Analysis of the Effect of Gross Domestic Product and Price of Food Commodities on Inflation in Indonesia

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Keywords: Gross Domestic Product, Price of Food Commodities, Inflation, Error Correction Model

Abstract: The purpose of this study was to find out how the effect of gross domestic product, the price of rice, the price of bulk cooking oil, the price of sugar, the price of curly red chili, and the price of chicken meat on inflation in Indonesia. The research method used was the regression technique with Error Correction Model data analysis. Data was processed using E-views 7.0. At unit root test, it is known that all observation variables were stationary. In determining the optimal lag length shows the criteria of Akaike Information Criterion (AIC), Schwarz Criterion (SC) and Human Quinn Criterion (HQ) and the smallest value was chosen between the optimal lag value of Schwarz Criterion (SC) at lag 1. The cointegration test results indicate that the variable was in a long-term equilibrium condition, so the regression results were cointegrated regression. Result of the classic assumption test were, data was normally distributed, free from autocorrelation, liberaly from the symptoms of multicollinearity, and free from the heteroscedasticity. The results obtained were the effect of gross domestic product variables, price of medium quality rice, price of bulk cooking oil prices in the short term positif and significant on inflation in Indonesia. Price of curly red chilli in the short term positif and not significant on inflation in Indonesia. Price of sugar and price of chicken meat in the short term negatif and not significant on inflation oi Indonesia. Also found that the effect of gross domestic product variables in the long term positif and significant on inflation in Indonesia, price of medium quality rice and price of curly red chilli in the long term positif and not signifikan on inflation in Indonesia. Price of bulk cooking oil prices, price of sugar, and price of chicken meat in the long term all not significant on inflation of Indonesia.

1 INTRODUCTION

Inflation is an increase in the prices of goods continuously in a certain period. The high inflation rate would reduce economic growth. The term of economic growth was used to describe the progress of economic development in a country. A country is said to experience growth, if the product of its goods and services increased or in other words there is a development of a country's potential Gross Domestic Product (GDP).

The increase in GDP have a good and bad effect on Indonesia's economic condition. One of them is the increase in GDP which is the cause of demand-side inflation, the consumptive behavior of the Indonesian people causes demand to increase so that prices can increase. In 2008 the value of GDP was only Rp. 1,524,123,000,000,000.00. Then in 2015 it grew to Rp. 2,272,929,000,000,000.00 despite the increase in GDP value good for Indonesia's economic growth, but could cause inflation. In Nugroho's research (2012) states that GDP has a positive impact on inflation.

In essence, community welfare will be achieved well if the basic needs of the community can be realized. One of the basic human needs is food. Therefore, the fulfillment of a country's food needs is an absolute matter. Based on the Food Price Index of the Food and Agriculture Organization (FAO), world food commodity prices have continued to increase since 2000. The world food crisis that occurred between 2007-2008 was marked by the price of food commodities which rose sharply and then reached its highest point in 2011-2012. Food Price Index data showed that the level of world food prices in 2011 was the latest record for the past ten years (published by the World Bank). The economies of countries in the world, especially developing countries with the largest expenditure of

Putri, K., Fitrawaty, . and Ayu, S.
Analysis of the Effect of Gross Domestic Product and Price of Food Commodities on Inflation in Indonesia.
DOI: 10.5220/0009502404730480
In *Proceedings of the 1st Unimed International Conference on Economics Education and Social Science (UNICEES 2018)*, pages 473-480
ISBN: 978-989-758-432-9

households, are food expenditure that has an impact and influence on the economy of the country.

The results of empirical research showed that food commodity prices is one of the biggest factors affecting the high inflation rate in developing countries such as China, India and Indonesia (Lee & Park, 2013). Data from FAO showed that the average inflation of Indonesian food commodities in the past ten years was 10.36%, while Thailand was around 5.57%, followed by Malaysia and the Philippines around 2.8%. Empirical studies show that the poor at both the national and regional levels are very sensitive and vulnerable to being affected by rising food inflation in recent years (Pratikto & Ikhsan, 2015). Food inflation is a significant contributor to inflation in Indonesia. Fluctuations in food commodity prices had become an important problem in controlling inflation in Indonesia. High inflation will cause people's real income to decline so that people's purchasing power decreases. Furlog in Astari (2015) stated that fluctuations in food commodity prices can be used as an inflation indicator because it has the ability to respond quickly to various economic shocks that occur, such as increasing supply and demand shocks.

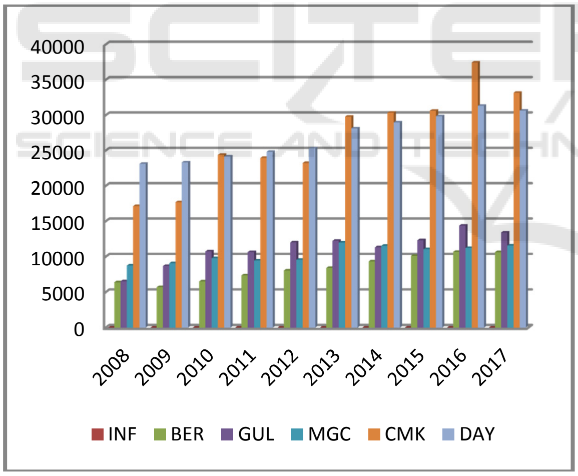


Figure 1: Food Commodity Price Development from 2008 up to 2017 (In Rupiah)

Based on the description previously stated, it is considered important to conduct research on how much effect the fluctuations in food commodity prices and gross domestic product have on inflation in Indonesia.

2 RESEARCH METHOD

The scope of the observations made in this study are; inflation data, Gross Domestic Product (GDP), and food commodity price data, namely medium quality rice price data, bulk cooking oil prices, local sugar prices, curly red chili prices, chicken meat prices in Indonesia using time series data in the period of 2008: Q1 - 2017: Q4. This research was limited by time series secondary data in the form of annual reports that have been compiled and have been published by related parties namely Bank Indonesia (BI), Central Statistics Agency (BPS), Logistics Agency (Bulog), and Development Planning Agency (BAPPENAS). Data is also obtained from books and other research results related to the research conducted.The increase in GDP have a good and bad effect on Indonesia's economic condition. One of them is the increase in GDP which is the cause of demand-side inflation, the consumptive behavior of the Indonesian people causes demand to increase so that prices can increase. In 2008 the value of GDP was only Rp. 1,524,123,000,000,000.00. Then in 2015 it grew to Rp. 2,272,929,000,000,000.00 despite the increase in GDP value good for Indonesia's economic growth, but could cause inflation. In Nugroho's research (2012) states that GDP has a positive impact on inflation.

Data analysis used Error Correction Model, which is a form of model used to determine the effect of short-term and long-term independent variables on the dependent variable. In addition to knowing the effect of economic models in the short and long term, the ECM model can also overcome data that is not stationary characterized by the presence of high R2 but has a low Durbin Watson value (Shocrul, 20011: 137). Data analysis in this study utilized Microsoft Excel 2007 software and then processed by E-Views 7.0. The model used in this study show below.

$$IINF_t = f\,(PDB_t, BER_t, MGC_t, GUL_t, CMK_t, DAY_t) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$IINF_t = \beta_0 + \beta_1 PDB_t + \beta_2 BER_t + \beta_3 MGC_t + \beta_4 GUL_t + \beta_5 CMK_t + \beta_6 DAY_t + \varepsilon i$$

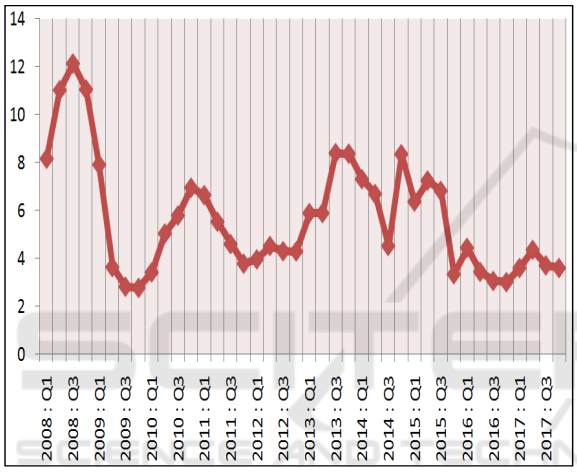
Where :

INF = rate of Inflation (%)
PDB = Produk Domestik Bruto (Milyar Rupiah)
BER = Medium quality rice prices (Rupiah)
MGC = Bulk cooking oil prices (Rupiah)
GUL = Local sugar prices (Rupiah)
CMK = Curly red chili prices (Rupiah)
DAY = Chicken meat prices (Rupiah)
β_0 = Constant

$\beta_1 : \beta_2 : \beta_3 : \beta_4 : \beta_5$ = Coefficient of Regression
εi = Disturbance error

3 RESULTS AND DISCUSSION

Data of inflation rates in Indonesia from 2008 to 2017, data of Indonesia's Gross Domestic Product (GDP) growth, data of changes in medium quality rice prices in Indonesia, data of changes in bulk cooking oil prices in Indonesia, data of changes in sugar prices in Indonesia, data of changes Curly red chili prices in Indonesia, and data of changes in prices of chicken meat in Indonesia are presented respectively in Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, and Figure 8.



Source : processed form Cenral Statistic Agency

Figure 2: Presentation of Graphs of Inflation Rate in Indonesia from 2008:1 to 2017:4

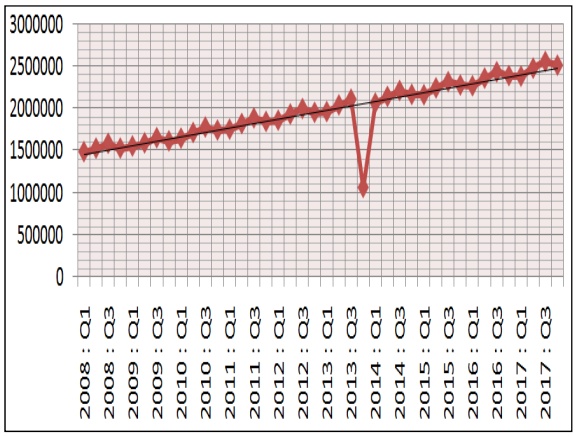


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Figure 3: Graph of Gross Domestic Product Growth in Indonesia Years from 2008: 1 to 2017: 4

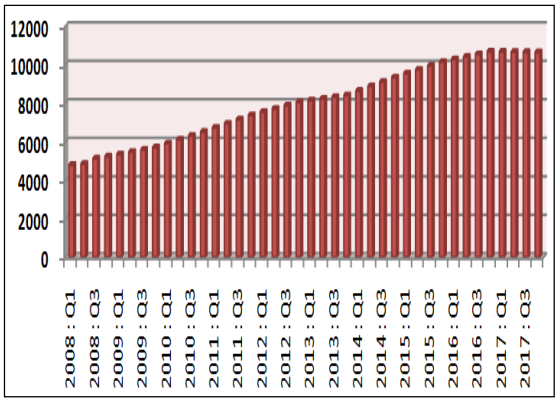

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Figure 4: Graph of change of Medium Quality Rice Prices in Indonesia from 2008: 1 to 2017: 4 (In Rupiah Currency)

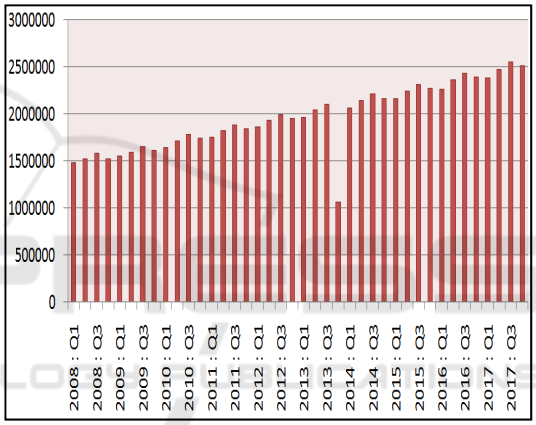

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Figure 5: Graph of Changes in Bulk Cooking Oil Prices in Indonesia from 2008: 1 to 2017: 4 (In Rupiah currency)

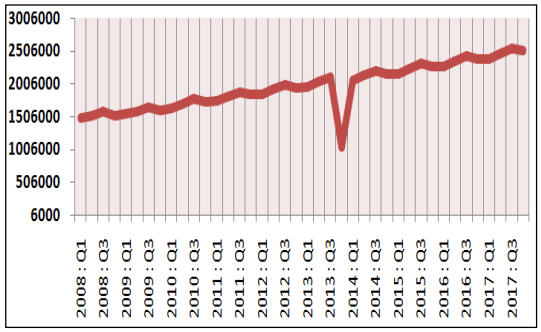

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Figure 6: Graph of Changes in Local Sand Sugar Prices in Indonesia from 2008: 1 to 2017: 4 (In Rupiah currency)

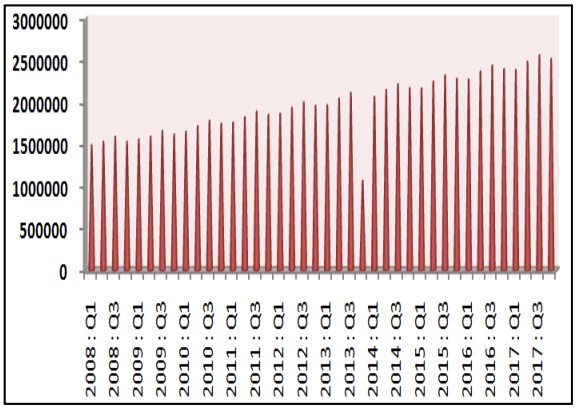

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Figure 7: Graph of Changes in Curly Red Chilli Prices in Indonesia from 2008: 1 to 2017: 4 (In Rupiah currency)

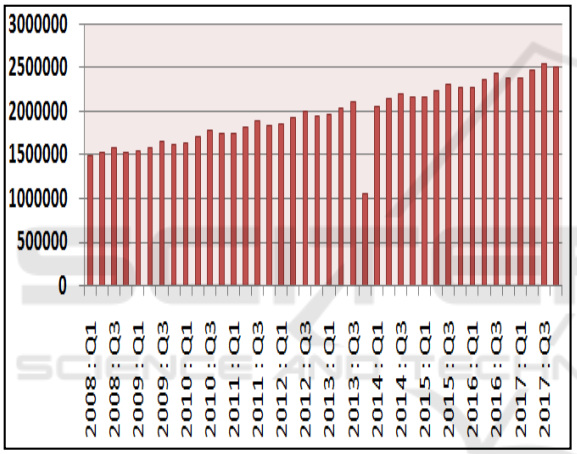

Figure 8: Chart of Chicken Meat Prices in Indonesia from 2008: 1 to 2017: 4 (In Rupiah currency)

Stationarity Test (Unit Root Test)

Stationary data is data that shows the mean, variance and autovariance (in lag variations) remain the same at any time when the data is formed or used, meaning that with stationary data the time series model can be said to be more stable. The data stationarity test used in this study is the Phillips Perron Test (PP test) with no trend constants is a test developed by Philips and Perron which aims to determine data stationarity at the level. If the results of the unit data root tests are obtained partially or all data is not stationary, it is necessary to proceed to the degree of integration test. Variables used in this study were none stationary with a probability level of $\alpha = 5\%$ at the level of the level. Therefore it is necessary to carry out further tests by using an integration degree test (different) to find out at what degree the data will be stationary. Based on the calculation results obtained values at the first different level are also not all stationary data. Then stationary test observations were carried out again at the second different level. Based on the calculation results obtained the calculated value for all stationary variables at the level of second different.

Tabel 1: Unit Root Test Results with the ADF Method in Second Different

Variables	Value of Statistic	Probability	Interprettation
LNINF	-6.0669	0.0000	Stationer
LNPDB	-6.2819	0.0000	Stationer
LNBER	-14.828	0.0000	Stationer
LNMGC	-5.9389	0.0000	Stationer
LNGUL	-4.4753	0.0013	Stationer
LNCMK	-6.5923	0.0000	Stationer
LNDAY	-6.1009	0.0000	Stationer

From Table 1 it was found that all calculated ADF values showed that all stationary observation variables were in second different after being reduced twice. After it is believed that all observation variables have the same degree of integration, cointegration tests can be performed on the observation variables

Determination of Optimal Lag Length

Lag Length Test (Determination of Optimal Lag) Optimal lag is the number of lags that have a significant influence or response. Determination of Lag According to Alfian (2011) besides influencing himself, a variable can also influence other variables. The lag testing used in this study uses the Akaike Information Criterion (AIC) approach, Schwarz Information Criterion (SC) and Hannan Quinn (HQ). The results show the Akaike Information Criterion (AIC), Schwarz Criterion (SC) and Human Quinn Criterion (HQ) criteria and the smallest value is chosen between the optimal lag Schwarz Criterion (SC) value in lag 1.

Cointegration Test.

Cointegration tests can be expressed as a test of the balance relationship or long-term relationship between economic variables as desired in the theory of econometrics (Insukindro, 1999). The method used for the cointegration test in this study is the Engle-Granger Cointegration Test method. The Agumented Dickey Fuller (ADF) test results can be seen in Table 2.

Tabel 2: Results of Cointegration Test

Variable	critical value of ADF			ADF	Prob abi-lity
	1%	5%	10%		
ECT	-3.6329	-2.9484	-2.6128	-4.922	0.000 3

Table 2 shows the ADF test value> Critical Value which is -4,922, then indicates cointegration between regression variables between gross domestic product value, medium quality rice price, bulk cooking oil price, local sugar price, curly red chili price, price of chicken meat to inflation. This indicates that the variable is said to be in a long-term equilibrium condition, so the regression results are cointegrated regression.

Error Correction Domowitz-El Badawi Model

The ECM model developed by Domowitz and El Badawi is based on the fact that the economy is in a state of imbalance. According to this model, the ECM model is valid if the error correction coefficient sign is positive and statistically significant. This error correction coefficient value is located 0 <g <1 (Widarjono, 2009: 336). Following the approach developed by Domowitz and El Badawi, the raw form of ECM was obtained as follows:

$$DLN(Y)_t = \alpha_0 + \alpha_1 D(LNBER)_t + \alpha_2 D(LNGUL)_t + \alpha_3 D(LNMGC)_t + \alpha_4 D(LNCMK)_t + \alpha_5 D(LNDAY)_t + \alpha_6 D(LNPDB)_t + \alpha_7 (LNBER_{t-1}) + \alpha_8 (LNGUL_{t-1}) + \alpha_9 (LNMGC_{t-1}) + \alpha_{10} (LNCMK_{t-1}) + \alpha_{11} (LNDAY_{t-1}) + \alpha_{12} (LNPDB_{t-1}) + \alpha_{13} ECT + \mu_t$$

To find out the specification of the model with ECM is a valid model, it can be seen in the results of statistical tests on the coefficient of ECT. To obtain the magnitude of the standard deviation of the long-term regression coefficient in the ECT model estimation.

$$DL(Y)_t N = \alpha_7 (LNBER_{t-1}) + \alpha_8 (LNGUL_{t-1}) + \alpha_9 (LNMGC_{t-1}) + \alpha_{10} (LNCMK_{t-1}) + \alpha_{11} (LNDAY_{t-1}) + \alpha_{12} (LNPDB_{t-1})$$

Error Correction Model can explain the behavior of short-term and long-term influence on independent variables on the dependent variable. The processing estimation results are carried out using the Eviews 7 program, with the ECM linear regression model, the results of data processing are shown at Table 3.

Tabel 3: Results of Regression Estimation with Error Correction Domowitz-El Badawi model

Variable	Coefisien	Statistic - t	Probability	Adjusted R^2
C	8.5110	0.4982	0.6229	0.7334
Short term				
D(LNPDB)	0.3198	2.6485	0.0381	
D(LNBER)	19.2491	2.6940	0.0127	
D(LNMGC)	12.67267	2.9262	0.0074	
D(LNGUL)	-2.6495	-0.9734	0.3400	
D(LNCMK)	2.0487	0.9981	0.3282	
D(LNDAY)	-14.9658	-2.0463	0.0518	
Long term				
LNPDB(-1)	0.0300	2.806059	0.0309	
LNBER(-1)	1.4953	1.2781	0.2134	
LNMGC(-1)	-1.5671	-1.2668	0.2174	
LNGUL(-1)	-0.9443	-0.6893	0.4972	
LNCMK(-1)	0.8277	0.7575	0.4561	
LNDAY(-1)	-0.4710	-0.2771	0.7841	
ECT	0.4943	5.8954	0.0000	

The results of the Domowitz-El badawi error correction model obtained a positive and significant coefficient value (probability value < absolute price of critical value for α = 5%). this indicates that the ECM model used in this study is valid or appropriate. in this study the value of ect (error correction term) is 0.4943 with a t-statistic value of 5.8954 > t-table 5% df 40 = 1.6838 significant at α = 5%. the ECT coefficient value is positive and statistically significant means that the Domowitz-El Badawi ECM specification model used in this study is valid (Widarjono, 2009).

Classical Assumption Test

Normality Test. The normality test is used to test whether in the regression model, the independent variable and the dependent variable are normally distributed or not. This test was carried out with Jarque Bera. The assumption of normality can be fulfilled the value of the Sig value > 0.05%. Based on data processing, the J-B statistical probability value is 0.2693 > α = 5% (0.05). So, it can be concluded that the data used in the ECM model is normally distributed.

Autocorrelation Test. The result of autocorrelation is that the estimated parameters are biased and the variants are minimum, so they are not efficient

(Damodar Gujarati, 2004). To test the presence or absence of autocorrelation, one of them is known by conducting the Breusch-Godfrey Test or the Langrange Multiplier (LM) Test. From the results of the LM test if the value of the Prob. F count is greater than alpha level 0.05 (5%) stating that the model is free from autocorrelation. Criteria for rejection or acceptance can be made using the Durbin-Watson Table. The criteria for acceptance or rejection to be made with the values of dL and dU are determined based on the number of independent variables in the regression model (k) and the number of samples (n). The values of dL and dU can be seen in Table DW with a significance level (error) of 5% ($\alpha = 0.05$). Number of independent variables: k = 6. Number of samples: n = 40. Table Durbin-Watson shows that the value of dL = 1.1754 and the value of dU = 1.8538 so that the criteria for whether or not autocorrelation can be determined. Durbin-Watson (DW) value is 2.0833, this value is greater than 1.8538 and smaller than 2.4922 so it can be concluded that the ECM model is free from the problem of autocorrelation.

Multicollinearity Test. Multicollinearity is the condition of a linear relationship between independent variables (Wing Wahyu, 2009). A good regression model should not have a correlation between independent variables. If the independent variables correlate with each other, then these variables are not orthogonal (Imam Ghozali, 2006). Orthogonal variables are independent variables with the value of correlation between each independent variable equal to zero. Multicolinerity in this study was tested using the partial correlation method between independent variables. The rule of tumb from this method is if the correlation coefficient is high enough above 0.85, we expect there is multicollinearity in the model (Widarjono, 2009: 106). The multicollinearity test results show that all independent variables have a correlation coefficient value below 0.85 so that it can be concluded that the ECM model is free from the symptoms of multicollinearity.

Heteroscedasticity Test. Heteroscedasticity aims to test whether in the regression model there is an inequality of variance from the residual one another observation. A good regression model is homoschedasticity or heteroscedasticity does not occur. To test for the presence or absence of heteroscedasticity Glejser Test can be used. If the value is Prob. F count is greater than alpha level 0.05 (5%) then Ho is accepted which means there is no heteroscedasticity. A good regression model is a regression that does not occur heteroscedasticity. If the significance value is > 0.05 then homoskedasticity occurs and if the significance value is <0.05, heteroscedasticity occurs.

Hypothesis Test

t-test. The t-statistical test is used to determine the effect of each independent variable on the dependent variable (Ghozali, 2013). Determine the acceptance criteria or rejection of H0, namely by looking at significant values. If p-value is < 0.05, then Ho is rejected or Ha is accepted and if p-value is > 0.05 then Ho is accepted or Ha is rejected. The F-Statistic Test is used to find out whether the independent variables simultaneously or simultaneously affect the dependent variable.

In the short term t-statistics and the probability of each variable gross domestic product (GDP) t-statistic = 2.6485 and the coefficient value = 0.0319 (prob = 0.0381) shows that the variable gross domestic product (GDP) has a positive effect and significantly influences inflation in Indonesia. Medium quality rice price variable (BER) with t-statistic value = 2.6940 and coefficient value = 19.249 (prob = 0.0127) shows that medium quality rice (BER) variable has a positive influence and significantly influences inflation in Indonesia. The variable price of bulk cooking oil (MGC) with a value of t-statistic = 2.9262 and the coefficient value = 12.6726 (prob = 0.0074) shows that the variable bulk cooking oil (MGC) has a positive and significant effect on inflation in Indonesia. Variable sugar (GUL) with t-statistic value = -0.9734 and coefficient value = -2.6495 (prob = 0.3400) shows that the variable price of sugar (GUL) has a negative effect and does not significantly influence inflation in Indonesia. Red curly chili variable (CMK) with t-statistic value = 0.9981 and coefficient value 2.0487 (prob = 0.3282) shows that the red curly chili variable (CMK) has a positive effect and does not significantly influence inflation in Indonesia. Chicken meat variable (DAY) with t-statistic value = -2.0463 with coefficient value = -14.9658 (prob = 0.0518) shows that the variable price of chicken meat has a negative effect and does not significantly influence inflation in Indonesia.

In the long term the gross domestic product (GDP) variable t-statistic = 2.8060 and the coefficient value = 0.0300 (prob = 0.0309) shows that the variable gross domestic product (GDP) is positively influential and significantly influences inflation in Indonesia. Medium quality rice price variable (BER) with t-statistic value = 1.2781 and coefficient value = 1.4953 (prob = 0.2134) shows that the medium

quality rice (BER) variable has a positive effect and does not significantly affect inflation in Indonesia. Variable price of bulk cooking oil (MGC) with t-statistics value = -1.2668 and coefficient value = -1.5671 (prob = 0.2174) shows that the variable bulk cooking oil (MGC) has a negative effect and does not significantly affect inflation in Indonesia. Variable sugar (GUL) with t-statistic value = -.6893 and coefficient value = -0.9443 (prob = 0.4972) shows that the variable price of sugar (GUL) has a negative effect and does not significantly influence inflation in Indonesia. Red curly chili variable (CMK) with t-statistic value = 0.7575 and coefficient value 0.8276 (prob = 0.4561) shows that the curly red chili variable (CMK) has a positive effect and does not significantly influence inflation in Indonesia. Chicken meat variable (DAY) with t-statistic value = -0.2771 with coefficient value = -0.4710 (prob = 0.7841) shows that the variable price of chicken meat has a negative effect and does not significantly affect inflation in Indonesia.

F-Test. In the short and long term, the estimation results can be seen that the F-statistic value is 5.0799 with a statistical probability of 0.0001 smaller than $\alpha = 0.05$ indicating that together all independent variables are gross domestic product (GDP), price of quality rice medium (BER), the price of bulk cooking oil (MGC), the price of sugar (GUL), the price of curly red chili (CMK), the price of chicken (DAY) and the Error Correction Term (ECT) have a significant effect on inflation in Indonesia.

Coefficient Determination Test. This means that if $R^2 = 0$, it indicates that there is no influence between the independent variables on the dependent variable. The smaller R^2 approaches 0, it can be said that the smaller the influence of the independent variable on the dependent variable. Conversely, if R^2 approaches 1, it indicates the stronger influence of independent variables on the dependent variables. Based on the results of data processing with the Error Correction Model method in the short and long term, the value of R Squared is 0.7334 or 73.34%, so that in the short and long term variables the gross domestic product (GDP), medium quality rice (BER), price bulk cooking oil (MGC), price of granulated sugar (GUL), curly red chili price (CMK), chicken meat prices (DAY) affect inflation in Indonesia with a value of 73.34%. while the rest in the short and long term is 26.66% explained by variables outside the model (not examined).

4 CONCLUSIONS

Based on the estimation results that have been done using the Domowitz-El Badawi Error Correction Model model the following conclusions can be drawn;

Of the several independent variables that were tried to be estimated in the equation of the effect of Gross Domestic Product variables, Medium Quality Rice Prices and Bulk Cooking Oil Prices in the short term these variables had a positive and significant effect on inflation in Indonesia. While the variable Curly Red Chilli Prices in the short term have a positive and not significant effect on inflation in Indonesia. As well as the variable sugar price and variable price of chicken meat, each variable in the short term does not affect inflation in Indonesia.

At long term, from several independent variables that are tried to be estimated in the equation of the variable effect of Gross Domestic Product has a positive and significant influence on inflation in Indonesia. Variable Price of Medium Quality Rice, and Price of Curly Red Chili have a significant positive effect on inflation in Indonesia in the long run. Variable Prices of Bulk Cooking Oil, Variable Prices of Sugar, and Variable Prices of Chicken Meat have a negative and not significant effect on inflation in Indonesia.

From the coefficient of determination (R^2) with the estimated model results obtained R-Squared value of 0.7334 meaning that in the short and long term variable Gross Domestic Product, Medium Quality Rice Prices, Bulk Cooking Oil Prices, Local Sugar Prices, Curly Red Chili Prices, and Chicken Meat Prices affect Inflation in Indonesia with a value of 73.34%. The rest is influenced by other variables not discussed in this study.

Based on the conclusions stated above, there are several suggestions that can be used as recommendations as follows;

Because of at the short term all the independent variables affect Inflation, it is recommended that the government implement appropriate fiscal and monetary policies. The policy objective is to maintain the stability of food commodity prices appropriately. This is due to the large contribution of the effects of food commodity prices on the inflation rate in Indonesia.

Because of the rate of economic growth will have a negative effect if accompanied by a high inflation rate. For this reason, there will be continued cooperation between Bank Indonesia as the monetary authority and the government as the fiscal authority and related agencies and institutions

to increase the effectiveness of inflation control through strengthening the national inflation control team.

The government is expected to collaborate sustainably with local farmers as well as food commodity traders. This is so that traders do not make prices according to their own wishes and local farmers get a comparable advantage from the price of the commodity. Also to equalize the welfare of the Indonesian people in each different region. So that later inequality between regions can be minimized.

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