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European Oil Price Uncertainty: A Panel Data Approach

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Abstract
This paper investigates the significant macroeconomic determinant such as inflation, exchange rate, oil export and oil import affecting oil price in 10 European countries namely Austria, Denmark, France, Germany, Greece, Italy, Norway, Turkey, United Kingdom and Spain from 1994 to 2014. Panel data are be use to run this analysis regarding the relationship between the dependent and independent variable. By employing Fixed Effect Estimation Model, the empirical result revealed that the oil price is influenced by the selected macro-economic factor. In particular, the evidence shows that inflation and oil import are significantly affect oil price in the majority of this country. Oil export and exchange rate does not give impact to oil price which mean insignificantly relationship between oil prices.

Keywords*: Oil Price; Inflation; Exchange Rate; Oil Export; Oil Import*

1. INTRODUCTION

Crude oil is the one of the important commodity to generate our economy. Fluctuation in crude oil price is the global phenomena that felt by each country in the world. This study focused more to European Countries. Nowadays, European countries have been experience a fluctuation in crude oil price. From this case, four macroeconomic variables are selected to test their relationship with oil price which is inflation, exchange rate, oil export and oil import. Oil price very well-known economic indicators since it really related to our life. Crude oil as an important production factor has had a significant position in the world economic. Especially after oil crises in 70th decade that led to economic regression in the west, oil and oil products were considered as important factor in production and in 80th decade, the relationship between oil and economic growth gained attention of the analysis. Fluctuations of the oil price and its considerable effect on the macro economic variables were considered by the most of the economists. From experimental viewpoints, there are many relationships that can be related to oil price.

1.1 Problem statement of the study

In European country the price of oil changing every year, and fluctuation in oil price in this country has impact to the instability in economic forces. Therefore, the author tries to find what influence the most of fluctuation in this crude oil. Ten European countries were selected to run the experiment. Event many studies relate the instability of crude oil with many factors, the authors choose macroeconomic factors such as inflation, exchange rate, oil export and oil import proxy to the oil price. The countries that have been chosen for this research are Austria, Denmark, France, Germany, Greece, Italy, Norway, Turkey, United Kingdom and Spain.

1.2 Literature review

Blanchardy & Gali (2007) found out that inflation give significant effect to oil price production. They also have positive relationship as increase in inflation will increase the oil price as well. The contribution inflation to oil had been observed recently and this is reliable since oil price changes according to the changes in inflation. Frankel (2010) said that oil have become the most important commodity. So, his study analyzed the instability in oil price crisis. The reason behind the world oil price increase is because different of the world currencies. It is mean that oil exchange rate have positive relationship with oil price. It is because, when the country who

have stable in their currency will gain more than country who are not stable since exchange rate play an important role in one country.

Next study is from (Alper &Torul, 2008) choose Turkey and found that oil price also have significant effect due to the fluctuation in exchange rate which lead to the different in term of currencies. It shows a positive relationship between the oil price and exchange rate since when exchange rate increase, the price of oil will also increase.Filis (2010), choose Greece since it one of the oil importers. The result revealed that oil export insignificant to oil price but it has positive relationship which mean increase in oil export will increase the world oil price. So that, abundant study related to the relationship between oil price and macroeconomic variable in European countries are analyze. AL-Fayoumi (2009) chooses three oil importing countries which is Turkey, Tunisia and Jordan. The author examines the relationship between oil price and oil import exists in the long run and it show oil import have significant effect of on oil price. As an addition, increase in oil import will increase the oil demand as well as will increase the oil export too.

According to Wu, Chung & Chang (2012), their result revealed that there is no relationship between oil price and exchange rate by using monthly data from January until December. They applied Copula-GARCH models and they conclude that exchange rate show insignificant effect to oil price since 2003. Atem, Kapper & Lamc (2015) found that exchange rate have relationship to the crude oil market. By applying Kilian method, their analysis show that changing in oil price does not affect the exchange rate but changing in exchange rate like depreciation affect the oil price. In addition, exchange rates react irregularly to crude oil price depend on the type of effect like large, small, positive or negative.Papers from Reboredo, Rivera-Castroa & Zebende (2014), examine the relationship between oil prices and the US dollar exchange rate and conclude by two findings. First, the cross correlation analysis show that oil price and exchange rate correlations were negative and low value. Second, oil price and the US dollar rise after the global financial crisis.

According to Ghosh (2009), run long-run test relationship using quantity of the crude oil import, income and price of the crude oil in India from 1970 to 1971 and 2005 to 2006. They found that in short and long run, they effect of oil import to oil price insignificant. In addition, granger causality shows that unidirectional long-run causality running from crude oil import to oil price.
Paper from Ziramba (2010), he investigate the relationship between imported crude oil and the price of crude oil within the period 1980 to 2006 in South Africa. They run the Johansen co integration multivariate test. The result show that the relationship exists between crude oil imports and the oil price and it is positive. Casassus, Cebalos & Higuera (2010) run the correlation test between inflation and oil price. The result shows positive correlation because oil is in the larger uses but this is only a minor part of it. In addition, they found that changes in inflation are sensitive to the oil price but it only low significant. It is generally acknowledged that changes in oil prices affect economic. By using 1990 table of input and output, the author tried to analyze is inflation affect in Turkey for crude oil price. Selected variable like fixed Nominal wages, profits, and interest and rent earnings were tested and the result is increasing prices of oil on inflation is limited. On the other hand, the variable change to general price level that includes inflation, the result come out significant which mean inflationary effect of oil prices. (Berument & Tasci, 2002).

2. METHOD AND MATERIAL

All the data of oil prices (crude oil price), oil export (merchandise export), oil import (merchandise import), exchange rate (US Dollar) and inflation (consumer price index). 10 selected European countries which are Austria, Denmark, France, Germany, Greece, Italy, Norway, turkey, United Kingdom and Spain are gathered from the World Bank database and OECD database. This data were collected within 21 years which is from 1994 until 2014.

The authors use panel estimation models which include pooled ordinary least square (OLS), fixed effects model and the random effects model. Each of the models is subject to limitations, thus using one method alone will not be effective. All the dataset of the study is tested by using all these models.

Next, statistically an important choice will be made between fixed effects model and the random effects model. According to the statistical rule, if the individual effects and the regressors are uncorrelated, then random effects model is used although the fixed effects still remains useful. Thus, if the regressors and individual effects are correlated then only fixed effects model should be used. In order to choose the correct model Hausman Specification test is conducted.

The general form of the Model Estimation:

$$(PRICE)i,t = \alpha + \beta 1\ (INF)i,t + \beta 2\ (ER)i,t + \beta 3\ (OE)i,t + \beta 4\ (OI) + \varepsilon t$$

Where:

PRICE = Oil Price
INF = Inflation
ER = Exchange rate
OE = Oil export
OI = Oil Import
α = Constant term
εt = Error term

In modelling oil price decision, the oil price is used as the dependent variable. The independent variables employed are inflation, exchange rate, oil export and oil import.

3. ANALYSIS AND RESULTS

Table 1: Descriptive statistic

	Variable	Result
1.	Inflation	-0.1417
2.	Exchange rate	0.4470
3.	Oil import	0.4280
4.	Oil export	-0.6311

From the above result, the dependent variable which is oil price, the average for this variable is 8.12721, while for the maximum and minimum is 12.00836 and 2.615204. The standard deviation is 2.180576 which show that the value are scattered far from the mean value. Next is independent variable. The first independent variable is inflation. The average for this variable is 0.9214086, while for the maximum and minimum is 4.665915 and -2.429462. The standard deviation is 0.9969299 which show that the value are scattered near to the mean value.

The second independent variable is exchange rate. The average for this variable is 0.1696112 while for the maximum and minimum is 2.196335 and -3.506558. The standard deviation is 0.9534063 which show that the value are scattered near to the mean value. The third independent variable is oil export. The average for this variable is 1.627853 while for the maximum and minimum is 4.248487 and -0.3005644. The standard deviation is 1.127882 which shows that the value are scattered near to the mean value.

The last independent variable is oil import. The average for this variable is 2.197434 while for the maximum and minimum is 3.62736 and 0.9132352. The standard deviation is 0.5620887 which show that the value are scattered near to the mean value

Table 2: Correlation result

	Variable	Result
1.	Inflation	-0.1417
2.	Exchange rate	0.4470
3.	Oil import	0.4280
4.	Oil export	-0.6311

Correlation use to determine the relationship between independent variable and dependent variable. From the result above, the correlation above show that inflation and oil import have negative relationship with oil price while exchange rate and oil export have positive relationship with oil price. The most influence variable among four variables is oil import toward oil price by ignoring the negative sign.

Table 3: Pooled Ordinary Least Square (OLS) result

	Variable	Coef	P > l t l
1	Inflation	0.1049906	0.351
2	Exchange rate	-0.1441778	0.367
3	Oil import	0.6902539	0.000
4	Oil export	-2.398402	0.000

*R^2 = 0.5037 f-stat = 0.0000

From the above result, it can be seen that oil import and oil export are significant with oil price. Inflation and exchange rate are not significant with oil price. The F-stat has 0.0000 which mean the p-value is significant (least than 0.05). Meanwhile, the coefficient of determination (R_2) is 0.5037 which indicate that as much as 50% of independent variables can well explained the depend variable (oil price), while the remaining is unexplained. Furthermore, exchange rate and oil import have shown negative relationship with the oil price while inflation and oil export show positive relationship between oil prices.

Table 4: Result of Breusch Pagan Test

Prob > chi2	0.0000

Breusch Pagan Test is used to answer the question Pool or not to Pool. From the table above, the p-value show significant since the result obtain is 0.0000 which is less than 0.05. Thus, The Random Effect Model (REM) will be conducted in this study.

Table 5: Random Effect Model result

	Oil price	Coef	P > l z l
1.	Inflation	0.1428693	0.002
2.	Exchange rate	-0.1220893	0.080
3.	Oil import	0.2074938	0.039
4.	Oil export	0.2074938	0.000

*R^2 = 0.4437 prob > 0.0000

The result above shows that inflation and oil import are significant with the oil price while oil export and exchange rate have insignificant with dependent variable (oil price). The Chi^2 has 0.0000 which means the p-value is significant since less than 0.05. The coefficient of determination (R^2) is 0.4437 which indicate that as much as 44.37% of independent variables can well explained the dependent variable, while the remaining is unexplained. From the

random effect regression result, the exchange rate and oil import have negative relationship with oil price while oil export and inflation show positive relationship with oil prices.

Table 6: Hausman Fixed Test result

Prob > chi2	**0.0120**

Hausman Fixed Test is run in order to choose fixed effect or must go back to random effect model. The result that obtains from hausman test is significant at 0.0120 which mean less than 0.05. So, the conclusion is needed to choose Fixed Effect as the best result.

Table 7: Fixed Effect Model result

	Oil price	**Coef**	**P > I t I**
1.	Inflation	0.135767	0.004
2.	Exchange rate	-0.1190724	0.085
3.	Oil import	0.1603628	0.115
4.	Oil export	-6.297075	0.000

*R^2 = 0.4232 f-stat = 0.0000

Due to significant of p-value of Hausman Fixed Test, need to proceed with fixed effects as the best result. From the table 7, the result shows that the F-stat has 0.0000 which means the p-value is practically significant since less than 0.05. In addition, from the t-test, oil import and inflation shows significance which are 0.0000 and 0.004, but exchange rate and oil export are not significant.

PRICE = 9.203832 + 0.135767INF – 0.1190724ER + 0.1603628OE – 0.6297075OI
(0.004) (0.085) (0.115) (0.000)

From the coefficient of this variable, it can be conclude that when 1% increases in inflation will increase US$ 0.135767 in oil price. Second, If 1 % increase in exchange rate, it will decrease US$ 0.1190724 in oil price. Third, If 1% increase in oil export, it will increase US$ 0.1603628 in oil price. Lastly, If 1% increase in oil import, it will decrease US$ 0.6297075 in oil price. Since the best result come from Fixed Effect Model, inflation and oil import show significant relationship with oil price which are 0.004 and 0.000. Meanwhile, exchange rate and oil export are show negatively relationship with oil price.

4. DISCUSSION AND CONCLUSION

From the result above, oil import is significant with oil price. This result support by Vrontisi, Kitous, Saveyn & Vandyck (2015), their analysis shows that a decrease of the oil import from US$100 to US$50 may lead to an oil price decrease about 0.7%. It means net oil importing countries gain and oil exporting countries lose. An author more focuses on the EU28 and it shows that having more oil importing country much better than having more an exporting country since the price will become low. From the finding, it shows that exchange rate and oil export is not significant. It is because exchange rate and oil export should not focus directly to the changes oil prices but need to consider about other independent variable like economic growth and other dependent variable. Future research also should use the crude oil price based of each country's currencies. Besides that, the next research and study could add more methodology to analyze the data. The shorter period of study may not be the representative way of the country can determine the impact oil price to aggregate macroeconomic behavior. Future research could make an in-depth and extended analysis on the impact of world oil price variables to aggregate macroeconomics. Thus, to have a better result in future, the researcher needs much longer period of the study.

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