



The Effect of Substitute Good Price on the Volume of Indonesian Refined Palm Oil (RPO) Exports to Pakistan 2014-2021

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Abstract. The aim of this research is to estimate the effect of the international price of soybean oil, as a substitute good for palm oil, including Refined Palm Oil (RPO) on the volume of the Indonesian RPO exports to Pakistan. Using monthly data from 2014 to 2021, the variables were analyzed with multiple linear regression and the Error Correction Model (ECM). The finding reveals that the international price of soybean oil has a positive and significant effect on the volume of Indonesian RPO exports only in the long run. The research also estimates the effect of the export price of RPO, the exchange rate (Rupiah to US dollar), and Pakistan inflation on the volume of Indonesian RPO exports to Pakistan. The result shows that the export price of RPO has a negative and significant effect on the volume of RPO exports in the long run and in the short run, the exchange rate and Pakistan inflation are statistically insignificant to affect the volume of Indonesian RPO exports. In conclusion, it is suggested that monitoring on the behavior of international prices of soybean oil, as a substitute good for palm oil, should be done on a regular basis; all palm oil stakeholders should collaborate effectively to ensure that the export price of Indonesian RPO remains competitive. The Government of Indonesia should consider to continue negotiating with the Government of Pakistan on the possibility of reducing palm oil import tariffs more than previously agreed in the scheme of the Indonesia-Pakistan Preferential Trade Agreement (IP-PTA) of 2012.

Keywords: RPO, Export, soybean oil, ECM, OLS

1. INTRODUCTION

Indonesia, as an agriculture country has several main commodities that have a competitive advantage in the international market, including palm oil. In 2022, palm oil contributed \$ 29.62 billion, or around 10.73%, to Indonesia's total non-oil and gas exports (BPS, 2022) and palm oil sectors employed 16 million workers (GAKPI, 2023) Indonesia and Malaysia are expected to dominate palm oil trade in the future by exporting more than 60% of total production to the global markets (OECD-FAO, 2021). Indonesia is exporting palm oil in the form of Crude Palm Oil (CPO) and its derivative products. One of the derivative products traded internationally and recorded in the Harmonized System is Refined Palm Oil (RPO) with HS Code 151190 and it will be the commodity analyzed in this study. RPO consists of several products, such as palm stearin (15119010), RDB palm oil (HS 15119090), palm *olein* (HS 15119030) and Others RPO products (HS 15119090). Palm *olein* mostly used for vanaspati/ghee, RBP palm oil is used for cooking oil in Pakistan (Firdaus et al. 2020).

There are several considerations for choosing Pakistan as the subject of this study. First, Pakistan is one of the main palm oil importers in the world, mainly in the type of RPO that is continuously importing by Pakistan from Indonesia (Chalil et al., 2018). Second, according to

the ITC Trade Map (2024) edible oil, mostly palm oil, is the main contributor (73.18%) to the trade balance of Indonesia and Pakistan. Third, Pakistan is a strategic destination with a fast-growing population and has strong potential as a gateway for accessing the Indonesian commodity market to its surrounding countries (Firdaus et al., 2022). Fourth, Indonesia has adopted a downstream policy on palm oil to improve the value added of CPO by producing several secondary and tertiary products and exporting them with higher value (Aulia et al., 2019). Fifth, Indonesia and Pakistan have applied a preferential trade agreement since 2013, and under the scheme, the import tariff on Indonesia's palm oil, including RPO, has been reduced by average 15% of the previous MFN tariff.

Indonesia and Malaysia are two main palm oil exporters in Pakistan. After the preferential tariff rate of Indonesia's palm oil applied since 2013, Indonesia has increased its market share of RPO from 73% in 2014 to 84% in 2021. Malaysia, on the other hand, decreased its market share of RPO from 27% in 2014 to 16% in 2021. In contrast, Malaysia maintains its dominance in the CPO market in Pakistan. Nevertheless, Malaysia decreased its market share from 94% in 2014 to 66% in 2020 with rather smaller tons. Indonesia's market share fluctuated with a range of 48% in 2018 and 5% in 2014, and none of Indonesia's CPO exported to Pakistan in 2016 and 2021 (UN Comtrade 2024). Malaysia still keeps exporting CPO to Pakistan to supply raw material for its CPO joint refinery industries in Pakistan (Ali A. et al., 2021).

Pakistan is deficient in edible oil production and one of the largest importers of edible oil in the world. It imports palm oil mostly from Indonesia and Malaysia, and imports soybean oil from other countries. Palm oil is Pakistan's largest food import as a consequence of Pakistan's increasing per capita consumption of edible oil and the inability to produce adequate quantities of edible oil domestically. To lessen the burden of the large amount of foreign exchange utilized for the edible oil imports, Pakistan has launched several enhancement programs for edible oil production, particularly those substitute commodities of palm oil domestically, and maintained 15 joint venture palm oil refineries in Pakistan. Pakistan still imports the soybean oil to meet its edible oil needs.

Previous studies on the effects of substitute good prices on the volume of palm oil exports are referred to. Abdullah A. (2011) found that the soybean oil price had a significant effect on estimated Indonesian palm oil exports in the Indian market. Zakaria et al. (2017) found that the demand for palm oil in China is very sensitive to the price discount of palm oil against the price of soybean oil. Rifin et al. (2021) found that soybean, rapeseed oil, and palm oil have a long run relationship or cointegrated. A shock in soybean price will have an immediate effect on the other two vegetable oils. Hariri et al. (2022) found that the effect of soybean oil price on the

export demand of Malaysian palm oil was positive and significant, implying that a 1% increase in the soybean oil price leads to an increase of 0,8% - 1,7% in the export demand for palm oil in 5 (five) main importer countries, including Pakistan, where the coefficients are in the long run (1,245) and in the short run (0,7172).

A few studies have been conducted on the Indonesian palm oil exports to Pakistan. Chalil et al. (2018) found that the volume of palm oil imports to Pakistan is significantly influenced by selling price, trade balance, and the price of soy bean oil. Selling price is the most influential factor. Girsang et al. (2018) found that partially, in the long term, the export demand of Indonesia's CPO is affected by the exchange rate Rupiah toward US\$ and by the international price of CPO in the short term. Yarasevika et al. (2022) found that in terms of the Islamic Organization Countries (IOC) RPO market, including Pakistan, real gross domestic product, export price of RPO, and local currency unit exchange rate are the most significant factors affecting the export demand of RPO in the IOC market.

Indonesia intends to keep the sustainability and growth of Indonesian RPO exports to Pakistan in the midst of international economic dynamics. Within such conditions, this research aims to estimate the effect the international price of soybean oil, as a substitute good for palm oil, and selected macroeconomic variables, such as the export price of RPO, the exchange rate, and Pakistan's inflation rate, on the volume of Indonesian RPO exports to Pakistan by using monthly time series data from 2014-2021 and analyzing with multiple linear regression and the Error Correction Model (ECM). This study aims further to analyze the effect of those factors on the volume of Indonesian RPO export to Pakistan, simultaneously and partially. Results of the study and analysis are expected to provide several policy and practical recommendations for Indonesian palm oil stakeholders.

2. RESEARCH METHODS

This study utilizes monthly time series data from the year 2014 until 2021. The data of export volume and value of RPO's Indonesia to Pakistan was derived from UN Comtrade, ITC Trade Map, and Central Bureau of Statistics/Biro Pusat Statistik (BPS) Indonesia. The exchange rate of Rupiah per USD obtained from Bank Indonesia and Ministry of Trade of Indonesia. The inflation rate of Pakistan was obtained from the Pakistan Bureau of Statistics and Trading Economics. Meanwhile, the international price of soybean was obtained from Federal Reserve Economics Data/FRED (<https://fred.stlouisfed.org/series/PSOYBUSDM>).

There are several steps taken to conduct some analysis in the research. The initial step is to conduct the unit root test or stationarity check on all variables in the model by using the

Augmented Dickey-Fuller (ADF) test. The advantage of the unit root test is that it can identify a better model and avoid spuriousness. After the unit root test, the analysis is proceeding into the long run estimation by using log linear form. The equation used to see the effect on the volume of Indonesian RPO exports to Pakistan in the long run by using the co-integration test is as follows:

$$\text{LnVRPO}_t = \beta_0 + \beta_1 \text{LnPRPO}_t + \beta_2 \text{LnER}_t + \beta_3 \text{Inf}_t + \beta_4 \text{LnHIMK}_t + e_t \dots\dots\dots(1)$$

Description:

LnVRPO = Export volume of RPO's Indonesia (natural log)

LnPRPO = Export price of RPO (natural log)

LnER = Exchange rate (natural log)

Inf = Pakistan inflation rate (%)

LnHIMK = soy bean world price (natural log)

β_0 = Intercept or Constanta

$\beta_1 - \beta_5$ = Slope

e_t = Error term period t

After the long run estimation is established, a co-integration test is performed to determine whether there is a balance between observed variables. The co-integration concept is related to the presence of long-term balance where the economic system is convergent all the time as intended by the theory. The method used in this study is the Engle-Granger method using the ADF method, which consists of two stages. The first stage is to regress the OLS (ordinary least square) equation and to find the residuals of the equation. The second stage is using the ADF test to test the residual of the equation.

If the variables are co-integrated, the residuals from the equilibrium regression can be used to estimate the ECM and to analyze the long run and short run effects of the variables, as well as to see the adjustment coefficient. The equation used to see the factors affecting the volume of Indonesian RPO exports to Pakistan in the short run is as follows:

$$\Delta \text{LnVRPO}_t = \beta_0 + \beta_1 \Delta \text{LnPRPO}_t + \beta_2 \Delta \text{LnER}_t + \beta_3 \Delta \text{Inf}_t + \beta_4 \Delta \text{LnHIMK}_t + \beta_5 \Delta \text{ECT}_{t-1} + e_t \dots\dots\dots(2)$$

Description:

$LnVRPO$ = Export volume of RPO's Indonesia (natural log)

$LnPRPO$ = Export price of RPO (natural log)

$LnER$ = Exchange rate (natural log)

Inf = Pakistan inflation rate (%)

$LnHIMK$ = soy bean world price (natural log)

β_0 = Intercept or Constanta

$\beta_1 - \beta_5$ = Slope

ECT_{t-1} = error correction term for one period from co-integration regression

e_t = Error term period t

After the ECM equation is established, parametric significances of long and short models by using the F test and t test are further conducted. In order to check the adequacy of the ECM model, it is necessary to carry out the classic assumption tests such as the normality test, the autocorrelation test, the multicollinearity test and the heteroscedasticity test.

Empirical Results

Unit Root Test

ADF-test was performed for testing the unit roots at level and first difference. ADF test results are presented in Tables 1 and 2.

Table 1. ADF test result at level

Variables	ADF-test	Mackinnon Critical Value 5%	Probability	Conclusion
LN RPO volume	-7.315091	-2.892200	0.0000	Stationary
LN Export price of RPO	-1.494962	-2.892200	0.5319	Nonstationary
LN Exchange rate	-2.209445	-2.892200	0.2044	Nonstationary
Inflation rate	-8.140165	-2.892200	0.0000	Stationary
LN the international price of soybean oil	-1.956524	-2.892200	0.3055	Nonstationary

Source: Secondary data analysis, 2024

Table 2. ADF test result at first difference

Variables	ADF-test	Mackinnon Critical Value 5%	Probability	Conclusion
LN RPO volume	-14.12028	-2.892200	0.0001	Stationary
LN Export price of RPO	-9.582106	-2.892200	0.0000	Stationary
LN Exchange rate	-11.11998	-2.892200	0.0000	Stationary
Inflation rate	-6.818571	-2.92200	0.0000	Stationary
LN the international price of soybean oil	-6.299659	-2.892200	0.0000	Stationary

Source: Secondary data analysis, 2024

The results of the unit root test showed that most variables have a unit root in their level form. In this case, the use of regression analysis using these variables in level form could lead to spurious regression. However, when the ADF test was conducted on the first difference of each variable, both dependent and independent, it was found that all of the series were all stationary. The stationary can be seen from the value of the ADF t-statistics being larger than the Mackinnon critical value at the 5% alpha, and also from the probability scores less than $\alpha = 5\%$, which proves that both variables are integrated of the same order. Therefore, the null hypothesis of non-stationary should be rejected at the 5% level of significance.

Based on the Engle-Granger method, the next step is to estimate the long run equilibrium relationship in levels by OLS and using the resulted residuals to test the hypothesis of co-integration by applying the ADF. In light of the first step, Table 3 shows the results of the long run estimation as follows:

Table 3. The Long-term Estimates

Variables	Coefficient	Std. Error	t-statistic	Prob.
C	0.779546	5.635105	0.138337	0.8903
LN Export price of RPO	-0.929570	0.189648	-4.901552	0.0000
LN Exchange Rate	1.105485	0.560490	1.972353	0.0516
Inflation Rate	-0.037756	0.046189	-0.817419	0.4158
LN Inter. Price of Soybean Oil	1.030087	0.207099	4.973875	0,0000
R-Squared	0.303916	Prob. (F-statistic)		0.000001
Adjusted R-Squared	0.273318	S.D dependent var		0.420525
F-Statistic	9.932818	Durbin Watson stat		1.322211

Source: Secondary data analysis, 2024

The results of long run estimation can be substituted to the equation (1) as follows:

$$\begin{aligned} \ln VRPO_t = & 0.779546 - 0.929570 \ln PRPO_t + 1.105485 \ln ER_t - 0.037756 \ln f_t + \\ & 1.030087 \ln HIMK_t + e_t \dots\dots\dots (3) \end{aligned}$$

The results in Table 3 indicate that the variables are co-integrated, and the OLS regression yields consistent estimators for the co-integrating parameters β_1 to β_5 . Based on Table 3 and equation (3), the following interpretations are presented. The value of the probability statistic (F-statistic) of the long-term equation is 0.00001 less than $\alpha = 0.0005$. The result implies that at least one of the independent variables has a significant effect on the volume of Indonesian RPO exports to Pakistan. The export price of RPO significantly affects the volume of Indonesian RPO exports, with a probability of $0.0000 < \alpha = 5\%$. The coefficient of the export price of RPO is negative (-0.929570) implying that, all else being equal, a 1% increase in the export price of RPO will result in a 0.9095% reduction in the volume of Indonesian RPO exports to Pakistan in the long run. Therefore, the null hypothesis that the export price of RPO does not have an effect on the volume of Indonesian RPO exports is rejected. The result is expected as stated in the hypothesis.

The coefficient for exchange rate is positive and for inflation is negative, as expected in the hypothesis. Nevertheless, the probabilities of the two variables are bigger than $\alpha = 0.0005$. Therefore, the null hypothesis that exchange rate and inflation do not have a significant effect on the volume of Indonesian RPO exports is accepted. The international price of soybean significantly affects the volume of Indonesian RPO exports with a probability of $0.0000 < \alpha = 5\%$. The coefficient of the international price of soybean oil is positive (1.0300870), implying that, all else being equal, a 1% increase in the international price of soybean oil, will result in a 1,0300% increase in the volume of Indonesian RPO exports to Pakistan in the long run. Therefore, the null hypothesis that the international price of soybean oil does not have an effect on the volume of Indonesian RPO exports is rejected. The result is expected as stated in the hypothesis. The coefficient for R-squared is 0.303916, implying that 30.39% variation of the value of volume of Indonesian RPO exports to Pakistan can be explained by the variation of the independent variables of this model. Where 69.61% remains is not explained in the estimated regression. The coefficient for probability of the F statistic is 0.0000, which implies that all independent variables simultaneously affect the dependent variable.

To determine if the variables are in fact co-integrated, denote the estimated residual of the long relationship from this equation by e_t . Thus e_t is the series of the estimated residuals at the long run relationship. If these deviations from long-run equilibrium are found to be stationary, then dependent variables and independent variables are co-integrated (Asteriou and Hall, 2011).

Table 4. Engle-Granger Test Result

Variable	Critical Value of McKinnon			ADF Score	Probability	Remark
	1%	5%	10%			
ECT	-3.5006	-2.8922	-2.5832	-9.2245	0.0000	Stationary

Source: Secondary data analysis, 2024

Based on the Engle-Granger test results using the ADF model in Table 4, the probability value of the ECT (Error Correction Term) = 0.0000 is lower than 0.0005 and the ADF score is bigger than the critical value of McKinnon ($-9.2245 > -2.8922$) at the 5% significant level, proving that the ECT variable is stationary at the level. The results indicate that the export price of RPO, exchange rate, inflation rate, and international price of soy bean oil and volume of Indonesian RPO exports are co-integrated. It also indicates that there is an equilibrium relationship between dependent variable and independent variables in the long run. Therefore, the null hypothesis of not being co-integrated between dependent variable and independent variables is rejected at the 5% level of significant.

If the variables are co-integrated, the residuals from the equilibrium regression can be used to estimate the ECM and to analyze the long-run and short-run effects of the variables as well as to see the adjustment coefficient (Asteriou and Hall, 2011). The short-run equation was formed by regressing the first difference of the dependent variable and the first difference of the independent variables and the lagged residual terms of the long-run relationship, or ECT.

Tabel 5. Estimation ECM

Variables	Coefficient	Std. Error	t-statistic	Prob.
C	0.023336	0.030685	0.760522	0.4490
LN Export price of RPO	-0.728944	0.237930	-3.063692	0.0029
LN Exchange Rate	-0.041289	1.246082	-0.033135	0.9736
Inflation Rate	-0.056759	0.029607	-1.917113	0.0584
LN Inter. Price of Soybean oil	0.298248	0.664254	0.448996	0.6545
ECT(-1)	-0.799935	0.090336	-8.855097	0.0000
R-Squared	0.529643	Prob (F-statistic)		0.00000
Adjusted R-Squared	0.503219	S.D. dependent var		0.421039
F-Statistic	20.04363	Durbin Watson stat		2.228092

Source: Secondary data analysis, 2024

The results of the short-run estimation can be substituted into the equation of (2) as follows

$$\Delta \text{LnVRPO}_t = 0,02336 - 0,728944 \Delta \text{LnPRPO}_t - 0,041289 \Delta \text{LnER}_t - 0,056759 \Delta \text{LnInf}_t + 0,2982248 \Delta \text{LnHIMK}_t - 0,799935 \Delta \text{ECT}_{t-1} + e_t \dots (4)$$

Based on Table 5 and equation (4), the following interpretations are presented. The value of the probability statistic (F-statistic) of the short-term equation is 0.0001 less than $\alpha = 0.0005$. The result implies that at least one of the independent variables significantly influences the volume of Indonesian RPO exports to Pakistan in the short run. The export price of RPO significantly affects the volume of Indonesian RPO exports with a probability of $0.0029 < \alpha = 5\%$. The coefficient of the export price of RPO is negative (-0.728944) implying that, all else being equal, a 1% increase in the export price of RPO will result in a 0.728944% reduction in the volume of Indonesian RPO exports to Pakistan in the short run. Therefore, the null hypothesis that the export price of RPO does not have an effect on the export volume of RPO is rejected. The result is expected as stated in the hypothesis. The coefficient for exchange rate is negative, which is not expected in the hypothesis. Meanwhile, the coefficient for inflation is negative, as expected in the hypothesis. Nevertheless, the probabilities of the two variables higher than $\alpha = 0.0005$. Therefore, the null hypothesis that exchange rate and inflation do not significantly affect the volume of Indonesian RPO exports is accepted.

The international price of soybean oil does not significantly affect the volume of Indonesian RPO exports with a probability of $0.6545 > \alpha = 5\%$. The coefficient of the international price of soybean oil is positive (0.298248) implying that, all else being equal, a 1% increase in the international price of soybean oil, will result in a 0,298248% increase in the volume of Indonesian RPO export to Pakistan in the short run. Therefore, the null hypothesis that the international price of soybean oil does not affect the volume of Indonesian RPO exports is accepted in the short run. The coefficient for R-squared is 0.529643, which implies that 52.96% of the variation of the volume of Indonesian RPO exports to Pakistan was explained by the variation of the independent variables of this model, whereas 47.04% remains, and is not explained in the estimated regression.

The coefficient for probability of the F statistic is 0.00000, which implies that all independent variables simultaneously affect the dependent variable. In the short-run, the Error Correction Term (ECT-1) coefficient is -0.799935, which is negative and significant at the 5% significant level, indicating that the ECM model is valid. It also indicates that dependent variable and independent variables will converge towards the long-run equilibrium. The ECT coefficient -0.799935, or nearly 80% difference between the long-run model and the short run

model, will be corrected in 24 (twenty-four) days, which is 80% x 30 days, since the observation data is in a monthly base.

In order to show the adequacy of the ECM model, some important diagnostic tests are applied, such as normality tests, autocorrelation tests, multicollinearity tests, and heteroscedasticity tests. The result is summarized in Table 6.

Table 6. Classical Assumption Test

Assumption	Diagnostic Test	p-value	Remarks	Conclusion
Normality	Jarque-Bera	0.2116	Insignificant to reject Ho	Fulfil
Autocorrelation	Breusch-Godfrey	0.0515	Insignificant to reject Ho	Fulfil
Homoscedasticity	Breusch-Pagan	0.2073	Insignificant to reject Ho	Fulfil
Multicollinearity	Variance Inflation Factor	VIP <10	Fulfil	Fulfil

Source: Secondary data analysis, 2024

Based on Table 6, at the 5% significant level, the classical test of OLS used to design the short-run equation of the ECM model has been fulfilled. The normality test is applied and shows insignificant to reject the null hypothesis that the residuals are normally distributed. Meanwhile, the autocorrelation test is applied and also shows insignificant to reject the null hypothesis that residuals are serially correlated. In addition, the variance of the residual is homoscedasticity and constant because the Breusch-Pagan test failed to reject the null hypothesis. In the following Table 7, the result of Variance Inflation Factor shows that all independent variables in the short run model have the value of Variance Inflation Factor less than 10. In this case, the assumption of no multicollinearity is fulfilled. Therefore, the ECM model can be used to estimate the regression coefficient of every variable in the short run equation.

Table 7. Multicollinearity Test

Variables	Coefficient Variables	Uncentered VIF	Centered VIF
D (LN Export price of RPO)	0,056611	1,091629	1,090433
D (LN Exchange Rate)	1,552720	1,158588	1,154156
D (Inflation Rate)	0,000877	1,035053	1,035026
D(LN Inter. Price of Soybean oil)	0,441234	1,219824	1,212195

Source: Secondary data analysis, 2024

Since the ECT model is valid, it can be further used to analyze the long run and short run relationship by testing simultaneously and partially the influence of independent variables on the dependent variable. Next, the analysis can be done to determine the value of the model of the long run and the short run equations.

F test is used to determine the influence simultaneously of independent variables such as the export price of RPO, exchange rate, inflation, and international price of soybean on the volume of Indonesian RPO exports. The test is also used as a feasibility test of the regression model used in this study. The result of the F-test in the long-run and the short-run is as follows:

Table 8 The result of F-Test

Relations	Prob. F-statistic	Alpha	F Count	F table	Conclusion
Long-run	0.00000	0.05	9.932818	2.47	Ho rejected
Short-run	0.00001	0.05	20.04363	2.47	Ho rejected

Source: Secondary data analysis, 2024

Table 8 shows that in the long run, the value of F count is 9.932818 which is bigger than F table = 2.47 on F statistic 0.0000 which is smaller than 0.005, indicating that simultaneously, the independent variables significantly affect the dependent variable. In the short-run, the value of F count is 20.04363 bigger than F table = 2.47 on F- statistic 0.0001, which is less than 0.005, indicating that simultaneously the independent variables significantly affect the dependent variable.

A t-test is used to determine the influence of the independent variables partially on the dependent variable. The result of the t-test in the long run and the short run can be summarized in the following Table 9.

Table 9. The result of t-test

Relations/ Variables	Coefficient	t-count	Probability	Conclusion
Long-run				
LN Export price of RPO	-0.929570	-4.901552	0.0000	Significant
LN Exchange Rate	1.105485	1.972353	0.0516	Not significant
Inflation Rate	-0.037756	-0.817419	0.4158	Not significant
LN Inter. Price of Soybean oil	1.030087	4.973875	0,0000	Significant
Short-run				
LN Export price of RPO	-0.728944	-3.063692	0.0029	Significant
LN Exchange Rate	-0.041289	-0.033135	0.9736	Not significant
Inflation Rate	-0.056759	-1.917113	0.0584	Not significant
LN Inter. Price of Soybean oil	0.298248	0.448996	0.6545	Not significant

Source: Secondary data analysis, 2024

3. DISCUSSION

The Effect of International Price of Soybean Oil on the Volume of Indonesian RPO Exports to Pakistan

The international price of soybean oil shows a positive and significant effect on the volume of Indonesian RPO exports to Pakistan in the long run. The coefficient of the international price of soybean oil is positive (1.0300) implying that, all else being equal, a 1% increase in the international price of soybean oil, will result in a 1,0300% increase in the volume of Indonesian RPO exports to Pakistan in the long run. This supports the finding of Abdullah A., (2011) who found that that the soybean oil price had a significant effect on estimated Indonesian palm oil export in the Indian market in the long run. Hariri et al. (2022) also found that the effect of soybean oil price on the export demand of Malaysia palm oil was positive and significant, implying that a 1% increase in the soybean oil price leads to an increase of 0,8% - 1,7% in the export demand for palm oil by 5 (five) main importer countries, including Pakistan, where the coefficients are 1,245 in the long run and 0,7172 in the short run. All those findings imply that the coefficient in the long run is larger than the coefficient in the short run. Nevertheless, in the short run, the international price of soybean shows an insignificant effect in this research. The result of the long-term relationship of substitution goods is, by economic theory, in the form of a positive relationship.

Products with close substitutes tend to have more elastic demand. A fall in price leads consumers to buy more of the product and less of the substitutes, and a rise in price leads consumers to buy less of the product and more of the substitutes (Lipsey 2008). IPOSS (2024) described that the fluctuation of palm oil prices is associated with the influence of other edible oil prices. The coefficient of the said association is 0,95 between palm oil and soybean oil. In Pakistan, crushing industries use the soybean for soybean meal and soybean oil for food and soft cooking oil (Monitor Paspi, 2019). The previous empirical research (Chalil et al., 2018) confirmed also that the volume of palm oil imports by Pakistan influenced by the price of soybean oil. Nevertheless, Girsang et al. (2018) found that in the short run, the coefficient of price of soybean oil was positive but insignificantly influenced the Indonesian CPO. Zainuddin (2022), however, found that the coefficient of price of soybean oil was negative and significantly influenced the export volume of Indonesia RPO to India.

The international price of international soybean oil per ton was indeed higher than the average maximum export price of Indonesian RPO per ton in US dollars during the observation months from 2014 to 2021 as the following descriptive statistics shows in Table 10.

Table 10. The Price Comparison of Export Price RPO and International Price of Soybean Oil

Variables	N	Mean	Minimum	Maximum	Std. Deviation
Export Price of RPO to Pakistan	96	747,44	369,43	1.236,27	184,43
International Price of Soybean Oil	96	776,59	577,67	1.475,15	210,88

Source: Secondary data analysis, 2024

Pakistan still imports the soybean oil to meet its edible oil needs. The imports of soybean and rapeseed oil are 2,6 million and 0,8 million tons, respectively, during 2021-2022. Pakistan current edible oil requirement is about over 4,7 million tons and is expected to be at 5,9 million tons in 2025-2026. Pakistan produced only 8% of the total edible oil requirement and the rest 92% in 2020-2021. (Abedullah et al. (2024).

It is also significant to note the relationship between the export price elasticities and coefficients of the international price of soybean oil. The coefficient of export price of RPO can also be implied as the elasticity of the export price of RPO that in the long run (0,9295) is larger than in the short run, (0,7289). Theoretically, the commodities that has inelastic price elasticity imply that the percentage of price change is larger than percentage of demand change. It could indicate that the consumers of Pakistan are not easy to find the substitute good as an alternative for palm oil. Abdullah A. (2011) said that the inelastic price elasticity of palm oil suggested that the choice of other products to be used as substitute goods for Indonesian palm oil, are not in numerous numbers. Meanwhile, the international price of soybean oil shows a significant effect on the volume of RPO in the long run, but is insignificant in the short run. This implies that when the export price of Indonesian RPO to Pakistan increases in the short run, consumers in Pakistan will not be easy to switch from consuming Indonesian RPO to available substitute goods, such as soybean oil. This finding supports the result of an estimation by Abdullah A. (2011) on exports demand of Indonesian palm oil in the Indian market. Nevertheless, monitoring on a regular basis of the behavior of the international price of soybean is advised, as Rifin (2021) concluded his analysis by advising palm oil and rapeseed oil producing countries must be aware of the change in price of soybean oil, which will directly affect both palm oil and rapeseed oil prices in the first month and still for the several months to come.

The Effect of Export Price of RPO on the Volume of Indonesian RPO Exports to Pakistan

The export price of RPO significantly affects the volume of Indonesian RPO exports, with probability of $0.0000 < \alpha = 5\%$. The coefficient of the export price of RPO is negative (-0.929570) implying that, all else being equal, a 1% increase in the export price of RPO will result in a 0.9095% reduction in volume of Indonesian RPO exports to Pakistan in the long run. The export price of RPO significantly affects the volume of Indonesian RPO exports with a probability of $0.0029 < \alpha = 5\%$. The coefficient of the export price of RPO is negative (-0.728944) implying that, all else being equal, a 1% increase in the export price of RPO will result in a 0.728944% reduction in the volume of Indonesian RPO exports to Pakistan in the short run. The result of the long-term relationship is, by demand theory, in the form of a negative relationship. A rise in the price of a product (with all other determinants of demand held constant) leads each consumer to reduce the quantity demanded of the product (Lipsey, 2001). In addition, Mankiw (2012) stated that other things being equal, when the price of a good rises, the quantity demanded of the good falls, and when the price falls, the quantity demanded rises. Previous researchers also found a negative relationship between price and palm oil relating to the demand of Indonesian palm oil by Pakistan. The volume of palm oil imports to Pakistan is significantly influenced by the selling price, trade balance, and the price of soy beans. Selling price is the most influencing factor (Chalil et al., 2018). In the market of Islamic Organization Countries (IOC) members, including Pakistan, the export price of RPO significantly influences the volume of export with the coefficient value of -0.30 (Yarasevika et al., 2022). The coefficient of the Indonesian CPO price to Pakistan is -0.0273, and it significantly affects the demand for CPO in the short run. Nevertheless, in the long run, the price of CPO insignificantly affects the demand for the CPO (Girsang et al., 2018). Nambiappan et al. (2019) also found the significant role of price in affecting Malaysian palm oil export demand by Pakistan. The coefficients of palm oil price both in the long run and the short run are -0,4450 and -0,5000, respectively.

The Effect of Exchange Rate on the Volume of Indonesian RPO Exports to Pakistan

The exchange rate of Rupiah is statistically insignificant to affect the volume of Indonesian RPO exports, despite a positive coefficient in the long run (1,1054) as expected in the hypothesis. Nevertheless, the coefficient of the exchange rate is negative in the short run (-0,00412). The negative effect was not expected as stated in the hypothesis. Referring to the research findings by Prasetyo et al. (2017), Brun et al. (2022) and Omer et al. (2023), there are several factors that could cause that the exchange rate of Rupiah is statistically insignificant to

affect the volume of Indonesian RPO export despite a positive coefficient. It takes the time to produce palm oil, including RPO, so as not to immediately respond by increasing the volume of exports. The volume of exports and imports could not change immediately after the change of exchange rate, in this case Rupiah depreciation, because the price of palm oil is mostly based on a predetermined contract. The importers were unaware of price changes related to the Indonesian rupiah depreciation, so there was a lag between decision making and RPO orders from Pakistan. The depreciation could increase inflation when the prices of goods and services produced overseas rise relative to those produced domestically, and Indonesian palm oil firms that rely on imported materials in their production process, pay more to buy these inputs. One of the reasons for the insignificant and negative coefficient of exchange rate in the short run could be the increasing use of palm oil for domestic consumption, including its use in the biofuel industry for B30 and B50. Since 2011, the Indonesian government has launched the biodiesel program by using palm oil as a raw material to achieve an alternative renewable energy source and to reduce the dependence on petroleum. Accordingly, the government and palm oil industries reduced the export of palm oil for domestic consumption. At the same time, the export price of palm oil was also stabilized. (IPOOS, 2024:81).

The Effect of Pakistan Inflation on the Volume of Indonesian RPO Exports to Pakistan

The inflation rate of Pakistan does not significantly affect the volume of Indonesian RPO in the long run and in the short-run. Similar results were also found by Girsang et al. (2018) which show that the inflation rate of Pakistan does not have a significant effect on CPO demand. Some evidence could support these results. The price elasticity of palm oil demand in Pakistan is inelastic, as indicated by the coefficient value of the export price of RPO = 0.9295 in the long run and 0.7289 in the short run. This coefficient also implies that in the event of an increase in the export price of RPO, in the short-run, Pakistani consumers face difficulties in switching from consuming Indonesian RPO for substitutions such as soybean oil. In addition, the consistency attempt by the Government of Pakistan to improve their trade balance with various interventions such as the Indonesia-Pakistan Preference Trade Agreement (IP-PTA), through which the import tariff of Indonesian palm oil, has been reduced by 15% on average of the previous MFN tariff. The reduction of the import tariff on the palm oil products of Indonesia, including the RPO, which effectively applied in 2013, at the end decreases the palm oil price in Pakistan's local market and increases the volume of palm oil imports. The empirical research on the impact of trade liberalization, including the reduction of the import tariff, on the welfare of the household importer countries estimated that the reduction of the import tariff

has impacted decreased inflation and increased the welfare of the household importer countries (Kwak et al., 2020; Arinze, 2023; Khan, 2005).

4. CONCLUSION AND RECOMMENDATION

This research shows that the international price of soybean oil and selected macroeconomic variables such as the export price of RPO, the exchange rate and the inflation rate of Pakistan, simultaneously have significant effect on the volume of Indonesian RPO exports to Pakistan from 2014 to 2021, both in the long run and short run. The ECM analysis shows that the negative and significant error correction coefficient signify that there is a long run or equilibrium relationship between the volume of Indonesian RPO exports and its affecting factors. Nevertheless, the result of the t-test shows that partially, the international price of soybean oil shows a positive and significant effect on the volume of Indonesian RPO exports in the long run, but it is insignificant in the short run. The export price of Indonesian RPO has a negative and significant effect on the volume of Indonesian RPO exports to Pakistan in the long run and in the short run. The coefficients of the export price are also regarded as the export price elasticities of RPO, which tend to be inelastic in the long run (0,9295) and in the short run (0,7289). The relationship between the export price elasticities of RPO which are larger in the long run than in the short run, and the international price of soybean significance only in the long run, suggests that when the export price of Indonesian RPO to Pakistan increases in the short run, consumers in Pakistan will not be easy to switch from consuming Indonesian RPO to available substitute good, such as soybean oil. Nevertheless, based on the findings, it is suggested that monitoring on the behaviour of international prices of soybean oil, as a substitute good for palm oil, should be done on a regular basis on the estimation that the change in price of soybean oil will directly affect palm oil price, including RPO. In this regard, the role of the export price of RPO is significant, thereby all Indonesian palm oil stakeholders should collaborate effectively to ensure that the export price of Indonesian RPO remains competitive. On the ground of bilateral economic benefit, the Government of Indonesia is suggested to continue negotiating with the Government of Pakistan on the possibility of reducing palm oil import tariffs more than previously agreed in the scheme of the Indonesia-Pakistan Preferential Trade Agreement (IP-PTA) of 2012. It is also proposed for further research to include some prospective independent variables affecting the volume of Indonesian RPO exports to Pakistan that are not yet included in this research, such as population rate and gross domestic product of the importing country. The unavailability of the monthly data of these variables during the observed period was the reason for the exclusion of the said variables from the models.

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