

# Fiscal Performance and External Public Debt Sustainability: A Case Study of Pakistan

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## Abstract

The present study analyzes the impact of fiscal performance on external debt sustainability for Pakistan using the time series data for the period 1976 to 2013. The objective of the study is to find out whether fiscal performance, segregated into tax revenue, non-tax revenue and government expenditures, strengthens or weakens the external debt sustainability indicators. To find the long run relation among the variables, Johansen Co-integration technique is applied. Vector Error Correction Model and parameter stability tests are also applied to examine the short-run relationship. The empirical results from this study show that enhancing the pool of government resource through tax revenue, non-tax revenue, and worker's remittances reduces the debt burden and contributes towards debt sustainability. On the other hand, increase in the total government expenditures flames the fire of debt burden and weaken the debt sustainability condition. The VECM and CUSUM test shows that parameters remain stable during the period of study. In the view of empirical findings, the study recommends that fiscal consolidation is required for improvement in external debt sustainability.

**Keywords:** external debt sustainability, debt carrying capacity, fiscal performance

## 1. Introduction

The Mercantilist School of thought strongly advocated public debt. According to the concept, public debt was never a cause for alarm. It enhanced the wealth of nations and not considered to be a transfer of burden to the future generation. Since, it helped in resource mobilization, giving a spur to the national industry, and hence economic growth. During the early 19<sup>th</sup> century, large amounts of public debt were raised to finance public works program for relief of unemployment and social welfare (Fetter, 1958). Public debt is an important source for bridging the financing gap of the economy. Prudent usage of this debt enhances the economic growth and builds up the capacity to service and repay it. But reliance of government finances on public debt for a longer time period might pose threat to its sustainability.

Developing countries' public debt structure differs from that of developed countries. The question why a nation is needed to raise public debt has strong relation to its overall economic performance. When a country is unable to stabilize its fiscal position, debt becomes burdensome and a country is likely to enter in debt trap. In case of Pakistan, there are many factors that contribute to the raising of public through domestic and external resources. On the revenue side, government is unable to properly mobilize the resources. The tax to GDP ratio (which remains around 10 %) is very low compared to the international standard requirement. Government is always unable to achieve the targeted level of tax revenue. The fiscal deficit rises due to higher tax evasion, the burden of government subsidies and heavy burden of defence expenditures. The present situation of the country has added fuel to the fire and the foreign investors are not inclined to invest in the country. Energy crises and terrorism have also lowered the economic activities, so lower output results in lower growth of GDP. The country also faces the balance of payment problem. In addition, liquidity position is not very strong due to the weak situation of the foreign exchange earnings and foreign exchange reserves. Higher fiscal deficit is also the symptom of weak fiscal position. To finance government expenditures, the government is forced to raise public debt. Furthermore, to pay back the debt and interest payments, more external debt is raised due to lesser resource mobilization domestically.

Prudent usage of public debt is necessary for its sustainability. It enhances the economic growth and builds up the capacity to debt servicing and its repayment. In other words, debt sustainability can be achieved when the revenue growth is greater than the growth of debt stock and debt ratios remain less than the recommended threshold levels. This supports the government to undertake its social and development goals. The debt burden becomes unsustainable when the revenue growth is less than growth in the debt burden and debt servicing exceeds the given threshold level. Hence, it is very crucial to analyse the impact of the fiscal performance on external debt sustainability.

The present study explores the relationship between fiscal performance and external debt sustainability indicators. To determine the long run relation among the variables, Johansen Co-integration technique is used. The Vector Error Correction Model is employed to test the short-run relationships and parameter stability tests are applied.

## 2. Literature Review

Most of the past literature has undertaken a descriptive analysis to address the issue of public debt sustainability. Tahir and Ahmad (1998), undertakes a descriptive analysis of public debt and its sustainability in Pakistan. According to the study, debt management is not the priority issue in economic policies and government respond to this issue in the unstable political situations. There is lack of proper institutional structure for deal with debt problem and holistic approach is required for proper debt management. A central agency is required for public debt management, equipped with trained and professional economists. The debt management policies should in accordance with other economic performance policies.

Descriptive analysis is also carried out by Marquez (2000), for ECCB member countries over the period of 1988 to 1998. Although, the growth rate of debt to GDP ratio seems to be declining. Debt arrears and external debt rescheduling implied that there is need of foreign debt management through proper policy action. Large fiscal deficit and external debt may raise interest payment expenditures and inflation in the economy of ECCB territories. The study concludes that exports earning through export diversification should enhance for increasing the debt carrying capacity. Reinhart, Rogoff, and Savastano (2003) also settle to similar conclusions i.e. weak fiscal and financial structure has led to debt intolerance and future default for emerging market economies. Short term interest rate, exchange rate, inflation and maturity structure are the relevant variables in describing the vulnerability towards debt intolerance. Islam and Biswas (2005), also assessed debt sustainability by using the descriptive statistics and estimated budget constraint equation for Bangladesh for the period 1981 to 2006. Interest payment on both types of debt has increased. Debt dynamic equation shows that interest rate is the major factor in changing the debt stock. On the other hand GDP growth, trade deficit, primary deficit, exchange rate and the reserve money has also impacted the debt growth. Debt to GDP ratio seems to be convergent due to explosive debt dynamic coefficient. The study recommend coordination between the fiscal and monetary policies, increase in tax revenue and growth of real interest less than GDP growth for overall debt sustainability.

According to Makin (2005), private-public partnership and fiscal consolidation for making the public debt burden sustainable and healthy macroeconomic performance. The study analyses the public debt sustainability and its possible implication on the economy of the Indonesia, Philippines, Malaysia and Thailand. Large budget deficits and bank recapitalization were the main cause of the countries' crises of late 1990's. Higher interest rate and exchange rate depreciation cause the public debt burden in these countries. The study shows that Malaysia and Thailand have the sustainable level of public debt while, Indonesia and Philippines have needed higher positive primary balance for debt sustainability. Proper mobilization and utilization of the resources is a key for raising the primary balance. Similarly, Samake and Tanner (2007), examine the debt sustainability for Brazil, Turkey and Mexico using the vector autoregressive approach. The data on interest rate, exchange rate, inflation and primary balance is used for the period 1995 to 2005. The result indicates that fiscal performance (interest rate and exchange rate shocks) shocks have contributed towards debt accumulation in the mentioned countries. For Brazil, current account surplus with the stable or decrease real interest rate leads towards the debt sustainability. Primary surplus would help in making the debt sustainable in Turkey. On the other hand, natural resource wealth contributes towards the debt sustainability in Mexico. Proper fiscal adjustment and primary surplus are required for making the debt burden sustainable in Brazil, Mexico, and Turkey.

The overall debt situation, its management and the role of monetary and fiscal policies is studied by Mahmood and Rauf (2008), The study considers the case study of Pakistan for the period 1970 to 2008. According to the study, despite the financial and fiscal reforms the fiscal deficit, external sector position, and overall debt situation has persisted. The improvement in the debt situation required the resource mobilization, its efficient utilization, reduction in fiscal and current account deficit through increased exports earnings, workers' remittances, import substitution, and the stable exchange rate. The relationship between fiscal performance and debt sustainability of Brazil is analysed by De Mello (2008). The study used the monthly data for the period 1995 to 2004 for primary budget surplus to GDP ratio, real interest rate, real GDP growth rate, monetary base to GDP ratio, and debt to GDP ratio. Johansen co-integration technique is applied for the long run relationship and error correction for short run estimation. Results from fiscal reaction function tell that government responds to the indebtedness level by raising their primary balance surplus. There exists long-run and the short run relationship in the fiscal reaction function. The Debt dynamic seems to be sustainable due the government spend-tax policy. For the sustainability of the Brazil's government should generate the primary balance surplus, reduce debt to GDP ratio and macroeconomic stability. Fiscal consolidation, lower level of current expenditure, better institutions will also cause a reduction in debt sustainability.

The debt sustainability for African countries is analysed by Muhanji and Ojah (2011). The study calculates the threshold debt ratios for the debt sustainability using the regression analysis. The time period covered is 1980 to 2008. According to research, debt to GDP and short-term debt to reserves ratio should be 80%, while debt to exports ratio should be 60% which is far less than recommended by the international bodies for

Highly Indebted Poor Countries (HIPC's). Stable political situation and good macroeconomic performance play a key role in enhancing debt sustainability of African countries. The study recommends export promotion policies with stable political and legal environment which can make the debt burden sustainable in African region countries.

Chandia and Javid (2013), analysed the Pakistan debt sustainability by estimating fiscal reaction function, extended fiscal reaction function, government expenditure and revenue adjustments to debt using OLS. The study estimates debt dynamics and impulse response function using unrestricted VAR and Johansson co-integration techniques, covering the time period from 1971 to 2008. The results confirm that government expenditures and revenues are both significant in making adjustment to debt. Impulse response function implies that interest rate and exchange rate appreciate with increase in the government expenditure. On the other hand, an increase in the tax collection will reduce the debt, while increase in the debt will lower the discounted future earnings. Decline in the revenue will reduce the output of the economy and increase in the debt. The study recommends that debt sustainability can be achieved by mobilization and proper utilization of the resources.

Dumitrescu (2014), examines the situation of public debt, its sustainability and determinants over the period 2002 to 2013 for Romania. The study estimates the budget constraints using primary budget expenditure, revenue, monetary base, average nominal interest rate and public debt. According to the results, fiscal deficit, negative primary balance, currency depreciation, weak fiscal position and policies have contributed positively towards public debt. On the other hand, real GDP growth and real interest rate result in a reduction of public debt. The present study contributes towards the literature by examining the segregated fiscal performance impact towards the external debt sustainability. In this way, it has important implications for external debt management policies.

## Data and Methodology

### 2.1 Variables and Data Sources

The main objective of the study is to examine the impact of fiscal performance on the domestic and external debt sustainability. The dependent variable is external debt sustainability and is measured as total external debt as a percentage of foreign exchange earnings (EDS). It is a flow ratio of external debt as a percentage of foreign exchange earnings and shows the debt repayment capacity of the country. Increase in this ratio shows lower debt carrying capacity of the economy and vice versa. The time series data on the independent variables is collected for tax revenue (TR), non-tax revenue (NTR) and total government expenditures (TGE) and worker's remittances (WR), where WR is the control variable. The sample time period for data is 1976 to 2013. The data sources include Handbook of Statistics on Pakistan Economy, various issues of Economic survey of Pakistan, Pakistan Statistical Year Book and World Development indicators (WDI).

### 2.2 Econometric Methodology

Simple regression analysis of the time series data may produce a spurious relationship. To find a meaningful long-run association among a set of time series, co-integration approach is applied. Co-integration implies that their stochastic trends are linked and they cannot move independently of each other, Enders (2010). So the first step for finding the co integration is to find the order of integration for all the variables included in the models. The order of integration means the number of differencing operation for making a series stationary. The study employs Augmented Dickey Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) unit root test to check the order of integration.

#### 2.2.1 The Augmented Dickey Fuller Test

ADF test take the following form of equation:

$$\Delta Z_t = \rho_0 + \theta Z_{t-1} + \sum_{i=1}^n \gamma_i \Delta Z_{t-i+1} + \epsilon_t \quad (1)$$

ADF takes care of parametric correction of serial correlation in residual term ( $\epsilon_t$ ) by including lagged difference of the dependent variable.

$$H_0: \theta = 1$$

$$H_1: \theta < 1$$

Null hypothesis states that the series is non-stationary (have a unit root problem). The  $T$  statistics are used to checking the significance of the empirical results, Gujarati (2003). The study uses Schwarz information Criterion (SIC) for optimal lag length selection.

#### 2.2.2 The Phillips-Perron (PP)

Phillips and Perron (1988), developed a non-parametric test for tackling serial correlation problem in residual without adding lags difference of the dependent variable. The t-ratio for this test is modified by the authors to take care of the serial correlation and the possible impact on asymptotic distribution of PP test Hill, R. C., Griffiths, W. E., & Lim, G. G. C. (2012).

The PP t-ratio is calculated through the following formula:

$$t_{\theta} = t_{\theta} \left( \frac{\alpha_0}{m_0} \right)^{1/2} - \left( \frac{N(m_0 - \alpha_0)(se(\hat{\theta}))}{2m_0^2 / \alpha_0} \right) \quad (2)$$

Where:

$\hat{\theta}$  is the estimate, and  $t_{\theta}$  is the t-ratio of  $\theta$ .  $se$  is the standard error of the  $\hat{\theta}$  and  $\alpha$  is the standard error of the test regression.  $\alpha_0$  is the consistent estimate of the error variance from Dickey fuller test equation.  $m_0$  is the estimator of the residuals spectrum at zero frequency. If there is the problem of the structural break in the time series data these test may be unable to catch.

### 2.2.3 The Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) Test

Kwiatkowski, Phillips, Schmidt, and Shin (1992), developed this test for checking the unit root problem in the time series data. This test is based on the residual from the OLS. LM statistics is used for this test for checking significance of t-statics. Here the null is that the series is stationary.

$$H_0: \theta < 1$$

$$H_1: \theta = 1$$

### 2.2.4 Johansen Co integration Approach

For multiple variables there may be more than one co-integrating vectors to exist. This implies that there is more than one long run equilibrium relationship among the variables. Single equation based Engle-Granger Co-integration approach is not appropriate for the multiple variables case. To find the long-term equilibrium relationship using the Johansen approach requires the appropriate lag length selection. Since, too many lags reduce the power of the tests and too few lags disturb the white noise process of the residual. Schwarz Information Criterion (SIC) is followed for lag length selection for both the domestic and external debt sustainability models.

The Johansen and the Stock and Watson in 1988 developed multiple equation Co-integration approach for finding the number of co-integrating vector. This approach is a multivariate generalization of the Dickey-Fuller Test Enders, W. (2010). Johansen Co integration gives the number co integrating vector and the speed of adjustment coefficients as well.

$$\Delta Z_t = A_0 + \pi Z_{t-1} + \sum_{i=1}^{p-1} \pi_i \Delta Z_{t-i} + \epsilon_t \quad (3)$$

Here,  $A_0$  = vector (n.1) of the constants, and  $\pi (= \alpha\beta')$  is the rank of the co integrated vector. It gives long run parameters,  $\beta = (\beta_1, \beta_2, \beta_3, \dots, \beta_n)'$ , speed of adjustment coefficients  $\alpha = (\alpha_1, \alpha_2, \dots, \alpha_n)'$ .  $Z_t$  = the (n.1) vector  $(Z_1, Z_2, \dots, Z_n)$  and  $\epsilon_t$  = is an n-dimensional identically and independently distributed error term with zero mean and variance matrix.

### 2.2.5 Vector Error Correction Model (VECM)

After estimating the number of co-integrating equations the VECM is estimated. This model gives the error correction term which shows the speed of adjustment of the short term deviation towards long run equilibrium. Vector Error Correction model is given as:

$$\Delta Y_t = \gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + \dots + \gamma_{k-1} \Delta Y_{t-k-1} + \pi Y_{t-1} + \mu_t \quad (4)$$

Where  $\pi$  contains the information regarding the error correction term. To check the parameters stability, CUSUM test of parameters stability is applied on the estimated model. The parameters will be stable if the graph of the CUSUM is within the critical bounds.

## 3. Empirical Results

The dynamic relation between fiscal performance and external debt sustainability is examined using the Johansen Co-integration approach. The estimated results are provided below:

### 3.1 Unit Root Tests

The results from ADF, PP unit root test depicts that all the variables have unit root problem at level and hence non-stationary. While the KPSS unit root also shows that all the series are non-stationary. The summary results for all the unit root tests are given below Table 1.

Variables	ADF		PP		KPSS	
	t-statistics	Probability	t-statistics	Probability	LM- STAT	Critical values at 5%
EDS	-1.800417	0.3745	-2.107122	0.2431	0.499911	0.436000
TR	-1.431538	0.5564	-1.431538	0.5564	0.676403	0.436000
TGE	-0.889416	0.7805	-0.813651	0.8035	0.582807	0.436000
NTR	-1.153520	0.6839	-1.248697	0.6427	0.559609	0.436000
WR	-0.049292	0.9476	-0.495293	0.8809	0.523690	0.436000

The first difference of all the variables is taken to make them stationary. The results are given below in

Table 2. The results indicate that all the series are of integrated order one ( $Z_t \sim I(1)$ ) where  $Z_t$  is the vector of all the variables used in the model. Since all the variables are integrated of same order one, this implies that co-integration can be applied in order to find the long run relationship among all variables.

Variables	ADF		PP		KPSS	
	t-statistics	Probability	t-statistics	Probability	LM- STAT	Critical values at 5%
EDS	-4.3674*	0.0014	-4.4195*	0.0012	0.11682**	0.436000
TR	-5.3434*	0.0001	-5.31285*	0.0001	0.04608**	0.436000
TGE	-4.8186*	0.0004	-5.13784*	0.0002	0.15413**	0.436000
NTR	-5.5323*	0.0001	-5.49710*	0.0001	0.06564**	0.436000
WR	-3.9332*	0.0045	-3.90729*	0.0048	0.23065**	0.436000

\* shows rejection of  $H_0$  at 1% level of significance.

\*\* shows rejection of  $H_0$  at 5 % level of significance.

### 3.2 Johansen Co-integration and long-run estimates

Johansen co-integration test is applied to find the number of co-integrating vectors among the variables. This method requires the optimal selection of the lag length. For the optimal lag selection Schwarz Information Criterion (SIC) is followed, which shows lag length of one (See Appendix, Table A). The results of Johansen Co-integration test are given below in Table 3. The results indicate the presence of one co-integrating equation, supporting single equation relationship among the variables under consideration.

Null Hypothesis ( $H_0$ )	Trace Statistic	Eigen Value
$r = 0$	81.04213* [0.0049]	37.38152** [0.0183]
$r \leq 1$	43.66060 [0.1173]	20.21206 [0.3267]

\* shows rejection of  $H_0$  at 1 % significance level

The result in Table 3 shows that a long-run relationship exists among the variables under consideration. In the next step, long-run coefficients of the co-integrating equation are estimated and the results are provided in Table 4.

Variables	C	TR	TGE	NTR	WR
Coefficients	289.5344	-1.8946** [4.15073]	1.7611** [-5.61763]	-3.7100** [4.27252]	-2.1394** [12.2940]

\*\* shows that all the coefficients are statistically significant at 5% level of significance

The empirical result indicates that all the coefficients are statistically significant at 5% level of significance. Accordingly, a unit increase in the tax revenue in long run reduces the ratio of external debt to foreign exchange earnings (which measures the external debt sustainability) by 1.89 units on average. This means that increase in tax revenue enhance the external debt carrying capacity. Similarly, a unit increase in total government expenditure increases the absolute value of the external debt sustainability (EDS) i.e. the ratio of total external debt to foreign exchange earnings by 1.76 units. This reflects that increase in the total expenditures enhance the external debt vulnerability. Empirical estimate of non-tax revenue shows that a unit increase in the non-tax revenue reduces the EDS ratio in the long run by 3.71 units. Hence, non-tax revenue also contributes towards external debt sustainability. Likewise, one unit increase in the workers remittances lowers ratio 2.14 units on average, showing that worker remittances also play its role in reducing the external debt liabilities. There is negative long run association among EDS, TR, NTR, and RWR and positive long run associations between EDS and TGE. This means that increase in tax & non-tax revenue and worker remittances increases the debt carrying capacity by making the debt sustainable, while increase in the total government expenditures increase the external debt liabilities. The empirical estimates depicts that non-tax revenue contributes more towards debt sustainability compared to the tax revenue and workers remittances.

### 3.3 The Short-run estimates: Vector Error Correction Model (VECM)

The short-run relationship is estimated using the vector error correction model (VECM). The advantage of using VECM is that it distinguishes between short and long run relationship among the variables Engle and Granger (1987). The error correction term shows the speed of adjustment towards the long-run, if any deviation occurs in the short-run. If the absolute value of the error correction coefficient is less than one it shows that system is not explosive. The results of VECM are provided in Table 5.

Table 5: Summary results for VECM and Diagnostic Test

$\mu_{t-1}$	-0.886881 [-6.07164]*
C	-7.346062 [-2.29537]
$R^2$	0.653505
S.E from Regression	17.57838
$\chi^2$ serial correlation	0.8381**
* shows that the coefficients are statistically significant at 5% level of significance.	
** shows the insignificance of the p-value at 5 % for residuals serial correlation LM test	

The results indicate that error correction term ( $\mu_{t-1}$ ) is statistically significant at 5 % level of significance. The term  $\mu_{t-1}$  has negative sign which implies that  $\Delta EDS_t$  fall for convergence towards long run equilibrium.  $\mu_{t-1}$  tells that annual adjustments of  $EDS_t$  will be about 89% is any deviation occurs in the short-run. It means 89 % of the discrepancy between the long run and short run  $EDS_t$  is corrected within a year. The time period required for the whole adjustment for the short term discrepancy is one year and two months approximately. R-square is 0.6535 indicating 65% variation explained by the explanatory variables in the model. The LM serial correlation test shows that there is no problem of serial correlation in residual term at 5 % level of significance.

To check the parameters stability, the CUSUM test of parameter stability is applied. The results show that the value of the CUSUM graph is within the 5 % critical bounds indicating that there is stable long run relation among all the variables. Thus we can say that results are appropriate for policy recommendation. The graph of CUSUM test is provided in Figure 1 (See Appendix).

#### 4. Conclusions

The present study examines the relationship between fiscal performance and external debt sustainability by employing the time series data for Pakistan covering the time period from 1976 to 2013. The Johansen Co-integration technique and Vector Error Correction Model is applied to examine the long-run and short-run relationships. The unit root tests (ADF, PP and KPSS) are applied to find the order of integration. The results of the unit root tests show that all the variables are integrated of order one. The Johansen Co-integration test confirms the presence of one co-integrating equation at 5 % level of significance. The long-run estimates are also statistically significant with expected signs. The error correction component also indicates that any short-run deviation is automatically adjusted in the long run and 89% disequilibrium is corrected each year. Taking the theoretical consideration, tax and non-tax revenue should significantly contribute towards improving the debt sustainability. The empirical results for Pakistan are in accordance with this view point. Since, the increase in capacity of the government to debt servicing and repayment through tax and non-tax revenue leads towards debt sustainability. For external debt sustainability, proper efforts need to be made to mobilize resources domestically through the tax and non-tax revenue. The total government expenditure has a negative relationship with debt carrying capacity. Therefore, government should rationalize the expenditures by specially focusing the expenditures that are non-productive in nature.

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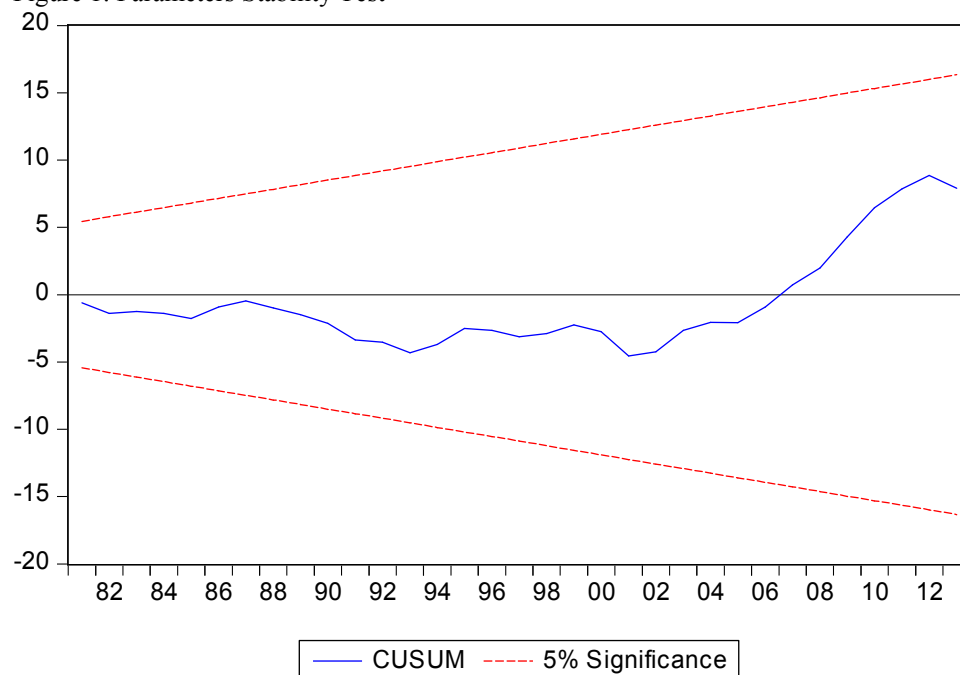
## Appendix

Table A: Lag Length Selection

Lag	AIC	SIC	HQ
0	40.72334	40.94553	40.80004
1	36.00454	37.33769*	36.46474*
2	36.23342	38.67754	37.07713
3	35.89877**	39.45385	37.12599

\* explains 1 lag length using Schwarz Information criterion (SIC) and Hannan-Quinn information criterion (HQ)

Figure 1: Parameters Stability Test





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