

Estimation of Income Taxation Function in Sudan for the Period (1992-2020)

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Abstract: This study tried to exam income tax in the Sudan; in this regard the study aims to examine the relationship between income tax and GDP, as well as identifying the income tax characteristics in the Sudan. The study depends on the assumption that income tax related positively to GDP, and it has a progressive type in Sudan. The study used the historical and analytical methodology, using for that (OLS) method for a series data during the period 1992-2020. The results of the study revealed that the relationship between income tax and GDP is positive and it was progressive in Sudan. The study recommended the necessity of tax evasion treatment, and activates income tax, so to serve the orientations of fiscal policy, to contribute in equality, and income redistribution in Sudan.

Keywords: tax, income, progressive, estimation, evasion, equality, redistribution.

تقدير دالة ضريبة الدخل في السودان للفترة 1992-2020

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المستخلص: حاولت الدراسة تقدير دالة ضريبة الدخل في السودان، وفي هذا الصدد هدفت الدراسة إلى فحص العلاقة بين ضريبة الدخل والناتج المحلي الإجمالي، والتعرف على خصائص ضريبة الدخل في السودان. اعتمدت الدراسة على افتراض أن ضريبة الدخل ترتبط بعلاقة موجبة مع GDP، وذات طبيعة تصاعدية في السودان. استخدمت الدراسة المنهج التاريخي التحليلي، بتطبيق طريقة (OLS) لبيانات السلاسل الزمنية خلال الفترة 1992 – 2020. أثبتت نتائج الدراسة أن العلاقة بين ضريبة الدخل وGDP موجبة، وأن ضريبة الدخل في السودان تصاعدية. توصي الدراسة بضرورة علاج مشكلات التهرب الضريبي، وتفعيل ضريبة الدخل لتخدم توجهات السياسة المالية، وتساهم في المساواة، وإعادة توزيع الدخل في السودان.

الكلمات المفتاحية: الضرائب، الدخل، تصاعدية، تقدير، التهرب الضريبي، العدالة، توزيع.

1- Introduction:

Tax policy has an important role to play in addressing income inequality. Personal income tax becomes one of the main factors for income distribution in LDCs societies. Taxation is an important fiscal policy which is more available to the government using to achieve the aims and objectives of the economic policy and plans; targeting the high output, low inflation rate, low unemployment, and stable

exchange rate system. Sudan characterized by continuous severe problems and difficulties both in the political, economical, and social affairs during the period (2010-2020). In 2011 Sudan government revenue decreased by 40% and also by 90% in exports because of the South Sudan's secession. The lost of oil revenues in Sudan create a dramatic severe macroeconomic problems such as; unemployment, inflation, and weak economic growth rate. Study tried to estimate income tax function in Sudan for the period (1992-2020), in this order a simple regression has been made for a linear income tax equation, using (OLS) method.

2- The Problem statement:

The main feature of tax structure in the developing countries depends more heavily on indirect tax for raising revenues as compared to developed countries. While developed countries depends on direct tax in raising revenues (about 43% of their total tax revenue). Sudan economy shows severe fiscal deficit in the annual budget for more decades. To cover the gap of deficit, the direct tax needs to be properly activated in order to serve the purpose of economic policy in the Sudan.

3- The Importance of Study:

Taxes generally contribute to the gross domestic product of a country. Taxes help spur economic growth, raising the standard of living, increasing job creation, and revenue generation. Tax is a major tool of fiscal policy which used in solving problems like inflation, unemployment, and also used in attracting local and foreign investment.

4- The Objectives:

1. To identify the relationship between income tax and GDP.
2. To identify the characteristics of income tax in Sudan economy.

5- The Hypothesis of the Study:

1. Income tax is related positively to GDP in the Sudan.
2. Income tax in the Sudan is a progressive one.

6- The Methodology and Data Collection.

Ordinary Least Squares Method (OLS) used as the fundamental analytical tool for the study. Dickey Fuller unit roots and Co-integration tests used as important tests before estimation step. Annual data were collected from reports of Central Bank of Sudan, the Ministry of Finance, the Statistic Center, journals, and scientific periodicals targeting the period 1992-2020.

7- Literature Review:

(Yadawananda and Achal, 2020) used a linear regression for property and capital tax, they found that capital and property tax affected the economic growth positively, but service and commodity tax have a negative effect.

There are four traditional criteria that have been used by economists ever since the famous canons of taxation of Adam Smith (1776) for evaluating the strengths and weakness of a tax system. These are allocation efficiency, equity, administrative feasibility, and revenue productivity.

(Afton Titus, 2021) argues that, the usage of financial resources is the most important tool for the countries to achieve the Sustainable Development Goals. Governments should improve the financial resources by using policies that to contribute the aims of increasing the local revenue. He also argues that the corporate income tax in the African countries is still the more effective tool in its economies which can be used to raise the fund and coverage the gap of budget deficit.

(Kyle and Granger, 2022) found that in African countries the employment and personal income tax function are progressive, but they were related negatively to income in the long-run. As they observed, at very low incomes ranged between (0.5) and (0.67) times GDP per capita the employment income tax is less progressive. This was proofed by a number of African countries systems in the lump-sum social security which are actually creating the regressive systems of the income tax.

Lewis (1966) and Kaldor (1964) argued that, the tax structure of undeveloped countries is characterized by the small share of total revenue raised by direct taxation. This may be attributed mainly to the lower tax rates, which exempt the majority of people from paying income taxes, as well as the considerable amount of tax evasion and avoidance.

According to (Rosario, 1981) The act of forecasting tax collection in the future is recently was used as a great economic policy tool in the determining budgetary gaps and the method of tax measures in the coming years. Also the forecasting tax models help governments to develop a new tax collection system.

Diana and Sommer (2018) used a micro data in their work to derive revenue parameters for different tax regimes (Austria, Germany, Hungary and Spain). Their results indicated that smooth tax functions can reduce some of the tax problems.

Hicks (1948) argued that two conditions are necessary if the tax structure is to reach its objectives efficiently. The first criteria of evaluating a tax system relates to whether that system moves the economy towards the optimum. In particular a tax structure is said to be more efficient the higher the national income. According to her, the tax revenue share in GNP should at least be 20%. On this ground alone, she believes, a determined effort to increase the tax revenue is called for. The second condition is to ensure a more income elastic tax structure. If these two conditions are fulfilled, Hicks is certain that the government should always able to keep situation in hand, because revenue will rise more rapidly than income.

According to (William and Andrew, 2014) tax exemption has a positive effect on encouraging worker by increasing work hours, saving, and investment. In other hand in the absence of an appropriate fiscal policy will leads to the problem of the budget deficit, low saving, and high interest rate. However, in Sometimes the elimination of tax rates cuts will reduce labor supply, investment, saving, and economic growth.

According to (Mihailo, Irena, and Nikola, 2020) there was a difference between corporate income tax and the personal income taxation. Corporate income tax has a developing component and imposed on the role of the implementer of numerous public policy goals.

Tax revenue improves the level of public welfare in the societies subject to the government budget, tax responding and transfers. There is a positive relationship between Social welfare and equally distributed resources (Peter and Emmanuel, 2011). Governments and policy makers of LDCs always facing the problems of: weak revenues, high expenditures, and rigid fiscal constraints. The scope of government to raise revenue is the most important objective of taxes system to serve and finance the public goods and public infrastructure. It is clear that the relationship between income tax and government spending is positive.

One of the characteristic features of the modern personal income tax is its discrimination among individuals taxpayers in accordance with the size of income received. In other words, the simple use of income as a tax base would suggest a common rate of tax independent of income size. But modern tax systems almost invariably include tax rates that vary directly with income size, such that these rates are normally progressive, rather than proportional or regressive (Buchanan, 1970)

8- Sudan Economic background:

Sudan has the ability to become a developed country and source of food security for the Arab world. The resources includes oil, mineral, fertile large land, water, and labor force. These natural resources can be used in agricultural sector to cover the gap of food and increasing the exports of the agricultural production. Sudan's geographical location helps its development of foreign trade across rivers, land, and the red sea (World Bank Report No. ACS 8803, 2014).

Since 1990s Sudan government policies used decentralization economic reforms, in the main public fields. Fiscal deficit was covered by oil revenues from the beginning years of the oil exploration 2002. The period follows South secession; Sudan economy suffers from the losses of oil exports revenues which lead to a hard situation and clear economic deterioration which are played the main reason of fiscal deficit problem (Fjeldstad, 2016).

To compensate the losses of oil revenues, Sudan government has pursued a package of policies including Three-Year Economic Salvation plan (2012-2014) to obtain an alternative financial resources. The plan focused on increasing tax revenues and rationalizing government spending. On the foreign trade

policy the plan aimed to activate the productive sectors capacities focusing on some commodities to achieve self-sufficiency and improving trade balance. The important targeting goods are sugar, wheat, medicines and seed oils; beside a set bundle of other commodities to increase exports volume which are include cotton, livestock, gum Arabic, and gold (Sudan National Reports, 2019).

Political instability and COVID-19 affected Sudanese economic activities; GDP was shrunk by 8.4% in 2020 after severe reduction by 2.5% in 2019. The COVID-19 played a negative role in the prices, foreign trade movement, transportation, and financial flows. These factors reduced investment, consumption, and economic growth. Inflation rate increased by 124.7% in 2020, this was affected by the problem of currently depreciation and monetization of the fiscal deficit. Public revenue shrunk by 34% in 2020 with continues increasing in government spending. Fiscal deficit accelerated by 12.4 percent in 2020 compared with 11.3 percent in 2019. Fiscal deficits financed by the Central Bank. Remedies and reforms were necessary to widen the tax base by rationing tax exemption and developing tax system (African Development Bank Group Report, 2020).

9- Taxation in Sudan:

According to Nimeiri (1974) the earliest indications of a tax and expenditure policy in the Sudan can be traced back to 1898, the year which marked the recon quest of Sudan by British and Egyptian forces. According to the Ministry of Finance (1964) the first budget of the colonial government for the year 1899 showed gross revenue of only Ls. 126596 and expenditure of only Ls. 230238.

Until the late 1950s, the tax system was depended on traditional taxes, because the tax policy during that period was guided by the need to raise revenue that was just enough to meet government minimum expenditure levels rather than to mobilize resources for economic development. The exception, however, was the business tax which introduced in 1913 when the Egyptian government ceased to provide financial assistance to the Sudan government. Personal income tax and land rent income tax were introduced in 1964. The exemption of personal income tax was Ls. 1350 in 1964. Stamp duties was first introduced in 1904, but was abolished in 1925 due to its administrative problems. However, it was reintroduced in 1965.

According to the Taxation Chamber of the Ministry of Finance and Economy (1977) direct taxes are now imposed on personal income, business profits, rental income, capital gains, stamp duty, and sales, in addition to a development tax, and a tax on expatriates' contribution. Personal income tax is imposed on salaries and wages, bonuses, remuneration, awards, and allowances. The personal income tax in the Sudan displays two major features that characterized the tax structure in LDCs. These features are responsible for the deficiency and inadequacy of taxation as a positive tool for raising the rate of public and private investment, as well as for achieving economic stability and equity. These include the low share

of tax revenue in national income, the heavy reliance on indirect taxation, and the small ratio of direct taxation as a percent of tax revenue (see the figures in table 1 below).

Table (1): Contribution of Direct and Indirect Taxes to Total Tax Revenue (2014-2020) SDG Million

	2003	2004	2016	2017	2019	2020
Direct Tax	523.00 (7.4)%	746.00 (7.3)%	3188.30 (5.9)%	3477.60 (6)%	9378.00 (5.76)%	20081.00 (7.69)%
Indirect Tax	2145.00 (30.5)%	3457 (33.7)%	38775.00 (71.2)%	43779.90 (76)%	113038.00 (69.47)%	139595.00 (52.76)%

Source: Sudan Central Bank, Annual Reports for Various issues.

Table (1) indicates the revenue collected from direct and indirect taxes for selected terms during (2003-2020). On average indirect tax represents 55.71% of total tax revenue which is nearly eight times that collected from direct tax. This is attributed to the lower tax rates, the exemption of the majority of people from paying income tax, and the considerable amount of tax evasion and avoidance.

10- Deficit and Tax Revenues:

During the period 2011-2018 the Sudanese government succeeded to fractionally compensate the oil revenues losses by increasing taxes revenues from 6% of GDP in 2011 to 7.40% of GDP in 2018. Sudan tax revenues are still among the lowest in low- and lower-middle income countries (LLMICs). Tax revenues represented only 7% of GDP on average compared to 12% in LLMICs during the period 1995–2015. In 2008 foreign direct investment reached in Sudan US\$ 2.80, declined from US\$ 2.30 billion in 2011 to 1.10 billion in 2018. Table (2); below reveals the tax, non-tax revenues, and budget deficit (Sudan National Report, 2019).

Table (2): tax Revenue, non-tax Revenue, and Budget Deficit (2012-2018) in SDG Million

	2012	2013	2014	2015	2016	2017	2018
Income tax	1479	1733	3070	3188	3478	4202	6637
Total tax revenue	15558 (6.4)%	24076 (7.0)%	35155 (7.5)%	41859 (7.2)%	47134 (7.1)%	63781 (8.2)%	91191 (7.4)%
Total non-tax revenue	5695 (2.3)%	8203 (2.4)%	13506 (2.9)%	10960 (1.9)%	8974 (1.3)%	11611 (1.5)%	27019 (2.2)%
Total revenues and grant	22168	34311	51228	54509	57866	77054	124946
Budget deficit	-7658	-6462	-4431	-6304	-11234	-14812	-37780

Source: Sudan National Report (2019). Figures which are in brackets; it is a percent to GDP.

Table (2) shows that, the Sudanese economy suffers from a continuous budget deficit for many years, and this relates to the South Sudan secession, the problem of political instability, civil wars, the

emergence of COVID-19 disease, and inappropriate economic policies. The total tax revenue share in percent of GDP was higher than that of total non-tax revenues.

11- Income Taxation and Economic Growth in Sudan:

The progresses of growth models create the needs for fiscal policy applications by using tax policy improving the growth performance. Tax collections and tax system have an effect on household saving and investment, also tax policy effect the investment resolutions and innovations of the firms. These decisions and motivations in the physical and human capital accumulation create the growth distinctions amongst the countries (Yadawananda and Achal, 2020).

Table (3): GDP Growth Rate, Tax Revenue, and the Deficit (2010-2014)

Year	2010	2011	2012	2013	2014
The growth rate in GDP (%)	5.20	2.70	1.40	4.40	3.60
Total Tax revenues ratio to GDP (%)	6.10	5.90	6.40	7.00	7.50
Budget Surplus/Deficit ratio to GDP (%)	2.11	3,11	1.70	1.90	0.93

Source: Annual Reports of Central Bank of Sudan, 2014.

Table (3) shows a decline in the GDP growth rate from 5.20% in 2010 to 2.70% in 2011, as a result of the declining manner of oil growth sector mainly, as well as the growth rate of agriculture, forestry, and mining held to increase in the budget deficit to 3.11 in 2011. Also GDP growth rate decreased from 4.4% to 3.6% in 2013 and 2014 respectively, this can be indicated by the decrease in the agricultural production sector in animal and agrarian sections, from 4.0% in 2013 to a negative rate 4.1% in 2014 (Central Bank of Sudan Annual Report, 2014). Budget deficit decreased from 1.9% of GDP in 2013 to 0.93% in 2014, so it can be observed that a decline in budget deficit is in line with increase in tax revenue.

12- The Progressivity of the Income Tax Schedules:

According to Cremer and Firouz (1994), to ascertain progressivity, both marginal and average tax rates are considered. For progressivity they examined the sign of marginal tax. They used the tax function formed as follows:

$$T = \theta y - a \dots \dots \dots (1)$$

Where: (T) income tax, (θ) the expected tax rate, (a) income supplement, and (y) personal income. Individual's average tax rate given by: (T/y). In this regard, Stieglitz and Atkinson (1980) based on the average tax rate as follows (based on equation 1):

$$\frac{d(T/y)}{dy} = \frac{a}{y^2} \dots \dots \dots (2)$$

$$\frac{d\theta}{dy} = 0 \dots \dots \dots (3)$$

In view of equation (2), if the tax function is linear the tax rate is progressive depends on ($a > 0$). The marginal tax rate should vary with income; it can be seen from equation (3).

Unit Roots Test:

Table (4): Dickey Fuller ADF Unit Roots Tests

Variable	ADF	Probability	ADF	Probability	ADF	Probability	Order
	Level		First Difference		2nd Difference		
T	-4.140139	0.0185					I(0)
1%	-4.440739						
5%	-3.632896						
10%	-3.254671						
GDP	-3.028009	0.0042					I(0)
1%	-2.674290						
5%	-1.957204						
10%	-1.608175						

Source: Prepared by the researchers from the product Eviews7 results.

Table (4) shows that the value of probabilities of GDP and income tax are less than the level of significance value (5%), this result will leads to the rejection of the null hypothesis. Also there is no unit root for the all variables, means that the series of our model is static at the first difference level. For that, it can be noticed the relationships between the variables are logic and not false, see table (3 and 4) in appendix.

Table (5): The Results of the Co-integration Test (Johansson)

Date: 02/20/22 Time: 04:33				
Sample (adjusted): 1994 2020				
observations: 27 after adjustments				
Trend assumption: No deterministic trend				
Series: T GDP				
Lags interval (in first differences): 1 to 1				
Unrestricted Co integration Rank Test (Trace)				
	0.05	Trace		Hypothesized
Prob.**	Critical Value	Statistic	Eigen value	No. of CE(s)
0.0032	12.32090	19.05953	0.424557	None *
0.0497	4.129906	4.138912	0.142122	At most 1 *
Trace test indicates 2 co integrating eqn.(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Hag-Michelis (1999) p-values				

Source: Eviews7 analysis products.

Using the results of the co-integration test in table (5) above, the null hypothesis will be rejected due to the absence of co-integration vector at the significant level (5%). Results reveal that there are two equations for the co-integration test among the variables of study, which indicated that time series of the model, are equilibrium in the long run.

13- Empirical Results:

Based on equation (1), Ordinary Least Squares method applied for a series data belonged to income tax and GDP during the period (1992-2020) presented in table (1) in appendix. Obtained the following estimated version of the income tax function, see table (2) in appendix:

$$\log(T) = -7.66 + 1.56 \log(GDP) + 0.42MA(2) \dots \dots \dots (4)$$

(-3.90)	(7.33)	(14678)
$R^2 = 0.85$	$F = 72.67$	$DW = 1.70$

The results of equation (4) reveal that income tax function is significant at the 1% level as indicated by the F- ratio (72.67). The coefficient of (GDP) as well as the elasticity parameter (1.56) is significant and relates positively with income tax at the level 1% as indicated by the t- ratio (7.33). The constant term (-7.66) is significant and has the right sign. The equation is highly significant as it indicated from the tests of R^2 , F, and DW. Equation (4) reveals that the income tax function for the Sudan is non linear ($G < 0$) and the elasticity of income tax revenue with respect of GDP is (1.56), which is greater than one, this suggests that income tax structure in Sudan is progressive. The marginal tax rate from equation (4) can be written as follows:

$$\frac{T(Y)}{\bar{T}(Y)} > 0 \dots \dots \dots (5)$$

The anti log of equation (4):

$$T(Y) = e^{-7.66} Y^{1.56} \dots \dots \dots (6)$$

$$\frac{T(Y)}{\bar{T}(Y)} = 1.56 > 1 \dots \dots \dots (7)$$

The reasons of weakness of progressive income tax (1.56) in the Sudan maybe due to the problems of tax evasion, deformation of income tax system, weakness of individuals' incomes and investment. The main results:

1. Income tax function in Sudan is non linear and relates positively to GDP.
2. Income tax structure in Sudan is progressive.

14- Conclusion:

Tax is an important tool for the fiscal policy in raising public revenues, attracting investment, solving inflation, and improves the public services sector. Income tax helps the policy makers to achieve

the goals of efficiency, equity, and income redistribution. The study tried to estimate income tax function by using OLS method for a series data during the period 1992-2020 in the Sudan. For that purpose the study assumed there a positive relationship between income tax and the GDP, also the income tax function in the Sudan is progressive. The results revealed that the income tax related positively to the GDP and it is a progressive one. In spite of a significant income elasticity sign in the estimated version, it was still weaker in the Sudan; this can be due to the tax evasion, economic deterioration, and a weak income tax structure. Sudanese government must take serious and urgent steps to activate and treat the income tax structure.

Recommendations.

- 1- The government of the Sudan should strive in the treatment of tax deformities.
- 2- Policy makers must activate income tax to contribute positively in economic activities.

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Appendix:

Table (1): Income Tax and GDP for the Period (1992 – 2020) in SDG Million

Year	Income Tax	GDP
1992	99.29	685133000
1993	120.06	1414868500
1994	141.11	3705198100
1995	150.45	8033698800
1996	160.22	11280018400
1997	172.20	18406531100
1998	187.01	22590658600

Year	Income Tax	GDP
1999	199.00	26977505300
2000	221.23	31516274000
2001	265.20	40658558000
2002	290.60	47756111000
2003	380.90	55733784000
2004	580.10	68721385000
2005	750.70	85707127000
2006	751.70	98291904100
2007	817.00	119837000000
2008	884.70	135512000000
2009	930.20	134215000000
2010	1136.00	170993000000
2011	1098.80	209071000000
2012	1432.30	225798000000
2013	1732.60	314075000000
2014	3070.10	440699000000
2015	3188.30	512095000000
2016	3477.60	639456000000
2017	4202.00	866956000000
2018	6637.00	1315980000000
2019	9060.00	1956450000000
2020	1160.66	4058930000000

Central Bank of Sudan Annual Reports for Varies Years.

Table (2): the estimation results of (OLS) using Eviews7 techniques

Dependent Variable: LOG(T)				
Method: Least Squares				
Date: 12/18/22 Time: 02:10				
Sample: 1992 2020				
Included observations: 29				
Convergence achieved after 4 iterations				
MA Back cast: 1990 1991				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0006	-3.905183	1.961736	-7.660938	C
0.0000	7.332384	0.076802	1.563142	LOG(GDP)
0.0000	14678.81	2.83E-05	0.415271	MA(2)
6.515533	Mean dependent var.		0.848253	R-squared
1.292926	S.D. dependent var.		0.836580	Adjusted R-squared
1.637959	Akaike info criterion		0.522669	S.E. of regression

Dependent Variable: LOG(T)			
1.779404	Schwarz criterion	7.102746	Sum squared residue
1.682258	Hannan-Quinn criter.	-20.75041	Log likelihood
1.704685	Durbin-Watson stat	72.66880	F-statistic
		0.000000	Prob. (F-statistic)

Table (3): Unit Roots Test for the Income Tax

Null Hypothesis: D(T) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 5 (Automatic - based on SIC, max lag=6)				
Prob.*	t-Statistic			
0.0185	-4.140139	Augmented Dickey-Fuller test statistic		
	-4.440739		1% level	Test critical values:
	-3.632896		5% level	
	-3.254671		10% level	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(T,2)				
Method: Least Squares				
Date: 12/18/22 Time: 02:45				
Sample (adjusted): 1999 2020				
Included observations: 22 after adjustments				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0010	-4.140139	0.947048	-3.920911	D(T(-1))
0.0448	2.203676	1.181673	2.604024	D(T(-1),2)
0.0410	2.250304	1.243117	2.797391	D(T(-2),2)
0.3176	1.036361	1.165082	1.207445	D(T(-3),2)
0.0172	2.701844	1.243939	3.360929	D(T(-4),2)
0.0000	7.292287	0.862902	6.292527	D(T(-5),2)
0.1249	-1.632246	348.0564	-568.1137	C
0.0259	2.491990	25.00678	62.31664	@TREND(1992)
-359.7341	Mean dependent var		0.978497	R-squared
2285.415	S.D. dependent var		0.967745	Adjusted R-squared
15.14767	Akaike info criterion		410.4501	S.E. of regression
15.54442	Schwarz criterion		2358570.	Sum squared resid
15.24113	Hannan-Quinn criter.		-158.6244	Log likelihood
1.960440	Durbin-Watson stat		91.01023	F-statistic
			0.000000	Prob(F-statistic)

Table (4): Unit Roots test for The GDP

Null Hypothesis: GDP has a unit root				
Exogenous: None				
Lag Length: 6 (Automatic - based on SIC, max lag=6)				
Prob.*	t-Statistic	Augmented Dickey-Fuller test statistic		
0.0042	-3.028009	Test critical values:		
	-2.674290	1% level		
	-1.957204	5% level		
	-1.608175	10% level		
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(GDP)				
Method: Least Squares				
Date: 12/18/22 Time: 02:48				
Sample (adjusted): 1999 2020				
Included observations: 22 after adjustments				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0085	-3.028009	0.519204	-1.572153	GDP(-1)
0.0037	3.434645	0.599574	2.059323	D(GDP(-1))
0.0000	6.009887	0.941432	5.657899	D(GDP(-2))
0.1837	-1.393797	1.498008	-2.087919	D(GDP(-3))
0.0009	4.105776	1.724919	7.082130	D(GDP(-4))
0.0053	-3.259522	1.240839	-4.044543	D(GDP(-5))
0.0061	3.189559	2.850745	9.092617	D(GDP(-6))
1.83E+11	Mean dependent var		0.985382	R-squared
4.57E+11	S.D. dependent var		0.979535	Adjusted R-squared
52.89980	Akaike info criterion		6.54E+10	S.E. of regression
53.24695	Schwarz criterion		6.42E+22	Sum squared resid
52.98158	Hannan-Quinn criter.		-574.8978	Log likelihood
			2.575140	Durbin-Watson stat