Macroeconomic Determinants of Public Debt in Tanzania: Empirical Evidence and lessons for Post COVID-19 Recovery

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Abstract
This study examines the macroeconomic determinants of public debt in Tanzania for the 1970-2019 period employing the ARDL model. The estimated results from the ARDL bound test reveal the presence of co-integration amongst the macroeconomic determinants of public debt. Moreover, in the short run, the ARDL shows that there is significant evidence that imports and government spending positively affect public debt while inflation rate affects public debt negatively, and the effect of foreign direct investment on public debt is statistically indistinguishable from zero. The study recommends that the governments of Tanzania should pursue sound macroeconomic policies that reduce public debt, while at the same time ensuring that resources are directed towards productive sectors of the economy in order to boost domestic production and increased revenue and export performance during the post- COVID 19.

Keyword: Government spending; export; import; inflation rate; foreign direct investment and public debt.

JEL Classification Codes: C12, C13, H63

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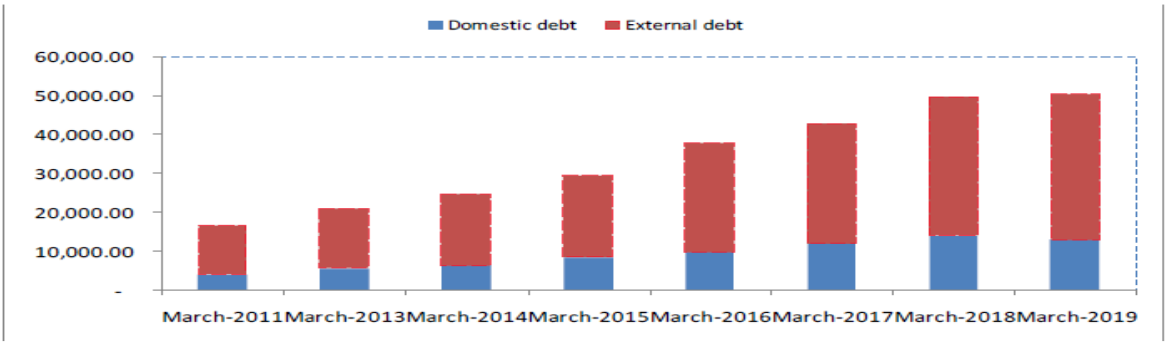
1.0 Introduction

Recently, government debt has become a subject of major policy discussion across countries and even more so in developing countries. This debate has been a subject of macroeconomic enquiry for a while prompting both academicians and policy makers alike to find out best policy options that can enable the country to trim down its external and internal debt burden in order to enjoy steady economic growth (Avalos, 2021). Ideally, the discussion by the academicians and policy makers revolves around examining whether the existing external debt and domestic debt are sustainable and consistent with the government revenue and expenditure patterns, and as to whether existing fiscal and monetary policies hold at an optimal level (Enock, 2017). The rationale for most countries to borrow from external sources is to shore up their foreign reserves position and strengthen their future foreign liquidity and mostly financed by international financial institutions like World Bank, International Monetary Fund (IMF) and private overseas creditors. In some cases, domestic borrowing is implemented with the purpose of controlling inflation rate, exchange rate, external crisis that could harm the economy at some point or with a view of redistributing income (Mabula & Mutasa, 2019).

Tanzania public debt during the last two decades has been on the rise and has attracted much debate among scholars and politicians due to current account deficit, lack of capital, and fiscal imbalances. Despite debt relief initiatives that were granted by multilateral creditors in 2006/2007 still public debt has been increasing. As shown in figure 1, the Government debt stock in 2018 was Tshs. 49,888.55 billion equivalents to an increase of 16.3 percent compared to shillings 42,883.59 billion as of 2017. The debt trend continued to exhibit an upward by increasing to 50,772.27 billion shillings in 2019, which is equivalent to an increase of 2.1 percent from 2018(URT, 2019).

Figure 1: Government debt



This increase has generally been considered to be at risk of debt distress because of the persistent rise in debt even though the debt is reported to be sustainable. In addition, data show that, on yearly basis, in the past four years public debt has continued to record increased growth rates compared to the corresponding increase in the preceding years. This rising trend is mainly attributable to several factors including the need to; finance budget deficit with the view to meet budgetary obligations. This entails among other things, the need to, implement fiscal policies geared towards taming the deficits and the development of the financial markets via debt instruments (Lotto and Mmari, 2018).

More importantly, it is worth noting that public debt does not constitute a burden when contracted loans are optimally deployed and the return of investment is enough to meet

maturing obligations while the servicing of the domestic economy is not undermined (Ojo, 1994). However, failure to utilize the loans in a more productive manner will be more harmful to macro-economic variables as well as economic growth and, more so for countries accessing concessional loans to finance post COVID 19 recoveries. For instance, during the 15-month period from April 2020 through June 2021, the World Bank Group deployed over $157 billion to help governments and the private sector in developing countries respond to the pandemic crisis with $ 35.2 billion of these amounts going to SSA countries (World Bank, 2021). Along the same line, the IMF has responded to the coronavirus crisis with unprecedented speed and magnitude of financial assistance to member countries, especially with the objective of protecting the most vulnerable and set the stage for inclusive and sustainable recovery. The Fund has temporarily doubled the access to its emergency facilities—the Rapid Credit Facility (RCF) and Rapid Financing Instrument (RFI). extended debt service relief through the Catastrophe Containment and Relief Trust (CCRT) to 29 of its poorest and most vulnerable member countries on their IMF obligations, covering these countries' eligible debt falling due to the IMF for the period between April 2020 and mid-October 2021. Since the beginning of the COVID-19 crisis, the IMF has supported 86 countries with over $110 billion, using a variety of instruments. The lending to Sub-Saharan Africa last year, for example, was 13 times more than the annual average over the previous decade (IMF, 2021). Tanzania is one of those SSA which benefited from the IMF support with the IMF Executive Board approving US$567.25 million in Emergency Support to address the COVID-19 Pandemic.

Based on these developments, most countries including Tanzania are continuously experiencing rising public debt accumulation. However, there is no empirical study that has attempted to examine macroeconomic effects associated with public debt in the light of the post COVID 19 crisis. This calls for the need to conduct an empirical analysis of public debt in Tanzania in order to make informed policy decisions with the view to enhance macroeconomic stability and bolster growth during the recovery period. The analysis is geared towards examining the direction of causality between government spending, inflation, exchange rate, investment, export, import and government debt as well as determining both the short run and long run effect of these macroeconomic variables on government debt using the autoregressive distributed lag (ARDL) approach.

The remainder of this study is organised as follows. Section 2 reviews the literature. Section 3 presents the methodology. Section 4 reports and discusses the estimated results. Section 5 concludes with policy implications.

2.0 Literature review

2.1Theoretical literature

Theoretical framework

The macroeconomic determinants of public debt analysis follow the growth cum debt model developed by Solis and Zedello (1985), the Keynesian "twin deficit hypothesis" that discusses the relationship between budget deficit and trade deficit by expounding it using the macroeconomic variables that affect the economy as a whole. In addition, two gap model developed by (Bacha 1989) and Harrod (1939) growth models that capture the saving investment gap, foreign exchange and fiscal constraints gap relationships are also invoked accordingly (Mehmood *et al*, 2021) & (Spencer &Yohe, 1970). The dual gap model with government expenditure and Taxes is given as:

$$S + T + M = I + G + X \quad (1)$$

Where S, T, M, I, G, X are Saving, Taxes, Import, Private domestic investment expenditures, government expenditure, export respectively. From the equation (1) Saving equation is defined in the equation (2) below:

$$S = (Y_p - C_p) + (T_c - G_c) \quad (2)$$

where by $(Y_p, C_p), T_c, G_c$ are private income, private consumption, government revenue and government expenditure respectively. The following equation was obtained by combination of equation 1 & 2. After combining equation 1&2 the thee gap model is formulated by making the subject Investment (I) as shown in the following model.

$$I = (Y_P - C_P) + (T_C - G_C) + (M - X) + G + T \quad (3)$$

Where by $(Y_P - C_P), (T_C - G_C)$ and $(M - X)$ can be related to public debt. This relationship arises out of the fact, when private consumption exceeds private income, then the saving investment gap occurs, whereas when government expenditure is greater than its revenue, a fiscal deficit occurs as well. In a similar vein, when import costs become higher than export earnings trade deficit arises as well. The attempt of most countries to fill those gaps leads to borrowing which is one of the leading causes of public debt. From equation 3 the functions$(Y_P - C_P), (T_C - G_C), (M - X)$ can be termed as components of public debt while other macro-economic variables that are not included in the equation can be decomposed in the model in order to capture other variables such as inflation and policy variables respectively. From equation 3 the model can be reduced and specified as:

$$I = PD + G + T \quad \rightarrow \quad PD = I - G - T \quad (4)$$

From this model, export and import are very important in explaining public debt but not captured in the model. In this case, the model can be modified to include import and export. Therefore, for this study the model from equation (4) can be stated as follows:

$$PD = F\ (GS, INF, FDI, EXP, IMP) \quad (5)$$

2.2 Empirical Literature

Natalia (2006) used Ordinary Least Square (OLS) to study the effects of economic and political factors on the level of government debt in Ukraine. The study used time series data for the period 1995-2006. The result indicates that, GDP per capital, growth rate of output, change in output gap, inflation, unemployment and real interest rate were found to be significant in explaining the level of government debt. That is, all the variables have a negative effect on debt except GDP which has a positive effect on debt. The study suggested that without softening political constraints and restraining from political interferences, Ukraine will not be in a position to control and manage the level of public debt. This entails that government should refrain from undertaking expansionary fiscal policies and doing away with unproductive public expenditures in order to reduce government debt.

Belguith and Omrane, (2017) analyzed macroeconomic determinants of public debt growth in Tunisia using time series data for the period from 1986 to 2015. The study used Johnsen co-integration test and Vector Error Correction Model (VECM). The result reveals that inflation, public investment and gross fixed capital formation reduce the value of public debt by 1.07, 2.12 and 0.51 respectively. However, real interest rate, budget deficit and trade openness have a positive and significant effect on public debt. The study suggested that, the only way to stop the process of debt accumulation is to reduce the primary deficit through continued fiscal adjustment. This situation has been perpetuated partly by the lack of accumulated resources for debt financing as exhibited by the increase in external borrowing from international organization. To address this problems, intuitively the study suggests that the economy needs to consider improvement of the productive opportunities for a sustained growth rate of the economy of more than 5%, the adjustment of the interest rate to a lower average levels. Lastly, ensuring that tax system is participatory and fair including the rationalization of budgetary choices. Swamy (2015) investigated the government debt and its macroeconomic determinants in India. The study used time series data for the period from 1980 to 2009. The study further employed Pairwise Demitrescu-Hurlin Panel Causality Tests and grouping regression model. The result shows that the causation for growth of national debt runs from real GDP growth, final consumption expenditure, inflation, trade openness, gross fixed capital formation, real interest rate, age dependency, population growth, and unemployment to debt. Moreover, the result showed that, real GDP growth, Foreign Direct Investment (FDI) and population growth have a negative effect on the debt while final consumption expenditure, gross fixed capital formation and trade openness in the economy have a positive effect on government debt. The study recommended that, India must increase ratio of resources in the area that reduce debt in order to stabilize the economy.

Lau *et al*., (2016) using annual time series data for the period 1976-2013 assessed the determinants of external debt in Thailand and Philippines. Thus study employed Augmented Dickey-Fuller test, Johansen Cointegration and Variance Decomposition. The results reveal that, there existence of short run linkages originated from inflation rate and real interest rate to public debt in Thailand. As for the Philippines, there is no evidence of short-run effect of gross domestic product (GDP), inflation rate, real interest rate to public debt, but the burden of short-run adjustment appears to have fallen mostly on gross domestic product. The study recommended that debt management could be implemented to control debt accumulation and to reduce dependence on debt relief in the form of foreign aid. Al-Fawwaz (2016) studied the determinants of external debt in Jordan using time series data covering the period of 1990 to 2014. The study employed Augmented Dickey-Fuller (test, Phillips-Perron (PP) tests, Wald Test for Cointegration and ARDL Model. The results reveal that, exchange rate and terms of trade were not statistically significant in short run while the gross domestic product per capital was negative and statistically significant at 5%. In the long run, terms of trade were also statistically significant and positively influencing debt while gross domestic product per capital and exchange rate were not statistically significant at all level.

Awan et al., (2015) study used ARDL Model in examining the macroeconomic determinants of external debt in Pakistan using annual time series data from 1976 to 2010. The findings reveal that, exchange rate, fiscal deficit and trade openness were found to be statistically significant with positive effect on debt in both short run ad long run except foreign aid and terms of trade. The study suggested that, the government should utilize well domestically available resources rather than depend on external sources of financing public expenditure.
Gokmenoglu & Rafik (2018) investigated the determinants of external debt using annual time series data for the period of 1970 to 2013 in Malaysia. The study used Johansen Cointegration

test for long run relationship, Vector Error Correction Model (VECM) and Granger Causality test for establishing directional relationship. The findings reveal that, there is long run relationship among the variables. Furthermore, the study found that, gross domestic product has a negative but statistically significant effect on public debt as opposed to recurrent and capital expenditure. The study suggested that the government should find other sources to finance expenditure and to reform subsidy system so as to impact growth positively.

Within the African context, Ssempala et al (2020) studied the the effect of public debt on economic growth in Uganda for the 1980 to 2016 period. The study employed both Unit root test, co-integration test and Autoregressive Distributed Lag (ARDL). The findings reveal that, the public debt has a negative and significant at 5% to affect economic growth while in long run public debt has mixed effect on economic growth that is total debt services has a negatively significant effect on economic growth but Gross debt positively affect economic growth. The study recommended that policies geared toward efficient use of borrowed funds so as to unlock the production capabilities of the country as well as heavy reliance on public debt must be discouraged in the short run.

Omar and Ibrahim (2020) conducted a study on the determinants of external debt with focus on Somalia. The study uses the annual secondary time series data on exchange rate, domestic investment, Gross domestic product and government spending for the period of 1980 to 2018, sourced from World Bank and United Nation Statistics Division. This study employed Autoregressive Distributed Lag (ARDL) model and Cointergration test. The result show that, in short run exchange rate and domestic investment have positively affect public debt at 5% level of significant where as Gross Domestic product and government spending have negatively affect public debt, also this results are consistent with the long run effect. The study suggested that the government should allocate resources and well utilization on the profitable sectors namely as: livestock, fisheries and agriculture, with the purpose of raising production in the country. Hlongwane and Daw (2022) study analyzed the determinants of public debt in South Africa by employing a Regime-Switching analytical technique and granger causality using secondary time series data covering the period from 1990 to 2020, The study findings showed that, government deposit, business confidence, government revenue, unemployment and government expenditure tend to positively affect public debt whereas consumer price inflation and gross domestic product negatively affects public debt, even though GDP was not statistically significant. In view of these findings the study recommended that, it pertinent that the government should reduce heavy dependency on public debt to finance fiscal stimulus.

To this end, following the empirical review conducted in both developed and developing countries, we have noted that macro-economic variables have varying degrees of effects on public debt both in the short run and long run. This could be associated with structural differences across countries and thus the ensuing effects cannot be the same. However, it is clear that most of these studies were done before the onset of the COVID-19 pandemic and those done even after it, did not take into consideration the fiscal implications associated with additional fiscal stimulus that most countries accessed in order to finance recovery from the post pandemic. Also, majority of studies were not conducted in Tanzania and their study focus in terms of the coverage period was either short for one to make a meaningful assessment, Thus, empirical evidence and lessons from post COVID-19 recovery will expand the understanding and the scope of macro-economic variables and their effect on public debt in Tanzania while informing policy making accordingly.

3.0 Methodology

The purpose of this study is to examine the macro-economic determinants of public debt in Tanzania mainland. The study adopted a modified version of the model by Zafar and Sabihuddin (2008) and Belguith and Omrane, (2017) using time series data covering 50 years from 1970- 2020 sourced from the National Bureau of Statistics (NBS) and Bank of Tanzania (BoT) database.

Data types and Methods of analysis

The study uses of quantitative time series data from 1970 to 2020 with the following independent variables namely; government spending, inflation rate, foreign direct investment, export and public debt as dependent variable. The selection of data from 1970-2020 aimed at capturing the effects on economic policies undertaken before and after the COVID-19 pandemic.

Unit Root Test

The time series properties of the data were checked to see whether they are stationary or not. To serve this purpose, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were used. While the ADF tests use a parametric autoregression to approximate the ARMA structure of the errors in the test regression, the PP tests on it part helps to correct the bias induced by DF tests due to omitted autocorrelation. Thus, the Phillips-Perron (PP) unit root tests differ from the ADF tests mainly in terms of how they deal with serial correlation and heteroskedasticity in the errors. The models below are used to carry out the ADF and Philips-Perron tests.

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \sum_{j-1}^{p}\left(\delta_j \Delta Y_{t-j}\right) + e_t \quad \text{[ADF-Test]} \tag{4}$$

$$y_i = \alpha + \rho y_{i-1} + \varepsilon_i \quad \text{[PP-Test]} \tag{5}$$

Whereby t is the time index, α is an intercept constant, γ is the coefficient presenting process root, p is the lag order of the first-differences autoregressive process, e_t is an independent variable identically distributing residual term, Δy_t is the first difference operator, y_{t-1} is one period lagged value of the variable y_t and ΔY_{t-j} is the difference of the lagged dependent variable, ρ autocorrelation parameter, and ε independent and identically distributed as $N(0,\delta^2)$.

ARDL Bounds test of Co-integration.

The purpose of the ARDL Bound test of Co-integration was to determine whether a long run or short run relationship existed among the variables in question. The F- statistic was used to test whether the variables are co-integrated or not. It tested the null hypothesis that there is no long run relationship between the variables against the alternative hypothesis that the variables have long run relationship. The guideline was to reject the null hypothesis if the calculated F-Statistic is greater than the upper bound critical value at 5% level of significance.

Model Specification

Following the model by Zafar and Sabihuddin (2008) and Belguith and Omrane, (2017), the mathematical model used to carry out empirical assessment of the macro-economic determinants of public debt is specified:

$$\mathrm{PD} = \mathrm{F}\ (\mathrm{GS}, \mathrm{INF}, \mathrm{FDI}, \mathrm{EXP}, \mathrm{IMP}). \quad (6)$$

Where

ND	=	Public Debt to GDP ratio
GS	=	Government Spending to GDP ratio
INF	=	Inflation Rate
FDI	=	Foreign Direct Investment to GDP ratio
EXP	=	Export to GDP ratio
IMP	=	Import to GDP ratio

Autoregressive Distributed Lag (ARDL)

The study specifies the generalized ARDL Model (n, k) as follows:

$$y_t = \alpha_0 + \sum_{i=1}^{n} \varphi_i y_{t-i} + \sum_{i=0}^{k} \beta_i x_{t-i} + \varepsilon_t \quad (7)$$

where y_t is a vector and the variables in $x_t$are purely stationary at level I (0) and first difference I(1). The coefficients are φ_i and β_i, the constant is c_0 while *n* and *k* are the optimal lags. In the presence of a long run and short run relationship of the variables, the econometric function that includes the variables namely; Government spending, Inflation, Exchange rate, Foreign Direct Investment, Export, Import and Government debt were estimated with the speed of adjustment from the short run disequilibrium toward the long run equilibrium. So, to capture the estimation of both short run and long run effect instantaneously, the operation difference (Δ) was introduced in both dependent and independent variables to represents short run dynamic while long run is measured by the parameters attached (Omar & Ibrahim, 2020). The estimated ARDL model is specified as follows:

$$\Delta ND_t = \beta_0 + \beta_1 ECT_t + \sum_{i=1}^{n} \beta_2 \Delta GS_{t-1} + \sum_{i=1}^{n} \beta_3 \Delta INF_{t-1} + \sum_{i=1}^{n} \beta_4 \Delta FDI_{t-1} + \sum_{i=1}^{n} \beta_5 \Delta EXP_{t-1} + \sum_{i=1}^{n} \beta_6 \Delta IMP_{t-1} + \sum_{i=1}^{n} \Delta ND_{t-1} \ \varepsilon_t \quad (8)$$

Granger Causality Test

The ARDL Model do not tell the directional causality among the variables such that; event X happens before event Y, it is likely that X causes Y to happen and the opposite can never be true. To establish causal relationship between variables, the study employed Granger causality test. The test involves fitting the following regressions models:

$$y_i = a_{0,i} + a_i y_{i,t-j} + \beta_i x_{i,t-j} \quad (9)$$

$$x_i = a_{0,i} + a_1 x_{i,t-j} + \beta_i y_{i,t-j} \quad (10)$$

where by

t =Time period, y =dependent variable, x =stands for explanatory variables, a, β = coefficient.

4.0 Results and discussion

Test for Stationarity (Unit Root Test)

This test was conducted to determine the order of co-integration for each variable by using two statistical techniques, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (P–P) test**.** Table 1 summarizes the unit root test results of the data at level 1 and at first difference.

Table 1: Unit Root at 95% level of confidence

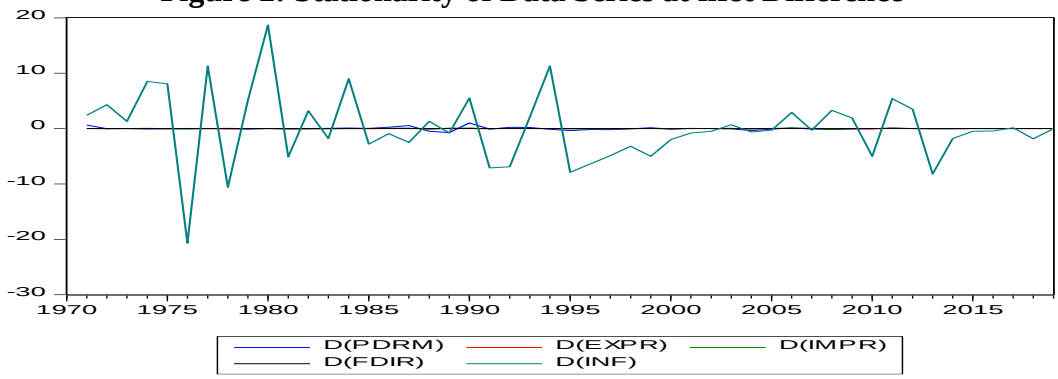
Variables	Augmented Dickey Test Statistics (With intercept and no trend)		Phillips-Perron Test Statistics (With intercept and no trend)	
	I(0)	I(I)	I(0)	I(I)
Public debt-to-GDP (PDRM)	-2.5213	-7.0074	-2.5047	-9.2785
	0.1167	0.0000***	0.1206	0.0000***
Import-to-GDP (IMPR)	-3.5461	-9.5804	-3.4459	-29.3940
	0.0107 **	0.0000***	0.0139**	0.0001***
Export-to-GDP (EXPR)	-2.4447	-7.1197	-2.4447	-7.1197
	0.1352	0.0000***	0.1352	0.0000***
Inflation (INF)	-2.0909	-8.9399	-1.9615	-8.9822
	0.2491	0.0000***	0.3024	0.0000***
Foreign Direct Investment-to-GDP (FDIR)	-2.0937	-9.0333	-1.8315	-9.6961
	0.2480	0.0000***	0.3613	0.0000***
Government Spending-to-GDP (GSR)	-1.0549	-9.0379	-1.0549	-9.0379
	0.7269	0.0000***	0.7261	0.0000***

Source: *Author's Computation from* ***Eviews*** *Version 10*

Note: **** significant at 1%; **significant at 5% and *significant at 10%*

Table 1 presents the variables at level I (0), that is before differencing and after 1st difference of all variables I(1) The results before differencing show that all data series are non-stationary at that level with the exception of the import variable which is integrated of I (0).

Figure 2: Stationarity of Data Series at first Difference



Also, after first differencing, all data series became stationary (see table 1 and figure 2), which implies that the null hypotheses of time series have a unit root ($\delta = 0$) at first difference and thus, were rejected in favour of the alternative hypotheses for all data series since the variables are integrated at I(0) and I(1). In this case the ARDL modeling was considered appropriate in estimating the short run and long run effect of macroeconomic determinants on public debt because the condition for ARDL model estimation was met.

Bounds Test for Co-Integration Analysis

The study carries out a bounds test for co-integration to examine the existence of the long run relationship among the variables in the model. By choosing a maximum of two lags based on AIC, the model was built by generating results using EVIEWS.

Table 2: F-Statistic Bound Test for Co-integration relationship

			Bound Critical Values (Restricted Intercept and no Trend)	
Test Statistic	Value	Significant level	I(0)	I(1)
F-statistic	5.2	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Note: I(0) = Lower Bound I(1) = Upper Bound
K is the number of regressor.

The result in Table 2 presents the bounds test for co-integration relationship for public debt against import, export, inflation rate, government spending and foreign direct investment. The null hypothesis of no co-integration among the variables is rejected since the calculated F-statistics is higher than the upper and lower level of bounds critical value at 1%, 5%, 10% level of significance for restricted intercept and no trend. The results seem to provide evidence for the existence of a long-run relationship among the variables in the model. These results also warrant proceeding to the second stage of estimation. Thus, the next estimation is the long-run coefficients of the ARDL model.

Table 3: Error Correction Model (ECM) for PDR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PDR(-1))	0.0097	0.0985	0.0986	0.9221
D(IMPR)	1.2034	0.4956	2.4283	0.0214**
D(IMPR(-1))	0.2575	0.5448	0.4727	0.6398
D(EXPR)	1.6823	1.2308	1.3668	0.1818
D(EXPR(-1))	4.7472	1.2893	3.6819	0.0009***
D(FDIR)	3.8998	2.7963	1.3946	0.1734
D(FDIR(-1))	-2.1922	2.7325	-0.8023	0.4287
D(INF)	-0.0042	0.0035	-1.1808	0.2470
D(INF(-1))	-0.0182	0.0039	-4.7141	0.0001***
D(GSR)	3.2450	0.8736	3.7148	0.0008***
D(GSR(-1))	3.2139	0.8697	3.6956	0.0009***
CointEq(-1)*	-0.5938	0.0897	-6.6195	0.0000***
R-squared				0.7462
Adjusted R-squared				0.6686
Durbin-Watson				2.1535

Source: *Author's Computation from* ***Eviews*** *Version 10*
Note: **** significant at 1%; **significant at 5%; *significant at 10%.*

The negative coefficient (- 0.5938) of the lagged Error Correction Term (ECT (-1)) or CointEq (-1) * and high significance of its standard error 0.0897 (P-value, 0.000) altogether give evidence of the presence of short run relationship for public debt against foreign investment, import, export, inflation rate and government spending. The error correction coefficient (-0.5938) implies that, the system converges towards long run equilibrium at a speed of 59.38%, if there is disequilibrium of the economy in the short run. This confirms that the deviation from

the long-term is corrected by 59.38 percent over each year. The lag length of short run model is selected on basis of Akaike Information Criteria (AIC).

Short run effects provide the empirical evidence that the import with no lag and lagged with one period were positively and statistically significant with no lag at 5 percent as expected. This implies that a unit increase in the ratio is likely to aggravate the public debt by 1.20 burdens with no lag and 0.25 with two lag in the economy, however its effect in one lag is not significant. These results are in contrast with the findings by Sabihuddin *et al*. (2008) who found negative relationship between import and public debt. Plausibly these could be due to the fact that the country has improved capital intensity that is associated with better productivity and higher returns over the investment. The export with no lags and lagged with one period were positively but statistically significant at one lag. It implies that, a unit increase in export ratio to GDP would increase public debt to GDP ratio by approximately 1.68 in short run. These results concur with Sabihuddin *et al*. (2008), who found a positive and significant effect on public debt. The positive effect from these views could be a result of higher dependency on low value added and primary goods export which is strongly connected with public debt problem.

However, when government spending to GDP ratio is estimated with no lag and lagged with one period, the results are statistically significant at 5 percent, implying that they positively tend to increase public debt. Intuitively this means that a unit increase in government spending to GDP ratio increases public debt by 3.24 and 3.21 percent at lags 0 and 1 respectively. This result is in line with Mehmood *et al* (2021) who found that government spending has a positive relationship with public debt. This is due to the fact that, when government spending increases and there are no readily available funds to finance it, the government will be compelled to borrow, and this will accelerate the rise in public debt.

The inflation rate with no lag and lagged with one period was negative and statistically significant at 5 percent level as expected. On average, this implies that a 1 percent increase in inflation rate would lead to a decline in public debt to GDP ratio by 0.4 percent, and 1.8 percent with no lag and one lag respectively in short run. This result concurs with Kotosz *et al* (2020) who found a negative relationship to public debt. The possible reason could be the moderate inflation which results to attract investors thus allowing the increase of the savings in short run.

The Coefficient of foreign direct Investment with no lag has positive sign and has negative sign when estimated with one lag but its effect not significant shows negligible effect on public debt burden. This result differs with Swamy (2015) who found negative value with significant effect on public debt. This could be partly due to the fact over the recent past that the government has started to reduce dependency on debt financing while the gap in foreign inflow was covered with foreign direct investment.

Table 4: Long Run ARDL (2, 2, 2, 2, 2, 2) Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IMPR	1.6345	1.3334	1.2258	0.2298
EXPR	-0.6474	2.7746	-0.2333	0.8171
FDIR	1.4398	5.8503	0.2461	0.8073
INF	0.0227	0.0111	2.0376	0.0505*
GSR	0.8920	0.6500	1.3723	0.1801
Constant	-0.0424	0.3789	-0.1117	0.9118

Source: *Author's Computation from* ***Eviews*** *Version 10*. Dependent variable: *PDR.*
Note: **** significant at 1%; **significant at 5%; *significant at 10%.*

The ARDL model in Table 4 reveals that holding Import, exports, Government Spending, Foreign Direct Investment and Inflation rate constant, public debt to GDP in Tanzania would decline by 0.0424, implying that this decrease is associated with other factors apart from those in the model. The coefficient of Import to GDP (1.6345) was positively and statistically insignificant at all levels of significance. This means that a unit increases in import to GDP ratio would lead to an increase in public debt by (1.6345), however, its effect is not significant. These results are not supported with Sabihuddin *et al*. (2008) who found negative effect of import on public debt. The coefficient of export to GDP ratio (-0.6474) was negative and statistically insignificant at all levels of significance. This implies that a unit increase in export to GDP ratio would lead to a decline in public debt by (-0.6474). These results are consistent with Kamal *et al*. (2008) who found negative relationship between export and public debt. This could be due to the fact that the country has over time been able to increase revenue collections partly due to increased indirect taxes and rising prices of the exports.

The coefficient of inflation rate (0.0227) was positively and statistically significant at 10 percent as expected. This implies that a unit increase of inflation rate would lead to raise public debt by (0.6474). This positive relationship implies that, an increase in the inflation rate put the pressure on exchange rate and to maintain the fixed rate, the country needs to increase foreign currency reserve, which can be met through foreign borrowing that may result in accumulation of external debt. The results differ from Bittencourt (2013) who found that inflation rate has a negative relationship with public debt. The negative effect could be as a result of interest rate control which reduce the effect of higher nominal interest rates on debt.

The coefficient of Foreign Direct Investment (1.4398) was positive and statistically insignificant at all levels of significance. This implies that a unit increase in foreign Direct Investment would lead to an increase in public Debt to GDP by (1.4398). This relationship may be due to a number factors such as poor and unreliable infrastructure as well as bureaucracy processes in facilitating foreign investments. Intuitively, this may necessitate a country to borrow externally with the objective of improving business environment and infrastructure development so as so to attract more of FDIs. This is why FDI inflows are also contributing to external debt accumulation. This result contrast with Swamy (2015) who found a negative relationship between FDI and Public debt. The difference from reference country is the fact that greater levels of foreign direct investment flowing into the economy entails that the flow of investors reduces the burden on the government's external borrowings.

The coefficient of Government Spending to GDP ratio (0.8920) was positive and statistically insignificant at all levels of significance. This implies that a unit increase of government spending to GDP ratio would lead to increases in Public Debt to GDP by (0.8920). Nevertheless, its effect is not statistically significant. This result concurs with Mehmood *et al* (2021) study which shows that countries with low revenue collections, tend to borrow more especially when the government expenditure increases (deficit financing) which in turn leads to rising public debt. Most countries including Tanzania over the recent past experienced reductions in public debt due to government stance to reduce reliance on foreign financing of the government budget. However, as noted in figure 4 the trend of the public debt has picked up an increasing trend more rapidly with the onset of the COVID 19 pandemic. With the pandemic forcing governments to increase public spending to tame the pandemic, government resorted to external borrowing especially from IMF and World Bank due to the existence of concessional loans and special window of funds for developing countries.

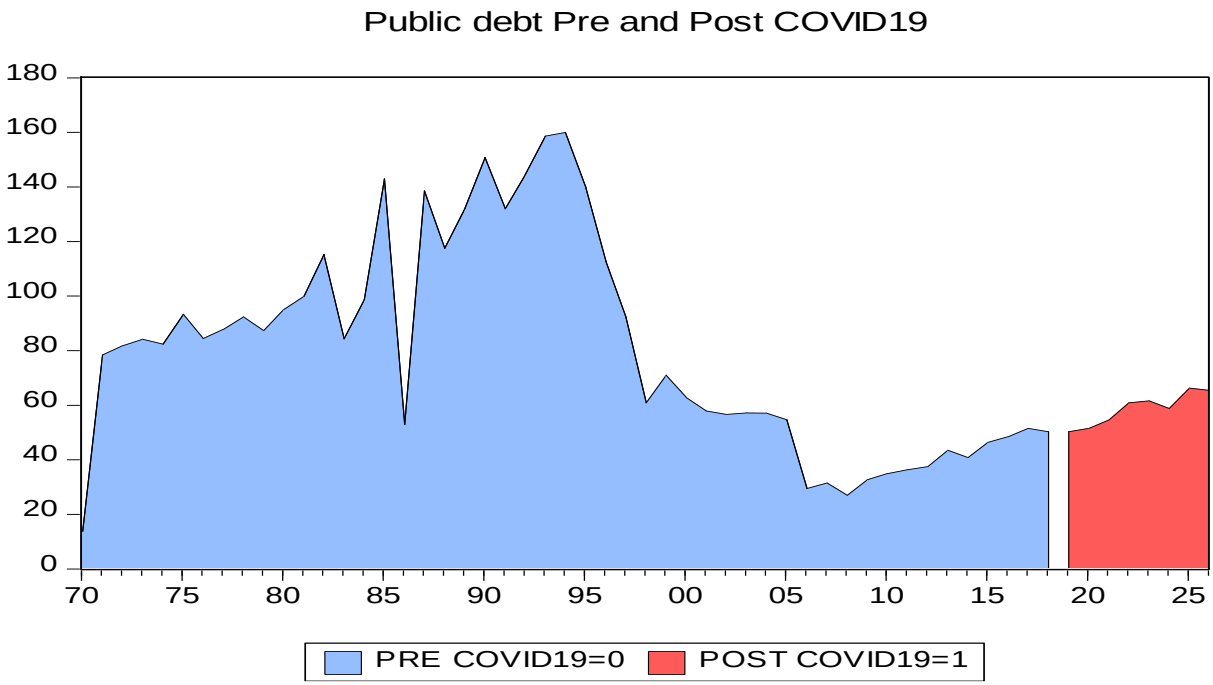


Figure 3: The Trend of Public debt Pre and Post Covid 19.

Figure 3 shows the trend of public debt during pre-pandemic and post pandemic period. It should be noted that, before the pandemic, Tanzania was already experiencing persistent buildup of the national debt. In the 1970s, the public debt started to be huge, partly due to shocks in oil prices as well as a fall in commodity prices (1973/74 and 1978/79). However, during the second phase government regime, the national debt continued to worsen reaching up to a maximum of 164.9% in 1994. After 1994, the debt ratio started to decline and reached 29.9% in 2006. This decrease in debt ratio was linked to the effects of implementation of Highly Indebted Poor Countries (HIPC) and Multilateral Debt relief (MDR) initiatives which culminated into Debt cancellation. But after 2008, public debt started rising slowly but steadily yet within sustainable limits with no signs of public debt distress. Moreover, the public debt is estimated to exhibit persistent sharp increase from 2022 up to 2026 mainly on account of relief loans from IMF and World Bank to address the effects associated with the pandemic and post-COVID 19 economic rebuilding and stabilization.

4.1 Model Diagnostic tests

The study applies various diagnostic tests to ensure that the estimated ARDL models satisfy ideal econometric assumptions such that the results are reliable, valid and make economic sense.

4.1.1 Stability test

Cumulative Sum (CUSUM) of the residuals revealed that the residuals' performance exhibits the presence of model stability (figure 5). If the curved line which represents the residuals falls outside the two extreme lines representing the critical region, the residuals will be regarded as unstable. This fact presents sufficient evidence to reject the null hypothesis at 5% level of significance and hence conclude that the model of the study is stable.

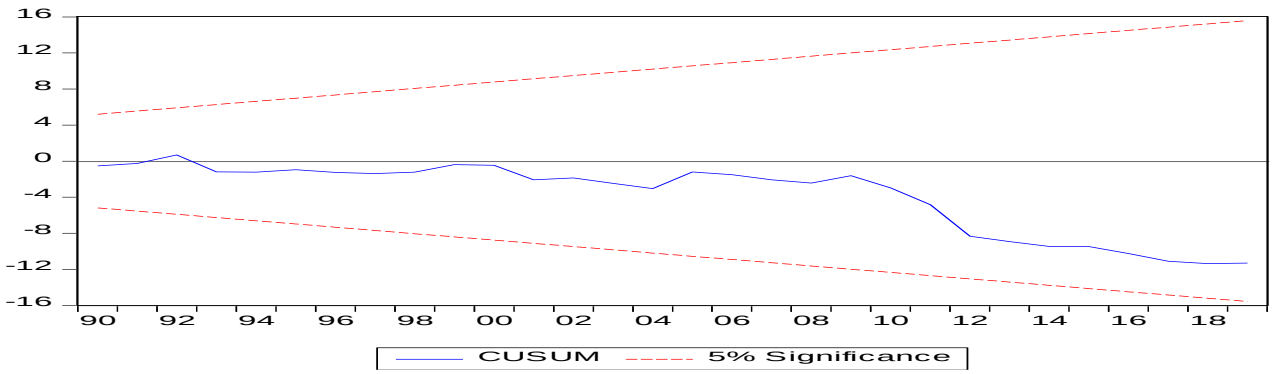


Figure 4: CUSUM of Residuals for ARDL Model

4.1.2 Serial correlation test

Jarque-Bera test for normality was applied to check whether the residuals are normally distributed or not in order to validate the model of the study(see appendix 2). The null hypothesis is that "the residuals of the data series are normally distributed" against alternative hypothesis "the residuals of the data series are not normally distributed". The results of the test reveal that the residuals were normally distributed because the p-value of Jarque-Bera statistics of 0.9002(p-value, 0.6375) was statistically insignificant. Also, the results were further confirmed with the presence of the Skewness value of -0.3335 and kurtosis value of 3.0721. Thus, this test confirms the evidence that the residuals were normally distributed.

4..1.3 Heteroskedasticity test

The Breusch-Godfrey LM Test in appendix 1 was applied to check for autocorrelation among the variables. The null hypothesis is that "*No serial correlation*" against the alternative hypothesis "*there is serial correlation*". The results of the test show that a statistically insignificant p-value (0.4275) was greater than 5% level of significance, therefore failing to reject the null hypothesis and conclude that residuals were not serially correlated.

4.1.4 Normality test

Glejser and Breusch-Pagan-Godfrey tests on Heteroskedasticity for ARDL model were used (see appendix 3). The Glejser F-statistic test (0.5250) and Breusch-Pagan-Godfrey tests F-statistics (0.6618) were highly insignificant 0.9190 and 0.8134 respectively. Thus, this confirmed that data series were homoscedastic with constant variance.

4.2 Granger Causality Test

The Granger Causality test investigates the flow of information between time series variables. Ideally, it is a statistical hypothesis test for determining whether one time series variable is useful for forecasting another variable. The test is extremely responsive to the number of lags accepted for the model. The F-Statistic bound test in table xx and model in table xx established that there exist both long run and short run relationship among regressors and public debt. These did not tell whether the relationship is a causal and the direction was not specified.

Table 5: Pairwise Granger Causality Tests

Null hypothesis	Obs	F-Statistic	P-Value
IMPR does not Granger Cause PDRM	48	3.3830	0.0432**
PDRM does not Granger Cause IMPR		3.4875	0.0395**
EXPR does not Granger Cause PDRM	48	0.9562	0.3924
PDRM does not Granger Cause EXPR		2.7515	0.0751*
INF does not Granger Cause PDRM	48	3.3832	0.0432**
PDRM does not Granger Cause INF		0.0109	0.9892
FDIR does not Granger Cause PDRM	48	1.5442	0.2251
PDRM does not Granger Cause FDIR		0.6697	0.5171
GSR does not Granger Cause PDRM	48	0.6186	0.5434
PDRM does not Granger Cause GSR		0.3010	0.7416
EXPR does not Granger Cause IMPR	48	0.0156	0.9845
IMPR does not Granger Cause EXPR		5.4702	0.0076 ***
INF does not Granger Cause IMPR	48	0.7885	0.4610
IMPR does not Granger Cause INF		0.2079	0.8131
FDIR does not Granger Cause IMPR	48	1.9200	0.1590
IMPR does not Granger Cause FDIR		0.1130	0.8934
GSR does not Granger Cause IMPR	48	0.9057	0.4118
IMPR does not Granger Cause GSR		2.0092	0.1465
INF does not Granger Cause EXPR	48	0.2166	0.8061
EXPR does not Granger Cause INF		0.1960	0.8227
FDIR does not Granger Cause EXPR	48	1.4043	0.2566
EXPR does not Granger Cause FDIR		0.2587	0.7732
GSR does not Granger Cause EXPR	48	0.19601	0.8227
EXPR does not Granger Cause GSR		1.2218	0.3047
FDIR does not Granger Cause INF	48	3.6937	0.0331**
INF does not Granger Cause FDIR		0.0084	0.9916
GSR does not Granger Cause INF	48	2.3895	0.1037
INF does not Granger Cause GSR		0.7757	0.4667
GSR does not Granger Cause FDIR	48	0.4701	0.6281
FDIR does not Granger Cause GSR		0.1824	0.8339

The Granger Causality test results in table 5 reveals that there is significant bi-directional causation between import and public debt in Tanzania. The direction of causation between import and public debt runs from import to public debt. In addition, there is a reverse causation from public debt to import movements. The test also discovered the existence of significant unidirectional causality running from public debt to export, inflation rate to public debt, import to export and Foreign Direct Investment to inflation rate. This is because in economies with high levels of public debt the causal relationship runs mostly from debt to the economy affecting macroeconomic variables. This direction of causation has no reverse movements. Moreover, the results in table 5 do not reveal any significant causation of government spending and import, government spending and inflation, foreign direct Investment and Public debt, government spending and public debt, inflation rate and import, foreign direct investment and import, government spending and foreign direct investment in Tanzania. This in a way entails that some aspects of government spending in some cases restrains economic growth while at the same time impacting the macro variables.

5.0 Conclusion and Policy Implications

This study has assessed the determinants of public debt in both short run and long run. From the foregoing findings, we note that there is significant evidence that import, export and government spending positively affect public debt while inflation rate affects public debt negatively in the short run. Likewise, there is no significant evidence to explain the positive

and negative effect of foreign direct investment with no lags and lagged by one respectively on public debt. However, the study found that in long run, inflation rate confirmed to have statistical evidence that affects public debt positively but import, export, Foreign Direct Investment and government spending have no significant evidence to affect public debt. To this end, the study established the presence of bi-directional causation between import and public debt. Also, we noted a unidirectional causality running from independent variables (i.e., import, export, inflation rate, and FDI) to dependent variable (i.e., Public Debt). Intuitively, these findings entail a number of policy implications including among others: putting in place prudent public debt management practices while ensuring that resources are directed towards productive sectors of the economy in order to boost domestic production and increased revenue and exports performance during post- COVID 19.

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APPENDICES

Appendix 1: Serial correlation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.876244	Prob. F(2,28)	0.4275
Obs*R-squared	2.827306	Prob. Chi-Square(2)	0.2433

Appendix 2: Homoskedasticity test

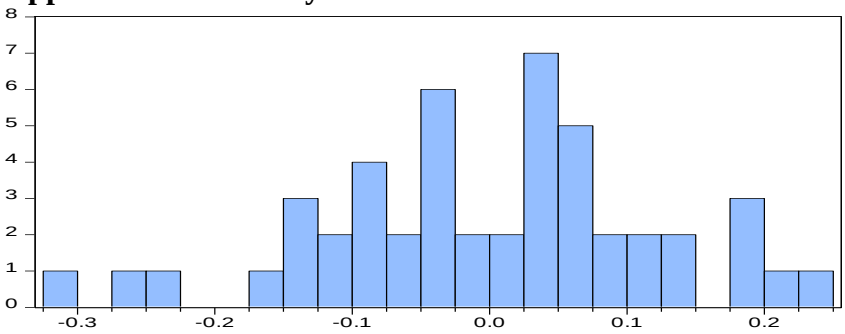
Heteroskedasticity Test: Glejser

F-statistic	0.525060	Prob. F(17,30)	0.9180
Obs*R-squared	11.00676	Prob. Chi-Square(17)	0.8562
Scaled explained SS	6.831920	Prob. Chi-Square(17)	0.9856

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.661785	Prob. F(17,30)	0.8134
Obs*R-squared	13.09120	Prob. Chi-Square(17)	0.7301
Scaled explained SS	5.298235	Prob. Chi-Square(17)	0.9968

Appendix 3: Normality test



Series: Residuals
Sample 1972 2019
Observations 48

Mean	8.33e-17
Median	0.005707
Maximum	0.245939
Minimum	-0.316970
Std. Dev.	0.121491
Skewness	-0.333520
Kurtosis	3.072152
Jarque-Bera	0.900299
Probability	0.637533