Analysis of Crude Oil Price and Exchange Rate Volatility on Macroeconomic Variables (Case Study of Indonesia as Emerging Economic Country)

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Abstract: This study aims to look into the impact of crude oil prices and exchange rate volatility on domestic gasoline prices in Indonesia, as well as macroeconomic variables like consumption and GDP (GDP). The author took a case study in Indonesia as an emerging country and net oil importing country. The research was conducted from 2010 to June 2018. In 2013 and 2014, there were significant changes in crude oil prices and exchange rate. Therefore the research period is considered appropriate to determine impacts due to variable changes. The research method used path analysis. The data used was time series from 2010 to June 2018. The result indicates that crude oil prices and exchange rates have a significant positive effect on Indonesian Gasoline prices, Consumption, and GDP as the R^2 obtained was 99.7%. Therefore it indicates that the utilised model can explain variable information up to 99.7%. In this study, in contrast to previous studies, the author examines both the impact of crude oil prices and the exchange rate on economic growth by including mediating variables such as domestic gasoline prices and domestic household consumption.

Keywords: Crude oil prices, exchange rate, gasoline prices, consumption, GDP

INTRODUCTION

In economics, crude oil prices, exchange rates and other macroeconomic variables is widely discussed. Studies on this topic mainly divided into several research categories. First, the study about the GDP as a key of macroeconomic variables. GDP become the standard measure of economic progress (CASSE, n.d). Furthermore, in many macroeconomic literatures, consumption has a determinant role in sustaining GDP. In developed and developing countries, consumption, especially private consumption, ranks first and more than 50% as GDP supporting factor and accounted about two-thirds of GDP (see for examples (Anonymous, 2018; BIS, 2011; Boustead, 1998; Byun, 2015; Morrison, 2013)).

Second, in terms of consumption, several factors determine the amount of consumption. Many economists such as Keynes, Duesenberry, Friedman, Ando and Modigliani found several factors that influence consumption, such as income, prices, preferences, substitute goods, interest rate and expectations (Bonsu & Muzindutsi, 2017). In Keynesian theory, current income is a main determinant in consumption. Nevertheless, another source stated that prices are the main determinant that influences people's consumption behavior (Bryan, 2014; Alatrash, 2018).

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Third, in terms of price formation of goods, production input is considered as the major determinant (Maraseni, Cockfield, & Apan, 2007). In addition, various policies which can affect the wealth have an important impact on consumption patterns (Bayar, Mc Morrow, et al., 1999). Fuel is one of the inputs used in the process of distributing raw materials, marketing processes and many more. Also it is an administered price commodity whose price can change any time according to government policy. The government price controls (policy) impacts on the economy (Murphy, Pierru, & Smeers, 2019) and the changes in fossils fuel prices increase the cost (Anand, 2016; Amelia, 2016; Kinata, 2016). Under the cost-push inflation theory, an increase in production costs will increase inflation (Mankiw, 2016), thus affect the wealth, change the demand and the consumption patterns (see for examples (Altantsetseg, Chen, & Chang, 2017; Malukele, 2012; Ma, Ailawadi, Gauri, & Grewal, 2011; Taechaubol, 2017)).

Fourth, the fuel prices is closely related to fluctuations in global economic activity especially for oil prices (European Central Bank, Giannone, Ferrara, & Delle Chiaie, 2017; Frankel & Rose, 2010). According to Kilian (2010), in the long run, 54% of the variation in the real gasoline price in the U.S. is driven by oil-market specific demand shocks, 41% by shocks to the global business cycle, and 4% by refining shocks with essentially no role for domestic gasoline demand shocks or global oil supply shocks. Martínez, Abadie, and Fernández-Macho (2018) revealed that there is a correlation between the price of crude oil and petroleum products, especially heating oil, kerosene and diesel. In the US also, crude oil and gasoline prices are related and show significant variability (Bremmer & Kesselring, 2016).

Beside has an impact on fuel prices, from several previous studies, oil prices thought has an impact on aggregate macroeconomics variables. Herrera, Karaki, and Rangaraju (2019) found empirical evidence that oil price has an asymmetric effect on U.S aggregate economic activities such as the components of GDP. Moreover, they explained that oil price disrupting the consumption through discretionary income channels and operating cost channels. Bildirici and Sonustun (2018) studied on oil exporting countries, revealed that oil price movements play an important role in the behaviors of economies and become the most important factor in the driving forces of the world economy. Balke and Brown (2018) found that U.S. GDP is affected by reductions in ROW oil production. in the long-run, when U.S. oil consumption falls, the elasticity of GDP with respect to oil prices falls as well.

Another factor that is thought to influence the price of fuel is the exchange rate. Based on the pass through effect theory, volatility in exchange rates can affect domestic prices through import channels (see for examples (Bahri, E, & Poniwati, 2017; S.-S. Chen, 2009a, 2009b; Edwards & Sahminan, 2008; Hamilton, 1996; Thorbecke, 2018)).

Concerning exchange rate, (Medlock and Jaffe, and Zhang et al., as cited in Ramos (2011); Breitenfellner, Cuaresma, et al. (2008) proved that improves on oil price forecasts is significantly caused by USD/EUR exchange rate. (Delsalle et al., 2002) reinforced that national currency exchange rate is one determined the gasoline prices. Chou and Tseng (2016) said in Taiwan, exchange rate shocks are the main source of price asymmetry. When changes in exchange rates occur, retail gasoline prices will adjust. Mensi, Hammoudeh, and Yoon (2015) show real evidence in Eurozone market, there were significant asymmetric volatility spillovers between the U.S. dollar exchange rate and the petroleum markets. However Chien, Lustig, and Naknoi (2019) in their study revealed that exchange rate weakly correlated macro fundamentals. Similar with Comunale (2017) who revealed that exchange rate volatilities are not robust in affecting GDP growth in EU members. Conversely, Lee and Yue (2017) revealed that USD exchange rate has positive effect on petroleum consumption, and then petroleum consumption increases real GDP in the environment of U.S.

If it examined theoretically and empirically, there is a chain effect. The variable world crude oil price and exchange rates are thought to affect the price of a country's domestic fuel. The next effect is when there is a changes in the price of domestic fuel, there is a change in consumption. As the biggest component of supporting GDP, the changes in consumption are thought to affect GDP as well. Therefore the author motivated to study the related variables. This paper has the objective to know the effect of world oil price and exchange rate to macroeconomic variables especially GDP through a few another macroeconomic variables as mediating variables. Or in another word, whether each macroeconomic variable is stimulated by crude oil price movements and the exchange rate or not.

Research on macroeconomic variables has been done before, but no consecutive at all. The study conducted by Alaimo and Lopez (2008) shows that the price of crude oil has a negative effect on oil consumption per unit of GDP in OECD countries. Other research conducted by Taghizadeh-Hesary and Yoshino (2015) the results shows that the effect of oil price fluctuations on developed oil importers' GDP growth is much milder than on the GDP growth of an emerging economic country. Kargbo (2018) shows that exchange rate fluctuations and gasoline prices only affect the CPI in the short term. Even the oil prices and exchange rate are the good predictor to forecast the other variables in the short-run (Beckmann, Czudaj, & Arora, 2017).

In this study, in contrast to previous studies, the author examines both the impact of crude oil prices and the exchange rate on economic growth by including mediating variables such as domestic gasoline prices and domestic household consumption. So that in this study divided into four key research, they are (i) the effect of world crude oil price on domestic gasoline prices, (ii) the effect of exchange rate volatility on domestic gasoline prices, (iii) the effect of world crude oil price and exchange rate on consumption through gasoline price, (4) the effect of world crude oil price and exchange rate on GDP through gasoline price and consumption.

The significance of the study can be predict the contagion effects among variables when the fluctuations of world crude oil prices and exchange rates exists. Both are important variables in world trade and price stability. Crude oil as one of the transportation fuels is the biggest contributor to the fluctuation of consumption and economic growth. Changes in world crude oil prices affect economic growth to export-import activities (Baffes, Kose, Ohnsorge, & Stocker, 2015). Even the sharp rise in world crude oil prices was once the cause of the recession (Alekhina & Yoshino, 2018). WE Council (2016) added that the main increase in consumption will come from the transportation sector.

Concerning exchange rate, when there is a change it will have an impact on different stakeholders in different ways. Changes in exchange rates will have an impact on the ability of stakeholders to pay for goods and services (Nonsolovino, n.d). De Grauwe and Schnabl (2008) emphasized that changes in exchange rates contributed substantially to macroeconomic stability, also had implications for international transmission and monetary policy transmission (Di Mauro, Rüffer, & Bunda, 2008).

Using the path method, the author takes a case study of Indonesia as a developing and emerging country Åslund (2013), Boediono and Pangestu (2018), Pasaribu (2012)). In addition, Indonesia is a net oil importer country. This is what distinguishes from previous studies which have taken many case studies in developed, large open economic and net oil exported countries.

Since 2004, Indonesia is a net oil importer Tharakan (2015), (World Bank, 2015) and has become one of Asia's top buyers (Dapice & Cunningham, 2011). According to report from EIA (2015) Indonesia currently imports crude oil to meet domestic demand. Until 2017, Indonesia can produced only 57% of its oil consumption (BP Statistical Review of World Energy, 2018).

LITERATURE REVIEW

Theoretical Review

Based on economists, GDP has several definitions: i) GDP, or GDP, is the value of the final goods and services produced in a country during certain period (Garín, Robert, & Sims, 2018; Parkin, 2012). ii) GDP can be defined statistically in two ways. First, GDP is the total income of all units in the economy; Second, GDP is total expenditure on the output of economic goods and services (Mankiw, 2016). In total expenditure method accounting, consumption is one of the component on supporting GDP.

Based on the consumption theory, there are several factors (cateris paribus) that affect the consumption desire (Hutchinson, 2016; Varian, 2016) such as: i) price level, ii) expectations, iii) tastes and preferences and iv) price of substitute or related goods. However prices are the main variable influencing consumption demand (Bryan, 2014). Another theory which popularized by John Maynard Keynes, the main variable influencing consumption is the real income (Breido & Tregub, n.d.). So there is a linkages between prices and real income. The higher prices means the lower real income and vice versa.

Growth in consumption, especially energy, can be controlled by price control policy, when there is an increase in gasoline prices, household consumption tends to decrease (see (Al-tai, 2015; Sohaili, 2010)). Nevertheless the response to the changes in fuel prices varies by country (Moshiri, 2015). For an industrialised country like United States, the long-term price elasticity is relatively high and households are more sensitive to a price increase than a price decrease, otherwise it seems no asymmetric effect of price variations for emerging country (Sentenac-Chemin, 2012).

Chou and Tseng (2016) in their study revealed that crude oil prices and the exchange rate are the main determinants in the formation of gasoline prices. Moreover Bagnai and Ospina (2016) shows that the exchange rate has positive asymmetry and crude oil prices have negative asymmetry with gasoline prices in the Eurozone. In Turkey, Akçelik and Öğünç (2016) confirmed that oil price pass-through to domestic prices is very fast and suggests that a 10% change in crude oil prices is associated with a 0.42 percentage points change in consumer inflation at the end of one year in. Zhang and Wang (2013) analyzed that in China respectively crude oil and gasoline futures 95.71% and 59.41% performed the price of discovery functions.

Empirical Review

Researches on related macroeconomic variables have been conducted before and show different results. Carpio (2019) found the results that gasoline prices are sensitive to changes in crude oil prices in the short and long term. Sun, Zhang, Hong, and Wang (2019) further confirms that the price of crude oil is positively related to gasoline prices. Research conducted by Marrouch and Mourad (2019) shows that rising gasoline prices shift consumers' demand towards the most fuel-efficient cars. Wang (2013) found the evidence that between oil price changes and personal consumption expenditures has nonlinear relationship via real balance effects where the effects of rising oil prices on personal consumption expenditures are greater than the falling oil prices. Karaki (2017) explains that oil price fluctuations do not affect GDP growth. While gasoline demand is found to be inelastic prices when there was an increase in crude oil prices, but an increase in crude oil prices increases welfare in Saudi Arabia by around 0.26% of Saudi GDP (Atalla, Gasim, & Hunt, 2018).

Concerning exchange rate, Ghoddusi, Morovati, and Rafizadeh (2019) found that positive exchange rate shocks have a significant negative impact on total gasoline consumption. Chou and Tseng (2016) added that gasoline price responses to exchange-rate shocks were slow and complex. C. Chen, Polemis, and Stengos (2019) also explained that real effective exchange rate can affect retail gasoline price through Exchange Rate Pass Through Theory (ERPT). Moreover, the exchange rate has significant negative impact on private consumption (Oseni, 2016). Bahmani-Oskooee, Kutan, and Xi (2015) added that only in the short-run, the exchange rate volatility has significant effect on all emerging countries. Jovic, Miladinovic, Micic, Markovic, and Rakic (2019) found the linear relationship between exchange rate and GDP. Conversely, Comunale (2017) found that exchange rate volatilities are not robust in affecting GDP growth.

RESEARCH METHOD

The sample period consists of monthly time series from January 2010 to June 2018. Data obtained from Bank Indonesia, International Finance Statistics, Pertamina, and Central of Statitics Bureau. Research method used path analysis. The author used path analysis due to existing more than one dependent variable. Also, several dependent variables act as intervening variables before final variable. According to Streiner (2005), Path analysis is capable to test a model possessing several dependent variables. There are "chains" effect in their influence. For example, variable A affects variable B, which in turn affects variable C. In this study, author has: i) two independent variable namely world oil price and exchange rate; ii) three dependent variable, one of them act as final variable namely GDP; two of them namely domestic gasoline price and consumption which act as mediating variable also indirectly linking between the independent variable (world oil price and exchange rate) and the final variable. The used of path analysis was justified by Retherford and Choe (2011) who mentioned that path analysis is a technique for analyzing cause and effect relationships that occur in multiple regression if the independent variables affect the dependent variable not only directly but also indirectly.

The price of oil examined was West Texas Intermediate (WTI) because almost all sectors use it as underlying commodity (Procházka & Hönig, 2018) and a global benchmark for world oil prices (Thorbecke, 2018). The exchange rate used was Rupiah against USD because USD was used for international trade (Auboin, 2012). The fossil fuel price was gasoline because all groups of people in Indonesia use it. To measure consumption ability, the author used national private consumption data because the sector dominates about 50% consumption activities in Indonesia. The last, GDP was used for anaylsis is real GDP.

RESULTS

Based on the results of the path analysis equation, the overall results were obtained as showed in Figure 1 and can be described as follows:

i. The direct relationship of WTI (X_1) to the gasoline price (Z_1) is obtained with a coefficient of 0.299. As seen Table 1, *t*-count > *t*-table statistics (2.107 > 1.976) and *p*-value < 0.05 (0.043 < 0.05) the hypothesis stated that WTI crude palm oil (X_1) affects the gasoline price (Z_1) is accepted. The positive coefficient states that if the price of WTI (X_1) increases, the gasoline price (Z_1) also increases. R^2 value obtained by 0.754 or 75.4% means that the WTI price (X_1) and Exchange Rate (X_2) has an effect of 75.4% on the gasoline price (Z_1), while the remaining 24.6% is influenced by other factors (Table 1).
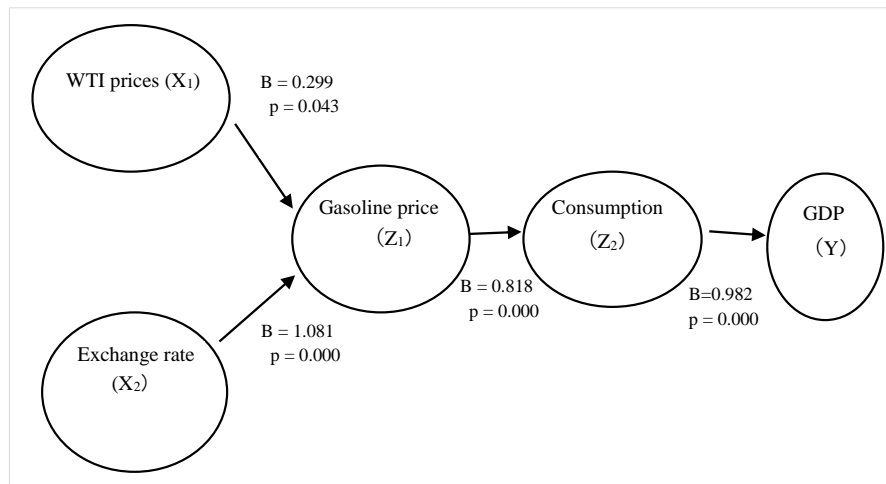
Figure 1 *Output of Path Analysis*

Table 1 *OUTPUT OF PATH*

Independent Variable	Beta	t_{count}	*p*-value
WTI price (X_1)	0.299	2.107	0.043
Exchange Rate (X_2)	1.081	7.614	0.000
$R^2 = 0.754$			
$t_{table} = 1.976$			
Dependent Variable = BBM price (Z_1)			

ii. Direct exchange rate (X_2) with the gasoline price (Z_1) is obtained with a coefficient of 1.081. As seen in Table 1, *t*-count > *t*-table statistics (7.614 > 1.976) and *p*-value < 0.05 (0.000 < 0.05), the hypothesis stated that the exchange rate (X_2) affects the gasoline price (Z_1) is accepted. The positive coefficient states that the higher the Exchange Rate (X_2), the higher the Indonesian gasoline price (Z_1). R^2 value obtained by 0.669 or 66.9% means that Consumption (Z_2) is influenced by the gasoline price (Z_1) of 66.9%, and the remaining 33.1% is influenced by other.

iii. The direct relationship between the gasoline price (Z_1) and consumption (Z_2) is obtained with a coefficient of 0.818. As seen in Table 2, *t*-count > *t*-table statistics (8.044 > 1.976) and *p*-value < 0.05 (0.000 < 0.05), the hypothesis stated that the gasoline price (Z_1) affects consumption (Z_2) is accepted. A positive coefficient means that the higher the gasoline price (Z_1), the higher consumption value (Z_2). R^2 value obtained by 0.964 or 96.4% means that GDP (Y) is influenced by Consumption (Z_2) of 96.4%, and the remaining 3.6% is influenced by other factors.

Table 2 *OUTPUTH OF PATH*

Independent Variable	Beta	t_{count}	*p*-value
BBM price (Z_1)	0.818	8.044	0.000
$R^2 = 0.669$			
$t_{table} = 1.976$			
Dependent Variable = Consumption (Z_2)			

iv. The direct consumption relationship (Z_2) and GDP (Y) is obtained with a coefficient of 0.982. As seen in Table 3, *t* count > *t*-table (29.072 > 1.976) and *p*-value < 0.05 (0.000 < 0.05), the hypothesis which states that Consumption (Z_2) affects GDP (Y) is accepted. The positive coefficient states that the higher the consumption value (Z_2), the higher GDP value (Y).

Table 3 *OUTPUTH OF PATH*

Independent Variable	Beta	t_{count}	*p*-value
Consumption (Z2)	0.982	29.072	0.000

$R^2 = 0.964$
$t_{table} = 1.976$
Dependent Variable = GDP (Y)

v. The indirect relationship between WTI (X_1) to consumption (Z_2) through the gasoline price (Z_1), the path coefficient is obtained from 0.299 x 0.818 = 0.245. As two path coefficients, indirect relationships (WTI and gasoline prices) are significant, indirect relationships (WTI and consumption through gasoline prices) in the path analysis are also significant. Positive coefficient (0.245), it can be concluded that the higher WTI (X_1), the consumption (Z_2) will be higher if only gasoline price increases (Z_1).

vi. The indirect relationship of the exchange rate (X_2) on consumption (Z_2) through the gasoline price (Z_1), the path coefficient is obtained from 1.081 x 0.818 = 0.884. As two path coefficients, indirect relationships (exchange rates and gasoline prices) are significant, the path coefficients in indirect relationships (exchange rates and consumption through gasoline prices) are also significant. Positive coefficient (0.884), it can be concluded that the higher exchange rate (X_2) made consumption (Z_2) will be higher if only gasoline price increases (Z_1).

vii. The indirect relationship of WTI (X_1) to GDP (Y) through the gasoline price (Z_1) and consumption (Z_2), the path coefficient is obtained from 0.299 x 0.818 x 0.982 = 0.240. As the two path coefficients, indirect relationships (WTI, gasoline prices and consumption) are significant, the path coefficients on indirect relationships (WTI to GDP through gasoline and consumption prices) are significant. Positive coefficient indicate that when WTI (X_1) increase, GDP (Y) will be increase if only gasoline price (Z_1) and Consumption increases (Z_2).

viii. The indirect relationship between the exchange rate (X_2) to GDP (Y) through the gasoline price (Z_1) and consumption (Z_2), the path coefficient is obtained from 1.081 x 0.818 x 0.982 = 868.34. As the two path coefficients possess significant direct relationships (exchange rates, gasoline prices, and consumption), the indirect relationship to variables (the exchange rate of GDP through gasoline prices and consumption is significant. The positive coefficient states that when the exchange rate (X_2) increase, GDP (Y) will be increase if only gasoline price (Z_1) and consumption increase (Z_2).

ix. The indirect relationship between the gasoline price (Z_1) against GDP (Y) through consumption (Z_2), the path coefficient is obtained from 0.818 x 0.982 = 0.803. As two path coefficients, indirect relationships (gasoline and consumption prices) are significant, the indirect relationship on the variable gasoline price to GDP through consumption is significant. The positive coefficient indicate when gasoline price (Z_1) increase, GDP (Y) will increase if only the consumption (Z_2) increase.

Furthermore, the author has tested the model validity. In Path analysis, the indicator of model validity is the determination of the total coefficients. It was obtained as described in the following formula:

Determination of the Total Coefficient
$R^2 total = 1 - Pe_{12}Pe_{22}Pe_{32}$
$R^2 total = 1 - (1-R_{12})(1-R_{22})(1-R_{32})$
$R_{12} = 0.754, R_{22} = 0.669,$
and $R_{22} = 0.964$

The R^2 total is the R square value of the first, second, and third equation models which resulted in total value 0.997 or 99.7%. It can be concluded that this model can explain 99.7% of the data. Therefore the path analysis results are feasible to be used. The following is a complete discussion of path analysis in this study.

DISCUSSION

The Effect of WTI price on Indonesia's Gasoline Price

The result of this study showed that gasoline price respond positively to increases on WTI price. The result is similar with Kpodar and Abdallah (2017), Rahman (2016), Sun et al. (2019). Bumpass, Ginn, and Tuttle (2015) also

revealed that gasoline price has respond symmetrically to an oil price, but they reinforced that the respond will be adjusted in the long run. Atil, Lahiani, and Nguyen (2014) analysed that gasoline price has significantly adjust to changes in the price of oil but the adjustment has nonlinear manner.

Figure 2 show the fluctuations of WTI price. The price was the highest in April 2011 at USD 113.93 per barrel. The high demand of crude oil particularly used by Northern countries, as they use oil as heating fuel during the winter. WTI price declined below USD 100 per barrel in May 2011 to January 2012. In February-April 2012 WTI price rose above USD 100 per barrel due to tensions in the Middle East between Iran and the West which caused world oil supply to decline (Kitous, Criqui, Bellevrat, & Chateau, 2010). High WTI price continued until September 2014 due to high consumption of oil as heating fuel due to extreme weather in America and Europe.
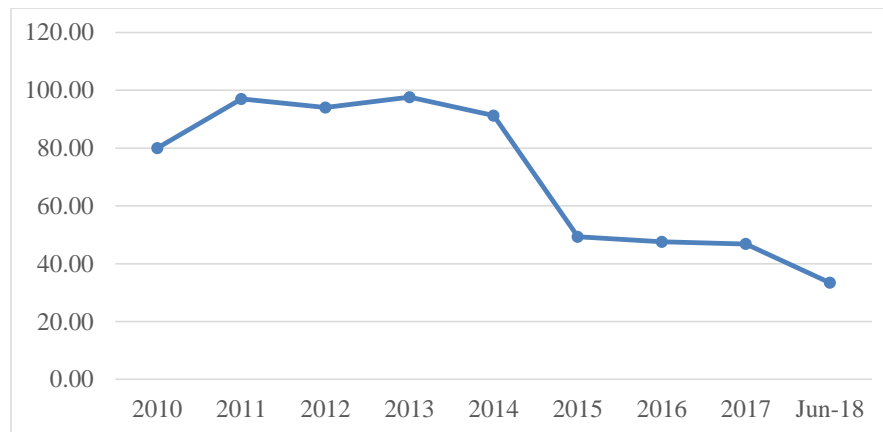

Figure 2 *WTI Price Fluctuations (Source: International Finance Statistic, processed)*

When the WTI prices increased in March 2011, the Indonesian Government had not decided yet to raise gasoline prices. At that time the State Government Budget still be able to finance fuel subsidies due to the increase of WTI price. In 2010-2012, domestic gasoline prices remained at Rp. 4,500/litre. The Indonesian government decided to start raising gasoline prices in April 2013. In 2013 the government decided to raise the domestic price of gasoline to Rp. 6,500/litre and Rp 8,500/litre. Rivani (2012) stated that the government decided to increase domestic gasoline prices for several reasons, as follows: i) Crude oil prices exceeded USD 100. On the other hand, State Budget in 2011 predicted crude oil price at USD 80 per barrel. Therefore, an additional subsidy of IDR 64 trillion was needed; ii) Low domestic prices encourage high consumption in Indonesia while Indonesia's crude oil production continues to decline; iii) Middle and upper class enjoy about more than 40% of fuel subsidies; iv) Adjusting gasoline prices allows the government to allocate more budget for poverty and development programs.

From 2015-2017 showed decreasing trend price under USD 50 per barrel. The decline in prices was caused by oil oversupply on the market that was not in accordance with demand. The decline in prices was caused by oil oversupply on the market that was not in accordance with demand. The decline in world crude oil prices was followed by a decline in domestic gasoline prices. In 2015 gasoline prices closed at the level of Rp. 7,300/litre and Rp. 6,550/litre. In 2017 the price of gasoline closed down further at the level of Rp. 6,450/litre.

In June 2018, world crude oil prices closed down. The price of WTI dropped around 25% from the previous year. High world crude oil production is believed to be the main cause of the fall in oil prices. Even US recorded the largest ever annual increase by any country in both oil and natural gas production last year, with the vast majority of both increases coming from onshore shale plays (BP Statistical Review of World Energy, 2019). Eventually OPEC enforced a meeting and decided to cut supply by 1.8 million barrels/day (bbls/d) through 2018 (PwC, 2019).

The Effect of Exchange Rate on Indonesia's Gasoline Price

The result showed that Rupiah exchange rate has positive significant effect on Indonesia gasoline price. When Rupiah depreciated against USD, the gasoline price will be increased. The result of this study is similar with Berument, Sahin, and Sahin (2014), Khatib (2013), Omagwa and Reardon (2017), and Ramos (2011) who revealed that the exchange rate has direct effect on gasoline prices and change in similar direction. In this case, Indonesia is a net oil importing country and the results of the study are relevant to the ERPT.

Hendar (2016) explained that ERPT is the way of exchange rate movements affect prices, initially through import prices, which feed through into the overall price level and domestic inflation. McCarthy as cited in Schröder and Hüfner (2002) further explained that ERPT can also occur through producer prices when there is an increase in production costs due to rising input prices. In this study, world crude oil is an input in making gasoline and Indonesia is an importer of crude oil. Thus when there is movement in the exchange rate, it will affect the price of imported crude oil and the price of gasoline produced by Indonesia.

Based on Central of Statistics Bureau data, in 2010 the volume of world crude oil imports reached 14,249.60 thousand tons and continues increase in 2016 up to 19,932.30 thousand tons. It occurs to meet the large gap between supply and demand of oil needed in Indonesia (Badaruddin, 2015; World Bank, 2015). Recently, Indonesia is ranked third as the world's crude oil importer in Southeast Asia after Singapore and Thailand.

In early 2010 the gasoline price was Rp 4,500/litre where exchange rate was stable at Rp 8,900-9,00/USD. The depreciation movement began to be seen in June 2012 to Rp 9,360/USD. In June 2013, the government raised the price of gasoline 44% per liter (Beaton, Lontoh, & Clarke, 2014) and increased by nearly 40% in November 2014 (Asian Development Bank, 2015). Because depreciated of Rupiah, the crude oil price increases in November 2014 were relatively large in local currency units, otherwise they were only 6 percent for gasoline and 11 percent for diesel when converted to U.S. dollars (Kojima, 2016). Until June 2018 the gasoline price has reached IDR 6,450/liter.

The Effect of WTI Price and Exchange Rate on Consumption Through the Gasoline Price

The result showed that WTI price and exchange rate have indirect significant positive impact on consumption through gasoline price. As WTI price and exchange rate increases, the consumption will be increase along with the increasing of gasoline price. As gasoline prices increases, consumption can not changes or fall instantly. For example, one family consumes 5 kg of rice per month. As gasoline price increases which followed by the increasing of rice price, it is not possible for a family to reduce rice consumption to 3kg per month. Thus, each must spend more money to meet their needs (consumption), especifically for daily lives and food. This shows that in the short-term the rise in gasoline prices to consumption is inelastic. As mentioned in the previous review literature, the long-term price elasticity is relatively high.

The result of this study is consistent with Valadkhani and Mitchell (2001) who revealed that rising crude oil prices affect both households and producers, moreover (Arndt, Benfica, Maximiano, Nucifora, & Thurlow, 2008) studied that rising crude oil price being transmitted to domestic prices and made the households are more vulnerable to food price increases. However, households in the top income are more sensitive compared to households in the low income (Schulte & Heindl, 2017; Valadkhani & Mitchell, 2001). Baghestani (2016); Mattioli, Wadud, and Lucas (2018) also reinforced that gasoline prices changes due to exchange rates fluctuation is consumption.

Kadence Indonesia Managing Director said in Iqbal (2013) based on the survey results, the average savings before the gasoline price increase was IDR 977,000. After gasoline price increase, the average savings value fell to IDR 823,000. In other words, the amount of savings per person before and after the increased gasoline prices decreased by around 16% and there was an increasing trend on consumption. High fuel prices, high food prices too and forces higher consumption (Timmer, 2008). This generally occurs on food consumption for urban area but tends to remain for sub-urban area. In urban area, people consume more in the non-food sector compared to the food sector so that when a crisis occurs the food consumption increases and returns to decline when the economy improves (Hartari, 2016).

Based on Pardamean (2009), from 2005 to 2008, during three period of increasing on gasoline price, there was an increased on public consumption patterns. It is similar with Said (2015) who exhibited that higher gasoline prices increases people's consumption patterns, the details are as follows: i) In low-income communities, consumption rate increased around 4%, and ii) middle-income community consumption increased by 5%. Besides food sector, there was another sector which increased positively ssignificant as gasoline price increased, it was an expenditure of motorcycle buyers (Rahmadini, 2007).

The Direct and The Indirect Effect of WTI price and Exchange Rate on GDP through Gasoline Price and Consumption

According to the path test, WTI price and exchange rate has direct impact on GDP positively. Also they have significant positively indirect impact on GDP if gasoline price and consumption increases. Consistent with Purcell and Sekar (2015) higher gas prices, also has a higher GDP. Litman (2011) reveal the similar issue, there is positive

relationship between fuel prices and GDP. Based on Central of Statistics Bureau data, consumption supports more than 50% Indonesia's GDP. Indonesia's GDP movement tends to move in the same direction of consumption movements (Figure 3).
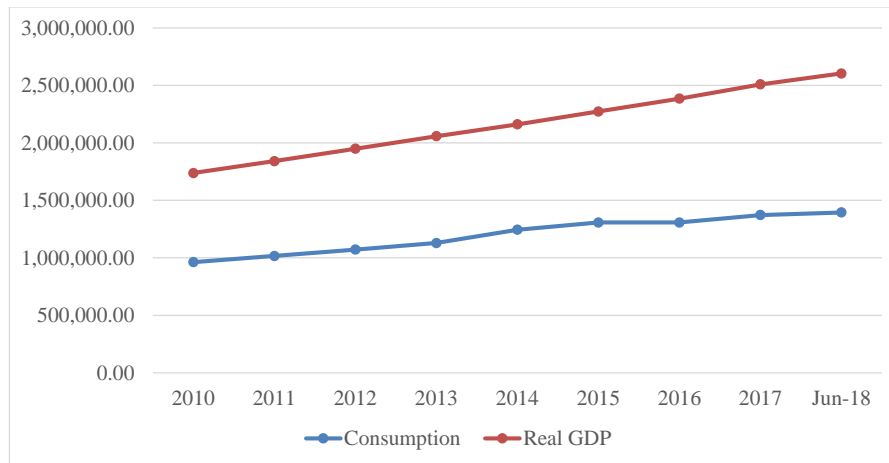

Figure 3 *Consumption and Real GDP (Source: Central of Statistics Bureau, processed)*

As stated earlier in the literature review, one method of calculating GDP is the expenditure method. With the expenditure method, GDP is calculated based on total expenditure on the output of economic goods and services (Mankiw, 2016). Consumption is household expenditure, so when consumption rises, the GDP will naturally increase too. This is confirmed by (Bonsu & Muzindutsi, 2017), they explained that household consumption has a significant effect on real GDP. Similar with Anghelache et al. (2011) who stated that GDP is resultant variable and the final consumption is factorial variable.

Nevertheless, the increasing of GDP cannot be summed up as an increased on economic growth rate (Figure 4). Economic growth is the process of increasing the sizes of national economies (Haller, 2012). (Palmer, 2012) said that it refers to an increase in the productive capacity. According to Surbhi (2015), economic growth rate implies the yearly increase in the country's GDP or Gross National Product (GNP) in percentage terms or the percentage change in the quantity of goods and services produced from one year to the next (Ghosh, 2007), while the measure of GDP is in units of Rupiah per year.
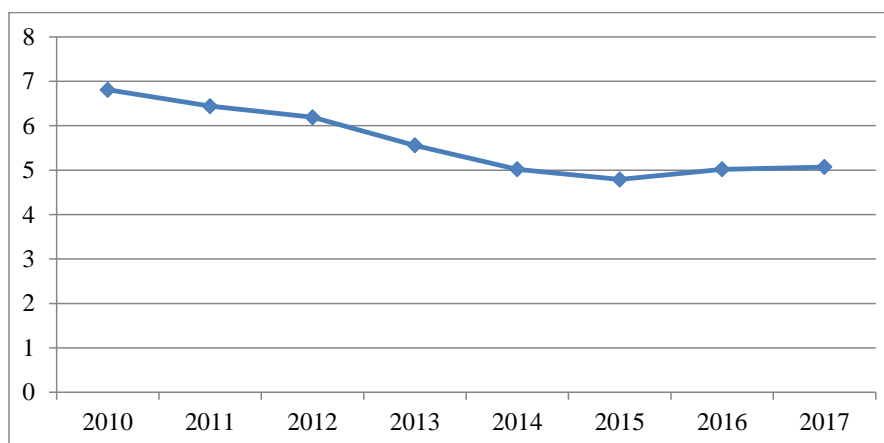

Figure 4 *Economic Growth Rate (Source: Central of Statistic Bureau, Processed)*

Some factors made the increasing of GDP did not followed by increasing on economic growth rate as follows:

i. The high crude oil prices are driving high inflation. This is consistent with cost-push inflation theory which stated that inflation rate rose due to increasing on production costs. The higher oil prices are also likely to take a toll on potential growth, due to higher input costs (OECD, 2011).

ii. The increasing on gasoline price caused the decreasing on several sector. As a result, the growth rate and productivity decreased (Qianqian as cited in (Nizar, 2012)). The transportation and the automotive sector as an

energy-intensive industry is one of the main sectors affected by November's price increases. Casier and Beaton (2015) Reported the sector have been hit hard.

iii. Exchange rate depreciation makes unfavorable investment expectations. It is consistents with (Aranyaratt, 2011) and Jonathan, Kenneth, and Gyang (2016) who revealed that exchange rate risk and foreign portfolio investment is negative indicating the depreciation of the currency and does not stimulate private domestic investment. Based on Central of Bureau Statistics, the Indonesia's investment has downward trend from 6.69% in 2010 to 5.01% in 2016.

iv. Exchange rate depreciations will rise the price of imported goods (Nell, 2000). It caused the value of net export decreased. It is consistent with Barguellil, Ben-Salha, and Zmami (2018) that nominal and real exchange rate volatility has a negative impact on economic growth.

CONCLUSION

Research result exhibited that the WTI price and the exchange rate has significant positive effect on the Indonesian gasoline price. Furthermore, gasoline price possess significant and positive impact on consumption and GDP. When the WTI price increased and the Exchange Rate depreciated, the import price of WTI more expensive and therefore increased the Indonesia's gasoline price. The consequences is the higher prices on commodity, forces the community spend more money on consumption needs. Because the consumption is the first component on sustaining GDP, the increasing on consumption ultimately increased the GDP.

Nevertheless, the GDP increase can not be summed up as the increasing of Indonesia's economic growth rate. Year to year, the economic growth rate has decreased. The GDP increased due to rising gasoline prices and consumption, which is followed by productivity decrease in the production sector, investment, and net exports. Annual economic growth recorded a decline from 6.81% in 2010 to 5.07% in 2017.

LIMITATIONS AND RECOMMENDATIONS

This research does not examine any control variables that affect the movement of world crude oil prices and the exchange rate. Also unknown is the effect of world crude oil prices and exchange rates on macroeconomic variables occurring in the short or long term. So the reader cannot predict how long the impact arising from the onset of changes in world crude oil prices and the exchange rate to the macroeconomic variables that was been studied.

The author recommends to the next researcher to examine the control variables which can affect world oil prices and exchange rates, before looking at their impact on macroeconomic variables. In addition, it is also necessary to use a method or simulation to estimate the extent of changes that occur in macroeconomic variables due to world oil prices and the exchange rate. Even better if examined the impact of the changes WTI price and exchange rate to macroeconomics in the short-term and long-term.

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