CHAPTER FIVE

EMPIRICAL EVIDENCE

5.1 Introduction

In this chapter the empirical evidence of the effect of fiscal policy on real exchange rates and the trade balance is presented. The analysis was conducted using variables in nominal terms and also in real terms. On the fiscal front, two key indicators that would be analysed are government spending and government revenue, while on the trade front the key variables are export and import. The real exchange rate used in this analysis is the bilateral exchange rate of ringgit Malaysia against the United States dollar, after adjusting for inflation rates in both economies. The real exchange rate is obtained after taking into account the ratio of United States producer prices to the Malaysian consumer prices and multiplied to the bilateral nominal exchange rate. The sample period is from the first quarter of 1983 to the final quarter of 1996.

5.1.1 Empirical analysis using variables in nominal terms.

In this part, unit root test and the error-correction equations are derived using nominal variables.

5.2 Unit-root Test

In order to analyse and to see the effect of fiscal policy on the real exchange rate and the trade balance, a unit root test was conducted in order to see if these variables were stationary or non-stationary. Each of the variables were tested in accordance of the following equation:

$$\blacktriangle Yt = \beta 1 + \beta 2 \text{ Trend} + \delta Yt_{-1} + \sum \alpha i \blacktriangle Yt_{-i} + \varepsilon t \qquad \text{(e.5.1)}$$

where, ▲ = First difference operator,

ε = random error

The null hyphothesis is that Yt contains a unit root against the alternative that it is stationary around a deterministic trend. Equation (e.5.1) was applied to the following variables, government spending(GS), government revenue(TR), real exchange rate(REX), exports(EX) and imports(IM).

Table 5.1 Augmented Dickey-Fuller test

Variables	Levels	First Difference
Log GS	-4.7747*	-7.9860*
Log TR	-2.9489	-8.4905*
Log REX	-1.9404	-6.2247*
Log EX	-2.4926	-7.5841*
Log IM	-2.2394	-5.8481*

Notes: All variables are in natural logarithm and were lagged by one quarter

* Significant at the 5% critical value of -3.4904 for 56 observations.

The results of the unit root test in table (5.1) indicate all the variables as significant when it is first differenced, therefore reflecting no existence of unit root.

5.3 Cointegration Test - The Engle-Granger Approach

In the following analysis, the cointegration test using the Engle- Granger approach was applied on the fiscal policy variables, the external trade variables and the real exchange rate. A step by step approach was conducted to analyse the long-run relationship between the variables.

5.3.1 Government Spending and Real exchange rate.

In order to analyse the long-term relationship between these two variables,the following equations were estimated. In the first equation government spending is estimated as a function of real exchange rate while in the second equation real exchange rate is estimated as a function of government spending. The relationship between government spending and real exchange rate is important in order to see the effects on prices of nontradables in the domestic economy. The expected sign of "g" and "h" is negative mainly because as government spending increases, it would cause prices of non-tradables to increase and therefore appreciate the real exchange rate.

$$\text{LogGS}_t = a + g\text{LogREX}_t + \mu_t \text{ --------------------- } \quad (e.5.2)$$

$$\text{Log REX}_t = c + h\text{LogGS}_t + \varepsilon_t \text{ --------------------- } \quad (e.5.3)$$

where: GS = Government spending

REX = Real Exchange Rate

μ and ε = Random error variables

Equation (e..5.2) and (e.5.3) were estimated and the following results were obtained.

$$\text{LogGS}_t = 9.0007 + 1.1831 \text{ LogREX}_t + \mu_t \text{ ---------------- } \quad (e.5.2a)$$

$$\text{LogREX}_t = -0.2294 + 0.0250 \text{ LogGS}_t + \varepsilon_t \text{ ---------------- } \quad (e.5.3a)$$

If both the variables of government spending and the real exchange rate are cointegrated, therefore the random error variables of μt and εt from equation (e.5.2) and (e.5.3) should be stationary. A unit root test was conducted on these two variables based on equation (e.5.4) and (e.5.5) and the results are reported in Table 5.2

$$\blacktriangle\mu t = \beta 1 + \delta\mu t\text{-}1 + \sum \alpha i\ \blacktriangle\mu t\text{-}i + \gamma t \quad \text{-------------------} \qquad (e.5.4)$$

$$\blacktriangle\varepsilon t = \beta 1 + \delta\varepsilon t\text{-}1 + \sum \alpha i\ \blacktriangle\varepsilon t\text{-}i + \gamma t \quad \text{------------------} \qquad (e.5.5)$$

where: ▲ = First Difference operator

Table 5.2: Augmented Dickey - Fuller test

Variable	First Difference
μt	-7.7001*
εt	-6.1034*

Notes: Both the random error variables were lagged by one quarter

* Significant at the 5% critical value of -3.4904 for 56 variables

With reference to Table 5.2 the results of the unit root test indicate the random error variables as significantly stationary and does not reflect the existence of unit root.

The long-run relationship between the two variables of government spending and the real exchange rate, is based on the error-correction models of equations (e. 5.6 and e. 5.7).

$$\blacktriangle LogGS_t = \varepsilon + \chi\varphi_{t-1} + \Sigma\gamma i \blacktriangle LogGS_{t-i} + \Sigma\beta j \blacktriangle LogREX_{t-j} + \phi_{t\text{--}} \quad (e.5.6)$$

$$\blacktriangle Log\ REX_t = \tau + \zeta\Pi_{t-1} + \Sigma\kappa i \blacktriangle Log\ REX_{t-i} + \Sigma\ \beta j \blacktriangle Log\ GS_{t-j} + \omega_{t-} \quad (e.5.7)$$

From equation (e.5.6) and (e.5.7) the short-run components are $\gamma i, \kappa i$, and βj, while the long-run components are Π and φ. The long-run components are derived as follows:

$$\varphi_t = LogGS_t - 0.5784\ LogREX_t \quad \text{-----------------------} \quad (e.5.8)$$

$$\Pi_t = LogREX_t - 0.0003\ LogGS_t \quad \text{-----------------------} \quad (e.5.9)$$

If the two variable, namely government spending (GS) and the real exchange rate (REX) are cointegrated the co-efficients of either 'χ' or 'ζ' from equations (e.5.6) and (e.5.7) respectively, will be significantly different from zero. Estimates of the error-correction model from equation (e.5.6) and (e.5.7) are presented in table 5.3.

Table 5.3

Estimates of Error-Correction Model

Equation	χ	γi (lag 1 quarters)	βj(lag 2 quarters)
E. 5.6	-0.2627	-0.3703	-0.2696
t- values	(-4.8656*)	(-13.9083*)	(-0.5418)
	ζ	κi(lag 1 quarters)	βj (lag 2 quarters)
E.5.7	0.9205	0.0898	-0.0080
t- values	(15.0450*)	(0.5818)	(-0.5731)

Note: * Significant at 5% level

The empirical evidence reflects that when government spending is the independent variable and real exchange rate the dependent variable, the real exchange rate would appreciate when government spending is increased. This is reflected by the negative co-efficient of (βj) in equation (e.5.7). The inverse relationship between government spending and real exchange rate reflects the channel of influence of government spending on real exchange rates. As government spending increase, the prices of nontradables increase and this would appreciate the real exchange rate. In equation (e.5.7) as government spending is increased 1%, the real exchange rate appreciates by 0.008% The co-efficient ζ in equation (e.5.7) is significant and this reflects that there is a long-run relationship between government spending and real exchange rate.

5.3.2 Government revenue and Real exchange rate

In this analysis, two variables namely government revenue(TR) and the real exchange rate(REX) is analysed in order to see the long-term relationship between the two variables. In the first instance the following equations are estimated for the purpose of cointegration between the variables. The expected sign for "g" and "h" are positive.

$$LogTR_t = a + g\ LogREX_t + \mu_t \quad \text{--------------------} \quad (e.5.10)$$

$$LogREX_t = c + h\ LogTR_t + \varepsilon_t \quad \text{---------------------} \quad (e.5.11)$$

The estimated equations provided the following results.

$$LogTR_t = 8.9060 + 1.2425 LogREX_t + \mu_t \quad \text{-------------------}(e.5.10a)$$

$$LogREX_t = -0.2021 + 0.0222 LogTR_t + \varepsilon_t \quad \text{----------------- -}(e.5.11a)$$

A unit root test was conducted on the random error variables of equation (e.5.10a) and (e.5.11a) and the results are reported in Table (5.4).

Table 5.4 **Augmented Dickey-Fuller Test.**

Variables	First Difference
μ_t	-7.7824*
ε_t	-8.0397*

Note: Both the random error variables were lagged by one quarter

* Significant at the 5% critical value of -3.4904 for 56 variables.

The error -correction model is as following.

$$\blacktriangle LogTR_t = \varepsilon_t + \chi\varphi_{t-1} + \sum\gamma_i \blacktriangle LogTR_{t-i} + \sum\beta_j \blacktriangle LogREX_{t-j} + \phi_t \text{---(e.5.12)}$$

$$\blacktriangle LogREX_t = \tau_t + \zeta\Pi_{t-1} + \sum\kappa_i \blacktriangle LogREX_{t-i} + \sum\beta_j \blacktriangle LogTR_{t-j} + \phi_t \text{ -----(e.5.13)}$$

From equations (e.5.12) and (e.5.13), the short-run components are γ_i, κ_i and β_j while the long-run components are Π and φ. The long-run components are derived by the following equations.

$$\varphi_t = LogTR_t - 0.4368 LogREX_t \text{ ---------------------------(e.5.14)}$$

$$\Pi_t = LogREX_t - 0.0242 LogTR_t \text{ ---------------------------(e.5.15)}$$

Estimates of the error-correction model of equations (e.5.12) and (e.5.13) are presented in Table (5.5).

Table 5.5

Estimates of Error-Correction Model.

Equation	χ	γi (lag 2 quarters)	βj(lag 1 quarters)
E.5.12	0.9892	-0.0025	0.0931
t – values	(22.7291*)	(-0.0159)	(0.4166)
	ζ	κi(lag 2 quarters)	βj (lag 1 quarters)
E.5.13	0.1320	-0.5519	0.0036
t - values	(1.2328)	(-10.7353*)	(0.6822)

Note: * Significant at 5% level

The empirical evidence reflects that there is a long-run relationship between government revenue and real exchange rate. This was reflected by the cq-efficient χ is equation (e.5.12). In equation (e.5.13) when the real exchange rate is the dependent variable and the government revenue is the independent variables, it reflects that a 1% increase in government revenue will depreciate the real exchange rate by 0.0036%. This was reflected by the co-efficient βj in equation (e.5.13). This finding reflects that as government revenue increase it will reduce prices of non-tradables and therefore make the real exchange rate competitive.

5.3.3 Exports and Real exchange rate.

As in the previous analysis of cointegration, in this analysis the purpose is in order to see the long-run relationship between exports(EX) and the real exchange rate (REX). The two equations in estimating the long-run relationship between the variables are as follows and the expected signs for "g" and "h" are to be positive.

$$LogREX_t = a + gLogEX_t + \mu_t \text{ ------------------------ } \quad (e.5.16)$$

$$LogEX_t = c + hLogREX_t + \varepsilon_t \text{ ----------------------- } \quad (e.5.17)$$

The estimated equations provided the following results.

$$LogREX_t = -0.2166 + 0.0216\ LogEX_t + \mu_t \text{ ----------- } \quad (e.5.16a)$$

$$LogEX_t = 2.8360 + 2.6080\ LogREX_t + \varepsilon_t \text{ ----------- } \quad (e.5.17a)$$

A unit root test was conducted on the random error variables of equation (e.5.16a) and e.5.17a) and the results are reported Table (5.6).

Table 5.6

Augmented Dickey-Fuller Test

Variable	**First Difference**
μt	-5.4906*
εt	-15.1361*

Note: Both the random error variables were lagged by one quarter.

* Significant at the 5% critical value -3.4904 for 56 variables.

There was no evidence of unit root on the random error variables and this would allow an error-correction model to be estimated using the following equations.

$$\blacktriangle LogEX_t = \varepsilon_t + \chi \varphi_{t-1} + \Sigma \gamma i \blacktriangle LogEX_{t-i} + \Sigma \beta j \blacktriangle LogREX_{t-j} + \phi_t \text{ -----(e.5.18)}$$

$$\blacktriangle LogREX_t = \tau_t + \zeta \Pi_{t-1} + \Sigma \kappa i \blacktriangle LogREX_{t-i} + \Sigma \beta j \blacktriangle LogEX_{t-j} + \phi_t \text{ ---- (e.5.19)}$$

The long-run components in equation (e.5.18) and (e.5.19) were derived in the following equations.

φ_t = $LogREX_t - 0.0066\ LogEX_t$ ------------------------ (e.5.20)

$\Pi_t = LogEX_t\ - 0.3315\ LogREX_t$ ------------------------ (e.5.21)

Estimates of equation (e.5.18) and (e.5.19) are presented in table (5.7)

Table 5.7

Estimates of Error Correction Model

Equation	χ	γi (lag 1 quarters)	βj(lag 1 quarters)
E.5.18	-0.1660	-0.5015	0.2213
t-values	(-0.7040)	(-8.5476*)	(1.1943)
	ζ	κi (lag1quarters)	βj (lag3quarters)
E.5.19	0.0227	-0.4607	0.2066
t-values	(1.6750**)	(-1.4306)	(1.8173**)

* Significant at 5% level.

** Significant at 10% level.

The relationship between exports and the real exchange rate is significant in the long-run. This is indicated by the co-efficient ζ in equation (e.5.19). The empirical evidence also reflects a positive relationship between real exchange rates and exports. In equation (e.5.18) the dependent variable was exports and the independent variable was real exchange rate and the co-efficient βj reflected that as the real exchange depreciates by 1%, exports will increase by 0.22%. The findings reflect that a gradual depreciation of the real exchange rate would be beneficial in arresting a trade deficit in the economy.

5.3.4 Imports and Real exchange rate.

The final long-run relationship that is analysed is between imports(IM) and the real exchange rate (REX). The long-run relationship is focused on the following equations. The expected co-efficients of "g" and "h" are negative.

$$LogREX_t = a + gLogIM_t + \mu_t \quad \text{------------------------} \quad (e.5.22)$$

$$LogIMt = c + hLogREX_t + \varepsilon_t \quad \text{------------------------} \quad (e.5.23)$$

The estimated equations provided the following results.

$$LogREX_t = 0.1848 - 0.0159\ LogIM_t + \mu_t \quad \text{------------------} \quad (e.5.22a)$$

$$LogIM_t = 9.7440 - 0.0305\ LogREX_t + \varepsilon_t \quad \text{------------------} \quad (e.5.23a)$$

The unit root test conducted on the random error variables reflected the variables as stationary and no evidence of unit root. (Table 5.8). This provided the opportunity to derive the error-correction models in equation (e.5.24) and (e.5.25).

Table 5.8

Augmented Dickey-Fuller Test

Variables	First Difference
μ_t	-6.0639*
ε_t	-4.9403*

Note: Both the random error variables were lagged by one quarter.

Significant at the 5% critical value -3.404 for 56 variables.

$\blacktriangle LogIM_t = \varepsilon_t + \chi\varphi_{t-1} + \Sigma\gamma_i \blacktriangle LogIM_{t-i} + \Sigma\beta_j \blacktriangle LogREX_{t-j} + \phi_t$ ------(e.5.24)

$\blacktriangle LogREX_t = \tau_t + \zeta\Pi_{t-1} + \Sigma\kappa_i \blacktriangle LogREX_{t-i} + \Sigma\beta_j \blacktriangle LogIM_{t-j} + \phi_t$ ------(e.5.25)

The long-run components in equation (e.5.24 and (e.5.25) are derived by the following equations:

φt = Log REXt - 0.0159 Log IMt ------------- (e.5.26)

Πt = Log IMt – 0.0305Log REXt ------------- (e.5.27)

Estimates of equation (e.5.24) and (e.5.25) are presented in Table (5.9).

Table 5.9

Estimates of Error Correction Model.

Equation	χ	γi (lag 1 quarters)	βj(lag 3 quarters)
E.5.24	0.6289	-0.5014	-0.8212
t-values	(0.8211)	(-2.5837*)	(-1.0844)
	ζ	κi (lag 2 quarters)	βj(lag 3 quarters)
E.5.25	-0.0614	-0.6253	-0.0654
t-values	(-3.4358*)	(-3.2685*)	(-0.9754)

Note: Significant at 5% level.

The empirical reflects that there is a long run relationship between real exchange rates and imports. This is reflected in equation (e.5.25), where the long-run component ζ is significant. In equation (5.24), the dependent variable is imports and the independent variable is the real exchange rate, the co-efficient βj reflects a inverse relationship between the real exchange rates and imports. It indicates as the real exchange rate depreciates by 1%, imports will reduce by 0.82%. The negative relationship between these two variables, reflects that the trade deficit in the economy can be improved if the currency is allowed to depreciate. This is consistent with our assumption that a depreciation of the real exchange rate will reduce imports.

5.4 Empirical analysis using variables in Real terms

In this part the unit root test and error-correction equations are derived by using real variables. In order to obtain the real variables, the nominal variables were deflated by the consumer price index.

5.4.1 Unit Root Test

A unit root test was conducted on the variables to see if these variables were stationary or non-stationary based on equation (e.5.1). Results of the unit root test are indicated in Table (5.10).

Table 5.10 Augmented Dickey Fuller Test

Variables	Levels	First Difference
Log RGS	-4.9001*	-7.6737*
LogRTR	-2.9295	-7.2097*
LogREX	-1.9404	-6.2247*
LogREXP	-2.7374	-7.3270*
LogRIMP	-2.1514	-6.2771*

Notes: All variables are in natural logarithm and lagged by one quarter.

*Significant at the 5% critical value of –3.4904 for 56 observations.

RGS = Real government spending

RTR = Real total revenue

REX = Real exchange rate

REXP = Real exports

RIMP = Real imports

5.4.2 Real Government spending and Real Exchange Rate

The long-term relationship between these two variables were analysed and the equations derived were equations (e.5.2) and (e.5.3) in the preceding analysis. The co-efficients "g" and "h" were expected to be negative and therefore the following results were obtained.

$$LogRGS_t = 2.1366 - 0.0363\ LogREX_t + \mu_t \qquad \ldots\ldots\ldots\ldots\ldots \quad (e.5.28)$$

$$LogREX_t = 0.0232 - 0.0048 LogRGS_t + \varepsilon_t \qquad \ldots\ldots\ldots\ldots\ldots \quad (e.5.29)$$

Unit root test conducted on the random error variables μ_t and ε_t from equation (e.5.28 and (e.5.29) and reported in Table (5.11).

Table 5.11 Augmented Dickey Fuller Test

Variable	First Difference
μ_t	-10.4680*
ε_t	-4.8739*

Notes: Both the random error variables were lagged by one quarter

*Significant at the 5% critical value of –3.4904 for 56 variables.

The unit root test indicated that both the real government spending and real exchange rate are cointegrated.

Based on equation (e.5.6) and (e.5.7), the long-run relationship between real government spending and real exchange rate was estimated. Results of this estimation are indicated in Table (5.12).

Table 5.12

Estimates of Error-Correction Model

Equation	χ	γ**i** (lag 1 quarters)	**βj**(lag 3 quarters)
E.5.6	0.5816	-0.7726	-0.2806
t-values	(5.4972*)	(-13.1827*)	(-1.7666**)
	ζ	**κi** (lag 1 quarters)	**βj**(lag 1 quarters)
E. 5.7	0.6959	-0.6908	-0.0082
t-values	(3.9180*)	(-6.9300*)	(-18272**)

Note: *Significant 5% level

**Significant at 10% level

The empirical evidence reflects that the expected inverse relationship between real government spending and real exchange rate was significant. This was reflected in co-efficient βj in equation (e.5.7) where real government spending was the independent variables and real exchange rate as the dependent variables. Co-efficient βj indicates if real government spending is increased by 1%, the real exchange rate will appreciate by 0.0082%. The appreciation of the real exchange rate is expected to occur mainly because the rise in prices of non-tradables following the increase in government spending. In both equations (e.5.6) and (e.5.7) the long-run components of χ and ζ were significant, indicating that there exist in long-run relationship between real government spending and real exchange rate.

5.4.3 Real government revenue and Real Exchange rate.

As in the preceding analysis, equation (e.5.10) and (e.5.11) were derived and estimated using the real government revenue and real exchange rate variables. The estimated co-efficients for "g" and "h" are expected to have a positive sign. The estimated equations provided the following results.

$$LogRTR_t = 6.8186 + 0.0673 \text{ Log } REX_t + \mu_t \quad \text{............ (e.5.30)}$$

$$LogREX_t = -0.1348 + 0.0698 \text{ } LogRTR_t + \varepsilon_t \quad \text{............ (e.5.31)}$$

Unit root test conducted on the random error variables of μ_t and ε_t from equation (e.5.30) and (e.5.31) are reported in table (5.13).

Table 5.13 Augmented Dickey Fuller Test

Variable	First Difference
μ_t	-6.7991*
ε_t	-7.9166*

Note: Both the random error variables were lagged by one quarter

*Significant at the 5% critical value of –3.4904 for 56 variables.

The unit root test indicated that both the real government revenue and real exchange rate are cointegrated. This provided the opportunity to estimate the long-run relationship between real government revenue and real exchange rate based on equation (e.5.12) and (e.5.13). The results of that estimate is provided in Table (5.14).

Table 5.14 Estimates of Error Correction Model.

Equation	χ	γi (lag 1 quarters)	βj(lag 2 quarters)
E.5.12	-0.2033	-0.4017	0.0035
t-values	(-3.6671*)	(-14.2535*)	(0.1696)
	ζ	κi (lag 2 quarters)	βj(lag 2 quarters)
E. 5.13	0.7484	-0.7806	0.0681
t-values	(10.8922*)	(-12.7494*)	(1.3541)

*Significant at 5% level.

The empirical evidence in equation (e.5.13) where real government revenue is the independent variables and real exchange as the dependent variable reflect a positive relationship. This was reflected by co-efficient βj in equation (e.5.13), where a 1% increase in real government revenue will depreciate the real exchange rate by 0.0681%. In both equations also the long-run component of χ and ζ are significant, thus indicating that there exist a long-run relationship between real government revenue and real exchange rate. The positive relationship between real government revenue and real exchange rate reflects that the exchange rate can be made as a tool to increase competitiveness of our exports if government revenue is increased. The increase in government revenue will cause prices of non-tradables to fall and therefore depreciate the real exchange rate.

5.4.4 Real Exports and Real Exchange Rate

In this analysis real exports and real exchange rate is analysed. Equation (e.5.16) and (e.5.17) were estimated using, variables in real terms. The expected co-efficient for "g" and "h" are positive. Results of that estimation are indicated below:

$$LogREX_t = -0.3763 + 0.1686\ LogREXP_t + \mu_t \quad \text{..............} \quad (e.5.32)$$

$$LogREXP_t = -17.1575 + 0.07678\ Log\ REX_t + \varepsilon_t \quad \text{............} \quad (e.5.33)$$

Unit root test conducted on the random error variable of μ_t and ε_t form equation (e.5.32) and (e.5.33) are reported in Table (5.15).

Table 5.15 Augmented Dickey Fuller Test

Variable	First Difference
μ_t	-9.0768*
ε_t	-5.1044*

Notes: Both the random error variables were lagged by one quarter.

*Significant at the 5% critical value of –3.4904 for 56 variables.

The unit root test indicate that both the real exchange rate and real exports have a long-run relationship and this provided the opportunity to estimate the error correction models based on equation (e.5.18) and (e.5.19). Results of that estimation is reflected in Table (5.16).

Table 5.16 Estimates of Error Correction Model

Equation	χ	γi (lag 2 quarters)	βj(lag 3 quarters)
E.5.18	-0.1491	-0.6266	0.1245
t-values	(-2.3063*)	(-7.1381*)	(1.9880**)
	ζ	κi (lag 1 quarters)	βj(lag 2 quarters)
E. 5.19	-0.0644	-0.4843	0.0562
t-values	(-0.3538)	(-3.0741*)	(0.3220)

*Significant at the 5% level.

The empirical evidence firstly reflects that the real exchange rate and real exports has a positive relationship. In equation (e.5.18), where real exports is the dependent variable and real exchange rate as independent variable, a 1% depreciation of the real exchange rate will cause real exports to increase by 0.1245% as reflected by the co-efficient βj in equation (e.5.18). The empirical evidence also reflects that there is a long-run relationship between real exports and real exchange rate, as reflected by the long-run component of χ in equation (e.5.18). The positive relationship between real exports and the real exchange rate reflects that a trade deficit in the economy can be arrested if the real exchange rate is allowed gradually to depreciate in order to make exports competitive in international markets.

5.4.5 Real Imports and Real Exchange Rate

The final analysis that was conducted was the relationship between real imports and real exchange rate. Equations (e.5.22) and (e.5.23) were estimated once again using variables in real terms. Results of that estimation are provided below:

$$LogREX_t = -0.0744-0.0273\ LogRIMP_t + \mu_t \qquad \ldots\ldots\ldots\ldots\ldots \text{(e.5.34)}$$

$$LogRIMP_t = 2.1926-0.0329\ Log\ REX_t + \varepsilon_t \qquad \ldots\ldots\ldots\ldots\ldots \text{(e.5.35)}$$

Unit root test conducted on the random error variables of (e.5.34) and (e.5.35) are reported in Table (5.17).

Table 5.17 Augmented Dickey Fuller Test

Variable	First Difference
μ_t	-5.7.451*
ε_t	-4.3995*

Notes: Both the random error variables were lagged by one quarter

*Significant at the 5% critical value of –3.4904 for 56 variables.

The unit root test indicate that both the real exchange rate and real imports have a long-run relationship and this provided the opportunity to estimate (e.5.24) and (e.5.25). Results of that estimation using variables in real terms are reflected in Table (5.18).

Table 5.18 Estimates of Error Correction Model

Equation	χ	γi (lag 2 quarters)	βj(lag 2 quarters)
E.5.24	-0.1562	-0.5301	-0.1363
t-values	(-2.1369*)	(-4.7778*)	(-2.0295*)
	ζ	κi (lag 2 quarters)	βj(lag 2 quarters)
E. 5.25	0.0946	-0.8558	-0.0818
t-values	(0.8014)	(-14.1627*)	(-0.7333)

*Significant at the 5% level.

The empirical evidence reflects that there exist a long-run relationship between real imports and real exchange rate. This is reflected by the co-efficient χ in equation (e.5.24). In equation, (e.5.24) where real imports is the dependent variable and real exchange rate as the independent variable, there is a inverse relationship between these two variables. This is indicated by co-efficient βj, where a 1% depreciation of the real exchange rate will cause a 0.0136% reduction in imports. This evidence reflects that depreciation of the real exchange rate would reduce real imports mainly because the rising cost involved in importing goods from overseas. It also provides an alternative for policy makers to have a gradual depreciation of the real exchange rate in order to reduce the trade deficit.

5.5 Implication of the empirical evidence

Empirical evidence obtained from the econometric study on the relationship between fiscal policy, real exchange rate and trade balance has important implications on policy decisions.

5.5.1 Government spending and real exchange rate

The relationship between government spending and real exchange rate was significant in nominal terms and in real terms. This long-run relationship reflects that as government spending increases, the real exchange rate will appreciate. It reflects that there is a inverse relationship between these two variables in nominal and in real terms. This inverse relationship reflects that as government spending increases, the prices of non-tradables in the economy would increase and this in turn would appreciate the real exchange rate. An appreciation of the real exchange rate during an economic recession would worsen the prospects of recovery for the economy. Therefore it is important that policy makers have a gradual approach in increasing government spending during economic downturns, since an appreciation of the real exchange would worsen the economic scenario. The appreciation of the real exchange rate must come from positive economic fundamentals such as strong economic growth, transparent policies and strong confidence on policy makers among foreign investors. An appreciation of the real exchange rate caused by an increase

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During economic upturns, excessive increase in government spending could also cause private investments to be crowded out. This crowding out can be caused by higher interest rates in the economy which in turn reduces private investments in the economy. Crowding out of private investments during an economic upturn, increases the burden on the government to sustain economic growth and therefore could increase the fiscal deficit in the economy. Appreciation of the real exchange rate and weak private investments would in turn increase the perception that a currency is overvalued during an economic upturn and will be the target of speculators.

5.5.2 Government revenue and real exchange rate

The empirical study has indicated that there is a long-run relationship between government revenue and real exchange rate in nominal and in real terms. The study also reflects that as government revenue is increased, the real exchange rate would depreciate gradually. This evidence reflects that a gradual increase in government revenue during an economic upturn will in turn increase the competitiveness of our exports by allowing the real exchange rate to depreciate. During economic downturns, it is difficult to increase government revenue, but policy makers must note that if the objective is to increase the competitiveness of our products in the international market, therefore government revenue must be allowed gradually to increase in order to depreciate the real exchange rate. A gradual depreciation of the real exchange during economic upturns also would not allow the currency to be speculated mainly because, investors would perceive that the currency is not overvalued.

During economic downturn, there must be a balanced approach in solving a recession. The objective must be clearly spelt out to currency speculators, in order to avoid unnecessary speculation on the currency. Implementing austerity policies such as increasing government revenue and reducing government spending would be well received by foreign investors since it would indicate that policy makers are allowing the real exchange rate to depreciate in the long-run, but in the short-run the pain that the economy has to experience is higher unemployment, slower economic growth and higher inflation.

5.5.3 Exports and real exchange rate

The empirical evidence reflected that there is a long-run relationship between real exchange rates and exports in nominal and in real terms. In both situations, the empirical evidence reflected that a depreciation of the real exchange rate would cause an increase in exports, therefore indicating the positive relationship between the two variables which is consistent with our hyphothesis. A depreciation of the real exchange rate increases exports, however it is important to note that excessive depreciation of the real exchange rate brought about by an increase in government revenue can actually increase inflation in the economy. A gradual increase in government revenue during an economic upturn can help arrest the trade deficit in the economy, however if the trade deficit is due to excess demand in the economy, policy makers would have to tighten monetary policy and also make sure that the real exchange rate does not appreciate due to higher interest rate differentials. It is important that policy makers tackle the trade deficit in the economy by increasing exports via a weak real exchange rate and control inflation through tight monetary policy.

During economic downturns solving a trade deficit problem via a weak real exchange rate is less difficult if policy makers increase government revenue. During economic downturns, excess demand in the economy is reduced and therefore inflationary pressures are less likely to build up, therefore paving the way for policy makers to increase exports by allowing the real exchange rate to depreciate.

5.5.4 Imports and Real Exchange Rate.

The empirical evidence from the study indicated that there is in long-run relationship between the two variables in real and in nominal terms. In both situations, the empirical evidence reflected that a depreciation of the real exchange rate would reduce imports. This inverse relationship is consistent with our hypthothesis. The trade imbalance in the economy brought about by excess demand can be tackled if the real exchange rate is allowed to depreciate, however if these imports of goods are capital and intermediate goods that help in sustaining economic growth, it would have adverse effects to allow the real exchange rate to depreciate. An increase in the import cost of capital and intermediate goods via a depreciation of the real exchange rate can inturn increase inflationary pressures in the economy. During economic upturns, the demand for these goods increase mainly due to the increase in private investments in the economy. Allowing the currency to depreciate during economic upturns can exacerbate inflationary pressures in the economy and crowd out private investments. An alternative would be to encourage local industries to produce these goods in the domestic economy instead of relying on imports. Capital and intermediate goods can be produced in the domestic economy if there is an increase in research and development activities. Policy makers should focus on policies that would enable these goods to be produced in the domestic economy instead on relying on a depreciation of the real exchange rate to arrest the trade deficit in the economy.

During economic recession, imports would naturally reduce mainly because thė reduction of income in the economy and weak private investments. The real exchange rate can be allowed to depreciate via an increase in government revenue, since inflationary pressures in the economy would have been subdued. Exports can be increased and imports reduced by allowing the real exchange rate to depreciate.

5.6 Conclusion

The empirical study has reflected that in real and in nominal terms, a increase in government spending would appreciate the real exchange rate while a increase in government revenue will depreciate the real exchange rate. The study also reflected that a depreciation of the real exchange rate would increase exports in real and in nominal terms, but instead will reduce imports in real and in nominal terms.

Implication of this study reflects that excessive increase of government spending in relative to government revenue during an economic downturn would actually appreciate the real exchange rate and worsen the trade balance in the economy. Worsening of the trade balance during a economic recession would prolong the economic downturn and thus create an overvalued currency and this in turn would invite speculation on the currency. During an economic upturn an increase in government spending in relative to government revenue would exacerbate inflationary pressures in the economy, since rising incomes in the economy would worsen the excess demand situation in the economy and therefore induce a deeper trade deficit in the economy. In this case also, the currency would be perceived as overvalued and thus invite speculation.

During economic downturn, increase in government revenue relative to government spending would depreciate the real exchange rate and provide support in turning around a trade imbalance in the economy. However the risk to this scenario is that it can induce an increase in inflation. Nevertheless the increase in inflation is expected to be minimal mainly because weak domestic demand during an economic downturn thus eliminating the risk of a excess demand scenario in the economy. During economic upturns, increase in government revenue relative to government spending would allow the real exchange rate to depreciate and therefore arrest the trade imbalance in the economy. Rising incomes during economic upturns increases the possibility of imports of luxury items, therefore a depreciation of the real exchange rate would help in arresting imports of these goods. Allowing the real exchange rate to depreciate during an economic upturn could also cause increase in inflation, however policy makers must be vigilant to stem inflation by tightening monetary policy.