



ANALYSIS OF INDONESIAN NATURAL RUBBER EXPORT DEVELOPMENT PERFORMANCE IN THE UNITED STATES MARKET

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Abstract

This research aims to determine the factors influencing Indonesian natural rubber exports to the United States. This research was conducted in March-May 2024. This quantitative research uses the 2 SLS (Two Stage Least Square) method with a simultaneous equation model. The data used is secondary data obtained from Trademap, the World Bank, and the Directorate General of Indonesian Plantations over 20 years (2001-2022). The results of the research show that in the equation for Indonesian natural rubber exports to the United States, the variables that have a significant influence are the variables namely Indonesian rubber prices, United States rubber prices, Indonesian rubber production, rubber production from competing countries, United States gross domestic product, export quota limitation policies, and United States inflation simultaneously has a significant influence on the variable of Indonesian rubber exports to the United States. In the Indonesian rubber price equation, the variables of world rubber prices, Indonesian rubber production, rubber prices of competing countries, demand for Indonesian rubber, total Indonesian exports, and export quota limitation policies simultaneously significantly affect the Indonesian rubber price variable. In the United States rubber price equation, world rubber prices, United States rubber substitute prices, and Indonesian rubber demand simultaneously significantly affect the United States rubber price variable.

Keywords : *Natural Rubber, Export, Rubber Price, Simultaneous Equation.*

1. INTRODUCTION

Natural rubber is Indonesia's export commodity with significant growth prospects. Rubber plants in Indonesia can thrive in almost all regions of Indonesia and produce high-quality yields (Muharami & Novianti, 2018). Indonesia currently ranks as the second leading global producer of natural rubber, behind Thailand. Furthermore, Indonesia has the largest natural rubber area of any nation. (Octaviani, 2018). Indonesia's potential land area and production align with the growing global demand for natural rubber (Zainuddin, 2020). In 2022, the global demand for natural rubber is projected to be 11.68 million tons, while the natural rubber-producing countries can only supply 10.18 million tons. Indonesia has the opportunity to expand the area of rubber production and increase rubber production to fulfil the world's natural rubber demand.

The development of Indonesia's natural rubber exports to the global market has yielded positive results. Indonesia has been regularly engaged in rubber export activities since 1970 to several countries worldwide. The volume of rubber exports from Indonesia has consistently increased, reaching 2.08 million tons of natural rubber exports in 2022 (Trade map, 2022). Indonesia's development strategy is to intensify and expand land to increase the volume of natural rubber exports. Land extensification is a strategy for expanding land to boost production output. From 1983 to 1996, Indonesia concentrated on expanding its naturally occurring rubber land, which covered 2.57 million to 3.51 million hectares. In addition, Indonesia implemented land intensification through replanting plants that had extended their productive period and using of superior seeds on newly developed land to boost productivity (Harahap & Segoro, 2018).

One of the top three countries globally in terms of natural rubber imports is the United States. The United States status as the leading importer of natural rubber globally can be caused by a rapid expansion of their industry. Natural rubber, which is the raw material for most industries in

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the United States, including the automotive, medical equipment, construction, manufacturing, and even the shipping industry, is also in increasing demand (Harahap & Segoro, 2018). The United States is Indonesia's largest importer of natural rubber. (Muharami & Novianti, 2018). Indonesia is the primary export destination for the United States due to the better quality of its natural rubber than rival nations such as Thailand and Malaysia. On global markets, Indonesian natural rubber is priced higher than other natural rubber exporting nations. In 2022, Indonesian natural rubber is projected to be priced at 1,739 USD per tonne. In contrast, its main competitors, Malaysia and Thailand, offer it for 1,552 USD per tonne and 1,683 USD per tonne, respectively (Trade map, 2022). However, even though Indonesian natural rubber has great potential in the form of large land areas and higher quality rubber compared to competing countries, in its development in the United States market, the export value of Indonesian natural fluctuates. Considering that natural rubber is one of the leading export commodities in Indonesia, natural rubber should show growth in export value and export volume.

2. IMPLEMENTATION METHOD

The research employs a quantitative data analysis approach, using secondary data from Trademap, the World Bank, and the Directorate General of Indonesian Plantations over 20 years (2001-2022). The data used are Indonesian natural rubber exports to the United States, Indonesian natural rubber prices, United States natural rubber prices, world natural rubber prices, competing countries natural rubber prices (Thailand), Indonesian natural rubber production, competing countries natural rubber production (Thailand), limitations on Indonesian natural rubber export quotas, demand for Indonesian natural rubber, total Indonesian natural rubber exports, United States gross domestic product (GDP), United States inflation, and prices of substitute goods for united states natural rubber.

The quantitative method in this research uses the 2 SLS (Two Stage Least Square) method approach with a simultaneous equation model. This approach offers a more comprehensive representation of the actual situation than a single equation model due to the interconnection of variables between equations and interacts with each other (Iswahyudi et al., 2019). In the simultaneous equation model, the object used is rubber. At the same time, the analysis results with quantitative methods are presented in tabulations and graphs and described descriptively based on theoretical purposes. Next, hypothesis testing is carried out on the expected value of each equation to clarify the connection between the variables and obtain information and meaning from the research problem. The formulation of the simultaneous equation model is as follows:

1. Exports of Indonesian Rubber to the United States

$$X_{US} = a_0 + a_1P_{ID} + a_2P_{US} + a_3Q_{ID} + a_4Q_C + a_5GDP_{US} + a_6PO + a_7IF_{US} + e \dots \dots \dots (1)$$

Keterangan :

- a_0 : Intercept
- $a_1 - a_7$: Regression coefficient
- X_{US} : Exports of Indonesian rubber to the United States (Tons/year)
- P_{ID} : Indonesian rubber prices (USD/ton)
- P_{US} : United States rubber prices (USD/ton)
- Q_{ID} : Indonesian rubber production (Tons/year)
- Q_C : Rubber Production of Competitor Countries (Tons/year)
- GDP_{US} : United States gross domestic product (USD/year)
- PO : Indonesian rubber export quota limit policy
- IF_{US} : United States inflation (%/year)
- e : error term

2. Indonesian Rubber Prices

$$P_{ID} = b_0 + b_1Q_{ID} + b_2P_W + b_3P_C + b_4D_{ID} + b_5X_{TOT} + b_6PO + e \dots \dots \dots (4)$$

Mean:



- b_0 : Intercept
- $b_1 - d_6$: Regression coefficient
- P_W : World rubber prices (USD/ton)
- Q_{ID} : Indonesian rubber production (Tons/year)
- P_C : Rubber prices in competitor countries (USD/ton)
- D_{ID} : Indonesian rubber demand (Tons/year)
- X_{TOT} : Total Indonesian natural rubber exports (Tons/year)
- PO : Indonesian rubber export quota limit policy
- e : error term

3. United States rubber prices

$$P_{US} = c_0 + c_1P_W + C_2PS_{US} + c_3D_{US} + e \dots \dots \dots (5)$$

Mean:

- c_0 : Intercept
- $c_1 - c_4$: Regression coefficient
- P_{US} : United States rubber prices (USD/ton)
- P_W : World rubber prices (USD/ton)
- PS_{US} : United States prices of rubber substitutes (Tons/year)
- D_{US} : United States rubber demand (Tons/year)
- e : error term

Identifying simultaneous equation models is possible by utilizing order conditions as adequacy conditions. Two conditions must be met for the structural equation in the model to be identifiable (Haryono & Wardoyo, 2012). namely:

- a. The ordering requirement is that to identify an equation, the combined value of the number of variables found in the model minus one and not in the equation but available in the other equations must be equal to the number of variables in the model. The order requirement can be stated as follows:

$$K - M > G - 1$$

Where :

$K-M = G-1$: correctly identified

$K-M > G-1$: overly identified

$K-M < G-1$: under identified

Where :

K : Total variables specified in the model, including intercept

M : Total variables of the identified equation

G : Total equations in the model

- b. The rank condition indicates that an equation is recognized within a model G of equations when it is possible to calculate at least one non-zero determinant of order $G-1$ from the coefficients of variables that are present in other equations but not in the equation itself.

Table 1 Order condition calculation results

Equations	K-M	< / = / >	G-1	Identified
X_{US}	14-8	>	3-1	Over identified
P_{ID}	14-7	>	3-1	Over identified
P_{US}	14-4	>	3-1	Over identified

An equation that is considered overidentified can be analyzed using method 2SLS. In this research, the model estimation method used is 2 SLS. The reason for choosing this method is that the application of 2 SLS yields more consistent, simpler, and easier forecasts compared to the 3

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SLS and FIML methods, which are more sensitive to measurement and model specification errors despite relying on more data (Gujarati, 1999).

3. RESULTS AND DISCUSSION**3.1 The growth of Exports of natural rubber from Indonesia to the United States****Tabel 2** The growth of Exports of natural rubber from Indonesia to the United States

No.	Year	Export Volume (tons)
1	2018	605,955
2	2019	578,573
3	2020	457,761
4	2021	534,763
5	2022	528,146

The volume of Indonesia's natural rubber exports to the United States has fluctuated. Natural rubber has a substitute product in the form of synthetic rubber, which tends to have a more stable price with almost similar quality. When the natural rubber price is usually lower than that of synthetic rubber unplanned increases, causing natural rubber to become more expensive than synthetic rubber, the demand for natural rubber will decrease because the natural rubber industry in the United States prefers to use synthetic rubber for production inputs (Widayanti, 2022). The US-China trade war, which started in the 4th quarter of 2017 until mid-2020, was also the cause of the decline in the exports natural rubber from Indonesia (Sadikin, 2023). This trade war started with the United States increasing import tariffs for China by 25 percent and then China responded by increasing import tariffs on United States products to 15 percent (Badiri, 2020). The short-term effects of the US-China trade war will reduce the volume and value of trade between the two countries and cause trade diversion in the two countries.

The US and China will shift export destination countries and import origin countries. In the medium to long term, the US-China trade war will hamper the rate of economic growth of the two countries, thereby reducing demand for imports, including imports of agricultural products from Indonesia. Rubber is a commodity that is seriously affected. Rubber is a raw material used to make vehicle tyres, which is China's leading export product to America. When tariffs on imports of vehicle tyres from China were implemented, consumers who previously used Chinese products switched to other products because of the increase in the price of vehicle tyres from China. The significant market reduction experienced by China forced them to reduce the number of products, which means they also reduced the number of raw materials imported to make vehicle tyres. On the other hand, the effect of this trade war on the United States has made the domestic market sluggish, marked by the decline in economic growth in the United States from 2018 to 2019. Consumer purchasing power is decreasing because per capita income is decreasing, and demand for industries that previously exported products to China is also decreasing. Some of these industries use natural rubber as raw material for natural rubber, such as aerospace, electronic components, medical equipment, and pharmaceutical industries. The decline in demand and production of products from these industries has also caused demand for natural rubber from Indonesia to the United States to decline (Sitorus, 2021).



3.2 Estimation of Model Equations

1. Indonesian rubber exports to the United States

Table 3 Estimated results of factors influencing Indonesian rubber exports to the United States

Equation			“R-sq”	F-Stat
Indonesian rubber exports to the United States (X_{US})			0.774	6.847
	Coef.	Std. err.	T-Ratio	P-Value
Constant	25.384	30.552	0.831	0.420
Indonesian rubber prices (P_{ID})	-713.109	578.947	3.232	0.038
United States rubber prices (P_{US})	1240.893	616.646	2.064	0.064
Indonesian rubber production (Q_{ID})	0.589	0.625	2.942	0.036
Rubber Production of Competitor Countries (Q_C)	0.404	0.717	2.56	0.582
United States gross domestic product (GDP_{US})	2.643	4.199	-0.629	0.539
Indonesian rubber export quota policy (PO)	0.006	0.88	-1.226	0.240
United States inflation (IF_{US})	-0.15	0.12	0.072	0.944

This equation is influenced by Indonesian rubber prices (P_{ID}), United States rubber prices (P_{US}), Indonesian rubber production (Q_{ID}), Rubber Production of Competitor Countries (Q_C), United States gross domestic product (GDP_{US}), Indonesian rubber export quota policy (PO) and United States inflation (IF_{US}). The R-square value is 0.774, these factors can explain Indonesian rubber exports to the United States (X_{US}) at 77.4%, while other variables outside the equation model explain the rest. Simultaneous test results at a 95% confidence level ($\alpha = 0.05$) obtained a value of $F_{test} = 6.847$ and $F_{table} = 2.62$ so that $F (test) > F (table)$. Which means Indonesian rubber price (P_{ID}), the United States rubber price (P_{US}), Indonesian rubber production (Q_{ID}), competing countries' rubber production (Q_C), United States gross domestic product (GDP_{US}), Indonesian rubber export quota policy (PO) and United States inflation (IF_{US}) simultaneously have a significant influence on the variable Indonesian rubber export to the United States (X_{US}).

Table 3 shows an equation for Exports of Indonesian rubber to the United States:

$$X_{US} = 25.384 - 713109 P_{ID} + 1,240.893 P_{US} + 0.589 Q_{ID} + 0.404 Q_C + 2.643GDP_{US} - 0.006 PO - 0.15 IF_{US} + e$$

The constant value in this equation is 25.384, which means that if all the variables in the Indonesian rubber export equation to the United States in a particular year are considered constant and without being influenced by other factors, it will increase Indonesian rubber natural exports to the United States (X_{US}) in Indonesia is 25,384 tons/year. Indonesian rubber prices (P_{ID}) possess a coefficient value of -713.109, which means that every time the price of Indonesian rubber increases by 1 USD, it will reduce Indonesian rubber exports to the United States by 713.109 tonnes/year. There is a negative relationship between Indonesian rubber prices and Indonesian rubber exports to the United States. When the price of Indonesian rubber increases, the exports of Indonesian rubber to the United States decrease. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.038, means that Indonesian rubber prices have a significant influence on Indonesian rubber export to the United States. United States rubber prices (P_{US}) have a coefficient value of 1,240.893, which means that every time United States rubber prices increase by 1 USD, Indonesian

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rubber exports to the United States increase by 1,240.893 tons/year. United States rubber prices directly positively correlate with the exports of Indonesian rubber to the United States, if United States rubber prices increase, Indonesian rubber exports to the United States will increase. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.064, means that United States rubber prices significantly influence on the Indonesian rubber export to the United States. Indonesian rubber production (Q_{ID}) has a coefficient value of 0.589, which means that every time Indonesian rubber production increases by 1 ton, Indonesian rubber exports to the United States increase by 0.589 tons/year.

Rubber production in Indonesia directly positively correlates with the exports of Indonesian rubber to the United States, if Indonesian rubber production increases, Indonesian rubber exports to the United States will increase. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.036, means that Indonesian rubber production has a significant influences on Indonesian rubber export to the United States. Competitor country rubber production (Q_C) has a coefficient value of 0.404, which means that for every additional 1 ton of rubber produced by a competitor country, Indonesia's exports to the United States will increase by 0.404 tonnes per year. Rubber production in competing countries has a positively correlates with the export of Indonesian rubber to the United States, if rubber production in competing countries increases, then Indonesian rubber exports to the United States will increase. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.582, means that competitor country rubber production does not have a significant influence on the Indonesian rubber export to the United States.

The United States Gross Domestic Product (GDP_{US}) has a coefficient value of 2.643, which means that every time the United States' GDP increases by 1 USD, it will increase Indonesian rubber exports to the United States by 2.643 tons/year. The GDP of the United States has a positive correlation with Indonesian rubber exports to the United States, if the GDP of the United States increases, then Indonesian rubber exports to the United States will increase. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.539, means that the United GDP do not has a significant influence on the Indonesian rubber export to the United States. Indonesian rubber export quota policy (PO) has a coefficient value of 0.06, after the policy of limiting export quotas, Indonesian rubber exports to the United States increased by 0.06 tonnes/year. Indonesian rubber export quota policy has a positive correlation with Indonesian rubber exports to the United States.

After the United States export quota limitation policy is implemented, Indonesian rubber exports to the United States will increase. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.240, means Indonesian rubber export quota policy does not have a significant influence on the Indonesian rubber export to the United States. United States inflation (IF_{US}) has a coefficient value of -0.15, which means that every time the United States inflation rises by 1%, Indonesian rubber exports to the United States will be reduced by 0.15 tonnes/year. United States inflation has a negative correlation with Indonesian rubber exports to the United States, if United States inflation increases, Indonesian rubber exports to the United States will decrease. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.944, means the United States inflation does not have a significant influence on the Indonesian rubber export to the United States.



2. Indonesian Rubber Prices

Tabel 4 Estimated results of factors influencing Indonesian rubber prices

Equation			“R-sq”	F-Stat
Indonesian Rubber Prices (P_{ID})			0.998	1410.501
	Coef.	Std. err.	T- Ratio	P-Value
Constant	0.271	0.337	0.805	0.433
World rubber prices (P_W)	0.155	0.058	2.654	0.018
Indonesian rubber production (Q_{ID})	-0.220	0.234	1.942	0.036
Rubber prices in competitor countries (P_C)	0.854	0.065	13.083	0.000
Indonesian rubber demand (D_{ID})	0.014	0.039	0.353	0.729
Total Indonesian natural rubber exports (X_{TOT})	-0.279	0.199	-1.403	0.181
Indonesian rubber export quota policy (PO)	-0.007	0.10	0.787	0.444

The Indonesian rubber price equation is influenced by world rubber prices (P_W), Indonesian rubber production (Q_{ID}), competing countries' rubber prices (P_C), Indonesian rubber demand (D_{ID}), total Indonesian exports (X_{TOT}), and Indonesian rubber export quota policy (PO). The R-square value is 0.998, which means that these factors can explain the price of Indonesian rubber (P_{ID}) by 99.8%, while other variables outside the model equation explain the rest. Simultaneous test results at a 95% confidence level ($\alpha = 0.05$) obtained a value of $F_{test} = 1410.501$ and $F_{table} = 2.51$ so that $F_{test} > F_{table}$, which mean world rubber prices (P_W), Indonesian rubber production (Q_{ID}), competing countries' rubber prices (P_C), Indonesian rubber demand (D_{ID}), total Indonesian exports (X_{TOT}), and Indonesian rubber export quota policy (PO) simultaneously have real effect on the Indonesian rubber price variable (P_{ID}).

Table 4 shows an equation for Indonesian rubber price:

$$P_{ID} = 0.271 + 0.220 Q_{ID} + 0.155 P_W + 0.854 P_C + 0.014 D_{ID} - 0.279 X_{TOT} - 0.007 PO + e$$

The constant value in the Indonesian rubber price equation is 0.271, which means that if all the variables in the Indonesian rubber price equation in a particular year are considered constant and without being influenced by other factors, the Indonesian rubber price (P_{ID}) will increase by 0.271 USD/ton. The world rubber price (P_W) has a coefficient value of 0.155, which means that every time the world rubber price increases by 1 USD, it will increase the price of Indonesian rubber by 0.155 USD/ton. World rubber prices have a positive correlation with Indonesian rubber prices. That is, if world rubber prices increase, then Indonesian rubber prices will also increase. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.018. This means that world rubber prices have a significant influence on Indonesian rubber prices.

Indonesian rubber production (Q_{ID}) has a coefficient value of -0.220, which means every time Indonesian rubber production increases by 1 ton, the price of Indonesian rubber will decrease by 0.220 USD/ton. Indonesian rubber production has a negative correlation with Indonesian rubber prices. That is, if Indonesian rubber production increases, the price of Indonesian rubber will decrease. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.036, means that Indonesian rubber production has a significant influences on the price of Indonesian rubber. Competitor country prices (P_C) have a coefficient value of 0.854, which means every time a competitor country's rubber price increases by 1 USD, the price of Indonesian rubber will increase by 0.854 USD/ton. The price of rubber in competing countries has a positively correlates with the price of Indonesian rubber.

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That is, if the price of rubber in competing countries increase, so will the Indonesian rubber price. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.000, means that the price of rubber in competing countries has a significant influences on the price of Indonesian rubber. Indonesian rubber demand (D_{ID}) has a coefficient value of 0.014, which means that every time Indonesian rubber demand increases by 1 ton, it will increase the price of Indonesian rubber by 0.014 USD/ton. Indonesian rubber demand directly positively correlates with the price of Indonesian rubber. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.729. This means that the demand for Indonesian rubber does not have a significantly influence on the Indonesian rubber price.

Total Indonesian rubber exports (X_{TOT}) have a coefficient value of -0.279, which means that every time Indonesian rubber production increases by 1 ton, the price of Indonesian rubber will decrease by 0.279 USD/ton. Total Indonesian rubber exports have a negative correlation with Indonesian rubber prices. That is, if total Indonesian rubber exports increase, the price of Indonesian rubber will decrease. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.181. This means that total Indonesian rubber exports do not have a significant influence on Indonesian rubber prices. Indonesian rubber export quota policy (PO) has a coefficient value of -0.007, which means that after the policy of restricting export quotas, the price of Indonesian rubber fell by 0.007 USD/ton. Indonesian rubber export quota policy has a negative correlation with Indonesian rubber price. After the policy of limiting export quotas, Indonesian rubber prices will decrease. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.444. This means that the Indonesian rubber export quota policy does not have a significant influence on Indonesian rubber prices.

3. United States rubber prices

Tabel 5 Estimated results of factors influencing United States rubber prices

Equation			“R-sq”	F-Stat
United States rubber prices (P_{US})			0.959	140.982
	Coef.	Std. err.	T-Ratio	P-Value
Constant	-			
World rubber prices (P_W)	0.636	1.125	-0.565	0.579
United States prices of rubber substitutes (PS_{US})	0.472	0.098	4.827	0.000
United States rubber demand (D_{US})	0.902	0.187	4.819	0.000
	0.109	0.172	-0.635	0.533

The United States rubber price equation is influenced by the world rubber price (P_W), the price of substitute goods for United States rubber (PS_{US}), and the demand for United States rubber (D_{US}). The R-square value is 0.959, which means that these factors can explain the United States rubber prices (P_{US}) by 95.9% while other variables outside the equation model explain the rest. Simultaneous test results at a 95% confidence level ($\alpha = 0.05$) obtained a value of $F_{count} = 140.982$ and $F_{table} = 3.40$ so that $F_{count} > F_{table}$, which mean that the World rubber prices (P_W), United States prices of rubber substitutes (PS_{US}), and the demand for Indonesian rubber (D_{US}) simultaneously have a significant influence on the variable United States rubber prices (P_{US}).

Table 5 shows an equation for United States rubber price:

$$P_{US} = -0.636 + 0.472 P_W + 0.902 PS_{US} + 0.109 D_{US} + e$$

The constant value in the United States rubber price equation is -0.636, which means that if all the variables in the United States rubber price equation in a particular year are considered constant and without being influenced by other factors, it will reduce the price of United States

rubber (P_{US}) by 0.636 USD. /ton. The world rubber price (P_W) has a coefficient value of 0.472, which means that every time the world rubber price increases by 1 USD, it will increase United States rubber prices by 0.472 USD/ton. World rubber prices have a positive correlation with United States rubber prices. If world rubber prices increase, so will the United States rubber prices. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.000. This means that world rubber prices significantly influence on United States rubber prices. United States prices of rubber substitutes (PS_{US}) have a coefficient value of 0.902, which means that every time the price of goods substituted for US rubber increases by 1 USD, it will increase the price of US rubber by 0.902 USD/ton. United States prices of rubber substitutes have a positive correlation with the United States rubber prices.

That is, if the price of substitute rubber in the United States increases, then the price of rubber in the United States also increases. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.000, means that the price of substitute goods for rubber in the United States has a significant influence on the price of rubber in the United States. The demand for United States rubber (D_{US}) has a coefficient value of 0.014, which means that every time the demand for United States rubber increases by 1 ton, it will increase the price of United States rubber by 0.014 USD/ton. The demand for United States rubber has a positive correlation with the price of United States rubber. That is, if the demand for United States rubber increases, the price of Indonesian rubber will increase. This happens because when demand rises and is not followed by an increase in supply, prices rise. The results of the t-test with a significance at $\alpha = 10\%$ showing the P value is 0.533. This means that the United States rubber prices do not have a significant influence on the United States rubber prices.

4. CONCLUSION

In the equation for export of Indonesian natural rubber to the United States, the variables Indonesian rubber prices, United States rubber prices, and Indonesian rubber production have a significant influence on Indonesian natural rubber exports to the United States. In contrast, the variables of competing countries' rubber production, United States gross domestic product, export quota limitation policy, and United States inflation do not have a significant influence on Indonesian natural rubber exports to the United States. In the Indonesian rubber price equation, the variables of world rubber prices, Indonesian rubber production, and rubber prices of competing countries have a significant influence on Indonesian rubber prices. In contrast, the variables of Indonesian rubber demand, total Indonesian rubber exports, and the United States export quota limitation policy do not have a significant effect on rubber prices. Indonesia. In the United States rubber price equation, the world rubber price variable and the United States price of rubber substitutes have a significant influence on the United States rubber price. In contrast, the United States rubber demand variable does not have a significant influence on the United States price.

5. SUGGESTION

1. To increase Indonesian natural rubber exports to the United States, the government needs to form a strategy to improve natural rubber production in Indonesia. The government needs to maintain the stability of domestic natural rubber prices to stimulate the growth of Indonesian natural rubber production, which will impact exports of Indonesian natural rubber to the United States.
2. The strategy to increase natural rubber production in Indonesia can be carried out by replanting rubber plantations and improving the quality of rubber cultivation through regular and balanced fertilization, selecting good clones to be used, and proper management and implementation of cultivation techniques, especially in the tapping process.
3. The stability of Indonesian rubber prices currently still depends on the rise and fall of world rubber prices, so efforts are needed so that Indonesian rubber commodities do not rely on the rise and fall of world natural rubber prices because Indonesia is one of the world's leading natural rubber producers.

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