*Pakistan Economic Review*
*3:1 (Summer 2020), pp.73-88*

# EXTERNAL DEBT AND CAPITAL ACCUMULATION NEXUS: EVIDENCE FROM PAKISTAN

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**Abstract**

The rising public debt burden is a common feature of the developing countries like Pakistan. This study is an attempt to empirically analyze external debt and capital accumulation nexus for Pakistan over the time period 1972-2016. The ARDL bound testing technique has been employed to estimate two different models which incorporate different indicators of external debt. Results indicate the existence of negative relationship between external debt to revenue ratio and stock of capital which supports the debt overhang hypothesis for Pakistan which states that large accumulated debt leads to decrease overall capital accumulation in an economy. Similarly, other indicators of external debt, namely, external debt service to revenue ratio, external debt to export ratio and external debt service to export ratio tend to bring a fall in stock of capital in Pakistan. On the basis of its findings, the study suggests the need for better and productive use of external debt in public sector development projects to foster the capital accumulation process in Pakistan.

**Keywords**: External Debt; Capital Accumulation; Human Capital, ARDL

**JELClassification:** H63; H71; E24; H63

## 1. INTRODUCTION

The continuous increase in the external debt burdens of the low-income countries is an indicator of economic slowdown and the lack of prudent debt management. In this regard, inappropriate structural reforms, lack of sustainable macroeconomic adjustment policies, lack of diversified export bases and political instability are considered as main drivers of the higher external debt burden (Zaidi, 2015). The immediate effect of the increasing debt can be observed through the decline in both domestic and the net foreign investment which further result in lower capital accumulation and output in an economy.

Economic theory postulates that rational borrowings encourage economic growth through capital accumulation and productivity growth. This is due to the reason that countries at their early stages of development generally tend to have smaller capital stocks with limited and inadequate investment opportunities. As a result, such countries assure higher rates of return on investment (Hameed et al., 2008).

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However, in case of developing countries the increasing debt burdens are posing a serious threat to the macroeconomic stability through affecting domestic investment and foreign direct investment. No doubt, supplementing resources by foreign economic assistance is important for initiating and accelerating the pace of economic growth, however, a persistent surge in the external debt burden for a long period can create some serious constraints for economic growth of a country. There is a close relationship between the nature of debt and economic activity. We can classify debts as productive debt and unproductive debt. A productive debt is one which is raised for productive purposes and it increases the productive capacity of an economy[2]. On the other hand, unproductive debts are not self-liquidating, and these debts also do not enhance the productive capacity of an economy[3]. Thus, debt financed investment should be productive so that it can earn a return higher than the cost of raising the debt (Adebusola et al.,2007).

Like many other developing countries, Pakistan is also confronted with the shortage of financial resources. To cure this problem, Pakistan has been bridging its resource gap through borrowing from external resources. Pakistan has been receiving foreign economic assistance since early 1950s for development requirements of its economy. Foreign aid has played an important role in the medium and long-term development programmes in Pakistan. Foreign economic assistance (loans, credits and grants) is mostly categorized as project aid and non-project aid.[4] The main objective of foreign assistance has been to complement domestic resources required to speed up pace of economic development process in the country. The debt burden continued to increase during 1980s and 1990s. Debt situation in Pakistan reached a vulnerable level in 1999 due to large and persistence current account and primary fiscal deficits. These twin deficits resulted in unstable accumulation of huge total debt. During the first half of the 1980s, domestic debt increased by 8 percent and followed by even a higher rate of 22 percent in the second half of 1980s (Adnan, 2008). The domestic and external debt situation got worsens during 1990s. The external debt to GDP ratio increased to 43 percent in 1998-99 from 34 percent in 1990-91 while domestic debt grew at a rate of 13.7 percent per annum during 1990s (Pakistan, 1999-00).

With severe financial problems Pakistan entered the 21st century. Public debt exceeded the revenues by more than 600 percent and it stood at 90 percent of GDP. At the same time, debt repayments accounted for more than half of the current revenues. In 2001, the World Bank declared Pakistan as a severely

[2]Productive debt is used for the projects which yield an income, like development of railways, power projects, irrigation projects, establishment of industries etc.

[3]An unproductive debt is incurred on those projects which do not yield any income such as financing war, controlling floods, epidemics etc.

[4] The main difference between a grant and a loan is repayment. A loan requires you to repay the money you borrow, whereas a grant does not. Grants are, essentially, a gift. In other words, they're non-repayable.

indebted South Asian country. Due to weak financial position of the country, Paris Club members and quasi-London Club rescheduled debt payments several times during 1998 to 2001 (Zaidi, 2015). After 2001, economic and public debt indicators showed some improvement in Pakistan. But unfortunately, this trend could not be persisted for a longer time period. In last few years, Pakistan is facing massive fiscal and current account deficits. The expansion of fiscal and current account deficits resulted in the higher borrowing through both internal and external sources to finance these deficits. The domestic and external debt has increased to Rs.3 trillion and Rs.3.4 trillion respectively. Public debt as a percentage of GDP increased to 61.6 percent in FY2012-13 from 55.2 percent in FY2006-07. Similarly, public debt as a percentage of revenue during 2016-17 fell to 442.5 percent from 479.2 percent in 2012-13 (Pakistan, 2016-17).

Given the above-mentioned background, the present study aims to explore the nature of relationship between external debt and capital accumulation in Pakistan. This exercise will enable to properly understand the consequences of various indicators of external debt burden for domestic capital accumulation in the country. Moreover, the findings of the study will provide an opportunity to suggest suitable measures such as improvements in the governance structure and ensuring fiscal transparency and discipline along with reducing the extent of aid fungibilityfor enhancing the stock of capital by optimal utilization of external borrowing. The significance of the study is apparent from the fact that it is first of its nature in the context of Pakistan which has endeavoured to gauge the relationship between some indicators of external debt burden and capital accumulation in Pakistan. The current study is unique in the sense that this type of research has not ever been conducted with reference to Pakistan.

The remainder of the study is structured as follows: in section 2, survey of relevant literature is given; section 3 presents estimation strategy and data; in section 4 main empirical results are discussed; and section 5 concludes the study.

## 2. LITERATURE REVIEW

Both the empirical and theoretical literature available on the nexus between external debt and capital accumulation confirm the deleterious consequences of external debt for capital accumulation. According to Krugman (1988), when the debt obligations in a country crosses the adequate level of borrowings, it discourages investment. This also implies that at higher level of debt burdens, investors would expect lower profits on their investments because they anticipate that in order to payback these outstanding debts, the government will increase taxes. Thus, large debt burdens discourage investment and hence slow down the capital accumulation process.

Only few studies have directly analyzed the impact of foreign debt on capital accumulation. With regard to quantify the nature of association between foreign aid, foreign borrowings and domestic capital accumulation, Gong and Zou (2000) show that foreign aid negatively affects capital accumulation in the long run.

However, in the short run, the relationship is positive because in the short run increase in foreign aid increases investment and capital accumulation and reduces external borrowings. Habimana (2005) investigates the nature of the relationship between higher level of external debt and capital accumulation in Rwanda. The findings of the study reveal a negative effect of external debt on capital accumulation process. It implies that the continuous increase in the debt burden can result in various macroeconomic effects including reduction in capital stock via decrease in domestic investment and lower output level in an economy. Several studies such as Cohen (1993), Wagner (1996), Deshpande (1997), Elmendorf and Mankiw (1998), Serieux and Samy (2001),Were (2001),Clements et al.,(2003) and Sen et al., (2007) have investigated the impact of foreign debt on growth via investment channel which is also called debt overhang hypothesis. All these studies support the existence of the debt overhang hypothesis.

There are quite a few studies which have attempted to investigate investment response to external debt in Pakistan. To this end, Chishti and Hasan (1992) analyzing the impact of foreign aid (grants and loans) on investment and consumption activities in public sector of Pakistan find that foreign aid in the form of grant shows a modest impact on public investment but foreign aid in the form of loans has a robust effect on public investment in Pakistan. Chaudhry et al., (2009) probe the effects of external debt on saving and investment in Pakistan for the period of 1973-2006. They document a positive but marginally significant impact of foreign debt on investment levels. They are of the opinion that inflows of foreign debt have favorable impacts on investment expenditures in Pakistan. Jafri and Habib (2012)analyzed the impact of external debt service payments on investment. The findings of the study exhibited that the debt services to the multilateral and private creditors have a significantly adverse impact on investment in case of Pakistan.However, this situation reverses in case of debt servicing to the bilateral creditors. Results also suggest that the impact of the external debt service payments on investment is dependent on the nature of credit institutions. Ali (2013) focuses on estimating the impact of external debt, foreign direct investment and workers' remittances on domestic investment in Pakistan from 1972 to 2007. The time series analysis reveals a significant investment increasing impact of foreign debt inflows into the Pakistan economy. Although, the impact of external debt on domestic investment is positive and significant, yet the study suggests that foreign debt should be utilized for indispensable purposes.

It is an undeniable fact that domestic capital accumulation plays a critical role to determine the trajectory of growth and similarly, foreign debt has a vital role to play for complimenting domestic resources in developing countries to speed up the process of capital accumulation and economic growth. Unfortunately, there is a dearth of literature having focus on gauging the role of various indicators of external debt burden on the process of capital accumulation in a developing country like Pakistan. The present study is aimed to fill this gap in the related literature.

## 3. ANALYTICAL FRAMEWORK

The two-gap model posits that developing economies face two gaps in their economy, which they have to fill. [5] The first gap is that between savings and investments in the economy. A developing country starts with very low savings, but it has to engage in a big push by investing heavily. In what ways would countries fill this gap between savings and investments? There is a lot of debate among economists here. However, a dominant view is that developing countries require capital from developed countries in the form of foreign aid, debt or foreign direct investment to get rid of this gap. The second gap corresponds to trade deficit, which is a mismatch between exports earnings and import payments. A developing country by definition produces only primary goods, whereas it would require large imports of consumer and capital goods. There is obviously a cost differential here, because of which developing countries would necessarily face trade deficit.

High debt stocks appear to affect growth through their dampening effects on both physical capital accumulation and total factor productivity (Pattilo et al., 2004). As they suggest, the size of the effects are similar to that of the effect on output growth: on average, for countries with high debt levels, doubling debt will reduce output growth by one percentage point and reduce growth in both per capita physical capital and total factor productivity by almost as much. The debt burden can have a depressing effect on growth through the government budget by crowding out public investment and instigating a reduction in private and total investment and a fall in the productivity of investment (Serieux and Samy, 2001). With this background, we proceed to the nature of the econometric model used in the study.

### 3.1. Econometric Model

To gauge the effect of external debt on capital accumulation two models are estimated. These models include debt to revenue ratios and debt to export ratios as explanatory variables along with some control variables. Debt to revenue ratios are used in order to capture the "crowding out" effects, while the debt to exports ratios serve to explore the "import compression" effects. The models are borrowed from Serieux and Samy (2001), in their study on the nature of the relationship between debt and growth, in a cross section of 53 low and lower-middle income countries covering the period from 1970 to 1999, where they estimate an investment equation, a human capital growth equation, and a growth equation. Their investment model is based on a modified version of the accelerator theory. Thus, we specify our econometric models as:

$$KS_t = \alpha_0 + \alpha_1 GDPGR_t + \alpha_2 EDR_t + \alpha_3 EDSR_t + \alpha_4 INF_t + \alpha_5 LHC_t + e_t \quad (1)$$

$$KS_t = \beta_0 + \beta_1 GDPGR_t + \beta_2 EDE_t + \beta_3 EDSE_t + \beta_4 INF_t + \beta_5 LHC_t + u_t \quad (2)$$

[5] See Chenery and Strout (1966).

where, KS represents stock of capital as percent of GDP taken as dependent variable, *GDPGR* denotes growth rate of *GDP* which shows economic growth performance of the economy, *EDR* is external debt to revenue ratio (or external debt as percentage of total public revenue),*EDSR* is external debt service to revenue ratio (or external debt service as percentage of total revenue),*INF* is consumer price index based inflation rate, *LHC* is natural logarithm of human capital proxied by gross secondary school enrolment, *EDE* is external debt to exports ratio (external debt as percentage of export earnings), *EDSE* denotes external debt service to exports ratio (or external debt as percentage of export earnings), *e* and *u* are random error terms.

### 3.2. Data and Estimation Technique

The study covers the time period from 1972 to 2016. All the required data have been sourced from the IMF's International Financial Statistic (IFS), Pakistan Economic Survey (various issues), and the World Bank's World Development Indicators (WDIs).

As data on stock of capital are not available in the context of Pakistan, the absolute stock of capital (K) serieshas been generated by applying the perpetual inventory method, asCaselli (2005)and Awounang and Foning (2014) did. The perpetual inventory equation is given by:

$$K_t = (1-\rho)K_t - 1 + I_t \tag{3}$$

where $I$ represents gross investment, and $\rho$ denotes the depreciation rate. Based on the fact that data are fully available for Pakistan ranging from 1972 to 2016, we take 1972 as reference year $(Year_0)$ to calculate the initial capital stock as follows:

$$K_{t0} = I_{t0}/(gI + \rho) \tag{4}$$

where, $gI$ is the geometric growth rate of the aggregate investment between time $t_0$ and time $t_0 + t_{44}$. The choice of this formula for calculating the initial capital stock is because it is the expression of the equilibrium capital stock in the Solow growth model. Following Caselli(2005),Cavalcanti etal., (2011) and Awounang and Foning (2014), the depreciation rate of capital is taken at 6%.

The present study employs the autoregressive distributed lag (ARDL) bounds testing technique developed by Pesaran and Pesaran (1997) and Pesaran et al., (2001) to empirically estimate models (1) and (2).This technique has many advantages over other co-integration techniques. Firstly, this technique is capable enough to yield consistent parameter estimates even in the case of small data set (Mah, 2000). Secondly, this technique provides consistent results irrespective of the fact that variables are integrated of orderI(0),I(1) or fractionally integrated.The ARDL representations of model (1) and (2) are as follows:

$$\Delta KS_t = \gamma_0 + \sum_{i=1}^{p} \gamma_1 \Delta KS_{t-i} + \sum_{i=0}^{p} \gamma_2 \Delta GDPGR_{t-i} + \sum_{i=0}^{p} \gamma_3 \Delta EDR_{t-i} + \sum_{i=0}^{p} \gamma_4 \Delta EDSR_{t-i} + \sum_{i=0}^{p} \gamma_5 \Delta INF_{t-i} + \sum_{i=0}^{p} \gamma_6 \Delta LHC_{t-i} + \lambda_1 KS_{t-1} + \lambda_2 GDPGR_{t-1} + \lambda_3 EDR_{t-1} + \lambda_4 EDSR_{t-1} + \lambda_5 INF_{t-1} + \lambda_6 LHC_{t-1} + \nu_t \quad (5)$$

$$\Delta KS_t = \delta_0 + \sum_{i=1}^{p} \delta_1 \Delta KS_{t-i} + \sum_{i=0}^{p} \delta_2 \Delta GDPGR_{t-i} + \sum_{i=0}^{p} \delta_3 \Delta EDE_{t-i} + \sum_{i=0}^{p} \delta_4 \Delta EDSE_{t-i} + \sum_{i=0}^{p} \delta_5 \Delta INF_{t-i} + \sum_{i=0}^{p} \delta_6 \Delta LHC_{t-i} + \kappa_1 KS_{t-1} + \kappa_2 GDPGR_{t-1} + \kappa_3 EDE_{t-1} + \kappa_4 EDSE_{t-1} + \kappa_5 INF_{t-1} + \kappa_6 LHC_{t-1} + \varepsilon_t \quad (6)$$

In models (5) and (6), the coefficients attached with difference operators measure short run dynamics, whereas, the terms with first lag capture long run relationship. For checking the existence of long run relationship between stock of capital and all the explanatory variables,a separate null hypothesis of no co-integration for models (5) and (6) is tested as:

$$\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$$

$$\kappa_1 = \kappa_2 = \kappa_3 = \kappa_4 = \kappa_5 = \kappa_6 = 0$$

For this purpose, the computed F-statistic from the test is compared with critical bound values from Pesaran et al., (2001). If the null hypothesis is rejected, it will point to the existence of a cointegrating relationship between capital stock and all the regressors given in models (1) and (2). If a long run relationship is established between the variables, next step is to estimate short run dynamics and stability of equilibrium relationship between capital stock and its determinants by means of the following two error correction models:

$$\Delta KS_t = \phi_0 + \sum_{i=1}^{p} \phi_1 \Delta KS_{t-i} + \sum_{i=0}^{p} \phi_2 \Delta GDPGR_{t-i} + \sum_{i=0}^{p} \phi_3 \Delta EDR_{t-i} + \sum_{i=0}^{p} \phi_4 \Delta EDSR_{t-i} + \sum_{i=0}^{p} \phi_5 \Delta INF_{t-i} + \sum_{i=0}^{p} \phi_6 \Delta LHC_{t-i} + \varpi ECT_{t-1} + \zeta_t \quad (7)$$

$$\Delta KS_t = \theta_0 + \sum_{i=1}^{p} \theta_1 \Delta KS_{t-i} + \sum_{i=0}^{p} \theta_2 \Delta GDPGR_{t-i} + \sum_{i=0}^{p} \theta_3 \Delta EDE_{t-i} + \sum_{i=0}^{p} \theta_4 \Delta EDSE_{t-i} + \sum_{i=0}^{p} \theta_5 \Delta INF_{t-i} + \sum_{i=0}^{p} \theta_6 \Delta LHC_{t-i} + \pi ECT_{t-1} + \zeta_t \quad (8)$$

where,$\varpi$ and $\pi$are coefficients of lagged error correction term (*ECT*) in equations (7) and (8) respectively. From Pesaran et al., (2001), it is evident that the coefficient of lagged ECT specifies the speed of adjustment which is linked to cointegration equation. Hence, lagged ECT characterizes the feedback of the system in stabilizing its disequilibrium. Finally, the validity of the estimated

econometric model is checked by means of some important stability and diagnostic tests which are frequently employed in empirical studies.

## 4. RESULTS AND DISCUSSION

The first step in the ARDL procedure is to test for unit roots to eliminate the possibility of I(2) variables. Because, in the presence of I(2) variables, the computed F-statistics provided by Pesaran et al., (2001) are no more valid since they are based on the assumption that the variables are I(0) or I(1). Consequently, the implementation of unit root tests in the ARDL procedure is necessary to ensure that none of the variables are integrated of order 2 or beyond. For this reason, the present study employs the Dicky-Fuller –Generalized Least Squares (DF-GLS) unit root test to check the stationarity of the time series. The DF-GLS unit root test results are reported in table 1. Results show that GDP growth rate, inflation and debt service to revenue ratio are stationary at level, whereas, all other variables are non-stationary at level but they become stationary at first difference. Hence, it confirmed that the regressors in models (1) and (2) have mixed order of integration and none of them is integrated of order two. This outcome makes a reasonable case for using the ARDL technique for getting short run and long run parameter estimates from models (5) and (6).

**Table 1. Results of DF-GLS Unit Root Test (1972-2016)**

| Variable | Level | First Difference | Mackinnon critical values for rejecting the unit root hypothesis (at 5%) | Decision |
|---|---|---|---|---|
| KS | -1.531 | -5.785 | -2.137 | $I(1)$ |
| GDPGR | -3.596 | - | -2.137 | $I(0)$ |
| INF | -2.962 | - | -2.137 | $I(0)$ |
| LHC | -1.17 | -7.097 | -2.137 | $I(1)$ |
| EDR | -1.160 | -2.734 | -2.137 | $I(1)$ |
| EDSR | -2.72 | - | -2.137 | $I(0)$ |
| EDE | -1.38 | -3.512 | -2.137 | $I(1)$ |
| EDSE | -1.23 | -6.758 | -2.137 | $I(1)$ |

The computation of the ARDL bounds testing is sensitive with lag length selection. Hence, in the second step, the orders of the lags in the ARDL models (5) and (6) are selected on each first differenced variable using the Schwarz Bayesian Criterion (SIC). Narayan and Narayan (2005) suggest that the SIC is the best for lag selection for the ARDL model with small sample. [6]

[6]The estimation task is executed by using the computer software EViews 9. Optimal lag length for each time series is selected the SIC with automatic lag selection option.

We reach our decision regarding the presence of the long run relationship between the variables of the specific model with a simple comparison, i.e., the bounds approach compares the calculated F-statistic against the critical values generated by lower critical bound and upper critical bound developed by Pesaran et. al., (2001). There is cointegration if the computed F-statistic is more than upper critical bound and no cointegration if the value of the F-statistic remains below the lower critical bound. However, if the sample test statistic falls between these two bounds, the result is inconclusive. All this relates to a situation when the regressors have mixed or of integration like ours. The results of the bounds testing to cointegration are displayed in Table (2).It is quite obvious that for both the models, the calculated F-statistic exceeds the upper bound at 5% level of significance, indicating rejection of null hypothesis of no cointegration. Thus, stock of capital forms a long run equilibrium relationship with external debt to revenue ratio, external debt service to revenue ratio, external debt to export ratio, external debt service to export ratio, GDP growth rate, inflation and human capital in the case of Pakistan over the study period 1972 to 2016.

**Table 2. Bound Test Results**

| Estimation | F-Test Statistic | Critical Value (5% Level of Significance) | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Model 5** | 5.20 | 2.48 | 3.67 |
| **Model 6** | 5.79 | 2.29 | 3.42 |

### 4.1. Short Run and Long Run Estimates of Model - 5

The next task in ARDL bound testing technique is to investigate the extent of the long run effects of explanatory variables on the dependent variable. We now proceed with the discussion of the results of model (5) given is table 3. The regression coefficient of growth rate of GDP is significantly and positively associated with capital stock, indicating that one percent increase (decrease) in economic growth rate will result in 0.311 percent increase (decrease) in capital accumulation in Pakistan. This finding is consistent with the notion of the Accelerator Theory of Investment. The effect of external debt to revenue ratio on stock of capital is significant but negative such that one percent increase (decrease) in the former brings a decrease (increase) of 0.08 percent in the latter. It indicates that with increase in debt to revenue ratio, the uncertainty regarding the government policies and actions also increases which adversely affects the level of capital accumulation in the economy. Especially, when government's debt stock increases, such obligations are usually financed through imposing high taxes which lead to the reduction in investment and discourages capital accumulation process. In such a situation, investors prefer to wait rather than investing in the long run projects (Agenor and Montiel, 1996). Additionally, the rapid accumulation of debt over a longer period of time may also result in massive capital outflows due to the unfavorable policies of government to finance its debt

obligations (Oks and Wijnbergen, 1995). The relationship between external debt to revenue ratio and capital accumulation can also be explained through the debt overhang hypothesis which states that rising debt burden leads to decrease investment in the economy(Deshpande, 1997; Fosu, 1999; Chowdhury, 2001). Similarly, the relationship between external debt service to revenue ratio and stock of capital has also emerged as significant and negative. This outcome implies that external debt servicing puts a pressure on the available resources in the country to be diverted towards investment purposes in the economy. Increasing burden of foreign debt payments limits the financial ability of an indebted nation like Pakistan to allocate sufficient resources for enhancing its stock of capital.

**Table 3. LongRun Estimates of Model (5)**

| Dependent Variable: KS | Selected ARDL(1, 1, 1, 2, 1, 1) | |
|---|---|---|
| Regressor | Coefficient | t-value |
| GDPGR | 0.311** | 2.699 |
| EDR | -0.180** | -2.217 |
| EDSR | -0.703*** | -4.301 |
| INF | -0.354*** | -3.287 |
| LHC | 0.0793** | 2.217 |
| C | 0.171* | 1.834 |

*Note: ***, ** and * indicate that coefficients are significant at 1% , 5% , and 10% levels respectively.*

The regression coefficient of inflation rate is negative and significant, implying that with one percent increase (decrease) in inflation rate, the stock of capital decreases (increases) by 0.354 percent. A high rate of inflation raises the cost of borrowing and thus lowers the rate of capital accumulation. Similarly, higher variations in prices make it difficult for investors to estimate the costs and benefits associated with a particular project which discourages the investors to start new and long run projects (Were, 2001). Higher rate of inflation also reduces the capital accumulation through its adverse effects on welfare of the individuals (Ahmed and Mohamed, 2005). Finally, human capital plays a significant and positive role in capital accumulation process. However, the magnitude of the long run impact of human capital on stock of physical capital is very small that one percent increase in human capital leads to 0.079 percent increase in stock of physical capital. The result may be different if we use some other proxy of human capital. Developed human capital is considered as a valuable asset for a nation with which the nation can improve its capacity to adopt new technologies and techniques of production (Schutt, 2003; Khan, 2005). It also enhances capital accumulation through creating more skills and knowledge related to the availability of investment opportunities in the economy.

Table 4 reports the short run dynamics of the model. In contrast to the long run outcomes, in the short run we see that only growth rate of GDP, external debt

service to revenue and human capital are significant drivers of capital accumulation in Pakistan. While rest of the regressors do not play a role in shaping the behaviour of capital accumulation, the coefficient of lagged error correction term (ECT) is negative and significant which indicates that the long run equilibrium relationship between stock of capital and all the explanatory variables given in table 3 is stable. The coefficient value of lagged ECT is -0.659, implying reasonably high speed of adjustment towards the long run equilibrium. In other words, it can be stated that in case of any deviation from the long run equilibrium, almost 66 % correction will take place in a year to restore the equilibrium position. Moreover, at the bottom of table 4, results of four diagnostic tests are given which indicate that our estimated model does not suffer from serial correlation, heteroscedasticity, functional form and normality issues.

**Table.4. Results of the Error Correction Model**

| Dependent Variable: (ΔKS)Selected ARDL (1,1,1,2,1,1) | | |
|---|---|---|
| Regressor | Coefficient | t-value |
| ΔGDPGR | 0.131*** | 8.882 |
| ΔEDR | -0.010 | -1.0787 |
| ΔEDSR | -0.009* | -1.933 |
| ΔEDSR(-1) | -0.006 | -0.962 |
| ΔINF | 0.059 | 1.572 |
| ΔLHC | -0.003** | -2.139 |
| ECT(-1) | -0.659*** | -5.345 |
| Diagnostic Tests | | |
| $\chi^2_{SC}$ = 0.129(0.716) $\chi^2_H$ = 0.851(0.356) | | |
| $\chi^2_{FF}$ = 1.688(0.194) $\chi^2_N$ = 1.562(0.306) | | |

*Note: ***, ** and * indicate that coefficients are significant at 1 percent, 5 percent and 10 percent levels of significance respectively.* $\chi^2_{SC}$, $\chi^2_H$, $\chi^2_{FF}$ *and* $\chi^2_N$ *denote LM tests for serial correlation, functional form and normality respectively. The associated p values are in parentheses.*

## 4.2. Short Run and Long Run Estimates of Model 6

The estimated long run results of model 6 are reported in table 5. All the regressors have been found as significant factors in determining capital accumulation in the long run. The impacts of growth rate of GDP, inflation rate and human capital on capital accumulation are consistent with the previous case of model 5 as displayed in table 3. The regression coefficient of external debt to export ratio is significant and negative, implying that external debt to export ratio discourages capital accumulation process in the long run in Pakistan. This finding suggests that one percent increase in external debt to export ratio will result in nearly 0.27 percent decline in stock of capital. The adverse effect of external debt

to export ratio on capital accumulation can be explained through the reduction in the import capacity of capital goods of the government, which is also known as the import compression effect. According to import compression effect, the increasing debt burden decreases the public investment.

**Table 5. Long Run Parameter Estimates of Model 6.**

| Dependent Variable: KS Selected ARDL(1,2,1,1,2,1) | | |
|---|---|---|
| Regressor | Coefficient | t-value |
| GDPGR | 0.419*** | 3.149 |
| EDE | -0.267*** | -2.836 |
| EDSE | -0.143** | -2.249 |
| INF | -0.242*** | -3.281 |
| LHC | 0.107*** | -3.520 |
| C | 0.342*** | 2.863 |

*Note: *** and ** indicate significant at 1% and 5% levels respectively.*

For the coefficient of external debt service to export ratio we also find it significant and negative such that one present increase (decrease) in debt service to export ratio decreases(increases) stock of capital by 0.143 percent. This finding presents external debt service as an impediment in the way of accelerating capital accumulation process in the long run. Hence, it transpires that external debt has played its adverse role in capital accumulation process during the sample period of study in the country. This outcome indicates that unfortunately we misused the borrowed fund in non-development projects (Zaidi, 2015). We did not remain successful in making the best possible productive use of the external debt, which resulted in increasing external debt burden on the economy. Hence, the rising debt burden emerged as one of the impeding factors in the way of fostering physical capital accumulation process in Pakistan.

Now let us come to short run analysis. From Table 6, it is obvious that capital accumulation process only gets affected from growth rate of GDP and external debt to export ratio where the former is positively and the latter is negatively associated with capital stock in the short run. None of the other variables appears as significant factor in shaping the behaviour of stock of capital. The regression coefficient of lagged ECT is in accordance with our prior expectation i.e., it is significant and negative. From the coefficient value of lagged ECT, it can be inferred that in case of an external shock to the long run equilibrium, association between stock of capital and all the regressors given in table 5, the forces of the model correct almost 79 percent disequilibrium every year, indicating a quick restoration. Finally, on the basis of four diagnostic tests provided at the bottom of Table 6, we can state that our estimated model is not plagued with any of four econometric problems. These outcomes actually increase our confidence on the overall findings of the estimated model. Finally, CUSUM and CUSUM of squares tests suggest stability of the parameter estimates of the estimated models as their plots remain within 5% level of significance (see figures 1 and 2).

**Table 6. Results of the Error Correction Model**

| Dependent Variable :(ΔKS) Selected ARDL(1,2,1,1,2,1) | | |
|---|---|---|
| Regressor | Coefficient | t-value |
| ΔGDPGR | 0.055** | 2.143 |
| ΔGDPGR(-1) | 0.093 | 1.361 |
| ΔEDE | -0.086*** | -5.997 |
| ΔEDSE | -0.137 | -1.277 |
| ΔLINF | -0.065 | -0.348 |
| ΔLINF | -0.049 | -0.784 |
| ΔHC | 0.101 | 1.221 |
| ECT(-1) | -0.792*** | -4.534 |
| Diagnostic Tests | | |
| $\chi^2_{SC}$ = 0.902(0.342) $\chi^2_H$ = 0.996(0.325) | | |
| $\chi^2_{FF}$ = 0.341[0.728] $\chi^2_N$ = 0.171(0.852) | | |

*Note: *** and ** indicate significant at 1% and 5% levels of significance respectively. $\chi^2_{SC}$, $\chi^2_H$, $\chi^2_{FF}$ and $\chi^2_N$ denote LM tests for serial correlation, functional form and normality respectively. The associated p values are in parentheses.*

**Figure 1. Plots of CUSUM and CUSUMSQ Tests (Model 5)**

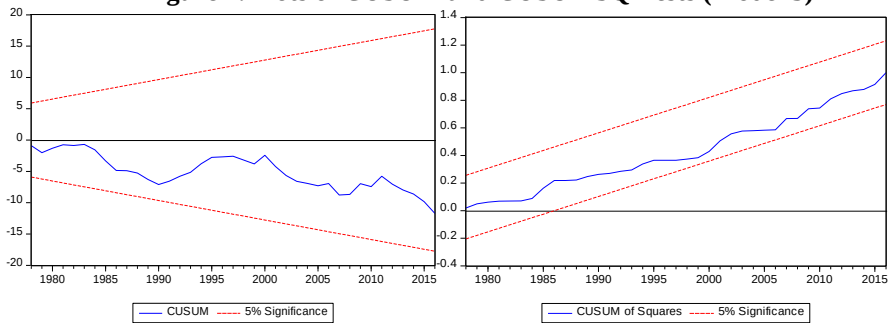
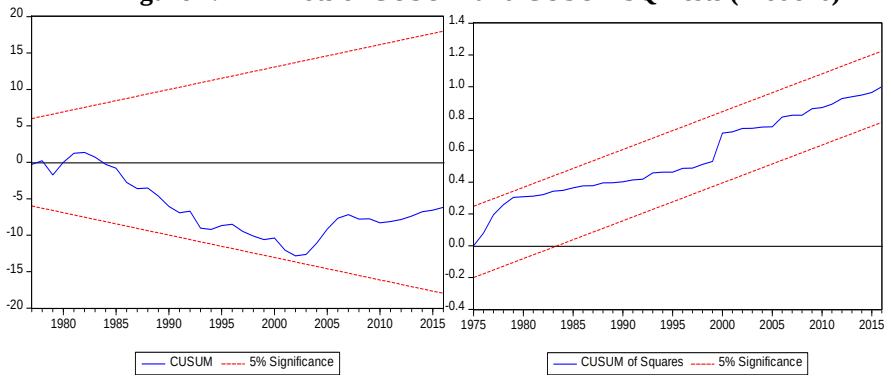



**Figure 2. Plots of CUSUM and CUSUMSQ Tests (Model 6)**



## 5. CONCLUSION AND POLICY RECOMMENDATIONS

This study investigates the implications of external debt for capital accumulation in Pakistan using the annual time series data covering the period from 1972 to 2016. To this end, different indicators of external debt have been used and the ARDL bound testing approach to cointegration has been employed to accomplish the empirical task. The findings of the study indicate that external debt does matter for capital accumulation process in Pakistan as external debt to revenue, external debt service to revenue, external debt to export and external debt service to export ratios have been found significant and adversely related with stock of capital in the long run in Pakistan. Nonetheless, in the short run, only external debt service to revenue and external debt to export ratios have emerged as significant determinants of the stock of capital. Similarly, inflation rate tends to bring a reduction while growth rate of GDP and human capital enhance the stock of capital in the long run.

Policy implications of the study are straight forward. Firstly, there is a need to formulate and implement a strict legal framework to allocate major chunk of external debt to public sector development programs. This action will stimulate business activities in the economy leading to significantly increase the stock of capital in Pakistan. Secondly, reforms should be introduced in tax system of the country for generating sufficient resources from within the country which will help in reducing external debt to revenue ratio. A fall in external debt to revenue ratio will induce capital accumulation process. Finally, as human capital has proved a significant driver of capital accumulation, therefore, government should invest in education and skills improvement programs to enhance the general as well as specific skills of the individuals.

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