

## The Dynamics of China's Economy and Its Impact on Indonesia's Economy

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### Abstract

*This study analyses the impact of China's economic growth dynamics on Indonesia's economy through changes in global commodity prices. As a country with significant commodity usage, China's economic dynamics greatly influence commodity prices at the global level. These fluctuations in commodity prices, in turn, can have negative effects on the economies of poverty-exporting countries including Indonesia. This study analyses the impact of China's real output growth on the Indonesian economy. Using simultaneous analysis, this study finds that although the effect is not direct, China's real output growth has a significant impact on Indonesia's economy through the global non-fuel commodity price index, with these exports accounting for 85 percent of Indonesia's total export value. The study also found that China plays an important role in influencing global non-fuel commodity prices, where a 10 percent increase in China's real output can raise global commodity prices by 3.99 percent.*

**Keywords:** Commodity, Economy, Consumption, Investment, Export, Import.

### INTRODUCTION

Over the past few decades, China has experienced rapid economic growth, making it the world's second-largest economy and a key driver of global economic growth. From 1979 to 2022, China's Gross Domestic Product (GDP) grew by an average of 9% per year. Owing to its high and sustained growth, China has become one of the main powers in the global economy.

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The importance of China's role in the global economy is evident from its dominance in world trade across various sectors, ranging from light manufacturing (such as textiles and apparel) to automotive and heavy industries, including the production of iron and steel, as well as chemicals. In addition, China is one of the largest importers of commodities, food, fuel, and mining products (WTO, 2022). China is a key trading partner in many countries, contributing a significant share of their exports. Moreover, China plays an important role in the global value chain. China is the world's factory that processes and manufactures various components or semi-finished goods and exports them back to various countries.

In Indonesia, China is a very important trading partner, especially for non-oil and gas exports. For Indonesia, a commodity exporter, China's economic dynamics have a greater impact on economic growth performance than the United States or the European Union.

The issue at hand is that China, which for decades has been the engine of global economic growth, is now entering a new era of slower economic growth. China's economic growth has slowed from 12.8% in 2005–2007, to 9.9% in 2008–2010, 8.4% in 2011–2013, 7.1% in 2014–2016, 6.6% in 2017–2019, and 4.5% in the pandemic years of 2020–2022. This trend clearly illustrates a slowdown in China's economy. Owing to its pivotal role in the global economy, particularly in commodity trade, the slowdown in China's growth has resulted in falling global commodity prices, thus having a negative impact on poverty-exporting countries, including Indonesia.

One consequence is that declining global commodity prices have led to deterioration in Indonesia's macroeconomic fundamentals. The high dependence on commodity exports coupled with slow structural transformation has caused Indonesia's export performance to falter when commodity prices fall. However, exports from the manufacturing and services sectors are not strong enough to compensate for the decline in commodity exports. Additionally, the depreciation of rupiah did not have a significant effect on boosting exports.

In relation to the above, this study aims to analyze the impact of China's economic growth dynamics on Indonesia's economy through the channel of changes in global commodity prices. As a country with significant commodity usage, China's economic dynamics will greatly influence commodity prices at the global level. This volatility in commodity prices, in turn, can negatively affect poverty-exporting countries (Osborn et al. 2011; Roache 2012; Zhai et al. 2016), including in Indonesia. It is important for Indonesia to understand China's role in the global economy, particularly because of its influence on

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commodity prices. This is particularly relevant, given Indonesia's continued heavy reliance on commodity exports.

### Theoretical Framework

Demand for a country's *output* in an open economy comes from consumption (C), investment (I), government spending (G), exports (X), and imports (M). This section describes the basic theories that influence each aggregate component.

Keynes' consumption theory states that disposable income primarily influences consumption (Mankiw, 2003; Prasmuko and Anugrah, 2010). *Disposable income* is income minus taxes ( $Y_d = Y - T$ ), where taxes are considered exogenous factors or factors that have already been determined.

In the intertemporal analysis, consumption behavior is also influenced by the interest rate ( $i$ ). A high interest rate encourages reduced consumption, as people tend to shift their consumption to future periods. Conversely, when interest rates fall, people choose to spend rather than save. An empirical model that can be used by considering both variables is

$$C_t = \alpha_t + \beta Y_{dt} + \lambda i_t + e_t$$

where  $i$  is the real deposit interest rate and  $\alpha_t$  represents the baseline consumption that is not affected by the income level. The *slope* of disposable income represents the variation in income that is permanent and *transitory* (Friedman 1957).

The second aggregate component of *output* demand is investment, which is highly dependent on the cost of capital or real interest rate (Mankiw, 2003). However, other studies include additional variables in the investment equation. Stirroh (2003), Yuliadi (2008), and Prasmuko et al. (2010) state that *output* affects investment. Investment is consumption in the form of capital goods (factories and equipment), buildings, and inventory, which increases the capital stock. In determining investment, economic agents consider the lending rate; when the lending rate is high, entrepreneurs reduce their demand for credit. Conversely, when the lending rate falls, entrepreneurs increase their demand for credit (Ehrman, 2001). Other factors that also affect investment include economic conditions, as reflected by the *output* or GDP. Under favorable economic conditions, companies will invest more. The formula used is as follows

$$I_t = \alpha_t + \beta I_{rt} + \lambda c_{rt} + \gamma Y_t + \Omega ER + e_t$$



Where  $It$  = investment,  $lrd$  = lending rate,  $cr$  = country risk,  $Y$  = *output*, and  $ER$  = *exchange rate*. A country's *risk* influences public expectations about its economic prospects, as reflected in the investment decisions made in that country. High risk reduces foreign investor confidence and places negative pressure on investment.

The third aggregate component in *output* demand is government spending, symbolized by  $G$ . Unlike other components, government spending is an exogenous factor, and its value is not determined within the system. Government consumption is an important tool in influencing *output*, inflation, and short-term unemployment because it has a larger multiplier effect than household consumption. Government consumption is highly dependent on revenue obtained from taxes and financing. In this study, government expenditure is considered an exogenous variable, on the grounds that it largely depends on government policy and is not determined within the system.

An open economy is characterized by international trade. Thus, exports and imports also influence a country's economic *output*. Exports refer to shipping or selling goods from overseas domestic markets. The export value is determined by the economic conditions of the destination country. The foreign *output* factor will have a positive effect, where an increase in foreign *output* will increase demand for domestic exports.

The exchange rate factor also plays a role in influences export demand. Depreciation of the domestic exchange rate will make domestic products cheaper, thereby increasing their competitiveness of domestic products. As such, a decline in the exchange rate will be followed by an increase in exports, and will also have a positive impact on *output* (Hallwood et al. 2000).

Additionally, the *output* factors of other countries also influence exports. When the *output* of a country (country A) declines, its purchasing power will also decrease, resulting in reduced imports by that country. Meanwhile, country B, which exports to country A, experiences a decline in exports. Thus, a decrease in overseas *output* can result in decreased exports for Country A, especially if that country is the main export destination, as is the case for China.

Regarding the role of *non-oil* commodities, movements in the global price index of *non-oil* commodities, including *food and beverages*, and the *input industry* make a significant contribution to international trade. This is particularly true for Indonesia, an exporting country, where *non-oil* commodity exports account for 80 percent of total exports. Thus, we can write the export equation as follows:

$$X_t = \alpha_t + \beta ER_t + \lambda Y_{cht} + \gamma non-oil_t + \Omega D_t + e_t$$



Where  $X$  is exports,  $ER$  is the exchange rate (Rp/USD),  $Y_{ch}$  is China's real output,  $non-oil$  is the global price index for *non-fuel* commodities, and  $D$  is the crisis dummy.

On the other hand, imports are influenced more by the domestic economy, where income reflects purchasing power. Import value is also affected by exchange rate movement. The appreciation of the exchange rate is followed by an increased demand for imports, especially for consumer goods. This is because an appreciation of the exchange rate makes the price of imported goods cheaper, thus increasing demand for those goods. The import equation is as follows:

$$M_t = \alpha_t + \beta ER_t + \lambda Y_t + \gamma P^*_t + \Omega D_t + e_t$$

Where  $M_t$  = imports,  $ER_t$  = exchange rate (Rp/USD),  $Y_t$  = national output,  $P^*_t$  = US CPI, and  $D$  = crisis dummy. In an open economy, the demand-side output of the economy follows the identity equation

$$Y_t = C_t + I_t + G_t + X_t - M_t$$

The inflation model is based on Phillips Curve theory (Mankiw, 2003) and incorporates variables for inflation expectations, output gap, and supply shock. As a proxy for inflation expectations, lagged inflation (one period before) is used, based on the assumption that people form their current inflation expectations based on the previous period's inflation (adaptive inflation theory). The output gap refers to the difference between the actual GDP and potential GDP, with potential GDP being the GDP trend. The supply shock variable is represented by the world oil price. The formula is as follows:

$$\pi = \pi_{t-1} + \beta(Y_t - Y_{pot_t}) + \lambda oil_t + e_t$$

where  $\pi$  = inflation,  $\pi_{t-1}$  = inflation expectations,  $Y_t$  = actual output,  $Y_{pot_t}$  = potential output, and  $oil_t$  = world crude oil price

## Research Method

### Model and Estimation Techniques

This study uses an econometric approach to *simultaneous equations*, commonly known as simultaneous models. A system of simultaneous equations is a set of equations in which endogenous variables in one or more equations serve as exogenous variables in other equations. Variables in a simultaneous model can have dual roles, functioning as both exogenous and endogenous (Gujarati, 2003).

Identifying the structure of the model is the first step in constructing a simultaneous model and determining whether parameter estimation can be resolved. In general, there are three possible identification outcomes.



1. Exactly identified:
2. a condition in which unique parameters are obtained, that is, there is only one value for each structural parameter coefficient.
3. condition in which more than one value was obtained for the structural equation parameters. Under identification, the values for the structural equation parameters cannot be obtained because the conditions do not meet the minimum requirements for calculating at least one parameter.

The identification process can employ two methods: *order* and *rank conditions* (Enders, 2004). The *order condition* procedure alone is not sufficient, and the *rank condition* procedure must be met as a sufficient condition. In this context, for a system of simultaneous equations with  $M$  structural equations to be identified, it must have at least  $(M-1)$  endogenous variables.

For a given  $m$  number of endogenous variables in the model,  $K$  as the total number of predetermined variables, and  $k$  as the number of predetermined variables in the equation to be estimated, the order condition follows these rules:

1. If
2.  $(K-k) = (m-1)$ , then the equation is said to be exactly identified. If
3.  $(K-k) > (m-1)$ , then the equation is over identified  
 $(K-k) < (m-1)$ , then the equation is under identified

An equation can be estimated if its condition is either *exact* or *over-identified*.

Three estimation techniques can be used: (i) *indirect least squares (ILS)*; this method is used for structural equations that are *exactly identified*; (ii) *ordinary least squares (OLS)*, which is used for structural equations that are *over-identified*, provided there are no endogeneity issues. In other words, there is no interdependence between these two equations. In this context, estimating the simultaneous equations yields the same results as estimating each equation separately. If there is an endogeneity problem, the method that should be used is *the two-stage least squares (TSLS) method*. (iii) The third estimation technique is *TSLS*, which is used to obtain the structural parameter values in equations that are *over-identified* and have endogeneity constraints.

The selection of the appropriate estimation technique is based on two factors: (i) identifying the ratio of endogenous and exogenous variables, and (ii) addressing endogeneity issues present within the structural equations.



### Empirical Model of the Study

The equations used to construct the simultaneous model are as follows.

1.  $C_t = \alpha_t + \beta Y_{dt} + \lambda i_t + e_t$
2.  $I_t = \alpha_t + \beta lr_{dt-4} + \lambda cr_{t-4} + \gamma Y_{t-4} + \Omega ER + e_t$
3.  $X_t = \alpha_t + \beta ER_t + \lambda Ych_t + \gamma nonfuel_t + \Omega D_t + e_t$
4.  $M_t = \alpha_t + \beta ER_t + \lambda Y_{t-4} + \gamma P^*_t + \Omega D_t + e_t$
5.  $Nonfuel = \alpha_t + \beta Ych_{t-1} + e_t$
6.  $Y_t = C_t + I_t + G_t + X_t - M_t$
7.  $\pi_t = \pi_{t-1} + \beta(Y_t - Y_{pot_t}) + \lambda fuel_t + e_t$

The simultaneous relationships among the variables and across the seven equations are illustrated in Figure 1.

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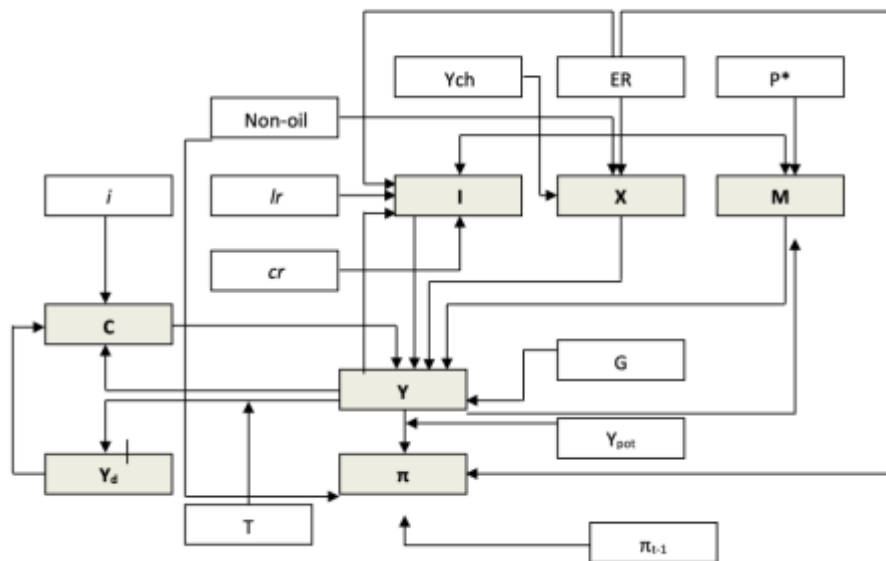


Figure 1. Relationships Between Variables in the Model

Using the order and rank condition procedures, the seven structural equations were overidentified. Therefore, the existing equations can be solved using the OLS and TSLS methods. As previously mentioned, one of the weaknesses of using the OLS method in simultaneous equations is the problem of endogeneity, which means that using OLS results in inefficient parameter estimates.

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### Data and Data Sources

The data used in this study include China's output, Indonesia's output, the global non-fuel commodity price index, Indonesia's real deposit and lending rates, Indonesia's CPI, the US CPI, the rupiah-to-dollar exchange rate, taxes, Indonesia's exports, imports, investment, government spending, the fuel commodity price index, and the index of political stability. The data period used was from 1996 to 2023, with quarterly frequency. A detailed description of the data used in this study is presented in Table 3.1.

| No | Variable                        | Variable Name   | Year          | Source     |
|----|---------------------------------|-----------------|---------------|------------|
| 1  | Output China                    | $Y_{ch}$        | 1996q1-2023q4 | IMF-IFS    |
| 2  | Output Indonesia                | $Y$             | 1996q1-2023q4 | IMF-IFS    |
| 3  | Indeks Harga Komoditas Non-Fuel | <i>non-fuel</i> | 1996q1-2023q4 | IMF-IFS    |
| 4  | Indeks Harga Komoditas Fuel     | <i>Fuel</i>     | 1996q1-2023q4 | IMF-IFS    |
| 5  | Real Deposit Rate               | $Dr$            | 1996q1-2023q4 | IMF-IFS    |
| 6  | Real Lending Rate               | $Lr$            | 1996q1-2023q4 | IMF-IFS    |
| 7  | CPI Indonesia                   | $\Pi$           | 1996q1-2023q4 | IMF-IFS    |
| 8  | CPI AS                          | $P^*$           | 1996q1-2023q4 | IMF-IFS    |
| 9  | Exchange Rate Riil              | $ER$            | 1996q1-2023q4 | IMF-IFS    |
| 10 | Tax                             | $T$             | 1996q1-2023q4 | IMF-IFS    |
| 11 | Export                          | $X$             | 1996q1-2023q4 | IMF-IFS    |
| 12 | Import                          | $M$             | 1996q1-2023q4 | IMF-IFS    |
| 13 | Investment                      | $I$             | 1996q1-2023q4 | IMF-IFS    |
| 14 | Government Expenditure          | $G$             | 1996q1-2023q4 | IMF-IFS    |
| 15 | Index of Political Stability    | $Cr$            | 1996q1-2023q4 | World Bank |

Specifically, the *index of political stability* data, which acts as a *proxy* for the *country risk* variable, is only available annually. Therefore, this study interpolates the *index of political stability* data to obtain quarterly data in line with the research requirements.

## RESULTS AND DISCUSSION

### Estimation of the Consumption Equation

In line with Keynes' basic theory, the estimation results of the consumption model using the TSLS approach show the positive influence of *disposable income* on

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consumption. Furthermore, the interest rate has a negative impact on consumption, which is consistent with the increasing opportunity cost of spending money. The estimation results are as follows.

$$C_t = 12.07 + 0.404 Y_{dt} - 0.001 i_t + e_t$$

$$(0.009)^{***} (0.0009) ; \text{Adj-}R^2 = 0.975$$

All variables were estimated in natural logarithmic form. These results indicate that autonomous consumption is positive and significant, which is consistent with theory. The *Marginal Propensity to Consume* (MPC) of 0.41 at the national level shows that consumption changes by 0.41% for every 1% change in *disposable income*.

Regarding the interest rate variable, the results indicate a relatively small response of consumption to changes in real deposit interest rates. The elasticity of consumption with respect to the interest rate is 0.001, meaning that a 1% increase in the interest rate is met with a 0.001% decrease in consumption. Theoretically, increases in deposit interest rates increase the cost of using money in the current period, encouraging consumers to reduce consumption and postpone it in the future. However, the estimation results, which show a positive sign and small consumption response, are most likely due to the unattractiveness of the interest rates offered, the population's low standard of living, and the focus on fulfilling basic needs.

### Estimation of the Investment Equation

The investment equation uses the *lending rate* and output as the main variables and includes the country risk variable, which is proxied by the index of political stability. The results of the TSLS regression equation are as follows.

$$I_t = 1.18 - 0.01 I_{rt} + 0.22 C_{rt} + 1.11 Y_{t-4} - 0.18 ER + e_t$$

$$(0.003)^{***} (0.06)^{***} (0.10)^{***} (0.06)^{***} ; \text{Adj-}R^2 = 0.964$$

From these regression results, we find that the lending rate has a negative and significant effect on investment, in line with the theory that the relationship between real interest rates and real investment is inverse (Mankiw, 2003). An increase in the real lending rate causes a decrease in investment with a relatively large impact, where a coefficient of minus 0.01 means that a 1% increase in the real lending rate will lead to a 0.01% decrease in investment. Conversely, if the real lending rate falls by 1%, it is followed by a 0.01% increase in investment.



For the country risk variable, inferential tests show results consistent with the theory. In this case, every 1-point increase in Indonesia's political stability index increases investment by 0.22 percent. This shows that political stability is an important consideration for both domestic and foreign business actors when investing

Regarding domestic output, the estimation results show a positive effect of output on investments. A high national output encourages increased investment, both domestic and foreign. This is because a high output signals a promising economic outlook for a country or region, thus attracting investor interest. The regression results at the national level indicate that output with a one-year lag has a positive and significant effect with an elasticity of 1.11. Compared to the other explanatory variables, output has the greatest influence. This demonstrates that national economic conditions and prospects are key factors in determining investments.

### Estimation of the Export Equation

The Export Equation uses the exogenous variable of China's *output* as a representation of global economic growth. This is crucial considering that the main objective of this study is to observe the impact of China's economic growth on Indonesia's economy, accompanied by a slowdown in global economic growth. China's economic growth can influence Indonesia's economy both directly and indirectly through the global *non-fuel* commodity price index. In addition, the export equation also includes the global *non-fuel* commodity price index and changes in the Rupiah exchange rate against the US dollar. The test results are as follows.

$$X_t = 9.38 + 0.66ER_t - 0.03Ych_t + 0.93nonfuel_t + e_t$$

(0.06)\*\*\*      (0.04)      (0.11)\*\*\* ; Adj-R<sup>2</sup> = 0.858

The regression results indicate that the global economy, as represented by *China's output*, does not significantly affect exports at the national scale. This contradicts the initial expectations proposed by previous researchers, who state that China has a direct positive effect on national exports. Nevertheless, it can be seen that the global *non-fuel* commodity price index variable has a positive effect on national exports. For every 1 percent increase in global *non-fuel* commodity prices, export values rose by 0.93 percent. This indicates that, although China does not have a direct impact, it exerts an influence on national export performance through *non-fuel* commodity global prices.



Meanwhile, changes in the Rupiah exchange rate against the US dollar have a positive and significant effect on exports. This is in line with theory, which states that a depreciating exchange rate is followed by an increase in exports. A 1 percent depreciation in Rupiah encourages a 0.66 percent increase in exports.

### Estimation of the Import Equation

For the import equation, this study uses domestic *output* factors, the world price index represented by the US *consumer price index* (US CPI), and Rupiah's exchange rate against the dollar. The empirical test results are as follows.

$$M_t = 5.86 + 0.07ER_t + 0.45Y_{t-4} + 0.78CPIAS_t + e_t$$

(0.07)            (0.18)\*\*            (0.57) ; Adj-R<sup>2</sup> = 0.762

The regression results for the import equation using the TSLS method show that the effect of output with a one-quarter lag is positive and significant with an elasticity rate of 0.45. This finding is consistent with the theory that the higher the level of a country's output, the greater the demand for imports. Meanwhile, the exchange rate and world price index do not significantly affect national imports.

### Estimation of the Non-Fuel Commodity Equation

In this study, the growth in non-fuel global commodity prices is a function of China's real *output* growth. The researchers' initial findings, using a correlation analysis with a *rolling window* estimation of 40 quarters, indicate a strong correlation between China's *output* growth and the non-fuel commodity price index, including *food*, *beverage*, and *industrial input*. This initial indication aligns with Osborn et al. (2015), who find a tendency for non-fuel commodity price movements to respond more strongly to China's economic growth. The empirical test results are as follows:

$$Nonfuel = 2.91 + 0.22Ych_t + e_t$$

(0.03)\*\*\* ; Adj R<sup>2</sup> = 0.439

As predicted, growth in China's real *output* has a positive and significant effect on global non-fuel commodity prices, with an elasticity rate of 0.22. In this case, for every 1 percent increase in China's real *output*, global *nonfuel* commodity prices will rise by 0.22 percent.

As the world's largest commodity consumer, it is natural for China's output growth to trigger a global commodity price increase. Relative to the total global production, China

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accounts for approximately 20 percent of non-renewable energy resource consumption, 23 percent of food agricultural commodities, and 40 percent of base metals. China's market share has increased sharply since 2000. This is because of China's rapid economic growth in the preceding decades. China's situation aligns with historical facts, showing that the wealthier a country becomes, the more its commodity consumption increases, stabilizing at a very high level (Roache, 2012). These findings are also in line with those of Osborn et al. (2015), who found China's important role in influencing commodity price movements in the world market.

### Inflation Equation Estimation

This inflation equation represents the economy's supply side. The standard specification used here is the Phillips Curve, with three main components: inflation expectations, output gap, and supply shock, represented by the rupiah exchange rate against the US dollar. The estimation results for this supply side are as follows:

$$\pi_t = 0.11 + 0.99\pi_{t-1} + 0.20(Y_t - Y_{pot_t}) - 0.01fuel_t + e_t$$

(0.013)\*\*\*      (0.09)\*\*      (0.009) ; Adj-R<sup>2</sup> = 0.996

Inflation expectations have a significant effect on the inflation rate, with a relatively large coefficient value of 0.99. In this model, agent behavior is specified as following an adaptive expectations formation process based on previous inflation rates. The output gap, which is the difference between actual and potential outputs, positively affects inflation with an elasticity of 0.20. A positive output gap generally indicates a faster moving economy, and under these conditions, inflationary pressures increase. Unlike the previous two variables, oil price does not significantly affect inflation. This can be due to two factors: (i) Indonesia receives additional export revenues as a result of higher fuel commodity prices and (ii) fuel commodities have long been products whose prices are regulated by the government (administered prices), so their price variation is relatively small in the domestic market.

### Model Simulation

At this stage, simulations are conducted to observe the impact of increases and decreases in *China's output* on Indonesia's economy. The simulation scenario analyzed is that China's real *output* increases by 10 percent.

Before proceeding to the simulation stage, the model must first be validated. The purpose of the validation is to determine whether the model can accurately capture

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changes in variable behavior when there are shocks in the system of equations. The test results show that the model has good validation, as indicated by several indicators, such as an RMSE value of less than 3 percent, and a Theil U1 statistic approaching zero. This indicated that the model simulation followed the actual data well.

When China's real *output increased by 10 %*, the global non-fuel price index rose by 3.99 percent. This results in lower domestic consumption owing to relatively higher prices and an increase in nominal interest rates to maintain deposit rates at a certain *real rate* level.

| Variable | Basic Value    | China Output Raise 10 Persen | Change |
|----------|----------------|------------------------------|--------|
|          | Predicted Mean | Predicted Mean               | %      |
| Nonfuel  | 4.833          | 5.026                        | 3.99   |
| $\pi$    | 4.284          | 4.285                        | 0.02   |
| C        | 20.4046        | 20.4039                      | -0.003 |
| I        | 19.550         | 19.565                       | 0.08   |
| X        | 19.663         | 19.809                       | 0.7    |
| M        | 19.557         | 19.557                       | 0      |

The outlook for rising global commodity prices, driven by demand from China, has encouraged increased investment in the domestic market. Although this study does not analyze down to the sectoral level, the researchers suspect that the rise in investment is very likely to occur in the manufacturing sector. Meanwhile, for exports, higher prices have resulted in a 0.7 percent increase in Indonesia's export value, or in nominal terms, a rise from USD 3.4 billion to USD 3.9 billion.

## CONCLUSION

This study aims to analyze the impact of China's real output growth on Indonesia's economy. Using a simultaneous equations model, the research finds that, although there is no direct effect, China's real output growth has a significant impact on Indonesia's economy through the global nonfuel commodity price index, where the share of these exports reaches 85 percent of Indonesia's total export value. This study also highlights the important role that China plays in influencing movements in global nonfuel commodity



prices, where a 10 percent increase in China's real output can raise global commodity prices by 3.99 percent.

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