Exchange Rate Pass Through During the Covid-19 Pandemic in Indonesia

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Abstract. This study uses the impulse response model from VAR to see the degree of exchange rate pass through (ERPT) to inflation. The Pass Through of exchange rate is defined as the percentage change in inflation either from the import or export side caused by changes in the exchange rate. Consumer Price Index (CPI) and the wholesale trade price index (WPI) are used in this study as the dependent variable and the exchange rate as an independent variable during pandemic conditions using monthly data from Bank Indonesia and the World Bank from March 2020 to May 2022. Using the ERPT formula in the impulse response test to see the degree of pass through of the exchange rate against the CPI and WPI, it was obtained a value of 0.24 and 0,91 respectively which means that a depreciation of the rupiah against the dollar by 1 percent will cause the CPI increase by 0.24 percent and WPI to increase by 0.91 percent. From these results, we can conclude that the ERPT for both the CPI and WPI is incomplete, which means that increase in the price level or inflation is less or not proportional to the change in the exchange rate.

Keywords: Exchange rate pass through · impulse response · inflation

1 Introduction

With increasingly open economy in Indonesia and accompanied by the development of globalization, it has caused the exchange rate to experience fluctuation that are no longer easily controlled by monetary policy makers. Coupled with the change in system of exchange rate in Indonesia from a fixed toward a flexible exchange rate system, where in this new system, the exchange rate fluctuates very easily depend on supply and demand in exchange rate market. The fluctuation of the exchange rate has also had an effect on other economic variables such as inflation. The percentage change in the price of goods or inflation in the country either from the import or export side caused by changes in the exchange rate is defined as the exchange rate pass through [1].

The size of a country's ERPT degree is determined by many factors. One of them is the business cycle of an economy, In addition to this the credibility of the central bank was also found to be able to withstand fluctuations in inflation caused by changes in the exchange rate [2]. [3] said countries that adoption of ITF or inflation targeting framework will reduce the effect of change in ERPT toward inflation, while [4] adds

that transparency will also in taking monetary policy will reduce the effect of ERPT on prices. Furthermore [5] states that the ERPT is determined by the volatility of exchange rate itself and the structure of market.

Previous research on the effect of the exchange rate on inflation has been carried out by many previous researchers and has provided some mixed findings regarding whether the degree of pass-through is high or low. When the price is rigid, they tend to be fixed and unable to adjust toward change of macroeconomic shock, then in the short run the ERPT becomes incomplete (Dornbusch, 1987). This study was supported by [6] who used a vector error-correction (VECM) approach to estimate the ERPT and found that the exchange rate pass-through was low and incomplete. [7] conducted a similar study using recursive VAR and concluded that the ERPT was also incomplete. He also added that the switch to non-food prices was more prominent than the switch to consumer prices. In addition, [8] uses the impulse response function to analyses the ERPT and finds that exchange rate depreciation affects prices even though the impact is incomplete, while using variance decomposition, he finds that expansionary monetary policy is a source of high inflation, so he concludes that in order to reduce inflation, it is hoped that there will be policies that lead to interest rates and exchange rates. However, another result was found by [9], He found that that the pass-through to the wholesale price index was more prominent than the pass-through to consumer prices and ERPT on inflation also found to be more complete and larger. In addition (Schmidt-Hebbel & Tapia, 2002) also adds that countries that adopt the inflation targeting framework cause inflation to be less responsive to changes in exchange rates.

In accordance with the theory, the depreciation of the exchange rate causes the value of imports and inflation to increase. However, different facts are found in Indonesia. In 2019 to 2021, the exchange rate depreciated when inflation decreased. In 2019 the Indonesian exchange rate against the US dollar was IDR 14139 to IDR 14525 in 2020 While inflation decreased in the same year from 2.71 to 1.69. Then it will be so important for us to analyses the impact of change in exchange rate toward inflation, whether the depreciation of exchange rate will cause inflation to increase or decrease. Because government need to seizing opportunities about this variable which will affect the economies, then also able to leap the imminent future about taking the next monetary policy related to inflation and exchange rate.

Previous studies have examined the exchange rate pass through on inflation in Indonesia, Most of empirical studies stated that ERPT in developed countries tend to be low [10, 11], while in developing countries the effect of ERPT tends to be higher and faster [12, 13]. So the author wants to see the effect inflation because of a change of exchange rate or known as exchange rate pass through in developing countries such as Indonesia during the covid-19 pandemic. This study uses the Consumer Price Index (CPI) and the wholesale trade price index (WPI) as the dependent variable and the exchange rate as the independent variable during the pandemic using monthly data from Bank Indonesia and the world bank from Indonesia and March 2020 to May 2022.

2 Method

This study aims to analyze the effect of changes in the exchange rate on two price indices, namely the consumer price index and the wholesale price index in Indonesia, better known as the Exchange Rate Pass Through. The data in this research are taken from Central Bureau of Statistics, Bank of Indonesia and the World Bank during the Covid-19 pandemic. This study uses the impulse response model from VAR to see the effect of the exchange rate on two inflation-determining indices, namely the consumer price index and the wholesale price index. Before estimating using VAR, this study first tested the stationarity of the data using the unit root test. This is because time series data generally have a trend that is not stationary or contains a unit root. In addition to the unit roots test, stability tests are also needed to ensure that the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEDV) results are valid. This study refers to the research conducted by [14] which calculates the degree of pass-through through impulse response analysis. Impulse response analysis is used to see the response of an endogenous variable which in this case is CPI and WPI from the change of the exchange rate.

In general, the econometric equation is:

$$\Delta ihk = \alpha_0 + \sum_{i=0}^{q} \beta_i \Delta er_1 + \epsilon_t \tag{1}$$

$$\Delta ihpb = \alpha_0 + \sum_{i=0}^{q} \beta_i \Delta er_1 + \epsilon_t \tag{2}$$

where *ihk* is consumer price index, ihpb is wholesale price index, er_1 is nominal exchange rate, is symbol for change, e is error, t is time representation. While the sum of $\sum_{i=0}^{q} \beta_i$ is ERPT after q periods.

In general, ERPT is a measure of the response rate of inflation to changes in exchange rates. ERPT measurement is usually carried out using the impact of the exchange rate on inflation indexes such as the consumer price index and the wholesale price index which can affect price inflation. In a simple way to calculate ERPT can use the following equation.

$$ERPT = \frac{Percentage\ change\ of\ domestic\ price}{Percentage\ change\ of\ exchange\ rate} \tag{3}$$

However, this study will examine the effect of changes in the exchange rate on inflation which is represented by the consumer price index and the price index of large changes using monthly data from the start of the pandemic in Indonesia from March 2020 up to May 2022. So to calculate the ERPT degree, this study uses the results from the standardized VAR impulse response to one percent depreciation via the degree pass through formula in Equation:

$$ERPT = \frac{\sum_{i=L}^{n} \psi_{nt}^{ihk}}{\sum_{i=L}^{n} \psi_{nt}^{e}} \tag{4}$$

where $\sum_{i=L}^{n} \psi_{nt}^{ihk}$ is the cumulative response of the CPI to changes in the exchange rate and $\sum_{i=L}^{n} \psi_{nt}^{e}$ is the cumulative response of the exchange rate to changes in the exchange rate itself.

3   Results and Discussion

The first step taken before calculating the degree of pass through is a stationary test for each variable using the unit roots test. Augmented test results state that all variables are stationary at the level and first difference. The next step is to determine the lag length criteria, in this study using the Akaike criteria or what is known as the AIC Akaike Information Criterion. In the results of the ERPT analysis of the CPI and WPI, the maximum lag is lag 1.

Before conducting an impulse response analysis to determine the degree of exchange rate pass through, a data stability test was first performed. The stability of the VAR system is seen from the inverse roots value of the polynomial AR characteristics. If all the roots have more than 1 mode and all of them are located in the unit circle, the resulting Impulse Response Function (IRF) is considered valid. On the results of the stability test using stata, it was found that the absolute value of the exchange rate data on the CPI was 0.0647–0.9588, while the absolute value of the Exchange rate and WPI was 0.43772–0.98627. So the IRF and FEDV results are said to be valid.

To get the pass through degree, this study refers to the research conducted by [14], where to calculate the ERPT was through the cumulative impulse response results from exchange rate shocks to the CPI or WPI and exchange rate shocks to the exchange rate itself. Using the ERPT formula in the value of the pulse response results to see the degree of exchange rate pass through against the CPI obtained a value of 0.24 which means that a depreciation of the rupiah against the dollar by 1 percent will cause a change in the increase in the CPI as much as 0.24 percent. Meanwhile, for the ERPT degree against the WPI, a value of 0.91 was obtained, which means that every 1 percent depreciation of the rupiah against the dollar causes a change in the WPI to increase by 0.91 percent. From these results, we can conclude that the ERPT for both the CPI and WPI is incomplete, which means that the increase in the change to the price level is less or not proportional to the change in the exchange rate.
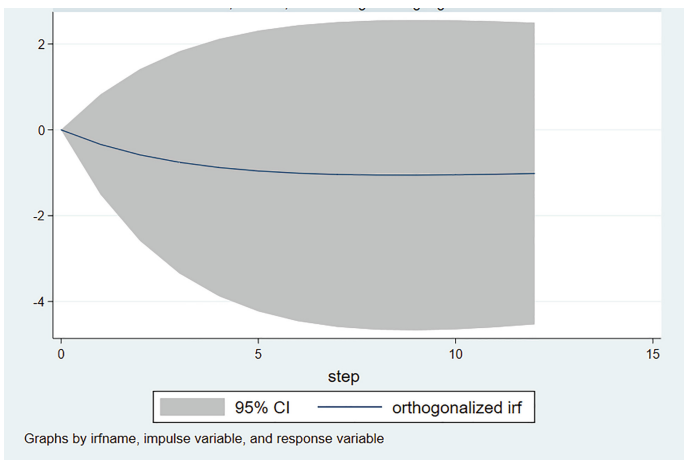

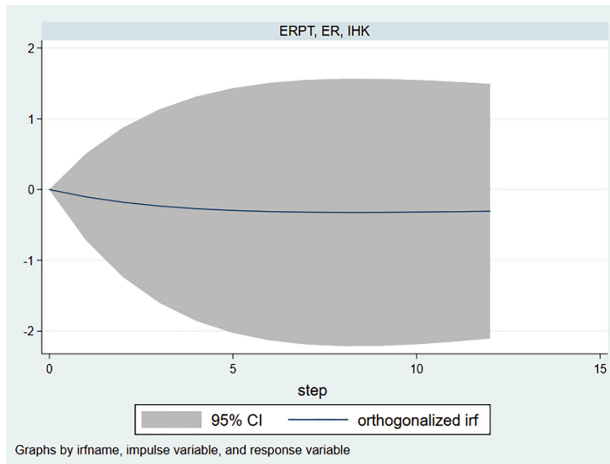**Fig. 1.** Impulse Response Results of ER to WPI

Fig. 2. Impulse Response Results ER to CPI

From Figs. 1 and 2 we can see the impulse response analysis curve to see the impact of changes in the exchange rate on the CPI and WPI in the future, so that a shock from the exchange rate will cause changes to the CPI and WPI. The effect of the exchange rate on the WPI almost touched 1% over the next year. Meanwhile, the effect of the exchange rate on the CPI is lower than the WPI, which is less than 1%. So that in the future, Bank Indonesia must be able to control the WPI value so that inflation remains stable.

The results of this study are in line with the research found by [14] and [9]. He found that exchange rate movements only had a moderate effect on domestic prices, while exchange rate pass throughs were stronger against the WPI relative to the CPI. This is because the effect of the pass-through exchange rate is much stronger in an environment of higher inflation.

[6] and [7] used a VECM to estimate ERPT and found that the exchange rate pass-through was incomplete and low. This study is in line with this study which found that the effect of the exchange rate on the CPI was incomplete. This is in accordance with the theory of purchasing power parity which states that every change in the exchange rate brings a proportional change in the price level. However, theoretically the effect of the exchange rate passed to prices is determined by many factors such as the power of firm in setting prices, the degree of openness of the economy, the condition of the economy, and the inflationary.

Most of the previous research found that prices reflect exchange rate movements fully, which means that incomplete or partial ERPT is also determined by several approaches. The macroeconomic approach [15] states that incompleteness stems from nominal rigidity which causes price unresponsiveness in the short term, while using the microeconomic approach states that the incomplete ERPT is due to differences in producer behaviour in setting the prices. [16]. In addition, the finding of an incomplete relationship between the exchange rate and inflation is because many literatures find that in developed countries

the relationship between these variables tends to be low because inflation in that country is also low.

4 Conclusion

Using the ERPT formula in the impulse response test to see the degree of ERPT against the CPI, it was obtained a value of 0.24 which means that a depreciation of the rupiah against the dollar by 1 percent will cause a change in the CPI increase of 0.24 percent. Meanwhile, for the degree of ERPT against the WPI, a value of 0.91 was obtained, which means that every 1 percent depreciation of the rupiah against the dollar causes a change in the IHPB to increase by 0.91 percent. From these results, we can conclude that the ERPT for both the CPI and IHPB is incomplete, which means that the increase in the change to the price level is less or not proportional to the change in the exchange rate.

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