Analysis of El Niño Impact and the Price of Food Commodities on Inflation

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Abstract

Volatile foods are a concern because this group is a significant contributor to inflation. Food production is very vulnerable to supply disruptions such as El Niño weather and other weather disturbances. This study analyzes the influence of El Niño on food Commodities and, inflation, in 25 provinces in Indonesia in 2008–2015 using the data panel method. The dependent variable in this study is inflation. While the independent variables are food commodities such as Prices of Chili, Onions, Rice, Soybeans, Corn, El Niño, and Inflation. El Niño and the price of food commodities have a positive and significant effect on inflation.

Keywords: El Niño; inflation; food commodities; data panel
JEL Classification: D04; D24; E31; Q2; Q15; Q54

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1. Introduction

Indonesia is one of the countries with the most population owned by the fourth position in the world. The increasing population of Indonesia will spend on food and beverage needs. The agricultural sector is a very important sector when there is turmoil in food prices that will disrupt economic prosperity.

Inflation is an economic phenomenon that is a crucial discussion because the disaggregation of inflation has a downward trend but is still high. The government has set a fairly low inflation target, which is in the range of 4 percent ±1 percent for 2016 and 2017 and by 3.5 percent ±1 percent in 2018. To achieve the low inflation target, it needs extra effort from all parties, especially in volatile food. It can be seen in figure 1 that inflation not only occurs because of the impact of administered prices such as increases in fuel and LPG prices, but also by volatile food.

Annual food group inflation mainly comes from rice and various chili commodities. Rice commodities experienced a price increase driven by the absence of *raskin*, so that the supply of rice among the community decreased. Commodity prices increase due to the high and low rainfall which creates the risk of drought and flooding which affects the food supply due to production constraints. So far, agricultural commodities such as rice and horticulture products (chili and red onion) are the trigger factors for inflation that occur in many regions as well as national scale. However, the commodity also faces many price fluctuations due to El Niño.

Food commodities have a very strategic role because the turmoil caused can affect macroeconomic conditions. For the Central Bank, especially those that implement the inflation targeting framework (ITF). Food commodities or volatile food are a concern because this group is a significant contributor to inflation. Success in controlling the prices of food commodities will be one of the supporting factors for success in controlling.

In general, inflationary turmoil in, Indonesia was triggered by pressure from three commodity groups with various problems which included the Volatile Food group, commodities whose prices were regulated by the government (administered prices) such as fuel, electricity and LPG tariffs and core inflation, namely components inflation which tends to be sedentary or persistent in the erosion of inflation and is influenced by fundamental factors, including demand-supply interactions.

Figure 2 historically (excluding the BBM policy period), CPI, Core, VF, and Adm Prices inflation were around 4.9 percent, 4.3 percent, 8.6 percent, and 3.6 percent respectively. Efforts need to be made to reduce the inflation rate in the future so that the upper limit of the future inflation target is not exceeded. To achieve a 3.5 percent inflation rate in 2018, extra efforts are needed to reduce volatile food inflation to around 3.1 percent, far below its historical level, as well as core inflation to compensate for adjustments in administered prices.

Like other developing countries, inflation in Indonesia is not merely a mone-
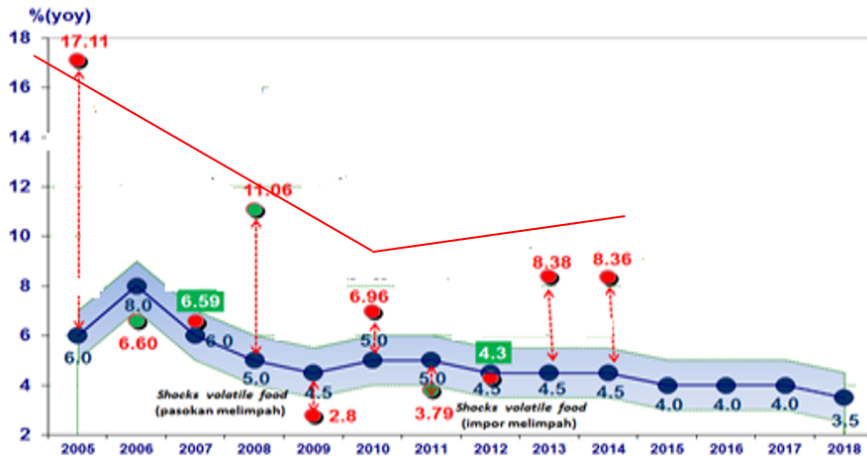
Figure 1: Inflation and Inflation Targeting
Source: Bank Indonesia (2015)

tary phenomenon; inflation in Indonesia is a structural phenomenon like cost-push inflation. Until now, Indonesia still faces several structural arrivals, including limited capacity building in the domestic economy, high dependence on natural resource-based exports, and imported raw materials. Food production is vulnerable to supply disruptions such as El Niño weather and other weather disturbances.

Inflation is a macroeconomic variable that gets full attention from all parties in maintaining the level of stability. In economic development, there is also a time when the failure of the government to develop the economy, failure to hack poverty tends to be caused by the failure of the government in managing the stability of the economy such as food prices which tend to be high and continue to increase.

When El Niño occurs, losses due to crop failure will be faced by farmers. The impact of climate change will have an impact on households and production factors. Households that fulfill their own needs, reducing production by 10 percent will reduce their consumption by 10 percent. Climate change is related to poverty, which, has an impact on reducing household consumption and reducing producer income (Hertel and Rosch, 2010).

Indonesia's geographical position in the tropics has specific climate characteristics. Rainfall is the most diverse and fluent climate element in Indonesia, so it is the most dominant climate element that characterizes Indonesia's climate. Nearly 60 percent of Indonesia's territory has annual rainfall reaching 2,000–3,500 mm (Baharsjah et al., 1985).

Climate change is a natural phenomenon that occurs on earth. The increase in temperature on the earth causes changes in weather patterns that can cause
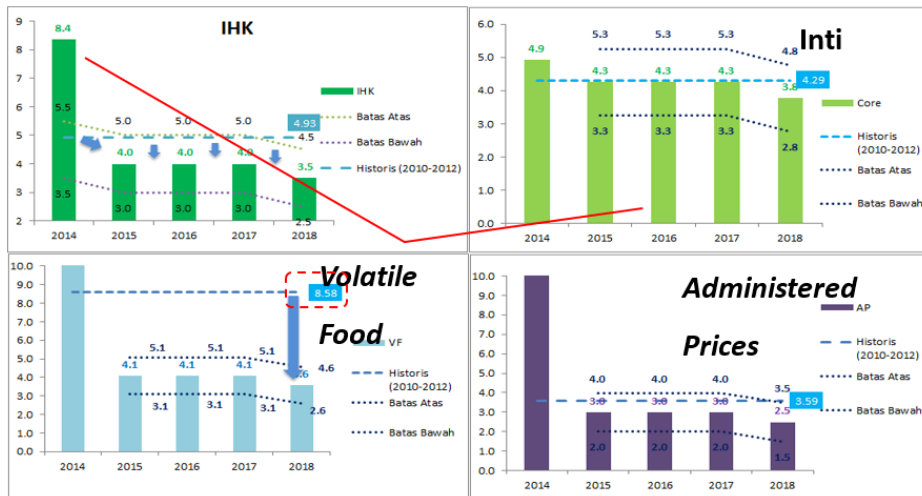
Figure 2: Inflation and Three Inflation Groups
Source: Bank Indonesia (2015)

an increase in unusual rainfall, storms, causing long droughts. One natural phenomenon is a form of climate change such as El Niño. El Niño is a condition of increasing sea surface temperatures in the Pacific Ocean which can cause reduced rainfall. One of the effects of the El Niño phenomenon is a drought in several regions such as Sumatra, Java, South Sulawesi, Bali, West Nusa Tenggara, and East Nusa Tenggara.

El Niño phenomenon can be observed by looking at the Southern Oscillation Index (SOI), which is an index based on differences in observations of atmospheric pressure at sea level. El Niño Southern Oscillation 3.4 (ENSO 3.4) shows variability in climate and air pressure in the Pacific region.

The term El Niño was originally used to describe the annual state of weak warm currents along the southern coast of Peru and Ecuador, which caused a decline in fish catches (Trenberth et al., 1997). The decline in fish catches is caused by nutrients that are usually raised to the surface by weakening upwelling. Further development of El Niño is a state of increasing sea surface temperature (sea surface temperature) from its normal temperature in the Pacific East Equator. La Nina is the opposite of El Niño, which is a decrease in sea surface temperature in the Pacific Ocean equatorial region from its normal temperature (Trenberth et al., 1997). El Niño is storage of conditions with a significant increase in sea surface temperature in the Pacific Ocean around the equator, especially in the Middle and East parts which have an impact on reducing the amount of significant rainfall in Indonesia. El Niño events are usually followed by a decrease in rainfall and an increase in air temperature. Decreasing rainfall due to El Niño can lead to crop failure due to drought.

The climate situation in agricultural production activities is an exogenous factor that cannot be controlled. In the use of input, technology, and land fertility, the same agricultural production achieved can vary due to climate influences. Estimation of loss of agricultural production due to climate anomalies can be achieved by comparing the quantity of actual production with expected production that can be achieved by normal climate conditions (Gommes, 1998).

The availability of air decreases so that the production and productivity of plants decreases or even cannot produce because plants increase drought. Damage to agricultural land due to El Niño climate anomalies can be interpreted as crop production will be related to these events. Extremely extreme climatic conditions and long durations during El Niño displacement can cause changes to food production.

1.1. Research Purpose

The purpose of this study is to analyze the impact of El Niño and the increase in food commodity prices on inflation.

2. Literature Review

2.1. Impact of Climate Change on Food Commodities

Climate change has the consequence of changing rainfall and extreme temperatures. The occurrence of El Niño or La Nina is indicated by the value of the Southern Oscillation Index (SOI) where if the SOI value has a value of ≤-8 shows an extreme value that describes the drought condition and describes the occurrence of El Niño and the value of +8 describes the occurrence of above normal rainfall conditions, while the SOI value in the interval between 8>SOI>-8 shows the tendency of climatic conditions to be normal. Changes in the transition or transition between El Niño and La Nina tend to be random, causing conditions to change cropping and harvesting patterns and quite difficult to anticipate

Climate change, both El Niño or La Nina, in addition to providing consequences for the occurrence of floods or droughts and impacts on changes in the planting area, harvest rates, and productivity of food commodities which will ultimately lead to changes in food commodity production. Changes in production of commodities have an impact on the situation of supply and demand for food commodities. Climate change has an impact on the area of harvest and food productivity because disasters take the form of floods and droughts which cause food crops to be affected by disruptions so that they are damaged or even become *puso*. Productivity changes due to the variability of extreme climatic conditions, directly and indirectly, resulting in fluctuating production and prices.

Climate change will greatly affect changes to 11 percent of agricultural land in developing countries, which results in a decline in grain production in 65 countries and result in a 16 percent decrease in GDP (FAO, 2007). Commodity

prices occur due to an imbalance between the number of requests and the number of offers needed by consumers.

Agricultural commodities are very dependent on the season, so price fluctuations during harvest and famine will affect the price of agricultural commodities. The instability of prices can reduce producer income in the harvest season and harvest failure in the dry season will burden consumers. Seasonal price volatility will result in macroeconomic conditions, especially an increase in inflation. Fluctuations in domestic food prices can be caused by several factors (Blein and Longo, 2009) as follows:

1. Natural factors, such as weather, climate and season
2. Reduced number of supplies, especially at the household and community level
3. The absence of producer organizations (farmers) and marketing chains
4. There is no market integration.

2.2. Relationship between Commodity Prices and Inflation

Commodity prices can be used as leading indicators of inflation (Furlong and Ingenito, 1996). Commodity prices can respond quickly to shocks that occur in the economy, such as increased demand or aggregate demand shock. Commodity prices are also able to respond to non-economic shocks such as floods, landslides, and other natural disasters that hinder the distribution channels of these commodities. In research conducted by Furlog and Ingenito by using the Vector Autoregression (VAR) and rolling regression method concluded that commodity prices have a very strong relationship with inflation even though the coefficient has decreased. The movement of food commodity prices will be in line with the overall price development of goods. The rapid response of commodity prices will signal that the increase in prices of other goods will follow so that inflationary pressures increase.

The increase in commodity prices was able to reduce people's purchasing power towards the consumption of these commodities so that it would cause a low level of public welfare. Therefore, changes in commodity prices are one of the dominant indicators that contribute to inflation

The link between commodity prices and consumer prices in China and Hong Kong, a study by Cutler et al. (2005) that uses the estimation of the Vector Autoregression (VAR) approach shows that changes in prices of non-fuel commodities can be used as a basis for estimating the Consumer Price Index (CPI). The increase in the price of non-fuel commodities affects the increase in the consumer price index.

2.3. Inflation

Inflation is a process of increasing prices in general and continuously (continuous). The Central Statistics Agency (BPS) defines inflation as a combined number

of changes in the price of a group of commodities of goods and services con-
sumed by the community and is considered to represent the entire commodity of
goods and services sold in the market. Mankiw (2007) states that inflation is the
entire increase in output prices in the economy.

Inflation can be defined as a period in which the purchasing power in a
monetary unit decreases or there is an increase in prices of most commodities of
goods and services continuously. If the increase in commodity city is only one or
several kinds, inflation cannot be said. Price increases are seasonal as in religious
holidays and holidays. While in broad terms, inflation can be defined as a relative
increase and has a large portion in the general price level.

Inflation is also a process of decreasing the value of currency continuously.
In other words, prices considered high is not necessarily indicative of inflation.
Inflation can be said to occur if the high price level is not accompanied by a
real increase in income, so it has been ensured that people's purchasing power
is getting weaker and will cause the welfare level to decrease. Bank Indonesia
defines inflation as increasing prices in general and continuously.

The Consumer Price Index (CPI) can be calculated per commodity, commodity
subgroup, or a combination of all commodities. There are several kinds of causes
of inflation. Mankiw (2007), distinguishes inflation into two based on the causes,
namely:

1. Demand pull inflation, namely inflation occurs because of an aggregate
   increase in demand for goods and services, so it will shift the aggregate
   demand curve to the right. This increase in demand cannot be balanced by
   producers to increase supply or fixed supply aggregate curves. Changes in
   non-price variables will cause the shifting of the aggregate demand curve
   or cause changes in the number of items requested at a certain price level.
   As a result, the balance point that reflects the price level and the amount
   of goods will shift to the right following the shift in the aggregate curve
   of demand and forming a new balance. Nicholson (1999) states that the
   shift in the demand curve can be caused by a variety of factors including
   the price of other goods, the distribution of income between households,
   tastes, changes in income and population. Changes in prices of other goods
   also affect the shift in the aggregate demand curve. If this condition lasts
   long, it will have an impact on the occurrence of inflation. An illustration
   of demand pull inflation is shown in Figure 3.

2. Cost push inflation, namely inflation occurs because of the aggregate de-
   crease in supply caused by rising production costs. The aggregate supply
   curve describes a series of combinations between commodity prices and
   the amount offered by sellers of these commodities (Hariyati, 2007) an item
   in the market such as rice produced by producers, to produce rice must use
   production factors. The factor of production has a distinctive characteristic,
   namely productivity decreases if more and more are used. The more goods
   produced, the more production factors used, so that the productivity of
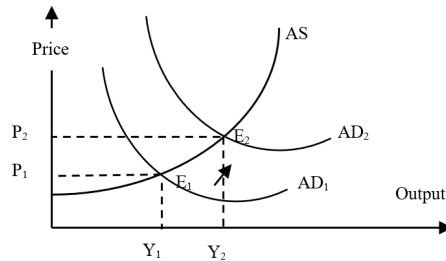   these factors decreases. Rising production costs encourage producers to

Figure 3: Illustration Demand Pull Inflation
Source: Mankiw (2007)

increase the prices of goods and services or reduce the amount of production of goods and services, so that it will shift the aggregate supply curve to the left. The occurrence of inflation due to cost push inflation will have a more dangerous impact than inflation due to the pull demand inflation. This is due to the occurrence of inflation due to cost push inflation resulting in a decline in people's purchasing power. An illustration of the inflation pressure costs can be seen in Figure 4.
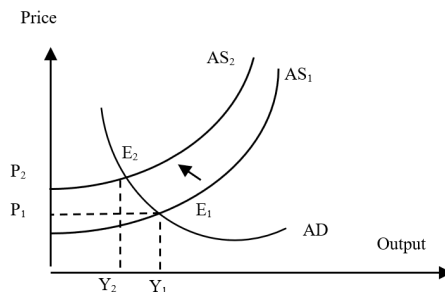

Figure 4: Illustration Cost Push Inflation
Source: Mankiw (2007)

Figure 4 explains that at the price of P1, the producer will offer goods of Y1. Increasing production costs, the supply curve shifts from AS1 to AS2. The shift causes the price to rise from P1 to P2. Cost-push inflation is inflation caused by an increase in production costs. More and more production factors are used so that production factors decrease. Declining productivity, producers must add production factors with an additional greater than the previous addition (in producing one product unit). This situation will increase additional costs or marginal costs.

The price change will affect the amount offered or change the combination of the price and the amount offered. While changes in non-price variables will

cause the shifting of the aggregate supply curve, changes in factors of production will cause the addition or reduction of the number of items offered at the same price level. Factors that cause shifts in aggregate supply curves include prices of factors of production, natural disasters, and technology (Nicholson, 1999).

Natural disasters such as El Niño will affect the supply because if a natural disaster such as El Niño occurs, it will cause crop failure and commodity supply will decline. Figure 4 shifts in the aggregate curve of supply from S1 to S2, one of which can be caused by natural disasters.

2.4. Previous Research

Climate phenomena such as EL Niño and La Nina have a significant impact on commodity prices. Brunner (2000) in *El Niño and World Primary Commodity Prices: Warm Water or Hot Air*. In this study an index that measures the occurrence of El Niño phenomena is used, namely a phenomenon of rising surface temperatures in the central and eastern Pacific Ocean. This research uses a vector autoregressive (VAR) method. The variable in this research is ENSO to see the impact of El Niño, Inflation, Economic Growth and Commodity Prices. For commodity prices, divided by 5 sectors and 33 commodities. In this study, it is known that El Niño has a significant impact on world commodity prices and increases the inflation rate to 3.5–4 percent. ENSO also affects inflation and world economic activity.

Research conducted by Cashin et al. (2015) in the title *Fair Weather or Foul? The Macroeconomic Effects of El Niño*. In this study analyze the mechanism of macroeconomic changes when environmental problems such as El Niño occur. This research uses the Global VAR (GVAR) method to analyze the international macroeconomic transmission of changes in the El Niño environment. The variables in this study use ENSO, real output, commodity prices and inflation. In this study, it was known that there was a different effect from El Niño on the countries studied in Australia, Chile, Indonesia, India, Japan, New Zealand and South Africa which were negatively affected by economic activity and there was an impact of inflation in the short term due to the increase global energy prices and rising non-fuel prices.

Utami et al. (2011) in *El Niño, La Nina, and Food Offers in Java, Indonesia* analyzed the effects of El Niño and La Nina on the supply of rice and corn at the farm level in Java. This research is estimated using cross section data from four provinces in Java and analyzed along with time series data from 1987–2006. The supply function of rice and net was analyzed using OLS, the supply of rice was estimated by log models, while the supply of maize with an autoregressive model, each analyzed using two regression equations. The influence of rainfall has an impact on food crop production. The decline in corn production is about seven times greater than the decrease in rice production. While La Nina has different effects for rice and corn. Rice experienced an increase in production at the time of La Nina while corn decreased production. El Niño and La Nina have no economic influence on the supply of rice and corn in Java.

Research conducted by Rahmat (2016) with the El Niño title on Indonesia's macroeconomic indicators. This study examines the impact of El Niño on inflation, GDP and poverty line using the VECM method. The results of this study are that El Niño has an impact on decreasing food production and increasing food prices which will further increase inflation, decrease GDP and increase the poverty line.

The El Niño impact on food prices and Indonesia's main food trade balance is carried out by Hernandes (2017). This study examines the impact of El Niño on food prices and the main food trade balance, namely rice, corn, and soybeans. El Niño's long-term impacts on prices and trade balance are analyzed by the VECM model. The results of the study show that El Niño has a positive impact on the price of rice commodity food through an increase in consumer prices and negatively related to commodity prices and prices. El Niño also has an impact on decreasing the trade balance of rice commodity food and the positive relationship to the trade balance between corn and soybeans.

3. Method

3.1. Data Types and Source

The data used in this study is monthly secondary data for the period 2005-2015. The provinces studied were 25 provinces in Indonesia. The data used is data to see the impact of El Niño on the inflation variable. The variable used in seeing El Niño's impact on inflation is ENSO 3.4. Prices of strategic food staple commodities such as rice, corn, soybeans, onion, and chilies.

Table 1: Explanation of Variables in Research

Variable	Explanation	Unit	Source
ENSO	El Niño South Oscillation	Index	CPC (Climate Prediction Center)
Rice	Rice Prices	Rupiah	BPS (*Badan Pusat Statistik*)
Soybeans	Soybeans Prices	Rupiah	BPS (*Badan Pusat Statistik*)
Corn	Corn Prices	Rupiah	BPS (*Badan Pusat Statistik*)
Chillies	Chillies Prices	Rupiah	BPS (*Badan Pusat Statistik*)
Onion	Onion Prices	Rupiah	BPS (*Badan Pusat Statistik*)
CPI	Consumer Price Index	Index	BPS (*Badan Pusat Statistik*)

3.2. Model Research

The model used in this study is a data panel. The model in this study consisted of two models. The first model is a model that describes the inflation conditions that are influenced by ENSO 3.4, rice prices, corn prices, soybean prices, shallots prices, chili prices. Mathematically the model used in this study is as follows:

$$
\begin{aligned}
\ln IHK_{it} = \alpha &+ \beta_1 \ln ENSO_{it} + \beta_2 \ln beras_{it} + \beta_3 \ln jagung_{it} \\
&+ \beta_4 \ln kedelai_{it} + \beta_5 \ln bawang_{it} + \beta_6 \ln cabe_{it} + e_{it}
\end{aligned}
\tag{1}
$$

with:

IHK_{it} : Consumer Price Index (Index);

$ENSO_{it}$: El Niño South Oscillation (Index);

$beras_{it}$: Rice Commodity Prices (Rupiah);

$jagung_{it}$: Corn Commodity Prices (Rupiah);

$kedelai_{it}$: Soybeans Commodity Prices (Rupiah);

$bawang_{it}$: Onion Commodity Prices (Rupiah);

$cabe_{it}$: Chilies Commodity Prices (Rupiah);

e_{it} : Error term.

3.3. Data Analysis Model

The method used in this study is descriptive analysis, namely by presenting data, tables, graphs, and previous research to support the arguments in this study. Next is the quantitative analysis using the econometric approach model that is using the panel data method. There are several types of econometric models in the data panel method, namely Pooled Least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). There are several tests in determining the model used in this study is the PLS, FEM, or REM model. The test used is the Chow Test to determine the FEM or PLS model and the Hausman Test to determine the REM or FEM model.

4. Results

4.1. Analysis Impact El Niño and Food Commodities on Inflation

In determining the best model, the Chow test and Hausman test were carried out. Based on the Chow test results show a smaller probability of a real level of five percent (0.00<0.05), meaning that there is enough evidence to reject H0, meaning that the model approach chosen is the fixed effect model approach. Next is the Hausman test. The Hausman test results show that the probability value is smaller than the real level of 5 percent (0.00<0.05), meaning that there is enough evidence to reject H0, meaning that the model approach chosen is the fixed effect model approach. Based on the results of testing, the best model approach chosen is the fixed effect model approach.

Processing with the fixed effect model approach is also carried out with the choice of weighting criteria, namely by weighting the SUR cross-section weighted. This method is a method that can correct heteroscedasticity and autocorrelation between units of cross-section so that the model produced in this study has been free from heteroscedasticity and autocorrelation.

Based on the estimation results shown in Table 2, the coefficient of determination (R2) for the inflation mode is 0.896795. It means that the variable price of onions, rice prices, chili prices, corn prices, soybean prices, and ENSO can

explain diversity in influencing inflation by 89.41 percent and the remaining 10.59 percent in the range that affects inflation is explained by other variables outside the model.

Table 2: Estimation of Factors that Affect to Inflation

Variable	Coefficient	Probability
C	-0.059829***	0.0000
LNBAWANG	0.047343***	0.0000
LNBERAS	0.275308***	0.0000
LNCABAI	0.011669***	0.0000
LNKEDELAI	0.100784***	0.0000
LNJGNG	0.093957***	0.0000
ENSO	0.007289***	0.0000
R-squared	0.896795	
Adjusted R-squared	0.895488	

Note: *** Significant at level 1 percent

The long trend of the rainy season is defined as a change in the period from the start of the rainy season to the end of the rainy season. The provinces in Indonesia experience a decreasing length of the rainy season. El Niño does not only affect the height of rainfall in Indonesia but also affects the beginning of the dry season or the end of the rainy season, depending on the time of formation, duration, and intensity. El Niño will certainly affect the performance of food in Indonesia, especially commodities that depend on rainfall conditions. The El Niño phenomenon is not well monitored, it will affect food performance and will increase inflation.

The results of the estimation of the inflation equation (*Lnihk*) indicate that all the variables in the equation have a positive and significant effect. A one percent change in the ENSO 3.4 index will cause an increase in inflation of around 0.0072 percent. The positive relationship between temperature rise due to El Niño and inflation found in this study is in line with the results of the study of Brunner (2000), who found El Niño to increase inflation. This El Niño phenomenon causes a decrease in food crop production, and the supply of food crops decreases. With this reduction in supply, it raises a higher balance of new prices, which causes food inflation and overall inflation to increase.

The food commodity analyzed in the *Lnihk* equation; this study finds rice as the biggest contributor to inflation, where every one percent increase in prices can increase inflation by 0.27 percent. This is reasonable because rice is indeed a major food commodity in Indonesia. Rice is the most important source of carbohydrates for the majority of people. Rice consumption per capita in Indonesia is even estimated at 98 kg per year, or one of the largest in the world (Ministry of Agriculture, 2016). The importance of rice makes the increase in prices of these commodities will have a major impact on inflation in Indonesia.

Another commodity that contributes most to inflation in Indonesia is soybeans. In this case, a one percent increase in soybean prices will increase inflation in Indonesia by 0.10 percent. Soybean needs in Indonesia are quite high. Espe-

cially for raw materials of tofu and *tempeh*, which are favorite food products in Indonesia (Naelis and Novindra, 2015).

Corn commodity contributes to inflation. An increase in corn prices by 1 percent will increase inflation by 0.09. Corn is one of the food ingredients used as raw material for the food industry and animal feed industry. The use of corn is relatively high as the main raw material in the feed industry (Setiawan and Hadianto, 2014).

Onion commodities contribute to inflation. A 1 percent increase in Shallot prices will increase inflation by 0.04. Shallot is used as a spice in cooking, a supplement for food and medicine. The contribution of shallots to inflation is because the commodity is a commodity that is consumed directly by the community (Setiawan and Hadianto, 2014).

Chili commodities contribute to inflation. The 1 percent increase in chili prices will increase inflation by 0.01. Chili can be used in both fresh and processed forms. Fresh chili can be used as a spice and chili sauce. The form of processed chili can be used as chili sauce and chili powder. Consumption of red chili is one of the raw materials in the food industry. Therefore an increase in the price of chili will provide an impact on inflation (Setiawan and Hadianto, 2014).

Table 3: Comparison of ENSO 3.4, Food Commodities, and Inflation

Years	Index			Volatile Food (Percent)	Indonesia Inflation Rate (Percent)
	ENSO 3.4	Food Production	Food Price		
2008	26.43	113.81	80.76	12.39	9.78
2009	27.49	121.08	90.78	12.43	4.81
2010	26.80	123.82	94.95	4.59	5.13
2011	26.39	127.42	109.07	14.86	5.36
2012	27.07	136.29	112.96	3.57	4.28
2013	26.78	137.48	123.80	9.60	6.41
2014	26.78	137.48	135.49	9.44	6.39
2015	26.77	146.72	138.24	2.03	6.38

Source: Author's calculation based on World Bank and BPS

The commodities of rice, corn, soybeans, shallots, and chili are the main staple foods that play an important role in fulfilling basic domestic needs and food security. El Niño, as a climate anomaly phenomenon that occurs globally, can have an impact on price increases through production shocks due to a longer than usual dry season. The high price of food will cause food inflation and will increase the overall inflation rate. This food price shock will continue to occur, given the trend of food prices that continues to increase every year.

The development of food production in Table 3, which includes strategic foods that can meet nutrition and living needs, namely rice, corn, soybeans, chili peppers, and onions except animal feed shows that the rate of food production in Indonesia shows an increasing trend. Increasing food production, which is getting lower every year, cannot offset the increase in food prices in Indonesia.

The El Niño period from 2008 to 2015, the growth of food production in Indonesia has decreased and increased. While for food prices in the year has

increased. The same goes for the inflation rate in the El Niño periods; Indonesia's inflation rate is getting higher. This is like what happened in the range of 2008, where the moderate El Niño level occurred, the inflation rate in Indonesia tended to increase, reaching 9.78 percent in 2008. The increase will be much greater when the El Niño phenomenon that occurs in Indonesia gets stronger. Thus, if every occurrence of the El Niño phenomenon of food production decreases, this will provide a shock to food prices in Indonesia, which will ultimately increase overall Indonesian inflation.

4.2. Conclusion

Based on the results of the analysis using panel data through the Fix Effect Model (FEM) method to determine the effect of El Niño and food commodity prices on inflation and El Niño influence. It can be concluded that:

1. El Niño, has a positive influence on inflation. This means that the higher the level of El Niño, the higher the inflation rate.
2. The high price of food is a factor in rising inflation. Among the various commodities analyzed by this study found that rice is a food product with the greatest potential contribution to inflation. In fact, this is reasonable because rice is indeed the main food for Indonesian people with growing demand conditions. The importance of the role of commodity prices (rice, soybeans, corn, onions, and chili) in influencing inflation in Indonesia. Therefore, fluctuations in food prices are one of the important issues in the Indonesian economy

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