DISCRETIONARY FISCAL DEFICIT: THE CASE OF MAURITIUS

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ABSTRACT

This paper seeks to provide additional evidence on the discretionary aspects of public sector spending and taxing policies in Mauritius. A game theoretic model is developed to analyse whether budgetary imbalances have been used as a tool for policy making or have they been just accounting imbalances resulting from the government's persuasion in its allocation and distribution objectives. Indeed, data for the period 1973-96 are used to estimate the model. Empirical findings confirm that there was lack of discretionary move towards stabilisation and the implementation of the budget as a policy variable. Also, characteristic roots computed from the reaction functions reveal the erratic behaviour of private spending. Besides, it was not surprising to find out that no co-integrating or long-run relationship exists between public and private aggregate spending. This paper can have great implications in future because continuous budgetary imbalances can make fiscal policy, and hence the economy as a whole, more destabilising

Keywords: Fiscal policy, private agents, national budget and deficit.

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INTRODUCTION

Broadly speaking, according to Musgrave (1959), a government has three main objectives, namely allocation, distribution and stabilisation. While the first two objectives can be addressed by tax and expenditure adjustments within the budget, the stabilisation objective is more precisely achieved if the budget balance is used as a policy variable. In more elaborate terms, the first two objectives focus on the incrementation exercise of the budget whereby taxes and expenditure items are adjusted to smooth the allocation of resources and to make distribution of income and wealth more equitable[1]. However, better than an accounting exercise, the budgetary figure *per se* can be constructed on an ex-ante basis as a policy variable to achieve specific macroeconomic targets.

Ever since the fundamental role of the government as a stabilising agent was recognised, researchers have attempted to evaluate the discretionary policies of governments. Studies on OECD countries such as Modigliani (1964), Kmenta and Smith (1973), Taylor (1979) have found that stabilisation policies adopted by the government to stabilise output led to destabilisation. As pointed out by Demery *et al.* (1985), failures in stabilisation are due to several complications such as unanticipated shocks to the economy, fiscal policy lags and political interferences. In non-OECD economies, however, stabilisation policies aim especially at minimising inflation rates. In high inflation economies such as Argentina, Brazil, Chile and Mexico, mixed results have been obtained about the effects of stabilisation attempts on inflation (for a good review on the effects of stabilisation policies, see for example Kiguel and Liviatan (1988, 1990) and Solimano (1989)). When the objective of the government changes from social welfare to vote maximisation, as discussed in the public choice literature, discretionary policies are used to achieve electoral ends. In fact, the theoretical model developed by Nordhaus (1975) that established this issue has not obtained considerable support from empirical studies (see for example Alesina (1992)).

Like many Sub-Saharan economies, Mauritius has been facing chronic fiscal deficits since independence in 1968 as can be seen in Table 1. The debt – GNP ratio increased rapidly during the late 1970s through the early 1980s. Fiscal reforms were suggested by the World Bank and IMF during the late 1970s when Mauritius had recourse to its first devaluation in 1979 (the second one occurred in 1981). The external debt position worsened obviously and it was essential for the government to reduce budgetary imbalance as part of the structural adjustment programme. Incidentally, fiscal deficits were reduced drastically but again rose in the 1990s. Thus it would be of great interest to analyse the policy of the government in the face of recurrent deficits and to find out whether such deficits were implemented as

Table 1. Trends in major budgetary variables

Year	Total Government Revenue (Rs mn)	Total Government Expenditure (Rs mn)	Fiscal Deficits/Surpluses (Rs mn)	Fiscal Deficits/Surpluses as % of GDP
1973	355.4	382.5	27.1	0.27
1974	460.4	661.9	201.7	1.85
1975	723.0	909.0	186.0	1.7
1976	1065.3	1274.2	208.9	1.6
1977	1173.2	1630.0	456.8	3.3
1978	1234.1	1961.3	727.2	0.51
1979	1418.0	2300.2	882.2	3.0
1980	1812.7	2709.3	896.6	2.3
1981	2073.0	3366.3	1293.3	2.2
1982	2288.7	3677.1	1388.4	4.2
1983	2825.2	3985.3	1160.1	5.9
1984	3122.7	3979.9	857.2	6.5
1985	3562.1	4385.4	823.3	5.8
1986	4130.5	4770.7	640.2	3.5
1987	5390.3	5336.2	(54.1)*	0.25
1988	6681.2	6593.9	(87.3)	0.34
1989	7698.7	8166.2	468.1	1.5
1990	9001.2	9158.7	157.5	0.45
1991	10176.3	10174.4	(1.9)	0.005
1992	11403.2	11761.6	358.4	0.8
1993	12441.2	12422.5	(18.7)	0.04
1994	13971.7	13932.4	(39.3)	0.06

(* Figures in brackets represent Budgetary Surpluses)

Source: Government Finance Statistics, Annual Issues

a tool of economy policy or were they generated on an ex-post basis as accounting imbalances.

The remaining part of this paper is organised as follows; in section II, we make a theoretical review of the importance of the Cyclically-Adjusted Deficit as a tool to analyse discretionary fiscal actions. In section III, we develop a game theoretic model that can be tested using Mauritian data. This model aims at explaining the outcome of fiscal deficits or at least tries to determine fiscal deficits as discretionary actions of a welfare maximising government. Finally, section IV describes the empirical results and provides for their policy implications.

DISCRETIONARY STABILISATION POLICIES AND THE CYCLICALLY-ADJUSTED DEFICIT

A deficit is the outcome of both discretionary and non-discretionary fiscal actions. The former is captured by the structural or Cyclically-Adjusted Deficit (CAD), whereas the latter action is taken care of by the cyclical deficit. To say more on these types of deficits, let us consider the simplest form of a deficit function[2]

$$D = G - T = d_0 - d_1 Y$$

The deficit equation consists of a structural part d_0 and an induced or cyclical part $d_1 Y$. Discretionary policies can alter d_0 or d_1 in an attempt to stabilise the path of aggregate expenditure, while cyclical fluctuations can alter the deficit depending on the directional change in Y and the gradient of D, that is, d_1. To understand the relative importance of CAD in demand management policies, the following diagrams can be considered.

Fig 1 illustrates how a fall in income from Y_0 to Y_1 alters the budgetary imbalance from a state of surplus to deficit. CAD which is calculated at Y_f, the full-employment level of income, correctly indicates the absence of discretionary motives of the government which otherwise would have shifted the function. At OY_f the deficit figure remains the same whether income is at OY_0 or OY_1. Thus at OY_f it can be observed that there has not been any shift in the deficit function. This clearly indicates that no exogenous shifts occurred in public revenue or expenditure. The invariance of these fiscal instruments indicates that no discretionary policy was adopted by the government.
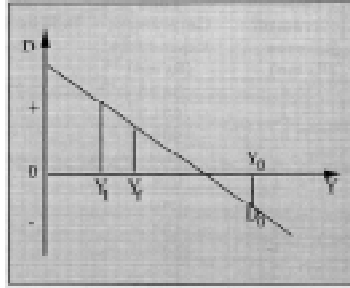
Fig 1. The cyclically-adjusted deficit

However in Fig 2. there are simultaneously two things happening. Firstly the government uses discretionary policy to alter the deficit function from D_0 to D_1 through lower government expenditure and secondly, a fall in the level of income results in a change in deficit. It will be noted that government budget imbalance would have gone from surplus (A) to deficit (B) had the conventional fiscal deficit method been used. In fact, as depicted by the diagram, the change in fiscal policy is correctly captured by the change from M+N to N, that is, a change in the deficit function itself attributable to a contractionary fiscal measure adopted by the government, basically meant to cut down the structural deficit. Thus, by relying on the actual fiscal measure or imbalance, misleading conclusions could be drawn about the fiscal stance. This is why many countries do compute CAD to judge the actual stance of fiscal policy[3]. CAD is actually used to analyse the steps taken by the government to stabilise the level of private expenditure responsible for cyclical variations. In the next section, a model of fiscal deficit determination is set out to calculate CAD and to analyse the kind of fiscal policy which is adopted in a country like Mauritius. A game theoretic framework is developed and certain hypotheses are tested in subsequent sections.
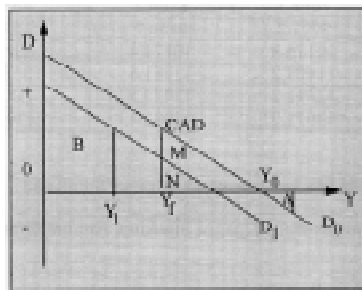

Fig 2. Implications of the cyclically-adjusted deficit

THE MODEL

In this model it is assumed that a two-party game is played between a welfare maximising government and private agents. The role of the government is confined to stabilising the economy around its full-employment level by manipulating aggregate private expenditure[4]. If private spending goes off-trend, government tends to cut down its own spending and raise tax rates to reduce excess spending. Alternatively, to restore the economy to its full-employment level whenever private spending falls below trend, government intervenes by raising its expenditure and reducing tax rates. Thus, in this framework it is clear that public sector monitors its deficit to maintain income at its natural rate. Private agents do also react to changes in fiscal policy and their expenditure patterns are often determined by periodic changes in discretionary policies adopted by the government. We assume here that reaction by the government to stabilise private expenditure is a credible threat which private agents must take into account in deciding upon their spending plans. We assume further that there is no asymmetry of information and that both government and private sector know and understand each other's reaction function. In other words, complete and perfect information characterises the model. It is also assumed that the private sector makes the first move or takes the lead and then the government follows suit. Hence agents' choices are sequential rather than simultaneous.

The game is a variable sum game with no possibility of co-operation. Utility functions of each player can be defined as follows:

$$\mu^A_t = m(D_t)$$

where μ^A_t is the utility of private agents, t is the time period, D_t is CAD to capture the discretionary policy of the government whereby

$$\frac{\partial \mu^A_t}{\partial D_t} > 0$$

The partial derivative is greater than zero to indicate that higher deficits lead to higher positive wealth effect as pointed by Blinder & Solow (1973) and higher disposable income through lower taxes. The above specification of private agents is very much consistent with a benevolent type of government. Our agents do not regard bonds (when government borrows instead of taxing) as zero net wealth (Barro, 1974). This means that they are myopic and do not engage in bequests. Thus, they are Keynesians.

$$\mu^G_t = \mu(D_t)$$

μ^G_t is the utility function of the government and $\dfrac{\partial \mu^G_t}{\partial D_t} < 0$ if and only if $\dfrac{\partial D_t}{\partial Z_t} > 0$

where Z_t is the deviation of private expenditure beyond its full-employment level. The partial derivative of government's utility with respect to Cyclically-Adjusted Deficit depends on the effectiveness of the stabilisation policy. If the deficit could counteract fluctuations in private expenditure, then utility is increased.

Once these assumptions have been stated, we can explain the nature of this game between private agents and the government in a more elaborated manner. If aggregate private expenditure, for example, goes beyond trend ($Z_t > 0$) in period t, then the government, whose utility is maximised by stabilising output around its full-employment level, will intervene to reduce CAD in period t+1. This will counteract private sector's expenditure and maintain it around the specified trend. This works the other way round too. On the other hand, private agents will use the signal from CAD to determine the path of their spending. It is slightly more complicated to establish directly a link between aggregate expenditure in period t+1 with CAD in period t. If CAD rises in period t, then private expenditure will also rise in that period but given that in the second round the government will reduce CAD, private agents will reduce their expenditure. Hence if CAD rises in period t, private expenditure falls in period t + 1. Indeed, in this case, private agents apply the idea of backwards-induction method (see Gibbons, 1992) before making any move. The action of private agents in period t + 1 is derived from the reaction of the government in period t+1 conditional on the specific move of the former in period t.

Before we could derive the reaction functions, let us analyse the following set of equations pertaining to the national income identity at full-employment (f)

$$Y^f = C^f + I^f + G^f + (X - M)^f$$

(1)

If we assume that Y^f is consistent with a balanced current account[4], that is,
$$X = M \text{ and } (X - M)^f = 0 \text{, hence}$$

$$Y^f = C^f + I^f + G^f$$

(2)

Let us subtract T^f (Tax at full –employment) on either side of the eqn. 2 to have

$$Y^f - T^f = C^f + I^f + G^f - T^f \qquad (3)$$
$$\Rightarrow \qquad Y_d^{\,f} = AE^f + D^f \qquad (4)$$

where AE^f is the aggregate private expenditure at full- employment denoted by $C^f +$ I^f and D^f is the deficit at full-employment, which is nothing but the Cyclically-Adjusted Deficit. AE^f is a control variable while D^f is a policy variable. If at time period t, $AE_t > AE^f$, say $AE_t = AE^f + d$ (d>0) then $(Y_d)^t > Y_d^f$. In this case government manipulates D^f to bring AE_t in line with AE^f. Since the game is sequential rather than instantaneous, the government reacts after a given lag (i.e ex - post) and hence the reaction function of the government becomes

$$D_t = a_1 [AE_{t-1} - AE^*] + a_0 \qquad (5)$$

Note that if $AE_{t-1} = AE^*$, where AE^* is the full-employment aggregate private expenditure, $D_t = a_o$ (its full -employment value)

This means that the Cyclically-Adjusted Deficit reacts to the deviation in aggregate private spending lagged by one year. To establish the reaction function of private agents, on the other hand, we recall the dynamic nature of the game with perfect information. Given the credible threat by the government to react to deviations in aggregate private spending, agents make use of the backwards-induction method to determine their spending plans at time t. This is explained by the following function.

$$AE_t = b_1 D_{t-1} + b_o \qquad (6)$$

Thus the reaction functions in this model are given as follows

Government	:	$D_t = a_1 [AE_{t-1} - AE^*] + a_o$	(7)
Private Agents	:	$AE_t = b_1 D_{t-1} + b_o$	(8)

Now if this deviation in eqn. 7 measured by Z_t is positive then a_1 must be negative such that D_t must fall due to higher tax and lower government expenditure. Similarly if Z_t is negative then D_t must increase with lower tax rates and higher government expenditure. Thus for fiscal policy to be stabilising a_1 must be negative.

Eqn. 6 represents the private sector's reaction function which implies that private

spending reacts to the discretionary policy of the government. If D_{t-1} falls, it means that in period t-1 tax rates are higher and public spending lower, consequently AE_{t-1} is lower. Thus, in period t-1, output falls below trend. In the next period the government will raise its spending and lower tax rates to encourage higher private spending and in this way, AE will rise in period t. Hence, we justify that coefficient b_1 must also be negative.

Given the two eqns. 5 and 6, an additional equation can be derived and estimated to confirm whether the path of aggregate expenditure becomes stable under the fiscal actions of the government

$$D_t = a_1(AE_{t-1} - AE^*) + a_o \qquad (5)$$

$$AE_t = b_1 D_{t-1} + b_o \qquad (6)$$

From eqn. 5

$$D_t = a_1 AE_{t-1} - a_1 AE^* + a_o$$
$$= a_1 AE_{t-1} - k \qquad (7)$$

(where k is a constant term equal to $+a_1 AE^* - a_o$)

We lag eqn. 7 by one-period to obtain

$$D_{t-1} = a_1 AE_{t-2} - k \qquad (8)$$

We replace eqn. 8 in eqn. 6

$$AE_t = b_1 a_1 AE_{t-2} - bk + b_o$$
$$= ß_1 AE_{t-2} + ß_o \qquad (9)$$

where $ß_1 = a_1 b_1$ and $ß_o = b_o - bk$
From eqn. 9 we compute the long-run equilibrium value of private expenditure as

$$AE^p = \frac{ß_o}{1 - ß_1} \qquad ß_1 \neq 1$$

The general solution becomes

$$AE^p = \frac{ß_o}{1 - ß_1} + A_1(r_1)^t + A_2(r_2)^t \qquad (10)$$

where r_1 and r_2 are known as the characteristic roots derived by solving second order linear differenced eqn. 9.

However, for eqn. 10 to be stable

$$\text{Lim}_{t \to \infty} AE^p = \frac{ß_0}{1- ß_1} \text{ if and only if } \text{Lim}_{t \to \infty} A_1(r_1)^t + A_2(r_2)^t = 0$$

$$\text{Lim}_{t \to \infty} A_1(r_1)^t + A_2(r_2)^t = 0 \text{ if and only if } |r_1| \text{ and } |r_2| < 1.$$

If $|r_1|$ and $|r_2| > 1$ then the stabilisation policy is not effective.

DATA AND EMPIRICAL ESTIMATES

The Cyclically-Adjusted Deficit (D_t) was computed for the period 1973-1996. These data were obtained from annual issues of two World Bank sources namely, the International Financial Statistics and the Government Finance Statistics, annual issues. The computation involves the conventional way of adjusting both government expenditure and government tax revenue to trend GNP. The trend GNP was computed from an exponential growth path fitted to the data. The variable D_t was then obtainable by deducting cyclically - adjusted revenue from cyclically-adjusted expenditure. Similarly, to calculate the deviations from the natural rate of aggregate private spending, we make use of the exponential trend of AE_t. When the regressions were carried out we obtain the following estimates;

$$D_t = 0.065 (AE_{t-1} - AE^*) - 0.11 \tag{5'}$$
$$(0.26) \qquad\qquad (-0.17)$$

$$\overline{R}^2 = 0.71 \qquad DW = 2.2 \qquad F = 15.31$$

$$AE_t = -2.3D_t + 5.2 \tag{6'}$$
$$(-11.89)\ (119.9)$$

$$\overline{R}^2 = 0.9 \qquad DW = 1.88 \qquad F = 141.4$$

All equations were estimated in log of real variables and t-ratios are in parentheses.

Eqn. 5' indicates that variable D_t does not depend on the deviations of one-period lagged private spending. The coefficient of interest, that is, 0.065 is insignificant and does not hold the appropriate sign. This tends to make us believe that the Mauritian Government does not carry out any discretionary policy that aims at

stabilising cyclical variations in private spending. Only expenditure-incrementation exercise is carried out along with insignificant changes in tax rates. The government brings about structural changes in the deficit figure based on exgenous factors such as population and infrastructural needs. However, eqn. 6' reveals that private agents make use of the discretionary changes in the budget. They incorporate these changes in deciding upon their spending potential. The coefficient has the appropriate and significant sign. What we can further deduce from eqn. 6' and private agents᾽ behaviour is that they perceive the significance of incorporating discretionary changes in the budget. To know whether this kind of interdependent action leads to a stable aggregate private spending over the long - run is to question the stability of eqn. 9.

Indeed this equation was estimated and the empirical results are reproduced below:

$$AE_t = 1.20AE_{t-2} - 0.7 \qquad (9)'$$
$$(1.87) \qquad (-1.2)$$

$$\overline{R}^2 \, 0.9 \qquad DW = 2.0 \qquad F = 29.9$$

This equation allows us to compute the long-run equilibrium value of AE_t

$$AE_t = AE_1$$

$$= \frac{-0.7}{-0.2} = 3.5$$

Further the characteristic roots are

$$r_1, r_2 = \frac{0 \pm \sqrt{0 - 4(-10)(1.2)}}{2(-1)}$$

$$\frac{\pm \sqrt{4.8}}{-2} = -1.1 \text{ and } 1.1$$

\The general solution therefore becomes

$$AE_t = 3.5 + A_o(-1.1)^t + A_1(1.1)^t$$

where A_o and A_1 are constants.

Since $|r_1| > 1$ and $|r_2| > 1$, this means that the general solution must be unstable, that is;

$$\underset{t \to \infty}{\text{Lim}} AE_t \neq AE^p, \text{ since } \underset{t \to \infty}{\text{Lim}} A_o (1.1)^t + A_1(-1.1)^t \to \infty$$

The above results reveal that the system underlying eqn. 9 is unstable. More precisely, aggregate expenditure follows an explosive and erratic path. The behaviour of this path is explained by the absence of a concrete counter-cyclical fiscal policy. This result is consistent with the empirical findings in the stabilisation literature (see Modigliani (1964), Kmenta & Smith (1973) and Taylor (1979)). The government has been expanding expenditure in excess of revenue to carry out more of its allocative and distributive functions rather than being actively involved in stabilisation of aggregate demand. In other words, the Mauritian government has devoted more attention to micro-budgetary objectives in processing public spending and taxing policies and has thus adopted the budget as an accounting rather than as a policy exercise.

Augmented-Dickey Fuller (ADF) tests were carried out to determine whether the variables are stationary. The results obtained indicate that the data are non stationary since D_t, AE_t, D_{t-1} and AE_{t-1} are all integrated of order 1, that is, I(1). The ADF statistics are reported in Table 2 .

Table 2. ADF tests for stationarity

Variables	Reported Statistics
D	-3.04
ΔD	-6.9*
D(-1)	-2.2
ΔD(-1)	-4.6*
AE	-1.14
ΔAE	-4.08*
ΔE	-1.07
ΔAE(-1)	-3.96*

* significant at 5%

However, further investigations were carried out to determine whether long-run relationships exist between the dependent and independent variables, pertaining to the reaction functions of both the government and the private sector. In fact, it was found that no cointegration relationship exists between the dependent and independent variables in both these reaction functions. This is derived from the ADF tests performed on the residuals which were not found to be white noise.

Table 3. Unit root tests on residuals

Equation	Reported Statistics
5 '	-3.81
6 '	-3.83

Therefore, no long-run relationship is observed. This may be due to the nature of our data. A larger sample size and quarterly data would have allowed us to draw more robust conclusions from our results.

CONCLUSIONS

This chapter has developed a theoretical model based on a two-player game that yields an unstable equilibrium. Evidence on the Mauritian economy indicates that the government does not carry out discretionary fiscal measures in an attempt to fine-tune private spending. Discretionary changes in the budget are used for other purposes such as responding to changes in population and infrastructural needs. One might conjecture that this is consistent with the fact that government prepares the budget as an expenditure-incremention exercise (probably as a purely accounting exercise). However, we found evidence to show that private agents do consider the discretionary policy changes that indirectly affect their expenditure. As expected, the absence of an active counter-cyclical fiscal policy makes private expenditure unstable as it grows over time. We also applied unit root and cointegration tests to confirm whether the relationships observed are spurious. We found that our variables were non-stationary and all integrated of order 1. Further, no cointegration or long-run relationship was found.

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FOOTNOTES

[1]. Indeed, the allocation and distribution functions are based on what is called expenditure incrementation exercise whereby trends in population (composition and structure) are taken into due consideration.

[2]. Assuming both G and T are functionally dependent on income.

[3].A comprehensive country-specific computation of CAD is undertaken in Chand (1977).

[4]. By assuming that the government sticks to its income stabilisation policy does not mean that we completely abstract from other stabilising roles of the government. Indeed, maintaining output around its natural rate ensures in itself price stability and assuming a fixed exchange rate system we eliminate shifts in IS and LM, thereby maintaining Balance of Payments stable.