Import Demand for Malaysian Palm-Based Oleochemical in the Netherlands

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IMPORT DEMAND FOR MALAYSIAN PALM-BASED OLEOCHEMICAL IN THE NETHERLANDS

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ABSTRACT

Malaysia is the second world largest palm oil producer. In 2016, Malaysia has produced 29.3% of world palm oil and 92.6% of the total production has been exported globally. Palm oil products are products that can be refined from the palm oil such as oleochemical and biodiesel. The main destination for Malaysian palm-based oleochemical products export is to the EU. As the Netherlands is the major palm-based oleochemical importer, this study attempts to examine the factors that influenced import demand of Malaysian palm-based oleochemical products in the Netherlands using the Autoregressive Distributed Lag (ARDL) Model. This study used annual data from 1984 to 2016. The results of the bound test indicated that there is a long-run relationship between the variables. The empirical results showed that domestic income, measured by the Gross Domestic Product (GDP) showed positive significant relationship as the GDP increases the demand for palm-based oleochemical from Malaysia also increases, while palm oil prices and total vegetable oils consumption have negative significant relationships with oleochemical demand. The evidence from this study indicated that demand from the Netherlands is significantly strong. Thus, the Malaysian government may need to further improve and reformulate the best strategy and policy to meet up with the increasing demand for palm-based oleochemical in the EU particularly in the Netherlands.

Keywords

Palm-based Oleochemical, Palm Oil Import Demand, Palm Oil Price, Gross Domestic Product, the Netherlands, Autoregressive Distributed Lag

INTRODUCTION

Oleochemical

Located near the equator, Malaysia is fortunate to have tropical climate which very well suits for oil palm cultivation. As a humid tropical crop, oil palm is best growing in the areas with temperature range between 22°C - 33°C (Hassan et al., 2018) and having at least 2,000 mm of rainfall homogeneously distributed throughout the year (Oettli et. al., 2018). In 2016, the planted area for oil palm in Malaysia was at 5.74 million hectares, estimated about 70-75% of the total agricultural land in Malaysia (The World Bank Group, 2018). The palm oil industry has made significant contribution to the Malaysia economy. The agriculture sector contributed 8.1% or RM89.5 billion to the Gross Domestic Product (GDP) in 2016, of which, oil palm was a major contributor to the GDP of agriculture sector at 43.1% (Department of Statistics Malaysia Press Release, 2017). Malaysia is known as the second world largest palm oil producer as it produced 29% of the world palm oil in 2016. In 1990, the planted area of oil palm trees was 2.03 Millionn Hectares (Mn Ha) and this has more than doubled to 5.74 Mn Ha in 2016 (Norhidayu et al., 2017).

Being an export-oriented country, Malaysia export close to 90% of its yearly palm oil production (Nambiappan et al., 2018). Oil palm products exported are in terms of crude palm oil (CPO), processed palm oil (PPO), palm kernel oil (PKO), palm kernel cake (PKC), oleochemicals, finished products, biodiesel and others. Among the top major destination of Malaysia oil palm products are India, the EU, and China. These three (3) markets have been consistently dominates the export market of Malaysian palm oil for the past five years, constituted circa 40% of the total Malaysian palm oil exports (Malaysian Palm Oil Board, 2017).

Apart from rapeseed and soybean oils, palm oil is the most significant vegetable oil in the EU market. With 2.06 million tonnes of palm oil imported in 2016, the Netherlands is the largest importer of palm oil within the EU, followed by Italy, Spain, Sweden and Denmark (MPOB, 2017). In this market, palm oil is mostly used in refined form. The refined palm oil used in many food products such as margarine, confectionery, chocolate, ice cream and bakery products. It is also used in non-food products such as soap, candles, detergents and cosmetics.

Due to the diversification in application, demand for palm oil and its related products has been growing rapidly. The rapid growth in palm oil production has contributed to the development of its downstream industry particularly the oleochemicals industry. Oleochemicals refers to the fatty acids and glycerol derived from the splitting of the triglycerides structure of oil or fat. Figure 1 shows the production of fatty acids and glycerine by splitting the oils and fats through a hydrolysis (using water) process (Yusoff, 2015).

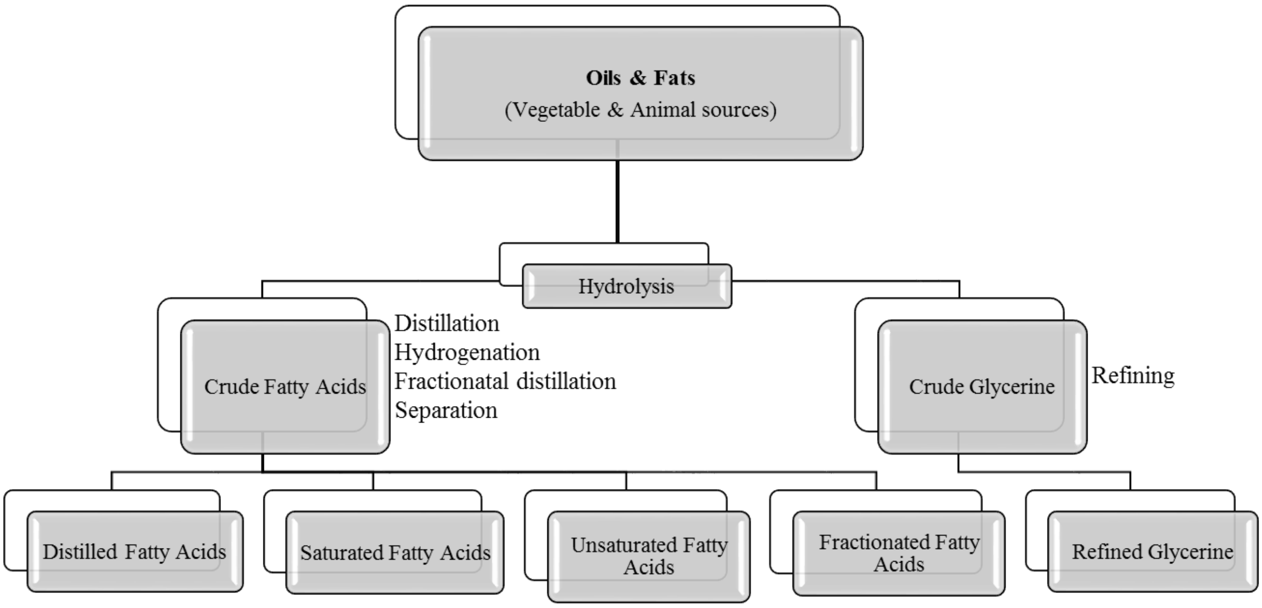

Figure 1 Production of oleochemicals (fatty acids and glycerine) via hydrolysis process

Oleochemical is necessary in the production of surfactants, cosmetics and toiletry products. Fatty acids, the most important basic oleochemical due to its versatility is used in the manufacture of cosmetics, rubber products, candles, and soap. Fatty acid which reacts with ammonia and hydrogen will produce fatty amines. This amines is mainly used in fabric softener, mining, textile and fiber industries and mineral oil additives.

In Malaysia, the oleochemical processing began in 1979 and in 1980s the first significant oleochemical plant named Acidchem started in Penang with capacity of 30,000 t/a, smaller than plants in Europe or USA. Due to low margins and demand for larger volumes, the oleochemical producers pushed engineering companies towards larger and modern plants with more advanced technology. The increase competition among the suppliers of plants particularly in the area of methyl ester, glycerine and fatty alcohols has resulted into lower investment costs (Qua Kiat Seng, 2017).

The oleochemical industry has growing rapidly year by year due to the growing demand for oleochemical derivatives by the manufacturing sector. The demand was also boosted following the mad cow disease or BSE (bovine spongiform encephalopathy) event in 2000. Started from this event, manufacturers of tallow fatty acids started to produce vegetable tallow fatty acid from vegetable oils including palm oil. Aside tallow, the vegetable oils-based oleochemicals also need to compete with the petroleum-based products. However, due to the increase of awareness for better environmental quality, the oleochemicals that were derived from renewable natural resources are environmentally safer than the petroleum products.

The largest importer of Malaysian palm-based oleochemicals in 2016 is the E.U, with total import of 529,629 tonnes of palm-based oleochemicals. This is accounted for 19% of the total Malaysian exports of palm-based oleochemicals in 2016. Of this, 74% (393,388 tonnes) were exported to the Netherlands, followed by Germany, the United Kingdom, France, and Spain (Malaysian Palm Oil Board, 2017).

Malaysian Vs. Indonesian Palm Oil in EU Market

Presently, Malaysia is the second world largest palm oil producer. Malaysia has produced about 29% of world palm oil and export close to 90% of palm oil products. The EU is an important market for Indonesia and Malaysia as both countries contributed 84% of the world palm oil production (MPOB, 2016). Palm oil in EU was used largely in food industry for making margarine, biscuit, chocolate and other food products. Palm oil is also widely used in oleochemical industry in making soap, detergent, cosmetics, and other oleochemical products.

Chart 1 showed that Malaysia is more concentrating on exporting refined palm oil. It shows 50% of total export volume was exported in the form of processed palm oil worth by RM33.66 billion, followed by palm based oleochemical (17%) worth RM16.84 billion and crude palm oil (15%) worth RM9.71 billion. In term of value, it is proven that downstream sector ultimately delivers more revenue to the industry. Meanwhile, Indonesia focus is still on CPO production. CPO is Indonesia's major export earner as 2015, 90% of its total export was selling in the form of basic material, CPO (antaranews.com, 2017) and still lagging behind Malaysia in the downstream sector which includes oleochemical production.

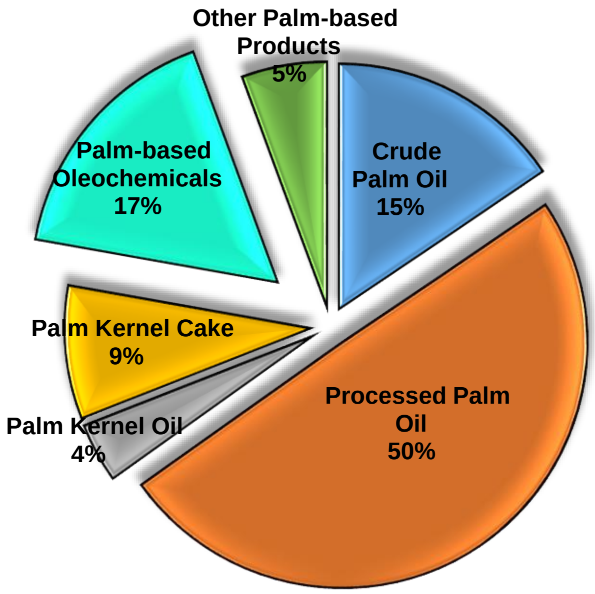

Chart 1: Malaysia Export Volume of Oil Palm Products: 2016 (%)
Source: Department of Statistic, 2017

Palm oil is one of the important source for oleochemical industry. The main advantage of palm oil as the feed stock for oleochemical production is due to its price competitiveness against other vegetable oils. In 2015, Indonesia and Malaysia had produced 33.6 million tonnes and 19.96 million tonnes of palm oil respectively (MPOB, 2015). Total export volume of Malaysian oleochemical products in 2016 amounted to 4.10 million tonnes. The EU is the major import market (19.21%), followed by China (14.23%) and USA (9.64%) (Chart 2). With rapid development of the oil palm production which provides stable supply to the oleochemical producers, Malaysia can play a big role to fulfill this demand.

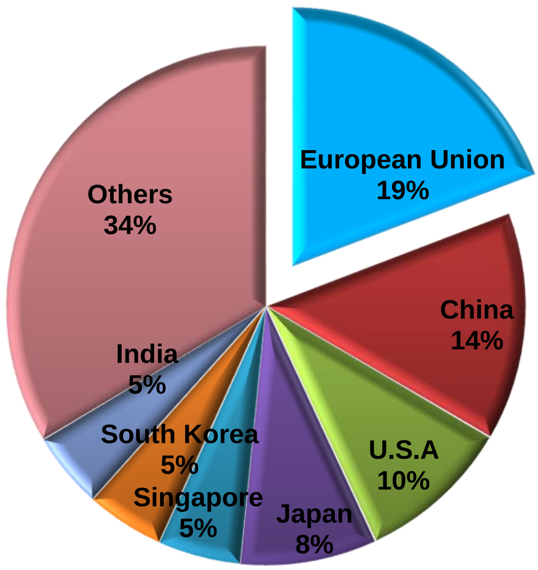

Chart 2: Export of Malaysian Oleochemicals to Major Destination, 2016 (%)
Source: MPOB, 2017

In 2015, the global market demand for oleochemical products was 12.86 million tonnes and is expected to reach 18.82 million tonnes by 2024 worth USD30.15 billion (Grand View Research, 2016). As Malaysia is one of the oleochemical producers, the government has pushed a greater investment in these high-yielding downstream sector as it expected to generate an incremental Gross National Income (GNI) of RM14 billion by 2020 (Kamil R, 2015).

Netherlands is one of the EU's large biomass technology industry. It is the biggest contribution compared to other EU countries in oleochemical which imported almost 6 million tonnes a year (MVO, 2014). It is well known fact that world population significantly affects demand for oils and fats. Population of Netherlands increased from 12.6 million peoples in 1967 to 17 million people in 2016 growing at an average annual rate of 0.62% (World Bank). Oleochemical are used in wide range of applications including surfactants, personal care, soap, detergents and food additives. Major chemical manufacturers have shifted their preference towards utilising-based chemicals for manufacturing polymers. This is anticipated to have a positive influence on the companies for developing the downstream potential of various oleochemical because high population will lead to high demand in these product line.

Income is another important factor that will shape the demand pattern (Trostle, 2010). This in fact will increase the consumption of oleochemical in the Netherlands. In 2016, Malaysian palm-based oleochemical has being exported by the Netherland at 393,388 million tonnes in which 74% of total palm-based oleochemical export to the EU. More than 10 years, the Netherlands has exported palm-based oleochemical from Malaysia more than half of the export to the EU (Figure 3). Therefore, it is believed that the Netherlands is the most important country for Malaysian palm-based oleochemical industry.

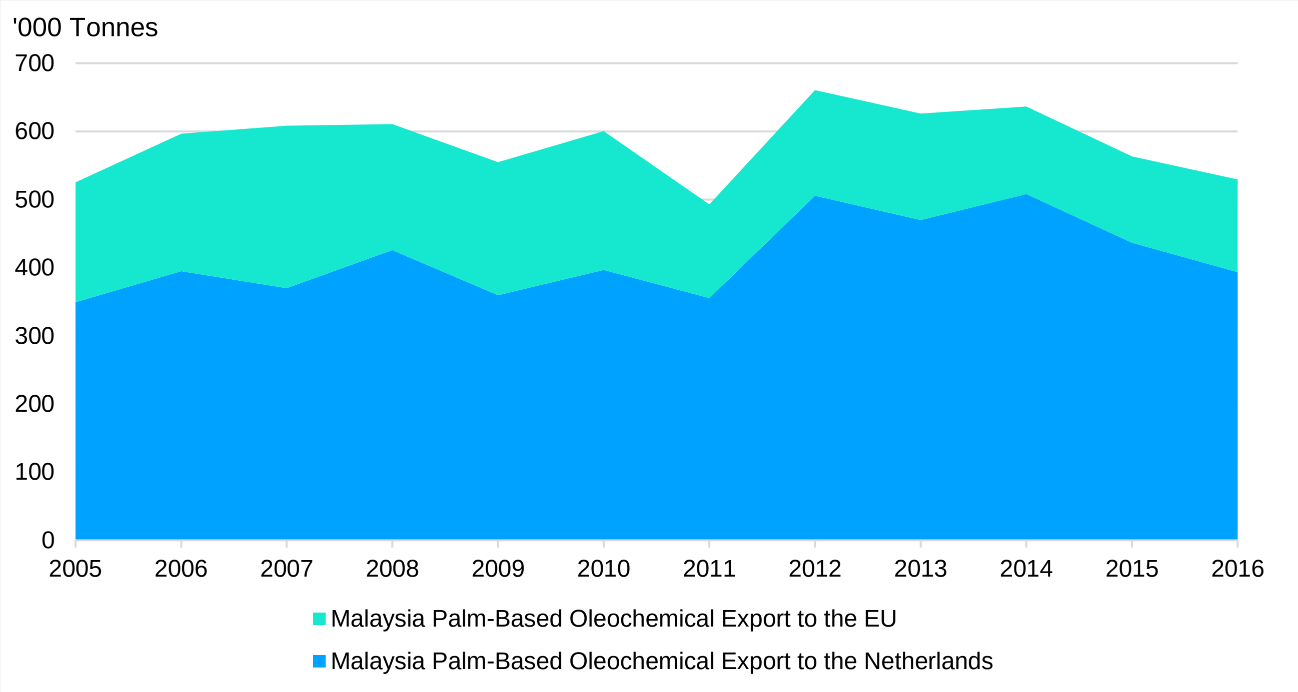

Figure 2: Malaysian Palm-Based Oleochemical Export to the EU and the Netherlands
Source: MPOB (2017)

METHODOLOGY

Annual data on the Netherland's palm based oleochemical import from Malaysia, palm oil prices, total vegetable oils consumption, and domestic income were collected from the United Nations Conference on Trade and Development (UNCTAD) database. The Autoregressive Distributed Lag (ARDL) bound testing approach is being used because this method able to capture the factors that contribute to the increase in export to the Netherlands significantly.

For empirical analysis, this study firstly investigated stationarity property of the variables by employing mostly used unit root tests in empirical literature including Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. The reason for the unit root tests is the generally economic and financial time series, such as prices and real GDP exhibit trending behaviour or non-stationarity in the mean. Moreover, economic and finance theory often suggested the existence of long-run equilibrium relationships among non-stationary time series variables. If these variables are integrated of order one (I(1)), co-integration techniques can be used to model these long-run relationship. Hence, pre-testing for unit roots is often a first step in the cointegration modelling.

This study then employed the Autoregressive Distributed Lag (ARDL) bound testing approach to cointegration developed by Pesaran et al., (2001) to verify the long-run relationship between variables. This method was chosen for its advantages in small observation as well as the fact that it can be applied irrespective of the order of integration, i.e., I(0) or I(1). In addition, the ARDL method avoided the larger number of specifications to be made in the standard cointegration test. These included decisions regarding the number of endogenous and exogenous variables (if any) to be included in the treatment of deterministic elements, as well as the optimal number of lags to be specified. By employing the ARDL method, it is possible to have different variables that have different optimal lags, which is impossible with the standard cointegration test. Moreover, the model could be used with limited sample data.

$$\Delta lnOLEOimport_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} \Delta lnGDP_{t-i} + \sum_{j=1}^{q} \beta_{2j} \Delta lnPOP_{t-j} + \sum_{k=1}^{r} \beta_{3k} \Delta lnCON_{t-k} + \delta_1 lnOLEOimport_{t-1} + \delta_2 lnGDP_{t-1} + \delta_3 lnPOP_{t-1} + \delta_4 lnCON_{t-1} + \varepsilon_t \quad (1)$$

H_0: $\delta_1 = \delta_2 = \delta_3 = 0$ (no cointegration between the variables)

$H_0: atleast\ \delta_m \neq 0\ for\ m = 1,2,3$

The study then estimated the long-run relationship between variables. The first step is to justify the interval for variables by using F-statistic (Variable addition test). Two (2) sets of critical bound for the F-statistic were generated by Pesaran et al. (2001); lower critical bound (LCB) and upper critical bound (UCB). If the F-statistic is less than the LCB, it indicates that there exists no cointegration or no long-run relationship between the studied variables. However, if the F-statistic is greater than the UCB, it means that there is cointegration or long-run relationships between the variables. On the other hand, if the F-statistic is between LCB and UCB, the cointegration test is considered to be inconclusive.

The second step of the ARDL estimation procedure involved the estimation of coefficients of the variables in the equation. The lag selection criterion of the model is based on either the Akaike Information Criterion (AIC) or Schwartz-Bayesian Criterion (SBC). Once cointegration is established, the conditional ARDL long-run model can be estimated as follows:

$$lnOLEOimport_t = \alpha_0 + \sum_{i=1}^{p} \delta_{1i} lnGDP_{t-i} + \sum_{j=0}^{q} \delta_{2j} lnPOP_{t-j} + \sum_{k=0}^{r} \delta_{2k} lnCON_{t-k} + \varepsilon_{t-1} \quad (2)$$

The subsequent estimation and model selection is made based on three (3) criteria, namely the adjusted R-squared, AIC and SBC, to select the maximum length of the interval.

Finally the study looked at the short-run dynamic parameters by estimating an error correction model associated with the previously determined long-run estimates. ARDL error correction model is expressed with the following equations:

$$\Delta lnOLEOimport_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} \Delta lnGDP_{t-i} + \sum_{j=1}^{q} \beta_{2j} \Delta lnPOP_{t-j} + \sum_{k=1}^{r} \beta_{3k} \Delta lnCON_{t-k} + \tau ECM_{t-1} + \varepsilon_{t-1} \quad (3)$$

Where β_1, β_2 and β_3 are the short-run dynamic coefficients of the model's convergence to the equilibrium, Ψ is the speed of adjustment parameter and ECM is the error correction term that is derived from the estimated equilibrium relationship of Equation (1). The Equation (3) indicated that when there is a shock in the economy, the higher the value of error correction coefficient (in negative term), the quicker the economy adjusts to achieve long-run equilibrium, and vice-versa. To ascertain the goodness of fit of the ARDL model, diagnostic and stability tests are conducted. The diagnostic test examined the serial correlation, and heteroscedasticity associated with the model by employing the Lagrange Multiplier (LM) test. The structural stability test was conducted to determine the stability of the model by employing the cumulative sum of recursive residuals (CUSUM) test and the cumulative sum of squares of recursive residuals (CUSUMSQ) test.

EMPIRICAL RESULT

Unit Root Tests

Prior to the testing of co-integration, this study conducted a test of order of integration for each variable using the Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) procedures to examine data stationarity, consequently the existence of unit root. *Table 1* indicated that based on the ADF and PP tests, the calculated t-statistic for all variables were less than the critical values in their level forms, suggesting that these variables are not stationary at level form. Thus suggesting that they are stationary after the first difference or integrated of order I(1).

TABLE 1. UNIT ROOT TESTS (WITH INTERCEPT)

Variable	**Level**				**First Difference**			
	ADF		**PP**		**ADF**		**PP**	
OLEOIMPORT	-2.11		-1.12		-3.27	**	-2.80	*
GDP	-1.89		-2.77	*	-3.04	**	-3.03	**
CONS	-1.31		-0.55		-5.09	***	-5.37	
POP	-1.93		-2.09		-7.12	***	-5.16	***

Note : * significant at 10% level, ** significant at 5% level, *** significant at 1% level

Autoregressive Distributed Lag (ARDL) Bound Testing

The result of the bound test in Table 2 indicated the existence of a long-run relationship between the variables. The reason is F-statistic result was higher than the upper bound value at level of significant 95% and other upper value at 90% level of significant.

TABLE 2. ARDL BOUND TEST OF COINTEGRATION

F-Statistics	**95% Lower Bound Value**	**95% Upper Bound Value**	**90%Lower Bound Value**	**90% Upper Bound Value**
8.17	2.45	3.63	2.01	3.10

Table 3 is the ARDL long run model. The most significant influence is GDP (positive relationship), as the GDP increases the demand for Malaysian palm based oleochemical also increases in a long run. For every 1% increase in real GDP, the Netherlands will increase the import palm based oleochemical from Malaysia by 9.21%. Other important factors are price of palm oil and total vegetable oils consumption which also significant (negative relationship) with the demand of Malaysian palm based oleochemical. It shows that as price of palm oil and total vegetable oils consumption decrease, the demand of Malaysian palm based oleochemical will increase significantly.

Long Run Estimations

TABLE 3. ESTIMATED LONG-RUN COEFFICIENTS USING ARDL APPROACH

ARDL (1,0,0,0) based on Schwarz Bayesian Criterion (SBC)		
Variable	**Dependent Variable: IMPO**	
	Coefficient	**t-value**
LPOP	-1.2051	-4.5010***
LCON	-3.5783	-12.5086***
LGDP	9.2186	19.7103***

Short Run Error Correction Models

The short run Error Correction Model (ECM) from ARDL model is presented in Table 4. Most of the variables were found to be significant in the short-run. The error correction terms (ECT(-1)) are negative and highly significant. It showed that there was causality in at least one direction. The ECT coefficient is -1.31, which indicates higher rate of convergence to the equilibrium.

TABLE 4. ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL MODEL

ARDL (5,5,3,5) based on Schwarz Bayesian Criterion (SBC)		
Variable	Dependent Variable: IMPO	
	Coefficient	t-value
D(LOLE(-1))	1.3540	5.9070***
D(LOLE(-2))	0.2955	1.1678
D(LOLE(-3))	0.5529	2.6591**
D(LOLE(-4))	0.2973	1.3774
D(LCON)	4.8105	3.2793**
D(LCON(-1))	3.1632	1.9013*
D(LCON(-2))	2.7383	1.6798
D(LCON(-3))	2.2656	1.2486
D(LCON(-4))	-12.4507	-4.1228***
D(LPOPR)	0.6942	1.2403

D(LPOPR(-1))	-1.9927	-2.7793**
D(LPOPR(-2))	2.4773	4.2448***
D(LGDP)	7.2015	0.8833
D(LGDP(-1))	40.3640	2.6633**
D(LGDP(-2))	6.8446	0.6136
D(LGDP(-3))	-15.7522	-1.4980
D(LRGDP(-4))	21.5605	3.1644**
ECT(-1)	-1.3063	-5.2069***
	Diagnostic Test	
R-Squared:	0.8203	
Adj.R-Squared:	0.4609	
Durbin Watson:	2.0615	
Alkaike Info Criterion:	1.1002	
F-Statistics (7, 24):	2.2822*	

The serial autocorrelation is checked by Breusch-Godfrey LM test. The greater than 0.05% value of LM test for 95% confidence interval represents the absence of serial autocorrelation. The results are Table 5. While figure 3 and 4 indicated that the model is stable (blue line located in range of red lines).

TABLE 5. RESIDUAL AND STABILITY DIAGNOSTIC TEST

Test	**Statistics**
Breusch-Godfrey LM test	2.94
ARCH	3.25

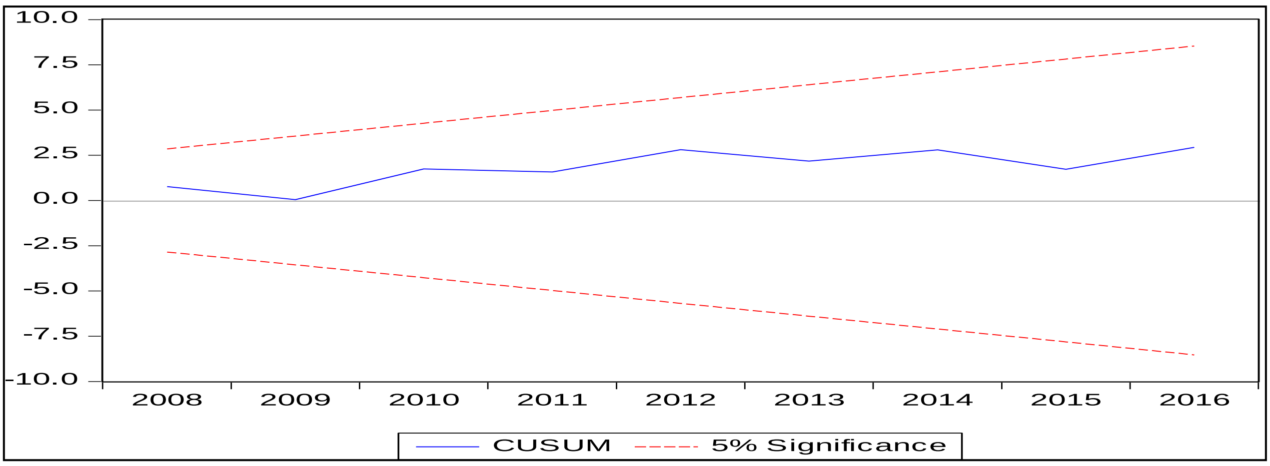

Figure 3: Cumulative Sum of Recursive Residuals (CUSUM)

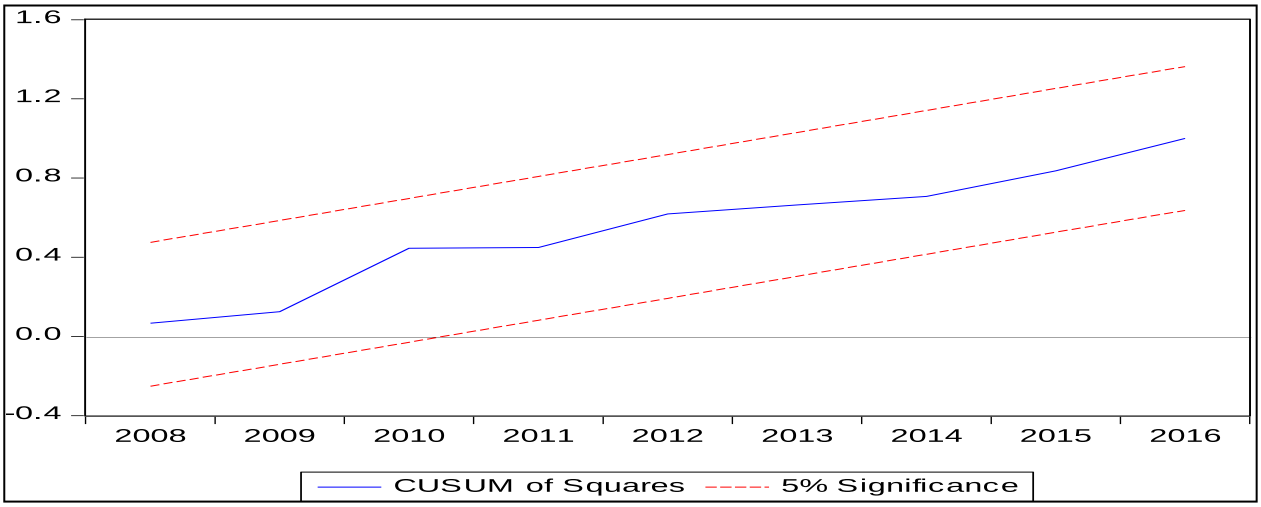

Figure 4: Cumulative Sum of of Square of Recursive Residuals

CONCLUSION

This study focused mainly to investigate the factors that influence import demand of Malaysian palm-based oleochemical product in the Netherland. The study found that there are relationships, both long run and short run in the demand for palm based oleochemical in the Netherland. Based on the results, the most significant influence is GDP (positive relationship), as the GDP increases the demand for palm-based oleochemical from Malaysia also increase. Price of palm oil and total vegetable oils consumption are significant (negative relationship) with the demand of Malaysian palm based oleochemical. Therefore, the future of the palm-based oleochemical industry is seen to be secure especially to Malaysia as the world second largest palm oil producer and exporter. The Malaysian government may need to further improve and reformulate the best strategy and policy to meet up with the increasing demand for palm-based oleochemical in the EU particularly in the Netherlands. Population especially in the developed countries are shifting away from petrochemicals even though the price of crude oil is competitive, there is still desire for degradable products. Other than that, household consumption of palm-based oleochemical products is expected to increase specially to look for biodegradable cleaners and cosmetics.

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