ASYMMETRIC PRICE TRANSMISSION OF SOME BASIC COMMODITIES IN INDONESIA

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Abstract

The prices of these international goods, world oil prices, exchange rates, and government policies, always influence developments in the current global era that drive domestic commodity prices. This study aims to analyze the effect of asymmetric price transmission on several Indonesian domestic commodities. Asymmetric price transmission occurs if the speed of price adjustment above or below the price trend is not the same. Positive or negative price changes occur if the price is above or below the price trend. Under dynamic conditions, each price will adjust to the long-term price level. This study applies the error correction model (ECM) method to capture the speed of adjustment of each commodity following the long-term price level. This study involves asymmetric price transmission to see price adjustments. Econometric testing through the error correction model is used to determine how much the domestic price adjustments are when there is an increase or decrease in international prices for essential commodities. The results showed an adjustment in domestic prices when global prices increased or decreased for wheat flour, granulated sugar, soybeans, beef, and broiler meat. Based on the coefficient and significance level, there was no domestic price adjustment for rice and broiler chicken eggs. Policy implications include providing input for policymakers in determining prices so that market prices are stable and in line with people's purchasing power.

Keywords: Price level; Publicly Goods Price; Commodity; Agriculture

JEL Classification: E31, H40, Q11, Q02, Q10

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INTRODUCTION

Price transmission in an integrated market occurs when producers can sell their products freely in the domestic or international markets; this is what makes the prices of these products in the domestic or international markets converge over time (Ghoshray, 2010). Domestic producers will decide to sell their goods internationally if the international price is higher than the domestic price; with reduced stocks of these products in the domestic market, the domestic price will increase. This process will continue until domestic prices equal international prices (Ghoshray, 2010). This condition is called symmetrical price transmission (Varela & Taniguchi, 2018).

Based on data from the World Bank and the Ministry of Trade of the Republic of Indonesia, it can be seen from several staple food commodities that when the international price of each commodity increases, domestic prices will also grow.

However, if there is a decline in global prices, domestic prices tend not to fall as fast and as big as the decline in international prices. The prices can be seen in the chart comparing domestic prices with international prices for staple goods, particularly Wheat, *Raw Sugar*, Rice, Soybean, Beef, Broiler Chicken Meat, Race Chicken Eggs.

Several staple food commodities that when the international price of each commodity increases, domestic prices will also increase. However, if there is a decline in international prices, domestic prices tend not to fall as fast and as big as the decline in international prices (World Bank, 2020). This fact can be seen in the chart comparing domestic prices with international prices for essential commodities. Figure 1 shows the development of granulated sugar.

As shown in Figure 1, the increase in international raw sugar prices from January 2004 to April 2022 seemed to fluctuate. Responded with an increase in the domestic price of granulated sugar, but the increase in proportion was not as big as the international price of raw sugar. Based on the graphs of developments in international and domestic prices, it can be seen that increases or decreases have responded to increases or decrease in international prices for sugar in domestic prices for Bapok. The increase or decrease is not as big or proportional to the increase or decrease in international prices. For certain staple goods (Bapok), domestic prices have responded to the increase or decrease in international prices almost stably.

Price transmission between international and domestic prices follows the concept of market integration and the Law of One Price (LOP) (Ghoshray, 2010). The concept of market integration is the degree of price transmission between two markets, both horizontally and vertically (Aragrande et al., 2017; Sekhar, 2012). Market integration operates following the LOP procedure. Similar commodities will follow the LOP concept. If LOP occurs in a commodity in all markets, the market is said to be integrated. In the domestic economy, if there is a LOP, the domestic market has market integration (Baquedano & Liefert, 2014; Rapsomanikis et al., 2004; Sekhar, 2012).

It is another case if market conditions are not integrated. This market integration causes the LOP concept to not occur in similar commodities in several markets in different locations. Price transmission in an unintegrated market causes asymmetric price transmission (APT) to occur (Sekhar, 2012). The APT phenomenon is the difference in response to a price with prices in different market locations due to increases or decreases in prices in markets with different locations (Jena, 2016). Similar to symmetric price transmission, APT is divided into horizontal and Vertical APT. APT can occur due to government intervenetion through government policies, such as determining floor prices at the farm level and ceiling prices at the consumer level for several dairy commodities in the United States (Barahona & Chulaphan, 2019; Panagiotou, 2021). Government intervention through policies to maintain stocks of production goods can also cause APT in Indonesia's rice commodities (Varela & Taniguchi, 2018).

Research on APT, both Horizontal and Vertical, on several prices of staple goods requires further research. Commodities of staple goods have been regulated in the Presidential Regulation of the Republic of Indonesia Number 71 of 2015 concerning Staple Goods and Important Goods. This study will look at the Horizontal APT for staple goods, namely rice, soybeans, beef, broiler chicken meat, and broiler chicken eggs, as well as Vertical APT for staple goods, namely flour and granulated sugar. For wheat flour and granulated sugar commodeties, the Vertical concept is used because of the difference in marketing levels at international prices and domestic prices. In contrast, the international price

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used for the wheat flour commodity is the international price of the wheat commodity (Chairy et al., 2020). In contrast, the domestic price is still the domestic price of wheat flour. For the commodity of granulated sugar, the international price is the international price of raw sugar, and the domestic price is still the domestic price of granulated sugar (Aragrande et al., 2017).

This research can provide new extensions by including the effects of fluctuations in the exchange rate and crude oil prices, especially those related to APT in the relationship between international prices and domestic prices. The primary model incorporates the exchange rate to obtain international price transmission to domestic prices for staple goods commodities. When the exchange rate appreciates, it will lower the domestic price of imported goods and vice versa; when it depreciates, it will increase its domestic price (Baquedano & Liefert, 2014). This study applies the variable price of crude oil to the model. When there is an increase in the price of crude oil, it is followed by an increase in production costs (Gilbert, 2010). Incorporating import tariff variables is essential in modeling international price transmission to domestic prices (Ceballos et al., 2017).

The opinion of researchers Meyer & von Cramon-Taubadel (2004) and Varela & Taniguchi (2018) regarding asymmetric price transmission is explained as follows. First, by using this model, gaps in an economy can be seen. Second, asymmetric price transmission plays an essential role in formulating a policy, considering that this model is very closely related to market power, so all findings regarding the case of asymmetric price transmission can be used to justify an intervention. Another previous study, namely KPPU (2009) added that asymmetric price transmission is essential in applied economics because it can see the level of welfare, both from the side of producers and consumers. This study looks at the relationship between price movements at the upstream and downstream levels, which can then describe whether conditions are efficient or not.

Meyer & von Cramon-Taubadel (2004) and Varela & Taniguchi (2018) also add that other factors can trigger asymmetric price transmission, namely informal collusion between companies with a reputation for having high costs. According to him, after the increase in input prices, all companies will adjust their output prices. Meanwhile, if input prices decrease, companies will avoid giving specific signals to competitors regarding collusion.

If the reaction of the output price (P^{out}) to the increase in the input price (P^{in}) is fuller and faster when compared to the decrease, then the asymmetric price transmission model that occurs is positive (Figure 5).

Conversely, if the reaction of the output price (P^{out}) to the decline in the P^{in} input price is fuller and faster when compared to the increase, then the asymmetric price transmission model that occurs is negative (Figure 6). Meyer & von Cramon-Taubadel (2004) added that the positive and negative characteristics of the asymmetric price transmission model could be interpreted as odd if viewed from a normative point of view. Asymmetric price transmission means that if the input price P^{in} represents the price of agricultural goods and the output price (P^{out}) represents the price at the retail level, then a negative asymmetric model is profitable for consumers. At the same time, a positive asymmetric model is unfavorable.

Peltzman (2000) mentions the last factor that causes asymmetric price transmission: the high cost of price adjustments. According to him, the tendency for asymmetric price transmission to occur will be greater if the costs required are expensive to adjust the price or quantity of inputs and outputs and if the costs required to vary erratically to

increase or decrease the price or quantity. Meyer & von Cramon-Taubadel (2004) and Varela & Taniguchi (2018) gave an example: when a decrease in input prices requires an increase in the number of inputs and outputs, it turns out that it costs more than reducing inputs or outputs.

The existence of government policies allows the government to intervene in prices. This intervention can be carried out by setting a floor price at the producer level and a ceiling price at the consumer level. Pricing at the farmer's level aims to protect farmers when there is a decrease in prices at the farmer's level. The government will not intervene when there is an increase in prices at the farm level. Such a policy can reduce the uncertainty of changes in costs faced by traders. Policies like this can cause asymmetric price transmission from the farm level to the consumer level (Kinnucan & Forker, 1987). Because when there is an increase in prices at the farm level, traders consider the price changes that occur to be permanent because there is no intervention from the government. The government's actions caused traders to not immediately adjust the selling price when there was a decline in prices at the farmer's level. Conditions like this lead to positive asymmetric price transmission conditions.

Conversely, when there is a price reduction at the farm level, traders will see that the price reduction is temporary because the government will directly intervene. This reduction causes traders to not immediately adjust the selling price when there is a decline in prices at the farm level. Conditions like this lead to positive asymmetric price transmission conditions.

Figure 2 shows an asymmetric price transmission model based on (Meyer & von Cramon-Taubadel, 2004; G. Varela & Taniguchi, 2018). When there is a positive shock on the P^{in}, the shock is fully responded to by P^{out}. However, when there is a negative shock on the P^{in}, the shock is not fully responded to by P^{out}.

Figure 3 shows an asymmetric price transmission model based on speed, where when a positive shock occurs at P^{in}, the shock is fully responded to by P^{out} at t_1. However, when a negative shock occurs on the P^{in}, the shock is fully responded to by P^{out} with a lag of n so that a new shock will be transmitted perfectly at t_{1+n}. Another alternative can be possible in cases where the asymmetric price transmission model is a combination. The shape of the asymmetric price transmission model is in Figure 3.

Figure 4 shows when a positive shock occurs on the Pin at time t1. P^{out} fully responded to the new shock at t_2. However, when a negative shock occurs on the P^{in}, the shock takes longer to respond than when a positive shock occurs and is not fully transmitted by P^{out} at t_3. According to (Meyer & von Cramon-Taubadel, 2004; G. Varela & Taniguchi, 2018), the asymmetry of price transmission can be vertical or horizontal. Asymmetric price vertical transmission occurs when farmers perceive price increases for agricultural goods to occur faster when there is an increase in the retail level. Conversely, if there is a decrease in the price of retail goods, the decrease in the price of weapons will not occur immediately. Meyer & von Cramon-Taubadel (2004) and Varela & Taniguchi (2018) gave an example of a horizontal asymmetric price transmission that occurs when an increase in wheat prices in the US causes a faster response for wheat prices in Canada than if there is a decrease with the same shock size.

The study of APT was conducted for the first time by (Houck, 1977), in which Houck separated the response to price changes when affected by an increase (positive) shock from a decrease (negative) shock from prices in different market locations. Houck created a static asymmetric model that is:

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$$K_{it} = K_{i0} + \alpha_0^* + \alpha_1^+ K_{jt}^+ + \alpha_2^- K_{jt}^- + v_t (1)$$

The variable K_{jt}^+ is a positive change in price at location j from t=1 to t, K_{jt}^- is a negative change in price at location j with the same period. The test is carried out by comparing the positive and negative change coefficients, namely α_1^+ and α_1^-, the price transmission is said to be symmetric if $\alpha_1^+ = \alpha_1^-$ while the price transmission is said to be asymmetric if the coefficients differ significantly and not identical.

The APT study conducted by Houck was criticized by Meyer & von Cramon-Taubadel (2004), Varela & Taniguchi (2018), who found that Houck's APT approach was inconsistent with the cointegration in the data used due to the use of VAR. Meyer & von Cramon-Taubadel (2004) and Varela & Taniguchi (2018) then used the ECM test used by Ekananda (2016a), Urbina & Rodríguez (2022) and Varela & Taniguchi (2018), namely:

$$\Delta K_{it} = \alpha_0 + \alpha_1 \Delta K_{jt} + \alpha_2^+ EC_{t-1}^+ + \alpha_3^- EC_{t-1}^- + \alpha_4 \Delta K_{it-1} + \alpha_5 \Delta K_{jt-1} + \varepsilon_t \ .(2)$$

The definition of the variable is as follows. Variable $EC_{t-1}^+ = EC_{t-1}$, if $EC_{t-1}>0$, else 0. Whereas $EC_{t-1}^- = EC_{t-1}$, if $EC_{t-1}<0$, else 0. The APT method developed by Meyer & von Cramon-Taubadel (2004) is often used by researchers, as did (Qin et al., 2016; Rapsomanikis et al., 2004; G. J. Varela & Taniguchi, 2014; G. Varela & Taniguchi, 2018). To obtain the final results in the form of α_1^+ and α_1^-, the stages that need to be carried out are the stationarity test, cointegration test, symmetric ECM model, and asymmetric ECM model.

This research applies the research of Varela & Taniguchi (2018) as the primary reference. The research was conducted on one of the commodities of staple goods in Indonesia, wheat flour. Varela & Taniguchi (2018) used only vertical APT analysis in their research. This research examines the relationship between the international and domestic prices of wheat flour in Indonesia. However, there is a new contribution, namely this research adds other types of commodities that have not been studied from staple goods, namely granulated sugar, rice, soybeans, beef, chicken meat, and eggs. In addition, this study also adds a control variable for the price of crude oil, which is used as a proxy that represents the magnitude of production and marketing costs of staple commodity goods in Indonesia.

RESEARCH METHODS

The model used to observe asymmetric price transmission between international prices and domestic prices for essential commodities in Indonesia refers to the model used by (Meyer & von Cramon-Taubadel, 2004; G. Varela & Taniguchi, 2018):

$$hkdp_t = \beta_0 + \beta_1 hikp_t + \beta_2 rer_t + \beta_3 coilp_t + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Where hkdpt is the domestic price of staple goods in Indonesia at the time of hikpt, is the international price of staple goods at time t, rer is the nominal exchange rate in rupiah/US$, coilp is the price of crude oil, and ut is term error The total domestic price of staple goods in Rupiah/Kg. International prices for raw sugar, beef, and broiler meat are in units of US$/Kg, for purebred chicken eggs in units of US$/dozen, while international prices for wheat flour, rice, and soybeans are in units of US$/mt .

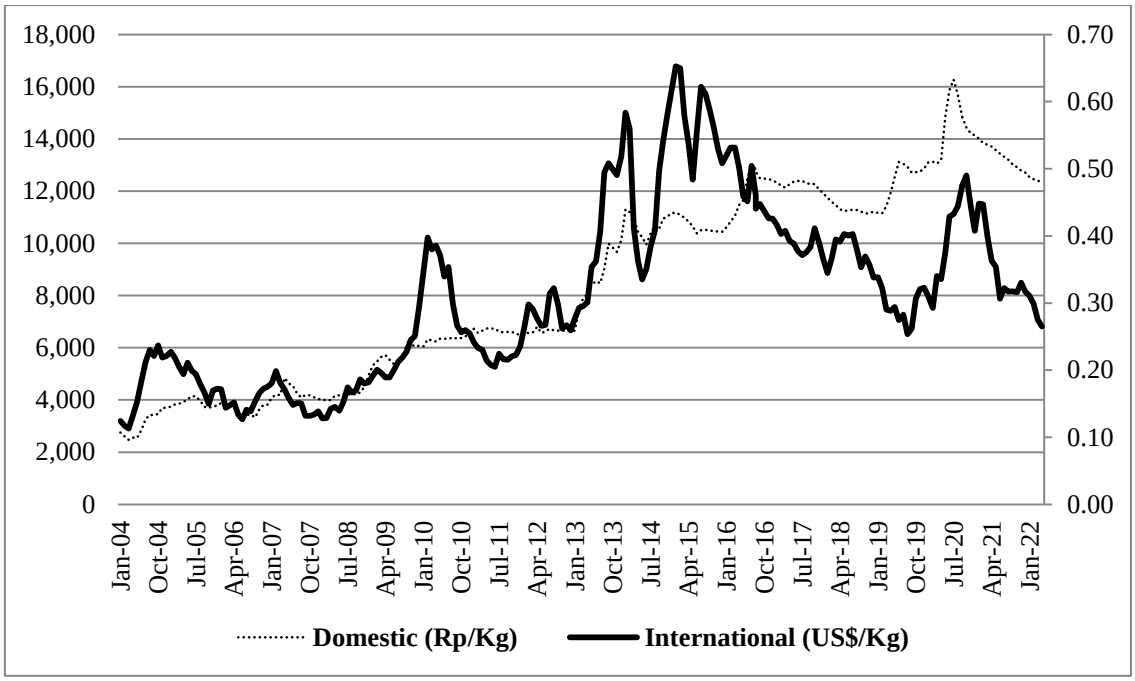

Figure 1. Prices of Domestic Sugar and International Raw Sugar

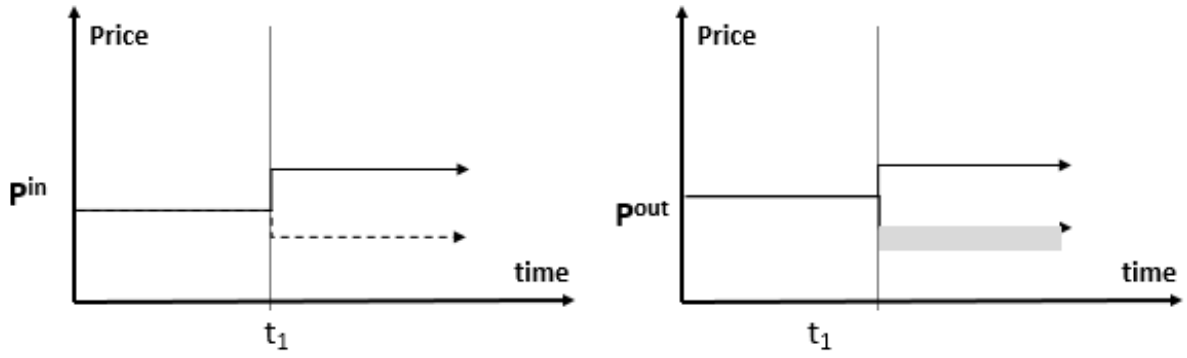

Figure 2. *APT Magnitude*

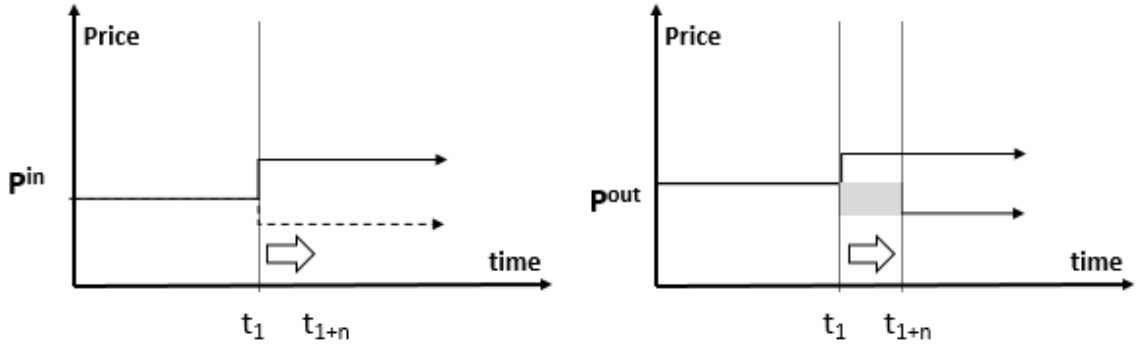

Figure 3. *APT Speed*

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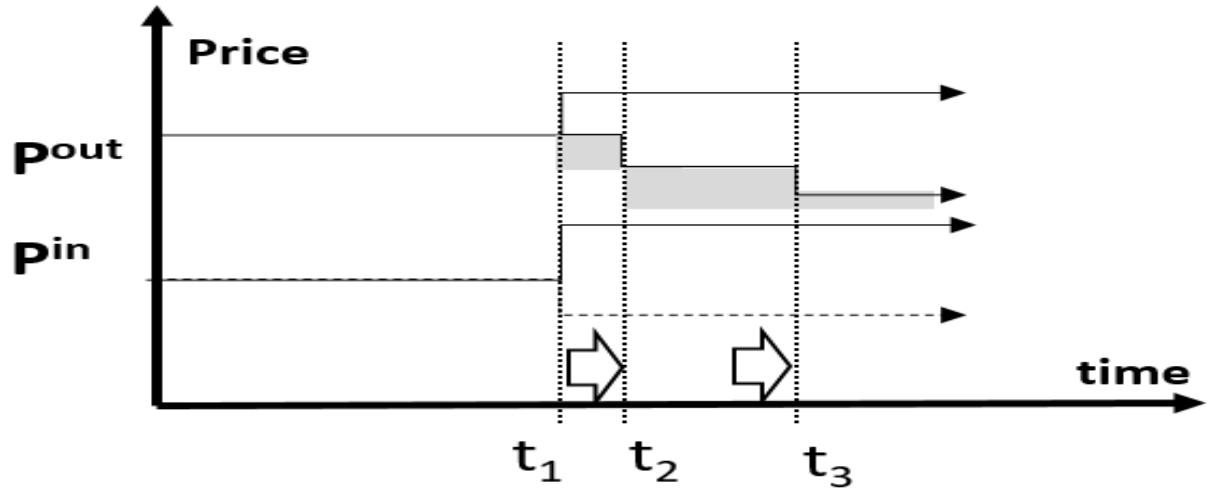

Figure 4. *APT (Combination)*

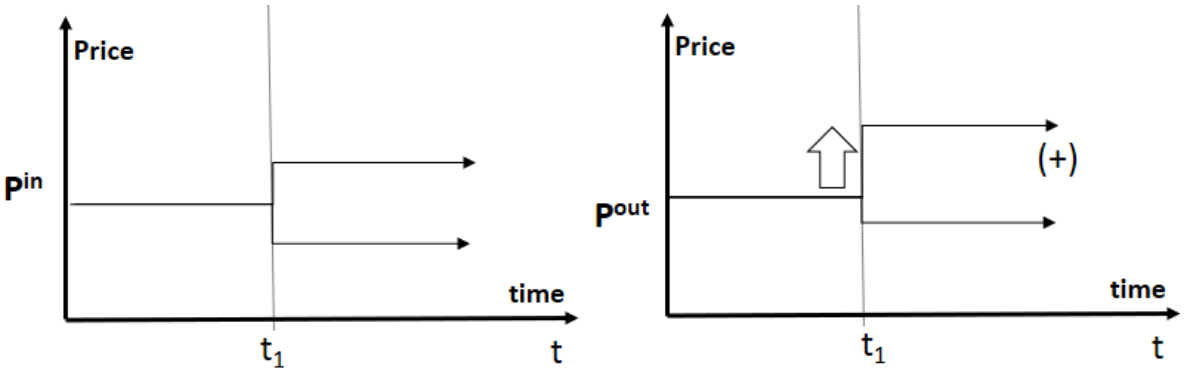

Figure 5. Positive APT

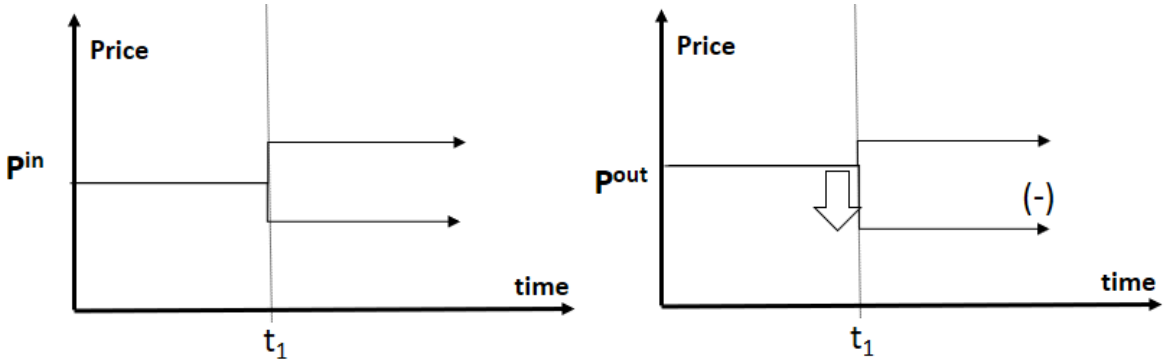

Figure 6. Negative APT

Stationarity testing of all variables is needed to see whether there is a unit root in the time series data for each variable (Baquedano & Liefert, 2014). Time series data is considered stationary if it does not have a unit root or has a constant mean and variance over time (Baqueadano, Liefert, & Shapouri, 2011). In addition, if there is a unit root, the estimation results will produce a spurious regression. The stationarity test in this study uses the ADF Test to see whether or not there is a unit root in the time series data used, with the null hypothesis that the equation has a unit root, with the alternative hypothesis that the equation has no unit root. If the stationary test results show that the time series data is stationary at the level, then the data is integrated at degree 0 or usually written as I(0), whereas if the data is stationary at the first difference level, then the data is integrated at degree 1 or I (1) (Im et al., 2003; Maddala & Wu, 1999; Pesaran et al., 2001).

If the cointegration test on the residuals from equation (3) is stationary, we developed equation (3) into a difference equation, then an equation will be formed with ECM elements. The differences will indicate the existence of short-term interactions, correction gauges, and the speed of price adjustment to the price level in the long term. To carry out the ECM mechanism, equation (3) is changed to the equation:

$$\Delta hdkp_t = \alpha_0 + \alpha_1 \Delta hdkp_{t-1} + \alpha_1 \Delta hikp_t + \alpha_2 \Delta hikp_{t-1} + \alpha_3 \Delta rer_t + \alpha_4 \Delta rer_{t-1} + \alpha_5 \Delta coilp_t + \alpha_6 \Delta coilp_{t-1} + \delta_1 \hat{e}_{t-1} + v_t \quad (4)$$

where Δ is the short-term proportional change, $\hat{e}_{t-1}$ is the estimated error that occurred in the previous period, δ is a parameter that captures the speed of price adjustment on the long-term balance $\boldsymbol{v}_t$ is white noise.

Equation (4) is the ECM mechanism which assumes symmetrical velocity and correction. Price positions above or below the term level will move at the same speed. According to the previous section's asymmetric price change problem and intuition, the adjustment speed does not impact the same. Equation (4) is developed into equation (5), where the correction on ECT is divided into 2 directions. To see the length of domestic price adjustment in this model, equation (4) can be separated into two errors, namely positive and negative (Ekananda, 2016b; Granger & Lee, 1989; Pesaran, 2014; Qin et al., 2016), namely:

$$\Delta hdkp_t = \alpha_0 + \alpha_1 \Delta hdkp_{t-1} + \alpha_1 \Delta hikp_t + \alpha_2 \Delta hikp_{t-1} + \alpha_3 \Delta rer_t + \alpha_4 \Delta rer_{t-1} + \Delta coilp_{t-1} + \delta_{11}^{+} \hat{e}_{t-1,+} + \delta_{12}^{-} \hat{e}_{t-1,-} + v_t \quad (5)$$

where the coefficient δ^+ is the speed of adjustment from domestic prices to long-term equilibrium when there is an increase in international prices, while $\delta^-$is the speed of adjustment from domestic prices to long-term balance when there is a decrease in international prices. In addition, $\hat{e}_{t-1,+}$ is an alleged error that occurs in the long-term balance, if $\hat{e}_{t-1,+}$ is positive, then $\hat{e}_{t-1,+}$= $\hat{e}_{t-1}$, otherwise, is zero. Whereas $\hat{e}_{t-1,-}$ is an error prediction that occurs in the long-term balance, if $\hat{e}_{t-1,-}$ is negative, then $\hat{e}_{t-1,-}$=$\hat{e}_{t-1}$, otherwise, is zero (Ekananda, 2016b; Granger & Lee, 1989; Pesaran, 2014).

The Wald test is needed to see the symmetrical conditions of the model in equation (5) with the hypothesis δ_{11}^{+}=δ_{12}^{-}, if the coefficients and are significant means the model is symmetrical. If the hypothesis is rejected, then it is suspected that there is an asymmetry in the long-run equation between domestic prices and international prices for these commodities (Alam et al., 2016; Ekananda, 2016b; Granger & Lee, 1989; Pesaran, 2014).

This study uses secondary data, which consists of international price data and domestic price data of staple goods

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(Bapok) commodities, as well as nominal exchange rate data and crude oil prices. The commodities of staple goods used in the study are shown in Table 1.

International prices for staple goods are from the World Bank Commodity Price Data (The Pink Sheet), except for international prices for purebred chicken eggs from the United States Department of Agriculture (USDA). Data on domestic prices for essential commodities come from the Center for Data and Information Systems, Ministry of Trade. Nominal exchange rate data comes from International Financial Statistics (IFS) International Monetary Fund (IMF). Crude oil price data comes from the World Bank Commodity Price Data (The Pink Sheet). The entire data is time series data from January 2004 to April 2022. Before estimating, all data on all variables in the basic form are converted into logarithmic form.

This study uses the analysis criteria used by (Meyer & von Cramon-Taubadel, 2004), namely APT speed, to see how much domestic prices adjust to returning to their long-term balance when there are increases and decreases in international prices. In addition, this study uses the analysis knife used by Varela & Taneguchi (2014) regarding Horizontal APT and Vertical APT to see domestic price adjustments to increases or decreases in international prices of staple commodities.

RESULTS AND DISCUSSION

Results

Increases or decreases in international prices of staple goods commodities (Bapok) are also responded to by increases or decreases in domestic prices of staple goods commodities (Bapok). For certain staple goods (Bapok), domestic prices have responded to the increase or decrease in international prices almost stably. There was a tendency for a decline in international prices for staple goods (Bapok), while domestic prices did not decline. Instead, there was a tendency for domestic prices to increase, namely wheat, rice, and soybeans.

The initial stage is the process of price transmission analysis, namely the need to test the stationarity of the data. The stationarity test used in this research uses the unit root test. In this study, the unit root test used was the Augmented-Dickey-Fuller (ADF) test (Baltagi., 2013; Greene, 2018; Im et al., 2003).

Based on the unit root test results using the ADF test, which can be seen in Table 2. All data is not stationary at the level with a significance of 1%. At the first difference, all-time series data are stationary at the 1% significance level. Based on the results of the stationarity test, domestic prices and international prices for each staple good may be integrated at degree 1 or I(1). This integration means that all data in this study, both data on each staple commodity and control variables, have a constant average value and variance over time and tend toward long-term balance. Furthermore, a cointegration test will be carried out to see whether there is a long-term relationship between domestic and international prices for each staple item.

The cointegration test on time series data is used to analyze whether there is movement between two variables that move together in the long run. Cointegration analysis is often used to see long-term economic relationships between integrated variables, even though these variables are not stationary (Baltagi., 2013; Greene, 2018; Im et al., 2003).

Table 3 estimates the long-term relationship between international prices, exchange rates, crude oil prices, and import tariffs on domestic prices for staple goods, namely flour, sugar, rice, soybeans, beef, broiler chicken meat, and broiler chicken eggs. Based on the estimation results, it can be seen that all staple goods commodities show integration in the

domestic market with the international market.

The coefficient of the nominal exchange rate for wheat flour, sugar, rice, soybeans, beef, broiler chicken meat, and eggs is significant at the 1% level and shows a positive sign. The magnitude of the coefficient of the nominal exchange rate in each commodity of staple goods varies, ranging from 1.07 to 1.69. As an example of the interpretation of the nominal exchange rate coefficient on rice, a 1% increase in the nominal exchange rate will cause an increase in domestic rice prices by 1.69% in the long run under ceteris paribus conditions. For the interpretation of the nominal exchange rate coefficient on broiler meat commodities, a 1% increase in the nominal exchange rate will cause an increase in domestic broiler meat prices by 1.07% in the long run under ceteris paribus conditions.

The price coefficient of crude oil in wheat flour, granulated sugar, rice, soybeans, beef, broiler chicken meat, and eggs is significant at the 1% level. The magnitude of the crude oil price coefficient in each commodity of necessities varies, ranging from 0.18 to 0.45. As an example of the interpretation of the price coefficient of crude oil in the commodity eggs, a 1% increase in the price of crude oil will cause an increase in the price of domestic chicken eggs by 0.45% in the long run under ceteris paribus conditions. For the interpretation of the price coefficient of crude oil in soybean commodities, a 1% increase in crude oil prices will cause an increase in domestic soybean prices by 0.18% in the long run under ceteris paribus conditions (Ekananda & Suryanto, 2021).

Table 4 shows the results of the stationarity test on commodity residues, wheat flour, granulated sugar, rice, soybeans, beef, broiler chicken meat, and purebred chicken eggs. Based on the estimation results, it can be seen that the residues of wheat flour, sugar, rice, soybeans, beef, and eggs are stationary at the 1% significance level, while broiler meat is stationary at the 5% significance level. It can be concluded that the entire model for each commodity has a long-term relationship. After carrying out the Symmetric ECM mechanism, the next step in this research is to carry out the Asymmetric ECM mechanism. The following is the estimation result of Asymmetric ECM (Granger & Lee, 1989; Greene, 2018; Nathaniel & Bekun, 2020; Panagiotou, 2021; Serra & Goodwin, 2003).

Table 5 shows the results of the asymmetric error correction model (ECM) mechanism. An asymmetric ECM test was carried out in this study, namely to see how much adjustments occurred to domestic prices in each period to carry out an adjustment process to return to its long-term balance when there were increases or decreases in international prices for several commodities of staple goods, namely wheat flour, sugar sand, rice, soybeans, beef, broiler chicken meat, and purebred chicken eggs. The asymmetrical condition is shown in the EC+ and EC- coefficient values. Asymmetric conditions can be seen if the coefficients of EC+ and EC- are different. The value of EC+ is used to see the length of time for domestic price adjustments when there is an increase in international prices to return to its long-term balance. While the value of EC- is used to see the length of time for domestic price adjustments when there is a decline in international prices to return to its long-term balance (Varela & Taniguchi, 2018).

Theoretically, the EC+ and EC- values are negative (-) so that domestic prices will return to long-term equilibrium in the long run. The values of the EC+ and EC- coefficients are used to see the time needed for domestic price adjustments to return to their long-term balance when there is an increase or decrease in international prices. For wheat flour, the EC+ and EC- values are negative (-), so domestic prices will return to long-term equilibrium in the long

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term. The EC- value is significant, meaning there is an increase in domestic price adjustments when the domestic price level is below the equilibrium price or the international price (Alam et al., 2016; Rapsomanikis et al., 2004).

For granulated sugar, the only significant EC value is EC+, meaning that there is an adjustment to a decrease in domestic prices when the position of domestic prices is above international prices. The speed of price decline towards long-term balance is 5.6%. In the rice commodity, the EC value is insignificant for EC+ or EC-. This fact shows that rice prices are not responsive to changes if there are changes in international prices (Asngari et al., 2020; Serra & Goodwin, 2003). For soybeans, the only significant EC value is for EC-, meaning that there is an adjustment for an increase in domestic prices when the position of domestic prices is below international prices (Dartanto & Usman, 2011; Junianto et al., 2022). The speed of adjustment towards a long-term balance is 16.1%. In the beef commodity, significant EC values, namely EC+ and EC-, mean domestic price adjustments when there is an increase or decrease in international prices to return to long-term balance.

In broiler, the only significant EC value is for EC-, meaning that there is an adjustment for an increase in domestic prices when the position of domestic prices is below international prices. The speed of adjustment towards a long-term balance is 13.7%. EC is not significant for EC+ or EC-in broiler egg commodities. This fact shows that the price of broiler chicken eggs is not responsive to changes if there are changes in international prices (Nafaati et al., 2021).

Table 1. Table of International and Domestic Prices

International Prices	Label	Domestic Prices	Label
Wheat	hikp.whea	Wheat	hdkp.whea
Raw Sugar	hikp.suga	Sugar	hdkp.suga
Rice	hikp.rice	Rice	hdkp.rice
Soybean	hikp.soyb	Soybean	hdkp.soyb
Beef	hikp.cow	Beef	hdkp.cow
Broiler Chicken Meat	hikp.broi	Broiler Chicken Meat	hdkp.broi
Race Chicken Eggs	hikp.egg	Race Chicken Eggs	hdkp.egg

Table 2. Stationarity Test at Level and First Difference Levels

No	Variable	Level	1st Diff	I(d)	No	Variable	Level	1st Diff	I(d)
1.	hdkp.whea	-1.16	-8.083***	I(1)	9.	hdkp.cow	-1.97	-15.81***	I(1)
2.	hikp.whea	-2.21	-11.412***	I(1)	10.	hikp.cow	-3.85	-9.88***	I(1)
3.	hdkp.suga	-2.44	-10.31***	I(1)	11.	hdkp.broi	-1.94	-4.04***	I(1)
4.	hikp.suga	-2.36	-10.75***	I(1)	12.	hikp.broi	-3.80**	-3.01	I(1)
5.	hdkp.rice	-2.02	-10.24***	I(1)	13.	hdkp.egg	-2.21	-4.26***	I(1)
6.	hikp.rice	-1.85	-9.14***	I(1)	14.	hikp.egg	-3.61**	-20.57***	I(1)
7.	hikp.soyb	-1.20	-12.38***	I(1)	15.	rer	-2.23	-10.59***	I(1)
8.	hikp.soyb	-2.21	-10.87***	I(1)	16.	coilp	-2.02	-11.05***	I(1)

Note: ***; **; *; shows significance at the level of 1%, 5%, and 10%.

Table 3. The Long-Run Equation of International Prices to Domestic Prices

Independent Variable	Dependent Variable D(hdkp)						
	Whea	Sugar	Rice	Soyb	Cow	Broil	Egg
Constant	-4.23***	-1.91***	-5.03***	-4.57***	-1.34***	-0.59*	-2.79***
Hikp	0.35***	0.55***	0.56***	0.72***	0.76***	0.71***	0.13***
NT	1.63***	1.38***	1.69***	1.55***	1.34***	1.07***	1.54***
CRUDE	0.37***	0.33***	0.33***	0.18***	0.21***	0.25***	0.46***
Tariff	0.01	-0.04***	-0.065***	0.01	0.01	-0.01	-0.04***
R-Squared	0.86	0.91	0.90	0,95	0.92	0.86	0.84
Adj. R-Squared	0.86	0.90	0.89	0.95	0.91	0.85	0.84

Note: ***; **; *; shows significance at the level of 1%, 5%, and 10%.

Table 4. Long-term Residual Equation Stationarity Test

Series	Intercept	Intercept and Trend
e-whea	-2.9010**	-3.1415*
e-suga	-3.61***	-3.86**
e-rice	-3.31**	-3.44**
e-soyb	-4.63***	-4.82***
e-cow	-3.59***	-3.76**
e-broi	-2.52	-2.72
e-egg	-4.44***	-4.95***

Note: ***; **; *; shows significance at the level of 1%, 5%, and 10%.

Figure 7 show the comparison of international wheat prices with EC+ and EC-, it can be seen that EC- responds more quickly to changes that occur in international wheat prices compared to the response from EC+, so it can be said that the domestic price of wheat flour adjusts more quickly to return to its long-term balance when it occurs. The decline in the international price of wheat. EC+ and EC- values for Wheat-Wheat Flour commodities are obtained from the separation of EC values, namely EC+ and EC-, where the value $EC_{t-1}^{+} = EC_{t-1}$, if $EC_{t-1}>0$, others 0. While $EC_{t-1}^{-} = EC_{t-1}$, if $EC_{t-1}<0$, others 0 .

The results of the analysis and position of EC+ and EC- are under the test results in Table 5. The bottom of Table 5 displays the coefficients of EC+ and EC-. Let's look at the third column for commodity rice. The two parameters are insignificant, so the numbers for the two ECs are meaningless. If we look at Figure 8, it can be seen that the EC+ chart has been above the balance for some time, and EC does not immediately return to the zero balance position.

Let's compare with Figure 9 a comparison of the international price of soybeans with EC+ and EC-that EC- responds more quickly to changes that occur in global soybean prices compared to the response from EC+, so it can be said that the domestic price of soybeans adjusts more quickly to return to its long-term balance when there is a decrease in the international price of soybeans (Krisdiana et al., 2021). The estimation results in Table 5 show that the EC- soybean is significant at the 1% level.

Based on Figure 10 regarding the comparison of international prices of raw sugar with EC+ and EC-, it can be seen that EC+ responds more quickly to changes that occur in international prices of raw sugar compared to the response from EC-, so it can be said that the domestic price of granulated sugar adjusts more quickly to return to its long-term balance when there is an increase in the international price of raw sugar (Agustin et al., 2022). The

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estimation results in Table 5 show that sugar EC+ is significant at the 1% level.

Other commodity images are not included in this article, but we present them briefly. A comparison of international beef prices shows that both EC+ and EC- respond to increases and decreases in global beef prices so it can be said that the speed of domestic price adjustments to increases and decreases in international beef prices is the same to adjust to return to long-term equilibrium. This research follows the results of the EC coefficient estimation in Table 5. Both sign signifycantly negative EC.

Table 5. Asymmetric Error Correction Model (ECM) Test.

Independent	Dependent Variable D(Hdkp)						
	Wheat	Sugar	Rice	Soyb	Cow	Broil	Egg
Const	0.00002	0.003*	0.002*	0.001	0.003***	-0.002	-0.001
D(Hdkp(-1))	0.465***	0.299***	0.277***	0.043	-0.118*	0.185***	0.140**
D(Hikp)	0.0050	0.096***	0.041	0.044	0.027	0.137	0.017
D(Hikp (-1))	0.028**	0.057**	0.021	0.001	-0.022	0.133	0.015
D(NT)	-0.0004	0.159**	0.022	0.064	0.034	0.055	0.049
D(NT(-1))	0.072**	0.129*	-0.006	0.016	0.032	0.131	0.105
D(CRUDE)	-0.009	-0.024	-0.014	0.027	-0.014	-0.061	-0.053
D(CRUDE(-1)	0.013	0.048**	-0.028	-0.010	-0.019	-0.003	0.006
Tariff	0.0002	-0.00004	0.002*	0.002	0.001	0.001	0.001
EC^+	-0.002	-0.056**	-0.026	-0.046	-0.031*	-0.050	-0.020
EC^-	-0.042***	-0.010	-0.005	-0.161***	-0.028*	-0.137***	-0.100
R2	0.413	0.311	0.162	0.251	0.111	0.156	0.119
Adj. R2	0.384	0.2779	0.1219	0.2147	0.0679	0.1149	0.077
Prob (F-stat)	0.000	0.000	0.001	0.000	0.006	0.0001	0.003

Note: ***; **; *; shows significance at the level of 1%, 5%, and 10%.

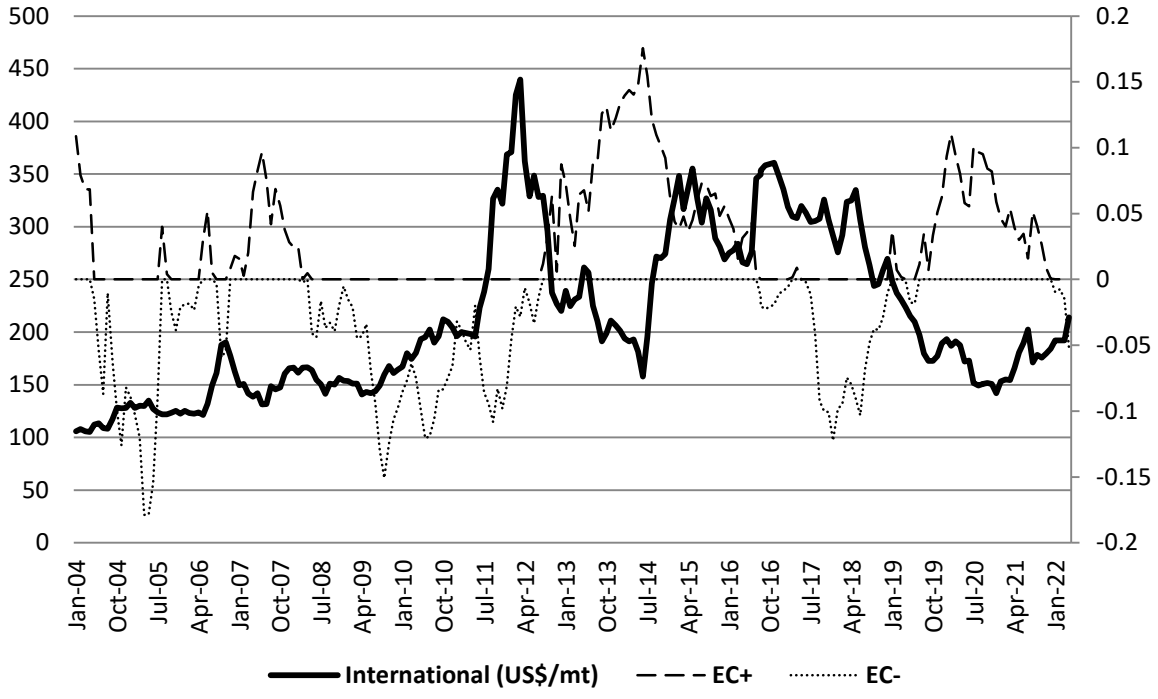

Figure 7. Comparison of International Wheat Prices with EC+ and EC-

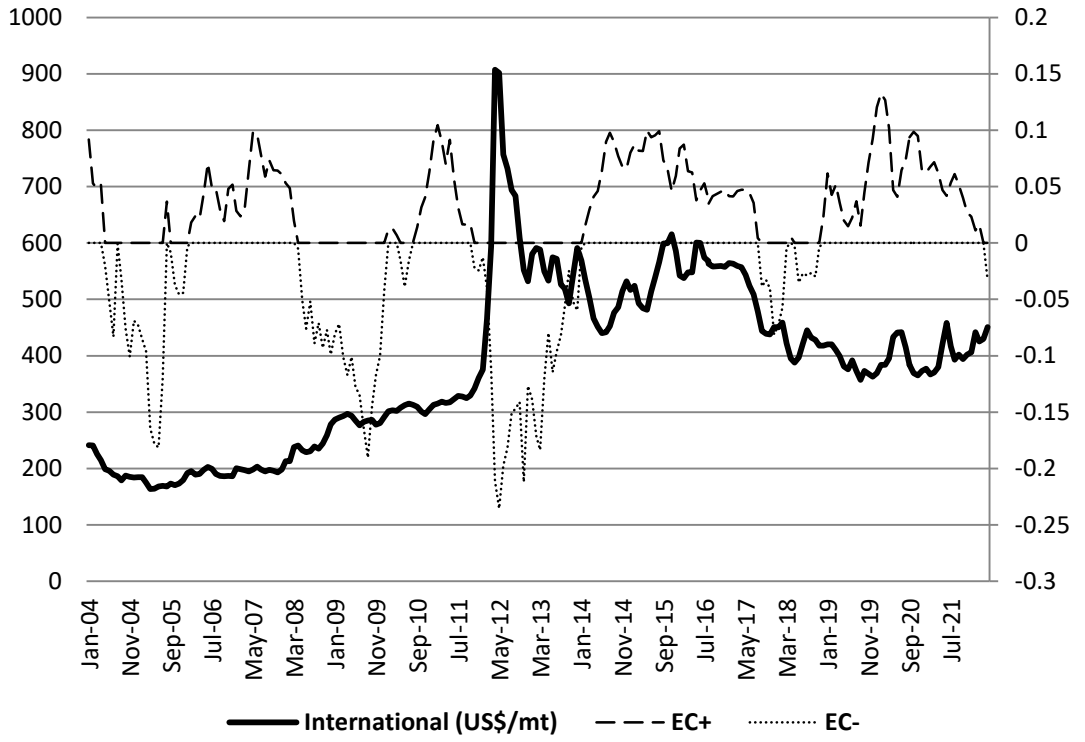

Figure 8. Comparison of International Rice Prices with EC+ and EC-

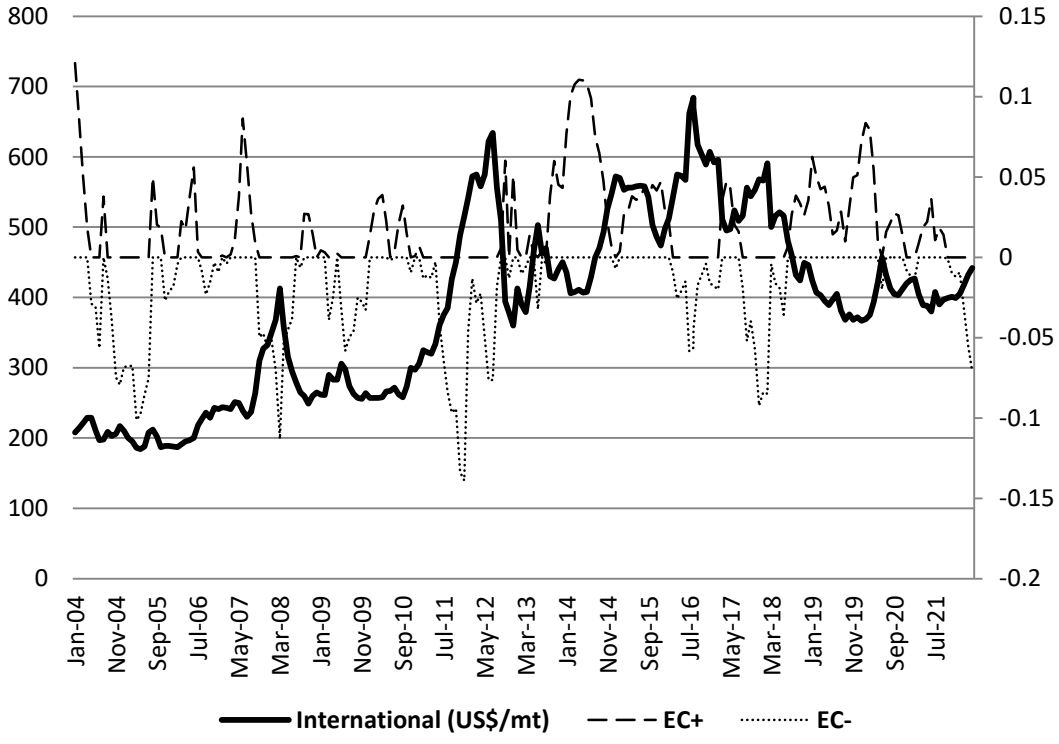

Figure 9. Comparison of International Soy Bean Prices with EC+ and EC-

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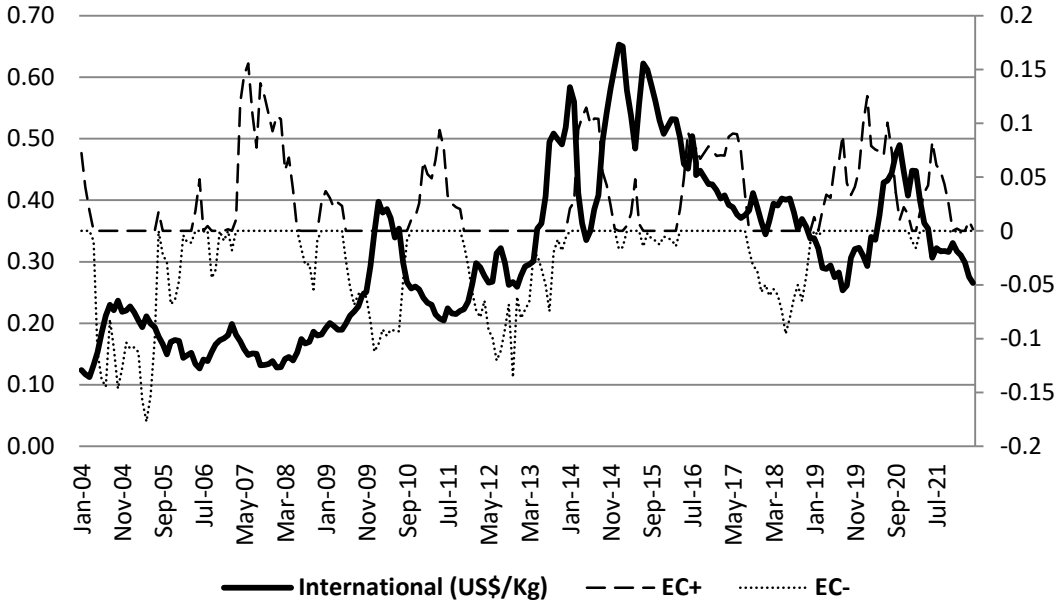

Figure 10. Comparison of International *Raw Sugar* Prices with EC+ and EC-

Discussion

The research results provide precious information for policymakers. Wheat, rice, soybeans, broiler chickens, and eggs are not responsive to lowering prices if there is an increase in prices compared to international prices. Increasing prices will reduce people's purchasing power and hinder economic growth. Following are some policies related to several commodities.

The government needs policies from the upstream aspect through the PKH Directorate General of the Ministry of Agriculture, primarily to stabilize Broiler / Live Bird Prices—certified seed quality regulation, balancing supply - demand in regulating broiler imports. Livestock business products are no longer sold as fresh chicken or fresh eggs but in the form of frozen chicken and processed chicken or even for eggs to be made into egg powder. The Ministry of Trade, following its authority, has also issued Minister of Trade Regulation Number 27 of 2017 concerning the Determination of Reference Prices for Purchases at Farmers and Reference Prices for Sales at Consumers to protect the prices of live birds and chicken eggs at the farmer level (Nugrahaeningtyas et al., 2018; Oetama & Purnama, 2022). Apart from that, to control brokers, the Ministry of Trade has also established regulations by having every broker registered with the Ministry of Trade.

This study's results show that beef's price quickly adjusts if there is a price change. This adjustment is, of course, supported by the government's efforts to meet beef stocks and the government's efforts to increase local beef production by empowering domestic breeders through livestock and beef import policies. Egg prices are not responsible if there is a price change. The government must try to stabilize the price of chicken eggs. Some of the policies that need to be strictly implemented are determining the reference price for eggs, assigning State-Owned Enterprises or SOEs to control the Grand Parent Stock (GPS) of laying hens, and continuing animal feed subsidies. To speed up controlling the price of eggs, the government can appoint BUMN to manage the GPS of laying hens so that people's laying hens can access it. Just a few

companies should not set up GPS-laying hens.

Rice prices also require special handling so that prices are under control. From the research results, it was found that the price of rice does not significantly adjust the price toward equilibrium if there is a price increase (Dartanto, 2015). The main core of rice price stability is the availability of rice in the domestic market. The increase in rice prices was caused by three factors: the rise in demand during the religious season. Second, the limited supply of rice in the market indicates that domestic rice production does not reach the target, or the surplus is very thin. Third, market intervention carried out by Bulog through supply availability and price stabilization programs is still not massive (Cuaton & Delina, 2022).

CONCLUSIONS

This research was conducted with the aim of seeing how much the domestic price will make adjustments when there is an increase or decrease in international prices to return to its long-term balance after being controlled by respective international prices, world oil prices, and the exchange rate of basic commodities in Indonesia. , especially the commodities of wheat flour, granulated sugar, rice, soybeans, beef, broiler chicken meat, and eggs.

Based on the estimation results, it shows that the overall EC coefficient for all staple goods commodities has a negative sign (-) meaning that it is in accordance with the theory described earlier, namely that domestic prices will converge towards their long-term balance. The value of each EC coefficient shows the speed of adjustment in each commodity of staple goods. The coefficient value for the speed of adjustment varies from 0.02 to 0.10. This value indicates that when there is an increase or decrease in international prices, domestic prices will make adjustments to return to their long-term balance of 2% to 10% in each period.

The soybean, when there is an increase or decrease in international prices, the domestic price will make adjustments to return to its long-term balance. The beef, when there is an increase or decrease in international prices, the domestic price will make adjustments to return to its long-term balance. The broiler meat, when there is an increase or decrease in international prices, the domestic price will make adjustments to return to its long-term balance. The broiler chicken egg, when there is an increase or decrease in international prices, the domestic price will make adjustments to return to its long-term balance.

The final test is the asymmetric ECM model test. The commodity with significant EC was wheat flour. Price adjustments increased for wheat, soybeans, and broiler chicken meat. The price of this commodity is responsive to an increase in its price position is below the equilibrium level or international price level. A commodity with significant EC+ is Sugar, and beef is responsive to fall if the commodity price position is above its equilibrium level. In other situations, wheat, rice, soybeans, broiler meat, and eggs are not responsive to decline if commodity prices are above the equilibrium level or world prices. The price of this commodity did not fall immediately even though world prices rose,

Domestic production is limited, while domestic demand is high (excess demand in the domestic market). So imports should be as a complement. Second, domestic production is limited, while domestic demand is high so imports will reduce domestic production. Third, from the point of view of the trade balance (or balance of payments), imports are more profitable because domestic production can be used for export, assuming the export price in foreign markets is higher than the import price that must be paid. The increase in imports did not reduce domestic produc-

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tion but increased exports; or even if the domestic production capacity is not fully utilized, the increase in imports can be positively correlated with the rise in domestic production or exports, assuming that foreign demand for domestic products increases.

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