Does Military Spending Explode External Debt in Pakistan?

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Abstract:
This paper explores the effect of military expenditures on external debt in case of Pakistan over the period of 1973-2009. For this purpose, ARDL bounds testing approach is used to examine cointegration between the variables. ADF, P-P and ADF-GLS, Clemente et al. (1998) unit root tests are applied to check the order of integration of variables. OLS and ECM regressions approaches are employed to investigate marginal impact of military spending on external debt in long and short run.

Our findings indicate cointegration which confirms long run relationship between military expenditures, external debt, economic growth and investment. The results reveal that a rise in military expenditures increases the stock of external debt. The inverse effect of economic growth on external debt is found and an increase in investment is also increasing external debt in the country. This study invites policy makers to approach the problem of curtailing external debt in innovative ways in case of Pakistan.

Keywords: Military Spending, External Debt, Cointegration
JEL Codes: C12, O22

Introduction

The nexus between military spending and external debt is a crucial issue for developing economies like Pakistan where rapid increase in military expenditure has economic implications for the country. Military spending affects the stock of external debt through many channels, for instance, Günlük-Senesen (2002b) pointed out that rapid increase in military spending raises volume of external debt by pressing budget revenues which increases the government borrowing from internal and external sources of finance and increases the debt liabilities in the country (Karagol, 2006). An increase in debt services is linked with high level of external debt which restricts investment and capital formation that in turn slows down the rate of economic growth. Further, the level of external capital is decreased due to heavy payments of foreign reserves (through exports) on external debt that further reduces the creditworthiness of an economy (Karagol, 2002) which has inverse impact on liquidity of debtor countries and limit their capacity to fulfill other national commitments (Karagol, 2006). Repayment of debt with heavy debt servicing has become serious problem both for developing and less developed economies of the globe now-a-days. Military spending in developing countries are import-intensive and have direct and positive effect on county's debt stock (Looney and Frederiksen, 1986). In this regard, Brzoska (1983) identified that an increase in military spending is major contributor to the stock of external debt in developing countries and latter on military spending-external debt was investigated by Looney (1987, 1989, 1998) etc.

The aim of paper is to investigate the relationship between military spending and external debt in the presence of economic growth, following Narayan and Smyth (2009) and Wolde-Rufael (2009) and investment in external debt model. The economic effects of investment have very important policy implications. Investment both public and private enhances the level of production which enables the country to earn foreign exchange through exports-enhancing effect. Further, investment helps the country by providing the tax collections that can be used to lower down the stock of external debt, This rational provides support to include investment as a potential exogenous variable in military spending-external debt model.

This study contributes to defence literature by four-folds: (i) present paper extends the external debt model developed by Narayan and Smyth and Wolde-Rufael (2009) by including investment, (ii) this is an effort to fill the research gap regarding Pakistan, (iii) ARDL Bounds testing approach to cointegration is employed to examine long run relationship among the variables which has never been used for this issue in the case of Pakistan and finally, innovative accounting technique introduced by Shan (2005) is applied to investigate the direction of causality among the variables.

Pakistani Context

The stock of foreign debt of Pakistan is more than twice its domestic debt which will be raised by more than 43% over the next five years (Ali, 2010). IMF reported that in 2011-12, there will be addition of US$ 2 billion and our external debt seems to exceed US$ 72 billion by 2015-16. There are many factors such as persistence of large fiscal and current account deficits, sharp depreciation in the exchange rate and unrestrained borrowing raised the stocks of external debt and this rush forward to foreign borrowing accumulated debt servicing to undesirable levels. In 2007, external debt rose to US$ 39 billion. This rise in external debt was due to floating interest rates. For last few years, in Pakistan, there was an increase in floating rate loans. In resulting, external debt rose up which further put the country into more deteriorate situation of external debt stock. Actually, high rate of flexible loans increased debt burden by increasing debt service payments which further had an adverse effect on lending rates. In this way, the major share of country's revenues was eaten up by debt servicing in 1999-2000 while payment on debt services was US$ 1.778 billion. The debt services ratio has halved by 2006-07 and debt services payment has declined to US$ 1.115 billion. This situation enabled the country to improve her budget deficit and current account but high foreign borrowing in 2007-08 and 2008-09 again raised debt services sharply. This did not leave ample room for public spending in the country to improve situation of social welfare (Ali, 2010).

Table-1: Trends in Military Spending and External Debt

Year	Military Spending	External Debt
2000-01	4.195	29.637
2001-02	4.508	30.811
2002-03	4.814	31.985
2003-04	5.015	33.307
2004-05	5.210	34.037
2005-06	5.269	35.900
2006-07	5.275	39.000
2007-08	5.316	44.500
2008-09	5.716*	50.700

Note: * indicates US $ billion

Table-1 indicates that there is a consistent rise in military spending on pay, allowances, and maintenance expenditures of defence personnel and the current holdings. This is due to large size of military in the country and combating with terrorism along with its western frontiers. The increase in terrorism has increased military spending to fight against it. It was said by Finance Minister of Pakistan "We are facing a situation in which our armed forces, paramilitary forces, and security forces are laying down their lives. They should know from this house that we all stand by them and that security is our top most concern". Pakistan has a long border with India and the government raises its defence spending consistently because of nonfriendly relationship with India. The historical increase in Indian defence spending also causes Pakistan's defence spending to increase (Öcal, 2003). Border clash with Afghanistan is another reason for increase in Pakistan's defence spending. Ongoing counter activities to combat terrorism further pressured defence spending to rise in 2008-09. Historical look indicates that budget deficit in Pakistan is rising day-by-day due to implementation of developmental efforts to sustain the pace of economic growth. In such scenario to finance military expenditures, government has to rely both on internal and external sources and in turn, it raises not only internal but also external debt.

The rest of study is organized as following: section-II presents review of literature, model construction and variable justifications have been discussed in section-III. Section-IV explains methodological framework, results are interpreted in section-V and conclusions and policy implication are drawn in final part.

II. Literature Review

There is little literature available over the effect of military spending on external debt and it is very important and pertinent issue for both developed and developing economies. In seminal work by Brzoska (1983), he showed the importance of military spending to investigate its effect on external debt in case of developing nations. Brzoska pointed out that 20-30% external debt in developing world is due to spending on arms. Latter on, Looney (1989) used data of 61 developing economies to examine how arm imports and military spending contribute to external debt and reported arms imports raise external debt in developing economies. For Arab region, Alami (2002) highlighted the significance of military expenditures in foreign debt and drafted characteristics of military credit markets that not only impacts civilian but also to indebtedness. The analysis showed that total indebtedness is much influenced by defence spending and military debt. Dunne et al. (2004a) developed a model for Argentina, Chile and Brazil to assess the effect of military spending on external debt using ARDL bounds testing approach to cointegration[1]. Their results showed that military spending has significant and positive effect on external debt in case of Chile but not for case of Argentina and Brazil. Furthermore, Dunne et al. (2004b) examined the impact of GDP, foreign exchange reserves, exports, arms imports, military spending, interest payments, financing from abroad, tax revenue and debt servicing on external debt for 11 industrialized countries and noted that a rise in military spending increases the stock of external debt. In case of Middle Eastern Countries, Narayan and Smyth (2009) investigated the impact of military spending on external debt in six Middle Eastern countries namely Oman, Yemen, Bahrain, Iran and Jordan using Pedroni (2004) approach to cointegration for long run relationship between the variables. Their empirical analysis provided support for stable long run relationship between military spending, external debt and national income. Apart from that results indicated that a rise in national income helps the Middle Eastern Countries to pay back their debt but this effect is nullified by an increase in military spending which has positive impact on external debt.

In country studies, Feridun (2004) conducted a study on Brazil to examine direction of causality between external debt and military spending. Empirical analysis reported that both variables are independent and no causal relationship exists between external debt and military spending. Kollias et al. (2004) used Greek data to explore relationship among Greek government central, internal and external debt, military spending, primary balance (deficit /surplus) and GDP including political colour[2]. Their results showed that military spending especially on arms imports increases external debt. The main reason is that expenditures on arms imports are being financed by foreign borrowing. In case of Turkey, Gunluk-Senesen (2004) assessed the role of defense spending on external debt and concluded that military equipment expenditures and arms imports are major contributors to raise external debt. On contrary, Looney (1989) and Sezgin (2004) included GDP, volume of imports, volume of exports and balance of trade, military expenditures as determinants of external indebtedness[3] and found negative effect of military spending on external debt but arms imports are positively correlated with external debt implying that Turkish arms import has increased the external debt[4]. Besides that Karagol (2005) applied Johansen and Juselius (1990) cointegration and VECM approaches for long run and causal relationship between military spending and external debt. Empirical analysis confirmed cointegration between both variables and military spending granger-caused external debt in case of Turkey. Karagol (2006) probed military-debt relationship by incorporating GNP (gross national product) in Karagol (2005) model. A cointegration approach developed by Johansen and Juselius (1990) was used for long run relationship between external debt, military spending and GNP. The empirical results reported that an increase in military spending is positively linked with external debt supported by variance decomposition.

Narayan and Narayan (2008) investigated relationship between external and internal debt, military spending and income in case of Fiji Islands using ARDL bounds testing approach to cointegration. Their results validated cointegration between the variables and an increase in military spending exploded external and internal debt while economic growth is positively and inversely linked with domestic debt and external debt respectively. Finally, in case of Ethiopia, Wolde-Rufael (2009) conducted a study to scrutinize the effect of military spending and income on external debt by applying ARDL bounds testing approach to cointegration. The empirical exercise showed that long run relationship between external debt, military spending and income exists and a rise in military spending increase external debt while income reduces it. Moreover, causality was running from military spending and income to external debt supported by variance decomposition approach.

In case of Pakistan, Looney (1998) has noted that capability of external borrowing is affected by military spending[5]. Looney used both cross-country and time series data to analyse the issue. The results indicated that military spending tended foreigner lenders to curtail the lending to Pakistan while Pakistan is relatively resource constraint country. This leads to conclude that a rise in military spending is linked with low capability for foreign lending. In literature review no relevant study has been found on military spending-external debt relation in case of Pakistan and is the main motivation for researchers to observe the effect of military spending on external debt using time series data.

III. Modeling and Justifications for the Variables

The aim of present paper is to investigate the relationship between military spending and external debt by incorporating economic growth and investment variables in military spending-external debt model in case of Pakistan over the period of 1973-2009. All series have been transformed into natural logs. Simple linear specification provides inefficient and unreliable empirical results due to sharpness in time series in developing economies (Karagol, 2006). In such situation, use of log-linear specification is better option for time series analysis and it directly produces elasticity. Log-linear specification provides better and unbiased empirical evidence (Sezgin, 2004). In the light of above discussion, log-linear equation for the empirical exercise is modeled to assess the effect of military spending, economic growth and investment on external debt:

$$LREDPC_t = \alpha_\circ + \alpha_1 LREDPC_{t-1} + \alpha_2 LRDSPC_t + \alpha_3 LGDPC_t + \alpha_4 LINVPC_t + \mu_i \ldots \text{(1)}$$

Where

$LREDPC_t$ = log of real external debt per capita

$LRDSPC_t$ = log of real military spending per capita

$LGDPC_t$ = log of GDP per capita

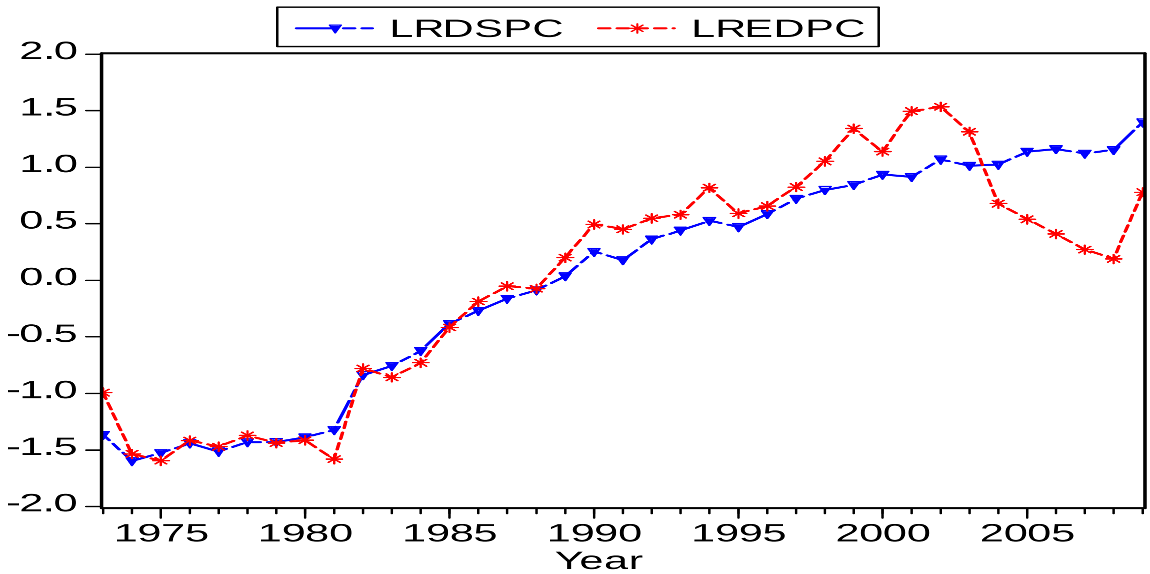
$LINVPC_t$ = log of investment per capita

It is expected that an increase in military spending has positive impact on external debt directly and indirectly. Brzoska (1993), Karagol (2005), Narayan and Narayan (2008) and Wolde-Rufael (2009) reported that if a country imports arm equipments and imports payments are financed by external sources then due to lack of foreign exchange reserves, a country relies on foreign borrowing which in turn increases external debt. Indirectly, military spending tends to lead external debt (Dunne et al. 2004a, b) in an economy like Pakistan where national budget is mostly in deficit (GoP, 2010). So domestic sources and external borrowing are used to finance budget deficits. Domestic debt is increased if budget is financed through domestic funds and if budget deficit is funded from external finance then external debt of country will be increased (see Narayan and Narayan, 2008 and Narayan and Smyth, 2009).

The effect of income on external debt can be either way. An increase in income is positively associated with external debt if rise in debt is due to consumption expenditures (Narayan and Narayan, 2008 and Wolde-Rufael, 2009). The consumption expenditures consist of high import of content. The high import of content leads to high import payments which seem to lead current account imbalances in the country (Narayan and Narayan, 2008 and Narayan and Smyth, 2009). An increase in income will decrease external debt if rise in income is from capital investment which mainly provides additional resources for government through taxation. This enables the government to pay off external debt and organize additional expenditures commitments (Narayan and

Narayan, 2008). Furthermore, Narayan and Smyth (2009) argued that income variable is included in debt model to examine the country's capacity to engage in foreign borrowing or to reflect other sources of finance (see Brzoska, 1983 and, Looney and Frederisksen, 1986)**.** For this reason, we have included real GDP per capita in the model. An increase in investment will reduce external debt as it allows the country to collect additional resources. These resources can be used to pay off external loans and to imitate other expenditures obligations in the country. This implies that effect of investment on external debt should be negative and vice versa.

Figure-1: Trends of Military Spending and External Debt



VI. Methodological Framework and Data Collection

We applied Clemente-Montanes-Reyes unit root test with two structural breaks to examine the order of integration of the variables and ARDL bounds testing approach to cointegration for long run relationship between military spending, external debt, economic growth and investment.

VI. I. Clemente-Montanes-Reyes Unit Root Test

In applied economic literature, ADF by Dicky and Fuller (1981)**,** P-P by Philip and Perron (1988) and DF-GLS by Elliot et al. (1996) used extensively to test the order of integration of the variables. The results of these tests are considered inappropriate due to their shortcomings. For example, these tests have poor size and power properties (Dejong et al. 1992) which make their results less reliable. Apart from that, ADF, P-P and DF-GLS unit root tests seem to over-reject the null hypothesis when it is true and accept it when it is false. This problem is solved by Ng-Perron (2001) unit root test. This test again provides spurious results because it is unable to detect the informations about structural break points occurred in time series data. To overcome this issue, we apply Clemente-Montanes-Reyes unit root test which is more powerful than Perron and Volgelsang (1992) and other traditional unit root tests. Perron and Volgelsang (1992) unit root test is applicable to detect information about one possible structural break. Clemente et al. (1998) extended the statistics of Perron and Volgelsang (1992) by incorporating the assumptions of two changes in the mean. The null hypothesis i.e. H_0 against alternative hypothesis i.e. H_a are as following:

$$H_0 : x_t = x_{t-1} + a_1 DTB_{1t} + a_2 DTB_{2t} + \mu_t \ldots \text{(2)}$$

$$H_a : x_t = u + b_1 DU_{1t} + b_2 DTB_{2t} + \mu_t \ldots \text{(3)}$$

In equation-2 and equation-3, DTB_{1t} is the pulse variable equalant to 1 if $t = TB_i + 1$ and zero if not. Moreover, $DU_{it} = 1$ if $TB_i < t(i = 1,2)$ and if this assumption violates then it is equal to zero. Modification of mean is represented by TB_1 and TB_2 time periods. Further, it is simplified with assumption that $TB_i = \delta_i T(i = 1,2)$ where $1 > \delta_i > 0$ while $\delta_1 < \delta_2$ (see Clemente et al. 1998). If two structural breaks are contained by innovative outlier then unit root hypothesis can be investigated by applying equation-4 is modeled as following:

$$x_t = u + \rho x_{t-1} + d_1 DTB_{1t} + a_2 DTB_{2t} + d_3 DU_{1t} + d_4 DU_{2t} + \sum_{i=1}^{k} c_j \Delta x_{t-1} + \mu_t \ldots (4)$$

This equation helps us to estimate minimum value of t-ratio through simulations and value of simulated t-ratio can be utilized for all break points if the value of autoregressive parameter is constrained to 1. For the derivation of the asymptotic distribution of said estimate, it is supposed that $\delta_2 > \delta_1 > 0, 1 > \delta_2 - 1 > \delta_0$. δ_1 and δ_2 obtain the values in interval i.e. $[(t+2)/T, (T-1)/T]$ by appointing largest window size. Further, this assumption i.e. $\delta_1 < \delta_2 + 1$ is used to show that cases where break points exist in repeated periods are purged (see Clemente et al. 1998). Two step approach is used to test unit root hypothesis, if shifts are in better position to explain additive outliers. In 1st step, purge deterministic variable by following equation-5 for estimation as following:

$$x_t = u + d_5 DU_{1t} + d_6 DU_{2t} + \widehat{x} \ldots (5)$$

The second step is related to search the minimum t-ratio by a test to test the hypothesis that $\rho = 1$, as following:

$$\hat{x}_t = \sum_{i=1}^{k} \phi_{1i} DTB_{1t-1} + \sum_{i=1}^{k} \phi_{2i} DTB_{2t-1} + \rho \hat{x}_{t-1} + \sum_{i=1}^{k} c_i \Delta \hat{x}_{t-1} + \mu_t \dots (6)$$

To make sure that $\min t_{\rho\ t}^{IO}(\delta_1, \delta_2)$ congregates i.e. converges to distribution, we have included dummy variable in estimated equation for estimation:

$$\min t_{\rho\ t}^{IO}(\delta_1, \delta_2) \rightarrow \inf_{\gamma} = \wedge \frac{H}{[\delta_1(\delta_2 - \delta_1)]^{1/2} K^{1/2}} \dots (7)$$

VI. II. ARDL Bounds Testing Approach for Cointegration

The autoregressive distributed lag (ARDL) bounds testing approach to cointegration developed by Pesaran et al. (2001) is applied to investigate the long run relationship between military spending, external debt, economic growth and investment. This approach is superior to traditional techniques due to numerous advantages. Firstly, ARDL can be applicable if the variables are integrated of order *I(0)* or integrated of order *I(1)* or integrated of order I(0)/ I(1). Secondly, this approach is free of any problem featured by traditional techniques such as Engle-Granger (1987), Johansen and Juselius (1990) and Philips and Hansen (1990) etc. Another merit is that, it has better properties for small samples. Thirdly, ARDL model helps to derive dynamic error correction model through a simple linear transformation without losing information about long span of time

(Banerrjee and Newman, 1993). The error correction model integrates the short-run dynamics with the long-run equilibrium without losing information about long-run. The ARDL bounds testing approach to cointegration involves estimating the unrestricted error correction method (UECM) of the ARDL model as follows:

$$\begin{aligned}\Delta LREDPC = {} & \alpha_{\circ} + \alpha_T T + \alpha_{REDPC} LREDCP_{t-1} + \alpha_{RDSPC} LRDSPC_{t-1} + \alpha_{GDPC} LGDPC_{t-1} + \alpha_{INVPC} LINVPC_{t-1} \\ & + \sum_{i=1}^{p} \alpha_i \Delta LREDPC_{t-i} + \sum_{j=0}^{q} \alpha_j \Delta LRDSPC_{t-j} + \sum_{l=0}^{m} \alpha_k \Delta LGDPC_{t-l} + \sum_{n=0}^{n} \alpha_l \Delta LINVPC_{t-n} + \mu_i \end{aligned} \quad (8)$$

$$\begin{aligned}\Delta LRDSPC = {} & \beta_{\circ} + \beta_T T + \beta_{RDSPC} LRDSPC_{t-1} + \beta_{REDPC} LREDPC_{t-1} + \beta_{GDPC} LGDPC_{t-1} + \beta_{INVPC} LINVPC_{t-1} \\ & + \sum_{i=1}^{p} \beta_i \Delta LRDSPC_{t-i} + \sum_{j=0}^{q} \beta_j \Delta LREDPC_{t-j} + \sum_{l=0}^{m} \beta_k \Delta LGDPC_{t-l} + \sum_{n=0}^{n} \beta_l \Delta LINVPC_{t-n} + \mu_i \end{aligned} \quad (9)$$

$$\begin{aligned}\Delta LGDPC = {} & \delta_{\circ} + \delta_T T + \delta_{GDPC} LGDPC_{t-1} + \delta_{RDSPC} LRDSPC_{t-1} + \delta_{REDPC} LREDPC_{t-1} + \delta_{INVPC} LINVPC_{t-1} \\ & + \sum_{i=1}^{p} \delta_i \Delta LGDPC_{t-i} + \sum_{j=0}^{q} \delta_j \Delta LRDSPC_{t-j} + \sum_{l=0}^{m} \beta_k \Delta LREDPC_{t-l} + \sum_{n=0}^{n} \beta_l \Delta LINVPC_{t-n} + \mu_i \end{aligned} \quad (10)$$

$$\begin{aligned}\Delta LINVPC = {} & \vartheta_{\circ} + \vartheta_T T + \vartheta_{INVPC} LINVPC_{t-1} + \vartheta_{RDSPC} LRDSPC_{t-1} + \vartheta_{REDPC} LREDPC_{t-1} + \vartheta_{GDPC} LGDPC_{t-1} \\ & + \sum_{i=1}^{p} \vartheta_i \Delta LINVPC_{t-i} + \sum_{j=0}^{q} \vartheta_j \Delta LRDSPC_{t-j} + \sum_{l=0}^{m} \vartheta_k \Delta LREDPC_{t-l} + \sum_{n=0}^{n} \vartheta_l \Delta LGDPC_{t-n} + \mu_i \end{aligned} \quad (11)$$

The drift component and time trend are shown by $\alpha_{\circ}, \beta_{\circ}, \delta_{\circ}, \vartheta_{\circ}$ and $\alpha_T, \beta_T, \delta_T, \vartheta_T$ respectively while μ is assumed to be white noise residual term. The akaike information criterion (AIC) is used to select the optimal lag structure to make sure that serial correlation does not exist. Pesaran et al. (2001) tabulated lower critical bound (LCB) and upper critical bound (UCB) to take decision whether long run relation between the variables exists or not. The null hypothesis of no cointegration is

$H_0: \alpha_{REDPC} = \alpha_{RDSPC} = \alpha_{GDPC} = \alpha_{INVPC} = 0$, $H_0: \beta_{REDPC} = \beta_{RDSPC} = \beta_{GDPC} = \beta_{INVPC} = 0$,

$H_0: \delta_{REDPC} = \delta_{RDSPC} = \delta_{GDPC} = \delta_{INVPC} = 0$ and $H_0: \vartheta_{REDPC} = \vartheta_{RDSPC} = \vartheta_{GDPC} = \vartheta_{INVPC} = 0$.

The hypothesis of cointegration is $H_a: \alpha_{REDPC} \neq \alpha_{RDSPC} \neq \alpha_{GDPC} \neq \alpha_{INVPC} \neq 0$, $H_a: \beta_{REDPC} \neq \beta_{RDSPC} \neq \beta_{GDPC} \neq \beta_{INVPC} \neq 0$

$H_a: \delta_{REDPC} \neq \delta_{RDSPC} \neq \delta_{GDPC} \neq \delta_{INVPC} \neq 0$ and $H_a: \vartheta_{REDPC} \neq \vartheta_{RDSPC} \neq \vartheta_{GDPC} \neq \vartheta_{INVPC} \neq 0$.

After computation of F-statistic, next step is to compare the calculated F-statistic with LCB (lower critical bound) and UCB (upper critical bound) tabulated by Pesaran et al. (2001). If computed F-statistic is greater than upper critical bound (UCB) then decision is in favor of cointegration i.e. long run relationship exists. There is no cointegration between the variables if calculated F-statistic is lower than lower critical bound (LCB). The decision will be inconclusive if calculated F-statistic lies between lower and upper critical bounds[6].

After finding the existence of long run relationship between the variables, an error correction representation can be developed as follows[7]:

$$(1-L)\begin{bmatrix} LREDPC_t \\ LRDSPC_t \\ LGDPC_t \\ LINVPC_t \end{bmatrix} = \begin{bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix} a_{11i}a_{12i}a_{13i}a_{14i} \\ b_{21i}b_{22i}b_{23i}b_{24i} \\ \delta_{31i}\delta_{32i}\delta_{33i}\delta_{34i} \\ \alpha_{41i}\alpha_{42i}\alpha_{43i}\alpha_{44i} \end{bmatrix} + \begin{bmatrix} \beta \\ \chi \\ \xi \\ \zeta \end{bmatrix} ECM_{t-1} + \begin{bmatrix} \eta_{1t} \\ \eta_{2t} \\ \eta_{3t} \\ \eta_{4t} \end{bmatrix} \ldots \quad (12)$$

where $(1-L)$ is the difference operator; ECM_{t-1} is the lagged error-correction term which is derived from the long run cointegrating relationship while $\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}$ and ε_{4t} are serially independent random errors with mean zero and finite covariance matrix. The existence of a significant relationship in first differences of the variables provides evidence on the direction of the short run causality while long run causation is shown by significant *t*-statistic pertaining to the error correction term (ECM_{t-1})[8]. In addition, to unveil the nature of the feedback effects among the variables, we further applied the innovative accounting approach to test the robustness of the results and to attain more details on the complex relationships between the variables.

GoP (2010) is combed to attain data on military spending and external debt. The data on nominal GDP, investment, CPI and population is obtained from world development indicator (CD-ROM, 2010).

V. Findings and Discussion

Descriptive statistics confirm that the four series are normally distributed as shown by Jarque-Bera statistics in the Table-2. Next step is to examine the integrating order of the variables i.e. military spending, external debt, economic growth and investment to apply ARDL bounds testing approach to cointegration. The main assumption of ARDL bounds testing is that variables should be integrated at I(0) or I(1) or I(1) / I(0) and no variable is integrated at I(2). It is pointed out by Ouattara (2004) that if any variable is integrated at I(2) then calculation of PSS (2001) F-statistic for cointegration becomes invalid. To ensure that no variable is stationary at 2nd difference, we have applied ADF, P-P and DF-GLS unit root tests and results are reported in Table-3. The results show that variables are nonstationary at their level form or I(0) while found to be integrated at I(1). It is pointed by Baum (2004), empirical evidence on order of integration of the variable by ADF, P-P and DF-GLS are not reliable. These unit root tests do have information about structural break points in the series.

To overcome this problem, we have used Clemente-Montanes-Reyes structural break unit root test and results are reported in Table-4. The main advantage of Clemente-Montanes-Reyes unit root test is that it has information about two possible structural break points in the series by offering two models i.e. an additive outliers (AO) model informs about a sudden change in the mean of a series and an innovational outliers (IO) model indicates about the gradual shift in the mean of the series. The additive outlier model is more suitable for the variables having sudden structural changes as compared to gradual shifts. Table-4 indicates contradictor results as compared to Table-3 by ADF, P-P and DF-GLS unit root tests. The results by Clemente et al. (1998) unit root test show that military spending[9] is integrated at I(0) while external debt, economic growth and investment are integrated at I(1), are more efficient and suitable for small sample data like in case of Pakistan. Our decision is based on results of Clemente et al. (1998) about integrating order of the variables.

Table-2: Descriptive Statistics

Variables	$LREDPC_t$	$LRDSPC_t$	$LGDPC_t$	$LINVPC_t$
Mean	4.5195	5.4720	10.0430	13.0171
Median	4.6045	5.6926	10.1145	13.1065
Maximum	4.9974	6.6893	10.4968	13.7552
Minimum	4.0220	4.0801	9.5819	12.1648
Std. Dev.	0.3117	0.8719	0.2716	0.3639
Skewness	-0.3117	-0.3692	-0.3127	-0.4834
Kurtosis	1.7939	1.6571	1.9762	3.2139
Jarque-Bera	2.8420	3.6207	2.2189	1.5121
Probability	0.2414	0.1635	0.3297	0.4695

Table-3: Unit Root Estimation

Variables	ADF Unit Root Test	P-P Unit Root Test	ADF-GLS Unit Root Test
$LREDPC_t$	–1.3010 (2)	–1.6959 (3)	-1.7342 (2)
$\Delta LREDPC_t$	–3.9260 (1)**	–5.2436 (3)*	-4.4726 (0)*
$LRDSPC_t$	–1.5261 (3)	–1.9070 (3)	-1.4105 (2)
$\Delta LRDSPC_t$	–4.2507 (1)**	–6.6612 (3)*	-4.8847 (0)*
$LGDPC_t$	–1.5158 (1)	–1.3704 (2)	-1.5182 (1)
$\Delta LGDPC_t$	–4.7890 (0)*	–4.8016 (2)*	-4.4300 (0)*
$LINVPC_t$	–1.8240 (2)	–2.0292 (3)	-1.8173 (2)
$\Delta LINVPC_t$	–4.7763 (0)*	–4.9054 (3)*	-4.7584 (0)*

Note: * and ** show significant at 1% and 5% level of significance while lag is given in parentheses.

Table-4: Clemente-Montanes-Reyes Unit Root Test with Two Structural Breaks

Variable	Innovative Outliers				Additive Outlier			
	t-statistic	TB1	TB2	Decision	t-statistic	TB1	TB2	Decision
$LREDPC_t$	-2.788	1980*	2004	I(0)	-5.349*	1980*	2002*	I(1)
$LRDSPC_t$	-7.465*	1980*	1996*	I(0)	-7.753*	1980*	1986*	I(1)
$LGDPC_t$	-5.388	1978	2002	I(0)	-5.876*	1991*	2003*	I(1)
$LINVPC_t$	-3.206	1979	2004*	I(0)	-5.787*	1992*	2004*	I(1)

Note: * indicates significant at 1% level of significance.

This mixed order of integration by Clemente et al. (1998) is followed to apply ARDL bounds testing approach to cointegration. Before proceeding to ARDL bounds approach, selection of appropriate lag order is necessary, in doing so, we have used akaike information criterion (AIC) to choose appropriate lag length and to capture the dynamic relationship to choose a best ARDL model[10]. So, AIC is chosen in this study which has superior predicting properties in small sample data set like our Pakistani case[11] and appropriate lag order is given in row-3 of Table-5.

To determine the existence of cointegrating relationship among real external debt per capita, real military spending per capita, real GDP per capita and real investment per capita, a joint significance F-test for the null hypothesis of no cointegrating relation $H_0: \alpha_{LREDPC} = \alpha_{LRDSPC} = \alpha_{LGDPC} = \alpha_{LINVPC} = 0$, $H_0: \beta_{LREDPC} = \beta_{LRDSPC} = \beta_{LGDPC} = \beta_{LINVPC} = 0$, $H_0: \vartheta_{LREDPC} = \vartheta_{LRDSPC} = \vartheta_{LGDPC} = \vartheta_{LINVPC} = 0$ has been tested. The calculated PSS (2001) F-statistics for long run cointegration i.e. $F_{LREDPC}(LREDPC / LRDSPC, LGDPC, LINVPC) =$ 6.480, $F_{LRDSPC}(LRDSPC / LREDPC, LGDPC, LINVPC) =$ 8.055 and $F_{LINVPC}(LINVPC / LREDPC, LRDSPC, LGDPC) =$ 7.783 are higher than upper critical bound (6.198) at 5% level of significance tabulated by Turner (2006).

Table-5: The Results of ARDL Cointegration Test

Bounds Testing to Cointegration				
Dependent Variable	$LREDPC_t$	$LRDSPC_t$	$LGDPC_t$	$LINVPC_t$
Optimal Lag Length	(2, 2, 2, 2)	(2, 2, 1, 1)	(2, 1, 2, 2)	(2, 2, 1, 2)
F-statistics	6.480**	8.055**	2.2518	7.783**
	Critical values (T = 38)#			
	Lower bounds $I(0)$	Upper bounds $I(1)$		
1 per cent level	7.397	8.926		
5 per cent level	5.296	6.504		
10 percent level	4.401	5.462		
Diagnostic tests				
R^2	0.8099	0.8725	0.8084	0.7898
F-statistics	5.4782 (0.0005)	7.7590(0.0000)	4.2202 (0.0031)	3.7590 (0.0058)
J-B Normality test	0.3347 (0.8458)	4.1282 (0.1269)	0.9442 (0.6236)	1.0584 (0.5890)
Breusch-Godfrey LM test	0.0929 (0.9117)	0.2287 (0.7982)	0.5419 (0.4730)	0.9054 (0.4268)
ARCH LM test	2.0444 (0.1630)	0.2539 (0.6180)	0.6147 (0.4391)	0.1509 (0.7004)
W. Heteroskedasticity Test	1.2578 (0.4625)	0.6343 (0.8095)	3.6016 (0.0072)	0.2400 (0.9966)
Ramsey RESET	0.2919 (0.5960)	1.3448 (0.2632)	0.5604 (0.4657)	0.0331 (0.8580)

Note: The asterisks *, ** and*** denote the significant at 1%, 5% and 10% level respectively. The optimal lag structure is determined by AIC. # Critical values bounds computed by surface response procedure developed by Turner (2006).

Note: The asterisks *** denote the significant at 10 per cent level. The optimal lag structure is determined by AIC. The probability values are given in parenthesis. # Critical values bounds computed by surface response procedure (Turner, 2006).

The critical bounds provided by Turner (2006) for cointegration are much suitable for small sample than PSS (2001) and Narayan (2005) and for models where four variables have been discussed. Our findings reveal that there are two cointegrating vector confirming cointegration between external debt and its determinants. The existence of cointegration validates the existence of a stable long run relationship between real external debt per capita, real military spending per capita, real GDP per capita and real investment over the period of 1973-2009 in case of Pakistan. Next turn is to investigate the long and short runs elasticities. The long run results are reported in Table-6.

Table-6: Long Run Results

Dependent Variable = $LREDPC_t$			
Variable	Coefficient	Std. Error	T-Statistic
Constant	13.5314	2.4639	5.4917*
$LREDPC_{t-1}$	0.5329	0.1090	4.8874*
$LRDSPC_t$	0.6245	0.1071	5.8296*
$LGDPC_t$	-0.2081	0.0359	-5.7966*
$LINVPC_t$	0.4666	0.1150	4.0553*
R-squared = 0.9721			
Adjusted R-squared = 0.9685			
S.E. of regression = 0.0552			
Akaike info criterion = 2.8259			
Schwarz criterion = -2.6059			
F-statistic = 270.8075			
Prob(F-statistic) = 0.0000			
Durbin-Watson stat = 1.7915			

Diagnostic tests	Statistics
J-B Normality test	0.6740 (0.7138)
Breusch-Godfrey LM test	0.3365 (0.5661)
ARCH LM test	0.0177 (0.8948)
White Heteroskedasticity test	0.9605 (0.4861)
Ramsey RESET test	0.1153 (0.7364

Long run results reveal that current value of dependent variable is positively and significantly influenced by its lag. It is noted that a 1% increase in current external debt is linked with 0.53% rise in external debt in future. The military spending is positively and significantly correlated with external debt. The results indicate that 0.62% external debt is increased due to 1% increase is military spending. This shows that military spending is major factor to increase external debt in the country. These findings are consistent with the view by Brzoska (1983) for developing economies, Dunne et al. (2004a) for Chile, Dunne et al. (2004b) for industrialized countries, Narayan and Smyth (2009) for Oman, Yemen, Bahrain, Iran and Jordan, Gunluk-Senesen (2004), Sezgin (2004), Karagol (2005), Karagol (2006) for Turkey, Narayan and Narayan (2008) for Fiji Island and

Wolde-Rufael (2009) for Ethiopia but contrary with Kollias et al. (2004) for case of Greece.

The positive effect of military spending on external debt has policy implications for policy makers that reductions in military spending can be a suitable tool to lower down external debt burden in case of Pakistan while rapid increase in defence spending will tend to increase the volume of external debt. It is claimed by Chowdhury (1994) that high volume of debt both external and internal will increase the country's leverage which limit the sources of external finance that leads to the financial distress and liquation. Further, financial distress and liquidation has negative effect on gross national product through domestic investment-declining effect. Higher level of public external debt is linked with lower capital formation and with high capital flight due to high tax expectations (Karagol, 2005).

Empirical evidence reveals that an increase in economic growth is inversely linked with external debt and it is statistically significant at 1% level of significance. It is noted on the basis of our results that a 1% increase in real income is linked with 0.2081% decline in external debt and validates the notion that Pakistan has capacity to repay the heavy amount of external debt back. This shows that a rise in economic growth can be used as a tool to reduce external debt burden. The lower volume of debt burden not only encourages capital formation but also boosts private and foreign investments in the country. This in turn will enhance gross national product and hence economic growth which can be used to lower down external debt further. This finding is consistent with

Narayan and Smyth (2009) for Middle Eastern countries and Wolde-Rufael (2009) for Ethiopian economy.

The results indicate that an increase in investment is positively and significantly linked with external debt. It is also document that a 1% rise in investment will contribute to external debt by 0.46%. The reason is, Pakistan is an economy, where national budget is mainly in deficit. Terrorist activities have shattered the trust of investors to make investment in the country as well as low quality of governance, lack of consistency in macroeconomic policies, high inflation and alarming situation of law & order have also played their role to reduce investment activities. This has reduced private investment as well as foreign investment. In such situation, capital outflow is increasing day by day (see Shahbaz et al. 2010a) which is 37.63% of domestic savings while domestic investment of domestic saving is 27.83%. To fill this gap, government of Pakistan has to rely on external sources of finance to fund investment ventures in the country. The long run model also passes all diagnostic tests regarding serial correlation, autoregressive conditional and white heteroscedisticity, normality of error tern and model specification.

The short run speed of adjustment procedure is estimated by the error correction term. The significance of error correction term (ECM_{t-1}) with negative sign provides support to earlier established long run cointegration relationship. If the value of ECM_{t-1} is between 0 and –1 then correction to $LREDPC_t$ in period t is a fraction of the error in period t-1. In such circumstances, the ECM_{t-1} is likely to cause the $LREDPC_t$ to congregate monotonically to its long-run stable path due to changes in the exogenous variables. The coefficient value of $LREDPC_t$ will be diverged if the ECM_{t-1} is positive or less than –2. Finally, there will be damped oscillations in $LREDPC_t$ about stable equilibrium path if the value of ECM_{t-1} is between –1 and –2.

Table-7: Short Run Results

Dependent Variable = $\Delta LREDPC_t$

Variable	Coefficient	Std. Error	T-Statistic
Constant	-0.0060	0.0137	-0.4403
$\Delta LREDPC_{t-1}$	0.3783	0.1366	2.7692*
$\Delta LRDSPC_t$	0.7904	0.0866	9.1176*
$\Delta LGDPC_t$	-0.1430	0.0407	-3.5105*
$\Delta LINVPC_t$	0.0010	0.1165	0.0087
ECM_{t-1}	-0.8803	0.2005	-4.3904*

R-squared = 0.7595
Adjusted R-squared = 0.7180
S.E. of regression = 0.0425
Akaike info criterion = -3.3225
Schwarz criterion = -3.0558
F-statistic = 18.3168
Prob(F-statistic) = 0.0000
Durbin-Watson stat = 1.9445

Diagnostic tests	Statistics
J-B Normality test	1.4320 (0.4886)
Breusch-Godfrey LM test	0.0026 (0.9592)
ARCH LM test	0.8265 (0.3700)
White Heteroskedasticity Test	0.9559 (0.5037)
Ramsey RESET	0.2009 (0.6574)

The empirical evidence reported in Table-7 indicates that the value of ECM_{t-1} is statistically significant at 1% significance level with negative sign. This implies that, the error correction process converges monotonically to the equilibrium path relatively quickly. High significance of ECM_{t-1} is further proof of the existence of established stable long run relationship between the variables. The value of is ECM_{t-1} equal to -

0.8803. It implies that deviation from short run towards long span of time is corrected by 88.03 percent per year. In short run, 0.37% external debt in current period is increased by its lagged value. Military spending is positively linked with external debt. Economic growth is inversely associated with external debt. The effect of rise in investment on external debt is positive but it is statistically insignificant.

Sensitivity Analysis and Stability Test

The short run diagnostic tests such as LM test for serial correlation, normality of residual term, ARCH test, white heteroscedisticity and model specification test have been conducted. The results are reported in lower segment of Table-7. The empirical findings show that the short-run model seems to pass all diagnostic tests successfully. The evidence indicates no confirmation of serial correlation and the residual term is normally distributed. Further more, the model has passed the Ramsey reset test which indicates that the functional form of the model is well specified. The empirical results do not show evidence of autoregressive conditional heteroscedisticity and white heteroscedisticity in the short run model. The stability tests have been used to investigate the stability of long and short run parameters. In doing so, cumulative sum (**CUSUM**) and cumulative sum of squares (**CUSUMsq**) tests have been employed.

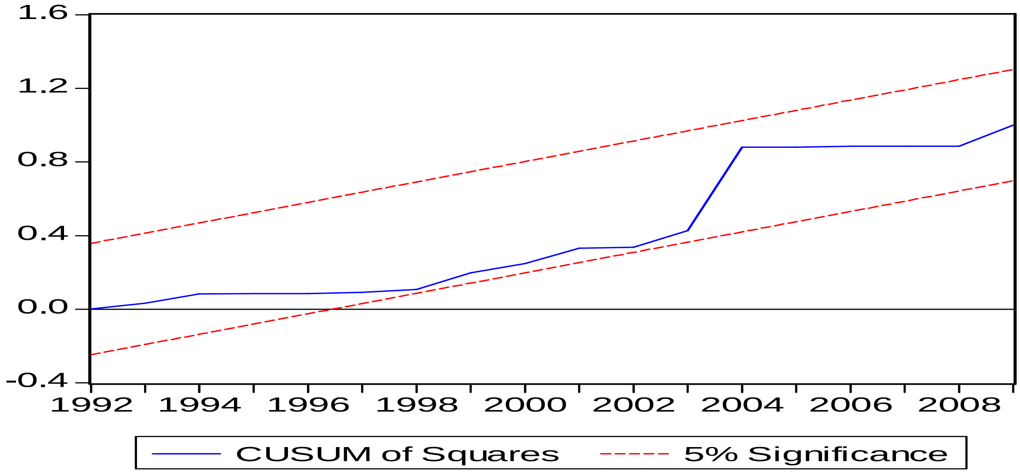
Figure **2**

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level.

Figure **3**

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level.

Pesaran and Shin, (1999) have suggested to estimate the stability of long and short run parameters by CUSUM and CUSUMsq tests. The graphs of both **CUSUM** and **CUSUMsq** are presented above (see figure **2** and **3)**. Figures 2 and 3 specify that plots for **CUSUM** and **CUSUMsq** are between critical boundaries at 5 % level of significance.

This confirms the accuracy of long and short run parameters which have impact on external debt in case of Pakistan. Moreover, both tests also verify the stability of ARDL model. This indicates that model seems to be steady and specified appropriately.

VECM Granger Causality Analysis

Although the evidence obtained so far has acknowledged the relationship between military spending, external debt, economic growth and investment, the results are not sufficient to identify whether the direction of causality is from military spending to external debt or vice versa. Morley, (2006) pointed out that if there is long run relationship between the variables then there must be granger causality, at least from any direction. That's why after finding cointegration between the variables; we have used VECM granger causality to detect the direction of causality between defence spending and external debt in the presence of economic growth and investment. The detection of direction of causal relationship between the variables provides a clear picture for policymakers to formulate a comprehensive and sound economic policy to curtail reduce debt burden by reducing military spending. The results of our empirical exercise regarding causality are reported in Table-8. Since the variables are cointegrated, the direction of causality can be divided into short- and long-run causation.

Table-8: The Results of Granger Causality

Dependent variable	Type of Granger causality: Short-run				Long-run	Joint (short- and long-run)			
	$\Delta LREDPC_t$	$\Delta LRDSPC_t$	$\Delta LGDPC_t$	$\Delta LINVPC_t$	ECM_{t-1}	$\Delta REDPC_t, ECM_{t-1}$	$\Delta LRDSPC_t, ECM_{t-1}$	$\Delta LGDPC_t, ECM_{t-1}$	$\Delta LINVPC_t, ECM_{t-1}$
	F-statistics [p-values]				[t-statistics]	F-statistics [p-values]			
$\Delta LREDPC_t$	–	32.4640* [0.0000]	5.5112** [0.0101]	0.0048 [0.9952]	–0.8550* [-2.8484]	–	22.1235* [0.0000]	5.9452* [0.0032]	0.0448 [0.9873]
$\Delta LRDSPC_t$	20.4792* [0.0000]	–	3.9221*** [0.0532]	0.3917 [0.6798]	-0.8326* [-3.9814]	29.2824* [0.0000]	–	10.1227* [0.0001]	6.6760* [0.0017]
$\Delta LGDPC_t$	9.5438* [0.0008]	4.3971** [0.0226]	–	0.9937 [0.3838]	-0.6355** [-2.0563]	8.3639* [0.0008]	2.9401*** [0.0518]	–	2.3224*** [0.1083]
$\Delta LINVPC_t$	0.1820 [0.8346]	0.7840 [0.4671]	3.4114** [0.0483]	–	-0.6959* [-3.2396]	4.6371** [0.0100]	3.9031** [0.0199]	6.8117* [0.0042]	–

Note: The asterisks *, ** and *** denote the significant at the 1, 5 and 10 per cent levels, respectively.

The t-significance of the one period lagged error correction term ECM_{t-1} in equations, represent the long run causality, while the joint significance LR test of the lagged explanatory variables represent the short run causality. Beginning with the long run causality, our empirical results suggest that ECM_{t-1} is having negative sign and statistically significant in all VECM equations, implying that bidirectional causality between military spending, external debt, economic growth and investment is found for long run. Additionally, the significant of ECM_{t-1} also exhibiting that if the system expose to shock it will convergence to the long-run equilibrium at a relatively high speed for external debt (-0.8550) and military spending (-0.8326) VECMs (vector error correction terms) as compared to the convergence speed of economic growth (-0.6355) and investment (0.6959) VECMs (vector error correction terms).

The Table-8 is showing long and short run causal effects. Our results reveal that in external debt equation, military spending and economic growth granger-cause external debt in long run as well as in short run, while investment granger-causes external debt only in long span of time. In defence spending equation, investment granger-causes economic growth in long run while military spending is granger-caused by external debt and economic growth in long and short runs. The granger causation is found from external debt and military spending to economic growth in growth equation while investment granger-causes economic growth in long run only. In investment equation, economic growth granger-causes investment in long and short runs while long run granger causation is found from military spending and external debt to investment. The main conclusion from granger causality analysis is that there is bidirectional causal relationship between military spending and external debt and same inference is drawn for the other variables. The findings regarding bidirectional causality between military spending and external debt are contrary with Sezgin (2004) and Karagol (2005) for Turkish and Wolde-Rufael (2009) for Ethiopia who reported unidirectional causality running from military spending to external debt.

Innovative Accounting Technique

Mostly, Granger causality tests do not seem to determine the relative strength of causality effects beyond the selected time span (Wolde-Rufael, 2009). In such circumstances, causality tests are inappropriate because these tests are unable to indicate that how much feed back is existed from one variable to other. To examine the feedback from one variable to another and to check the relative effectiveness of causality effects ahead of sample period, we have applied innovative accounting technique (variance decomposition and impulse response function). Variance decomposition approach is an alternate of impulse response function (Diagram of impulse response function is also given in figure-4). This process explains how much of the predicted error variance for any variable is described by innovations generated throughout each independent variable in a system over various time horizons. The results indicate that external debt is explained 58% by its own innovative shocks while defense spending, economic growth and investment explain it by 19.62%, 15.33% and 6.94% through their innovative shocks. External debt explains defense spending by 34.23% while 30.43% defense spending is explained by its own innovations. Economic growth contributes by 33.54% to explain defense spending while investment share is minimal. It is concluded on basis of analysis that there is bidirectional causal relationship exists between military spending and external debt although causality is strong from external debt to military spending.

Table-7.2 reveals that economic growth is explained more than 34% (35%) by external debt (military spending) while 28% through its innovative shocks. Empirical evidence indicates military spending and economic growth granger-cause each other but dominating from military expenditures to economic growth. Unidirectional causality is found from external debt to economic growth. Investment contribution is 2% to explain economic growth through its innovative shocks. The substantial portion of investment is explained by external debt and military spending which is 43.15% and 31.18% respectively. It indicates that causality from external debt and military spending to investment is found. Overall analysis indicates that results from both approaches i.e.

VECM and variance decomposition approach are more or less same. It is confirmed that there is bidirectional relation between military spending and external debt.

Table-9.1: Variance Decomposition

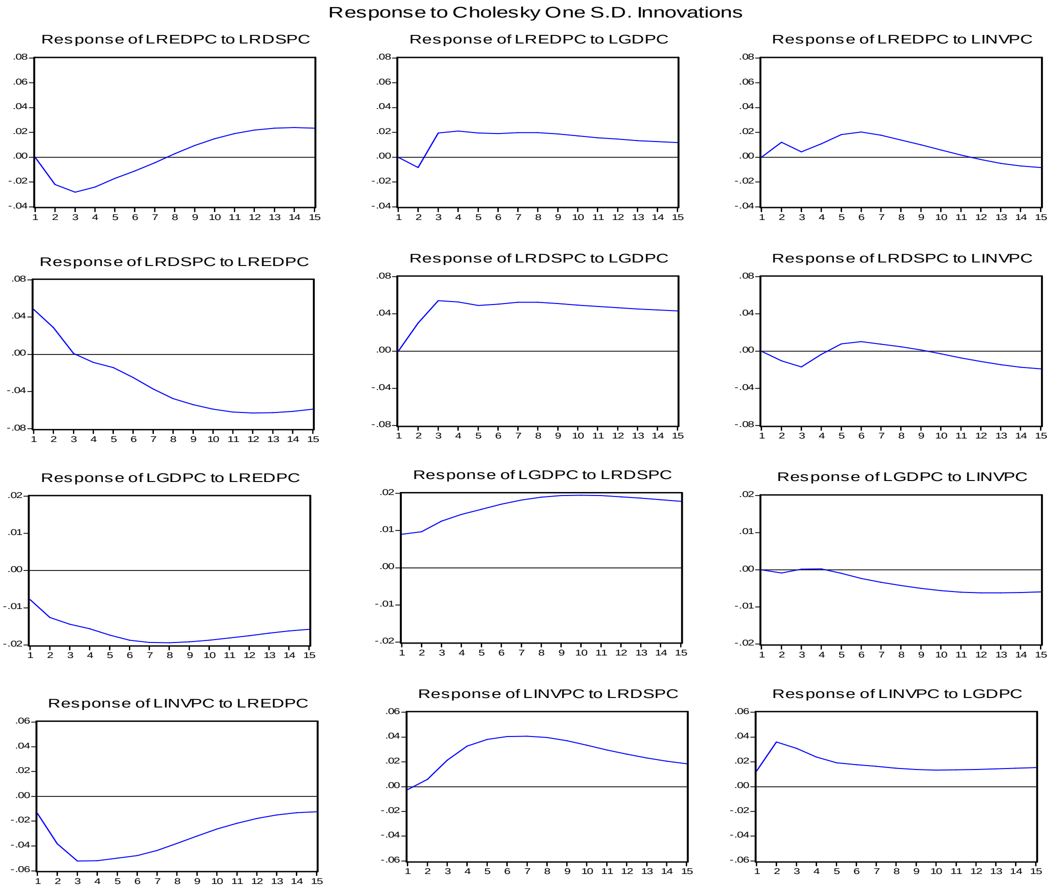
Variance Decomposition of $LREDPC_t$				
Period	$LREDPC_t$	$LRDSPC_t$	$LGDPC_t$	$LINVPC_t$
1	100.0000	0.0000	0.0000	0.0000
2	92.2431	5.3805	0.7793	1.5969
3	83.6720	11.0435	3.8818	1.4024
4	77.1424	14.0197	6.7628	2.0749
5	72.1041	14.8899	8.8161	4.1897
6	67.9843	14.8135	10.5916	6.6104
7	65.0003	14.2376	12.5377	8.2242
8	63.2000	13.5942	14.2473	8.9583
9	62.2362	13.3445	15.3980	9.0211
10	61.6784	13.6876	15.9848	8.6490
11	61.1960	14.5544	16.1505	8.0988
12	60.6067	15.7582	16.0506	7.5843
13	59.8626	17.1009	15.8208	7.2155
14	59.0016	18.4237	15.5627	7.0118
15	58.0914	19.6255	15.3396	6.9434
Variance Decomposition of $LRDSPC_t$				
Period	$LREDPC_t$	$LRDSPC_t$	$LGDPC_t$	$LINVPC_t$
1	45.1992	54.8007	0.0000	0.0000
2	43.7736	42.1678	12.5207	1.5378
3	29.9505	29.6115	36.5946	3.8432
4	23.6859	24.4002	48.8390	3.0747
5	20.5519	22.1942	54.3643	2.8894
6	19.7276	20.8476	56.5721	2.8525
7	21.2283	20.2618	56.0004	2.5093
8	23.9585	20.6727	53.2998	2.0689
9	26.8160	21.8651	49.6426	1.6761
10	29.2936	23.4262	45.8846	1.3955
11	31.2267	25.0658	42.4457	1.2616
12	32.6016	26.6405	39.4883	1.2694
13	33.4894	28.0800	37.0453	1.3851
14	33.9979	29.3483	35.0839	1.5697
15	34.2341	30.4345	33.5433	1.7880

Table-9.2: Variance Decomposition

Variance Decomposition of $LGDPC_t$				
Period	$LREDPC_t$	$LRDSPC_t$	$LGDPC_t$	$LINVPC_t$
1	14.3294	18.9534	66.7171	0.0000
2	21.9847	17.2543	60.6903	0.0705
3	26.0806	20.0457	53.8273	0.0463
4	28.7961	22.8220	48.3462	0.0355
5	31.1137	24.9199	43.9111	0.0551
6	32.9388	26.6503	40.2346	0.1760
7	34.1783	28.2417	37.2086	0.3713
8	34.9213	29.6831	34.7828	0.6126
9	35.3089	30.9255	32.8787	0.8867
10	35.4513	31.9687	31.4046	1.1752
11	35.4277	32.8382	30.2778	1.4561
12	35.2989	33.5579	29.4299	1.7131
13	35.1107	34.1466	28.8048	1.9377
14	34.8962	34.6224	28.3545	2.1266
15	34.6773	35.0037	28.0389	2.2799
Variance Decomposition of $LINVPC_t$				
Period	$LREDPC_t$	$LRDSPC_t$	$LGDPC_t$	$LINVPC_t$
1	6.2101	0.19045	5.2426	88.3567
2	26.1525	0.65342	23.1069	50.0871
3	41.3641	4.66845	22.7904	31.1769
4	47.2753	10.4470	19.9919	22.2857
5	49.6297	15.6528	17.4298	17.2875
6	50.2381	19.7255	15.5982	14.4381
7	49.8232	22.8732	14.2875	13.0158
8	48.8658	25.3263	13.3805	12.4272
9	47.7345	27.1858	12.8000	12.2795
10	46.6367	28.5417	12.4815	12.3399
11	45.6647	29.5060	12.3664	12.4627
12	44.8458	30.1830	12.4070	12.5641
13	44.1715	30.6525	12.5671	12.6087
14	43.6168	30.9730	12.8188	12.5912
15	43.1536	31.1885	13.1382	12.5196

Impulse response function shows that direction of response due to random shock of independent variables on dependent one. The figure-4 shows that shock in military spending leads to a decrease in external debt till 8th year then it becomes positive and is increasing external debt till 15th time horizon. This shows that consistent rise in military spending is burdensome and increases the volume of external debt. Economic growth also leads external debt very sharply till 3rd time horizon then response of external debt due to a random shock in economic growth goes downward. It shows that Pakistan is utilizing her capacity to pay back loans and lower the burden of external debt. The response of external debt due to random shock in investment is interesting which reveals that investment leads external debt to rise till 11th year then response of external debt becomes negative. This implies that after a threshold level investment helps to decline external debt burden by providing the additional resources such as tax collection.

Figure-4 Impulse Response Function



VI. Conclusions and Policy Implications

The nexus between military spending and economic growth has been discussed in literature extensively. Now researchers have diverted their attention to examine the impact of military spending on external and internal debt. This is new exploration in literature to make contribution using cross-country or country case study. Our study is also an effort to contribute in literature by investigating the effect of military spending, economic growth and investment on external debt in case of Pakistan using time series data for the period of 1973-2009. In doing so, ARDL bounds testing approach to cointegration was used which confirmed the existence of cointegration between military spending, economic growth, investment and external debt.

The empirical analysis reveals that external debt in current period is positively influenced by debt in previous period while rise in military spending has positive and significant effect on external debt. An increase in income has inverse impact on external debt. The effect of investment is also positive and significant on external debt in the country. Same inference can be drawn for short run results but investment has effect on external but it is statistically insignificant. The causality analysis indicated bidirectional causality between external debt and military spending while strong causation is running from external debt to military spending and same inference can be drawn for economic growth and military spending. Unidirectional causal relation is found from external debt to economic growth and military spending to investment.

The amount of public debt is equivalent to 56% of GDP. The internal debt is mounted to 31% of GDP while external debt is amounted to 25% of GDP in 2008-09. In the context of policy implication, present study suggests that Pakistan is an agrarian country. The exports share of agriculture sector is 1.1948% of merchandise exports while share of imports of agriculture sector is 7.8176% of merchandise exports in 2008-09. It implies that agriculture sector has potential in making contribution to curtail external debt by boosting exports share in trade. In doing so, government must pay her attention to increase research and development expenditures to improve the quality of agri-exports. This will not only increase productivity of agriculture sector but also enhance its share to trade. The increased share of agriculture will be used to curtail external debt by earning foreign exchange. Furthermore, manufacturing sector should also be on priority to increase its share to trade for foreign exchange reserves by diversifying the quality of intermediate and finished export items.

In the background of our empirical investigation, it can be highlighted that both Pakistan and India are strategically important nuclear states, and their cordial mutual relationship is important for the South East Asian region as well as the global economy and peace. Therefore, it is highly appropriate if both governments initiate bilateral talks to develop mutual confidence and harmony to fight against poverty. The population size and population growth rate of both countries do not permit them to invest such a huge chunk of their annual budgets on their military spending. It is strategically important for them to start dialogue to reach at a consensus for peace and prosperity by reducing their military size and expenditures. The reductions in military spending of both countries by mutual understanding will save the countries from external debt and will shift resources to developmental projects and stimulate the pace of economic growth. This will enhance the capacity to develop as well as increase the market share by raising production levels for both economies.

For further research, our model has potential to include other relevant variables such as internal debt following (Narayan and Narayan, 2008) and exchange rate i.e. the rational is that rapid currency devaluations raise the cost of debt servicing which increase debt services and hence total volume of external debt. Inclusion of these variables will provide a comprehensive picture which enables us to capture the exact effect of exchange rate on external debt and, whether military spending raises internal debt or not.

Footnotes

1. They included external debt, military spending, exports, GDP, foreign exchange reserves and interest rate proxied by six-month London Interbank Offer interest rate in their model.
2. This dummy takes value 1 when government is right wing, 2 when government is center right, 3 when government belongs to centre, 4 when government is center left and 5, when government is left wing.
3. Sezgin has used time series data over the period of 1979-2000 with log-linear specification.
4. Sezgin (2004) findings are consistent with the view by Looney (1989) for case of Turkey.

5. Bruck (2000) has noted that civil war in Mozambique is major reason for high burden of external debt.
6. To establish the goodness of fit of the ARDL model, the diagnostic test and the stability test have also been conducted. The diagnostic test examines the serial correlation, functional form, normality and heteroscedisticity associated with the model. The stability test is checked by applying the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals ($CUSUM_{SQ}$).
7. If cointegration is not detected, the causality test is performed without an error correction term (ECM).
8. However, it should be kept in mind that the results of the statistical testing can only be interpreted in a predictive rather than in the deterministic sense. In other words, the causality has to be interpreted in the Granger sense.
9. ADF, P-P and DF-GLS unit root tests showed unit root problem till lag 5.
10. See Feridun and Shahbaz (2010)
11. For more details (see Lütkepohl, 2005)

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Appendix-A

Innovative Accounting Technique

To investigate the dynamic relationship between military spending, external debt, economic growth and investment, Vector Auto Regression (VAR) Approach has been used. Innovation Accounting Technique (variance decomposition and impulse response function) that has not been used before to investigate causal relationship between the variables. This approach estimates the forecast error variance decomposition which allows inferences to be drawn with the proportion of movements in particular time periods due to its own shocks and shocks arising from other variables in the VAR as well. Through the application of Vector Auto Regression, effect of a shock of one variable can be checked on the other variables included in the model which also include future values of shocked variables. This procedure tends to break down the forecast error variance of each variable following a "shock" to particular variable that makes possible to identify which variable affects strongly and, vis-à-vis its shock. For instance, innovative shock in military spending leads substantial variations in external debt is examined through application of Vector Auto Regression but shocks in external debt shows only minimal impact on military spending. This leads to conclude that military spending seems to granger-cause external debt or causal relationship is running from military spending to external debt.

The time path of the effects of innovative shocks of independent variable can be examined through impulse response function. The impulse response function also estimates that how each variable responds over time to the first "shocks" in other variable (s). These two approaches are termed as "Innovation Accounting Technique" which allows a perceptive insight into the dynamic relation between military spending, external debt, economic growth and investment. Military spending granger-causes external debt if military spending explains more of the variance as compared to external debt and vice verse, as it is indicated in variance decomposition method which breaks down the forecast error for military spending and external debt. In the light of the above discussion, one may establish a VAR system that takes following the form:

$$V_t = \sum_{i=1}^{k} \delta_i V_{t-1} + \eta_t$$

where, $V_t = (LREDPC_t, LRDSPC_t, LGDPC_t, LINVPC_t)$

$$\eta_t = (\eta_{REDPC}, \eta_{RDSPC}, \eta_{GDPC}, \eta_{INVPC})$$

$\delta_1 - \delta_k$ are four by four matrices of coefficients and η is a vector of error terms. $REDPC_t$ = real external debt per capita, $RDSPC_t$ = real military spending per capita, $GDPC_t$ = real GDP per capita and $INVPC_t$ = real investment per capita.