



THE EMPIRICAL ANALYSIS OF THE EFFECT OF EXTERNAL DEBT ON TANZANIA'S ECONOMIC GROWTH FROM 1970 – 2020

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Abstract: *This study empirically analysed the effect of external debt on Tanzania's economic growth for the period 1970 – 2020. The study was guided by five specific objectives which were tested empirically to check the relationship between the dependent variable and the independent variable. The specific objectives of the study were: to test the relationship between external debt and economic growth, to establish the influence of external debt service to GDP growth. Also to ascertain the outcome of exchange rate on economic growth, to determine the effect of inflation rate to growth of GDP and to find out the impact of interest rate on the growth of the economy in Tanzania. The study used quantitative research approach to analyse macroeconomic variables. The method was used because it is a statistical measurement used to analyse secondary time series data set. In this case Vector Error Correction model was applied to check the relationship between the dependent and independent variables. Regression results show no short-run significant relationship between dependent and independent variables except for the long-run... The study recommends among others, that the government has to investing external debt on sustainable development projects including infrastructure. Again the government of Tanzania has to foster tourism and export which are the major sources of raising earnings of foreign exchange in the country so as to reduce external borrowing.*

Keywords: *External Debt, Economic Growth, External Debt Service, Augmented Dickey Fuller*

1.1 Introduction

This study examined the association between economic growth and external debt in Tanzania from 1970-2020. Kraay & Nehru (2006) define external debt as funds borrowed from external reliable sources. These can be foreign governments like United States of America and China and also foreign institutions such as World Bank and International Monetary Fund. Debt servicing in Tanzania a developing nation differs from the developed ones like United States due to the fact that when

comparing Tanzanian shillings against US\$, the currency depreciation is very high. So it is difficult for Tanzania to service the debt in due time as a developed nation could manage.

Despite the endowment of its natural resources, Tanzania has remained one of the Least Developed Countries (LDCs) in the world. It faces the problem of annual budget deficit every year. External borrowing is necessary because local funds collected by the government through taxation and exportation are not sufficient to finance public expenditures. In 2020 fiscal operations resulted in an overall deficit of TZS 159.5 billion (BOT, 2020).

Tanzania like any other developing countries currently cannot advance its economy to the level deemed reasonable, neither has it enhanced sufficient infrastructure nor delivery of quality services to the public using only its own local sources of income. The government of Tanzania has been borrowing since independence so as to combat its annual budget deficit. It has been borrowing from developed economies and from international financial organizations, especially from the International Monetary Fund (IMF) and from the World Bank (WB). The motive of borrowing is to finance its budget deficit due to shortages of the obtained local funds (James & Alex, 2021).

In the early 1970's, Tanzania experienced oil crisis. In 1974 there was severe hunger in the country due to low amount of rainfall which led to poor harvest. Towards the end of 1970s, there was a war between Tanzania and Uganda aggressed by the tyrannical leader of Uganda, Idi Amini Dada. All these problems caused economic setbacks and so, created economic crisis in the country. A solution for that situation was to borrow funds from the rest of the world. Among other expenditures, the borrowed funds were used for investment in industrial based projects, like construction of roads, railway line and renovation of harbours for the purpose of facilitating both local and international transport. In spite of debt servicing, all the aforementioned economic activities lead to annual growth of external debt in Tanzania (Chindengwike & Kira, 2021).

In its annual report, Bank of Tanzania (BOT, 2015) revealed the increased size of the national debt as it hits 40 trillion TZS in July 2015. The report shows that debt is about four times the debt of 10 years ago. The new debt was an increase of 29.4 trillion TZS of what the public debt was in July 2005. The debt increased by 24.2 trillion TZS between December 2010 and July 2015. Showing its negative attitude towards it, BOT insists that it is economically detrimental and puts Tanzania in an awkward fiscal posture and the country's creditworthiness locally and internationally becomes doubtful creating fear of debt crisis especially if the money borrowed were not well invested in projects that generate returns for loan repayment.

In addition, the presented annual report of BOT (2019/20) shows that external debt service was US\$ 1,617.6 million. From this amount, the US\$ 1,263.0 million was the principal debt payment and the US\$ 354.6 million was the interest payment. Therefore this amount of debt service was equivalent to 17.6 percent of exports. But the required debt service was supposed to be 21.0 percent. This shows clearly that in this period debt service was below the sustainability threshold. In other words, 3.4 percent of debt service was postponed to future payment especially when the economy improves. This scenario indicates that a portion of debt burden was carried forward. External debt is not stagnant it keeps evolving time after time as figure 1.1 below portrays.

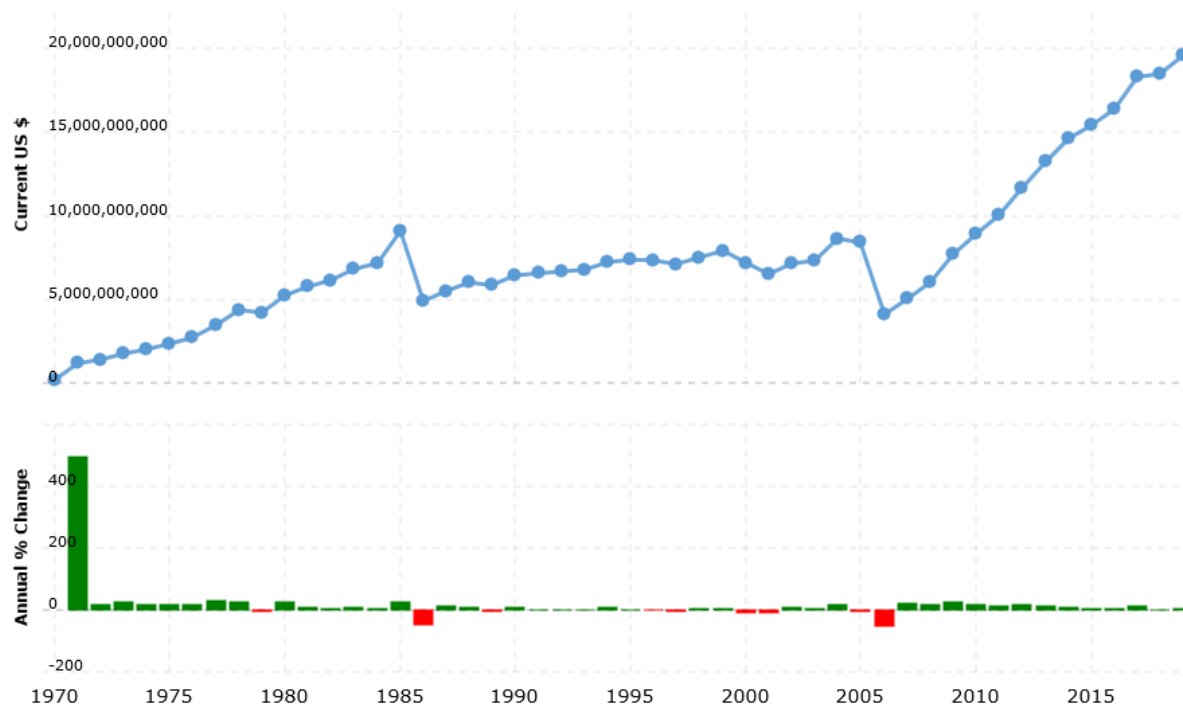


Figure 1: Evolution of National Debt (US\$ in Millions)

Source: World Bank (2015)

The figure above shows how national debt has been evolving year after year from 1970 to 2015. It is measured in terms of United States Dollar (US\$) in Millions. From the base year the trend shows external debt rising and falling year after year. On the other hand GDP is fluctuating. The up and down movement of GDP indicates positive and negative economic growth. It is clearly shown in the figure that from 2015 onwards Tanzania’s external debt is increasing.

Tanzania’s external debt for 2019 increased to US\$ 19,584,049,478, which represents 5.92 percent increase from 2018. But also external debt for 2018 was US\$ 18,489,828,009, which represents 1.03 percent increase from 2017. Again external debt for 2017 was US\$ 18,301,183,902, which represents 11.73 percent increase from 2016. Finally, external debt for 2016 was US\$ 16,380,492,423, which again represents 6.28 percent increase from 2015 (World Bank, 2015).

World Bank states that, the total external debt is the sum of public guaranteed and private nonguaranteed long-term debt. Short-term debt includes all debt whose maturity is one year or less. These data are in current US\$ (World Bank, 2019).

This study empirically analyzed how external debt affects economic growth in Tanzania. Cointegration results show that, there is long-run relationship between Gross Domestic Product and log External Debt. That is because both the explained and the explanatory variables have positive relationship and their probabilities are significant at 5 percent level of significant.

1.2 Justification of the Study

Since independence in 1961, Tanzania has been trying hard to ensure economic growth. Apart from tax collection, Tanzania engages in some other economic activities for raising national income. These include exporting agricultural products, fostering tourism, creating conducive environment for attracting Foreign Direct Investment (FDI), and also mining activities. URT (2010) affirms that in order to achieve its macroeconomic objectives, Tanzania like any other country borrows both internally and externally to finance economic activities.

The country has been taking external debt before 1970 to 2020 and it keeps on borrowing particularly from external lenders such as china, World Bank and IMF. However, the economy is not growing at a fast pace to ensure prosperity. The country takes such loans from the rest of the world. These loans are in a form of cash or material support.

Tanzania's external borrowing has been increasing year after year (BOT, 2020). Thus, Tanzania's external debt has been increasing to an alarming threshold. A rapid rising graph of external debt is therefore, whistling some signals for important measures to be taken to rescue the situation. It was therefore important to conduct this study for the purpose of analysing the effect of external debt on Tanzania's economic growth in order to alert economic policy makers about country's position concerning external debt. Different studies have been conducted on the same problem dealt in this research. However, the time covered is less than fifty one years as for the case of Chindengwike & Kira (2021) who carried out a research to examine the impact of foreign debts on economic growth in Tanzania for the period 1988 to 2020. The authors used Augmented Dickey-Fuller, Philips Peron and Johansen cointegration tests. Their study revealed that, short-term foreign debt has positive influence on economic growth while the long-term foreign debt stock has no significant effect on economic growth. Unlike the current study, their study covers 32 years only. Through this dissertation, suggestions are provided to the government on how to go about external debt.

1.3 Study Objective; Generally the objective of this study was to analyse empirically the effect of external debt on Tanzania's economic growth.

1.3.1 Hypotheses of the Study

Below are hypotheses that were tested in this research.

H1: External debt service significantly affects growth of the economy in Tanzania.

H2: There is no positive relationship between exchange rate and economic growth.

H3: Increase in inflation rate boosts GDP growth.

H4: High interest rate accelerates growth of the economy.

1.4 Literature Review

This part of the study presents both theoretical and empirical reviews showing the contribution of ideas of the previous authors on the problem dealt in this study.

As per theoretical literature review, a number of theories have been put forward by several scholars to explain the problem of external debt in relation to economic growth. Some of the theories which are relevant to this study are discussed in this part. These are financing gap theory, external debt effects theory, debt overhang theory, neoclassical theory of growth, new economic growth theory.

The financing gap theory is used in this study because it is a model for measuring the financing gap in developing countries like Tanzania. The theory forecasts country's economic growth through proper allocation of the obtained debt. It encourages exchange of ideas about development issues through economic debates (Lewin *et al.*, 2003).

Studies confirm that foreign loans have positive results especially as it affects economic growth but to a certain level only. After reaching a certain threshold level the effects of additional debt on the economy will gradually drop due to limitation of capital in underdeveloped countries. That is why external debt is important (Pattillo *et al.*, 2004).

Sundell & Lemdal (2011) define debt overhang as a debt burden which is so large to be taken as an additional debt to finance future projects. This theory deeply analyses capital flight and austerity measures that affect the debt overhang. It implies that large borrowing leads to high debt, debt traps and slowing down of economic growth. Debts largeness; earnings is used to pay off all the existing debts instead of funding new investments. This theory was applied in this study to analyse the relationship that exists between external debt, investment and the future debt payments.

Banton (2020) updated neoclassical theory of growth and which was reviewed by Boyle in 2020. The theory depicts how steady economic growth rate is influenced by three driving forces which are labour, capital, and technology. This model was developed by two economic researchers; Robert Solow and Trevor Swan in 1956 to analyse long-run economic growth. This theory is used in this study to analyse the long-run economic growth.

The theory emphasizes human capital such that trained workers can contribute a lot to technological advancement which is necessary for economic growth. To achieve growth, the theory urges the government to encourage technological innovation. The model emphasizes on increasing both capital and labour productivity which in turn leads to new economic growth (Pettinger, 2019).

Several studies have been conducted worldwide on the effect of external debt on economic growth. Some studies show adverse effect and some others come up with positive effect of external debt on economic growth. Below is the empirical review of previous studies.

According to Saxena & Shanker (2012), in 1990s the Indian economy faced an adverse Balance of Payment (BOP). To overcome this economic situation, India was required to raise its reserves by borrowing from the International Monetary Fund (IMF). The external borrowing was believed to be an important component for improving economic conditions, to return to a normal state and reviving the declining economy. The impact of external debt on economic growth of India was examined using the Ordinary Least Square (OLS) method. Secondary data ranging from 1990-91 to 2015-16 was used. But the obtained results were contrary to the expectations because of the adverse relationship between GDP and external debt.

Boboye & Ojo (2012) applied regression analysis of OLS to investigate the effect of external debt burden on economic growth and development of Nigeria using secondary data from different local

sources. The sources included Central Bank of Nigeria, economic and financial review. The researchers came up with the finding which indicates that external debt had a negative effect on the national income and per capita income of the nation. This led to devaluation of the national currency which caused the economy of Nigeria to be depressed.

A study was conducted to examine the impact of foreign debts on economic growth in Tanzania from 1988/89 to 2019/20. A time series research design was adopted including data of 32 years (observation) with the aim of making evaluation of the variable relationship. Johansen's cointegration test results revealed positive impact on economic growth both in the long-run and in the short-run while in some other years of the same time range, when tests were done, indicated the existence of negative relationship between the dependent and the independent variables (Chindengwike1 & Kira 2021).

Lelya & Ngaruko (2021) examined the impact of external and domestic debt on economic growth in Tanzania over a period of 1980 – 2019. The study applied Vector Error Correction Model (VECM) for estimation of the time series dataset. The study showed cointegration within variables. The authors wanted to ensure data validity and reliability. So they carried out tests on normality and multicollinearity as well as on unit root and heteroscedasticity. The empirical findings showed a positive effect because both external and domestic debts significantly affect the economic growth of Tanzania.

1.5 Methodology

This study used a quantitative approach to analyse the macroeconomic variables used in the study. This approach of data analysis was adopted because it is a statistical measurement applied in analyzing secondary time series dataset. This approach is helpful in determining and describing the relationship that exists between external debt and economic growth in Tanzania

Model Specification

Generally, this work aimed at examining the effect of external debt on Tanzania's economic growth. Therefore, the study has adopted the model from simple open macroeconomic debt growth model used by Boboye & Ojo (2012) who examined the effect of external debt on the level of economic growth and the volume of investment in Nigeria for a period of 1980 - 2008. In this model, the researchers used Ln as the log of their variables Real Gross Domestic Product (RGDP), External Debt (EXTDEBT), Exchange Rate (EXC) and Consumer Price Index (CPI). In order to fit the current study, the adopted model was modified by dropping CPI thereby adding the following variables: EDS, INF and INR.

Theoretical Model Specification

Barro & Sala-i-Martin (2003) argue that a constant need to borrow from foreign sources arises from the recognized role of capital in developmental process of any nation. Sustainable economic growth requires a given level of savings and investment and in a case where it is not sufficient, it results in external borrowing. Herein lays the basis for the dual-gap analysis. The dual-gap theory postulates that for development to occur it requires investment and this investment is a function of savings. So, investment requires sufficient domestic savings. But in the low economy countries, domestic saving is not sufficient enough to ensure that development takes place. The dual-gap framework is coined from a

national income accounting identity which states that excess investment expenditure over domestic savings is equivalent to the surplus of imports over exports.

Thus, at equilibrium the following identities hold:

$$I - S = m - x \dots\dots\dots (1)$$

$$S - I = x - m \dots\dots\dots (2)$$

Where:

I = Investment

S = Savings

m = real import

x = real export

The above equations show that the domestic resource gap (S – I) is equal to foreign exchange gap (x – m). An excess of import over export implies an excess of resources used by an economy over resources generated by it. This implies that the need for foreign borrowing is determined overtime by the rate of investment in relation to domestic savings. Solow growth model is built on a closed economy which uses labour (L) and capital (K) as means of production. Under this situation the implication of external debt on growth can be seen using its effect on the public saving which in turn is used as investment in a closed model.

The Solow growth model identifies three sources of economic growth which are capital accumulation, labour force growth and technological progress. Capital investment, whether inform of machines or people, makes a direct contribution to production. Baumol & Blinder (2009) contend that “for a given technology and a given labour force, labour productivity will be higher when capital stock is larger”. Improvements in technology lead to economic growth because a superior technology leads to higher productivity of workers. A higher population growth rate leads to a higher steady-state economic growth rate because, in the long-run equilibrium, all aggregate variables (production, capital, and labour) increase at the rate of population growth. Moreover, economic growth tends to be related to the international trade patterns of a country because the opening of trade enlarges the size of the market such that domestic firms can grow and expand through exporting to the rest of the world. Again, if economies are closed to trade they are also closed to new markets, variety of resources, new ideas for innovation and the invention of the new technologies from other regions of the world.

To meet the objective of this research, the study starts by repressing the economic growth rate by three variables: physical capital and labour and human capital in an endogenous growth model of Solow (1956) augmented by human capital. Consequently, we obtained a Cobb-Douglass function of the form:

$$Y = X^\beta \dots\dots\dots (3)$$

Where

Y is the vector of dependent variable

X is a vector of independent variables, and

β is a vector of parameters

Below is the important Solow Model from the modified equation (3).

$$Y = F(K, AL) = K^\alpha(AL)^{1-\alpha} \dots\dots\dots (4)$$

Where

Y = Output

K = Capital

L = Labour

α = Output elasticity

A = Technical Progress

As per debt overhang theory, a government with debt overhang problem will always raise taxes on the private sector as a means of transferring resources to the public sector. This, in turn, discourages private sector investments and as such, more government public spending on infrastructure decreases (for example the government cannot be able to perform the likes of Standard Gauge Railways and Mwalimu Nyerere Hydroelectric Power Project) as the available resources are used to pay debt obligation.

Economic Model Specification

Based on the above theoretical framework discussion, this study then modifies the model in equation (4) above in order to read as:

$$GDP = A[K^{\beta_1}][L^{\beta_2}][(EXD)^{\beta_3}][(EDS)^{\beta_4}][(EXR)^{\beta_5}][(INF)^{\beta_6}][(INR)^{\beta_7}]..... (5)$$

Where K = Gross Capital Formation and L = Labour Force

Introducing natural logarithms (Ln) to equation (5) above a linear equation is obtained as below:

$$LnGDP = LnA + \beta_1LnK + \beta_2LnL + \beta_3LnEXD + \beta_4LnEDS + \beta_5LnEXR + \beta_6LnINF + \beta_7LnINR (6)$$

Where $Ln = Log_e$

This formulation is one of the economic models which fit cases of double log models. The double log models are based on the facts which have bigger values that make huge variations. So, the Cob-Douglas formulation helps to make the model linear when log is introduced. However, since data for inflation and interest rate are not in bigger values and are presented in percentages, therefore the natural log for these variables was removed (Gujarati, 2004). Capital (K) and labour (L) were dropped because are not variables of interest for this study. Since LnA is a constant, it is therefore replaced by β_0 which stands as constant parameter. Therefore, equation 6 above appears in equation 7 below which represents the regression version of an economic model.

$$LnGDP = \beta_0 + \beta_1LnEXD + \beta_2LnEDS + \beta_3LnEXR + \beta_4INF + \beta_5INR..... (7)$$

Where variables as already defined above

Econometric Model Specification

The main aim of this empirical enquiry is to determine whether external debt affects economic growth of Tanzania. According to Barro, and Sala-i-Martin (2003), economic theories are not sufficiently able to underpin the exact determinants of growth.

In line with past studies and to analyse properly the effect of external debt on economic growth, the multivariate statistical model specification in this study was used applying variables like gross

domestic product, external debt stock, debt service, exchange rate, inflation rate and interest rate. Based on equation 7, the error term was added and so, specified the following empirical model.

$$LnGDP = LnA + \beta_1 LnEXD + \beta_2 LnEDS + \beta_3 LnEXR + \beta_4 INF + \beta_5 INR + \varepsilon \dots\dots\dots (8)$$

Empirical Model Specification

In this case, econometrically, LnA is a constant term. Hence, it is proxied by β_0 .

Therefore, equation (8) becomes:

$$LnGDP_t = \beta_0 + \beta_1 LnEXD_t + \beta_2 LnEDS_t + \beta_3 LnEXR_t + \beta_4 INF_t + \beta_5 INR_t + \varepsilon_t \dots\dots\dots (9)$$

Where $Ln(GDP)$ stands for natural logarithm of GDP, $Ln(EXD)$, stands for natural logarithm of external debt, $Ln(EDS)$ stands for natural logarithm of external debt service, $Ln(EXR)$ stands for natural logarithm of exchange rate, $\beta_4(INF)$ stands for inflation rate and $\beta_5(INR)$ stands for interest rate, β_0 stands for intercept of the model (constant parameter). $\beta_1, \beta_2, \beta_3, \beta_4,$ and β_5 are parameters which stand for elasticity coefficients.

t represents time. The t is introduced in the empirical equation because of time series data.

ε stands for the error term which takes into account the impact of other determinants of economic growth that are omitted in the model.

Table 1: Variable Measurement and Expected Signs

Variable	Measurement	Expected Sign
Gross Domestic Product	Annual growth rate in percentage	Dependent Variable
External Debt	Gross National Income in percentage	Negative
Debt Service	Millions US\$	Positive
Exchange rate	US\$ per TZS	Positive
Inflation rate	Percentage	Positive
Interest rate	Percentage	Negative

Source: Researcher 2022.

At the first step of data analysis, stationary status of all the data series was done through unit root test. For this purpose, Augmented Dickey-Fuller (ADF) test was applied. After checking the stationarity then cointegration analysis was performed and it was found that, there is long-run relationship between dependent and independent variables.

Once variables have been classified as integrated of order $I(0), I(1), I(2), \dots, I(n)$. It opens the possibility of setting up models that lead to stationary relations among the variables. Using the Engle-Granger Cointegration procedure as detailed by Gujarati (1995), the residuals are obtained.

$$\varepsilon_t = LnGDP_t - LnEXD_t - LnEDS_t - LnEXR_t - LnINF_t - LnINR_t \dots\dots\dots (10)$$

Then the residual ε was tested for stationarity using the ADF test against the following Hypothesis: $H_0:$

$\varepsilon_t =$ Not Stationary (that is $I(d)$ where $d > 0$)

$H_A:$ $\varepsilon_t =$ Stationary (that is $I(d)$ where $d = 0$).

If null hypothesis is accepted, then we conclude that the variables have the same trend (are cointegrated) and as such can stay in a fixed long-run relationship with each other. Otherwise, we cannot model a long-run position (Gujarati, 2004).

1.6 Empirical Findings and Discussions

The obtained data were analyzed empirically using STATA fourteenth version computer software.

1.6.1 Analysis of Descriptive Statistics

Analysis of descriptive statistics involves the process of identifying the effect of external debt on economic growth in Tanzania. Table 2 below lists down six variables with 51 observations processed in the STATA data editor. The study time ranges from 1970 to 2020 (51 years).

Table 2: Descriptive Summary Statistics

Variables	Observations	Mean	Std. D	Minimum	Maximum
GDP	51	4.554902	2.45612	-2.4	8.5
EXD	51	8.19e+09	5.89e+09	1.97e+08	2.55e+10
EDS	51	2.29e+08	2.85e+08	3795468	1.27e+09
EXR	51	741.5608	770.1949	6.9	2298.5
INF	51	15.58627	11.12313	2.4	36.1
INR	51	16.59118	7.566383	7.5	36

Source: STATA Estimation (2022)

1.6.2 Interpretation of the Results

Table 2 above presents maximum and minimum values for every variable in the table. Also the table shows the mean and the standard deviations for all variables. The mean value of GDP growth rate is about 4.6, meaning for about 51 years, on average, Tanzania's economy has grown for about 4.6 percent.

The minimum growth rate of country's economy was -2.4 percent recorded in 1983. This economic decline was due to global oil crisis and Tanzania-Uganda war effects occurred in the early and in the late 1970s respectively. The maximum growth rate was 8.5 percent recorded in 1985 due to good performance of macroeconomic variables like tourism and export.

The mean of external debt is 8.19 billion; meaning on average Tanzanian external debt for 51 years has accumulated US\$ 8.19 billion (TZS 18.8 trillion); its minimum being US\$197 million in 1970 and the maximum of US\$ 25.5 billion in 2020.

The mean value of external debt service was US\$ 229 million, on average, for 51 years. This means out of US\$ 8.19 billion the country has managed to service about US\$ 229 million. The minimum debt serviced value is about US\$ 3.8 million and the maximum value serviced being US\$ 1.27 billion.

The mean of exchange rate is 741.5608, standard deviation is 770.1949, the minimum is 6.9 and the maximum is 2298.5. The mean for inflation is 15.58, standard deviation is 11.12, the minimum is 2.4 and the maximum value is 36.1. The mean for interest rate is 16.59, standard deviation is 7.566 minimum is 7.5 and the maximum is 36.

1.6.3 Unit Root Test

All variables were not stationary at level (had unit root problem) based on Augmented Dickey-Fuller Unit Root Test. The results show that for all variables the absolute values of test statistics (calculated values of τ) are less than critical values (tabulated values of τ) at 5 percent significance level. The probability values also are greater than 0.05 as well as 0.1. Hence, we failed to reject the null hypothesis about the presence of unit root. To overcome this challenge, the variables were differenced. The results of differenced for unit root test are given in table 3.

Table 3: ADF Unit Root Test Results

Variables	Test statistic (at level)	Test statistic (Differenced)	Order of integration
GDP	-2.493	-8.007	<i>I</i> (1)
EXD	-2.298	-5.825	<i>I</i> (1)
EDS	-2.188	-4.202	<i>I</i> (1)
EXR	1.852	-4.488	<i>I</i> (1)
INF	-1552	-6.024	<i>I</i> (1)
INR	-1.694	-3.820	<i>I</i> (1)
Critical value at 5 percent	-2.933	-2.936	

Note: HO = has as the unit root while H1 = has no unit

Source: STATA Estimation (2022)

At first difference the results show that, all absolute values of calculated τ statistics of all variables are greater than the critical values at 1 percent and 5 percent levels of significance. Therefore, we reject the null hypothesis of unit root test in the series. So, the variables, GDP, log EXD, log EDS, EXR, INF and INR are integrated at order 1. Hence, dependent and independent variables are integrated at the same order.

Cointegration test requires selection of an appropriate Lag Length (LL). This was done by using Akaike Information Criterion (AIC), Hannan-Quin Information Criterion (HQIC) and Schwarz Bayesian Information Criterion (SBIC). The value with the lowest AIC, HQIC and SBIC identifies the best model. The best number of lags is selected based on the order criteria and the results are presented in table 4.

Table 4: Optimal Selection Lag Length

Number of obs = 47

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-801.381	.	.	.	3.4e+07	34.3566	34.4455	34.5928
1	-568.668	465.43	36	0.000	7879.44*	25.9859*	26.608*	27.6392*
2	-541.337	54.663	36	0.024	12286.4	26.3548	27.5102	29.4252
3	-517.948	46.777	36	0.108	25791	26.8914	28.5801	31.37
4	-470.408	95.079*	36	0.000	24437	26.4004	28.6223	32.3051

Source: STATA Estimation (2022)

From the table above the best number of lags according to AIC, HQIC and SBIC is one. Therefore lag one is favorite for this choice due to the fact that the minimum value of all three criteria lies at lag one. The results for Johansen co-integration test are given in table 5 bellow.

Table 5: Cointegration Test

Number of obs = 47

Max rank	Parms	Lag Length	Eigen Value	T Statistic	5 percent Critical Value
0	42	-619.74582	.	101.1732	94.15
1	53	-599.0236	0.57079	59.7288*	68.52
2	62	-588.44916	0.35054	38.5799	47.21
3	69	-580.13684	0.28772	21.9553	29.68
4	74	-573.37456	0.24120	8.4307	15.41
5	77	-569.89286	0.13247	1.4673	3.76
6	78	-569.15919	0.02950		

Source: STATA Estimation (2022)

Table 5 shows that there is one cointegrated equation since the maximum rank of 1 were indicated (rank with a star). This means there is long-run equilibrium between the dependent variable and the independent variables. Though variables currently are not stationary, but in their combination are stationary in the long-run. This, therefore, required estimation by the use of vector error correction mechanism.

1.6.4 Vector Error Correction Model

The Vector Error Correction Model (VECM) was preferred in this study. The results of VECM (as presented in table 6) show that the significant relationship is in the long-run only. In the short-run there is no significant relationship between the preferred variables. The coefficient of error correction is -0.30876. This implies that, it takes one year to correct disequilibrium of 31 percent. This coefficient has negative sign as required, and it is significant at 5 percent significant level. This information is presented in table 6 below.

Table 6: Vector Error Correction Model

Variables	Coef	Std. Err	t	P value of t	95% Coef. Interval
_Cel L1	-.3087635	.1438027	-2.15	0.032	-.5906116 -.0269154
GDP LD	-.1959555	.1646824	-1.19	0.234	-.5187272 .1268161
Log EXD LD	-.3598572	1.054443	-0.34	0.733	-2.426528 1.706813
Log EDS LD	-.8522434	1.140589	-0.75	0.455	-3.087757 1.383271
EXR LD	.0024171	.0039559	0.61	0.541	-.0053363 .0101706
INF LD	.0262077	.0496804	0.53	0.598	-.071164 .1235794
INR LD	-.0267042	.1230356	-0.22	0.828	-.2678495 .2144411
CONS	.8747613	.5232895	0.67	0.095	-.1508672 1.90039

Source: STATA Estimation (2022)

1.6.5 VEC for Long-Run

For the case of long-run, the results show that there is long-run relationship between variables because their probability values are less than 0.01 meaning they are significant at 1 percent significance level, except for the case of inflation.

Table 7: VEC Long-Run

Beta	Coef.	Std. Err.	z	P value of z	[95 % Conf. Interval
Log GDP	1
LogEXD	-9.996105	2.164955	4.62	0.000	5.752871 14.23934
LogEDS	-3.156473	1.050736	-3.00	0.003	-5.215878 -1.097067
Log EXR	.0058832	.00123	-4,78	0.000	-.0082939 -.0034725
INF	.038393	0582033	-0.66	0.509	-.15247 .0756827
INR	.1983906	.0540331	3.67	0.000	.0924877 .3042934
CONS	167.3296

Source: STATA Estimation (2022)

Where VEC represents Vector Error Correction

From table7, the estimated empirical regression model is expressed as;

$$\ln GDP = -167.3 + 10.0\ln FRD + 3.2\ln FDS - 0.01EXR - 0.01INF - 0.2INR \dots\dots\dots (11)$$

SE (2.2) (1.1) (0.0) (0.6) (0.1)

1.6.6 Interpretation of Long-Run Results

Intercept interpretation, when External Debt (EXD), External Debt Service (EDS), Exchange rate (EXR), Inflation rate (INF) and Interest rate (INR) are zero on average, the economy decreases by about 167.3 percent, ceteris paribus.

The coefficient of natural log External Debt (lnEXD) has a positive sign, and it is significant. It shows that, ceteris paribus one percent increase of external on average leads to an increase of economic growth by about 10 percent.

The coefficient of natural log External Debt Service (lnEDS) has a positive sign and it is significant. It indicates that, one percent increase of external debt service on average, leads to an increase of economic growth by about 3.2 percent, ceteris paribus.

Furthermore, the coefficient of Exchange rate (EXR) has a negative sign but it is significant. It implies that, on average, one percent increase of exchange rate causes the economy to decline by about 0.01 percent, ceteris paribus.

The coefficient INF has a negative sign and it is also insignificant. It could suggest that, when inflation increases by one percent on average, would cause the economy to decrease by about 0.04 percent, ceteris paribus.

Finally, the coefficient INR has a negative sign but it is significant. Thus, it suggests that, an increase of one percent interest rate on average, leads the economy to decrease by about 0.2 percent *ceteris paribus*.

1.6.7 Hypotheses Verification

The results support the null hypothesis which states that, external debt service significantly affects growth of the economy in Tanzania. In the long-run it has a positive impact and it significantly effects economic growth. Therefore, from the revealed results, we failed to reject the null hypothesis.

The null hypothesis states that, exchange rate does not significantly affect economic growth. In the long-run it is significant but it effects negatively the economic growth. Therefore, from the revealed results we failed to reject the null hypothesis.

The null hypothesis states that increase in inflation rate boosts GDP growth. The coefficient of inflation rates in the long-run shows a negative effect but it is insignificant on economic growth.

The null hypothesis states that high interest rate accelerates growth of the economy. The interest rate in the long-run has a negative effect but it is significant on economic growth. Therefore from the revealed results we reject the null hypothesis while accepting the alternative hypothesis which states that high interest rate slows down growth of the economy in Tanzania.

1.6.8 Post-Estimation

Post estimation tests were conducted and it was found that there is no multicollinearity since the mean VIF value is 6.21, less than 10 as required. Also White's test for heteroscedasticity revealed that there is no problem of heteroscedasticity where Chi-square probability values is 0.1875, leading to failure to reject null hypothesis of homoscedasticity. Breusch-Godfrey LM test for autocorrelation also revealed that there is no serial correlation problem since the Chi-square probability value is 0.5344, leading to failure to reject null hypothesis of no serial correlation.

For the case of model specification Ramsey RESET test revealed that there is no omitted variable since the F probability value is 0.6883, which makes the null hypothesis that, the model has no omitted variables not to be rejected. Therefore, the results are reliable and can be used for inference and policy recommendation.

1.6.9 Granger Causality Test

Before testing for causality, VAR model was estimated as shown in table 9 bellow. This was done because Granger causality is post-test after VAR.

Table 8: Estimated VAR for GDP Growth and External Debt

Dependent variable	Independent variable	Coef.	Std. Err	z	P value of z	[95% Conf. Interval]	
GDP	GDP L1	0.571179	0.114508	4.99	0.000	0.346747	0.795611
	Log EXD L1	0.362761	0.346577	1.05	0.295	-0.31652	1.04204
	CONS	-6.24304	7.717755	-0.81	0.419	-21.3696	8.88348
LEXD	GDP L1	0.019944	0.013588	1.47	0.142	-0.00669	0.046575
	Log EXD L1	0.76519	0.041126	18.61	0.000	0.684586	0.845795
	CONS	5.297533	0.915804	5.78	0.000	3.502591	7.092476

Source: STATA Estimation (2022)

Since results of VAR itself had no important inference to causality approach, Granger causality test followed testing the causality between GDP growth and external debt. The results are presented in table 9 below.

Table 9: Granger Causality Tests after VAR

Equation	Excluded	chi2	df	P value
GDP	Log EXD	1.0956	1	0.295
GDP	ALL	1.0956	1	0.295
Log EXD	GDP	2.1544	1	0.142
Log EXD	ALL	2.1544	1	0.142

Source: STATA Estimation (2022)

The results in table 9 revealed that, there is no causality for the two considered variables. Neither GDP growth nor external debt has causality effect to each other. This may be due to short-run impact as it was revealed by the VECM short-run results revealing no any significant effect of external debt to economic growth.

1.7 Conclusion

The study found that, in Tanzania there is a positive relationship between external debt and economic growth in the long-run. The reason is that, external debt takes long to generate income for the country. But also the country is significantly servicing the debt at a lower level which in fact accumulates debt that can be a burden for the future generation. A negative relationship that exists between exchange rate and economic growth discourages development in the country. From regression results, interest rate and economic growth have negative relationship. This is an indication that whenever interest rate is high, Tanzania's economic growth is slowed down.

1.8 Recommendations

In order to achieve the optimal use of the borrowed funds, this study recommends among others that, it is quite important for the government to ensure appropriate allocation of external debt especially in the sustainable income generating projects such as Standard Gauge Railways, Mwalimu Nyerere Hydroelectric Power Project and road construction.

In order to avoid adverse relationship between external debt and economic growth, the study recommends that the country has to invest external debts in the projects which promote economic and growth and human capital development.

Proper management of the foreign borrowed funds will solve the problem of debt burden which discourages Foreign Direct Investment and private investments in the country. When servicing of the external debt does not lead to economic crisis in the country, will instead create a better economic environment which will be an attraction of both foreign and local investments expected for the contribution to economic growth in the country.

Tourism and export are major sources of raising earnings of foreign exchange which is very important for the economy of the country. Thus, the government of Tanzania has to foster tourist sector through creating attractive environment and advertisements to be done regularly in order to attract as many tourists as possible. Also the government has to improve domestic products like cotton sisal and tobacco so as to promote exportation of quality goods to the rest of the world for the purpose of earning foreign money thereby reducing external borrowing.

1.9 Policy Implication

The results obtained after conducting this study are important as they can be used by policy makers on economic matters to set up proper plans for both short-term and long-term sustainable development projects. The aim is to achieve proper management of the funds obtained from the foreign lenders who expect payment of the principal together with the interest in due time.

The obtained external debts must be used for economic purposes and not for social or political reasons. This will help Tanzania to avoid accumulation of external debt stock overtime and prevent it from any hidden motive behind external debts.

The findings of this study can be used as reference for the formulation and implementations of the proper strategies of foreign fund management needed for the achievement of government's target of the economic growth.

Economic advisors and the policy makers including the government leaders and everyone who participate in the economic affairs are supposed to ensure that decisions for taking external debt must be reasonable enough so as to avoid unbearable debt servicing burden. Otherwise external debt can jeopardize country's sovereignty particularly, if the size of country's economic growth is unreasonable. Finally the government authorities who are responsible for external debt should ensure that debt payment obligations are fulfilled in time and not to pass a maximum time limit as to cause debt overhang.

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