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## Article

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# Macroeconomic Factors Affecting Natural Gas Export Management

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## ABSTRACT

Indonesia as a rich country with its natural resources to be one of the countries in the world to play an active role in increasing international trade flows. One of the energy which is very beneficial to human life is a natural gas. The use of this energy will meet to household needs and another important needs for industry. The data presented is a secondary data in the form of time series for 22 years, a period 1995-2017. The variables of this study are domestic consumption, exchange rate, international price, and GDP per capita of the importing country. Then, the analytical method used is auto-regressive distributed lag (ARDL). The results of the analysis shown that in the short term all variables such as domestic consumption, exchange rates, natural gas prices and GDP per capita significantly influence to volume of natural gas exports. While in the long run term, the results which is the same as the short run, that is, all the independent variables such as domestic consumption, the exchange rate, international prices and GDP per capita have a significant effect on the volume of natural gas exports.

**Keywords:** Gas Consumption, Exchange Rate, Natural Gas, Gross Domestic Product

**JEL Classifications:** E2, E6, Q4

## 1. INTRODUCTION

Indonesia is a rich country with its natural resources, human resources, and has a land and sea that stretches geographically. So, it's not difficult for Indonesia to obtain various types of natural resource products such as petroleum, tin, copper, and many other types of natural products in the country. With the condition of abundant natural resources requires that government elements can act actively in terms of management and utilization. Even though when observed from the point of view of fulfilling domestic benefits, it has not been very good. However, such a note is an opportunity for the government to take proactive steps, only this form of implementation must be intensified so that later it can significantly increase the utilization of the community and contribute foreign exchange earnings through international trade climate channels. International trade is divided into two

categories, namely trade in goods and services trade. International trade activities carried out aiming to improve the country's living standards (Schumacher, 2013). Therefore, there will be a rapid flow of globalization so that positive inter-governmental agreements can be produced, the scale of the impact to continue to increase exports and imports within the country will run in harmony. In terms of the level of exports can provide foreign exchange for domestic and in terms of state imports are able to contribute in the form of increased goods on the domestic market. One of the advantages of Indonesia x in intensifying international trade is that Indonesia must be able to maximize the available natural resources. The diversity of natural resources x abundant as Crude Palm Oil (CPO), petroleum, coal, and natural products other. Indonesia is expected to be able to exploit x in an orderly fashion, meaning that it is not just being overexploited but it requires regular management so that it does not cause sustainable environmental damage. Of the

abundance of natural resources found in Indonesia, one of the very useful energy for human life is unconsciously natural gas, with various uses of natural gas, it cannot be denied that the needs of the world community will continue to increase.

## 2. LITERATURE REVIEW

In relevant literature review, Shofi and Fawaid (2016) conducted a study related to the analysis of the performance of tobacco exports in the Indonesia Vector Auto-Regression (VAR) approach. By using variables such as the exchange rate of the rupiah against the US dollar, world tobacco prices, and the amount of tobacco production that will analyze the effect of these variables on the performance of Indonesia's tobacco exports in the short and long term (Rafindadi and Ozturk, 2016). The results of the analysis in this study are all of them including the rupiah exchange rate variable against the US dollar, the international tobacco product price index and the total tobacco production have a significant effect on the performance of Indonesian tobacco exports in the short and long term (Shofi and Fawaid, 2016).

Export theory, export is one of the most important components in an economy, which means that exports with imports can produce a balance of payments from a country. The export illustrates the injection of a tool that can inject funds into the national income circulation flow (Puspita et al., 2015). In reality, the application of domestic goods exported to other countries contains various kinds of benefits that the exporter receives. As expressed by (Abdullateef and Waheed, 2010), there are five advantages in international trade such the gain of exchanges, specialization gains in the production of goods, trading gains with a variety of individual preferences for the choice of several types of products offered, the gain of endowment diversity, and the gain of modern technology transfer (Rostin et al., 2019).

Demand and supply theory, international trade can be defined as the exchange of goods and services that has gone beyond national borders. Of course, each country will take advantage of the benefits arising from international trade (Halomoun and Mawardi, 2017). The trade was depended on demand and supply. By definition, the demand is a relationship between the amount of goods and services demanded at a particular market at a certain price level in a certain time period (Elvira, 2015). That also applies in the context of the foreign exchange market where the relationship between demand and supply will affect the exchange rate. The real depiction of demand in the foreign exchange market is that when there is excess demand for USD, the price will be increasing (Adom, 2011).

In a microeconomics, there is an opposite on demand, namely supply, it can be strengthened in a transaction in a market that has a combination of supply and demand to make it happen (Alkhateeb et al., 2017). Therefore it can be illustrated that on the supply side, the reaction caused by the seller's behavior in providing or offering goods needed by the public in the market will influence the supply side (Denisova, 2019). If chosen from a legal standpoint, by definition a legal offer is a statement that explains the nature of the relationship between the price of an item and the amount of goods offered by the seller (Nyangarika, 2018). In essence the law of supply says that the higher the price of an item, the more the

amount of goods to be offered by sellers in the market. However, the lower the price of an item will affect the quantity of goods to be offered in the market (Sukirno, 2016).

Domestic consumption is the fulfillment of the needs of goods and services that provide world-class benefits and benefits for the consumers themselves (Kholiq, 2015). Similarly, Suherman stated that consumption can be interpreted as the final use of goods and services used to meet human needs in spending part of their income to buy goods and services (Bass, 2018).

The exchange rate is defined as the exchange between two different currencies, so there will be a comparison of values or prices between the 2 currencies (Davari et al., 2018). Comparison between the value of this currency is called the exchange rate (Anwary, 2011). Then according to Cahya and Indrajaya interpreted the exchange rate as the amount of domestic currency that must be paid to obtain one unit of foreign currency (Ningsih and Indrajaya, 2017). The exchange rate is very instrumental in maintaining the development of the economy as a whole, it cannot be separated from the role of the exchange rate to stabilize the performance of international trade (Ginting, 2013).

International price is an exchange rate of goods and services for consumers and producers that can be expressed in terms of monetary units such as rupiah (Halomoun, 2017). It can be concluded that the price of an item has a value in it that can be exchanged using a means of payment that is the value of currency (Nyangarika, 2019). So that both parties can benefit from this exchange through the sale and purchase of goods. This also applies to price movements in an international market commodity, where prices are an important reference for the continuation of export-import activities between countries (Puspita et al., 2015).

GDP is a number of products in the form of goods and services produced by production units within a country's territorial boundaries for 1 year (Denisova et al., 2019). The function of GDP is an important indicator to find out how much total income everyone receives in the country's economy (Imron, 2020). One type of GDP is GDP per capita, seen from its understanding that there is an average quantity or value of goods and services available to each population in a country in a given period. This per capita GDP can also be used as a way to compare the welfare or standard of living of a country from year to year (Wibowo, 2013). Therefore this indicator has a very important role to measure to what extent it affects the activity of international transactions between countries (Adom, 2011).

As researched by Ginting related to the analysis of factors affecting the export of apparel to Japan from 1990 to 2013. One of the variables studied is gross domestic product (GDP) simultaneously testing the effect on apparel exports but partial testing has no significant effect on export volume (Lovelyi and Nathaz, 2016).

## 3. RESEARCH METHOD

The data presented is a secondary data in the form of time series for 22 years, a period 1995-2017. In this research, a quantitative

approach is used which aims to get a general picture through the relationship that occurs between the influence of independent variables on the dependent variable. The method used by means of Auto-Regressive Distributed Lag (ARDL), using this method assumes that a variable is influenced by variable itself but in a previous time, to test several independent variables, namely Domestic Consumption ( $X_1$ ), Exchange Rate ( $X_2$ ), International Prices ( $X_3$ ), and GDP Per Capita importing countries ( $X_4$ ). While the dependent variable is export volume (Y). Sources of research data obtained come from Statistics Indonesia, Central Bank Indonesia, IMF, Director General of Customs. Thus, the modelling of this study is mentioned below.

$$y_t = \beta_0 + \beta_1 y_{t-1} + \dots + \beta_p y_{t-p} + \alpha_0 x_t + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \dots + \alpha_q x_{t-q} + \varepsilon$$

#### 4. RESULTS AND ANALYSIS

In the stationary test results in Table 1 obtained the probability value of the independent variables such as the domestic consumption, exchange rates, international prices, GDP per capita are stationary at the level of 1st difference with a significance level of 5% ( $\alpha = 0.05$ ), except on the dependent variable namely the stationary export volume at the level. All variables tested have a probability value < critical value (5%). So from the stationarity test results it can be concluded that one stationary variable at the level and four other independent variables are stationary at the 1<sup>st</sup> difference level.

From testing through ARDL Bound Testing methods, it can be shown that the test-statistic of 32,42433 is greater than the critical value of 5% which is only 3.49, therefore it can be seen that the test-statistic is more significant than the critical value, in the sense that the data can be co-integrated (Ali et al., 2015). So there is a relationship between variables in the short term and long term (Table 2). In other words the estimation results presented in this bound testing test are the existence of a co-integration relationship between the volume of natural gas exports with domestic consumption, the exchange rate of the rupiah against the dollar, the GDP per capita of the importing country, and world gas prices (Mikhaylov, 2019).

In the study of determining the optimal lag length using the Hannan Quinn Criterion (HQ) approach, the results can be seen in Table 3.

Based on the Hannan Quinn Criterion there are 20 top models. If we look carefully at the right model for the ARDL method in this study, it is ARDL (1,3,3,3), so we use 1 lag and maximum 3 lags, because it has a very small error when compared to other ARDL models (Ekananda, 2016).

Auto-regressive Distributed Lag (ARDL) is the least square regression method that contains the lag of the dependent and explanatory variables, or can be defined by the regression model that includes variable values that explain the present value or the lag value of the dependent variable as one of the explanatory variables (Table 4).

$H_0$ :  $\alpha_1, \alpha_2, \alpha_3, \alpha_4 > 0.05$  ( $\alpha$  5%)

$H_a$ :  $\alpha_1, \alpha_2, \alpha_3, \alpha_4 \leq 0.05$  ( $\alpha$  5%)

**Table 1: Unit root test results**

ADF statistics	Level		First difference	
	T-stat	Prob.	T-stat	Prob.
Volume (Y)	-3,219,792	0.0330	-3,575,523	0.0158
Price (X1)	-1,964,056	0.2992	-5,995,646	0.0001
GDP (X2)	0.062084	0.9549	-4,376,856	0.0030
Exchange rate (X3)	-1.96757	0.2977	-6.294140	0.0001
Consumption (X4)	-1.880087	0.3348	-4,619637	0.0016

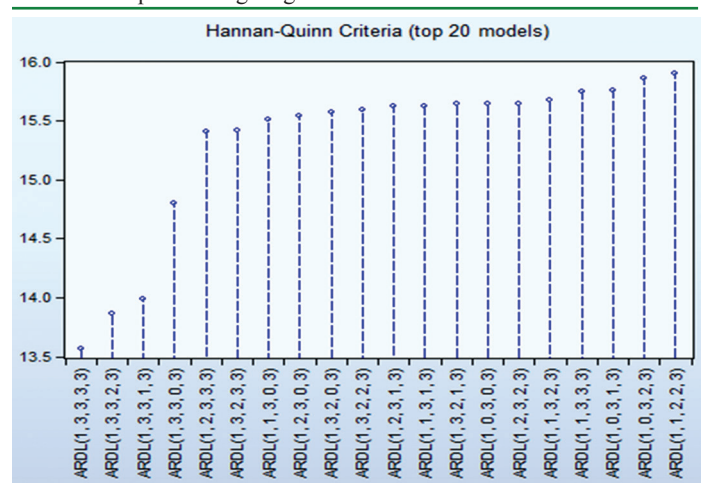
Source: data processed, 2020

**Table 2: ARDL bound testing results**

Test-statistics	Critical value 5%	Decision
32.42433	3.49	Co-integration occurred

Source: data processed, 2020

**Table 3: Optimum lag length**



Source: data processed, 2020

Analysis based on the Table 5, long-term ARDL method equation as below:

- The International Price variable get a coefficient value  $-0.463356$  and the probability value  $0.0053$ , in the sense that the PRICE variable has a significant and negative relationship to the variable volume of natural gas exports and the results of the hypothesis reject  $H_0$
- The international price ( $-1$ ) get the coefficient value of  $-0.619186$  and the probability value reaches  $0.0022$ , in the sense that the price variable in the first quarter has a significant and negative relationship to the variable volume of natural gas exports which results from the hypothesis rejecting  $H_0$
- International Price ( $-2$ ) get a coefficient value reaching  $-0.380933$  and the probability value reaching  $0.0068$ , in the sense that the PRICE variable in the second quarter has a significant and negative relationship to the variable volume of natural gas exports which results from the hypothesis rejecting  $H_0$
- Gross domestic product (GDP) get coefficient values reaching  $-0.570063$  and probability values of  $0.0031$ , in the sense of having a significant and negative relationship to the natural gas export volume variable, the hypothesis rejects  $H_0$
- GDP ( $-1$ ) get a coefficient value of  $0.286119$  and a probability value of  $0.007$ , in the sense that the GDP variable in the first quarter has a positive and significant relationship to the



**Table 4: Short-term ARDL test results**

Variable	Coefficient	Probability	Decision
PRICE	-0.463356	0.0053	Influence to the export of natural gas volume
PRICE (-1)	-0.619186	0.0022	Influence to the export of natural gas volume
PRICE (-2)	-0.380933	0.0068	Influence to the export of natural gas volume
GDP	-0.570063	0.0031	Influence to the export of natural gas volume
GDP (-1)	0.286119	0.0070	Influence to the export of natural gas volume
GDP (-2)	-0.373755	0.0048	Influence to the export of natural gas volume
EXCHANGE RATE	-0.772937	0.0030	Influence to the export of natural gas volume
CONSUMPTION	-4.069609	0.0041	Influence to the export of natural gas volume
CONSUMPTION (-1)	-11.13641	0.0018	Influence to the export of natural gas volume
CONSUMPTION (-2)	-3.834299	0.0080	Influence to the export of natural gas volume

Source: data processed, 2020

**Table 5: Long-term ARDL test results**

Variable	Coefficient	Probability	Decision
PRICE	-0.463356	0.0529	Influence to the export of natural gas volume
GDP	-0.570063	0.0545	Influence to the export of natural gas volume
GDP (-2)	-0.659874	0.029 0	Influence to the export of natural gas volume
EXCHANGE RATE	-0.772937	0.0309	Influence to the export of natural gas volume
CONSUMPTION	-4.069609	0.0446	Influence to the export of natural gas volume
CONSUMPTION (-2)	7.302114	0.0237	Influence to the export of natural gas volume
CONSUMPTION (-3)	3,834299	0.0435	Influence to the export of natural gas volume

Source: data processed, 2020

variable volume of natural gas exports which results from the hypothesis rejecting  $H_0$

- f. GDP (-2) get a coefficient value reaching -0.373755 and its probability value reaching 0.0048, in the sense that the GDP variable in the second quarter has a significant and negative relationship to the variable volume of natural gas exports which results from the hypothesis rejecting  $H_0$
- g. Exchange Rate get the coefficient value reaching -0.772937 and the probability value reaching 0.003, in the sense of having a significant and negative relationship to the variable volume of natural gas export which results from the hypothesis rejecting h) domestic consumption get the coefficient value reaching -4.069609 and the probability value reaching 0.0041, in the sense of having a significant and negative relationship to the variable volume of natural gas exports which results from the hypothesis rejecting  $H_0$
- h. Domestic Consumption (-1) get a coefficient reached -11.13641 and P-value reached 0.0018, in the sense CONSUMPTION variable in the first quarter had a significant and negative relationship to the natural gas export volume variable results the hypothesis rejects  $H_0$
- i. Domestic consumption (-2) get a coefficient value reaching -3.834299 and the probability value reaching 0.008, in the sense that the CONSUMPTION variable in the second quarter has a significant and negative relationship to the variable volume of natural gas export exports which rejects  $H_0$  (Table 1).

Analysis based on this long-term equation using the ARDL method as below:

First, the International PRICE variable get the coefficient value created is -0.463356 and the probability value is 0.0529, which means that these results indicate that in the long run there is a significant and negative relationship to the volume of natural gas exports which the hypothesis rejects  $H_0$ .

Second, the gross domestic product (GDP) variable get the new coefficient value of -0.570063 and the probability value of 0.0545, which means that these results indicate that in the long run it has a significant and negative relationship to the volume of natural gas export which the hypothesis rejects  $H_0$ .

Third, the GDP variable (-2) get the coefficient value created is -0.659874 and the probability value is 0.029, which means that in the second quarter GDP variable this result shows that in the long run it has a significant and negative relationship to the volume of natural gas export which the hypothesis rejects  $H_0$ .

Fourth, the exchange rate variable get the coefficient value of -0.772937 and the probability value is 0.0309, which means that this result shows that in the long run it has a significant and negative relationship to the volume of natural gas exports which the hypothesis rejects  $H_0$ .

Fifth, the domestic consumption variable get the coefficient value is -4.069609 and the probability value is 0.0446, which means that this result shows that in the long run it has a significant and negative relationship to the volume of natural gas exports which the hypothesis rejects  $H_0$ .

Domestic consumption variable (-2) get the coefficient value of 7.302114 and the probability value of 0.0237, which means that this result the second quarter, consumption variable shows that in the long run it has a positive and significant relationship to the volume of natural gas export which rejects  $H_0$ .

Domestic consumption variable (-3) get the coefficient value of 3,834299 and the probability value of 0.0435, which means that this result consumption variable shows that in the long run it has a positive and significant relationship to the volume of natural gas exports which the hypothesis rejects  $H_0$ .

## 5. CONCLUSION

First, the international price of natural gas commodities in the short-term is a significant and negative relationship to the demand for natural gas commodities in South Korea. That's means in short-run, when the international price increase, it will be decreasing the export of natural gas volume from Indonesia to South Korea. While in the long-run the result is same with short-run there is a significant and negative relationship to the demand for natural gas commodities in South Korea. That's means in long-run, when the international price decrease, it will be increasing the export of natural gas volume from Indonesia to South Korea.

Second, the gross domestic product per capita of the importing country in the short run-term, the results get a negative and positive relationship (in the sense of two variables being negative while another one is positive) and significant for the demand of natural gas commodities in South Korea. That's means negative relationship in short-run, when the GDP per capita increase (people's purchasing power will increase), it will be decreasing the export of natural gas volume from Indonesia to South Korea. Besides, the positive relationship is predicted happen, although people's purchasing power will increase but they will buy another alternative gas, so natural gas exports from Indonesia to South Korea will continue to increase.

While in the long run-term, the result is a significant and negative relationship to the demand for natural gas commodities in South Korea. It is predicted when GDP per capita increase, Indonesian people will use a lot of natural gas to develop their economic activities, so it will be decreasing the export of natural gas volume from Indonesia to South Korea.

Third, the exchange rate of the Indonesian Rupiah against the US Dollar in the short term is the result of a significant and negative relationship to the demand for world natural gas commodities in South Korea. That's means in short-run, when the exchange rate increase (USD is strengthening), it will be decreasing the export of natural gas volume from Indonesia to South Korea. While in the long-run the result is a significant and negative relationship to the demand for natural gas commodities in South Korea. That's means in short-run, when the exchange rate decrease (IDR is strengthening), it will be increasing the export of natural gas volume from Indonesia to South Korea.

Fifth, the domestic consumption in the short term is the result of a significant and negative relationship to the demand for natural gas commodities in South Korea. It is predicted because when the domestic consumption of Indonesia increase, it will be decreasing the volume of natural gas export from Indonesia to South Korea. While in the long run the results are negative and positive (in the sense that two variables are positive while the other variable is negative) and significant for the demand for natural gas commodities in South Korea. It will predicted because in long-run, Indonesia innovates and have produce another alternative gas, so natural gas exports from Indonesia to South Korea will continue to increase.

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