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GMTR ANALYSIS CREATE OPTIMAL ECONOMIC GROWTH

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Abstract

Laffer curve theory is applied in this study using an endogenous growth model supported by production or utility-related taxes. Estimated tax rates that maximize economic growth can be determined by modeling the relationship between taxes and economic growth. The maximum level of this model is known as the growth maximizing tax ratio (GMTR). The results of Ordinary Least Square (OLS) based on the magnitude of the regression coefficient show that the GMTR, which creates optimal Indonesian economic growth, is 12.00%.

Keywords : *Economic growth, tax ratio, Laffer curve, GMTR*

JEL Clasification : *O23, O47, H11, H21, H60*

1. INTRODUCTION

Taxes have an important role for a country, especially in terms of development. This is because the largest income for a country is taxes. Taxes imposed by the government on the subject or object of the tax are used to provide security, and social facilities and create economic welfare for the community (Appah, 2004; Appah & Oyandonghan, 2011).

Policy elements of the tax base and tax rate structure can affect economic growth. During the 2010-2020 time period, the average economic growth in Indonesia per year was 4.78% YoY or 5.47% YoY if 2020, when Indonesia's economic growth was minus -2.07% due to the COVID-19 pandemic was not included. The COVID-19 pandemic that occurred in early 2020 resulted in a decline in the domestic economy. In the context of national economic recovery, tax incentive policies can reduce the burden on companies, increase the vitality of market entities and encourage economic growth, thereby reducing downward pressure on the economy (Guo & Shi, 2020). However, the provision of fiscal stimulus, in the form of a reduction in tax rates, will certainly have an impact on the amount of tax revenue. This can be seen from the decrease in tax revenues of 141,634 billion rupiahs in 2020 compared to the previous year. This decrease in tax revenue was also followed by a decrease in state revenue by 260,685 billion rupiahs compared to the previous year.

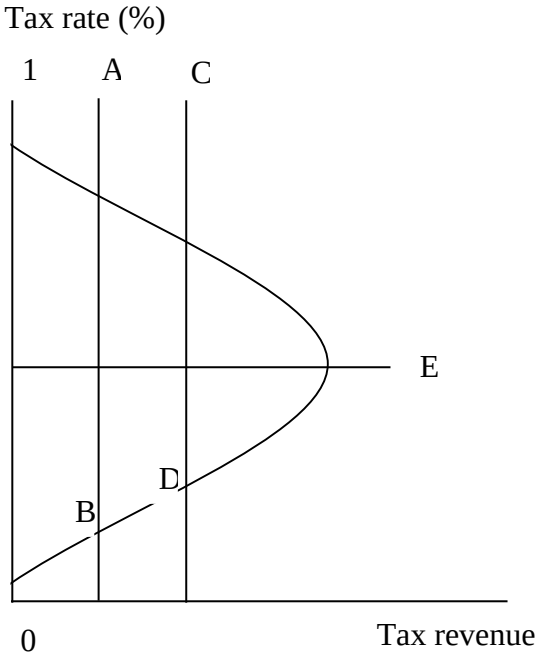
According to economic theory, fiscal policy refers to actions taken by the government to raise and spend state funds (Mankiw, 2010). In contrast, a fiscal stimulus policy can be defined as a fiscal policy that is implemented expansively through a lax budget policy with the intention of boosting the economy (Abimanyu, 2005). It is recognized that fiscal policy has many benefits in improving the economy, especially when the economy is experiencing a slowdown (Ismal, 2011).

Significant income tax reductions encourage more consumer spending. Lower taxes can boost the government's tax take and boost economic activity (aggregate supply) (Escobar-Posada & Monteiro, 2018; and Zheng & Severe, 2016). Tax reductions encourage more capital investment and higher pay (Auerbach, 2018). Linking taxes with political economy suggests that the model that follows political economy is from the tax base. The proposed model shows that tax exemptions for some strategic groups will invest more resources (Ilzetzki, 2018).

Fiscal policy is a weapon used by the government to influence the economy. It has the power to either boost growth or causes a recession (Hermawan, 2016). The tax structure can affect economic growth (Wu et al., 2017). An effective tax system is very important to strengthen the legitimacy,

accountability, and responsiveness of the state (Fjeldstad, 2014).

The existence of a set of tax rates maximizes revenue and promotes economic progress. An income-maximizing tax rate structure is represented by a bell-shaped Laffer curve in terms of tax policy.



Source: Wanniski (1978)

Figure 1. Laffer Curve

Laffer defined the Laffer curve in his essay in 2004. It is a curve that depicts the two consequences of a tax rate reduction, namely the arithmetic effect and the economic effect (Laffer, 2004). First, there is an arithmetic effect where a decrease in the tax rate will result in a decrease in tax revenue according to the amount. Second, there is an economic effect. A decrease in tax rates will result in an increase in productivity and the number of workers. It will increase economic activity (Liapis et al., 2014).

The Laffer curve, which describes the relationship between tax rates and tax collections, shows that two tax rate points will increase tax revenues by the same amount. The curvature of the curve from point 0 to E is called the normal area, while the curve from point E to point 100 is called the forbidden area.

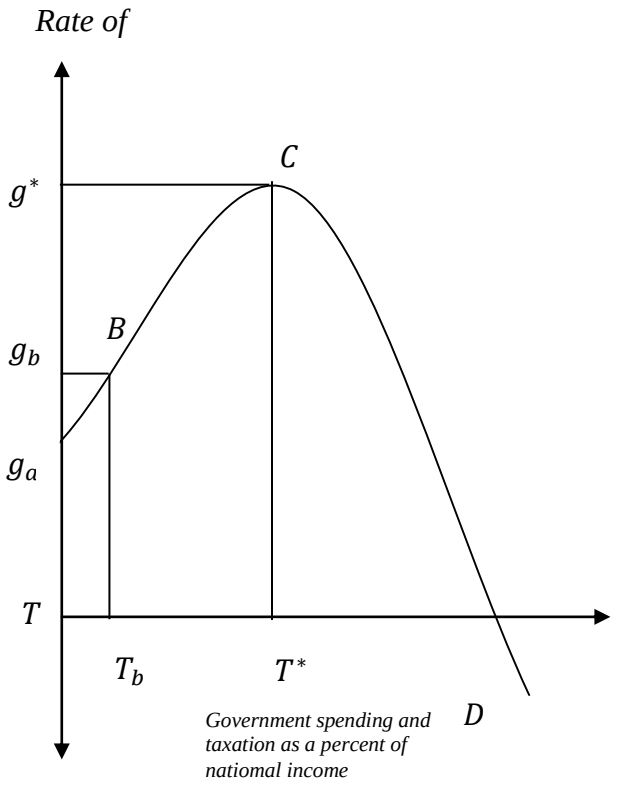
Tax policy in the form of tax rates will maximize income, which is indicated by a bell-shaped Laffer curve (Karas, 2012). Given that seigniorage and public debt are both significant sources of funding for government expenditures in emerging nations, empirical evidence on the Laffer curve is somewhat constrained in these nations (Ehrhart et al., 2014). Nutahara (2015) Japan's Laffer curve was examined using the neoclassical growth model. Based on the findings, the government should raise the labor tax rate while lowering the capital tax rate in order to maximize tax revenue because the labor tax rate is lower at the top of the Laffer curve while the capital tax rate is much closer to or higher than the top of the Laffer curve. The Laffer effect can be used to justify budgetary imbalances and tax redistribution from consumption to saving and from poor to rich and can increase GDP by increasing consumption (Davis, 2018; Forte, 2015; and Yossinomita, 2022).

A tax is a tool that has the power to impact the entire economic system (Milasi & Waldmann, 2018). The relationship between the volume of tax income and the rate of economic growth of a nation can be discovered by looking at the Laffer curve in a broader context. That there is a maximum value or ratio of tax revenue to a particular GDP (tax/GDP) that can result in ideal and stable economic growth. The tax rate that will maximize growth is at this stage (GMTR) (Barro, 1990; and Chen, 2019).

Theoretically, in 1995 economists from new economic theories, such as Robert J. Barro and Xavier Sala-I Martin, were pioneers who introduced the theory of the growth maximizing tax rate (GMTR). That there is a certain ratio of tax revenue to a gross domestic product that is needed to produce a high level of economic growth. This optimal point is known as GMTR (Barro & Martin, 2004).

Furthermore, empirical research on GMTR was first conducted by Gerald W. Scully 1995, who discovered GMTR in the United States of America. Scully uses econometrics with two regression equation models. In the first model, Scully uses a quadratic function based on the theoretical model developed by Barro and Martin. Meanwhile, in the second model, Scully uses his own theoretical model. Scully assumes that there are two sectors that carry out activities in a country's economy, namely the government sector and the private sector. These two sectors have a role in national production through a production function known as the Cobb Double Glass production function.

Using data on the ratio of the amount of government spending to GDP. In 1998, world economists Chao and Grubel conducted empirical research to find GMTR in Canada. The difference with the research conducted by Scully, Chao and Grubel uses data on the ratio of the amount of government spending to GDP as an estimator of tax variables. Chao and Grubel calculated the GMTR using the Scully Curve.



Source: Chao & Grubel (1998)

Figure 2. Scully Curve

The Scully curve is a curve that suggests that when it is assumed that government expenditures are financed entirely from tax revenues which are at zero, then economic growth will be at g_a, which is the lowest point of economic growth, this is because the economy is experiencing inefficiency as a result of a poor government. Do not have the funds to provide public goods. When there is a change in the private sector, namely the supply of capital, labor, and other resources, where the government spends at point T_b, and economic growth will increase towards point g_b, this is because the government provides public goods to facilitate economic activities. The most optimal spending done by the government is at point T^*, because at this point economic growth will reach its optimal point, namely point g^* (Chao & Grubel, 1998).

By maintaining tax rates in line with a number of optimal levels, an optimal fiscal revenue policy will balance the effects of both positive and negative tax externalities on economic growth patterns during the economic cycle (Kavese & Phiri, 2020). Equilibrium fiscal policy is a fiscal policy that maximizes economic growth (Dai, 2018). Fiscal policies that maximize economic growth are financed by rational taxation (Nguyen, 2020). There is an inverse U-shaped relationship between democracy and growth and inequality and growth when there is an egalitarian redistribution of wealth or political power. This is because growth first increases and then declines as the equilibrium tax rate approaches and then exceeds the rate that maximizes growth (Davis, 2018).

This study uses the Laffer curve theory and the equation model developed by Gerald Scully (1995) in his research entitled "The growth tax in the United States" (Scully, 1995) and "Taxation and economic growth in New Zealand" (Scully, 1996), and the research of Johny Chao and Herbert Grubel entitled "The optimum levels if spending in Canada" (Chao & Grubel, 1998), which will later be adjusted to the economic conditions in Indonesia in order to estimate the statistically optimal level of economic growth.

Research that discusses the relationship between taxes and the economy in Indonesia is still limited to normative analysis, with little empirical analysis. Information and studies on GMTR Indonesia do not yet exist or have not been detected in the form of national or international journal publications. By using time series data for the last 20 years, namely the period 2001-2020, it is hoped that the results of the research that will later be obtained will better describe the economic conditions faced by the government. This study uses data: tax revenue; non-tax revenue; GDP; foreign debt; and economic growth to obtain the amount of GMTR that can create an optimal growth rate in Indonesia. The purpose of this research is to obtain and measure the GMTR that can create an optimal growth rate. And to analyze whether Indonesia has reached the optimal point or is operating below or above it. Based on the amount of GMTR obtained from this research, it can be used as input by the government in carrying out fiscal policy, especially in terms of creating optimal economic growth.

2. RESEARCH METHODOLOGY

2.1.The research method used

The research method used in this study is a qualitative method with descriptive statistical analysis and quantitative methods with a data analysis design. Qualitative methods are used to describe the variables to be discussed. Meanwhile, quantitative methods are used to test the relationship of test variables to answer the hypothesis or problem formulation formed.

2.2.Types and sources of data

This study uses secondary data with the type of time series data, sourced from the Ministry of Finance (Directorate General of Taxes) and the Central Bureau of Statistics. The data used in this study are tax revenue data; non-tax revenue; GDP; foreign debt; and economic growth during the period 2001-2020.

2.3.Data analysis method

Descriptive statistical analysis model

A descriptive statistical analysis model is used to see the development of tax revenues, non-tax state revenues, and state revenues. In addition to looking at the development of state revenues, tax revenues, and non-tax state revenues, it will also be presented how big the contribution of tax revenues and non-tax state revenues is to the structure of Indonesian state revenues. The formula used to see the development and contribution is as follows:

$$GTAX = \frac{TAX_n - TAX_{n-1}}{TAX_{n-1}} X\ 100\% \quad (1)$$

$$GNTAX = \frac{NTAX_n - NTAX_{n-1}}{NTAX_{n-1}} X\ 100\% \quad (2)$$

$$GSR = \frac{SR_n - SR_{n-1}}{SR_{n-1}} X\ 100\% \quad (3)$$

Information:

$GTAX$ = Growth of tax revenue per year
TAX_n = Tax revenue for a certain year
TAX_{n-1} = Previous year's tax revenue
$GNTAX$ = Growth of non-tax state revenue per year
$NTAX_n$ = Non-tax state revenue for a particular year
$NTAX_{n-1}$ = Previous year's non-tax state revenue
GSR = Growth of state income per year
SR_n = State revenue for a particular year
SR_{n-1} = Previous year's state revenue

$$CTAX = \frac{TAX}{PN} X\ 100\% \quad (4)$$

$$CNTAX = \frac{NTAX}{PN} X\ 100\% \quad (5)$$

Information:

$CTAX$ = Contribution of tax revenue to state revenue
TAX = Tax revenue
$NTAX$ = Non-tax state revenue
PN = State revenue

Furthermore, the development of several macroeconomic variables, such as GDP and foreign debt. The formula used to see these developments is as follows:

$$GGDP = \frac{GDP_n - GDP_{n-1}}{GDP_{n-1}} X\ 100\% \quad (6)$$

$$GFD = \frac{FD_n - FD_{n-1}}{FD_{n-1}} X\ 100\% \quad (7)$$

Information:

$GDGP$ = GDP growth per year
GDP_n = GDP for a given year
GDP_{n-1} = previous year's GDP
GFD = Foreign Debt growth per year
FD_n = Foreign Debt of a certain year
FD_{n-1} = Previous year's External Debt

Multiple regression analysis models with the Laffer curve theory approach to finding GMTR

a. Research result

The turning point of the curve produced by the Laffer curve hypothesis is the study's limitation. Where the minimum turning point and the maximum turning point are the two possible outcomes for the turning point of the curve produced by a model, in the Laffer curve hypothesis, the turning point of the curve must be able to show as the maximum point, so that the best analytical model in this study must be able to have the most extreme turning point to fit the Laffer curve hypothesis.

In order to scientifically determine the ideal rate of economic growth, the following equation is used:

$$Y_t = \alpha + \beta_1\tau_t + \beta_2\tau_t^2 + \beta_3 NT_t + \beta_4 D_t + \varepsilon_t \quad (8)$$

Information:

Y = Economic growth
α = Constant
β = Coefficient
τ = Tax ratio (tax revenue / GDP)
NT = Ratio of non-tax state revenue to GDP
D = Ratio of external debt to GDP
ε = *error term*
t = Time Period

The equation for GMTR can be calculated as follows:

$$\frac{\delta\gamma}{\delta\tau} = \beta_1 + 2\beta_2\tau = 0$$

$$\tau = -\frac{\beta_1}{2\beta_2} \text{ where } \tau = \text{GMTR} \quad (9)$$

Assuming that government spending is entirely financed from tax revenues, then to accommodate the variables, the ratio of non-tax state revenue to GDP and the ratio of foreign debt to GDP are added to fulfill the assumption that G = T.

b. Significant test

This study uses 95% or α = 5% = 0.05 Confident Interval

c. Classic assumption test

1. Test for normality
   To determine whether the residual value is regularly distributed or not, perform a normality test.
2. Test for multicollinearity
   The multiple linear regression model's multicollinearity tests are intended to ascertain whether there is a high degree of correlation between the independent variables.
3. Test for heteroscedasticity
   The heteroscedasticity test determines whether differences between one residue and another observation are unevenly distributed. The homoscedasticity property, which refers to a similarity in variance between the residues of different observations, is one of the regression models that satisfies the criteria.
4. Test for autocorrelation
   The autocorrelation test determines if a period t and the prior period are correlated (t-1). Testing the influence of the independent variable on the dependent variable through regression analysis ensures that there is no link between current observations and historical observation data.

3. RESULT AND DISCUSSION

3.1. Research Result

Descriptive statistical analysis

Strategy and management of tax revenues play an important role in achieving economic development targets. During 2001-2020, the realization of tax revenues in Indonesia increased from year to year (Table 1.). Tax revenues at the beginning of the research year, namely in 2001, amounted to 185,541 billion rupiahs. Then, based on time it continued to increase until 2020 to 1,285,136 billion rupiahs. The average tax revenue during the study period was 823,247 billion rupiahs, with an average growth of 13.73%. Tax revenue growth was at a minus position compared to the previous year in 2009 and 2020, namely -5.89% and -16.88%. This minus growth was due to the fact that 2009 was the year after the global economic crisis that had an impact on the Indonesian economy. Meanwhile, the minus growth of tax revenue in 2020 was confirmed due to the COVID-19 pandemic that occurred in early 2020, which was also accompanied by a decline in the world and domestic economy. And for national economic recovery, the government issues or provides tax incentive policies that are useful for reducing the burden on companies, increasing the vitality of market entities, and encouraging economic growth, thereby reducing downward pressure on the economy due to the COVID-19 pandemic. The largest tax revenue growth occurred in 2001 when the realization of tax revenue grew by 60.07% compared to the previous year. The big growth in 2001 was most likely due to the fourth tax reform in the 2000s.

Non-tax state revenues during the 2001-2020 study period increased and decreased or were unstable, with an average of 262,909 billion rupiahs per year, with an average growth rate of 9.61%. During the research period, at least 5 times, non-tax state revenues experienced negative growth, with the largest negative growth occurring in 2015, which was -35.87%. The lack of growth in non-tax state revenues was caused by the decline in revenues from natural resources (SDA) of oil and natural gas and mineral and coal mining (minerva) due to the decline in coal commodity prices in the international market.

The contribution of tax revenues to state revenues during the period 2001-2020 continued to increase with an average contribution of 73.18%, while the contribution of non-tax state revenues to state revenues averaged 26.43%. This shows that tax revenue in the structure of state revenue is the most important component, meaning that the size of tax revenue will affect the size of state revenue.

In addition to looking at the development of tax revenues, non-tax state revenues, and the contribution of tax revenues and non-tax state revenues to the structure of Indonesian state revenues, this study also examines the development of several macroeconomic variables, such as GDP, foreign debt, and economic growth.

Table 1. Development of Tax Revenues, Non-Tax State Revenues, State Revenues, Foreign Debt, GDP, and Economic Growth (2001-2020)

Year	TAX	GTAX	NTAX	GNTAX	SR	GSR	CTAX	CNTAX	GDP	GGDP	FD	GFD	Y
	Billion of Rupiah	%	Billion of Rupiah	%	Billion of Rupiah	%	%	%	Billion of US$	%	US$	%	%
2001	185.541	60,07	115.059	28,67	301.078	46,63	61,63	38,22	160,45	-2,77	132.710.089.752	-7,87	3,64
2002	210.088	13,23	88.440	-23,14	298.528	-0,85	70,37	29,63	195,66	21,94	128.444.200.508	-3,21	4,50
2003	242.048	15,21	98.880	11,80	341.396	14,36	70,90	28,96	234,77	19,99	134.372.632.167	4,62	4,78
2004	280.559	15,91	122.546	23,93	403.367	18,15	69,55	30,38	256,84	9,40	138.041.813.872	2,73	5,03
2005	347.031	23,69	146.888	19,86	495.224	22,77	70,08	29,66	285,87	11,30	142.131.795.440	2,96	5,69
2006	409.203	17,92	226.950	54,51	637.987	28,83	64,14	35,57	364,57	27,53	135.970.010.957	-4,34	5,50
2007	490.989	19,99	215.120	-5,21	707.806	10,94	69,37	30,39	432,22	18,56	147.827.337.604	8,72	6,35
2008	658.701	34,16	320.605	49,04	981.609	38,68	67,10	32,66	510,23	18,05	157.916.194.612	6,82	6,01
2009	619.922	-5,89	227.174	-29,14	848.763	-13,53	73,04	26,77	539,58	5,75	179.404.709.351	13,61	4,63
2010	723.307	16,68	268.942	18,39	995.271	17,26	72,67	27,02	755,09	39,94	198.278.352.696	10,52	6,22
2011	873.874	20,82	331.472	23,25	1.210.600	21,64	72,19	27,38	892,97	18,26	219.629.383.247	10,77	6,17
2012	980.518	12,20	351.805	6,13	1.338.110	10,53	73,28	26,29	917,87	2,79	252.622.872.897	15,02	6,03
2013	1.077.307	9,87	354.752	0,84	1.438.891	7,53	74,87	24,65	912,52	-0,58	263.643.564.689	4,36	5,56
2014	1.146.866	6,46	398.591	12,36	1.550.491	7,76	73,97	25,71	890,81	-2,38	292.565.178.480	10,97	5,01
2015	1.240.419	8,16	255.628	-35,87	1.508.020	-2,74	82,25	16,95	860,85	-3,36	307.719.279.474	5,18	4,88
2016	1.284.970	3,59	261.976	2,48	1.555.934	3,18	82,59	16,84	931,88	8,25	318.942.189.756	3,65	5,03
2017	1.343.530	4,56	311.216	18,80	1.666.376	7,10	80,63	18,68	1.015,62	8,99	353.564.020.105	10,86	5,07
2018	1.518.790	13,04	409.320	31,52	1.943.675	16,64	78,14	21,06	1.042,27	2,62	379.588.979.497	7,36	5,17
2019	1.546.142	1,80	408.994	-0,08	1.960.634	0,87	78,86	20,86	1.119,09	7,37	402.083.881.044	5,93	5,02
2020	1.285.136	-16,88	343.814	-15,94	1.647.783	-15,96	77,99	20,87	1.058,42	-5,42	417.481.122.086	3,83	-2,07
Average	**823.247**	**13,73**	**262.909**	**9,61**	**1.091.577**	**11,99**	**73,18**	**26,43**	**668,88**	**10,31**	**235.146.880.412**	**5,62**	**4,91**

Source: Author's preparation (2022)

Indonesia's GDP development during the period 2001-2020 was US$668.88 billion dollars, with an average growth of 10.31%. The Indonesian state failed to take advantage of the opportunities of the commodity boom era in the 2000s, and this can be seen in Indonesia's GDP growth which tends to experience a slowdown. Even the average GDP growth only grew by 1.83% during the 2012-2020 period. In 2020 GDP growth decreased due to the COVID-19 pandemic with a growth rate of -5.42%.

Foreign debt can be seen in Table 1. Indonesia's external debt position continued to increase, starting from US$132,710,089,752 in 2001 and continuing to increase to US$417,481,122,086 in 2020. The average growth of Indonesia's external debt during the study period is US$235,146,880,412, with an average growth of 5.62%. The posture of Indonesia's state budget, which is always in deficit, is the main reason foreign loans always increase. The policy in the form of foreign loans is carried out to cover the budget deficit. The solution to reducing foreign borrowing is to increase state revenues, particularly from the taxation sector, which is the main sector in the structure of state revenues.

Based on table 1, Indonesia's economic growth during the period 2001-2020 was in the range of 3-6%, except at the end of the research period, namely 2020. Indonesia's economic growth experienced negative growth of -2.07%. Minus economic growth was caused by the COVID-19 pandemic that hit the Indonesian economy and major countries in the world. Developed countries such as the United States, Germany, Britain, and Japan even experienced negative economic growth that was greater than Indonesia. The United States economic growth was minus -3.50%. This is due to the implementation of a lockdown that hampers economic activity, where the spread of COVID-19 in the United States occurred so quickly that it made the United States the country with the highest number of cases. The German economy grew negatively by -5%. UK minus -9.9%. Meanwhile, Japan closed 2020 with a minus of -4.8%.

Multiple regression analysis models with the Laffer curve theory approach to finding GMTR

Research result

The results of the study using Ordinary Least Square (OLS) obtained the following results:

Table 2. OLS Estimation Results

Variable	Coefficient	t-statistics	Probability	Adjusted R^2
C	-68.90785	-5.759245*	0.0000	0.808632
τ	12.85456	5.772035*	0.0000	
τ^2	-53.54569	-5.112315*	0.0001	
NT	-0.090561	-0.370519[d]	0.7162	
D	-0.048699	-3.245849*	0.0054	

Source: Author's preparation (2022)

Information :
* significant at 1% confidence level
** significant at 5% confidence level
*** significant at 10% confidence level
d is not significant

From the regression results, the following equation model is formed:

$$Y = -68{,}90785 + 12{,}85456\,\tau - 53.54569\,\tau^2 - 0.090561NT - 0.048699\,D \quad (10)$$

Significant test

In a mutual signification test (F Statistics Test), based on the results of data processing, the calculated F value (F-statistic) is 21.07123 with probability F-statistic : 0.000005 < from the value of α = 1% (0.01), with a level of 99% confidence, it can be concluded that the independent variables (τ; τ^2; NT, and D) together have a significant effect on the dependent variable (Y). Coefficient of Determination Test, based on the results of data processing, the adjusted R^2 value is 0.808632, meaning that the influence of the independent variables: the ratio of tax revenues to GDP, the ratio of non-tax revenues to GDP, and the ratio of foreign debt to GDP in influencing the dependent variable: economic growth in Indonesia. Indonesia is 80.86% and the remaining 19.14% is influenced by variables outside the model.

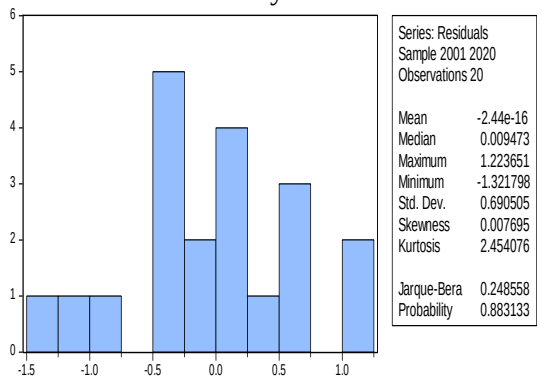
Meanwhile, for the test of each variable (t-test statistic), first, the variable of the ratio of tax revenue to GDP has a positive effect on economic growth. Second, the square of the ratio of tax revenue to GDP has a negative effect on economic growth. Third, the variable ratio of foreign debt to GDP has a negative effect on economic growth. These three independent variables have a significant effect with probability α = 1% (0.01), with a 99% confidence level. Meanwhile, the ratio of non-tax revenues to GDP has no effect on economic growth. This means that the value of non-tax revenues that increase or decrease will not affect economic growth.

Classic assumption test

The classical assumption test was conducted utilizing the findings of the OLS model analysis to confirm that the regression equation had accuracy in an estimate and was fair and consistent. These traditional assumption tests include the autocorrelation test, heteroscedasticity test, multicollinearity test, and normality test.

1. Normality test

   The results of the normality test are as follows:



Source: Normality test results (2022)

Figure 3. The results of the normality test

The results of the normality test show that the Jarque-Bera probability value is 0.883133 > 0.05, meaning that the data is normally distributed.

2. Multicollinearity test

   The results of the multicollinearity test are as follows:

	τ	τ^2	NT	D	Y
τ	1.000000	0.997449	0.810388	0.179820	0.626049
τ^2	0.997449	1.000000	0.817875	0.175262	0.586777
NT	0.810388	0.817875	1.000000	0.455245	0.283305
D	0.179820	0.175262	0.455245	1.000000	-0.270328
Y	0.626049	0.586777	0.283305	-0.270328	1.000000

Source: Multicolinearity test results (2022)

Figure 4. The results of the multicollinearity test

The results of the multicollinearity test show that the numbers outside the diagonal line are < 1, meaning that there is no multicollinearity.

3. Heteroscedasticity test
The results of the heteroscedasticity test are as follows:

Heteroskedasticity Test: White

F-statistic	1.845904	Prob. F(4,15)	0.1726
Obs*R-squared	6.597340	Prob. Chi-Square(4)	0.1588
Scaled explained SS	2.698041	Prob. Chi-Square(4)	0.6096

Source: Heteroscedasticityity test results (2022)

Figure 5. The results of the heteroscedasticity test

The results of the heteroscedasticity test showed that the probability value of Chi-Square Obs*R-squared was 0.1588 > 0.05, meaning that there was no heteroscedasticity. Or research data is homoscedastic.

4. Autocorrelation test
The results of the autocorrelation test are as follows:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.067271	Prob. F(2,13)	0.9353
Obs*R-squared	0.204868	Prob. Chi-Square(2)	0.9026

Source: Autocorrelation test results (2022)

Figure 6. The results of the autocorrelation test

The results of the autocorrelation test showed that the probability value of Chi-Square Obs*R-squared was 0.9026 > 0.05, meaning that there was no autocorrelation.

Based on the results of the normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test, it can be concluded that the research data is free from the problem of classical assumptions so that the regression model can be accepted.

3.2. Discussion

The ratio of tax income to economic growth has a strong positive impact on the probability = 1 percent (0.01), with a regression coefficient of 12.85456 according to the findings of the regression using the OLS method in Table 2. According to the study's findings, economic growth will increase by 12.85456 percent for every 1% increase in tax ratio, ceteris paribus. The findings of this study are consistent with those of previous studies by Aydin & Esen (2019), Chao & Grubel (1998); Kavese & Phiri (2020); and Scully (1995, 1996). However, this is not in line with the results of research conducted by: Bhimjee & Leão (2020); Dai (2018); Ehrhart et al., (2014); dan Fève et al. (2018); Kamiguchi & Tamai (2019); and Ueshina (2018).

The ratio of foreign debt to economic growth has a significant negative effect on the probability α = 1% (0.01) with a regression coefficient of -0.048699. The results of this study mean that every 1% increase in the ratio of foreign debt to GDP will reduce economic growth by 0.048699%, ceteris paribus. The results of this study are in line with the results of research conducted by Adam & Bevan (2005); Hogan (2004); Kamiguchi & Tamai (2019); and Mensah et al. (2018). However, it is not in accordance with the results of research conducted by: Bhimjee & Leão (2020); Ehrhart et al., (2014); and Fève et al., (2018). Limited liquidity is heterogeneous in each country, resulting in the nature of the Laffer curve depending on external debt, which is an important means of financing public spending and balancing government budgets. (Bhimjee & Leão, 2020; Ehrhart et al., 2014; and Fève et al., 2018).

Barro's theory suggests that government spending financed by taxes will have a positive impact on a country's economic growth, provided that government spending is used for productive things, such as infrastructure development which will later support economic activity (Davis, 2018; Milasi & Waldmann, 2018; and Tavani & Zamparelli, 2020). The results of this study also show that the square of

the ratio of tax revenue to GDP has a negative coefficient, with a significant level of probability α = 1% (0.01). This explains that in the long term, an increase in the ratio of tax revenue to GDP will have an impact on decreasing economic growth.

The results of this study are in line with the theory proposed by Peacock & Wiseman (1961) that the community has a level of tax tolerance, meaning that there is a level of tax that can be accepted by the community so that they have the willingness to pay the taxes needed by the government to finance their expenditures. This level of tolerance is the limit for the government in collecting taxes from the community.

In 1995, Scully found the GMTR for the United States to create optimal economic growth, and the United States GMTR is 22.9% of total GDP. Scully also estimates that if the GMTR is achieved, Real GDP growth in the United States will grow 5% annually. In addition, the deadweight loss is well above the GMTR. A year after measuring the GMTR for the United States, Scully also measured the GMTR for New Zealand, which was around 20.2%. In 1998, world economists Chao and Grubel conducted empirical research to find GMTR in Canada by using data on the ratio of the amount of government spending to GDP as an estimator of tax variables. Assuming G=T, Chao and Grubel find the GMTR for Canada is 34%.

Aydin & Esen (2019) It investigates the nonlinear link between tax income and economic growth in 11 countries throughout Europe and the Central and Southeastern Baltics between 1995 and 2014. The findings indicate that for full transition economies, 18.0 percent of GDP, 18.50 percent for developing countries, and 23.00 percent for developed countries is the ideal level of tax income to maximize economic growth. Aydin & Esen (2019) also showed that the level of tax revenue below the optimal threshold had a beneficial impact on economic growth, while the level of tax revenue above the optimal point had a negative impact.

Kavese & Phiri (2020) examines the optimal tax in South Africa by using the Scully optimal tax calculation applied to the 2002–2017 quarterly data. Empirical results show that governments pursue growth-maximizing tax rates during business cycle enhancements while generally using income-maximizing tax rates during recessionary periods.

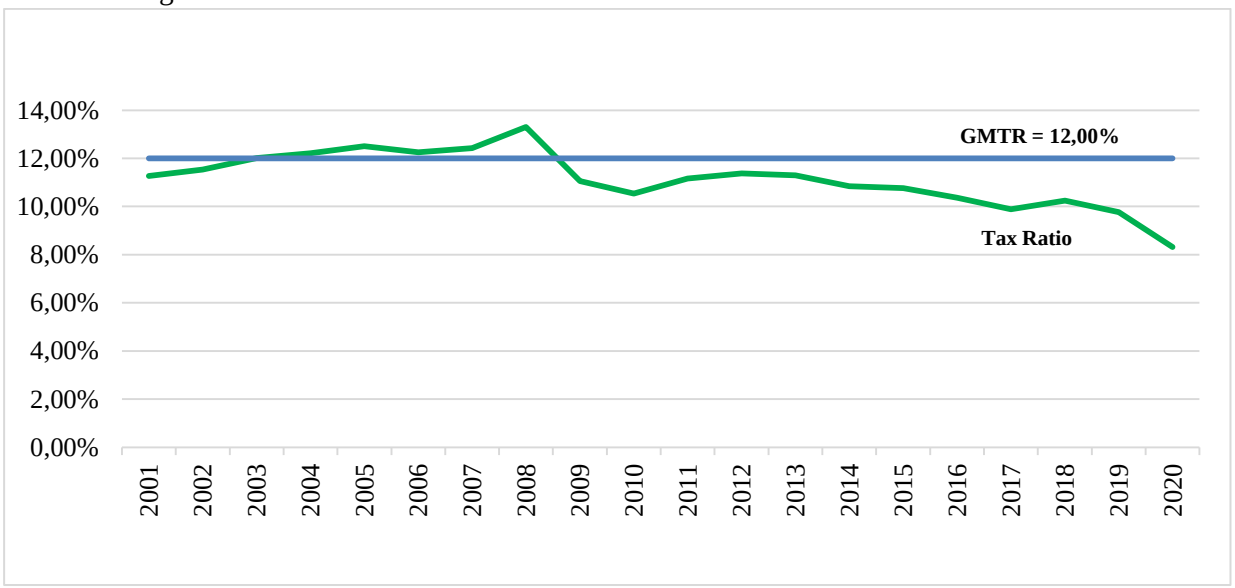
The purpose of this study is to see the effect of the ratio of tax revenue on GDP and find the GMTR that creates optimal growth for the country of Indonesia. The magnitude of Indonesia's GMTR based on the regression coefficient is as follows:

$$\frac{\delta\gamma}{\delta\tau} = 12{,}85456 + 2(-53.54569)\,\tau = 0$$

$$\tau = -\frac{\mathbf{12{,}85456}}{\mathbf{2(-53.54569)}}$$

$$\tau = 12{,}00336\,\%$$

Based on the estimation results above, the amount of GMTR for Indonesia that can create optimal economic growth is 12.00%. Next, we will compare the amount of GMTR with the tax ratio for the period 2001-2020, as shown in Figure 7.



Source: Author's preparation (2022)

Figure 7. Comparison of Tax Ratio with GMTR

Based on the graph in Figure 7. it can be seen that the ratio of tax to GDP, on average, is still below the GMTR, 12.00%. The average tax-to-GDP ratio during the study period was 11.16%. It can be concluded that the position of the Indonesian state is still located on the left of the Laffer curve in the form of an inverted “U” letter, or more precisely, on the left of the Scully curve, which describes the relationship between the rate of economic growth and the tax ratio.

Based on data and graphs, the tax ratio that was above GMTR occurred in 5 periods, namely from 2003 to 2008, where the largest tax ratio was in 2008, which was 13.31%. The high tax-to-GDP ratio in 2008 was most likely due to the sunset policy program implemented in 2008, which was a government program to increase tax revenues in the form of eliminating tax sanctions. This policy of providing tax facilities only applies in 2008, in the form of the abolition of tax administration sanctions in the form of interest as regulated in Law Number 28 of 2007.

The results showed that the GMTR for Indonesia, during the study period, from 2001-2020, was 12.00%. With a total tax revenue of 16,464,941 billion rupiahs during the period 2001-2020, if GMTR can be achieved since 2001 and continues to be the same or can be maintained until 2020, the total tax revenue for 2001-2020 will increase to 18,659,422 billion rupiahs, rose to 2,194,481 billion rupiahs. The amount of the increase is large enough to finance economic development.

Effective tax rates can have a double effect on a country's economic policies. The average economic growth during 2001-2020 was 4.91%. If the GMTR of 12% can be achieved since 2000 and continues to be maintained until 2020, then by substituting the GMTR in the regression equation model assuming other variables are constant, Indonesia's economic growth will increase by 1.40% to 6.31%.

The Laffer curve hypothesis, which is used to calculate and examine the ideal rate of economic growth, has a derivative called GMTR. A Scully curve, or inverted "U" form, can be used to depict the GMTR. According to Barro and Scully's argument, tax income will boost economic growth if it is used to fund productive activities that will boost economic growth, such as infrastructure construction. The study's findings, however, indicate that economic growth will be negatively impacted if tax funds are primarily utilized to fund wasteful expenditures like paying down state debt. Because allocating a portion of state revenue to repay debt, it will reduce the portion for the development of productive activities, and this will certainly reduce the country's economic growth rate.

Fiscal policy taken by the government must be a policy that maximizes economic growth financed by rational taxation. The optimal tax structure is a tax structure that considers and maximizes economic growth and welfare.

4. CONCLUSION

This study identifies the following data: GDP, foreign debt, tax revenues, non-tax revenues, and economic growth. And consider how the tax revenue ratio affects economic growth. It may be concluded from time series data covering the years 2001 to 2020 and using the analytical technique of Ordinary Least Square (OLS) that the ratio of tax revenues significantly boosts economic growth. The tax revenue ratio variable, which has a strong negative influence on economic growth, shows that, however, tax revenues that are consistently increased will have a negative impact on economic growth.

The major goal of this study is to estimate the GMTR, along with examine how the ratio of tax revenues affects economic growth. The GMTR that generates the best economic growth in Indonesia is 12.0 percent, according to the magnitude of the regression coefficient. The total tax revenue will rise by 13.33 percent of the total tax income if the GMTR of 12.00 percent can be met and maintained between 2001 and 2020. Additionally, the average economic growth will rise by 28.50 percent.

The government is anticipated to utilize the study's findings as guidance for implementing fiscal measures that will promote the strongest possible economic expansion. Since taxes are the greatest and most likely source of state income, the government must adopt taxation policies that take current economic conditions into account. The author expects that the findings of this study will serve as a starting point for future research on economics and taxation. Regarding the assessment of the tax policies adopted by the government in raising tax revenues and the national economy, it is anticipated that future research will be able to investigate the topic more comprehensively and in-depth. Moreover, for research at the regional level, it is how the effect of the ratio of regional taxes on economic growth, as well as finding the amount of GMTR that creates optimal economic growth in an area.

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6. DECLARATIONS

All co-authors have seen and agreed with the manuscript's contents, and there is no financial interest to report. Therefore, we certify that the submission is original work and is not under review at any other scientific journal.

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