

## **DEFENSE EXPENDITURES AND EXTERNAL DEBT: EVIDENCE FROM PAKISTAN AND INDIA**

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**Abstract.** Defense expenditures and external debt is an area that is less focused in the defense economics literature. This study has explored the defense-debt nexus for the two rival neighboring countries, *i.e.* Pakistan and India. We have used the time series data for the period of 1972 to 2010. The methodology employed for the study is Autoregressive Distributed Lag ARDL. Dunne (2003) defense-debt model has been used to probe the impacts of defense expenditures on external debt in both the countries. The findings of the study suggest that defense spending has escalated external debt in both the countries. The study suggests that both the countries must reduce their defense expenditures as these are contributing to their external debt accumulation. So, both the countries should lessen their defense spending to get the sovereignty and self-esteem in the world.

**Keywords:** Defense expenditures, External debt, Pakistan and India, ARDL

**JEL classification:** H56, H63, P24

### **I. INTRODUCTION**

There are many dimensions of defense expenditures. A lot of empirical and theoretical work has been carried out to explore the economic effects of defense spending since the seminal study of (Benoit, 1973). The defense-

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growth relationship has been the center of attention of the researchers or more specifically the defense economists. A few studies (*see* Brzoska, 1983; Looney, 1989; Karagol and Sezgin, 2004; Kollias *et al.*, 2004; Dunne *et al.*, 2004a; 2004b; Günlük-Senesen, 2004; Karagol, 2005; Narayan and Narayan, 2008; Narayan and Smyth, 2009; Wolde-Rufael, 2009 and Shahbaz *et al.*, 2013) have focused on defense-debt relationship. The countries like Pakistan and India, who have hostile relationship with each other, have to spend more on defense activities. Therefore, we cannot ignore the role of defense spending in external debt accumulation of these countries. The countries have to hinge on internal or external debts to finance the sizeable defense expenditures. It is a matter of great importance to investigate the impact of defense outlays on external debt because external debt has adverse economic effects.

This study has significance in the existing defense-debt literature due to two reasons. Firstly, it is the prime attempt on defense-debt relationship for Pakistan and India simultaneously. The second contribution of this study is that it uses an ARDL approach to examine the defense-debt relationship.

The study is planned as follows: In section II, we have reviewed the studies on defense expenditures and external debt. Section III contains the model specification. Section IV presents data, description of variables and methodology. ARDL Model Specification and Bounds Testing Procedure have been explained in section V and VI respectively. The empirical results have been elaborated in section VII. Finally, section VIII offers the conclusion of the study.

## **II. STUDIES ON DEFENSE EXPENDITURES AND EXTERNAL DEBT**

The defense-debt nexus is a controversial area of defense economics. The researchers have concentrated little on this aspect of defense expenditures. Therefore, less empirical studies are available on the subject both for developing and developed countries.

The pioneer study to explore the defense-debt relationship was conducted by Brzoska (1983). The findings of the study revealed that defense spending was the main cause of external debt in developing countries. According to Brzoska, defense spending escalated the external debt 20% to 30%.

Looney and Frederiksen (1986) analyzed the impacts of defense expenditures, external debt and investment on economic growth for two set

of developing countries (thirty eight resource constrained and twenty eight resource unconstrained countries) over the period of 1970-1982. The authors used factor and discriminate analysis to classify the countries. The study considered the borrowing capacity of countries while explaining the defense-growth relationship. The empirical results indicated the positive effects of defense spending on growth in unconstrained countries while negative insignificant effects of defense spending were found for constrained countries.

Looney (1987) investigated the impact of military spending on the external public debt of third world countries. The author grouped the third world into two separate groups *i.e.* un-dynamic resource constrained countries and dynamic less constrained countries. The study found that defense expenditures contributed to external debt of constrained countries but no such evidence was found for unconstrained countries.

Dunne (2003) examined the relationship between military spending and debt in three South American countries (Argentina, Brazil and Chile) in 1980s. The findings of the study suggested that military expenditures did not contribute in Argentina and Brazil's debt evolution but some evidence was found for Chile.

Dunne *et al.* (2004) explored the impact of defense expenditures on external debt of eleven small industrializing countries (including Pakistan and India) by employing the dynamic panel data and Arellano–Bond GMM techniques over the period of 1960-2000. The empirical results of both techniques indicated the positive relationship between defense spending and economic growth.

Narayan and Smyth (2009) investigated the defense-debt nexus for six Middle Eastern countries (Bahrain, Iran, and Jordan Oman, Syria and Yemen) over the period 1988-2002.

The study found long run relationship between defense expenditures, external debt and income using Pedroni test for panel cointegration. The authors indicated that military expenditures contributed to external debt of Middle Eastern countries.

Now we turn towards the national studies. In another study, Looney (1989) investigated the defense-debt nexus for Pakistan and highlighted that defense spending of Pakistan influenced the capability of foreign borrowing. The study showed that foreign lenders reduced lending to Pakistan due to increase in military spending and Pakistan being the resource constraint country.

Karagol and Sezgin (2004) attempted to document the relationship between defense expenditures and debt rescheduling in Turkey over the period 1955–2000 using the Probit model approach. The empirical results suggested that financial variables contributed in rescheduling probabilities while political variables were not found significant in debt rescheduling.

Günlük-Senesen (2004) evaluated the role of defense spending in the evolution of external indebtedness of Turkey in 1980s. The study concluded that besides other factors defense spending increased the Turkey's current account deficit and external debt. Sezgin (2004) studied the defense and debt relationship in Turkey over the period of 1979-2000. The study used Engle–Granger methodology to analyze the impacts of defense spending, defense equipment expenditures and arms imports on Turkey's external debt. The findings suggested the negative relationship between defense spending and external debt in the long run. The arms imports showed the positive effect on external debt in the short run.

Karagol (2005) applied the multivariate model to explore the causal relationship between defense spending and foreign debt in Turkey for the period 1955-2000. The study revealed the long run relationship or cointegration between defense spending and foreign debt. Positive effects of defense spending were found for external debt accumulation. Granger causality test suggested the unidirectional causality from defense spending to debt. Another study by Karagol (2006) re-evaluated the defense-debt relationship for Turkey over the period of 1960-2002 by extending the Looney and Frederiksen's (1986) study. The study found positive relationship between defense spending and external debt by applying various econometric tools, *i.e.* cointegration, impulse response functions and variance decomposition.

Karagol and Turhan (2008) estimated the relationship between defense expenditures, external debt and political business cycles in Turkey over the period 1960-2002. The study included two effects of political business cycles namely the electoral effects and the partisan effects. The findings of the study suggested that the effects of defense spending were positive under impulse response functions. The study explored the importance of colors of political parties. The results revealed that political ideology and fiscal policy played a vital role in determining the defense expenditures.

Feridun and Sissoko (2008) discussed the impact of defense spending on external debt in Brazil for the period 1971-2002. The study concluded Granger causality test to explore the defense-debt relationship. The findings of the study suggested that defense spending mounted up the debt of Brazil. Unidirectional causality found from defense spending to external debt.

Narayan and Narayan (2008) examined the impact of defense expenditures on external debt in Fiji over the period 1970-2005. The study used cointegration and vector error correction framework. The empirical results suggested that military spending contributed a lot in the evolution of both external debt and domestic debt in the long run.

Wolde-Rufael (2009) investigated the defense-debt relationship in Ethiopia for the period 1970–2005. The study conducted Autoregressive Distributed Lag (ARDL) approach to cointegration and Granger causality tests. The findings of the study suggested positive and significant effect of defense spending on external debt. Moreover, a causal and long-run relationship was found between defense spending, external debt and income.

In the latest study by Shahbaz *et al.* (2013) for Pakistan investigated the impacts of defense spending on external debt over the period of 1973-2009. The authors applied the ARDL bounds testing approach of cointegration. The empirical results suggested the cointegration among the defense expenditures, external debt, investment and economic growth. The study indicated the positive relationship between defense expenditures and external debt. Moreover, the study suggested some policy implications to reduce the external debt in Pakistan.

After reviewing the above mentioned empirical studies, we can conclude that defense spending mount up external indebtedness.

### III. MODEL SPECIFICATION

Brzoska (1983) contributed in the literature of defense economics by exploring the positive defense-debt relationship in his seminal study for developing countries. The other empirical studies also suggested the positive association between defense spending and external debt. On the basis of existing empirical studies, the positive relation between defense outlays and external debt can be explained through three channels. First, defense spending is a component of total government expenditures. So, it is part of budget and government has to finance it through different sources internally or externally. Tax is the most significant internal source of financing the government outlays. If the tax revenues are inadequate to finance the defense expenditures, government has to face a budget deficit. To finance the budget deficit, government needs foreign borrowing in case of limited domestic resources. Dunne (2003) pointed out four ways of deficit financing due to large defense spending:

1. Use of foreign exchange reserves

2. Printing of currency
3. Borrowing from abroad
4. Borrowing internally

These modes of deficit financing have their own limitations and implications. If government uses foreign exchange reserves to finance the deficit, this may create foreign exchange crises. Similarly, printing of currency generates inflation due to increase in money supply. Borrowings domestically and externally have also the side effects on the economy such as crowding out of private investment due to domestic debt and external debt crises due to external borrowing.

So, external debt accumulates with an increase in defense expenditures for the countries like Pakistan and India. Second, the countries with less foreign exchange reserves have to rely more on external debt to finance arms imports military expenditure (Dunne *et al.*, 2004; Karagol, 2005; Narayan and Narayan, 2008 and Wolde-Rufael, 2009). Third, the countries, that are producing arms in their own territory, have to import modern automated technology and intermediary equipments. Therefore, these countries by compulsion finance these products either by foreign borrowing or by lessening their foreign exchange reserves (Günlük-Senesen, 2004; Narayan and Narayan, 2008; Narayan and Smyth, 2009).

As such there is no specific theory to explain the defense-debt relationship in the literature. Narayan and Smyth (2009) noted:

“In terms of the existing literature there are no firm guidelines on what explanatory variables to include in addition to military expenditure.”

Dunne *et al.* (2004) argued:

“In developing a model of military spending and debt, the aim is not to provide a complete explanation of the evolution of debt, but to discern the specific effects of military expenditure on debt, given the capacity of the economy to finance the domestic and foreign spending that military expenditure involves.”

Thus, the core issue is that how the defense expenditures are financed when we are investigating the impacts of defense spending on external debt. If the defense spending is financed through tax revenues, there will be no need of external borrowing. But if the defense outlays were financed through external borrowing, it would then create external debt accumulation.

The existing empirical studies on defense-debt relationship reveal that two factors must be kept in mind while modeling the defense-debt phenomenon: (i) country's capacity to engage in external borrowing and (ii) alternative financing sources.

In line with the above discussion and Dunne (2003) model, we are including GDP, foreign exchange reserves and exports along with defense expenditures to analyze the defense-debt relationship for both countries. The functional form of the defense-debt model can be written for both the countries as:

$$REDP = f(RGDP, REXP, RFER, RDEP) \quad (1)$$

$$REDI = f(RGDP, REXP, RFER, RDEI) \quad (2)$$

The variable of GDP is included in the model to capture the capacity of a country for paying the foreign debt. An increase in GDP would enhance capacity of a country to pay the external debt. In the same fashion, increase in GDP can encourage the new external borrowing. So the expected sign of this variable is vague. 'Non-defense exports' is intended to include expected negative sign in the model. Export revenues create the supply of foreign exchange that leads to fall in external borrowing. High foreign exchange reserves indicate the ability of a country to manage debt. If foreign exchange reserves increase, the country can pay more of its external debt and reliance on external borrowing can decrease. So, this variable has expected negative sign. Lastly, the variable of defense spending is expected to show positive sign due to external debt as a mode of financing.

#### **IV. DATA, DESCRIPTION OF VARIABLES AND METHODOLOGY**

##### **DATA**

The data sources for Pakistan are *Handbook of Statistics on Pakistan Economy 2010*, *World Development Indicators* and *Global Development Finance*. Specifically, data on dollar exchange rate, GDP at constant 2000 US \$ and GDP at current 2000 US \$ have been acquired from *World Development Indicators* and *Global Development Finance* while the data on exports, external debt, defense expenditures and foreign exchange reserves have been taken from *Handbook of Statistics on Pakistan Economy*.

For India's data, *Handbook of Statistics on the Indian Economy 2011*, *World Development Indicators* and *Global Development Finance* have been used. Specifically, data on dollar exchange rate, GDP at constant 2000 US \$

and GDP at current 2000 US \$ have been acquired from *World Development Indicators* and *Global Development Finance* while the data on exports, external debt, defense expenditures and foreign exchange reserves of India have been taken from *Handbook of Statistics on the Indian Economy*.

For both the countries, we have converted all the variables from local currency to US \$ by means of \$ exchange rates and then deflated all the variables by GDP deflator to find inflation adjusted or real variables. To check the stationarity or nonstationarity of all the series of the variables, Augmented Dickey Fuller (ADF) test has been used to examine the integration properties of variables. There is an evidence of unit root (non-stationarity) found in almost all the variables specified in the above mentioned equations. We have shown the results of ADF test in Table 1.

TABLE 1  
Results of Augmented Dickey Fuller Test

Unit Root Test on Level (For Pakistan)							
Variables	None	Lags	Intercept	Lags	Intercept and Trend	Lags	Conclusion
<i>RDEP</i>	0.45297	0	-1.83097	0	-1.68005	0	I(1)
<i>RGDP</i>	2.2422	4	2.4333	1	-0.5962	1	I(1)
<i>RED</i>	1.4907	0	-0.9581	0	-1.8811	0	I(1)
<i>REXP</i>	2.9138	0	-0.1262	0	-2.3062	0	I(1)
<i>RFER</i>	0.5074	0	-0.4978	0	-1.9010	0	I(1)
Unit Root Test on Level (For India)							
Variables	None	Lags	Intercept	Lags	Intercept and Trend	Lags	Conclusion
<i>RDEI</i>	2.0877	0	0.3518	0	-0.0287	0	I(1)
<i>RGDP</i>	17.5319	0	12.4944	0	5.1692	0	I(0)
<i>RED</i>	3.7472	0	1.3511	0	-2.6363	0	I(1)
<i>REXP</i>	1.9535	2	1.5477	2	0.4770	2	I(1)
<i>RFER</i>	2.5054	0	1.3795	0	-0.7516	0	I(1)

Source: Authors' calculations



We have applied Autoregressive Distributed Lag (ARDL) Model to estimate the equations as it requires any order of integration. We have discussed the ARDL technique in section V.

### DESCRIPTION OF VARIABLES

*RDEP* = Real Defense Expenditures of Pakistan

*RDEI* = Real Defense Expenditures of India

*REDP* = Real External Debt of Pakistan

*REDI* = Real External Debt of India

*RGDP* = Real Gross Domestic Product

*REXP* = Real Exports (merchandise or non-defense)

*RFER* = Real Foreign Exchange Reserves

### V. ARDL MODEL SPECIFICATION

In this section, we derive the general form of the error correction model (ECM) by using the two variables  $X_t$  and  $Y_t$  with  $n$  lags for  $Y_t$  and  $m$  lags for  $X_t$ .

$$Y_t = \alpha_0 + \sum_{i=1}^n \alpha_i Y_{t-i} + \sum_{j=0}^m \beta_j X_{t-j} + u_t \quad (3)$$

$\beta_0$  exhibits the impact of  $X_t$  on  $Y_t$  in short run. Long run coefficients can be determined by setting  $Y_t = Y_{t-1} = Y_{t-2} = \dots = X_{t-n} = Y_t^*$  and  $X_t = X_{t-1} = X_{t-2} = \dots = X_{t-n} = X_t^*$  and plugging in (3).

$$Y_t^* = \alpha_0 + \alpha_1 Y_t^* + \alpha_2 Y_t^* + \dots + \alpha_n Y_t^* + \beta_0 X_t^* + \beta_1 X_t^* + \beta_2 X_t^* + \dots + \beta_n X_t^* + u_t$$

After rearranging the terms, we have:

$$Y_t^* = A + BX_t^* + u_t \quad (4)$$

Where

$$A = \frac{\alpha_0}{(1 - \alpha_1 - \alpha_2 - \dots - \alpha_n)}$$

$$B = \frac{(\beta_0 + \beta_1 + \beta_2 + \dots + \beta_n)}{(1 - \alpha_1 - \alpha_2 - \dots - \alpha_n)}$$

$B$  is (a composite parameter) the long run multiplier. We derive Error Correction Model (ECM) from equation (3) by substituting the following expressions:

$$Y_{t-n} = Y_{t-(n-1)} - \Delta Y_{t-(n-1)}$$

and  $X_{t-n} = X_{t-(n-1)} - \Delta X_{t-(n-1)}$  (5)

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \dots + \alpha_{n-1} Y_{t-(n-2)} + (\alpha_{n-1} + \alpha_n) Y_{t-(n-1)} - \alpha_n \Delta Y_{t-(n-1)} \\ + \beta_0 + \beta_1 Y_{t-1} + \dots + \beta_{m-1} Y_{t-(m-2)} + (\beta_{m-1} + \beta_m) Y_{t-(m-1)} - \beta_m \Delta Y_{t-(m-1)}$$

Now substituting the following expressions:

$$Y_{t-(n-1)} = Y_{t-(n-2)} - \Delta Y_{t-(n-2)}$$

and  $X_{t-(m-1)} = X_{t-(m-2)} - \Delta X_{t-(m-2)}$  (6)

After substituting, we have:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \dots + \alpha_{n-3} Y_{t-(n-3)} + (\alpha_{n-2} + \alpha_{n-1} + \alpha_n) Y_{t-(n-2)} - \\ (\alpha_{n-1} + \alpha_n) \Delta Y_{t-(n-2)} - \alpha_n \Delta Y_{t-(n-1)} + \beta_0 X_t + \beta_1 X_{t-1} + \\ \dots + \beta_{m-3} X_{t-(m-3)} + (\beta_{m-2} + \beta_{m-1} + \beta_m) X_{t-(m-2)} - \\ (\beta_{m-1} + \alpha_m) \Delta X_{t-(m-2)} - \alpha_n \Delta X_{t-(n-1)}$$

The consecutive substitution of equations (5) and (6) and similar equations would finally give us the following expression:

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \theta X_{t-1} + \sum_{j=1}^{n-1} a_j \Delta Y_{t-j} + \sum_{j=0}^{m-1} b_j \Delta X_{t-j} + \varepsilon_t$$
 (7)

The composite parameters in equation (7) are defined as:

$$a_j = - \sum_{i=j+1}^n a_i, \quad b_j = - \sum_{i=j+1}^m b_i, \quad \gamma = \sum_{i=1}^n a_i - 1, \quad \theta = \sum_{i=0}^m \beta_i$$

The Unrestricted Error Correction Models (UECMs) to explain the defense-debt relationship for Pakistan and India are given below respectively:

$$\begin{aligned}
\Delta(\text{REDP})_t &= \alpha + \beta_1(\text{REDP})_{t-1} + \beta_2(\text{RGDP})_{t-1} + \beta_3(\text{REXP})_{t-1} + \\
&\quad \beta_4(\text{RFER})_{t-1} + \beta_5(\text{RDEP})_{t-1} + \sum_{i=1}^{p_1} \delta_1 \Delta(\text{REDP})_{t-i} + \\
&\quad \sum_{i=0}^{p_2} \delta_2 \Delta(\text{RGDP})_{t-i} + \sum_{i=0}^{p_3} \delta_3 \Delta(\text{REXP})_{t-i} + \sum_{i=0}^{p_4} \delta_4 \Delta(\text{RFER})_{t-i} \quad (8) \\
&\quad + \sum_{i=0}^{p_5} \delta_5 \Delta(\text{RDEP})_{t-i} + \varepsilon_t
\end{aligned}$$

$$\begin{aligned}
\Delta(\text{REDI})_t &= \alpha + \beta_1(\text{REDP})_{t-1} + \beta_2(\text{RGDP})_{t-1} + \beta_3(\text{REXP})_{t-1} + \\
&\quad \beta_4(\text{RFER})_{t-1} + \beta_5(\text{RDEI})_{t-1} + \sum_{i=1}^{p_1} \delta_1 \Delta(\text{REDI})_{t-i} + \\
&\quad \sum_{i=0}^{p_2} \delta_2 \Delta(\text{RGDP})_{t-i} + \sum_{i=0}^{p_3} \delta_3 \Delta(\text{REXP})_{t-i} + \sum_{i=0}^{p_4} \delta_4 \Delta(\text{RFER})_{t-i} \quad (9) \\
&\quad + \sum_{i=0}^{p_5} \delta_5 \Delta(\text{RDEI})_{t-i} + \varepsilon_t
\end{aligned}$$

The parameters  $\beta_i$  are long-run multipliers and the  $\delta_i$  are short-run dynamic parameters of ARDL.  $\varepsilon_t$  is white noise error and  $\Delta$  shows first difference sign.

## VI. BOUNDS TESTING PROCEDURE

It is essential to test the existence of long run relationship before estimating long-run parameters and error correction coefficients. For the purpose, Ordinary Least Squares (OLS) method is employed to locate the value of F or Wald Statistic for the joint significance of the parameters of lagged variables *i.e.*

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0 \quad (\text{No Cointegration})$$

$$H_1 = \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0 \quad (\text{Cointegration})$$

In equations (8) and (9), null hypothesis exhibits that lagged variables have no long run relationship whereas the alternative hypothesis shows the long run relationship. The null hypothesis is tested by using F-statistic as follows.

- If F statistic > the upper bound critical value, the null hypothesis is rejected.
- If F-statistic < the lower bound critical values, the null hypothesis is accepted
- If F-statistic is between the lower and upper bound critical values, the test is inconclusive.

If long-run relationship exists, the long-run coefficients can be calculated by employing the following equations for both the countries:

$$REDP_t = \alpha + \sum_{i=1}^{p_1} \eta_1 (REDP)_{t-i} + \sum_{i=0}^{p_2} \eta_2 (RGDP)_{t-i} + \sum_{i=0}^{p_3} \eta_3 (REXP)_{t-i} + \sum_{i=0}^{p_4} \eta_4 (RFER)_{t-i} + \sum_{i=0}^{p_5} \eta_5 (RDEP)_{t-i} + \varepsilon_t \quad (10)$$

$$REDI_t = \alpha + \sum_{i=1}^{p_1} \eta_1 (REDI)_{t-i} + \sum_{i=0}^{p_2} \eta_2 (RGDP)_{t-i} + \sum_{i=0}^{p_3} \eta_3 (REXP)_{t-i} + \sum_{i=0}^{p_4} \eta_4 (RFER)_{t-i} + \sum_{i=0}^{p_5} \eta_5 (RDEI)_{t-i} + \varepsilon_t \quad (11)$$

The short-run dynamics can be estimated by the following equations for Pakistan and India:

$$\Delta REDP_t = \alpha + \sum_{i=1}^{p_1} \lambda_1 \Delta (REDP)_{t-i} + \sum_{i=0}^{p_2} \lambda_2 \Delta (RGDP)_{t-i} + \sum_{i=0}^{p_3} \lambda_3 \Delta (REXP)_{t-i} + \sum_{i=0}^{p_4} \lambda_4 \Delta (RFER)_{t-i} + \sum_{i=0}^{p_5} \lambda_5 \Delta (RDEP)_{t-i} + \omega ECM_{t-1} + \varepsilon_t \quad (12)$$

$$\Delta REDI_t = \alpha + \sum_{i=1}^{p_1} \lambda_1 \Delta (REDI)_{t-i} + \sum_{i=0}^{p_2} \lambda_2 \Delta (RGDP)_{t-i} + \sum_{i=0}^{p_3} \lambda_3 \Delta (REXP)_{t-i} + \sum_{i=0}^{p_4} \lambda_4 \Delta (RFER)_{t-i} + \sum_{i=0}^{p_5} \lambda_5 \Delta (RDEI)_{t-i} + \omega ECM_{t-1} + \varepsilon_t \quad (13)$$

In the equations (12) and (13), the short run parameters are attached with summation signs and ECM ( $\omega$ ) coefficient shows the speed of adjustment towards the long-run equilibrium in both the equations. ECM coefficient should be negative and statistically significant for convergence.

## VII. EMPIRICAL RESULTS

### THE ORDER OF LAG AND BOUND TESTING

We have used the Schwarz Bayesian Criterion (SBC) to determine the maximum lag length of the variables for both the countries' models. The SBC has suggested optimal lag length 2 in both ARDL models. We have employed the OLS on (8 & 9) to find the F-statistic by applying the Wald test. The results of Wald test for both the models are reported in Table 2.

TABLE 2  
F-test for Cointegration

		5% Critical Value Bounds		10% Critical Value Bounds	
Country	F-Statistic	I(0)	I(1)	I(0)	I(1)
Pakistan	6.38	2.26	3.35	2.62	3.79
India	4.67	2.26	3.35	2.62	3.79

NOTE: Critical values are obtained from Pesaran *et al.* (1996).

For Pakistan, the calculated value of F-statistic is 6.38, which is greater than the upper bound at 5% and 10%. Similarly, for India, the calculated value of F-statistic is 4.67; it is above than the upper bound at 5% and 10%. These results show that we are unable to accept the null hypothesis of no cointegration. So, long run relationship exists in both models for Pakistan and India.

### LONG-RUN ESTIMATING RESULTS

Now the next step is to find out the long run coefficients of ARDL models for both the countries. The results of the estimated long run coefficients are presented in Table 3. For both the countries, we have specified four variables. The dependent variable is Real External Debt whereas Real GDP, Real Exports, Real foreign Exchange Reserves and Real defense Expenditures are explanatory variables.

First we explain the coefficient of Real GDP (RGDP) for both the countries. Real GDP in defense-debt model exhibits the capacity of a country to pay foreign liabilities. The parameter of RGDP is negative and statistically significant in both the models. This suggests that real external debt of both the countries decreases due to an increase in RGDP. Dunne (2003) also

pointed out that “an increase in GDP automatically lowers the debt burden as a share of GDP, but may also encourage new borrowing.”

In fact, the coefficient of RGDP can have either sign as Narayan and Narayan (2008) argued:

“That a rise in income will either increase or decrease external and domestic debts. A rise in income will increase debts, if the rise is due to consumption expenditure, which consists of high import content. High import content implies a higher import bill, leading to current account imbalances. Thus, a country needs to borrow to meet the imbalances. A rise in income will reduce debts if the rise comes from capital investment, which produces additional revenue for the government, allowing the government to pay off debts and meet additional expenditure obligations.”

Our results are compatible with the studies (Dunne, 2003; Narayan and Narayan, 2008; Narayan and Smyth, 2009; Wolde-Rufael, 2009) that found the negative relationship between RGDP and real external debt. In contrast, there are some studies that found the positive relationship between RGDP and real external debt (*see Dunne et al., 2004; Sezgin, 2004*).

TABLE 3

Estimated Long Run Coefficients using the ARDL Approach

Pakistan			India		
Dependent variable: REDP ARDL (1, 2, 1, 1, 0)			Dependent variable: REDI ARDL (1, 1, 1, 1, 1)		
Regressor	Coefficient	t-statistic	Regressor	Coefficient	t-statistic
RGDP	-0.49964	-9.3705	RGDP	-1.5640	-2.6137
REXP	-0.51012	-1.9393	REXP	-10.2176	-1.7636
RFER	-0.46493	-1.9641	RFER	-6.2889	-1.5349
RDEP	5.1701	7.1686	RDEI	49.5689	2.0711
C	-1708.3	-1.9438	C	9819.0	0.36267

The second variable is Real exports (REXP). The variable of REXP enhances the supply of foreign exchange reserves of a country that can be used to repay the debts. So, negative sign is expected on this variable. The coefficient of REXP is negative and statistically significant in both the models of Pakistan and India. Dunne (2003) argued that “Export earnings

help generate foreign currency to make debt payments, and also allow imports to be made without resorting to overseas borrowing, so this variable should have a negative sign.”

Karagol and Sezgin (2004) noted about the negative relationship between external debt and exports:

“Of two countries with equally high debt service ratios, the country having the highest exports/GNP ratio would have the most foreign exchange left over after debt service payments relative to its GNP, *ceteris paribus*. This is a more stable characteristic of the economy and may thus influence the attitude toward rescheduling. A high exports/GNP ratio would tend to reduce the need for painful domestic adjustments, associating a large exports sector with a low probability of rescheduling.”

Our results are in line with the studies (Dunne, 2003; Karagol and Sezgin, 2004). Exports can have the positive sign as well. Dunne *et al.* (2004) claimed:

“..... but exports are a bit more difficult to call. We might expect a negative sign, but it is also possible that increases in exports lead to increased imports of capital and so lead to the positive effect.”

Foreign exchange reserves play an important role in defense-debt model. The coefficient of real foreign exchange reserves (RFER) appears with negative sign in both the models. This suggests that external debt liabilities decrease with an increase in foreign exchange reserves of both the countries. Looney (1987) argued that “The countries with high level of reserves are not compelled to accrue external debt.”

But Dunne (2003) has contradictory remarks:

“High reserves may indicate an enhanced ability to manage debt; also, new debt was sometimes used to build up reserves, as discussed, so this variable can probably be expected to have a positive sign, if it is significant.”

Turning to the main focus of this study, the coefficient of real defense expenditures is positive and statistically significant in both the models. Defense spending contributes to the external debt accumulation directly or indirectly. The countries with less foreign exchange reserves have to rely more on external debt to finance arms imports military expenditure (*see* Dunne *et al.*, 2004; Karagol, 2005; Narayan and Narayan, 2008; Wolde-Rufael, 2009). Defense spending is a budget item and government has to

finance it through different sources internally or externally. Tax is the most significant internal source of financing the government outlays. If the tax revenues are inadequate to finance the defense expenditures, government has to face a budget deficit. To finance the budget deficit, government needs foreign borrowing in case of limited domestic resources. (see Dunne *et al.*, 2004; Narayan and Narayan, 2008; Narayan and Smyth, 2009).

### ERROR CORRECTION ESTIMATING RESULTS

The short run dynamic parameters are estimated by the unrestricted error correction model (UECM). We have reported the error correction estimation results in Table 4.

In Pakistan's equation, the dependent variable is dREDP and in India's equation, the dependent variable is dREDI where d shows the first difference of the variable. The change in RGDP is negatively related to external debt of Pakistan and India. The change in REXP has negative effects on external debt liabilities of both the countries. The change in foreign exchange reserves has negative relation with external debt. The change of defense expenditures is positively related to external debt.

TABLE 4

Error Correction Representation for the Selected ARDL Model

Pakistan			India		
Dependent variable: dREDP ARDL (1, 2, 1, 1, 0)			Dependent variable: dREDI ARDL (1, 1, 1, 1, 1)		
Regressor	Coefficient	t-statistic	Regressor	Coefficient	t-statistic
dRGDP	-0.60264	-2.9267	dRGDP	-0.40999	-4.7153
dRGDP1	1.4015	5.8837	dREXP	-1.8119	-7.3497
dREXP	-0.24314	-0.90817	dRFER	-0.59266	-5.7423
dRFER	-0.11041	-0.66596	dRDEI	3.5307	2.3722
dRDEP	3.4491	7.2073	dC	-1225.6	-0.39619
dC	-1139.7	-1.9294	ecm(-1)	-0.59046	-9.6111
Ecm(-1)	-0.66712	-7.2136			

The error correction term exhibits the speed of adjustment to restore the equilibrium in the dynamic model. The coefficient of error correction term (ECM) indicates how quickly or slowly the variables move towards



equilibrium. The term should be statistically significant with negative sign. The parameter of ECM for Pakistan and India is equal to  $-0.66712$  and  $-0.59046$  respectively. It suggests that the deviation from the long term equilibrium following a short run shock is corrected by more than half within one year. The findings indicate that the speed of adjustment is fairly high and it would return to its equilibrium level quickly.

### VIII. CONCLUSION

In this study, we have investigated the defense-debt relationship for both the countries of sub-continent using the data for the time period 1972-2010. An Autoregressive Distributed Lag (ARDL) technique has been employed to explore defense-debt nexus. This is the first study that examines the defense-debt relationship simultaneously for Pakistan and India using ARDL approach.

The seminal and pioneer study was conducted by Brzoska (1983) to explore the positive defense-debt relationship for developing countries. We have used the Dunne (2003) defense-debt model to investigate the impacts of defense expenditures on external debt in both the countries. The dependent variable was real external debt and explanatory variables were RGDP, Real exports, Real foreign exchange reserves and real defense spending. The signs of all the variables were found negative except defense spending in both the countries. The empirical results of this study verified the Brzoska (1983) and Dunne (2003) defense-debt model by finding the positive association between defense spending and external debt in both the countries.

The implications of study suggest that both the countries must reduce their defense expenditures as these are contributing to their external debt accumulation. Dunne (2003) argued:

“This does suggest that military burden may be important in determining debt in countries, but it is only of significance when it is not swamped by other macroeconomic and international factors.”

Therefore, from this study, we can conclude that both the countries should lessen their defense spending to reduce the foreign reliance.

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