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The Nexus between Tax Base and Tax Revenue Collection in Tanzania: A Vector Correction Model Analysis

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Abstract

Tax income collection is critical to every government's economic prosperity. Tax base in Tanzania still is not archived well and hence leads revenue collection to drop frequently. The primary goal of this study is to determine the relationship between Tanzania's tax base and tax revenue collection. In this study, a quantitative research approach and a time series research design were used. The research population included economic data from 1990 to 2020. This research was based on 30 observations (Annual economic data) gathered from reliable sources such as the Tanzania Revenue Authority (TRA) and the World Bank (WB). According to the study's findings, tax base effects tax revenue collection in Tanzania since the variable cointegrates with tax revenue collection. The research shows that the variables, notably the tax base and tax revenue collection, are cointegrated and nearing equilibrium in the long term. According to the paper, a more functional tax structure should be established and implemented to expedite financial activities and increase tax revenue collection throughout the country.

Keywords: *Tax base, Tax revenue collection, Tanzania*

Introduction

All countries throughout the world are now aware that in order to achieve long-term economic development, they must step up their efforts to mobilize domestic resources (Bothole, 2010). According to Tanzi and Zee (1997) and Semboja (2001), governments that raise domestic revenue have a higher chance of attaining fiscal sustainability. Taxation is one of the domestic income streams that governments employ to raise cash. Taxation is a compulsory levy imposed by the government on its citizens in order for the government to meet its fiscal commitments (Muibi and Simbo, 2013; and Botlhole, 2010). Tax revenue is generated by both direct and indirect taxes. Direct taxes, such as Pay as You Earn, are paid and accounted for by individuals and companies (PAYE). VAT and other indirect taxes are charged on production and consumption (Vat). Import and excise tariffs are the most important sources of revenue in developing countries. Taxation permits the government to transfer funds from the private to public sectors in order to fund government spending. Some growing nations confront the difficulty of relying too much on a limited tax base to collect money. Small revenue streams are more susceptible to external forces, offering a substantial challenge to their tax structure. As a result, rising economies needed to implement tax changes. Tanzania's tax reforms began in the 1960s, with significant progress made in the 1970s. The basis for the revisions was the tax system's inability to collect enough money to cover the rapidly expanding expenditure

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generated by the Arusha Declaration of 1967's social-economic and political expansion. The major aims of Tanzania's tax increases in the 1960s and 1970s were revenue and equity, although protection became a more important purpose in the 1970s (Osoro, 1995). The 1969 Sales Tax Act was the instrument for accomplishing revenue and equity objectives. The 1969 Sales Tax Act reveled that there is positive association between sales tax and revenue collection (Osoro, 1995).

The goal of enacting the new sales tax Act was to counteract the reduction in import duty income due to the expansion of import substitution businesses and to lower rural taxes. The primary reform of the 1970s was the implementation of a progressive income tax in 1973. The Act was succeeded by the 1976 Act, which boosted import tax rates and abolished excise duty in the late 1970s (Osoro,1995). Tanzania experienced a drought disaster from the mid-1970s to the 1980s, resulting in a large fiscal budget and balance of payment deficit (BOP). To address this issue, the nation considered foreign finance, which did not materialize. Negotiations with the IMF were also unsuccessful. As a result, the government was forced to rely on internal resources. Borrowing and Subsidies let the government to finance the deficit. To discourage goods imports, trade restrictions and exchange control were used to reduce the BOP imbalance (Osoro,1993).

Liberalization was implemented by the government beginning in 1984. The 1986 IMF negotiations resulted in an injection of foreign resources to finance the deficit. Apart from the commencement of Trade Liberalization, the Economic Recovery Program (ERP) was also introduced around the same time period. Many forms of study were undertaken, and it was proposed that key taxes be simplified and rationalized by lowering tax rates and adding rate categories, with the goal of improving compliance and administration. In order to decrease and encourage exporters, the government repealed all export duties in 1985. Import duty and sales tax were decreasing in 1985, 1988, and 1990. In order to streamline and rationalize the sales tax system and tax administration, the government restored the excise fee that had been repealed in the 1970s in 1989. Marginal tax rates were reduced from 95%-75% in 1986/87 to 40% in 1990. These policies aim to boost employees' after-tax income, which has been declining since the 1890s (Osoro, 1993).

The introduction of Trade Liberalization in 1984 paved the way for private sector competition in the market, which was followed by the abolition of all export restrictions in 1999, resulting in a decrease in inflation when accompanied with substantial macroeconomic stabilization measures. Economic recovery and

significant business expansion have happened. Excise duty rates were hiked in 1993/1994 and 1994/1995 to compensate for the revenue tax collection deficit caused by the fiscal imbalance that developed in 1993/1994. Domestic sales and income taxes are falling, but imports and customs levies are skyrocketing. "The erosion of the total tax ratio, as well as the increased weight of trade taxes in total revenue, prompted Tanzanian authorities to delay further tariff reductions until measures to improve tax and customs administration, reduce the scope of exemptions, and broaden the domestic tax base were implemented" (Kaanan, 2000).

Notwithstanding these improvements, Tanzania continues to have a budget deficit year after year. The deficit is the result of a decrease in tax income received to pay for government spending. Despite significant progress in the late 2000s, Tanzania's current tax revenues are among the lowest in the world. In 2014, the government earned $6 billion in income, or approximately 12% of GDP, which was sufficient to support nearly three-quarters of government spending but insufficient to fund much-needed infrastructure and social service projects" (World Bank, 2015).

Tanzanian taxes are governed by the Income Tax Act (CAP 332 R.E 2019). Non-tax revenue streams for the government include fees, fines, penalties, and dividends (Chijoriga, 2012). Despite the availability of other sources of government revenue, taxes are widely regarded as the most significant (Muibi and Sinbo, 2013). In Tanzania, for example, taxation accounts for approximately 90% of total government income, while non-taxation revenue accounts for approximately 10%. Taxation is necessary for both the government and the individual (Getachew et al, 2015). It is a source of revenue that contributes to the state's economic growth and helps to support development projects such as national infrastructure construction (Ade et al., 2018). Similarly, people value taxation since it enables for the supply of social amenities like water facilities, the construction of schools, roads, hospitals, educational services, and energy supplies (Galbraith, 2019). Tax changes may stimulate improved tax revenue collection performance by eliciting a positive reaction and increasing accountability, as well as improving institutional capability (Fjeldstad, 2014). Taxation is stated to be more than simply the government's and people' responsibilities; it is also about politics, power, and how authority is exerted through formal and informal organizations (Fjeldstad, 2014). Since 1996, the Tanzania Revenue Authority (TRA) has been in charge of tax collection in Tanzania. The Ministries, Departments, and Agencies (MDAs) are in responsibility of collecting non-taxation revenue (URT,2004). Prior to the establishment of TRA in 1996, the Ministry of Finance was in charge of tax

collection. The Ministry of Revenue was organized into three revenue divisions: Income Tax, Customs and Excise, Sales Tax, and Internal Revenue. The TRA was founded by Act of Parliament No. II of 1995 in 1995. Tanzania's revenue authority is divided into four main divisions: Customs and Excise, Domestic Revenue, Large Taxpayers, and Tax Investigations. One of the goals of establishing TRA was to increase revenue collection by enhancing tax administration, tax assessment, and making taxation simple to comprehend in order to encourage voluntary compliance (URT, 2004). There are two types of tax compliance: voluntary tax compliance and involuntary tax compliance (Mengistu, 2018). Voluntary tax compliance is defined as the desire to pay taxes without pressure, whereas involuntary compliance is the inverse of voluntary compliance (Kassa, 2021). Voluntary tax compliance lowers revenue collection costs and expenses. Tax compliance is affected by a variety of factors that influence tax revenue collection in Tanzania.

Research Problem

Tax evasion is a serious financial problem all over the world, reducing a country's revenue and capacity to support a wide range of social programs. Uncollected tax in the United States is predicted to exceed $1 trillion each year" (Davison, 2021), whereas unpaid tax in Canada resulted in CAD$21 million in fines (Dubinsky & Zalac, 2021). With such levels of tax evasion, it is apparent that tax revenue collection has never been an easy undertaking, despite its economic relevance to the global expansion of governments.

TRA develops two corporate plans, one for 1998/99 to 2002/03 and another for 2003/04 to 2007/08. They are known to as the first and second corporate plans, respectively. The first corporate strategy focused on implementing second-generation reforms aimed at improving operational efficiency and making the system and administration more understandable and transparent, which might lead to more voluntary compliance and revenue collection (Unpan, 2019).

Throughout the effort to implement the first and second corporate plans, several reforms and modernization measures have been utilized. Tanzanian tax reforms aimed to improve revenue collection while maintaining tax rates as low as possible (Temu, 2014).

Tax reforms, according to Fjedstad (1995), are undertaken to boost tax revenue collection in order to make the government self-sufficient by collecting sufficient sums to support its budget. Tax reform can reduce tax avoidance and evasion, resulting in increased revenue collection for paying public goods and services. Tanzania's tax reforms were made to address a serious financial issue. Because of the crisis, the goal of tax reform was to make the government self-sufficient by collecting enough money to support the budget and leave a surplus over and above the previous period's deficit (Fjelstand, 1995).

In underdeveloped countries, budget deficits arise because tax collection does not balance budget spending. Mooyi (2003) have all done several studies in response to changes in tax income and GDP (2007). These Kenyan studies discovered a favorable relationship between tax revenue and GDP, but they ignored crucial issues concerning tax revenue drivers such as tax base, trade openness, per capita income, tax rate change, and other factors influencing tax revenue.

Stotsky and Woldemariam (2007) conducted research in Sub-Saharan African nations on tax initiatives, which revealed that many Sub-Saharan African governments experience problems in obtaining tax money for public purposes. The purpose of the study was to determine the factors of the tax portion of GDP and to develop a measure of tax efforts. Nagy (2000) found that tax revenue performance differs among Arab nations, with some countries experiencing continuous increases in tax revenue shares in recent years while others experiencing a decline in tax revenue shares.

Since the writings of Grossman and Helpman (1990), Romer (1990), and Young (1990), the role of trade in promoting economic growth has generated an increasing number of economic studies (1991). The question is whether the notion of trade-led growth holds water. Trade openness has been shown to boost economic growth in the long run by increasing access to goods and services, improving resource allocation efficiency, and increasing total factor productivity through technology diffusion and knowledge dissemination (Barroand Sala-i-Martin, 1997), Rivera-Batiz & Romero, 2003). As a result, countries with more free trade are more likely to outperform those with less open trade.

Tax revenue collection is crucial to promoting long-term economic growth in both developed and developing countries (Bitababaje, 2020). Tanzania's tax-to-GDP ratio, in particular, has seen a consistent reduction from 13.6% (2015/16) to 12.9% (2019/20), with causes cited as inadequate usage of government

resources, poor follow-up on tax debt, and weak tax policy addressing tax base (NAOT, 2020; OECD, 2019; African Economic Outlook, 2015; Ministry of Finance and Planning- Tanzania, 2020). If this tendency continues, the nation's economy will be severely harmed. As a result, the study intends to investigate the relationship between tax base and tax revenue collection in Tanzania as a ten-year intervention approach.

Research Objectives

The objective of the study is to assess the nexus between tax base and tax revenue collection in Tanzania

Literature Review

Theoretical Literature Review

Optimum Tax Theory

Ramsey (1927) and Mirrlees (1971) define optimum tax theory as being concerned with the degree and type of economic redistribution. The optimum tax theory aims to identify how the government might enhance social welfare through taxes and transfers while minimizing taxpayer sacrifice. Whether intentional or not, optimum tax theory, to a considerable extent, represents a resource egalitarian vision of distributive fairness. Yet, the theory's assumptions are based on incentives, efficiency, and the information that decisions convey about individual well-being. According to this theory, optimum taxation is a function of the tax charge and how the tax is collected in order to achieve equitable redistribution of welfare. The theory is significant since it identified the factors that influence tax collection.

Ability to Pay

Kendrick (1939) established the concept of ability to pay, which saw tax duty in its true form, i.e., compulsory payment to the state without remuneration. It makes no assumptions about commercial or semi-commercial interactions between the state and its citizens. According to this viewpoint, people should pay taxes because they can, and their proportionate share of the total tax burden should be determined by their respective ability to pay. This idea has been around as long as the benefit hypothesis. Socialist thinkers were forced to support it since it conformed to ideals and conceptions of justice and equity. Non-socialist intellectuals endorsed the idea as well, and it became a component of welfare economics theory. The core notion of this theory is that the cost of taxation should be carried by members of society in accordance with the ideals of justice and equality, and that these values necessitate allocating the tax burden in accordance with their relative ability to pay.

Empirical Review

Osoro (1993), a Tanzanian scholar, investigates the revenue productivity implications of Tanzanian tax policy. Tax buoyancy was modeled in the study using a double log form equation, and tax revenue elasticity was computed using the proportional adjustment approach. The justification for using the proportional method was because over the sample period, 1979 to 1989, a succession of discretionary modifications occurred, making the use of the dummy variable methodology hard to apply. The analysis determined that Tanzania's tax strategy has failed to increase tax collections. The government's issuance of numerous tax exemptions and bad tax management were blamed for these results. Ariyo (1997) assessed the efficiency of the Nigerian tax system from 1970 to 1990 reveled that there is positive association between tax base and revenue collection.

Ole (1975) examined the income elasticity of Kenya's tax structure from 1962/63 to 1972/73. Without concern for outliers, tax revenue was regressed on income. During the research period, the tax system was income inelastic, according to the data. According to the analysis, the system required immediate adjustments in order to increase production. The findings also revealed that Kenya's tax structure was unsustainable and that the country would need foreign help to close the budget deficit.

Among Kenyan scholars, Muriithi and Moyi (2003) examined whether Kenya's tax policy meets the objective of making individual tax yield responsive to changes in national income using the concepts of tax buoyancy and elasticity, they calculated the responsiveness of tax yield on income. The findings demonstrated that tax policy had a positive impact on the overall tax structure and individual tax management, but that the reforms failed to make revenue responsive to changes in income reform.

In Malawi, one of the researchers Chipeta (1998), evaluated the effects of tax policy on tax yields during the years of 1970 and 1994. The buoyancy was 0.95 and the elasticity was 0.6, according to the data. The investigation found that tax bases rose at a slower rate than GDP. Kusi (1998) examined Ghana's tax policies and revenue production between 1970 and 1993. The data showed a pre-reform buoyancy of 0.72 and an elasticity of 0.71 from 1970 to 1982. From 1983 to 1993, the period after reform exhibited enhanced buoyancy of 1.29 and elasticity of 1.22. According to the report, the changes had a significant influence on tax revenue productivity between 1983 and 1993.

The studies on economic reforms conducted by Tanzi (1993), Basu and Morrisey (1997), and Patel et al. (1997) were influenced in part by the fact that the negative effects of reduced public investment are felt with long lags, whereas other components of government budgets, such as transfers and public sector wage bill, have higher and more immediate political costs. The extent to which economic changes effect public investment spending may vary depending on macroeconomic conditions, economic structure, degree of development, and government size. Milambo (2001), a Zambian researcher, examined the revenue productivity of Zambia's tax system from 1981 to 1999 using the Divisia index technique. According to the data, the elasticity was 1.15 and the buoyancy was 2.0.

Research Methodology

This study used a quantitative research technique and a time series research design. The study's population included economic data from 1990 through 2020. This analysis relied on 30 observations (Annual data) derived from credible sources such as the Tanzania Revenue Authority (TRA) and the World Bank (WB). The econometric technique used to test the relationships which exist between dependent variable and independent variables was a Vector Correlation Model (VCM) because it is an economic model used in predicting the value of a variable base on the value of other two or more variables. This technique was adopted from several studies (e.g., Bothole, 2010; Wawire, 2011; and Aamir, al,2011; Muibi and Simbo,2013) carried on the same topic. Since the objectives of the study is to investigate the nexus between tax base and revenue collection. The following are equation that explains the relationship between tax base and tax revenue collection in Tanzania;

$$GDPT_t = f\ (TB) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (i)$$

Whereby: $GDPT_t$= Tax to GDP ratio $TB = Tax\ Base$;

$$GDPT_t = \alpha + TB_t + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots (ii)$$

Whereby: $GDPT_t$= Tax to GDP ratio; $TB = Tax\ Base$; α= Constant; β_1, are coefficients; ε *is the error term* , $_t$ *is year*, α *is level of significance 95%.*

Research Hypothesis

$$H_o: \beta_{1=0} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (iii)$$

Where by $H_o = Null\ Hypothesis$; $\beta_3 = Tax\ Base$

$H_1 : \neq \beta_{1=0}$ …………………………………………………………………………….……………*(iv)*
Where by $H_1 = Alternative\ Hypothesis$; $\beta_1 = Tax\ Base$

Results and Discussions

The first step was to find the maximal lag order of the integration (*d*) and find out whether the variables are stationary variables under study. This was established using Augmented Dickey Fuller (ADF) unit root test. Secondly, the optimal lag order (*k*) was established using Akaike Information Criteria (AIC) and Schwartz Information Criteria (SIC). The third step was to test if there was a long run relationship (cointegration) between the variables. This was done though Johansen technique.

Lag Order Selection Criteria

Table 1: VAR Lag Order Selection Criteria

Lag	AIC	SC	HQ
0	63.74234	63.93982	63.79201
1	54.72280	55.71018*	54.97112*
2	54.71921*	56.49651	55.16620

* Indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The table 1 clearly shows the optimal lag length for the four variables. Tax revenue collection, tax base by using AIC and SIC, the applied criterion is to look on the lowest AIC and SIC. This gives the optimal best lag to use. The results show AIC of 54.7191, which is in a second lag. This results supported by (Muibi and Simbo, 2013).

Stationarity / Unit Root Test for Tax Revenue Collection

Stationarity of the time series can be checked by using Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) and using unit root test Augmented Dickey-Fuller test (ADF test) or any other test. To test for stationarity of the time series data, we need to test for unit root at level, if the time series data is not stationarity at level, then difference the time series data until becomes stationary. By using ADF or Philips Perron etc, we confirm for stationarity at either 10%, 5% or 1% statistical significance level with three options for constant or trends, constant only or none. The Null Hypothesis (**Ho**): "The variables are not stationary or has a unit root" and Alternative hypothesis ($\mathbf{H_1}$): "The variables had stationarity/ had no unit root" (Botlhole, 2010).

Stationarity test at level

Null Hypothesis: tax revenue collection has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=2)

Table 2: Stationarity Test at level

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.516639	**0.7950**
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

By using ADF test for unit root test, Table 2 indicates that the p value is **0.7950** greater than 0.05 significant level, this means that we accept the **Ho** in favor of H_1 which shows the tax revenue series is non stationary or has a unit root. Therefore, there was a need of differencing the series in order to get a stationary series (Botlhole, 2010).

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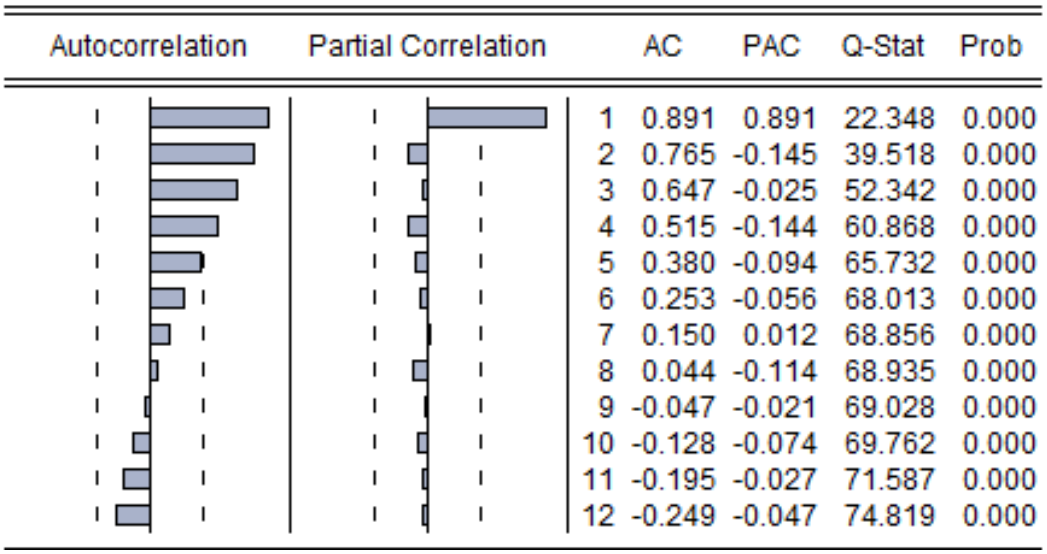
Figure 1: Correlogram at Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.891	0.891	22.348	0.000
		2	0.765	-0.145	39.518	0.000
		3	0.647	-0.025	52.342	0.000
		4	0.515	-0.144	60.868	0.000
		5	0.380	-0.094	65.732	0.000
		6	0.253	-0.056	68.013	0.000
		7	0.150	0.012	68.856	0.000
		8	0.044	-0.114	68.935	0.000
		9	-0.047	-0.021	69.028	0.000
		10	-0.128	-0.074	69.762	0.000
		11	-0.195	-0.027	71.587	0.000
		12	-0.249	-0.047	74.819	0.000

Using correlogram, the series shows that there are spikes outside the confidence bounds indicated in dotted line whereas for a stationary time series the ACF and PACF spikes should lie inside the confidence bounds. Based on such provided grounds, the series is non stationary at levels thus it's statistical and variances could change in time (Botlhole, 2010).

Stationarity at first difference

Null Hypothesis: D(tax revenue collection) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=2)

Table 3: Stationarity at first Difference

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.219335	**0.0018**
Test critical values:	1% level	-4.416345	
	5% level	-3.622033	
	10% level	-3.248592	

The results show that the ADF test for the unit root is 0.0018 which is less than 0.05 significant level. This confirms the tax revenue series is stationary at first difference. Thus, we reject the Null hypothesis and accept the alternative hypothesis that the series is stationary at first difference I (1) (Botlhole, 2010).

Figure 2:

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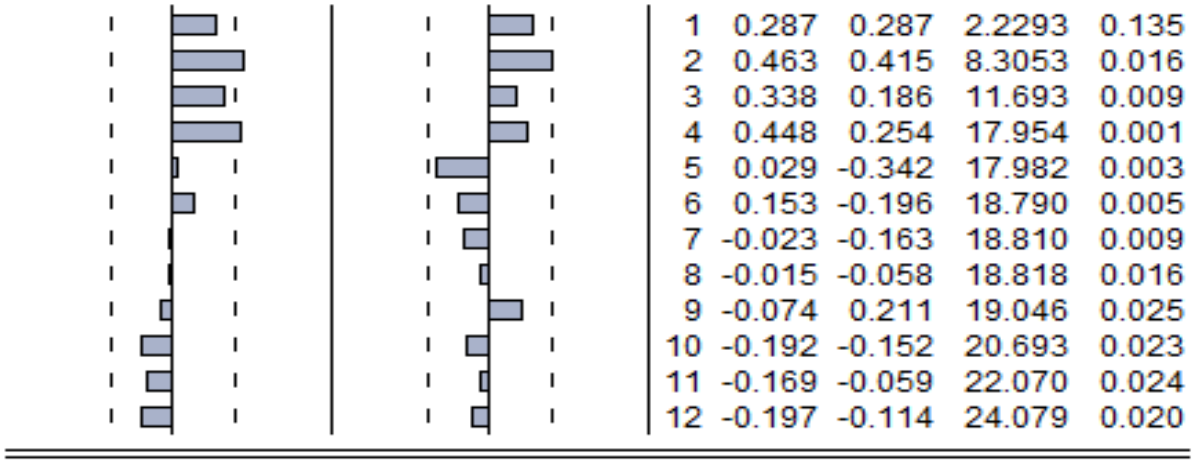


Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.287	0.287	2.2293	0.135
		2	0.463	0.415	8.3053	0.016
		3	0.338	0.186	11.693	0.009
		4	0.448	0.254	17.954	0.001
		5	0.029	-0.342	17.982	0.003
		6	0.153	-0.196	18.790	0.005
		7	-0.023	-0.163	18.810	0.009
		8	-0.015	-0.058	18.818	0.016
		9	-0.074	0.211	19.046	0.025
		10	-0.192	-0.152	20.693	0.023
		11	-0.169	-0.059	22.070	0.024
		12	-0.197	-0.114	24.079	0.020

Figure two for correlogram clearly shows that all the bars are inside the confidence bounds, implying that the Tax revenue collection series is stationary at I (1).

Johansen Co-integration Test

Co-integration test was employed using Johansen technique to suggestion whether the variables had a long run relationship. The null hypothesis Ho: There is no co-integration, while Alternative Hypothesis: There is Co-integration. The Johansen Co-integration techniques uses two criteria to determine whether there is relationship between the variables in the long run, the trace statistic and the Maximum Eigen statistic. When Trace statistic is greater than the critical values at 5% significant level, it is thus agreed that variables exhibit the long run relationship, otherwise no long run association among the variables in linear fashion (Muibi and Simbo, 2013).

The results in table three, Indicate that the trace statistic for all the hypothesized cointegrating equations is greater than the critical value, and the probability value for each are less than 0.05. We reject the Null hypothesis Ho and accept the Alternative hypothesis that there is cointegration. These results indicate that there is cointegration between the two variables that is tax revenue and tax base. The two variables are cointegrated and moving together in a long-run towards equilibrium (Muibi and Simbo, 2013).

Trace statistic

Table 3: **Unrestricted Cointegration Rank Test (Trace)**

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**
None *	114.9876	47.85613	0.0000
At most 1 *	42.06632	29.79707	0.0012
At most 2 *	19.91554	15.49471	0.0101

Maximum Eigen statistic

Table 4: Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	72.92132	27.58434	0.0000
At most 1 *	22.15078	21.13162	0.0358
At most 2	13.09207	14.26460	0.0760
At most 3 *	6.823463	3.841466	0.0090

Table four indicates that the Max Eigen statistic for the hypothesized number of Cointegrating Equations (CE), There are three CE at none, at most 1 and at most 3 with Max Eigen values greater than the critical value and their corresponding probability values are less than 5% significant level. The max Eigen value for at most 2 has failed to fulfil the criteria for co-integration as Max value is 13.092 which is less than the critical value 14.264. The test generally indicates there are three integrating equations. Hence accept the Alternative hypothesis that there is co-integration and reject the null hypothesis.

Long run Model

Tax base plays a vital role to any countries tax revenue collection. The long run and short run shocks has impact either positive or negative to tax revenue collection. For a normalized equation, we interpret the coefficients of variables in inverse effect sign in the long run.

Table 5: **Normalized cointegrating coefficients (standard error in parentheses)**

TAX_REVENUE_COLLECTION	TAX BASE
1.000000	-175970.1
	(20560.2)

Table five indicates that the coefficient of tax base is -175970.1, meaning that there is a positive long relationship between tax base and Tax revenue collection variables. The study indeed concurs with studies done by scholars such as Gaalya, Edward and Eria (2017).

Vector Error Correction Model (Vecm)

Error Correction Model (Ecm)

Table 6: Error Correction Estimates

Cointegrating Eq:	CointEq1
TAX_REVENUE_COLLECTION_MIL(-1)	1.000000
TAX BASE (-1)	-175970.1
	(20560.2)

The ECT Equation:

ECTt−1=18200909

Vector Error Correction Model (VECM)

The ECT is shown below, and the dependent variable is tax revenue collection, and the other variables like tax base are independent variable. The dependent variable: DTax.

Table 7: Vector Error Correlation Description

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	**-0.258779**	0.108991	-2.374314	0.0351
C(2)	-0.305518	0.229511	-1.331171	0.2079
C(3)	0.335421	0.358774	0.934908	0.3683
C(4)	-40058.76	45084.28	-0.888531	0.3917
C(5)	-49915.90	38374.25	-1.300765	0.2178
C(6)	-8085.460	6360.229	-1.271253	0.2277
C(7)	-5088.774	5665.719	-0.898169	0.3868
C(8)	-1545.524	3885.586	-0.397758	0.6978
C(9)	-3081.647	3534.875	-0.871784	0.4004
C(10)	1583105.	808795.9	1.957360	0.0740

Table Seven shows the Error Correction Term (ECT) which is c(1) = -0.2587 which is a good sign towards adjustment to the equilibrium representing 25.87%, meaning that the model adjusted by 25.87% towards long run and has the probability value 0.0351 which is less than the significance level. Similarly, c (2) to c (9) these are the short run coefficients showing the shocks in the model, and c (10) is a constant.

Table 8: Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.846814	Prob. F(2,12)	0.1999
Obs*R-squared	5.413244	Prob. Chi-Square(2)	0.0668

Findings as portrayed in Table 8 observed that R square corresponding to Probability value of 0.0668 which is greater than the 5% significant level. We accept the Ho that the model has no serial correlation, hence not suffering from serial correlation. The calculation of tax to GDP ratio for known values of explanatory variables becomes incompetent since the variation of the result includes the variation of both residuals and of the non-parameter estimate. Nevertheless, some scholars, like Koutsoyiannis (1975), criticize that the assumption of homoscedasticity is often dishonored in apply. This is due to the nature of variables. For example, utilization against income, when income modify, it is clear that consumption will also change. Consequently, the variation of expenditure was being due to the variation of both income and residuals.

The P-Values of Breusch-pagan (0.0738) are less than our 10 level of implication (10% or 0.1). So, null hypothesis which state that the variation for lasting is uniform and, thus, cannot be old. This additional imply that the supposition has been dishonored.

Heteroskedasticity test and ARCH effects

Table 9: **Heteroskedasticity Test: Breusch-Pagan-Godfrey**

F-statistic	2.391277	Prob. F(8,14)	0.0735
Obs*R-squared	13.28078	Prob. Chi-Square(8)	0.1025
Scaled explained SS	4.260581	Prob. Chi-Square(8)	0.8329

Source: STATA. 2022

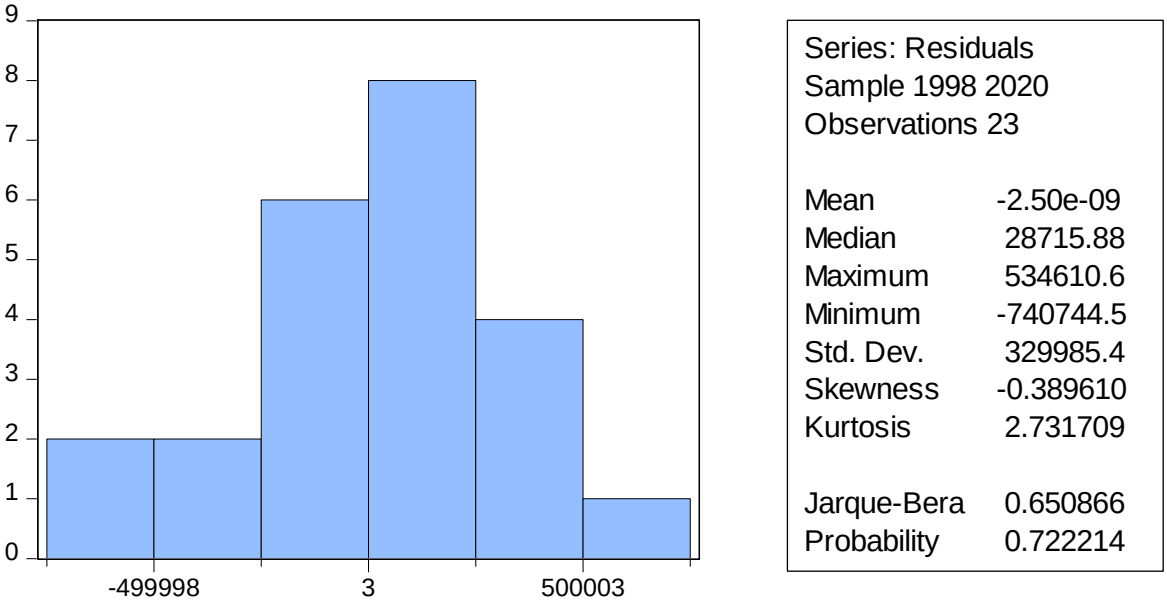
Heteroskedasticity test arch effect

Table 10: Heteroskedasticity Test: ARCH

F-statistic	0.004446	Prob. F(1,20)	0.9475
Obs*R-squared	0.004889	Prob. Chi-Square(1)	0.9443

The table 10 indicates that the observed R squared has 94.4% which is greater than significant level of 5%. Thus, accept the Ho and reject the alternative hypothesis, then the model is free from ARCH effects.

Figure 3: Normality Test



The Figure three clearly depicts the normal curve, by using Jarque Bera with probability 72.22%, which is greater than 5% significant level. Therefore, all variables under study are normally distributed.

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Figure 4: Stability Test

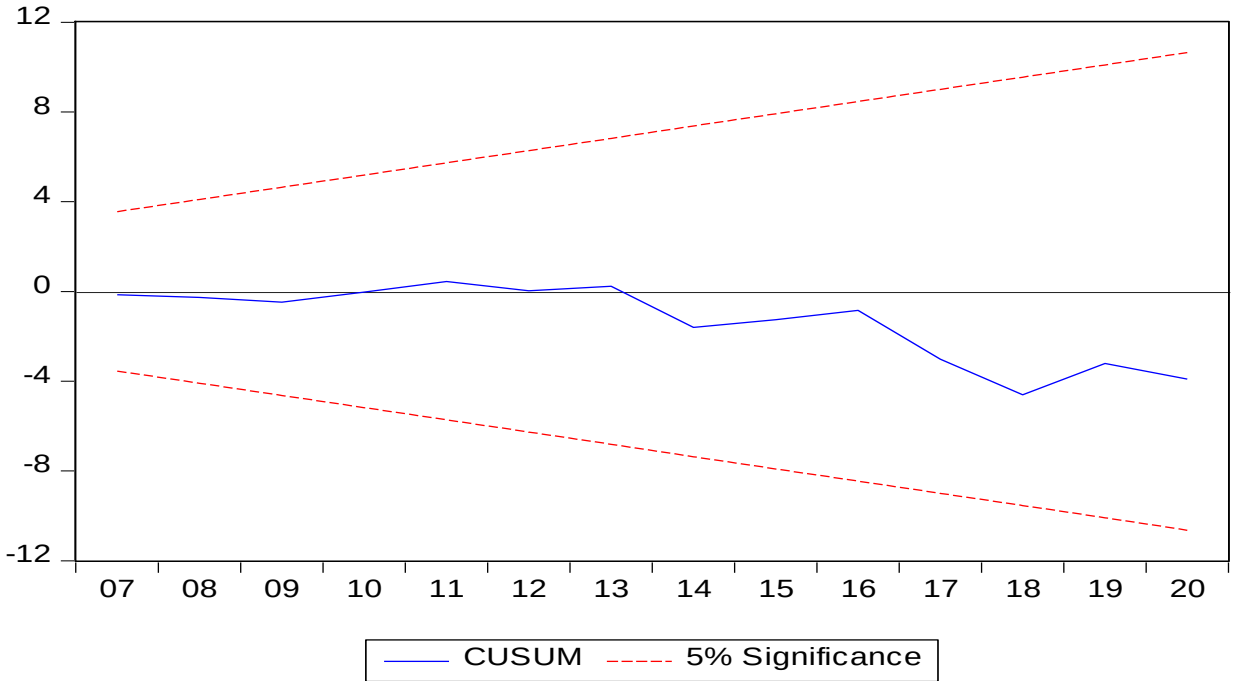

Figure four shows that the blue line lies between the 5% significance level, showing that the model is stable, but if the blue line lies outside the 5% significance level, means that the model is not good. The P-Values of Breusch-pagan (0.0738) are less than our 10 level of implication 10% or 0.1 (Chindengwike, 2021).

Table 11: Regression Results between tax base and revenue collection

Tax to GDP	**Coef.**	**St. Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	Sig
Tax base	-0.315	0.043	-7.41	0.000	-0.232	-0.399	***
Const	0.021	0.013	1.76	0.255	-0.006	0.020	
Mean dependent var		0.955	SD dependent var			0.375	
R-squared		0.469	Number of obs			1192.000	
F-test		14.539	Prob > F			0.000	
Akaike crit. (AIC)		600.899	Bayesian crit. (BIC)			626.316	

H_O: There is no relationship between tax base and the revenue collection in Tanzania.

Johansen co-integration test employed rejected the null hypothesis H_O: There is no relationship between tax base and the revenue collection in Tanzania and accepted the alternative hypothesis.

Conclusions and Recommendations

This study found that statistic for all the hypothesized counteracting equations is greater than the critical value, and the probability value for each are less than 0.05. These results indicate that there is co-integration between the four variables that is tax revenue, tax base and tax revenue collection are integrated and moving together in a long-run towards equilibrium.

Therefore, tax base influence tax revenue collection. There should be establishment and implementation of more workable tax structure to allow financial exchanges which will also boost tax revenue collection across the country. The recommend that the policy makers to formulate new tax laws that can help the Tanzania Revenue Authority to increase tax base so as boost tax revenue.

Another study could be conducted to ascertain the influence of other determinants on tax revenue collection in Tanzania. Also the next study should expand the number of observations (sample) and use another research methodology.

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