

Research Article

The Influence of Exports, Imports, and Domestic Investment on Inflation Control in Indonesia

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Abstract.

This study aims to analyze the effect of exports, imports, and domestic investment on the inflation rate in Indonesia in the short and long term. The data used is secondary data for the period 1992-2021. The analysis method used is the auto regressive distributed lag model. The results of this study indicate that in the short term, the inflation rate in Indonesia is influenced by the previous year's inflation, exports and imports the last year, imports the prior year, and investments the previous year. Meanwhile, in the long term, investment has a significant effect on the inflation rate, but exports and imports are not important.

Keywords: inflation, export, import, domestic investment, ARDL

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1. Introduction

Inflation is one of the important indicators that receives special attention from monetary and fiscal authorities in various countries. Unstable inflation rates can cause macroeconomic diseases, resulting in instability in the economy. High and uncontrolled inflation can reduce purchasing power and impoverish people. Therefore, inflation stability needs to be controlled by monetary policy and fiscal policy simultaneously. Inflation fluctuations are economic phenomena that can cause problems in economic activities. Maintaining macroeconomic stability is one of the main problems experienced by the economy in developing countries, especially maintaining the stability of the rupiah to avoid inflation (1).

The government and central bank as policy makers always pay attention to the problem of inflation to ensure that the policies made are credible policies to achieve a low and reasonable inflation rate. In addition, the two authorities also continue to focus

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on formulating policies that can maintain the stability of the monetary and financial sectors and the real sector so that economic activities continue to grow and develop. Therefore, the use of macroeconomic variables in this study, such as exports, imports, and domestic investment, is considered important to be studied more deeply so that the impact of the resulting policies can be more effective in controlling inflation.

Research on inflation influenced by macroeconomic variables has been widely conducted in various countries, although with different variations, both in terms of variables, methodology, and results. Research conducted by (2) in Pakistan on Empirical Analysis of Exports, Imports, and Inflation, using the Vector Error Correction Model (VECM) method showed a significant positive effect of exports and imports on inflation. Meanwhile, (3) found a negative effect of investment on inflation in Sri Lanka. (4) in their research looked at the dynamic relationship between exports, imports, investment, and inflation using the VECM method. The results of their research found that exports imports, and foreign investment had a significant negative effect on inflation in India. The relationship between investment and inflation was also studied by (5) who found an effect of investment on inflation in the United States. (6) in their research showed the effect of imports on inflation in Indonesia using the Vector Autoregression (VAR) method.

Previous studies have not focused their studies specifically on the influence of exports, imports, and investment in an econometric model that can answer the short-term and long-term effects of each variable. Therefore, this study uses the ARDL model to analyze this. In addition, the investment variables used in previous studies tend to use foreign investment, while this study uses domestic investment variables because domestic investment is very necessary to strengthen the fundamental resilience of the domestic economy as well as a driver of inflation stabilization.

2. Methods

This research is a type of quantitative descriptive research. The type of data used in this study is secondary data. The data used is time series data from 1992 to 2021, namely Export, Import, and Domestic Investment (DI) data in Indonesia. Data sources were obtained from the official website of the Ministry of Investment or the Investment Coordinating Board of Indonesia, the official website of Bank Indonesia, and the official website of the Central Statistics Agency of Indonesia in 2022. The data analysis method used to help analyze time series data in this study is the Autoregressive Distributed Lag

(ARDL) analysis method. This analysis is used to see and state the functional relationship between independent variables and dependent variables in the short and long term. The ARDL method is used in this research test because when the stationarity test is carried out at the level level, the time series data is not stationary but stationary at different levels of differentiation (7).

Autoregressive Distributed Lag (ARDL) Model, is a combination of AR (Auto Regressive) and DL (Distributed Lag) models. The AR model is a model that uses one or more past data from the dependent variable. While the DL model is a regression linking data at present and past time (lagged) from the independent variable (8).

The data will be analyzed using the Autoregressive Distributed Lag (ARDL) analysis method, according to (9) in general, the ARDL model can be explained by the following equation:

$$y_t = a + \sum_{i=1}^n \alpha_1 y_{t-1} + \sum_{i=1}^n \alpha_2 x_{1t-1} + \beta_1 x_{1t} \quad (1)$$

Description: Coefficient α : Short-term dynamic relationship model, Coefficient β : Long-term dynamic relationship model.

The advantage of ARDL is its ability to detect both long-term and short-term dynamics. Based on the general ARDL model in equation (1) which is the short-term relationship equation is as follows:

$$\sum_{i=1}^n \alpha_1 y_{t-1} + \sum_{i=1}^n \alpha_2 x_{1t-1} \quad (2)$$

The long-term relationship in the application of the ECM model (application of the Error Correction Model) is shown by the equation:

$$\beta_1 x_{1t} \quad (3)$$

Based on the explanation above, the ARDL equation used in this study is:

$$\begin{aligned} INF_t = a + \sum_{i=1}^n \alpha_1 INF_{t-1} + \sum_{i=1}^n \alpha_2 EXP_{t-1} + \sum_{i=1}^n \alpha_3 IMP_{t-1} \\ + \sum_{i=1}^n \alpha_4 DI_{t-1} + \beta_2 EXP_t + \beta_3 IMP_t + \beta_4 DI_t \quad (4) \end{aligned}$$

Where: INF is the Inflation Rate, EXP is export, IMP is import, and DI is Domestic Investment, a; Constant, Coefficient α ; Short-term dynamic relationship model, Coefficient β : Long-term dynamic relationship model, t; Year.

Furthermore, there are several stages of testing, namely: Stationarity Test (Unit Root Test), Determination of Optimum Lag, ARDL Estimation (Short Term), Cointegration Test (Bound Test), ECM Estimation (Long Term), Classical Assumption Test, and Stability Test (CUSUM Test) ARDL Model.

3. Result and Discussions

To estimate and analyze data on the influence of Exports, Imports, and Domestic Investment (DI) on the Inflation Rate in Indonesia, the ARDL (Auto Regressive Distributed Lag) model is used. There are several stages of testing in estimating the ARDL model, as follows:

3.1. Stationarity Test Results (Unit Root Test)

To avoid the problem of spurious regression, what must be done is to change non-stationary data into stationary data (10). The stationarity test is carried out using the Unit Root Test to determine at what level or difference data can be said to be stationary. If the level of the data is not yet stationary, data differentiation is carried out at the first difference level. If the data at the first difference level is still not able to be stationary, then the data is not suitable and feasible to use the ARDL model, because the ARDL model can only be used if the data is stationary at the level and first difference levels (11).

TABLE 1: Results of Level and First Difference Stationarity Tests.

Variables	Level Prob*	Description	First difference Prob*	Description
Inflation	0.0001	Stationary	0.0000	Stationary
Export	0.9293	Non-stationary	0.0047	Stationary
Import	0.8478	Non-stationary	0.0002	Stationary
DI	0.0000	Stationary	0.0000	Stationary

Source: Data processed by Eviews Note: $\alpha = 5\%$

From the table above, it can be seen that the inflation and Domestic Investment (DI) variables have been stationary at the level, while the Export and Import variables at the level show results that are not yet stationary because the probability value is more than $\alpha = 0.05$. So that re-testing is carried out at the first difference level. The test results at

the first difference level show that all Inflation, Export, Import, and Domestic Investment variables have been stationary at the first difference level. This has fulfilled the ARDL test assumption that data stationarity applies at the level and also the first difference.

3.2. Results of Determining Optimum Lag

Determining the optimum lag aims to find and find out the amount of time lag or time interval in the research variables that are by the Autoregressive Distributed Lag model. In this study, the determination of Optimum Lag uses the Akaike Information Criteria (AIC). To determine the best ARDL model, can be seen from the smallest AIC value.

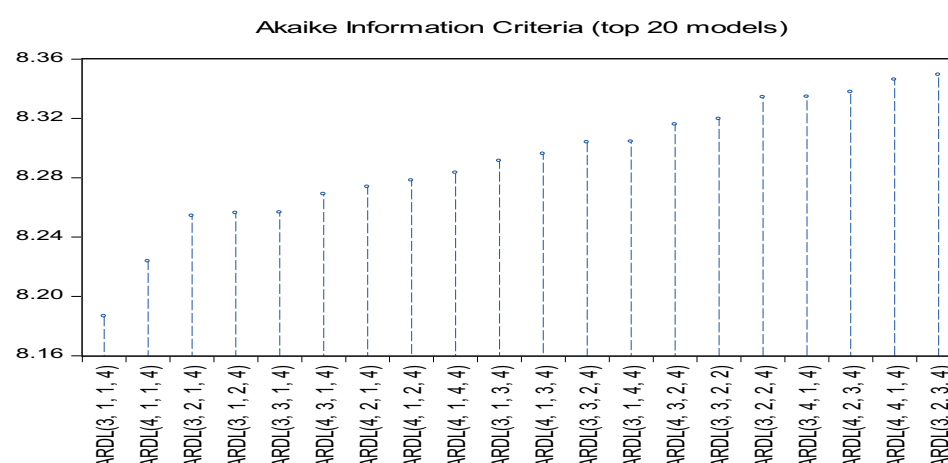


Figure 1: Results of Determining Optimum Lag.

The image above shows that of the 20 best ARDL models presented by AIC, the selection results chose the ARDL model (3,1,1,4) as the most appropriate model to use in this study. The ARDL model (3,1,1,4) means that the Inflation Rate variable will be estimated with 3-time lags, the Export variable will be estimated with 1-time lag, the Import variable will be estimated with 1-time lag, and the Domestic Investment (DI) variable will be estimated with 4-time lags.

3.3. ARDL Estimation Results (Short Term)

After it is known that the optimum lag of the ARDL model to be used is the ARDL model (3,1,1,4), a short-term ARDL estimation is carried out. The results of the analysis show that the short-term influence of the ARDL model on the independent variables and dependent variables forms a short-term relationship equation used in this study, namely:

$$\begin{aligned}
INF_t = & -4.9770 - 0.8810 * D(INF)_{(-1)} - 0.4827 * D(INF)_{(-2)} - 0.6699 * D(INF)_{(-3)} \\
& + 0.9014 * D(EXP) - 1.1119 * D(EXP)_{(-1)} - 0.4861 * D(IMP) + 1.0901 * D(IMP)_{(-1)} \\
& - 0.4551 * D(DI) - 0.4767 * D(DI)_{(-1)} - 0.3277 * D(DI)_{(-2)} \\
& - 0.1500 * D(DI)_{(-3)} - 0.1949 * D(DI)_{(-4)} \quad (5)
\end{aligned}$$

$$R^2 = 0.825 \quad F_{Stat} = 4.723 \quad DW = 1.819$$

The results of the analysis above show that the differences in the variables *INF* (-1), *INF* (-2), *INF* (-3), *EXP*, *EXP* (-1), *IMP* (-1), *DI*, *DI* (-1), and *DI* (-4) have a significant effect on *INF* in the short term, while the differences in the variables *IMP*, *DI* (-2), and *DI* (-3) are not significant. The results of this study are in line with research conducted by (12), which found that the Inflation Rate in the previous 3 time periods had a negative and significant effect on the Inflation Rate in the current period. This shows that government policies, namely monetary and fiscal authorities, are credible policies to achieve a low and reasonable Inflation Rate in the last 3 years.

Therefore, it can be assumed that when the Inflation Rate increased in the previous year, the government paid more special attention to the Inflation Rate by making policies so that economic sectors could continue to run so that they can avoid the scarcity of domestic goods and keep the price of goods stable which in the end the Inflation Rate will also be stable. The results of this study are also supported by the results of previous research conducted by (13) which found that in the short term Exports have a positive and significant effect on the Inflation Rate in Indonesia. This means that when aggregate demand exceeds the level of domestic output or domestic aggregate supply, the mismatch between demand and supply conditions will lead to inflationary conditions.

The results of this study are supported by the results of previous studies conducted by (14) which also stated that in the short term, exports have a negative and significant effect on the inflation rate in Indonesia. This can be seen in the period of this study, especially during the monetary crisis that hit Indonesia in early July 1997, resulting in the export value in 1997 and 1998 decreasing from 53,444 million USD to 48,848 million USD or decreasing by 8.6% and the inflation rate in 1998 increasing from 11.1% to 77.6%.

The declining export value was also influenced and exacerbated by various national problems such as crop failures due to long dry seasons, forest fires, declining demand in the international market, and many companies having to close, thus increasing unemployment. This illustrates that economic sector activities at that time could not run smoothly and had an impact on the decline in the amount of domestic output which would directly cause the export value to also decrease.

This study is supported by previous research conducted (15) which states that in the short term, imports in the current year show a negative but insignificant effect on the inflation rate in Indonesia. It can be assumed that every year the domestic aggregate demand and supply for imported goods changes relatively due to consumer income levels, consumer tastes, and domestic prices of goods. So in responding to consumer aggregate demand for imported goods and aggregate supply or the limited amount of production of goods domestically, the government in this case the fiscal authority stimulates importers to increase the value of imports by making import policies so that tax costs are reduced and import regulations are simplified so that imported goods can be easily enjoyed by domestic consumers and the amount of domestic goods supply is sufficient with the hope that the price level of domestic goods will also be stable.

The results of this study differ from the results of previous research conducted by (2) which found that in Pakistan imports have a positive and significant effect in the short term on the inflation rate. In addition, this study is in line with (3) which found an influence of investment on inflation in Sri Lanka. Likewise, in line with the research of (16) which found a negative influence of investment on inflation. (4) also emphasized the significant influence of investment, exports, and imports in India, although the investment data used in the study was foreign investment.

3.4. Cointegration Test Results (Bound Test)

The next stage in the ARDL model is to conduct a cointegration test (Bound Test) to determine whether or not there is a long-term relationship between the independent variables and the dependent variables. From the Bound Test results, the f-statistic value is greater than the f-critical value at the upper limit of I (1) or 1st difference at a significance level of 1%, namely $10.25 > 4.66$. These results indicate that the variables studied have cointegration at a significance level of 1%. This proves that the three independent variables in this study, namely Exports, Imports, and Domestic Investment (DI), have a long-term relationship to the Inflation Rate in Indonesia.

3.5. ECM Estimation Results (Long Term)

After the cointegration test is carried out and the model is declared to have a long-term relationship, the next step is to estimate ARDL by applying the Error Correction Model to produce a long-term relationship equation or long-run form. In the ARDL Model with the application of the Error Correction Model (ECM), it is a long-term model that will produce a Cointeq probability value or Error Correction Term (ECT). The Cointeq probability value or ECT must be <5% error rate. And the coefficient value in Cointeq shows the speed of adjustment which is the speed of adjustment in responding to changes.

From the results of the analysis, it can be seen that the long-term influence of the ARDL model on the Export, Import, and Domestic Investment (DI) variables on the Inflation rate variable is presented in the following equation:

$$\text{CointEq} = INF_t - (-0,0694 \cdot D(EXP)_t + 0,1991 \cdot D(IMP)_t - 0,5289 \cdot D(DI)_t - 1,6405)) \quad (6)$$

The results of the equation above show that the CointEq value $(-1) = -3.033631$ and the probability value is significant at a 5% error rate, which means that there is a model adjustment from the short term to the long term in this model. The Cointeq coefficient shows the speed of adjustment or the speed of adjustment in responding to changes. The ECT or CointEq value is negative and significant, so the ARDL (3,1,1,4) model has met the validity requirements. The CointEq coefficient value shows a speed of adjustment of 303% per year or it can be interpreted that when the Inflation Rate variable experiences a shock, it will be corrected by the Export, Import, and DI variables at a speed of 303% per year or adjusted in the next 3 years. Furthermore, it is known that the DI variable has a significant effect on the Inflation Rate in the Long Term with a coefficient value of -0.528869. This means that if there is a 1% increase in DI, the Inflation Rate in Indonesia will fall by 0.52%, while EXP and IMP are not significant.

The results of this study are supported by the results of research conducted by (17) which states that in the long-term period of 1990-2016, Exports had a negative but insignificant effect on the Inflation Rate in Indonesia because demand in the international market for Export goods always changes every year. The results of this study are supported by the results of research conducted (13) which states that Imports have a positive but insignificant effect on the Inflation Rate in Indonesia. Imports have a positive but insignificant effect on the Inflation Rate in Indonesia because there are many regulations related to Import policies from the government, domestic demand, and also fluctuating price levels in the international market.

This study is also in line with the findings of (4) who confirmed the significant influence of investment, exports, and imports in India, although the investment data used in the study was foreign investment.

3.6. Classical Assumption Test

The results of the classical assumption test show that the model used passes or is free from the problems of normality, autocorrelation, heteroscedasticity, and multicollinearity.

3.7. ARDL Model Stability Test

The ARDL model stability test is used to see the stability of the test parameters on short-term and long-term variables so that it can be seen that the independent variables and dependent variables tested with this ARDL model are stable and valid for interpretation.

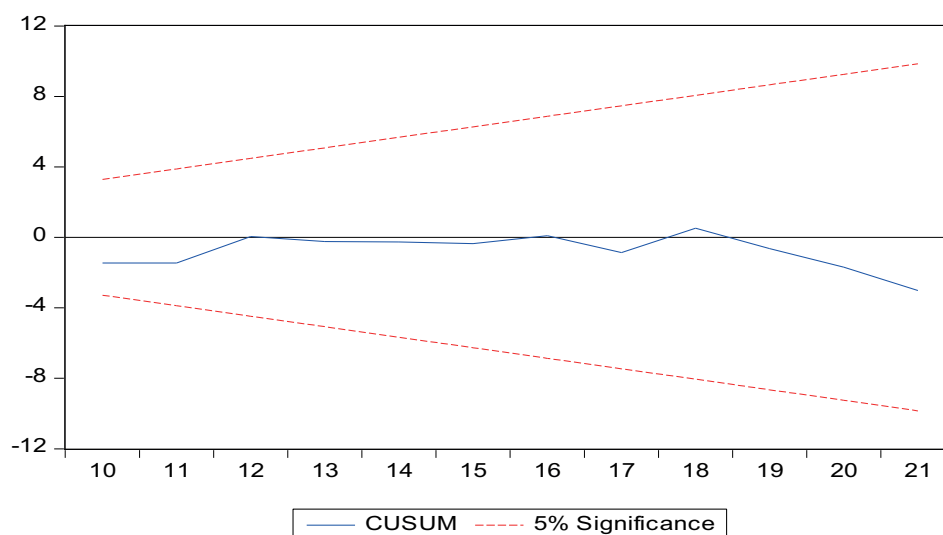


Figure 2: Stability Test Results (CUSUM Test) of the ARDL Model. *Source: Data processed by Eviews.*

The figure above shows that the blue line which is the CUSUM line is still between the red line which is the significant line with an error rate of 5%, meaning that the ARDL model used is in a stable state for use in this study.

4. Conclutions

Based on the results of the analysis and discussion that have been presented, the following conclusions can be drawn:

1. In the short term, the Inflation rate at lags 1, 2, and 3 or in the previous year, 1 year before, and 3 years before has a negative and significant effect on the current year's Inflation rate in Indonesia. In addition, the current year's Export also has a positive and significant effect on the Inflation rate in Indonesia. Meanwhile, Export at lag 1 or 1 year before shows a negative and significant effect on the current year's Inflation rate in Indonesia. However, in the long term, it does not have a significant effect on the Inflation rate in Indonesia

2. In the short term, the current year's Import does not have a significant effect on the Inflation rate in Indonesia. In the short term, Import at lag 1 or 1 year before has a positive and significant effect on the current year's Inflation rate in Indonesia. However, in the long term, Imports do not have a significant effect on inflation.

3. In the short term, Domestic Investment in the current year, 1 year before, and 4 years before shows a negative and significant effect on the current inflation rate in Indonesia. Domestic Investment in the long term also has a negative and significant effect on the inflation rate in Indonesia. Meanwhile, in the short term, Domestic Investment in the previous 2 years and 3 years before did not show a significant effect on inflation.

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