CHAPTER 9

STRUCTURAL STABILITY

9.1 Structural Stability

We have examined the relationship between government revenue and government expenditure on the historical data for chosen countries throughout the respective chosen periods of study and consequently different relationship between government revenue and expenditure have been established by assuming constant parameters in the relationship during entire study period. The above results will be suspect if there have been any structural change in the historical data. By structural change we mean that the values of the parameter of VECM and VAR Model do not remain the same during whole sample period. During the entire sample period, 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. We can't ignore the effects of such type of shocks throughout the entire time period. In presence of structural changes, the estimated econometric relationship between the macroeconomic variables fails to produce true economic relationship.

According to Lucas critique, it is inappropriate to estimate econometric models of the economy, in which endogenous variables appear as unrestricted functions of predetermined variables. The classical time series regression model is based on the assumption that the data generating processes are stationary- the constancy of parameter. An implicit assumption in this type of exercise is that the econometric relationship will remain stable under different scenarios. Lucas argues that dynamic economic theories hold that this assumption is not true. Consequently, we would expect that the econometric relationships might change as a result of a structural change over the entire time period.

As a researcher it is imperative to identify as to whether any structural changes did occurre in the long run dataset for sample countries throughout the study period. On the basis of structural changes the whole sample period will be divided into different sub-periods in which econometric relationships between two fiscal variables may undergo changes following structural changes in the economy.

9.2 Chow Test

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 data set. In order to trace any structural change in the relationship between these two fiscal variables following table on recursive residual estimation of the equation $E_t = \alpha + \beta R_t + \vartheta_t$ report the observed values of F-Statistic obtained from the recursive estimations of the relationship between revenue & expenditure during entire time span. The Cointegration, Error Correction Mechanism and VAR approach are used for each sub-period separately to detect the long-run relationship and direction of causality (Granger) between government revenue and government expenditure respectively for Indonesia, Malaysia, Singapore and Thailand. For better insight another test which is known as Plots of Recursive Residual Test and CU-SUM Square Test have been applied to detect the possible structural break throughout the whole span.

Section 9.3
Case study of Indonesia

9.3.1 Findings

Table 9.1 shows the observed values of F-Statistic obtained from the recursive estimations of the relationship between revenue & expenditure during the period 1968-2008. The Cointegration and Error Correction Mechanism are used for each sub-period separately to detect the long-run relationship and direction of causality between government revenue and government expenditure respectively.

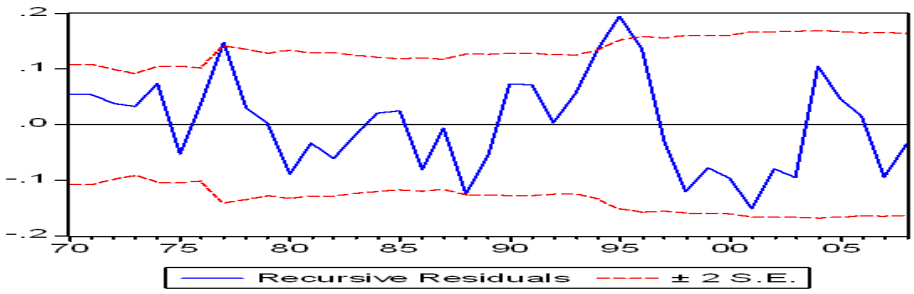
Table 9.1 (Indonesia)
Results of Chow Break-Point Test (1968-2008)

Year	*F-statistic*	*probability*
1972	0.696170	0.504902
1973	0.802396	0.455900
1974	0.922032	0.406654
1975	0.614856	0.546151
1976	1.89020	0.315886
1977	1.150361	0.327584
1978	0.778369	0.466527
1979	0.896213	0.416786
1980	1.049788	0.360204
1981	0.519314	0.599201
1982	0.392365	0.678235

1983	0.296788	0.744955
1984	0.298019	0.744052
1985	0.295447	0.745940
1986	0.324468	0.724948
1987	0.358573	0.701073
1988	0.39761	0.675322
1989	1.546054	0.226539
1990	3.161744	0.053994
1991	2.750419	0.076980
1992	2.372036	0.073970
1993	2.816088	0.072709
1994	2.623046	0.086036
1995	1.919718	0.160974
1996	2.482325	0.097361
1997	4.983213	0.012119
1998	**5.384128***	**0.008864**
1999	3.701371	0.034249
2000	3.013997	0.061283
2001	2.071944	0.140308
2002	0.760969	0.474385
2003	0.474040	0.626211
2004	0.959196	0.392524
2005	0.652131	0.526818.
2006	1.174831	0.320128

*denotes Chow break point.

Figure 9.1
Plots of Recursive Residuals



9.3.2 Findings

It is observed from the Table 9.1 and Figure 9.1 plots of recursive residuals that there exists a structural change in the relationship between government revenue & government expenditure during the whole period 1968-2008. The year 1998 has been considered as a possible break point year in view of the fact that the Indonesian economy was badly hit by the Asian financial crisis in 1997. On the basis of this, the entire sample periods have been divided into two sub-periods. The first sub-period covers the time period 1968-1997 and the next sub-periods range over 1998-2008.

The Cointegration and causality link between government revenue & government expenditure in two sub periods have been examined in two sub-sections 11.4 & 11.5 by using Johansen cointegration Method and Error Correction Mechanism (ECM) respectively. The results of cointegration are presented in the Tables 9.2.

Sub-section 9.3.I (1966-1997)
Indonesia

Results of cointegration in the sub-period 1966-1997 are being presented in the Table 9.2.

Table 9.2
Summary of Johansen Cointegration Test Results
(Sub-period 1966-1997)

Country	Lag order	Data trend:	None Model 1	None Model 2	Linear Model 3	Linear Model 4	Quadratic Model 5
		Rank or No. of CEs	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Indonesia	1	Trace	2	1	2	0	0
		Max – Eigen	2	1	0	0	0
	2	Trace	0	1	1	0	2
		Max – Eigen	0	1	0	0	0
	3	Trace	0	0	0	0	0
		Max – Eigen	0	0	0	0	0

9.3.I (a) Findings

It is observed from the Table 9.2 that in case of model 1, 2 and 3 with lag order 1 both revenue and expenditure are cointegrated during 1966 to 1997. For lag order 2, model 2 reports the presence of Cointgration between revenue and expenditure during this sub-period. This implies that in Indonesia there is a long-run relationship between government revenue and expenditure during this sub-period. Trace and Max-Eigen value reports no cointegration for lag order 3. So the above statistical results indicate the presence of Cointegration between these two variables in Indonesia for lag order 1 and 2.

Next we report the Granger causality test results by Vector Error Correction Model for lag order 1 during the first sub-period 1968 to 1997 for Indonesia.

The results of estimation of ECM during the sub-period 1968-1997 are being reported in the Tables 9.3 and 9.4.

Table 9.3
Estimates of Vector Error Correction Model
(Sub-Period 1968-1997)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔE_t (1)	Constant	0.11	0.02	4.69
	Z_{t-1}	-1.20	0.32	-3.72*
	ΔR_{t-1}	-0.83	0.34	-2.41*
	ΔE_{t-1}	0.64	0.31	2.02*
R-squared=0.38, Adj R-squared=0.30, F-statistic-=4.95, Log likelihood=26.04,AIC=-1.57, SBC=-1.38				

Δ denotes first difference.
Figures in the parentheses (.) denotes lag order
*denotes significance at 5% level.

Table 9.4
Estimates of Vector Error Correction Model
(Sub-Period 1968-1997)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔR_t	Constant	0.12	0.02	4.61
	Z_{t-2}	0.70	0.34	**-2.04***
	ΔR_{t-1}	-0.79	0.36	**-2.14***
	ΔE_{t-1}	0.63	0.33	**1.85***
R-squared=0.20, Adj R-squared=0.10, F-statistic-=1.98, Log likelihood=24.08,AIC=-1.43, SBC=-1.24				

Δ denotes first difference.
Figures in the parentheses (.) denotes lag order.
*denotes significance at 5% level.

9.3.I (b) Findings

It is observed from the Tables 9.3 and 9.4 that the error-correction term (Z_{t-1}) in expenditure equation is significant at 5% levels. In expenditure equation, first period lagged revenue and expenditure are significant at 5% level of significance. The error-term Z_{t-2} in revenue equation is also significant & all the independent lagged variables are also significant. All these findings indicate that there is a bi-directional causality between revenue and expenditure in Indonesia during the sub-period 1968-1997. During the sub-period 1968-1997 Fiscal synchronization principle exits in Indonesia.

9.3. I(c) Impulse Response Function

In order to quantify the interrelationship between revenue and expenditure in the first sub-period we present the results of Impulse response function and results of variance decomposition in the following tables. The impulse responses of expenditure and revenue are being presented in Tables 9.5 & 9.6

Table 9.5
Impulse Response of Government Expenditure
Sub-period-1966-1997

Response of GE		
Period	GE	GR
1	0.103099	0.000000
2	0.065189	0.016777
3	0.047926	0.080347
4	0.043181	0.098363
5	0.040606	0.106164
6	0.039450	0.109986
7	0.038958	0.111620
8	0.038737	0.112340
9	0.038639	0.112661
10	0.038596	0.112803
Cholesky Ordering GE GR		

9.3.I (d) Findings

It is observed from the Table 9.5 that as shocks transmitted through the revenue channel responses of expenditure maintained a rising trend since $t \geq 3$. Expenditure responded positively in the very early part of projection t=1,2 due to impulses transmitted through expenditure shocks but in the remaining part revenue shocks dominated the expenditure shocks in explaining the expenditure.

Table 9.6
Impulse Response of Government Revenue
Sub-period-1966-1997

Response of GR		
Period	GE	GR
1	0.084862	0.070901
2	0.062739	0.059194
3	0.049755	0.104383
4	0.046561	0.117262
5	0.044822	0.122476
6	0.044022	0.125105
7	0.043684	0.126230
8	0.043532	0.126723
9	0.043465	0.126943
10	0.043436	0.127041
Cholesky Ordering GE GR		

9.3.I(e) Findings

It is observed from the Table 9.6 that following shocks transmitted through the revenue channel responses of revenue exhibited a rising trend since $t \geq 3$. Revenue responded positively in the very early part of projection t=1, 2 due to impulses transmitted through expenditure shocks but in the remaining part revenue shocks dominated the expenditure shocks in explaining the revenue.

9.3.I (f) Summary of the above Findings

Revenue shocks were found to be a dominating factor in generating the variations in expenditure in the long run. Shocks transmitted through revenue channel changed the long run equilibrium base of expenditure. Expenditure shocks produced significant variations in revenue in the short-run but this shock was short-lived as it fails to change long-run equilibrium base of the revenue profile.

Variance Decompositions of revenue and expenditure are being reported in Tables 9.7 & 9.8

Table 9.7
Variance Decomposition of Government Revenue
Sub-period-1966-1997

Variance Decomposition of GR			
Period	S.E	GE	GR
1	0.110582	58.89146	41.10854
2	0.140244	56.62663	43.37337
3	0.181769	41.20214	58.79786
4	0.221265	32.23380	67.76620
5	0.256841	26.96793	73.03207
6	0.289062	23.61031	76.38969
7	0.318432	21.33777	78.66223
8	0.345474	19.71581	80.28419
9	0.370616	18.50700	81.49300
10	0.394186	17.57420	82.42580
Cholesky Ordering GE GR			

9.3.I (g) Findings

It is observed from the Table 9.7 that expenditure shocks contributed around 59% variations in revenue at t=1. At t=2 it explained around 57% variations in revenue. Since $t \geq 3$ revenue shocks dominated over the expenditure shocks in constituting the long run variations in revenue. Revenue shocks accounted for around 82% variations in revenue and expenditure shocks contributed around 18% variations in revenue.

Table 9.8
Variance Decomposition of Government Expenditure
Sub-period-1966-1997

Variance Decomposition of GE			
Period	S.E	GE	GR
1	0.103099	100.0000	0.000000
2	0.123128	98.14332	1.856681
3	0.154638	71.82625	28.17375
4	0.188289	53.70643	46.29357
5	0.219938	42.77075	57.22925
6	0.249050	35.86516	64.13484
7	0.275685	31.26658	68.73342
8	0.300205	28.03264	71.96736
9	0.322968	25.65166	74.34834
10	0.344271	23.83219	76.16781
Cholesky Ordering GE GR			

9.3.I (h) Findings

It is observed from the Table 9.8 that expenditure shocks contributed whole variations in expenditure at t=1. At t=2 it accounted for around 98% variations in expenditure. Since $t \geq 3$ revenue shocks dominated over the expenditure shocks in constituting the long run variations in expenditure. Revenue shocks accounted for around 76% variations in expenditure and expenditure shocks contributed around 24% variations in expenditure in the long-run.

9.3.I (i) Summary of the above Findings

It has been observed from the analysis of impulse response function and variance Decomposition that revenue shocks and expenditure shocks were the main guiding factor behind the constitution of expenditure profile and revenue profile. Revenue shocks took the dominant role in generating the variations in revenue while expenditure shocks explained moderate variations in revenue and expenditure which reflects the dependency of expenditure on revenue to some extent. The joint analysis suggests that feedback from revenue to expenditure was found to be strong but the opposite relationship between revenue and expenditure was found to be very weak during the sub-period 1966-1997. The empirical evidence accepts the fiscal synchronization principle in Indonesia during this sub-period.

Sub-Section 9.3.II (1998-2008)

Indonesia

The results of cointegration during the sub-period 1998-2008 are reported in the Tables 9.9

Table 9.9
Summary of Johansen Cointegration Test Results
(Sub-period 1998-2008)

Country	Lag order	Data trend:	None Model 1	None Model 2	Linear Model 3	Linear Model 4	Quadratic Model 5
		Rank or No. of CEs	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Indonesia	1	Trace	1	0	0	0	0
		Max – Eigen	1	0	0	0	0

9.3.II (a)Findings

It is observed from the Table 9.9 that in case of model 1 having no intercept and no trend with lag order 1 both Trace and Max-Eigen results indicate that both revenue and expenditure are cointegrated during 1998 to 2008. This implies that in Indonesia there is a long-run relationship between government revenue and expenditure during this sub-period. Lag order 2 and 3 can't be applied due to lack of observations.

The results of estimation of ECM during the sub-period 1998-2008 are reported in the tables 9.10 and 9.11.

Table 9.10
Results of Estimation of VECM
(Sub-period 1998-2008)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔE_t (1)	Constant	0.15	0.04	3.30
	Z_{t-1}	-1.62	0.69	**-2.32***
	ΔR_{t-1}	-1.81	0.77	**-2.35***
	ΔE_{t-1}	0.93	0.59	1.57
R-squared=0.63, Adj R-squared=0.41, F-statistic-=2.91, Log likelihood=9.69,AIC=-1.26, SBC=-1.17				

* denotes the significance at 5%.

Figures in the parentheses (.) denotes lag order.

Table 9.11
Results of Estimation of VECM
(Sub-period 1998-2008)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔR_t (1)	Constant	0.15	0.04	3.26
	Z_{t-2}	0.81	0.68	1.17
	ΔR_{t-1}	-1.57	0.76	**-2.07***
	ΔE_{t-1}	0.82	0.58	1.40
R-squared=0.49, Adj R-squared=0.19, F-statistic-=1.65, Log likelihood=9.81,AIC=-1.29, SBC=-1.20				

* denotes the significance at 5%.

Figures in the parentheses (.) denotes lag order.

9.3.II (b)Findings

It is evident from the tables 9.10 and 9.11 that in expenditure equation the error correction term Z_{t-1} is significant at 5% level and the first period lagged revenue is also significant at 5% level. In revenue equation the error correction term Z_{t-2} is insignificant at 5% level and first period lagged expenditure is also insignificant at 5% level. These results indicate that revenue causes (Granger) expenditure during the sub-period 1998-2008.

9.3.II (c) Summary of the above Findings

During the first sub-period 1966-1997 both revenue and expenditure have a long-run equilibrium relationship and Bidirectional causality link between government revenue and expenditure exists in Indonesia. During the sub-period 1998-2008, the empirical results suggest that unidirectional causality running from revenue to expenditure exists in Indonesia. These empirical findings were not in conformity with the findings of the study from the historical dataset.

The impulse responses of revenue and expenditure of the estimated VECM are being presented in Tables 9.12 and 9.13.

Table 9.12
Impulse Response of Government Revenue
Sub-period-1998-2008

Response of GR		
Period	GE	GR
1	0.073584	0.080452
2	0.013868	0.014114
3	0.028019	0.129283
4	0.017338	0.066652
5	0.023003	0.106367
6	0.019507	0.083017
7	0.021566	0.097037

8	0.020333	0.088686
9	0.021068	0.093673
10	0.020629	0.090698
Cholesky Ordering GE GR		

9.3.II (d)Findings

It is observed from the Table 9.12 that following shocks transmitted through the revenue channel responses of revenue exhibited a rising trend since $t \geq 1$. During the projection period revenue shocks dominated over the expenditure shocks in producing the variations in revenue.

Table 9.13
Impulse response of Government Expenditure
Sub-period-1998-2008

Response of GE		
Period	GE	GR
1	0.110563	0.000000
2	0.011862	-0.025022
3	0.029752	0.133960
4	0.014746	0.050942
5	0.022341	0.104964
6	0.017587	0.073400
7	0.020372	0.092401
8	0.018701	0.081093
9	0.019696	0.087847
10	0.019102	0.083818
Cholesky Ordering GE GR		

9.3. II (e) Findings

It is observed from the Table 9.13 that the shocks transmitted through the revenue channel responses of expenditure maintained a rising trend since $t \geq 3$. Expenditure dominated over the revenue shocks in generating the variations in the very early part of projection t=1, 2 due to impulses transmitted through expenditure shocks but in the remaining part revenue shocks played insignificant variations in expenditure.

9.3. II (f) Summary of the above Findings

Revenue shocks were found to be a dominating factor in generating variations in expenditure in the long run. Shocks transmitted through revenue channel changed the long run equilibrium base of expenditure. Expenditure shocks produced insignificant variations in revenue but this shock was short-lived as it fails to change long-run equilibrium base of the revenue profile.

9.3. II (g) Variance Decomposition

Variance Decompositions of revenue and expenditure of estimated VECM are being reported in tables 9.14 and 9.15.

Table 9.14
Variance Decomposition of Government Revenue
Sub-period-1998-2008

Variance Decomposition of GR			
Period	S.E	GE	GR
1	0.109028	45.55008	54.44992
2	0.110809	45.66393	54.33607
3	0.172563	21.46566	78.53434
4	0.185798	19.38714	80.61286
5	0.215323	15.57618	84.42382
6	0.231595	14.17376	85.82624
7	0.252027	12.70103	87.29897
8	0.267948	11.81231	88.18769
9	0.284631	11.01607	88.98393
10	0.299443	10.42775	89.57225
Cholesky Ordering GE GR			

9.3.II (h) Findings

It is observed from the Table 9.14 that expenditure shocks contributed around 45% variations in revenue at t=1, 2. It explained around 11% variations in revenue since $t \geq 3$ revenue shocks dominated over the expenditure shocks in constituting the long run variations in revenue. Revenue shocks accounted for around 89% variations in revenue and expenditure shocks contributed around 11% variations in revenue.

Table 9.15
Variance Decomposition of Government Expenditure
Sub-period-1998-2008

Variance Decomposition of GE			
Period	S.E	GE	GR
1	0.110563	100.0000	0.000000
2	0.113978	95.18035	4.819648
3	0.178386	41.63898	58.36102
4	0.186102	38.88542	61.11458
5	0.214827	30.26332	69.73668
6	0.227700	27.53468	72.46532
7	0.246577	24.16277	75.83723
8	0.260242	22.20823	77.79177
9	0.275374	20.34612	79.65388
10	0.288481	18.97777	81.02223
Cholesky Ordering GE GR			

9.3.II (i) Findings

It is observed from the Table 9.15 that expenditure shocks contributed entire variations in expenditure at t=1. At t=2 it accounted for around 95% variations in expenditure. Since $t \geq 3$ revenue shocks dominated over the expenditure shocks in constituting the long run variations in expenditure. Revenue shocks accounted for more than 81% variations in expenditure and expenditure shocks contributed less than 19% variations in expenditure in the long-run.

9.3.II (j) Summary of the above Findings

It has been observed from the analysis of variance Decomposition and impulse response function that revenue shocks were the main guiding factor behind the constitution of expenditure profile. Revenue shocks took subordinate role in generating the variations in revenue and expenditure profile. Expenditure shocks took in-dominant role in producing the variations in revenue. All these results indicate the presence of causality running from revenue to expenditure. Thus in the fiscal management in Indonesia the decision about revenue was taken first and then expenditure decision followed such that Tax-and- Spend principle during the sub-period 1998-2008 became evident.

Section 9.4
Case Study of Malaysia

Table 9.16

Results of Chow Break-Point Test (1963-2007)

During 1963-2007			**During 1981-2007**	
Year	F-statistic	probability	F-statistic	probability
1965	0.352358	0.705136		
1966	0.289229	0.750356		
1967	0.285257	0.753301		
1968	0.311502	0.734064		
1969	0.398829	0.673681		
1970	0.666416	0.519001		
1971	1.221896	0.305176		
1972	0.896403	0.415851	--	--
1973	0.921688	0.405932	--	--
1974	1.091372	0.345210	--	--
1975	1.665739	0.201590	--	--
1976	1.927674	0.158445	--	--
1977	2.195346	0.124237	--	--
1978	2.357918	0.107325	--	--
1979	2.752215	0.075585	--	--
1980	2.815292	0.715020	--	--
1981	2.528622	0.092143	--	--
1982	3.484940	0.040014	--	--
1983	**5.087925***	**.010623**	--	--
1984	5.885193	.005663	4.018228	.031867
1985	4.665319	.014945	4.013985	.031967

1986	3.540347	.038164	4.049719	.031133
1987	3.931582	.027412	4.315907	.025612
1988	5.138080	.010205	4.445148	.023324
1989	4.489675	.017253	4.533856	.021882
1990	5.398056	.008298	4.053519	.031045
1991	7.116686	.002223	4.314514	.025638
1992	7.831464	.001317	5.022182	.015497
1993	8.745532	.000687	5.929740	.008379
1994	4.744113	.014018	5.334709	.012493
1995	1.612135	.211848	6.621818	.005354
1996	0.509143	.604760	7.968331	.002348
1997	0.371777	.691808	10.51415	.000571
1998	1.589586	.216326	**23.82357***	**.000000**
1999	2.562497	0.089408	28.76647	.00000
2000	3.030990	.059201	24.54006	.00000
2001	1.478377	.239908	10.96669	.00000
2002	0.990562	.380080	5.830536	.0089
2003	0.503560	.608064	3.42342	.062159
2004	0.200432	.819174	1.629278	.217899
2005	0.077284	.925761	.892235	.423452
2006	0.27666	.972731	.489175	.619367
2007	--	--	--	--

*indicates Chow break point.

Figure 9.2
Figure: Plots of Recursive Residuals

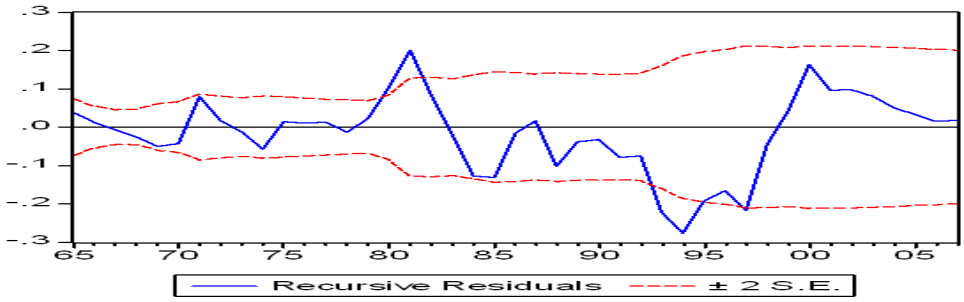
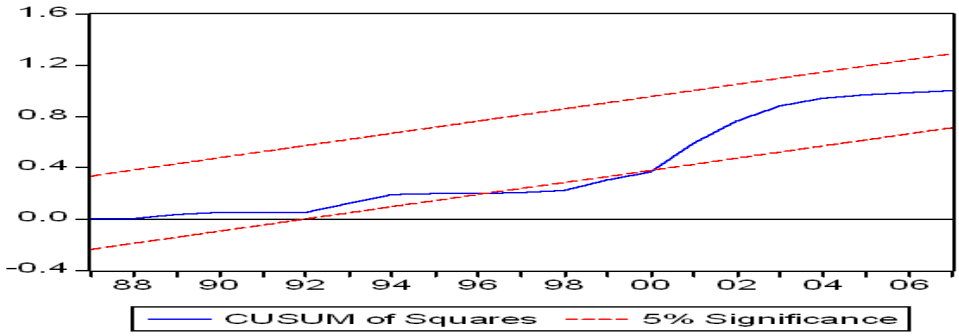


Figure 9.3
Figure: Plots of CUSUM of Squares



9.4.1Findings

It is observed from the Table 9.16 and Figures 9.2 and 9.3 that there exist two possible structural changes in the relationship between government revenue & government expenditure during the whole period 1963-2007 in Malaysia. The first possible structural change occurred in 1983 due the worldwide recession in 1981-82 and consequently depressed the prices of Malaysia's traditional commodity exports, growth slackened and investment fell The year 1981-82 was witnessed as commodity shocks. The first sub-period covers the time period 1963-1984. The above table and figure indicate another structural break in the year 1998.The second possible structural change occurred in the year 1998 due to falling currency values in the wake of the financial crisis of 1997-98 which pushed the Malaysia's economy to further external shocks. The time period 1985-2007 depicts another sub-period with singular structural beak 1998.

Between the two sub-periods, the cointegration and Granger causality link between government revenue & government expenditure through VECM are examined in sub section 9.4.I and 9.4.II

Sub section- 9.4.I
Malaysia (1963-1984)

Results of Johansen Cointgration Test and VECM are being presented below. The optimal lag length is determined by Akaike Information Criterion.

Table 9.17
Summary of Johansen cointegration Test Results
(Sub-period 1963-1984)

Country	Lag order	Data trend: None Model 1	None Model 2	Linear Model 3	Linear Model 4	Quadratic Model 5	
		Rank or No. of CEs	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Malaysia	1	Trace	2	2	1	0	2
		Max – Eigen	2	2	1	1	2

9.4.I(a)Findings

It is observed from the Table 9.17 that in case of all model with lag order 1 both Trace and Max-Eigen results indicate that both revenue and expenditure are cointegrated during 1963 to 1984. This implies that in Malaysia there is a long-run relationship between government revenue and expenditure during this sub-period.

Table 9.18
Results of Estimation of VECM
(Sub-period 1963-1984)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔE_t (1)	Constant	0.07	0.02	3.84
	Z_{t-1}	-1.33	0.25	**-5.13***
	ΔR_{t-1}	-0.81	0.29	**-2.81***
	ΔE_{t-1}	0.81	0.21	**3.82***
R-squared=0.68, Adj R-squared=0.62, F-statistic-=11.55, Log likelihood=33.07,AIC=-2.90, SBC=-2.70				

* denotes the significance at 5%.
Δ denotes first difference order. / Figures in the parentheses (.) denotes lag order.

Table 9.19
Results of Estimation of VECM
(Sub-period 1963-1984)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔR_t (1)	Constant	0.11	0.02	5.19
	Z_{t-2}	0.67	0.27	**2.44***
	ΔR_{t-1}	-0.59	0.30	**-1.92***
	ΔE_{t-1}	0.25	0.22	1.11
R-squared=0.28, Adj R-squared=0.15, F-statistic-=2.17, Log likelihood= 31.93,AIC=-2.79, SBC=-2.59				

Δ denotes first difference order.
* denotes the significance at 5%./ Figures in the parentheses (.) denotes lag order.

9.4.I(b)Findings

It is observed from the tables 9.18 and 9.19 that the error-correction term (Z_{t-1}) in expenditure equation is significant at 5% levels. In expenditure equation, first period lagged revenue and expenditure are significant at 5% level of significance. The error-term Z_{t-2} in revenue equation is significant & first period lagged revenue is also significant. All these findings indicate that there is a uni-directional causality running from revenue to expenditure in Malaysia during the sub-period 1963-1985.

The impulse responses of expenditure and revenue are presented in tables 9.20 and 9.21

Table 9.20
Impulse Response of Government Expenditure
Sub-period-1963-1984

Response of GE		
Period	GE	GR
1	0.028684	0.043082
2	0.044473	0.024656
3	0.071808	-0.029108
4	0.075729	-0.069062
5	0.063625	-0.069729
6	0.046721	-0.040266
7	0.039193	-0.009803
8	0.044003	-0.000886
9	0.054638	-0.014694
10	0.061828	-0.035453
Cholesky Ordering GR GE		

9.4.I(c) Findings

It is observed from the Table 9.20 that following shocks transmitted through the revenue channel, responses of expenditure produced negative trend since $t \geq 3$. Expenditure responded positively for $1 \leq t \leq 10$ due to impulses transmitted through expenditure shocks. During the whole projection period expenditure shocks dominated over revenue shocks in generating variations in revenue profile.

Table 9.21
Impulse Response of Government Revenue
Sub-period-1963-1984

Response of GR		
Period	GE	GR
1	0.054789	0.000000
2	0.048334	-0.016155
3	0.060773	-0.037441
4	0.056162	-0.045212
5	0.050261	-0.037790
6	0.044720	-0.024154
7	0.044610	-0.015927
8	0.048255	-0.017758
9	0.052199	-0.025814
10	0.053424	-0.032641
Cholesky Ordering GE GR		

9.4.I (d)Findings

It is observed from the Table 9.21 that in response to shocks transmitted through the revenue channel, responses of revenue exhibited a negative trend since $t \geq 2$. Revenue did not respond at t=1. Impulses transmitted through expenditure channel, revenue produced significant

variations for 1≤ t≤ 10. Expenditure shocks became the dominant factor in explaining the variations in revenue.

9.4.I (e) Summary of the above Findings

Expenditure shocks were found to be a dominating factor in generating variations in expenditure and revenue. Expenditure shocks changed the long run equilibrium base of revenue profile. Revenue shocks produced insignificant variations in revenue and expenditure.

Variance Decompositions of forecast errors for revenue and expenditure are being reported in Tables 9.22 and 9.23

Table 9.22
Variance Decomposition of Government Revenue
Sub-period-1963-1984

Variance Decomposition of GR			
Period	S.E	GR	GE
1	0.054789	100.0000	0.000000
2	0.074827	95.33883	4.661168
3	0.103413	84.45122	15.54878
4	0.126066	76.67516	23.32484
5	0.140879	74.12677	25.87323
6	0.149767	74.50559	25.49441
7	0.157079	75.79583	24.20417
8	0.165281	76.98402	23.01598
9	0.175240	77.35566	22.64434
10	0.186088	76.84203	23.15797
Cholesky Ordering GR GE			

9.4.I(f)Findings

It is observed from the Table 9.22 that revenue shocks contributed around 77% of variations in revenue at t ≥ 4. At t=1 total revenue variations were mainly due to revenue shocks and at t=2 it explained around 95% of variations in revenue. Since t ≥ 4 expenditure shocks accounted for 24% of variations in revenue. Revenue shocks dominated over the expenditure shocks in constituting the variations in revenue for1 ≤ t≤ 10.

Table 9.23
Variance Decomposition of Government Expenditure
Sub-period-1963-1984

Variance Decomposition of GE			
Period	S.E	GR	GE
1	0.051758	30.71401	69.28599
2	0.072557	53.19699	46.80301
3	0.106152	70.61415	29.38585
4	0.147556	62.88529	37.11471
5	0.175166	57.81693	42.18307
6	0.185708	57.76863	42.23137

7	0.190051	59.41097	40.58903
8	0.195081	61.47487	38.52513
9	0.203120	63.94075	36.05925
10	0.215261	65.18107	34.81893
Cholesky Ordering GE GR			

9.4.I(g)Findings

It is observed from the Table 9.23 that revenue shocks dominated over the expenditure shocks in producing the variations in expenditure profile for $2 \leq t \leq 10$. At t= 1 expenditure shock was the dominant factor behind the variations in expenditure. Expenditure shocks constituted at least 69% variations in expenditure while revenue shocks accounted for about 31% variations in expenditure. At $t \rightarrow \infty$ contribution of revenue shocks was about 65% while that of expenditure was 35%.

9.4. I(h)Summary of the above Findings

It is therefore observed from the analysis of impulse response function and variance decomposition that revenue shocks were the main guiding factor behind the constitution of expenditure profile. Revenue shocks took the dominant role in generating the variations in revenue and expenditure. The joint analysis indicates that the causality running from revenue to expenditure was stronger. It therefore, offers that the Malaysia government followed Tax-and-Spend principle in the sub-period 1963-1984 for fiscal management.

Sub section-9.4.II

Malaysia (19985-2007)

Let us consider the results of Johansen cointegration test and VECM for testing Granger causal relationship between government revenue and its expenditure in the sub-period 1985-2007.

Results of Johansen cointegration test are presented in Table 9.24

Table 9.24
Summary of Johansen cointegration Test Results
(Sub-period 1985-2007)

Country	Lag order	Data trend:	None Model 1	None Model 2	Linear Model 3	Linear Model 4	Quadratic Model 5
		Rank or No. of CEs	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Malaysia	1	Trace	1	0	0	0	2
		Max – Eigen	1	0	0	0	0
	2	Trace	1	0	0	1	2
		Max – Eigen	1	0	0	1	2
	3	Trace	2	1	0	0	2
		Max – Eigen	2	1	0	0	0

9.4.II(a)Findings

It is observed from the Table 9.24 that in case of model 1with no intercept and no trend for lag orders 1 and 2, Trace and Max-Eigen Statistics indicate one Cointgrating vector suggesting that both revenue and expenditure are cointegrated during the sub period 1985-2007. For lag order 3, model 2 with intercept and no trend shows the presence of Cointgration between revenue and expenditure during this sub-period. This implies that in Malaysia there is a long-run relationship between government revenue and expenditure during this sub-period. Thus the findings indicate the evidence of Cointegration in Malaysia over the period of study.

Table 9.25
Results of Estimation of VECM
(Sub-period 1985-2007)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔR_t (3)	Constant	0.11	0.03	3.11
	Z_{t-1}	-0.68	0.28	**-2.38***
	ΔR_{t-1}	0.16	0.32	0.51
	ΔR_{t-2}	0.03	0.31	0.12
	ΔR_{t-3}	-0.007	0.30	-0.02
	ΔE_{t-1}	-0.53	0.36	-1.46**
	ΔE_{t-2}	-0.17	0.35	-0.48
	ΔE_{t-3}	-0.33	0.35	-0.96
R-squared=0.43, Adj R-squared=0.06, F-statistic-=1.19, Log likelihood=23.68,AIC=-1.65, SBC=-1.26				

Δ denotes first difference.
Figures in the parentheses (.) denotes lag order.
*denotes significance at 5% level. **denotes significance at 10% level.

Table 9.26
Results of Estimation of VECM
(Sub-period 1985-2007)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔE_t (3)	Constant	0.13	0.03	3.73
	Z_{t-2}	-0.29	0.26	-1.10
	ΔR_{t-1}	-0.13	0.30	-0.43
	ΔR_{t-2}	-0.01	0.28	-0.05
	ΔR_{t-3}	-0.61	0.28	**-2.18***
	ΔE_{t-1}	-0.25	0.33	-0.73
	ΔE_{t-2}	-0.12	0.33	-0.38
	ΔE_{t-3}	0.08	0.32	0.26
R-squared=0.53, Adj R-squared=0.23, F-statistic-= 1.78, Log likelihood=25.24,AIC=-1.81, SBC=-1.41				

Δ denotes first difference.
Figures in the parentheses (.) denotes lag order.
*denotes significance at 5% level.

9.4.II(b) Findings

It is observed from the Table 9.25 and 9.26 that the error-correction term (Z_{t-1}) in revenue equation is significant at 5% levels. In revenue equation, all the lagged coefficients of revenue and expenditure except first period lagged expenditure are insignificant at 5% level of significance. The error-term Z_{t-2} in expenditure equation is insignificant & all lagged coefficients except third period lagged coefficient of revenue are not significant at 5% level. All these findings indicate that there is a uni-directional causality running from expenditure to revenue in Malaysia during the sub-period 1985-2007. This outcome suggests that spend-and-tax principle was followed in Malaysia over the sub-period 1985-2007.

The responses of Impulse of revenue and expenditure is presented in the following Table 9.27 and 9.28

Table 9.27
Impulse Response of Government Expenditure
Sub-period-1985-2007

Response of GE		
Period	GE	GR
1	0.063190	0.055679
2	0.026169	0.057192
3	0.023663	0.062932
4	-0.024495	0.071663
5	0.003758	0.074782
6	0.004050	0.061915
7	0.016373	0.060980
8	0.008617	0.048041
9	0.023784	0.038676
10	0.020811	0.033412
Cholesky Ordering GR GE		

9.4.II(c) Findings

It is observed from the Table 9.27 that following shocks transmitted through the revenue channel, expenditure exhibited positive response and dominated the expenditure shocks since $t \geq 2$. Revenue innovation had a permanent effect on expenditure profile. Revenue shocks were more dominant than the expenditure shocks in constituting the new higher level of long-run equilibrium.

Table 9.28
Impulse response of Government Revenue
Sub-period-1985-2007

Response of GR		
Period	GR	GE
1	0.091443	0.000000
2	0.051384	0.006342
3	0.039074	0.029818
4	0.009760	0.032270
5	0.020917	0.051911
6	0.003893	0.063136
7	0.012984	0.066262
8	-0.000734	0.063112
9	0.005487	0.062203
10	0.006662	0.052115
Cholesky Ordering GR GE		

9.4.II (d)Findings

Table 9.28 reports that the revenue responses to a one unit shocks in revenue were very significant for $1 \leq t \leq 3$. For $4 \leq t \leq 10$ expenditure shocks dominated over revenue shocks in generating variations in revenue. Expenditure shocks played greater variations in revenue in the long-run. Revenue shocks had a positive impact on revenue profile in the short-run.

9.4.II (e)Summary of the above findings

Revenue shocks and expenditure shocks were found to be a dominating factor in generating the variations in expenditure and revenue respectively. Revenue shocks changed the long run equilibrium base of expenditure profile. Expenditure shocks produced significant variations in revenue and expenditure.

Variance Decompositions of revenue and expenditure are being presented in the tables 9.29 and 9.30

Table 9.29
Variance Decomposition of Government Revenue
Sub-period-1985-2007

Variance Decomposition of GR			
Period	S.E	GR	GE
1	0.091443	100.0000	0.000000
2	0.105083	99.63573	0.364272
3	0.116010	93.09468	6.905324
4	0.120809	86.49748	13.50252
5	0.133144	73.68215	26.31785
6	0.147406	60.18330	39.81670
7	0.162135	50.38658	49.61342
8	0.173987	43.75753	56.24247
9	0.184853	38.85240	61.14760
10	0.192175	36.06864	63.93136
Cholesky Ordering GE GR			

9.4.II(f)Findings

It is observed from the Table 9.29 that revenue shocks contributed entire variations in revenue at t=1. For $2 \leq t \leq 7$ total revenue variations were mainly due to revenue shocks. Since $t \geq 8$ expenditure shocks dominated over the revenue shocks in producing the variations in revenue. As $t \rightarrow \infty$ contribution of expenditure in the variation of revenue was 64% while that of revenue was 36%.

Table 9.30
Variance Decomposition of Government Expenditure
Sub-period-1985-2007

Variance Decomposition of GE			
Period	S.E	GR	GE
1	0.084220	56.29321	43.70679
2	0.105113	42.33708	57.66292
3	0.124777	33.64130	66.35870
4	0.145962	27.40076	72.59924
5	0.164046	21.74482	78.25518
6	0.175388	19.07667	80.92333
7	0.186407	17.65954	82.34046
8	0.192691	16.72649	83.27351
9	0.197968	17.29005	82.70995
10	0.201844	17.69554	82.30446
Cholesky Ordering GR GE			

9.4. II(g) Findings

It is observed from the Table 9.30 that expenditure shocks dominated over the revenue shocks in producing the variations in expenditure for $2 \leq t. \leq 10$. At t=1 revenue shock was the dominant factor behind the variations in expenditure. At t>6 expenditure shocks constituted at least 82% variations in expenditure while revenue shocks accounted for 18% variations in expenditure.

9.4.II (h) Summary of the above Findings

It is, therefore, observed from the analysis of impulse response function and variance Decomposition that expenditure shocks were the main guiding factor behind the constitution of revenue profile. Expenditure shocks took greater role than revenue shocks in generating the variations in expenditure. The joint analysis indicates that the causality running from expenditure to revenue was strong and the opposite relationship between revenue and expenditure was found to be weak. The empirical results suggest that in Malaysia fiscal authority followed spend-and-tax principle in the sub-period 1985-2007.

Section 9.5
Case Study of Singapore

Table 9.31
Results of Chow Break-Point Test (1966-2007)

During 1966-2007			**During 1987-2007**	
Year	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
2001	7.360371	0.001987	20.38233	0.000031
2002	4.577305	0.016511	7.650757	0.004270
2003	1.910481	0.161958	3.100364	0.071130
2004	0.967592	0.389162	1.960041	0.171406
2005	0.268697	0.765815	0.986982	0.393072
2006	0.127983	0.880246	0.49389	0.618756
2007	----	---	---	---

*indicates Chow break point.

Figure 9.4

Plots of Recursive Residuals (1966-2007)

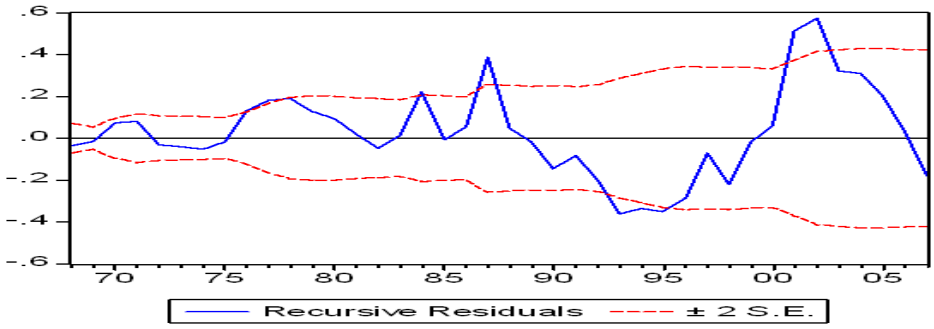
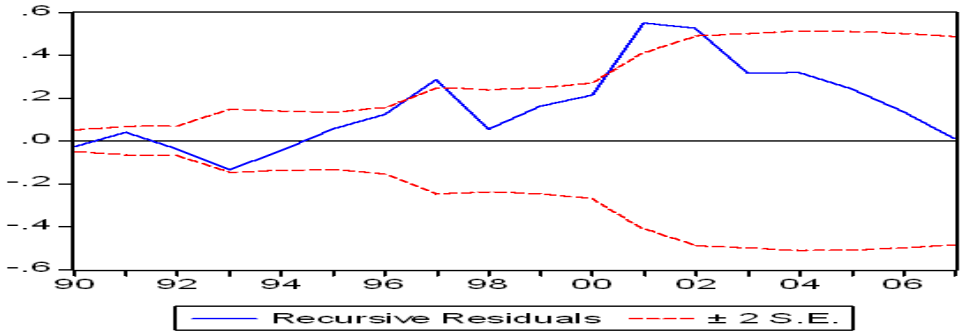


Figure 9.5

Plots of Recursive Residuals (1988-2007)



9.5.1Findings

It is observed from the Tables 9.31 as well as Figure 9.4 and 9.5 that there exist two possible structural changes in the relationship between government revenue & government expenditure over the period 1966-2007. Chow test and plots of recursive residual confirm possible structural breaks in the year 1987 and 1998. These breaks were due to reduction in fiscal surplus in view of negative growth in 1985 in Singapore and the year 1997 was marked by higher level of spending and lesser collection of revenue for Asian financial crisis respectively. Two distinct sub-periods persist in the historical dataset. The first sub-period covers the time period 1966-1987. The second sub-periods ranges over 1988-2007 with another break 1997.

In two different sub-periods, the cointegration and Granger causality link between government revenue & government expenditure through VECM are being examined in sub sections 9.5.I and 9.5.II

Sub-section 9.5.I
Singapore (1966-1987)

The long-run relationship between these two fiscal variables is performed for the sub-period 1966-1987 through Johansen Cointegration Test.

Table 9.32
Johansen Cointegration Results
Sub-Period 1966-1987

Country	Lag order	Data trend:	None Model 1	None Model 2	Linear Model 3	Linear Model 4	Quadratic Model 5
		Rank or No. of CEs	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Singapore	1	Trace	0	0	0	0	0
		Max – Eigen	0	0	0	0	0
	2	Trace	0	0	0	0	0
		Max – Eigen	0	0	0	0	0
	3	Trace	2	1	1	1	1
		Max – Eigen	2	1	1	1	1

9.5.I (a) Findings

It is observed from the Table 9.32 that for lag order 1 and 2 Trace and Max-Eigen Statistics accept the null hypothesis of no cointegration for all models showing no long-run relationship between two fiscal variables. But for lag order 3 Trace and Max-Eigen Statistics reject the null hypothesis of no cointegration at 5% level of significance. Both test results suggest that a long-run equilibrium relationship between these fiscal variables does exist in this sub period. For further analysis the vector Error Correction Model is used to investigate the Granger causality between government revenue and government expenditure for the sub-period 1966-1987.

Table 9.33
Results of Estimation of VECM
(Sub-period 1966-1987)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔR_t (3)	Constant	0.24	0.04	5.31
	Z_{t-1}	0.65	0.33	**4.95***
	ΔR_{t-1}	0.75	0.25	**2.96***
	ΔR_{t-2}	0.42	0.21	**1.93***
	ΔR_{t-3}	0.79	0.24	**3.23***
	ΔE_{t-1}	-1.33	0.31	**-4.19***
	ΔE_{t-2}	-0.59	0.25	**-2.35***
	ΔE_{t-3}	-1.48	0.28	**-5.25***
R-squared=0.77, Adj R-squared=0.61, F-statistic-=4.92, Log likelihood=27.24,AIC=-2.13, SBC=-1.74				

Δ denotes first difference.
Figures in the parentheses (.) denotes lag order.
*denotes significance at 5% level.

Table 9.34
Results of Estimation of VECM
(Sub-period 1966-1987)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔE_t (3)	Constant	0.17	0.06	2.83
	Z_{t-2}	-0.21	0.45	0.47
	ΔR_{t-1}	0.39	0.34	1.12
	ΔR_{t-2}	0.32	0.29	1.07
	ΔR_{t-3}	-0.35	0.33	-1.04
	ΔE_{t-1}	-0.20	0.43	-0.47
	ΔE_{t-2}	-0.53	0.34	-1.54
	ΔE_{t-3}	-0.20	0.38	-0.53
R-squared=0.50, Adj R-squared=0.15, F-statistic-= 1.44, Log likelihood=21.63,AIC=-1.51, SBC=-1.20				

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Δ denotes first difference.
Figures in the parentheses (.) denotes lag order
*denotes significance at 5% level.

9.5.I(b) Findings

It is observed from the Tables 9.33 and 9.34 that the error-correction term (Z_{t-2}) in revenue equation is significant at 5% levels. In revenue equation, all the coefficients of lagged independent variables are significant at 5% level of significance. The error-term Z_{t-1} in expenditure equation is insignificant & all the coefficients of lagged independent variables are not significant at 5% level. All these results confirm that there is a uni-directional causality running from expenditure to revenue in Singapore during the sub-period 1966-1987. This outcome suggests that spend-and tax doctrine was adopted in Singapore over the period 1966-1987.

Impulse analysis and variance Decompositions are used to examine the relationship between the variables as observed from the Error Correction Mechanism.

The impulse responses of revenue and expenditure are being presented in the following Tables 9.35 & 9.36

Table 9.35
Impulse Response of Government Expenditure
Sub-period-1966-1987

Response of GE		
Period	GE	GR
1	0.097588	0.000000
2	0.103685	0.011884
3	0.076952	0.008711
4	0.072184	-0.042915
5	0.086041	-0.018223
6	0.069675	0.002984
7	0.124713	-0.036572
8	0.090644	0.014216
9	0.013836	0.024466
10	0.088110	-0.068755
Cholesky Ordering GR GE		

9.5. I(c) Findings

It is observed from the Table 9.35 that, in response to shocks transmitted through the expenditure channel, expenditure exhibited positive movement and dominated the revenue shocks since $t \geq 1$. Expenditure innovation had a permanent effect on expenditure profile. Expenditure shocks were more dominant than revenue shocks in constituting the new higher level of long-run equilibrium.

Table 9.36
Impulse Response of Government Revenue
Sub-period-1966-1987

Response of GR		
Period	GE	GR
1	0.028408	0.065560
2	0.034455	0.008763
3	0.099906	-0.017181
4	0.026577	0.030914
5	0.092604	-0.056641
6	0.179554	-0.059035
7	0.058886	0.075052
8	0.082459	-0.072807
9	0.171510	-0.064399
10	-0.061794	0.146346
Cholesky Ordering GR GE		

9.5. I(d) Findings

Table 9.36 reports that revenue shocks generated significant variations in revenue at t=1. For $2 \leq t \leq 10$ expenditure shocks dominated over the revenue shocks in generating the variations in revenue. Expenditure shocks played greater variations in revenue in the long-run. Expenditure shocks had a permanent impact on revenue profile.

9.5.I(e) Summary of the above findings

Expenditure shocks were found to be a dominating factor in generating the variations in revenue. Expenditure shocks changed the long run equilibrium base of revenue profile. Expenditure shocks produced insignificant variations in expenditure. It is, therefore, clear that expenditure shocks were found to have a positive impact on revenue profile.

The Variance Decomposition of revenue and expenditure is presented in the Tables 9.37 and 9.38

Table 9.37
Variance Decomposition of Government Revenue
Sub-period-1966-1987

Variance Decomposition of GR			
Period	S.E	GE	GR
1	0.071450	15.80809	84.19191
2	0.079807	31.31063	68.68937
3	0.129017	71.94393	28.05607
4	0.135305	69.27092	30.72908
5	0.173468	70.64294	29.35706
6	0.256546	81.28270	18.71730
7	0.273709	76.03753	23.96247
8	0.294986	73.27791	26.72209
9	0.347246	77.27647	22.72353
10	0.381857	66.52130	33.47870
Cholesky Ordering GE GR			

9.5. I(d) Findings

It is observed from the Table 9.37 that revenue shocks dominated over the expenditure shocks in constituting the variations in revenue at t=1 and 2. For $3 \leq t \leq 7$ total revenue variations were mainly due to expenditure shocks. So at $t \rightarrow \infty$ contribution of revenue shocks was about 34% while that of expenditure shocks to total variations of revenue was around 66%.

Table 9.38
Variance Decomposition of Government Expenditure
Sub-period-1966-1987

Variance Decomposition of GE			
Period	S.E	GE	GR
1	0.097588	100.0000	0.000000
2	0.142882	99.30825	0.691745
3	0.162520	99.17805	0.821950
4	0.182934	93.84801	6.151992
5	0.202978	94.19700	5.802999
6	0.214624	94.79036	5.209637
7	0.250907	94.06353	5.936473

8	0.267157	94.48057	5.519435
9	0.268632	93.71147	6.288528
10	0.290953	89.05510	10.94490
Cholesky Ordering GE GR			

9.5. I(e) Findings

It is observed from the Table 9.38 that expenditure shocks dominated over the revenue shocks in producing variations in expenditure since $t \geq 1$.Hence expenditure shocks became the dominant factor behind variations in expenditure in the long run. Expenditure shocks constituted about 90% variations in expenditure while revenue shocks accounted for 10% about variations in expenditure.

9.5. I(f) Summary of the above Findings

It is, therefore, observed from the analysis of impulse response function and Variance Decomposition that expenditure shocks were the main guiding factor behind the constitution of revenue profile. Expenditure shocks took the dominant role in generating the variations in revenue and expenditure. The joint analysis of table 9.38 and 9.39 indicate the unidirectional causality running from expenditure to revenue was stronger. Thus the empirical evidence suggests a unidirectional relationship and lend support to Spend-and-Tax policy in Singapore in the sub-period 1966-1987

Sub-section9.5.II
Singapore (1988-2007)

Next we report the results of Johansen cointegration test for long-run relationship and VECM for Granger causal relationship between government revenue and expenditure in the sub-period 1988-2007.

Table 9.39
Johansen Cointegration Results
Sub-Period 1988-2007

Country	Lag order	Data trend:	None Model 1	None Model 2	Linear Model 3	Linear Model 4	Quadratic Model 5
		Rank or No. of CEs	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Singapore	1	Trace	0	0	0	0	0
		Max – Eigen	0	0	0	0	0
	2	Trace	0	0	0	0	0
		Max – Eigen	0	0	0	0	0
	3	Trace	1	1	1	2	2
		Max – Eigen	1	1	1	2	2
	4	Trace	2	2	1	2	2
	4	Max – Eigen	2	2	1	2	2

9.5. II(a) Findings

It is observed from the table 9.39 that for lag orders 1 and 2 Trace and Max-Eigen Statistics accept the null hypothesis of no cointegration for all models showing no long-run relationship between two fiscal variables. But for lag order 3, Trace and Max-Eigen Statistics reject the null hypothesis of no cointegration at 5% level of significance. Both test results suggest that a long-run equilibrium relationship between these fiscal variables does exist in this sub period. For further analysis the Vector Error Correction Model is used to investigate the Granger causality between government revenue and government expenditure for the sub-period 1988-2007.

Table 9.40
Results of Estimation of VECM
(Sub-period 1988-2007)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔR_t (4)	Constant	0.08	0.05	1.50
	Z_{t-2}	-0.04	0.35	**-0.12**
	ΔR_{t-1}	0.59	0.26	**2.24***
	ΔR_{t-2}	-0.12	0.33	-0.37
	ΔR_{t-3}	0.46	0.26	1.75
	ΔR_{t-4}	-0.44	0.31	-1.42
	ΔE_{t-1}	-0.42	0.31	-0.77
	ΔE_{t-2}	-0.61	0.30	-2.02
	ΔE_{t-3}	0.43	0.32	1.35
	ΔE_{t-4}	-0.87	0.35	-2.47
R-squared=0.84, Adj R-squared=0.55, F-statistic-=2.93, Log likelihood=18.03,AIC=-1.07, SBC=-0.59				

Δ denotes first difference order.
Figures in the parentheses (.) denotes lag order
*denotes significance at 5% level.

Table 9.41
Results of Estimation of VECM
(Sub-period 1988-2007)

Dependent variable	Explantory variable	coefficient	Standard error	t-statistics
ΔE_t (4)	Constant	0.15	0.03	4.06
	Z_{t-1}	1.00	0.23	**4.30***
	ΔR_{t-1}	-0.24	0.17	-1.39
	ΔR_{t-2}	-0.55	0.22	**-2.47***
	ΔR_{t-3}	-0.35	0.17	**-2.01***
	ΔR_{t-4}	-0.38	0.20	**-1.84***
	ΔE_{t-1}	-0.30	0.20	-1.46
	ΔE_{t-2}	-0.39	0.21	-1.92*
	ΔE_{t-3}	-0.27	0.21	-1.29
	ΔE_{t-4}	-0.59	0.23	-2.54*
R-squared=0.84, Adj R-squared=0.55, F-statistic-= 2.93, Log likelihood=24.18,AIC=-1.89, SBC=-1.41				

Δ denotes first difference order..
Figures in the parentheses (.) denotes lag order.
*denotes significance at 5% level.

9.5. II(b) Findings

It is observed from the tables 9.40 and 9.41 that the error-correction term (Z_{t-2}) in revenue equation is not significant at 5% levels. In revenue equation, all the coefficients of lagged independent variables except second and fourth period lagged expenditure are insignificant at 5% level of significance. The error-term Z_{t-1} in expenditure equation is significant & all the coefficients of second, third and fourth lagged revenue variables are significant at 5% level. All these results confirm that there is a Uni-directional causality running from government revenue to expenditure in Singapore suggesting tax-and-spend principle during the sub-period 1988-2007.

Impulse analysis and Variance Decompositions are used to examine the relationship between the variables as observed from the Error Correction Mechanism.

The impulse response of expenditure and revenue is presented in the tables 9.42 & 9.43

Table 9.42
Impulse Response of Government Expenditure
Sub-period-1988-2007

Response of GE		
Period	GR	GE
1	0.007459	0.083227
2	0.095074	1.91E-05
3	0.107049	-0.020442
4	0.099019	-0.029489
5	0.107688	0.000726
6	0.128219	0.003147
7	0.118442	-0.010016
8	0.088866	-0.001589
9	0.061073	-0.003790
10	0.026822	0.002379
Cholesky Ordering GR GE		

9.5. II(c) Findings

It is observed from the Table 9.42 that in response to shocks transmitted through the revenue channel expenditure exhibited positive response and dominated the expenditure shocks for $2 \leq t \leq 10$. Revenue innovation had a permanent effect on expenditure profile. Revenue shocks were more dominant than the expenditure shock in producing variations in expenditure at t=1.

Table 9.43
Impulse response of Government Revenue
Sub-period-1988-2007

Response of GR		
Period	GR	GE
1	0.125960	0.000000
2	0.193794	-0.017568
3	0.186709	-0.058664
4	0.173818	0.014199
5	0.164180	-0.041093
6	0.054252	-0.031036
7	-0.035649	0.030413
8	-0.068336	0.028468
9	-0.102971	0.028564
10	-0.102845	0.039102
Cholesky Ordering GR GE		

9.5. II(d) Findings

Table 9.43 reports that revenue shocks played significant variations in revenue $1 \leq t \leq 6$. For $7 \leq t \leq 10$ expenditure shocks dominated over revenue shocks in generating variations in revenue. Expenditure shocks played greater variations in revenue. Expenditure shocks had a permanent impact on revenue profile in the long run.

9.5. II(e) Summary of the above findings

Revenue shocks were found to be a dominating factor in generating variations in expenditure and revenue. Revenue shocks changed the long run equilibrium base of expenditure profile. Expenditure shocks produced significant variations in revenue and changed the long-run equilibrium base of revenue profile.

The Variance Decompositions of revenue and expenditure are being presented in the following tables 11.44 and 11.45

Table 9.44
Variance Decomposition of Government Revenue
Sub-period-1988-2007

Variance Decomposition of GR			
Period	S.E	GR	GE
1	0.125960	100.0000	0.000000
2	0.231799	99.42557	0.574431
3	0.303368	95.92524	4.074763
4	0.349923	96.77271	3.227288
5	0.388703	96.26691	3.733095
6	0.393696	95.73955	4.260451
7	0.396475	95.21063	4.789370
8	0.403327	94.87380	5.126199

9	0.417243	94.74138	5.258621
10	0.431506	94.26213	5.737874
Cholesky Ordering GR GE			

9.5. II(f) Findings

It is observed from the Table 9.44 that revenue shocks dominated over the expenditure shocks in constituting variations in revenue for $1 \leq t \leq 10$. So at $t \rightarrow \infty$ contribution of revenue shocks was 94% while that of expenditure shocks to total variations of revenue was around 06%.

Table 9.45
Variance Decomposition of Government Expenditure
Sub-period-1988-2007

Variance Decomposition of GE			
Period	S.E	GR	GE
1	0.083560	0.796781	99.20322
2	0.126576	56.76603	43.23397
3	0.167029	73.67434	26.32566
4	0.196400	78.70498	21.29502
5	0.223987	83.62643	16.37357
6	0.258109	87.65456	12.34544
7	0.284164	89.69043	10.30957
8	0.297739	90.60629	9.393711
9	0.303962	90.97143	9.028572
10	0.305153	91.03565	8.964348
Cholesky Ordering GE GR			

9.5. II(g) Findings

It is observed from the Table 9.45 that expenditure shocks dominated over revenue shocks in producing the variations in expenditure at t=1. For $2 \leq t \leq 10$ revenue shocks produced larger variations in expenditure and consequently revenue became the dominant factor in explaining the variations in expenditure in the long run. Expenditure shocks constituted at least 9% variations in expenditure while revenue shocks accounted for about 91% variations in expenditure.

9.5.II.(h)Summary of the above Findings

It is therefore observed from the analysis of impulse response function and Variance Decomposition that revenue shocks were the main guiding factor behind the constitution of expenditure profile. Expenditure shocks took the subordinate role in generating the variations in revenue and expenditure. The joint analysis indicates that causality running from revenue

to expenditure was found to be stronger during this sub-period. So the empirical evidence does lend support to Tax-and-Spend principle in Singapore in the sub-period 1988-2007

Section 9.6
Case study of Thailand

Table 9.46
Results of Chow Break-Point Test (1953-2007)

During 1953-2007		
Year	F-Statistic	Probability
1953	---	---
1954	---	---
1955	---	---
1956	---	---
1957	1.089384	0.344123
1958	1.069499	0.350751
1959	1.285881	0.285216
1960	0.983888	0.380838
1961	1.920058	0.157048
1962	3.303961	0.057044
1963	3.968814	0.025005
1964	4.511575	0.015700
1965	5.204649	0.008771
1966	6.744083	0.002519
1967	6.892900	0.002240
1968	7.515865	0.001378
1969	7.201659	0.001759
1970	7.630401	0.001262
1971	6.287876	0.003623
1972	4.878931	0.011513
1973	4.159890	0.021206
1974	4.275851	0.019197
1975	6.043590	0.004411
1976	6.325558	0.003515
1977	5.383897	0.007561
1978	5.391791	0.007512
1979	5.468511	0.007052
1980	5.621402	0.006220
1981	5.490463	0.006962
1982	5.562959	0.006525
1983	5.368743	0.007649
1984	5.540084	0.006649
1985	5.830039	0.005245
1986	7.156007	0.001823

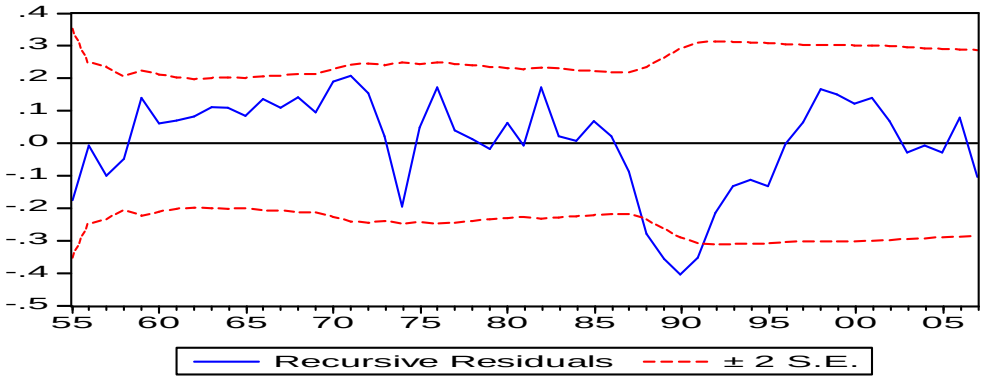
1987	9.466493	0.000319
1988	11.52178*	0.000074
1989	8.239092	0.000793
1990	3.956006	0.025284
1991	1.026063	0.365705
1992	0.189703	0.827786
1993	0.411339	0.664941
1994	0.791100	0.458830
1995	1.334638	0.272291
1996	2.109355	0.131777
1997	2.320776	0.108482
1998	1.913167	0.158057
1999	1.233486	0.299818
2000	0.700446	0.501075
2001	0.363076	0.697317
2002	0.027004	0.973371
2003	0.055628	0.945949
2004	0.034320	0.966285
2005	0.035127	0.965506
2006	0.463330	0.631807

*indicates Chow break point.

Another test which is recursive residual test for structural change is also used for giving additional insight in this study. Plots of recursive residuals are presented in figure 9.6 which shows that the plots of recursive residuals lie outside the 5% critical band around the year 1986-1988. We seek to test for structural change occurring somewhere from 1986 to1988.

Figure 9.6

Plots of recursive residuals during 1953-2007



9.6 1Findings

It is observed from the Table 9.46 and Figure 9.6 that possible structural change occurred in 1987-88 due to macroeconomic uncertainty, hardship and difficult economic adjustment and consequently depressed economic growth and declining investment especially in the late eighties. On the basis of this evidence we split the entire sample into two sub-periods. The first sub-period covers the time period 1953-1987.The second sub-period ranges over 1988-2007.

Between the two sub-periods, the cointegration and Granger causality link between government revenue & government expenditure through VECM are being examined in sub section 9.6.I and 9.6.II

Sub section 9.6.I

Thailand (1953-1987)

Next we seek to report results of Johansen cointegration test and VECM for Granger causal relationship between government revenue and its expenditure in the sub-period 1985-2007.

Table 9.47
Summary of Johansen Cointegration Test Results
(Sub-period 1953-1987)

Country	Lag order	Data trend:	None Model 1	None Model 2	Linear Model 3	Linear Model 4	Quadratic Model 5
		Rank or No. of CEs	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Thailand	1	Trace	2	2	1	1	2
		Max – Eigen	2	2	1	1	2
	2	Trace	2	2	1	1	2
		Max – Eigen	2	2	1	1	2
	3	Trace	2	2	1	2	2
		Max – Eigen	2	2	1	0	2

9.6.I(a) Findings

It is observed from the Table 9.47 that in case of linear model 3 with intercept and no trend, Trace and Max-Eigen Statistics indicate that at most one Cointegration did exist in Thailand for lag orders 1, 2 and 3. These findings suggest that both revenue and expenditure are cointegrated in Thailand during the sub period 1953- 1987. This outcome indicates that both revenue and expenditure have a long-run relationship in Thailand over the period of study concerned.

Table 9.48
Estimates of Vector Error Correction Model
Sub-Period 1953-1987

Dependable variable	Explantory variable	Coefficient	S.E	t- statistic
(ΔE_t)	Constant	0.09	0.01	4.95
	Z_{2t-1}	0.83	0.16	**4.96***
	(ΔR_{t-1})	-0.60	0.22	**-263***
	(ΔE_{t-1})	0.15	0.14	1.05
	R-squared=0.47, Adj R-squared=0.41, F-statistic-= 8.53, Log likelihood=40.71,AIC=-2.21, SBC=-2.41			

Δ denotes first difference
*denotes significance at 5% level.

Table 9.49
Estimates of Vector Error Correction Model
Sub-periods 1953-1987

Dependable variable	Explantory variable	Coefficient	S.E	t- statistic
ΔR_t	Constant	0.07	0.01	4.40
	Z_{1t-1}	-0.001	0.15	-0.01
	ΔR_{t-1}	-0.23	0.20	-1.14
	ΔE_{t-1}	0.10	0.13	0.79
	R-squared=0.05, Adj R-squared=-0.04, F-statistic-= o.56, Log likelihood=44.23,AIC=-2.43, SBC=-2.25			

Δ denotes first difference

9.6.I(b) Findings

It is observed from the Table 9.48 and 9.49 that the error-correction term (Z_{2t-1}) in expenditure equation is significant at 5% levels and first period lagged revenue (R_{t-1}) is significant at 5% level of significance. In revenue equation, the error correction term Z_{1t-1} is not significant at 5% level. first period lagged revenue (R_{t-1}) and expenditure (E_{t-1}) are insignificant at 5% level in revenue equation.

All these findings indicate that there is a long-run equilibrium relationship between government revenue and government expenditure in Thailand during the sub-period 1953-1987. It also reports that revenue Granger caused expenditure but expenditure did not cause (Granger) revenue during the sub-period 1953-1987.

Impulse analysis and variance Decompositions are used to examine the relationship between the variables as observed from the Error Correction Mechanism.

The impulse response of revenue and expenditure is presented in the following Table 9.50 and 9.51

Table 9.50
Impulse response of Government Expenditure
Sub-period-1953-1987

Response of GE		
Period	GR	GE
1	0.032323	0.067853
2	0.028344	0.026814
3	0.059454	0.001775
4	0.065439	0.001203
5	0.065092	0.000957
6	0.065652	0.000260
7	0.065918	0.000143
8	0.065929	0.000144
9	0.065936	0.000130
10	0.065944	0.000124
Cholesky Ordering GR GE		

9.6.I(c) Findings

It is observed from the Table 9.50 that following shocks transmitted through the revenue channel expenditure exhibited significant response and revenue shocks dominated over expenditure shocks in constituting the larger variations in expenditure for $1< t \leq 10$. Revenue innovation had a permanent effect on its own profile.

Table 9.51
Impulse response of Government Revenue
Sub-period-1953-1987

Response of GR		
Period	GR	GE
1	0.067550	0.000000
2	0.055074	0.007263
3	0.057533	0.001253
4	0.060237	1.73E-05
5	0.060235	0.000248
6	0.060198	0.000169
7	0.060265	0.000114
8	0.060278	0.000115
9	0.060276	0.000115
10	0.060277	0.000113
Cholesky Ordering GR GE		

9.6.I(d) Findings

Table 9.51 reports that as shocks transmitted through revenue led to significant variations in revenue over $1 \leq t \leq .10$. Expenditure shocks produced insignificant variations in revenue over the period of projection. Revenue shocks had a permanent impact on its own profile.

9.6.I(e) Summary of the above findings

Revenue shocks were found to be a dominating factor in generating variations in expenditure and revenue. Revenue Shocks changed the long run equilibrium base of expenditure profile. Casualty running from revenue to expenditure was observed to be stronger in Thailand in the sub-period 1953-1987.

The Variance Decompositions of revenue and expenditure are being presented in the following table 9.52 and 9.53

Table 9.52
Variance Decomposition of Government Expenditure
Sub-period-1953-1987

Variance Decomposition of GR			
Period	S.E	GR	GE
1	0.067550	100.0000	0.000000
2	0.087458	99.31035	0.689646
3	0.104692	99.50440	0.495601
4	0.120785	99.62766	0.372338
5	0.134972	99.70148	0.298518
6	0.147787	99.75088	0.249120
7	0.159603	99.78635	0.213652
8	0.170606	99.81297	0.187027
9	0.180941	99.83369	0.166312
10	0.190717	99.85027	0.149734
Cholesky Ordering GR GE			

9.6.I(f) Findings

It is observed from the Table 9.52 that the variations in revenue were mainly due to revenue shocks. Table reports that revenue shocks dominated over the expenditure shocks in constituting the variations in revenue for $1 \leq t \leq 10$ and expenditure shocks produced insignificant variations in revenue. So at $t \rightarrow \infty$ contribution of revenue shocks was almost 100%.

Table 9.53
Variance Decomposition of Government Expenditure
Sub-period-1953-1987

Variance Decomposition of GE			
Period	S.E	GR	GE
1	0.075158	18.49550	81.50450
2	0.084682	25.77233	74.22767
3	0.103484	50.26536	49.73464
4	0.122445	64.46594	35.53406
5	0.138675	72.29187	27.70813
6	0.153431	77.36489	22.63511
7	0.166991	80.89177	19.10823

8	0.179535	83.46848	16.53152
9	0.191260	85.43320	14.56680
10	0.202309	86.98084	13.01916
Cholesky Ordering GR GE			

9.6.I(g) Findings

It is observed from the Table 9.53 that expenditure shocks dominated over the revenue shocks in producing the variations in expenditure since $1 \leq t \leq .2$. For $3 \leq t \leq .10$ revenue shocks became the dominant factor behind the variations in expenditure in the long run. For $t \rightarrow \infty$ expenditure shocks constituted at least 13% variations in expenditure while revenue shocks accounted for 87% variations in expenditure.

9.6.I (h) Summary of the above Findings

It is therefore observed from the analysis of impulse response function and variance decomposition that revenue shocks were the main guiding factor behind the constitution of expenditure profile. Revenue shocks took the dominant role in generating variations in revenue and expenditure. The joint analysis indicates the existence of uni-directional causality running from revenue to expenditure. Thus the empirical evidence does lend support to the principle of Tax-and-Spend in Thailand in the sub-period 1953-1987.

Sub section 9.6.II

Thailand (1988-2007)

Results of Johansen cointegration test and VECM for Granger causal relationship between government revenue and expenditure in the sub-period 1988-2007 are being reported through the following tables.

Table 9.54
Summary of Johansen Cointegration Test Results
(Sub-period 1988-2007)

Country	Lag order	Data trend:	None Model 1	None Model 2	Linear Model 3	Linear Model 4	Quadratic Model 5
		Rank or No. of CEs	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Thailand	1	Trace	1	1	1	0	2
		Max – Eigen	1	1	1	0	0
	2	Trace	0	0	0	0	0
		Max – Eigen	0	0	0	0	0
	3	Trace	1	1	1	2	2
		Max – Eigen	1	1	1	2	2

9.6.II (a) Findings

It is observed from the Table 9.54 that for lag orders 1 and 3, both revenue and expenditure are cointegrated during the sub period 1988- 2007. Since Trace and Max-Eigen Statistics indicate that at most one Cointegration did exist in Thailand for lag orders 1 and 3.

This implies that in Thailand there was a long-run relationship between government revenue and expenditure during this sub-period.

Table 9.55
Estimation of Vector Error Correction Model
Sub-Period 1988-2007

Dependable variable	Explantory variable	Coefficient	S.E	t- statistic
ΔE_t	Constant	0.06	0.02	3.17
	Z_{2t-1}	0.39	0.18	**-2.17***
	ΔR_{t-1}	0.33	0.21	**1.58****
	ΔE_{t-1}	-0.45	0.30	-1.50
	R-squared=0.84, Adj R-squared=0.55, F-statistic-= 2.93, Log likelihood=24.18,AIC=1.89,SBC=1.41			

Δ denotes first difference.
*denotes significance at 5% level
** denotes significance at 10% level

Table 9.56
Estimates of Vector Error Correction Model
Sub-Period 1988-2007

Dependable variable	Explantory variable	Coefficient	S.E	t- statistic
ΔR_t	Constant	0.004	0.02	0.17
	Z_{1t-1}	-0.35	0.22	-1.61
	ΔR_{t-1}	0.74	0.25	2.90*
	ΔE_{t-1}	0.01	0.36	0.03
	R-squared=0.42 Adj R-squared=0.30, F-statistic-= 3.49, Log likelihood=22.82,AIC=-2.09,SBC=-1.89			

* denotes significance at 5% level.
Δ denotes first difference.

9.6.II (a) Findings

Tables 9.55 and 9.56 report that the error-correction terms (Z_{t-1}) in expenditure equation is significant at 5% levels and in expenditure equation, the first period lagged revenue is significant at 10% level. In revenue equation, the error correction term Z_{t-2} in not significant at 5% level of significance but the first period lagged revenue is significant at 5% level.

9.6.II (b) Summary of the findings

All these findings indicate that there was a cointegrating relationship between government revenue (R_t) and government expenditure (E_t) in Thailand during the sub-period 1988-2007. This implies that both revenue and expenditure have long-run relationship and this relationship is stable over this sub-period. During this sub-period, only the first period lagged revenue better forecast the current revenue and expenditure in the short-run and therefore uni-directional causality (Granger) running from revenue to expenditure is observed during this sub-period. All these results confirm that fiscal authority of Thailand followed Tax-and-spend Principle in this sub-period.

Impulse analysis and Variance Decompositions are used to examine the relationship between the variables as observed from the Error Correction Mechanism.

The impulse response of revenue and expenditure are being presented in the following Tables 9.57 and 9.58

Table 9.57
Impulse Response of Government Expenditure
Sub-period-1988-2007

Response of GE		
Period	GR	GE
1	0.040942	0.048963
2	0.067091	0.012357
3	0.096739	0.035333
4	0.106961	0.025882
5	0.110479	0.037043
6	0.104566	0.034404
7	0.097935	0.038209
8	0.091261	0.036278
9	0.087671	0.036709
10	0.086306	0.035285
Cholesky Ordering GR GE		

9.6.II (c) Findings

It is observed from the Table 9.57 that the shocks transmitted through the revenue channel expenditure exhibited positive response and revenue shocks dominated over the expenditure shocks in constituting the larger variations in expenditure for $2 \leq t \leq 10$. Revenue innovation had a permanent effect on expenditure profile.

Table 9.58
Impulse Response of Government Revenue
Sub-period-1988-2007

Response of GR		
Period	GR	GE
1	0.077213	0.000000
2	0.118783	0.013532
3	0.125470	0.021663
4	0.111480	0.029619
5	0.089464	0.031708
6	0.070163	0.031846
7	0.058134	0.029608
8	0.054105	0.027474
9	0.055755	0.025601
10	0.060160	0.024739
Cholesky Ordering GR GE		

9.6.II (d) Findings

Table 9.58 reports that following shocks transmitted through revenue channel, revenue played significant variations in revenue for $1 \leq t \leq .10$. Thus, revenue shocks dominated over the expenditure shocks in generating variations in revenue. Revenue shocks had a permanent impact on its own profile.

9.6.II (e) Summary of the above findings

Revenue shocks were found to be the dominating factor in generating variations in expenditure and revenue. Revenue shocks changed the long run equilibrium base of expenditure profile. Casualty running from revenue to expenditure was observed to be stronger in Thailand in the sub-period 1988-2007.

The variance Decomposition of revenue and expenditure is presented in the tables 9.59 and 9.60

Table 9.59
Variance Decomposition of Government Revenue
Sub-period-1988-2007

Variance Decomposition of GR			
Period	S.E	GR	GE
1	0.077213	100.0000	0.000000
2	0.142318	99.09590	0.904102
3	0.190962	98.21097	1.789035
4	0.223095	96.92656	3.073440
5	0.242447	95.68720	4.312799
6	0.254397	94.51578	5.484219
7	0.262629	93.58320	6.416804
8	0.269548	92.86952	7.130484

9	0.276442	92.36305	7.636950
10	0.283992	92.00488	7.995121
Cholesky Ordering GE GR			

9.6.II (f) Findings

It is observed from the Table 9.59 that the variations in revenue were mainly due to revenue shocks. The Table reports that revenue shocks dominated over the expenditure shocks in constituting the variations in revenue for $1 \leq t \leq 10$. So at $t \rightarrow \infty$ contribution of revenue shocks was 92% while that of expenditure shocks to total variations of revenue was around 08%.

Table 9.60
Variance Decomposition of Government Expenditure
Sub-period-1988-2007

Variance Decomposition of GE			
Period	S.E	GR	GE
1	0.063824	41.14864	58.85136
2	0.093420	70.78127	29.21873
3	0.139047	80.35364	19.64636
4	0.177327	85.78994	14.21006
5	0.212185	87.02760	12.97240
6	0.239040	87.70715	12.29285
7	0.261135	87.55842	12.44158
8	0.278991	87.40925	12.59075
9	0.294737	87.16739	12.83261
10	0.309133	87.03197	12.96803
Cholesky Ordering GE GR			

9.6.II(g)Findings

It is observed from the Table 9.60 that revenue shocks dominated over the expenditure shocks in producing the variations in expenditure since $2 \leq t \leq .10$. At t=2 revenue shocks were the dominant factor behind the variations in expenditure. Since $t \rightarrow \infty$ expenditure shocks constituted at least 13% variations in expenditure while revenue shocks accounted for 87% variations in expenditure.

9.6.II (h) Summary of the above Findings

It is, therefore, observed from the analysis of impulse response function and variance Decomposition that revenue shocks were the main guiding factor behind the constitution of expenditure profile. The joint analysis indicates uni-directional causality from revenue to expenditure and suggesting revenue causes expenditure during this sub-period. So the empirical evidence does lend support the Tax-and-Spend principle in Thailand in the sub-period 1988-200