Investigate the effect of economic finance essay

Finance

Chapter 1

Introduction

1. 0: Introduction

This chapter will be cover about introduction of the research. Section 1. 1 discussed about background of study. Section 1. 2 described about problem statement of the study. Section 1. 3 discussed about question of the study. Section 1. 4 discussed about objective of study. Section 1. 5 will be discussed about scope of study. In the last section of chapter 1 which is section 1. 6 discussed about significance of this study.

1. 1: Background of study

The purpose of this research paper is to investigate the effect of economic variables (Interest Rate, Exchange Rate) and crude oil prices towards the export price of crude palm oil Malaysia in short-term and long-term relationship. It is can't be denied that, the economic growth in Malaysia is heavily dependent on the energy consumption, therefore it was necessary for us to understand the effect of economic variables towards energy commodities. According to the source from Malaysian Palm Oil Board (MPOB), Malaysia is the second world's largest palm oil exporter after Indonesia.

Crude Palm Oil

Palm oil is an important source for global oils, and has become one of the world's most highly consumed edible oils. There is around 60% of crude palm oil produced in Malaysia are export to China, the European Union, Pakistan, United States and India. Those countries import crude palm oil are mostly

made into cooking oil, margarine, specialty fats and oleochemicals. Besides that, western countries are also looking for substitution of energy sources. Thus, Malaysia government had been mainly focus on study of produce biodiesel by using crude palm oil and government also declared that all diesel must contain 5% of palm oil in year 2007. The reason of Malaysia government to implement this strategy is to increase the amount of palm oil produce, and produce another sources of energy to substitute the crude oil in order to meet the demand of European countries, China and India. Due to that, the demand and price of crude palm oil are higher than previous year. Therefore, the domestic market and export market in Malaysia can be expanded. Abdul et al.(2011) also disclose that the prices of crude palm oil can be stabilized by increasing the demand of palm diesel. Crude palm oil futures was firstly introduced in October, 1980 at the Kuala Lumpur Commodity Exchange (KLCE). Bursa Malaysia is the largest palm oil futures trading in the world. There are 2 economic reasons to launched FCPO in Malaysia. Firstly, to provide an efficient price discovery mechanisms for the palm oil industry. Secondly, the reasons are to provide a hedging mechanism against the risk of price instability. In the past decade, the volatility in the energy commodity prices creates uncertainty which in turn forms an unstable economy while this has caused many difficulties to many economies and developed economies (Abdul et al., 2011). According to the Table 1, it indicates that the Crude palm oil prices have the third highest instability index which are 2. 24 is relatively volatile compare with other commodities product in Malaysia. The fluctuation prices of crude palm oil is a notable risk facing by the producers, traders, consumers, and anyone who involved in the production and marketing of palm oil.

Table 1: Degree of Price Instability of Selected Commodities

MARKET/COMMODITY

PERCENT DEVIATION FROM TREND

INSTABILITY INDEX

Soybean Oil17. 751. 92Palm Oil19. 702. 24Groundnut Oil23. 212. 26Coconut Oil28. 803. 12Cocoa14. 651. 46Rubber13. 791. 42Petroleum14. 371. 16(Data source: World Bank)The price forecasts for export crude palm oil is necessary for decision making in such situation of uncertainty and high risk. Precise price predict are very important in order to stimulate an efficient decision making as there is time lag intervenes between making decisions and the actual output of the commodity in the market (Mad Nasir and Fatimah, 1991).

Figure 1. 0: Palm Oil Yearly Export Price – Malaysia Ringgit per Metric Ton

(Source: EMIS, http://www. securities. com/macro/ceic/index. html? pc= MY&page= act&mid= 22036)According to the above Figure 1. 0, it indicated that the Malaysia Crude Palm Oil export price was fluctuated from year 2002 to year 2012. There are many factors causes the volatility of crude palm oil price such as weather condition, demand and supply as well as price of other substitute's product. In the past decades, crude palm oil is mostly used in manufacture cooking oil, margarine, and food products. However, in the recent year, demand of biodiesel had been steadily increase thus it causes the demand of palm oil to be increasing too, which biodiesel is an alternative to petroleum (Abdul et al., 2011)From the Figure 1. 0 indicates that there is a sharply increase of crude palm oil export price from November 2006 to May

2008 as approximately RM3. 45k per metric ton. Furthermore, the Figure 1. 0 also shows that the highest export price of crude palm oil from year 2002 to year 2012 is approximately RM4. 98k per metric ton in July 2011. Because of the crude palm oil can be utilized to substitute the petroleum fuels and manufactured biodiesel, so causes the demand of crude palm oil increasing. Therefore, there is a correlation between crude oil and crude palm oil prices (Basiron, 2008). However, there was a slight decrease in Malaysia crude palm oil export price from year 2008 to 2009 as there was an economic downturn in the western countries. This causes lots of demand being decrease due to factories stopped operating in those countries to cope with inflation and loss.

Interest Rate

Interest rate can be defined as the rate surcharge on the money borrowed or loan. However, it also can be defined as the return derived from an investment. The interest rate in a country is setting by the country's central bank. We also called it as the lending rate (BLR). For example, the U. S. Fed funds rate is the amount banks charge each other for the overnight loans. Interest Rate is changed based on the fiscal policy or monetary policy implement by government. As a results, interest rate is necessary for determinant the commodity prices. Increasing on the interest rate will decrease the demand for storable commodities or increase the supply of the commodity through a variety of channels: by increasing the incentive for extraction today rather than tomorrow (think of the rates at which oil is pumped, gold mined, forests logged, or livestock herds culled); by decreasing firms' desire to carry inventories because of the cost of carrying

inventory increased (think of oil inventories held in tanks); by encouraging speculators to shift out of spot commodity contracts, and into treasury bills (Jeffrey Frankel, 2008). Moreover, when the interest rate is higher, consumers have to pay more to finance their consumption. The demand of commodity will decrease because of higher required payments, thus it affect the prices of commodity go down. However, if the interest rate is lower it will have the inverse effect. Nowadays, commodities are asset that's part of the portfolio for hedge funds. If interest rate is lower, investor will want to invest in stock, bonds and also include taking open positions in financial market for commodities. The interest rate using for this study is based on the lending rate (BLR) of Bank Negara Malaysia.

Exchange Rate

Exchange rate can be described as the rate of one currency can be exchange for another different currency and it also can be defined as the price of one currency expressed in terms of another different currency. Exchange rate for a currency is changing from time to time, it is due to the currencies are traded on an open market and demand for them varies based on what is happening in that country. The profit of multinational corporations can be affected by the changes in the exchange rate from time to time. There are several factors can cause the exchange rate move up and down such as, interest rate, economic growth, demand and supply, and political issues. The changes in the exchange rate will also affect the value of foreign investment held by individual investors. There are many researches had been prove that there is an impact on the volume of export and import towards the fluctuation of the exchange rate. The quantities of supply and demand for

commodity products export and import can be influenced by the volatility on the exchange rate. On the point view of an exporter, if the exchange rate is appreciate, it will cause reducing the competiveness of exporter in international market, the sales and profit will shrink and the stock price will decrease. However, in the point view as an importer, importer will receive benefit such as increasing their competiveness in the domestic market while the local currency of the exporter is appreciated. Thus, this will increase their profit and sales. In contrary, while the exchange rate is depreciated, it will cause the inverse effect to the importers and exporters. Therefore, the volatility of exchange rate can displace the global market equilibrium. According the above theory, it is very important and necessary to investigate the relationship between the exchange rate and price of crude palm oil. The exchange rate of Malaysia Ringgit to USD will be using in this studies and the data is collected from Bank Negara Malaysia.

Crude Oil Price

Crude oil also can call as petroleum, where it is naturally occurring substances found deep beneath the earth's surface. It can refined into gasoline, diesel, jet fuel, kerosene, heating oil, and literally thousands of other products called petrochemicals. Crude oil plays a important role to the society including in economy, politics and technology. The volatility of the crude oil can cause the direct and indirect impact to the world economy. Thus, investors are very concern on movement of the crude oil price in global. The highest of crude oil price is bad for global economy. The increasing in the price of crude oil will brings effect to the industries and business across the board. There is many researches had been done on the

study of the effect of changes in crude oil price towards the economic growth and also investigates the relationship between commodity price and crude oil price. Moreover, many studies had been done indicates that higher price of crude oil cause the high inflation and recession economy. Thus, the increasing on the crude oil price will increase the risk to the global economy growth. According to the Figure 2. 0, there is an upward trend on the price of crude oil throughout the 10 years. This results a heavy burden towards the world's economic growth. During the financial crisis in year 2008, the Figure 2. 0 shows that the price of crude oil is the most highest among the 10 years, where the price of crude oil is RM430. 78 per barrel. As a results, the higher price of crude oil will advances palm oil futures. The higher price of crude oil stimulated the countries of export crude palm oil such as Malaysia and Indonesia take the advantages of purchase and selling big amount of fertilizer at discounted price to planters of crude palm oil and rubber to promote famers to plant more oil palm. Therefore, the volume of supply crude palm oil will increase and this also will cause them to meet the growing demands for palm oil.

Figure 2. 0: Crude Oil (Petroleum) Yearly Price-Malaysia Ringgit per Barrel

(Source: WorldBank, http://www. indexmundi. com/commodities/? commodity= crude-oil&months= 240&cy= myr

1. 2: Problem Statement

Nowadays, due to the crude palm oil can using to produce bio-fuel, the demand of the crude palm oil had been increasing over this few years. Crude palm oil is the one of the major source in contributing the economic growth

in Malaysia. It is because Malaysia is the second largest exporter of crude palm oil in the world. Same to the other agriculture commodities, crude palm oil export price is posed to significant price volatility. In the past decades, the export price of crude palm oil is changed without any clear tendency. Due to the fluctuations in crude palm oil is the significant risk to economic growth in Malaysia, producers of palm oil, traders and consumers, therefore, it is necessary for us to determine the effect of economic variable and crude oil prices on the export price of crude palm oil. There is many researches had been done on the study of the changes in crude palm oil price, but they do not much focus on study the short-term and long term relationships of interest rate, exchange rate, and crude oil prices with the export price of crude palm oil. The dynamic relations of economic variables and crude oil price on the export price of crude palm oil must be first considered. Therefore, the problem statement of this research is to find out that " What are the relationship of interest rate, foreign exchange rate and crude oil price towards the export price of crude palm oil Malaysia?"

1. 3: Research Question

This research is conducted to solve the following question: To determine whether there is any effect of interest rate, exchange rate, and price of crude oil towards the Malaysia crude palm oil export prices? Does the relationship of interest rate, foreign exchange rate and crude oil price towards the export price of crude palm oil Malaysia is in short run, or long run, or both?

1. 4: Research Objective

The overall objective of this study is to observe and explore how the interest rate, exchange rate and crude oil price are directly and indirectly affect the export price of crude palm oil Malaysia. Thus, this research aims at investigating the short-term and long-term relationship between the interest rate, foreign exchange rate and crude oil price towards the export price of crude palm oil Malaysia.

1. 5: Scope of the Study

The scopes of this research are using the monthly time series data from January 1996 through November 2012 in Malaysia which is obtained from the EMIS and World Bank. This secondary data would be used for investigating the effect of interest rate, exchange rate, and price of crude oil towards the export price of crude palm oil Malaysia.

1. 6: Significance of the Study

The proposed research will determine the impact of interest rate, exchange rate, and crude oil prices toward the export price of crude palm oil Malaysia. The results of this study will benefit the producers, traders and consumers in the production of crude palm oil. They can predict and forecast the crude palm oil export price by analyzing the trend and pattern of interest rate, exchange rate and price of crude oil. Furthermore, they also can hedge their investment portfolio effectively from the information in this study.

Chapter 2

Literature Review

2. 0: Introduction

This chapter will cover the literature review of the relationship of interest rate, exchange rate, and price of crude oil towards the price of crude palm oil.

2. 1: Relationship between Interest Rate and Price of Crude Palm Oil

The relationship between interest rate and price of crude palm oil is important capture in literature, it is because of the relationship between interest rate and commodity price has a broad history in past decades. Interest rate will directly and indirectly affect the commodity prices, it is because when the interest rate is increase, the borrowing rate and lending rate will increase, consumers will feel burden if they are borrow money from bank on their consumption. Therefore, increasing in interest rate will affect the purchasing power of consumer and investor. Joseph W. Gruber and Robert J. Vigfusson (Nov, 2012) investigating the Effect of Interest Rates on the Volatility and Correlation of Commodity Prices. This study is carried out from 1985 to mid of 2012 time periods. Theoretical framework of Deaton and Laroque (1992) and GARCH model is applied in this study. By using the theory framework of Deaton and Laroque (1992), the study indicates that decreasing in the interest rate will cause the decrease on the fluctuation of commodity prices, due to the decreasing inventory carrying costs increase incentives to smooth prices overtime in response to transient shocks. Furthermore, through using GARCH model, the research indicates that if the

real interest rate decreasing, the volatility of commodity price reducing. On the other hand, as the interest rate is increase, the average conditional covariance across commodity prices is declining; nevertheless, the coefficients are insignificant. Theodosios Palaskas and Panos Varangis (1989) conducted a study on the Long-Run Relationship between the Primary Commodity Prices and Macroeconomic Variables. The integration and co-integration tests are applied in this study to test the hypothesis that there is a long term relationship between commodity market prices at the aggregate and disaggregate levels and several macroeconomic variables such as interest rate, inflation rate, and money supply. The econometric techniques such as Vector Error Correction Model (VECM), Granger-Causality Test, Unit Root Test and Augmented Dickey-Fuller (ADF) Test are employed in this research. The findings from the research is the hypothesis that there is a stationary long-term relationship between the interest rate and degree of commodity prices is accepted. This results support the theory of commodities as financial assets and match with Powell's (1989) findings that interest rates play little role in either the short run or the long run. Research of investigating the relationship between interest rate and the prices of commodity had been conducted by Hector O. Zapata and T. Randall Fortenbry (Mar, 1995). The study had applied Johansen Co-integration methodology and Error Correction Model (ECM) to determine the long run and short run relationship between interest rate and price of commodity. According to the Trace statistic value in Johansen co-integration test, it indicates Chicago cash price for soybeans, nearby futures prices and the interest rate followed each other. It means that there is co-integration among the variables. Moreover, the findings from this study supported to the

proposition that interest rate can bring impact towards the cash and futures price of commodity and movement of these variables are the same. The results from this study are supported and consistent with the findings of Fortenbry and Zapata, and proposed that bivariate co-integration tests for storables may be fragile.

2. 2 Relationship between Exchange Rate and Crude Palm Oil Prices

It is can't be denied that, exchange rate play an important role in affecting the sales and purchase or agriculture commodities that are internationally and domestically traded. Foreign exchange rate can bring effect on the volume of crude palm oil export to other countries, thus the demand and supply of crude palm oil will be affected by the fluctuation of exchange rate. Therefore, it is necessary for determine the relationship between exchange rate and crude palm oil prices. Jane Korinek and Marilyne Huchet-Bourdon (2011) conduct a study on " To what extent do exchange rates and their volatility affect trade?" The objective of this research is to study the effect of exchange rates and their fluctuations on trade flows in China, the Euro area and the United States in two broadly defined sectors, agriculture on the one hand and manufacturing and mining on the other. This study employed the Autoregressive Distributed Lag (ARDL) model in order to examine the effect of exchange rates and their volatility on imports and exports in the three geographical areas, and GARCH model to determine the estimate exchange rate volatility. The result of the study indicates that short-term effects of the exchange rate on trade are limited. Moreover, this research also shows that export is more sensitive compare with import towards the changes in the

level of exchange rate. In conclusions, the research finds that fluctuations of exchange rate affect trade flows only slightly. However, the level of exchange rate impacts trade in both agriculture and manufacturing and mining sectors but do not explain in their entirety the trade imbalances in the three countries examined. Harri et al. (2009) had conduct a study on examine the relationship between the prices of agricultural commodities, exchange rate, and oil prices. This research is carried out from year 2000 to year 2008. The econometric techniques employed in this study is Augmented Dickey-Fuller (ADF) test in order to examine the stationary of time series data in level and co-integration test is applied to test the presence of co-integration between exchange rate, crude oil and the selected agricultural commodities. Moreover, the lag length is determined by using AIC and SBC criteria. The outcomes of the research indicate that the lag length is four for corn, soybean oil, cotton and wheat. This results shows that there are longer dynamic relations between crude oil and corn, soybean oil than between crude oil and cotton and wheat. On the other hand, Johansen co-integrating test outcomes indicates 2 cases, which is; 1)a constant is included in the error correction component but not in the autoregressive component of the VAR model, and 2) a constant to be included in the autoregressive component of the VAR model but not in the error correction component. Therefore, this first co-integrating realtion is described as the one between crude oil, corn and exchange rate, though the second co-integration relation is interpreted as a relation between the exchange rate and crude oil. The outcomes accept the assumption of normality, homoscedasticity and no autocorrelation in the residuals for the 3 equations. Thus, the test of weak exogenity show that the null hypothesis fail to rejected at the 0. 05 level of

significance for crude oil while it is rejected for corn and the exchange rate. In conclusions, the occurring of co-integrating relations between several agricultural commodities, crude oil and exchange rate is tested. The results suggest that all of these prices are interrelated. Kovyralova and Bahmani-Oskooee (2008) had conduct a research on examine the effect of exchange rate uncertainty on trade flow. The study used the aggregate export and import data on 177 commodities traded between the United States and the United Kingdom. This research is carried out on the data from year 1971 until year 2003 . The econometric techniques applied in this study are Co-integration tests and Vector Error Correction Model (VECM) to analyze the data. The findings from the research indicate that the fluctuations of the real bilateral dollar-pound rate has a short-term significant effect on imports of 109 and exports of 99 industries. However, in many cases, there is adverse effect. Furthermore, from the research the researchers also found that the number of significant cases is somewhat reduced in the long-term with imports of 62 and exports of 86 industries which are significantly affected by the exchange rate fluctuations. In conclusion, researchers conclude that the impacts is negative supporting the opponents of floating rate in many cases.

2. 3: Relationship between Crude Oil Prices and Crude Palm Oil Prices

There are various research had been conducted regarding the relationship between Crude Oil prices and Crude Palm Oil prices over past decades. The increasing in crude oil price could cause the higher cost of production which results the commodity prices to be increase. As we know that, when the crude oil price turn to higher, consumer will try to purchase the biofuels

rather than crude oil, as the biofuels had been developed as the alternative sources energy. Therefore, the increasing on the demand of biofuels will cause the price of crude palm oil to be increase, it is because crude palm oil is used to produced the biofuels. Guo Hongpeng, Li Fan, Yang Weiguang, and Yang Yinsheng (September, 2011) had perform a study on investigating the relationship between the crude oil and agricultural commodities prices in the global market. This research is carried out using the monthly time series data covered from July 2001 to June 2011 of wheat, corn and soybeans come from Chicago Nearby contract of wheat, corn and soybeans futures closing price, crude oil price comes from UK, North Sea Brent crude oil spot price, unit: USD/ barrel. Econometric techniques employed in this study are Granger Causality test, and Augmented Dickey Fuller (ADF) test. The Granger Causality test is applied to examine the affect relationship, and the ADF test is employed to test the unit root tests for series of the crude oil price and the prices of soybeans, corn and wheat. Through using the Granger Causality test, the researchers reveal that there is close relationship between the crude oil and agricultural commodities price and conclude that the volatility of commodities price is affected by the level of crude oil prices changed. Besides that, they also found that inevitable increasing in crude oil price is due to the scarcity of crude oil resources. In conclusion, they declared that the increasing on prices of agricultural commodities is caused by the level of crude oil prices in two ways: 1) Price of Crude Oil affect price of oil increased, thus, the demand for biofuels raw materials rising, the supply and demand of agricultural commodities unbalance, and lead to the higher price of agricultural commodities, 2) Increased on energy cost which were employed in agricultural production is resulted by the higher price of

crude oil, transportation costs of agricultural product also increased, therefore price of agricultural production increasing inevitably. Yu et al. (2006) conduct a research on investigating the long-term relationship among the prices of edible oils and crude oil. This research is conducted using multivariate time series monthly data from year 1999 until year 2006 in Malaysia. The econometric techniques employed in this study are Co-integration test and Augmented Dickey-Fuller (ADF) test. Through applied ADF test, the researcher found that all the price of edible oil are non-stationary at the 0. 05 significance level except the price of palm oil. However, the null hypothesis of being non-stationary which integrated at the first differences for all edible oil is rejected. Moreover, Schwarz Loss, and Hannan and Quinn are employed to investigate the lag length from unrestricted VARs that is fit to the five prices in level and the outcomes indicates that lag length of one is chosen. On the other hand, co-integration test outcomes indicate that one co-integrating vector with the constant inside the co-integrating space exists among these five series. The weak-exogenity test is applied to examine the market's response to perturbations in the long run and the outcomes indicate that the crude oil price is likely to be exogenous. Amna Awad Abdel Hameed and Fatimah Mohamed Arshad (2009) had perform a research on investigating the long-term relationship between the prices of crude oil and selected vegetable oils which include of palm oil, soya bean oil, sunflower oil and rapseed oil. This research is carried out utilizing the time series monthly data over the period from January 1983 until March 2008 in Malaysia. The econometric techniques are applied in this study is the Engle-Granger two-stage estimation procedure and Error Correction Model (ECM). The Engle-Granger two-stage estimation procedure

is employed to examine the relationship between crude oil prices and the selected vegetable oils, and ECM is utilized to investigate further the characteristics of the dynamic relationship between the prices. The researchers found that all the series were non-stationary with the presence of unit root which is statistically significant in the first differences at the level of 0. 01. The Johansen's maximum likelihood approach is applied to examine the relationship between crude oil and each of the selected vegetable oils. However, in the short term both test failed to accept the absence of a co-integrating relationship between crude oil amd price vegetable oils series at the level 0. 05 significance. In the conclusion, the Granger Causality test indicates that there is a long-term relationship between crude oil prices and the price of selected vegetable oils.

Chapter 3

Data and Methodology

3. 0: Introduction

The technical flow of how the research is conducted will be outline in this chapter. Econometric analysis is used to carry out this research where the model is created and regressed and investigating the relationship either short term or long term or both between the economic variable and crude oil prices towards the price of crude palm oil in Malaysia. Furthermore, the methods that will applied in this study are include; unit root test, co-integration test, vector error correction model, vector auto-regressive model and Granger-causality test. Firstly, unit root test will be applied in order to test whether the time series data of those variables are stationary or non-stationary. Once this requirement has met, VAR model is applied to select

the optimal lag in order to perform the Johansen Co-integration test, Granger causality test and VECM. Johansen Co-integration test is applied to determine the existence of co-integration between crude palm oil prices with the economic variables and crude oil price. Moreover, the Granger causality test would be utilized to test the short term relationship between these variables. After that, VECM will be applied in order to test the long-term relationship between economic variables and crude oil prices towards the price of crude palm oil. Other than the discussion of methodology, the data sources for this study will be explained during this chapter.

3. 1: Data Sources

The data of interest rate, exchange rate, Crude oil price, and price of crude palm oil are collected based on monthly data basis. The periods chosen for this research is from January 1996 until Nov 2012, which consists of 203 months. During the period from year 1995 to year 2012, there is many economic events occurred, such as the financial crisis in Asia on year 1998 to year 1999, global economic recession within the years 2007 to year 2009, and the credit crisis on U. S. A. in year 2008 to year 2010. Due to the long period chosen in this study, thus the nature of long-run relationships between the series can be determined. Besides that, there is a phenomenal increase in commodity prices during the period chosen for this study. The variables Price of crude palm oil are the export price quoted in Malaysia Ringgit per ton. Besides, the variables crude oil prices are quoted in Malaysia Ringgit per barrel, variables interest rate are collected based on the real interest rate in Malaysia and variables exchange rate are collected based on

the MYR/USD. All the source data are obtained from Bank Negara Malaysia, World Bank and MPOB.

3. 2: Econometric Methodology

This study undertakes econometric techniques in order to study the relationship between the economic variables and crude oil prices towards the export price of crude palm oil in Malaysia throughout 17 years using monthly prices. This research project will evaluate the hypothesis of whether or not the changes in crude oil prices, interest rate and exchange rate affect the export price of crude palm oil in Malaysia. The research method apply in this study consists of unit root test, co-integration test, vector auto-regressive model, granger-causality test and vector error correction model. In order to study the theoretical relations between the independent variables and dependent variables, this research project will applied the methodology suggested by Sadorsky(1999). After that, this research paper will continue to test the stationarity of the times series variables by using Engle-Granger Co-integration test which it is suggested by Engle and Granger (1987). In the end, Granger causality test will be used to investigate the short-term relationship between those independent variables and dependent variables. In short, this study is summarized in the research framework as shown in the Figure 3. 0.

Figure 3. 0: Research Framework

Exchange Rate

Interest Rate

Price of Crude oil

Export Price of Crude Palm Oil Malaysia

Independent VariableDependent Variable

Figure 4. 0: Relationship between Independent Variables and Dependent Variable

Long TermShort-TermType of relationshipMovement of export price of Crude Palm OilChange in Exchange RateChange in Interest RateChange in price of Crude OilThe independent variables applied in this study are crude oil price (COP), interest rate (IR), and exchange rate (ER), while the dependent variable is export price of crude palm oil (CPO). This research paper adopts an econometrics model in order to denote the relationship between interest rate, exchange rate and crude oil prices towards the price of crude palm oil. The following are the model that will be applied in this study.

$CPOt = α + β1\ IRt\text{-}1 + β2\ ER\ t\text{-}1 + β3COP\ t\text{-}1 + Єt(1)$

$LN\_CPOt = α + β1\ LN\_IR\ t\text{-}1 + β2\ LN\_ER\ t\text{-}1 + β3\ LN\_COP\ t\text{-}1 + Єt(2)$

$CPOt = α + β1\ IR\ t\text{-}1 + β2\ ER\ t\text{-}1 + β3\ COP\ t\text{-}1 + Єt(3)$

Where; CPO = Export Price of CPO in Malaysia (monthly)α = Constant VariableIR = Interest RateCOP = Price of Crude OilER = Exchange Rateβ1, β2, β3 = Coefficient describe how changes in all this variable affect the value of CPOЄ = Random error

3. 2. 1: Unit Root Test

The Unit-root tests are applied in order to investigate whether a time series variable is stationary or non-stationary. Hatanaka (2003) proves that the mean and covariance of the time series do not depend on time, then it is said to be non-stationary. In other words, when there is a variable contain a unit root then it is said to be non-stationary. Besides, in order to test the long term relationship between the variables, co-integration test need to be applied when time series data are integrated at first difference, I(1). Augmented Dickey-Fuller (ADF) test and Phillips Perron (PP) test can utilized to determine the existence of the unit root in the variables. ADF test and PP test are used to test whether the time series variable is stationary or it should be difference to result in a stationary series.

3. 2. 1. 1: Augmented Dickey- Fuller Test (ADF)

In this research paper, ADF unit root test applied to test the order of the integration of the series of the four variables. Difference the time series data by using ADF t-statistic is the best way to transform the non stationary time series data into a stationary form. ADF test is the wider version of the standard DF test which it is applied to solve the problem of autocorrelation in the standard DF test. DF test can be augmented through adding various lagged dependent variables. By using Akaike criteria (AIC), the optimal number of lags where it is necessary requirement for perform further testing can be determined. The AIC formula is as:

(4)

Where k is the number of parameters in the statistical model, and L is the maximized value of the likelihood function for the estimated model. The AIC

is applied in the model selection and the smaller values of the AIC will be better. This is supported by the Lee (2009) which assume that the y series follows an AR(p) process and adding p lagged difference terms of the dependent variable y to the right hand side of the test regression as follow:

(5)

Where is a constant, the coefficient on a time trend and the lag order of the autoregressive process. If the variables are stationary in 1st difference, then the model should be estimated by using first difference in the variable. The null hypothesis of the ADF t-test is: H0: θ = 0 (There is unit root) (6)Which indicates that the time series data need to be differenced until it become stationary form. The hypothesis alternative as: HA: θ < 0 (There is no unit root)(7)Where it indicates the time series is trend stationary and required to be analyzed by using a time trend in the regression model instead of differencing the data. If the time series need to be differenced by n times until it become stationary, then it contains of q unit-roots. In short, it is said to be integrated of order of q denoted as I(q). X and Y variables are said to be co-integrated.

3. 2. 1. 2: Phillips – Perron Test

Phillips – Perron (PP) test is another method of unit root test which is known as Phillips – Perron (PP) test. Lee (2009) reveals that the PP test estimates the non-augmented Dickey – Fuller test equation: Δ(8)Where Δ is the first difference operator. PP test make a non-parametric to the t-test statistic. Moreover, the test is robust with respect to unspecified autocorrelation and heteroscedasticity in the disturbance process of the test equation. However, Davidson and Mackinnon (2004) suggest that the performance of Philips-

Perron test is worse in finite samples as compared to the augmented Dickey-Fuller test.

3. 2. 2: Johansen Co-integration Test

Johansen Co-integration test is the test utilized to determine the number of co-integration vectors. Johansen (1991) suggests Johansen test has both the estimation and hypothesis testing performed in a unified framework. Johansen's methodology takes its starting point in the vector autoregression (VAR) of order P given by:

(9)

Where yt is an x1 vector of variables that are integrated of order one - commonly denoted I(1) – and €t is an n x1 vector of innovations. Co-integration is an econometric property of time series variables and there is a correction among variables. There will be a possible of the existence of a series of residuals when there is relationship between variables. When the residual has a pattern, and are stationary, it indicates that these variables are co-integrated. Besides that, it also shows that there is a long-term relationship between the variables. However, if the residual is normal, it means that the short term and long-term relationship between the variables is same. The variables are not co-integrated when the residuals are random walk. In order to perform co-integration test, firstly we need to select an optimal lag interval, the lag interval with the lowest AIC value will be chosen for the co-integration test. Then, Granger causality test would be applied in the further analysis. The procedure applied two test to test the co-integration, which are; the Maximum Eigenvalue test and the Trace test. There is no co-integration between the variables when the Trace and Max-

eigenvalue statistics are smaller than their critical value, do not reject H0, and vice versa. The hypothesis for co-integration is as follow: H0: The variables are not co-integrated. HA: The variables are co-integrated. The Trace statistic tests the null hypothesis of r co-integrating vectors against the alternative hypothesis of n co-integrating vectors. The equation for Trace statistic test is as follow:

(10)

On the other hand, the maximum eigenvalue test tests the null hypothesis of r co-integrating vectors against the alternative hypothesis of r+ 1 co-integrating vectors. Neither of these test statistics follows a chi square distribution in general; asymptotic critical values can be found in Johansen and Juselius (1990) and are also given by most econometric software packages. The equation for the maximum eigenvalue test is as follow:

(11)

3. 2. 3: Vector Error Correction Model (VECM)

The VECM method apply in order to evaluate the short run properties of the co-integrated series once the co-integration test indicates that there is co-integration between series and we know that long term equilibrium relationship between series was exists. A VECM can lead to a better understanding of any non-stationarity among the time series. The VECM model has co-integration equation built into the specification so that it restricts the long-term behavior of the endogenous variables to converge to their co-integrating relationship while allowing for short-term adjustment dynamics. The co-integration equation is known as the error correction

method (ECM) since the deviation from long-term equation is corrected gradually through a series of partial short-term adjustments. (Engle and Granger, 1991). The regression equation form for VECM is as follows:

(14)

(15)

The number of co-integrating vector will indicates on the co-integration rank in VECM. Besides that, a rank of two indicates that two linearly independent combinations of the non-stationary variables will be stationary. Furthermore, VECM would be able to separate the short-term from long-term relationship. A negative and significant coefficient of the ECM (i. e. et-1in the above equations) indicates that any short-term fluctuations between the independent variables and the dependant variable will give rise to a stable long run relationship between the variables.

3. 2. 4: Granger Causality Test

Granger (1969) proposed that a time series variable X is said to be Granger-cause Y if it can be shown, usually through a series of t-test and F-tests on lagged values of X (with lagged valued of Y also included), that those X values provide statistically significant information about the future values of Y. Therefore, if in the past X contains useful information (in addition to the information in past Y) to predict future Y, then X is said to Granger-cause Y. This test involves estimating the simple vector auto regressions (VAR). The number of lags to be included is usually chosen using an information criterium, such as the Akaike information criterion or the Schwarz

information criterion. The casuality relationship can be determined by estimating the following:

(12)
and

(13)

The hypothesis for the Granger causality test is as follow: H0 : $\beta 1j = 0$, $j = 1$, 2,...m (x does not Granger-cause y)HA: $\beta 1j \neq 0$, $j = 1$, 2,...mAccording to Engle and Granger (1987), two I (1) series are said to be co-integrated if there is an existence of linear combination of the two variables which produces a stationary trend. Any non-stationary series are co-integrated may diverge in the short run, but they must be linked together in the long run (Amna and Fatimah, 2009). In This analysis, we will obtain two tests, which are: (1) investigates the null hypothesis that the X does not Granger-cause Y and (2) investigates the null hypothesis that the Y does not Granger-cause X. If we fail to reject the previous null hypothesis and reject the latter, then we conclude that X changes are Granger-caused by a change in Y. Unidirectional causality will occur between two variables if either null hypothesis of equation (12) or (13) is rejected. However, if the null hypothesis of equation (12) and (13) are rejected, it indicates that there is bi-directional causality between X and Y.