**THE IMPACT OF MACROECONOMIC VARIABLES ON PUBLIC DEBT IN TANZANIA 1990-2021**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF THE DEGREE OF MASTER   
OF SCIENCE IN ECONOMICS (MSc. Economics) DEPARTMENT OF ECONOMICS AND COMMUNITY ECONOMIC DEVELOPMENT OF   
THE OPEN UNIVERSITY OF TANZANIA**

**2023.**

# CERTIFICATION

The undersigned certifies that he has read and here by recommends for acceptance by the Open University of Tanzania a dissertation entitled, **“The Impact of Macroeconomic Variables on Public Debt in Tanzania from 1990 to 2021”**. In partial fulfillment of the requirements for the award of Degree of Masters of Science in Economics of Open University of Tanzania (MSc. Economics).

**…………………………………**

**Dr. Felician Mutassa**

**(Supervisor)**

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**....................................**

**Signature**

**................................**

**Date**

# DEDICATION

This dissertation is dedicated to my beloved wife Regna Gabriel Bukula for her support during this study. My beloved mother Kasigwa Magoro, my two lovely sons Derick Pastory Nyaonge and Damian Pastory Nyaonge and lastly, I dedicate this work to my beautiful daughter Abida Pastory Nyaonge. The academic successes that I have attained so far in improvement of my career are the result for their sacrifice, support and dedication they have laid.

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# ABSTRACT

This study assessed the impact of macroeconomic variables on public debt in Tanzania from 1990 to 2021. Tanzania uses debt received from internal and external sources in financing its deficit budget and implementing development projects to facilitate economic development. Tanzania public debt stock depicted an upward trend for the last decade, reaching USD 33,773.1 million at end of June 2021. The study employed VECM to capture the long and short run relationship of macroeconomic variables. Furthermore, the findings show that the coefficient of all independent variables had negative impact on public debt and statistically significant at 5percent while FDI had a positive impact on public debt in short run.

The study also recommended to the government the followings; to provide training to civil servants about loan utilization, emphasizing the government to direct loan to the development projects, emphasized the government to reduce duplicative programs and to take the soft loan in order to facilitate economic developments. The findings also had a number of policy implications including the need to implement responsible debt management procedures while making sure that resources are allocated to the economy's productive projects in order to facilitate economic development.

**Key words:** Public Debt,Inflation Rate, Government Expenditure, Foreign Government Investment.

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# LIST OF ABBREVIATIONS

ARDL Autoregressive Distributed Lag

CAG Controller and Auditor General

ECM Error Correction Model

ECM Error Correction Model

FDI Foreign Direct Investment

GDP Gross Domestic Product

GE Government Expenditure

IMF International Monetary Fund

INF Inflation Rate

NBS National Bureau of Statistics

OLS Ordinary Least Square

OUT Open University of Tanzania

PD Public Debt

UNCTAD United Nations Conference on Trade and Development

USD United States Dollar

VECM Vector Error Correction Model

WB World Bank

# CHAPTER ONE

# INTRODUCTION

## 1.1 Overview

This chapter covers the background of the study, statement of the problem, research objectives, research hypothesis, significance of the research and organization of the study.

## 1.2 Background of the Study

Borrowing is a central aspect of sustainable development of economy of a nation since it is one of the principal tools for resource mobilization and bedrock to direct the mobilization of resources, particularly in developing nations (WB, 2018). Underlying this is the fact that economic growth is the foremost objective of most developing countries thus resources are mobilized from various sources including the public debt for investment into different projects for the growth acceleration (Reinhart, Carmen, Vicent & Keneth, 2012). This is the fact that the sustainable economic growth of an economy is the most vital objective of macroeconomic policies especially the less developed countries like Tanzania. This is based on the reason that these countries are characterized by low capital formation due to low levels of domestic savings, investment and the growing fiscal deficits driven by high levels of debt service (Reinhart et al., 2012).

## 1.2.1 Global Trend of Public Debt

Total world debt declined for 10 percentage points of GDP in 2021 to 247 percent of GDP (US$ 235 trillion). This follows the largest one - year increase in global debt in 2020, when it rose by 29 percentage points of GDP. The fall in debt accounted for one third of the increase in 2020. The world’s public debt fell from 100 percent of GDP in 2020 to 96 percent of GDP in 2021, supported by strong real GDP growth, high inflation, and the withdrawal of COVID-19 fiscal support measures (IMF Global Debt Database, 2022).

## 1.2.2 Regional Trend of Public Debt

The region of South Asia appears to have the fastest increase in 2021, with a predicted 10.2 percent increase to $900 billion. This was primarily caused by the estimated 9 percent increase in India's external debt, which represents approximately 70% of the total external debt of the region. However, Bangladesh and Pakistan also experienced a significant increase in long-term external public and publicly guaranteed debt in 2021, with estimated increases of 23% and 11%, respectively. Despite a 5.6 percent decline in South Africa's external debt stock, it is anticipated that the external debt of Sub-Saharan African nations increased by an average of 6% in 2021, somewhat faster than in 2020. foreign debt growth in the Middle East and North Africa is predicted to have decreased to 5.5 percent in 2021 from 8.5 percent in 2020, with Egypt's foreign debt stock increasing by an anticipated 13 percent.

Countries in low- and middle-income such as Latin America and the Caribbean, external debt stocks rose an estimated 3.4 percent in 2021, a marked contrast to the 0.3 percent contraction recorded in 2020. The rise in 2021 was pushed by the estimated 4.8 percent increase in Brazil’s external debt which offset the estimated 2.2 percent contraction in Mexico and sharp increase in external debt accumulation in other countries in the region including Colombia and Peru, up an estimated 11 percent and 22 percent respectively over the prior year. Countries in Europe and Central Asia region external debt stocks accumulated at a much slower pace in 2021, rising on average an estimated 1.3 percent as compared to an increase of 3.1 percent in 2020. The downturn reflected a general slowdown in external borrowing across the region and in some countries e.g., Romania

## 1.2.3 Tanzania’s Trend of Public Debt

National debt stock (public and private) depicted an upward trend for the last decade, reaching USD 33,773.1 million at end of June 2021 (50.3 per cent of GDP in nominal terms). Out of this, external debt (public and private) was USD 25,519.3 million, equivalent to 38.0 percent of GDP, and domestic debt was USD 8,253.8 million, equivalent to 12.3 percent of GDP The increase in the National debt is mainly attributed to implementation of development projects by the Government and expansion of the private sector which raises the need for new financing (Debt Sustainability Analysis - Report, 2021). According to Tanzania’s trend of public debt, it showed that there were different and mixed results; where by the impact of macroeconomic variables on public debt depends on country uniqueness methods and data used. This had also been noticed by Belguith and Omrane, (2017) who argued that some macroeconomic variables such as inflation rate, public investment and gross fixed capital formation have negative impact on public debt while other macroeconomic variables including real interest rate, budget deficit and trade openness have a positive and significant effect on public debt. That’s why the concern of this report is to assess the impact of macroeconomic variables on public debt in Tanzania from 1990 to 2021.

## 1.3 Statement of the Problem

Public debts are one of the main problems facing many countries globally, this is due to the fact that most of developing countries depend on debts to finance their deficit budget. Many nations borrow money with intention of improving their economy for the aim of investing in different projects including construction of hydroelectric plant, transport infrastructure, management of all corrupt practices and building accountable public services, which keep their debt keeping in growing annually (UNACTAD, 2018). The first option for most of developing countries that face deficit is to borrow domestically from financial institutions, however due to lack of well-established banking systems the internal sources are usually insufficient to finance the entire budget deficit (Agenor & Montel, 1996). So, countries have to borrow from external sources that include developed countries and international organizations especially IMF and World Bank. Public debt can have either positive or negative effects on the economic growth of country’s economy (Krugman, 2006).

If public debts are used for development expenditure, then the country may benefit because development expenditure like infrastructures and investments may have a multiplier effect on boosting economic growth of a country. However, if public debt can be used for recurrent expenditure, it may cause adverse effects on the economy, firstly, in some instances the amount of the public debt might be large compared with the growth of the size of the economy of the borrower which can lead to a possible capital flight which may most likely discourage private investment (Ajayi, 1991). Being a developing country, Tanzania also has no exception when it comes to the use of public debt due to budget deficit. For instance, as the result of budget deficits; public debt of United Republic of Tanzania depicted an upward trend for the last decade, reaching USD 33,773.1 million at end of June 2021 (Debt Sustainability Analysis - Report, 2021).

According to debt sustainability analysis report, (2021) public debt of United Republic of Tanzania showed an upward trend for the last decade, reaching USD 33,773.1 million at end of June 2021 (50.3 per cent of GDP in nominal terms). Out of this, external debt was USD 25,519.3 million, equivalent to 38.0 percent of GDP, and domestic debt was USD 8,253.8 million, equivalent to 12.3 percent of GDP The increase in the national debt is mainly attributed to implementation of development projects by the government and expansion of the private sector which raises the need for new financing.

The evidence from debt sustainability analysis report, (2021) shows that despite the government conscious efforts in managing the public debt, the debt is still a burden to the Tanzanian economy. This study assesses the impact of macroeconomic variables on public debt in Tanzania from 1990 to 2021 with specific focus on Tanzania public debt which accounts for almost 50.3 per cent of GDP in nominal terms. Therefore, the study will fill the gap of analyzing the public debt by assessing the impact of macroeconomic variables on both external and domestic debt (public debt) specifically in Tanzanian economy from 1990 to 2021.

## 1.4 Objectives of the Study

This study guided by two types of research objectives, such as general objective and specific objectives.

## 1.4.1 General Objective of the Study

This study assessed the impact of macroeconomic determinant on public debt in Tanzania over the past 32 years (1990 – 2021).

## 1.4.2 Specific Objectives of the Study

i. To assess the effect of government spending on public debt in Tanzania,

ii. To examine the impact of inflation rate on public debt in Tanzania,

iii. To assess the impact of Foreign Direct Investment (FDI) on public debt in Tanzania

## 1.5 Research hypothesis

This study guided by the following research hypothesis as follow under in null form:

1. H0: Government spending has no significant impact on Tanzania public debt
2. H0: Inflation rate has no significant impact on Tanzania public debt
3. H0: Foreign direct investment (FDI) has no significant impact on public debt

## 1.6 Significance of the Study

The findings from this study will help to inform the stakeholders, including the economists, policy makers, legislators, researchers, and politicians on peoples’ mindsets against public debt, the relationship between public debt and the economic growth of the country. Secondly, the findings will help the stakeholders to make decision on what type of national debt to take, where the debt should be allocated in order to accomplish social and development goals for economic growth as well as how the debt is going to be serviced. Thirdly, researchers may use the knowledge generated through this study to either for argument to their studies or plan for further studies around the topic. Fourthly, through the findings of this study a researcher himself/herself will add a body of knowledge by providing in-depth understanding about public debt. Lastly the study will enable the researcher to meet the requirements for the award of a degree of masters of science in economic from the Open University of Tanzania (OUT).

## 1.7 Organization of the study

This study is divided into six chapters: The first chapter comprise of the background of the study, statement of the problem, objective of the study, research hypothesis, significance of the study and organization of the study. Followed with Literature review which presents the conceptual definitions, theoretical and empirical literature reviews, research gap and conceptual frameworks, chapter three is about research methodology that employed in execution of the research including overview of the chapter, research design, research approach, study area, research population, sample size and sampling technique, data collection method, data analysis, model specification, estimation techniques and research ethics consideration and confidentiality. Chapter four is made up of empirical analysis and presentation of results/findings. Chapter five presents discussion of findings and the final chapter (chapter six) includes conclusion, recommendation, policy implication and area for further study.

**CHAPTER TWO**

# LITERATURE REVIEW

## 2.1 Overview

This chapter literature review covers; conceptual definitions, theoretical literature review, empirical literature reviews, conceptual framework of the study and research gap as well. Under this study various empirical literature reviews have been conducted to study the macroeconomic determinants on public debt in general. Conventional theory of government debt has been used to provide the benchmarks to guide the study.

## 2.2 Conceptual Definitions

## 2.2.1 Public Debt

Public debt is defined as sovereign liabilities According to the International Monetary Fund (IMF, 1988), all debts acknowledged by the government to borrow from the rest of the economy or foreign countries at a given level at a specific point of time. Ahuja (2013) defines public debt as the amount of money owed by the government or all financial liabilities of a government from individuals, financial institutions, organizations and foreign countries.

**2.2.2 Inflation Rate**

According Shahid, M. (2014) Inflation rate refer to a rise in the price level of a good or service or market basket of goods and/or services. Inflation has been known for a long time due to its vibrant impact, and since 1945 it has also been regarded in research field wages and machinery hire rates, which is causing serious distress among the stakeholders.

**2.2.3 Foreign Direct Investment (FDI)**

Foreign Direct Investment (FDI) defined as long -term investment in a country in which the investor has significant control over the management of the host country’s enterprise (Samsudin et al., 2012). Furthermore; according to the IMF and OECD Foreign Direct Investment (FDI) reflects the aim of obtaining a lasting interest by a resident entity of one economy (direct investor) in an enterprise that is resident in another economy (the direct investment enterprise). The “lasting interest” implies the existence of a long-term relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the latter.

**2.2.4 Government Expenditure**

According to Adamu, J., & Hajara, B. (2015) Government expenditure reveals the magnitude of government involvement in the economy.

## 2.3 Theoretical Literature Review

This section covers one theory which underpinned the study; this theory included conventional theory of government debt as shown below.

## 2.3.1 Conventional Theory of Government Debt

This theory was founded by Elmendorf, D. W., & Mankiw, N. G. (1999) as they were assessing Government debt and its effect on the economy. The authors have documented both short run and long run effect of government debts. From this convention theory, the proponents believe that government debt stimulate aggregate demand in the short run and crowding out in the long run. In a short run, the proponents state that the government uses its debts and minimize tax to finance its spending. As a result, both households' current disposable income and their wealth increases. The conventional theory states that the increase of both disposable and wealth of households accelerate their overall demands of products or services. The important question here is the linkage to the economic growth. Elmendorf & Mankiw (1999) are in agreement with Keynesians that the increase in aggregate demand increases national income as well. The national income is a functional of expenditure on investment, consumption, and trade openness among others. On top of that, when the government use debts to finance its both development and recurrent budgets, it ultimately affects national income. The emphasis of this in the short run is positive relationship between stimulated aggregate demand attributed by the increase in wages, and production in the economy.

In the long run, this conventional theory emphasizes the relationship between national income and list of economic variables including private consumption, private savings, and taxes minus government transfers, investment, and net export. Elmendorf & Mankiw (1999) claim that usually when the government uses debts to finance its spending then taxes normally is reduced. This affects public savings but increases private savings. Therefore, in the long run, the decrease in public savings resulted from the public debt affect both direct domestic capital stock and foreign investment. In conversional view, the decrease in domestic capital signifies the decrease in output and income as well. Equally, when foreign investment decreases as a result of public a debt that implies means residents will likely have small capital abroad and thus decrease their capital income.

Conventional theory has provided and has clearly shown interaction between public debts and its effect on the economy thorough interaction between macroeconomic variables such as outputs, savings and investment for examples on public debt and its impact on the economy in general. The theory has documented national income as function aggregate demand measured by final consumption, investment, next export, taxes less government spending. The theory has further shown short run positive relationship between public debt and aggregate demand which affect national income, as well as the extent to which public debt reduced national savings that ultimately affect domestic investment, foreign investment and net export of a country.

## 2.4 Empirical literature reviews

Various empirical studies have been conducted to study the impact of macroeconomic determinants of public debt in Tanzania. This section attempts a review of some of the past studies which were conducted both within the country and abroad whose topics were related to the current subject as follow.

## 2.4.1 General Empirical Studies on Public Debt

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.

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.

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 impact public debt differently. 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.

Hlongwane and Daw (2022) study analyzed the macroeconomic 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.

## 2.4.2 Empirical literature review on external debt

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 Co- integration and Variance Decomposition. The results revealed that, there was 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.

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 Co- integration 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.

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 Co- integration 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.

Kasidi and Awan (2016) conducted a study in Tanzania on the impact of external debt on economic growth. The study collected data for the period of 1990 – 2010 to assess the impact of external debt on economic growth. The results indicated that, there was no long run relationship between external debt and economic growth.

Jilenga, Xu and Dacka (2016) studied the impact of external debt on economic growth in Tanzania using ARDL model utilizing time series data from 1971-2011. They found that in the long run external debt is positively related to economic growth while foreign direct investment had a negative impact on economic growth. Furthermore, in short run analysis revealed no directional causality between the variables.

Naeem (2015) conducted a study on the consequences of public debt in economic growth investment in the Philippines for the period 1975 – 2010 using the autoregressive distributed lag techniques. The results show that public external debt had a negative and significant impact on the economic growth and investment which confirmed the existence of a debt overhang effect. However, the study could confirm the existence of crowding out theory since debt servicing revealed insignificant correlation with investment and economic growth.

## 2.4.3 Empirical literature review on domestic debt

Lotto (2018) examined the impact of domestic debt on the economic growth in Tanzania for the period of 1990 to 2015 utilizing standard least relapse to assess its belongings. The investigation finds that there is backwards however unimportant connection between home-grown obligation and the financial development of Tanzania as estimated by gross domestic product annual growth. Furthermore, the study suggested such relation has might been influenced by over borrowing and improper use of the borrowed funds.

Lucky and Godday (2017) in Nigeria empirically examined the serial correlation between public debts structure and the performance of Nigerian economy for the period 1990-2015 using simple and multiple regression analyses. The variables used in the analysis include gross domestic product, domestic debt, external debt and total debt. The results of simple regression total public debt have a positive and significant impact on gross domestic product. Similarly results of multiple regression revealed that the domestic debt has a positive and significant effect on the economic growth.

Adofu and Abula (2010) conducted similar study in the context of Nigerian economy. The authors examined relationship between domestic debt and economic growth in Nigeria. They used econometric modelling and the time series data from 1986 – 2005. The findings reveal that there is negative relationship between domestic debt and economic growth.

## 2.5 Conceptual frameworks

According to Young (2009), conceptual framework is a dramatically representation that shows the relations between the dependent concept and independent concepts. In this study the conceptual framework depicts the impact of macroeconomic determinants on public debt. The dependent variable is public debt and the independent variables are government spending, inflation rate and foreign direct investment (FDI).

**Figure 2. 1 Conceptual framework**

**Independent Concept (IC)**

**Dependent Concept (DC)**

Government Spending

Inflation Rate

Foreign Direct Investment (FDI)

Public Debt

**Source: Researcher Own Design**

## 2. 6 Description Measurement of the Variables

**Table 2. 1 Description Measurement of the Variables**

|  |  |
| --- | --- |
| **Variables** | **Measurements** |
| Public Debt (PD) | Total debt stock to GDP in (%) |
| Government Spending (GE) | Government spending to GDP ratio in (%) |
| Inflation Rate (INF) | Inflation rate in percentage (%) |
| Foreign Direct Investment (FDI) | Foreign Direct investment (FDI) to GDP ratio in (%) |

**Source: Researcher Own Design**

## 2.7 Research gap

A number of studies assessed the impacts of macroeconomic variables on public debt in many developing countries and the available empirical evidences were mixed. The review of existing empirical and theoretical studies of macroeconomic variables on public debt relationship indicate that it was inadequate to make any generalization of the relationship between macroeconomic variables and public debt. Various studies example; Belguith and Omrane, (2017) argued that some macroeconomic variables such as inflation rate and public investment have negative impact on public debt while others including real interest rate, budget deficit and trade openness have a positive and significant impact on public debt. It is necessary to consider the case of each country separately in order to understand various dynamics involved in public debt. Therefore, the study will fill the gap of analyzing the public debt by assessing the impact of macroeconomic variables on both external and domestic debt (public debt) specifically in Tanzanian economy from 1990 to 2021.

# CHAPTER THREE

# RESERCH METHODOLOGY

## 3.1 Overview

This chapter presents the methodology that will be used in order to meet the objectives of this study; it consists of study approach, research design, study area, research population, sample size and sampling technique, data Collection methods, data analysis, model specification, estimation techniques, other diagnostic tests and research ethics consideration and confidentiality.

## 3.2 Study Approach

Research approach refers as a course of action that consists of actions of broad assumptions to wide ranging methods of data collection, analysis and interpretation, Creswell (2013). This study opted for quantitative approach, due to the following reasons; the secondary data required in this study were in numeric form and quantitative approach commonly used for testing hypothesis that intended to address the relationship between the variables.

## 3.3 Research Design

Research design refers to the plan on how a researcher scientifically will collect and examine data needed to answer research questions or hypothesis (Mwakalasya & Manamba, 2017). This study opted for time series research design, due to the fact that the relationship between macroeconomic variables on public debt needed to be tested using various econometric tools.

## 3.4 Study Area

The study conducted in the United Republic of Tanzania. This was because Tanzania is also one of the Sub-Saharan Africa countries which experiences increase in the level of public debt.

## 3.5 Research Population

The study covered a period of 32 years from 1990 to 2021.This is because 32 years is a minimum recommended years for a time series data.

## 3.6 Sample Size

The sample of this study were taken from years ranging from 1990 to 2021, which consisted of 32 years. This period was chosen because of its availability and is a minimum recommended years for a time series data.

## 3.7 Data Collection Methods

Data collection refers to the gathering specific information aimed at providing some facts Kombo and Tromp (2006). These data were collected from documentary reviews such as journals, newspapers, and different published reports such as Bank of Tanzania reports, National Bureau of Statistics reports, World Bank reports and internet sources.

## 3.8 Data Analysis

The data analyzed using STATA computer software because of its ability to help researchers to analyses data easily and efficiently (Baum, 2006). The method of analysis of the study was Ordinary Least Squares method (OLS) in order to capture the impact of macroeconomic variables on public debt, where by multiple regression includes public debt as dependent variable, government expenditure, inflation rate and foreign direct investment as independent variables.

## 3.9 Model Specification

To assess the impact of macroeconomic variables on public debt in Tanzania, an econometric model adopted but modified from those used by Malik and Atique (2012) as follows;

**PD = f (GE, INF, FDI) ……………………………………………………. ………(i)**

The econometric equation specified in their linear form is given as bellow:

**PD = β0 + β1GE + + β2INF + β3FDI + 𝜀………………………………………… (ii)**

Where:

PD = Public debt, GE = Government expenditure, INF = Inflation, FDI = Foreign Direct Investment, β0 = Slope of the regression, β1, β2, β3 = Coefficient of regression, 𝜀 = error term which accounts for other unobserved factors.

## 3.10 Estimation Techniques

## 3.10.1 Testing for Stationarity (unit root test)

A unit root test applied to check if or not the data taken was stationary or not stationary, this was because if the variables under the study were non-stationary, they may lead to biased and inefficient results. The possibility of non-stationarity had been attributing to changes in economic policies or changes in the structure of the economy. For that reason, the Dickey-Fuller test used on each variable to determine if they were stationary or non-stationary.

## 3.10.2 Co - Integration Test

Co-integration was developed as a technique for determining whether there was long run relationship among of variables. Co - integration implies that in the long-run series that data were non-stationary move together. When variables were co-integrated, regression is carried out in levels using non-stationary variables in which there was no problem of spurious regression and the coefficients were estimated as long-run coefficients.

## 3.10.3 Error Correction Model (ECM)

In order to capture short-term and long-term dynamic the study applied Error Correction Model (ECM). Error correction terms obtained by regressing dependent variable on independent variables and then produce residual series from the estimated ordinary square. It measures the speed of adjustment of the dependent variable as the independent variable(s) changes. If the variables were co-integrated then an error correction model used to estimate a single logarithm line with single equation error correction model (ECM) by ordinary least squares (OLS) method. The choice of this technique was due to its suitability and it had been used successfully in other studies in Tanzania, for instance, Mushi (1998) and Bashagi (2003).

## 3.10.4 Heteroscedasticity Test

Heteroscedasticity refers to the dispersion of the variance, which is caused by statistical models that allows random variables to differ in variance. It is very important to conduct the test since presence of heteroscedasticity can leads into biased estimators of standard errors.

## 3.10.5 Multicollinearity Test

Multicollinearity problem exists when two or more independent variables have a perfect or approximate linear relationship. Therefore, it was important to test for multicollinearity before conducting further econometric analysis.

## 3.11 Research Ethics Consideration and Confidentiality

Saunders, et al., (2012) explained that research ethics are equally important whether secondary data or primary data are used in a study. Subsequently, in this study four features of research ethics were considered and observed. These features were confidentiality, anonymity, plagiarism as well as safety. Plagiarism was an ethical matter the researcher was faced, whereby the researcher worked hard and avoid repetition works from other researchers and to make an original work by recognizing the Authors of every material used through the use of citation and paraphrasing. All information and data which was collected was treated with strict confidentiality and was used only for research purpose, and was not appropriate to other research findings.

# CHAPTER FOUR

# PRESENTATION OF FINDINGS/RESULTS AND DISICUSSIONS

## 4.1 Overview

This chapter presents the results and discussion of the findings regarding the impact of macroeconomic variables on public debt in Tanzania from 1990 to 2021. The data was analyzed using the STATA computer software, chosen for its ability to facilitate efficient analysis of collected data.

The study employed the VECM model as the method of analysis to capture the influence of macroeconomic variables on public debt. The model involved multiple regressions with public debt as the dependent variable, and government expenditure, inflation rate, and foreign direct investment as the independent variables. This approach enables a comprehensive examination of the relationship between these macroeconomic variables and public debt.

## 4.2 Data Reliability

This sub section explores the properties of each variable by descriptive statistics and correlation between the variables.

## 4.2.1 Basic Descriptive Statistics

Before conducting further data discussion, it is crucial to understand the properties of each variable by generating descriptive statistics. Table 4.1 presents the descriptive statistics of the variables included in the model. These descriptive statistics provide valuable insights into the dataset. They reveal the average values, standard deviation values, maximum and minimum values and variability of the data. This information helps in understanding the characteristics and distribution of the data, aiding further analysis and interpretation of the dataset.

**Table 4. 1 Descriptive Statistics of Variables**



**Source: Author’s STATA output, (2023)**

The Foreign Direct Investment (FDI) had an approximately a mean value of 2.56, indicating the average level of foreign direct investment across the observations and its standard deviation was an approximately 1.53 reflects the variability in the FDI values, this indicated that both mean and standard deviation of Foreign Direct Investment (FDI) were low compared to other variables as shown to the table 4.1. Furthermore, the minimum value of both public debt and Foreign Direct Investment (FDI) recorded was 0, observed in 1991 to 1992, indicating instances where there was no public debt and Foreign Direct Investment (FDI). On the other hand, the maximum value of Foreign Direct Investment (FDI) observed was 5.7 in 2010 which was low figure compared with other variables as depicted by table 4.1.

## 4.3 Summary of the data

## 4.3.1 Public Debt

Figure 4.1 represents the public debt as one of the data collected by the researcher. Public dept consisted of 32 observations, that were from 1990 to 2021 in yearly basis. On average, the public dept had a mean value of approximately 63.94 as a percent of Gross Domestic Product (GDP). This indicates that the average public debt value across the observations was around this figure. The variability in the public dept variable was reflected by its standard deviation, which was approximately 54.09. This suggests that the values of public dept variable were spread out, indicating a wide range of debt amounts. The minimum value recorded in the public debt as a percent of GDP was 0 which was observed in 1990 to 1993, while the maximum value observed was 240.9 which was observed in 1994, signifying the full range of public debt values presented in the dataset.

**Figure 4. 1 Public Debt**



**Source: Author’s STATA output, (2023).**

## 4.3.2 Inflation Rate

Figure 4.2 represents inflation rate as one of the data collected by the researcher. This was another variable of interest, which also consisted of 32 observations. The mean value of the Inflation rate variable was approximately 11.81, indicating the average of inflation rate across the observed periods. The standard deviation of approximately was 9.52 suggesting a moderate level of dispersion of inflation values. The lowest recorded value in the Inflation rate was 3.29 which was observed in 2020, while the maximum value observed was 35.8 which was observed in 1990, reflecting the range of inflation rates captured in the dataset.

**Figure 4. 2 Inflation Rate**



**Source: Author’s STATA output, (2023)**

## 4.3.3 Foreign Direct Investment (FDI)

Figure 4.3 represents Foreign Direct Investment as one of the data collected by the researcher which consisted of 32 observations. The mean value of the Foreign Direct Investment was approximately 2.56, indicating the average level of foreign direct investment across the observations. The standard deviation of foreign direct investment was approximately 1.53 reflecting the variability of foreign direct investment values. The minimum value recorded of foreign direct investment was 0, observed in 1991 to 1992, indicating instances where there was no foreign direct investment. On the other hand, the maximum value observed was 5.7 observed in 2010 representing the highest level of foreign direct investment in the dataset.

**Figure 4. 3 Foreign Direct Investment (FDI)**



**Source: Author’s STATA output, (2023).**

## 4.3.4 Government Expenditure

Figure 4.4 represents government expenditure as one of the data collected by the researcher which also consisted of 32 observations. government expenditure had mean value of 11.43, indicating the average level of government expenditure across the observed periods. The standard deviation of government expenditure was approximately 3.69 reflecting the variability in the expenditure values. The lowest value recorded was 7.77 observed in 2019, while the highest value was 19.64 observed in 1992 representing the range of government expenditure captured in the dataset.

**Figure 4. 4 Government Expenditure**



**Source: Author’s STATA output, (2023).**

## 4.4 Diagnostic Checks

## 4.4.1 Lag Selection Criteria for the Variables

The lag selection process helps determine the optimal lag order for each variable in a regression model. The analysis covers a sample period from 1994 to 2021. The table 4.2 presents the lag selection criteria for each variable and provides key information for evaluating the model fit and significance including the variable at different lag orders. Based on the lag selection criteria analysis, it is recommended to include one lag (lag 1) of Inflation and FDI in the regression model. These variables show significant results according to the likelihood ratio test and exhibit the lowest AIC, HQIC, and SBIC values. Table 4.2 shows findings which provide guidance for determining the appropriate lag order for each variable in further regression analysis.

**Table 4. 2 Lag Selection Criteria for the Variables**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **lag** | **LL** | **LR** | **df** | **p** | **FPE** | **AIC** | **HQIC** | **SBIC** |
| 0 | -203.088 |  |  | 496.21 | 14.7205 | 14.7642 | 14.8633 |  |
| 1 | -170.992 | 64.191 | 9 | 0.000 | 95.8831\* | 13.0709 | 13.2454\* | 13.6418\* |
| 2 | -165.467 | 11.051 | 9 | 0.272 | 126.202 | 13.319 | 13.6245 | 14.3182 |
| 3 | -153.17 | 24.594 | 9 | 0.003 | 106.559 | 13.0835 | 13.5199 | 14.5109 |
| 4 | -142.808 | 20.723\* | 9 | 0.014 | 110.335 | 12.9863\* | 13.5536 | 14.8419\* |

**Source:** **Author’s STATA output, (2023)**

Note: The asterisks (\*) indicate the lag order that yields the best fit according to the respective criterion.

## 4.4.2 Stationarity (Unit root) Test

A unit root test was applied to check if or not the data taken were stationary, this was because if the variables under the study were non-stationary, they may lead to biased and inefficient results. The possibility of non-stationarity would have been attributed to changes in economic policies or changes in the structure of the economy. For that reason, the Dickey-Fuller test was performed on each variable to determine if they are stationary or non-stationary. The null hypothesis was as that the series has unit root test. The criterion in making the decision was that if test statistics (absolute value) is lower than the 5% critical value (absolute value) do not reject the null hypothesis, hence data are not stationary and has a unit root. If test statistics (absolute value) is greater than the 5% critical value (absolute value) reject the null hypothesis, hence data are stationary and has no unit root. The hypotheses for a unit root test were as follow under;

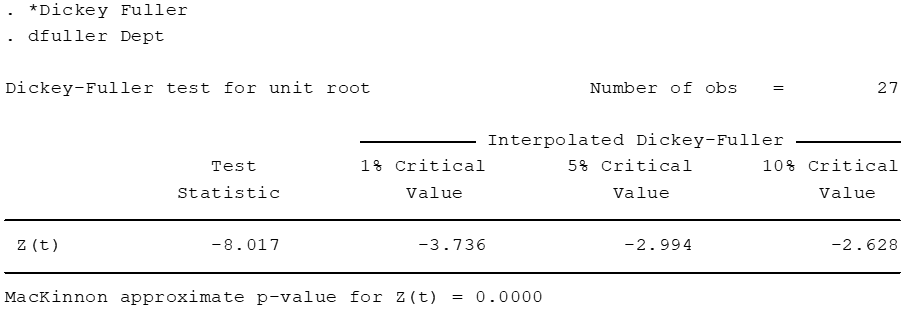
H**0**: Data are not stationary and has a unit root

H1: Data are stationary and has no unit root

## 4.4.2.1 Results for Augmented Dickey- Fuller (ADF) at Level

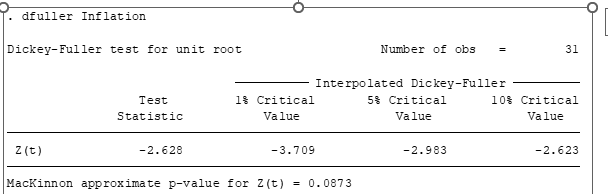
At level each variable was checked for unit root, and at level, only two variables public debt and foreign direct investment were found to be stationary while the remaining variables such as inflation rate and government expenditure were found to be non-stationary as seen in table 4.3, table 4.4, table 4.5 and table 4.6 shown below. The first difference applied to check stationarity for inflation rate and government expenditure.

**Table 4. 3 Augmented Dickey- Fuller results for Public Debt test Results**

**Source: Author’s STATA output, (2023)**

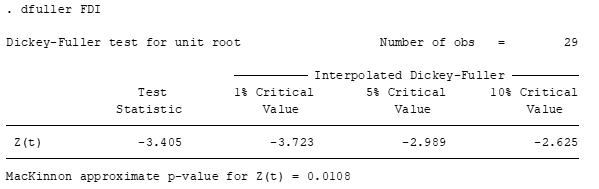
From above results, it shows that public debt was stationary at level, that had no constant term at lag (0). Since the computed Z(t) exceeds the 5% critical value in absolute terms as shown |-8.017|>|-2.994|, therefore there was enough evidence of rejecting the null hypothesis; implying that the public debt variable was stationary and has no unit root, hence it can be used for further estimations.

**Table 4. 4 Augmented Dickey- Fuller results for Inflation Rate test Results**

**Source: Author’s STATA output, (2023)**

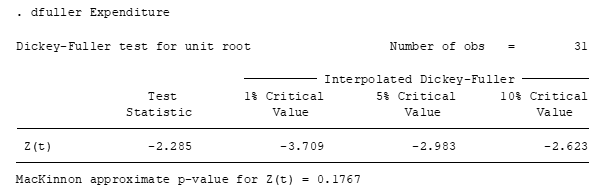
From above results, it shows that inflation rate was not stationary at the level, that had no constant term at lag (0). Since the computed Z(t) was lower than 5% critical value in absolute terms as shown |-2.628|<|-2.983|, therefore there was enough evidence of not rejecting the null hypothesis; implying that the inflation rate variable was not stationary and has a unit root, hence cannot be used for further estimations.

**Table 4. 5 Augmented Dickey- Fuller results for FDI test Results**

**Source: Author’s STATA output, (2023).**

From above results, it shows that foreign direct investment was stationary at the level, that had no constant term at lag (0). Since the computed Z(t) exceeds the 5% critical value in absolute terms as shown |-3.405|>|-2.989|, therefore there was enough evidence of rejecting the null hypothesis; implying that the foreign direct investment variable was stationary and has no unit root, hence it can be used for further estimations.

**Table 4. 6 Augmented Dickey- Fuller results for government expenditure test Results**

**Source: Author’s STATA output, (2023)**

From above results, it shows that government expenditure was not stationary at the level that had no constant term at lag (0). Since the computed Z(t) was lower than 5% critical value in absolute terms as shown |-2.285|<|-2.983|, therefore there was enough evidence of not rejecting the null hypothesis; implying that the government expenditure variable was not stationary and has a unit root, hence cannot be used for further estimations.

## 4.4.2.2 Results for Augmented Dickey- Fuller (ADF) at First Difference

At first difference all variables were found to be stationary when they were tested for unit root because the test statistics absolute values were greater than 5% critical value as depicted in table 4.7 and table 4.8.

**Table 4. 7 Augmented Dickey- Fuller results for government expenditure Results**

**Source: Author’s STATA output, (2023)**

From above result, it shows that government expenditure was stationary at first difference that has no constant term at lag (1). Since the computed Z(t) exceeds the 5% critical value in absolute terms as shown |-4.047|>|-2.989|, therefore there was enough evidence of rejecting the null hypothesis; implying that the government expenditure variable was stationary and has no unit root, hence it can be used for further estimations.

**Table 4. 8 Augmented Dickey- Fuller results for Inflation Rate test Results**

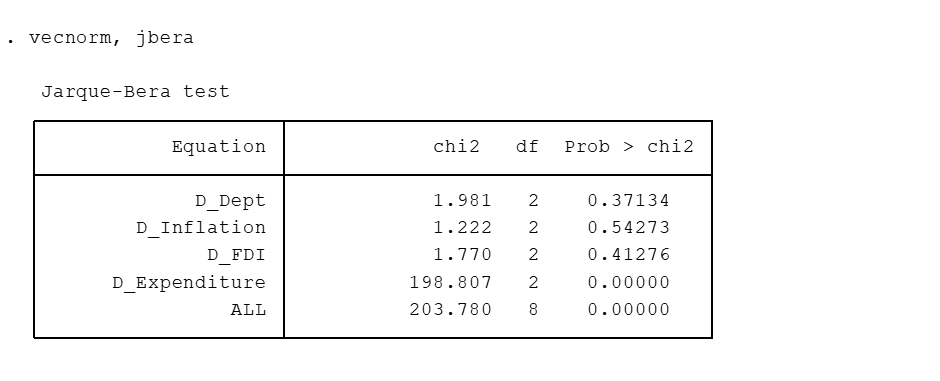
**Source: Author’s STATA output, (2023)**

From above results, it shows that inflation rate was stationary at the first difference that had no constant term at lag (1). Since the computed Z(t) exceeds the 5% critical value in absolute terms as shown |-5.659|>|-2.989|, therefore there was enough evidence of rejecting the null hypothesis; implying that inflation rate variable was stationary and has no unit root, hence it can be used for further estimations.

## 4.4.3 Normality Test

Jarque-Bera test, was used to assess the normality of a distribution of the variables. Based on the Jarque-Bera test results, public dept, inflation rate and foreign direct investment indicate that the residuals do not significantly deviate from normality while the government expenditure with chi-square statistic of 198.807, degrees of freedom 2 and the p-value of 0.00000 less than 5 percent, this indicates that the residuals of the government expenditure equation significantly deviate from normality see table 4.9 below.

**Table 4. 9 Normality Test**

****

**Source:** **Author’s STATA output, (2023)**

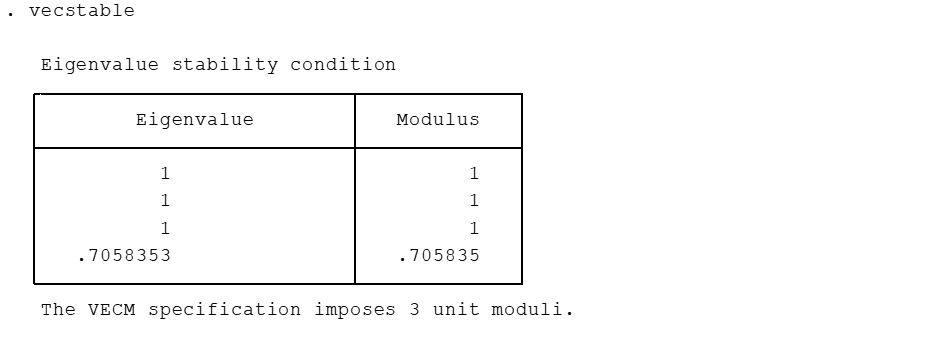
From the above results which shows that three variables such as public dept, inflation rate and Foreign Direct Investment (FDI) were normally distributed while government expenditure was significantly deviating from normality. According Li, xiang et al, (2012) the model suggests that at least one of the variables in the dataset significantly deviates from a normal distribution, therefore, the targeted variables was normally distributed and that were enough for considering the results of the model.

## 4.4.4 Stability Test

The stability of a Vector Error Correction Model (VECM) can be assessed through the examination of eigenvalues. The eigenvalues provide insights into the characteristic roots of the system and help determine the presence of stability or non-stationarity in the variables. The eigenvalues and their moduli were analysed to assess the stability of the VECM specification.

The reported outputs indicate the presence of four eigenvalues in the VECM model. The modulus of an eigenvalue represents the absolute value of the eigenvalue and provides information about its distance from the origin as shown by figure 4.10 below.

**Table 4. 10 Stability Test**

****

**Source: Author’s STATA output, (2023)**

From table 4.10, the outputs showed that three of the eigenvalues have a modulus of 1, which means they were unit roots. Unit roots indicated the presence of non-stationarity in the variables. The fourth eigenvalue had a modulus of 0.705835, indicating that it was less than 1 and therefore stable. Furthermore, in the Vector Error Correction Model (VECM) specification, it was imposed that there were three-unit moduli. This means that out of the four eigenvalues, three were constrained to be unit roots to ensure stationarity in the long run.

Lastly; overall results suggest that the Vector Error Correction Model (VECM) specification meets the stability condition by imposing three-unit moduli, which helped to address non-stationarity in the model.

## 4.4.5 Multicollinearity Test

The correlation coefficients between the variables debt, inflation rate, foreign direct investment and government expenditure were examined to assess the presence of multicollinearity. The correlation matrix showed the pairwise correlations between the variables as shown on table 4.10 below.

**Table 4. 11 Multicollinearity Test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Debt** | **Inflation rate** | **FDI** | **Expenditure** |
| **Debt** | 1.0000 |  |  |  |
| **Inflation rate** | 0.8105 | 1.0000 |  |  |
| **FDI** | -0.3219 | -0.1581 | 1.0000 |  |
| **Expenditure** | 0.3121 | 0.4605 | 0.0364 | 1.0000 |

**Source:** **Author’s STATA output, (2023)**

Based on the correlation coefficients, it was evident that public debt and inflation rate exhibit a strong positive correlation of (0.8105), while public debt and foreign direct investment display a moderate negative correlation (-0.3219). other correlation was between public debt and government expenditure which was (0.3121) showing that there was correlation but very weak correlation as shown in the table 4.11 above.

To address the issue of multicollinearity between public debt and inflation rate, the variable Inflation rate was dropped from the analysis and proceed with the interpretation of other variables without considering inflation rate. By removing the highly correlated variables, the impact of multicollinearity on the analysis was reduced and ensure more reliable results among of the data.

## 4.4.6 Autocorrelation Test

The test was performed with a lag order of 1, meaning it checks for autocorrelation between the residuals and their lagged values. The test statistic is 21.7740 with 16 degrees of freedom and the p-value associated with the chi-square statistic was 0.15064 as indicated in table 4.12 below. The following were the hypothesis below;

H0: There is no autocorrelation at lag order

H1: There is autocorrelation at lag order

**Table 4. 12 Autocorrelation Test**

|  |  |  |  |
| --- | --- | --- | --- |
| **lag** | **Chi2** | **df** | **Prob > chi2** |
| 1 | 21.7740 | 16 | 0.15064 |

**Source:** **Author’s STATA output, (2023).**

Based on the Lagrange-multiplier test results, with a p-value of 0.15064, there was no sufficient evidence to reject the null hypothesis. This suggests that there was no significant autocorrelation at the lag order of 1 in the residuals of the model.

## 4.4.7 Johansen test for cointegration

The Johansen tests for cointegration were conducted on public dept, inflation rate, foreign direct investment and government expenditure. These tests aimed to determine the presence of a long-term relationship or equilibrium between the variables. The analysis included a constant trend and one lag, using a sample of 27 observations spanning from 1995 to 2021. The results of the Johansen tests were presented in the table 4.13 below, which summarizes the findings for different ranks (number of cointegrating vectors) and their associated statistics.The trace test for cointegration was used to reveal the finding in table 4.13, implying that null hypothesis of no cointegration rejected if the value of trace statistics is greater than 5% critical value. The hypotheses for the tests are as follow under from rank zero to rank three as shown under;

**(i) For Rank 0 …………………………………………………………… i**

H0: No cointegrating equation

H1: There is cointegrating equation

**(ii) For Rank 1 …………………………………………………………… ii**

H0: No cointegrating equation

H1: There is cointegrating equation

**(iii) For Rank 2 ……………………………………………………………. iii**

H0: No cointegrating equation

H1: There is cointegrating equation

**(iv) For Rank 3 ……………………………………………………………. iv**

H0: No cointegrating equation

H1: There is cointegrating equation

**Table 4. 13 Johansen test for cointegration**

**Source:** **Author’s STATA output, (2023)**

Since the guideline is when the trace statistics is greater than 5% critical value, the null hypothesis can be rejected and accept alternative hypothesis but if the trace statistics is less than 5% critical value then null hypothesis cannot be rejected and rejecting alternative hypothesis.

From table 4.13 above shows that at rank 0, the LL was -286.7664 and there was no eigenvalue available, with trace statistics (88.0088) which was greater than 5% critical value (47.21). Therefore, the null hypothesis of no cointegration is rejected at rank 0. Secondly from the same table 4.13 above shows that at rank 1, the LL was -261.28971 with eigenvalue 0.84850. The trace statistics (37.0554) which was greater than 5% critical value (29.68). Therefore, the null hypothesis of no cointegration is rejected at rank 1. Thirdly from the above table 4.13 indicating that at rank 2, the LL is (-250.44502) with eigenvalue of 0.55216. The trace statistics (15.3660) which was lower than 5% critical value (15.41). Therefore, the null hypothesis does not reject at rank 2, hence there were two cointegration equation in the model. This implies that our four variables were cointegrated or all four variables had long run associations or they tend to move together in the long run.

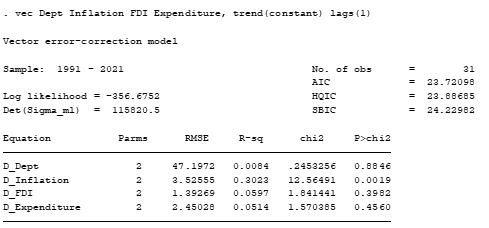
## 4.4.8 Vector Error-Correction Model (VECM) Results

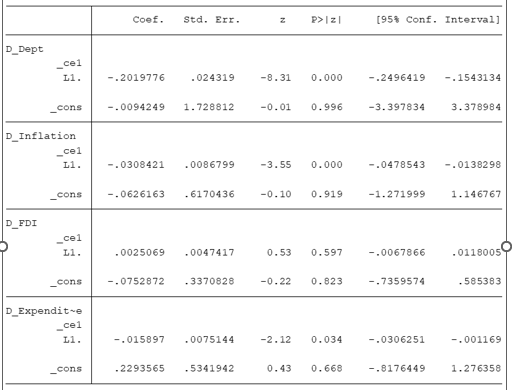
The vector error correction model (VECM) was estimated with a trend specification that included a constant and one lag. The analysis involved four variables such as public debt, foreign direct investment and government expenditure. The sample consisted of 27 observations from 1995 to 2021. The model fit was assessed using the Akaike Information Criterion (AIC) and the log-likelihood. The AIC value was 20.16961, indicating a reasonable fit of the model to the data. The log-likelihood was -261.2897, which measures the goodness of fit of the model.

## 4.4.8.1 Short Run Estimation Results

From the Vector Error correction Model (VECM) results in table 4.14 below, it was revealed that in the short run, both inflation rate and government expenditure had negative coefficients of (-0.0308421) and (-0.015897) respectively on public debt. This implies that both inflation rate and government expenditure had positive impact on public debt during the study period ceteris paribus. Furthermore, foreign direct investment had a positive coefficient of 0.0025069, which implying that foreign direct investment had a negative impact on public debt during the study period ceteris paribus.

**Table 4. 14 VECM Results- Short-Run Effect**



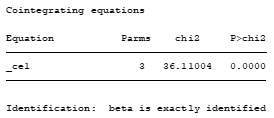


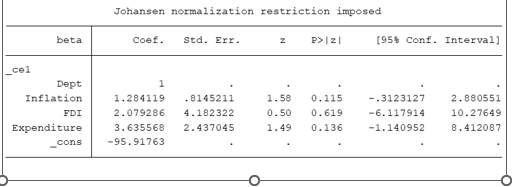
**Source: Author’s STATA output, (2023)**

## 4.4.8.2 Long-Run Estimation Results

The long run estimation results as analysed by VECM, and public debt was positioned as the dependent variable in table 4.15. In the long-run the signs of the coefficients were reversed in order to state the relationship of the variables. From the table 4.15 showed that all macroeconomic variables such as inflation rate, foreign direct investment and government expenditure had negative relationship and statistically significant impacts at 5% level of significance on public debt. In conclusion all macroeconomic variables such as inflation rate, foreign direct investment and government expenditure had symmetric impact on public debt in the long-run ceteris paribus. See table 4.15 below.

**Table 4. 15 VECM Results - Long-Run Effect**



  
 **Source: Author’s STATA output,** **(2023)**

## 4.4.9 Granger Causality test

Apart from determining the impact of macroeconomic variables on public debt. it was also important to determine the correlation between the current values of public debt and the past values of macroeconomic variables and vice-versa, in other words the direction of causality between these variables. To determine the causal relationship between the variables, the granger causality test was carried out using the Vector Error Correction Model (VECM) framework. The VECM was suitable for studying cointegrated time series, where variables share a long-run equilibrium relationship. The analysis involved estimating separate equations for each dependent variable while excluding one variable at a time as the potential predictor.

## 4.4.9.1 Public Debt Equation of Granger Causality

The granger causality test between foreign direct investment and public debt to GDP ratio yielded a chi-squared test statistic of 7.6873 with 2 degrees of freedom and a p-value of 0.021. Since the excluded variables were telling that, the null hypothesis there is no granger causality between foreign direct investment and public debt to GDP ratio. Table 4.16 shows the results of foreign direct investment p- value (0.021) was less than the critical value (0.05). Therefore, there was enough evidence of rejecting null hypothesis of no granger causality between foreign direct investment and public debt. Hence, foreign direct investment granger causes public debt at 5 percent level of significant.

Furthermore, Vector Error Correction Model framework performed the granger causality test between government expenditure and public debt to GDP ratio. The result was chi-squared test statistic of 0.32676 with 2 degrees of freedom and a p-value of 0.849. Since the excluded variables were telling that, the null hypothesis there is no granger causality between government expenditure and public debt. Table 4.16 shows the results of government expenditure p- value (0.849) was greater than the critical value (0.05). Therefore, there was enough evidence of not rejecting null hypothesis of no granger causality between government expenditure and public debt. Hence, government expenditure not granger cause public debt at 5 percent level of significant.

The granger causality test considers both foreign direct investment and government expenditure together yielded a chi-squared test statistic of 9.6191 with 4 degrees of freedom and a p-value of 0.047. Since the p-value of both foreign direct investment and government expenditure was (0.047) was less than critical value (0.05). therefore, there was enough evidence of rejecting null hypothesis of no granger causality. Hence, foreign direct investment and government expenditure together granger cause public debt at 5 percent level of significant.

## 4.4.9.2 Foreign Direct Investment Equation of Granger Causality

The granger causality test of both government expenditure and public debt yielded a chi-squared test statistic of 0.63624 and 0.312 respectively with 2 degrees of freedom and a p-value of 0.728 and 0.856 respectively. Table 4.16 shows the results of both government expenditure and public debt p-value (0.728 and 0.856) respectively were greater than critical value (0.05). Therefore, there was enough evidence of not rejecting null hypothesis of no granger causality between government expenditure, public debt to foreign direct investment. Hence, government expenditure and public debt no granger cause to foreign direct investment at 5 percent level of significant.

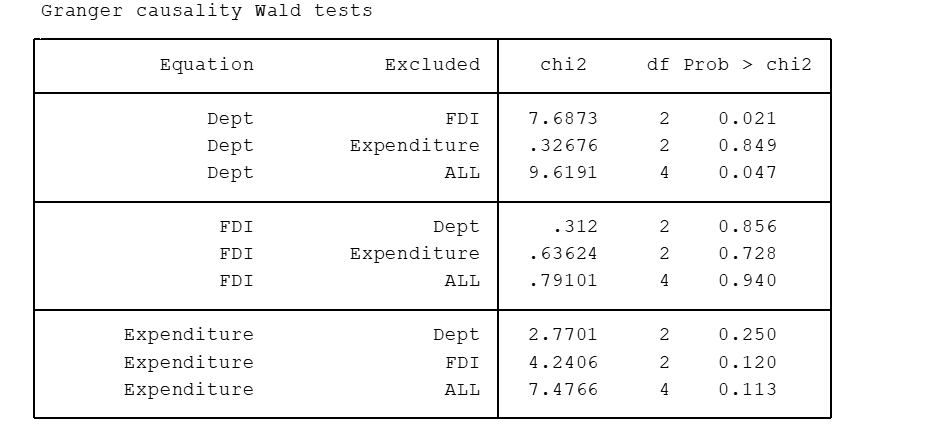
The granger causality test that considers both public debt and government expenditure together yielded a chi-squared test statistic of 0.79101 with 4 degrees of freedom and a p-value of 0.940. Since the p-value of both public debt and government expenditure was (0.940) which was greater than critical value of (0.05). therefore, there was enough evidence of not rejecting null hypothesis of no granger causality. Hence, both public debt and government expenditure together no granger cause foreign direct investment at 5 percent level of significant.

## 4.4.9.3 Government Expenditure Equation of Granger Causality

The Granger causality test of both public debt and foreign direct investment yielded a chi-squared test statistic of 2.7701 and 4.2406 respectively with 2 degrees of freedom and a p-value of 0.250 and 0.120 respectively. Table 4.16 shows the results of public debt and foreign direct investment p – value of (0.250 and 0.120) respectively were greater than critical value of (0.05). Therefore, there was enough evidence of not rejecting null hypothesis of no granger causality between public debt, foreign direct investment to government expenditure. Hence, public debt and foreign direct investment no granger causality to government expenditure at 5 percent level of significant.

The granger causality test that considers both public debt and foreign direct investment together yielded a chi-squared test statistic of 7.4766 with 4 degrees of freedom and a p-value of 0.113. Since the p-value of both public debt and foreign direct investment was (0.113) which was greater than critical value (0.05). therefore, there was enough evidence of not rejecting null hypothesis of no granger causality. Hence, public debt and foreign direct investment together no granger cause government expenditure at 5 percent level of significant.

**Table 4. 16 Granger Causality Wald Tests**



**Source: Author’s STATA output, (2023)**

**4.5 Discussion of Estimation Results based on the Objectives of the study**

Under this part, the values of the coefficients of the macroeconomic variables as indicated in table 4.15 in chapter four were discussed correlated to the objectives of the study. Noticing that public debt was positioned as the dependent variable while inflation rate, foreign direct investment and government expenditure were independent variables and in the long-run relationship the signs of the coefficients of the macroeconomic variables were reversed.

## 4.5.1 The Impact of Inflation Rate on Public Debt

From the Vector Error Correction Model results in table 4.15 it was shown that inflation rate had a negative impact on public debt in Tanzanian economy in the period of study and statistically significant impact at 5 percent level of significance on public debt by 1.284119 units. This implies that in the long run a percentage increase in inflation rate by 1 percent leads to a decrease in public debt by 1.284119 percent on average ceteris paribus. Likewise, from the Vector Error Correction Model (VECM) results in table 4.14, it was revealed that the coefficient estimate of inflation rate on public debt was (-0.0308421), this implies that in the short – run inflation rate had a 0.0308421 negative impact on public debt in Tanzania economy on average ceteris paribus. This result was statistically significant at 5 percent level of significance.

The finding of this study was consistent with some scholars, for instance 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 results indicated that, 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 was all the variables had a negative impact on government debt. Another scholar was Belguith and Omrane, (2017) analysed 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 revealed that inflation, public investment and gross fixed capital formation reduce the value of public debt by 1.07, 2.12 and 0.51 respectively.

## 4.5.2 The impact of Government Expenditure on Public Debt

From the Vector Error Correction Model (VECM) results in table 4.15 it was shown that government expenditure had a negative impact on public debt in Tanzanian economy in the period of study and statistically significant impact at 5 percent level of significance on public debt by 3.635568 units. This implies that in the long run a percentage increase in government expenditure to GDP ratio by 1 percent leads to a decrease in public debt by 3.635568 percent on average ceteris paribus. Likewise, from the Vector Error Correction Model (VECM) results in table 4.14, it was revealed that the coefficient estimate of government expenditure on public debt was (-0.015897), this implies that in the short – run government expenditure had a 0.015897 negative impact on public debt in Tanzania economy on average ceteris paribus. This result was statistically significant at 5 percent level of significance.

The finding of this study was inconsistent with some scholars, for instance 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 showed 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 and population growth had a negative impact on the debt while final consumption expenditure, gross fixed capital formation and trade openness in the economy had a positive impact on government debt. Other scholar was Hlongwane and Daw (2022) study analysed 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 expenditure, government deposit, business confidence, government revenue, unemployment and tend to positively affect public debt whereas consumer price inflation and gross domestic product negatively affects public debt.

## 4.5.3 The impact of Foreign Direct Investment (FDI) on public debt

From the Vector Error Correction Model results in table 4.15 it was shown that foreign direct investment had a negative impact on public debt in Tanzanian economy in the period of study and statistically significant impact at 5 percent level of significance on public debt by 2.079286 units. This implies that in the long run a percentage increase in foreign direct investment by 1 percent leads to a decrease in public debt by 2.079286 percent on average ceteris paribus. Similarly, from the Vector Error Correction Model results in table 4.14, it was revealed that the coefficient estimate of foreign direct investment on public debt was (0.0025069), this implies that in the short – run foreign direct investment had a 0.0025069 positive impact on public debt in Tanzania economy on average ceteris paribus. This result was statistically insignificant at 5 percent level of significance.

The finding of this study showed both consistent with swamy’s study in long run and inconsistent with swamy’s study in short run, for instance 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. Moreover, the results of Swany study showed that, real GDP growth, foreign direct investment and population growth have a negative effect on the debt.

# CHAPTER FIVE

# CONCLUSION, RECOMMENDATION AND POLICY IMPLICATION

## 5.1 Introduction

The main aim of this study was to assess the impact of macroeconomic variables on public debt in Tanzania over the past 32 years (1990 – 2021). The variables used were public debt to GDP as dependent variable and inflation rate, foreign direct investment and government expenditure as explanatory variables. The study used Vector Error Correction Model to capture the impact of macroeconomic variables on public debt. The study also used Johansen test for cointegration to capture the long run association of the variables. The period of the study cover from 1990 to 2021 to capture the different economic shocks (fluctuations). This chapter covers six parts such as introduction of the chapter, the summary of findings, conclusion of the study, recommendations and policy implication as well as area for further studies.

## 5.2 Summary of findings

The main objective of this study was to assess the impact of macroeconomic variables on public debt in Tanzania over the past 32 years (1990 – 2021). The study performed the Johansen test for cointegration and granger causality test to explain the long run association and causalities of the variables. The study specifically established the VECM model in order to capture the long and short-run relationship between independent and dependent variables for this study.

The study adopted a time series research design and collected secondary data from Bank of Tanzania (BOT) and National Bureau of Statistics (NBS) from 1990 to 2021. These data were analysed using STATA software to assess the impact of macroeconomic variables on public debt in Tanzania. The study performed the appropriate diagnostic tests in order to determine the validity and reliability of the data being used for the investigation. Furthermore, a cointegration test was performed and it suggested an existence of an underlying equilibrium relationship binding all variables. The estimation results confirm a statistically significant relationship between inflation rate, foreign direct investment and government expenditure on public debt in Tanzania in during the period of study.

## 5.3 Conclusion of the Study

This research was mainly intended to assess the impact of macroeconomic variables on public debt in Tanzania over the past 32 years (1990 – 2021). The study used Vector Error Correction Model to capture the impact of macroeconomic variables on public debt and the following main conclusions were obtained;

Firstly, there was a significant negative impact of inflation rate on public debt in Tanzania in both short and long-run period. On average, this implies that a 1 percent increase in inflation rate would lead to a decline in public debt to GDP ratio by 1.284119 percent in long run and 0.0308421 percent in short run. The possible reason could be the creeping and moderate inflation which results to attract investors thus allowing the increase of the savings mostly in short run period.

Secondly, there was a significant negative impact of government expenditure on public debt to GDP ratio in Tanzania economy in both short and long-run period. On average, this implies that a 1 percent increase in government expenditure would lead to a decline in public debt to GDP ratio by 3.635568 percent in long run and 0.015897 percent in short run. This implying that if the country decides to spend large part of the income obtained from different sources such as loans from internal and external borrowing, tax collection and other sources in development expenditures leads to the decline of public debt (MoF-report, 2022).

Lastly, it was shown that foreign direct investment had a negative impact on public debt to GDP ratio in Tanzanian economy in the long run period but positive impact on public debt to GDP ratio in short run during the period of study. This implies that in the long run a percentage increase in foreign direct investment by 1percent leads to a decrease in public debt to GDP ratio by 2.079286 percent on average ceteris paribus and it was revealed that the coefficient estimate of foreign direct investment on public debt to GDP ratio was (0.0025069) in short run and statistically significant at all levels of significance. This implying that a percentage increase in foreign direct investment in short run by leads to an increase in public debt to GDP ratio by 2.079286 percent on average ceteris paribus. 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 to attract more of FDIs.

## 5.4 Recommendations from the findings

Based on the findings of the current study the impact of macroeconomic variables on public debt in Tanzania. the following were the main recommendations provided by the researcher aimed at advising the government of Tanzania and responsible authorities as follow under;

1. **Budget allocation on development projects**

The government should keep making sure that a major portion of public debt is used for initiatives that boost economic growth, such building roads, railroads, ports, and energy. The majority of these initiatives would support microeconomic development.

1. **Capacity Building to Civil Servants**

The government should have more resources available to handle project financing through public loans. Due to poor negotiation abilities amongst civil servant increase the possibility of receiving loans with unfavourable terms. Additionally, the government incurs costs in the procurement process when carrying out development initiatives. Therefore, having officials with extensive procurement knowledge will aid the government in acquiring items at fair prices. Additionally, capacity building will give public servants the project management and design abilities necessary for successful public initiatives. In general, boosting capacity is crucial to ensuring that the full chain of public debts is carried out by highly skilled government workers.

1. **Soft Loans / Concessional Loans**

The Tanzanian government should keep securing loans with very favourable terms through the Ministry of Finance. Soft loans must therefore be provided in exchange for actions that won't have a long-term negative impact on society or the economy.

1. **The Role of CAG**

The CAG should be granted complete authority to investigate public debt, and the government must abide by his or her recommendations. For the fiscal year that ended in June 2019, the CAG office, for instance, recommended first setting up a monitoring and evaluation mechanism to keep track of the disbursement and use of funds derived from public debt; the follow-up mechanism will ensure implementing agencies properly account for the utilization of borrowings on a regular basis; and setting up coordination mechanisms to make it easier to reconcile signed loan contracts and disbursement. Second, think of a plan to encourage the growth of the domestic financial sector to draw more investors to bonds with longer maturities (Treasury bonds). Create the auction committee, assign roles and tasks, and formally record any decisions.

1. **Avoid Duplicative Programmes**

For the purpose of funding social and economic operations, the government often accepts loans from a wide range of diverse partners. However, non-state actors, such as NGOs and others, who are funded by the development partners frequently carry out comparable functions as the government. It is crucial to have well-coordinated projects that follow current programs and steer clear of those that are already in place.

1. **Political Harmonization**

Political sceptics have access to some of the development projects that were financed by public debt. The opposition parties have condemned the majority of the massive projects. It would be crucial to make sure that all public projects are harmonious. This will lessen the chance that ongoing development initiatives will be abandoned.

## 5.5 Policy Implications

These findings have a number of policy implications, including the need to implement responsible public debt management procedures while making sure that resources are allocated to the economy's productive sectors in order to increase domestic production and revenue that can be used to pay off the public debt.

## 5.6 Area for further study

There is need to investigate other impacts of macroeconomic variables (determinants) on public debt in Tanzania necessary for economic growth. To this end, there is, therefore, a need to undertake more studies in other developing countries or even in East Africa Community (EAC) to compare and corroborate the results of this study. Such findings can enhance management of public debt in the country (Tanzania). Also, there is need to conduct a study on the impacts of other macroeconomic variables (determinants) apart from Foreign Direct Investment (FDI), government expenditure and inflation rate in order to obtain other macroeconomic variables impacts (determinants) on public debt in particularly Tanzania.

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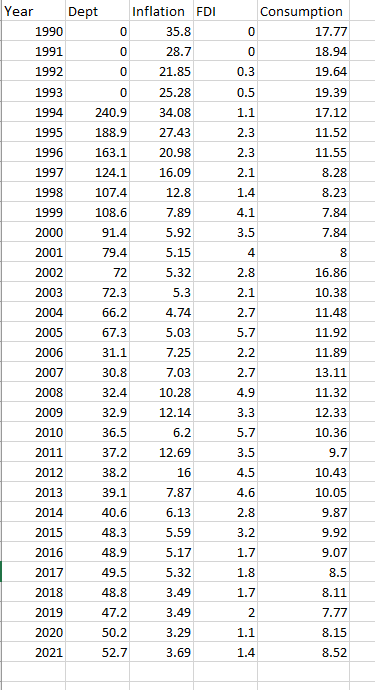
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# APPENDICES

# APPENDIX I

# DATA USED



## APPENDIX II

## RESEARCH CLEARANCE LETTERS



