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The Impact of Coal Production, Oil and Gas Production, and Fuel Consumption on the Value of Public Assets in the Energy Sector

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A R T I C L E I N F O

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A B S T R A C T

This study aims to analyze the influence of coal production, oil and gas production, and fuel consumption on the value of public assets of the energy sector in Indonesia by using a quantitative approach through multiple linear regression. Secondary data in the form of time series data was obtained from official government publications, then tested using classical assumption tests before regression analysis was carried out. The results of the study show that only partially oil and gas production has a significant effect on the value of public assets, while coal production and fuel consumption do not have a significant effect. However, simultaneously, these three variables have a significant effect on the value of public assets in the energy sector. The Adjusted R-Squared value of 98.59% indicates that the model is able to account for almost all variations in the value of public assets. These findings confirm that energy production capacity, especially oil and gas production, has a major role in determining the size or size of public assets in the energy sector in Indonesia

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INTRODUCTION

The energy sector plays a strategic role in supporting national development, making the value of public assets in the energy sector a crucial indicator of a country's capacity to optimally manage and utilize energy resources. The value of these public assets reflects the country's substantial economic, infrastructure, and natural resource potential in the energy sector. To understand the factors influencing the value of these public assets, it is crucial to analyze energy production and consumption variables, key elements of the national energy structure. One variable closely related to the value of public assets in the energy sector is coal production (X1). The level of coal production reflects the extent of energy resources that can be produced and utilized. Theoretically, increased coal production is associated with increased national energy capacity, which in turn strengthens the value of the country's energy assets. Coal production also indicates the extent to which natural resource potential can be mobilized as part of strategic economic assets in the energy sector.

LITERATURE REVIEW

In addition to coal, oil and gas production (X2) is also a crucial factor directly related to the formation of the value of public assets in the energy sector. Oil and gas production reflects the availability of fossil fuels, which are part of the country's assets in the form of reserves and production. Economically, the higher the level of oil and gas production, the greater the value of energy assets that can be recorded as national resources. Therefore, oil and gas production is strongly linked to the value of public assets through its contribution to the formation of economic value and energy capacity. Conversely, fuel consumption (X3) also has an inseparable relationship with the value of public assets in the energy sector. Fuel consumption reflects the energy needs of the public and the business world, which serves as the basis for determining infrastructure capacity and national energy supply. High energy consumption demonstrates the significant role of the energy sector in economic activity and is thus linked to the increase in the value of public assets through the use, provision, and demand for energy infrastructure. Therefore, fuel consumption reflects energy demand, which influences the size of assets required to support national energy supply. Based on this relationship, the three variables of coal production (in tons), oil and gas production (in tons), and fuel consumption (in tons) have a direct relationship with the value of public assets in the energy sector (in billions of Rupiah) through the mechanism of resource contributions, production capacity, and energy demand levels. Therefore, this study was conducted to empirically analyze the influence of these three variables on the value of public assets in the energy sector in Indonesia, so as to obtain a clearer understanding of the relationship between energy production potential and national energy needs on the value of public assets.

METHODOLOGY

This research employs a descriptive verification method with a quantitative approach. The descriptive method is used to describe and explain the actual conditions of the energy sector data studied without modifying the existing variables. Meanwhile, the verification method is used to test the relationships and influences between variables, specifically the relationship between coal production, oil and gas production, and fuel consumption on the value of public assets in the energy sector in Indonesia. This research is an associative research because it aims to determine the relationship between several independent variables and one dependent variable. In this study, the independent variables used are coal production (X1), oil and gas production (X2), and fuel consumption (X3), while the dependent variable is the value of public assets in the energy sector (Y). A quantitative approach is applied in this study, where all variables are measured numerically and analyzed using statistical techniques. The data used are secondary data in the form of historical data obtained from official government publications, such as reports from the Ministry of Energy and Mineral Resources (ESDM), the Central Statistics Agency (BPS), and financial reports or annual reports containing the value of public assets in the energy sector. The research data covers a specific time period (time series), with variables including coal production (in tons), oil and gas production (in tons), fuel consumption (in tons), and the value of public assets in the energy sector (in billions of Rupiah).

To analyze the data, this study used multiple linear regression to determine the influence of coal production (X1), oil and gas production (X2), and fuel consumption (X3) on the value of public assets in the energy sector (Y). The analysis was conducted using EVIEWS statistical software. Prior to conducting the regression analysis, the model was first tested using classical assumption tests, including: a normality test to ensure the distribution of residual data follows a normal pattern, a multicollinearity test to ensure there is no strong relationship between independent variables, a heteroscedasticity test to assess the consistency of residual variance, and an autocorrelation test to determine whether residuals are related between periods. All these tests were conducted to ensure that the regression model met the eligibility requirements, ensuring reliable and valid analysis results.

RESULTS AND DISCUSSION

Descriptive Statistical Analysis

	X1	X2	X3	Y
Mean	24.02000	7.401000	2292.750	101.0290
Median	23.65500	7.625000	279.3200	102.3000
Maximum	28.21000	11.55000	20554.00	114.4700
Minimum	19.87000	3.110000	140.4100	87.08000
Std. Dev.	2.703167	3.018850	6416.742	9.500862
Skewness	0.132394	-0.048552	2.666055	-0.081959
Kurtosis	1.903772	1.668462	8.109210	1.808342
Jarque-Bera	0.529929	0.742677	22.72309	0.602882
Probability	0.767233	0.689811	0.000012	0.739751
Sum	240.2000	74.01000	22927.50	1010.290
Sum Sq. Dev.	65.76400	82.02109	3.71E+08	812.3975
Observations	10	10	10	10

Figure 1

Based on the descriptive analysis, the coal production variable (X1) has a minimum value of 19.87 and a maximum value of 28.21, with a mean of 24.02. The standard deviation of 2.703 indicates that the data distribution is relatively small and quite close to the mean. Skewness is 0.132, indicating a slight skew to the right (positive). Meanwhile, the kurtosis value of 1.903 indicates that the data distribution tends to be flatter than a normal distribution (platokurtic). The Jarque-Bera value of 0.5299 with a probability of 0.7672 (>0.05) indicates that the coal production data can be assumed to be normally distributed.

For the oil and gas production variable (X2), the minimum value was 3.11 and the maximum value was 11.55, with a mean of 7.401. The standard deviation of 3.018 indicates significant variation between observations. A skewness of –0.048 indicates that the data distribution is nearly symmetrical, while a kurtosis value of 1.668 indicates that the distribution is slightly flatter than a normal distribution. A Jarque-Bera value of 0.7426 with a probability of 0.6898 (>0.05) indicates that the oil and gas production data are normally distributed.

Furthermore, the fuel consumption variable (X3) shows a minimum value of 140.41, with a very large maximum value of 20,554.00, and a mean of 2,292.75. The very high standard deviation of 6,416.742 indicates that the data have a high level of variation and are widely dispersed from the mean. A skewness value of 2.666 indicates that the data are highly right-skewed, while a kurtosis of 8.109 indicates a highly spiky distribution (leptokurtic). The Jarque-Bera value of 22.723 with a probability of 0.000012 (<0.05) indicates that the fuel consumption data is not normally distributed.

For the energy sector public asset value variable (Y), the minimum value was 87.08 and the maximum value was 114.47, with an average of 101.03. A standard deviation of 9.500 indicates a moderate spread of the data relative to the mean. The skewness value is -0.081, indicating a slight left-skewing of the distribution, while the kurtosis value of 1.808 indicates that the distribution is flatter than a normal distribution. The Jarque-Bera value of 0.6029 with a probability of 0.7397 (>0.05) indicates that the Y data is normally distributed.

Overall, the standard deviation value for each variable indicates the level of variation in the data from its mean. Variables with high standard deviations, such as fuel consumption (X3), exhibit high data inconsistency, making the mean less representative of the overall data. Conversely, variables with low standard deviations, such as coal production (X1), indicate that the data are more concentrated around the mean, making the mean a reasonably good representation.

Classical Assumption Test

Before conducting further analysis to determine the effect of coal production, oil and gas production, and fuel consumption on the value of public assets in the energy sector, both partially and simultaneously, the following classical assumption test was conducted:

Normality Test

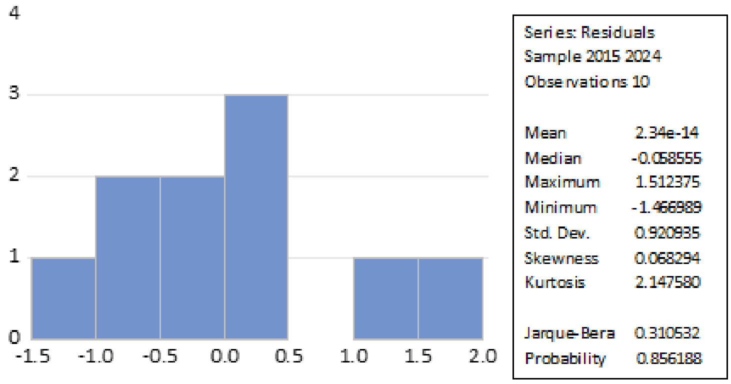

Figure 2

The probability value of the Jarque-Bera test is 0.856188 (approximately 0.8), as seen in the output above. Because this value is greater than the standard significance limit of 0.05, it can be concluded that the residual data is normally distributed. This means that the residuals in the regression model are normally distributed, thus fulfilling one of the requirements of the classical assumption test.

Multicollinearity Test

Variance Inflation Factors
Date: 11/21/25 Time: 12:11
Sample: 2015 2024
Included observations: 10

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	2.71E+10	785.1283	NA
X1	8.232659	96.80357	3.376134
X2	0.185735	667.3272	4.180196
X3	0.000780	98.63251	4.794510

Figure 3

Based on the multicollinearity test output in the Variance Inflation Factors (VIF) table, it can be seen that all independent variables used in this study, namely X1, X2, and X3, have Centered VIF values of 3.376134 for X1, 4.180196 for X2, and 4.794510 for X3, respectively. All VIF values are well below the general tolerance limit of 10, thus concluding that there are no symptoms of multicollinearity in the regression model.

Low VIF values indicate that the independent variables in the study are not strongly correlated with each other, thus not causing distortion in the estimation of the regression coefficients. Thus, the classical assumption of multicollinearity has been met, and the regression model used is deemed suitable for further analysis.

These results confirm that the relationships between the independent variables are normal and do not influence each other excessively, thus maintaining the accuracy and validity of the regression model.

Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.227890	Prob. F(3,6)	0.8738
Obs*R-squared	1.022895	Prob. Chi-Square(3)	0.7957
Scaled explained SS	0.211294	Prob. Chi-Square(3)	0.9757

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/21/25 Time: 12:04
Sample: 2015 2024
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.525951	13.61820	-0.112052	0.9144
X1	0.140154	0.782651	0.179076	0.8638
X2	-0.131548	0.709684	-0.185361	0.8591
X3	-4.52E-05	5.61E-05	-0.805457	0.4513

R-squared	0.102290	Mean dependent var	0.763309
Adjusted R-squared	-0.346566	S.D. dependent var	0.861927
S.E. of regression	1.000194	Akaike info criterion	3.127439
Sum squared resid	6.002326	Schwarz criterion	3.248473
Log likelihood	-11.63719	Hannan-Quinn criter.	2.994665
F-statistic	0.227890	Durbin-Watson stat	1.866150
Prob(F-statistic)	0.873799		

Figure 4

Based on the output above, the probability obs R-squared value is 0.7957 (>0.05), so it can be concluded that the heteroscedasticity test assumption has been met or the data has passed the heteroscedasticity test.

Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.399294	Prob. F(2,4)	0.3462
Obs*R-squared	4.116426	Prob. Chi-Square(2)	0.1277

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 11/21/25 Time: 11:56
Sample: 2015 2024
Included observations: 10
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.205508	21.38874	0.336883	0.7531
X1	-0.393927	1.214129	-0.324452	0.7619
X2	0.305533	1.055772	0.289393	0.7867
X3	-2.21E-05	6.16E-05	-0.357871	0.7385
RESID(-1)	0.484737	0.456775	1.061216	0.3484
RESID(-2)	-0.725315	0.576671	-1.257761	0.2769

R-squared	0.411643	Mean dependent var	2.34E-14
Adjusted R-squared	-0.323804	S.D. dependent var	0.920935
S.E. of regression	1.059597	Akaike info criterion	3.237364
Sum squared resid	4.490983	Schwarz criterion	3.418915
Log likelihood	-10.18682	Hannan-Quinn criter.	3.038202
F-statistic	0.559718	Durbin-Watson stat	2.016158
Prob(F-statistic)	0.731370		

Figure 5

Based on the output above, the Probability Obs*R-Squared value of 0.1277 is greater than 0.05. This indicates that the regression model does not experience autocorrelation issues. In other words, there is no significant relationship between the current residual value and the previous residual value. Therefore, it can be concluded that the model meets the assumptions of the autocorrelation test and is suitable for further analysis.

Multiple Linear Regression Test

Dependent Variable: Y
Method: Least Squares
Date: 11/21/25 Time: 11:53
Sample: 2015 2024
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	77.51772	15.35713	5.047670	0.0023
X1	0.042753	0.882589	0.048440	0.9629
X2	3.056065	0.800304	3.818629	0.0088
X3	-5.83E-05	6.33E-05	-0.920387	0.3929

R-squared	0.990604	Mean dependent var	101.0290
Adjusted R-squared	0.985906	S.D. dependent var	9.500862
S.E. of regression	1.127910	Akaike info criterion	3.367784
Sum squared resid	7.633086	Schwarz criterion	3.488818
Log likelihood	-12.83892	Hannan-Quinn criter.	3.235010
F-statistic	210.8621	Durbin-Watson stat	1.179903
Prob(F-statistic)	0.000002		

Figure 6

In the Eviews output results above, the following regression equation is obtained:

Y = 77.51772 + 0.042753 X1 + 3.056065 X2 – 5.83E-05 X3 + ε

Based on the regression results, a constant value of 77.51772 was obtained. This means that if variables X1 (Coal Production), X2 (Oil and Gas Production), and X3 (Fuel Consumption) remain unchanged or are zero, then the average value of public assets in the energy sector (Y) is estimated to be 77.51772 units.

Furthermore, the regression coefficient for variable X1 is 0.042753 and is positive. This means that for every 1 unit increase in Coal Production (X1), the value of public assets (Y) will increase by 0.042753 units, assuming variables X2 and X3 remain constant.

The regression coefficient for variable X2 is 3.056065 and is positive. This indicates that for every 1 unit increase in Oil and Gas Production (X2), the value of public assets (Y) will increase by 3.056065 units, assuming variables X1 and X3 remain constant.

Meanwhile, variable X3 has a negative regression coefficient of –5.83E-05. This means that every 1 unit increase in fuel consumption (X3) will actually decrease the value of public assets (Y) by 5.83E-05 units, assuming variables X1 and X2 remain constant.

Model Testing

Dependent Variable: Y
Method: Least Squares
Date: 11/21/25 Time: 11:53
Sample: 2015 2024
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	77.51772	15.35713	5.047670	0.0023
X1	0.042753	0.882589	0.048440	0.9629
X2	3.056065	0.800304	3.818629	0.0088
X3	-5.83E-05	6.33E-05	-0.920387	0.3929

R-squared	0.990604	Mean dependent var	101.0290
Adjusted R-squared	0.985906	S.D. dependent var	9.500862
S.E. of regression	1.127910	Akaike info criterion	3.367784
Sum squared resid	7.633086	Schwarz criterion	3.488818
Log likelihood	-12.83892	Hannan-Quinn criter.	3.235010
F-statistic	210.8621	Durbin-Watson stat	1.179903
Prob(F-statistic)	0.000002		

Figure 7

T-Test (Partial)

Based on the test results, variable X1 has a t-statistic value of 0.048440 and a significance value (Prob.) of 0.9629. Because this value is greater than 0.05, it can be concluded that X1 does not significantly influence variable Y.

Furthermore, variable X2 has a t-statistic value of 3.818629 with a significance value of 0.0088. Because this value is less than 0.05, it can be concluded that X2 significantly influences variable Y.

Meanwhile, variable X3 has a t-statistic value of -0.920387 with a significance value of 0.3929. Because the significance value is greater than 0.05, X3 does not significantly influence variable Y.

F Test (Simultaneous)

The test results show an F-statistic of 210.8621 with a probability value of 0.000002. Because this probability value is less than 0.05, it can be concluded that variables X1, X2, and X3 simultaneously have a significant effect on variable Y. This means that the regression model used is appropriate for explaining the relationship between these variables.

Determination Test

The Adjusted R Squared value obtained is 0.985906. This means that 98.59% of the variation or change in variable Y can be explained by variables X1, X2, and X3. The remaining 1.41% is explained by other factors outside the model or outside the variables examined in this study.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis, this study shows that coal production, oil and gas production, and fuel consumption have a significant relationship with the value of public assets in the energy sector in Indonesia. Partially, the oil and gas production variable (X2) significantly influences the value of public assets in the energy sector (Y). This indicates that increased oil and gas production directly contributes to strengthening the value of state assets in the energy sector. Conversely, the coal production variable (X1) and fuel consumption (X3) do not significantly influence the value of public assets, although the direction of their relationship remains theoretically relevant.

However, the simultaneous test results indicate that the three variables X1, X2, and X3 jointly significantly influence the value of public assets in the energy sector. This finding confirms that the value of public assets is influenced by a combination of energy production capacity and national energy consumption levels. Furthermore, the high Adjusted R-Squared value of 98.59% indicates that the regression model is capable of explaining most of the variation in the value of public assets in the energy sector, thus making the model highly representative.

Overall, this study concludes that energy production, particularly oil and gas production, is a major factor influencing the value of public assets in the energy sector in Indonesia. Although coal production and fuel consumption do not have a significant effect individually, both variables still contribute to the value of public assets when analyzed simultaneously. Therefore, energy sector management policies need to consider the balance between energy production capacity and national energy needs to ensure a sustainable increase in the value of public assets.

FURTHER STUDY

This research still has limitations, so it is necessary to conduct further research related to the topic of The Impact of Coal Production, Oil and Gas Production, and Fuel Consumption on the Value of Public Assets in the Energy Sector in order to perfect this research and increase insight for readers.

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