

# Should Rupiah and Yuan Move Together?

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**Abstract:** *This study investigates the feasibility of a fixed exchange rate policy between the Indonesian rupiah (IDR) and the Chinese yuan (CNY) using Vector Error Correction Model (VECM) estimation. Specifically, it presents 12 model simulations that illustrate the response of trade balance growth to various weighted combinations of IDR and CNY, derived using the Hodrick-Prescott filter, during the period from July 2005 to December 2016. The results indicate that close coordination between the IDR and the yuan yields a positive response both in the short run and the long run following a currency shock. Conversely, a fixed exchange rate regime that closely follows the yuan proves advantageous only in the short term but is vulnerable to currency shocks, leading to a negative trade balance in the long run. Therefore, this study recommends close coordination between the IDR and CNY but rejects the implementation of a fixed exchange rate between the two currencies.*

**Keywords:** Fixed exchange rate, Rupiah, Yuan, Macroeconomics

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## 1. Introduction

Every country knows that the global economy and politics today are not easy for policymakers to navigate. From an economic perspective, various policymaking institutions reveal a rather discouraging economic outlook. For instance, the International Monetary Fund (2017) indicates that although global economic growth will slightly rise in 2017, uncertainty is also increasing due to the new US administration. The World Bank (2017) states that the economic outlook for 2017 is troubled by weak investment in most emerging market countries, subdued growth, and heightened uncertainty. The weak investment prediction for the medium term in emerging market economies may also affect Indonesia. Furthermore, from a political perspective, the unconventional nature of US politics following the election of the new president inevitably introduces uncertainty into international relationships, placing pressure on governments to formulate optimal policy responses to secure their domestic economies

Indonesia has shown steady progress in macroeconomic performance over the past several years. In the real sector, Indonesia's GDP in the fourth quarter of 2016 achieved positive growth of 4.94%, although this increase is lower than the same quarter in the previous year, which reached 5.12%. The trend of positive economic growth in Indonesia is also reflected in its inflation rate. During the period from December 2016 to February 2017, Indonesian inflation rose from 3.02% to 3.83%, indicating that Indonesian economic growth is accelerating positively. This situation is further supported by an increase in loan growth in December 2016, reaching 7.9% compared to the same month in the previous year (Bank of Indonesia, 2016). The credit rating for the Indonesian economy also shows a positive outlook. Moody's upgraded

its outlook for Indonesia's sovereign credit rating to positive BAA3 in February 2017. Finally, the ease of doing business in Indonesia improved significantly, with the number of days required decreasing from 106 days in 2015 to 91 days in 2016 (World Bank 2016).

However, strong economic performance does not necessarily indicate long-term promising economic conditions. For instance, Indonesia's debt sustainability continues to place pressure on future generations to repay both the principal and interest. The government debt-to-GDP ratio in Indonesia has risen from 22.96% in 2012 to 24.9% in 2013, 25.02% in 2014, 27% in 2015, and 28% in 2016. In 2017, Indonesia's budget deficit is reported at 2.41% of GDP, below the maximum threshold of 3% of GDP (Ministry of Finance, 2017). Although these measures are relatively safe, the pace of debt is expected to grow in 2017, as the Indonesian government plans to offer US\$ 45 billion worth of debt paper to the global investor community. Amid a more uncertain global economic outlook, as described, the high debt density in Indonesia could propagate shocks to the domestic economy if the fundamentals of the Indonesian economy do not weaken, both financially and institutionally.

Although we focus on the debt-to-GDP ratio to reflect debt sustainability, the largest portion of Indonesian GDP still comes from consumption, which is a vulnerable variable in the face of economic shocks. Total consumption in Indonesia accounted for more than 57.1% of GDP in 2015 (OECD, 2017). Diversifying the economic structure remains a significant challenge for the Indonesian government. As a small open economy, foreign investment plays a crucial role in achieving better economic diversification, particularly foreign direct investment. Foreign investment is expected to enhance Indonesia's industrial capacity, facilitate knowledge transfer, reduce the unemployment rate, and ultimately improve welfare. To achieve this, close cooperation between Indonesia and countries worldwide is essential to attract more investment to Indonesia, including with China, the second-largest economy in the world.

The closer coordination between Indonesia and China has drawn significant attention from the public today, especially in light of China's ongoing economic slowdown. As China's government works to reform its policies, Indonesia appears to be a promising emerging market for new investment opportunities. This close coordination has sparked a new idea among Indonesian government executives regarding the possibility of implementing a fixed exchange rate between Indonesia and China. Theoretically, a fixed exchange rate would benefit both countries that maintain a close trade relationship over the long term. However, given China's economic slowdown, weakening global economic prospects, and the newly strengthened relationship between these two nations, the possibility of this new exchange rate regime presents an intriguing topic for study. Unfortunately, there are not many empirical studies that analyze this new idea feasibility.

This study aims to empirically assess the feasibility of a new exchange rate policy and estimate the impact of various coordination between IDR and CNY on the Indonesian economy. Notably, this study focuses on whether implementing a fixed exchange rate regime benefits the Indonesian economy. We specifically examine the trade balance's response to the different coordination. The trade balance (in real value) is selected as the response variable because it most accurately represents real economic activity through exports and imports. Furthermore, we only consider the trade balance as a response variable to allow for a realistic understanding that currency coordination must be accompanied by changes in other endogenous macroeconomic variables. This study aims to illustrate the baseline estimation of the costs and benefits of various coordination between the two currencies, which will hopefully help address this particular question. The results of this study are expected to provide a preliminary practical

understanding of the policy implementation between IDR and CNY and inspire other similar studies to explore this topic further question.

This study consists of several sections. Section 2 contains some literature studies. Section 3 contains the methodology used. Section 4 analyzes the model estimation result. Section 5 focuses on the policy implications of the result. Section 6 concludes.

## **2. Literature Review**

### **2.1 Exchange rate regime**

The economy of a country can be generally divided into four main sectors: the real sector, the government sector, the financial sector, and the external sector. In macroeconomics, the role of the exchange rate is crucial, especially in the external sector. The external sector relates to a country's interactions with the international economy, primarily in terms of exports and imports. An export is the activity of selling goods and services from within a country to outside it, while an import is the activity of buying goods and services from outside a country to bring into it. The role of the exchange rate crucially determines the trade relationship between the two countries. Exporters always expect the local currency to depreciate, making their local goods and services sold abroad cheaper and consequently more competitive. Conversely, importers typically anticipate an appreciation of the local currency, which would make foreign goods and services less expensive. Therefore, the monetary authority needs to maintain the value of the local currency at a fair level to prevent losses for both exporters and importers. Additionally, besides the value of the local currency, its volatility over time is crucial in shaping the expectations of both exporters and importers regarding the future state of the economy. Excessive volatility in the local currency creates significant uncertainty for these agents (exporters and importers) and can lead to a higher loss of potential output due to their inability to set optimal prices and quantities.

Given the importance of the role of exchange rates, both in terms of their level and volatility, the relevant authority adopts an exchange rate regime that provides a framework for managing this variable. Hubbard and O'Brien (2012) show that in the past, most exchange rate regimes were fixed systems in which exchange rates were set at levels determined and maintained by governments. Under the gold standard, the currencies of participating countries were convertible into an agreed-upon amount of gold. However, this regime is no longer in use today and has been replaced by several other exchange rate regimes, namely the floating exchange rate regime, managed floating exchange rate regime, and fixed exchange rate regime (pegged).

#### **a. Floating exchange rate regime**

A floating exchange rate regime is a system in which the value of the local currency, relative to other currencies, is fully determined by the forces of supply and demand in the market. Under this regime, the central bank does not intervene in the market to influence the currency's value. The advantage of this regime is that, without foreign exchange intervention, foreign reserves will not be significantly eroded. Additionally, this regime reflects the true state of the market, allowing agents to construct rational expectations to understand how the future economy is likely to unfold. Unfortunately, this regime is vulnerable to speculative attacks, meaning that the market can be influenced by speculators who intentionally seek to increase or decrease the value of foreign currency currency.

### **b. Managed Floating exchange rate regime**

In some cases, giving up a fixed exchange rate regime for a floating exchange rate regime is not a good option. Consider Indonesia during the 1998 Asian crisis. Due to low levels of foreign exchange reserves, the government decided to let the currency be determined by market forces. As a result, the currency depreciated significantly. This occurred because the market had a very negative sentiment toward the Indonesian economy at that time. Therefore, another approach to managing local currency volatility is the managed floating regime. As its name suggests, a managed floating regime is a system where the central bank can intervene in the currency's value using its foreign reserves, when necessary, usually when market dynamics move outside its intervention bands. To appreciate the exchange rate, a central bank must sell international reserves and buy domestic currency in the foreign exchange market. Conversely, to depreciate the exchange rate, the central bank must buy international reserves and sell domestic currency in the foreign exchange market

### **c. Fixed exchange rate regime**

The last type of exchange rate regime is known as a fixed exchange rate regime, or more commonly as a pegged exchange rate. A fixed exchange rate is a system in which the local currency is set to fluctuate but remains at a consistent level in relation to an anchor currency. The anchor currency can vary; it may be the currency of another country, such as the US dollar or the Swiss franc, or weighted currencies like Special Drawing Rights (SDR). Generally, the main motivation behind the implementation of a fixed exchange rate regime is international trade. Specifically, two countries that have strong trade cooperation benefit from reduced currency volatility, allowing exporters and importers to set optimal prices and quantities to maximize welfare. The advantage of this regime is that it can enhance intense international trade between the two countries, enabling each to achieve its optimum profit. However, the disadvantage is that the country pegging its exchange rate must sacrifice its foreign reserves to maintain alignment with the anchor currency. A well-known example of this type of regime is China's pegging of its yuan to the USD before 2005.

## **2.2 Indonesian currency regime**

As the largest country in Southeast Asia, Indonesia has faced volatile economic turbulence in managing its exchange rate system. Simorangkir and Suseno (2002) classify the development of the Indonesian currency regime into five main periods: the Independence period (1945-1959), the Leading Economic Regime period (1959-1966), the Stabilization period (1966-1983), the Economic Deregulation period (1983-1997), and the Post-Crisis period (after 1998). During the Independence period (1945-1959), Indonesia adopted a fixed exchange rate system. This period marks the inception of the Indonesian currency. The same regime continued during the Leading Economic Regime period (1959-1966), during which Indonesia maintained the fixed exchange rate system amid significant political turmoil. Furthermore, the fixed exchange rate regime persisted through the Stabilization period (1966-1983) and the Economic Deregulation period.

The turning point of the reform in Indonesia's currency regime occurred in 1998 when a currency crisis impacted the fundamental aspects of the Indonesian economy. The crisis that began in Thailand's baht spilled over to other Asian countries, including Indonesia, forcing the authorities to implement changes in the currency regime. For instance, on July 11, 1997, Indonesia decided to expand the intervention band from 8% to 12%. The central bank also enacted a tight monetary policy and made significant interventions in the foreign exchange market to mitigate the depreciation of the local currency. As these policies proved to be largely ineffective, the authorities ultimately decided to abandon the fixed exchange rate and

implemented a managed floating exchange rate regime on August 14, 1997. This regime has been maintained since then since.

### **2.3 Yuan and global economic slowdown**

China is the second- largest economy and has the highest population in the world. Since its formation in 1949, China has shown impressive yet controversial growth in the global economy. This country adopts a growth model that many analysts describe as unsustainable (Xu, 2015). China' s economy relies heavily on investment and global demand, offering cheap labor compared to other developing countries, making this country attractive as the largest engine of global growth in the last two decades. Exports have increased to bridge the gap between domestic consumption and investment. Most investments flow into infrastructure, as China considers real estate and manufacturing as primary sectors. Thus, more than half of its GDP comes from investment. During its period of rapid growth, China continued to push investments to produce goods to satisfy global demand.

However, the 2008 subprime financial crisis hit China as severely as it did other industrialized countries such as the US and those in Europe, significantly decreasing the global demand that once flowed into China. As a result, China is experiencing overcapacity, a slowdown, and is now struggling to rebalance its economy to regain global confidence. Other social issues, such as demographics, political structure, institutional capacity, and debt sustainability, also lead analysts to speculate about the future of the Chinese economy. Overall, currency performance in China shows a gradual depreciation of the Yuan against the US dollar. In the past, China was the country that implemented a fixed pegged exchange rate against the US dollar. However, in August 2015, China changed its policy and implemented a managed floating exchange rate to manage Yuan volatility. This allows China to control its currency volatility through foreign reserve interventions and capital controls, in addition to being determined by the forces of the global market. This action is also part of the objective of the People' s Bank of China to gradually devalue the Yuan against the US dollar.

### **2.4 Previous studies**

Studies related to the fixed exchange rate regime have been widely conducted in various countries from different perspectives. Bubula and Otker-Robe (2003) examined whether fixed exchange rates are more crisis-prone. They found that the fixed exchange rate regime is more susceptible to crises than floating exchange regimes, particularly in countries well-integrated with the international capital market. Moheput (2005) researched the choice between exchange rate regimes and currency boards. This study highlights how fixed and floating exchange rate regimes have been at the center of debate for years. It demonstrates that for economies with a short-term horizon, currency boards produce quick results. However, for economies with medium- and long-term perspectives, institutional factors must be prerequisites for the effective functioning of currency boards. Lastly, for economies dependent on exports and imports, adopting a crawling peg system can help maintain advantages and minimize the costs of transition.

Stockman (1999) compared various exchange rate regimes and concluded that, in most countries, a free-floating exchange rate regime is likely a better choice than attempting to peg an exchange rate. Kenen (2000) analyzed the costs and benefits of institutionalizing fixed exchange rates by synthesizing and supplementing the theory of optimum currency areas. The findings indicate that a fixed exchange rate can be optimal when combined with a monetary union and a fiscal federation. Jefferis (2015) studied exchange rate policy reform in South Sudan, concluding that transitioning to a freely floating exchange regime could significantly

benefit the country's economic development. However, economic reform is essential as a complement to the implementation of this policy. Bailliu (2003) examined exchange rate regimes in emerging markets and concluded that, for an emerging market integrated into global financial markets, neither fixed nor floating exchange rates serve as good alternatives. The study suggests that traditional pegged exchange rates based on fixed parity and narrow fluctuation bands are inherently unstable and vulnerable to speculative attacks.

Mishkin (1998) investigated the implementation of exchange rate pegging in emerging markets, revealing that pegged exchange rates are not a suitable strategy for conducting monetary policy. Klein and Shambaugh (2005) analyzed the role of fixed exchange rate regimes in bilateral trade. Their findings highlight the significant impact of fixed exchange rates on bilateral trading between two countries. Kato and Uctum (2003) explored the factors influencing the choice among three exchange rate regimes, showing that each country faces different factors affecting its selection criteria related to financial and policy variables. Gudmundsson, Petursson, and Sighvatson (2000) analyzed the appropriate exchange rate arrangement for Iceland, based on its structural characteristics and the need for a credible nominal anchor, concluding that a flexible exchange rate regime suits Iceland's structural needs.

Aizenman and Glick (2005) investigated the observed relationship between pegged exchange rates and the associated costs of exiting the regime. Their study suggests that using pegged exchange rates as an anti-inflation commitment device can trap the economy and lead to greater output contraction during regime changes. Tiwari (2003) examined post-crisis exchange rate regimes in Southeast Asia, finding that Indonesia faced a period of political instability that compelled the adoption of a managed floating exchange rate regime. Edwards (1996) studied the reasons why some countries adopt different exchange rate regimes from a political economy perspective, concluding that past political instability often drives countries to abandon pegged exchange rates. Shambaugh (2002) investigated how fixed exchange rates affect monetary policy. The author categorized countries into pegged or non-pegged exchange rate regimes and analyzed whether nations with fixed exchange rates must adjust their interest rates in response to changes in the base country. The results indicated that fixed exchange rates compel countries to align their monetary policy more closely than floating exchange rates. However, implementing fixed exchange rates incurs costs. The author noted that fixed exchange rate regimes involve a loss of monetary autonomy.

### **3. Research Methodology**

#### **3.1 Data**

Data in this study consist of monthly secondary data from July 2005 to December 2016. The total number of observations used in the study is 138, derived from a period of 16 years and six months. The reason for using July 2005 as the starting point is to align with China's reform of its exchange rate policy regime, which released its peg from the US dollar in that month. The variables in the study include the growth of the Indonesian currency (IDR/USD), the growth of the Chinese currency (CNY/USD), and Indonesian trade balance.

All variables are expressed in terms of year-on-year (YoY) growth rate, i.e. the percentage growth of a certain month about the same month in the previous year. The reason to express the variables regarding growth is particularly to omit the seasonality effect. Also, expressing the variables in growth terms makes them independent from the unit of measurement, such that the dynamics between IDR and CNY are comparable.

### a. Growth of Indonesian currency (IDR)

This variable represents the YoY growth of real Indonesian currency toward the US dollar (IDR/USD). The variable is presented in percentage. For instance, the growth of IDR/USD on January 2015 is measured by the growth of real currency on January 2015 relative to January 2014. Real currency is calculated by adjusting nominal real by YoY inflation.

$$\% IDR_{Jan\ 2015} = \frac{(IDR_{Jan\ 2015} - IDR_{Jan\ 2014})}{IDR_{Jan\ 2014}} \times 100$$

Monthly data of IDR/USD is calculated by simple average of all daily middle currency values in one month. The data of monthly Indonesian currency is gathered from the Central Bank of Indonesia.

### b. Growth of China currency (CNY)

This variable represents the YoY growth of China currency toward the US dollar (CNY/USD). The variable is presented in percentage. For instance, the growth of CNY/USD on January 2015 is measured by the growth of nominal currency on January 2015 relative to January 2014. Real currency is calculated by adjusting nominal real by YoY inflation.

$$\% CNY_{Jan\ 2015} = \frac{(CNY_{Jan\ 2015} - CNY_{Jan\ 2014})}{CNY_{Jan\ 2014}} \times 100$$

Monthly data of CNY/USD is calculated by simple average of all daily middle currency values in one month. The data of monthly Indonesian currency is gathered from the China bureau of statistics.

### c. Growth of Indonesian trade balance (Trade\_B)

Trade balance is defined as the difference between export and import (Export-Import). We calculate the YoY growth of trade balance by

$$\% \text{ trade balance} = \% \text{ export} - \% \text{ Import}$$

where % export is defined as yoy export growth, i.e. the percentage growth of export level at a current month relative to the export level of the same month in previous year. Similarly, % import is defined as YoY import growth, i.e. the percentage growth of import level at current month relative to the import level of the same month in previous year. All in real terms.

## 3.2 Methodology

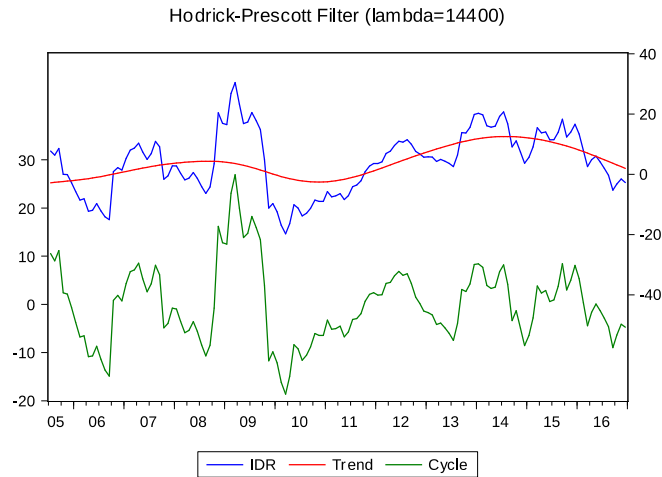
### 3.2.1 Dynamics decomposition

In this study, we use Hodrick-Prescott Filter to decompose the currency dynamics of IDR and CNY into two components, namely *steady state (trend)* and *cycles*, such that

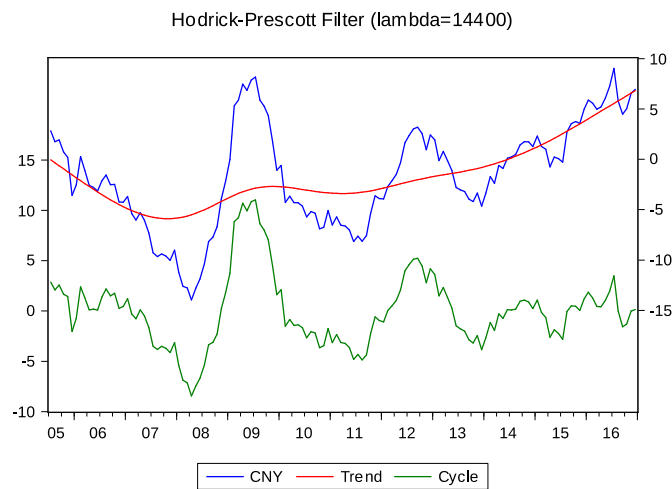
$$\begin{aligned} IDR &= IDR_{trend} + IDR_{cycles} \\ CNY &= CNY_{trend} + CNY_{cycles} \end{aligned}$$

The intuition behind decomposing the dynamics of these two currencies stems from the understanding that a steady state (trend) reflects the natural direction of a currency, representing the economic fundamentals of a country, while the cycle captures market sentiments and the effects of policy intervention in response to economic shocks. By breaking down the currency

dynamics into trends and cycles, we can separate policy intervention from the natural behavior of the currency. This reasoning allows us to quantitatively align the natural currency movements with policy interventions in Indonesia and China. Additionally, we assume that the cycles sufficiently represent all economic shocks affecting the economy. In other words, we posit that the cycles derived from the filter in both currencies reflect the net impact of policy actions by authorities, minus any shocks. Figures 1 and 2 below show the decomposition of IDR and CNY respectively.



**Figure 1: HP Filter for Indonesian rupiah (IDR)**



**Figure 2: HP filter for China currency (CNY)**

### 3.2.2 Interaction Scenarios

Three scenarios are introduced to represent the interaction between IDR and CNY, namely *pure IDR*, *mixed IDR-CNY*, and *close CNY*. The motivation of introducing these three scenarios is to present various interaction possibilities between IDR and CNY. We assume a frictionless global economy such that the degree of interaction between IDR and CNY represents the degree of “closeness of economic cooperation” between Indonesia and China. That is, we set the criteria that

$$\phi_{Close\ CNY} > \phi_{Mixed\ IDR} > \phi_{Pure\ IDR}$$

where  $\phi$  denotes the degree of “closeness of economic cooperation” between Indonesia and China.

### a. Pure IDR

This scenario simulates the independence between IDR and CNY. This is a benchmark scenario. Pure IDR is purely derived from the dynamics of IDR, such that

$$Pure\ IDR = IDR_{trend} + IDR_{cycle}$$

In this scenario, we approximate a state where Indonesia relies on current policy regime (managed floating regime) in controlling its IDR dynamics. Using this scenario, we are then interested to investigate how the growth of Indonesian trade balance responds to the dynamics of Pure IDR.

### b. Mixed IDR

This scenario simulates the closer coordination dynamics between IDR and CNY. We approximate a state where Indonesia observes China's policy action and formulate the best rule as the response to maintain its close coordination. We simulate a situation where Indonesia adopts a portion of China's currency policy, such that

$$Mixed\ IDR = IDR_{trend} + \alpha IDR_{cycle} + \beta CNY_{cycle}$$

where  $\alpha$  and  $\beta$  represent the degree of policy adoption that Indonesian authority copes to Indonesia's economy and China's economy, respectively. Note that we have to satisfy a constraint that

$$\alpha + \beta = 1$$

In this study, we simulate various possibilities of the values  $\alpha$  and  $\beta$  as shown in table 1. That is, we simulate that Indonesian authority maintains a balance policy mix between Indonesia and China in maintaining their economic coordination. Using this scenario, we are then interested to investigate how the growth of Indonesian trade balance responds to the dynamics of *Mixed IDR*.

**Table 1: Various possibilities of weights**

Variable	$\alpha$	$\beta$
B01	0.9	0.1
B02	0.8	0.2
B03	0.7	0.3
B04	0.6	0.4
B05	0.5	0.5
B06	0.4	0.6
B07	0.3	0.7
B08	0.2	0.8
B09	0.1	0.9

### c. Close CNY

This scenario simulates the intense coordination dynamics between IDR and CNY. We approximate a state where Indonesia fully adopts China's currency policy action to maintain its intense economic coordination. Although it may be potentially defined interchangeably, this scenario is not the same with fixed exchange rate regime between the two currencies. In this scenario, we simulate that Indonesia is still using its fundamental currency direction. However,

suppose due to the intense economic coordination with China (e.g. long term trading partner agreement in substantial commodities), Indonesia must observe and absorb China's policy action to prevent significant contraction in the economy. On the other hand, fixed exchange rate policy is defined as a state that will consequently push IDR to exactly follow the dynamics of CNY, regardless how much the foreign reserves spent. Hence, these two concepts are two different things. Accordingly, by following this logic, we formulate the new dynamics as

$$\textit{Close CNY} = \textit{IDR}_{trend} + \textit{CNY}_{cycle}$$

Using this scenario, we are then interested to investigate how the growth of Indonesian trade balance responds to the dynamics of *Close CNY*.

#### **d. Fixed CNY**

This final scenario simulates the implementation of fixed exchange rate between IDR and CNY. In this study, we approximate the fixed exchange rate between the two currencies by

$$\textit{Fixed CNY} = \textit{CNY}_{trend} + \textit{CNY}_{cycle}$$

This approximation is derived by assumption that the coordination between the two currencies is only one direction. That is, Indonesia is assumed to have unlimited foreign exchange reserve that always ready to be sacrificed to exactly follow the dynamics of real CNY. On the other hand, China is assumed not to be affected by the dynamics of IDR. Technically, it can be said that Indonesia always gives the best response to exactly follow the CNY movement, but not vice versa. Thus, we do not take any element from IDR dynamics in the equation of Fixed CNY above.

### **3.2.3 Regression Analysis**

The methodology to simulate various interactions of IDR and CNY depends on the nature of the data used. That is, we stick on the general understanding that a number of lags is required to create an optimal model, as well as the knowledge whether or not the variables are stationary. In case all variables are stationer on the same level without cointegrations, Vector Autorgression (VAR) would be a good alternative to model the dynamics. However, cointegration requirement is also crucial to model the dynamics. That is, if cointegrations exist then the method of Vector error correction model (VECM) is the best choice. Due to the nature of data as given in the next sections, this study uses VECM in modeling the dynamics and VAR in choosing the number of optimal lags.

#### **a. Vector Autoregression**

In an N-variable vector autoregression of order p, of VAR(p), we estimate N equations. In each equation, we regress the relevant hand-side variable on p lags of itself and p lags of every other variables. Trends, seasonal and other exogenous variables may also be included, as long as they're all included in every equation. The key point is that, in contrast to the univariate case, VAR allows for cross-variable dynamics. Each variable is related not only to its own past but also to the past of all other variables in the system (Diebold, 2003). In case of two variables and one lag, we derive equations as follows:

$$\begin{aligned}
y_{1,t} &= \delta_{11}y_{1,t-1} + \delta_{12}y_{2,t-1} + \varepsilon_{1,t} \\
y_{2,t} &= \delta_{21}y_{1,t-1} + \delta_{22}y_{2,t-1} + \varepsilon_{2,t} \\
\varepsilon_{1,t} &\sim WN(0, \sigma_1^2) \\
\varepsilon_{2,t} &\sim WN(0, \sigma_2^2) \\
\text{Cov}(\varepsilon_1, \varepsilon_2) &= \sigma_{12}
\end{aligned}$$

Each variable depends on one lag of the other variable in addition to one lag of itself. That is one obvious source of multivariate interaction captured by the VAR that maybe useful for forecasting. In addition, the disturbances may be correlated, so that when one equation is shocked, the other will typically be shocked as well (Diebold, 2006, p. 283). VAR is also used when the variables in the study hare not sure being placed as dependent or independent variable. In that case, we should make all variables as endogenous variables.

### b. Vector Error Correction Model

VECM is a restricted VAR and this model is used when cointegration among variables are found or there is long run equilibrium between the variables. The cointegration can be tested by Johansen cointegration test. The general VECM with deterministic trend is:

$$\Delta Y_t = \emptyset + \Pi Y_{t-1} + \alpha t + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t$$

Where the value of  $\emptyset$  and  $\alpha$  depends on the scenario, that is:

$\emptyset \neq 0$  deterministic trend in  $Y_t$

$\alpha \neq 0$  Quadratic trends in  $Y_t$

The intuition of this expression is that a change in  $Y_t$  can come from the time trend, of the error correction part of the expression. The last part of the expression with a summation from  $i=1$  to  $p-1$  of lagged values of the differenced dependent variables is used to eliminate serial correlation (Thomsen et al, 2013).

### c. Model Criteria

Two the most famous models criteria in selecting the best fitted model are used, namely Akaike Information Criterion and Schwartz Information Criterion. Akaike Information Criterion (AIC) is effectively an estimate of the out-of-sample forecast error variance, like standard error, but it penalizes degrees of freedom more harshly. It is used to select among competing forecasting models (Diebold, 2006, p.28). The formula is:

$$AIC = e^{\left(\frac{2k}{T}\right)} \frac{\sum_{i=1}^T e_i^2}{T}$$

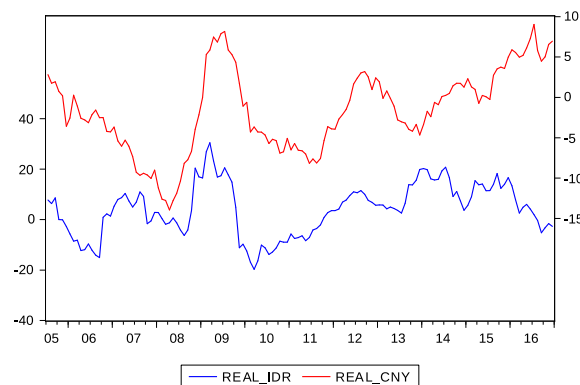
The Schwartz Information Criterion (SIC) is an alternative to the SIC with the same interpretation but a still harsher degrees-of-freedom penalty (Diebold, 2006, p.28). The formula is:

$$SIC = T^{\left(\frac{k}{T}\right)} \frac{\sum_{i=1}^T e_i^2}{T}$$

## 4. Results and Analysis

### 4.1 Preliminary Analysis

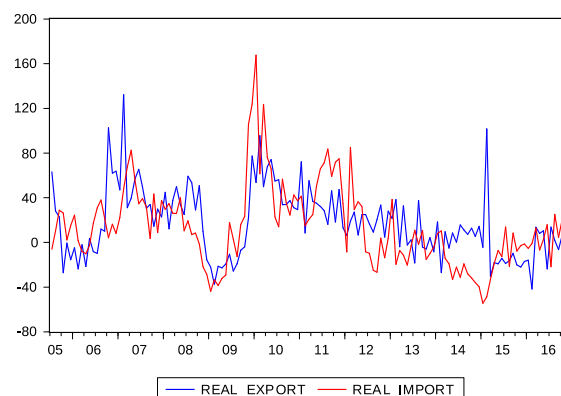
This section explores the current condition of the IDR and CNY. Figure 3 below illustrates the dynamics of the Indonesian Rupiah (IDR) and Chinese Yuan (CNY) during the observed period from July 2005 to December 2016. As shown in the graph, both currencies generally move in opposite directions, except during the 2005 oil price shock and the 2007-2009 global financial crisis. For instance, from 2005 to 2006, both currencies appreciated simultaneously, while during the global financial crisis from 2007 to 2009, both currencies experienced significant depreciation. Conversely, from 2010 onwards, the dynamics of both currencies move in opposition direction.



**Figure 3: real IDR and real CNY dynamics during July 2005 - Des 2016**

Overall, since 2010, both currencies have shown opposite trends. That is, the IDR has exhibited a quadratic decreasing trend (appreciation), while the CNY demonstrates an increasing trend (depreciation). The depreciation of the CNY is due to China's economic slowdown in response to weaker demand and excess inventories in infrastructure.

Figure 4 illustrates the dynamics of the real trade balance in Indonesia. We approximate the trade balance by the gap between year-on-year exports and year-on-year imports. We refrain from using the trade balance as a percentage of other macroeconomic variables, such as GDP, in order to isolate the response of the trade balance to changes in GDP. During the observation period, Indonesia experienced a significant decline in exports during the 2008-2009 global financial crisis and faced higher imports due to the sharp depreciation of the rupiah as the US dollar fell. Furthermore, during 2014-2015, the figure indicates that the IDR experienced a high depreciation.



**Figure 4: Export and Import growth Dynamics**

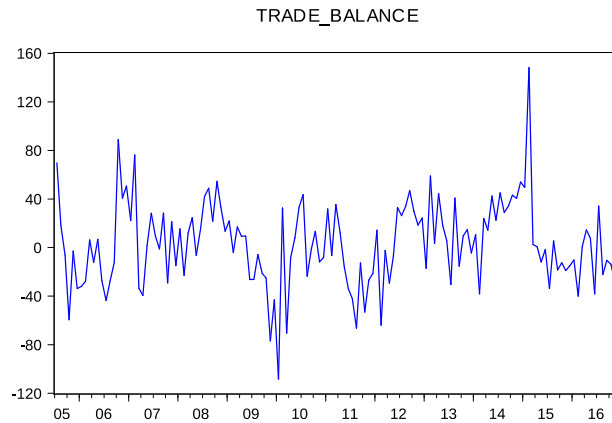


Figure 5: Real trade balance dynamics during July 2005 - Des 2016

#### 4.2 Scenario Analysis

This section presents the dynamics comparison of all scenarios: *pure IDR*, *mixed IDR* (all  $\alpha$  and  $\beta$ ), *close CNY* and *fixed CNY*. As shown in figure 5, pure IDR is expressed in blue, mixed IDR in red and close CNY in green line. The formula of each scenario is presented in section 3.2.2. Some insights based on the comparison above are as follow. As shown in the figure, the fluctuation of the three scenarios is decreasing. That is, pure IDR dynamics expose higher fluctuation compared to the *mixed IDR* dynamics, higher the *mixed IDR* dynamics fluctuates more than the *close CNY* dynamics. Our approximation shows that the higher adoption portion of China's policy results in the lower fluctuation of real IDR. Technically, the higher  $\beta$ , the lower IDR fluctuates. However, this phenomenon doesn't necessarily recommend that Indonesia should adopt China's exchange rate policy. Instead, we analyze that the effect of this policy adoption relates to the higher foreign reserve spent by China to prevent further falling. In other words, Indonesia must consider its level of foreign reserve in order to choose the most appropriate value of  $\beta$ .

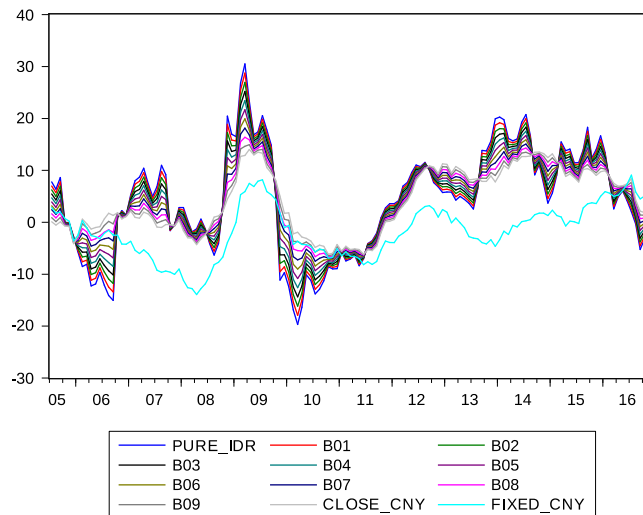


Figure 6: Dynamics comparison among scenarios

#### 4.3 Stationary test

We conduct Augmented Dickey Fuller (ADF) to test the stationary of data. The test was conducted in three different scenarios namely without trend and intercept, with intercept but no trend, and without both intercept and trend, with the following hypothesis:

$H_0$  : Variable has unit root

$H_1$  : Variable has no unit root

Table 2, table 3 and table 4 show the test results, respectively. As shown in all tables, almost all variables, except trade balance, contain unit root at data level in the three scenarios, as the p-values are higher than 5% significance level. Given that all variables, except growth in trade balance, contain unit root in data level, we're interested in conducting unit root test on the first differenced. As shown in the tables, all variables exhibit significant p-value less than 5%. Thus, there is sufficient evidence to reject null hypothesis and conclude that there is no unit root in the first difference data.

**Table 2: Unit root test by Augmented Dickey Fuller test with no trend and no intercept**

Variable	No Intercept No Trend		Unit root level	Unit root diff
	Level	1 <sup>st</sup> Diff		
IDR	0.214	0.000	Yes	No
CNY	0.240	0.000	Yes	No
Pure IDR	0.214	0.000	Yes	No
Close CNY	0.323	0.000	Yes	No
Fixed CNY	0.240	0.000	Yes	No
Trade balance	0.000	0.000	No	No
B01	0.237	0.000	Yes	No
B02	0.262	0.000	Yes	No
B03	0.290	0.000	Yes	No
B04	0.319	0.000	Yes	No
B05	0.349	0.000	Yes	No
B06	0.377	0.000	Yes	No
B07	0.273	0.000	Yes	No
B08	0.256	0.000	Yes	No
B09	0.249	0.000	Yes	No

**Table 3: Unit root test of Augmented Dickey Fuller test with intercept and no trend**

Variable	No Intercept No Trend		Unit root level	Unit root diff
	Level	1 <sup>st</sup> Diff		
IDR	0.418	0.000	Yes	No
CNY	0.734	0.000	Yes	No
Pure IDR	0.418	0.000	Yes	No
Close CNY	0.597	0.000	Yes	No
Fixed CNY	0.734	0.000	Yes	No
Trade balance	0.000	0.000	No	No
B01	0.443	0.000	Yes	No
B02	0.470	0.000	Yes	No
B03	0.499	0.000	Yes	No
B04	0.530	0.000	Yes	No
B05	0.561	0.000	Yes	No
B06	0.592	0.000	Yes	No
B07	0.461	0.000	Yes	No
B08	0.448	0.000	Yes	No
B09	0.462	0.000	Yes	No

**Table 4: Unit root test with Augmented Dickey Fuller test with intercept and trend**

Variable	No Intercept No Trend		Unit root level	Unit root diff
	Level	1 <sup>st</sup> Diff		
IDR	0.787	0.000	Yes	No
CNY	0.195	0.000	Yes	No
Pure IDR	0.787	0.000	Yes	No
Close CNY	0.747	0.000	Yes	No
Fixed CNY	0.195	0.000	Yes	No
Trade balance	0.001	0.000	No	No
B01	0.804	0.000	Yes	No
B02	0.821	0.000	Yes	No
B03	0.837	0.000	Yes	No
B04	0.850	0.000	Yes	No
B05	0.862	0.000	Yes	No
B06	0.766	0.000	Yes	No
B07	0.729	0.000	Yes	No
B08	0.672	0.000	Yes	No
B09	0.630	0.000	Yes	No

#### 4.4 Lag Length Criteria

We conduct lag length criteria conducted by Vector Autoregressive (VAR) based on the first differenced variables. As shown in table 5, the result shows that almost all variables are optimum at lag 3, except *Fixed CNY* variable, which shows at maximum lag 1. Thus, all models are built in the form of three lags, except the model with *Fixed CNY* as an independent variable.

**Table 5: Optimal lag length criteria**

Variable (in first difference)	Optimal lag length*
Trade balance	3
Pure IDR	3
Close CNY	3
Fixed CNY	1
B01	3
B02	3
B03	3
B04	3
B05	3
B06	3
B07	3
B08	3
B09	3

#### 4.5 Cointegration

Given that the dependent variable (first differenced in trade balance) and independent variables (first differenced variables) are stationer in the the first differenced, it is required to investigate whether there exists a cointegration between dependent and independent variable. We conduct Johansen cointegration test and results the number of cointegration as shown in Table 6. As shown in the table, all variables contain 1 cointegration based on the trace and eigen values. Thus, we conclude that trade balance growth and real currencies growth reach an equilibrium

in the long run. This is in line with theoretical literatures explaining that the trade balance is very sensitive to the dynamics of currency rate. Also, given the existence of the cointegrations within the models, the method we use to develop is Vector Error Correction Model (VECM).

**Table 6: The result of Johansen cointegration test**

Variable (in difference)	Cointegration with trade balance	
	Trace	Eigen values
Pure IDR	1	1
Close CNY	1	1
Fixed CNY	1	1
B01	1	1
B02	1	1
B03	1	1
B04	1	1
B05	1	1
B06	1	1
B07	1	1
B08	1	1
B09	1	1

#### 4.6 Granger Causality test

Finally, we conduct Granger causality test to investigate the causality between independent and dependent variable. The hypotheses conducted in the test are as follow:

H1: The independent variable doesn't granger cause the Trade balance

H2: the trade balance doesn't granger cause the independent variable

**Table 7: P-values of Granger causality test among variables**

Variable	Trade Balance	
	H1	H2
Pure IDR	0.881	0.165
Close CNY	0.008*	0.358
Fixed CNY		
B01	0.872	0.162
B02	0.847	0.160
B03	0.797	0.159
B04	0.709	0.156
B05	0.573	0.154
B06	0.392	0.154
B07	0.208	0.540
B08	0.079**	0.182
B09	0.002*	0.249

\*significant at 5% significance level \*\*significant at 10% significance level

As shown in the table 7, significant granger causality exists in variable *Close CNY*, and *B09* at 5% significance level and in variable *B08* at 10% significance level. This implies that the hypothesis stating that close CNY doesn't Granger cause the trade balance growth is rejected at 5% significance level. In other words, we estimate that Close CNY causes trade balance growth but not vice versa. Similar results and interpretation also holds for other variables namely *B08* and *B09*.

#### 4.7 Model comparison

Given the existence of cointegration, we develop Vector Error Correction Model (VECM) between Trade balance and each variable in separate models. Table 8 shows the estimation results. Table 9 shows the variance decomposition of trade balance response due to shock hitting the currency by 1 standard deviation. Figure 7 shows the impulse response function of trade balance due to currency shock up to 26 months, which is numerically given in table 10.

### 5. Analysis

#### 5.1 Result Analysis

We conduct vector error correction estimation for all models. A total of 12 models are estimated using a lag of three, as shown in Table 8. As indicated in the table, all cointegration coefficients are significant at the 5% significance level, demonstrating a cointegration between the trade balance growth in first differenced form and the growth of various dynamic combinations of IDR and CNY growth, also in first-differenced form. Based on the estimations, only four models exhibit a significant relationship between trade balance growth and currency dynamics growth at the 5% significance level: the models with independent variables B08, B09, Close CNY, and Fixed CNY. For clarity in our explanation, we will denote these models as model B08, model B09, Close CNY, and Fixed CNY.

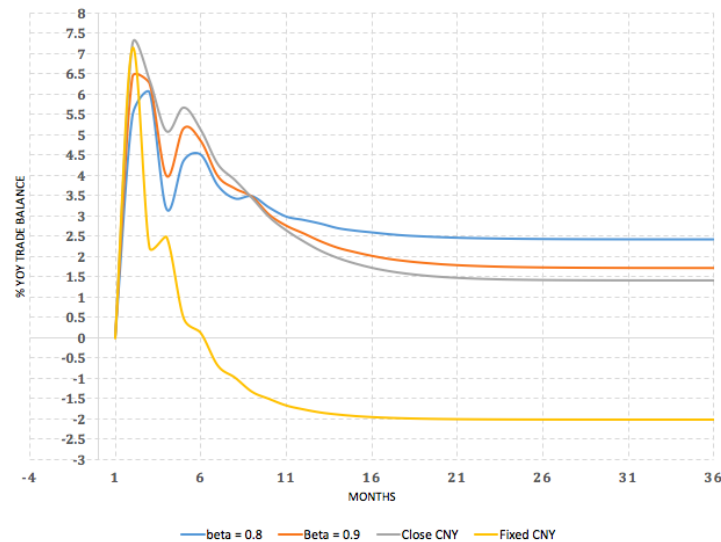
Model B08 demonstrates a significant relationship between trade balance growth and currency dynamics, comprising 20% IDR and 80% CNY dynamics (as explained in the variable section). This model suggests that a 1% increase in the difference of B08 growth corresponds significantly to a 3.463% increase in the trade balance growth difference between the two corresponding months. The model presents an  $R^2$  of 0.47, indicating that B08 growth can explain 47% of the variation in trade balance growth. Figure 7 illustrates the impulse response function of trade balance growth due to a one standard deviation shock of B08. The figure illustrates that trade balance growth returns to equilibrium after 29 months following the shock, as indicated in Table 10. The impulse response reveals that at equilibrium, trade balance growth reaches 2.42% after 36 months. The dynamics of trade balance due to this shock can be decomposed, as shown in the variance decomposition in Table 9. Based on this decomposition, the role of B08 in the dynamics increases over time. After 36 months, B08 accounts for 21.34% of trade balance growth dynamics.

Model B09 exhibits a significant relationship between trade balance growth and currency dynamics, with 10% attributed to IDR and 90% to CNY dynamics (recall that B08 is constructed from the dynamics of these two currencies, as explained in the variable section). This model implies that a 1% increase in the difference of B09 growth corresponds significantly to a 4.635% increase in the trade balance growth difference between the two corresponding months, which is higher than the B08 model. The model shows an  $R^2$  of 0.481, indicating that B08 growth can explain 48.1% of the variation in trade balance growth. Figure 7 presents the impulse response function of trade balance growth resulting from a one-standard deviation shock to B09. The figure illustrates that trade balance growth returns to equilibrium after 30 months post-shock. The impulse response indicates that, at equilibrium, trade balance growth reaches 1.71% after 36 months, which is slightly longer than in the B08 model and reflects a lower level of equilibrium. The dynamics of trade balance resulting from this shock can be decomposed, as shown in Table 9 of the variance decomposition. Based on the variance decomposition, the role of B09 in the dynamics is increasing over time. Up to 36 months, B08 accounts for 20.29% of trade balance growth dynamics, which is less than indicated by the B08 model.

**Table 8: Vector Error Correction Model Estimation Result**

Variables	D(Trade Balance)											
CointEq1	-0.322*	-0.340*	-0.355*	-0.372*	-0.392*	-0.415*	-0.441*	-0.467*	-0.483*	-0.484*	-0.475*	-0.443*
C	0.023	0.044	0.067	0.009	0.120	0.147	0.170	0.181	0.164*	0.113*	0.035*	-0.689*
D(Trade balance(-1))	-0.429*	-0.422*	-0.414*	-0.405	-0.395*	-0.383*	-0.369*	-0.355*	-0.345*	-0.342*	-0.341*	-0.443*
D(Trade balance(-2))	-0.054	-0.050	-0.045	-0.039	-0.032	-0.024	-0.015	-0.005	0.003	0.010	0.016	-
D(Trade balance(-3))	-0.054	-0.052	-0.050	-0.047	-0.043	-0.039	-0.034	-0.028	-0.022	-0.018	-0.014	-
D(Pure_IDR(-1))	-0.306											
D(Pure_IDR(-2))	0.289											
D(Pure_IDR(-3))	-1.001											
D(B01 (-1))		-0.225										
D(B01 (-2))		0.359										
D(B01 (-3))		-1.049										
D(B02 (-1))			-0.103									
D(B02 (-2))			0.449									
D(B02 (-3))			-1.096									
D(B03 (-1))				0.081								
D(B03 (-2))				0.570								
D(B03 (-3))				-1.138								
D(B04 (-1))					0.360							
D(B04 (-2))					0.731							
D(B04 (-3))					-1.170							
D(B05 (-1))						0.781						
D(B05 (-2))						0.951						
D(B05 (-3))						-1.184						
D(B06 (-1))							1.410					
D(B06 (-2))							1.251					
D(B06 (-3))							-1.167					
D(B07 (-1))								2.309				
D(B07 (-2))								1.649				
D(B07 (-3))								-1.108				
D(B08 (-1))									3.463*			
D(B08 (-2))									2.124			
D(B08 (-3))									-0.999			
D(B09 (-1))										4.635*		
D(B09 (-2))										2.546		
D(B09 (-3))										-0.780		
D(Close_CNY(-1))											5.319*	
D(Close_CNY(-2))											2.702	
D(Close_CNY(-3))											-0.266	
D(Fixed_CNY(-1))												5.923*
<b>R-squared</b>	0.442	0.430	0.432	0.434	0.437	0.442	0.449	0.459	0.470	0.481	0.489	0.462
<b>Adjusted R-squared</b>	0.411	0.398	0.400	0.403	0.406	0.411	0.419	0.429	0.441	0.453	0.461	0.450
<b>Schwarz criterion</b>	14.595	9.999	9.996	9.992	9.986	9.978	9.965	9.948	9.926	9.905	9.889	9.791

\*significant at 5% significance level (p-value < 0.005)



**Figure 7: Impulse response function of chosen models**

**Table 9: Variance Decomposition of chosen models**

Period	1	12	24	36
<b>B08</b>	0	13.51	17.60	21.34
<b>B09</b>	0	15.56	18.28	20.29
<b>Close CNY</b>	0	18.00	19.94	21.29
<b>Fixed CNY</b>	0	5.87	9.19	12.44

**Table 10: Trade balance steady state dynamics**

Period	B08	B09	Close CNY	Fixed CNY
1	0.00	0.00	0.00	0.00
2	5.46	6.42	7.22	7.14
3	6.05	6.27	6.35	2.24
4	3.17	3.99	5.09	2.49
5	4.37	5.16	5.67	0.49
6	4.51	4.85	5.12	0.13
7	3.75	3.98	4.27	-0.68
8	3.43	3.67	3.88	-0.97
9	3.49	3.47	3.44	-1.32
10	3.21	3.03	2.97	-1.50
11	2.98	2.76	2.64	-1.66
12	2.90	2.57	2.37	-1.75
13	2.81	2.37	2.14	-1.83
14	2.70	2.21	1.96	-1.88
15	2.64	2.10	1.82	-1.92
16	2.59	2.01	1.72	-1.94
17	2.55	1.94	1.63	-1.96
18	2.52	1.88	1.57	-1.97
19	2.49	1.84	1.53	-1.98
20	2.48	1.81	1.49	-1.99
21	2.46	1.78	1.47	-1.99
22	2.45	1.76	1.45	-2.00
23	2.44	1.75	1.44	-2.00
24	2.44	1.74	1.43	-2.00
25	2.43	1.73	1.42	-2.00
26	2.43	1.73	1.41	-2.00
27	2.43	1.72	1.41	-2.00
28	2.43	1.72	1.41	-2.00
29	2.42	1.72	1.41	-2.00
30	2.42	1.71	1.41	-2.00
31	2.42	1.71	1.41	-2.00
32	2.42	1.71	1.40	-2.00
33	2.42	1.71	1.40	-2.00
34	2.42	1.71	1.40	-2.00
35	2.42	1.71	1.40	-2.00
36	2.42	1.71	1.40	-2.00

Model Close CNY demonstrates a significant relationship between trade balance growth and currency dynamics growth of 100% CNY dynamics while still maintaining Indonesia's exchange rate policy direction. This model suggests that a 1% increase in the difference of Close CNY growth significantly corresponds to a 5.319% increase in the trade balance growth difference between the two corresponding months, which is higher than the two previous models, B08 and B09. The model shows an  $R^2$  of 0.489, indicating that Close CNY growth can explain 48.9% of the variation in trade balance growth, also higher than the two previous models. Figure 7 illustrates the impulse response function of trade balance growth resulting from a 1 standard deviation shock of Close CNY. The figure indicates that trade balance growth returns to equilibrium after 32 months following the shock. The impulse response reveals that at equilibrium, trade balance growth reaches 1.40% after 36 months, which is a slightly longer period and a lower level of equilibrium compared to the two previous models, B08 and B09. The dynamics of trade balance resulting from this shock can be decomposed, as shown in the variance decomposition presented in Table 9. Based on the variance decomposition, the role of Close CNY in the dynamics increases over time. Up to 36 months, B08 accounts for 21.29% of trade balance growth dynamics, which is higher than the B09 model but nearly equivalent to the B08 model.

Finally, the Close CNY model demonstrates a significant relationship between trade balance growth and real CNY growth in its first-differenced form. Recall that this model mimics the fixed exchange rate regime between Indonesia and China, where Indonesia strictly follows the dynamics of China's currency, but not vice versa. This model indicates that a 1% increase in

the difference of Close CNY growth from last month corresponds significantly to an increase of 5.923% in the trade balance growth difference this month, the highest among all model alternatives. The model shows an  $R^2$  of 0.462, implying that the linear combination of independent variables can explain 46.2% of the variation in trade balance growth, the lowest among all model alternatives. Figure 7 presents the impulse response function of trade balance growth due to a 1 standard deviation shock to Close CNY. The figure illustrates that trade balance growth returns to equilibrium after 32 months following the shock.

The impulse response indicates that at equilibrium, the trade balance growth reaches 1.40% after 36 months, which is a slightly longer period and a lower level of equilibrium compared to the two previous models, B08 and B09. The dynamics of the trade balance resulting from this shock can be decomposed, as shown in Table 9 (variance decomposition). Based on the variance decomposition, the role of Close CNY in the dynamics increases over time. Up to 36 months, B08 accounts for 21.29% of the trade balance growth dynamics, higher than the B09 model but almost equivalent to the B08 model. From the impulse response perspective, model B09 reaches equilibrium after 22 months, marking the fastest adjustment relative to all model alternatives. However, despite reaching equilibrium very quickly, this model ultimately results in a very low equilibrium value of -2% compared to all models.

## 5.2 Model Comparison

Overall, the comparison of all four models is summarized in table 11 below.

**Table 11: Model Summary**

Period	Model			
	B08	B09	Close CNY	Fixed CNY
$R^2$	0.47	0.481	0.489	0.462
Schwartz criterion	9.92	9.90	9.89	9.79
Adjustment (month)	29	25	26	22
Short run response	3.46	4.63	5.31	5.92
Long run response	2.42	1.71	1.40	-2.00

As shown in the table above, there are some interesting points to discuss. All models exhibit almost similar coefficients of determination ( $R^2$ ) and Schwartz criteria, around 0.4 and 0.9, respectively. Therefore, choosing the model based solely on statistical assumptions is insufficient. In this study, the choice of model is based on three additional criteria: the length of adjustment (in months), short-run response, and long-run response

As shown in Table 8, we consider the model with Fixed CNY as the independent variable to be inferior compared to all model alternatives for several reasons. This inferiority is primarily due to the negative trade balance equilibrium offered by this model, at -2.00%. Despite providing the highest short-run response of 5.92% and the fastest equilibrium speed of adjustment at 22 months, the negative trade balance growth will result in higher import growth than export growth, potentially followed by Rupiah appreciation. This circumstance implies that the fixed exchange rate policy between the Rupiah and Yuan, where Indonesia follows the growth dynamics of the Yuan (and not vice versa), leads to a short-term benefit for Indonesia, but may result in long-term disadvantages. Indonesia needs to focus not only on a high short-run response of trade balance growth but also on sustaining positive trade balance growth in the long run that ensures its local goods remain competitive abroad.

Given that all models with a fixed CNY are not a good choice, the decision should lie among models B08, B09, and Close CNY. This conclusion confirms that a fixed exchange rate between the Rupiah and CNY is not recommended, as it may only improve short-term outcomes but can lead to a permanently negative trade balance once a shock hits the pegged currency. Interestingly, the four models estimated above show that there is a trade-off between short-run and long-run responses. Specifically, the higher the trade balance responds to changes in currency interaction between IDR and CNY in the short run, the lower its equilibrium level of adjustment will be due to currency shocks; that is, the trade balance becomes more fragile to currency shocks

The rest of the models - B08, B09, and Close CNY – can only be chosen based on the policy direction of the Indonesian government. For instance, if the Indonesian government has a higher preference for the short run than the long run, model Close CNY is the best alternative. On the other hand, if the Indonesian government is more likely to respond to the long run rather than the short run regarding trade balance, then model B08 is the best alternative. Finally, if the Indonesian government focuses more on how quickly the trade balance adjusts to currency shocks, then model B09 is the best choice. However, despite the policy discretion, this study estimates the best model using a simple mathematical rule to measure the deviation of responses across the models. This approach is merely an example of selecting the model mathematically, while more accurate estimation is needed to choose the best model.

**Table 12: Choice among models**

Model switching (from-to)	Short run	Long run	Sum
B08 – B09	1.17	-0.71	0.46
B09 – Close CNY	0.68	-0.31	0.37
Close CNY – B08	-1.85	1.42	-0.43

Table 12 illustrates the potential deviation gains across models based on the assumption that the Indonesian government assigns equal weights to both short-run and long-run responses of the trade balance. Considering our reference model is B08, switching from B08 to B09 results in a higher short-run trade balance increase of 1.17% but a decrease in long-run trade balance gain of 0.71%. Consequently, the net result of these two gains is 0.46. Since there is a positive gain from switching from model B08 to B09, we prefer B09 over B08. In a similar manner, comparing model B09 to Close CNY shows an increase in the short-run trade balance of 1.85% but a decrease in the long-run trade balance of -1.40%, yielding a net gain of 0.37. As switching from B09 to Close CNY also results in a positive gain, we favor the Close CNY model over B09. Finally, considering the switch from the Close CNY model back to model B08 completes the cycle. The transition from Close CNY to B08 leads to a decrease in the short-run trade balance of -1.85% while increasing the long-run trade balance by 1.42%, resulting in a net gain of -0.43%. Therefore, we prefer to remain with the Close CNY model rather than B08. While this straightforward evaluation method may not fully reflect reality, as it hinges on the weight the government assigns to short-run versus long-run responses, two key conditions persist: the greater the weight the government places on the short run (with the long run held constant), the decision aligns with model B08. Conversely, the greater the weight the government allocates to the long run, the decision aligns with the Close CNY model.

## 6. Closing

### 6.1 Conclusion

One significant finding of this study is that a fixed exchange rate regime between Indonesia and China is not recommended based on the trade balance response. This is because, although the trade balance shows the highest response compared to other model alternatives, this regime exhibits fragility due to an economic shock that leads to a negative response of the trade balance in the long run. However, despite the fixed exchange rate regime not being recommended, this study indicates that close cooperation between Indonesia and China is advisable, as only the B08, B09, and Close CNY models reveal significant statistical responses towards Indonesian trade balance growth. Additionally, these three models can still result in a positive long-run trade balance response. However, the choice of models depends on government policy direction.

### 6.2 Policy Implication

The results of this study contribute to a policy plan owned by the Indonesian government, which is to implement a fixed exchange rate between the IDR and CNY. The findings suggest that a fixed exchange rate regime between the IDR and CNY may not be advisable. This policy could leave Indonesia worse off in the long run, resulting in a negative trade balance growth during currency shocks despite its short-term benefits. However, close coordination between the IDR and CNY is still recommended, as the estimations show that such coordination can lead to positive trade balance growth in both the short and long run.

It is crucial to note that the results of this study are derived from the analysis of the dynamics of two currencies using historical currency data. Therefore, the findings can only be applied to future policy under certain assumptions, such as no changes in the long-term direction of economic policy and the absence of social frictions that hinder close coordination between the two countries. The future state will be uncertain if the government undertakes very radical policy reforms that structurally change the direction of its endogenous economic variables. Therefore, to ensure that close coordination between these two currencies remains relevant for future policy formulation, there are some recommendations that the Indonesian government needs to consider take.

First, closely observing China's economic dynamics is essential. China has been struggling to implement reforms both within its government structure and its economic policies, which inevitably influences the current state of its relationship with Indonesia. To achieve close coordination, Indonesia must always be prepared to respond effectively to China's macroeconomic policy. For instance, this includes accommodating export and import activities and transferring technology, labor, and capital. However, this success can only be achieved if the second requirement, as outlined below, is met satisfied.

Second, in maintaining the close relationship mentioned previously, the Indonesian government must ensure that negative externalities from the coordination are minimized as much as possible. One crucial source of negative externalities is the trust of the people in the government. Unfortunately, trust is a fragile equilibrium amid the rapid development of information through the internet and social media. Trust can easily deviate from its optimal state due to rumors, racist activities, religious conflicts, and the government's unwillingness to listen. Thus, to achieve close coordination, the Indonesian government must be able to eliminate social conflicts by imposing credible, swift, and trustworthy social and legal policies, while also listening carefully to what the people expect from their government. Protection of local

Indonesian rights is an example of an externality source that can deeply affect trust in the government. For instance, due to close coordination, a significant number of laborers are being transferred from China to Indonesia, generating rumors and concerns among local Indonesians. The government must anticipate these externalities with credible foreign labor policies, a secure job market for local people, and ensure that the agreements benefit the Indonesian populace

Finally, it is essential for the Indonesian government to eliminate political influence from its commercial decisions. For instance, the study results indicate that implementing a fixed exchange rate can significantly enhance trade balance growth in the short term. This makes it very tempting for the government to pursue this policy while overlooking its long-term negative effects. Consequently, the government may tend to engage in what is known as a political business cycle, where they prioritize immediate economic impacts to impress citizens for their reappointment in the new presidential term election.

### 6.3 Limitation and recommendation

The critical point to note is that the result of this study only applies to one response variable, the trade balance, and is based on the assumption that trade between Indonesia and China is frictionless. Of course, there may be other variables that affect the trade balance. However, it is important to emphasize that this study isolates the response solely to the trade balance by considering how the close relationship between exchange rates and export and import activities matters. Due to this limitation, this study presents ample opportunities for further improvements from various perspectives. For instance, one could add more independent variables, replace the dependent variable with other types of variables, decompose the trade balance into specific commodities, or simply use different econometric methods.

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