



The Causal Relationship between Government Expenditure & Tax Revenue in Barbados

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Overview

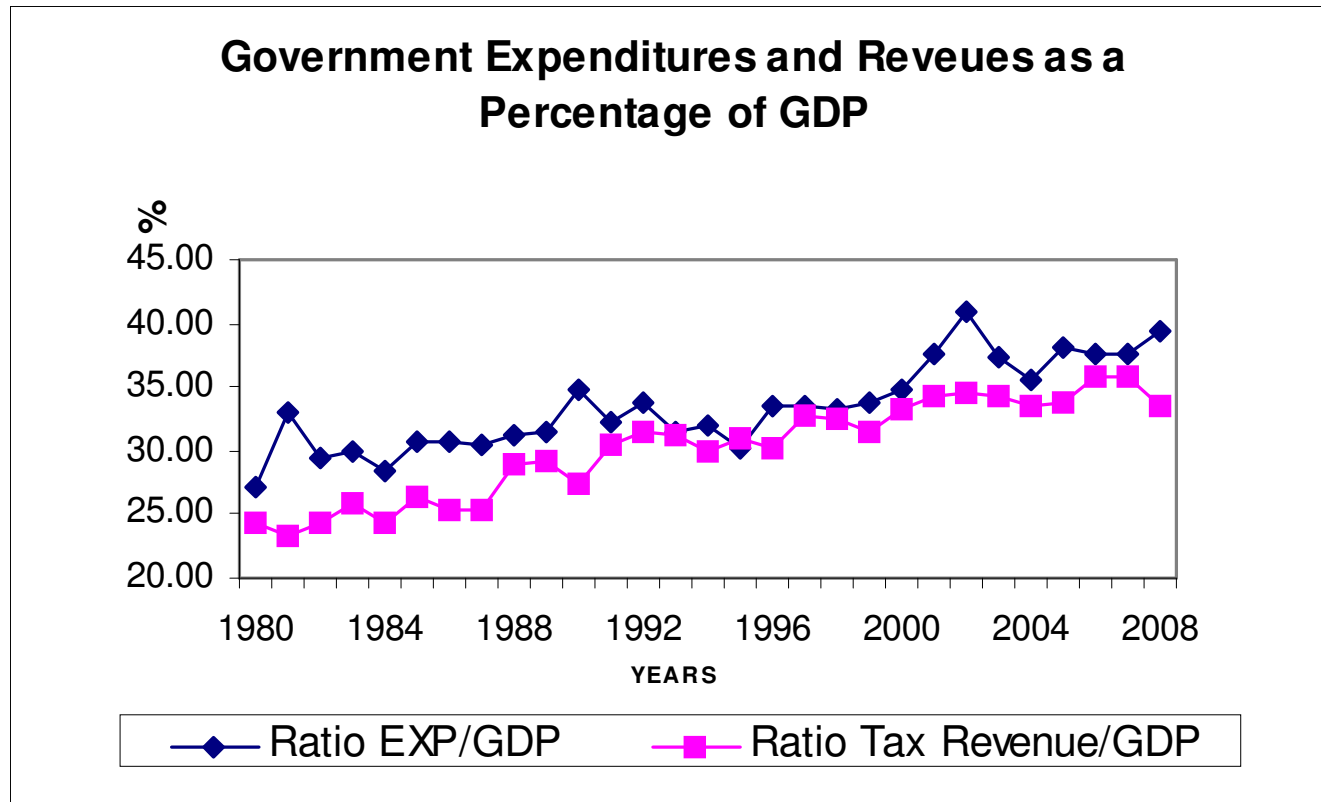
- Introduction
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- Stylized facts: fiscal trends in Barbados
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Introduction

- Escalating fiscal deficits are known to have adverse effects on an economy varying from high real interest rates, a decline in private sector investment and an increase in the rate of inflation.
- There exist various views on solving the problem of when a country spends more than it earns.
- In Barbados the government is considered to be one of the many countries that spends more than it earns. For the majority of times during the period of analysis the expenditure to GDP ratio has exceeded the ratio of tax revenue to GDP.

Introduction



Introduction



- Given the growing disparity between revenue and expenditure the paper seeks to:
 - examine the linkage between these variables as it becomes crucial in finding the optimal solution to controlling the fiscal imbalance of the government.
 - To determine if the linkage previously found by Craigwell et al (1994) is applicable today.
 - To determine whether the findings of the paper are sensitive to the frequency of the data.



Introduction

- Not to mention, the recent downgrade of Barbados' long-term foreign currency rating by Standard & Poor's from BBB+ to BBB, the government of Barbados should exercise caution, especially when it significantly spends above what it earns.
- Moreover, in the 2008 budgetary statement the government raised taxes on a number of items, in an effort to minimise the size of the deficit.
- Would this approach be successful?

Literature Review - spending taxation nexus



- There are four main hypotheses regarding the government spending/taxation nexus.
- These are as follows:
 - 1. Taxes and spending are causally independent
 - 2. Tax-and-spend (taxes causes spending)
 - 3. Spend-and-tax (spending causes taxes)
 - 4. Fiscal Synchronization (spending and taxes are determined concurrently)



Literature Review - spending taxation nexus

- Fiscal synchronization:
 - Musgrave (1966) and Meltzer and Richard (1981) noted that the public simultaneously determine the level of government spending and taxation by contrasting the benefits of government services with their costs.



Literature Review - spending taxation nexus

- Tax-and-spend (taxes causes spending)
 - There is the commonly held view that the more taxes a government receives the more they spend.
 - Friedman (1982) emphasised this point. As a result he proposed tax cuts as a means of controlling the fiscal deficit.
 - He reasoned that when taxes are cut the fiscal deficit would be larger, hence placing undue pressure on the Government to reduce the fiscal deficit.
 - Friedman found a positive causal relationship between spending and taxation.

Literature Review - spending taxation nexus



- Tax-and-spend (taxes causes spending)
 - Buchanan and Wagner (1977, 1978) also found that taxes causes spending. However, the direction of the relationship was negative.
 - Instead like Friedman who proposed tax cuts they proposed tax increases.
 - Buchanan and Wagner believed that persons would perceive that the cost of government programmes have become more expensive, thus resulting in a reduction in spending.
 - They concluded that a tax increase along with reduced spending can curtail the deficit.



Literature Review - spending taxation nexus

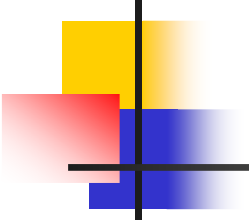
- Spend-and-tax (spending causes taxes)
 - Barro (1979) and Peacock and Wiseman (1979) argued that government spends first then tax later.
 - They believed that temporary increases in government spending tend to become enduring and lead to permanent tax increases. To finance the excessive spending.
 - The solution to the budget deficit problem is spending cuts.



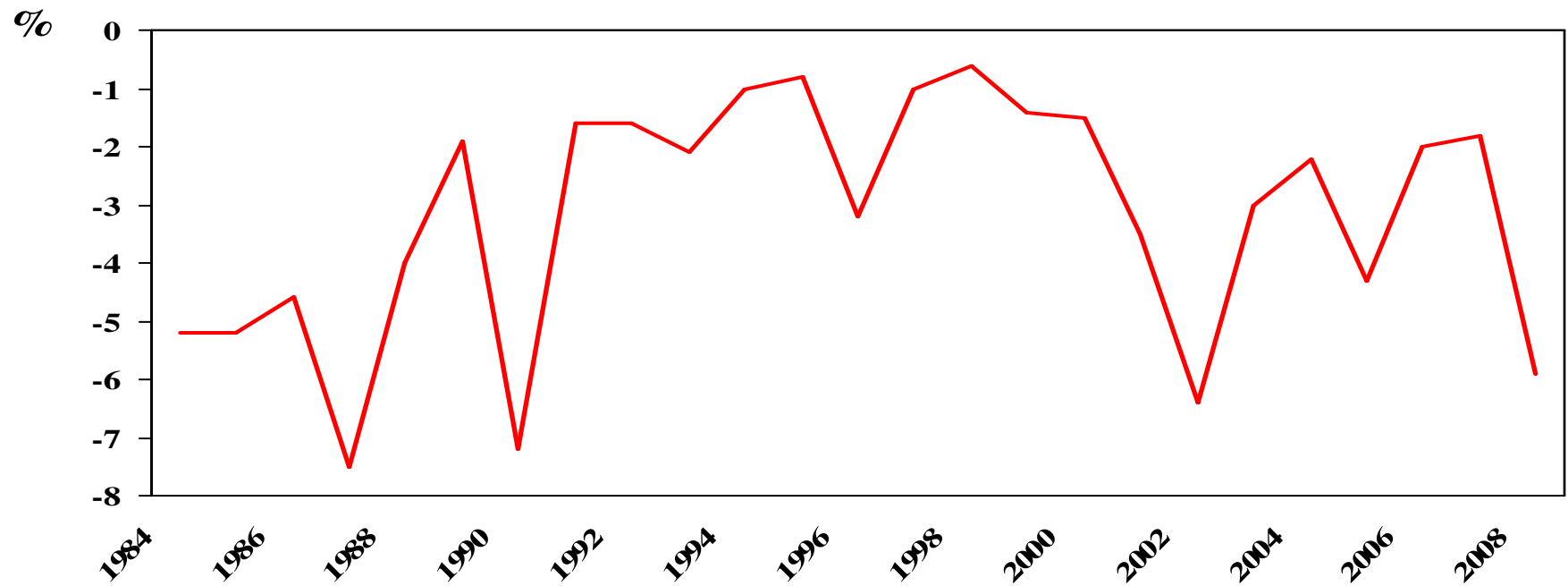
Literature Review - spending taxation nexus

- Darrat (1998) investigated the interrelationship between government spending and revenues in Turkey. The author found a stable long run relationship between the two variables, where taxes unidirectionally Granger-cause negative changes in spending. As a result it was noted that an increase in taxes in Turkey is the best way to manage budget deficits.
- In the Caribbean region work undertaken by Craigwell et al (1989) examined government revenue and expenditure causality in Barbados during the period 1973 to 1989. The authors found causality occurred from government revenue to expenditure.

Stylized facts: fiscal trends in Barbados



Fiscal deficit to GDP Ratio

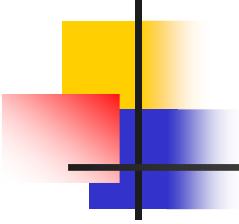


Stylized facts: fiscal trends in Barbados

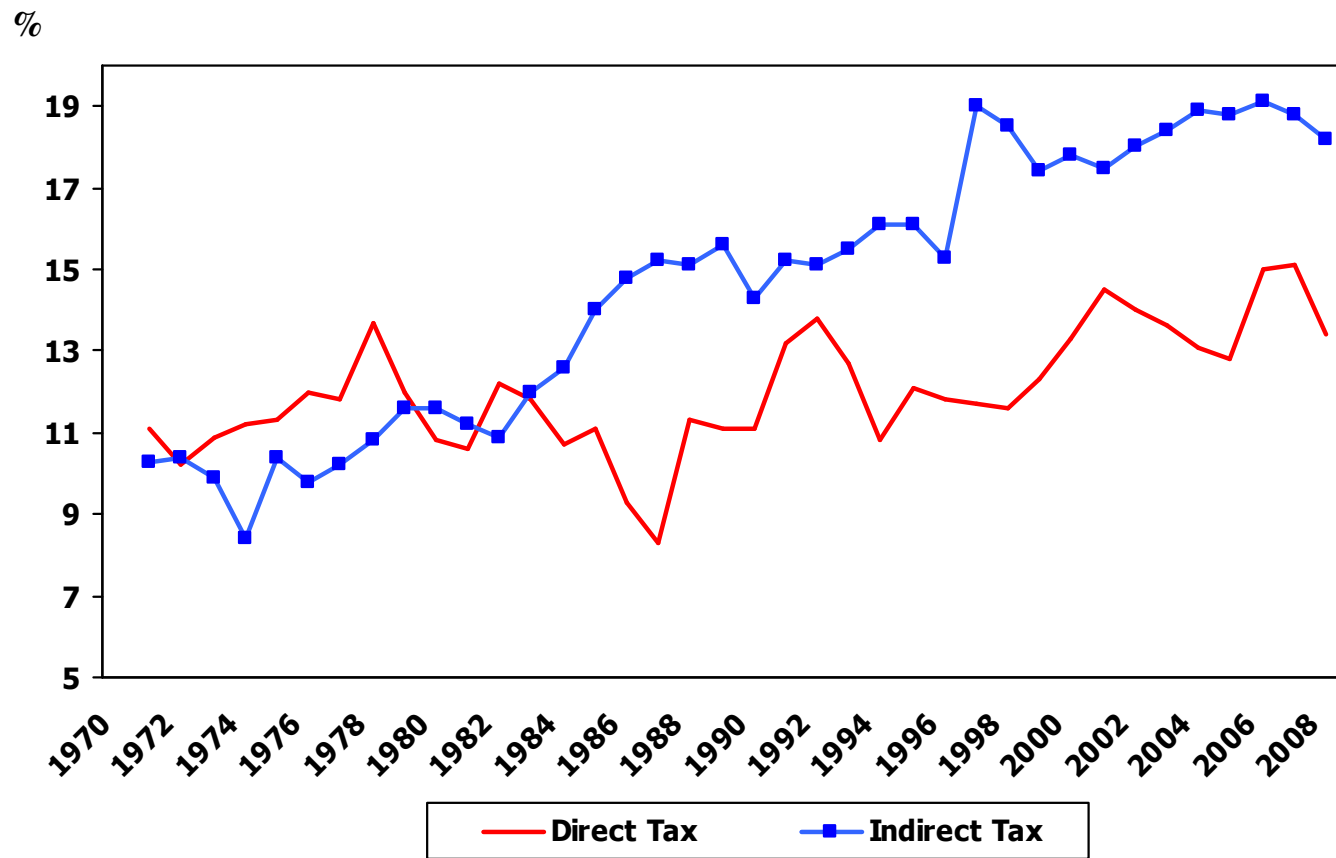


- The period 1984-1990 could be considered one of moderate to extreme fiscal disequilibrium. During this period the average annual deficit to GDP was approximately 5.1%.
- In the following years 1991-1992 Barbados instituted a major programme of macroeconomic stabilisation and adjustment.
- The post adjustment period of 1992 to 2001 registered relatively low fiscal disequilibrium.

Stylized facts: fiscal trends in Barbados

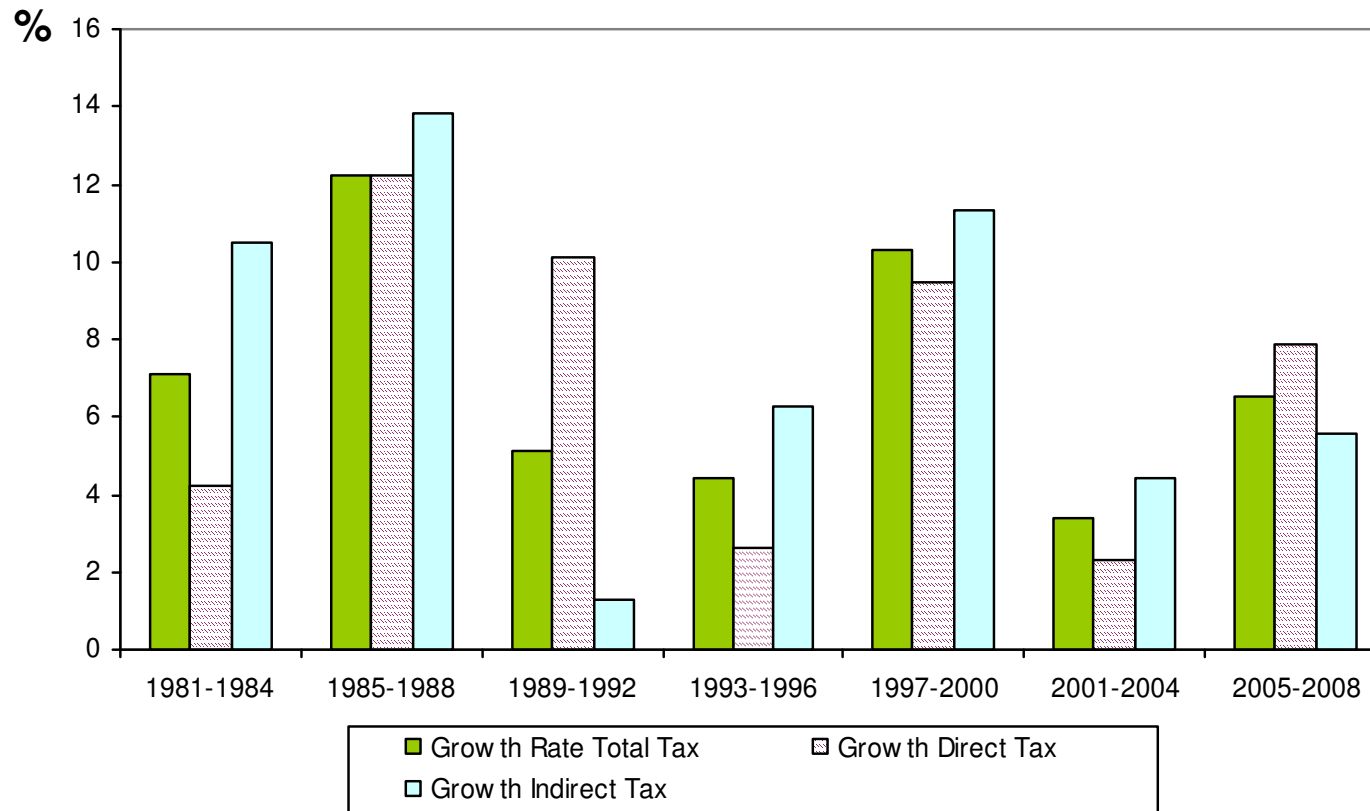
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- The year 2002 and onwards was characterised by relatively weak fiscal effort, deficit averaged 3.7% of GDP.
 - Throughout the years, from about 1980 there were several tax reforms, which shifted the bulk of revenue being collected from direct taxation to indirect taxes.
 - The direct tax system was highly progressive.

Stylized facts: fiscal trends in Barbados



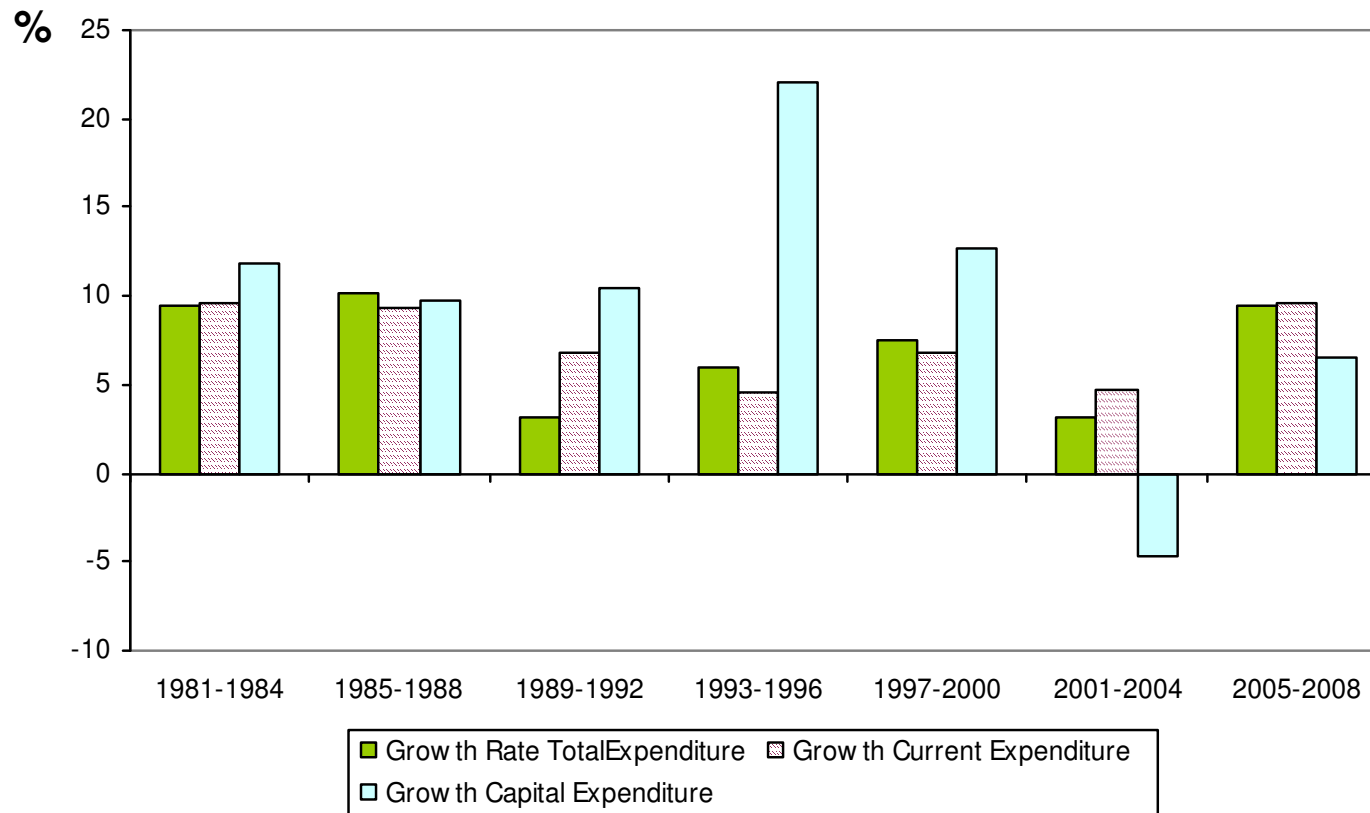
Stylized facts: fiscal trends in Barbados

Average Growth Rate of Tax Revenue



Stylized facts: fiscal trends in Barbados

Average Growth Rate of Expenditure

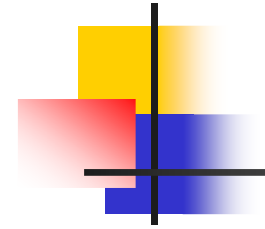


Data & Methodology



- Data used in the study:
 - Government spending (G)
 - Government Revenue (T)
 - Gross Domestic Product (Y)

Methodology



- The methodology used in this study is Granger's Causality (the vector error correcting model-VECM) & the Johansen cointegrating technique.
 - Both annual and quarterly data were used in the study.
- Before the above tests were performed we determined the stochastic properties of each time series using three standard tests- the Augmented Dickey-Fuller (ADF) test by Dickey and Fuller (1979, 1981), the Philips Perron (PP) (1988) and the KPSS test by Kwiatkowski et al (1992).
- Additionally, the Hegy test was used to analyse the integrated properties of the data, particularly to account for seasonal elements that may exist in the data.

Table 1 – Unit Root Tests – Annual Data

Methodology

Unit Root Test-Annual Data

Variables	ADF		PP		KPSS	
	Level	1 st Difference	Level	1 st Difference	Level	1 st Difference
G	- 1.9743	-6.7618***	-3.2340	-6.4263***	0.6933++	0.1161
T	- 2.4146	-5.9049***	-2.3768	-5.8703***	0.6898++	0.1095
Y	- 2.7051	-3.4538**	-2.4505	-3.4765**	0.5508++	0.1156

Notes: *, **, *** are the MacKinnon critical values for the rejection of the null hypothesis of a unit root at the 10%, 5% and 1% levels respectively, for both the ADF and PP tests, while +, ++, +++ are the critical values for the LM statistic of the KPSS test and denote rejection of the null hypothesis of stationarity at the 10%, 5% and 1%, respectively (based upon the asymptotic results presented in KPSS(1992) -Table 1, pp.166.



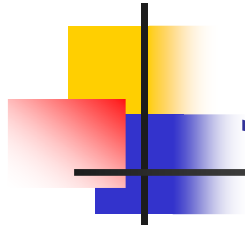
Unit Test results-for quarterly data

- The Hegy test was used to test for the existence of seasonality in the data.
- Our results on Table 3, indicated that a non-seasonal unit root existed in the each data series. However, when the seasonal dummies are removed from the regression a unit root becomes present at the annual frequency for all the variables at the 5% level of significance, while G and Y also obtain unit roots at the biannual frequency. Consequently we modelled for the seasonality according.



Methodology

- To examine the cointegrating properties of the variables before testing for Granger causality we utilize the maximum likelihood method developed by Johansen (1988)
- For the annual data- one cointegrating relationship.
- For quarterly data – two cointegrating relationships



Johansen Test-Annual Data

Variables	Max Eigen Statistic	5% Critical Value	Trace Statistic	5% Critical Value
G, T and Y				
$H_0: r=0$	37.43**	25.82	59.16**	42.92
$H_0: r \leq 1$	11.4	19.39	21.74	25.87
$H_0: r \leq 2$	10.34	12.52	10.34	12.52



Johansen Test-Quarterly Data

Table 4 – Johansen Test – Quarterly Data

H_0	LR	P Value	90%	95%	99%
0	84.56***	0.0000	39.73	42.77	48.7
1	39.28***	0.0004	23.32	25.73	30.67
2	6.55	0.4043	10.68	12.45	16.22

Notes: *** Denotes rejection of H_0 at 1% level of significance. This estimation included: intercept, trend and seasonal dummies.



Methodology

Given each variable is integrated of order (1), \sim G-I(1), T-I(1) and Y-I(1), and the variables are cointegrated. We used the vector error correction model (VECM) as given by [system 3] and then proceeded to test the causal relationships among the variables of interest.

$$\Delta G_t = a_3 + \sum_{i=1} \beta_{3i} \Delta G_{t-i} + \sum_{i=1} \lambda_{3i} \Delta T_{t-i} + \sum_{i=1} \phi_{3i} \Delta Y_{t-i} + \xi_i (ECM)_{t-1} + \varepsilon_{3t}$$

$$\Delta T_t = b_3 + \sum_{j=1} \alpha_{3j} \Delta T_{t-j} + \sum_{j=1} \kappa_{3j} \Delta G_{t-j} + \sum_{j=1} \rho_{3j} \Delta Y_{t-j} + \eta_j (ECM)_{t-1} + \mu_{3t}$$



Granger Causality Test Results

Null Hypothesis	F-statistic	T-Statistic on ECM_{t-1}
Annual Data		
T does not Granger cause G	0.969	-3.185*
G does not Granger cause T	0.052	-3.381*
Quarterly data		
T does not Granger cause G	3.361*	-2.323*
G does not Granger cause T	0.834	-2.379*

Notes: * Denotes rejection of H_0 at 5% level



Empirical Results

- The results show that there is bidirectional causality between government expenditure and tax revenue for both annual and quarterly data over the long term, as shown by the ECM terms.
- However, for annual data in the short run we found an absence of coordination between revenue and expenditure decisions. (independence).
- For quarterly data the results suggest that in the short run unidirectional causality runs from taxes to government expenditure, indicative of the tax-and-spend hypothesis.



EMPIRICAL RESULTS

- Our findings allow us to highlight that an increase in tax revenue will most likely translate into more spending by Government, which in turn can result in a larger budget deficit.
- Findings similar to those of Craigwell et al (1989). -quarterly data



Conclusion

- This paper investigated the causal relationship between government spending and taxes for Barbados.
- Results were sensitive to the frequency of the data in the short-run.
- Raising taxes in an effort to control rising budget deficits might not prove to be the optimal solution to the budget deficit phenomenon.
- The Government should consider raising taxes and reducing spending simultaneously in an effort to control budget deficits as evidenced by the long-run results.