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Analysis on Indonesia's beef import

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Abstract

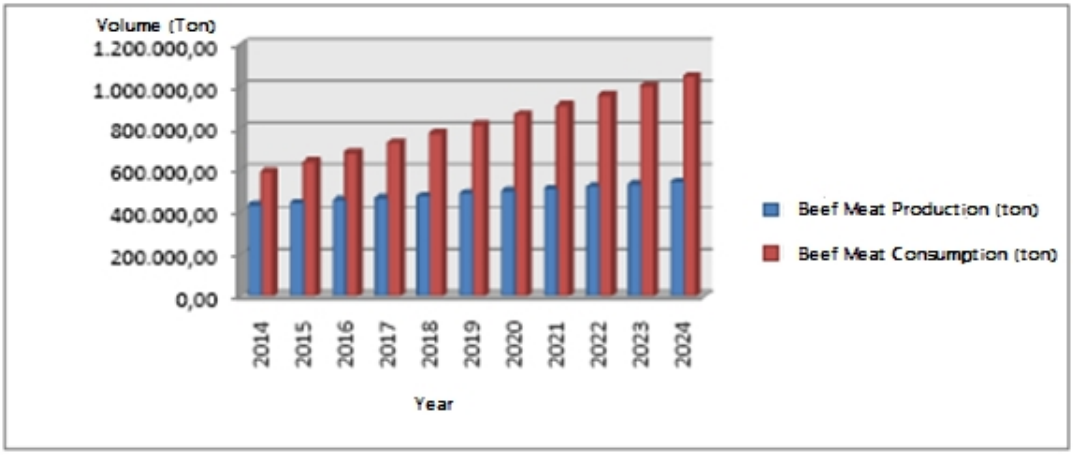
This research aims to analyze the effect of imported beef price, per capita income (GDP), and domestic beef price toward the volume of Indonesia's beef import within the period of 1983-2014 by using Error Correction Model (ECM) analysis method. The research result shows that the variables used in this research have significant effect in short term, except per capita income. In long term, all of the variables have significant effect toward beef import. The conducted Wald test displays that restriction is invalid which means that economically society's decision in purchasing beef is influenced by inflation.

Abstrak

Penelitian ini bertujuan untuk menganalisis pengaruh harga daging sapi impor, pendapatan per kapita (GDP), dan harga daging sapi dalam negeri terhadap volume impor daging sapi Indonesia dalam periode 1983-2014 dengan menggunakan metode analisis Error Correction Model (ECM). Hasil penelitian menunjukkan bahwa variabel yang digunakan dalam penelitian ini memiliki pengaruh yang signifikan dalam jangka pendek, kecuali pendapatan per kapita. Dalam jangka panjang, semua variabel berpengaruh signifikan terhadap impor daging sapi. Uji Wald yang dilakukan menunjukkan batasan yang tidak valid yang berarti bahwa secara ekonomis, keputusan masyarakat dalam pembelian daging sapi dipengaruhi oleh inflasi.

Introduction

The increasing of population and improvement of living standard will increase consumption pattern, including beef consumption. The increasing of beef consumption is not compensated with the increasing of beef production, thus it is needed to import beef. The beef import which increases annually gives economic and social benefit toward Indonesia.



Source: Processed secondary data

Figure 1: Projection of National Supply and Consumption of Beef

In figure 1, it shows the projection of national supply and consumption of beef. It can be seen that throughout the years the production of beef is relatively stable, meanwhile the consumption of beef increases as population grows. Furthermore, it is estimated that if there is no significant technology advancement in producing the local beef and no significant increasing of cow population, gap between the local beef production and the number of demand will be widening. Thus, it will affect the import volume which will be higher.

The effort in improving the food security, especially related to livestock product excluding the ability in providing livestock product, also needs to concern the effort conducted to improve society purchasing power. In livestock farming, the implementation of free trading is advantageous in one hand, but in another hand it is challenging for livestock farmer in Indonesia. From producing aspect, that condition depends on the price of production means, such as animal feed and price of livestock farming commodity and production efficiency. Production cost is expected to increase, depending on the imported component of industrial raw materials such as animal feed, medicine, and selective breeding. Meanwhile, livestock price is predicted to decrease, thus the livestock faming faces open competition with producer from developed countries which indeed their production cost is efficient.

The growing of population and the change in consumption pattern also the public taste cause the national consumption of beef tends to rise. All this time, the need of beef in Indonesia is fulfilled by three sources, which are: local cows, imported cows, and imported beef. Several efforts done by the government in stimulating the production of local livestock are: (1) enhancement of animal feed, (2) improvement of the quality of selective breeding through artificial insemination, and (3) disease eradication program.

The government also has conducted efforts in empowering people livestock farming by the development of People Livestock Farming Industry (Inayat) which makes use of partnership pattern between a company and the people livestock farming in form of Perusahaan Inti Rakyat (PIR). However, it seems that all efforts which have been done by the government have not significantly pushed the production of local livestock. It is proved by Indonesia's volume of beef import which keeps increasing. This condition is deteriorated by Indonesia which experienced economy crisis since July 1997, thus it causes local beef production cost becomes more expensive. As consequence, it affects to the declining of that commodity production. To reduce beef import which increases every year the government in 2005 and 2010 launched a program to accomplish beef self-sufficient through working on farming revitalization. However, that program has not yet been successful. Then, it is followed by beef self-sufficient program in 2014, but then the government could not realize it.

The increasing of import is also caused by the price of imported beef which has lower price compared to local beef. By the price of imported beef which is inexpensive, the consumers indeed choose to purchase imported beef. This condition makes the beef import to increase because the demand of imported beef also increases. Because the price of imported beef is cheaper that local beef, local livestock farmers incur loss.

Higher income affects the number of commodity demanded. This condition also happens in beef demand. Beside to improve nutrition quality, the increasing of income also raises the beef demand. On table 1, it can be seen that in 2014 per capita income declined, but the demand of beef import increased. It is possibly caused by the change in public taste.

Table1: Volume of Beef Import, Price of Imported Beef, GDP/capita and Price of Local Beef

Year	Volume of Beef Import (ton)	Price of Imported Beef (US$/kg)	GDP per capita (US$)	Price of Local Beef (Rp/kg)
2010	84508	3.2	3125	57.944
2011	55413	3.7	3648	69.725
2012	30377	4.1	3701	76.925
2013	39569	4.1	3624	84.180
2014	57052	4.9	3492*	99.056

Note: * Temporary number

Source: Central Bureau of Statistics (BPS), Director General of Ministry of Agriculture, and World Bank

Tahaıa and Hahnb (2015) stated that the three most influential factors which affects South Africa beef import are the change of public taste and/or beef processing method, price, and market segment of imported beef. The main result shows that the change in taste-technology has more effect toward fowl and pork import than the change in price, even though fowl price tends to increase less than beef, pork and other beef.

Giamalva (2013) uses a price-adjusted index of demand to estimate the change in Korean consumers' demand for U.S. beef from 2003 through 2011, and provides an overview of Korea's consumption, production, and imports of beef over this period. It finds that Korean demand for U.S. beef is estimated to have increased substantially since 2009, namely the first full year after signing of the Beef Protocol, but in 2011 remained well below the level observed in 2003.

Kawashima and Sari (2010) analyze the demand for beef in Japan. They calculate the elasticities of substitution, often called Armington elasticities, which reflect incomplete substitutability because of perceived product characteristics. They divide the determinants of the Japanese demand for beef imports into two factors, namely substitution elasticity and country-of-origin bias, and demonstrate how these measurements are associated with trade policy and food scare events. They use a time-varying parameter model is used to shed light on the dynamic effects of the import liberalisation and BSE outbreaks on the measurements. The estimation results reveal that the estimated substitutability and country-of-origin bias are very sensitive to the BSE cases, but not to the process of trade liberalisation.

Kusriatmi et al. (2014) investigate the effects of beef import restrictions policy on bef self-sufficiency in Indonesia. They aim to analyze the impact of the restrictions of beef import on the performance of the beef cattle industry and livestock subsector and the forecast of beef self sufficiency achievement in Indonesia. They suggest that restrictions on imports of feeder cattle and beef would increase domestic beef production and beef demand, but would reduce the population and production of cattle and livestock subsector performance. They also suggest that reduction in imports of beef and feeder cattle followed by technology improvement will accelerate the achievement of beef self-sufficiency in Indonesia.

Lee and Kennedy (2009) conduct a research on the effects of price and quality differences in source differentiated beef on market demand in South Korea. They use the quantity of an endogenous demand system derived through maximizing the economic welfare of market participants including local beef consumers and local and foreign beef suppliers. They find that as

implied by the high relative price of locally produced "Hanwoo" beef, substitutability between local and imported beef is shown to be very weak and the own price elasticity of South Korean beef is shown to be inelastic. Furthermore, related to quality differences between source differentiated beef, South Korean beef consumers show a preference for Australian beef relative to U.S. and Canadian beef, perhaps due to BSE concerns.

Fousekis, P. and B.J. Revell (2000) uses a differential approach to analyze demand for meat in the United Kingdom during 1989–99. They find that differential demand systems with fixed price effects can better explain consumers' retail purchase allocation decisions for beef, lamb, pork, bacon and poultry compared with models containing variable price effects. They also find that the real expenditure and the Hicksian demand elasticities are generally found to be quite different from earlier studies using AIDS models.

Bett et al. (2012) ensure that sociodemographic factors, such as housing location, family member proportion and family size are important factor in explaining the variation of meat product consumption. By considering the policy choice which will improve consumers' income, it will cause a high consumption which contributes more incentive for beef production. The information gained will give benefit to groups concerning in livestock farming sector in general. It will be used in formulating policy which will be effective and in line with food security and poverty alleviation.

There are quite numerous researches about beef import with various variables. Besides using the same variable with the previous research, the researcher of this research adds Wald test.

Methods

This research analyzes factors influencing beef import in Indonesia, using volume of beef import as the dependent variable and the independent variables used are the price of imported beef, the per capita income (GDP), and the price of local beef. The data used are time series collected for 32 years (1983-2014) from various sources, such as Central Bureau of Statistics, Director General of Ministry of Agriculture, and World Bank.

Model specification

In analyzing variables influencing Indonesia's beef import, the researcher believes that the analysis is comparable to demand theory, thus the equation used is:

$$Q = f(Pm, Y, Pa)$$

From the function above, it can be derived this equation:

$$Q = A - \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

where Q is the beef import (ton), Pm or X_1 is the price of imported beef (US$/kg), Y or X_2 is the per capita income (US$), Pa or X_3 is the price of local beef (Rp/kg).

The effects of each variable are: the price of imported beef has negative effect toward beef import; the per capita income has positive effect toward beef import; and the price of local beef has positive effect toward beef import. Before testing, MWD (Mackinnon, White, Davidson) test is initially conducted to determine whether the equation is linear or nonlinear.

Results and Discussions

The first step to do the analysis is doing a test of normality which result shows that the probability is amounted at 0.505566, which is bigger than 0.05, or in other words having zero hypothesis, thus the model of regression is normally distributed (Figure 2).

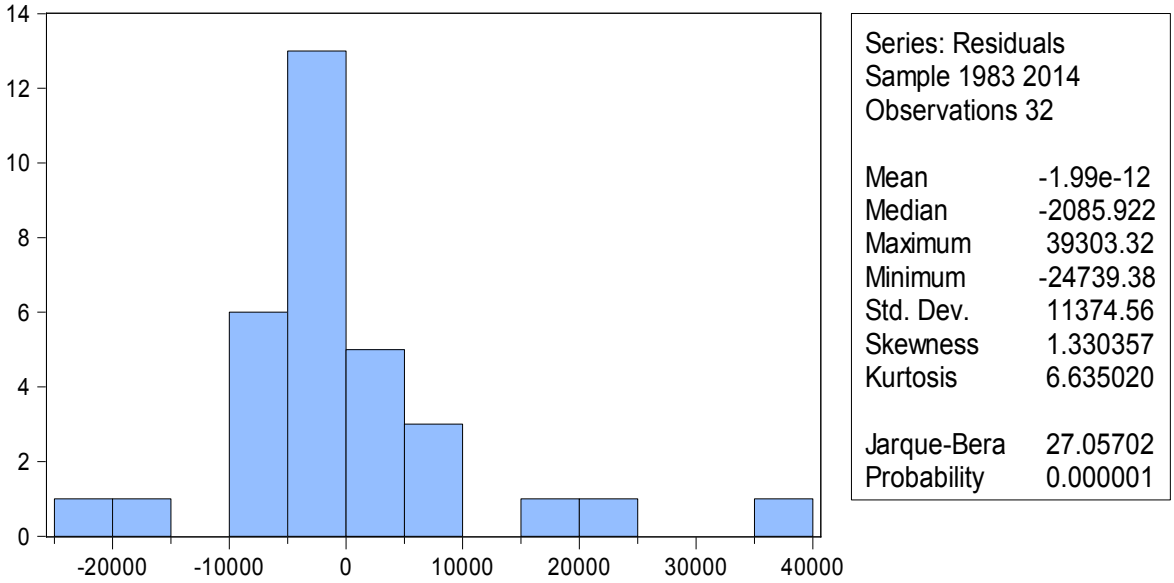


Figure 2: Result of Date Normality Test

Stationarity test

Before using ECM, researcher has to make sure that the data is stationer. Thus, the researcher has to at first test the roots of the unit. If the data are not yet stationer, the researcher needs to continue to the next step which is conducting test of integration degree. The results of roots of the unit tests can be seen in table 2.

Based on the result of unit roots test using ADF test, it can be inferred that not all variables are stationer (ADF) at data level. It can be seen from absolute value of t-statistic level that the data of all variables are less than the critical value at α = 5%. It also appears from the probability that all level of variable are more than α = 5% (not significant). This means that those variables are not stationer at some levels. The data, which are not stationer, are then tested by using unit roots test at the level of 1st difference. The test result at the level of 1st differenceshows that all stationer variable at the level of 1st difference on α = 5%. It can be seen from the absolute value of t-statistics, which says that 1st difference is larger than the critical value of all variable at the level of α = 5%. In addition, it can also be seen from the amount of probability at the level of 1stdifference, which is less than α = 5% (significant), so that all variables are at the level of 1st difference.

Table 2: Result of Stationarity Test

ADF STATISTIK	t-stat level data	t-stat 1st difference	*Critical value (α = 5%) level data*	*Critical value (α = 5%) 1st difference*	Prob toward*level* data	Prob toward*1st difference*
Log Y	-2.846226	-5.898389	-3.562882	-3.574244	0.1927	0,0002
Log X1	-2.345839	-9.387683	-3.562882	-3.568379	0.3987	0.0000
Log X2	-4.966647	-5.225693	-3.562882	-3.595026	0.0019	0.0014
Log X3	-2.447910	-6.570412	-3.562882	-3.568379	0.3497	0.0000

Cointegration test

The analysis of data time series requires stationarity as one of the important basis to create valid process. There is a situation where the researcher can analyze the relation between time series variables, even though the variables are not stationer, that is when the linear combination of those variables are stationer. Such a situation is usually called cointegration. This cointegration test is conducted to find out the long term parameter as requested by theory of economics. The results of cointegration test are as in Table 3 and Table 4.

On the result of Johanes' cointegration test, there are some sentences saying that "Trace test indicates no cointegration at the 0.05 level" and "Max-eigenvalue test indicates no cointegration at the 0.05 level". Both sentences state that there is no cointegration on the data, which means that the price of imported beef, per capita income and the price of local beef do not have any long term impact toward the volume of imported beef.

Estimated error correction model (ECM)

Error Correction model is a method of econometrics analysis which is used to find out both the equation of short term and long term balance regression. This ECM method uses error correction term variable (ECT). To determine whether the error correction model is suitable or not; or whether the ECM is valid or not, the researcher has to make sure that the ECT efficient value is 0 <ECT <1, which is statistically significant. If the coefficient is not significant, the model will not be suitable; thus, the researcher needs to do further specification. The results of ECM test are as in Table 5.

Table 3: The result of cointegration test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.561752	46.94132	47.85613	0.0608
At most 1	0.307074	22.19218	29.79707	0.2880
At most 2	0.238830	11.18723	15.49471	0.2003
At most 3	0.095171	3.000267	3.841466	0.0832

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4: Cointegration Equation

1 Cointegrating Equation(s):		Log likelihood	-55.43888
Normalized cointegrating coefficients (standard error in parentheses)			
LOGY	LOGX3	LOGX2	LOGX1
1.000000	-1.335381	-0.629271	2.115209
	(0.16146)	(0.15838)	(0.45163)

Table 5: Result of ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.155011	0.152566	1.016022	0.3190
D(LOG(X1))	-0.197211	0.309902	-0.636364	0.5301
D(LOG(X2))	-0.068245	0.056101	-1.216459	0.2347
D(LOG(X3))	0.136830	0.925941	0.147774	0.8837
ECT(-1)	-0.524510	0.191181	-2.743533	0.0109
R-squared	0.267043	S.D. dependent var		0.654339
Adjusted R-squared	0.154280	Prob(F-statistic)		0.078792
F-statistic	2.368185	Durbin-Watson stat		1.949400

Based on the result of estimated ECM, the E-coefficient of ECT variable is amounted on -0.524510, with the maximum significance level at -2.743533 and probability 0.0109. It means that this variable is significant at the level of $\alpha = 5\%$. Moreover, the difference between the actual imported beef volume and the equivalency value is amounted on -0.524510, which will be suited in one year. Therefore, the specification of model used in this research is precise and is able to clarify both short term and long term relation. As a consequence, that equation is valid and there is no reason to reject it.

Next, to figure out the possibility of restriction, the researcher uses Wald test. This test 'forces' the variables to be homogeny by having one degree, or, in the other word, the number of coefficient on each variable is zero ($\beta_1 + \beta_2 + \beta_3 = 0$). The results of Wald test are as follow:

Table 6: Result Wald Test

Test Statistic	Value	df	Probability
t-statistic	-5.572964	28	0.0000
F-statistic	31.05792	(1, 28)	0.0000
Chi-square	31.05792	1	0.0000

By looking at result F from the table above, it can be seen that one degreed equation is proven. It means that economically, restriction is not valid; and the way citizens buy beef is still influenced by inflation.

Conclusion

By using Error Correction Model (ECM) as the method of regression analysis, the result shows that: (1) there are stationary data at first difference (2) the data used in this research are cointegrated, which means that there is a long term parameter relation (3) the coefficient value of ECT is– 0,524510 and is significant at $\alpha = 5\%$; it implies that the model used in this research is valid and trustworthy. Furthermore, the conclusion of this research are as follow: (1) the variables used in this research has significant influence on the short term, except the per capita income variable (2) At the long term, all variables used in this research have significant influence on Indonesian beef import in 1998-2014 (3) Wald test shows that the restriction is not valid, which means that economically the citizens consideration to buy beef is not influenced by inflation.

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