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Analysis of the Influence of World Oil Prices, Total Money Supply, Exchange Rate, and Export Value on Inflation Levels in Indonesia 2020-2021

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Abstract: *This research is entitled "Analysis of the Influence of World Oil Prices, Money Supply, Exchange Rates (KURS), and Export Values on Inflation in Indonesia in 2020-2021". This study aims to determine the effect of world oil prices, money supply, exchange rates, and export values on inflation in Indonesia. The method used in this study uses the Partial Adjustment Model (PAM) regression analysis. The short-term model or the estimator model of the PAM. The data used is time series data for 2020-2021. The results of the study show that world oil prices and exchange rates have a significant effect on the inflation rate. Meanwhile, the amount of money in circulation and the value of exports do not significantly affect the inflation rate.*

Keywords: World Oil Prices, Money Supply, Exchange Rates, Export Value, Inflation Rate

I. INTRODUCTION

Inflation is an economic phenomenon arising from implementing of fiat standards in the economy. The fiat standard in question is that the state gives authority to the central bank to issue and circulate money based on trust. It was implemented because the standardization of money with gold could no longer meet the money needs in an economy that was advancing rapidly.Inflation has positive and negative effects on a country's economy but frequently has a negative impact. Producers have responded positively to one of the positive effects of inflation, such as increased economic output due to rising prices. Adverse economic effects include decreasing investor enthusiasm, failing to generate economic growth, worsening income distribution, and reducing people's purchasing power.(Yoga Budi Ramadhan, 2021)

As one of many developing countries, Indonesia has high and volatile inflation (volatile) characteristics. In conditions where inflation fluctuates so rapidly, some people's level of prosperity will fall. Furthermore, inflation will cause productive investment to fall, production costs to rise, and the economy to become unstable. In Indonesia, inflation is also very harmful to society because it reduces the actual value of money held by the general public. People on fixed incomes will see their purchasing power eroded by inflation, reducing their ability to meet their needs. Inflation can also reduce people's desire to save money in physical form; if this occurs, it will impact the business world and investment, hindering economic output growth. (Luhgede et al., 2014)

This inflation can occur in countries whose economies are growing and developing. There are two leading causes for inflation:Demond Pull Inflation. This inflation occurs because there is an imbalance in demand and an increase in the production amount that occurs, according to the law of demand. If what happens is a lot of demand and fixed supply, then the price will go up. Furthermore, if this incident continues, it will result in continuous inflation. It was troubleshooting by opening up new production capacity and adding a new workforce.Cost-Push Inflation is caused by production costs that occur because increases in input costs or production factor costs trigger them. It can be resolved in two ways, by increasing the price of the product with the same number of offers or by increasing the price due to a decrease in production.(Santosa, 2017)

The inflation category is also based on the level of severity. There are three levels of inflation:Mild Inflation, Which is classified as mild inflation, around only 10% per year. The impact of inflation is insignificant because price increases only occur in general and are not comprehensiveModerate Inflation, This inflation is quite dangerous, with around 10-

30% per year. The impact of this inflation affects the welfare of people who have a fixed incomeHeavy Inflation, it inflation will cause a country to massively slow down by around 30-100% per year The impact of this inflation makes people utterly dependent on cash ownership. When inflation occurs, bank interest will be much lower than the inflation rate. Therefore, money will continue circulating in the community because they want the money stored in the bank to stay the same value.Prospects for long-term economic development will worsen if inflation cannot be controlled. Inflation tends to accelerate if it is not controlled. This increasingly severe inflation tends to reduce productive investment, reduce exports, and increase imports. This tendency will slow down economic growth.(Fuad Anshari et al., 2017)

Macro variables influence price stability in an economy; therefore, the inflation rate is often used as an indicator of economic stability. Inflation can decrease real household income, especially for workers who earn a fixed income. According to Bank Indonesia (2016), inflation can also hinder real economic growth, triggering an increase in the unemployment rate and in the long term can cause social instability.(Pratiwi & Prasetyia, 2013)

The fluctuating inflation rate in Indonesia, with various influencing factors, makes it increasingly difficult to control inflation, so in controlling it, the government must know the factors that can cause inflation to form in Indonesia. In an open economy, price stability can be seen from the exchange rate of a currency. (Manuela Langi Theodores ,Masinambow Vecky, 2014)This exchange rate is the price of goods and services demanded and offered by a country. The supply and demand of that currency influence the high or low exchange rate of a currency. A high depreciation in the value of the rupiah will result in an increase in the prices of goods, especially imported goods or industrial raw materials that cannot be produced domestically. This situation resulted in soaring inflation. If this situation occurs continuously and the price level continues to increase daily, it will cause a high inflation rate from year to year(Rusbariand et al., 2012).

Based on this background, it is known that the rate of inflation in Indonesia shows a positive trend every year even though the decline is still low. It is due to the need to optimize several monetary policies in Indonesia and world oil prices, which fluctuate yearly. The inflation rate can be controlled with several monetary policies that align with economic problems. A country's economic activities are always connected to money payment activities.(Kalsum et al., 2021)

II. THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1. Inflation Rate

The inflation rate is the tendency for the price of goods and services to increase continuously. In another sense, if the price of goods and services in the country increases, inflation will increase because this causes the value of the country's currency to drop. According to Bank Indonesia, inflation is a tendency for prices to increase in general and continuously. According to DwiEkoWaluyo, inflation is a form of the economic disease that arises and is experienced in almost all countries. This theory was put forward in his book Theory of Involved Macroeconomics in 2002. According to Winardi, a period at a certain time occurs when the monetary unit's purchasing power decreases. This understanding can arise when the value of money deposited in circulation exceeds the amount in circulation or the services offered.

2.2. Word Oil Prices

Price is an exchange rate that can be equated with money or other goods for the benefits derived from an item or service for a person or group at a certain time.(Mubarok et al., 2019) Crude oil is a commodity and energy source for a country's growth. One of the factors affecting world oil prices is world economic growth. If the global economy tends to strengthen, it will be followed by an increase in oil demand, so world crude oil prices tend to be pushed up. From the supply side, fluctuations in world crude oil prices are influenced by the availability of crude oil supplies by producing countries that are members of OPEC (Organization of Petroleum Exporting Countries) and producing countries that are not members of OPEC (Personal et al., 2015)

2.3. Money Supply

The definition of the money supply in the economy can be divided into three. Namely, the money supply in the narrow sense (M1), the money supply in the broad sense (M2), and the money supply in the inclusive sense (M3).

2.3.1. Money supply in the narrow sense (M1) is the currency in circulation which is supplemented by demand deposits owned by individuals, companies, and government-owned entities (Nur Indah puspitarani, 2021)

2.3.2. Money supply in a broad sense (M2) includes currencies in circulation, demand deposits, and quasi-money. Quasi money consists of time deposits, savings, and foreign currency (savings) accounts owned by domestic private companies (Nur Indah puspitarani, 2021)

2.3.3. The money supply in an inclusive sense (M3) includes all time deposits (TD) and savings balances (SD), the size of rupiah or foreign currency owned by residents at banks by non-bank financial institutions.(Nur Indah puspitarani, 2021).

2.4. Exchange Rate

The exchange rate is the value of foreign exchange (Forex) or the ratio of the value of money/foreign currency to the value of money/currency of the country concerned. In other words, the exchange rate is a comparison of the value/price between the currency of one country and another. 4 This comparison is called the exchange rate. There are three exchange rate systems used in Indonesia, namely:

2.4.1. Fixed Exchange Rate System, in a fixed exchange rate system, can be done in several ways. First, with pegged to currency, the exchange rate is determined by linking it directly to a particular currency, and second, pegged to a basket of currency, namely the weighted exchange rate of each currency which is generally adjusted according to the size of trade and investment relations.(Astika et al., 2017)

2.4.2. Floating Exchange Rate System In a floating exchange rate system, exchange rates are allowed to move according to the forces of demand and supply that occur in the market. So, the exchange rate will strengthen if there is excess supply over demand, and conversely, the exchange rate will weaken if excess demand over supply occurs in the foreign exchange market.(Amaliyah & Aryanto, 2022)

2.4.3. Controlled Floating Exchange Rate System: The exchange rate is determined according to the market mechanism as long as it is within the intervention band or the intervention band limit set by the central bank. Intervention in the foreign exchange market is an unannounced target zone.(Sonia & Setiawina, 2016)

2.5. Export Value

Export can be interpreted as the delivery and sale of goods from within the country to abroad. According to Murni (2009:208), export is an economic activity selling domestic products to foreign markets. According to Sukirno (2010: 205), the advantage of exporting is that it can expand the market, increase the country's foreign exchange, and expand employment.(Ahmad Rizal, 2022)

III. RESEARCH METHODOLOGY

This research uses Partial Adjustment Model (PAM) regression analysis. The short-term model or the estimator model of the PAM. The data used in this research is time series data. This analysis determines the effect of the independent variables on the dependent variable.

$$INF_t = \alpha + \beta_1 \ln(HMD)_t + \beta_2 ln(JUB)_t + \beta_3 ln(KURS)_t + \beta_4 ln(EKSP)_t + \mu$$

Where :

INF	: Inflation Rate (%)
HMD_t	: *World Oil Prices*(%)
JUB_t	: *Money Supply*(Rupiah)
$KURS_t$	: *Exchange Rates*(Dollar)
$EKPS_t$	: Exsport Value(Rupiah)
α	: Constanta
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$	: Regression Coeficient

Log : Logarithmic Operation

μ : Standar Error

t : Amount of time

IV. RESULT AND DISCUSSION

The regression coefficient INF_{t-1} (λ), is seen to be 0.4262 with a p-value or empirical probability (significance) t 0.0140 (< 0.05), meaning that the adjustment coefficient (δ) will meet the requirements 0 < δ < 1 and significant. These two conditions indicate that the estimated model is truly a short-term PAM model, which can represent a long-term theoretical relationship between the dependent variable and the independent variable, which is specified as a long-term PAM model.

$$\log\widehat{INF_t} = 22{,}87194 - 0{,}3458\log HMD_t + 1{,}1130\log JUB_t$$
$$(0{,}1922)(0{,}2377)$$
$$-4{,}3356\log KURS_t \; + \; 0{,}2564\log EKS_t$$
$$(0{,}0760)^{**} \qquad (0{,}6922)$$

R^2= 0,6367; DW = 2,4892; F = 4,5585; Prob. F = 0,0127

Diagnostics test

1. Multicollinearity (VIF)
   ln(HMDt) = 5,1565; log(JUBt) = 5,8899; log(KURSt) =1,3241;
   ln(EKSt) = 11,228; INF_{t-1}= 1,2261
2. Residual Normality (Jarque Bera)
   JB(2) = 0,4594; Prob. JB(2) = 0,7947
3. Autocorrelation (Breusch Godfrey)
   χ2(3) = 4,6187; Prob. χ2(3) = 0,2019
4. Heteroscedasticity (White)
   χ2(20) = 14.2709; Prob. χ2(20) = 0,1130
5. Linearity (Ramsey Reset)
   F(2,21) = 2,5645; Prob. F(2,14) = 0,1218

Description: *significant atα = 0,01; ** significant at α = 0,05; *** significant ar α = 0,10; the number in the bracket is the probability of the *t* statistic.

Source: Eviews 10

Table 1. Estimation result of time series data econometric regression model

4.1 Classic assumption test

4.1.1. Multicollinearity.

Variabel	VIF	Kriteria	Kesimpulan
ln(HMDt)	5.1565	< 10	It does Not Cause Multicollinearity
ln(JUBt)	5.8899	< 10	Does Not Cause Multicollinearity
ln(KURSt)	1.3241	< 10	It does Not Cause Multicollinearity
ln(EKSt)	11.228	> 10	Cause Multicollinearity
INF_{t-1}	1.2261	< 10	It does Not Cause Multicollinearity

Source: Eviews 10

Table 2. Multicollinearity

The multicollinearity test used is the VIF test. The multicollinearity VIF test occurs when the VIF value of the independent variables in the estimated model has a value > 10. The results of the VIF multicollinearity test are presented in Table 2.

4.1.2. Residual Normality

From Table. One, it can be seen that the p (p-value), probability, or empirical statistical significance of JB is 0.7947 (>0.10), so H0 is accepted. In conclusion, the residual distribution of the estimated PAM model is standard.

Residual normality was tested using the Jarque Bera (JB) test. H0 Jarque Bera test is the distribution of average estimated model residuals, while the HA distribution of estimated model residuals is not normal. H0 is accepted if the p (p-value), probability, or empirical statistical significance JB >α; H0 is rejected if the p (p-value), probability, or statistical empirical significance JB ≤α.

4.1.3. Autocorrelation

From Table 1., it can be seen that the p (p-value), probability, or empirical statistical significance of the BG test is 0.2019 (> 0.10), so H0 is accepted. In conclusion, there is no autocorrelation in the PAM estimated model.

Autocorrelation will be tested using the Breusch Godfrey (BG) test. H0 from the BG test shows no autocorrelation in the estimated model; The HA has an autocorrelation in the estimated model. H0 is accepted if the p (p-value), probability, or statistical significance of the BG test >α; H0 is rejected if the p (p-value), probability, or statistical significance of the BG test ≤α.

4.1.4. Heteroscedasticity

From Table 1., it can be seen that the p (p-value), probability, or empirical statistical significance of White's test is 0.1130 (> 0.10), so H0 is accepted. In conclusion, there is no heteroscedasticity in the PAM estimated model.

White's test will be used to test heteroscedasticity. H0 White test, there is no heteroscedasticity problem in the estimated model, and the HA has a heteroscedasticity problem in the estimated model. H0 is accepted if the p (p-value), probability, or empirical statistical significance of White's test >α; H0 is rejected if the p-value, probability, or statistical significance of the White test ≤α.

4.1.5. Linearity

From Table 1, it can be seen that the p (p-value), probability, or statistical, empirical significance of the Ramsey Reset F test is 0.1218 (> 0.10), so H0 is accepted. In conclusion, the specification of the PAM estimated model is precise or linear.

The specification accuracy or model linearity will be tested using the Ramsey Reset test. Ramsey Reset test has H0 exact or linear estimated model specifications; meanwhile, the HA specification of the estimated model is imprecise or non-linear. H0 is accepted if the p (p-value), probability or statistical significance F test Ramsey Reset >α; H0 has rejected if the value of p (p-value), probability or statistical significance F test Ramsey Reset ≤α

4.2Model Goodness test

4.2.1. Existence of an Estimated Model

An estimated model exists if all the independent variables simultaneously influence the dependent variable (the estimated model regression coefficient is not simultaneously zero). The existence test of the model is estimated using the F test. In this study, because there are four independent variables of the estimated model, the formulation of the hypothesis test is $H0$: $\beta1 = \beta2 = \beta3 = \beta4 = 0$, the simultaneous regression coefficient is zero, or the estimated model does not exist; HA: $\beta1 \neq 0$ $\beta2 \neq 0$ $\beta3 \neq 0$ $\beta4 \neq 0$, the regression coefficients are not simultaneously zero or the estimated model exists. $H0$ will be accepted if the p-value (p-value), probability, or statistical empirical significance F >α; $H0$ will be rejected if the p-value, probability, or empirical statistical significance of F . From Table 1, it can be seen that the statistical significance value F is 0.0127<0.05. Then H0 is rejected, so the model used exists. It means that simultaneously

the variables of World Oil Prices, Money Supply, Exchange Rates, and Export Value significantly affect the Inflation Rate.

4.2.2. Interpretation of the Coefficient of Determination

The coefficient of determination R-Square(R^2) shows the predictive power of the estimated model. From Table 1. it can be seen that it has a value of 0.6367, meaning that 63.67% of the variation in World Oil Prices (HMD), Total Money Supply (JUB), Exchange Rates (KURS), and Export Value variables (EXS) can explain variation in Inflation Rate (INF) while other variables outside the study demonstrate 36.33%, is influenced by variables or other factors not included in the PAM estimator model. It also shows that the PAM estimated has very high predictive power. However, statistical significance f of 4,5585 with a probability of 0,0127 (0,05) for the variable of the inflation rate.

4.2.3. Influence Validity Test

The effect validity test examines the significance of the independent variables, which significantly influence the dependent variable.

Variable	Sig. t	Criteria	Effect conclusion
ln(HMDt)	0,1922	> 0,10	Not significant
ln(JUBt)	0,2377	> 0,10	Not significant
ln(KURSt)	0,0760	< 0,10	Significantofα = 0,10
ln(EKSt)	0,6922	> 0,10	Not Significant

Source: Eviews 10

Table 3. Influence Validity Test

V. CONCLUSION

Conclusion Based on the discussion on the analysis of the effect of World Oil Prices,Money Supply, Exchange Rates, and Export Value on the Inflation Rate in Indonesia in 2020-2021, conclusions using the Partial Adjustment Model (PAM)can be drawn as follows.

a. The World Oil Price Variable harmed Inflation Rate in Indonesia in 2020-2021.
b. The Money Supply Variable harmed the Inflation Rate in Indonesia in 2020-2021.
c. The Exchange Rate Variable positively affected the Inflation Rate in Indonesia in 2020-2021.
d. The Export Value Variable harmed the Inflation Rate in Indonesia in 2020-2021.
e. Based on the classic classical assumption test results, there were no multicollinearity, heteroscedasticity, orautocorrelation problems in the model. In the normality test, there are no deviations, so the residuals are normally distributed. The linearity test shows that the model specifications are correct.

f. The coefficient of determination R-Square(R^2) shows the predictive power of the estimated model. From Table 1. it can be seen that it has a value of 0.6367, meaning that 63.67% of the variation in World Oil Prices (HMD), Total Money Supply (JUB), Exchange Rates (KURS), and Export Value variables (EXS) can explain variation in Inflation Rate (INF) while other variables outside the study demonstrate 36.33%, is influenced by variables or other factors not included in the PAM estimator model.

g. Based on the model existence test (Test F), it can be seen that the statistical significance value F is 0.0127<0.05. Then H0 is rejected, so the model used exists. It means that simultaneously the variables of World Oil Prices, Money Supply, Exchange Rates, and Export Value significantly affect the Inflation Rate.

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