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Analysis of the Effect of International Prices, Production Volume, and the US Dollar Exchange Rate on Nickel Exports in East Luwu Regency

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ABSTRACT: East Luwu Regency is one of the potential areas in Indonesia whose main sector is nickel mining. Nickel is one of the raw materials for making electric vehicles that are needed in this world, especially for countries in Europe, especially with the green transformation through Net Zero Emissions in 2050. Indonesia as a country with the number one nickel production in the world restricts exports abroad by implementing a nickel ore export ban policy in order to maintain domestic nickel reserves and increase added value by refining nickel into semi-finished goods which will certainly provide benefits for exporting regions. This policy was implemented on January 1, 2020 passed Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia No. 11 of 2019 which turned out to have a positive impact on the value of nickel exports in Indonesia, especially in one of its nickel mining areas, namely East Luwu Regency. The purpose of this study is to identify and analyze the effect of international prices, production volume and the exchange rate of the United States dollar on nickel exports in East Luwu Regency. This study uses quantitative research methods using the help of SPSS 29 software. Based on the study results it has been obtained that: (1) International prices, production volume, and US dollar rate simultaneously affect the value of nickel exports in East Luwu Regency (2) International prices have a positive and partially significant effect on the value of nickel exports in East Luwu Regency (3) Production volume has a positive and partially significant effect on the value of nickel exports in East Luwu Regency (4) The U.S. dollar exchange rate has a negative and partially significant effect on the value of nickel exports in East Luwu Regency.

KEYWORDS: International price, volume of production, currency of the US Dollar, value of nickel exports

I. INTRODUCTIONS

Indonesia is a developing country with a superior geographical location, rich natural resources and experiencing a demographic bonus [18]. Demographic rewards are an opportunity for a country, in this case Indonesia, to achieve prosperity thanks to a large proportion of the productive population and there are several issues related to economic transformation in maximizing the potential of Indonesia's natural resources through increasing international competitiveness. International trade is one of the activities that occur due to the globalization process in the world. The existence of globalization will form a relationship of dependence and competition between countries in various ways, one of which is in the form of international trade. In the current era of modernization, several countries follow export-dependent development as a maneuver to drive economic stability. International trade can be the driving force of a country's economy if it is carried out efficiently and effectively, as well as knowing the opportunities that a country has [6]. Several factors promote international trade: differences in technology, differences in resources, imperfect competition in the domestic market, government policy, and demand-side differences, such as differences in tastes and preferences. difference in per capita income [7].

East Luwu Regency is one of the areas in South Sulawesi Province that has some very promising export development potential and certainly has benefits as a resource in economic development both at the local and provincial levels. This is supported by a government decree that still mentions development policies that are certainly geared towards the social aspects of society and the market in order to facilitate fair competition and ultimately encourage growth.

Nickel is the main export commodity of East Luwu Regency with the highest export value among other commodities. Nickel is a metal element that is formed naturally and is most often found in the earth's crust [20]. Nickel products are needed by many industries, such as stainless steel, batteries, metal alloys and metal plating. Stainless steel is used in various downstream industrial fields, ranging from household appliances, transportation, to construction. This causes 70% of the world's nickel to be dominated by nickel production for stainless steel needs [13].

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Indonesia is one of the countries rich in mineral resources such as nickel, bauxite, tin, gold, silver, copper and others, but these minerals have not been able to prosper the nation and cannot prosper the nation yet. country and country as authorized Under Section 33 of the 1945 Constitution, this is because these raw materials are mainly exported as (raw) ore with low selling value [14].

Data from the US Geological Survey (USGS) in 2021 states that Indonesia is the country with the largest nickel production in the world [1]. In 2021 alone, the production increased by 30 percent, which made Indonesia ranked first in terms of production [19]. Indonesia holds a strategic position in this nickel industry as the owner of largest nickel in the world resources so the nickel supply chain is likely to be significantly affected by Indonesia's policies [16]. Data from the Ministry of Energy and Mineral Resources has presented that Indonesia currently has nickel mines with an area of 520.87 thousand hectares spread across seven provinces consisting of Southeast Sulawesi, North Maluku, South Sulawesi, Central Sulawesi, Papua, West Papua and Maluku. Seven regions have nickel reserves of 11.7 billion tons with reserves of 4.5 billion tons, including low-grade nickel and high-grade nickel [11].

On January 1, 2020, the Indonesian government implemented a nickel ore export ban policy through Minister of Energy and Mineral Resources Regulation No. 11/2019 [9]. The existence of this policy has succeeded in significantly increasing the value of nickel exports by 17 trillion rupiah at the end of 2014 to 326 trillion rupiah in 2021, an increase of 19 times. This policy certainly has a positive impact on Indonesia's foreign exchange earnings and even provides great benefits to the economies of regions where nickel mines exist [8]. The existence of the ban policy, the demand for nickel commodities as raw materials for electric car batteries will continue to grow, one of which is in the European Continent, which is estimated that in 2030 the amount of demand will match the total world demand in 2021. This can be proven by the demand that increased by 170 percent in 2020. Moreover, with the target of green transformation through Net Zero Emissions by 2050 [10].

Export growth is certainly affected by the exchange rate in which a country will affect export growth. This means that the exchange rate also affects export growth in regions at the provincial or district level that carry out export activities. A stronger exchange rate will result in the number of exports of a country decreasing. This is because domestic goods or commodities can be said to be more expensive than foreign goods.

Table 1. Exchange Rate of Rupiah against US Dollar in 2018-2022

Year	US Dollar Rate
2018	14,481
2019	13,901
2020	14,105
2021	14,269
2022	15,731

Source: Ministry of Trade Republic of Indonesia, 2023

Based on the above data, it is known that the exchange rate of the rupiah against the United States dollar in the last 5 years has fluctuated. In 2020 to 2022, the exchange rate weakened by IDR 14,105 to IDR 15,731 per US dollar. This means that foreign currencies have strengthened which of course can have an effect on the high demand for exports of an exporting country or region. In addition to the rupiah exchange rate experiencing a weakening in that year, it turned out that in 2019 it strengthened with a value of IDR 13,901. In that year, the rupiah exchange rate against the United States dollar appreciated so that it could cause the export demand for a commodity to decline because the currency in the country was more expensive and proved that domestic goods could also be said to be more expensive than goods abroad.

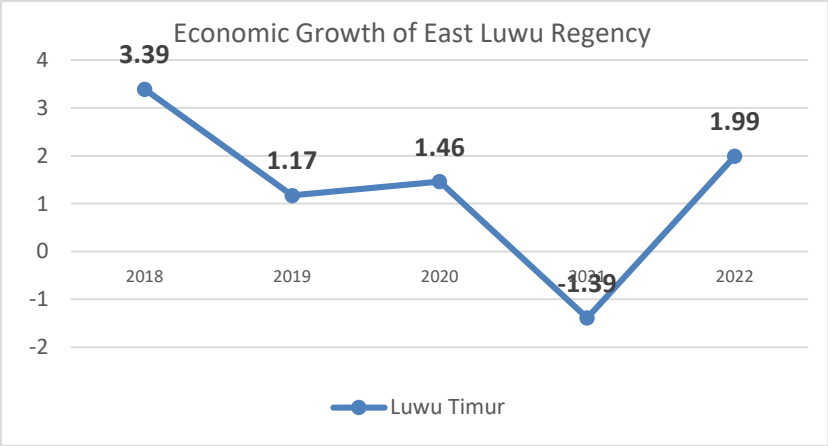

Figure 1. Economic Growth of East Luwu Regency in 2018-2022
Source: BPS East Luwu Regency, 2023

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Figure 1 above shows that the economic growth of East Luwu district has decreased in 2019 and 2021. The lowest level of economic growth occurred in 2021 because the COVID-19 pandemic had a negative impact, especially in the economy. The sluggish economic growth with a percentage value of -1.39 shows that several sectors have experienced setbacks due to the work from home policy and self-restriction in interaction which has an impact on the performance of several sectors. In 2022, it became a positive trend for the economic growth of East Luwu Regency as the first step for the local government to implement the national economic recovery program, of course providing clear evidence that economic growth increased again with a value of 1.99 percent. This increase in economic growth in 2022 shows that several sectors that previously experienced setbacks are now breaking through these obstacles with the help of effective policies from the government.

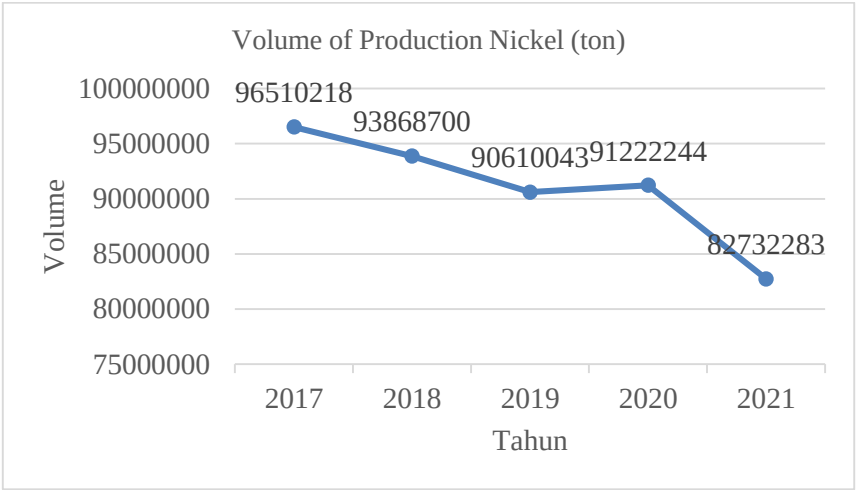

Figure 2. Volume of Production Nickel in 2017-2021
Source: BPS East Luwu Regency, 2023

Based on the graph above, the volume of nickel production from 2017 to 2021 has fluctuated. Figure 2 above shows that the highest nickel production volume of the last five years was in 2017 at 93,868,700 tons and the lowest was in 2021 with a volume of 82,732,283 tons. Although the volume of nickel production has decreased in 2021, when compared to the value of exports, of course, it still has a positive impact on the economy of East Luwu Regency because the policy of the Indonesian government regarding the ban on nickel ore exports has made the selling price of nickel ore abroad soar higher than the previous price. Currently, the price of nickel is 19,612.5 US dollars or around Rp 274.5 million per ton, while in 2017 the nickel price was still around 6,520 US dollars or around Rp 94.5 million per ton. The nickel price of the two different periods has a very far value, proving that nickel as the main export of East Luwu Regency is a potential in supporting the economy and development in the region and making an economic contribution to South Sulawesi Province and Indonesia. Here is the data for development of nickel export value in East Luwu Regency.

Table 2. Nickel Export Value of East Luwu Regency in 2018-2022

Year	Nickel Export Value of East Luwu Regency (US$ Million)
2018	776,90
2019	784,45
2020	764,41
2021	953,17
2022	1179,46

Source: BPS East Luwu District, 2023

The value of nickel exports has fluctuated over the last 5 years as shown in Table 2. The value of nickel exports turned out to make a major contribution to the economy of East Luwu Regency, which in 2021 to 2022 experienced an increase with a value of 953.17 million US dollars to 1179.46 million US dollars. In addition, 2020 was the lowest nickel export value in the last 5 years due to the obstruction of the production COVID-19 pandemic response, but still had a positive impact on the economic growth of East Luwu Regency. It is known that the contribution of the mining sector, namely nickel, to the economy of East Luwu Regency is 40 to 70

percent compared to the agricultural sector and other sectors. So it can be concluded that the mining sector is the main milestone of the economy in East Luwu Regency.

II. LITERATURE REVIEW

Based on the research conducted by [12] states that the nickel commodity export price variables have a positive effect on nickel export value, in which the price of each nickel item i ncreases by 1%, it will increase the value of nickel exports. In addition, research results from [15] indicate that global prices positively and significantly impact the export value of Indonesian tin.

The increasing production volume of a commodity will certainly affect its export value. The volume of nickel production has increased, of course, it will have an impact on increasing the export value of nickel because the availability of nickel has increased and the supply for nickel commodities at home or abroad has also increased. Based on research conducted by [17], it is stated that production has a positive and significant impact on Indonesia's nickel ore exports. Consequently, it can be inferred that the quantity of nickel production impacts the worth of nickel exports.

International trade is affected by exchange rates, which means that changes in exchange rates have an effect on the international trade exports of a product.In the exchange rate system, depreciation or appreciation of the currency value will result in changes to exports. If the exchange rate depreciates, it will cause exports to increase because the value of foreign currency increases in price and vice versa if the exchange rate appreciates. Research [21] states that Exchange rate variables have a significant impact on Indonesia's coal exports. In contrast to research conducted by [15] concluded that the exchange rate has no direct effect on the value of Indonesian tin exports. In other words, when the exchange rate increases, the value of tin exports does not increase.

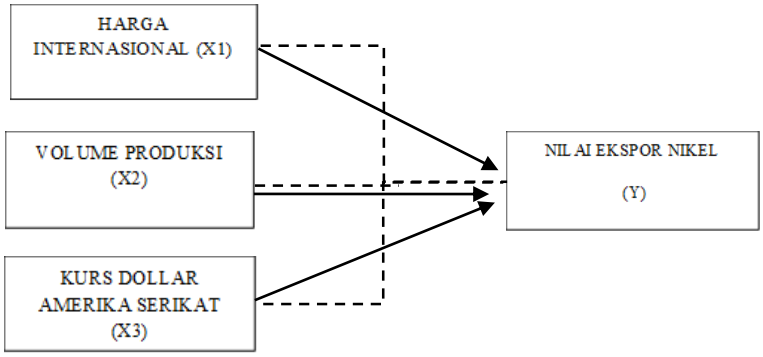

Figure 3. The Conceptual Framework

The following are hypothesized to occur:

H1. It is suspected that international prices have a positive effect on the value of nickel exports in East Luwu Regency.

H2. It is suspected that production volume has a positive effect on the nickel export value of East Luwu Regency.

H3. It is suspected that the US The exchange rate of the dollar has a positive effect on nickel export value of East Luwu Regency.

III. RESEARCH METHODS

This research design is organized based on the premise of this research on "Analysis of the Effect of International Prices, Production Volume and US Dollar Exchange Rate on Nickel Exports in East Luwu Regency" This research uses descriptive and quantitative analysis methods.

The scope of this research covers the East Luwu Regency area, Indonesia. The reason for choosing East Luwu Regency is because the mining sector in the form of nickel makes a major contribution to the region's economy of 40 to 70 percent compared to the contribution of other sectors.

The research objects used in this study are international prices, production volume and the exchange rate of the US dollar by looking at the nickel export value of East Luwu Regency.

The variables that will be used in this study are international prices, production volume, the US dollar exchange rate and the value of nickel exports in East Luwu Regency with quarterly data benchmarks from 2014-2022.

The data used in this study are from the Central Bureau of Statistics of East Luwu District, the Central Bureau of Statistics of South Sulawesi Province, the Ministry of Commerce of the Republic of Indonesia and Westmetall. The data collection method used was the non-participatory observation method. The data analysis technique used in this study is multiple regression analysis as an econometric tool to describe the characteristics of a sample or a location observed using the SPSS 29 application.

IV. RESULTS OF RESEARCH AND DISCUSSION

Table 3. Descriptive Statistical Test Results

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
International Price	36	8501	29029	14846.86	4972.970
Production Volume	36	12567	22661	18373.25	2427.777
Dollar Rate	36	11704	15670	13817.21	925.942
Nickel Export Value	36	108720000	336680000	210241111.11	57651302.489
Valid N (listwise)	36				

Source: data processed by SPSS 29, 2023

Table 3 shows that the international price variable (X1) with a total of 36 data has a minimum value of 8501, a maximum value of 29029, a mean value of 14846.86 and a standard deviation of 4972.970. Nickel production volume (X2) with a total of 36 data has a minimum value of 12567, a maximum value of 22661, a mean value of 18373 and a standard deviation value of 2427.777. The US dollar exchange rate (X3) with a total of 36 data has a minimum value of 11704, a maximum value of 15670, a mean value of 13817.21 and a standard deviation value of 925.942. The nickel export value of East Luwu Regency (Y) with a total of 36 data has a minimum value of 108720000, a maximum value of 336680000, a mean value of 210241111.11, and a standard deviation value of 57651302.489. This means that the mean value is greater than the standard deviation, which indicates that the data used is very diverse. This also means that the data used is a better representation of the overall data available.

Table 4. Multiple Linear Regression Test Results

Model		**Unstandardized Coefficients B**	**Std. Error**	**t**	**Sig**
1	(Constant)	-27590101.596	88503733.601	-.312	.757
	International Price	13340.132	828.877	16.094	<.001
	Volume Production	10421.635	1952.760	5.337	<.001
	Dollar Rate	-10979.581	4474.503	-2.454	.020

Source: data processed by SPSS 29, 2023

$$Y = -27590101.596 + 13340.132X1 + 10421.635X2 - 10979.581X3 + e$$

Table 4 provides an interpretation that:

It is known that the constant coefficient is negative at -27590101.596. This means that when the international price, production volume and US dollar exchange rate remain constant, the value of nickel exports in East Luwu Regency will decrease by 27590101.596.

It is known that the international price coefficient is positive at 13340.132. This means that when the international price increases, the nickel export value in East Luwu Regency will increase by 13340.132.

It is known that the Production Volume coefficient is positive by 10421.635. This means that when the Production Volume increases, the nickel export value in East Luwu Regency will increase by 10421.635.

It is known that the coefficient of the US dollar exchange rate is negative by -10979.581. This means that when the US dollar exchange rate increases, the nickel export value in East Luwu Regency will decrease by 10979.581.

Table 5. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		36
Normal Parameters[a,b]	Mean	.0000001
	Std. Deviation	18850865.26750878
Most Extreme Differences	Absolute	.130
	Positive	.130
	Negative	-.117

Test Statistic			.130
Asymp. Sig. (2-tailed)[c]			.130
Monte Carlo Sig. (2-tailed)[d]	Sig.		.123
	99% Confidence Interval	Lower Bound	.114
		Upper Bound	.131

Source: data processed by SPSS 29, 2023

From the data in Table 5 above, it can be seen that the value of Asymp.Sig. (2-tailed) is 0.130 significance at 0.05, means that the data is normally distributed. The value obtained is greater than 5 percent.

Table 6. Autocorrelation Test Results

Model Summary[b]					
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Durbin-Watson**
1	.945[a]	.893	.883	19714706.794	2.189

Source: data processed by SPSS 29, 2023

From table 6 it shows that the Durbin Watson value is (dw = 2.189). This "dw" value will be put aside with the "du" and "dl" values where the "du" and "dl" values with a sample size of 36 and the number of independent variables of 3 obtained table dl values are dl = 1.2953 and du = 1.6539. When juxtaposed, there is no correlation where du < dw < 4-du with the value obtained, namely, du (1.6539) < dw (2.189) < 4-du (2.3461). Thus, it can be concluded that there is no autocorrelation in the regression model between the independent variables of international price, production volume and US dollar exchange rate with the dependent variable of nickel export value of East Luwu Regency.

Table 7. Multicollinearity Test Results

Model		**Collinearity Statistics**	
		Tolerance	**VIF**
1	(Constant)		
	International Price	.654	1.530
	Volume Production	.494	2.024
	Dollar Rate	.647	1.546

Source: data processed by SPSS 29, 2023

Based on the data table 7 above, it can be seen that all the independent variables used are VIF value smaller than 10 and a tolerance of more than 10 percent. The international price (X1) stands at 1,530 and 0.654, the volume of nickel production (X2) stands at 2,024 and 0.494, and the exchange rate to the US dollar (X3) stands at 1.546 and 0.647, so it can be concluded concluded that the results of this study were correct. does not show multicollinearity between the independent variables and the model should satisfy the requirements of classical assumptions of regression analysis.

Table 8. Heteroscedasticity Test Results using Spearman's Rho

Correlations						
			Harga	**Volume Produksi**	**Kurs Dollar**	**Unstandardized Residual**
Spearman's rho	Harga Internasional	Correlation Coefficient	1.000	-.499**	.487**	.236
		Sig. (2-tailed)	.	.002	.003	.165
		N	36	36	36	36
	Volume Produksi	Correlation Coefficient	-.499**	1.000	-.665**	-.229
		Sig. (2-tailed)	.002	.	<.001	.178
		N	36	36	36	36
		Correlation Coefficient	.487**	-.665**	1.000	.319

Kurs	Sig. (2-tailed)	.003	<.001	.	.058
Dollar	N	36	36	36	36
Unstand	Correlation Coefficient	.236	-.229	.319	1.000
ardized	Sig. (2-tailed)	.165	.178	.058	.
Residual	N	36	36	36	36

Source: data processed by SPSS 29, 2023

In the above Table 8, it can be seen that all of the independent variables used in this study have a probability value that is greater than or equal to 0.05, namely international prices (X2) of 0.165, production volume (X3) of 0.178, and the US dollar exchange rate (X4) of 0.058. From these results, it can be concluded that there is no problem of heteroskedasticity in the data that is the subject of this study.

Table 9. Determination Coefficient Test Results

Model	R	R Square	Adjusted R Square	Std.Error of the Estimate	Durbin Watson
1	.945[a]	.893	.883	19714706.794	2.189

Source: data processed by SPSS 29, 2023

From the table of research results above, it shows that the Adjusted R2 value is 0.883. This means that 88.3% of the East Luwu Regency's nickel export value variable is significantly affected by the independent variables, i.e. international prices, production volumes and the US dollar exchange rate, had an impact of 11.7%, while the other variables did not. Part of this research model has an impact of 11.7%.

Table 10. F Test Results

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1038911145088736 80.000	3	3463037150295789 2.000	89.100	.001[b]
	Residual	1243742924668188 8.000	3 2	388669663958809.0 00		
	Total	1163285437555555 68.000	3 5			

Source: data processed by SPSS 29, 2023

Based on table 10 above, it is known that the Sig. F value in the table is 0.001. The significant value of F in the table is 0.001 < 0.05 and F-count > F-table (89.100 > 2.90) then as the basis for decision making in the F test it can be concluded that the international price variable, nickel production volume and the exchange rate of the United States dollar simultaneously have a joint effect on the value of nickel exports in East Luwu Regency.

Table 11. Results of the t-test

Model	t	Sig.
Constant	-.312	.757
International Price	16.094	.001
Volume Production	5.337	.001
Dollar Rate	-2.454	.020

Source: data processed by SPSS 29, 2023

From Table 11 above, it is known that:
The international price variable partially positively affects the value of nickel exports in East Luwu Regency. From the test results it is known that the significant value of the international price variable is 0.001, which is smaller than the real level of 5 percent or 0.05.

The nickel production volume variable has a partial positive effect the value of nickel exports in East Luwu Regency. The results of the SPSS 29 application test obtained a significance value of the nickel production volume variable of 0.001. This shows that the significance value of this independent variable is smaller than the real level of 5 percent or 0.05.
The U.S. dollar exchange rate variable has a partially negative and significant effect on the value of nickel exports in East Luwu Regency. This is expressed as a significance value of 0.020, which is 5% or 0.05 lower than the true level.

CONCLUSIONS

International prices, production volume and the U.S. dollar exchange rate have a significant effect simultaneously on the value of nickel exports in East Luwu Regency.
International prices have a positive and partially significant effect on the value of nickel exports in East Luwu Regency.
Production volume has a positive and partially significant effect on the nickel export value of East Luwu Regency.
The US dollar exchange rate has a negative and partially significant effect on the nickel export value of East Luwu Regency.
The international price of nickel has a significant and positive influence on the value of nickel exports in East Luwu Regency. Based on the results of the multiple linear analysis test, it shows that the regression coefficient of the international price variable is positive. It can be seen that t-count> t-table (16.094> 2.036), then H0 will be rejected and H1 will be accepted. This means that international prices partially have a positive and significant effect on the value of nickel exports in East Luwu Regency. Based on research conducted by [12] stated that the nickel commodity export price variable has a positive effect on the export value of nickel commodities. This is due to several factors such as nickel as the main raw material, plans to ban exports, and also scarcity. Research conducted by [15] shows that international prices have a positive and significant effect on the export value of Indonesian tin. Furthermore, the above research findings are also supported by research conducted by [5] which indicates that coal price has a significant effect on coal export value.
Nickel production volume has a significant and positive influence on the value of nickel exports in East Luwu Regency. Based on the results of multiple linear analysis tests, it shows that the regression coefficient of the nickel production volume variable is positive. The result of t-count> t-table (5.337> 2.036), then H0 is rejected and H1 is accepted. This means that the volume of nickel production has a positive and significant partial effect on the value of nickel exports in East Luwu Regency. When the volume of nickel production increases, the value of nickel exports will also increase and vice versa. An increase in production volume will also be able to meet the needs of many countries in terms of producing one of them is electric vehicles while still maintaining nickel reserves in the country for domestic needs as well. This is supported by research [2] which states that production has a positive and significant effect on Indonesia's crude oil exports. In addition, based on research conducted by [3] stated that the volume of production partially has a positive and significant effect on the value of Indonesian coal exports. The higher the production volume indicates that the coal supply carried out by the producer is also getting bigger. This research is also supported by [17] which concluded that production has a positive and significant effect on Indonesia's nickel ore exports.
The hypothesis states that the US dollar exchange rate has a positive effect on nickel exports in East Luwu Regency. However, the results of the multiple linear analysis test show that the regression coefficient of the United States dollar exchange rate variable is negative. Since the result of the number t is negative, a formula is constructed, namely -t-count < -t-table (-2,454 < -2.036), then H0 is rejected, meaning that the US dollar exchange rate negatively and significantly affects the value of nickel exports in the East Luwu regency. There is a negative relationship between exchange rates and exports where if the exchange rate of a country's currency appreciates, there will be an increase in imports and a decrease in exports made by a country. This happens because the price of goods or a commodity in the country tends to be expensive when compared to the price of similar goods or commodities abroad. In addition, the negative relationship between the US dollar exchange rate and the nickel export value of East Luwu Regency is also due to the value of the currency used, especially in countries that import the largest nickel from Indonesia, namely European countries that use the euro currency. Based on the study of [17] which asserts that the exchange rate of the US dollar has a negative and significant effect on the exports of nickel ore of Indonesia and is also supported by the study of [4] which asserts that significant negative impact of the US dollar. exchange rate for the value of Indonesia's non-oil and gas exports. Exchange rate fluctuations can affect product prices in foreign markets. When the rupiah strengthens, the price of products in foreign markets will increase. This will have an effect on the competitiveness of Indonesian export products or commodities decreasing. In addition, this statement is also in line with the results of research conducted by [2] which states that the US dollar exchange rate has a negative and significant effect on Indonesian crude oil exports.

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