

# Impact of Public Debt on the economic growth of Pakistan

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By

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## **Abstract**

Over the years Pakistan has failed to collect enough revenues to finance its budget. Consequently, it has been facing the problem of twin deficits and resultantly to finance their developmental activities government has to rely on public external and domestic debt. The positive effects of public debt relate to the fact that in resource-starved economies debt financing if done properly leads to higher growth and adds to their capacity to service and repay external and internal debt. The negative effects work through two main channels--i.e., “Debt Overhang” and “Crowding Out” effects. The present study examines the consequences of public debt for economic growth and investment in Pakistan for the period 1972-2009. It develops a hybrid model that explicitly incorporates the role of public debt in growth equations. As the some variables are I (1) and other are I (0) so Autoregressive Distributed Lag(ARDL) technique has been applied to estimate the model. Study finds that public external debt has negative relationship with per capita GDP and investment confirming the existence of “Debt Overhang effect”. However, due to insignificant relationships of debt servicing with investment and per capita GDP, the existence of the crowding out hypothesis could not be confirmed. Similarly, domestic debt has a negative relationship with investment and per capita GDP. In other words, it seems to have crowded out private investment.

**Key Words:** Public Debt, Economic Growth, Investment, ARDL

**JEL Classification:** H63, O43, E22, C22

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<sup>1</sup> **Author’s Note:** These are the authors’ personal viewpoints and do not reflect the viewpoints of their affiliated institutions.

# 1 Introduction

Heavy indebtedness of the developing economies is one of the major challenges at the beginning of 21st century. Needless to point out, government can finance its budget and development efforts by borrowing or taxing the output. However, taxes tend to distort the structure of relative prices, borrowing, if pushed beyond the carrying capacity of an economy, creates problems of intergenerational equity, and it can cause a transfer of resources that tends to be undermining growth. Yet borrowing has to be done to finance public expenditure to increase social welfare and promote economic growth.

Public debt can be classified as sum of external debt and domestic debt. As far as the relationship between external debt and economic growth is concerned, a reasonable level of borrowing is likely to enhance economic growth, through capital accumulation and productivity growth (Chowdhury, 2001). Because at early stages of development, countries have small stocks of capital and they have limited investment opportunities. External borrowing for productive investment creates macroeconomic stability (Burnside, 2000), external debt is also been seen as capital inflow having positive effect on domestic savings, investment and economic growth; it implies that foreign savings complement domestic savings to cater for investment demand (Eaton, 1993). However, high level of accumulated debt has an adverse effect on rate of investment and economic growth. Most broad rationalization of the adverse effect of debt is “debt overhang” effect. If there is some likelihood that in future, debt will be larger than the country’s repayment ability then anticipated debt-service costs will depress further domestic and foreign investment (Krugman, 1988; Sachs, 1990; Karagol, 2002). The other channel through which debt obligations affect economic growth is known as “crowding out” effect. If a greater portion of foreign capital is used to service external debt, very little will be available for investment and growth. Debt-servicing cost of public debt can crowd out public investment expenditure, by reducing total investment directly and complementary private expenditures indirectly (Karagol, 2002; Diaz-Alejandro, 1981). However, various authors (Pattillo 2002, 2004) are unable to find evidence of a significant crowding out effect, while others (i.e. Chowdhury, 2004, Clements, 2003, Elbadawi, 1997) finds that both debt burden and debt service obligations have reduced the investment and economic performance.

In developing countries, policy makers and international organizations have given domestic debt far less attention as compared with external indebtedness. Issuing domestic debt,

whether to finance fiscal deficit or to mop up monetary liquidity, involves a complex assessment of the costs and benefits to the economy. The justification behind creation of domestic debt in poor countries is that it kindles development of deep and liquid internal financial markets, protect countries from unfavourable external shocks, and mitigate foreign exchange risk (Del, 2003; Aizenman, 2004; Kumhof, 2005). Domestic debt can crowd in risky private sector investment by protecting bank balance sheets and profitability (Barajas 1999; 2000). As such, investments are more proficient compared with investment associated with low risk. Most important concern about domestic debt is crowding out effect on private investment. When governments borrow domestically, they use domestic private savings, otherwise that may have been on hand for private sector lending. In turn, smaller residual pool of loan able funds was available in market to elevate the cost of capital for private borrowers. It results in dropping private investment demand, and therefore capital accumulation, growth and welfare (Diamond, 1965). Domestic debt is also viewed as more expensive in comparison to concessionary external financing (Burguet , 1998). As a result, interest load of domestic debt may absorb important government revenues and thus crowd-out pro-poor and growth enhancing expenditures. High-yielding government domestic debt held by banks can make them self-satisfied about costs and decrease their efforts to mobilize deposits and fund private sector projects (Hauner, 2006).

The present study will explore the impacts of public debt on economic growth in Pakistan. Furthermore, as investment is the basic channel through which public debt affects growth. Therefore, it becomes very important that the relationship between debt and investment is explored, which is what this study also seeks to do.

The organization of the paper will as follows; after the brief introduction in section two a brief review of the literature is presented, section three presents a brief scenario of public debt, and economic growth in Pakistan, whereas the section four provide a detailed discussion on theoretical model, data and estimation methodology. Section five and six are devoted for discussion of the results of growth and investment models respectively. The last section presents the conclusions emerged from the study and policy implications.

## **2 Literature Review**

Numerous studies have dealt with the debt-economic growth relationship over the last two decades. After the second oil crisis in 1979, all countries were affected by the worldwide recession of 1980-1983. Due to low goods prices, high real rates of interest and slow growth

in the industrial countries, some debtor countries have experienced debt servicing problems. Therefore, the period since 1982 has been portrayed as a period of debt overhang. However, the new economic and political changes deem it necessary to carry out additional studies to make use of more recent data and econometric techniques. An overview of literature is summarized as under.

Levy and Chowdhury (1993) has concluded that an increase in the public and publicly guaranteed external debt may indirectly depress the level of GNP by discouraging capital formation and encouraging capital flight due to tax increase expectations. Cunningham (1993) found that debt burden has a negative effect on economic growth because of the impact on the productivity of labour and capital. In another study Sawada (1994), finds that heavily indebted countries (HICs) have debt overhang problems. Since their current external debts are above the expected present value of the future returns. Many other studies; Chowdhury (2001), Siddiqui and Malik (2001), Easterly (1999, 2001 and 2002) and Sen (2007) comes to the same conclusion that external debt negatively affects economic growth. Impact of high debt on growth appears to operate through both a strong negative effect on physical-capital accumulation and on total factor productivity (TFP) growth. In addition, neither TFP nor private savings rates are affected by external debt levels (Patillio, 2004). Fosu (1996), argued that GDP growth is negatively influenced via a diminishing marginal productivity of capital. It was also estimated that on average a high debt country faces about one percentage reductions in GDP growth rate annually. Latter on Fosu (1999), comes to the conclusion that negative relationship between economic growth and debt might be due to a poor performance of recipient country.

Smyth and Hsing (1995) find that in early 1980, debt ratios rose but it was below 38.4, and debt-financing have stimulated the economic growth. On the other hand, during 1986-1993, debt ratio rose from 40.7 percent to 50.9 percent. This ratio is above the (38.4) optimal debt ratio and it is expected to adversely affect the economic growth. In another very comprehensive study Patillo (2002) indicated that on average, external debt is growth-enhancing up to about 160% of export to debt level, and growth-reducing thereafter (i.e. the debt overhang range). Further, their study suggests that the debt overhang mechanism works through the productivity of investment as much as it does through the volume of investment. However, Maghyereh (2002) comes to the conclusion that in Jordon, external debt below the threshold level of 53 % of GDP has a positive relationship with GDP and thereafter the relationship turns to be negative. Blavy (2006) finds that 'threshold level of debt' is 21% of

GDP, below that level, debt is positively associated with productivity, but the coefficient for the “above threshold debt” becomes negative and significant. The total effect of high debt is significantly negative. It found that doubling of public debt would reduce productivity growth of about 1.5%.

As mentioned earlier investment is very important channel through which economic growth is affected. Cohen (1993) found that the level of debt does not explain the slowdown of investment in highly indebted developing countries. Warner (1992) suggests that the reasons behind the decline of investment in many of the heavily indebted countries are declining exports prices, high world interest rates, and sluggish growth. These shocks could have directly caused investment to decline. It was argued that debt failed to have a negative coefficient as the debt theories predict. These findings were criticized by Rockerbie (1994) and it was argued that these shortcomings may have caused investment to be biased and unreliable testing method. Deshpande (1997) also comes to the conclusion that relationship between external debt and investment is negative.

Metwally (1994) found that capital inflows have a significant impact on the growth in Algeria, Egypt and Morocco. In a study on Kenyan economy, Maureen (2001) finds that current debt flows, stimulate investment while past debt accumulation discourages investment. This confirms the existence of a debt overhang problem in Kenya. It has also been found that ‘crowding out’ of current investment as a result of servicing relatively large amounts of external debt so Debt servicing does not appear to affect growth adversely but has some crowding out effects on private investment.

Abbas(2005) finds that there was a significant positive growth payoff to debt, even at the very high levels of 93% of GDP. Analysis presented quite a complex picture of the relationship between debt and growth, and domestic debt and growth. On one hand, the results seemed to affirm conventional wisdom that the decision to switch the source of budgetary finance from external to domestic debt would be fraught with difficulties. On the other, the study obtained quite robust results on the growth payoff of domestic debt issuance in more developed financial systems. However the overall relationship remained negative. Abbas (2007) has extended its previous work; and finds the evidence that above a ratio of 35% percent of bank deposits domestic debt undermines economic growth.

Anwar (2002) concluded that if exports remain stagnant, then devaluation has directly increased foreign debt in rupee and results in dramatic increase in debt service burden, lower

economic growth and higher poverty level. Study argues that it is crucial to address basic reasons that caused debt build-up and subsequent adverse effects on economic growth and poverty levels while designing a debt reduction strategy. Policy of tax reforms, expanding the production and export base and creating diversification in exports can be handy in tackling debt problem.

In another study, Waheed(2006) concluded that there is primary deficit so it has to be filled out by domestic debt. The only way to stop the process of debt accumulation is to reduce the primary deficit by continued fiscal adjustment. This adjustment should not be achieved on the cost of cut in development expenditure rather there is need for serious efforts to increase domestic tax revenue.

From the review of literature it can be broadly surmised that divergent opinions exist on practically every aspect of the relationship of debt with key economic variables. Firstly, most of the studies on the subject focus on the relationship between external debt and economic growth, neglecting domestic debt entirely or mentioning it in the passing. The reason is the understanding that, unlike domestic debt, external debt is more difficult to service and repay. But this is true only when the domestic debt is moderate and not when it is large and growing. Secondly, most of these studies have been conducted by using panel data. There is very limited studies on Pakistan on the impacts of public debt on economic growth.

### **3 Situation of Public Debt in Pakistan<sup>2</sup>**

At the time of independence Pakistan was a poor and underdeveloped country. In order to stimulate economic growth, adequate revenues are a prerequisite but Pakistan but since independence, it is facing financial crunch. Confined revenues and savings coupled with rising expenditures have caused situation of persistent fiscal deficit over the years. Similarly, situation of balance of payment is also not satisfactory and Pakistan is facing current account deficit. These deficits are filled by public debt and Pakistan has to spend considerable portion of its GDP on interest payments of the loans. The need to service debt obligation is undermining economic performance and resulting in collapse of development planning. Because debt obligations and expenditure on debt servicing become a resource drain for already limited revenues and is halting economic growth and poverty reduction efforts. Decade of 1990s is a typical example of this situation, during 1990s Pakistan is facing severe

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<sup>2</sup> For detailed discussion see Akram et al (2011)

fiscal deficit, elevated public debt and near to the ground economic growth and rising incidence of poverty. Developing countries with higher incidence of public debt have to cope up with the same situation.

Several points can be concluded after examining Public debt scenario in Pakistan. Firstly, debt problem has been in making for a long time. Inability of successive governments to reduce fiscal deficit significantly, unproductive use of debt and stagnant growth in real revenues has fuelled the debt problem. Secondly, rising public debt in Pakistan is largely contributed by factors like stagnant government revenues and high real cost of borrowing. Resultantly, sharp fluctuation in real cost of borrowing, dynamics of the growth in public debt also changed over time. Thirdly, debt problem can't be detached from broader issues of economic strategy and management especially policies regarding savings, exports, and revenue, expenditure etc. Lastly, due to rising expenditure on debt servicing governments have always reduced development expenditure instead of reducing the current expenditure. Pakistan's increasing debt servicing requirements during 1990s exerted significant strain on fiscal management. To meet the commitments under IMF's structural adjustment program, Pakistan had to reduce size of the budget deficit to less than 5 % of GDP during 1990s. As revenue generation efforts are only partially successful and Pakistan is unable to generate adequate revenues to meet expenditure. Consequently, successive governments have tried to reduce deficit by reducing development expenditure that has hampered economic growth process and resulted in decline in human development indicators and it has raised incidence of poverty. Moreover, public debt servicing placed serious constraints for priorities of government's budgetary allocations, leaving very limited resources available for development expenditure. However, improved situation of Debt obligations aftermath of 9/11, Pakistan got considerable fiscal space to increase expenditure on development projects especially in social sector and infrastructure development, extremely vital for pro poor and sustainable economic growth. Pakistan got much needed fiscal space but it is debatable whether Pakistan has developed a sound fiscal policy to get long-term benefits from it or not. Debt explosion coupled with higher fiscal and current account deficit resurfaced in 2008 and is a major threatening syndrome for economic management, it depicts that Pakistan has wasted the opportunity for sustainable growth.

## 4. Data and Methodology:

Following the analogy of the inclusion of exports in production function, Cunningham (1993) has introduced debt burden into the production function. This is because debt burden has important implications for the capital and labour productivity. Nations that carries a significant debt burden requires to spend portion of its resources to service its debt liabilities having significant implications on decisions regarding the employment of labour and capital in the production function. Therefore, a debt-inclusive production function can be written in the following form.

$$Y = A(K, L, Debt) \text{-----}(1)$$

Where Y, K, L, debt and A are the measure of GDP, capital stock, labour force, public debt and other constant factors respectively. This makes standard assumption in equation that input elasticities of output are constant and technical change is neutral.

Keeping in view the importance of investment according to the Presbitero (2005), it is better to disentangle the analysis of public debt and economic growth in a two-step relationship, firstly the direct links between public debt and economic growth are explored then relationship between public debt and Investment is also analysed.

The growth equation in the reduced vector form can be written as under:

$$y_t = \alpha + \beta y_{t-1} + \sum_{j=1}^k \delta x_{tj} + \sum_{m=1}^p \pi Debt_{tm} + \varepsilon_t \text{ .....}2$$

Where  $y_t$  is log of per capita GDP at t time and  $y_{t-1}$  is lagged value of GDP.  $x_{tj}$  is a vector of control variables,  $x_{tm}$  is the vector of various public debt indicators, and  $\varepsilon_t$  is the classical error term.

This model can be further extended to capture the effects of debt on investment, as it is the basic channel through which debt affects economic growth.

$$Inv_t = \alpha + \sum_{j=1}^k \delta x_{tj} + \sum_{m=1}^p \pi Debt_{tm} + \varepsilon_t \text{ .....}2$$

Where  $inv_t$  is log of investment at t time and  $x_{tj}$  is a vector of control variables,  $x_{tm}$  is the vector of various public debt indicators, and  $\varepsilon_t$  is the classical error term.

To empirically test, the relationship between public debt and economic growth, time series data of Pakistan for the period of 1972-2009 has been used. Different variables have been used in various studies to analyze the impact of public debt on economic growth. A brief description and some background of the variables used is summarised in table 1 below:

**Table 1 Data Source**

Sr. No.	Name of Variable	Data Source	Description
1.	Per Capita GDP (Yt)	WDI <sup>3</sup>	Different measures of GDP growth have been used in literature e.g. Per capita GDP, GDP growth rate, Real GDP, Real GNP etc. In the present study, we have used per capita GDP because it not only captures the perspective of economic growth and welfare.
2.	Investment (Kt)	WDI	For capital stock the main variables used in the literature are gross domestic investment (Gross capital or gross fixed capital formation), Investment/output ratio, (Capital stock is calculated by using hedonic valuation method and by using the perpetual inventory method). We use gross capital formation as a ratio to GDP.
3.	External debt (ED_Y)	GDF <sup>4</sup>	These indicators of public debt are categorised into two categories <b>Stock variables:</b> The stock variables relates to value of the debt burden to different key economic indicators e.g. debt/exports ratio, debt/GDP ratio, domestic debt/GDP ratio.
4.	Domestic Debt (dd_y)	IFS <sup>5</sup>	The most widely used indicator to judge stock of public debt (including external debt) is its ratio to GDP.
6	Debt Servicing (DS_X)	GDF	<b>Flow variables:</b> Flow variables focus on debt service payment and relate debt servicing to GDP. Public debt consists of two parts i.e. external debt and domestic debt. In the study, we have used Public external Debt/GDP, Domestic Debt/GDP and Debt Servicing/Exports ratios.
7.	Exports	WDI	
8.	Imports	WDI	
9.	Openness (op)	WDI	The measures used in this study include tariffs and quotas, real exports, real imports, balance of trade and the ratio of exports and imports as percentage of GDP.

<sup>3</sup> World Development Indicators (World Bank)

<sup>4</sup> Global Development Finance (World Bank)

<sup>5</sup> International Financial Statistics (IMF)

<b>11.</b>	Inflation (inf)	WDI	In order to capture the impact of uncertainty created by debt/debt servicing, inflation becomes very crucial as a control variable. There exist different indicators to measure inflation. Consumer price index and GDP deflator are most widely used indicators of inflation. In this study, we have used CPI as an indicator of inflation.
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### Estimation Methodology:

For the time series, in order to guard against spurious regression, the first step is to see whether the series is stationary or non-stationary; to ensure that unit root tests are used. The time-series method used has the problem of settling at the very outset the issue of the stationarity of the data. If some variables are I(I) then standard regression analysis may yield spurious results.<sup>6</sup> To tackle that issue the latest approach is the cointegration analysis. In the present study, ADF unit root test has been applied. The detailed results of unit root test are summarised in table 2 below:

**Table 2 Results of unit root test**

Name of Variable	Level			1st Difference		
	Intercept	Trend and Intercept	None	Intercept	Trend and Intercept	None
<b>Yt</b>	-1.3058	-3.1201	-3.1851	-3.9636*	----	----
<b>OP</b>	-2.3112	0.2769	-5.6354*	----	----	----
<b>INF</b>	-3.2371**	----	----	----	----	----
<b>KT</b>	-2.3304	-2.2869	-5.0182*	-----	----	----
<b>ED_Y</b>	-1.0071	-1.1647	-1.2025	-4.5151*	----	----
<b>DD_Y</b>	-2.8093	-2.6208	-0.1687	-5.1595*	----	----
<b>DS_X</b>	-2.0982	-2.9363	-0.7879	-7.9247*	----	----

**Null Hypothesis:** Existence of unit root. \*, \*\* denotes the rejection of Null at 5% and 10% level respectively

The results of unit root test reveal that the model is a mixture of I(0) and I(I) variables, so most appropriate method for estimation in these circumstances is Autoregressive Distributed Lags Model (ARDL) Cointegration technique proposed by Pesran et. al (2001).

The basic conditional VECM equation for the relationship between public debt and economic growth equation 2 can be written as under.

<sup>6</sup> Newbold (1974)

$$\Delta y_t = \alpha + \gamma_1 y_{t-1} + \gamma_2 op_{t-1} + \gamma_3 k_{t-1} + \gamma_4 ed_y_{t-1} + \gamma_5 ds_x_{t-1} + \gamma_6 dd_y_{t-1} + \sum_{i=1}^p \omega_i \Delta y_{t-i} + \sum_{i=0}^p \tau_i \Delta op_{t-i} + \sum_{i=0}^p \sigma_i \Delta k_{t-i} + \sum_{i=0}^p \beta_i \Delta ed_y_{t-i} + \sum_{i=0}^p \varphi_i \Delta ds_x_{t-i} + \sum_{i=0}^p \theta_i \Delta dd_y_{t-i} + \varepsilon_t \text{-----A}$$

Where  $\gamma_i$  the long run multipliers are  $\alpha$  is the intercept and  $\varepsilon_t$  is the error term. Similarly, the ARDL specifications for investment is presented in equation B :

$$\Delta k_t = \alpha + \gamma_1 k_{t-1} + \gamma_2 inf_{t-1} + \gamma_3 y_{t-1} + \gamma_4 [ed_y]_{t-1} + \gamma_5 [ds_x]_{t-1} + \dots \text{-----B}$$

Where  $\alpha$  is intercept,  $\varepsilon_t$  is the error term, similarly  $\gamma_1, \dots, \gamma_6$  are the long run coefficients and  $\omega, \tau, \sigma, \pi, \beta, \varphi$  and  $\theta$  are the short run dynamic coefficients. It is also worthwhile to define the variables here  $y, k, op$  and  $inf$  denote per capita GDP, investment openness and inflation respectively. Similarly,  $ed_y$  (external debt as percentage of GDP),  $ds_x$  (debt servicing as percentage of exports) and  $dd_y$  (domestic debt as percentage of GDP) are the major indicators of public debt used in the analysis. From these equations long run and short run relationships can be derived.

## 5. Growth equation results:

As mentioned above, equation A has been estimated for cointegration. The ARDL cointegration procedure begins with conducting the bound test for the null hypothesis of no Co-integration-- i.e.

$$\text{Ho: } \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0 \quad \text{against the alternative hypothesis of} \quad \text{H1: } \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq 0$$

For F-test, the selection of maximum lag length is very important. The observations in the study are annual and we have only 36 observations with six parameters. For such short observations, as suggested by Pesran (2001), we have selected a maximum lag length of 2. The estimation results of F-test for the level of significance are summarized in table 3.

**Table 3 Bound F test results**

Country	F-Statistic Value	Lag length	Significance level	Bound Critical Values	
				I(0)	I(1)
Pakistan	6.188	2	1%	3.15	4.43
			5%	2.45	3.61
			10%	2.12	3.23

The results reveal that the F-statistic is greater than the upper bound critical values. It depicts that there exists a co-integrating relationship among the variables. After determination of the existence of cointegration among the variables, the next step in the ARDL approach is to determine the long-run coefficients for equation A. To find out the optimal length for the long-run coefficients of Eq. (A), Schwarz Bayesian criterion (SBC) of the lag selection is utilized. The long-run results are summarized in table 4.

**Table 4 long run estimation results (1,1,0,0,1,2)**

Variable	Coefficient	Std. Error	t-Statistic
Constant	0.798221	0.190963	4.179970
KT(-1)	0.095112*	0.046206	2.058433
OP	0.089862*	0.046123	1.948336
ED_Y	-0.160239*	0.025842	-6.200679
DS_X(-1)	-0.004322	0.014070	-0.307201
DD_Y(-2)	-0.014205	0.014709	-0.965728
R-squared	0.995511		
Adjusted R-squared	0.994341		
F-statistic	850.1940		
Prob(F-statistic)	0.000000		
Serial Correlation LM test	1.845262		
P value of LM test	0.1715		

\*and \*\* represent significance at 5% and 10 % level respectively

### Long run Relationships

The results confirm the negative relationship between external debt indicators and economic growth. *External debt as percentage of GDP* has significant and negative relationship with per capita GDP in Pakistan. Debt servicing as percentage of exports has

insignificant relationship in Pakistan. It reveals that in Pakistan, debt overhang hypothesis seem to have played a significant role while the crowding out effect of external debt is not significant. The effects of domestic debt are negative and insignificant relationship with per capita GDP. Domestic debt has both positive and negative effects on economic growth. However, financial markets liberalization and macroeconomic stability is a necessary condition for the domination of positive effects (Del, 2003). Pakistan is lacking on these grounds so negative impacts of domestic debt are dominating.

The conventional wisdom is that investment enhances economic growth. This proposition has received support from various studies ---e.g. Barro (1991) Pattillo(2002) and Abbas (2007)---which say that investment has had a positive relationship with per capita GDP. Openness is found to have positive and significant relationship with per capita GDP. It also supports the conventional wisdom that globalization and free trade promotes economic growth. It is supported by various earlier studies including Naqvi (2010).

Diagnostic tests results suggest a high value of  $R^2$  revealing that overall goodness of fit of the model is satisfactory considering the number of variables. The F-Statistic measuring the joint significance of all the regressors in the model is also statistically significant. Serial correlation LM test indicates that there exists no serial correlation.

### Short run Relationships

After estimating long run coefficients, the final step in ARDL approach is the analysis of Error correction and estimation of short run coefficients. According to the relevant theory if there is cointegration among the variables then in the short-run error correction will also happen. The results of Error Correction Model are summarized in table 5.

**Table 5 Error correction representation of the selected ARDL model**

Variable	Coefficient	Std. Error	t-Statistic
Constant	0.00093	0.00429	0.21749
D(KT)	0.01339	0.05677	0.23577
D(KT(-1))	0.128012*	0.04776	2.68044
D(OP)	0.044413	0.032878	1.350842
D(ED_Y)	-0.18442*	0.03267	-5.64514
D(DS_X)	-0.01240**	0.00830	-1.49378
D(DS_X(-1))	-0.02656*	0.00668	-3.97391
D(DD_Y)	0.02269	0.01386	1.63723

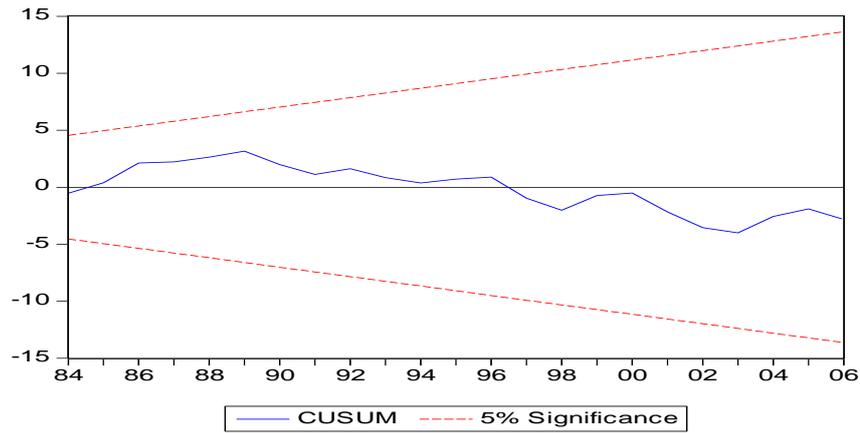
<b>D(DD_Y(-1))</b>	-0.00710	0.00904	-0.78535
<b>D(DD_Y(-2))</b>	0.01936	0.01244	1.55723
<b>ECT(-1)</b>	-0.72659*	0.19252	-3.77413
<b>R-squared</b>	0.731924		
<b>Adjusted R-squared</b>	0.530867		
<b>F-statistic</b>	3.640381		
<b>Prob(F-statistic)</b>	0.008916		

\*, and \*\* denote significance at 5% and 10 % level respectively

According to the results given in the table above, the existence of a stable long-run relationship among the variables is further confirmed by the significant error correction term (Bannerjee et al., 1998). The coefficient of the error correction term also represents the speed of adjustment. That is following a disturbance in the unrestricted model how quickly the variables returned backs to their long-run values. The results suggests that following a shock, approximately 72%, adjustment towards the long-run equilibrium is completed after one year.

The results reveal that external debt as percentage of GDP has negative and significant relationship in the short run. As far as debt servicing as percentage of exports, it also has a negative and significant relationship in the short run with per capita GDP. However, domestic debt does not have a significant effect on per capita GDP in the short run. Similar to the long run investment has a positive and significant effect on per capita GDP in the short run. However in the short run openness has insignificant relationship with per capita GDP.

The cumulative sum (CUSUM) graphs show that coefficient of the short run lies within the critical limits and indicate stability in the coefficients over the sample period.



**Figure 1** CUMSUM test

## 6. Investment equation results:

To analyze the impact of debt on investment equation B will be used and following test of cointegration performed:

Ho:  $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$  against the alternative hypothesis of

H1:  $\gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq 0$

Similar to the estimation reported above, maximum lag length of 2 has been selected. The results of F-test for the significance of are summarized in table 6.

**Table 6** Bound F-test results

Country	F-Statistic Value	Lag length	Significance level	Bound Critical Values	
				I(0)	I(1)
Pakistan	2.18	2	1%	3.15	4.43
			5%	2.45	3.61
			10%	2.12	3.23

The table shows that calculated F-statistics value lie within the bound limits at 10% level of significance. Therefore, these results are inconclusive and from the results of error correction model we will decide about the existence of the cointegration. After determination of cointegration among the variables, long run relationship is determined and long run coefficients are estimated for equation **B**. The optimal length of the long-run coefficients is found by using the lag selection criterion of SBC. The long-run results of Eq. (B) are summarized in table 7:

**Table 7 Long Run Estimation Results (1,0,1,1,1,2)**

Variable	Coefficient	Std. Error	t-Statistic
INF	0.082148*	0.022979	3.574845
ED_Y(-1)	-0.164481*	0.073332	-2.242953
DS_X(-1)	-0.010207	0.038837	-0.262823
DD_Y(-1)	-0.095909*	0.048019	-1.997317
YT(-2)	0.080666**	0.04478	1.801379
Constant	2.117185	0.666954	3.174409
<b>R-squared</b>	0.645456		
<b>Adjusted R-squared</b>	0.552966		
<b>F-statistic</b>	6.978675		
<b>Prob(F-statistic)</b>	0.000254		
<b>Serial Correlation LM test</b>	2.004280		
<b>P value of LM test</b>	0.1597		

\*, \*\* and \*\*\* denotes significance at 1% , 5% and 10 % level respectively

The table 7 above reveals that in the long-run external debt as percentage of GDP has a negative and significant relationship with investment. It suggests that for Pakistan debt overhang hypothesis has a role in curtailing investment. However, debt servicing as percentage of exports has a negative but significant relationship with investment. Combined results of the impacts of public external debt and debt servicing show that in Pakistan, debt overhang is the major channel curtailing investment and per capita GDP.

The domestic debt also seems to have a negative and significant relationship with investment. This situation is well explained by Hauner (2006). He points out that government domestic debt held by banks results in making banks self-satisfied with their costs and makes them reduce their efforts to mobilize deposits to fund private sector projects. Hence, domestic

debt reduces investment to some extent. In Pakistan, inflation, perhaps due to its mild nature has helped investment. It is also evident from the results that per capita GDP has a positive and significant relationship with investment.

The diagnostic tests show that there exists no serial autocorrelation and satisfactory goodness of fit. In the last step of ARDL the short run coefficient of the model are estimated and results are presented in table 8.

**Table 8 Error correction representation of the selected ARDL model (1,0,1,1,1,2)**

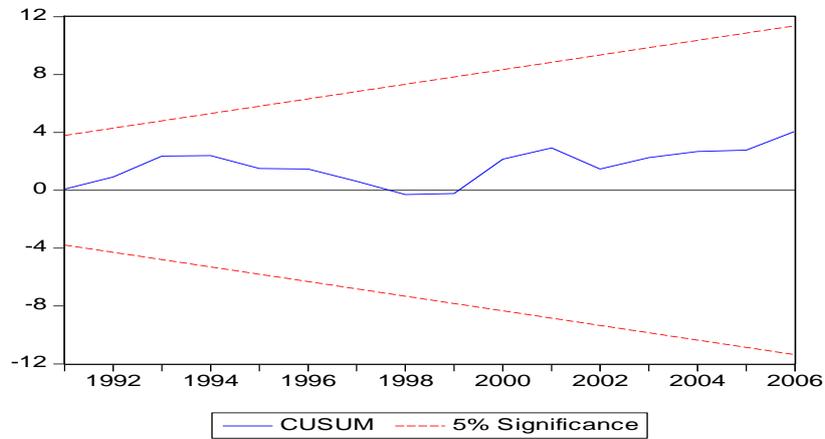
Variable	Coefficient	Std. Error	t-Statistic
Constant	-0.02953	0.01504	-1.96324
D(KT(-1))	0.247017	0.15417	1.602239
D(INF)	0.034109	0.021647	1.575683
D(ED_Y)	-0.41422*	0.203461	-2.03586
D(ED_Y(-1))	-0.24726*	0.124859	-1.98033
D(DS_X)	-0.05105	0.036778	-1.38795
D(DS_X(-1))	-0.02393	0.027757	-0.86224
D(DD_Y)	0.033382	0.033803	0.987534
D(DD_Y(-1))	-0.04228	0.050002	-0.84557
D(YT)	-0.47572	0.560392	-0.8489
D(YT(-1))	0.538052*	0.285887	1.882046
D(YT(-2))	0.992588**	0.561617	1.767375
ECTK(-1)	-0.85042*	0.265804	-3.19944
<b>R-squared</b>	0.74623		
<b>Adjusted R-squared</b>	0.555902		
<b>F-statistic</b>	3.920766		
<b>Prob(F-statistic)</b>	0.006235		

\* and \*\* denotes significance at 5% and 10 % level respectively

According to the results given in the table above, the existence of a stable long-run relationship among the variables is confirmed by the significant error correction term (Bannerjee et al., 1998). The results suggests that following a shock, after one year, about 85% adjustment back towards the long-run equilibrium is completed.

In the short run, public external debt has a negative and significant relationship with investment. It is also evident from the results that per capita GDP has a positive and significant relationship with investment in Pakistan. From the above results it can be concluded that debt variables have an insignificant relationship in the short run but a significant one in the long run.

The cumulative sum (CUSUM) graphs, indicate the stability in the coefficients over the sample period.



**Figure 2** CUMSUM test

## Conclusions and Policy Implications

The present study examines consequence of public debt for economic growth and investment regarding Pakistan. Furthermore, study has also investigated impacts of certain other variables on economic growth.

In Pakistan, public external debt has a negative and significant relationship with per capita GDP and investment, both in the short run and in the long run. Therefore, the results strongly confirm the existence of “Debt Overhang effects”. On the other hand, only in the short run debt servicing has a negative and significant relationship with per capita GDP. But from this evidence we cannot infer the existence of the “crowding out effect” because debt servicing does not seem to significantly affect investment. Domestic debt has a negative and significant relationship with investment, suggesting that it has tended to crowd out private investment. However, domestic debt does not have significant relationship with per capita GDP; and that investment has a positive and significant relationship with per capita GDP.

Keeping in view the findings of the study, various policy implication have emerged.

- 1) First and foremost implication of the study is that heavy reliance on external debt must be discouraged. Public external debt almost always results in deteriorating economic growth process, partly because it also adversely affects investment.
- 2) As domestic debt has negative relationship with investment and per capita GDP. Therefore, the policy makers should not use the domestic debt to finance the fiscal deficit rather there is a dire need to enhance efforts to stimulate the revenue or reduce the current expenditures.
- 3) The present study shows that openness is growth enhancing however if the country wants to accelerate economic growth with the help of trade and openness then this policy must be supplemented with pro-poor policies.

It may be interesting to highlight new areas of research that the present study suggests. In line with Pattilo (2002) and various others, this study is also unable to find out the full significance of “crowding out effect” of debt servicing, but there is consensus that debt servicing results in reducing the development expenditure. To test this argument further it is suggested that an empirical study may be conducted that explores the relationship between 3D’s of public expenditure i.e. Development Expenditure, Defence Expenditure and Debt Servicing Expenditure. In that study by analyzing the interlink-ages between 3D’s, the government preferences for the development expenditure may be further explored.

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