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REVIEW OF LITERATURE

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STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

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APPENDIX/ANNEXURE

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CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

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- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

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- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

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GOVERNMENT REVENUE AND EXPENDITURE NEXUS IN SINGAPORE: STRUCTURAL STABILITY AND CAUSALITY ANALYSIS

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ABSTRACT

The causal relationship between government revenue and its expenditure is an important topic in public finance literature. It is well known that fiscal policy is basically revenue generating policy of the government and the government finances its expenditures on the basis of the fiscal policy. The purpose of the study is to examine the causal relationship between these fiscal variables over the period 1966-2007 and to identify the structural changes in the estimated causal relationship in Singapore. The unit root test shows that the dataset are non-stationary at their level. The Engel-Granger Two Step Method exhibits that the residuals are non-stationary which implies no cointegration between the concerned variables. The causality test through Vector Autoregressive Model reports that Tax-and-Spend principle is observed over the span of 42 years. The Chow Test for structural change shows two structural breaks in year 1987 and 1997. Fiscal neutrality principle is observed in the first sub-period 1966-1986, uni-directional causality running from revenue to expenditure exists in the second sub-period 1987-1997 and the third sub-period 1998-2007 is marked by presence of Tax-and-Spend principle. The causal relationship between revenue and expenditure is not the same in different sub-periods. The policy implication of these findings suggests that the estimated causal relationship with historical dataset may not provide reliable guideline for constituting fiscal policy from the end of the government.

KEYWORDS
Chow Test, Engel-Granger Cointgration Method, Government expenditure, Government revenue, Unit Root Test, VAR, VECM.

JEL CLASSIFICATION
E62, C22, H61, H62.

1. INTRODUCTION

A sound fiscal policy has an important and far-reaching role to promote price stability, economic growth and employment. The two main instruments of fiscal policy are government expenditure and government revenue. Government uses fiscal policy to influence the level of aggregate demand in the economy, in an effort to achieve economic objectives of price stability, full-employment and economic growth. Keynesian economics suggest that increasing government expenditure and decreasing tax rates are the best ways to stimulate aggregate demand. Classical and neo-classical economists argue that crowding out completely negates any fiscal stimulus. The nexus between government revenue and government expenditure has attracted significant interest in recent years. The economy of Singapore is a highly developed state capitalist mixed economy. Until the Asian crisis of 1997, Singapore as a country of south-East Asian countries was viewed by many analysts as a shining example of the Asian economic miracle. It was one of the fastest–growing economies in the world. Singapore has always enjoyed a strong fiscal position. Singapore government has always been in a surplus position from 1966 to 2007 except the year 1986 while all the South-East Asian economies have been suffering from persistent budget deficits. Direction of causal relationship between government revenue and expenditure and its implication with respect to budget deficit or surplus has not been empirically resolved till date. The empirical results of different studies on different countries over the last four decades were different and conflicting. In investigating the causal relationship between government revenue and its expenditure almost all the studies were concerned with historical dataset.

According to Locus Critique, the relationship among macro-economic variables estimated by using the historical dataset may not represent the dynamic nature of the relationship. The relationships among the variables undergo change following structural changes in the economy. The structural changes may be due to external forces or internal forces. So it becomes pertinent to identify structural changes in the historical dataset and then examine the impact of changes on the relationship. The assumption of stability in the long-run relationship between revenue and expenditure following structural changes would be an important potential shortcoming of the past research. No study has been carried out in this particular direction in Singapore which justifies the need of more research. Hence this study helps to fill this gap and provides useful findings to policy makers of Singapore for the development. The prime objective of this paper is to examine structural breaks in the historical dataset and its impact on the existing causal relationship between these fiscal variables. This study differs from the existing study as the study takes structural changes into account.

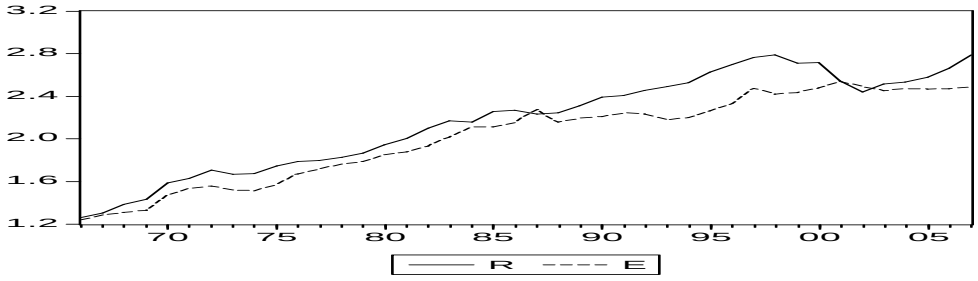
DATA

The study takes the use of annual dataset for government revenue and expenditure in Singapore covering the period from 1966 to 2007.The data have been collected from different issues of International Financial Statistics (IFS) where the base period of Consumer Price Index is 2000(=100). We have used natural log values of real revenue and real expenditure as denoted by R_t and E_t respectively. we have used log value of real government revenue and real government expenditure as denoted by R_t and E_t respectively in order to remove heteroscedasticity in the data set.

TIME PLOT OF R_t AND E_t IN SINGAPORE

It is observed from the following figure (1) that both the series are highly trended the period concerned .This feature of the series is pointers to their non–stationarity .This leads us to examine the nature of stationarity of R_t and E_t series.

FIGURE 1: TIME PLOT OF E_t AND R_t (At level)



The structure of the study proceeds as follows: theoretical and empirical literature are explained in section 2, in section 3 methodologies applied in the study are discussed, section 4 reports empirical results, section 5 provides structural stability and section 6 concludes.

2. LITERATURE REVIEW

THEORETICAL LITERATURE

The literature has identified four main hypotheses to explain the relationship between government revenue and government expenditure. **Tax-and-Spend Hypothesis** holds that the amount of tax revenue determines the size of government expenditure. So there is a unidirectional causal relationship running from government tax revenue to government expenditure. Friedman (1978), Buchanan and Wagner (1977, 1978) holds this view. According to Friedman (1982) a cut in tax leads to higher deficits which would influence government to reduce its level of spending. Buchanan and Wagner (1978) share the same view that taxes *Granger cause* government expenditure but the casual relationship is negative. **Spend-and-Tax Hypothesis** postulates that government expenditure actually Granger causes tax revenue. Government takes the expenditure decision first, and then imposes tax on the people. So, there exists a *unidirectional causality* running from government expenditure to government revenue. This view is based on the observations that any large-scale exogenous disturbances (like was, political disturbances or natural disasters etc.) induce an increase in government spending and, therefore, an increase in tax revenues.This hypothesis is motivated by Peacock and Wiseman (1961) and 1979), Barro (1974-1978). It is implicitly assumed that expenditure changes Granger cause corresponding changes in revenue. **Fiscal Synchronization Hypothesis** holds that government expenditure and government revenue are interdependent and these are determined simultaneously .So, there exists a bi-directional causal link between the variables concerned .Specifically, government expenditure can Granger cause government revenue and/or government revenue can Granger cause government expenditure. Musgrave (1969), Meltezer and Richard (1981) have supported this view. The **Fiscal Neutrality School** holds that government expenditure and government revenue are independent. There is no relationship between them at all (Baghestani and Mc. Nown).

2.1 EMPIRICAL LITERATURE

A number of empirical works have been done in connection with the above four hypotheses.

Several empirical studies have been taken up since 1980 with varying conclusions regarding the relationship between expenditure and revenue levels in different countries. These studies differ in the matter of research methodologies, target countries, period of studies, frequencies of dataset etc. Some of the important studies are being reviewed below.

Manage and Marlow (1986) for USA over the periods 1929-1982 gave support to a Bi-directional causality between government expenditure and government revenue. Ram (1988) in the USA over the period 1929-1983 supported Bi-directional Granger causality. Miller and Russck (1990) found Bi-directional Granger causality for the USA over the period 1946-1987. Naidu, Mohasin and Nishe (1995) observed Bi-directional causality in the state of Andhra Pradesh, India over the period 1969-1990. Brandely T. Ewing and James E. Payne (1998) examined Latin American countries and got mixed results supported the evidence of Bi-directional causality between government revenue and government expenditure. The Chile and Paraguay results supported the evidence of Bi-directional causality between government revenue and government expenditure. Khalid H.A Al-Qudair (2005) found the existence of Bi-directional causality between government revenue and government expenditure in the kingdom of Saudi Arabia. Abdul Aziz and shah Habibullah (2000) investigated the causality between government revenue and government expenditure in Malaysia for the period 1960-1997 and gave support to the existence of Bi-directional causality between government revenue and government expenditure. Mukhopadhyay and Maitra (2006) investigated the Granger Causality between government revenue and government expenditure in India for the period 1950-2005 and observed 'Fiscal Synchronization Principle' in India. They also found the evidence of fiscal 'Synchronization Principle' in Sri Lanka over the period 1957-2004.

Anderson, Wallace and Warner (1986) found the evidence of spend and tax principle in the USA over the period 1946-1983. George Hondmyianmis and Evangelia papapethru (1996) observed spend and tax principle in Greece over the period 1987-1993. D.M. Mithani and Goh Soo Khon (1999) examined the causal relationship between government revenue and government expenditure in Malaysia over the period 1970.1- 1994.1 and observed the unidirectional causality from expenditure to revenue. Dhanasekharan (2000) examined the revenue and expenditure relationship in India for the period 1960-1997 and found the existence of spend and tax principle. Hussain (2004) investigated the relationship between government revenue and government expenditure for Pakistan from 1973-2003 and found the evidence of spend and tax principle in Pakistan. Mukhopadhyay and Maitra (2008) examined the causal relationship between government revenue and government expenditure in Pakistan over the period 1957-2008 and found the evidence of spend-tax principle in Pakistan. Lusinyan and Thornton (2010) examined the relationship between government revenue and government expenditure in presence of structural break and found spend-tax principle in UK during 1750-2005.

Joulfinia and Mookherjee (1991) studied the revenue and expenditure relationship in OECD countries during the period 1955-1986 and found Tax and Spend principle in OECD countries. Baghestani and Mc. Mown (1994) examined the granger causality between government revenue and government expenditure in USA for the period 1955-1989 and testified the validity of Tax and Spend Principle in USA. Darrat (1998) examined the revenue – expenditure nexus in Turkey and reported principle of Tax and Spend in Turkey. Wan Kyu Park (1998) investigated the Granger causality between government revenue and government expenditure in Korea over the period 1964-1992 and found the unidirectional causality from revenue to expenditure in Korea. Omo Aregbeyen and Taofik Mohhammed Ibrahim (2005) studied the long-run relationship and dynamic interaction between government revenue and government expenditure in Nigeria for the period 1970-2008 and they confirmed the Tax-Spend hypothesis in Nigeria. Wong Hock Tsen and Lim Kian Ping (2005) examined the relationship between government revenue and government expenditure in Malaysia and found the evidence of Tax-Spend Principle in Malaysia over the period 1965-2002. Jaka Sriyana (2009) studied the relationship between government revenue and government expenditure for Indonesia over the period 1970-2007 and suggested the principle of Tax-Spend principle in Indonesia. Muhammed Imtaz Subhami, Syed Akif Hasan, Amber Osman and Tanzeed Rafiq (2012) examined the nexus between government revenue and government expenditure for Pakistan from the period 1979-2010 and they found Tax-Spend Principle.

3. METHODOLOGY

Macroeconomic time series data basically contain unit root and stochastic trends. The first step is to detect the presence of non-stationarity among the variables. The Augmented Dickey-Fuller test (ADF 1981) and Phillips-Perron (PP 1988) unit root test with intercept and with intercept and trend are applied to examine stationarity or non-stationarity of both the series concerned. In this test, the minimizing of Akaike Information Criteria (AIC) determines the optimal lags and specification. The Engel-Granger cointegration method is used to test the long-run relationship between the variables concerned. The Vector Error Correction Model (VECM) is applied to examine whether the long-run relationship is stable along with causality test in the short run. Unresticted Vector Autoregressive Model (UVAR) is used for Granger Causality between the variables concerned in the long run. In order to test structural break in the data set we use the Chow test.

4. EMPIRICAL RESULTS

The results of ADF and PP test are reported in the table1 for the level data and differenced data of each of the variable.

RESULTS OF ADF & PP TESTS

All the results of ADF & PP test for the presence of unit roots in the series concerned are reported in table 1.

TABLE 1: RESULTS OF THE ADF & PP UNIT ROOT TESTS

variable	Model specification	ADF Statistics	PP statistics	Critical values at 5%	Degree of integration
E_t	Intercept	-1.79	-2.19	-2.93	I(1)
	Intercept & trend	-1.57	-1.40	-3.52	I(1)
ΔE_t	Intercept	-6.22	-6.24	-2.93	I(0)
	Intercept & trend	-6.48	-9.60	-3.52	I(0)
R_t	Intercept	-1.67	-1.75	-2.93	I(1)
	Intercept & trend	-2.14	-1.88	-3.52	I(1)
ΔR_t	Intercept	-4.59	-4.66	-2.93	I(0)
	Intercept & trend	-4.73	-4.74	-3.52	I(0)

*denotes significance at 5% level.
Lag length automatic based on modified AIC, Max lag=9 in ADF test.
Neway-West using Bartlett Karnel in PP test. Δ represents first difference.

FINDINGS FROM THE TABLE 1

The hypothesis of unit roots of E_t and R_t can't be rejected at 5% levels in presence of the constant and also intercept & trend The hypothesis of unit roots for ΔE_t and ΔR_t series are rejected at 5% with intercept and as well as trend & intercept. The hypothesis of unit roots for ΔE_t and ΔR_t series are also rejected at 5% level with exogeneous constant and as well as intercept & linear trend in the maintained regression equation. All these observations confirm that E_t and R_t series follow random walks or martingales with drift. ΔE_t and ΔR_t are stationary. E_t and R_t series are difference stationary.

ENGEL-GRANGER TWO- STEP METHOD

According to Engel-Granger (1987) the variables will be cointegrated when the linear combination of the non -stationary variables is stationary. The linear combinations of these variables are:

$$R_t = \alpha + \beta E_t + \vartheta_t \qquad 1$$

$$\text{or, } \vartheta_t = R_t - \alpha - \beta E_t$$

$$E_t = \gamma + \delta R_t + \omega_t \qquad 2$$

$$\text{or, } \omega_t = E_t - \gamma - \delta R_t$$

Here, v_t and w_t represent the linear combination of R_t and E_t.
Now if $\hat{v}_t$ and $\widehat{w_t}$ are stationary i.e. I(0) then E_t and R_t are cointegrated at levels i.e.CI(1,1). Consequently, the cointegation between E_t and R_t is being examined through the stationarity of the residuals $\hat{v}_t$ and $\widehat{w_t}$.

STATIONARITY OF RESIDUALS

Stationarity of the corresponding residuals $\hat{\vartheta}_t$ and $\hat{\omega}_t$ has been examined through the ADF and PP tests .The results of the tests are given by the table 2

TABLE 2: ADF & PP UNIT ROOT TESTS ON $\widehat{\vartheta_t}$ & $\widehat{\omega_t}$

Variable	Null Hypothesis	ADF Test statistic	Lag length*	PP Test statistic	Lag length †	Critical values 1% 5% 10%
ϑ_t	$\widehat{\vartheta_t}$ has a unit root(intercept)	-2.40 (0.13)	0	-2.58 (0.10)	2	-3.52 -2.9 -3.59
ω_t	$\widehat{\omega_t}$ has a unit root(intercept)	-2.43(0.13)	0	-2.53(0.12)	2	-3.52-2.91 -3.59

*Lag length automatic based on modified AIC, Max lag=09/ Figure in (.) represents standard Error.
†Neway-West using Bartlett Karnel**.** Mackinnon (1996) one sided P-values.

FINDINGS FROM THE TABLE 2

The null hypothesis of unit root (with drift) for the residuals $\hat{\vartheta}_t$ & $\hat{\omega}_t$ is not rejected by ADF and PP test at 5%. So the residuals $\hat{\vartheta}_t$ & $\hat{\omega}_t$ are not stationary. Both the tests confirm that the residuals $\hat{\vartheta}_t$ and $\hat{\omega}_t$ are not free from random walk. Therefore, both revenue & expenditure are not cointegrated at level. Johansen Cointgration test also confirms the same which is not reported here but available on demand. This implies that both revenue & expenditure have no long-run equilibrium relationship. Since the revenue and expenditure series are non-stationary the vector error correction model can't be applied.

VECTOR AUTOREGRESSION MODEL

We have sought to enquire into the interrelationship between government expenditure & government revenue in Singapore by establishing a structural model of revenue & expenditure. For this purpose, we have applied the Vector Autoregession Model. This model has desirable property that it treats all variables symmetrically.
The model of VAR for government expenditure & government revenue consists of the following equations.

$$R_t = c_1 + \sum_{i=1}^{k} a_{1i} R_{t-i} + \sum_{i=1}^{k} b_{1i} E_{t-i} + e_1 \qquad 3$$

$$E_t = c_2 + \sum_{i=1}^{k} a_{2i} E_{t-i} + \sum_{i=1}^{k} b_{2i} R_{t-i} + e_2 \qquad 4$$

Where a_{1i},b_{1i} and c_i are the parameters to be estimate. Here, E_t and R_t represent government expenditure and government revenue at time t respectively.E_{t-i} and R_{t-i} represent government expenditure and government revenue at time t- i, i=1,2,3,…, respectively. e_1 and e_2 are the stochastic error terms, called impulse or innovations or shocks in the VAR model.
These equations 3 and 4 do not represent any joint relationship between E_t and R_t .These equations, therefore, represent seemingly unrelated regression SUR model. The estimation of the model considers and uses the contemporaneous Var-Covariace matrix(Ω) of the error terms involved such that Ω =Var-Cov(u,u)where Ω is a positive matrix In this study both FPE & AIC select a lag length of one by applying lag selection criteria.

ESTIMATION AND RESULTS OF VAR MODEL

The Results of the estimation of the VAR Model are being presented through the tables 3 and 4

TABLE 3: RESULTS OF VAR ESTIMATION (REVENUE EQUATION)

Dependable variable	Explantory variables	Cofficents	S.E	t- Statistics
ΔR_t	Constant	0.06	0.02	2.42
	ΔR_{t-1}	0.33	0.16	2.04*
	ΔE_{t-1}	-0.12	0.18	-0.69

R^2 = 0.10, Adj R^2 = 0.05, F-statistic = 2.12, D.W= 1.98
*denotes significance at 5% level.

TABLE 4: RESULTS OF VA ESTIMATION (Expenditure Equation)

Dependable variable	Explantory variables	Cofficents	S.E	t- Statistics
ΔE_t	Constant	0.05	0.02	1.93
	ΔR_{t-1}	0.36	0.14	2.56*
	ΔE_{t-1}	-0.07	0.15	-0.45

R^2 = 0.15, Adj R^2 = 0.10, F-statistic = 3.29, D.W= 1.96

*denotes significance at 5% level.

FINDINGS FROM THE TABLE 3 and 4

In expenditure equation, the coefficient of revenue in t-1 period (R_{t-1}) is positive & significant at 5% level. This indicates that revenue does cause expenditure in the long-run during the period of study. The first period lagged expenditure in revenue equation is insignificant but lagged revenue is significant at 5% level of significance. This implies that expenditures do not influence the revenues in Singapore during 1966-2007 and revenue considerations are the main guiding factors behind the constitution of expenditure profile. Revenue is found to granger cause expenditure & elasticity of expenditure with respect to revenue is 0.36. Following a rise in revenue in the just previous period was followed by a rise in current expenditure. This rise in revenue is designed to propel the growth of government expenditure. Therefore, the budget process of Singapore government is largely driven by revenue consideration not by expenditure consideration.

Tax-and-spend hypothesis is the prevalent feature of the fiscal system in the economy of Singapore over the period of study (1966-2007)

So far we have examined the relationship between government revenue and government expenditure over the entire sample period 1966-2007.The above results will be biased if there is a structural change in the time series dataset. During the entire sample period 1966-2007, there might be a possibility of structural change in the relationship because of policy changes, institutional changes, external shocks, change in social attitudes and motivation etc. In this study, we have made an attempt to find out whether the causal relationship between revenue and expenditure as observed from the above study underwent significant changes over the period concerned due to structural changes in dataset if any.

5. STABILITY ANALYSIS

We break up the entire sample period into different sub-periods through the 'Chow Break-Point Test which is basically a 'Recursive Estimation Procedure' with the historical dataset in order to trace any structural change in the relationship between these two fiscal variables. Table 5 reports the observed values of F-Statistic obtained from the recursive estimations of the relationship between revenue & expenditure during entire time span. Table 5 also shows the observed values of F-Statistic obtained from the recursive estimations of the relationship between revenue & expenditure during the period 1987-2007.The results of recursive estimations of the relationship between revenue & expenditure against each iteration is reported in the table 5 during the period 1998-2007. The cointegration and Error Correction Mechanism and VAR approach are carried out for each sub-period separately to detect the direction of causality between government revenue and government expenditure.

Table 5 presents the values of F- statistic with their probabilities on recursive residual estimation of the equation.

$E_t = \alpha + \beta R_t + \vartheta_t$

TABLE 5: RESULTS OF CHOW BREAK-POINT TEST (1966-2007)

During 1966-2007			**During 1987-2007**		**During 1998-2007**	
Year	F-statistic	probability	F-statistic	probability	F-statistic	probability
1972	0.182052	0.182052	---	----	---	
1973	0.500310	0.610281	---	---	---	
1974	0.992179	0.380168	---	---	---	
1975	1.865611	0.168705	---	---	---	
1976	3.134878	0.054935	---	---	---	
1977	3.396776	0.043933	---	----	---	
1978	3.125998	0.055356	----	---	---	
1979	2.713175	0.079173	----	---	---	
1980	2.722950	0.078498	---	---	--	
1981	2.909495	0.066727	----	-----	---	
1982	3.637118	0.035869	----	-----	---	
1983	5.015480	0.011668	----	----	---	
1984	6.092785	0.005069	----	----	----	
1985	5.234814	0.009817	----	---	--	
1986	5.872110	0.005995	----	---	----	
1987	6.166585	0.004794*	----	----	----	
1988	4.243637	0.021704	---	----	---	
1989	6.579536	0.003519	---	-----	---	
1990	8.966779	0.000646	0.16692	0.847644	---	
1991	9.766335	0.000378	0.423817	0.661272	---	
1992	11.68471	0.000111	0.601457	0.559266	---	
1993	11.81225	0.000102	1.372014	0.280293	---	
1994	9.077371	0.000599	4.787376	0.22430	---	
1995	7.331597	0.002029	14.30683	0.000277	---	
1996	4.779420	0.014076	33.00323	0.000001	---	
1997	2.877527	0.068604	49.42628*	0.0000000	---	
1998	3.652320	0.035414	25.73876	0.000007	---	
1999	3.988282	0.026751	2.9714	0.000005	---	----
2000	5.451057	0.008292	25.31981	0.000008	3.810396	0.085476
2001	7.360371	0.001987	20.38233	0.000031	3.672066	0.090906
2002	4.577305	0.016511	7.650757	0.004270	10.37603*	0.011282
2003	1.910481	0.161958	3.100364	0.071130	5.483217	0.044226
2004	0.967592	0.389162	1.960041	0.171406	3.190164	0.113830
2005	0.268697	0.765815	0.986982	0.393072	3.137522	0.116784
2006	0.127983	0.880246	0.49389	0.618756	3.629366	0.504624
2007	----	---	---	---	---	---

*indicates Chow break point.

It is observed from the table 5 that there exists structural change in the relationship between government revenue & government expenditure during the whole period 1966-2007. Chow test confirms possible structural breaks in the year 1987 and 1997 and these breaks were due to reduction in fiscal surplus in view of negative growth in 1985 and the year 1997 was marked by higher level of spending and lesser collection of revenue for Asian financial crisis respectively. Three distinct sub-periods persist in the historical dataset. The first sub-period covers the time period 1966-1986. The second sub-periods ranges over 1987-1997. The next sub-period extends from 1998 to 2007.The causality test both in the short-run and long-run is performed in different sub-periods In order to examine if structural changes occurred during the whole time span change the estimated causal relationship.

5.1 CHECK OF RESIDUALS FOR COINTEGRATION IN THE SUB-PERIOD 1966-1986

Stationarity of the corresponding residuals $\hat{\vartheta}_t$ and $\hat{\omega}_t$ has been examined through the ADF and PP tests .The results of the tests are given by the table (6).

TABLE 6: ADF & PP UNIT ROOT TESTS ON RESIDUALS ($\widehat{\vartheta_t}$ & $\widehat{\omega_t}$)

Variable	Null Hypothesis	ADF Test statistic	Lag length*	PP Test statistic	Lag length †	Critical values 1% 5% 10%
ϑ_t	$\widehat{\vartheta_t}$ has a unit root(intercept)	-2.82	0	-2.81	1	-3.80 -3.02 -2.65
$\omega\hat{}_t$	$\widehat{\omega_t}$ has a unit root(intercept)	-2.68	0	-2.68	0	-3.80 -3.02 -2.65

*Lag length automatic based on modified AIC, Max lag=08

†Neway-West using Bartlett Karnel

Mackinnon (1996) one sided P-values.

5.2 FINDINGS FROM THE TABLE 6

The null hypothesis of unit root (with drift) for the residuals $\hat{\vartheta}_t$ & $\hat{\omega}_t$ is not rejected (by ADF and PP test) at 5% .So the residuals $\hat{\vartheta}_t$ are $\hat{\omega}_t$ are not stationary. Since both the tests confirm that the residuals $\hat{\vartheta}_t$ and $\hat{\omega}_t$ are not free from random walk. This means that both the residuals are non-stationary. Therefore, both revenue & expenditure are not cointegrated at level. This result is also supported by Johansen Cointgration test which is not reported here. This implies that in the sub-period 1966-1986, both revenue & expenditure have no long-run equilibrium relationship as observed from table 2 while dealing with historical dataset. The causality link between government revenue and its expenditure is carried out through VAR model in the sub-period 1966-1986. The lag order of 1 is selected through AIC and SC. The results are reported in the table 7 and 8

TABLE 7: RESULTS OF VAR ESTIMATION UNDER SUB-PERIOD 1966-1986

Dependable variable	Explantory variables	Cofficents	S.E	t- Statistics
ΔR_t	Constant	0.13	0.04	3.12
	ΔR_{t-1}	-0.19	0.28	-0.69
	ΔE_{t-1}	0.07	0.29	0.26

R^2 = 0.02, Adj R^2 = -0.09, F-statistic = 0.23, D.W= 1.98

Δ represents first-difference series.

TABLE 8: RESULTS OF VAR ESTIMATION UNDER SUB-PERIOD 1966-1986

Dependable variable	Explantory variables	Cofficents	S.E	t- Statistics
ΔE_t	Constant	0.07	0.03	1.98
	ΔR_{t-1}	0.20	0.25	0.79
	ΔE_{t-1}	-0.07	0.15	-0.45

R^2 = 0.06, Adj R^2 = -0.05, F-statistic = 0.52, D.W= 1.96 /Δ represents first-difference series.

5.3 FINDINGS

All the results from table 7 & 8 confirmed that in revenue equation, first period lagged revenue (R_{t-1}) & first period lagged expenditure (E_{t-1}) are insignificant at 5% level. In expenditure equation, the first period lagged revenue and lagged expenditure are insignificant at 5% level. All these findings indicate that Fiscal Neutrality principle exits in the long-run during the sub-period 1966-1986. This result implies that fiscal authority of Singapore takes the revenue and expenditure decisions independently during the sub-period1966-1986.

In the second sub-period 1987-1997 Trace test and Max-Eigen value test (not reported here) confirms one coingrating equation in the system through Johansen Cointegration Test but no causality through VECM is observed in the short-run. We have performed the VAR Model with lag order of two. The lag period two (t=2) is chosen on the basis of lowest value of AIC, SC and HQ.

TABLE 9: RESULTS OF VAR ESTIMATION SUB-PERIOD 1987-1997

Dependable variable	Explantory varibles	Coefficients	Standard Error	t- statistic
ΔEt	ΔR_{t-1}	0.88	0.54	1.62
	ΔR_{t-2}	-1.22	0.50	-2.41*
	ΔE_{t-1}	-0.17	0.28	-0.63
	ΔE_{t-2}	-0.72	0.28	-2.55*
	C	0.24	0.05	4.63

R^2 = 0.67, Adj R^2 = -0.34, F-statistic = 2.05, D.W= 1.96

Δ represents first-difference series. / *denotes significance at 5% level.

TABLE 10: RESULTS OF VAR ESTIMATION SUB-PERIOD 1987-1997

Dependable variable	Explantory varibles	Coefficients	Standard Error	t- statistic
ΔRt	ΔR_{t-1}	0.29	0.51	0.57
	ΔR_{t-2}	0.58	0.48	1.20
	ΔE_{t-1}	0.21	0.26	0.79
	ΔE_{t-2}	0.38	0.26	1.44
	C	-0.10	0.50	-2.07

R^2 = 0.82, Adj R^2 = -0.64, F-statistic = 4.64, D.W= 1.97

Δ represents first-difference series.

5.4 FINDINGS FROM THE TABLE 9 & 10

It is observed from the table 9 & 10 that in expenditure equation, second period lagged revenue is significant at 5% levels. In revenue equation, all lagged independent variables are insignificant at 5% level.The JB Statistic shows normality of the residuals. LM and Portmanteau tests depict no serial correlation problem. All these findings indicate that second period lagged revenue affects current expenditure in Singapore during the sub-period 1987-1997. Since the coefficient is negative (-1.22) implying that the causal relationship is negative. Expenditure does not cause revenue in Singapore during the sub-period 1987 -

1997. The empirical findings support uni-directional causality running from revenue to expenditure in Singapore during the second sub-period 1987-1997. This sub- period is marked by **Tax-and- Spend Principle and supports the Buchanan and wagner (1977,1978) view of negative causal relationship.**This result is not conformity with the findings from the study of the historical dataset.

The summary of Johansen Cointegtation test results from 1998 to 2007 is shown in table 11

TABLE 11: SUMMARY OF JOHANSEN COINTEGRATION TEST DURING 1998-2007

Hypothesized no of CE (S)	Eigen values	Trace Statistic	5% critical value	1% critical value
*None***	0.991	38.20	15.41	20.04
At most1	0.009	0.07	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5% (1%) level.

Trace test indicates 1 cointegrating equation at both 5% and 1% levels.

Hypothesized no of CE (S)	Eigen values	Max-Eigen Statistic	5% critical value	1% critical value
*None***	0.99	38.12	14.07	18.63
At most1	0.009	0.07	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5% (1%) level.

Max-Eigen value test indicates 1 cointegrating equation at both 5% and 1% levels.

Based on the statistical results, both Trace and Max-Eigen tests with linear deterministic trend fail to reject the null of at most one cointegrating equation in the system. The results suggest that both revenue and expenditure have a long-run relationship during this sub-period. Vector Error correction model can't be used to investigate the short-run causality between revenue and expenditure n this sub-period because of lack of observation which might pose a problem to this study. Vector Autoregressive Model of lagged order 1 selected by SC & HQ is performed to investigate the causal relationship between revenue and expenditure in this sub-period. The results of VAR Model is reported in the following table 12 and 13.

TABLE 12: VAR ESTIMATION ON REVENUE EQUATION (1998-2007)

Dependable variable	Explantory variables	coefficients	Standard Error	t- Statistic
ΔR_t	Constant	0.007	0.07	0.09
	ΔR_{t-1}	0.25	0.44	0.57
	ΔE_{t-1}	-0.76	0.94	-0.81

R^2 = 0.19, Adj R^2 = -0.09, F-statistic = -0.06, D.W= 1.97

Δ represents first-difference series.

TABLE 13: VAR ESTIMATION ON EXPENDITURE EQUATION (1998-2007)

Dependable variable	Explantory variables	coefficients	Standard Error	t- Statistic
ΔE_t	Constant	0.02	0.02	1.02
	ΔR_{t-1}	0.26	0.13	1.93*
	ΔE_{t-1}	0.21	0.29	0.73

R^2 = 0.38, Adj R^2 = 0.17, F-statistic = 1.87, D.W= 1.96

Δ represents first-difference series. / *denotes significance at 5% level.

5.5 FINDINGS

It is observed from the table 12 and 13 that in revenue equation lagged revenue and lagged expenditure are insignificant at 5% level. In expenditure equation lagged revenue is significant at 5% level but lagged expenditure is insignificant at 5% level. All the results indicate that revenue causes expenditure in the period 1998-2007. This sub-period is marked by presence of unidirectional causality running from revenue to expenditure. Fiscal authority of Singapore takes the revenue decision first and then makes expenditure accordingly in this sub-period.

LIMITATIONS

Cointegration test and causality test through ECM can't be conducted due to the insufficient number of observation. This is one of the limitations in our study but with more data documentation we believe that similar studies could be undertaken.

6. CONCLUSION

The empirical results obtained from the study with historical dataset (1966-2007) indicate that the uni-directional causality running from revenue to expenditure exists in Singapore. This implies that Singapore government takes the decision of revenue first and then makes expenditure accordingly. The fiscal authority of Singapore is more concerned with the programmes of collecting tax revenues and non-tax revenues. This revenue profile determines the size of government expenditure in Singapore. Following structural breaks in the year 1987 and 1997 the parameters with historical dataset appears to be unstable. No causality between government revenue and its expenditure is observed in sub-period 1966 -1987. Fiscal authority of Singapore takes the revenue and expenditure decision independently in the first sub-period period 1966-1986. In the second sub-period 1987-1997, Uni-directional causality running from revenue to expenditure is observed. This result suggests that the budget process of Singapore is mainly driven by revenue consideration in the sub-period 1987-1997. In the third sub-period 1998-2007 Tax-and-Spend principle is observed and therefore revenue considerations play a dominant role in constituting the expenditure profile. All these findings as observed in different sub-periods confirm instability of the estimated causal relationship with historical dataset. Consequently, the estimated causal relationship with historical dataset may not provide reliable guideline for preparing fiscal policy. On the other hand, estimated causal relationship varies in different sub-periods. These may provide reliable guidelines for decision making process.

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