The Impact of Public Debt on Economic Growth of Pakistan

Amara Akram Khan, Dr. Abdur Rauf, Dr. Mirajul-haq, Nighat Anwar

[1]Correspondence author is MPhil Scholar at Kashmir Institute of Economics, UAJ&K, [2]Assistant Professor Kashmir Institute of Economics, UAJK, [3]Assistant Professor, Inslamic International University, Islamabad, [4]MPhil Scholar at Kashmir Institute of Economics, UAJ&K.
Email: Ab.rauf.khattak@gmail.com, amarakhan448@gmail.com

Abstract
This study is an attempt to explore the impact of public debt on economic growth of Pakistan. To explore the relationship the study used augmented Solow growth Model. To test the model, Bound test for Cointegration is applied on time series data that cover the period from 1972 to 2013. The empirical results of the study suggest that public debt and economic growth has positive but statistically insignificant relationship. In addition, our control variables i.e., population growth enter in the model with expected negative sign while human capital and private investment bear their expected positive signs and are also statistically significant. This indicates that human capital and private investment play a vital role in the growth and development of an economy.
Keywords: Public Debt, Economic Growth, ARDL, Private Investment

Introduction
        In middle income countries, governments use public debt as an important tool to finance its expenditures. Public debt is considered as double-edged sword .For instance, effective utilization of public debt can increase economic growth and enhance government to achieve macro-economic goals. Theoretically financing the development projects through public debt can provoke a country to build its productive capacity and increase economic growth (Cohen1993). Debts may be foreign and domestic. Mismanagement of public debt reduces economic growth and become the biggest hurdle for the economy, a case very common in developing countries.
In Pakistan public debt is increasing continuously with an alarming rate without making any impressive contribution in production process. In the end-March 2013, public debt reached at Rs.13, 626 billion, an increase of Rs.959 billion or 8 percent higher than the debt stock at

the end of previous fiscal year. Public debt as a percent of GDP reached at 59.5 percent of GDP by end-March 2013 compared to 59.8 percent during the same period last year[1].

The relationship between public debt and economic growth is still inconclusive. There is no clear agreement among economists that whether financing government expenditure by debt is good, bad or neutral in terms of its real effects, especially on investment and growth. In analytical perspective, the classical economist argued that public debt is a burden to the society and in long period of time public debt discourage investment. The neoclassical economist considers that public debt is harmful for economic growth while in the Ricardian view, government debt is considered equivalent to future taxes (Barrow, 1974). In the Keynesian paradigm, public debts establish a key policy prescriptive. The neoclassical and Ricardian schools focus on the long-run effects while Keynesian view have emphasized on the short-run effect of public debt on economic growth. In the light of this discussion this paper is an attempt to investigate the impact of public debt on economic growth of Pakistan.

Literature Review

The impact of public debt on economic growth is analyzed by many researchers. For instance, Akram (2011) investigated the debt effect on Pakistan's economy by using Autoregressive Distributed Lag (ARDL) technique. The study found public debt negatively affect investment and hence economic growth. Similarly, Raiz and Anwar (2012) analyzed relationship between public debt and economic growth of Pakistan. The study found that public debt has negative impact on the economic growth. Similarly, most of the studies investigated the role of total public debt on economic growth in developing countries like, Presbitero (2011) analyzed the impact of total public debt on economic growth in developing countries by using generalized method of moments (GMM) techniques and found that public debt has a negative impact on output growth up to a threshold of 90 percent of GDP.

The cross countries analysis of public debt on economic growth have been found as Cunningham (1993) analyzed the relationship between the level of total debt and economic growth for sixteen heavily indebted nation's .Study concluded that the total debt has negative affect on the economic growth, as the productivity of capital and labor are significantly reduced. Similarly, Sachs (1986) also supported the negative impact of public debt on private investment. Moreover Afxentiou (1993) comes with the same findings for twenty developing countries. The study specified that in seven out of twenty countries the debt service ratio reduced the economic growth, whereas six out to twenty, the interest service ratio was found to be the most significant factor. In case of Nigeria, Aminu.U *et al.* (2013) investigated the impact of external debt and domestic debt on economic growth by using Ordinary least square (OLS) method and find out that external debt have negative impact on economic growth while domestic debt has positive impact on economic growth (GDP).

Likewise the studies of developing countries some studies have been done for developed countries that explored debt and growth relation e.g. Checheritaand Rother (2010) investigated the average impact of government debt on GDP growth in twelve Euro area countries. The study focused four channels (i.e. public investment, private investment, private savings and total factor productivity) through which public debt influenced on economic growth. Empirical results showed a highly statistically significant non-linear relationship between the government debt ratio and per-capita GDP growth for the 12 pooled euro area countries. Similarly, Kumar and Woo (2010) analysed the impact of high public debt on long-

---

[1] Pakistan Debt Policy statement 2011-12 Debt

run economic growth through OLS regression. The empirical results indicated an inverse relationship between initial debt and subsequent growth.

To find out the causal relationship between public debt and economic growth Panizza and Presbitero (2012) tested the hypothesis that whether public debt has a causal effect on economic growth .Their study have used the sample of OECD countries by using an instrumental variable approach. Final results were consistent and have a negative correlation between debt and growth. Another study of D. Amassoma (2011) examined the causal nexus between external debt, domestic debt and economic growth in Nigeria. The result showed that there is a bi-directional causality between domestic debt and economic growth. Regarding Pakistan's economy, Shahen and Ayub (2014) investigated the impact of Government Debt and basic needs on economic growth in case of Pakistan. Empirical results showed significant impact of all variables except debt servicing. While the cros-sectional study of Ribeiro *et al*. (2012) that analyzed the effect of public debt and other determinants on the economic growth of selected European Countries by using multiple linear regression models. Findings of this research showed that country determinants influence the efficiency of public borrowing and its effect on GDP. There was no significant relation between debt crisis, level of government debt and its effect on GDP. However, private borrowing showed a positive effect on the economy in every country.

On the other hand, Tsintzos *et al.* (2011) examined the effects of the ratio of internal to external public debt on a country's economic growth. These effects were examined through a competitive and decentralized model of endogenous economic growth, which relies on public investments. Theirs findings showed that as the internal-external public debt ratio increases, the public to private capital ratio increases which in turn positively affects the long run economic growth rate

Model Specification, Data and Methodology
Model Specification
Theoretical Framework

In this study we extended the new classical Solow growth model and the technological progress is disaggregated into exogenous technical progress. By augmenting the model, we analyse how public debt affect economic growth. It is notable that the disaggregation of the exogenous technical progress term is consistent with the literature and adheres to the conditional convergence hypothesis, Barro and Sala-I-Martin(1995).

We assume an economy in which output is producing with Cobb-Douglas terminology.

$$Y_t = U_t K_t^{\propto} H_t^{\beta} L_t^{1-\alpha-\beta} \dots \dots \dots \dots \dots \dots \dots \dots . (1)$$

Where α, β> 0 and α +β < 1.Y_t is output, U_t is technological progress and other institutional factors, L_t is labor, K_t is physical capital, and H_t is human capital at time t respectively. Again we explain U_t as the product of level of technology which is exogenous hence with other institutional factors at time t, U_t take the following form,

$$U_t = A_t D_t \dots \dots \dots \dots \dots \dots . (2)$$

Where A_t shows level of technology and D_t is level of public debt at time t. It can be pointed out that D_t is synonymous with the direct effect of public debt on output.

Empirical Model

Keeping our main objective in view following base model for growth has been developed

$Y_t = β0+β_1PD_t+ β_2PI_t+ β_3PG_t + β_4HC_t+ μ_t$........ (3)

Where, Y_t is Real GDP, PD_t is public debt PI_t is private investment, PG_t *is* Population growth

HC_t is Human capital and μ_t is Error term.

Data and Methodology
Data

This study examines the impact of public debt on economic growth of Pakistan. To explore this knot empirically we used time series data of Pakistan spanning from 1972 to 2013.Important variables used in this study include real GDP, Public Debt, Private Investment, Secondary School Enrolment, and Population Growth. Real GDP is our dependent variable taken as a proxy of economic growth and data on real GDP is obtained from World Development Indicator (WDI).The data of public debt and private invest are taken from Economic Surveys of Pakistan (various issues) while the data on Secondary School Enrolment (proxy of human capital) and Population Growth (proxy of labor force) are taken from World Development Indicator (WDI).

Methodology
Bound Test for Cointegration
This study used Bound test for Cointegration to check the long run relationship in the model. This technique is preferred because; it is appropriate without considering whether the variables of model are purely 1(0), I (1) or even mutually integrated. Second, it avoids the uncertainty about the pretesting of stationarity. Third it is reliable even the sample size is small, Ghatak and Siddiki(2001).

A specific econometric model is as following

$$\Delta y_t = \alpha + \sum_{i=1}^{m} \beta_{1i} \Delta y_{t-1} + \sum_{i=1}^{m} \beta_{2i}\Delta PD_{t-1} + \sum_{i=1}^{m} \beta_{3i} \Delta PI_{t-1} + \sum_{i=1}^{m} \beta_{4i} \Delta HK_{t-1} + \sum_{i=1}^{m} \beta_{5i}\Delta PG_{t-1} + \beta_{6i}GDP_{t-1} + \beta_{7i}PD_{t-1} + \beta_{8i}PI_{t-1} + \beta_{9i}HK_{t-1} + \beta_{10i}PG_{t-1} + \mu_t \ldots.4$$

Where *m* is lag length and under bound testing approach the null hypothesis of no long run relationship among y_t and its determinants are,

$H_0{:}\beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = 0$
$H_1: \beta_i \neq 0$
Where i= 6, 7, 8,9,10

By testing above null hypothesis, co-integration can be checked through Wald-F test. If the test statistics exceed from upper critical values than null hypothesis for no long run Cointegration is rejected and vice versa is the case when the calculated Wald F-Statistic lies below the lower boundaries of the tabulated Wald F-statistic. The long run elasticities, in case Cointegration exist, can be found by normalizing β_i for model as:

$$Y_{t-1} = \frac{\beta_8}{\beta_6}pd_{t-1} + \frac{\beta_9}{\beta_6}PG_{t-1} + \frac{\beta_{10}}{\beta_6}PI_{t-1} + \frac{\beta_{11}}{\beta_6}HK_{t-1} \ldots\ldots..(5)$$

Error Correction Mechanism

The short run dynamics are examined by using the error correction mechanism (ECM) that explains the changes in dependent variable by the changes in explanatory variables as well as deviations from the long run relationship among the variables and its determinants. To go through the process of stationarity time series data may loss degrees of freedom. Thus to avoid this fear the ECM is applied. A specific ECM equations is as following;

$$\Delta y_t = \alpha + \sum_{i=1}^{m} \beta_{1i} \Delta GDP_{t-1} + \sum_{i=1}^{m} \beta_{2i}\Delta PD_{t-1} + \sum_{i=1}^{m} \beta_{3i} \Delta PI_{t-1} + \sum_{i=1}^{m} \beta_{4i} \Delta HK_{t-1} + \sum_{i=1}^{m} \beta_{5i}\Delta PG_{t-1}$$
$$+ \beta_{6i}GDP_{t-1}$$
$$+ \beta_{7i}PD_{t-1} + \beta_{8i}PI_{t-1} + \beta_{9i}HK_{t-1} + \beta_{10i}PG_{t-1} + \theta EC_{t-1} + \mu_t \dots 6$$

On left hand side y_t is real GDP. Coefficients on right hand side ($\beta 1\ to, \beta 5$) denoted short run dynamics.. $\beta 0$ Is intercept while difference operator is shown byΔ, random error term is denoted as μ_t, EC_{t-1} is an error correction term and i show lag length. The sign of parameter θ is expected to be negative. Whereas error correction term is formulated as

$$EC_t = y_t - \left(\frac{\beta_7}{\beta_6} pd_{t-1} + \frac{\beta_8}{\beta_6}K_{t-1} + \frac{\beta_9}{\beta_6}PI_{t-1} + \frac{\beta_{10}}{\beta_6}HK_{t-1}\right) \dots\dots\dots(7)$$

Results and Discussion
Unit Root Analysis
    Mostly the time series data has a unit root, which if regressed, leads to spurious results. Therefore to avoid the ambiguity in findings, the data is checked for unit root analysis. Second the pretesting of unit root will determine the order of integration, which further guide for a suitable technique, to apply in the data. This study used Augmented Dicky and Fuller (ADF) and Phillips-Perron (PP) tests for unit root analysis of the data, results displayed in table 4.1 below;

Table 4.1
Unit Root Analysis

ADF Test			Phillips-Peron Test	
Variables	**Level**	**First difference**	**Level**	**First difference**
GDP	-1.1438	-5.6030	-1.3443	-5.6012
	(0.9087)	(0.0002)	(0.8622)	(0.002)
PG	-3.2102	…………	-3.1524	………….
	(0.0910)		(0.0920)	
PD	-1.8761	-4.8711	-2.3025	-4.8385
	(0.6486)	(0.0017)	(0.4232)	(0.0019)
PI	-1.8346	-7.1451	-2.0524	-7.1154
	(0.6694)	(0.0000)	(0.5560)	(0.0000)
HK	-1.3457	-6.6041	-1.3202	-6.6071
	(0.8618)	(0.0000)	(0.86871)	(0.0000)

Note: P values in parenthesis

    The results presented in above table suggest that GDP, PD, PI and HK are integrated of order one 1(1) while the PG is stationary at level 1(0). The study also applied Phillips Peron test because it use nonparametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms, and found same results as were obtained through ADF. Based on these findings the ARDL/Bound test for Cointegration is best suited for analysis.

Lag Length and Criteria Selection

After analysing the unit root testing the next step is to choose lag length for co integration because the number of lags capture the dynamics of series. There are different criterions for selection of optimal lag length. The results of different criterions are in Table 4.2 below.

Table 4.2
Selection of Lag Length

Lag	LnL	LR	FPF	AIC	SC	HQ
0	-331.35	NA	13.85	16.817	17.02	16.89
1	-57.98	464.74	5.660*	4.399	5.66*	5.18
2	-31.97	37.71*	5.730	4.348*	6.670	4.85*

* indicates lag order selected by the criterion.
LR: sequential modified, FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Based on the findings of Akaike Information Criterion (AIC) and Hannan-Quinn information criterion, lag length two is the optimal lag length.

Long Run Cointegration Analysis

The long run Cointegration decision is made through Wald-F-statistics. In this approach, we compare our F value with lower and upper bound critical values calculated by (Pesaran et al., 2005). The critical bound value of Narayan (2005) are calculated on the basis of small as well as large sample size (30 to 80).These values are more reliable rather than Pesaran et al (2001) critical bounds values which are calculated on the basis of large sample sizes. If the computed F-statistic is above the upper bound critical value than null hypothesis for no long run Cointegration is rejected, if lies below the lower bound critical value then the null hypothesis for no long run Cointegration is accepted while in case lies in between upper and lower bounds then the decision will not be a clear one as it is the inconclusive region, See table 4.3 below.

Table 4.3
The Bound Test for Cointegration

Specification	Lower bound	Upper bound	F-statistic	Decision
GDP/PD,PI,HK,PG	3.51	4.58	9.23	Co integration
PD/GDP,PI,HK,PG	…………	……….	1.99	No Co integration
PI/GDP,PD,HK,PG	…………	………….	0.75	No Co integration
HK/GDP,PD,PI,PG	………..	…………	3.41	No Co integration
PG/GDP,PD,PI,HK	………..	………….	0.58	No Co integration

Note: Critical values are obtained from Narayan (2005) table

The results present in above table shows that calculated F-statistic (9.23) exceeds the upper bound of the tabulated value of F-statistics at 5% level of significance and thus there exist long run cointegration as suggested by Pesaran et al. (2005). Moreover, when rest of the variables are normalized to check whether there exist a long run cointegration or not it is found that in all the other specifications (taking each one dependent) the null hypothesis for no long run cointegration is accepted because the values of calculated F-statistics lies below the lower bound of tabulated F-statistic at 5% level of significance.

Long Run Estimates

After establishing the long run Cointegration among the series, in next step we explore long run impacts of public debt on economic growth, the results are displayed below;

$$RGDP_t = 3.628 + 0.0038PD_t + 0.109PI_t - 0.162PG_t + 0.098HK_t$$

t- Statistic: (2.80) (0.303) (2.77) (-2.03) (2.28)

P value (0.004) (0.76) (0.006) (0.065) (0.006)

R^2 0.79 Adjusted R^2 0.71 DW-Stat 2.104

F-Statistics 14.2 (0.000)

The results presented above shows that although there exist positive but statistically insignificant relationship between public debt and economic growth, which mean that public debt hasn't play any role in growth process of Pakistan economy. These results are parallel to the findings of Akram (2011) and Rais and Anwar (2012). The possible reasons behind insignificant findings is that it may not be used properly in production process of economy, the mismanagement and corruption may also be the other reasons behind insignificant impacts of public debt on economic growth. Amongst the other variables, private investment has strong positive effects on growth of the economy. These findings are in line with the studies of Hague (2013) and Fatima (2012), Pattillo and others (2002). Secondary School Enrolment (human capital) also has positive and significant impact on GDP which strengthen Lucas (1993) idea that human capital accumulation serve as an engine of economic growth. This result is similar to the findings of (Nabila *et.al* 2011). Population growth is used as a proxy of labor force which enter in the model significantly and with expected negative sign. These findings support the augmented neoclassical growth model of Mankiw et al (1992) which shows that the high level of population growth rate leads to lower per capita income by lowering the steady state value of capital per worker.

Short Run Estimates

The Error Correction Model for short run impacts of public debt on economic growth is presented below

$$DRGDP_t = 0.244 + 0.260PD_t + 0.1391PI_t + 0.177PG_t + 0.548HK_t - 0.674ECM_{t-1}$$

t- Statistic: (2.09) (0.300) (2.43) (-2.14) (2.48) (-3.36)

P value (0.079) (0.765) (0.003) (0.09) (0.005) (0.010)

R^2 0.32, Adjusted R^2 0.22, DW-Stat 2.104

F-Statistics 2.019 (0.083)

The results presented in above equation are same as in long run. Although our model is in equilibrium in long run but it is not necessary that it always be in equilibrium in short run so ECM is used to rectify this. The coefficient of ECM enter in the model with negative sign (-0.674), which is statistically significant and shows high convergence to the long run equilibrium within a short period of time by 67%. Similarly, the overall goodness of the model as shown by the adjusted coefficient of determination is 0.32, which shows that about 32

percent of the variation experienced in the gross domestic product of Pakistan is explained by the explanatory variables included in our model. The value of F-statistic is 2.019 which shows that the explanatory variables are important determinant of economic growth.

Diagnostic Test

Our model specification satisfied all the diagnostic tests .Table 4.8 represent the results of these tests. The results presents in table below suggest that the estimation of long-run coefficients and *ECM* are free from serial correlation, heteroscedasticity, functional form and non-normality.

Table 4.4
Diagnostic Test Results

Test Stat.	F-Statistics
(LM) test	2.675 (0.103)
Ramsey's Test	1.0192 (0.313)
Jarque-Bera test	1.676 (0.386)
White test	0.911 (0.340)

Stability Test

To test stability of model this study estimates the CUSUM and COSUMQ stability test. In present study the variables and data are stable because the plot of cumulative sum of recursive residuals CUSUM does not cross the critical boundaries. The results of this test is presented below
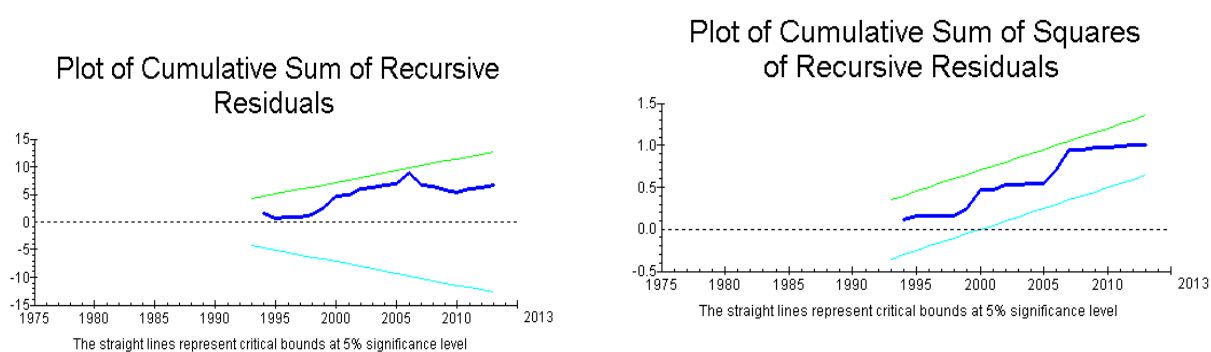

Fig. 1   Cusum and Cusum Sq

Conclusion and Recommendation

This study analysed the impact of public debt on economic growth in case of Pakistan over the period from 1972 to 2013.The empirical analysis has carried out through ARDL co-integration technique. The short run dynamic of model and speed of adjustment is captured through Error Correction Method (ECM). For stability of the model different tests were applied that indicated stability of the long run coefficients .Empirical results of this study revealed that, although the impact of Public Debt on economic growth is positive but statistically insignificant in long run, shows that   it plays no role in economic growth process.

As for as human capital is concern in models, it has positive and significant impact on economic growth indicated that an educated and highly productive labor force can lead to accelerate the growth process. While population growth is negatively and significantly correlated to economic growth indicated that high rate of population growth affects economic growth adversely. The significant adjustment parameter obtained from the cointegration equation confirmed the long run relationship and an estimation of adjustment parameter suggested a reasonable speed that correct the disequilibria in one year.

References
Abbas, S. M. A. & Christensen, J. E. (2007). "*The Role of Domestic Debt Markets in Economic Growth: An Empirical Investigation for Low-income Countries and Emerging Markets,*" IMF Working Paper, No. 07/12

Adofu, I., and Abula, M. (2010). "*Domestic Debt and the Nigerian Economy*", Current Research Journal of Economic Theory, 2(1): 22-26,

Afxentiou, P. C. (1993). "*GNP growth and foreign indebtedness in middle income developing countries,*" International Economic Journal, (7), 81-92

Ahmad.M.J, Sheikh.M.R and Tariq.K. (2012). "*Domestic Debt and Inflationary Effects: An Evidence from Pakistan*", International Journal of Humanities and Social Science, 2(18), 256-263

Ajayi, S.I. and Khan, M. (2012). "*External Debt and Capital Flight in Sub-Sahara Africa,*" African Economic Research Consortium. 17 (3)

Ajisafe, R. A., Nassar, M. L., Fatokun, O., Soile, O. I., and Gidado, O. K. (2006). "*External Debt and Foreign Private Investment in Nigeria: A Test for Causality,*" African Economic and Business Review, 4(1), 48-63

Akram.N (2011). "*Impact of Public Debt on Economic Growth of Pakistan*", The Pakistan Development Review, 50(4), 599-615.

Amassoma.D,(2011). "*External Debt, Internal Debt and Economic Growth Bound in Nigeria using a Causality Approach,*" Current Research Journal of Social Sciences 3(4): 320-325, 2011

Chaudry, I.S, Malik.S and Ramazan,M.(2009). "*Impact of foreign debt on savings and investment in Pakistan,*" Journal of Quality and Technology Management, 5 (2), 101-115.

Checherita, C.and Rother, P. (2010). "*The impact of high and growing government debt on economic growth an empirical investigation for the euro area*", European Central Bank, Working Paper Series No.1237.

Chongo.B.M (2013). "*An Econometric Analysis of the Impact of Public Debt on Economic Growth: The Case of Zambia.*

Chowdhury, Abdur R., (2001). "*Foreign Debt and Growth in Developing Countries,*" paper presented at WIDER Conference on Debt

Karagol, E. (2002). "*The Causality Analysis of External Debt Service and GNP:*" The Case of Turkey", Central Bank Review, 39-64

Krugman, P, (1988). "*Financing vs.Forgiving a Debt Overhang: Some Analytical Issues,*" NBER Working Paper, No. 2486

Kumar, M.S and Woo,J.(2010). "*Public Debt and Growth*" IMF Working Paper, No.10

Maana, I.Owino, R. and Mutai, N. (2008). "*Domestic Debt and its Impact on the economy – The case of Kenya*", paper presented during the 13th Annual African Conference.

Meltzer, L. A. (1951). "*Wealth, saving, and the Rate of Interest*", Journal of Political Economy.

Modigiliani, F. (1961). "*Long Run Implications of Alternative Fiscal Policies and the Burden of National Debt*", Economic Journal, 71, 730-55.

Muhammad .H and Muhammad. (2011). "*Role of Private Investment in Economic Development of Pakistan*" International Review of Business Research Papers. 7 (1), 420-439.

Nabila .A,Parvez .A and Hafeezur Rehman(2011). "*Impact of Government Spending in Social Sectors on Economic Growth: A Case Study of Pakistan*" Journal Of Business & Economics, 3 (2), 214-23

Narayan,p.(2005). "*The Saving and Investment Nexus for China: Evidence from Cointegration Tests*" Applied Economics, 37:1979-1990.

Romer, P., (1986). "*Increasing Returns and Long Run Growth*," Journal of Political Economy, 94, 1002-1037

Sachs, J. (1986). "*Managing the LDC Debt Crisis*," Brookings Papers on Economic Activity, 17, 397-440

Savvides, A. (1992). "*Investment Slowdown in Developing Countries During the 1980s: Debt Overhang or Foreign Capital Inflows*," Kyklos, 45(3): 363-378.

Table 4.5
Dependent variable is Real GDP

Long Run Estimates (ARDL)		Short Run Estimates (ECM	
Variables	**Coefficients**	**Variables**	**Coefficients**
PD_t	0.0038 (0.764)	DPD	0.2607 (0.765)
PI_t	0.1095 (0.006)	DPI	0.1391 (0.002)
PG_t	-0.1629 (0.065)	DPG	0.1779 (0.095)
HK_t	0.0981 (0.006)	DHK	0.5482 (0.005)
		ECM (-1)	-0.674 (0.105)
R-Square R-Bar-Squared DW statistic F-statistic	0.795 0.174 2.104 748.23 0.000)	R-square R-Bar-Squared DW statistic F-statistic	0.3202 0.0228 2.321 2.019 (0.083)
LM test Jarque-Bera test	2.675 (0.103) Ramsey test 1.6766 (0.386) White test	1.0192 (0.313) 0.9114(0.340)	