This has not, however, been without much controversy and debate which, alas, has not been resolved. Keynes [23], for instance, challenged the then orthodox view that the rate of interest was the "price" of savings and managed to impose his own view that high interest rates would be self defeating. On the contrary, the authorities should seek to keep the rate of interest as low as possible to encourage investment and, consequently, higher levels of economic growth. As for developing economies, the very notion of an interest rate policy continues to be challenged on the basis of the absence of an organized securities market (Sundararajan [31]).

In response to empirical and other studies giving credence to such views, Feldstein [13] points out that the apparent failure of interest rates in regression models was due to the use of nominal rather than real[1] rates. This distinction was also employed in the seminal works of McKinnon [27] and Shaw [29], which have perhaps given the greatest theoretical boost to interest rate policy potential in developing countries. Both these authors challenged the prevailing orthodoxy and argued that, contrary to the Keynesian paradigm,

[1]Defined as the difference between the nominal rate of interest and expected rate of inflation

higher real interest rates result in higher savings levels, leading to higher levels of investment and economic growth.

The McKinnon-Shaw hypothesis unleashed a series of direct policy applications and empirical work (Fry [14], [15], [16]; Abe *et al.* [1]; Giovannini [19], [20]; Leite and Makonnen [24], to cite but a few) which often result in contradicting conclusions.

There seems to emerge, however, one area of agreement: whether or not interest rates matter is largely an empirical question to be settled on a case by case basis. In this paper, we look at the case of Trinidad & Tobago over the period 1965-1987. In the following section, we discuss the general modelling framework and the statistical/econometric methodology to be used in the paper. In section 3, we specify the models to be estimated and give some indications about the data problems involved. In section 4 we present and analyse the results obtained and in section 5 we conclude the paper.

2. THE MODEL (S)AND MODELLING METHODOLOGY

Our central concern is the potential of interest rates as a policy instrument for mobilizing savings in Trinidad & Tobago. Theory, however, leads us to believe that this is but one of the determinants of savings (and some may even argue that it is not even the most important one). Some "activity" variable, such as the level of national income or some other variant of this measure, has especially since

Keynes been considered quite important. The general form of our model will be

$$S = f(\mathbf{i}, Y, u)$$

where S is the savings variable, **i** a vector of real interest rates, Y the activity variable and u a vector of other variables. Due to the openness of the Trinidad & Tobago economy, u can be safely proxied by some measure of capital inflows (or foreign savings). We will also be particularly interested to see how this variable affects the final form of the savings functions to be estimated since one of the problems likely to be faced by the Trinidad & Tobago economy in the future will be the diminishing importance of such flows in the capital accumulation process.

The fundamental methodology employed in this paper is the cointegration approach - see for example Hendry [22] and Engle and Granger [12] - which has already found application in Caribbean econometric studies such as Downes *et al.* [11], and Leon [25]. Briefly, this approach involves the specification and estimation of a "long-run" or cointegrated savings model (based on the general formulation given above) followed by the specification and estimation of a corresponding "short-run" Error Correction Mechanism (ECM) savings model based on the Granger Representation Theorem (Engle and Granger [12]).

A necessary step in this approach is the determination of the order of integration of the various series to be used in the long-run models and, eventually, of the residuals obtained from the regressions (which must be empirical white noise). This essentially involves the use of testing procedures such as those developed by *Dickey and Fuller [9]* to determine the degree of differencing required to obtain a stationary series. Application of the Granger Representation Theorem requires that all series used be integrated of order 1 - or I(1) - and that the regression residuals be stationary - or I(0). See Downes and Leon [10] and Leon [25] for applications to Caribbean problems.

We also employ a subsidiary testing procedure based on the concept of Granger-causality (see Granger [21]). This procedure allows us to test whether interest rates "cause" (in a very well defined sense) the savings variables in question. We limit our investigations to the use of direct Granger tests (as opposed to more complicated procedures such as those due to Sims [30]). This is not in any way a shortcoming, as has been pointed out by Nakhaeizadeh [] and Geweke *et al.* [18]. Application of these tests also require the use of I(0) series.

3. Model Specification and Data

Since there is almost total ignorance about the nature of the savings function in Trinidad & Tobago, we consider in this paper two broad specifications. The first, which is similar to that tested by Fry [14] and Giovannini [19], is

$$s = a_1 (r-\pi) + a_2 y + a_3 f + u \qquad (1)$$

where s is the savings ratio, r the nominal rate of interest, π the expected rate of inflation (so that $(r-\pi)$ is the real interest rate), y per capita income (natural logarithm), f the foreign savings ratio and u the usual disturbance term. We also consider a modified version of this model, again similar to one used by Fry [14]:

$$s = b_1 (r-\pi) + b_2 (1/y^2) + b_3 (1/y^4) + b_4 f + u \qquad (1a)$$

The second specification is more standard:

$$S = c_0 + c_1 (r-\pi) + c_2 Y + c_3 F + u \qquad (2)$$

where F represents the level of foreign savings (S, Y and F are all real).

The data to be used presented quite a challenge. In the first place, the very term "savings" is not unambiguous, and may refer to financial savings as well as to savings as defined in the national accounts (which is the one employed here). Even then, however, problems persist. We would ideally have liked to use some measure of Gross Private Savings, but such series are unavailable. What is available is a series for net national savings which is obtained as a residual by deducting total consumption (itself obtained as a residual in other calculations!) from national disposable income. If to this we add the gross capital consumption we obtain a measure of Gross national savings. See [5], [6] and [7] for details.

Then we have the matter of determining the "real" interest rate. The first problem to resolve, of course, is what nominal interest rate to use among the many published by the Central Bank of Trinidad & Tobago [5]. Theory indicates that some measure of the deposit rate or even the rate on some short term security such as Treasury Bills might be useful. We opted for the weighted deposit rate and the Treasury Bill rate which we used alternately.

How does one measure the "expected" rate of inflation? Several alternatives are presented in the literature, including the use of the actual rate (based on some measure of inflation like the Consumer or Retail Price Index). The procedure we adopt in this paper is based on the following "adaptive expectations" model:

$$\pi_t = \lambda p_t + (1-\lambda)\,\pi_{t-1} \qquad\qquad 0 < \lambda < 1$$

where p is the actual rate of inflation based on the Retail Price Index. A set of series of π was generated using $\pi_0 = p_0$ and a grid of values of λ varying in the [0,1] interval. We retained the π-series which gave us the highest R^2 in the long run regressions and, for both interest rates used, this occurred for $\lambda = 0.20$.

4. Empirical Results

Unit Roots

All series entering the relations (1) and (2) above are subjected to the Dickey-Fuller test. For any series X, this is based on the following regression model

$$\Delta X_t = \beta X_{t-1} + \sum_{i=1}^{k} \theta_i \Delta X_{t-i} + \varepsilon_t$$

where k is chosen so that ε is empirical white noise. The null hypothesis that X ~ I(1) is tested against the alternative that X ~ I(0). The null is rejected if β is negative and insignificant. The appropriate significant points for this test are provided by Fuller [17], p. 371.

The tests indicated that all series used were I(1). Details are available from the authors on request.

Causality

Direct Granger tests are based on the following restricted and unrestricted regression models:

$$X_t = \sum_{i=1}^{m} a_i X_{t-i} + \varepsilon_t$$

$$X_t = \sum_{i=1}^{m} a_i X_{t-i} + \sum_{j=0}^{n} b_j (r-\pi)_{t-j} + e_t$$

The following statistics can be used to test the null hypothesis that $(r-\pi)$ does not cause X:

$$Q_1 = T\,(SSE_\varepsilon - SSE_e) \,/\, (SSE_e)$$

$$Q_2 = T \log\,(SSE_\varepsilon \,/\, SSE_e)$$

$$Q_3 = T\,(SSE_\varepsilon - SSE_e) \,/\, (SSE_\varepsilon)$$

where SSE_ε and SSE_e are, respectively , the sum of squared errors due to the regressions on the restricted and unrestricted models, and T the number of observations. Under the null hypothesis, all statistics are asymptotically distributed as a χ^2 with (n+1) degrees of freedom. See Geweke *et al* [17].

The results obtained are displayed in Tables 1-4. They are not very convincing and, in only exceptional cases, do we have significance even at the 10% level. It must be pointed out, however, that these results are not extremely reliable, mainly because of the relatively small sample sizes employed (after all, the statistics used are distributed *asymptotically* as a χ^2). This meant, in particular, that we were limited in the length of lags we could employ and, indeed, there is no theoretical justification for any particular lag length although, as Nakhaeizadeh [23] shows, the results of the tests can be very sensitive to the lag structure. Nevertheless, we were able to discern some element of causality which, given the limitations mentioned, is still some justification for employing the real interest rates in the regressions which follow.

Table 1

Testing for Causality

Causality from Deposit Rate to Savings Ratio

Lags (m,n)	Q1	Q2	Q3
1, 1	4.197	3.826	3.498
1, 2	4.779	4.285	3.857
1, 3	4.667	4.173	3.747
1, 4	6.746	5.729	4.907
2, 1	*4.880	4.367	3.923
2, 2	4.941	4.416	3.962
2, 3	5.158	4.563	4.056
2, 4	9.136	7.389	6.06
3, 1	4.17	3.77	3.42
3, 2	4.256	3.84	3.477
3, 3	4.295	3.872	3.503
3, 4	8.466	6.939	5.758
4, 1	3.107	2.866	2.65
4, 2	3.253	2.991	2.755
4, 3	3.339	3.063	2.817
4, 4	4.438	3.967	3.56

* Significant at 10% Level

Table 2

Testing for Causality

Causality from Treasury Bill Rate to Savings Ratio

Lags (m,n)	Q1	Q2	Q3
1, 1	2.499	2.361	2.233
1, 2	2.624	2.465	2.32
1, 3	2.819	2.929	2.455
1, 4	**11.58	8.943	7.048
2, 1	2.889	2.699	2.525
2, 2	2.897	2.706	2.531
2, 3	3.437	3.159	2.91
2, 4	***20.47	**13.67	*9.579
3, 1	1.996	1.898	1.807
3, 2	2.026	1.925	1.831
3, 3	2.599	2.436	2.286
3, 4	***19.72	**13.32	*9.41
4, 1	1.912	1.817	1.728
4, 2	1.915	1.82	1.731
4, 3	3.71	3.373	3.076
4, 4	**13.91	*10.31	7.846

*** Significant at 1% level

** Significant at 5% level

* Significant at 10% level

Table 3

Testing for Causality

Causality from Deposit Rate to Savings

Lags (m,n)	Q1	Q2	Q3
1, 1	2.311	2.192	2.082
1, 2	2.551	2.401	2.263
1, 3	2.665	2.494	2.337
1, 4	2.946	2.728	2.531
2, 1	3.072	2.858	2.663
2, 2	3.078	2.863	2.668
2, 3	3.579	3.279	3.011
2, 4	3.632	3.309	3.023
3, 1	2.4	2.26	2.131
3, 2	2.4	2.26	2.131
3, 3	2.6	2.437	2.287
3, 4	2.564	2.397	2.244
4, 1	2.215	2.089	1.972
4, 2	2.221	2.094	1.977
4, 3	2.439	2.288	2.148
4, 4	2.646	2.469	2.307

Table 4

Testing for Causality

Causality from Treasury Bill Rate to Savings

Lags (m,n)	Q1	Q2	Q3
1, 1	2.499	2.361	2.233
1, 2	2.624	2.465	2.32
1, 3	2.819	2.629	2.455
1, 4	**11.58	8.943	7.048
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4, 4	**13.91	*10.31	7.846

*** Significant at 1% level

** Significant at 5% level

* Significant at 10% level

Cointegrated Models

The results obtained for models 1 and 2 are displayed, respectively, in Tables 5 and 6 where d and b (which replace r in the more general specification) represent, respectively, the nominal deposit and treasury bill rates. A dummy variable is incorporated into each equation to capture the effects of the "oil boom" period (1974-1981). The method of estimation is Ordinary Least Squares except in cases where autocorrelation appeared to be a problem in which case the procedure proposed by Beach and McKinnon [3] was employed as well. In all the cases reported, the Dickey-Fuller test indicated that the residuals obtained were I(0). This is intuitively obvious given the values of the Durbin-Watson statistics appearing in the tables.

Table 5

Model (1): Results for Cointegration Models

Dependent Variable: Savings Ratio (s)

y	(d - π)	(b - π)	1/y2	1/y4	f	Dummy	R2	DW	F-Stat
0.028 [14.4]	0.641 [2.35]	-	-	-	-0.348 [2.26]	0.15 [5.22]	0.86	1.66	46.3
0.025 [17.0]	0.653 [2.18]	-	-	-	-	0.198 [9.54]	0.83	1.94	55.5
0.028 [14.5]	-	0.416 [2.31]	-	-	-0.299 [1.91]	0.151 [5.20]	0.86	1.64	46
0.025 [17.7]	-	0.469 [2.48]	-	-	-	0.194 [10.3]	0.84	1.97	59.3
-	1.27 [2.13]	-	58.2 [2.42]	-2493.1 [1.98]	-0.533 [2.43]	0.126 [3.65]	0.86	1.57	35.9
-	1.22 [1.98]	-	63.6 [2.66]	-2768.1 [2.20]	-0.623 [3.08]	0.102 [2.94]	0.79	2.01	21.5*
-	-	1.4 [2.76]	92.4 [3.00]	-4320.6 [2.66]	-0.601 [2.90]	0.104 [2.96]	0.88	1.48	41.3
-	-	1.37 [2.68]	94.1 [3.22]	-4404.8 [2.84]	-0.657 [3.49]	0.09 [2.71]	0.82	2.01	26.6*

* Beach-McKinnon Procedure

R2 is corrected for degrees of Freedom

Figures in parentheses are T-Statistics

Table 6

Model (2): Results for Cointegration Models

Dependent Variable: Savings (S)

Constant	Y	(d-π)	(b-π)	F	Dummy	R2	DW	F-Stat
-122.9	0.256 [4.25]	2143.8 [2.03]	-	-	450.4 [10.3]	0.9	2.41	69.5
-123.8	0.257 [5.20]	2276.1 [2.59]	-	-	461 [12.8]	0.94	1.96	115.5*
-214	0.343 [5.56]	2865.6 [2.99]	-	-0.449 [2.67]	5.68 [5.68]	0.93	1.85	70.7
-337.11	0.414 [4.89]	-	2589.2 [2.90]	-0.418 [2.50]	327 [5.56]	0.93	1.63	69.3
-364.3	0.442 [4.51]	-	2476.6 [2.28]	-0.598 [3.87]	241.9 [3.66]	0.85	2.04	32.1*
-235.6	0.323 [3.74]	-	2080 [2.12]	-	443 [10.8]	0.9	2.27	70.7

*Beach-McKinnon Procedure

R2 corrected for Degrees of Freedom

T-Statistics in Parentheses

To judge by the values of the R^2 and F statistics, the overall fits are, by any standard, quite good. All variables carry the *a priori* expected signs, are significant at least at the 10% level and most are significant at the 5% level The interest rate variable[1], in particular, is always significant at this level and, despite the fact that the income and foreign savings variables always do quite well (in particular the results quite clearly show the important influence of this latter variable on domestic savings habits), there is clearly more than a little support for the importance of interest rates in the determination of savings behaviour in Trinidad & Tobago, at least in the long run.

The policy makers cannot ignore this conclusion although the precise nature of the policy measures to be adopted will depend on which specification is taken as the "correct" one. The responsiveness of the savings ratio to changes in these rates, for instance, vary somewhat depending on whether model (1) or model (1a) is the correct specification. Notwithstanding this, the range is well within the realms of reality. A 1% rise in the deposit rate, for example, will cause the savings ratio to rise by an amount that will vary from 0.006 to 0.013. This means that a savings ratio of 20% will rise to somewhere between 20.6% and 21.3%. In both models 1 and 2, however, there is no marked difference in the response of the savings variable to the competing rates of interest.

[1]Interest rates are measured as real numbers as opposed to percentages. It is important to note this for a proper interpretation of the coefficient values.

ECM Models

The Granger Representation Theorem allows quite a range of specifications, and we experimented with quite a few of them. None, however, gave results that were markedly better (and in most cases they were worse) than the following very simple representations derived, respectively, from models 1, 1a and 2:

$$\Delta s = a_1 \, \Delta(r-\pi) + a_2 \, \Delta y + a_3 \, \Delta f + a_4 \, e_{-1} + u$$

$$\Delta s = b_1 \, \Delta(r-\pi) + b_2 \, \Delta(1/y^2) + b_3 \, \Delta(1/y^4) + b_4 \, \Delta f + b_5 \, e_{-1} + u$$

$$\Delta S = c_1 \, \Delta(r-\pi) + c_2 \, \Delta Y + c_3 \, \Delta F + c_4 \, e_{-1} + u$$

where e represents the residuals obtained from fitting the corresponding cointegrated models. The results obtained are displayed in Tables 7 and 8.

Table 7

Model (1): Results for ECM Models

Dependent Variable: Savings Ratio (Δs)

Δy	Δ(d - π)	Δ(b - π)	Δ(1/y2)	Δ(1/y4)	Δf	e-1	R2	DW	F-Stat
0.129	-0.784	-	-	-	-0.755	-0.629	0.78	1.87	23.9
[1.34]	[1.24]				[6.69]	[2.94]			
-0.093	-2.69	-	-	-	-	-0.695	0.29	1.83	4.87
[0.600]	[2.74]					[2.14]			
0.091	-	-0.919	-	-	-0.755	-0.681	0.78	1.72	24.05
[0.837]		[1.37]			[6.92]	[2.99]			
-0.195	-	-2.55	-	-	-	-0.787	0.24	1.6	3.95
[1.11]		[2.37]				[2.21]			
-	-0.515	-	240.3	-7786.7	-0.828	-0.695	0.79	1.75	19.2
	[0.853]		[0.713]	[0.821]	[7.38]	[3.24]			
-	-0.492	-	151.2	-5314.8	-0.806	-0.653	0.77	1.7	17.5*
	[0.785]		[0.436]	[0.544]	[6.96]	[2.92]			
-	-	-0.407	217.8	-7295.1	-0.9	-0.854	0.82	1.48	22.3
		[0.682]	[0.678]	[0.800]	[8.55]	[3.79]			
-	-	-0.446	154.1	-5457.9	-0.874	-0.843	0.81	1.46	49.8*
		[0.732]	[0.473]	[0.590]	[8.27]				

* Residuals based on Beach-McKinnon Procedure

R2 is corrected for degrees of Freedom

Figures in parentheses are T-Statistics

Table 8

Model (2): Results for ECM Models

Dependent Variable: Savings (ΔS)

ΔY	Δ(d-π)	Δ(b-π)	ΔF	e-1	R2	DW	F-Stat
0.138 [0.854]	-4350.1 [2.12]	-	-	-0.967 [2.66]	0.33	1.86	5.81
0.113 [0.724]	-4558.5 [2.31]	-	-	-1.102 [3.04]	0.38	1.8	7.08*
0.378 [4.78]	-919.3 [0.915]	-	-0.841 [9.81]	[3.12]	0.86	1.54	41.8
0.367 [4.35]	-	-1237.7 [1.23]	-0.854 [10.1]	-0.653 [3.16]	0.87	1.45	42.1
0.398 [4.37]	-	-955.8 [0.893]	-0.874 [9.55]	-0.575 [2.51]	0.85	1.38	35.7*
0.073 [0.405]	-	-4116.8 [1.89]	-	-0.902 [2.32]	0.25	1.69	4.34

esiduals obtained from Beach-McKinnon Procedure

corrected for degrees of freedom

ures in parentheses are T-Statistics

These models all represent short-run adjustment processes. The residuals obtained were all I(0) processes (a result which can be gleaned intuitively from inspection of the Durbin-Watson statistics). This time, however, there is considerable variation in the goodness of fit of the various models, and there is a marked difference in performance when the foreign savings variable is present - in fact, this variable is by far the best performing of all explanatory variables. Added to this, the interest rate variables do not at all perform well in this short-run representation. In fact they always have the incorrect sign and are, in most cases, insignificant (as are too the income variables).

The evidence seems to indicate that an active interest rate policy may not bear fruit in the short run and that domestic savings in the short run will be heavily influenced by the availability of foreign savings.

CONCLUSION

The study indicates quite clearly that real interest rates do have some significant influence on savings behaviour in Trinidad & Tobago, though its importance is more marked over the long rather than the short run. The policy makers, we are certain, cannot afford to ignore this. However; there are some caveats.

In the first place, the period covered is quite short and, we dare say, quite exceptional. In particular, there was an intervening "oil boom" over the period 1974-1981 and the size and importance of the dummy variables obtained indicate that this event cannot be ignored. Secondly, it is clear that both income and foreign savings weigh heavily on the savings formation process and, in the short run at least, foreign savings is clearly more influential than interest rates. Policy instruments must also be put in place to deal with a host of targets (in addition to savings) which almost certainly should include income and foreign savings (essentially the Balance of Payments). This suggests, among other things, the use of a multiequation system which we intend to be the subject of a future paper.

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