Determinant of Pertamax Fuel Demand in Purwokerto

By:
Tami Agustini Fauzan
Faculty of Economics and Business, Universitas Jenderal Soedirman
Email: fauzantami@gmail.com

ABSTRACT

This research is aiming to analyze the effect of several factors such as Pertamax price, Pertalite price, income, year of vehicle and vehicle type on Pertamax fuel demand in Purwokerto and analyze which one is the most influencial factors on the Pertamax fuel demand using elasticity test. The data used in this research are primary data taken from 100 respondents all around Purwokerto then analyzed using multiple regression analysis. The result of multiple regression analysis indicated that income and vehicle type have significant effect on Pertamax fuel demand in Purwokerto while the other factors such as Pertamax price, Pertalite price and year of vehicle have no influence on Pertamax demand in Purwokerto. This research also indicated that vehicle type was the most influencial factors on Pertamax demand. From all the result that has been found, the result of regression shows that people in Purwokerto have a tendency to keep putting the quality at any price level set by the government. In this case government have to further intensify massively on advertising on good impact of Pertamax either for machine or environment and expected to improve better performance and quality either in terms of services on each gas station or oil distribution.

Keywords: demand, Pertamax fuel, gasoline demand.

ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh beberapa faktor seperti harga Pertamax, harga Pertalite, pendapatan, tahun kendaraan dan jenis kendaraan pada Pertamax permintaan bahan bakar di Purwokerto dan menganalisis mana yang merupakan faktor yang paling berpengaruh pada permintaan bahan bakar Pertamax menggunakan uji elastisitas. Data yang digunakan dalam penelitian ini adalah data primer yang diambil dari 100 responden di sekitar Purwokerto kemudian dianalisis menggunakan analisis regresi berganda. Hasil analisis regresi berganda menunjukkan bahwa pendapatan dan jenis kendaraan berpengaruh signifikan terhadap permintaan BBM Pertamax di Purwokerto sedangkan faktor lain seperti harga Pertamax, harga Pertalite dan tahun kendaraan tidak berpengaruh terhadap permintaan Pertamax di Purwokerto. Penelitian ini juga menunjukkan bahwa jenis kendaraan merupakan faktor yang paling berpengaruh terhadap permintaan Pertamax. Dari semua hasil yang telah ditemukan, hasil regresi menunjukkan bahwa masyarakat di Purwokerto memiliki kecenderungan untuk tetap menempatkan kualitas pada setiap tingkat harga yang ditetapkan oleh pemerintah. Dalam hal ini pemerintah harus lebih mengintensifkan secara besar-besaran pada iklan tentang dampak yang baik dari Pertamax baik untuk mesin atau lingkungan dan diharapkan untuk meningkatkan kinerja dan kualitas yang lebih baik baik dalam hal layanan di setiap pom bensin atau distribusi minyak.

Kata kunci: Permintaan, Bahan Bakar Pertamax, Permintaan Bensin.

INTRODUCTION

Economic activity is one of the main activities in the fulfilment of human needs. Related to the fulfilment of this needs, human beings are confronted with the necessity of energy as a support for other activities such as consumption, production, and distribution. Oil is one of the vital energy that can always be highlighted by every statisticry in the world (Lin & Ouyang, 2014). Most of people will need oil to turn on their machine whether for industry or for transportation and of course every statisticry has they own rules to manage their oil supply, distribution even price (Romero-Jordan, Rio, Jorge-Garcı, & Burguillo, 2010).

In Indonesia, especially in the regime of Joko Widodo, fuel are divided into 3 kind, which are Jenis BBM Tertentu (JBT), Jenis BBM Khusus Penugasan (JBKP), and Jenis BBM Umum (JBU). JBT is a kind of gasoline consist of kerosene and solar oil and subsidise by the government, JBKP consist of Premium (RON 88) which is not subsidise by government but the price evaluated every 3 months by the government, and the last is JBU consist of Pertalite, Pertamax Series, and Dex Series, the price of these gasolines are following market condition (BPH Migas, 2015). By this classification, the government then has a data that can show us which one is the most demanded kind of fuel in Indonesia represent in figure down below.

Table 1. Demanded Kind of Fuel in Indonesia (Litre)

Type	2015	2016
JBU	44,453,906.80	48,655,005.97
JBKP	12,232,560.95	10,616,961.61
JBT	14,894,147.29	14,283,716.67

Source: BPH Migas, 2018

From this figure, we known that JBU (Jenis BBM Umum) has the largest number of demand when it compared to JBKP (Jenis BBM Khusus Penugasan) and JBT (Jenis BBM Tertentu). JBU has sold 44,453,906.80 liters in 2015 and increase to 48,655,005.97 liters in 2016. It means that people demand more of gasoline that contain in JBU which is Pertalite, Pertamax series and dexlite rather than gasoline contain in JBKP and JBT. The change in the fuel consumption pattern is due to the high rate of fuel consumption for private vehicles (Demirbas, Balubaid, Basahel, Ahmad, & Sheikh, 2015). It is directly proportional with vehicle sales in Indonesia which also rose sharply from 19 million vehicles in 2000 to 114 million vehicles in 2014 with an annual average increase of 13.7 percent (Outlook Energi Indonesia, 2016).

In Indonesia, the type of fuel which used for passenger vehicles has various kind, but in general the fuel for engines that do combustion with ignition is gasoline fuel. This gasoline fuel types have different qualities in each combustion and calculated in units of Research Octane Number (RON) (Speth et al., 2014). The types of gasoline fuel based on its RON are:
(1) Premium (RON 88)
(2) Pertalite (RON 90)
(3) Pertamax (RON 92)
(4) Pertamax Turbo (RON 95) (BPH Migas, 2015).

Fuel classification based on RON is aim to defer the quality of RON to the price (Aguirre & Ibikunle, 2014; Speth et al., 2014). The higher the RON means the better the combustion because it does not contain lead in the mixture, so the price of fuel with higher RON level will be more expensive when compared to the fuel with lower RON level (Morganti, Mun, Brear, Yang, & Dryer, 2013; Rankovic, Bourhis, Loos, & Dauphin, 2015; Speth et al., 2014). RON is the amount of pressure given before gasoline is burned (Anderson et al., 2012). If vehicle wants to have good durability, then it should use the octane fuel which is corresponding to the compression ratio of the motor engine.

Contents with RON 88, premium is included to the fuel that is not environmental friendly. Premium has been reduced due to the use of vehicles manufactured over year 2000 have different

engine (Ekholm, Krey, Pachauri, & Riahi, 2010). For example, on a motorcycle with an output year above 2000 has been using an injection system so that the use of premium will make it more wasteful and more quickly damaged. This is because the premium is flammable so before the premium flow to the spark plug it is already burning and the remaining combustion turn to be crust or we called it lead.

Because of that issue, PT. Pertamina (Persero) releases a new type of fuel that is called Pertalite. The purpose of this Pertalite is to add some alternative fuel for vehicles that use compression equivalent to premium. Different from the premium, this Pertalite has RON above premium and lower than Pertamax. With RON 90, Pertalite can be categorized as a fuel that meets the durability and economically standards. It will not cause interference to the engine because of the octane 90 is compatible with the compression ratio of vehicles in Indonesia. Other than that, Pertalite has a higher Air Fuel Ratio to the fuel consumption, so that engine performance can be more optimum and efficient when traveling long distances because fuel operating costs Rp / Km will be more efficient compared to premium (Pertamina, 2017). Unlike the Pertalite, Pertamax is a more environmental friendly fuel. A vehicle that is made with the technology of catalytic converters and electronic fuel injection (EFI) are advised to use Pertamax because it is already contain with additives which is EcoSave Technology with function to keep the purity of fuel and clean engine. The combustion that occurs when using the Pertamax only when in contact with the spark plug which is causing the perfect combustion and leave no crust or lead.

In the period of January-July 2016 and January-July 2017, premium sales declined from 79.6 percent to 41.6 percent, while fuel types Pertalite and Pertamax respectively grew from 9 percent to 40.6 percent and 11.4 percent to 17.8 percent. However if we can seen it further, the decreasing in premium which is very drastic occurred by deduction amount of supplies of premium based on Presidential Regulation number 191 year 2014 about Supply, Distribution and Fuel Retail Selling Price Article 3 Section 2 and 3 which says that JBKP distributed to all area in Indonesia except DKI Jakarta, Banten, West Java, East Java, Central Java, DI Yogyakarta and Bali. Besides a premium presence is slowly eroded by the emergence of alternative fuel (Pertalite) in 2015, it is also advised by PT. Pertamina to gas stations outlet throughout Indonesia to replace premium with Pertalite.

Since this research take case in Purwokerto, so in Table 2 there is a data described about Pertamax demand in Purwokerto which is conducted from 4 gas station in north Purwokerto, west Purwokerto, east Purwokerto and south Purwokerto.

Table 2. Number of Pertamax Sales in Purwokerto

Year	2012	2013	2014	2015	2016	2017	Total
Volume (Kilo Liter)	740	984	1,408	5,776	9,396	7,408	25,712

Source: Pertamina, 2017

Based on the data listed on Table 2, it can be known that in 2012 Pertamax sales in Purwokerto only 740 Kilo Liters and reached 9,396 Kilo Liters in 2016. This increasing in sales shows that there is a significant change in people's choice where Pertamax has high and drastical numbers of sales.

The theory of consumer behavior is the grand theory of this research. Consumer theory explains the nature of the demand of the community, what is the reason for consumers to buy more goods at lower prices and reduced the purchase at a higher prices, or how a consumer can buy two combinations of goods in accordance with the income that he has (Sukirno, 2013). Based to the theory, this research also using factor price as one of independent variable. Price factors divided into the price of Pertamax and the price of Pertalite as a substitution good and this two kind of prices will be measured by *likert scale*. The *likert scale* will show us the perception of Pertamax consumer to the price and it will give us explanation how people can make the decision to buy it or not in the certain price. According to the theory, if the price of goods increase, the demand of items will be reduced, if the price decrease, the demand will increase. On the other hand, the demand of a person also depends on its perception towards other goods prices. For example, if the price rises, then the

Pertamax demand against Pertalite will increase, this also applies vice versa. In economic theory, Pertalite is called substitutes goods (Sukirno, 2013).

In addition to the price factor, the demand of Pertamax can be based on the type of vehicles as we know that the demand of gasoline for car is more than motorcycle (Karathodorou, Graham, & Noland, 2010), and it is also can lead to year of vehicles which the demand of Pertamax can be based on the year of the vehicle since Pertamax are highly recommended for vehicle produced after year 2000. Besides, income also be a factor that can have an effect on the number of demand. In fact, this income effect is on a person's expenditure budget lines where the increase and decrease in the revenue budget lines curve can shift to the right and to the left (Romero-Jordan et al., 2010).

RESEARCH METHOD

The data are collected from Pertamax consumers in Purwokerto. The object of this study leads to variables such as the price of the goods, the price of other goods (substitution), income, year of the vehicle, and vehicles type. Data are conducted through direct interviews to respondents using a questionnaire tool. Respondents are expected to fill the questionnaire with the circumstances of real event. Questionnaire contains questions and filled by respondents. The population of this research is consumers of Pertamax in Purwokerto. The sampling technique used is accidental sampling. Author looked for respondent in a line of gas station spread along Purwokerto districts accidentally without having any data of respondent before. Therefore, the sample size determined in this study was calculated based on the Slovin. This study uses Multiple linear regression analysis.

RESULT AND DISCUSSION
Characteristics of Respondent Based on Year of Vehicle

Table 3. Distribution of Respondent based on Year of Vehicle

No.	Year of Vehicle	Total	Percentage
1	≤ 1999	1	1
2	2000-2002	3	3
3	2003-2005	3	3
4	2006-2008	14	14
5	2009-2011	15	15
6	2012-2014	21	21
7	2015-2017	39	39
8	2018	4	4
	Total	100	100

Source: Primary Data Processed, 2018

This research shows that respondents who used vehicle around year 1999 only 1 percent, 2000 to 2002 is 3 percent, 2003 to 2005 is 3 percent, 2006 to 2008 is 14 percent, 2009 to 2011 is 15 percent, 2012 to 2014 is 21 percent, 2015 to 2017 is 39 percent, and 2018 is 4 percent. So, the conclusion is mostly repsondents who are using Pertamax is people who has vehicle year around 2015 to 2017 and 99 percent of them using vehicle above year 2000.

Characteristics of Respondents Based on Districts

Table 4. Distribution of Respondent based on District

No.	District	Total	Percentage
1	East Purwokerto	20	20
2	West Purwokerto	30	30
3	South Purwokerto	23	23
4	North Purwokerto	27	27
	Total	100	100

Source: Primary Data Processed, 2018

This Research shown us that mostly respondents who lived in east Purwokerto is 20 percent from 100 respondents, west Purwokerto has 30 percent from 100 respondents, south Purwokerto has 23 percent of 100 respondents, and north Purwokerto has 27 percent from 100 respondents. This respondents selected randomly from 9 gas stations in all around Purwokerto.

Characteristics of Respondents Based on Income

Table 5. Distribution Respondent by Income

No.	Income (Rupiah)	Total	Percentage
1	1,000,000 - 4,140,000	56	56
2	4,140,001 - 7,280,000	36	36
3	7,280,001 - 10,420,000	4	4
4	10,420,001-13,560,000	0	0
5	13,560,001-16,700,000	2	2
6	16,700,001-19,840,000	0	0
7	19,840,001-22,980,000	0	0
8	22,980,001-26,120,000	0	0
9	26,120,001-29,260,000	0	0
10	≥29,260,001	2	2
	Total	100	100

Source: Primary Data Processed, 2018

The data shown us that most of respondents income mostly on range Rp1,000,000 to Rp4,140,000 with 56% from total respondents and Rp4,140,001 to Rp 7,280,000 with 36% of total respondents. Therefore, the percentage of this income is taken from random people so all the respondents have a same chance although the income is quite same.

Multiple Linear Regression Result

Table 6. Result of Multiple Regression

Variable	Coefficient	t statistic	p-value
Constant	20.787	2.116	0.037
X_1	-0.697	-0.419	0.676
X_2	0.363	0.370	0.712
X_3	7.384	2.144	0.035
D_4	-2.157	-0.616	0.540
D_5	25.432	6.288	0.000

Adj R^2 = 0.483
N = 100 - 12 outlier
F = 17.238
DW = 2.113

Source: Primary Data Processed, 2018

To analyze the effect of variable independent to dependent, this research using regression analysis calculated by software *SPSS.17*. Based Table 8, expressed estimation as follows:

$$Y = 8.603 + 0.210X_1 - 0.187X_2 + 1.572X_3 - 0.1233D_4 + 21.085D_5$$

The price of Pertamax variable noted as X_1 has no significant effect to the demand of Pertamax. The actual reason behind this calculation is because most of Pertamax user will always stay in Pertamax whatever the price is. This also not in accordance with the demand theory which stated that if the price incease, demand of some goods will decrease (Sukirno, 2013). It doesn't mean that the theory is wrong, it is just because Pertamax is a unique kind of goods which people needs

especially for people who are concern with the quality. They thought that Pertamax is suitable for their vehicles so even the price is increasing, they will always using of Pertamax in concern of quality.

As a substitution good, variable price of Pertalite or noted as X_2 no significant effect on Pertamax demand. The actual reason behind this calculation is barely same with the variable X_1. Whatever the price itself and the substitution price is, the demand for Pertamax will never change in order to the quality decision.

Regression coefficient of Income (X_3) is positive 7.384. This means if income increase Rp1,000,000, the demand for Pertamax will also increase 7.384 liters. In addition to regression coefficient, t-statistic of this variable is 2.144 which is more that t-table 1.960 with probability value equal to 0.035 means income has a significant effect to demand of Pertamax. As demand theory said, an increase in income will affect to the demand for goods. The consumer can afford to buy the highest price level of product in this case Pertamax fuel because they have an addition of money to buy more goods or luxury goods (Hellweg, Frischknecht, & Hendriks, 2010).

The theory which is implemented on this research about shifting in demand curve because of the change in Y axis and its impact to change in X axis through income increasing has been proved. Income has a positive effect on demand for gasoline (Romero-Jordan et al., 2010). Logically, people with higher income will choose the best fuel for their vehicle in order to the quality, of course they can afford it because their income is high and that is why income can affecting the demand for Pertamax fuel (Baranzini & Weber, 2013; Romero-Jordan et al., 2010).

Year of Vehicle (D_4) also suspected have any influence on demand for Pertamax, the reason is vehicle year above 2000 recommended for using Pertamax because their engine is compatible with this kind of fuel. In this research, vehicle year using a requirement for vehicles from developed statisticry (Singapore) which rules that maximum vehicles year has to be only 10 years. If today is 2018 means vehicles minimum year is 2008. This research using D_1= vehicle year > 2008 and D_0 = vehicle year < 2008. From Table 13, it shown that t statistic up to -0.616 which means less than t table 1.960 with probability value equal to 0.540 and located in H_0 accepted area it shows that this variable has no significant effect on demand for Pertamax. Logically, when people are comfortable using Pertamax as their daily fuel, even if they vehicles are less than 2008 or even less than 2000, they will always make Pertamax as they first choice. Back then to the reality, Pertamax has a good quality and more suitable for vehicles.

It has been mention that variable vehicle type (D_5) are using dummy variable D_1= car and D_0= motorcycle. Based on Table 6, it shown that t statistic equal to 6.288 which is more than t table 1.960 with the probability value 0.000. This calculation means that variable vehicle type has significant effect to demand for Pertamax and D_1 = car which is suspected as the influencer. Logically, car tank is bigger than motorcycle so demand for car will much more than motorcycle.

The result calculate that adjusted R-Squared is 0.483 means that variable Pertamax (X_1), price of Pertalite (X_2), income (X_3), year of vehicle (D_4) and vehicle type (D_5) together can describe to variable Y (Demand of Pertamax) equal to 48.3 percent, the other 51.7 percent are describe by another variable outside this research.

F statistic is 31.516 and F probability equal to 0.000 and F statistic > F Table (17.238 > 2.48), means that all independent variable together simultaneously affecting the dependent variable or variable price of Pertamax (X_1), price of Pertalite (X_2), income (X_3), year of vehicle (D_4) and vehicle type (D_5) together simultaneously affecting demand for Pertamax in Purwokerto.

According to alpha 0.05, the constant value equal to 20.787 and has significant effect to Pertamax demand with probability 0.037. This means in the normal situation without any concern of independent variable such as price of Pertamax, price of Pertalite, income, year of vehicle and vehicle type there will be constantly has a positive change 20.787 percent to the demand of Pertamax.

Elasticity Test
This research using Eviews 9.0 to find out the elasticity test described in table down below:

Table 7. Elasticity Test

Variable	Coefficient	Standarized Coefficient	Elasticity at Means
X_1	0.361863	0.032484	0.071780
X_2	-0.707786	-0.035840	-0.092590
X_3	7.35E-07	0.203379	0.127200
D_4	-2.158456	-0.048955	-0.069425
D_5	25.46204	0.593714	0.166006

Source: Primary Data Processed, 2018

As written before that the significant factors to dependent variable only income (X_3) and vehicle type (D_5). Elasticity at means of variable income is 0.127200 and elasticity at means of variable vehicle type is 0.166006. So, it means that variable vehicle type (D_5) is the dominant variable that has biggest contribution to dependent variable. It is because car tank will need more fuel than motorcycle so the demand of car is higher than motorcycle (Labandeira, Labeaga, & López-otero, 2017). The value of elasticity at means of these two variable are < 1, it means that this variable is inelastic, in other word the change in income and vehicle type will not affecting much to the demand of fuel because fuel is a kind of goods that will always needed for everyone.

CONCLUSION

Based on previous chapter explanation about the result of this research, so it can be conclude that:

(1) Based on f-test, simultaneously variable price of Pertamax, price of Pertalite, income, year of vehicle and vehicle type affecting the demand for Pertamax in Purwokerto. Partially, independent variable X_1 which is price of Pertamax, X_2 which is price of Pertalite and D_4 which is year of vehicle have no significant effect on pertamax fuel demand in Purwokerto, but variable X_3 which is income and D_5 which is vehicle type have positive significant effect on Pertamax demand in Purwokerto.

(2) Based on elasticity test, the most dominant variable on this model is vehicle type (D_5). So it means the demand for pertamax is mostly affecting by vehicle type rather than income.

Implication is the final goal that a researcher should suggest to the party who are related to this research based on what researcher has been found. The implication of this research are as follows:

(1) The price variable both Pertamax price and the price of Pertalite as substitution goods states that these two variables have a negative effect on Pertamax demand, it shows that Pertamax consumers in Purwokerto have a tendency to keep putting the quality at any price level set by the government so it gives a positive trend to a Pertamax demand in Purwokerto. Government in this case PT Pertamina (Persero) regional IV have to further intensify massively on advertising on good impact of Pertamax either for machine or environment.

(2) Vehicle type has the greatest significant influence on Pertamax demand because car has a bigger tank than motorcycle. As of 100 respondents, about 79 percent of consumers stated that PT Pertamina (Persero) has been able to provide fuel for the community and 21 percent said not yet because many areas are still unable or even difficult to access fuel. So some of them are forced to buy fuel from 'Pertamini' because it is difficult to reach the gas station. Nevertheless, out of 100 respondents, about 80 percent stated that PT Pertamina (Persero) has been able to be customer oriented and feels that PT Pertamina (Persero) has provided good service to consumers as evidenced by never having vacancies or delay in tanks in pom gasoline around Purwokerto. Based on research results, PT Pertamina (Persero), especially for regional IV marketing office is expected to improve better performance and quality both in terms of service and distribution in order to continue to excel in competing with the competitors.

Along description of this research, there are also limitations contained in this research such as:
(1) Research only held in Purwokerto so it is not generally represent all consumer because it is only small part of Banyumas Regency.
(2) Alpha used in *Slovin* formula is 10% because it shows only 99.96 or 100 respondents to be investigated rather than using alpha 5% that shows 397 respondents due to the limitations of fund, time and human capability.
(3) There are 12 outlier data which has extreme value and cannot be included on data analysis.
(4) Expenditure used in the questionnaire is a proxy of income.

REFERENCES

Aguirre, M., & Ibikunle, G. (2014). Determinants of renewable energy growth: A global sample analysis. *Energy Policy*, 1–11. https://doi.org/10.1016/j.enpol.2014.02.036

Anderson, J. E., Dicicco, D. M., Ginder, J. M., Kramer, U., Leone, T. G., Raney-pablo, H. E., & Wallington, T. J. (2012). High octane number ethanol – gasoline blends : Quantifying the potential benefits in the United States. *Fuel*, *97*, 585–594. https://doi.org/10.1016/j.fuel.2012.03.017

Baranzini, A., & Weber, S. (2013). Elasticities of gasoline demand in Switzerland. *Energy Policy*, *63*(1), 674–680. https://doi.org/10.1016/j.enpol.2013.08.084

BPH Migas. 2017. Apa itu BBM Tertentu, Khusus Penugasan dan Umum. http://www.bphmigas.go.id/berita/apa-itu-bbm-tertentu-khusus-penugasan-dan-umum, accesed on February 2018.

Demirbas, A., Balubaid, M. A., Basahel, A. M., Ahmad, W., & Sheikh, M. H. (2015). Octane Rating of Gasoline and Octane Booster Additives. *Potroleum Science and Technology*, *33*(11), 1190–1197. https://doi.org/10.1080/10916466.2015.1050506

Ekholm, T., Krey, V., Pachauri, S., & Riahi, K. (2010). Determinants of household energy consumption in India. *Energy Policy*, *38*(10), 5696–5707. https://doi.org/10.1016/j.enpol.2010.05.017

Hellweg, S., Frischknecht, R., & Hendriks, H. W. M. (2010). Cumulative Energy Demand As Predictor for the Environmental Burden of Commodity Production, *44*(6), 2189–2196.

Karathodorou, N., Graham, D. J., & Noland, R. B. (2010). Estimating the effect of urban density on fuel demand. *Energy Economics*, *32*(1), 86–92. https://doi.org/10.1016/j.eneco.2009.05.005

Labandeira, X., Labeaga, J. M., & López-otero, X. (2017). A meta-analysis on the price elasticity of energy demand ☆. *Energy Policy*, *102*, 549–568. https://doi.org/10.1016/j.enpol.2017.01.002

Lin, B., & Ouyang, X. (2014). Energy demand in China : Comparison of characteristics between the US and China in rapid urbanization stage. *Energy Conversion And Management*, *79*(1), 128–139. https://doi.org/10.1016/j.enconman.2013.12.016

Morganti, K. J., Mun, T., Brear, M. J., Yang, Y., & Dryer, F. L. (2013). The Research and Motor octane numbers of Liquefied Petroleum Gas (LPG). *Fuel*, *108*, 797–811. https://doi.org/10.1016/j.fuel.2013.01.072

Pertamina. 21 August 2017. Konsumsi BBM Berkualits Tinggi Makin Meningkat. http://www.pertamina.com/news-room/siaran-pers/konsumsi-bbm-berkualitas-tinggi-makin-meningkat/, accessed on 12 October 2017.

Rankovic, N., Bourhis, G., Loos, M., & Dauphin, R. (2015). Understanding octane number evolution for enabling alternative low RON refinery streams and octane boosters as transportation fuels. *FUEL*, *150*(15), 1–7. https://doi.org/10.1016/j.fuel.2015.02.005

Romero-Jordan, D., Rio, P. del, Jorge-Garcı, M., & Burguillo, M. (2010). Price and income elasticities of

demand for passenger transport fuels in Spain . Implications for public policies. *Energy Ploicy*, *38*, 3898–3909. https://doi.org/10.1016/j.enpol.2010.03.010

Speth, R. L., Chow, E. W., Malina, R., Barrett, S. R. H., Heywood, J. B., & Green, W. H. (2014). Economic and Environmental Bene fi ts of Higher-Octane Gasoline. *Environmental Science & Technology*, *48*(2), 6561–6568.

Sukirno, Sadono. 2013. Mikroekonomi Teori Pengantar. Edisi Ketiga. Jakarta: Raja Grafindo Persada.