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Effect of Debt Overhang on the Development of Heavily Indebted Poor Countries: Debt Laffer Curve Analysis

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Abstract

This study explores that whether the debt financing or debt forgiving would be suitable for the Highly Indebted Poor Countries (HIPCs). Debt Laffer curve theory has been tested in 21 HIPCs by applying price equation of debt, maximized value of debt and price elasticity approach over the period of 1980 to 2016. The maximized value of debt criterion implies that Chad is not eligible for the debt write-off strategy in comparison with the rest of the countries. By applying price elasticity approach, it is observed that only Burkina Faso, Cameroon, Chad, and Republic of Congo are eligible for debt financing while the remaining countries should adopt debt write-off facility. The crux of the study is that overall debt forgiveness is suitable for the HIPCs. Moreover, it is also in the favor of both the creditor countries and various international financial institutions such as World Bank and IMF and HIPCs itself. The study suggests that the creditors should continue to financing along with improving structural policies and institutions of the HIPCs.

Key Words: Debt Overhang, Price elasticity, HIPCs,

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1. Introduction

External debt can be observed as a gear to economic growth if managed and implied to targeted and weak areas of the economy through proper planning as arrangement of extra resources are considered integral to local savings. It could likewise exchange of technology, production and management skills which therefore revitalizes economic growth (Mullick, 1988). The reason for foreign debt is to expand genuine exchange of assets from the developed countries to the developing countries, so that these nations may get economic growth and therefore enhance their welfare by investing foreign debt in a proper way.

Debt Laffer curve is basically a rating tool which is helpful for credit worthiness of debtor's/creditors country. To understand debt Laffer curve, one should understand debt overhang first. Debt overhang can be measured as the difference between the present value of a country's contractual debt obligations and the expected resource transfers that are needed to service it (Agénor, 2000). Debt overhang situation may properly be explained by supposing a country that has debt stock in current period and she has to repay it in future and debtor country's resources that are earned in current period through that debt will be flight away to the creditor countries in future as the result of debt servicing of that initial debt. After this, debtor country will get small benefit and she has to finance her investments through additional loans and resultantly debt servicing obligations accumulate.

When a country is in debt overhang situation, the creditor's country has two options for debtor country: one is debt forgiveness and second is debt financing. Creditor country has to decide whether she should go for debt forgiveness or debt financing. They can finance if they hope that debtor country will repay her debt and they can forgive by reducing the debt to that level that debtor country can repay it. Debt Laffer curve helps creditor country in taking decision between forgiving or financing. If any country lies on the wrong side of debt laffer curve, debt forgiving will be suitable both for creditor.

This study has estimated that which countries are on correct or wrong side of debt Laffer curve to point out whether debt forgiveness will be favorable for these countries or not? This study has significance because it will help the HIPCs to cope with their excessive debt issues. The study would also support the creditors of these countries to make clear cut policies whether they should continue to finance or they should give the facility of debt write-off to the HIPCs so that their provided debt is managed and used properly. The study is also imperative because it will help to boost the economic growth and welfare of the people of HIPCs by adopting the proper external debt management policy.

The rest of the study is arranged as. Section 2 explains the literature on empirical studies on debt laffer curve. Section 3 gives theoretical underpinning of debt laffer curve while in section 4 model specification is given. Section 5 explains data sources, Results and discussions. In the last section, the conclusions and policy implications are presented.

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2. Review of Empirical Studies

In this section, we have reviewed the empirical studies based on debt Laffer curve analysis. Claessens (1990) supported his results on a pooled cross-sectional regression utilizing the data of December 1986, 1987, and 1989 secondary market prices of bank debt for countries. The study assumed a linear relationship between the secondary market price of debt (P) and its face value (D). Claessens pointed out that only five of the twenty-nine countries were on the wrong side of the curve, while two were near the peak. These findings recommend that "across-the-board debt forgiveness generally via lessening of the nominal claims outstanding, unfavorable of the creditors for most heavily indebted countries.

Krugman (1998) analyzed the trade-off faced by the creditor countries. When a country is in debt overhang situation, creditor's country has two options for debtor country: debt forgiveness and debt financing. Creditor country has to decide whether he should go for debt forgiveness or debt financing. They can finance if they hope that debtor country will repay its debt and they can forgive by reducing the debt level to one that debtor country can repay it.

Chaudhary and Anwar (2001) explained the debt Laffer curve approach for South Asian countries to observe whether debt reduction was favorable for these countries or not. Two approaches i.e. OLS estimates and price elasticity applied by using time series analysis in this study. Data for the purpose of analysis were taken from 1970-71 to 1994-95 for all the South Asian countries. The results showed that Pakistan, Bangladesh, Nepal, Sri Lanka, and India lie on the correct side of debt Laffer curve.

Pattillio, Poirson and Ricci (2003) utilized the debt Laffer curve analysis to demonstrate the impact of debt on growth by distinguishing the top point where debt starts to affect negatively on growth. In their paper, they went further into breaking down through what channels external debt influences growth. They examined whether debt affects growth generally through factor accumulation or productivity. They found that the negative effect of higher debt on growth which seem to work both through a solid negative impact on physical capital accumulation and aggregate factor productivity growth

Sundell and Lemdal (2011) explored debt overhang and the effects on developing and developed economies. This study investigated association between debt, future payments and investments. There were 19 heavily indebted poor countries and 5 indebted poor countries during the two different crises of different periods. The findings demonstrated that developing and developed nations vary in the impact that debt overhang exerted on investments.

Sichula (2012) analyzed the presence of debt overhang in South African development community and the impact of debt relief on SADC. The study concluded that debt services did not have and direct relationship with GDP or private capital and debt overhang was still a paradox while debt relief played a major role in GDP growth for these countries.

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Tatu (2014) assessed the debt Laffer curve for Romania's case to investigate either it is enduring from debt overhang or not. Results showed that Romania does not suffer from debt overhang and is on correct side of debt Laffer curve and may possess this position up to coming years.

After reviewing the literature, it is concluded that there are very few studies that are focused on debt Laffer curve especially for Heavily Indebted Poor Countries. There is only one study that is of Claessens, in which HIPCs are focused but utilizing one technique that is OLS. While Cohen has dealt with price elasticity approach and Chaudhary and Anwar have combined both techniques i.e. OLS and Price elasticity to estimate the debt Laffer curve for South Asian Countries. For HIPC, no study has been conducted to analyze debt laffer curve by using three techniques i.e. and Price elasticity so this is research gap and this study is being based on the foundation of this research gap.

To the best of our knowledge there are three researches on debt Laffer curve. Among them one is of Claessens (1990) for 29 HIPCs in which Debt Laffer curve is estimated with OLS technique, while Cohen (1988) endeavored to find out the Debt Laffer curve problem with price elasticity approach for 31 developing countries. The third study is of Chaudhary and Anwar (2001) which is for South Asian countries in which both techniques, the Price Elasticity and the OLS have been used to estimate the debt Laffer curve. Not a single study exists in which three approaches i.e. price equation of debt, maximized value of debt and price elasticity approach are used to estimate the debt Laffer curve for Heavily Indebted Poor countries giving the room for further research.

3. Debt Laffer curve: Theoretical Underpinning

This section comprises of conceptual and theoretical foundations of debt Laffer curve. Applying the Laffer curve to the issue of indebtedness, the relationship between the nominal value of debt and market value of debt obligations are considered. To determine the position of the debt holder country, there are two plausible options: it can either be on the wrong side or on the correct side of the Debt Laffer Curve. If the country is on the wrong side of the Debt Laffer Curve (when nominal debt claims diminish, the market value of debt goes up), it would ultimately give benefit of creditor; while on the contrary, if the country is on the correct side, debt forgiveness would not give benefit to the creditors (Claessens, 1990).

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Figure 1: Debt Laffer Curve

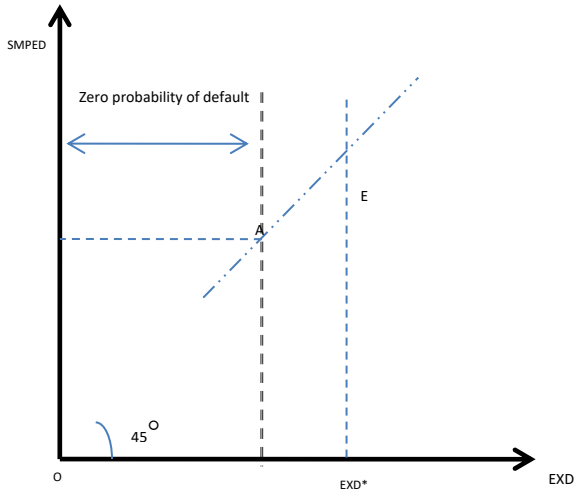

Figure 1 outlines the relationship between the nominal value of external debt (EXD) and the Secondary market price of the external debt outstanding (SMPED). When the debt stock is at lower level, the creditors assume that all the debt payments would be paid fully and it follows the 45- degree line up to a specific point here indicated as A. In this case, the value of SMPED would be unity.

Surpassing point A due to a further increment in EXD*, the default risk grows corresponding with the possibility of repayment falling beneath unity. Point E denotes the defining moment where EXD* (Nominal or contractual value of debt) and the risk of genuine default achieve a level that causes SMPED to decrease (Agénor, 2000).

On the correct hand side of point E, a nation is said to be on the wrong side of the Debt Laffer curve with expectations of lower repayments due to additional debt. Potential investors and creditors see this as a disincentive and subsequently investments decline intensely. This impact is sufficiently solid to guarantee that the market value of debt would increase when the stock of debt is decreased. To put it in another way, debt installments will increase when the amount used to debt servicing is decreased. For lenders, soothing part of the debt would be favorable as the capacity and possibly additionally the willingness of the indebted country to service its debt is prone to go up. Debtors then gain through decreased general debt and an encouraged creditworthiness and appeal as a reliable debtor that really benefits his or her debt (Woller and Phillips, 1996).

4. Model Specification

We are doing debt Laffer curve analysis by applying three approaches i.e. price equation of debt, maximized value of debt and price elasticity approach.

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4.1 Price Equation Approach

Debt Laffer curve demonstrates the connection between nominal and market value of debt. The secondary market price of the debt determines the market value of the debt (Cohen, 1989 and Claessens, 1990). Market value of debt is further a function of nominal external debt and other creditworthiness variables. To make things easier, it is assumed that growth rate of exports is exogenous and debt servicing is paid in equal annual installments. It also assumed that interest rate is constant during and after the grace period and is payable only after the grace period (Chaudhary and Anwar, 2001). There are three steps by which we can find the secondary market price of debt.

Step 1: Equal Annual Installments (EAI)

Equal Annual Installments on external debt outstanding for HIPC can be calculated through equation (1).

$$EAI = \frac{(\text{Ai})\ (\text{EXD})\ (1+\text{Ai}/100)^{\text{T}}\ \ (1+\text{Gi}/100)^{\text{G}}}{100(1+\text{Ai}/100)^{\text{T}}} \qquad \textbf{(1)}$$

Where:

Ai = Average interest rate on external debt

EXD = External debt outstanding

Gi = Grace period interest rate

G = Grace period

T = Repayment period

Step 2: Present Value of External Debt Outstanding

In this step, present value of external debt (PVED) using the discount rate (D) can be estimated by using equation (1).

$$PVED = \frac{(\text{EAI})\ [1\text{-}1/(1+\text{D}/100)]}{\text{D}/100(1+\text{D}/100)^{\text{G}}} \qquad \textbf{(2)}$$

Step 3: Secondary Market Price of External Debt Outstanding

Secondary market price of the external debt outstanding can be found by dividing the equation (2) by external debt outstanding. This is also called the price equation of debt.

$$SMPED = \alpha_0 + \alpha_1 EXDX + \alpha_2 GRX + \varepsilon \qquad \textbf{(3)}$$

Where:

SMPED = Secondary market price of external debt outstanding

EXDX = External debt outstanding to exports ratio

GRX = Exports growth rate

4.2 Maximum Value Approach

The second criterion is maximum value based approach. It shows that whether a country is on the correct or wrong side of the debt laffer curve. It can be calculated by the product of Secondary market price and external debt outstanding:

$$\text{MVED} = (\text{SMPED}*\text{EXD}) \qquad \textbf{(4)}$$

MVED= Maximized value of external debt

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SMPED= Secondary market price of external debt
EXD = External debt outstanding

4.3 Price Elasticity Approach

Price elasticity approach explains the own price effect of demand for external debt. To find the degree of responsiveness of external debt, following equation can be estimated:

$$LSMPED=\beta_0 + \beta_1 LEXTD + \beta_2 GRX + \varepsilon \quad \textbf{(5)}$$

Where:
LSMPED = Secondary market price of external debt outstanding (in Log form)
LEXTD = External debt outstanding to exports ratio (in Log form)
GRX = Exports growth rate
The decision of debt writes off strategy is based on marginal price of debt which can be found by applying the following formula (Cohen, 1989):

$$PEED = (SMPED)\ (1\text{-}tx)\ (DEXD) \quad \textbf{(6)}$$

Where PEED is the price elasticity of external debt, DEXD is the change in external debt and tx is t-statistics.
According to Cohen: If $PEED > (1- tx)(SE)$ then debt write-off is favorable.

5. Results and Discussions

The data of the study covers the time period from 1985 to 2014 that have been taken from International Debt Statistics (IDS), World Development Indicators (WDI) for 21 out of 35 Heavily indebted poor countries Benin, Burkina Faso, Burundi, Cameroon, Chad, Cote d'Ivoire, republic of Cango, The Gambia, Guinea, Honduras, Madagascar, Malawi, Mali, Mauritania, Niger, Rwanda, Sierra Leone, Senegal, Tanzania, Togo and Uganda. Some countries are excluded due to data limitations are Afghanistan, Bolivia, Central African Republic Comoros, Democratic republic of Cango, Ethopia, Ghana, Guinea-Bissau, Guyana, Haiti, Liberia, Mozambique, Nicaragua, Sao Tome & Principe and Zambia.
In this study, the main focus of the study is to trace out whether the HIPCs can benefit from debt write-off or not? For that purpose, Debt Laffer Curve analysis has been carried out. There are three methods that have been utilized in the literature for Debt Laffer Curve analysis: i) Price equation of debt through OLS ii) Maximum value of debt and iii) Price elasticity Method[1]. We have used both the methods for the Debt Laffer Curve analysis.

5.1 OLS Estimates of Price Equation of External Debt

Firstly, to estimate the price equation of external debt for 21 heavily indebted poor countries, OLS has been applied. Initially, to find secondary market price for debt (SMPD), Equal Annual Installments (EAI) have been calculated for HIPCs through equation (1). After that, the present

[1] Claessens (1990), Sachs and Huizinga (1987) estimated the Debt Laffer curve with OLS technique while Cohen (1989) applied price elasticity method.

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value of debt outstanding has been calculated from EAI by utilizing equation (2). As the market value of external debt is taken in terms of the secondary market price of external debt in this study so SMPED is estimated by using equation (3).

The result of OLS estimates of Secondary market price of external debt equation are displayed in Table 1, 2 and 3. Each table consists of seven countries due to space limitations and better interpretation of the results. Table 1 shows the findings for Benin, Burkina Faso, Burundi, Cameroon, Chad and Republic of Cango while Table 2 includes, Cote d'lvoire, The Gambia, Guinea, Honduras, Madagascar, Malawi and Mali and Table 3 represents Mauritania, Niger, Rwanda, Sierra Leone, Senegal, Tanzania, Togo and Uganda. The dependent variable in all these tables is secondary market price for debt (SMPED) while the explanatory variables include External debt outstanding to exports ratio (EXDX) and growth rate of exports (GRX) along with autoregressive terms to remove the issue of autocorrelation.

Turning to Table 1, the first explanatory variable is EXDX which has the negative and significant association with SMPED for Benin, Burkina Faso, and Republic of Congo. This means that 1 percent decrease in nominal debt outstanding increases the market value of debt significantly by 0.023141 for Benin, 0.028778 for Burkina Faso, 0.029865 in the case for Republic of Congo. Whereas EXDX has positive and significant relationship with SMPED for Burundi, Cameroon, and Chad which explain that 1 percent increase in nominal debt outstanding increases the market value of debt significantly by 0.000863 for Burundi, 0.004172 for Cameroon, and by 0.000184 in the case of Chad.

The second explanatory variable is GRX which is positively and significantly associated with SMPED for Benin, Burkina Faso, and Republic of Congo. This represents that 1 percent increase in growth rate of exports increases the market value of debt by 0.026021 for Benin, 0.248903 for Burkina Faso and 0.474524 for Republic of Congo. Whereas negative association exists between GRX and SMPED for Burundi, Cameroon and Chad which means that 1 percent decrease in GRX increases the value for SMPED by 0.025991for Burundi, by 0.291343 for Cameroon and by 0.001692 for Chad.

Table 1: OLS Estimates of Price Equation of External Debt

Dependent Variable: SMPED						
Explanatory Variables	**BEN**	**B.FASO**	**BDI**	**CMR**	**CHD**	**R.CONG**
Constant	0.358758 (0.4447)	0.310363 (0.3140)	0.019545 (0.1324)	0.220965 (0.4676)	0.131458 (0.6667)	0.290729 (0.4256)
EXTD	- 0.023141 (0.0967)	-0.028778 (0.4964)	0.000863 (0.0782)	0.004172 (0.9359)	0.000184 (0.9957)	- 0.029865 (0.3706)
GRX	0.026021 (0.2853)	0.248903 (0.0221)	-0.025991 (0.3767)	-0.291343 (0.0020)	- 0.001692	0.474524 (0.4368)

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					(0.9463)	
AR(1)	-----	-----	-----	0.859216 (0.0000)	0.446354 (0.2783)	-----
AR(2)	0.968837 (0.0000)	0.901659 (0.0000)	-----	-----	-----	0.825108 (0.0014)
R^2	0.762929	0.630800	0.252928	0.725061	0.217925	0.621627
D.W	1.696775	1.963810	1.945563	1.944151	2.084495	1.778689
Prob(F-statistic)	0.000000	0.000055	0.150264	0.000000	0.611380	0.000114

Source: Authors' calculations

The results of Table 2 shows that EXDX asserts positive effect on SMPED for Cote d'Ivoire, The Gambia, Guinea, Honduras, Madagascar, Malawi and Mali. This means that 1 percent increase in EXDX increases in SMPED by 0.108662 for Cote d'Ivoire, for The Gambia by 0.010403, by 0.028919 for Guinea, 0.024613 for Honduras, and by 0.048447 for Madagascar, 0.00412 for Malawi, and by 0.028622 for Mali. The other independent variable GRX has the positive and significant association with SMPED for Guinea and Honduras. This shows that if there is 1 percent increase in growth rate of exports the value for SMPED increases by 0.196692 for Guinea, and by 0.010176 for Honduras. For Cote d'Ivoire, The Gambia, Madagascar, Malawi and Mali, there is negative and significant association between GRX and SMPED.

Table 2: OLS Estimates of Price Equation of External Debt

Dependent Variable: SMPED							
Explanatory Variables	**CDV**	**GMB**	**GIN**	**HND**	**MDG**	**MWI**	**MLI**
Constant	0.018575 (0.9517)	-0.021884 (0.6665)	-0.031130 (0.6750)	-0.012502 (0.7262)	-0.016749 (0.8450)	0.000512 (0.0854)	0.054356 (0.7224)
EXTD	0.108662 (0.7986)	0.010403 (0.0000)	0.028919 (0.0007)	0.024613 (0.0000)	0.048447 (0.0075)	0.00412 (0.5158)	0.028622 (0.0464)
GRX	-0.218243 (0.8075)	-0.090157 (0.0000)	0.196692 (0.0186)	0.010176 (0.9112)	-1.097870 (0.0000)	-0.000334 (0.2816)	-0.310176 (0.0012)
AR(1)	-----	-0.490960 (0.0127)	0.468633 (0.0257)	-----	0.440231 (0.0029)	-----	0.151364 (0.3941)
AR(2)	-----	-----	-----	-----	-----	0.171022 (0.6885)	-----
R^2	0.027196	0.536914	0.677209	0.778540	0.849540	0.227054	0.437758
D.W	1.702240	2.018134	1.603429	1.926078	1.995222	2.188437	2.031131
Prob(F-statistic)	0.959485	0.000125	0.000161	0.000000	0.000000	0.728637	0.001342

Source: Authors' calculations

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The OLS estimates of price Equation of external debt for Mauritania, Niger, Rwanda, Sierra Leone, Senegal, Tanzania, Togo and Uganda are presented in Table 3.

Table 3: OLS Estimates of Price Equation of External Debt

Dependent Variable: SMPED								
Explanatory Variables	**MRT**	**NGR**	**RWA**	**S.LEO**	**SEN**	**TEZ**	**TGO**	**UGN**
Constant	-0.008228 (0.9268)	-0.011706 (0.8741)	0.187443 (0.4396)	0.044449 (0.8345)	-0.057285 (0.7986)	0.002288 (0.7982)	0.035616 (0.8709)	0.027264 (0.4248)
EXTD	0.012714 (0.0029)	0.078180 (0.2927)	0.002351 (0.6908)	-0.007796 (0.7645)	0.065023 (0.2610)	0.000519 (0.0128)	0.038683 (0.4362)	0.056705 (0.1705)
GRX	0.154698 (0.0000)	-0.364553 (0.0558)	0.059799 (0.0320)	-0.000554 (0.0036)	0.421366 (0.0000)	0.012620 (0.0021)	-0.131763 (0.6456)	-0.000304 (0.7954)
AR(1)	0.336913 (0.1008)	-----	0.736485 (0.0000)	0.040718 (0.9077)	0.601963 (0.0004)	0.313640 (0.4924)	0.152332 (0.4294)	-----
AR(2)	-----	-0.881654 (0.0871)	-----	-----	-----	-----	-----	-----
R^2	0.661600	0.871065	0.580687	0.202773	0.640813	0.850337	0.122046	0.067900
D.W	1.661940	1.881419	2.592292	1.951031	1.804394	1.979580	2.029640	2.013300
Prob (F-statistic)	0.000002	0.241245	0.000032	0.147386	0.000004	0.000000	0.419536	0.360750

Source: Authors' calculations

It shows the negative association between EXDX and SMPED for Sierra Leone which shows that 1 percent decrease in nominal debt outstanding increases the market value of debt significantly for Sierra Leone by -0.007796 while there is positive association between EXDX and SMPED for Mauritania, Niger, Rwanda, Senegal, Tanzania, Togo and Uganda that shows that if there is 1 percent increase in EXDX, then market value for debt increases by 0.012714, 0.078180, 0.002351, 0.065023, 0.000519, 0.038683 and by 0.056705 for Mauritania, Niger, Rwanda, Senegal, Togo and Uganda respectively. The relationship between Growth rate of exports and SMPED shows positive and significant association for Mauritania, Rwanda, Senegal, Tanzania and Togo while negative association for Niger, Sierra Leone, Togo and Uganda.

The results of R square shows that model used in this study are very good in case of Benin, Burkina Faso, Cameron Republic of Congo, Gambia, and Guinea Honduras Madagascar. Mauritania, Nicaragua Rwanda, Senegal, Tanzania, and Uganda, while for Burundi, Chad, Malawi, Mali, Sierra Leone and Togo, the values of R^2 are low. Durbin Watson test shows that problem of multicollinearity does not exist in any country.

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5.2 Estimation of the Maximized Value of External Debt

In Table 4, maximized value of external debt is calculated to sort out the position of a country on debt Laffer curve. To calculate maximized value of debt, nominal value of external debt outstanding is multiplied by its secondary market price of external debt for each HIPC as mentioned in equation (4). Maximized value for debt is calculated for the current year[2] i.e. 2014 as well as for the years 1990, 2000, and 2010 for the decade wise analysis.

For this purpose, debt to export ratio of targeted year is compared to the debt to export ratio of that year for which the value of external debt is maximized. If the debt to export ratio of targeted year[3] is less than the debt to export ratio correspondent to the value for which external debt is maximized, the country will be on the correct side of the debt Laffer curve for that specified year and debt write off will not be favorable to that country. But if the debt to export ratio of the targeted year is greater than the debt to export ratio of the year for which its value of debt is maximized, the country will be on the wrong side of the debt Laffer curve for that specified year and the debt write off will be favorable to that country.

The results of the maximum value of external debt reflects that debt to export ratio of Benin in 2014 is 0.855727 which is less than its debt to export ratio for which its value of debt maximized (14.2982187) i.e. 5.925466. Table 4 also indicates the decade wise comparison between the current debt to export ratio and debt to export ratio for which external debt for Benin is maximized, represents Benin was on the wrong side of the debt Laffer curve for the year 1990 while in 2000 and 2010 Benin was on the correct side of the debt Laffer curve. In the case of Burkina Faso it is clear from the Table 4 that it is on the correct side of the debt Laffer curve as its current Debt to export ratio in 2014 is 0.611499 which is less than its debt to export ratio for which its value of debt maximized MVD (5.64802443) that is 2.701161. Decade wise analysis indicates that Burkina Faso was on the correct side of the debt Laffer curve in 1990, while in 2000 it was on the wrong side and in 2010 it came up on the correct side of the debt Laffer curve.

If Burundi is taken into account to check whether it is on the correct side of the debt laffer curve or on the wrong side, the results show that Burundi is on the correct side of the debt laffer curve as its EXTD value for year 2013 is 1.170302 which is less then it's value for EXT for which its value of debt maximized MVD (0.053774685) i.e. 1.312525. Decade wise analysis indicates that Burundi was on the wrong side of the debt Laffer curve in year 1990, while remained on correct side of the debt Laffer curve in 2000 and in 2010. In the case of Cameroon, it is clear from the Table 4 that it is on the wrong side of the debt Laffer curve as its Debt to export ratio is 0.435611 in 2014 which is greater than its debt to export ratio for which its value of debt maximized MVD (1.164048749) that is 0.30652. Decade wise analysis indicates that Burkina Faso was on the wrong side of the debt Laffer curve in 1990, while during year 2000 and 2010 Burkina Faso remained on the correct side of the Debt Laffer curve.

[2] Current year: In this analysis 2014 is termed as Current year instead of 2016-17 due to unavailability of the data.
[3] Targeted year: The desired year for which the debt Laffer curve analysis is processed to check whether the country is on the correct side of the Debt laffer curve or not.

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Chad is on the wrong side of the debt Laffer curve as its value for EXTD is 25.6939 for year 2014 that is greater than which is greater than the debt to export ratio for which value of external debt for Chad maximized MVD (23.3807289) that is 2. During year 1990 Chad remained on the correct side of the debt Laffer curve while during year 2000, and 2010 also Chad remained on the wrong side of the debt Laffer curve. Republic of Congo is on the wrong side of the debt Laffer curve as its value for EXTD for year 2014 is 1.466701 greater than the debt to export ratio for which value of external debt for Republic of Congo is maximized (0.32071006) that is 1.098322. Decade wise analysis indicates that Republic of Congo was on the correct side of the debt Laffer curve in 1990, 2000 while on the wrong side in year 2010.

In the case of Cote d'Ivoire results, it is on the correct side of the debt laffer curve as its Debt to export ratio for the year 2014 is 0.65189 which is less than the debt to export ratio for which value of external debt for Cote d'Ivoire is maximized (21.6734645) that is 0.830895 Decade wise analysis indicates that Burkina Faso was at the wrong side in 1990, while in during years 2000 and 2010 was at the correct of the debt Laffer curve. The Gambia, at the wrong side of the debt Laffer curve as its value for EXTD is 1.54546 for year 2014 that is greater than the debt to export ratio for which value of external debt for The Gambia is maximized (0.02372193) that is 1.158978. In 1990, 2000, and 2010 also The Gambia was on the correct side of the debt Laffer curve.

Debt to export ratio for Guinea in 2014 is 0.125846 that is less than the debt to export ratio for which the value of external debt is maximized 0.06500518 that is 0.543171, results shows that Guinea is on the correct side of the debt Laffer curve. Similarly, during 1990, 2000 and for 2010 also Guinea remained on the correct side of the Laffer curve. Honduras, at the wrong side of the debt Laffer curve as its value for EXTD is 0.630229 for year 2014 that is greater than the debt to export ratio for which value of external debt for Honduras is maximized (0.24510314) that is 0.500914. During years 1990, 2000, and 2010 also Honduras was at the correct side of the debt Laffer curve. In the case of Madagascar results in the Table 4 that it is on the correct side of the debt laffer curve as its Debt to export ratio for the year 2014 is 0.025583 which is less than the debt to export ratio for which value of external debt for Madagascar is maximized (0.01782021) that is 0.03125 Decade wise analysis indicates that Madagascar was at the correct side in 1990, 2000 and in 2010.

Malawi at the correct side of the debt Laffer curve as the value for EXTD is 0.508751 for year 2014 that is less than the debt to export ratio for which value of external debt for Malawi is maximized (0.09096975) that is 0.651222. During years 1990, 2000, and 2010 also Malawi was at the correct side of the debt Laffer curve. Mali is on the wrong side of the debt Laffer curve as the value for EXTD for year 2014 is 1.008511 greater than the debt to export ratio for which value of external debt for Mali is maximized (3.68188609) that is 0.852712. Decade wise analysis indicates that Mali was at the correct side of the debt Laffer curve in 1990, 2000 and in 2010 also. Mauritania is on the wrong side of the debt Laffer curve as the value for EXTD for year 2014 is 0.608576 greater than the debt to export ratio for which value of external debt for Mauritania is

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maximized (0.2876522) that is 0.56072. Decade wise analysis indicates that Mauritania remained at the correct side of the debt Laffer curve in 1990, 2000 and in 2010.

Niger, at the correct side of the debt Laffer curve as its value for EXTD is 0.936914 for year 2014 that is less than the debt to export ratio for which value of external debt for Niger is maximized (1.73342536) that is 1.054236. During 1990 Niger was on the wrong side of the debt Laffer curve while for the year 2000, and 2010 also Niger was on the correct side of the debt Laffer curve. Debt to export ratio for Rwanda in 2014 is 1.339207 that is less than the debt to export ratio for which the value of external debt is maximized 0.06500518 that is 0.543171, results shows that Rwanda is on the correct side of the debt Laffer curve. Similarly, during 1990, 2000 and for 2010 also Rwanda remained on the correct side of the Laffer curve.

Sierra Leone, at the correct side of the debt Laffer curve as its value for EXTD is 0.18021 for year 2014 that is less than the debt to export ratio for which value of external debt for Sierra Leone is maximized (4.0451E-05) that is 1.100688. During years 1990, 2000, and 2010 also Sierra Leone was at the correct side of the debt Laffer curve. In the case of Senegal results in the Table 4 that it is on the wrong side of the debt laffer curve as its Debt to export ratio for the year 2014 is 0.881541 which is greater than the debt to export ratio for which value of external debt for Senegal is maximized (0.41729963) that is 0.8207 Decade wise analysis indicates that Senegal was at the correct side in 1990 and 2000 while at wrong side in 2010. Tanzania at the wrong side of the debt Laffer curve as the value for EXTD is 0.880062 for year 2014 that is greater than the debt to export ratio for which value of external debt for Tanzania is maximized (0.64389946) that is 0.849199. Decade wise analysis indicates that Tanzania was at the wrong side of the debt Laffer curve in 1990, at correct side in year 2000 and again at wrong side during 2010. Togo is on the wrong side of the debt Laffer curve as the value for EXTD for year 2014 is 0.260712 greater than the debt to export ratio for which value of external debt for Togo is maximized (0.05210485) that is 0.249835. Decade wise analysis indicates that Togo remained at the correct side of the debt Laffer curve in 1990, 2000 and in 2010. Uganda is on the wrong side of the debt Laffer curve as the value for EXTD for year 2014 is 0.800332 greater than the debt to export ratio for which value of external debt for Mali is maximized (0.38033692) that is 0.697541. Decade wise analysis indicates that Uganda was at the correct side of the debt Laffer curve in 1990, 2000 and in 2010.

In nutshell, overall position of the HIPCs countries in the debt Laffer curve is estimated through comparing the debt to export ratio of the current year with the value of debt to export ratio corresponding to its overall maximized value of debt. The results show that Benin, Bolivia, Burkina Faso, Burundi, Cameroon, Republic of Congo, Cote d'lvoire, Gambia, Guinea, Honduras, Madagascar, Malawi, Mali, Mauritania, Niger, Rwanda, Sierra Leone, Senegal, Tanzania, Togo and Uganda are on the debt laffer curve.

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Table 4: Secondary Market Prices of External Debt, Maximized Value of External Debt and External Debt Outstanding to Exports of HIPC (1980-2014)

(Millions)

Years	1.Benin			3. Burkina Faso			4. Burundi			5. Cameroon			7. Chad			8. Republic of Congo			9. Cote d'Ivoire		
	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX
1980	1.00000	14.30	5.93	0.19638	1.27	2.87	0.06949	1.19	33.19	0.16773	12.73	3.62	0.11629	1.17	14.09	0.22483	4.48	27.78	0.16340	44.10	7.41
1981	0.26894	4.18	3.34	1.00000	5.65	2.70	0.48713	9.58	41.36	0.67777	48.63	3.92	0.11629	0.99	9.70	1.00000	14.77	28.83	1.00000	285.89	9.81
1982	0.52566	10.04	9.84	0.30026	1.67	3.02	0.96709	22.91	33.26	1.00000	67.57	3.75	0.30001	1.98	10.67	0.47099	8.71	29.88	0.84090	244.35	10.22
1983	0.10539	2.03	10.25	0.46479	2.77	3.81	1.00000	30.12	35.63	0.68123	42.17	3.37	0.30001	1.97	6.16	0.76651	13.83	30.92	0.94783	249.67	10.38
1984	0.48327	8.78	6.28	0.54769	3.16	3.29	0.44960	13.07	31.05	0.28099	15.32	2.67	0.23426	1.10	3.17	0.84737	13.92	1.21	0.47661	102.72	7.11
1985	0.30192	6.85	6.64	0.23005	1.64	4.26	0.17955	6.49	28.18	0.64440	34.50	2.47	0.36706	2.02	5.64	0.59466	14.14	1.94	0.55284	134.21	7.59
1986	0.34842	9.52	7.13	0.25048	2.39	4.75	0.17294	8.19	33.13	0.50420	35.26	2.71	0.03418	0.28	5.60	0.32421	12.68	4.99	0.36832	108.18	7.88
1987	0.05859	1.87	6.92	0.32790	3.99	4.23	0.27691	18.32	58.45	0.26417	20.99	3.76	0.07819	0.86	6.03	0.73808	32.82	4.43	0.32488	117.95	10.19
1988	0.18384	5.63	9.72	0.19568	2.35	3.85	0.13477	8.96	47.78	0.53024	43.84	3.57	0.05750	0.66	5.05	0.47354	21.27	4.76	0.36029	129.04	10.79
1989	0.05917	1.59	9.15	0.17470	1.70	3.84	0.14384	9.25	54.77	0.46171	43.33	4.00	0.05742	0.67	5.87	0.35508	14.80	3.31	0.38224	153.62	12.41
1990	0.09079	2.51	7.34	0.24485	2.72	3.03	0.09896	6.13	63.41	0.45777	51.71	4.49	0.11272	1.57	5.09	0.18768	9.19	3.26	0.29424	144.17	13.76
1991	0.06802	1.92	5.18	0.04705	0.63	3.79	0.12286	7.76	49.27	0.39908	44.90	4.72	0.03962	0.64	6.96	0.00000	0.48	3.95	0.29088	149.16	15.17
1992	0.08447	2.40	5.30	0.02554	0.37	4.44	0.07917	5.06	58.93	0.17826	22.56	5.31	0.03882	0.75	8.56	0.25374	12.32	3.86	0.29491	154.36	14.48
1993	0.04605	1.36	5.10	0.09893	1.55	5.02	0.10834	6.67	61.75	0.22365	23.67	5.63	0.04472	0.95	10.44	0.00000	0.53	4.46	0.21431	108.66	15.40
1994	0.07054	1.68	4.27	0.17210	2.39	4.94	0.07343	4.48	58.90	0.07489	8.79	6.50	0.11797	1.97	8.57	0.06048	2.49	4.00	0.17666	55.81	8.93
1995	0.08747	1.83	3.28	0.01917	0.28	5.08	0.08715	4.72	38.80	0.08968	11.45	6.22	0.04751	0.78	5.09	0.05816	2.57	3.19	0.05679	17.55	6.83
1996	0.03483	0.67	2.80	0.07114	1.06	5.32	0.07104	3.28	80.37	0.02849	3.55	4.92	0.03766	0.63	6.96	0.00000	0.33	1.85	0.04343	13.21	5.87
1997	0.08512	1.62	3.36	0.03577	0.52	5.66	0.06333	2.08	33.92	0.06768	7.92	4.66	0.02461	0.40	8.56	0.00000	0.30	1.69	0.04088	9.36	4.41
1998	0.06949	1.27	3.12	0.36870	5.62	5.80	0.05561	1.72	42.99	0.01901	2.26	4.83	0.11530	1.89	10.44	0.00000	0.37	2.48	0.01112	2.34	3.90
1999	0.10121	1.78	2.81	0.04553	0.73	6.04	0.06004	1.66	45.22	0.04397	4.87	5.00	0.03717	0.71	8.57	0.00000	0.28	1.62	0.01392	2.59	3.43
2000	0.05593	0.90	2.91	0.07830	1.13	5.68	0.14161	2.76	35.14	0.01268	1.34	3.92	0.02415	0.43	11.06	0.11697	2.18	0.70	0.01507	2.52	3.71
2001	0.01000	0.17	3.07	0.02101	0.31	5.34	0.03400	0.57	35.97	0.04488	4.28	3.32	0.09246	1.46	12.10	0.01100	0.22	0.90	0.00159	0.24	3.19
2002	0.01549	0.27	2.84	0.07827	1.14	4.71	0.02879	0.53	47.11	0.02034	1.98	3.22	0.02485	0.45	13.15	0.00992	0.23	0.95	0.01413	2.00	2.36
2003	0.04310	0.68	2.14	0.01215	0.20	4.16	0.01576	0.29	39.33	0.02662	2.87	3.33	0.02452	0.53	14.20	0.01612	0.42	0.92	0.00000	1.40	2.11
2004	0.00743	0.13	2.10	0.01625	0.29	3.07	0.02884	0.47	24.62	0.02933	2.96	2.58	0.03986	0.84	15.24	0.02847	0.77	0.74	0.02849	4.17	1.86
2005	0.02828	0.45	1.97	0.03210	0.57	3.06	0.02871	0.37	13.04	0.00000	0.70	1.63	0.08495	1.38	16.29	0.01037	0.22	0.42	0.04461	5.80	1.49
2006	0.01924	0.12	0.65	0.00000	0.10	1.39	0.00000	0.13	13.64	0.03982	1.19	0.61	0.00000	0.16	17.33	0.02948	0.55	0.30	0.02067	2.83	1.44
2007	0.02596	0.20	0.54	0.04626	0.60	1.62	0.05815	0.75	13.04	0.01079	0.29	0.42	0.03327	0.54	18.38	0.01698	0.25	0.24	0.16937	24.39	1.47
2008	0.02404	0.22	0.55	0.03280	0.43	1.22	0.03608	0.37	6.22	0.00588	0.14	0.32	0.01786	0.26	19.42	0.10723	1.31	0.70	0.02455	3.02	1.06
2009	0.01939	0.23	0.81	0.02228	0.34	1.36	0.02457	0.10	3.44	0.01951	0.51	0.48	0.13899	2.32	20.47	0.00946	0.13	0.90	0.09156	12.30	1.07
2010	0.00731	0.11	0.85	0.04143	0.69	0.84	0.00602	0.02	2.06	0.00808	0.20	0.44	0.44833	8.14	21.51	0.00900	0.05	0.95	0.04479	4.53	0.79
2011	0.03010	0.49	0.93	0.09051	1.51	0.57	0.01685	0.05	1.31	0.04949	1.16	0.31	0.10309	1.88	22.56	0.05790	0.32	1.10	0.18821	21.67	0.83
2012	0.00546	0.09	0.85	0.04874	0.85	0.50	0.01385	0.04	1.28	0.03780	1.04	0.36	0.06666	1.22	23.60	0.00459	0.03	1.22	0.16700	13.73	0.62
2013	0.03799	0.72	0.86	0.08671	1.51	0.62	0.01395	0.04	1.17	0.02808	0.99	0.43	1.00000	23.38	24.65	0.02056	0.16	1.34	0.06767	6.56	0.73
2014	0.06359	1.03	0.86	0.07271	1.26	0.61	0.01382	0.04	1.06	0.02485	0.93	0.44	0.01132	0.26	25.69	0.00407	0.04	1.47	0.00979	0.92	0.65

Source: Authors' calculations

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Table 4: Secondary Market Prices of External Debt, Maximized Value of External Debt and External Debt Outstanding to Exports of HIPC (1980-2014)

(Millions)

Years	11. The Gambia			12. Guinea			15. Honduras			17. Madagascar			18. Malawi			19. Mali			20. Mauritania		
	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX
1980	0.03209	0.80	37.47	0.24994	15.08	16.61	0.16509	30.74	19.24	0.17574	4.75	5.21	0.36005	1122.95	990.92	0.21058	4.55	8.23	0.08784	6.21	26.19
1981	0.18783	5.91	48.17	1.00000	57.32	14.41	0.67576	134.87	22.10	1.00000	27.62	6.95	1.00000	2651.69	835.05	1.00000	22.28	11.12	0.43455	32.88	22.32
1982	0.20762	6.71	38.54	0.70886	33.26	13.56	0.70548	145.41	26.31	0.67317	17.35	6.75	0.21020	535.04	946.01	0.58031	12.05	10.91	0.52409	42.46	26.49
1983	0.18876	6.07	39.25	0.66414	25.13	8.66	0.49935	110.49	27.15	0.61522	13.78	6.26	0.36717	867.07	855.44	0.92616	19.59	10.13	1.00000	84.87	23.92
1984	0.02571	0.82	27.08	0.50136	15.46	7.14	1.00000	230.32	26.68	0.32416	6.93	5.41	0.48940	1010.50	604.70	0.22570	5.47	10.41	0.28768	22.77	23.96
1985	1.00000	24.50	28.10	0.24129	9.98	4.67	0.61574	159.84	28.09	0.17153	3.91	6.44	0.13035	286.63	796.32	0.15673	4.63	12.41	0.27338	21.61	19.64
1986	0.02773	0.53	20.54	0.33562	31.61	16.61	0.45702	123.91	26.46	0.10033	2.38	5.89	0.36281	796.81	807.93	0.27424	9.72	12.79	0.26810	23.72	19.89
1987	0.01425	0.28	15.63	0.57043	49.57	14.41	0.49031	142.66	30.14	0.12756	3.02	5.48	0.09060	201.33	718.60	0.69940	29.70	12.43	0.12816	11.92	21.17
1988	0.02682	0.48	12.13	0.19738	15.41	13.56	0.86827	237.70	26.13	0.06820	1.33	4.69	0.12550	211.40	493.21	0.16128	7.05	13.61	0.09610	8.58	18.71
1989	0.01186	0.19	9.68	0.24416	14.97	8.66	0.90929	236.97	24.01	0.04454	0.72	3.44	0.07180	102.39	460.25	0.16718	7.44	12.62	0.26104	20.75	16.32
1990	0.00911	0.14	9.35	0.29641	17.71	7.10	0.61755	145.11	22.31	0.01968	0.31	3.24	0.04351	61.96	314.79	0.19109	9.17	10.85	0.20789	17.25	17.49
1991	0.10871	0.76	3.10	0.40233	20.16	5.91	0.29469	50.15	16.12	0.03031	0.45	3.01	0.10366	142.52	263.67	0.08924	4.79	11.51	0.39179	23.99	13.06
1992	0.00285	0.02	3.12	0.28008	11.23	5.86	0.21088	37.49	16.12	0.02509	0.32	2.54	0.02299	28.64	286.59	0.46011	27.35	12.64	0.06388	3.53	12.91
1993	0.00281	0.02	3.01	0.10211	4.37	5.65	0.09509	16.61	14.09	0.01639	0.18	2.13	0.04831	50.19	297.16	0.27080	15.61	12.09	0.09430	4.81	12.00
1994	0.00291	0.02	3.17	0.06353	2.93	6.83	0.34291	50.25	10.71	0.01807	0.15	1.29	0.07111	64.80	257.43	0.25056	9.61	9.28	0.08511	4.06	11.18
1995	0.01921	0.13	3.76	0.12570	5.62	6.38	0.08114	9.76	7.21	0.01733	0.11	0.82	0.09290	52.92	120.36	0.20211	7.34	6.76	0.01523	0.75	9.73
1996	0.00181	0.01	2.97	0.11400	5.10	5.68	0.06512	6.23	4.83	0.00344	0.02	0.62	0.02591	10.00	69.48	0.08610	3.23	6.81	0.09152	4.53	9.66
1997	0.00252	0.02	2.92	0.02085	1.00	6.38	0.35832	28.83	3.56	0.01210	0.06	0.57	0.00549	1.69	52.03	0.07936	2.96	5.64	0.10633	4.77	9.75
1998	0.00424	0.03	2.49	0.05902	2.75	5.64	0.02401	1.79	2.99	0.00406	0.02	0.54	0.00486	1.37	48.41	0.17072	6.36	5.67	0.07745	2.81	9.19
1999	0.00634	0.05	2.63	0.03827	1.55	5.22	0.00985	0.70	3.08	0.00289	0.01	0.49	0.00577	1.32	43.62	0.28877	9.29	4.52	0.00417	0.15	1.42
2000	0.00765	0.06	2.61	0.05194	1.90	4.82	0.01653	0.91	1.37	0.00244	0.01	0.35	0.00356	0.61	36.65	0.00000	0.30	4.51	0.03743	1.22	2.70
2001	0.00401	0.03	2.80	0.02363	0.78	3.91	0.00726	0.34	1.15	0.00213	0.01	0.27	0.00208	0.27	27.12	0.02120	0.58	3.06	0.01637	0.49	3.71
2002	0.00715	0.06	3.41	0.02303	0.80	4.34	0.01392	0.66	1.08	0.00237	0.01	0.25	0.06596	4.54	14.42	0.03126	0.84	2.50	0.03249	0.89	5.28
2003	0.00320	0.02	5.42	0.02433	0.76	4.12	0.01553	0.71	1.04	0.00171	0.01	0.29	0.00054	0.04	10.77	0.03817	1.27	2.84	0.01709	0.45	3.93
2004	0.00946	0.06	3.78	0.11078	3.12	3.43	0.00443	0.21	0.91	0.00191	0.00	0.16	0.00096	0.06	11.25	0.07483	2.38	2.56	0.04401	1.03	3.93
2005	0.00756	0.05	3.39	0.02003	0.43	2.29	0.00463	0.17	0.98	0.00193	0.00	0.13	0.00112	0.06	8.87	0.05667	1.70	2.08	0.08350	1.77	4.21
2006	0.00036	0.00	3.31	0.03055	0.51	1.53	0.00659	0.18	0.67	0.00162	0.00	0.04	0.00044	0.01	1.55	0.00939	0.14	0.79	0.01263	0.16	3.31
2007	0.00908	0.06	2.34	0.01337	0.21	1.18	0.00697	0.14	0.42	0.00211	0.00	0.04	0.00085	0.01	1.34	0.08262	1.46	0.88	0.03491	0.45	3.02
2008	0.00571	0.02	0.99	0.02535	0.33	0.90	0.01949	0.41	0.42	0.00288	0.00	0.04	0.00034	0.00	1.17	0.04001	0.77	0.73	0.03549	0.48	0.66
2009	0.00179	0.01	1.46	0.01066	0.13	1.06	0.01423	0.30	0.49	0.00204	0.00	0.05	0.00071	0.01	0.95	0.04412	0.93	0.95	0.09460	1.46	0.94
2010	0.00000	0.04	1.46	0.03898	0.39	0.64	0.01518	0.32	0.43	0.00000	0.01	0.04	0.00020	0.00	0.85	0.02830	0.67	0.94	0.02934	0.45	0.66
2011	0.00642	0.02	1.16	0.00783	0.07	0.54	0.01007	0.22	0.35	0.02087	0.02	0.03	0.00138	0.01	0.65	0.06651	1.73	0.91	0.02090	0.29	0.44
2012	0.00271	0.01	1.12	0.00000	0.03	0.13	0.00000	0.24	0.36	0.00063	0.00	0.03	0.00027	0.00	0.70	0.12599	3.68	0.85	0.00086	0.01	0.55
2013	0.00401	0.01	1.36	0.00477	0.01	0.14	0.00761	0.25	0.50	0.00191	0.00	0.02	0.00000	0.09	0.65	0.05999	2.04	1.01	0.00000	0.17	0.56
2014	0.00373	0.01	1.55	0.00511	0.01	0.13	0.00297	0.10	0.63	0.00103	0.00	0.03	0.00004	0.00	0.51	0.09252	3.11	1.01	0.00161	0.03	0.61

Source: Authors' calculations

(Contd …)

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Table 4: Secondary Market Prices of External Debt, Maximized Value of External Debt and External Debt Outstanding to Exports of HIPC (1980-2014)

(Millions)

Years	22. Niger			23. Rwanda			24. Sierra Leone			25. Senegal			26. Tanzania			27. Togo			28. Uganda		
	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX	SMPED	MVED	EXDX
1980	0.23815	4.88	3.18	0.17701	4.10	11.76	0.683234	12624.18	6693.31	0.23038	8.57	4.48	0.07677	73.17	125.12	0.11287	49.87	5.48	0.11341	1474.21	3930.60
1981	1.00000	21.92	4.04	0.63667	14.17	11.88	0.009122	193.0359	10393.10	1.00000	38.00	3.79	0.50794	434.32	105.63	0.53823	230.09	5.07	0.83321	7600.16	3330.24
1982	0.42290	7.85	4.21	0.66756	15.63	14.96	0.046656	895.0316	12963.39	0.46544	17.93	4.26	0.19225	136.63	134.03	0.51474	222.45	4.88	0.08687	1429.94	4742.28
1983	0.35375	6.11	4.46	0.90977	23.05	16.06	0.004173	67.06229	11308.68	0.41423	16.28	4.04	0.26142	164.31	127.95	0.63219	257.34	5.11	0.16344	2127.20	3539.61
1984	0.15310	2.34	4.38	0.50507	13.21	14.32	0.000394	4.30507	6287.30	0.38593	14.92	4.22	1.00000	531.90	105.13	0.49540	211.96	4.13	0.04017	444.28	2607.99
1985	0.15806	3.22	6.44	1.00000	31.52	18.52	0.002892	21.52408	4649.12	0.44043	18.19	4.83	0.09287	56.18	138.55	0.00000	0.00	4.57	0.11809	683.46	1554.15
1986	0.02659	0.67	5.94	0.42338	17.71	17.66	0.006236	31.84497	3344.81	0.17214	8.49	4.58	0.05142	14.71	64.15	0.29278	0.15	3.92	1.00000	2802.19	664.81
1987	0.08718	2.46	5.16	0.60824	33.90	31.25	1.000000	2283.695	1247.88	0.17529	10.98	5.67	0.06313	18.24	72.39	0.08042	0.05	4.12	0.01210	16.42	406.65
1988	0.05259	1.62	6.35	0.53794	31.68	33.70	0.002442	3.36908	880.95	0.08291	5.08	5.27	0.03389	44.62	259.66	0.07063	0.05	3.79	0.00098	0.46	176.15
1989	0.14799	4.02	6.17	0.67889	36.21	34.04	0.002978	2.67678	504.93	0.07502	3.81	4.03	0.41196	436.53	197.05	0.13905	0.09	3.60	0.06695	16.50	88.72
1990	0.08922	2.84	5.66	0.59414	31.89	36.44	0.000071	0.04078	273.41	0.10048	5.84	3.78	0.08928	85.21	175.35	0.04742	0.04	3.08	0.00050	0.10	113.88
1991	0.05749	1.67	6.90	0.21281	11.30	37.39	0.001631	0.43605	118.75	0.25625	14.35	4.05	0.06741	51.19	147.97	0.05438	0.04	3.33	0.00051	0.09	87.81
1992	0.19061	5.67	6.88	0.29050	15.22	50.29	0.000890	0.14317	78.74	0.10160	5.90	4.03	0.06548	40.33	105.40	0.00000	0.01	3.68	0.00044	0.05	66.09
1993	0.14848	4.41	8.35	0.13097	6.39	46.45	0.000034	0.00483	79.01	0.07272	4.41	4.91	0.06310	31.70	63.86	0.00000	0.01	5.92	0.00018	0.02	33.24
1994	0.08108	1.78	8.04	0.12958	5.67	86.83	0.000066	0.00745	52.03	0.14486	6.31	3.36	0.03822	15.63	42.22	0.00000	0.01	4.51	0.00005	0.01	19.20
1995	0.00911	0.20	6.62	0.32194	10.07	31.65	0.000027	0.00180	52.41	0.03397	1.46	2.70	0.07390	24.30	25.35	0.21106	0.15	3.55	0.00004	0.00	14.79
1996	0.02083	0.42	5.22	0.05560	1.59	32.13	0.000018	0.00096	46.95	0.06624	2.64	2.75	0.02160	5.93	19.30	0.13833	0.09	2.67	0.00003	0.00	12.19
1997	0.02466	0.49	6.24	0.01028	0.27	17.24	0.000015	0.00072	99.71	0.05282	2.07	2.92	0.01265	2.79	17.06	0.00000	0.01	2.61	0.00003	0.00	12.70
1998	0.00244	0.05	5.36	0.00000	0.28	23.40	0.000079	0.00342	75.23	0.10238	4.21	2.80	0.02198	4.02	14.90	0.00000	0.01	2.63	0.00003	0.00	12.74
1999	0.02655	0.54	6.10	0.01634	0.55	27.80	0.000000	0.37056	106.43	0.01602	0.64	2.63	0.00851	1.48	13.95	0.17799	0.13	2.94	0.00002	0.00	11.81
2000	0.00333	0.07	5.88	0.03083	0.98	22.54	0.000007	0.00022	54.22	0.00622	0.22	2.59	0.00532	0.78	10.40	0.00000	0.01	3.17	0.00004	0.00	10.60
2001	0.01432	0.26	5.23	0.02230	0.71	18.37	0.000039	0.00076	23.11	0.01889	0.67	2.42	0.00381	0.48	6.93	0.11871	0.08	2.90	0.00002	0.00	10.72
2002	0.03141	0.62	5.63	0.02168	0.81	28.72	0.000009	0.00020	19.84	0.04334	1.65	2.40	0.00238	0.31	6.57	0.05627	0.04	2.59	0.00002	0.00	11.71
2003	0.00912	0.21	5.26	0.10250	3.36	22.52	0.000004	0.00009	12.82	0.02993	1.21	2.12	0.00349	0.43	5.41	0.00000	0.01	2.33	0.00002	0.00	10.42
2004	0.02521	0.53	3.79	0.02556	0.80	15.09	0.000005	0.00011	9.89	0.01638	0.59	1.58	0.00312	0.42	4.99	0.00000	0.01	2.19	0.00006	0.00	6.95
2005	0.01216	0.24	3.27	0.03782	0.96	9.76	0.000006	0.00011	7.48	0.02721	0.94	1.35	0.00764	0.79	3.40	0.04028	0.03	1.72	0.00001	0.00	4.83
2006	0.00488	0.04	1.21	0.06267	0.41	1.66	0.000006	0.00008	4.75	0.01256	0.21	0.65	0.00210	0.09	1.23	0.00000	0.01	1.78	0.00002	0.00	1.19
2007	0.03789	0.40	1.30	0.22964	1.90	1.70	0.000007	0.00004	1.38	0.06654	1.40	0.69	0.00077	0.04	1.20	1.00000	0.83	1.73	0.00002	0.00	1.01
2008	0.00000	0.09	0.76	0.17324	1.42	1.13	0.000004	0.00002	1.55	0.10007	2.18	0.57	0.00139	0.07	0.91	0.00000	0.01	1.01	0.00001	0.00	1.06
2009	0.01208	0.13	0.89	0.08983	0.85	1.55	0.000005	0.00003	1.78	0.01834	0.53	0.88	0.00082	0.05	1.13	0.00000	0.01	1.00	0.00003	0.00	0.91
2010	0.01319	0.17	0.95	0.01751	0.17	1.52	0.000003	0.00002	1.47	0.00695	0.21	0.87	0.00009	0.01	0.99	0.07235	0.08	0.67	0.00000	0.00	0.85
2011	0.05269	0.92	1.22	0.01232	0.15	1.30	0.000007	0.00004	1.10	0.00987	0.31	0.78	0.00000	0.64	0.85	0.00000	0.01	0.20	0.00003	0.00	0.72
2012	0.00424	0.07	1.04	0.01415	0.17	1.16	0.000002	0.00001	0.43	0.01176	0.42	0.82	0.00036	0.02	0.77	0.00000	0.01	0.24	0.00002	0.00	0.59
2013	0.09036	1.73	1.05	0.00727	0.11	1.25	0.000002	0.00001	0.30	0.00122	0.05	0.84	0.00006	0.00	0.82	0.04047	0.05	0.25	0.00001	0.00	0.70
2014	0.04442	0.84	0.94	0.04455	0.78	1.34	0.000002	0.00001	0.18	0.00000	0.41	0.88	0.00489	0.37	0.88	0.03402	0.04	0.26	0.00002	0.38	0.80

Source: Authors' calculations

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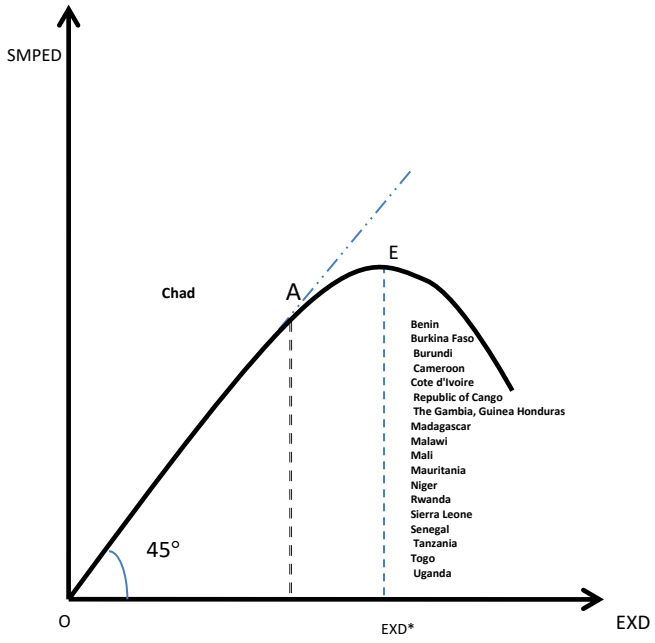
5.3 Debt Laffer curve for HIPCs

This section provides the estimates of Debt to export ratio at which the overall market value of debt is maximized EXDX* and Debt to export ratio for the current year (2014) EXDX for Heavily indebted poor countries. Table 5 elaborates that only Chad is on the correct side of the debt Laffer curve and is not eligible for debt write-off whereas Benin, Burkina Faso, Burundi, Cameroon, Cote d'Ivoire, republic of Cango, The Gambia, Guinea, Honduras, Madagascar, Malawi, Mali, Mauritania, Niger, Rwanda, Sierra Leone, Senegal, Tanzania, Togo and Uganda are on the wrong side of the debt laffer curve hence it is beneficial for the creditors to forgive debt.

Figure 2: The Debt Laffer Curve for HIPCs



Source: Authors' calculations

These results are also explained thorough the debt Laffer curve Figure 2. The 45-degree line divides the countries in two parts. The countries which are on the declining part of the debt laffer curve are on the wrong side while those countries which lies above the 45-degree line, are on the correct side of the debt laffer curve. Based on these results, the bottom line of this section is that the overall debt forgiveness is suitable for the heavily indebted poor countries as it will be in the favor of creditor countries and international financial institutions such as World bank and IMF.

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Table 5: Estimates of Debt to Export Ratios for HIPCs

Country	MVD	EXDX	EXDX*	Log(EXDX)	Standardized Value	Conclusion
Benin	14.29821872	0.855727	5.925466	1.779259	0.100519	Wrong side
Burkina Faso	5.64802443	0.611499	2.701161	0.993682	0	Wrong side
Burundi	30.1206608	1.170302	35.5328	3.570456	0.329714	Wrong side
Cameroon	67.5681426	0.43561	3.753667	1.322733	0.042104	Wrong side
Chad	23.3807289	25.6939	24.64858	3.204719	0.282916	Correct side
Cango	32.8220419	1.466701	4.427531	1.487842	0.063231	Wrong side
Cote d'lvoire	285.892135	0.65189	9.806348	2.28303	0.16498	Wrong side
The Gambia	24.5046878	1.54546	28.09558	3.335612	0.299664	Wrong side
Guinea	57.3201879	0.125846	14.41422	2.668215	0.214267	Wrong side
Honduras	237.702323	0.630229	26.12761	3.262993	0.290372	Wrong side
Madagascar	27.6248038	0.025583	6.950462	1.938808	0.120935	Wrong side
Malawi	2651.69345	0.508751	835.0541	6.727497	0.733676	Wrong side
Mali	29.6958822	1.008511	12.43342	2.520388	0.195351	Wrong side
Mauritania	84.8665845	0.608576	23.92347	3.17486	0.279095	Wrong side
Niger	21.9159456	0.936914	4.038554	1.395887	0.051465	Wrong side
Rwanda	36.2058909	1.339207	34.04276	3.527617	0.324232	Wrong side
Sierra Leone	12624.1877	0.18021	6693.312	8.808864	1	Wrong side
Senegal	37.9996013	0.881541	3.791748	1.332827	0.043396	Wrong side
Tanzania	531.904183	0.880062	105.1313	4.65521	0.468515	Wrong side
Togo	257.338183	0.260712	5.106037	1.630424	0.081475	Wrong side
Uganda	7600.16182	0.800332	3330.236	8.110798	0.910678	Wrong side

Source: Authors' calculations

5.4 The Price Elasticity Approach

The next approach is the price elasticity approach to check Cohen favorability condition of debt write-off. To find the degree of responsiveness of external debt, equation (5) is estimated:

i. Price Elasticity Equation of External Debt

The results of the price elasticity equation of external debt are given in Table 6, 7 and 8. Table 6 exhibits the negative and significant association between log of external debt outstanding to exports (LEXTD) and log of secondary market price of external debt (LSMPED) for Burkina Faso, Chad, and Republic of Congo. This means that 1 percent increase in nominal debt outstanding decreases the market value of debt by 0.063526 percent for Burkina Faso, 0.074995 percent for Chad, 0.148127 percent in the case for Republic of Congo.

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Table 6: OLS Estimates of Price Elasticity Equation of External Debt

Dependent Variable: LSMPED						
Explanatory Variables	**BEN**	**B.FASO**	**BDI**	**CMR**	**CHD**	**R.CONG**
Constant	-3.729894 (0.0000)	-2.293801 (0.0021)	-4.400053 (0.0000)	-2.402021 (0.001)	-2.146549 (0.4829)	-2.643759 (0.0024)
LEXTD	0.876516 (0.0062)	-0.063526 (0.9050)	0.346176 (0.0123)	0.197804 (0.6580)	-0.074995 (0.9581)	-0.148127 (0.8231)
GRX	0.219768 (0.5789)	1.068724 (0.0999)	-0.584263 (0.3425)	-0.651832 (0.0495)	-0.024699 (0.8826)	2.638003 (0.4234)
AR(1)	0.352498 (0.1490)	---	---	---	0.429045 (0.2052)	---
AR(2)	---	0.751782 (0.0001)	---	0.874515 (0.0000)	---	0.735061 (0.0076)
R^2	0.510713	0.551484	0.411142	0.780073	0.201719	0.561069
D.W	2.043507	1.518612	1.974742	1.492621	2.070302	1.730788
Prob(F-statistic)	0.000191	0.000505	0.031994	0.000000	0.651135	0.000575

Source: Authors' calculations

While for remaining countries there is positive and significant relationship between LEXTD and LSMPED as 1 percent increase in nominal debt outstanding increases the market value of debt significantly by 0.876516 percent for Benin, 0.346176 percent for Burundi, 0.197804 percent for Cameroon, by 4.949800 percent in the case of Cote d'Ivoire, for Gambia by 1.013554 percent, by 0.743096 percent for Guinea, 1.070229 percent for Honduras, and by 0.797628, 0.109916, 0.717656 , 0.835239, 1.893065 , 0.199163, 0.901615, 1.329133, 1.001291, 0.613207 and 0.960362 percent for Madagascar Malawi, Mali, Mauritania, Niger, Rwanda, Sierra Leone, Senegal Tanzania, Togo and Uganda respectively.

Table 7: OLS Estimates of Price Elasticity Equation of External Debt

Dependent Variable: SMPED							
Explanatory Variables	**CDV**	**GMB**	**GIN**	**HND**	**MDG**	**MWI**	**MLI**
Constant	-0.834167 (0.4470)	-6.220179 (0.0000)	-3.814604 (0.0000)	-4.224380 (0.0000)	-3.849329 (0.0000)	-7.515629 (0.000)	-3.189515 (0.0000)
LEXTD	4.949800 (0.2466)	1.013554 (0.0000)	0.743096 (0.0004)	1.070229 (0.0000)	0.797628 (0.0002)	0.109916 (0.5361)	0.717656 (0.0225)
GRX	-7.852451 (0.3601)	0.100119 (0.6162)	0.844890 (0.6488)	0.055772 (0.9320)	-1.930875 (0.2102)	0.540203 (0.6539)	-0.629608 (0.5713)
AR(1)	---	-0.203923 (0.5566)	0.406891 (0.1117)	0.268055 (0.1403)	0.617980 (0.0001)	-0.882975 (0.0274)	0.156388 (0.6590)

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AR(2)	-0.978816 (0.1734)	---	---	---	---	---	---
R^2	0.955074	0.556879	0.688479	0.864506	0.837752	0.686210	0.366118
D.W	1.811021	2.065243	2.303791	1.847697	2.282757	1.899874	2.002869
Prob(F-statistic)	0.313175	0.000068	0.000116	0.000000	0.000000	0.058876	0.006958

Source: Authors' calculations

The relationship between LEXTD and LSMPED shows negative and significant association for Burundi, Cameroon, Chad, Cote d'Ivoire, Madagascar, Mali, Niger, Sierra Leone, and Uganda while positive and significant relationship for Benin, Burkina Faso, Republic of Congo, Gambia, Guinea, Honduras, Malawi, Mauritania, Rwanda, Senegal, Tanzania and Togo. The results of R square show that the model used in this study are very fit for Benin, Burkina Faso, Cameron Republic of Congo, Gambia, Guinea Honduras, and Madagascar. Mauritania, Nicaragua Rwanda, Senegal, Tanzania and Uganda while for Burundi, Chad, Malawi, Mali, Sierra Leone and Togo, Models are not fit and Durbin Watson test shows that problem of multicollinearity does not exist in any country.

Table 8: OLS Estimates of Price Elasticity Equation of External Debt

Dependent Variable: LSMPED								
Explanatory Variables	**MRT**	**NGR**	**RWA**	**S.LEO**	**SEN**	**TEZ**	**TGO**	**UGN**
Constant	-4.272573 (0.0000)	-2.607757 (0.0493)	-2.961064 (0.0102)	-12.95175 (0.0000)	-4.101720 (0.0000)	-7.216012 (0.0000)	-3.556462 (0.0000)	-10.96409 (0.0000)
LEXTD	0.835239 (0.0000)	1.893065 (0.5821)	0.199163 (0.6080)	0.901615 (0.0006)	1.329133 (0.0136)	1.001291 (0.0014)	0.613207 (0.2015)	0.960362 (0.0037)
GRX	0.310973 (0.4147)	-12.21093 (0.1124)	0.113912 (0.5354)	-0.004595 (0.2347)	1.146020 (0.1494)	0.188500 (0.7897)	0.275005 (0.8883)	-0.006230 (0.7964)
AR(1)	0.177860 (0.4568)	----	0.846604 (0.0000)	0.121513 (0.5438)	0.645828 (0.0002)	-0.228203 (0.5299)	0.031768 (0.8433)	0.442091 (0.0727)
AR(2)	----	-0.668362 (0.3637)	----	----	----	----	----	
R^2	0.602708	0.710456	0.731756	0.760152	0.665920	0.753374	0.120145	0.681141
D.W	1.954708	1.679180	1.747745	2.004489	1.474841	1.920926	1.980124	1.785057
Prob(F-statistic)	0.000015	0.495252	0.000000	0.000000	0.000001	0.000026	0.428594	0.000002

Source: Authors' calculations

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ii. Cohen Condition Analysis

Continuing the same approach, now we check whether the debt write-off is favorable to a country or not for HIPC countries. First of all, marginal price of debt is calculated and then price elasticity of external debt outstanding is measured. Results are presented in Table 9.

Table 9: Evaluation of Cohen Condition to Probe Relative Effectiveness of Debt Written Off

Sr #	Country Name	PEED	Std. Error	t-Statistic	1 – tx	(1 – tx)SE	Debt Write Off
1	Benin	0.88	0.30	2.95	-1.95	-0.58	Favorable
2	Burkina Faso	-0.06	0.53	-0.12	1.12	0.59	Not Favorable
3	Burundi	0.35	0.12	2.90	-1.90	-0.23	Favorable
4	Cameroon	0.20	0.44	0.45	0.55	0.24	Not Favorable
5	Chad	-0.07	1.39	-0.05	1.05	1.47	Not Favorable
6	Congo	-0.15	0.65	-0.23	1.23	0.80	Not Favorable
7	Cote d'lvoire	4.95	2.02	2.45	-1.45	-2.93	Favorable
8	The Gambia	1.01	0.17	6.05	-5.05	-0.85	Favorable
9	Guinea	0.74	0.17	4.28	-3.28	-0.57	Favorable
10	Honduras	1.07	0.13	8.25	-7.25	-0.94	Favorable
11	Madagascar	0.80	0.19	4.16	-3.16	-0.61	Favorable
12	Malawi	0.11	0.17	0.65	0.35	0.06	Favorable
13	Mali	0.72	0.30	2.41	-1.41	-0.42	Favorable
14	Mauritania	0.84	0.15	5.60	-4.60	-0.69	Favorable
15	Niger	1.89	2.91	0.65	0.35	1.02	Favorable
16	Rwanda	0.20	0.38	0.52	0.48	0.18	Favorable
17	Sierra Leone	0.90	0.23	3.85	-2.85	-0.67	Favorable
18	Senegal	1.33	0.51	2.63	-1.63	-0.82	Favorable
19	Tanzania	1.00	0.27	3.76	-2.76	-0.73	Favorable
20	Togo	0.61	0.47	1.31	-0.31	-0.14	Favorable
21	Uganda	0.96	0.30	3.18	-2.18	-0.66	Favorable

Source: Authors' calculations

The results of Table 9 suggest that debt write off is favorable to the countries namely Benin, Burundi Cote d'lvoire, Gambia, Guinea, Honduras, Madagascar, Malawi, Mali, Mauritania, Niger, Rwanda, Sierra Leone, Senegal, Tanzania, Togo and Uganda as Cohen condition is satisfied. So far as Burkina Faso, Cameroon, Chad and Republic of Congo are concerned, Cohen condition is not satisfied.

6. Conclusions and Policy Recommendations

The main purpose of this study was to explore which of the policy is suitable for HIPCs i.e. debt write-off (debt forgiveness) or debt financing. The study is based on debt Laffer curve analysis of HIPCs. Out of 35 HIPCs, 21 countries are included for the analysis. We have calculated the price equation of debt by using the secondary market price of the external debt. The study has found mixed results of price equation of debt. The maximum value criterion shows that all HIPCs are on the wrong side of the debt laffer curve except Chad suggesting the creditors that debt write-off

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strategy is favorable for them. In the last part of the study, we have also calculated Cohen condition. The results show that debt write-off is favorable for the creditors of all the HIPC except Burkina Faso, Cameroon, Chad and Republic of Congo.

Based on the findings of the study, following policies are recommendations for HIPCs.

- It is recommended that debt financing is only suitable for Burkina Faso, Cameroon, Chad, and Republic of Cango.
- Debt write-off strategy is suggested for Benin, Bolivia, Burundi, Cote d'lvoire, Gambia, Guinea, Honduras, Madagascar, Malawi, Mali, Mauritania, Niger, Rwanda, Sierra Leone, Senegal, Tanzania, Togo and Uganda.
- HIPCs need to strengthen their debt management programs to condense their debt vulnerabilities decisively.
- Countries should focus on macroeconomic stability and pay attention on their social structural programs and reforms like PRSP (poverty reductions support programs) supported by Worlds financial institutions like World Bank and IMF etc.
- HIPCs must invest significant part of their external debt on growth oriented policies such as export-growth etc. such like manufacturing, assembling, apparels etc.
- International Financial institutions and donor's countries for HIPCs should cooperate and finance the Research and development departments especially of agricultural, Information technology, so that they may able to better handle new bio-technologies to advance agricultural growth.

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