International Journal of Management Research and Emerging Sciences
Volums 4 Issue 1 (2014) PP. 27-46

External Debt Sustainability Analysis: A Case of SAARC Countries

Muhammad Ramzan Sheikh[1], Muhammad Nauman Abbasi[2], Saliha Iqbal[3], Salman Masood[4]

ABSTRACT

This study conducts the external debt sustainability analysis for the eight SAARC economies using the data from 2000 to 2013. Three types of techniques- univariate unit root tests, panel unit root tests and the cointegration tests are applied. According to the first and second type of tests results, the external debt of SAARC economies is unsustainable individually but sustainable as a whole. The results of third type of tests reveal that the external debt of the SAARC economies is unsustainable individually and wholly with some exceptions. The study deduces that the external debt of SAARC countries is unsustainable so they should exploit their domestic resources instead of going for the foreign resources and encourage saving and investment environment in their countries.

Keywords: *External Debt, Sustainability Analysis, Panel Data Analysis, Cointigration Tests, SAARC Economies.*

INTRODUCTION

External debt sustainability is burning issue and popular topic of debate due the worldwide debt crisis. Nowadays, in the second decade of third millennium, almost all economically developing countries are subject to the problem of external debt because of current account and fiscal deficits. The external borrowing is increasing drastically day by day and across the world. All countries belonging to South Asian Association for Regional Cooperation (SAARC) are also inherently developing and relatively poor countries that largely rely on the external borrowing for their public finance (Mahmood, 2014).

According to the World Bank's International Debt Statistics 2015, the external debt stock of SAARC countries has reached $548,280.9 million in 2013 while the external debt stock of all developing countries is $5,506,372.2 million for the same year. The total external debt services paid by the SAARC countries in year 2013 is $53022.2 million in comparison with the overall

1. Lecturer, School of Economics, Bahauddin Zakariya University, Multan Pakistan. Email: ramzansheikh@bzu.edu.pk
2. Faculty Member, Institute of Management Sciences, Bahauddin Zakariya University, Multan. (abbasimna@bzu.edu.pk)
3. M.Phil Student, School of Economics, Bahauddin Zakariya University Multan. Email: saliha_iqbal@yahoo.com
4. Ph.D Scholar, Superior University, Lahore. Email: directorqa@superior.edu.pk

developing countries external debt servicing paid amount of $731,921.7 million. But when the macroeconomic aggregates are observed especially those crucial to the external debt sustainability analysis, it is found that Gross National Income of SAARC economy approaches to the $ 2376783.1 million in the 2013 and same indicator is reported as $ 23,698,068.9 million for all developing countries. The external debt owed by low income and developing countries to the developed countries' public and private financial institutions is one of the major causes of contemporary increasing global poverty and inequality. The surpassing debt is restricting countless underdeveloped countries, who had taken the debt to grow their economies, from economic development. It is because all borrow but few of them have the capacity to deal with this problem.

Just by having a glance on the above mentioned figures, nobody can suppose that this external borrowing will be blessing or the curse for the borrowing countries. To forecast this, external debt sustainability analysis is necessary. According to the IMF (1997), "A country can be said to achieve external debt sustainability if it can meet its current and future external debt service obligations in full, without recourse to debt rescheduling or the accumulation of arrears and without compromising growth".

As the condition of external debt sustainability has become necessary condition for sustainable economic growth in open economies that's why its importance has enhanced with the theoretical expansion as well as advancement of world economies in the third millennium. This analysis is very important for the economic development of any economy. The economic development is considered to be the function of financial capital availability to that country along with other factors. Any country that faces short of financial capital can finance development by the dint of her access to the international financial markets and to the international lending institutions. The countries borrow from the other countries to finance their projects.

The general objective of this study is to analyze the external debt sustainability using panel data of all SAARC countries. This is the first study which attempts to conduct the external debt sustainability analysis using the panel of all SAARC countries. Structure of the study is as follows. The section 2 provides the review of the theories and approaches of external debt sustainability. The section 3 comprises of the literature review of empirical studies. The section 4 gives the discussion on the issues of data while the section 5 conducts the econometric analysis of external debt sustainability and discusses the results. The section 6 draws conclusion from the results and converse on policy implications to avoid the issues under discussion.

2. THE EXTERNAL DEBT SUSTAINABILITY APPROACHES

There are various approaches to the external debt sustainability analysis which are briefly reviewed in this section.

2.1 FINANCIAL SUSTAINABILITY PERSPECTIVE BASED APPROACHES

Financial sustainability perspective based approaches are mainly concerned with the financial position of the borrowing country regarding repayment of their debt. This perspective also considers the impact of debt on the financial position of the borrowing country. There are two types of financial sustainability perspective based approaches i.e., borrower based and the lender based approaches which are explained in the following section.

a) The Borrower Based Approach to External Debt Sustainability

The borrower based approach to external debt sustainability focuses on the behavior of borrowing country about its capacity and willingness to retire its external debt obligations. The borrower based financial sustainability perspective concentrates on the internal and external gaps which the borrower country faces and these gaps ultimately determines the debt capacity of a country that is why, this perspective is also known as the debt capacity perspective. The literature on this viewpoint can be split into three types of models i.e. threshold models, debt optimizing model and non-optimizing models.

- **Threshold Models of External Debt Sustainability**

The threshold models of external debt sustainability are based on the notion of nonlinear relationship between the external debt and growth. According to these models, there are one or more critical levels of external debt sustainability indicators. When external debt mounts up to these levels, it hampers the economic activity and turns out to be detrimental to economic growth and considered to be unsustainable. While below these level it speeds up the economic growth and these growth augmenting level of foreign debt are considered to be the sustainable levels.

According to Nasa (2009), the threshold models of external debt sustainability are divided into two categories with respect to the method of determination of threshold level which are the Exogenous Threshold Models and the Endogenous Threshold Models.

A. Exogenous Threshold Models

The exogenous threshold models involve the models which are built using the concept of non linear relationship between the external debt and growth and use the critical levels of external debt to analyze the sustainability of

external debt but these models does not determine the critical levels endogenously and specific to the country. These models take the thresholds or critical levels of debt as given or exogenous. Widely used exogenous threshold models include the Interaction Debt Dummy Model, Linear Spline Model etc.

i. Interaction Dummy Model

The simplest and widely used method to capture the non linearities in the relationship of debt and growth is the creation and inclusion of interaction "high debt" and "low debt" dummy variables in the growth regression model. In the model the interaction dummy variables capture different impacts of external debt to export ratio above and below the critical level. The dummy variable Vit, where "i" is the country at "t" time, takes on the value 0 if the external debt is above the threshold level and value 1 if the external debt is below the threshold level.

In this type of models, usually two methods are adopted to determine the threshold level of external debt. The first method computes the median external debt " " of each country and uses these medians to find their average and that average of median external debts, , is used as the common threshold for the assessment of external debt sustainability.

$$V_{it} = f(x) = \begin{cases} 1, \& \overline{d_i} < \tilde{d} \\ 0, \& \overline{d_i} > \tilde{d} \end{cases}$$

The other method uses the following threshold determined by the World Bank.

$$V_{it} = f(x) = \begin{cases} 1, & \overline{d_i} < 150\% \\ 0, & \overline{d_i} > 150\% \end{cases}$$

ii. Linear Spline Model

Linear Spline Model segregates the total debt values into n segments and estimates the n parameters for each of these segments. Knots are placed between each of two consecutive segments. So, total (n-1) knots are placed to separate the n segments. These knots perform the role of threshold levels and having more than one threshold levels is the distinct feature of these kinds of models. Because this type of models take the number of knots and the location of knots arbitrarily that is why fall into the category of exogenous threshold models.

iii. The External Debt Sustainability Analysis Framework for Low Income Countries (Indicator Based Approach)

The IMF and World Bank redefined the term external debt sustainability and

proposed an approach to examine it in 1996 when they launched the Original HIPC Initiative. The initiative was built on the Debt Sustainability Analysis (DSA) which was basically the borrower based analysis and that analyzed the behavior of debtor country that was the country's ability and willingness to fulfill its debt obligations External debt sustainability can be examined by conducting a forward looking analysis of the indicators of debt burden which analyze the evolution of debt burden under the baseline scenario and under the stress test scenarios. These analyses, in practice, require the projection of income and expenditure flows considering the exchange rate changes and the flows of debt servicing. The projections of external debt dynamics further depends upon the financial and other macroeconomic market developments which are inherently volatile and uncertain.

B) ENDOGENOUS THRESHOLD MODELS

The endogenous threshold models determine the threshold level of debt endogenously. The external debt threshold is estimated instead of assuming in such kind of models. Hansen's threshold model (2000) is very popular and most accurate example of this category of model which does not require a specific functional form for applying the methodology of estimating the β's and threshold level of debt simultaneously. In Hansen methodology, a common threshold is estimated across the countries.

- **Debt Optimizing Models**

The second sort of financial sustainability perspective based a borrower based approach to the external debt sustainability include the debt optimizing models which deals with the question of optimal level of debt. It emphasizes that how much a country should borrow that mobilized resources would be beneficial for her after retiring the debt. The underlying notion in these models is almost similar to the threshold models but these models determine the optimal level of debt where the marginal cost of external borrowing is equal to the marginal benefit of external borrowing.

Marginal Cost of External Borrowing = Marginal Benefit of External Borrowing

If the marginal cost of external borrowing is greater than its marginal benefit, it's beneficial for a borrower not to borrow as borrowing in such situation leads to net loss after all. If the marginal cost of borrowing is less than its marginal benefit, it means that the borrower country is in the situation of net gain and she should definitely borrow.

- **Non-Optimizing Debt Models**

The last kind of borrower based financial perspective of external debt sustainability is the non-optimizing debt models. These models include the growth cum debt models and debt dynamics model. These models have been briefly discussed in the following section.

I. THE GROWTH-CUM DEBT MODEL

The growth-cum debt model is based on medium term analysis of debt and its costs and benefits. It not only takes into account the current growth stage but the future growth path also. This model emphasizes that the country should decide about debt accumulation considering its cost (interest rate) and benefits (marginal productivity of resources if invested) as well as its investment opportunities and growth rate. The country should become net borrower in case of domestic saving gap if there are profitable investment opportunities with greater (or at least equal) marginal rate of return of capital and higher (or at least equal) growth rate than (to) the interest rate. i.e. $g > r$ and $MPK > r$

Otherwise country's the debt will hamper the economic growth and economy will face the problem of unsustainable external debt level. This model and some of its extensions have the similar theme as the inter temporal borrowing and lending model which suggests that a country can speed up its economic growth by filling domestic investment - domestic saving gap from the foreign saving to attain the optimal level of investment. It necessitates that current and in coming years the economic growth rate must be so high that the country easily can service its debt obligations.

An important drawback of Growth-Cum Debt Model is that it completely disregards the foreign exchange gap which is directly linked to the country's debt repayment capacity and just considers the domestic saving- investment gap.

II. DEBT DYNAMICS MODEL

The debt dynamic model also compares the benefits from external borrowing (or the repayment capacity) to the costs of external borrowing and considers the value of exports as the best indicator of repayment capacity of a country by arguing that the debts are repaid in foreign currency and foreign exchange capacity is better measured through the value of exports instead of GDP. This approach emphasizes on the debtor country's external solvency by stressing economies external sector performance and disregards the country's GDP and domestic investment saving gap (Nissanke and Ferrarini, 2001). In other words, this approach links the country's repayment capacity directly to the country's exports earnings. So with this view, the condition for external debt sustainability changes to that the cost of borrowing or the interest rate must be less than to the growth rate of exports (the expression of country's debt repayment capacity) as also mentioned by Nissanke and Ferrari (2001).

b) Lender Based Approach /Intertemporal Budget Constraint (IBC)

According to the Intertemporal Budget Constraint based concept of debt sustainability, external debt of a country is considered to be the sustainable

if the country satisfies the condition of No Ponzi Game (NPG) which requires the equivalence of actual external debt and present discounted value of the country's future trade surpluses.

The NPG condition sometimes also termed as the present value constraint. PVC testifies that a country's external debt is sustainable if the Inter-temporal Budget Condition or (IBC) transversality condition is fulfilled in infinite horizon. The necessary condition for the sustainability of a country's external debt is that the current external debt stock should be equal to the present discounted value of future trade surpluses. In terms of growth rates, the criteria restricts that the growth rate of trade surplus should surpass the interest rate on debt which confirms that the debtor country is accumulating the sufficient exports' earning that the country can fully retire its current foreign debt obligations.

Econometrically, in literature, the external debt sustainability using IBC has been analyzed employing two distinct types of approaches. First is Unit root approach and second is a Cointegration approach. According to unit root approach, for a sustainable level of external debt, country's the external debt to exports ratio should be stationary or I(0). Cointegration approach requires that the external debt stock and exports should be cointegrated.

2.2 THE ECONOMIC SUSTAINABILITY BASED APPROACHES

The Economic Sustainability Perspective, also called the development perspective, looks at the channels through which debt burden blights the economic growth of debtor country. This approach basically analyses the inter-linkages between the fiscal deficit, inflation rate, exchange rate, investment, imports and exports or balance of payments, economic growth and external debt stock and external debt servicing. According to this approach, the debt burden blights the economic growth via two main channels which are Cash Flow Effect and Disincentive Effect.

1. THE CASH FLOW EFFECT

The Cash Flow effect refers to the obstruction in public investment and relegation in capital imports supplementary to public investment on account of augmented external debt servicing which ultimately perishes the economic growth and development in the country. Because the public investments most of the times, especially in cases of developmental projects, are complementary to the private investments that's why decline in public investment crowds out the private investment. (Arnone et al, 2005)

2. DISINCENTIVE EFFECTS

The disincentive effect can be justified with the help of debt overhang hypothesis and debt laffer curve. Both theories say that very high level of debt put negative effects or disincentive effects on the economic growth. Both theories are briefly discussed in this section.

- **Debt Overhang Hypothesis**

The Debt Overhang hypothesis was formulated and tested by the Krugman in 1988 for the first time and by Sach in 1989 after that. By the debt overhang they mean that a country's level of debt is much high that debtor country losses its ability to attract the new investment (domestic and foreign) due to the present inability to service its debts and prospects of sinking the investment returns fully or almost fully into future debt servicing. They believed that the current debt overhang puts disincentive effect on investment by discouraging the future investment and cause a huge deadweight lose. It further snatches the economic reform ability of debtor country. The debtor country remains fail to accumulate resources even the investment is beneficial for the country and can bring growth to the economy (Krugman,1988). The Debt overhang theory establishes the negative relationship between the high debt and economic growth.

- **Debt Laffer Curve**

The Debt Laffer curve relates the level of debt to the GDP growth. It shows the inverted U relationship between the said two macroeconomic variables. In other words, according to this concept there is no linear relationship between the debt and GDP. The shape of the laffer curve reflects that there is a country specific threshold level of debt and if debt exceeds to that level will not only cap the growth process but also give a reverse gear to the economic growth of that country. So the debt is considered to be sustainable if it is lower than or at least equal to that threshold level.

3. REVIEW OF EMPIRICAL LITERATURE ON EXTERNAL DEBT SUSTAINABILITY

External debt sustainability is very hot topic of debate due the worldwide debt crisis. A literature is available on this topic. This section reviews the studies related to the external debt sustainability and its different aspects.

Jafri (2008) analyzed the sustainability of Pakistan's external debt in medium term framework. Availing the Debt Sustainability Analysis (DSA) technique based on simple accounting approach, the author estimated the equation of evolution of external debt based on the data for the period of 1999 to 2008 and making projections for the period of 2009 to 2013. The ratio of country's

non interest current account balance to GDP, nominal interest rate on debt stock, exchange rate, real GDP growth, inflation and the ratio of net non debt creating capital inflows to GDP were considered the main component of evolution of external debt. Nominal value if external debt to GDP ratio was used as indicator for setting the threshold level. The author developed the different scenarios (baseline and two alternatives) for making projections. Further the sensitivity test was conducted comprising of the comparisons of baseline path of debt to the paths of two alternative scenarios by assuming shocks in debt dynamic components and to the projections of six bounds. The results of the DSA predicted the growth in the external debt to GDP ratio in both, the small individual shock and large combined shock to the components of evolution of external debt, cases but the growth will remain in safe limits in the former case only and not in the latter case which demands the debt rescheduling.

Emilia and Emilian (2008), choosing Romania as the testing case, examined its public and foreign debt sustainability. Using the monthly data from January 1992 to December 2007, Phillips Perron Unit root test, cointegration and OLS regression were applied on two equations carrying the exports, imports , current account Deficit, trade deficit and lagged dependent variable as independent variables and external debt and public external debt as dependent variables respectively. The results of the study confirmed the weak sustainability of Romanian debts.

Nwachukwu (2008) studied the implications of the Enhanced Heavily Indebted Poor Countries (HIPC) -Multilateral Debt Relief Initiative (MDRI) Framework for external debt sustainability in 16 post completion point countries by checking that whether net present value of their external debt will, by the end of 2015, trim down to sustainable level of 150 percent of their exports with the help of growth with debt model. The author observed that total external debt to export ratio, till 2015, will shrink down to the 176 percent only if these countries enjoy relief under enhanced HIPC MDRI.

In 2009, Mehmood et al. calculated the debt ratios and derived the necessary and sufficient conditions for the sustainability of government and external debt of Pakistan rooted in two theoretical models. Soaking up the annual data for the period of 1971 to 2008, the study resulted in the indication of unsustainable public and external debts as effect of not meeting only the sufficient condition for debt sustainability except few early years of new millennium.

Zanhier and Rossini (2009) reviewed the composition of current account and the sustainability of external debt. Utilizing the extension of usual

approaches (Obstfeld and Rogoff, 1996) to solvency determination, distress of external debt of the economy was assessed. Operating with the yearly data from 1992 to 2003 and utilizing the Estimated Generalized Least Squares (EGLS) technique, Static panel of 19 countries was estimated to reexamine the impact of equity flows on the external debt of the countries.

Gunter et al. (2009) criticized the IMF and World Bank's debt sustainability framework which was presented for the analysis of low income countries by enunciating that it made the aforementioned countries prey of low debt – low growth circumstances and proposed the new concept of debt sustainability conducive to Millennium Development Goals by linking the economic debt capacity of a country to the social development position. They stressed on the importance of a country's level and extent of MDG achievement in deciding the limit of the country's external borrowing.

Workie (2011) empirically examined the debt sustainability and economic growth causality in European Union. The author utilized the data of 27 European countries for the time period from 1995 to 2010 and developed three non overlapping panels, each of five year and applied the panel data approach for both the fixed effect model and the random effect model. The average growth rate of real GDP per capita was regressed against the ratio of debt as percentage of GDP and its square. Other independent variables incorporated in the model were education, government consumption, inflation, labor force growth, openness and research and development expenditure. The result of the paper suggested that the growth rate of GDP per capita was adversely affected by debt at high levels.

Porcil et al. (2011) presented a dynamic model based on Post Keynesian macroeconomics which is to deal with mechanism, conditions and monetary policy rules which are the basis of external debt crisis and its unsustainability and affect the growth and stability of the small developing economy which completely integrated to the world financial and good markets. The model focused on two kinds of policy rules i.e. inflation target and exchange rate target, both implemented via the Interest Rate Operations Procedure (IROP) which influenced the stability of the small open economy. The model inferred that in order to keep the economy away from external instability, strict monitoring of the evolution of exchange rate is crucial. The model further put forward that if the foreign and domestic interest rates tend to be very close to each other then the real exchange becomes more effective to stabilize the economy.

Muhanji and Ojah (2011) conducted analysis of the management and sustainability of foreign debts of African countries. Using the data for 24

African countries, the authors regressed the debt indicators against the various thresholds. Utilizing the data for the period of 1970 to 2008, the fixed effects method was applied on the model for estimation. The growth rate of GDP was entered as dependent variable in the model while the explanatory variables included the relative interest rate, lagged inflation, exchange rate, terms of trade, household consumption, consumption imports, investment imports, export, Debt to GDP ratio and debt to export ratio. The result of the study explored that Debt to GDP ratio rose if either a country's debt accumulated faster than the GDP or if external debt rose whilst GDP remained unchanged.

Nasir and Noman (2012) used three-step non linear framework for the assessment of external debt sustainability. In the first step, linearity property of foreign debt was verified by utilizing the general linearity Harvey and Leybourne (2007) test to determine the linearity property of external debt ratio and current account ratio(two measure of external debt sustainability) which requires the determination of order of integration of time series. In second step sustainability of non linear processes was tested by Kapetanio, Shin and Snell (2003) or KSS test and sustainability of linear processes was examined by Augmented Dickey Fuller (ADF) test and in the third step the ADF test was applied on the non linear processes and comparison between the results of two steps was established. The study resulted in the favor of non linear unit root test's better performance than the ADF test in determining the stationary property of series by providing the evidence of 36 debt and 55 current account ratios' non linearity and sustainability.

Adler and Sosa (2013) studied the external conditions as well as debt sustainability for the case of Latin America. They reported that growth-conducive external position of aforesaid country had boosted the economy in the 21st century. They further proposed the framework for the analysis of debt sustainability which along with the domestic factors took the external or global factors into account that captures the impacts of global crisis on the debt sustainability countries. The results of the study revealed that the external factors did not seem to be the concern of debt sustainability of Latin America, just domestic growth buffers especially the fiscal policy instrument are the source of concern.

Mehmood et al. (2014) conducted comparative analysis of external and public debt sustainability in the four major SAARC economies which include Pakistan, Bangladesh, India and Sri Lanka. The authors first compared the traditional debt ratios with the threshold levels and then derived the necessary and sufficient conditions of External and public debt

sustainability. The results of the study showed that debt level of all studied economies were unsustainable. The reason of these unsustainable debt levels is the twin deficits.

After having the review of all relevant literature it is concluded that there is need for a study which analyze the external debt sustainability for all SAARC countries. There is a gap in the literature for a study which conducts the analysis for each country individually and as whole.

4. DESCRIPTION OF DATA SET

The data used in this study cover the time span of 14 years from 2000 to 2013. Due to unavailability of data, it was impossible to choose the larger span. For the balanced panel data, it is found suitable as this time span overlaps all country data. The annual data of 8 SAARC countries (Pakistan, India, Bangladesh, Nepal, Sri Lanka, Bhutan, Maldives and Afghanistan) is selected for the analysis. All the data are collected from the source of World Development Indicators (WDI) of World Bank. The data chosen for analysis is in current US dollars. The following five variables, used in the analysis and their definitions are given below.

GROSS DOMESTIC PRODUCT

GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. (World Bank, 2014). The World Bank has calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

TOTAL EXTERNAL DEBT SERVICE

Total debt service is the sum of principal repayments and interest actually paid in form of currency, goods, or services on long-term debt, interest paid on short-term debt, and repayments (repurchases and charges) to the IMF.

TOTAL EXTERNAL DEBT STOCK

Total external debt is debt owed to nonresidents repayable in 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. (World Bank, 2014) Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt.(World Bank, 2014)

GROSS FIXED CAPITAL FORMATION

According to WDI, Gross fixed capital formation (formerly gross domestic

fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. (World Bank, 2014) Data are in current U.S. dollars.

EXPORTS

Merchandise exports show the value of goods provided to the rest of the world valued in current U.S. dollars. (World Bank, 2014).

Using the above mentioned variables, the following indicators of external debt sustainability are developed.

Table 1: Construction of External Debt Sustainability Indicators

Variable	Description	Definition
DGR	Debt to GDP ratio	It is the expression of external debt stock as percentage of GDP.
DER	Debt to exports ratio	It is the expression of external debt stock by the exports and multiplying it by 100.
DCR	Debt to capital ratio	It is the expression of external debt stock as percentage of gross fixed capital formation.
DSGR	Debt service to GDP ratio	It is the expression of total external debt service as percentage of gross domestic product.
DSER	Debt service to exports ratio	It is the expression of total external debt service as percentage of exports.
DSCR	Debt service to capital ratio	It is the expression of total external debt service as percentage of gross fixed capital formation.

5. EXTERNAL DEBT SUSTAINABILITY ANALYSIS: RESULTS AND DISCUSSION

There are three main types of techniques to check the status of countries regarding the external debt sustainability that are univariate unit root tests, panel unit root tests and panel cointegration tests. In this section, following to Nasa (2009) various univariate unit root tests and panel unit root tests have been employed to check the time series properties of series in order to know about the robustness of the results.

5.1 UNIVARIATE UNIT ROOT APPROACHES

There are three univariate unit root test applied to assess the external debt sustainability of each SAARC country and to make sure that the results of this research are robust and reliable. The Table 2 summarizes the results of previously discussed three tests for univariate unit root in level which are the ADF, PP and DF-GLS respectively for each of eight SAARC economies individually. The results have been generated using the statistical software E-Views 7 employing the data of 14 years from 2000 to 2013 for each country.

Table 2: Unit Root Tests at Level (2000-2013)

Country	Variable	ADF			PP			DF-GLS		Conclusion
		Constant	Trend	None	Constant	Trend	None	Constant	Trend	
Afghanistan	*DGR*	-0.914	-1.913	-1.406	-0.914	-1.913	-1.410	-0.928	-2.095	NS
	DER	-8.088	-6.06	-1.207	-1.204	-2.388	-1.207	-2.079	-2.569	NS
	DCR	-1.6764	-2.733	-1.192	-1.693	-2.714	-1.192	-1.754	-2.862	NS
Bangladesh	*DGR*	-0.024	-4.814	-1.257	0.325	-2.196	-1.980	-0.350	-4.019	NS
	DER	0.005	-3.458	-2.104	0.005	-2.664	-2.104	-0.616	-3.794	NS
	DCR	-0.269	-3.188	-1.324	0.145	-2.178	-2.181	-0.531	-4.437	NS
Bhutan	*DGR*	-2.536	-2.008	0.670	-1.838	-1.788	0.484	-2.453	-2.723	NS
	DER	-2.684	-2.717	-2.684	-1.365	-1.401	-1.365	-2.813	-3.273	NS
	DCR	-3.584	-3.350	-0.140	-1.339	-1.565	0.292	-3.549	-3.832	NS
India	*DGR*	-1.155	-0.852	0.118	-1.155	0.057	0.118	-1.203	-1.359	NS
	DER	-1.974	-1.310	-1.974	-3.395	-0.687	-2.123	-1.638	-1.622	NS
	DCR	-1.353	-0.468	-0.732	-1.899	1.409	-1.899	-1.327	-1.106	NS
Maldives	*DGR*	-1.221	-0.598	-0.088	-1.281	-0.710	-0.106	-1.226	-1.015	NS
	DER	-1.958	-1.930	-0.550	-1.958	-1.930	-0.427	-1.991	-2.221	NS
	DCR	-0.813	-1.299	-1.442	-0.907	-1.558	-1.404	-1.284	-2.215	NS
Nepal	*DGR*	-0.602	-4.824	-2.803	-0.442	-1.887	-3.757	-0.123	-3.924	NS
	DER	-3.021	-2.948	0.597	-3.021	-2.948	0.597	-3.694	-3.979	NS
	DCR	0.682	-3.314	-3.285	-0.664	-2.003	-3.969	-0.071	-2.427	NS
Pakistan	*DGR*	-1.665	-3.143	-2.132	-0.827	-1.632	-1.773	-1.666	-3.492	NS
	DER	-1.754	-1.668	-1.430	-1.754	-1.668	-1.430	-1.616	-1.778	NS
	DCR	-2.528	-2.873	-1.286	-1.433	-1.512	-0.963	-2.535	-3.192	NS
Sri Lanka	*DGR*	-0.857	-1.777	-0.859	-0.787	-1.777	-2.103	-0.793	-1.994	NS
	DER	-0.808	-1.590	1.216	-0.808	-1.590	1.415	-0.925	-1.805	NS
	DCR	-0.450	-3.086	-0.839	-0.669	-3.236	-0.793	-1.674	-4.251	NS

Source: Authors' calculations

Note: NS stands for Non-stationary/Unsustainable Critical values of ADF and PP tests, which are roughly same , are-3.72, -2.99 and -2.62 at 1%, 5% and 10% respectively. Df-GLS test depends upon the lag length for 5% and 10% but not for the 1%. At 1% its critical value is -2.65. At 5% its values are -2.44, -2.39, 2.34 and 2.29 respectively with lag 1, 2, 3 and 4.

In the first column, names of countries are shown while in the second column the name of the variable are mentioned. Three external debt sustainability indicators are tested named as DGR, DER and DCR respectively for each country. Column three, four and five show the results of tests and in the last column the conclusion on the basis of tests result is mentioned. All the results have been generated using the Schwarz Info Criterion (SIC) which uses the maximum lag length equal to 2. The Third Column illustrates the three kinds of results obtained by including the only constant, trend and in the last without trend and intercept into the equation of ADF test. The column four gives the same type of information extracted using the PP test and column five shows the same sort of results got from DS-GLS test. The last column explores that all three debt ratios of all countries are non stationary at 90 percent level of significance or on 10 percent probability of error (p value is less than or equal t to the 0.1). On the basis of results that the all series are non stationary, it is concluded that the current external debt level of all countries relative to their repayment capacity is very high and consequently unsustainable which can obstruct the positive economic boom in

the concerned economies.

The Table 3 recapitulates the outcomes of same three tests for univariate unit root i.e., ADF, PP and DF-GLS in first difference for each of aforesaid economies individually.

Table 3: Unit Root Tests at First difference (2000-2013)

Country	Variable	ADF			PP			DF-GLS		Conclusion
		Constant	Trend	None	Constant	Trend	None	Constant	Trend	
Afghanistan	*DGR*	-3.362	-3.187	-3.231	-3.361	-3.183	-3.231	-3.515	-3.527	S
	DER	-3.282	-0.958	-4.353	-5.245	-8.933	-4.581	-3.994	-4.007	S
	DCR	-3.808	-3.750	-3.987	-3.810	-3.750	-3.987	-3.993	-4.140	S
Bangladesh	*DGR*	-5.040	-4.371	-1.930	-2.362	-2.631	-1.972	-3.951	-3.130	S
	DER	-2.867	-2.720	-2.179	-2.829	-2.695	-2.141	-2.956	-3.026	S
	DCR	-4.098	-4.126	-1.725	-2.252	-2.176	-1.788	-3.518	-2.897	S
Bhutan	*DGR*	-2.136	-1.988	-2.184	-2.136	-1.952	-2.144	-2.204	-2.207	S
	DER	-2.719	-1.667	-2.793	-1.721	-1.392	-1.798	-1.674	-2.805	S
	DCR	-1.531	-0.366	-1.617	-1.087	-0.365	-1.043	-1.639	-1.727	S
India	*DGR*	-2.632	-3.381	-2.739	-2.639	-5.562	-2.748	-2.765	-3.734	S
	DER	-3.340	-3.316	-3.148	-3.337	-7.454	-3.145	-3.505	-4.336	S
	DCR	-2.324	-4.091	-2.536	-2.336	-4.283	-2.547	-2.420	-4.555	S
Maldives	*DGR*	-2.825	-3.313	-2.933	-2.835	-3.130	-2.940	-2.863	-3.603	S
	DER	-3.977	-3.898	-3.977	-4.043	-4.157	-4.248	-4.172	-4.309	S
	DCR	-2.354	-2.275	-2.213	-2.354	-2.218	-2.354	-2.437	-2.507	S
Nepal	*DGR*	-3.678	-3.569	-2.867	-3.666	-3.560	-2.887	-3.755	-3.823	S
	DER	-3.473	-3.373	-3.611	-4.043	-3.547	-4.753	-3.637	-3.734	S
	DCR	-3.981	-3.779	-2.720	-3.939	-3.748	-2.736	-4.030	-4.086	S
Pakistan	*DGR*	-2.754	-2.454	-2.090	-1.929	-1.844	-1.598	-2.894	-2.926	S
	DER	-2.798	-2.677	-2.729	-2.798	-2.680	-2.729	-2.924	-2.982	S
	DCR	-2.640	-3.241	-2.569	-1.888	-1.823	-1.747	-2.804	-3.045	S
Sri Lanka	*DGR*	-3.893	-3.772	-3.221	-3.904	-3.825	-3.221	-4.080	-4.156	S
	DER	-3.519	-3.478	-3.293	-3.522	-3.566	-3.292	-3.685	-3.822	S
	DCR	-3.072	-2.644	-2.720	-3.211	-2.967	-2.726	-2.703	-2.739	S

Source: Authors' calculations

Note: S stands for Stationary Critical values of ADF and PP tests, which are roughly same , are-3.72, -2.99 and -2.62 at 1%, 5% and 10% respectively. Df-GLS test depends upon the lag length for 5% and 10% but not for the 1%. At 1% its critical value is -2.65. At 5% its values are -2.44, -2.39, 2.34 and 2.29 respectively with lag 1, 2, 3 and 4.

The whole structure of the table and evaluation criteria, used for attaining this information, is same as used in the Table 2. The results reveal that the all external debt burden ratios are stationary when once differenced in all type of tests and all three types of test equations. These results does not lead us to the conclusion that the external debt of all countries has become stationary because the taking the first difference to make the series stationary has no economic meaning in the external debt sustainability assessment criterion.

5.2 PANEL UNIT ROOT TESTS

In the last chapter, there was a brief discussion on the various panel unit root tests. In this section those three panel unit root tests that are the Levin, Lin and Chu test, Fisher ADF test and the Im Pesaran & Shin test, have been applied on the external debt sustainability indicators.

Table 4 sums up the results of above discussed three types of panel unit root test in level and in first differenced. For each of first two tests, three equations are tested first includes the constant, second includes trend factor while the third

equation includes neither constant nor trend. The last test, IPS test is applicable on two types of equation, one including constant and second including trend. The probabilities are mentioned in parentheses below the statistical values. Maximum 10 percent probability of error is set as the benchmark for making decision regarding the significance of results. If the results are significant we reject the null hypothesis that series has unit root and accept the alternative hypothesis of no unit root in series or in other word, the series is stationary and which in our analysis mean that the external debt is sustainable. The external debt is unsustainable otherwise.

Table 4: Panel Unit Root Tests at Level (2000-2013)

Variable	Test Specification	Levin, Lin &Chu			Fisher-ADF			Im Pesaran & Shin	
		Constant	Trend	None	Constant	Trend	None	Constant	Trend
DGR	*Level*	-0.25 (0.39)	-4.62 (0.00)	-2.65 (0.00)	9.09 (0.90)	24.39 (0.08)	30.75 (0.01)	-0.98 (0.83)	-1.35 (0.08)
DER	*Level*	-4.462 (0.00)	-1.256 (0.10)	-2.963 (0.00)	26.52 (0.04)	20.37 (0.20)	38.39 (0.00)	-2.19 (0.01)	-0.63 (0.26)
DCR	*Level*	-1.17 (0.11)	-3.92 (0.00)	-3.07 (0.00)	16.42 (0.42)	33.99 (0.00)	26.88 (0.04)	-0.002 (0.49)	-2.21 (0.01)

Source: Authors' calculations
Note: Probability values are in the parenthesis.

The out of eight, five calculations are showing the rejection of null hypothesis of " DGR has a unit root" which mean that the DGR of SAARC countries stationary in level or I(0) which lead to the conclusion that the overall external debt level of SAARC countries is sustainable. For the DER or external debt to exports ratio, almost all, except two statistics and probabilities exhibit that the external debt stock of concerned economies, in overall, is sustainable in relation to their overall exports in level. The external debt to capital ratio is also I(0) when tested at 10 percent p values , in five out of eight calculations leading to the conclusion that the SAARC countries are having capacity to generate resources to service its debt.

5.3 Cointegration Methods

The panel cointegration tests are divided into two types. One is the residual based cointegration tests and the other is likelihood based. The Table 5 summarizes the results obtained by testing the individual SAARC countries' estimated residuals for the univariate EG Residual-based stationarity test. The findings shows that the ADF test statistic is less than the MacKinnon critical values for all countries except Pakistan, Sri Lanka and Bangladesh which lead us to the conclusion that the external debt of all SAARC countries is unsustainable except the aforementioned countries at 95 percent level of significance.

Table 5: EG Residual-based Stationary Test (Univariate)

Countries	ADF-test statistic	MacKinnon critical values	Conclusion
Afghanistan	-2.5331	-3.1199	Non Stationary (Unsustainable)
Bangladesh	-3.3478	-3.1449	Stationary (Sustainable)
Bhutan	-2.1530	-3.1449	Non Stationary (Unsustainable)
India	-1.8968	-3.1449	Non Stationary (Unsustainable)
Maldives	-0.6652	-3.1199	Non Stationary (Unsustainable)
Nepal	-1.7402	-3.1199	Non Stationary (Unsustainable)
Pakistan	-4.6022	-3.1449	Stationary (Sustainable)
Sri Lanka	-3.2425	-3.1199	Stationary (Sustainable)

Source: Authors' calculations
Note: All the values are at 5% level of significance.
The values for Bangladesh and Sri Lanka are unsustainable at 1% level of significance.

Table 6 shows the results of panel Engle Granger residual based stationarity test using residual of overall SAARC countries. The results of three different test that are the Levin, Lin &Chu test, Im, Pesaran & Shin and the Fisher-ADF test have been shown. The t statistics and probability values both make it clear that the series are non stationary at 90 percent level of significance or 10 percent probability of error and hence the external debt level of SAARC countries in overall is also unsustainable in all cases.

Table 6: EG Residual-based Stationary Test (Panel)

Countries	Test	t-statistic	Prob.	Conclusion
SAARC Countries	Levin, Lin & Chu	0.4041	0.6569	Non Stationary (Unsustainable)
	Im, Pesaran & Shin	1.6592	0.9515	Non Stationary (Unsustainable)
	Fisher-ADF	14.5320	0.5519	Non Stationary (Unsustainable)

Source: Authors' calculations

6. CONCLUSION AND POLICY RECOMMENDATIONS

In this study, we have applied various econometric techniques useful to assess the sustainability of external debt. Various univariates and panel unit root test have been applied to our selected data of 14 years for eight SAARC economies. Three different techniques were applied. The first was the univariate unit root tests (ADF, PP and DF-GLS) to know the external debt sustainability of individual countries and found that all the countries

are facing the unsustainable level of debts which was evident from their non stationary series of external debt stock to GDP, external debt stock to exports, external debt stock to capital ratio, external debt service to the GDP, external debt service to exports and external debt service to capital ratios. The second type of tests, panel unit root tests (LL, Fisher-ADF, and IPS), were applied to assess the external debt status of SAARC countries as a whole and found that the external debt of the SAARC economies as a whole was sustainable which is incompatible with the results of previous test. The third type of tests includes time series and panel cointegration based approaches and found that there was no long run relationship observed between external debt and GDP for the each of SAARC countries except Bangladesh, Pakistan and Sri Lanka which mean that five countries has the unsustainable external debt except the three aforementioned countries and EG-residual based panel cointegration approach declared their external debt unsustainable as a whole. The results of residual based panel cointegration approach are preferred as its results are consistent with the individual country results and it is concluded that the external debt of SAARC countries is unsustainable. On the basis of results, it can be said that the surpassing external debt is leading the SAARC economies toward the low level of growth and retarding development in the economies.

In order to avoid unsustainable levels of external debt, it is recommended that the all SAARC economies can cut their current expenditures instead of directly going for external borrowing and reallocate their resources in the development heads. The countries may create the economic environment attracting the foreign investment which supplements not only the countries capital stock by filling the saving investment gap but also removes fiscal and current account deficits. The borrowing countries can substitute external borrowing with the internal borrowing. They can utilize their externally borrowed resources in productive and development purposes so that the profits and better repayment capacity can make the debt sustainable leading to substantial growth as well as removes from the disincentive effect and attracts investment. The country should export more and try hard to stable the currency to commodity (general price level) as well as currency to currency exchange rate, should adopt measures to increase the domestic saving and investment rates, should borrow from the sources having the less volatile and low interest rate.

REFERENCES

Adler, G. and Sosa, S. (2013). External Conditions and Debt Sustainability

in Latin America. IMF Working Paper. WP/13/27

Arnone, M., Bandiera, L., and Presbitero, A. F., (2005). External Debt Sustainability: Theory and Empirical Evidence. Working Paper No. 33, Catholic University of Milan (Piacenza), December 2005.

Dickey, D.A. and Fuller W.A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root, Journal of American Statistical Association, 74(366), pp. 427-431.

Emilia, C., and Emilian, M. (2008).Analyzing the Relationship between Public and External Debt Sustainability: Case Study Romania.

Gunter, B. G., Rahman, J., and Shi, H. (2009). Linking Social Development with the Capacity to Carry Debt: Towards an MDG-Consistent Debt-Sustainability Concept. Development Policy Review, 27 (3): 269-286.

Hansen, B.E. (2000). Sample Splitting and Threshold Estimation, Econometrica, 68, pp 575-603.

Im K.S., Pesaran M.H. and Shin Y. (1997). Testing for Unit Roots in Heterogeneous Panels, Mimeo, Department of Applied Economics, University of Cambridge.

International Monetary Fund (1997).Debt Relief for low-Income Countries and the HIPC Initiative, Working paper 97/24.

Jafri, S. K. (October, 2008). External Debt Sustainability Analysis for Pakistan: Outlook for the Medium Term. SBP Working Paper Series No. 27 .

Keating, M. O., and Keating, B. P. (2003). Measuring the Sustainability of Latin American External Debt. Applied Economics Letters, 10, 359–362.

Krugman, P., (1988). Financing vs. Forgiving a Debt Overhang: Some Analytical Rates, Journal of Development Economics, 29, pp 253-68.

Mahmood, T., Rauf, S. A., and Ahmad, H. K. (2009). Public and External Debt Sustainability in Pakistan (1970s —2000s). Pakistan Economic and Social Review, 47(2), 243-267.

Mahmood, T., Arby, M. F., and Sheraz, H. (2014). Debt Sustainability: A Comparative Analysis of SAARC Countries, Pakistan Economic and social Review, 52(1), 15-34.

Muhanji, S. and Ojah, K. (2011). External Shocks and persistence of External Debt in Open Vulnerable Economies: The Case of Africa". Eco-

nomic Modelling, 28, 1615 –1628.

Muhanji, S. and Ojah, K. (2011). Management and Sustainability of External Debt: A Focus on the Emerging Economies of Africa". Review of Development Finance,1, 184 –206.

Nasa, B., Investigating the Debt- Growth Relationship for Developing Countries; A Multi Country Econometric Analysis. Unpublished doctoral dissertation, University of Leicester, 2009.

Nasir,A. and Noman, A.M. (2012). Sustainability of External Debt: Further Evidence From Non-linear Framework. International Review of Applied Economics. 26(5), 673-685.

Nissanke, M., and Ferrarini, B., (2001). Debt Dynamics and Contingency Financing Theoretical Reappraisal of the HIPC Initiative. Wider Discussion Parer2001/139.

Nwachukwu, J. (2008). The Prospects for Foreign Debt Sustainability in Post-Completion-Point Countries: Implications of the HIPC-MDRI Framework. Development Policy Review, 26 (2): 171-188

Porcil, G. deSouza, A. G. and Viana, R. (2011). External Debt Sustainability and Policy Rules in a Small Globalized Economy. Structural Change and Economic Dynamic 22, 269-276.

Rossini, G., and Zanghieri, P. (2009). Current Account Composition and Sustainability of External Debt, Applied Economics, 41, 677–683.

Sachs J., (1989). The Debt Overhang Problem of Developing Countries, Paper presented in memory of Carlos Diaz-Alejandro, Helsinki, August.

World Bank (2014). World Development Indicators/ data is available at http://data.worldbank.org/