CHAPTER 6

VECTOR ERROR CORRECTION MODEL

6.1 Vector Error Correction Model

Both government revenue (R_t) and government expenditure (E_t) series over the sample period are cointegrated for Indonesia, Malaysia, Singapore & Thailand. Therefore, it becomes imperative to know whether the long run relationship between government revenue (R_t) and government expenditure (E_t) is stable. Stability of long run relationship is studied through the estimation of an appropriate Vector Error Correction Model (VECM).Vector Error Correction Model (VECM) also gives important information about the short run dynamics between two fiscal variables.

Before the estimation of restricted Vector Error Correction Model (VECM), the selection of lag length is important and the appropriate lag length is determined through the 'selection Criteria' like AIC, SIC, LR, HQ etc. Table 6.1 presents results of VAR Lag Order Selection Criteria.

Table 6.1

The Results of VAR Lag Order Selection Criteria

	log	Log L	LR	FPE	AIC	SC	HQ
Indonesia (1968-2008)	0	70.41395	**NA***	**8.49E-05***	-3.698052	**-3.610975***	-3.667353
	1	71.47372	1.947676	9.96E-05	-3.539120	-3.277890	-3.447024
	2	73.97931	4.333990	0.000108	-3.458341	-3.022958	-3.304848
	3	74.87903	1,459008	0.000129	-3.290758	-2.681222	-3.075868
Malaysia (1956-2007)	0	99.14317	**NA***	**3.00E-05***	**-4.738691***	**-4.655102***	-4.708253
	1	101.8756	5.064983	3.19E-05	-4.676858	-4.426092	-4.585543
	2	103.3668	2.618660	3.62E-05	-4.554477	-4.136533	-4.402258
	3	104.7327	2.265374	4.13E-05	-4.425984	-3.840861	-4.212914
Singapore (1966-2007)	0	45.76132	**NA***	0.000343	-2.303228	**-2.17039***	**-2.272562***
	1	50.46058	8.656522	**0.000330***	**-2.340030***	-2.086414	-2.248035
	2	52.18503	2.995104	0.000373	-2.220265	-1.789321	-2.066938
	3	53.17698	1.618448	0.000440	-2.061947	-1.458625	-1.847289
Thailand (1953-2007)	0	115.1840	**NA***	**4.05E-05***	**-4.438588***	**-4.362831***	**-4.409639***
	1	116.6171	2.697586	4.48E-05	-4.337925	-4.110652	-4.251077
	2	117.6982	1.940470	5.03E-05	-4.223247	-3.844458	-4.078500
	3	119.7428	3.537309	5.44E-05	-4.146777	-3.616472	-3.944132

*Indicates lag order selected by the criterion.

LR represents sequential LR test statistic (each test at 5% level)

FPE presents final prediction error.

AIC refers to Akiake information criterion.

SC represents Schwarz information criterion.

HQ presents Hannan-Quinn information criterion.

6.2 Findings

It is observed from the Table 6.1 that LR statistics, FPE statistics, AIC statistics, SC statistics and HQ statistics for lag 0 for Indonesia, Malaysia, and Thailand are significant. But in case of Singapore, FPE statistics and AIC statistics are significant for lag 1while SC statistics and HQ statistics for lag 0 are significant. The zero lag order indicates contemporaneous relationship between government revenue (R_t) and government expenditure (E_t). In that case Vector Error Correction Model is not possible. As the present study is concerned with annual data, lag order 1, 2 and 3 are chosen to estimate restricted VECM for Indonesia, Malaysia, Singapore, and Thailand.

The results of Vector Error Correction Model (VECM) through the estimation of equations (6) and (7) for Indonesia, Singapore, Malaysia, and Thailand are being reported in Tables 7.2, 7.3, 7.4 and 7.5 respectively.

$$\Delta E_t = \alpha_1 + \rho_1 Z_{1t-1} + \sum_{i=1}^{m} \beta_{1i} \Delta E_{t-i} + \sum_{i-1}^{m} \gamma_{1i} \Delta R_{t-i} + \theta_1 \ldots\ldots (6)$$

$$\Delta R_t = \alpha_2 + \rho_1 Z_{2t-1} + \sum_{i=1}^{m} \beta_{2i} \Delta R_{t-i} + \sum_{i-1}^{m} \gamma_{2i} \Delta E_{t-i} + \mu_1 \ldots\ldots \quad (7)$$

Table 6.2 (Indonesia)

The Results of Restricted Vector Error Correction Model (VECM)

Lag order	Dependable variable	Explantory variable	Coefficients	S.E	t- value
Lag l	ΔE_t	ΔR_{t-1}	-0.428392	0.30545	-1.420251**
		ΔE_{t-1}	0.263650	0.28394	0.92855
		Z_{t-1}	-0.691355	0.28684	**-2.41026***
		$constant$	0.090417	0.02284	4.35214
R^2 = 0.18 , $Adj.\ R^2$ = 0.10 , $F-Statistic$ = 2.52, $log\ likelihod$ = 30.02 , $AIC = -1.33$, $SBC = -1.16$					
Lag 1	ΔR_t	ΔR_{t-1}	-0.326124	0.30857	-1.05688
		ΔE_{t-1}	0.150569	0.28684	0.52492
		Z_{t-2}	-0.124476	0.28977	0.42956
		$constant$	0.106401	0.02308	4.61069
R^2 = 0.06 , $Adj.\ R^2 = -0.03$, $F-Statistic$ = 0.73, $log\ likelihod$ = 29.62 , $AIC = -1.31$, $SBC = -1.14$					
		ΔR_{t-1}	-0.022800	0.32139	-0.07094

Lag 2	ΔE_t	ΔR_{t-2}	0.518071	0.30026	**1.72542***
		ΔE_{t-1}	0.085064	0.29872	0.28476
		ΔE_{t-2}	-0.335949	0.28248	-1.18927
		Z_{t-1}	-0.259204	0.30609	-0.84682
		$constant$	0.064083	0.02912	2.20100
R^2 = 0.16 ,$Adj.$ R^2 = 0.02, $F-Statistic$ = 1.14, $log\ likelihod$ = 30.33 , AIC = −1.28, SBC = −1.02					
Lag 2	ΔR_t	ΔR_{t-1}	0.035192	0.31672	0.11111
		ΔR_{t-2}	0.572051	0.29589	**1.93329***
		ΔE_{t-1}	-0.072028	0.29438	-0.24467
		ΔE_{t-2}	-0.469500	0.27838	-1.68655
		Z_{t-2}	0.330443	0.30164	1.09547
		$constant$	0.083011	0.02869	2.89312
R^2 = 0.12 ,$Adj.$ R^2 = -0.09, $F-Statistic$ = 0.93, $log\ likelihod$ = 30.89 , AIC = −1.32, SBC = −1.05					
Lag 3	ΔE_t	ΔR_{t-1}	0.020508	0.34648	0.05919
		ΔR_{t-2}	0.567498	0.34040	**1.66716***
		ΔR_{t-3}	0.128674	0.33555	0.38347
		ΔE_{t-1}	0.025919	0.35435	0.07314
		ΔE_{t-2}	-0.411798	0.32261	-1.27646
		ΔE_{t-3}	-0.125597	0.31364	-0.04045
		Z_{t-1}	-0.167809	0.35786	-0.46892
		$constant$	0.065866	0.03442	1.91372
R^2 = 0.15, $Adj.$ R^2 = -0.06, $F-Statistic$ = 0.72, $log\ likelihod$ = 29.07 , AIC = −1.13, SBC = −0.79					
Lag 3	ΔR_t	ΔR_{t-1}	0.065404	0.33887	019301
		ΔR_{t-2}	0.612835	0.33293	**1.84076**
		ΔR_{t-3}	0.138449	0.32819	0.42186
		ΔE_{t-1}	-0.128847	0.34657	-0.37177
		ΔE_{t-2}	-0.543741	0.31553	-1.72328
		ΔE_{t-3}	-0.150182	0.30676	-0.48958
		Z_{t-2}	0.418008	0.35001	1.19429
		$constant$	0.086603	0.03366	2.57274
R^2 = 0.13, $Adj.$ R^2 = -0.09, $F-Statistic$ = 0.62, $log\ likelihod$ = 29.90 , AIC = −1.18, SBC = −0.83					

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

6.3 Findings

It is observed from Table 6.2 that in case of expenditure equation with lag order 1, the coefficient of Z_{t-1} is found to be statistically significant at 5% level and it has negative sign. As the value of coefficient of error correction term is negative, it indicates that short-run shocks pulled down the government expenditure E_t below the long-run equilibrium value. Since the absolute value of Z_{t-1} is less than unity implying that following short-run shocks, oscillations of expenditure followed a convergent path. In case of revenue equation for lag order 1, Z_{t-2} is negative and statistically insignificant at 5% level. The results indicate short-run shocks transmitted through revenue channel failed to produce any variations from the long-run equilibrium value that revenue maintained with expenditure then the system is in the state of short-run equilibrium. Thus the long-run relationship between government revenue (R_t) and government expenditure (E_t) is stable. In revenue equation, both the lagged independent variables are insignificant at 5% level. The first period lagged revenue ΔR_{t-1} in expenditure equation is significant at 10% level and expenditure i.e ΔE_{t-1} is found to be insignificant suggesting Granger causality running from government revenue (R_t) to government expenditure (E_t). The error correction terms of both the expenditure and revenue equations of lag order 2 and 3 are insignificant at 5% levels.

Table 6.3 (Singapore)
The results of restricted Vector Error Correction Model (VECM)

Lag order	Dependable variable	Explantory variable	Coefficients	S.E	t- value
Lag 1	ΔE_t	ΔR_{t-1}	0.168861	0.15257	1.40679**
		ΔE_{t-1}	-0.040788	0.13543	-0.28046
		Z_{t-1}	-0.238284	0.09511	**-2.50522***
		$constant$	0.058578	0.02248	2.60828
R^2 = 0.27, $Adj.\ R^2$ = 0.22, $F-Statistic$ = 4.59, $log\ likelihod$ = 33.55 , $AIC = -1.47, SBC = -1.30$					
Lag 1	ΔR_t	ΔR_{t-1}	0.401417	0.19130	**2.09835***
		ΔE_{t-1}	-0.135238	0.18235	-0.74164
		Z_{t-2}	0.082196	0.11926	0.68921
		$constant$	0.062673	0.02816	2.22561
R^2 = 0.11, $Adj.\ R^2$ = 0.40, $F\ Statistic$ = 1.55, $log\ likelihod$ = 24.50 , $AIC = -1.02, SBC = -0.85$					
Lag 2	ΔE_t	ΔR_{t-1}	0.179286	0.15794	1.13513
		ΔR_{t-2}	0.066853	0.17144	0.38996
		ΔE_{t-1}	-0.062427	0.16780	-0.37203
		ΔE_{t-2}	-0.106123	0.15400	-0.68913
		Z_{t-1}	-0.213139	0.10944	-1.94759
		$constant$	0.062160	0.02639	2.35538
R^2 = 0.27$Adj. R^2$ = 0.17,$F-Statistic$ = 2.55,$log\ likelihod$ = 32.28 , $AIC = -1.34, SBC = -1.09$					

Lag 2	ΔR_t	ΔR_{t-1}	0.407384	0.18900	**2.15551***
		ΔR_{t-2}	0.297427	0.20514	1.44987
		ΔE_{t-1}	-0.265461	0.20079	-1.32209
		ΔE_{t-2}	-0.201997	0.18427	-1.09619
		Z_{t-2}	0.17977	0.13095	1.37282
		$constant$	0.060530	0.03158	1.91676
R^2 = 0.18, $Adj.\ R^2$ =0.06, $F-Statistic$ = 1.52, $log\ likelihod$ = 25.28 , $AIC = -0.98$, $SBC = -0.73$					
Lag 3	ΔE_t	ΔR_{t-1}	0.136038	0.15329	0.88748
		ΔR_{t-2}	0.14453	0.16424	0.08800
		$\boldsymbol{\Delta R_{t-3}}$	-0.385973	0.16856	**-2.28988***
		ΔE_{t-1}	0.049995	0.16770	0.29812
		ΔE_{t-2}	0.062031	0.16383	0.37862
		ΔE_{t-3}	0.30033	0.14986	0.20041
		Z_{t-1}	-0.342626	0.11366	**-3.01451***
		$constant$	0.078275	0.02835	2.76100
R^2 = 0.40 $Adj.\ R^2$ = 0.27 ,$F-Statistic$ = 2.97, $log\ likelihod$ = 34.78 , $AIC = -1.40$, $SBC = -1.06$					
Lag 3	ΔR_t	ΔR_{t-1}	0.409892	0.19992	**2.05030***
		ΔR_{t-2}	0.303200	0.21420	1.41549
		ΔR_{t-3}	0.266516	0.21983	1.21235
		ΔE_{t-1}	-0.330898	0.21872	-1.51289
		ΔE_{t-2}	-0.309444	0.21367	-1.44822
		ΔE_{t-3}	-0.055569	0.19545	-0.28432
		Z_{t-2}	0.219677	0.14824	1.48194
		$constant$	0.056399	0.03697	1.52533
R^2 = 0.21, $Adj.\ R^2$ = 0.02, $F-Statistic$ = 1.13, $log\ likelihod$ = 24.69 , $AIC = -0.87$, $SBC = -0.53$					

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

6.4 Findings

Table 6.3 reports that in case of expenditure equation with lag order 1, the coefficient of $Z_{t-1}$is negative and it is statistically significant at 5% level implying that the series can't drift too far apart and convergency is achieved in the long-run. On revenue equation , the coefficient of Z_{t-2} has a negative sign and it is statistically insignificant at 5% level suggesting that any shocks in revenue failed to produce any appreciable change in long-run relationship that government revenue (R_t) maintained with government expenditure (E_t). Barring first period lagged revenue, all the coefficients of lagged revenues and lagged expenditures of both revenue and expenditure equations are found to be statistically not significant at 5% level. The results show that there is no evidence of Granger causality between revenue and expenditure.

It is also observed from Table 6.3 that in case of expenditure equation with lag order 3, the coefficients of Z_{t-1} have expected negative sign & are statistically significant at 5% level which imply that the shocks pulled down expenditure below the long-run equilibrium value and the time path of expenditure converges towards the equilibrium in the following period. In case of revenue equations with lag order 3, the coefficients of Z_{t-2} are found to be positive and statistically insignificant. As the coefficients of Z_{t-2} are positive, the short-run shocks pulled up the revenue from the long-run equilibrium value but oscillations of revenue followed a convergent path as the absolute values of the coefficients are less than unity. In expenditure equation with lag order 1 the first period lagged revenue $i.e\ \Delta R_{t-1}$ is significant at 5% level and in expenditure equation with lag order 3, third period lagged revenue $i.e\ \Delta R_{t-3}$ is significant at 5% level. This result shows the evidence of Granger causality running from revenue to expenditure in Singapore and not vice versa for the study period.
Therefore, the empirical findings suggest that the fiscal authority of Singapore followed the tax-and spend principle over the period of study.

Table 6.4 (Malaysia)

Results of Restricted Vector Error Correction Model (VECM)

Lag order	**Dependable variable**	**Explantory variable**	**Coefficients**	**S.E**	**t- value**
Lag 1	ΔE_t	ΔR_{t-1}	-0.146973	0.18411	-0.79830
		ΔE_{t-1}	0.145324	0.19057	2.40330
		Z_{t-1}	-0.145324	0.12325	**-1.79150**
		$constant$	0.046179	0.01601	2.88400
$R^2 = 0.15, Adj.\ R^2 = 0.10$, $F - Statistic = 2.38$, $log\ likelihod = 52.06$, $AIC = -2.23, SBC = -2.07$					
Lag 1	ΔR_t	ΔR_{t-1}	0.003836	0.19328	**0.01984**
		ΔE_{t-1}	0.057984	0.20006	0.28983
		Z_{t-2}	0.199160	0.12939	0.28983
		$constant$	0.199160	0.12939	1.53928

R^2 = 0.07 ,$Adj.\ R^2$ = 0.40, $F - Statistic$ = 1.06, $log\ likelihod$ = 49.07 , $AIC = -2.13$, $SBC = -1.97$					
Lag 2	ΔE_t	ΔR_{t-1}	-0.153182	0.19447	-0.78573
		ΔR_{t-2}	-0.046884	0.19447	-0.24108
		ΔE_{t-1}	0.477636	0.20700	2.30747
		ΔE_{t-2}	-0.014400	0.21804	-0.06604
		Z_{t-1}	-0.147694	0.14448	-1.02225
		$constant$	0.049610	0.01955	2.53752
R^2 = 0.15 , $Adj.\ R^2$ = 0.03, $F - Statistic$ = 1.24, $log\ likelihod$ = 50.48 , $AIC = -2.11$, $SBC - 1.86$					
Lag 2	ΔR_t	ΔR_{t-1}	-0.000940	0.20532	**-0.00458**
		ΔR_{t-2}	-0.029987	0.20481	-0.14641
		ΔE_{t-1}	0.051602	0.21800	0.23671
		ΔE_{t-2}	0.058754	0.22963	0.25586
		Z_{t-2}	0.179161	0.15216	1.17745
		$constant$	0.063241	0.02059	3.07146
R^2 = 0.07 $Adj.\ R^2$ =0.05 $F - Statistic$ = 0.58, $log\ likelihod$ = 48.03 , $AIC = -2.01$, $SBC = -1.76$					
Lag 3	ΔE_t	ΔR_{t-1}	-0.171601	0.21281	-0.80636
		ΔR_{t-2}	-0.057072	0.20236	-0.28204
		$\boldsymbol{\Delta R_{t-3}}$	-0.180310	0.19871	**-0.90740**
		ΔE_{t-1}	0.489109	0.22355	2.18792
		ΔE_{t-2}	0.062256	0.23346	0.26667
		ΔE_{t-3}	0.031334	0.22372	0.14006
		Z_{t-1}	-0.186631	0.16101	**-1.15913**
		$constant$	0.057511	0.02251	2.55466
R^2 = 0.18 $Adj.\ R^2$ = 0.01, $F - Statistic$ = 1.08, $log\ likelihod$ = 49.79 , $AIC = -2.03$, $SBC = -1.70$					
Lag 3	ΔR_t	ΔR_{t-1}	-0.023440	0.22580	**-0.10381**
		ΔR_{t-2}	-0.042864	0.21471	-0.19964
		ΔR_{t-3}	-0.184159	0.21084	-0.87346
		ΔE_{t-1}	0.068247	0.23719	0.28772
		ΔE_{t-2}	0.129547	0.24770	0.52299
		ΔE_{t-3}	0.047501	0.23738	0.200011
		Z_{t-2}	0.137445	0.17084	0.80454
		$constant$	0.070545	0.02389	2.95339
R^2 = 0.10 $Adj.\ R^2$ = -0.08, $F - Statistic$ = 0.58, $log\ likelihod$ = 47.36 , $AIC = -1.92$, $SBC = -1.58$					

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

6.5 Findings

It is observed from Table 6.4 that in case of expenditure equation with lag order 1, the coefficient of Z_{t-1} is found to be statistically significant at 5% level and it has negative sign.

As the value of coefficient of error correction term is negative, it indicates that short-run shocks pulled down the government expenditure E_t below the long-run equilibrium value. The absolute value of Z_{t-1} being less than unity implies that, following short-run shocks, oscillations of expenditure followed a convergent path. In case of revenue equation for lag order 1, Z_{t-2} is negative and statistically insignificant at 5% level. This indicates short-run shocks, transmitted through revenue channel, failed to produce any variations from the long-run equilibrium value that revenue maintained with expenditure. Then the system is in the state of short-run equilibrium. Thus the long-run relationship between government revenue (R_t) and government expenditure (E_t) is stable. The first period lagged revenue ΔR_{t-1} and expenditure i.e ΔE_{t-1} in both revenue and expenditure equations are found to be statistically insignificant suggesting no Granger causality running from government expenditure (E_t) to government revenue (R_t) and vice-versa.

In case of revenue and expenditure equations with lag order 2 and 3, the coefficient of $Z_{t-1}\ and\ Z_{t-2}$ are found to be statistically insignificant at 5% level. It indicates that the system is in the state of equilibrium. The shocks transmitted through revenue and expenditure channels failed to produce any significant variations from the long-run equilibrium value. Thus the long-run relationship between government revenue (R_t) and government expenditure (E_t) is stable. All lagged independent variables in both revenue and expenditure equations by varying lag order from 2 to 3 are found to be statistically insignificant suggesting no Granger causality between government expenditure (E_t) to government revenue (R_t) in any direction.

The above findings confirm the presence of fiscal neutrality in Malaysia during the period of study.

Table 6.5 (Thailand)

The Results of Restricted Vector Error Correction Model (VECM)

Lag order	Dependable variable	Explantory variable	Coefficients	S.E	t- value
Lag 1	ΔE_t	ΔR_{t-1}	-0.069092	0.16058	-0.43028
		ΔE_{t-1}	0.068545	0.14085	0.48664
		Z_{t-1}	-0.254007	0.08610	**-2.95019***
		$constant$	0.0600516	0.01544	3.91894
R^2 = 0.15, $Adj.\ R^2$ = 0.10, $F-Statistic$ = 3.11, $log\ likelihod$ = 60.09 , AIC = -2.11, SBC = -1.96					

Lag 1	ΔR_t	ΔR_{t-1}	0.218457	0.16648	1.31220
		ΔE_{t-1}	0.000204	0.14603	0.00140
		Z_{t-2}	0.038323	0.08927	0.42931
		$constant$	0.053812	0.01601	3.36116
R^2 = 0.04, $Adj.\ R^2$ = 0.02 ,$F-Statistic$ = 0.67, $log\ likelihod$ = 58.18 , $AIC = -2.04$, $SB = -1.89$					
Lag 2	ΔE_t	ΔR_{t-1}	-0.008882	0.15167	-0.05856
		ΔR_{t-2}	0.059810	0.15931	0.37544
		ΔE_{t-1}	0.000319	0.13294	0.00240
		ΔE_{t-2}	0.015327	0.13195	0.11616
		Z_{t-1}	-0.196932	0.08826	**-2.23123***
		$constant$	0.060923	0.01707	3.56886
R^2 = 0.15, $Adj.\ R^2$ = 0.06, $F-Statistic$ = 1.64, $log\ likelihod$ = 64.05 , $AIC = -2.23$, $SBC = -2.01$					
Lag 2	ΔR_t	ΔR_{t-1}	0.247424	0.17100	1.44693
		ΔR_{t-2}	0.096281	0.17961	0.53604
		ΔE_{t-1}	-0.036666	0.14989	-0.24462
		ΔE_{t-2}	-0.085280	0.14877	-0.57325
		Z_{t-2}	0.074247	0.09951	0.74611
		$constant$	0.054753	0.01925	2.84477
R^2 = 0.05 , $Adj.\ R^2$ =-0.04, $F-Statistic$ = 0.54, $log\ likelihod$ = 57.82 , $AIC = -1.99$, $SBC = -1.76$					
Lag 3	ΔE_t	ΔR_{t-1}	0.021577	0.15659	0.13779
		ΔR_{t-2}	0.033597	0.16327	0.20578
		$\Delta \boldsymbol{R_{t-3}}$	0.124938	0.16245	0.76907
		ΔE_{t-1}	-0.039751	0.15405	-0.25805
		ΔE_{t-2}	0.008353	0.13515	0.06181
		ΔE_{t-3}	0.097086	0.13416	0.72363
		Z_{t-1}	-0.176210	0.09508	**-1.85335***
		$constant$	0.049277	0.02000	2.46377
R^2 = 0.18 $Adj.\ R^2$ = 0.05,$F-Statistic$ = 1.42, $log\ likelihod$ = 63.45 , $AIC = -2.17$, $SBC = -1.87$					
Lag 3	ΔR_t	ΔR_{t-1}	0.253682	0.17979	1.41101
		ΔR_{t-2}	0.073405	0.18745	0.39159
		ΔR_{t-3}	0.006476	0.18652	0.03472
		ΔE_{t-1}	-0.005257	0.17687	-0.02972
		ΔE_{t-2}	-0.074328	0.15516	-0.47903
		ΔE_{t-3}	0.054884	0.15404	0.35630
		Z_{t-2}	0.068924	0.10916	0.63141
		$constant$	0.048835	0.02296	2.12667
R^2 = 0.06 $Adj.\ R^2$ = -0.09, $F-Statistic$ = 0.40, $log\ likelihod$ = 56.41 , $AIC = -1.89$, $SBC = -1.59$					

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

6.6 Findings

Table 6.5 reports that in case of expenditure equation with lag order 1 the coefficient of $Z_{t-1}$is negative and it is statistically significant at 5% level implying that the series can't drift too far apart and convergency is achieved in the long-run. In revenue equation, the coefficient of Z_{t-2} has a negative sign and it is statistically insignificant at 5% level suggesting that any shocks in revenue failed to produce any appreciable change in long-run relationship that government revenue (R_t) maintained with government expenditure (E_t). All the coefficients of lagged revenues and lagged expenditures of both revenue and expenditure equations are found to be statistically not significant at 5% level. The results show that there is no evidence of Granger causality between revenue and expenditure in Thailand.

It is also observed from table 6.5 that in case of expenditure equation with lag order 2 and 3, the coefficients of Z_{t-1} have expected negative sign & are statistically significant at 5% level which imply that the shocks pulled down expenditure below the long-run equilibrium value and the time path of expenditure converges towards the equilibrium in the following period. But in case of revenue equations with lag order 2 and 3, the coefficients of Z_{t-2} are found to be positive and statistically insignificant. Therefore, the system is in equilibrium. In revenue equation with lag order 2 and 3, the coefficients of all lagged revenues and expenditures are statistically insignificant at 5% level. Results indicate that there exists no evidence of Granger causality between revenue and expenditure in Thailand. Fiscal Neutrality Principle was the prevalent feature of the fiscal management in Thailand over the period of study.

6.7 Summary of the findings in section 6.2-6.5

It is observed from Tables 6.2, 6.3, 6.4 & 6.5 that any divergence from the long-run equilibrium value in one period is corrected gradually in the next period by the size of that coefficient. This means that the system settles down as time goes on. The long-run relationship between government expenditure (E_t) and government revenue (R_t) is stable for all chosen countries over the respective periods of study. The statistical findings show that there is no evidence of Grager causality between government expenditure (E_t) and government revenue (R_t) for Malaysia and Thailand but Granger causality running from revenue to expenditure exists in Singapore and Indonesia.

It, therefore, follows the fiscal neutrality principle for Malaysia and Thailand and Tax-and-Spend principle for Singapore and Indonesia. Fiscal authorities of Singapore and Indonesia takes the decisions of revenue first & then expenditure for making fiscal management. Malaysian & Thailand government takes the decision of revenue and expenditure in isolation.