MODELS OF EXTERNAL DEBT GROWTH RELATIONSHIP

FOR PAKISTAN.

By

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CHAPTER 1

INTRODUCTION

External debt is an important source of financing for developing countries through capital accumulation, infrastructure development and human resource development. The two-gap model of Chenery and Strout (1966) provides motivation for reliance on external debt. According to this model in less developed countries (LDC) the demand for investment cannot be met from domestic savings and exports earning are also insufficient to finance imports. Accordingly, domestic savings are insufficient to finance the level of investment in developing countries which are at their early stages of development. In order to fill the saving-investment gap, the less-developed countries tend to borrow from the developed countries.

The theoretical foundation for the role of external finance in helping economic growth of developing countries is based on the famous Harrod-Domar growth model. According to this model, as the economic growth rate in labor abundant developing countries depends solely on investment, the key to enhance economic growth is to invest more. Developing countries, however, may not be able to save enough to finance the desired level of investment. Essentially, there will be a gap between domestic saving and the desired level of investment. In such circumstances, external finance fills the gap between saving and investment. The increase in investment financed by external resources may boost economic growth in the recipient country.

Many poor developing countries like Pakistan have accumulated a large amount of external debt which they cannot sustain. There is an increasing concern that large amounts of external debts are retarding growth and considerable amounts of these debts are utilized in debt servicing replacing to a great extent their socio-economic development expenditures.

Several studies have argued that external debt is the main reason for the weak performance of developing countries. In this regard the Debt Overhang hypothesis is the most commonly used argument to establish a negative relationship between external debt and economic growth. According to the debt-overhang hypothesis, when countries accumulate external debt, investors anticipate a higher future tax to finance the external debt-service payments. This reduces investment and, hence, adversely affects economic growth. (See, for example, Deshpande (1997), Cunningham (1993), Sawada (1994), Bauerfreund (1989), Rockerbie (1994) and Afxentiou (1993)).

Since the external debt must be paid back, the debt service payments take resources away from domestic use. The debt-service payments require an increase in taxes or a reduction in government expenditure. Endogenous growth model of Barro (1990) shows that an increase in distortionary taxes and/or reduction in productive public spending tend to hamper economic growth. This suggests that the effect of external debt on economic growth depends on the relative strength of the two opposite effects; the favorable impact of the external debt inflows and the unfavorable effect of debt-servicing repayments. That is, the impact of external debt on economic growth depends on the magnitude of external debt. Pattillo *et al.*. (2002) investigate the non-linear impact of external debt on economic growth for 93 developing countries spanning from Asia, Latin

America Sub-Saharan Africa, and the Middle East. Their results indicate that the impact of external debt on economic growth becomes negative at 160-170 percent of exports and 35-40 percent of GDP.

A numbers of studies have been undertaken that have focused on the impact of external debt on economic growth in case of Pakistan. [See, for example, Zafar and Zahid (1998), Hameed *et al*. (2008), Siddiqui and Afia (2001)]. Most of the studies have found negative relationship between external debt and economic growth. The general conclusion of these studies is that external debt has insignificant or negative relationship with economic growth.

Most of the economists assert that macroeconomic mismanagement is not only the cause of slow growth but it also explains why some developing countries have become heavily indebted. Thus, the problem of sluggish growth can be attributed to external debt but, the roots of a debt crisis can be traced in poor policy making. Easterly (2002) concludes that macroeconomic policies of the highly indebted poor countries (HIPCs) are the main cause of their high indebtedness. So, the external debt of a country has relationship with its policy decisions. World Bank (1990) concludes that capital inflows will be more effective in the countries which have stable macroeconomic policies and few distortions. Burnside and Dollar (1997, 2000) analyze the impact of foreign aid on economic growth in the presence of macroeconomic policies and find that aid is ineffective if sound macroeconomic policies are absent in the of aid-recipient countries. There is also a possibility that external debt has detrimental effect due to the absence of sound macroeconomic policies.

Furthermore, external debt may have different effects on economic growth depending upon its source structure. Tiruneh (2003) argues that in order to analyze the impact of external debt on economic growth, external debt might not be used in aggregate form. The empirical models in which external debt is taken in aggregate form and all its components are assumed to have the same effect on economic growth, may give misleading results. For example, the rational for decomposing the total external debt into bilateral external debt and multilateral external debt is that the bilateral external debt is strategically and politically driven rather than policy or poverty focused. Therefore, its impact on economic growth can be negative. In contrast, multilateral external debt can promote economic growth because it is policy or poverty driven to some extent and is often accompanied by low interest rates. So, it is expected to enhance economic growth.

1.1. Significance of the Study:

There is hardly any study for Pakistan that analyzes the impact of external debt on economic growth in the presence of macroeconomic policy and in the perspective of the source structure of external debt. The present study attempts to fill this gap. Firstly, external debt is interacted with macroeconomic policies to analyze the impact of external debt on economic growth in the presence of macroeconomic policies. Secondly, external debt is disaggregated into bilateral and multilateral external debts to trace their respective affects in economic growth separately. To be more specific, the study focuses on the following objectives,

- To examine the relationship between total external debt and economic growth.
- To determine how the relationship depends upon the state of macroeconomics policies.

- To investigate whether effect of external debt on economic growth is linear or nonlinear.
- To determine how the relationship between external debt and economic growth depends on the components of the external debt with respect to bilateral and multilateral debts.

The study has been organized in the following way. Chapter 2 contains the review of the main theories and empirical studies on external debt-growth relationship. Overview of the Pakistan economy and external debt is presented in Chapter 3. Theoretical framework and mathematical models of external debt–growth nexus are presented in Chapter 4 and 5 respectively. Data, variables construction and estimation issues are discussed in chapter 5, while empirical results are presented and discussed in chapter 7. Finally, Chapter 8 concludes the study.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

This section discusses some of the theoretical studies postulating the external debt-growth relationship and then reviews empirical work on the subject. The main focus of this chapter is to explain why external debt may not always have positive impact on economic growth.

2.2. Theories of the External Debt-Growth Relationship

The theoretical models exploring the external debt-growth relationship can be divided into three groups. The first group includes theories which describe that reasonable level of external debt stimulates economic growth. The second group of theories relates that high accumulated debt has detrimental effect on economic growth, while third group of theories combines these two effects and argue that the impact of external debt on economic growth is nonlinear in nature. (i-e., at the earlier stage of borrowing the country experiences positive growth and once the external debt level reaches a critical point, the effect of external debt becomes negative). The reminder of this subsection discusses each of the three types of the theoretical models postulating the external debt-growth relationship.

2.2.1. Models with Positive Debt-Growth Relationship

According to numerous theoretical models, reasonable levels of current debt inflows are positively related with growth. In traditional neo-classical models, for example, capital mobility or the country's ability to borrow and lend enhances transitional growth. There is an incentive for capital scarce countries to borrow and invest since the marginal product of capital is greater than the World interest rate. The first group of theories can be represented by the post-Keynesian and neoclassical models. The early post Keynesian models, such as Harrod-Domar model, have emphasized the importance of savings and investment for growth.

The Harrod-Domar growth model shows through a mathematical equation, the existence of a direct relationship between investment to GDP ratio and the rate of economic growth. The model concludes that economic growth is a direct result of capital accumulation generated through savings. Assuming that there is abundant supply of labour, the model indicates that scarcity of capital is the only constraint to production. The model itself predicts that the rate of GDP growth will be equal to investment to GDP ratio divided by the incremental capital-output ratio. If national saving are not enough to finance the desired level of investment, developing countries may resort to foreign borrowing to yield the target growth rate.

Eaton (1993) looks at the relationship between debt and growth of two particular models, one of Uzawa (1965) (which is explained by Lucas (1988) and hence is known as Uzawa-Lucas model) and the other of Cohen (1991). He finds that in both of these models the rate of growth falls as the cost of foreign capital (interest rate) increases because higher world interest rate makes savings more attractive than

current consumption. Also higher world interest rate makes foreign capital more expensive and thus foreign borrowing falls. The ultimate result is a positive relationship between debt and growth.

2.2.2. Models with Negative Debt-Growth Relationship

Theories of the second group can be portrayed by the well-known debt-overhang hypothesis suggested by Krugman (1988) and Sachs (1989).The basic idea behind the debt overhang hypothesis is that when countries accumulate large external debt, potential investors anticipate a higher tax rate in the future that is required to finance the external debt. This discourages investors and reduces the level of investment. The decline in investment caused by anticipation of higher future taxes, in turn, retards economic growth. Thus, according to the debt-overhang hypothesis, outstanding external debt affects economic growth adversely through its disincentive effect on investment.

According to Claessens *et al.* (1996, pp. 17), the debts overhang theory

> *"is based on the premise that if debt will exceed the country's repayment ability with some probability in the future, expected debt servicing is likely to increasing function of the country's output level. Thus some of the returns by investing in the domestic economy are effectively taxed away by existing foreign creditors and investment by domestic and new foreign investors is discouraged."*

Krugman (1998) constructed a model of debt overhang in which he considers the dilemma of debt repayment from creditor's point of view; he argues that a country has debt problems when its own discounted value of all future resource transfers is less than

the present value of debt. Facing these problems, the creditors try to find such a strategy, which would maximize the present value of the debt. This strategy takes into account the tradeoff between debt forgiveness and further financing of the country so that the present value of the debt should be comparable with the present value of the future country earnings. This in turn will imply that the returns from investments in the country will face high marginal tax demanded by creditors, which will level off current and future investments.

According to the Hjertholm *et al.* (1998) there are two versions of debt overhang hypothesis; the narrow version and the broad version.

The narrow version says that private agents in the debtor country and foreign investors see a heavy debt burden as an indication of the future tax on the returns on capital. (Krugman 1998; Sachs 1986). That is, the government is expected to increase taxes in future in order to pay debt service payments. The higher future taxes mean lower net returns on capital. This in turn lead to lower investment and, hence, lower growth.

According to the broader approach higher external debt implies higher debt servicing cost, which increases the likelihood that government will devalue its currency or do inflationary financing because of excess demand for foreign exchange created by debt servicing. Uncertainties created by this will decrease the return on investment resulting in lower level of investment and slow growth as well.

Apart from the debt overhang hypothesis, there are several channels through which external debt negatively affects economic growth. Large accumulated external debt may lead to expectation that the debt servicing may be financed through the discretionary fiscal policies, such as inflation tax, reducing the public investment, etc.

Again this may have negative impact on economic growth by reducing the level of investment.

The high external debt also leads to import compression, including the imports of technological goods that are vital for some of the export sectors to remain competitive. Serieux and Samy (2001) argue that for an indebted country within convertible domestic currency, higher debt service payments, given vulnerable export earnings and absence of non-debt creating capital inflows would mean a serious cutback in imports and import compression either through price rationing (devaluation of the domestic currency) or non-price rationing (import restriction). The joint effect may drive indebted poor countries to deep deindustrialization.

Another way the external debt negatively affects economic growth is through capital flight. Capital flight is a situation when money or other assets flow out of a country, due to an economic event (such as an increase in taxes or government defaults on its debts) and this decreases the rate of return on investment, and , hence the level of investment as well. This capital outflow is accompanied by decline in the exchange rate (depreciation in a variable exchange rate regime, or a forced devaluation in a fixed exchange rate regime). As Alejandro (1984, p. 345) correctly puts for Latin America "Another concern during 1980-81 could have been that the public debt was financing not bad investment projects nor unsustainable consumption but private capital flight."

Increased macroeconomic uncertainty caused by high external debt negatively affects economic growth because of the consequent uncertainty about how this external debt will be paid back. Secondly, it may not be known under what terms and conditions the external debt will be rescheduled, whether there would be additional lending, etc.

Investment literature suggests that under uncertainty investment is also low, even if economic indicators are improving. Under uncertainty, most of the investment will be made in short-term projects with quick returns, rather than long-term ones. Productivity of overall capital will decrease due to misallocation of investment, thus it will lower the economic growth.

2.2.4 Models with Nonlinear Debt Growth Relationship

A historical assessment reveals that both of the above views are consistent with the actual experience of the indebted countries. External borrowing had a positive impact on economic growth but continued borrowing had negative impact on economic growth.

Theories of the third group can be depicted by the concept of debt Laffer curve. Sachs (1989) introduced the concept of debt Laffer curve through the theory of debt overhang, in the form of a non-linear relationship between external debt and economic growth. Thus, the positive effect of debt on growth is diminishing to the extent that at higher stock of debt, the debt servicing cost becomes too large and the external debt starts to negatively affect economic growth. According to Sachs (1989), the reason of the inverse relationship between external debt and economic growth is the high marginal tax imposed on the future income of current investment. This would promote current consumption rather than current investment.

The theoretical model developed by Calvo (1998) can be ascribed to the third group of models. His model postulates three distinct phases of debt. In the first phase, economic growth is positively related to the level of debt. The second phase is an intermediate phase wherein economy can exhibit either high or low growth path. Finally, the third phase is the one in which economic growth is adversely affected by debt

accumulation. This three-phased relationship is shown in Figure 2.1. D^* is the optimum level of external debt that maximized the rate of economic growth. Any level to the right of D* is converted into sluggish economic growth. The level of external debt possibly depends on the productivity of investment, the proportion of external debt that is devoted to boosting investment versus sustaining domestic consumption and other such factors.

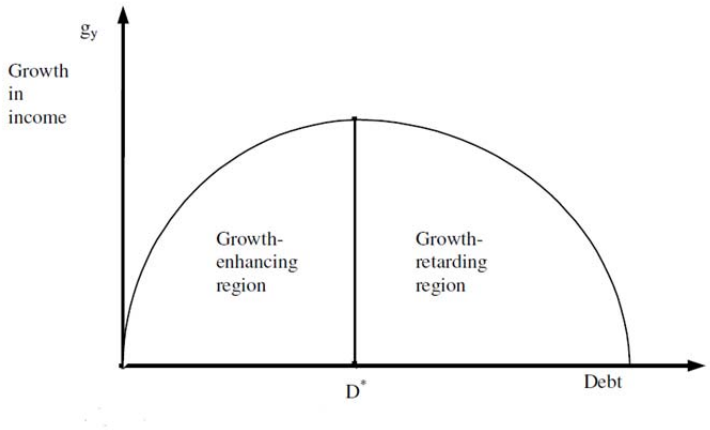

Figure 2-1: Debt Laffer curve[1]

The external debt and growth nexus has been a hot issue of research since 1980s. Number of countries has been analyzed and the number of studies has been published since 1980s. Some of the studies found a negative impact of external debt on economic growth. Afxentiou (1993) revealed that indebtedness affects economic growth negatively. Studies of Deshpande (1997) and Cunningham (1993) found a strong negative relationship between external debt and growth. Chowdhury (1994) concludes that the long-run impact of external debt on growth is positive in Indonesia, South Korea and Bangladesh. Cohen (1993) revealed that level of external debt does not affect economic growth in 81 developing countries. Given these results, it is hard to conclude the

[1]Source: Tiruneh (2003, p. 185)

relationship between external debt and economic growth. So, further research is required to be done under this topic.

Table 2-1 presents the summary of the empirical studies related to the impact of external debt on economic growth. From the studies presented in Table 2.1, we can conclude that the impact of external debt on economic growth depends upon the time period used in the study. Prior to the 1980 external was positively affecting economic growth and after that it negatively affected economic growth. Conclusion of the above studies also varied depending upon the structure of the data used. Most of the panel data studies conclude that the impact of external debt is negative or non-linear whereas in case of time series studies the results are mixed. The above studies have also shown that the relationship between external debt and economic growth differ among countries. Depending on these different results, it is not appropriate to generalize the relationship between the external debt and economic growth. The situation of each developing country should be considered separately because overall economic and political environment, organizations and institutions in developing countries are significantly different.

Table 2-1: Summary of Literature Review

Study	Countries and Data	Main findings
Geiger (1990)	• 9 highly indebted South American countries • For the period 1974 to 1986	• External debt and economic growth have negative and statistically significant negative relationship.
Warner (1992)	• 13 highly indebted Less developed countries (LDC) • Cross section data for the period 1982-1989	• External Debt does not decrease the level of investment.
Savvides (1992)	• 43 less developed countries	• Debt overhang and decrease in capital inflow negatively affect the level of investment.

	• Cross section data for the period 1980-1986.	• A decline in commercial debt inflow is more important factor in explaining the decline in investment than non-commercial inflow.
Afxentiou (1993)	• 20 middle- income developing countries • For the period 1971-1988	• Negative relationship exists between the level of external debt and economic growth. • Large amount of external debt accumulation creates mismanagement and this bad domestic management negatively affects economic growth. If external capital is not used efficiently, this would negatively affect growth.
Cohen (1993)	• 81 developing Countries • For the time period 1965-87	• GDP growth is not affected by the level of external debt.
Chowdhury (1994)	• 8 developing	• Long run impact of external debt on growth is found to

	countries • For the time period 1970-1988	be positive in Indonesia, South Korea and Bangladesh.
Rockerbie (1994)	• 13 Less Developed Countries (LDC) • for the time period 1965-1990	• The debt crisis of 1982 significant reduces domestic investment in less developed countries (LDCs). • Debt servicing negatively affect economic growth.
Sawada (1994)	• Highly indebted countries • For the time period 1955-90.	• Debt overhang problem exists in highly indebted countries. • Because current external debts are greater than expected present value of the future gains.
Smyth and Hsing (1995)	• USA • time series data for the period 1960-81	• Optimal debt to GDP ratio is about found to 38 % of GDP that will maximize growth. • In 1980s and early 1990s federal debt was below 38 percent of GDP. So, it positively affected the economic

		growth. During the period 1986-93 debt was greater than 38 percent of GDP. So, it negatively affected economic growth.
Afxentiou and Serletis (1996)	• 55 developing countries • For the period 1970-1990.	• During 1970 to 1980s external debt did not affect economic growth negatively • For 1980-90 the negative relationship is found between external debt and economic growth.
Amoateng and Amoako-Adu (1996)	• 35 less developed countries • For the time period 1971-1990.	• Unidirectional and positive causal relationship between foreign debt service and economic growth after excluding exports revenue growth for South of Saharan countries and Africa during 1983-90.
Elbadawi, *et al*. (1997)	• 99 developing countries. • Panel data for the time period 1960-94.	• There results indicate that growth maximizing external debt to GDP ratio is about 97%.

Deshpande (1997)	• 13 severely indebted countries • Panel data for the time period 1971-91.	• For the 1975-1983 period external debt has positive impact on investment. Whereas for the 1984-1991 period external debt negatively affects investment.
Fosu (1999)	• 35 Sub-Saharan countries • Cross section data for the time period 1980-90	• The external debt negatively affects economic growth, and this may be due to the poor performance of debt receiving countries. • Growth equation re-estimated for the time period 1980-1985. When Sub-Saharan countries adopted structural adjustment programmes growth equation again showed a negative relationship between external debt and economic growth.
Siddiqui and Afia (2001)	• South Asian Countries • Panel data for the	• The impact of external debt on economic growth is non-linear. • Critical values of debt-to-GDP, debt servicing-to-

	time period 1975-98.	exports and debt-to-exports, are 61% , 12.75% and 179% respectively at which debt has the maximum effect on economic growth. • Pakistan's external debt is expected to negatively affect economic growth because its external debt is above these critical ratios while the other two countries (Sri Lanka and India) are below the critical levels of the ratios.
Were (2001)	• Kenya • Time series data from 1970-1995.	• Existence of a debt overhang problem in Kenya. • External debt retards economic growth and private investment.
Karagol (2002)	• Turkey • Time Series data for the time period 1965-2001	• Debt service negatively affects economic growth in the long run. • Results of Granger causality test shows uni-directional causality from debt service to economic growth.

Pattillo *et al*. (2002)	• 93 developing countries spanning from Asia, Latin America Sub-Saharan Africa, and the Middle East. • Panel data over the period 1969-98.	• There exists a nonlinear relationship between external debt and economic growth. • The average impact of external debt on growth is negative when external debt is above 160-170 % of exports and 35-40 % of GDP. • This non-linear impact of external debt on growth works through total factor productivity (TFP), not through the level of investment.
Clements *et al*. (2003)	• 55 low income countries • Panel data for the time period 1970-99.	• Debt has negative effect on economic growth after it reaches a threshold level, which is estimated at 50% of GDP for the face value of external debt and at around 20-25% of GDP for its estimated net present value. • Negative effects of external debt on economic growth work through reduction in public investment.
Pattillo *et al*. (2004)	• 61 developing	• Negative impact of high external debt operates both

	countries • Panel data over the period 1969-98	through negative impacts on capital accumulation and total factor productivity.
Burnside and Dollar (1997, 2000)	• 56 developing countries • Panel data for six four-year periods (1970-93)	• Defining sound macroeconomic policy as low inflation, small fiscal imbalance and an open trade regime, it is found that sound policies not only promote growth but also increase the effectiveness of aid inflow.
Hameed *et al*. (2008)	• Pakistan • Time series data for the period 1970-2003	• External debt servicing on exerts adverse effects on labor and capital productivity which in turn hampers economic growth**.**
Malik *et al*. (2010)	• Pakistan • Time series data for the period 1972-2005	• External Debt has statistically significant negative relationship with economic growth. Debt servicing has also significant and negative impact on growth.
Chaudhary and Sabahat	• South Asian countries	• The growth maximizing external debt to export ratio

(2001)	• Time period 1971-95	for Pakistan economy is found to be 3.44 in 1995. Pakistan external debt to export ratio is 2.72 which is less than the growth maximizing external debt to export ratio. • Pakistan, Bangladesh, Sri Lanka, India, and Nepal are on the right side of the debt Laffer curve because their current debt to export ratio is less than the growth maximizing debt to export ratio. Whereas, Maldives and Bhutan lie on the wrong side of the debt Laffer curve because their current debt to export ratio is greater than the growth maximizing debt to export ratio.
Waheed (2005)	• Pakistan • Time Period 1980 to 2002	• The study concludes that continued government policy reforms and sound debt management are essential for getting out of the current external debt problem

2.3. Conclusion

In this chapter, the theoretical and empirical aspects of external debt and economic growth have been reviewed. Theoretically, external debt works through saving and investment channels. External debt will be effective if it increases saving, investment and thus economic growth. However, external debt will negatively affect economic growth if it is used to increase government consumption or to invest in low priority investment projects. Macroeconomic instability of the debtor country may be one of the causes of failure of external debt to raise the pace of economic growth. Study of World Bank (1990) concludes that the countries with stable macroeconomic environment in terms of low inflation, low fiscal deficit and a free trade regime are likely to get more benefit from aid inflow for sustainable economic growth.

CHAPTER 3

OVERVIEW OF PAKISTAN ECONOMY AND EXTERNAL DEBT

3.1. Introduction

Pakistan's experience of external debt over the past several decades has not been much satisfactory. Pakistan has always been away from the stage of self-sustaining economic growth despite receiving huge amounts of external debt. In this chapter, we summarize the situation of external debt inflow and economic growth of Pakistan.

Section 3.2 presents the analysis of external debt and economic growth. External debt indicators are presented in section 3.3.

3.2. External Debt and Economic Growth

The history of Pakistan foreign economic assistance started from July 1951 and since then there has been an upsurge in the volume of aid received. A significant acceleration was seen in the debt accumulation in 1960 when the average accumulation rate was about 24 percent per annum. As a result of this high rate of accumulation the external debt of Pakistan reached $ 2.7 billion in 1969. The debt accumulation further accelerated in 1970s which results into a big jump in external debt from $3.79 billion in 1971 to $8.78 billion in 1978. In 1972, external debt servicing as a percentage of export earning was 18.3 percent, it reached to 32.5 per cent by the end of the 1970s. (See, Waheed, 2000)

In the period of 1980s the Afghan war brought up huge amount US foreign assistance. The unexpected windfall allowed the government to put efforts in reforming

the economy and reducing the fiscal and external account balances. Although the GDP growth rate was impressive in 1980s yet the effort remained emphasized on the short-term growth rather than long term which negatively affected the country capacity for generating sustainable growth, reducing poverty and achieving equitable distribution. The short-term growth policies resulted in deterioration of physical infrastructure and worsening of the public sector imbalances. The neglect of social and human development sector left Pakistan at par with African countries. Saving rate was very low during the 1980s and trade gap widened during the period. During this period Pakistan 50 percent of the external resource requirement were met through foreign aid, borrowing and worker remittances. In first half of 1980s Pakistan's debt to GDP ratio was 40.3 percent but in second half of the 1980s the ratio increased to 48.4 percent of GDP. (Zaidi, 1999).

Pakistan enjoyed high economic growth in the 1980s but serious downturn in all social and economic indicators was recorded in the subsequent period of 1990s. Problems like decline in the economic growth, hike in prices, acceleration in debt burden accumulation, widening of macroeconomic imbalances and doubling of the poverty indicators was recorded in the mentioned period. Because of non-implementation of the agreements with the International Financial Institutions, the financial credibility of the country worsened. Foreign investment reduced because of the decision of freezing foreign reserves of the resident and nonresident Pakistanis which eroded the confidence of local investors. Foreign investors were aggrieved because the power purchase contracts were re-scrutinized and criminal operation was launched against Hubco (an independent power producing company).

The annual growth rate showed a decline from 6.3% in 1980s to 4% in 1999. The services and manufacturing sector both showed a very poor performance. As the service sector is the major source of employment generation both in urban and non-form rural areas, the decline in service sectors negatively affected the overall employment rate.

The atomic detonation in May 1998 dried up the foreign saving, which used fill the saving investment gap. As a result the investment to GDP ratio moved in downward direction. The reduction in investment made it more difficult for the economy to resume the path of high growth.

A large domestic and external debt accumulation was recorded as result of persistent fiscal and external deficit in the decade. The external debt of Pakistan jumped from $20.85 billion in 1990 to $33.84 billion in 1999 which was 53% of GDP. During the decade Pakistan's external debt grew at average growth rate of 6.5%. At the end of the decade the value of external debt as percent of exports was recorded as 350 percent, which is much higher than the safe limit of 150%. The ratio of debt-services to export-earnings also crossed the bench mark of 20% and was recorded as 30.36 percent.

The hike in the debt servicing resulted in the persist high fiscal deficit of 7 percent of GDP. Besides the debt servicing, the major factor contributing to high fiscal deficit was lower tax to GDP ratio which at the end of the decade was recorded as 12.8 percent. As a result of this twin menance, a major downturn was recorded in the development expenditures which declined to 3 percent of GDP from 8 percent in the first half of the 1980s. All this resulted in reduced social sector expenditure below the desired level.

The external sector deficit climbed to 4 percent of GDP in the 1990s from 2.6 percent in the 1980s. The major factor responsible for this upsurge was the stagnant

exports. The exports of goods and services remained between $6.21 and $10.25 billion. This inability to expand export made it more difficult for the country to service external debt obligation.

As consequence of the May 1998 event, an important source of external liquidity that is foreign currency deposit was lost. Worker's remittances went down to $1 billion. Foreign investment inflows were below $400 million. Due to shoot up in the oil import prices the oil import bill become doubled and reached $2.6 billion. Although some increase in the volume of textile export was seen in the period but unit value of export were down by 7-10 percent. Thus, for the next few years Pakistan experienced the external gap of $2.5 billion to $3 billion. For the betterment of the economy Pakistan had to find ways for debt relief or debt rescheduling. For this purpose Pakistan entered into a stand-by arrangement with the IMF in 2000 for nine months.

Pakistan enjoyed high economic growth rate of about 6.3 percent and per capita income in current dollar terms of about $1000 in sub period of 2001-06. Significant employment generation and poverty reduction was recorded in the above mentioned period. Although the stock of external debt increased from $33 billion in 1999 to $35 billion in 2006, yet as percent of GDP it declined from 53 percent to 28 percent during the same period.

Exports of goods and services recorded 66 increases rising from $10.60 billion in 2000 to $17.19 billion in 2005. The private investment was encouraged by low interest rate of 4 to 5 percent, which also fueled growth. The tax revenue got doubled in five years with growth rate of 14 percent. Despite the post-earth quake relief expenditure and reconstruction expenditure, the fiscal deficit remained below 4 percent of GDP annually.

The other economic achievement of the period includes tripling of foreign exchange reserves from $16.8 billion in 2000 to $46 billion in 2006. If the foreign loan disbursement and official grant are excluded the foreign exchange earnings increased from $ 14.3 billion to $42 billion the same period.

After the 9/11 event Pakistan was provided with debt relief and official economic sanctions were removed. Pakistan's access to international financial institutions was easy and Pakistan received new loans and grants after the 9/11 event. Bilateral donors actively contracted new loans and grants. In period from 2003-2006 Pakistan enjoyed average growth rate of 6.3%. Significant reductions in unemployment and poverty were also recorded during this period. According to one estimate from 1999 to 2008 about 11.8 million new jobs were created. **(**See Government of Pakistan, 2010**).**

The stock of external debt liability was reduced to 28 percent in 2006 from 46 percent in 2002. A considerable improvement in debt servicing capacity was recorded as the debt-servicing as percentage of foreign exchange earnings declined to 9 percent in 2006 from 26 percent in 2002. Foreign exchange reserves climbed to US $ 14 billion in 2006 from $ 6.4 billion in 2002. Exports of goods and services increased by 55% during the period 2002-2006. Fiscal deficit during the 2002-2007 was around 4% of the GDP. A six fold increase in the worker remittances through official channels was recorded from 2002 to 2006.

The subsequent period of 2007-08 and 2008-09 brought many difficulties for Pakistan economy. The momentum of high economic growth slowed down the growth rate of GDP went down from 7.6 percent in 2006 to 3.6 percent in 2009. Fiscal deficit crossed the limit prescribed in fiscal responsibility act and exceeded 7 percent of the

GDP. The external current account deficit exceeded 6 percent of GDP due to the deteriorating trade imbalance. Foreign capital inflows were also at its low levels, used to fill the current account deficit. Inflation rate was more than 10 percent on yearly basis, affecting the poor and the fixed income groups badly.

After some progress from 2001 to 2007, Pakistan's debt position worsened in 2008, due to the large fiscal and current account deficits. The External debt as a percentage of foreign exchange receipts increased to 127 % in 2008 from 121 % in 2006, showing that the External debt is growing at a faster rate than foreign exchange earnings. The stock of External debt and liabilities in 2008 was US$ 45.9 billion, a rise of US$ 5.4 billion, showing a 13.3 % increase over the stock of external debt at the end of 2007. The rise of external debt in 2008 is mainly due to the current account deficit and fiscal deficit. (Hussain, 2008).

In the year 2009-10 Pakistan was facing serious security problems followed by rehabilitation of internally displaced people. Pakistan was having one of largest internally displaced persons(IDPs) Population in 2009, with an estimated over 3 million people displaced from their homes in Swat, Bajaur, Malakand division, and South Waziristan agency (SWA).Despite facing security problems and severe energy crises, Pakistan managed a growth rate of 4.1% during 2009 compared with the low growth rate of 2.1% in the previous year. This improvement in the growth rate can be attributed to the larger than expected cotton output and increase in the external demand for Pakistan's export especially, cotton. During 2009 the unemployment rate increased from 5.2 percent to 5.5 percent. The FDI during 2009-10 declined by 45%. Pakistan macroeconomic stability factors were satisfactory if compared with 2008-09. Fiscal adjustment of 2.4 percent

occurred in 2009-10 due to reduction of fiscal deficit to 5.2 percent in 2009-10 from 7.4 percent in 2008-09. The current account deficit reduced from 8.3 percent of GDP (US$ 13.9 billion) in 2007-08 to 5.6 percent (US$ 9.3 billion) in 2008-09. A huge reduction in inflation rate was recorded from 25 percent in 2008 to 8.9 percent in 2009. The international credit worthiness of the country was upgraded by credit rating agencies during the period. According to budget estimate 2009-10, interest and principal repayment of foreign loan amounted to nearly 40 percent of total revenue. During the first nine months of the 2009-10 an increase of US $2 billion was recorded in the external debt and liabilities. At the end of March 2010 Pakistan's outstanding stock rose to US $54 billion from US $52 billion at the end of 2009. **(**See Government of Pakistan 2010**).**

The period of 2010-11 added new challenges like shocks in the commodity and oil prices, the fall out of global financial crises and great flood, to the already present security challenge that Pakistan was facing since 2001. The floods during July-September 2010 wiped out 2 percent of growth and caused $10 billion damage to the economy of the country. As a result of these floods about 20 million people were displaced and more 50,000 Square Kilometers area was badly affected. Despite facing these challenges, Pakistan registered growth rate of 2.4 percent during the period. The recorded rate fell short of the target growth rate of 4.1 percent. The low growth rate can be attributed to the badly affected agriculture sector due to the floods. The services sector showed a strong performance and grew by 4.1 percent growth. The 14 percent increase in CPI was recorded during the period July-May 2010-11 which was 2.4 percentage points higher than the inflation rate in the previous period. The external debt of Pakistan climbed from US $55.9 at the end of June 2010 to $59.5 billion by end March 2011. In other words

Pakistan experienced a growth rate of 6.4 percent in its external debt, which was much lower than the previous year growth of 13.4 percent. The main reason for this slow growth in the external debt were the decreasing current account deficit, low debt creating foreign flows and depreciation of the USD against the other currencies. (Government of Pakistan, 2011).

3.3. External Debt Indicators

The absolute numbers of external debt are not meaningful without any reference to the means to repay debt. This section presents some of the important external debt indicators to assess the external debt burden and the repayment capacity of Pakistan.

3.3.1 External Debt to GDP Ratio

External debt to GDP ratio relates external debt to resource base or the repayment capacity.This ratio provides some indication of the potential to service external debt by switching resources from production of domestic goods to the production of exportable goods.

Figure 3.1 presents the information on Pakistan's external debt to GDP ratio over the period 1970 to 2009. In the beginning of 1970s, the external debt to GDP ratio was 33.9 percent. However, this debt ratio drastically increased reaching to 73 percent in 1973 due to abrupt devaluation of Pak rupee by about 100 percent. However, from 1973 to 1981, this ratio showed a declining trend and reached to 37 percent. The ratio functioned between 37 percent to 51 percent between 1982 to 1991. From 1992 to 1999, in most of the period this ratio remained above 50 percent, a critical benchmark[2]. This shows that

[2] See Ashfaq M. (2004).

Pakistan's external debt was almost unsustainable in 1990s. The debt ratio shows a decreasing trend after year 1999 and reduced to 33 per cent in the 2009.

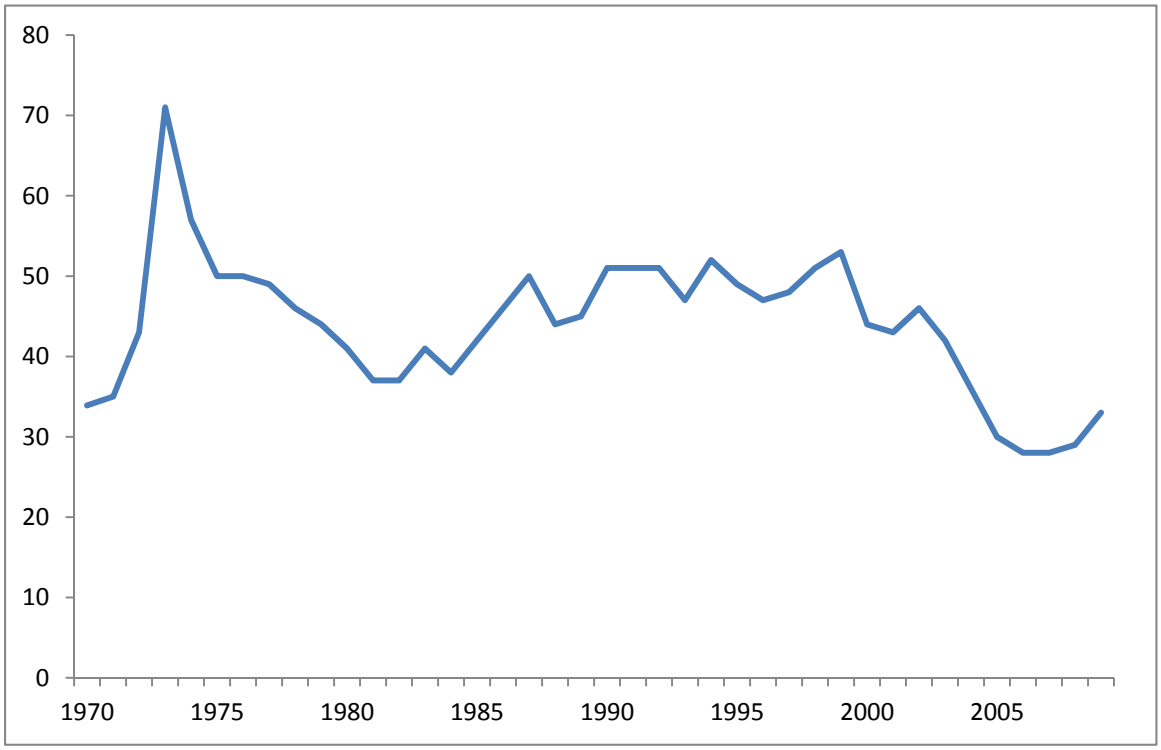

Figure 3.1: Total external debt as a Percent of GDP

3.3.2. External Debt-to-Export Earnings Ratio

The external debt-to-exports ratio is the ratio of external debt to the country's exports of goods and services. This ratio can be used as a measure of repayment because a growing external debt-to-exports ratio indicates that growth rate of external debt is more than its external income. The ratio is useful as a trend indicator closely related to the repayment capacity of a country. A country may have small debt to GDP ratio but large debt to export ratio if export of goods and servies is a small proporation of GDP. According to Pattillo *et al*. (2004) , the benchmark for this ratio is 190 percent of export.

The trend in the ratio of external debt to export earning is shown in figure 3.2. In the 1971, the external debt to export ratio was 500.5 percent. After several fluctuations between the years 1971 and 1985, the debt ratio reached to 411 in 1985. From 1985 to 1991 this ratio showed a slightly decling trend and rached to 301 percent in 1991. The ratio ranged between 294 percent to 350 percent from 1992 to 1999. After that, it experienced a slight decline reached to 186 percent.in 2006 but increasing thereafter.

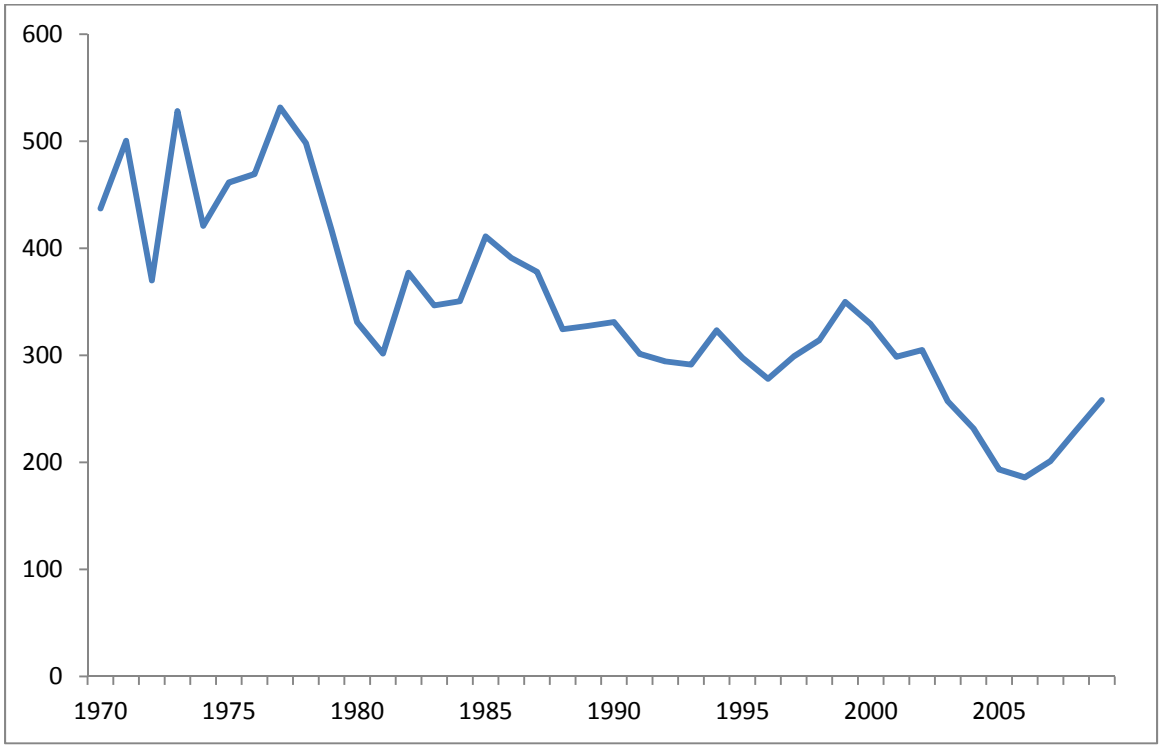

Figure 3.2: External debt as a percent Export Earning

3.3.3. Debt Service-to-Export Earnings Ratio

This ratio is defined as the ratio of external debt-service (principal and interest) payments on external debt to exports of good and services for any one year. The debt service to export ratio is a debt sustainability indicator because it shows how much of the debt servicing is financed through country's export revenue. In other words, this ratio indicates the repayment ability and credit worthiness of a debtor country.

Debt Service as a percent export earning over the period 1971 to 2009 is presented in Figure 3.3. The ratio varied from 33 percent to 25 percent from 1970 to 1975. Its value increased to 44.22 percent in 1985 and then fell to 31.72 percent in 1995. In 1997 its value increased to 40.67 percent and remained in-between 22 percent to 30 percent from 1996 to 2004. In the past five years, 2005 to 2009, its valued remained in-between 11 percent to 16 percent.

According to the report of Heavily Indebted Poor Countries Debt Strategy and Analysis Capacity Building Programme (HIPC CBP)[3], when debt servicing of a country transcends 20 percent of its export earnings, its debt becomes unsustainable. So according to this criterion the external debt of Pakistan was unsustainable expect in the years 1972, 1974, and then 2005 to 2009.

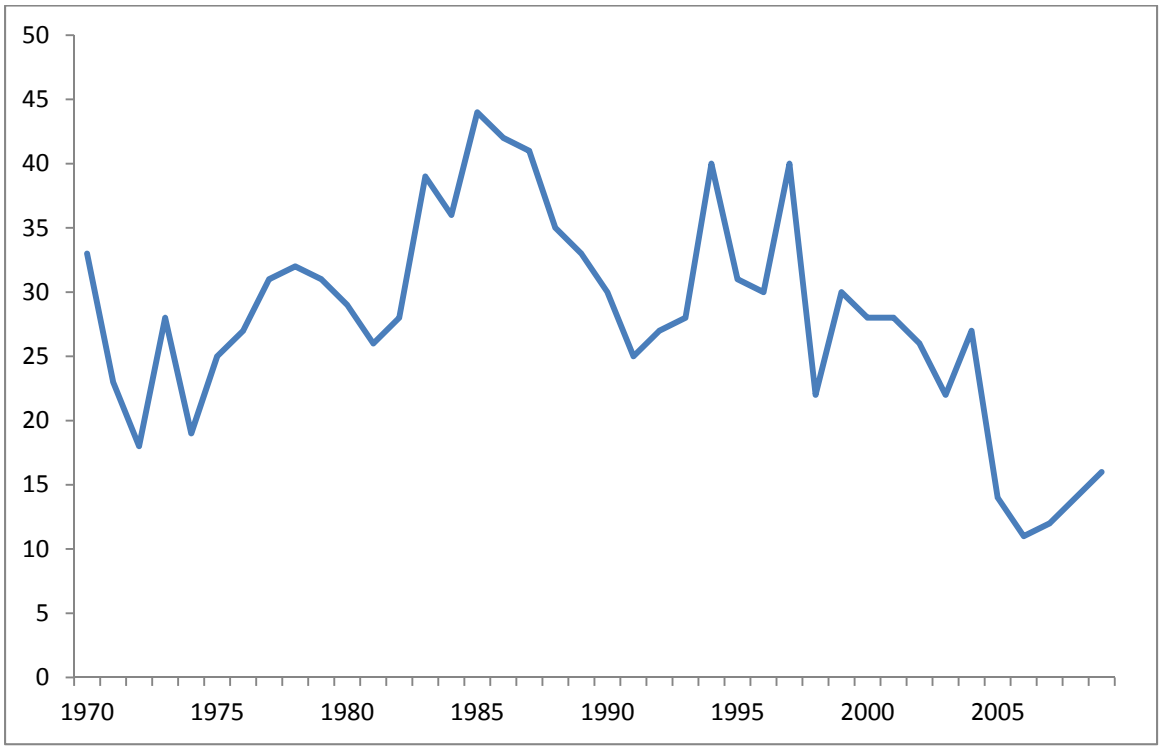

Figure 3.3: Debt Service as a percent Export Earning

[3] http://www.hipc-cbp.org/files/en/closed/General%20Resources/General%20Reference/Debt_Sustainability_Ratios_Jan08.pdf.

3.3.4. Interest Payments to Export Earnings Ratio

The ratio of average interest payments to export earnings indicates terms of external indebtedness and thus serves as a key indicator for assessing the debt burden of a country. The time profile of the ratio of interest payments to export earning is shown in Figure 3.4.

This ratio varied between 10 percent to 13 percent from 1970 to 1978. Interest payments on external debt took up 16 percent of export earnings in 1985. In 1997, this ratio decline to 12 percent. After that the ratio is showing a declining trend.

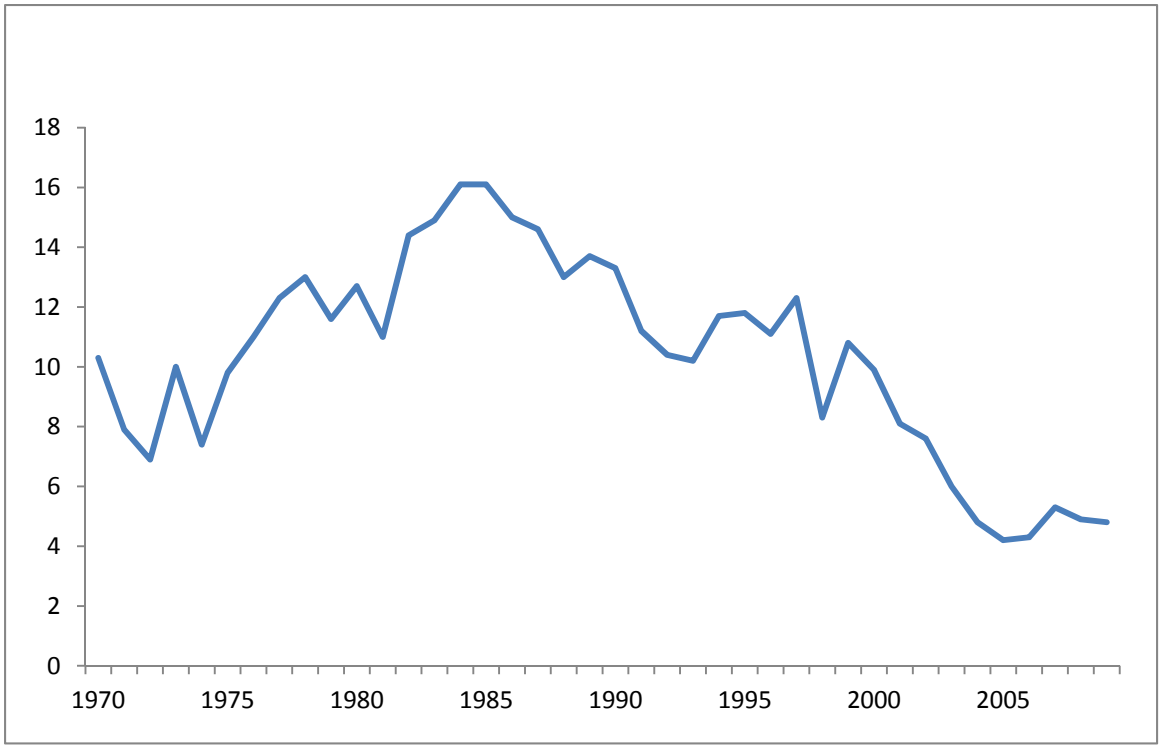

Figure 3.4: Interest Payments as a percent of Export Earnings

3.3.5. External Debt to Reserves Ratio

External debt to reserve ratio is another important indicator of indebtedness of a country. The External Debt to Reserve Ratio is presented in Figure 3.5.

Figure 3.5 presents the time pattern of external debt to reserves ratio. The figure shows this ratio decreases from 10 percent in 1971 to 7 percent in 1974 and to 4 percent in 1983. With a sharpe increase, the ratio reached to 20 percent in 1991 and then abrupt decline to 7 percent in 1994. After reaching 22 percent in 1996, this ratio is showing a declining trend reaching to its lowest value 2.6 percent in 2007.

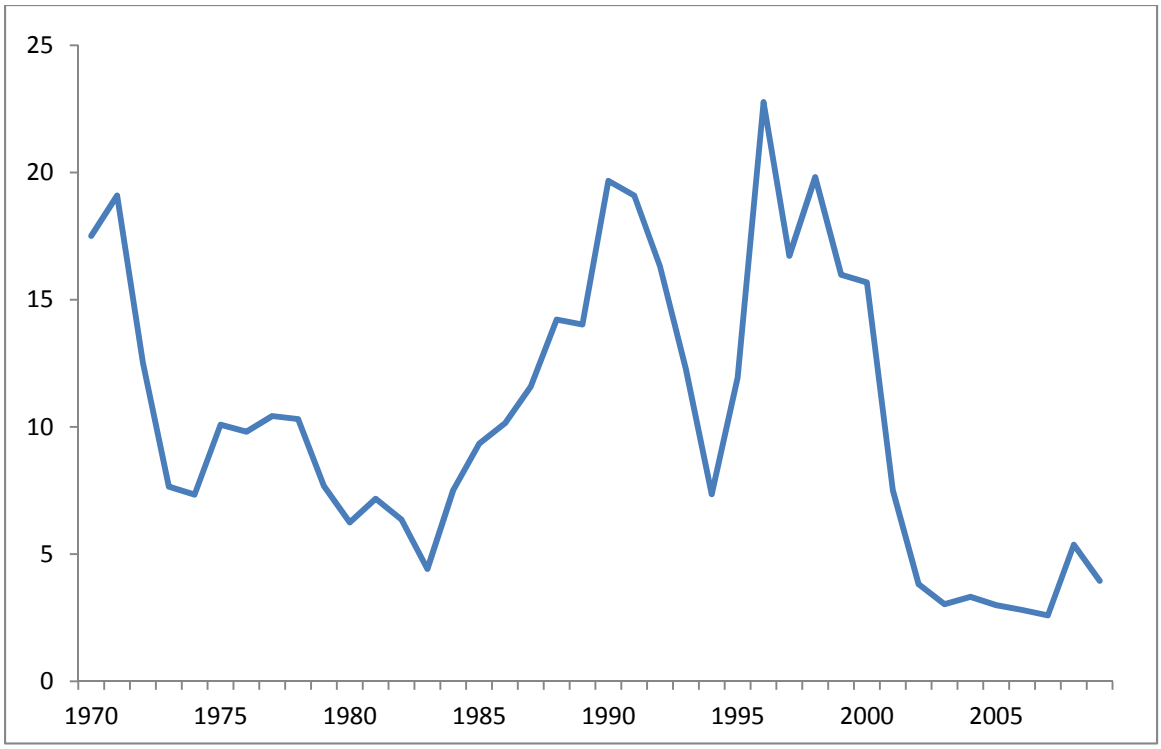

Figure 3.5: External Debt to Reserve Ratio

3.3.6. Short Term Debt to Total External Debt Ratio

The ratio of short-term external debt to total external indicates the reliance on short term financing. Short-term debts are usually made on less preferable terms, and a high ratio of short-term debt to total debt can be taken as a sign of weak economy.

Figure 3.6 shows the trend in the ratio of short term debt to total external debt. This ratio increased nearly continuously from a minimum of 3 percent in 1976 to 8.64 percent in 1981. Then the ratio decreases to 6 percent in 1982 and then it sharply increase

to 17.7 percent in 1991. Then this suddenly decline to 7 percent in 7 percent in 1994. In 1995 the ratio increases to 10.72 percent. After that the ratio is also showing a declining trend, and reaching to the value 2.7 percent in 2009.

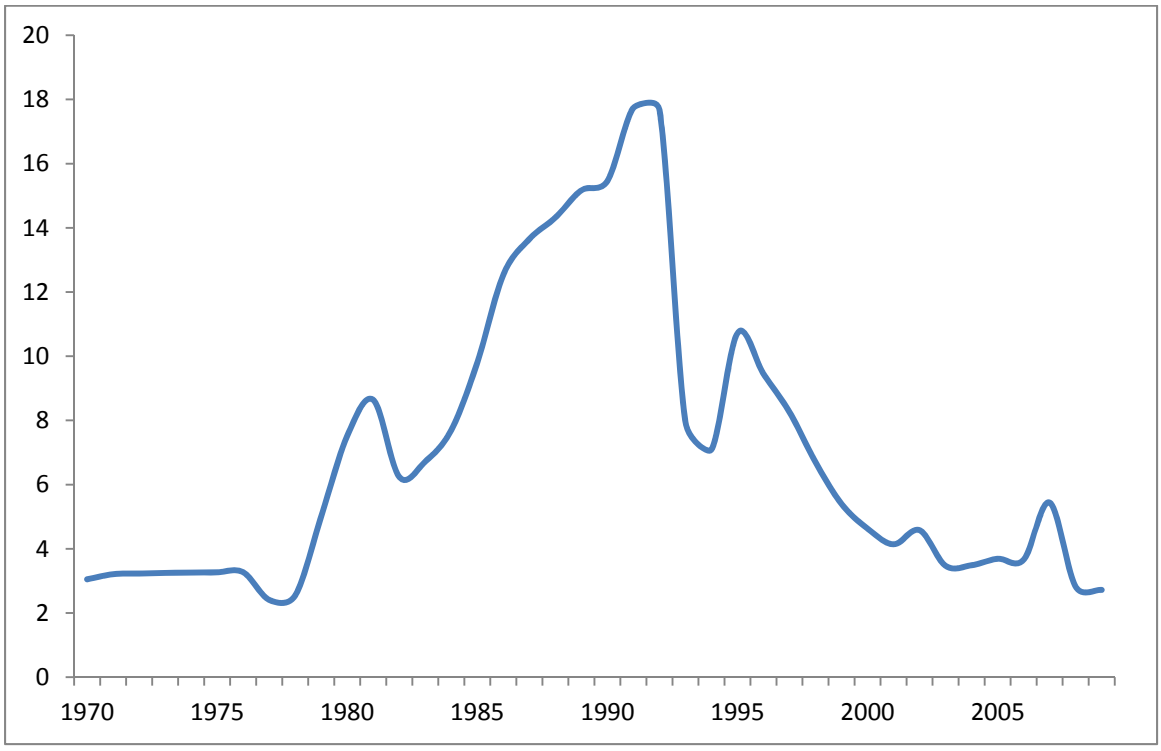

Figure 3.6: Short term external debt as a percent of Total external debt

3.3.7. Multilateral and Bilateral External debt

The two main institutional sources of external debt are bilateral and multilateral external debt. Bilateral external debt was the major sources of external debt uptill 1992. After 1992 there was a significant increase in the share of external debt from multilateral sources. The reason of this may be that in 1990 Pakistan adoped the Structural Adjustmen Program of IMF and World Bank. The time pattern of bilateral and multilateral debts are shown in figure 3.7 . The figure which clearly shows a significant shift from bilateral to multilaeral debt from the 1970s through the 1980s and till the mid 1990s. thereafter , the composition of debt has remained more or less stable.

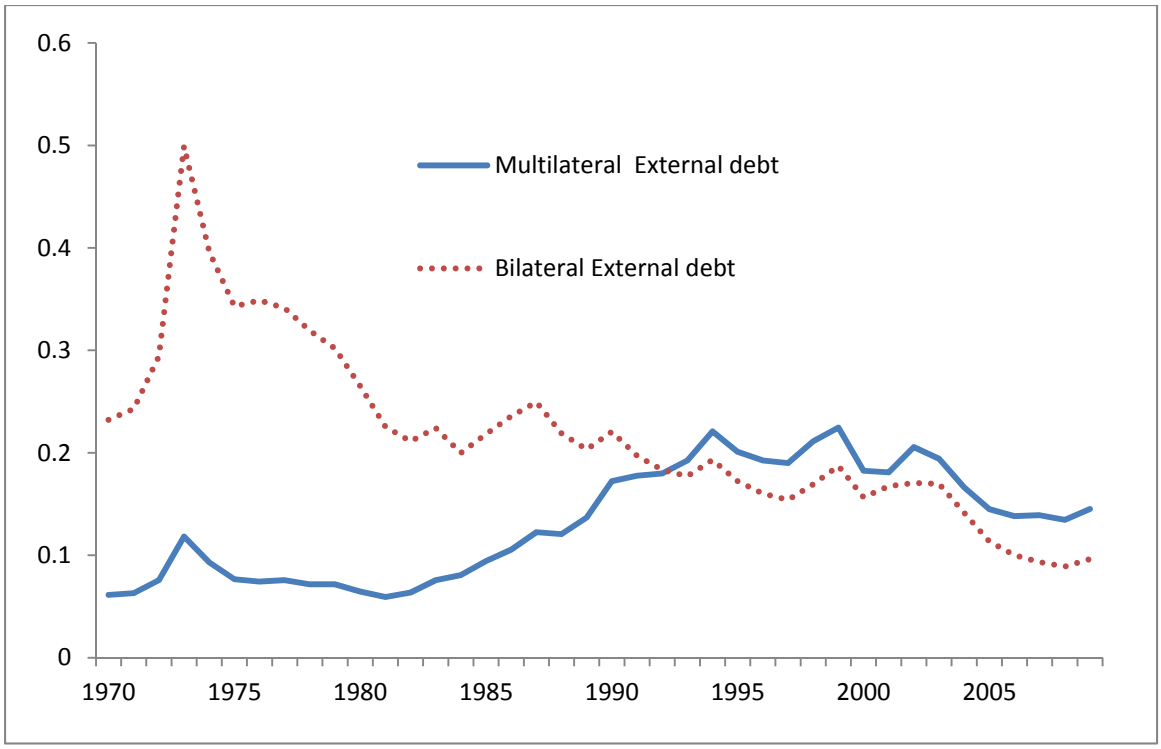

Figure 3.7: External Debt inflow by Source

3.4. Conclusion

Pakistan's experience of external debt over the last several decades has not been all satisfactory. The country has accumulated an enormously large amount of external debt without having developed the socio-economic infrastructure necessary to sustain a growth process (Ahmed and Amjad, 1985).

The graph of external debt indicators shows that economy of Pakistan precarious with unsustainable external debts. The main cause of increase in external debt is inappropriate utilization of external debt in the form of wasteful government spending, and financing of current expenditure, and investing in low priority development projects. Inappropriate utilization of external debt is believed to have negative impact on the economic development of a country.

CHAPTER 4

Theoretical Framework for Nonlinear Debt Growth Relationship

4.1. Introduction

In the empirical literature a growing number of studies have found that the relationship between economic growth and foreign debt is non-linear. Initially, foreign debt affects growth positively and then, after a certain threshold level, increasing foreign debt affects growth adversely. (See, for instance Elbadawi *et al*., 1997 and Pattillo *et al*., 2002).

That is, initially foreign debt increases the growth rate of the economy, reaches a optimal level, then beyond a certain threshold foreign debt level, foreign debt affects growth adversely as the negative effect of the debt service payments and the disincentive effect of debt overhang dominate. Thus the key issue is to find the threshold foreign debt level that maximizes the growth rate. However, this issue has been generally ignored in the theoretical literature. The theoretical model presented in this chapter is taken from Assefa (2005).

4.2. Basic Structure

Production Function

Firms produce goods and services using labor and capital as inputs. It is assumed that government spends on infrastructure that enhances the productivity of private capital. The output of the single domestic good depends on domestic private capital and public capital. Thus the production function is specified as:

$$Y = AK^{1-\alpha}K_G^{\alpha} \quad 0 < \alpha < 1 \text{ and A} > 0 \qquad (1)$$

In the above specification, Y is output, K is the private capital stock, and K_G is public capital. The production function exhibits diminishing returns with respect to each of the inputs but constant returns to scale over the two inputs jointly. Public capital enhances the productivity of private capital. We assume that there is no depreciation or adjustment cost in both private and public capital. Labor is not included in the model and we can think of private capital as being a composite of both physical and human capital. Suppose the public capital to private capital ratio is denoted by p, equation (1) can also be rewritten as

$$Y = Ap^{\alpha}K \tag{2}$$

Household Sector

Utility function of the representative infinitely lived household is given by:

$$U = \int_0^{\infty} \frac{\sigma}{\sigma-1} C_t^{\frac{\sigma-1}{\sigma}} e^{-\rho t} dt \quad \sigma > 0, \rho > 0 \tag{3}$$

There is no population growth. The parameters are σ, ρ are the consumer's rate of time preference and the elasticity of intertemporal substitution respectively. Since the emphasis is on foreign public debt, domestic public debt is ignored. It is only the government that can borrow from the world market; individuals do not have access to international financial market. Thus, setting private saving equal to private investment the representative agent's instantaneous budget constraint can be written as:

$$\dot{K} = (1-t)Y - C \tag{4}$$

Where Y is output and t is the income tax rate.

Government

The budget constraint of the government is given as:

$$\dot{F} = r(z)F + I_G - tY \tag{5a}$$

Where, I_G is public investment, F denotes the stock of foreign public debt, z represents the foreign public debt to private capital ratio, and r (z) is the interest rate. Government is this model collects taxes from income, borrows internationally and invests in capital.

Public investment is specified as:

$$\dot{K}_G = I_G \tag{5b}$$

The interest rate faced by the small economy in the international market is given by

$$r(z) = r^* + \Psi(z) \tag{6}$$

$$\Psi'(z)>0,\ \Psi''(z)>0, z = \frac{F}{K},\ z > 0.$$

where r* is the exogenous constant world interest rate, $\Psi(z)$ is a country specific risk premium over the world interest rate and it is assumed to be an increasing function of foreign debt to capital ratio, z. That is $\Psi'(z) >0$, the higher the foreign debt to capital ratio, the higher is the risk premium and hence the cost of borrowing.[4] This specification this implies that higher foreign public debt to capital ratio is associated with higher risk of default.

Balanced Growth Path

Along the balanced growth path C, F, K, K_G, and Y all grow at the rate γ that will be determined later. Thus corresponding to equation (5a), the interternporal budget constraint of the government can be written as:

$$tAp^{\alpha} - p\gamma = (r(z) - \gamma)z \tag{7}$$

[4]The choice of the foreign debt to capital ratio as a measure of the debt servicing capacity of a country is common in the literature. See Turnovsky (1997).

Assuming the tax rate and public capital as given and K_o (initial value of capital)>0, representative household selects C and K such that utility function is maximized with respect to the budget constraint given by equation (4). Thus, the current period Hamiltonian of the optimization problem is given as:

$$H = \frac{\sigma}{\sigma-1}\left[C^{\frac{\sigma-1}{\sigma}}\right] + \lambda[(1-t)AK^{1-\alpha}K_G^{\alpha} - C] \tag{8}$$

The first order conditions of the Hamiltonian with respect to C and K are, respectively given by:

$$C^{\frac{-1}{\sigma}} = \lambda \tag{9a}$$

$$\rho - \frac{\dot{\lambda}}{\lambda} = [(1-t)(1-\ \alpha)A\left(\frac{K_G}{K}\right)^{\alpha}] \tag{9b}$$

The transversality condition is:

$$\lim_{t\to\infty} \lambda K(t)\, e^{-\rho t} = 0 \tag{9c}$$

Equation (8a) implies that in equilibrium, the marginal utility of consumption equals the marginal utility of wealth or the shadow value of capital. Taking the time derivative of (8a) and using (8b), the growth rate of consumption can be expressed as:

$$\gamma = \frac{\dot{C}}{C} = \sigma[(1-t)(1-\ \alpha)A(p)^{\alpha} - \rho] \tag{10}$$

Along the balanced growth path C, K,K_G and Y all grow at the rate γ shown in equation (10). Equation (10) shows that the growth rate is the function of two fiscal instruments: the tax rate and the public capital to private capital ratio. From equation (10), we can see that while the income tax rate reduces the growth rate, the public to private capital ratio increases the growth rate. Differentiating the equation (10) with respect to t and p yields :

$$\frac{\partial \gamma}{\partial t} = -(1-\alpha)\sigma A p^{\alpha} \; < \; 0 \qquad (11a)$$

$$\frac{\partial \gamma}{\partial p} = \alpha\sigma(1-t)(1-\alpha)\sigma A p^{\alpha-1} \; > \; 0 \qquad (11b)$$

Equation (11a) shows that for a given public capital ratio, an increase in the distortionary tax rate reduces the long-run growth rate. Thus, an increase in debt service payments, for a given public capital ratio, requires raising the tax rate and, hence, affects the growth rate adversely. Equation (11b), on the other hand, implies that for a given tax rate, an increase in the public capital ratio increases the growth rate. That is, the model suggests that a foreign borrowing, financed increase in the public capital ratio increases the growth rate.

Suppose g denotes the public investment to output ratio. Then equation (5b) can be rewritten as $\dot{K}_G = I_G = gY$. Combining the budget constraint of the representative agent (equation (4)) and the government budget constraint of equation (5a) and noting equation (5b), for a given external public debt to capital ratio (z), we can express the aggregate resource constraint of the economy as:

$$\dot{K} = \frac{1}{1-z}[(1-g)AK^{1-\alpha}K_G^{\alpha} - r(z)zK - C] \qquad (12)$$

In order to discuss the steady state and the transitional dynamics, it is convenient to express the relevant variables as ratios of private capital. Thus, we denote the consumption to private capital ratio by c. The equilibrium dynamics of the decentralized economy can be expressed as:

$$\frac{\dot{c}}{c} = \frac{\dot{C}}{C} - \frac{\dot{K}}{K} = \sigma\left[(1-t)(1-\alpha)A\left(\frac{K_G}{K}\right)^{\alpha} - \rho\right] - \frac{1}{1-z}[(1-g)Ap^{\alpha} - r(z)z - c] \qquad (13a)$$

$$\frac{\dot{p}}{p} = \frac{\dot{K_G}}{K_G} - \frac{\dot{K}}{K} = gAp^{\alpha-1} - \frac{1}{1-z}[(1-g)Ap^{\alpha} - r(z)z - c] \qquad (13b)$$

Equation (13a) shows the growth rate of the consumption to private capital ratio and is obtained from equations (9) and (12). The growth rate of public capital from equation (5b) , noting that g denotes the public investment to output ratio, along with the aggregate resource constraint of equation (12) gives equation (13b).

In the steady state, consumption, private capital and public capital all grow at the same rate. This implies that in the steady $\dot{c} = \dot{p} = 0$. Thus, from equations (13a) and (13b), the steady state equilibrium in the economy is given by the following two equations (where asterisks denote steady state values of the variables).

$$\sigma(1-z)[(1-t)(1-\alpha)A(p^*)^{\alpha} - \rho] = [(1-g)A(p^*)^{\alpha} - r(z)z - c^*] \quad (14a)$$

$$(1-z)gA(p^*)^{\alpha-1} = [(1-g)A(p^*)^{\alpha} - r(z)z - c^*] \quad (14b)$$

The above two equations determine the steady state values of the public capital to private capital ratio and the consumption to private capital ratio. One can analyze the transitional dynamics of the decentralized economy by linearizing equations (13a) and (13b) around the steady state values c* and p*.

4.2. External Public Debt and Economic Growth

This section analyzes the non-linear relationship between external public debt and economic growth. Moreover, the possible channels through which external public debt affects the growth rate will be explored.

The government is assumed to finance public investment through foreign capital inflow. The assumption that foreign borrowing finances public investment implies that:

$$\dot{K}_G = \theta \dot{F} \quad (21)$$

Where θ is the proportion of the flow of foreign borrowing that is used to finance public investment[5].

Previously, we have seen that the tax rate and public capital ratio affect the growth rate. Thus, external public debt affects the growth rate if it affects these fiscal policy instruments. From equation (10) we can see that the impact of external public debt ratio on the long run growth rate is given as:

$$\frac{\partial \gamma}{\partial z} = -(1-\alpha)\sigma A p^{\alpha}\left[\frac{dt}{dz} + \frac{\alpha(1-t)}{p}.\frac{dp}{dz}\right] \quad (22)$$

Equation (22) shows that growth is adversely affected by the excessive external public debt. Higher external debt implies higher debt service payments which lead to higher current tax rate or lower productive government spending. A higher tax rate or lower government spending leads to lower growth. Thus, the transmission mechanisms are current taxes and productive government expenditure.

A direct link between the external public debt ratio and the growth rate can be established by explicitly taking into account how the government finances the public investment. Note that for a given θ, equation (21) implies that $K_G = \theta$ F. Substituting this into equation (10) and noting that $z = F/K$, we get:

$$\gamma = \sigma[(1-t)(1-\alpha)A\theta^{\alpha}z^{\alpha} - \rho] \quad (23)$$

Equation (23) shows that the growth rate depends on the tax rate and the external public debt ratio. For a given tax rate, growth rate is positively affected by higher external public debt ratio. This is because the public debt is used to accumulate public capital that enhances productivity. However, government budget constraint shows that we

[5] For instance for private foreign borrowing Barro *et al*. (1995) assume that private capital equals to foreign debt, i.e., K=F. See also Cohen and Sachs (1986) for a similar assumption.

cannot increase public capital by just accumulating more external public debt without increasing the tax rate because of rising risk premium on outstanding debt, and the solvency condition.

The tax rate depends on the external public debt ratio. A higher external public debt ratio implies more external public debt service payments. For the government to remain solvent, this requires a higher tax rate. Or, a larger part of the flow of foreign borrowing will be channeled to financing debt service payments and the rate of public capital accumulation will be lower. However, for a given proportion of external public borrowing channeled to public investment (θ), higher external public debt results in a higher tax rate. This in turn affects the growth rate adversely.

Thus for given values of r, z, A,α,θ,σ, and ρ the model can be summarized with the following equations:

$$p = \theta z \tag{24a}$$

$$t = \frac{r(z)z - \sigma(1-\theta)z[(1-\alpha)A\theta^{\alpha}z^{\alpha} - \rho]}{A\theta^{\alpha}z^{\alpha}[1-\sigma(1-\alpha)(1-\theta)z]} \tag{24b}$$

$$\gamma = \frac{\sigma[(1-\theta)A\theta^{\alpha}z^{\alpha} - (1-\alpha)r(z)z - \rho]}{[1-\sigma(1-\alpha)(1-\theta)z]} \tag{24c}$$

Equations (24a) to (24c) express the public capital ratio, the tax rate, and the growth rate in terms of external public debt ratio (z) and the structural parameters. Notice that equation (24a) is simply the result of our assumption as to how the government uses the flow of external borrowing and is obtained from equation (21) for a given level of θ.

Plugging equation (24a) into the growth rate expression of equation (10) and substituting the resulting growth rate expression into the government's intertemporal

budget constraint of equation (7) yields equation (24b). And finally, we obtain equation (24c) by substituting equation (24b) into equation (23). Thus, equations (24b) and (24c) summarize the implication of the assumption about public investment financing on the simple model.

We have seen previously that the tax rate affects the growth rate adversely while the public capital affects the growth rate favorably. Equations (24a) and (24b), on the other hand, show that external public debt affects both the tax rate and the public capital ratio. Thus external public debt ratio affects the growth rate through its effect on the tax rate and the public capital ratio. That is, in so far as the resources obtained through external public debt accumulation are invested productively, external public debt has both a contractionary and a stimulating effect on the economy. Indeed, equation (24c) shows that external public debt has two opposite effects on the growth rate. While the interest payment affects the growth rate adversely, the accumulation of public capital financed by foreign public debt creating inflows affects the growth rate positively. Thus, the net effect of external public debt on the long-run growth rate depends on the relative strengths of the two opposite effects. Along the balanced growth path differentiating equation (24c) with respect to the external public debt ratio, we obtain:

$$\frac{d\gamma}{dz} = \frac{\sigma(1-\alpha)}{\pi^2}\{A\theta^{\alpha}z^{\alpha-1}(\alpha\pi + \eta z) - r(z) - \pi r'(z)z - \sigma(1-\theta)\rho\} \qquad (25)$$

where $\eta = \sigma(1-\theta)(1-\alpha)$ and $\pi = 1 - \eta z$

Suppose that the interest rate equation (6) takes the following specific form[6]:

$$r(z) = r_w + \beta z^2 \qquad (26)$$

[6] See Harberger (1985), Glenn (1997), and Schmitt-Grohe and Uribe (2003)

Where $0 \leq \beta \leq 1$ is the risk premium country is facing in the international market and r_w is the exogenous world interest rate. The rational for using the quadratic form is that the more you borrow the more interest you will be required to pay.

The growth maximizing external public debt ratio is obtained by setting the derivate in equation (25) equals to zero. Substituting equation (26) into equation (25) and setting the result equal to zero gives the following equation:

$$2\beta z^{*3}\eta + (1-\alpha)\eta A\theta^{\alpha} z^{*\alpha} + \alpha A\theta^{\alpha} z^{*\alpha-1} = r_w + \sigma(1-\theta)\rho \qquad (27)$$

Equation (27) is non-linear in z^* and to obtain the solution for the growth maximizing external public debt ratio. Assefa, (2005) made certain simplifying assumptions that country does not face the risk premium in international borrowing (i.e.$\beta = 0$) and all the flow of external borrowing is used to finance public investment (i.e., θ =1)[7], then from equation (27) the optimal external public debt ratio is given by:

$$z^* = \left(\frac{\alpha A}{r_w}\right)^{\frac{1}{1-\alpha}} \qquad (28)$$

The growth maximizing external public debt ratio depends on the elasticity of output with respect to public capital (α), the interest rate and the technology parameter. The growth maximizing external public debt ratio will be higher if the interest rate is lower or if the elasticity of output with respect to public capital is higher. In this model, as the external public debt creating-inflows finance public capital accumulation, it is not surprising to see that the growth maximizing external public debt ratio depends on the interest rate (which is the cost) and the elasticity of output with respect to public capital.

[7] Such simplifying assumption is not uncommon in the literature. For instance, Pitchford (1970) and Bade (1972) also assume that all foreign borrowing is used for productive purposes.

4.3. Conclusion

The finding of a positive growth maximizing external public debt to capital ratio has an important implication for the relationship between external public debt and economic growth. The existence of a growth maximizing external public debt ratio implies that the relationship between external public debt and the long run growth rate depends on whether the external public debt to capital ratio is above or below the critical value, z*. Specifically, the marginal effect of external public debt on the growth rate is positive below z* but negative above z*. Thus, if a certain fraction of the inflow of external public borrowing is used to finance public investment, then there is a critical level of external public debt to capital ratio beyond which the marginal impact of external public debt on the growth rate becomes negative.

The lesson learnt in this chapter will be incremental in proposing a number of econometrics models to study the debt-growth relationship in the next chapter.

CHAPTER 5

MODELS OF EXTERNAL DEBT-GROWTH NEXUS

5.1. Introduction

This chapter firstly presents the model used to estimate the external debt-growth relationship and then discusses the various specifications that are employed to model the issues of macroeconomic policies, source structure of total external debt (multilateral external debt versus bilateral external debt) and external debt Laffer curve.

5.2. The External Debt-Growth Model

Growth is inevitability related to a country's indebtedness. A country needs resources in order to develop and grow. In general most of the resources are generated domestically but developing countries often need external resources and have to borrow from outside. History shows that many advanced countries borrowed during their development phases. Hong Kong, Singapore, South Korea, Taiwan, also known as the Newly Industrialized Countries, is examples of this borrowing phenomenon.

The original explanation for why external debt may deter growth in developing countries comes from Krugman (1988) and Sachs (1989) in the form of debt overhang hypothesis. The debt overhang situation arises when a country has accumulated so much external debt relative to its income/repayment ability that it cannot fully meet the external debt servicing obligations without borrowing further and/or increasing taxes. Since the government has already over borrowed any further borrowing is unlikely or at least very limited, the only viable option the government has is to increase taxes. Therefore, high debt induces investors to cut back on their investments because they perceive a large

external debt stock as higher future taxes on their investments. The implication is that the resulting lower investment slows down the growth of output.

The external debt may have positive or negative impact on growth. The external debt may boost growth if it increases saving, investment and thus growth. On the other hand, external debt may have negative impact on growth if debt overhang hypothesis holds.

Apart from the negative effect of debt overhang, external debt may also have a crowding out effect. That is, external debt service payments require resources to be transferred away from domestic use. Thus, higher debt-service is likely to crowd out investment and public spending given limited government revenues. This crowding-out of public spending on infrastructure, health and education becomes particularly acute, once all the other government sources, such as foreign reserves have been used up in servicing the debt. Because of the crowding out effect explained above we expect the relationship of growth with external debt to be negative. To capture the crowding out effect the external debt to export ratio is included in the equation.

GDP is affected by many other important variables. so this study include the vector of control variables includes variables that are deemed to be essential in explaining growth and include: inflation rate, budget deficit to GDP ratio, secondary school enrollment ratio and trade openness which is measured as export plus import to GDP ratio.

The following paragraphs discuss the justification of each control variable included in the equation. Prices play an important role in an economy by giving the different agents signal in their attempts to allocate resources efficiently. High and rapidly

increasing prices distort this role of prices. Thus a high level of inflation may be inimical to growth by adversely affecting the decision-making effort of agents (see Barro (1997) and Khan and Senhadji (2001) for details). Thus, we expect inflation to adversely affect growth.

Fiscal position of government is another determinant of growth. Studies of Fischer (1993) and Easterly and Rebelo (1993) examined the role of fiscal policy in determining the growth of output. They found that large and consist budget deficits are negatively correlated with the growth. Thus, a balanced budget should have a positive effect reflecting macroeconomic stability.

Human capital is another important variable in explaining growth. Thus the model includes human capital measured by secondary school enrolment rate. Human capital is expected to have a positive impact on growth because educated and skilled people tend to be more productive.

Openness, measured by the total trade as a ratio of GDP reflects how quickly and easily a country is able to trade and adopts foreign technology. An economy with a more open trade policy can quickly adopt the newly developed ideas and equipment's from the rest of the world than an economy with a restricted trade policy. This is particularly important for developing countries, as the rate at which they can trade and implement the new technologies is central to their growth. However, this is based on the assumption that new technologies will increase the efficiency of output, which requires not only an open trade policy but also the provision of necessary skills and trainings to labor force. Gallup *et al.* (1998) showed that open economies are generally in a better position to import new technologies and new ideas from the rest of the world as compared to closed economies.

Similarly, countries that are more open to the international markets can generally export more. Therefore, we expect the trade openness to have positive effect on growth (Barro (1997), Easterly and Levine (1997), and Collier and Gunning (1999)).

We now present a few models explaining the role of external debt in growth. To assess the impact of external debt on growth, debt variables are included in the standard growth model. The empirical specification of the external debt-growth model is based on the studies by Elbadawi *et al.* (1997), Pattillo *et al.* (2002, 2004) and Hansen (2004). The basic model estimated in this study is of the following form.

$$GDP_t = f(ED_t, DSX_t, INF_t, BDG_t, SER_t TO_t, \varepsilon_t) \quad (5.1)$$

Where GDP is the log of real GDP (dependent variable),

ED stands for ratio of external debt to GDP,

DSX is the external debt service to export ratio,

INF is the inflation rate,

BDG is the budget deficit to GDP ratio,

SER is the secondary school enrollment ratio included as a proxy for human capital,

TO stands for trade openness, measured as export plus import to GDP ratio.

In the theoretical framework presented in the chapter 4, we have seen that excessive external public debt and the associated debt service payments affect growth adversely.

So far, the model has not taken into account the role of macroeconomic policies in the context of debt growth relationship. Stable macroeconomic environment and fewer distortions make capital inflows more effective. Distortionary policies, on the other hand, tend to reduce the efficiency of capital investment and thus the growth.

Burnside and Dollar (1997, 2000, 2004) focus on the necessity of sound monetary, fiscal and trade policies as conducive for sustainable growth. A country with sound policy-making would be one with low inflation, small fiscal imbalance and an open trade regime. They incorporate aid and aid-policy (Aid*pol) interactive term into the neoclassical growth framework. The main message of their studies is that aid works only when government policies are good.

According to Fischer (1993), causation runs from good macroeconomic policy towards economic growth. He argues that growth is negatively associated with high inflation, large budget deficits, and distorted foreign exchange market. High inflation creates the uncertainty which reduces incentives for investment and thus growth. Budget deficit also reduces both capital accumulation and productivity growth. Most of the studies found that a low inflation rate stimulates growth, or in other words the stabilization of inflation is necessary for growth.

Similarly, balanced budget is generally likely to have positive impact on growth. Radelet *et al*. (2006) suggest that non-inflationary monetary policy and low budget deficits are essential for savings and for accumulating capital. High inflation and large budget deficits cause the financial instability and discourage the savings and investment. The study of Zafar and Zahid (1998) regarding Pakistan concludes that budget deficit has negative impact on real GDP and per capita real GDP. Higher budget deficit crowds out private investment by increasing the interest rate. Secondly, budget deficit is financed through taxation, which lowers the incentive for saving and investment.

Openness of trade is considered an important factor which can increase growth through several ways, it provides access to sophisticated technology and variety of inputs

for production from abroad and it increases the efficiency of domestic markets through increased specialization by providing access to markets abroad.

Hudson and Mosley (2001) mentioned two reasons for the inclusion of policy variables in the regression model. First, to consider the possibility that countries with a good policy environment grow faster, regardless of the levels of other important variables. Second, there is possibility that in the presence of good policy environment, aid is more likely to translate into investment.

Tiruneh (2003) argues that in order to analyze the impact of external debt on economic growth, external debt might not be used in aggregate form. The empirical models in which external debt is taken in aggregate form and all its components are assumed to have the same effect on economic growth, may give misleading results. For example, the rational for decomposing the total external debt into bilateral external debt and multilateral external debt is that the bilateral external debt is strategically and politically driven rather than policy or poverty focused. Therefore, its impact on economic growth can be negative. In contrast, multilateral external debt can promote economic growth because it is policy or poverty driven to some extent and is often accompanied by low interest rates. So, it is expected to enhance economic growth.

So, external debt interacted with macroeconomic policies (ED*P) is added to the growth equation, to see whether the impact of external debt on growth is conditional on macroeconomic policies or not. And to see, the effect of composition of external debt on growth, the following model is estimated. That is;

$$GDP_t = f\left(ED_t\ ,\ ED_t\ P_t\ ,(MD_t/ED_t)\ ,SER_t\ ,\varepsilon_t\right) \qquad (5.2)$$

Where $ED_t\ P_t$ is the interactive term of macroeconomic policy and external debt.

(MD_t/ED_t) is the ratio of multilateral external debt to total external debt.

$ED_t P_t$ is external debt interacted with the variable representing macroeconomic policy index P_t. The macroeconomic policy is constructed as weighted average of inflation rate, budget deficit as a percent of GDP and trade openness. Inflation rate is used as a measure of monetary policy and the relevant literature suggests a negative impact of inflation on growth. Budget deficit to GDP ratio is used as a proxy for fiscal policy as suggested by Easterly and Rebelo (1993) and it is expected that high budget deficit negatively affect the growth. Trade openness is measured as export plus import to GDP ratio and positive relationship between GDP growth and trade openness is expected. MD_t/ED_t is the ratio of multilateral external debt to total external debt. We expect positive impact of multilateral external debt on growth as it can promote growth because it is policy or poverty driven issue to some extent; and is often accompanied by low interest rates. So, the coefficient of MD_t/ED_t is expected to be positive. The remaining variables have been defined previously.

Inflation, budget deficit and trade openness are omitted from the above debt growth model because external debt interacted with the macroeconomic police index is added to the above growth model, where the macroeconomic policy index is the weighted average of the inflation, budget deficit and trade openness. Inclusion of inflation, budget deficit and trade openness are expected to cause the problem of multicollinearity.

To allow for the possible non-linearity in the relationship of growth with external debt, the following growth equation is proposed.

$$GDP_t = f(ED_t, ED_t^2, (MD_t/ED_t), INF_t, BDG_t, SER_t, TO_t, \varepsilon_t) \quad (5.3)$$

Where, ED_t^2 is the square of external debt to GDP ratio.

The variables ED and ED^2 are included to take into account the possible nonlinear impact of external debt on growth. More specifically, in the above specification ED and ED^2 capture the impact of external debt below and above the threshold level, respectively. For nonlinear relationship between external debt and growth we expect a positive and negative coefficient of ED and ED^2 respectively.

The theoretical framework presented in chapter 4 predicts that there is a non-linear relationship between external public debt and growth. External public debt affects the growth through two channels. The first channel is the public capital ratio. The external public debt that is used to accumulate public capital affects the growth positively. The second channel is the tax rate. Financing external public debt requires the government to raise the tax rate, which in turn affects the growth adversely. Thus the net effect of external public debt on the growth rate depends on the relative strength of the two opposite effects.

5.3. Conclusion

This chapter develops a few models of external debt–growth nexus to analyze the impact of external debt on growth. A macroeconomic policy index is constructed to see whether external debt inflows work better in the presence of good policy environment. Total external debt is also decomposed into bilateral external debt and multilateral external debt and square of external debt is considered to analyze the separate contributions of these components of external debts to growth.

CHAPTER 6

DATA, VARIABLE CONSTRUCTION AND ECONOMETRICS ISSUES

6.1. Introduction

In this chapter data, variable construction and econometrics issues involved in the estimation process are discussed. Section 6.2 and 6.3 describe the variables used in the econometrics analysis and the data sources. Section 6.4 gives details about the construction of macroeconomic policy index. Then it gives some key descriptive statistics and bivariate correlation between variables used in the study. The last section discusses detail about the unit root test and Autoregressive Distributive Lag approach to cointegration.

6.2. Data Sources

The data on the variables used in this study are taken from various sources. The exact definition of variables and their data sources are briefly described in Table 6.1.

Table 6.1: Definitions, Sources and Expected Sign of the variables included in the regression.

Variable	Definition	Source
GDP	Log of Real GDP	World Bank World Development Indicators (WBWDI), 2001 (CD-ROM)
ED	Total External Debt to GDP ratio	Global Development

	"Total external debt is debt owed to nonresidents repayable in foreign currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt."	Finance Data Base of World Bank
$ED_t P_t$	Total External Debt to GDP ratio interacted with macroeconomic Policies	Global Development Finance Data Base of World Bank
ED^2	Total External Debt to GDP ratio square	Global Development Finance Data Base of World Bank
BD	"Bilateral External Debt to GDP Ratio, bilateral debt includes loans from governments and their agencies (including central banks), loans from autonomous bodies, and direct loans from official export credit agencies."	Global Development Finance Data Base of World Bank

MD	"Multilateral External Debt to GDP Ratio, multilateral loans include loans and credits from the World Bank, regional development banks, and other multilateral and intergovernmental agencies. Excluded are loans from funds administered by an international organization on behalf of a single donor government."	Global Development Finance Data Base of World Bank
BDG	Budget Deficit to GDP ratio	WDI (World Development Indicators)
INF	Inflation, The percentage change in the Consumer price index reflects macro- economic stability)	WDI (World Development Indicators)
SER	secondary school enrolment rate as a proxy for human capital Development.	Economic Survey of Pakistan
TO	Trade Openness, captures external shocks)	WDI (World Development Indicators)
MD_t/ED_t	Ratio of multilateral external debt to	WDI (World

	total external debt	Development Indicators)
P	Macroeconomic Policy Index constructed using inflation, Budget deficit to GDP and Trade openness.	Author's calculation.

6.3. Variables Construction

6.3.1 Ratio of Multilateral External Debt to Total External Debt

To analyze the impact of external debt on the growth, the ratio of multilateral external debt to total external debt MD_t/ED_t is constructed. Figure 6.1 shows the time path of the ratio of multilateral external debt to total external debt. In the beginning of 1970s, the Pakistan was confronted with a low multilateral external debt to total external debt ratio consisting of only 18 percent. However, this ratio started to increase and reached to 33.5 percent by the year 1990, thus being almost 2 times of higher than in 1971. From 1993 to 2001, this ratio remained at 41 percent. In 2000's, the ratio showed an increasing trend and reached to 49 percent. After that, it experienced a slight decline, reaching to 43 percent.

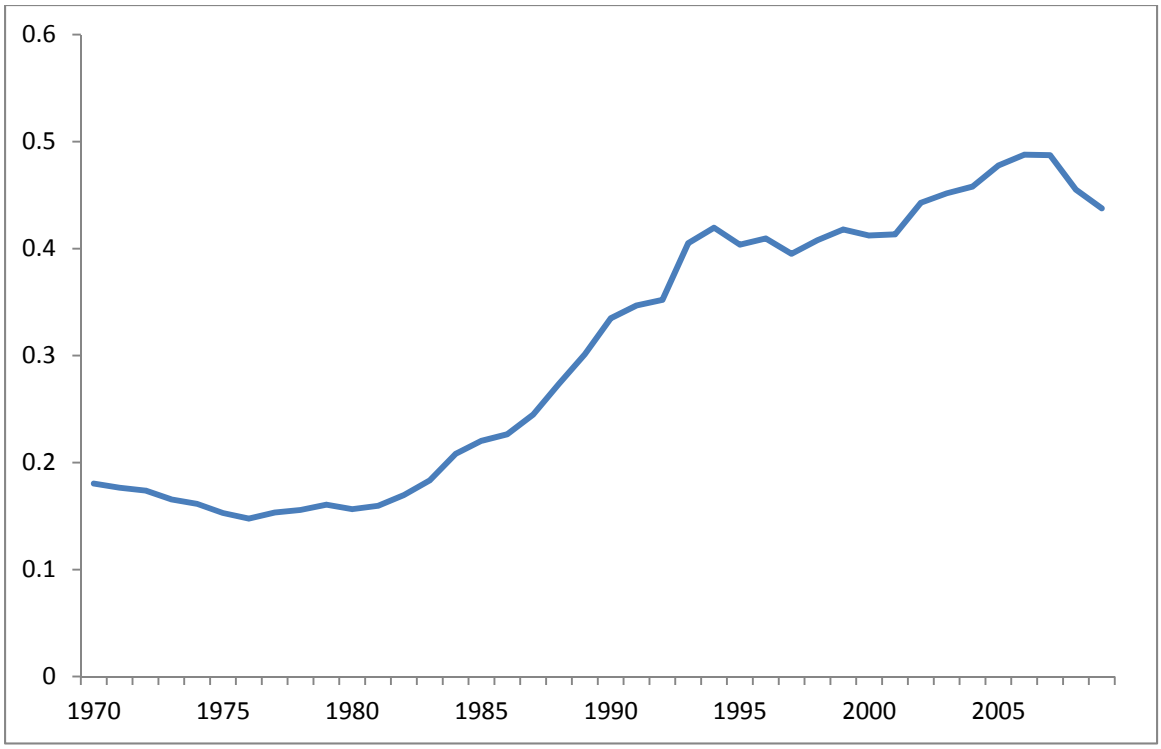

Figure 6.1: Ratio of multilateral external debt to total external debt

6.3.2 Construction of Macroeconomic Policy Index

Following the Burnside and Dollar technique (1997, 2000, 2004) the macroeconomic policy index is constructed as a weighted average of three macroeconomic policies *i.e.* monetary policy, fiscal policy and trade policy. The three policies are captured by inflation, budget deficit and trade openness. The weights are generated from the Principle Component analysis.

Various methodologies exist to construct indices, a subjective method (weighted average), a least-square regression model, and the principal component analysis.

Burnside and Dollar (1997) have used regression analysis to construct the macroeconomic policy index. The composite policy index is developed by using the following regression coefficients.

Policy=1.28+6.85*Budget surplus-1.40*Inflation+2.16*Openness.

The approach considered in this study is the principal component analysis. We intend not to use the least-square regression model for two reasons. First, with this methodology, weights are determined with a regression where the left-hand side variable would be the one we want to forecast later. Second, it would not be efficient to use regression analysis to find out the weights, because estimated parameters (weights) may be unstable because of multicollinearities.

Principal Component Analysis (PCA) is a method that allows reducing a system of highly correlated variables into a smaller number of dimensions, whose correlation is minimized.

The main objective of a PCA is to reduce the number of dimensions in the data without losing too much information. It is therefore vital to select the most important principal components. For this purpose, there exist a number of selection criteria. The one which is mostly used in PCA analysis is proposed by Kaiser (1960). Kaiser's approach is to retain components with eigenvalues greater than or equal to 1. In other words, unless a principal component explains at least as much of the variability as the original variable, it is not useful in explaining differences.

The Policy index for a period is based on the formula:

$$\text{Policy Index} = \alpha 1 \text{ inflation rate} + \alpha 2 \text{ budget deficit} + \alpha 3 \text{ trade openness}$$

where $\alpha 1$, $\alpha 2$ and $\alpha 3$ represent the normalized weights of the first principle component.

Table 6.2 shows the normalized weights of each variable to be used in constructing a policy variable.

Table 6.2: Weights of each variable

Variable	Normalized Weights
INF	-0.32876
BDG	-0.33509
TO	0.336151

So, on the basis of this we take

Policy Index = -0.32876* INF -0.33509* BD + 0.336151* TO

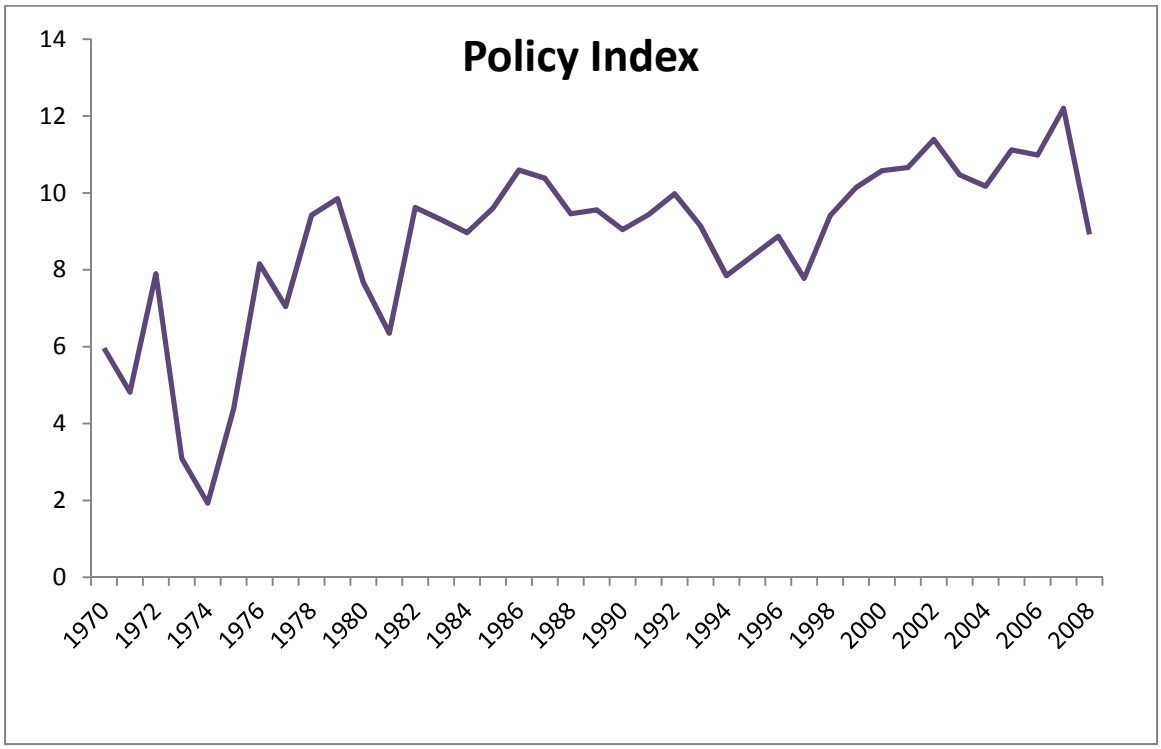

Figure 6.2 Graph of Policy Index

Unstable macroeconomic policies of Pakistan are depicted from the figure 6.2. There is sharp decline in the value of policy index in the early 1970's, due to high inflation and budget deficit of that period. High budget deficit and high inflation rate in early 1970s are the major causes of this. The dismemberment of Pakistan and oil price shock are the major events of early the 1970s. As a result, this period is marked with high inflation and high budget deficit. In 1980s, the movement of inflation rate and budget deficit somehow depicts inverse relationship. The period of 1980s are marked with high budget deficit and low inflation rates up to some extent as compared to the period 1990s which is characterized by high inflation rates and high budget deficits. The fiscal deficit that was significantly high in 1980s remained so in the 1990s. The average inflation rate in 1980s was 7.3% as compared to 12.2% in 1970s. However, the trends of inflation rate and budget deficit are reversed in the 1990s, characterized with high inflation rate and budget deficit episode which have negative impact on the policy index. In 1990, government of Pakistan adopted trade liberalization policy along with financial and tariff reforms, which showed some positive signs for the economy but failed to achieve the objective due to political instability, law and order situation as well as inconsistency in the macroeconomic policies. Nuclear tests, freezing of the foreign currency accounts and military takeover in 1999, further led down in the economy. The first five years of the 21st century were marked with low and stable inflation rate and budget deficit because of abundant inflow of capital in the form of remittances and aid that contributed to macroeconomic stability. After 2005, international financial crisis, high food and oil prices and the most terrible law and order situation badly deteriorated the macroeconomic stability in the country.

Figure 6.3 plots the inflation rate and macroeconomic policy index. It is interesting to note that the macroeconomic policy index (dotted line) tracks the inflation rate relatively well. Whenever inflation rate is high, the value of macroeconomic policy index is low.

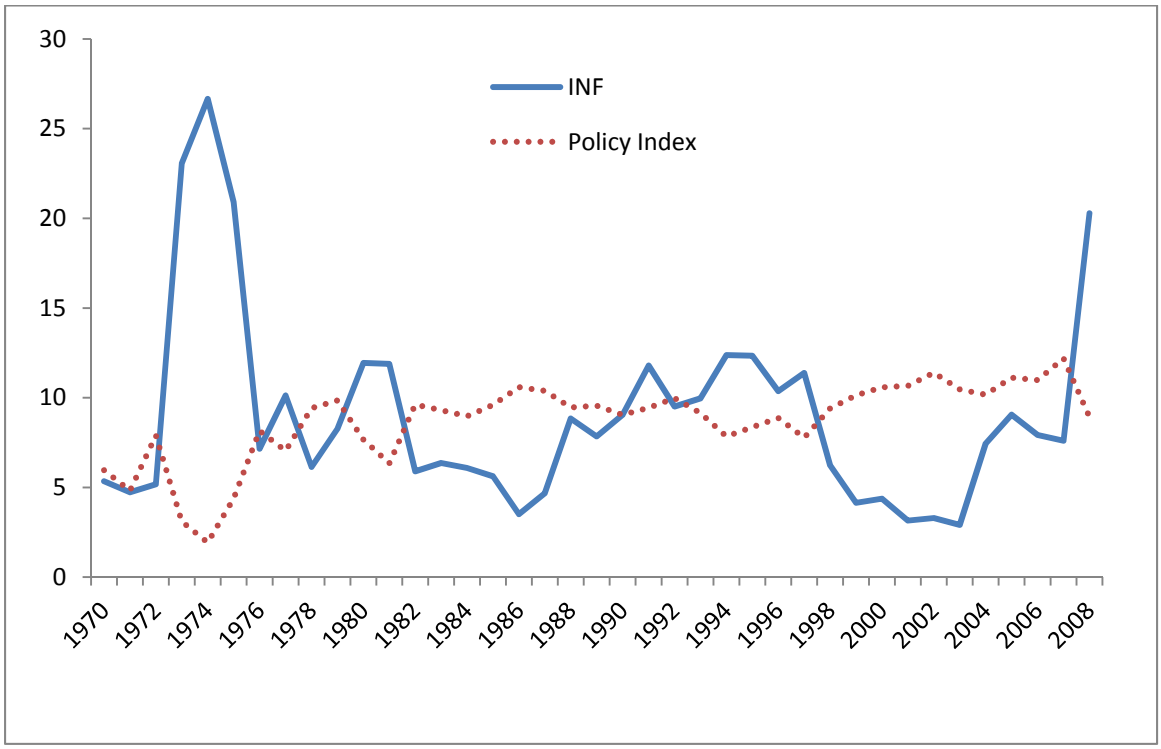

Figure 6.3: Inflation and Policy Index

Figure 6.3 and 6.5 plot the budget deficit to GDP ratio and trade openness each with the policy index. The policy index also appears to follow the budget deficit and trade openness variables fairly well.

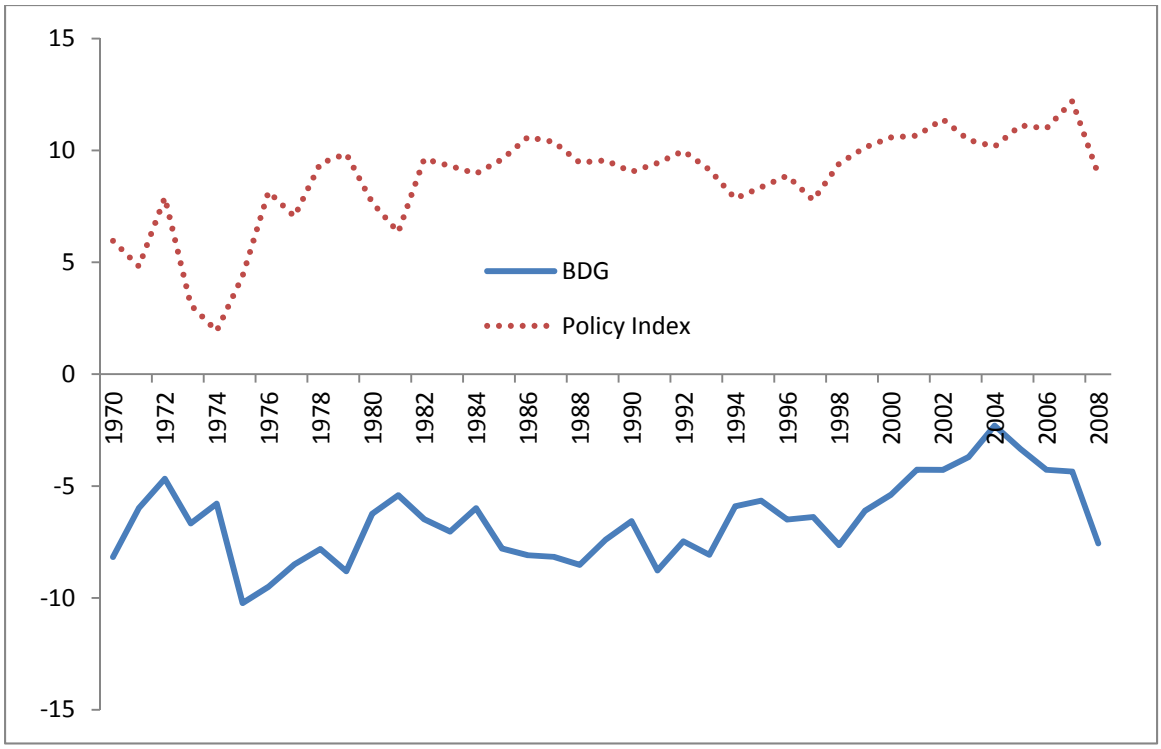

Figure 6-4 Budget Deficit and Policy Index

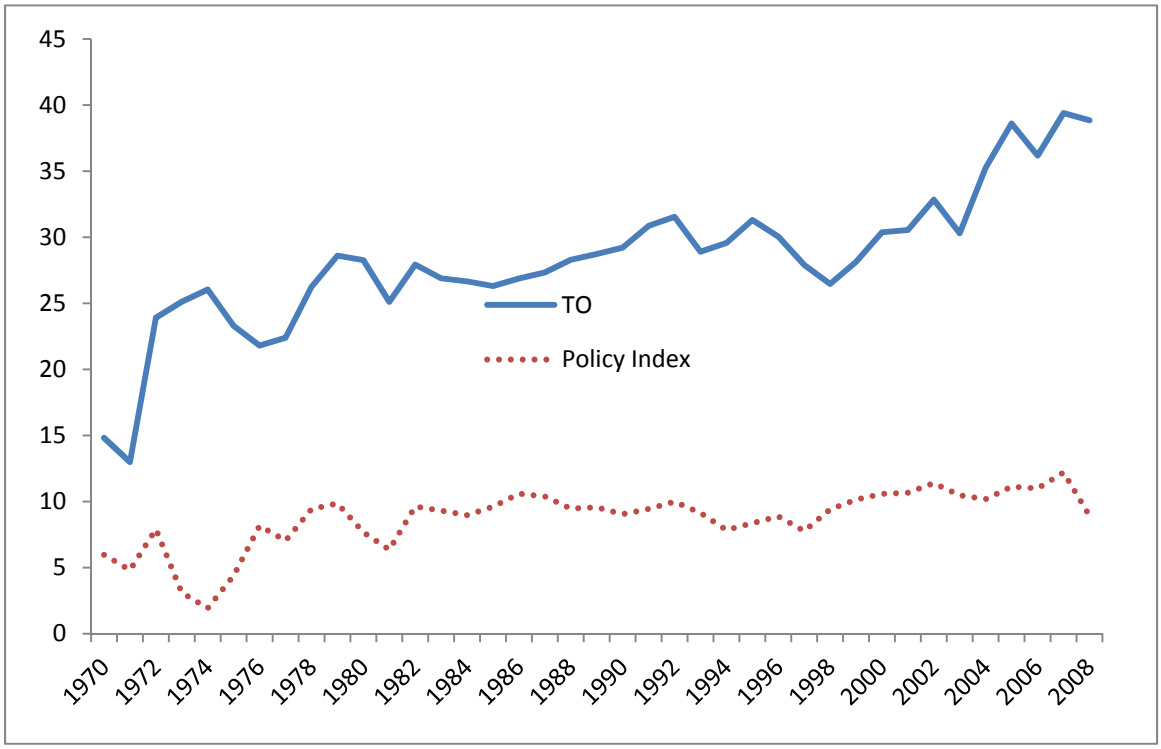

Figure 5-5 Trade Openness and Policy Index

6.4. Descriptive Statistics

Table 6.6 shows descriptive statistics for the variables used in this study. Two measures of the central tendency or the averages of the variables are used: mean and median. As we can see in Table 6.6, the mean and the median is almost same for all the variables expect inflation rate (INF), policy index (P) and external debt interacted with macroeconomic policies ($ED_t P_t$). This implies that the variables GDP, ED, ED^2, MD/ED, BDG, SER, TO have symmetrical distribution. The mean of inflation rate is greater than the median; this implies that inflation rate is positive skewed. Whereas the policy index and external debt interacted with macroeconomic policy index are negatively skewed because its mean is less than its median.

The spread of the variables is measured by the coefficient of variation, which is defined as the standard deviation divided by mean. According to coefficient of variation, GDP has the least variation ranging from 10.23 to 11.03. On the other hand inflation rate, policy index and external debt interacted with macroeconomic index are highly volatile variables as indicated by the minimum and maximum range and coefficient of variation.

Table 6.6: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Coefficient of Variation
GDP	10.64	10.68	11.03	10.23	0.02
ED	0.44	0.45	0.72	0.28	0.19
ED^2	0.2	0.2	0.51	0.08	0.39
BD	0.31	0.31	0.6	0.14	0.28
MD	0.13	0.13	0.22	0.05	0.41
MD_t/ED_t	0.29	0.29	0.48	0.14	0.41
SER	0	0	0	0	0
INF	0.05	0.05	0.09	0.03	0.3
TO	0.09	0.07	0.26	0.02	0.6
BDG	0.33	0.34	0.38	0.19	0.12
P	0.06	0.06	0.1	0.02	0.27
ED*P	5.01	5.49	10.11	-4.24	0.66

Table 6.7 presents the bivariate correlation coefficients between the variables used in the study. The correlation coefficient between the log of real GDP and other variables is as expected. The log of real GDP is negatively correlated with total external debt, bilateral external debt, inflation rate, budget deficit to GDP ratio. Whereas log of Real GDP is positively correlated with multilateral external debt, secondary school enrollment ratio, trade openness, macroeconomics policy index, and external debt interacted with macroeconomic policies.

Table 6.7: Correlation between the variables

	GDP	ED	ED^2	BD	MD	MD/ED	SER	INF	TO	BDG	P	ED.P
GDP	1											
ED	-0.34	1										
ED^2	-0.32	0.98	1									
BD	-0.78	0.81	0.81	1								
MD	0.76	0.23	0.22	-0.37	1							
MD/ED	0.95	-0.26	-0.24	-0.76	0.85	1						
SER	0.2	-0.52	-0.45	-0.4	-0.17	0.18	1					
INF	-0.17	0.31	0.39	0.36	-0.09	-0.13	0.1	1				
TO	0.39	0.15	0.13	-0.08	0.38	0.3	0.03	0.15	1			
BDG	-0.5	0.38	0.34	0.56	-0.32	-0.55	-0.27	0.17	-0.01	1		
P	0.7	-0.48	-0.51	-0.71	0.41	0.62	0.16	-0.75	0.18	-0.52	1	
ED.P	0.61	-0.28	-0.35	-0.56	0.49	0.54	-0.03	-0.82	0.18	-0.34	0.94	1

6.5. Econometrics Methodology/Issues:

6.5.1 Unit Root Test

Time series literature requires researchers to check for unit root for each variable before estimating any regression model. If the presences of unit root a series is considered to be non-stationary. Results of regression model including non-stationary variables are considered to be spurious. So, this study uses the augmented Dickey-Fuller (ADF) tests and Phillips-Perron (PP) Tests to check the stationary properties of the data. ADF test assume that the errors follow a white noise process. Thus, an error term should be uncorrelated with the others, and have a constant variance. PP test is a generalization of the ADF test that allow for a weaker set of assumptions concerning the error process. The test differ from the ADF test mainly in the how it deals with potential autocorrelation in the errors, while the ADF test includes the lag of dependent variable to correct the problem of autocorrelation in errors. The PP test corrects for any serial correlation and

heteroskedsaticity in the errors of the test regression by directly modifying the test statistics. PP test statistics have the same asymptotic distribution as the ADF statistics.

6.6 Econometrics Specifications of the Models

6.6.1 Testing of Long run relationship: Preliminaries

Cointegration refers to the existence of long-run equilibrium relationship between two or more time series variables which are individually non-stationary at their level form (Gujarati, 1995). The idea working behind cointegration analysis is that although macroeconomic variables may trend up or down over time, the groups of variables may drift together and, hence, form a long-run relationship.

Numbers of cointegration techniques are available to test the existence of long-run relationship among variables. Most commonly used cointegration techniques are Johansen and Juselius approach to cointegration (Johansen, 1990) and Engle–Granger (1987) two-step residual-based cointegration.

Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such stationarity (linear combination) exists, the non-stationary time series variables are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship between the variables.

The limitations of the Engle and Granger approach to cointegration are: first, it does not guide us about the dependence of one variable on the other. Secondly in case of more than one independent variables, there is possibility of more than one cointegrating relationships. But the Engle and Granger approach to cointegration is unable to capture

this possibility. Third, Engle and Granger approach to cointegration is a two-step procedure. Any error made in the first step will be carried on to the next step.

The procedure of Johansen and Juselius (1990) deals with these problems. But like the Engle-Granger procedure, this method also assumes that all the variables are integrated of the same order with certainty; and the power of unit root test is low for determining the order of integration with certainty. Furthermore, Johansen's cointegration approach estimates the long run relationship within the context of a system of equations.

Autoregressive Distributive Lags (hereafter ARDL) approach to cointegration developed by Pesaran *et al*. (2001) overcomes certain drawbacks associated with Engle-Granger and Johansen approaches to cointegration. It is the unification of autoregressive and distributed lag models.

ARDL approach to cointegration employs only single equation to estimate the short run and long run components of the model simultaneously. The estimates derived from ARDL cointegration are unbiased and efficient. This avoids the problems that may arise due to serial correlation and endogeneity (Pesaran *et al*., 2001). Narayan and Narayan (2007) explain that ARDL approach to cointegration is also applicable in small sample, whereas Engel & Granger (1987) and Johansen (1990) methods are not reliable for small sample. As demonstrated by Pesaran and Shin (1999), ARDL approach to cointegration perform better than in small sample as compared to Johansen cointegration approach, which typically requires a large sample size for the results to be valid.

The most critical aspect of ARDL approach is that it does not assume that all the variables are integrated of the same order. The variables can be integrated of order one I(1), or they can be stationary I(0) or mixture of both. This feature makes the standard cointegration techniques unstable because the power of the standard unit root test to identify the order of integration of variables is low. However, ARDL approach to cointegration requires that the regressand is I(1) and explanatory variables are not integrated of order higher than one.

The ARDL procedure comprises of two stages. First, the long run relation between variables is tested using F-statistic to determine the significance of the lagged levels of the variables in the unrestricted error correction model. In the second stage, the coefficients of the long-run relationship are estimated, because of the above mentioned advantages, this study employs ARDL approach for the estimation of various models proposed in Chapter 4.

6.6.2 ARDL Model Specification

In this section, general form of the error correction model is derived using the two variables X_t and Y_t , the latter considers as a dependent variable. Thus, consider relationship involving lags m for X_t and n for Y_t.Consider the following two-variables Y_t and X_t with n-lags of both variables.

$$\mathrm{Y_t} = \alpha_0 + \sum_{\mathrm{i=1}}^{\mathrm{n}} \alpha_\mathrm{i}\, \mathrm{Y_{t-i}} + \sum_{\mathrm{i=0}}^{\mathrm{m}} \beta_\mathrm{j}\, \mathrm{X_{t-i}} + \mathrm{u_t} \qquad (6.1)$$

Here, β_0 denotes the short run impact of X_t on Y_t.

Long run coefficients can be obtained by setting

$$Y_t = Y_{t-1} = Y_{t-2} = \cdots = Y_{t-n} = Y_t^* \qquad (a)$$

$$X_t = X_{t-1} = X_{t-2} = \cdots = X_{t-n} = X_t^* \qquad (b)$$

Substituting (a) and (b) into equation (6.1), we get

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

Rearranging the terms, yields

$$Y_t^* = A + B.X_t^* + u_t \tag{6.2}$$

where $A = \frac{\alpha_0}{(1-\alpha_1-\alpha_2-\cdots-\alpha_n)}$ $B = \frac{(\beta_0+\beta_1+\beta_2+\cdots+\beta_n)}{(1-\alpha_1-\alpha_2-\cdots-\alpha_n)}$

The composite parameter B is called the long-run multiplier.

We derive Error Correction Model directly from equation (6.1) as follows.

Substitute in equation (6.1) the following expressions.

$$Y_{t-n} = Y_{t-(n-1)} - \Delta Y_{t-(n-1)} \tag{6.3 a}$$

$$X_{t-n} = X_{t-(n-1)} - \Delta X_{t-(n-1)} \tag{6.3 a}$$

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

Next, substitute:

$$Y_{t-(n-1)} = Y_{t-(n-2)} - \Delta Y_{t-(n-2)} \tag{6.4 a}$$

$$X_{t-(m-1)} = X_{t-(m-2)} - \Delta X_{t-(m-2)} \tag{6.4 b}$$

The result is as follows

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

Successive substitution on the pattern of equations (6.3 a, b), (6.4 a, b), and so on will finally yield the following results.

$$\Delta Y_t = \alpha_0 + \sum_{j=1}^{n-1} a_j Y_{t-j} + \sum_{j=1}^{m-1} b_j Y_{t-j} + \gamma Y_{t-1} + \theta X_{t-1} + \varepsilon_t \qquad (6.5)$$

The composite parameters in equation (6.5) are defined below.

$$a_j = -\sum_{i=j+1}^{n} \alpha_i$$

$$b_j = -\sum_{i=j+1}^{m} \beta_i$$

$$\gamma = \sum_{i=1}^{n} \alpha_i - 1$$

$$\theta = \sum_{i=0}^{m} \beta_i$$

Therefore, On the basis of equation (6.5) the unrestricted Error Correction Models (ECMs) corresponding to the debt-growth relationships (5.1), (5.2) and (5.3) are respectively given below.

$$\Delta GDP_{t=}\alpha_1 + \sum_{i=1}^{p} \vartheta_{1i}\, \Delta GDP_{t-i} + \sum_{i=0}^{q} \vartheta_{2i} \Delta\, ED_{t-i} + \sum_{i=0}^{q} \vartheta_{3i} \Delta\, DSX_{t-i} + \sum_{i=0}^{q} \vartheta_{4i}\, \Delta INF_{t-i}$$
$$+ \sum_{i=0}^{q} \vartheta_{5i} \Delta\, BDG_{t-i} + \sum_{i=0}^{q} \vartheta_{6i}\, \Delta SER_{t-i} + \sum_{i=0}^{q} \vartheta_{7i} \Delta\, TO_{t-i} + \gamma_1 GDP_{t-1}$$
$$+\gamma_2 ED_{t-1} + \gamma_3 DSX_{t-1} + \gamma_4 INF_{t-1} + \gamma_5 BDG_{t-1} + \gamma_6 SER_{t-1} + \varepsilon_t \qquad (6.6)$$

ε_t is white noise error and Δ is the first difference operator or changes from period t-1 to t.

In the following equation, we incorporate interactive term of macroeconomic policy and external debt to see whether impact of external debt on economic growth depends upon the state of macroeconomic policies or not.

$$\Delta GDP_{t=}\alpha_1 + \sum_{j=1}^{p} \pi_{1j}\, \Delta GDP_{t-j} + \sum_{j=0}^{q} \pi_{2j} \Delta\, ED_{t-j} + \sum_{j=0}^{q} \pi_{3j}\, \Delta(ED\ P)_{t-j}$$

$$+ \sum_{j=0}^{q} \pi_{4j} \Delta\, (MD/ED)_{t-j} + \sum_{j=0}^{q} \pi_{5j}\, \Delta SER_{t-j} + \gamma_1 GDP_{t-1} + \gamma_2 ED_{t-1}$$

$$+\gamma_4 (MD/ED)_{t-1} + \gamma_3 (ED\ P)_{t-1} + \gamma_5 SER_{t-1} + \varepsilon_t \qquad (6.7)$$

The equation below includes the square of external debt, to analyze the non-linear relationship between external debt and economic growth.

$$\Delta GDP_t = \alpha_1 + \sum_{j=1}^{p} \mu_{1j}\, \Delta GDP_{t-j} + \sum_{j=0}^{q} \mu_{2j} \Delta\, ED_{t-i} + \sum_{j=0}^{q} \mu_{3j} \Delta ED_{t-j}^2 + \sum_{j=0}^{q} \mu_{4j} \Delta (MD/ED)_{t-j}$$

$$+ \sum_{j=0}^{q} \mu_{5j}\, \Delta INF_{t-j} + \sum_{j=0}^{q} \mu_{6j} \Delta\, BDG_{t-j} + \sum_{j=0}^{q} \mu_{7j}\, \Delta SER_{t-j} + \sum_{j=j}^{q} \mu_{8j} \Delta\, TO_{t-j}$$

$$+\gamma_1 GDP_{t-1} + \gamma_2 ED_{t-1} + \gamma_3 ED_{t-1}^2 + \gamma_4 (MD/ED)_{t-1} + \gamma_5 INF_{t-1}$$

$$+\ \gamma_6 BDG_{t-1} + \gamma_7 SER_{t-1} + \gamma_8 TO_{t-1} + \varepsilon_t \qquad (6.8)$$

6.6.3. Bounds Testing:

To test for the existence of long run relationship, the following null hypothesis is tested against the accompanying alternative hypothesis using F statistics. The null hypothesis is that the coefficients of the lagged variables are simultaneously equal to zero which implies there is no long run relationship exists among the variables, while the alternative hypothesis is that at least one of these coefficients is not equal to zero.

$$H_0{:}\gamma_K = 0 \text{ for all k}$$

$$H_a{:}\ \gamma_K \neq 0 \text{ for at-least one k}$$

The F-statistics has a non-standard distribution which depends upon: whether the variables included in the ARDL model are integrated of order I(0) or I(1) or a mixture of I(0) and I(1); the number of regressors.

The computed F is compared with critical values proposed by Pesran *et al.* (2001). If the computed F statistic is greater than the upper bound critical value, then the null hypothesis of no long-run relationship is rejected in the favor of alternative hypothesis that there exists a long-run relationship. If F statistics is less than the lower bound critical values, the null hypothesis is accepted implying that there is no a long run relationship. Finally, if the F-statistics lies between the lower and upper bound critical values the test is inconclusive for the given level of significance.

If long run relationship exists then long run parameter can be estimated by using the equations (6.9), (6.10), (6.11).

$$GDP_{t=}\alpha_{12} + \sum_{i=1}^{p} \vartheta_{12i}\, GDP_{t-i} + \sum_{i=0}^{q} \vartheta_{22i}\, ED_{t-i} + \sum_{i=0}^{q} \vartheta_{32i}\, DSX_{t-i} + \sum_{i=0}^{q} \vartheta_{43i}\, INF_{t-i} + \sum_{i=0}^{q} \vartheta_{52i}\, BDG_{t-i} + \sum_{i=0}^{q} \vartheta_{62i}\, SER_{t-i} + \sum_{i=0}^{q} \vartheta_{72i}\, TO_{t-i} \quad (6.9)$$

$$GDP_{t=}\alpha_{1} + \sum_{j=1}^{p} \pi_{12j}\, GDP_{t-j} + \sum_{j=0}^{q} \pi_{22j}\, ED_{t-j} + \sum_{j=0}^{q} \pi_{32j}\, (ED\ P)_{t-j} + \sum_{j=0}^{q} \pi_{42j}\, (MD/ED)_{t-j} + \sum_{j=0}^{q} \pi_{52j}\, SER_{t-j} \quad (6.10)$$

$$GDP_t = \alpha_1 + \sum_{j=1}^{p} \mu_{12j}\, GDP_{t-j} + \sum_{j=0}^{q} \mu_{22j}\, ED_{t-i} + \sum_{j=0}^{q} \mu_{32j} ED_{t-j}^2 + \sum_{j=0}^{q} \mu_{42j} (MD/ED)_{t-j}$$

$$+ \sum_{j=0}^{q} \mu_{52j}\, INF_{t-j} + \sum_{j=0}^{q} \mu_{62j}\, BDG_{t-j} + \sum_{j=0}^{q} \mu_{72j}\, SER_{t-j} + \sum_{j=j}^{q} \mu_{82j}\, TO_{t-j} \quad (6.11)$$

The ARDL specification for the short-run dynamics can be found by estimating the equations (6.12), (6.13), (6.14) for the various debt-growth models.

$$\Delta GDP_{t=}\alpha_{13} + \sum_{i=1}^{p} \vartheta_{13i}\, \Delta GDP_{t-i} + \sum_{i=0}^{q} \vartheta_{23i} \Delta\, ED_{t-i} + \sum_{i=0}^{q} \vartheta_{33i} \Delta\, DSX_{t-i} + \sum_{i=0}^{q} \vartheta_{43i}\, \Delta INF_{t-i}$$

$$+ \sum_{i=0}^{q} \vartheta_{53i} \Delta\, BDG_{t-i} + \sum_{i=0}^{q} \vartheta_{63i}\, \Delta SER_{t-i} + \sum_{i=0}^{q} \vartheta_{73i} \Delta\, TO_{t-i} + \Psi_1 ECM_{1t-1} \quad (6.12)$$

Where ECM term (ECM_1) is defined as

$$ECM_t = GDP_t - \alpha_{12} - \sum_{i=1}^{p} \vartheta_{12i}\, GDP_{t-i} - \sum_{i=0}^{q} \vartheta_{22i}\, ED_{t-i} - \sum_{i=0}^{q} \vartheta_{32i}\, DSX_{t-i} - \sum_{i=0}^{q} \vartheta_{43i}\, INF_{t-i}$$

$$+ \sum_{i=0}^{q} \vartheta_{52i}\, BDG_{t-i} + \sum_{i=0}^{q} \vartheta_{62i}\, SER_{t-i} + \sum_{i=0}^{q} \vartheta_{72i}\, TO_{t-i}$$

Equation (6.13) presents the short-run dynamics for the debt polices equation.

$$\Delta GDP_{t=}\alpha_1 + \sum_{j=1}^{p} \pi_{13j}\, \Delta GDP_{t-j} + \sum_{j=0}^{q} \pi_{23j} \Delta\, ED_{t-j} + \sum_{j=0}^{q} \pi_{33j}\, \Delta (ED\ P)_{t-j}$$

$$+ \sum_{j=0}^{q} \pi_{43j} \Delta\, (MD/ED)_{t-j} + \sum_{j=0}^{q} \pi_{53j}\, \Delta SER_{t-j} + \Psi_2 ECM_{2t-1} \quad (6.13)$$

Where

$$ECM_{2t} = GDP_t - \alpha_1 - \sum_{j=1}^{p} \pi_{12j}\, GDP_{t-j} - \sum_{j=0}^{q} \pi_{22j}\, ED_{t-j} - \sum_{j=0}^{q} \pi_{32j}\, (ED\ P)_{t-j}$$

$$- \sum_{j=0}^{q} \pi_{42j}\, (MD/ED)_{t-j} - \sum_{j=0}^{q} \pi_{52j}\, SER_{t-j}$$

$$\Delta GDP_t = \alpha_1 + \sum_{j=1}^{p} \mu_{13j}\, \Delta GDP_{t-j} + \sum_{j=0}^{q} \mu_{23j} \Delta\, ED_{t-i} + \sum_{j=0}^{q} \mu_{33j} \Delta ED_{t-j}^2 + \sum_{j=0}^{q} \mu_{43j} \Delta (MD/ED)_{t-j}$$

$$+ \sum_{j=0}^{q} \mu_{53j}\, \Delta INF_{t-j} + \sum_{j=0}^{q} \mu_{63j} \Delta\, BDG_{t-j} + \sum_{j=0}^{q} \mu_{73j}\, \Delta SER_{t-j} + \sum_{j=j}^{q} \mu_{83j} \Delta\, TO_{t-j}$$

$$\Psi_3 ECM_{3t-1} \qquad (6.14)$$

Where

$$ECM_{3t} = GDP_t - \alpha_1 - \sum_{j=1}^{p} \mu_{12j}\, GDP_{t-j} - \sum_{j=0}^{q} \mu_{22j}\, ED_{t-i} - \sum_{j=0}^{q} \mu_{32j} ED_{t-j}^2 - \sum_{j=0}^{q} \mu_{42j} (MD/ED)_{t-j}$$

$$- \sum_{j=0}^{q} \mu_{52j}\, INF_{t-j} - \sum_{j=0}^{q} \mu_{62j}\, BDG_{t-j} - \sum_{j=0}^{q} \mu_{72j}\, SER_{t-j} - \sum_{j=j}^{q} \mu_{82j}\, TO_{t-j}$$

In the equations (6.12), (6.13), (6.14), the parameters associated with the summation signs represent the short-run parameters and the coefficient of ECM in various equations represent (Ψ) shows the speed of adjustment to the long-run equilibrium. Coefficient of adjustment should be negative and statistically significant for convergence.

CHAPTER 7

EMPIRICAL RESULTS

7.1. Introduction

This chapter presents the empirical results and their interpretation for various econometrics models proposed in chapter 6. Results of unit root are presented in section 7.2. Section 7.3 presents the results of bound test of cointegration. After that, we examine whether there is any evidence of a negative relationship between external debt and growth in the absence of interaction of policy. Following this, we incorporate the Burnside and Dollar definition of good policy into growth equation in order to examine the relationship between external debt and real GDP growth in the presence of macroeconomic policy. After that, ratio of multilateral external debt to total external is included in the growth equation to examine the effect of increase in the proportion of multilateral debt on growth. An autoregressive distributed lag (ARDL) methodology as discussed in chapter 6 has been utilized in order to get the long run and short run parameters simultaneously. After examining the long run relationship, the long-run and short-run parameters are estimated in the next stage.

7.2. Results of Unit Root Test

The estimation process starts by testing the time series properties of the data using the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Unit root test is carried out in order to ensure that variables are not I(2). According to Ouattara (2004), F-statistics for bounds test provided by Pesaran *et al*. (2001) remains valid if and only if the variables used in the model are either I(0) or I(1). The results of ADF and PP tests are presented in Table 7.1.

Table 7.1: Results of ADF and PP Tests

Variable	ADF test statistics		PP test statistics		Order of Integration (at 5% level of significance)	Order of Integration (at 10% level of significance)
	Level	First Difference	Level	First Difference		
GDP	-0.4798	-4.6692*	-0.4344	-4.6488*	I(1)	I(1)
ED	-2.4136	-5.3407*	-2.4332	-6.0736*	I(1)	I(1)
ED^2	-2.8985**	-6.6484*	-2.9141**	-7.4187*	I(1)	I(0)
BD	-1.3879	-6.0799*	-1.3879	-6.2589*	I(1)	I(1)
MD	-1.4184	-5.3017*	-1.4184	-5.2100*	I(1)	I(1)
MD/ED	-0.2937	-3.7423*	-0.4832	-3.6535*	I(1)	I(1)
SER	-1.9696	-4.4305*	-1.8176	-5.6986*	I(1)	I(1)
TO	-2.0743	-6.869*	-1.9622	-7.0424*	I(1)	I(1)
INF	-2.6938**	-4.8821*	-2.7147**	-4.5735*	I(1)	I(0)
BDG	-2.762**	-7.1277*	-2.8638**	-7.1542*	I(1)	I(0)
P	-2.5069	-7.9534*	-2.4164	-11.3989*	I(1)	I(1)
ED*P	-2.5998	-7.4109*	-2.5079	-10.6557*	I(1)	I(1)

*Note: The statistics significance at 5 % and 10% levels are indicated by * and ** respectively.*

The results of the ADF and PP tests indicate that the all the variables are integrated of order one at 5% level of significance. Three variables ED^2, INF, and BDG become integrated of order zero if 10% level of significance is used. However, no variable is integrated of order two even at 1% level of significance. This means that the basic conditions for the applications of bounds test are met and we can safely move to the next step of the analysis.

7.3. Bound Test for Cointegration

In the first step of ARDL model, equations (6.6), (6.7) and (6.8), are estimated to examine the long-run relationship between variables. The numbers of lags are selected

according to Schwarz Bayesian Criterion (SBC). The estimation is conducted for the time period 1970–2009. Initially we set 2 lags and by using the general to specific methodology we delete the insignificant variables from the model. The final model is selected when the estimated equations satisfy all the diagnostic checks including the Jarque-Bera statistic for normality of the residuals, the Breusch-Godfrey test for serial correlation, ARCH residuals for homoscedasticity and the Ramsey RESET test for specification error. Plot of Cumulative sum of recursive residual (CUSUM) and Cumulative sum of square of recursive residual (CUSUMSQ) statistic indicate no evidence of mis-specification and structural instability for the period estimated. The results of the F-Statistics of bounds test for various equations are presented in Table 7.2.

Table 7.2: F-Statistics for Cointegration Relationship

Equation	**Computed F-Statistics**[8]	**Critical F-statistics at 5% level**[9]		**Outcome**
		I(0)	**I(1)**	
$Fy(GDP/ED, DSX, BDG, INF, SER, TO)$	8.78	2.84	4.29	Cointegration
$Fy(GDP/ED, ED * P, (MD_t/ED_t), SER, TO)$	7.55	3.28	4.59	Cointegration
$Fy(GDP/ED, ED^2, (MD_t/ED_t), BDG, INF, SER, TO)$	6.79	2.74	4.22	Cointegration

In each of the specifications the calculated value of F-statistics is greater than the upper bound critical value. This indicates that a long-run relationship exists in each of the specifications of external debt growth relationship.

[8] Equations of F-Statistics for models of external debt are presented in the Appendix.
[9] Critical Values are taken from Pesaran *et al.* (2001), Table CI (iii), Case 111: Unrestricted intercept and no trend.

7.4. Total external Debt and Real GDP Growth

After verifying the existence of long-run relationship between external debt and real GDP based on equation (6.6), the results of the long-run and short-run relationships of total external debt and real GDP along with the other variables are presented below.

Long Run Coefficients:

$$GDP_t = \underset{(47.63)^*}{10.30} - \underset{(-1.39)^{***}}{0.534\,ED} - \underset{(-2.51)^{**}}{0.719\,DSX} - \underset{(-5.60)^*}{2.96\,INF} - \underset{(-1.08)}{1.39\,BDG} + \underset{(2.46)^*}{3.41\,SER} + \underset{(6.74)^*}{4.52\,TO}$$

Short Run Coefficients:

$$\Delta \mathrm{GDP_t} = \underset{(7.25)^*}{0.662} - \underset{(-4.34)^*}{0.659}\Delta \mathrm{GDP_{t-1}} - \underset{(-2.50)^{**}}{0.0982}\Delta \mathrm{ED} - \underset{(-1.86)^{***}}{0.0339}\Delta \mathrm{ED_{t-1}} - \underset{(-1.02)}{0.0176}\Delta \mathrm{DSX_{t-1}}$$

$$- \underset{(-3.07)^*}{0.0843}\,\Delta INF_t - \underset{(-2.47)^{**}}{0.0802}\,\Delta INF_{t-1} - \underset{(-1.03)}{0.893}\,\Delta BDG_{t-1} + \underset{(4.24)^*}{0.479}\,\Delta SER_t + \underset{(3.35)^*}{0.126}\,\Delta TO_t$$

$$+ \underset{(3.11)^*}{0.134}\Delta TO_{t-1} - \underset{(-7.18)^*}{0.0643}\,ECM_{t-1}$$

* Indicates the significance at 1% , ** Indicates the significance at 5% , *** Indicates the significance at 10%

The coefficient of external debt is statistically significant and negative both in the short-run and long-run. The negative relationship between external debt and growth is consistent with the findings of Borensztein (1990a, 1990b), Eaton (1987) and Elbadawi, *et al.* (1997).

The results also support the finding of Zafar and Zahid (1998) for Pakistan. Their study concludes that an important reason for the negative impact of external debt may be non-sustainable situation caused by its debt obligations. As a result, Pakistan is currently having huge external debt. In any case, it appears that in case of Pakistan external debt has not been efficiently used, it may be used to increase government consumption.

The negative coefficient of debt service to export ratio indicates the presence of crowding out effect. Increase in debt service takes the resources away from spending on

infrastructure; health and education, thereby negatively affecting growth. Sheikh *et al.* (2010) also found the negative impact of debt and debt service payments on growth of GDP per capita for Pakistan.

There might be a number of reasons for the negative impact of external debt on the growth. Unstable and deteriorated macroeconomic policies may be one cause of the adverse impacts of external debt on real GDP because unstable macroeconomics polices in terms of misallocation of resources discourage investment and GDP growth.

The coefficient of inflation is negative and statistically significant both in the short run and long run. High inflation harms growth by creating instability in the real value of money, discouraging investment, savings and efficiency of productive factors. High inflation may lead to shortages of goods if consumers begin hoarding out of goods that in turn lead to increase in prices in the future. Our result is consistent with Paul, *et al.* (1997) who also reported negative relationship between inflation and economic growth for Pakistan.

The budget deficit has insignificant negative effect on the economic growth in the short run as well as in the long run. Zafar and Zahid (1998) study regarding Pakistan, conclude that budget deficit is negatively related with growth rates in per capita real income and real GDP. Two reasons were mentioned about negative relationship between fiscal deficit and growth in context of Pakistan. First is that when fiscal deficit is financed through distortion taxation, it would lower the incentive for saving and investment, thereby lowering the rate of capital accumulation and economic growth. The second argument is that higher budget deficit crowds out private investment.

Positively significant impact of trade openness on real GDP is broadly consistent with empirical literature and economic theory. Trade openness positively affects economic growth through several channels like access to advanced technology, availability of a greater access to variety of inputs for production, access to foreign market for domestically produced goods, etc. These results are consistent with the findings of Mohsin *et al*. (2001) and Iqbal and Zahid (1998).

Secondary school enrollment is used as a proxy for human Capital and has significantly positive impact on growth both in the short run and long run. More educated individuals tend to have higher employment rate and earnings and produce more output relative to those who are less educated.

The coefficient of ECM term is -0.0643 and statistically significant, this means about -6.43% adjustment will take place within one year towards equilibrium.

The various diagnostics for the model of total external Debt and growth are presented below. This model passes all the diagnostic tests.

Table 7-3: Diagnostic Tests for the model of Total External Debt and Growth

Test Statistics	F-Stat	Prob
Serial Correlation	1.0557	.318
Functional Form	.035726	.852
Normality*	1.8462	.397
Heteroscedasticity	.15423	.697

*Normality test is based on Chi-square test

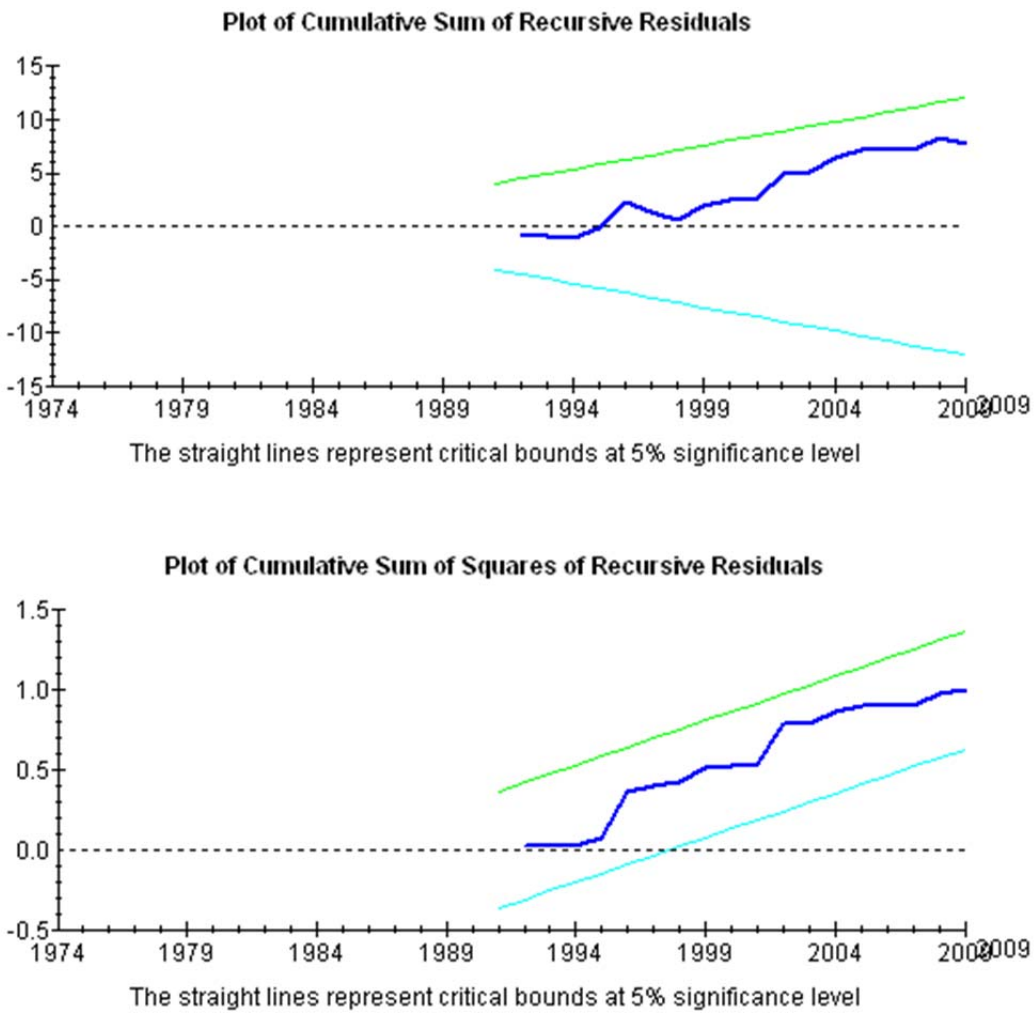

Figure 7-1: Plot of CUSUM (above) and CUSUMSQ (below) statistics for the model of External Debt and growth.

Graph of the cumulative sum of the recursive residuals (CUSUM) and cumulative sum of the recursive residuals squared (CUSUMSQ) for external debt growth model shows that external debt growth model is stable as of the CUSUM and CUSUMSQ fall within the 5% critical lines.

7.5. Macroeconomic Policy and Effect of Composition on Economic Growth

To analyze the impact of external debt on economic growth in the presence of macroeconomic policies, equation (6.7) is estimated and the results are presented below.

Long Run Coefficients:

$$GDP_t = \underset{(92.98)^*}{10.53} - \underset{(-4.39)^*}{0.738\, ED_t} + \underset{(4.34)^*}{.0601\, (ED \times P)_t} + \underset{(6.71)^*}{0.838\, (MD/ED)_t} + \underset{(3.77)^*}{2.88\, SER_t}$$

Short Run Coefficients:

$$\Delta GDP_t = \underset{(3.58)^*}{1.39} - \underset{(-2.88)^*}{0.416\, \Delta GDP_{t-1}} - \underset{(-4.46)^*}{0.198\, \Delta ED_t} + \underset{(5.64)\ ^*}{0.0080\, \Delta(ED\ P)_t}$$

$$+\underset{(2.37)\ **}{0.1109\, \Delta\, (MD/ED)_t} + \underset{(3.15)^*}{0.382\, \Delta SER_t} - \underset{(-3.50)^*}{0.1324\, ECM_{t-1}}$$

* Indicates the significance at 1% , ** Indicates the significance at 5% , *** Indicates the significance at 10%

External debt to GDP ratio alone has negative impact on economic growth both in the long run and short run. When ED*P (external debt to GDP ratio * Policy Index) is added to the equation, external debt still has negative impact on economic growth in the long run as well as in the short run but debt interacted with policy has significantly positive impact on economic growth both in the short run and in the long run. This result implies that the impact of external debt on economic growth is a function of macroeconomic policies of the country. Therefore, the better the policy in terms of low budget deficit and low inflation, the higher the possibility that external debt will have positive impact on economic growth.

So, external debt is expected to enhance the growth and development in developing economies with sound economic policies. Incidence of slow growth rate and the positive association between policy and growth may suggest that poor and

inconsistent economic policies of Pakistan are responsible for the sluggish and weak contribution of external debt to growth

There are two possible justifications for the positive effect of debt on growth in the presence of good macroeconomic policy. Countries with stable macroeconomic policies are more attractive for the investor. High inflation and high budget deficit may cause the macroeconomic instability which discourages the investment. Montiel and Serven (2004, pp. 6) argue that when "other things equal, reduced aggregate volatility and lower inflation likely had a positive impact on the income of the poor" 2) high non developing expenditure cause the high budget deficit. In case of high budget deficit, external debt may be used to increase government consumption instead of increasing investment.

MD/TD , the ratio of the multilateral external debt to total external debt, indicates the composition of total external debt. The coefficient of multilateral external debt to total external debt is positive both in the short run and long run. This means that for a given level of total external debt, an increase in the proportion of multilateral debt or a decrease in the proportion of bilateral debt exerts favorable effect on economic growth both in the short run long run. This may suggest several things. First, bilateral external debt might be strategically and politically driven rather than being policy or poverty focused. Therefore, its impact on growth may be negative. This negative relationship between bilateral external debt and economic growth suggest that resource transfer from developed countries to developing countries is oriented towards their own economic and strategic interests instead of needs of the recipients. These donors' motives and interests may be the cause of failure of external debt's contribution in the development process of Pakistan

economy. In contrast, multilateral external debt may promote growth because it is up to a large extent policy or poverty driven and is often accompanied by low interest rates. These results are consistent with the findings of Tiruneh (2003,2004).

The coefficient of ECM variable is negative, less than one in absolute term and statistically significant with the coefficient of 13%, implying that the speed of adjustment or convergence to equilibrium is 13%.

The model of Macroeconomic policy and debt composition passes tests for Serial correlation, Heteroscedasticity, Functional form and Normality of residuals. The results are presented in table 7-4.

Table 7-4: Diagnostic Tests for the Model of Macroeconomic Policy and Debt Composition

Test Statistics	F-Stat	Prob
Serial Correlation	.97519	.332
Functional Form	1.5882	.218
Normality*	.038069	.981
Heteroscedasticity	1.9468	.172

*Normality test is based on Chi-square test

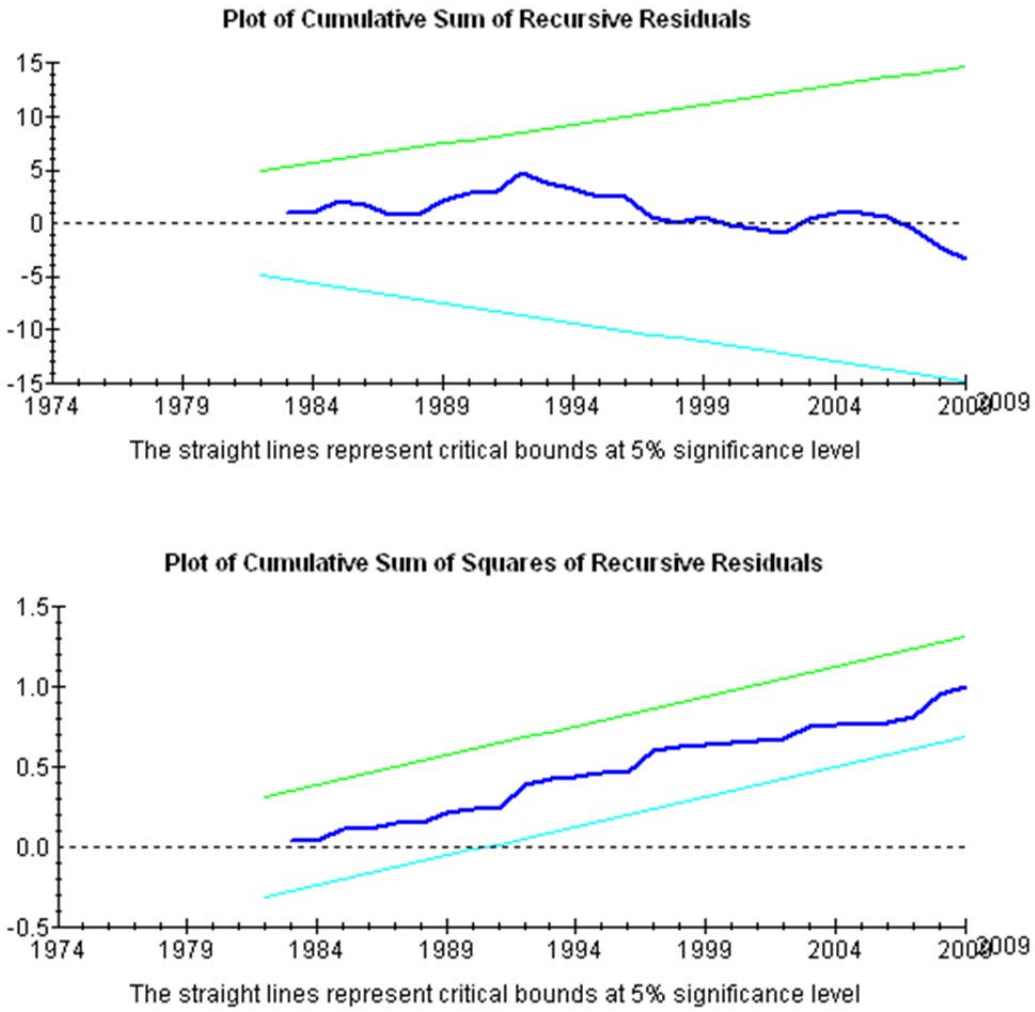

Figure 7-2: Plot of CUSUM (above) and CUSUMSQ (below) statistics for the Model of Macroeconomic Policy & Debt Composition

Moreover, CUSUM and CUSUMSQ statistic is also within the 5 percent critical lines which give confirmation of parameter stability exposed by Figure 7-2.

7.6. External Debt Laffer curve

In this section we estimate the equation (6.8), to analyze the possible non-linear relationship between external debt and growth. The results of long-run and short-run coefficients are presented below.

Long Run Coefficients:

$$GDP_t = \underset{(29.80)^*}{9.916} + \underset{(1.59)^{***}}{3.2775\ ED_t} - \underset{(-1.998)^{**}}{5.8558\ ED_t^2} + \underset{(5.159)^*}{.99637\ (MD/ED)_t}$$

$$\underset{(-1.465)}{-.34691\ INF_t} - \underset{(-2.148)^{**}}{1.88\ BDG_t} + \underset{(3.163)^*}{3.17\ SER_t} + \underset{(1.818)^{***}}{0.789\ TO_t}$$

Short Run Coefficients:

$$\Delta GDP_t = \underset{(3.58)^*}{1.194} - \underset{(-3.28)^*}{0.495\ \Delta GDP_{t-1}} + \underset{(1.74)^{***}}{0.395\Delta ED_t} - \underset{(-2.18)^{**}}{0.705\ \Delta ED_t^2}$$

$$\underset{(2.21)^*}{+0.119\ \Delta(MD/ED)_t} - \underset{(-1.59)}{0.043\Delta INF_t} - \underset{(-2.66)^*}{0.228\Delta BDG_t}$$

$$\underset{(5.05)^*}{+0.576\ \Delta SER_t} + \underset{(1.752)^{***}}{0.031\ \Delta TO_t} + \underset{(1.33)}{0.054\ \Delta TO_{t-1}} - \underset{(-3.58)^*}{0.120\ ECM_{t-1}}$$

* Indicates the significance at 1% , ** Indicates the significance at 5% , *** Indicates the significance at 10%

The coefficient of the debt to GDP ratio is positive and significant while the coefficient for the debt-to-GDP ratio squared is negative and significant as expected. Accordingly, the results from the quadratic model suggest that there is an inverted U-shaped relationship between debt and growth as postulated by the debt Laffer curve. In other words, beyond a certain threshold, higher external debt retards economic growth. The threshold level is calculated by taking the derivate of the debt Laffer curve equation. The results indicate that a in the long run turning point is 27% of the debt to GDP ratio. In the short run, the threshold level is 26% of debt the GDP. These results support the

findings of Benedict C. *et al.* (2003), Elbadawi *et al.* (1997) and Siddique and Afia (2001).

As of June 2011 Pakistan's external debt to GDP ratio is estimated at 30 percent**.** Comparison of the current external debt to GDP ratio and growth maximizing external debt to GDP ratio implies that Pakistan external debt is above the growth maximizing external debt ratio. In other words, Pakistan seems to have relied on external resources a little too much and it needs to resorts to exploring and utilizing domestics resources.

The coefficient on ECM of is negative and statistically significant. This provides further evidence on the existence of stable long run level cointegration relationship. The negative and statistically significant coefficient of ECM means that, there is no problem of adjustment in the long run in case of shocks in the short-run.

The various diagnostics for the model of external debt Laffer curve are presented below. The model of external debt Laffer curve passes all the diagnostic tests presented in table 7-5.

Table 7-5: Diagnostic Tests for the Model of Debt Laffer curve

Test Statistics	F-Stat	Prob
Serial Correlation	.75331	.395
Functional Form	.27578	.605
Normality*	.35843	.836
Heteroscedasticity	.11265	.739

*Normality test is based on Chi-square test

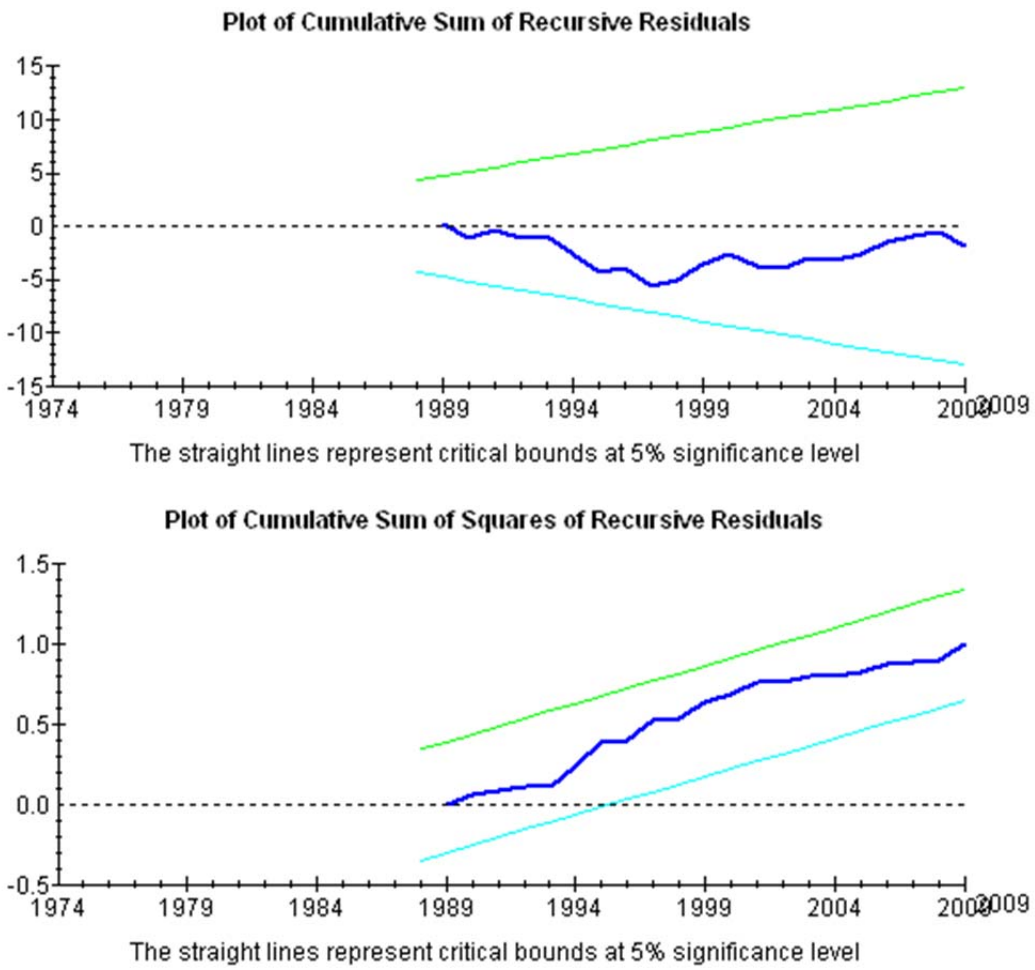

Figure 7-3: Plot of CUSUM (above) and CUSUMSQ (below) statistics for the Model Debt Laffer Curve

From the above figures, we learn that both CUSUM and CUSUMSQ statistics are in the critical intervals. It suggests that there parameters are stable during the period of 1970 - 2009.

7.7. Conclusion

The empirical findings in this paper suggest that external debt and real GDP have negative relationship, while the external debt interacted with macroeconomic policy has positive impact on real GDP both in the short run and long run. The threshold external debt-to-GDP ratio is 27 percent and 26 percent in the long run and short run respectively. It is further observed that it is the bilateral and not the multilateral component of the total external debt that retards growth.

CHAPTER 8

CONCLUSION

The main focus of this study has been to analyze the impact of external debt on economic growth. In the earlier studies of the external debt on growth in Pakistan, a number of researchers have explored its different directions of influences on growth. However, there is hardly any study that concentrates on its nonlinearity, disaggregation into bilateral and multilateral debts and interaction with macroeconomic policy.

The main objectives of this study are to empirical analyze of the impact of external debt on growth once external debt is interacted with macroeconomic policy index and total debt stock is decomposed according to source structures (bilateral and multilateral) and to analyze the possible non-linearity of relationship between external debt and economic growth.

The external debt growth model has been empirical tested for Pakistan over the period 1970-2009, by using the ARDL approach to cointegration.

The major point emerging from this study is that external debt retards growth under the period of study when external debt to GDP alone is considered in the growth regression. In order to analyze the effectiveness of economic policies in utilizing foreign debts for productive purposes, a composite macroeconomic policy index comprising of monetary policy, fiscal policy and trade policy proxied by inflation, budget deficit and trade openness respectively is constructed by using the principle component analysis. When External debt interacted with the policy variable is added into the growth equation, external debt alone still has a negative relationship both in the short run and long run but

the interactive term involving external debt and policy variable has positive and significant effect on growth in the long run and short run.

The results indicate that there is a threshold level after which additional external debt is detrimental to growth. The average impact of external debt on growth appears to become negative for external debt level exceeding about 27% and 26% in the long run and short run, respectively. Therefore, the current level of debt, which is about 30 percent of GDP seems to have crossed the optimal level and is now retarding growth. Bilateral external debt negatively affects growth whereas the multilateral external debt positively affects growth.

Our finding suggests that sound economic management policy in terms of low inflation, trade openness and low budget deficit is crucial for external debt effectiveness. There is need to implement appropriate policy measure , in order to achieve the positive impact of external debt on economic growth through minimizing budgetary deficit, lowering the inflation rate and achieving trade openness. Pakistan needs to reduce its dependence on external debt has to put serious efforts to mobilize the domestic resources.

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APPENDIX

Final Equation for the F-Statistics of External debt and Economic growth

Autoregressive Distributed Lag Estimates			
ARDL(2,2,1,2,0,1,2) selected based on Schwarz Bayesian Criterion			
Dependent variable is GDP			
Regressor	**Coefficient**	**Standard Error**	**T-Ratio[Prob]**
GDP(-1)	0.27639	0.15718	1.7585[.095]
GDP(-2)	0.65933	0.15208	4.3355[.000]
ED	-0.09829	0.03939	-2.4952[.022]
ED(-1)	-0.03007	0.033931	-.88620[.387]
ED(-2)	-0.033875	0.018164	-1.8649[.078]
DSX	-0.0176	0.017257	-1.0200[.321]
DSX(-1)	-0.02864	0.018749	-1.5274[.143]
INF	-0.08429	0.027485	-3.0668[.006]
INF(-1)	-0.02553	0.031812	-.80265[.432]
INF(-2)	-0.08017	0.032514	-2.4657[.023]
BDG2	-0.08934	0.086925	-1.0278[.317]
SER	0.47974	0.1132	4.2380[.000]
SER(-1)	-0.2605	0.12318	-2.1149[.048]
TO	0.12627	0.037656	3.3533[.003]
TO(-1)	0.03059	0.035768	.85523[.403]
TO(-2)	0.13385	0.043107	3.1051[.006]
C	0.66195	0.09124	7.2543[.000]
R-Squared	.99983	R-Bar-Squared	.99968
S.E. of Regression	.0040909	F-stat. F(16, 19)	6839.7[.000]
Mean of Dependent Variable	10.6969	S.D. of Dependent Variable	.22877
Residual Sum of Squares	.3180E-3	Equation Log-likelihood	158.3854
Akaike Info. Criterion	141.3854	Schwarz Bayesian Criterion	127.9255
DW-statistic	2.3674		

Testing for existence of a level relationship among the variables in the ARDL model				
F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
8.7778	2.8410	4.2853	2.3957	3.6729

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

Final Equation for the F-Statistics of Macroeconomic Policies and Debt Composition

Autoregressive Distributed Lag Estimates			
ARDL(2,1,0,0,0) selected based on Schwarz Bayesian Criterion			
Dependent variable is GDP			
Regressor	**Coefficient**	**Standard Error**	**T-Ratio[Prob]**
GDP(-1)	0.45158	0.16056	2.8125[.009]
GDP(-2)	0.41602	0.14465	2.8761[.008]
ED	-0.19816	0.04444	-4.4580[.000]
ED(-1)	-0.10048	0.028919	-3.4745[.002]
EDP	0.008046	0.001428	5.6355[.000]
Y	0.11093	0.0468	2.3703[.025]
SER	0.38228	0.082793	4.6173[.000]
C	1.3945	0.38963	3.5791[.001]
R-Squared	.99958	R-Bar-Squared	.99947
S.E. of Regression	.0052634	F-stat. F(7, 28)	9441.8[.000]
Mean of Dependent Variable	10.6969	S.D. of Dependent Variable	.22877
Residual Sum of Squares	.7757E-3	Equation Log-likelihood	142.3332
Akaike Info. Criterion	134.3332	Schwarz Bayesian Criterion	127.9991
DW-statistic	2.2514		

Testing for existence of a level relationship among the variables in the ARDL model				
F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
7.5525	3.2845	4.5993	2.7195	3.8788

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

Final Equation for the F-Statistics Debt laffer Curve

Autoregressive Distributed Lag Estimates			
ARDL(2,0,0,0,1,0,1,2) selected based on Schwarz Bayesian Criterion			
Dependent variable is GDP			
Regressor	**Coefficient**	**Standard Error**	**T-Ratio[Prob]**
GDP(-1)	0.38422	0.16657	2.3066[.031]
GDP(-2)	0.49535	0.15117	3.2768[.003]
ED	0.3947	0.2273	1.7364[.096]
ED2	-0.70519	0.32292	-2.1838[.040]
Y	0.11999	0.054364	2.2071[.038]
INF	-0.04312	0.027202	-1.5850[.127]
INF(-1)	0.001338	0.028086	.047627[.962]
BDG2	-0.22679	0.085193	-2.6621[.014]
SER	0.57586	0.11402	5.0507[.000]
SER(-1)	-0.19382	0.12545	-1.5450[.137]
TO	0.030896	0.041086	.75199[.460]
TO(-1)	0.009673	0.040948	.23623[.815]
TO(-2)	0.054471	0.041024	1.3278[.198]
C	1.1942	0.34606	3.4509[.002]
R-Squared	.99972	R-Bar-Squared	.99955
S.E. of Regression	.0048337	F-stat. F(13, 22)	6029.1[.000]
Mean of Dependent Variable	10.6969	S.D. of Dependent Variable	.22877
Residual Sum of Squares	.5140E-3	Equation Log-likelihood	149.7403
Akaike Info. Criterion	135.7403	Schwarz Bayesian Criterion	124.6557
DW-statistic	2.2404		

Testing for existence of a level relationship among the variables in the ARDL model				
F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
6.7905	2.7457	4.2250	2.3238	3.5898

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.