ANALYZING INDONESIA’S INFLATION IN 1998-2020: ERROR CORRECTION MODEL APPROACH

Shaila Farizqiyah*, Indah Yuliana
State Islamic University of Maulana Malik Ibrahim, Malang, East Java, Indonesia
*shaila.farizqiyah@gmail.com

ARTICLE INFO
Published: October 30th, 2022
Keywords: inflation, welfare, interest rate

ABSTRACT
Inflation is a macroeconomic problem that is of concern, unstable inflation has a negative impact on people’s welfare, so inflation control is important. The purpose of this study is to estimate the factors that influence inflation in Indonesia for the period 1998-2020. The research method uses descriptive analysis by providing an overview of the development of inflation, interest rates, exchange rates, household consumption, and GDP in Indonesia during 1998-2020. Quantitative analysis using Error Correction Model (ECM). This study uses secondary data from the Central Statistics Agency (BPS) and Bank Indonesia (BI). The results obtained indicate that all variables (interest rates, exchange rates, household consumption and GDP) simultaneously have a significant effect on inflation, both in the long and short term. Based on the results of the partial test, the interest rate variable has a positive and significant effect on inflation in Indonesia both in the long and short term. The exchange rate variable partially has a negative and significant effect on inflation in Indonesia, both in the long and short term. Furthermore, the GDP variable partially has a positive and significant effect on inflation in the long term but not significant in the short term. Meanwhile, the household consumption variable partially has no significant effect on inflation in Indonesia during the 1998-2020 period.

INTRODUCTION
The economy of a country can be seen from various macroeconomic indicators. These macroeconomic indicators include exchange rates, economic growth, trade balance deficit and inflation (Indonesia’s National Development Planning Agency, 2021). Inflation is an interesting economic phenomenon to discuss, especially with regard to its broad impact on macroeconomic aggregates. Inflation is also a problem that every economy faces. The extent to which this problem is bad differs from one time to another, and differs from country to country. Of the various macroeconomic indicators, inflation is one of the important indicators for a country’s economy. Inflation has a considerable influence on the achievement of several macroeconomic policy objectives, such as economic growth, employment opportunities, income distribution and balance of payments. In addition, inflation can create an economic dilemma in every country.

Inflation can be caused by monetary and nonmoneter factors (Gunawan, 1991). Furthermore, the view of inflation was refined by the emergence of the theory of expectations, which revealed that economic actors form expectations of the inflation rate based on adaptive expectations and rational expectations. Figure 1 shows the development of inflation and economic growth from 1998-2020 in Indonesia.
Analyzing Indonesia’s Inflation in 1998-2020: Error Correction Model Approach

Figure 1. Inflation Development and Economic Growth Rate in 1998-2020 in Indonesia
Source: Bank Indonesia, 2021 (Processed)

Inflation is one of the important macroeconomic issues to control. The importance of controlling inflation is based on the consideration that high and unstable inflation has a negative impact on people's welfare (Endri, 2008). So the author is interested in conducting research on how the inflation rate in Indonesia is with the title: "Analysis of the Inflation Rate in Indonesia in 1998-2020 (Error Correction Model Approach)".

Given that there are so many factors determining inflation in a country, it is necessary to identify the source of inflation in Indonesia. So that the formulation of the problems in this study is how fluctuations in inflation, interest rates, exchange rates, household consumption and Gross Domestic Product (GDP) in Indonesia for the 1998-2020 period, what factors affect inflation fluctuations in Indonesia during the 1998-2020 period and how the implications of government policies for inflation stabilization in Indonesia.

The purpose of this study is the first to analyze the development of inflation, interest rates, exchange rates, household consumption and Gross Domestic Product (GDP) in Indonesia for the period 1998-2020 (Novita & Herianingrum, 2020). Second, to estimate and analyze what factors affect inflation fluctuations in Indonesia during the 1998-2020 period. Third, to analyze the implications of government policies for inflation stabilization in Indonesia.

Effect of Interest Rates on Inflation

The relationship between interest rates and inflation is in line with the factual condition that the variable interest rate used in this study is the policy rate of Bank Indonesia. Thus, the relationship between inflation as the final target of monetary policy and interest rates as the operational target of monetary policy should be strong. This is also in line with Juhro's opinion (2021) which states that monetary policy seeks to influence aggregate demand to achieve goals, namely the inflation rate using interest rates. Changes in interest rates will affect the cost of capital which in turn will affect investment expenditure and consumption which are components of aggregate demand.
A positive relationship can be explained using the logic of this regression equation, namely that if the policy rate rises, then inflation will rise and vice versa if the policy rate falls, inflation will fall. This is because the unidirectional relationship in this regression equation is the indented variable and its effect on the independent variable. In the facts on the ground, as Juhro argued above, Bank Indonesia will respond to current and future inflation developments. If inflationary pressures increase now and in the future, Bank Indonesia will raise the policy rate to dampen the inflation rate. Similarly, it will lower interest rates whenever inflationary pressures are reduced.

The results of this study are in line with the results of research by Andrianus and Niko (2006) which show that interest rates have a significant effect on inflation. Also the results of the research of Langi et al. (2014) which also uses the ECM model shows that Bank Indonesia's interest rate in the short term has a positive and significant relationship to changes in the percentage of the inflation rate. However, from the results of Soleh's research (2013) there is a different direction, namely showing that interest rates have a negative and significant effect on inflation.

Effect of Exchange Rate on Inflation

For the long-term relationship between the exchange rate and inflation, it can be explained that the nominal movement of the exchange rate (nominal) has increased or depressed since 1998-2020. On the other hand, inflation in Indonesia tends to decline. This is due to the normal world oil price and other major world commodity prices, inflation in Indonesia tends to show a downward trend. On the contrary, the rupiah exchange rate against the US Dollar nominally tends to increase, from time to time. With such movements in exchange rate and inflation data, then the coefficient of the equation will show negative signs. The results of Listiani's (2006) research as well as Andrianus and Niko (2006) also concluded that the exchange rate negatively affects inflation. However, the results of this study are not in line with the results of research conducted by Loungani and Swagel (2000) which states that developing countries with a free-floating exchange rate system, the influence of expansionary policies both through the money supply and exchange rate depreciation encourages an increase in inflation and the impact is significant.

In the short term, the exchange rate also has a negative but not significant relationship to inflation, it can be explained that short-term exchange rate fluctuations are indeed very dynamic, and this exchange rate movement is not all transmitted by an increase in the domestic price level. The existence of a negative relationship is due to factors outside the exchange rate being more dominant in the formation of the inflation rate, for example, the increase in fuel prices, food prices, electricity tariffs, transportation tariffs and so on.

Effect of Home Consumption Tano p Inflation

The results of quantitative research show that household consumption has no significant effect on inflation can be attributed to the results of a descriptive analysis, namely that the inflation trend throughout 1998-2020 tends to decrease. On the other hand, Household Consumption other than in 1998 and 2020, tends to have stable growth (Martanto et al., 2021).
The Effect of GDP on Inflation

The results of quantitative research that show GDP only has a significant effect in the long term on inflation, can be attributed to seeing the results of a descriptive analysis that the inflation trend throughout 1998-2020 tends to decrease. On the other hand, GDP tends to be stable in growth, in addition to 1998 and 2020. The data on GDP in 1998 and 2020, which contracted quite deeply, are likely to affect the condition of the relationship between these two variables. Therefore in short-term relationships it becomes unconstitutional (Priyono, 2016).

Policy Implications

To re-quote Milton Friedman's statement, "Inflation is always and everywhere phenomena", shows its relevance in Indonesia, because from the research period of 1998-2020, inflation on an annual basis continued to appear, high and fluctuating. However, indeed in the last 6 years inflation in Indonesia has begun to show a decline and is relatively low (Listika et al., 2019).

From the results of the descriptive analysis, it can be identified the causes of inflation in the research data range, namely 1998-2020, namely that fluctuations and high inflation mainly occur during times when there is a shock in fuel price increases. Next, if there is a decrease in fuel prices, inflation tends to fall. Seasonally, the National Religious Holidays period can also drive inflation up, due to an increase in public demand. The results of the quantitative analysis identified the influence of variable interest rates, exchange rates, household consumption and GDP on inflation in Indonesia.

Monetary Policy

Monetary policy can be said to be the spearhead in controlling inflation from the demand side (Haryono et al., 2003). In this case, Bank Indonesia influences the demand for public money by raising or lowering interest rates. This increase in interest rates will affect people's choice to keep money in the bank or use it for investment. Investment will increase aggregate demand. In relation to inflation, when there is high inflationary pressure, Bank Indonesia will raise interest rates and will reduce investment and ultimately reduce aggregate demand, which in turn will reduce inflationary pressures.

Fiscal Policy

As Nopirin (1997) defines fiscal policy related to inflation, fiscal policy is a policy that concerns the regulation of government spending and taxation that can directly affect total demand and thus affect prices. This condition can trigger the ineffectiveness of the policies taken, because efforts to encourage high economic growth will have an impact on inflation.

METHOD

The analytical methods used in this study are qualitative and quantitative descriptive analysis. The descriptive analysis method aims to provide a description or overview of developments regarding inflation, interest rates, exchange rates, household consumption, and GDP.
Analyzing Indonesia’s Inflation in 1998-2020: Error Correction Model Approach

in Indonesia in 1998-2020. Meanwhile, quantitative analysis is used to see how the influence of free variables (Interest Rate, Exchange Rate, Household Consumption and GDP) on bound variables, namely Inflation.

The type of data used in this study is secondary data that is quantitative. The main data in this study are inflation, BI policy rate, exchange rate in Indonesia, household consumption in Indonesia and gross domestic product. The data is sourced from the Central Statistics Agency (BPS) and Bank Indonesia (BI). In addition, the supporting data of this research also comes from various national and international journals.

To answer the problem in this study, namely by using the Error Correction Model (ECM). This model is taken because it can see and analyze short-term and long-term relationships the influence of independent variables on dependent variables. In addition, ECM is able to correct short-term imbalances towards long-term equilibrium and is also able to explain the influence between independent variables on dependent variables in the present and past times by using time series data or non-stationary time series. This analysis uses the help of Eviews 8 with the aim of determining the influence of independent variables on their dependent variables.

The model equation is as follows:

\[ INF = f (SB, KURS, KONS, PDB) \]

INF = Inflation
SB = Interest Rate (Bank Indonesia policy rate)
KURS = Rupiah Exchange Rate per US dollar
KONS = Household Consumption
GDP = Gross Domestic Product

RESULT AND DISCUSSION

Long-Term Regression

The Ordinary Least Square model is carried out to determine the impact of interest-rate-free variables, exchange rate, Household Consumption, and GDP against inflation-bound variables in the long term. The following are the results of long-term estimates of free variables against inflation in the period 1998 to 2020, as shown in table 1.

Table 1. Long-term estimation output

<table>
<thead>
<tr>
<th>Dependent Variable: INF</th>
<th>Method: Least Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Included Observations: 23</td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Coefficient</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>C</td>
<td>-135.5740</td>
</tr>
<tr>
<td>SB</td>
<td>2.788165</td>
</tr>
<tr>
<td>LOG(KURS)</td>
<td>-18.64807</td>
</tr>
<tr>
<td>LOG(KONS)</td>
<td>-86.19925</td>
</tr>
</tbody>
</table>
Then the model obtained is:

\[
\text{INF}_t = \beta_0 + \beta_1 \text{SB}_t + \beta_2 \log(\text{KURS})_t + \beta_3 \log(\text{KONS})_t + \beta_4 \log(\text{PDB})_t + \epsilon_t
\]

\[
\text{INF}_t = -135.5740 + 2.788165\text{SB}_t - 18.64807\log(\text{KURS})_t - 86.19925\log(\text{KONS})_t + 101.6419\log(\text{PDB})_t + \epsilon_t
\]

Source: Data Processed, 2021

In the long run the probability for the exchange rate variable of 0.0679 is significant at a confidence level of 10%, GDP of 0.00786 is significant at a confidence level of 10%, and SB of 0.0000 is significant at a confidence level of 5%, while for probability of a KONS variable of 0.2034 means insignificant. The exchange rate coefficient has a statistically significant effect and has a negative sign. The value of the variable exchange rate coefficient is -18.64807, indicating that there is a negative influence between the exchange rate variables on inflation. It means that if the exchange rate rises (depreciates) by 1%, Indonesia's inflation will decrease by 18.64807 percent assuming other variables remain.

The SB coefficient has a statistically significant effect and has a positive sign. The value of the SB variable coefficient is 2.788165. This shows that there is a positive influence between the variable interest rates on inflation. This means that if the interest rate rises by 1 percent, Indonesia's inflation will increase by 2.788165 percent assuming other variables remain.

The SB coefficient has a statistically significant effect and has a positive sign. The value of the SB variable coefficient is 2.788165. This shows that there is a positive influence between the variable interest rates on inflation. This means that if the interest rate rises by 1 percent, Indonesia's inflation will increase by 2.788165 percent assuming other variables remain.

Next, the GDP coefficient has a significant effect and has a positive influence with the value of the variable coefficient of GDP being 101.6419. This shows that there is a positive influence between the variables of GDP on Inflation. This means that if GDP increases by 1 percent, Indonesia's inflation will increase by 101.6419 percent assuming other variables remain. Meanwhile, the coefficient of cons has no statistically significant effect and has a negative sign. The value of the cons variable coefficient is -86.19925.

After previously testing the requirements to determine the estimation model, it is known that the data is stationary at the first difference level and cointegration occurs, the model should use an
Analyzing Indonesia’s Inflation in 1998-2020: Error Correction Model Approach

ECM estimate. After regressing free variables to bound variables, the next step is to look at the value of the root units of the residual or Error Correction Term (ECT) of the regression equation.

**Table 3.** Root Unit Test Results against Residual Regression Equations

<table>
<thead>
<tr>
<th>Null Hypothesis: RES has a unit root</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lag Length: 1 (Automatic – based on SIC, maxlag=4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-3.420390</td>
</tr>
<tr>
<td>Test critical values: 1% level</td>
<td>-3.788030</td>
</tr>
<tr>
<td>5% level</td>
<td>-3.012363</td>
</tr>
<tr>
<td>10% level</td>
<td>-2.646119</td>
</tr>
</tbody>
</table>


Source: Data Processed, 2021

From table 3, it can be seen that the test results of the root test unit of the residual regression equation are significant at the first difference level, it can be seen that the probability value is less than the signification rate of 5%. Thus the results of the stationarity test against residuals are further strengthened that against the data used there is cointegration at the level level.

**Short-Term Regression (ECM)**

ECM is used to determine the effect of free variables on short-term bound variables and their quick adjustment to return to their long-term balance of time series data for variables that have cointegration. The following is a table of ECM model regression results:

**Table 5. ECM Model Regression Results (Short Term)**

<table>
<thead>
<tr>
<th>Dependent variable: D (INF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Included Observations: 22 after adjustments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.190944</td>
<td>2.695328</td>
<td>-0.070843</td>
<td>0.9444</td>
</tr>
<tr>
<td>D(SB)</td>
<td>2.915832</td>
<td>0.254828</td>
<td>11.44237</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(LOG(KURS))</td>
<td>-19.93933</td>
<td>9.225721</td>
<td>-2.161276</td>
<td>0.0462</td>
</tr>
<tr>
<td>D(LOG(KONS))</td>
<td>-102.2551</td>
<td>97.37922</td>
<td>-1.050071</td>
<td>0.3093</td>
</tr>
<tr>
<td>D(LOG(PDB))</td>
<td>121.4591</td>
<td>100.9522</td>
<td>1.203135</td>
<td>0.2464</td>
</tr>
<tr>
<td>RES(-1)</td>
<td>-0.687986</td>
<td>0.233556</td>
<td>-2.945704</td>
<td>0.0095</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.958289</td>
<td>Mean dependent var</td>
<td>-3.448182</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.945255</td>
<td>S.D. dependent var</td>
<td>16.79582</td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>3.929842</td>
<td>Akaike info criterion</td>
<td>5.802077</td>
<td></td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>247.0986</td>
<td>Schwarz criterion</td>
<td>6.099634</td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-57.82284</td>
<td>Hannan-Quinn criter.</td>
<td>5.872172</td>
<td></td>
</tr>
</tbody>
</table>
Analyzing Indonesia’s Inflation in 1998-2020: Error Correction Model Approach

F-statistic  73.51874  Durbin-Watson stat  1.584830
Prob(F-statistic)  0.000000

Source: Data Processed, 2021.

The models obtained are:
\[
\text{INF}_t = \beta_0 + \beta_1 \text{D}(\text{SB})_t + \beta_2 \text{D} \left( \log(\text{KURS}) \right)_t + \beta_3 \text{D} \left( \log(\text{KONS}) \right)_t + \beta_4 \text{D} \left( \log(\text{PDB}) \right)_t + \beta_4 \text{RES}(-1)_t + \epsilon_t
\]

\[
\begin{align*}
\text{INF}_t &= -0.190944 + 2.915832 \text{D}(\text{SB})_t - 19.93933 \text{D} \left( \log(\text{KURS}) \right)_t - 102.2551 \text{D} \left( \log(\text{KONS}) \right)_t + 121.4591 \text{D} \left( \log(\text{PDB}) \right)_t - 0.687986 \text{RES}(-1)_t + \epsilon_t \\
(0.0000) & (0.0462) (0.3093) (0.2464) \\
\end{align*}
\]

F-statistic = 73.51874; F-probability = 0.000000; \text{R}^2 = 0.958289

From the results of the estimates in the table above, in the short term the probability for the SB and KURS variables is significant at a confidence level of 5%. Whereas the variables KONS and GDP for the short term are not significant at both 5% and 10% confidence levels.

A statistically significant \text{RES}(-1) value means that the specific model used is valid. A \text{RES}(-1) coefficient value of -0.687986 indicates that short-term equilibrium fluctuations will be corrected towards a long-term equilibrium. This means that based on the speed of adjustment, there is a 69% imbalance in the short-term effect of the variables Interest Rate, Exchange Rate, Household Consumption and GDP on the variable Inflation. The SB (Interest Rate) change coefficient has a statistically significant effect and has a positive sign. The value of the variable coefficient of interest rates is 2.915832, indicating that there is a positive influence between the variables of interest rates on inflation. That is, if the Interest Rate rises by 1 percent then inflation increases by 2.915832 percent assuming other variables remain.

The exchange rate change coefficient has a statistically significant effect and has a negative sign. The value of the KURS (Exchange rate) variable coefficient is -19.93933, indicating that there is a negative influence between the KURS variables on inflation. That is, if the KURS rises by 1 percent (or depreciation) then inflation decreases by 19.93933 percent assuming other variables remain. The coefficient of change in KONS (Household Consumption) and GDP (Gross Domestic Product) has an insignificant effect statistically (5% and 10%).

Hypothesis Test

This hypothesis test is used to determine the effect of interest rates, exchange rates, household consumption, GDP on Indonesia's inflation both partially and simultaneously.

Coefficient of Determination (R²)

The coefficient of determination in the long term is obtained by a figure of 0.941401, meaning that the contribution of all free variables in explaining bound variables by 94.14% and the remaining 5.86% is explained by other variables outside the model. Meanwhile, in the short term, a figure of 0.958289 was obtained, which shows that the contribution of all free variables in explaining inflation-bound variables of 95.83% and the remaining 4.17% is explained by other variables outside the model.
Simultaneous Significance Test (F Test)

Based on the results of the analysis using the Eviews 8 software, in the long term a probability value of F of 0.000000 is obtained and similarly in the short term a probability value of F of 0.0000 is obtained in a significant level of 5%, the F test can be concluded that in the long term and in the short term all variables both Interest Rate, Exchange Rate, Household Consumption, and GDP together have a significant effect on the bound variable, namely Inflation.

Partial Significance Test (T-test)

The results of the partial test analysis (Test t) in the long term showed that the variables free of Interest Rates, Exchange Rates and GDP individually had a significant effect on inflation at a confidence level of 10% (except SB 5%). The partial test in the short term shows that the variables of interest rates and exchange rates have a significant effect on inflation at signification levels of 5% and 10%, respectively.

The results of the analysis of the Interest Rate variable show that in the long term this variable has a coefficient of 2.788165 and a probability of 0.0000, while in the short term it has a coefficient of 2.915832 and a probability of 0.0000. In a significant degree of 5%, the variable interest rate has a significant and positive effect on inflation both in the long and short term.

Furthermore, the results of the analysis show that the exchange rate variable in the long term has a coefficient of -18.64807 and a probability of 0.0679, while in the short term it has a coefficient of -19.93933 and a probability of 0.0462. In a significant degree of 10%, the exchange rate variable is significant and negatively affects inflation both in the long term and in the short term.

The analysis of the Household Consumption variable shows that in the long term this variable has a coefficient of -86.19925 and a probability of 0.2034, while in the short term it has a coefficient of -102.2551 and a probability of 0.3093. In the 5% significance level, the variable household consumption both in the long term and in the short term does not have a significant effect on inflation.

Finally, the GDP variable in the long term has a coefficient of 101.6419 and a probability of 0.07686, while in the short term it has a coefficient of 121.4591 and a probability of 0.2464. In the level of significance of 10%, the GDP variable has a significant and positive effect on inflation in the long term, but has an insignificant effect on inflation in the short term.

CONCLUSION

During the 1998-2020 period, Indonesia’s economic condition as seen from the variables of inflation, interest rates, exchange rates, household consumption and GDP tended to fluctuate. Such fluctuations are mainly due to internal and external factors. External factors tend to have a strong impact on the Indonesian economy, especially during the monetary crisis in Southeast Asia 1997-1998 and the global financial crisis in 2008. During the 1997-1998 crisis, inflation was relatively high, caused, among other things, by deep exchange rate depreciation. High inflation has prompted Bank Indonesia to implement a tight monetary policy by raising interest rates that are relatively
Analyzing Indonesia’s Inflation in 1998-2020: Error Correction Model Approach

high. The combination of these further makes household consumption and GDP contract. As for the global financial crisis in 2008-2009, economic conditions were not as bad as during the 1997-1998 crisis. Inflation and interest rates have increased and the exchange rate has also depreciated. Nevertheless, household consumption and GDP can still grow quite well.

Based on the results of testing the inflation rate in Indonesia during the period 1998-2020 using the ECM method, the results were obtained, that simultaneously in both the long and short term, the variables of interest rates, exchange rates, household consumption and GDP had a significant effect on inflation. Meanwhile, based on the results of partial testing both in the long and short term, variable interest rates have a positive and significant effect on inflation in Indonesia. Partial exchange rate variables in the long term and in the short term had a negative and significant effect on inflation in Indonesia in the 1998-2020 period. Furthermore, the GDP variable partially has a positive and significant effect on inflation in the long term but not significantly in the short term. Meanwhile, the variable of partial household consumption has no significant effect in the long and short term on inflation in Indonesia during the 1998-2020 period.

REFERENCE


https://doi.org/10.29259/jep.v16i1.8874

https://doi.org/10.22437/jpe.v16i3.14360
Analyzing Indonesia’s Inflation in 1998-2020: Error Correction Model Approach


Priyono, T. C. (2016). Esensi ekonomi makro. Zifatama Publisher.