

INFLATION VALUE FORECASTING POST COVID-19 IN DENPASAR USING ARIMA

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ABSTRACT

Forecasting is used to predict something that will happen in the future so that appropriate actions can be taken. ARIMA is a time series forecasting method that was developed where the observation data in a time series data interact. Inflation instability in Denpasar City in the future will make it difficult for the central bank and the government to determine policy. The Covid-19 pandemic has an impact on the value of inflation in Denpasar City. The purpose of this study is to estimate inflation in Denpasar City after Covid using the best ARIMA model. Inflation data was taken from BPS Denpasar City from January 2020 to August 2022. ARIMA analysis was carried out according to the Box-Jenkins procedure, namely searching the data, estimating parameters and significance tests, and determining the best ARIMA model. The results of the analysis show that the best ARIMA model is ARIMA (0,1,1). The results of this study indicate that monthly inflation in Denpasar City is likely to continue to increase. Based on these results, it is hoped that appropriate policies will be made to reduce inflation.

Keywords: forecasting, inflation, post covid-19, ARIMA

1. INTRODUCTION

Corona virus disease 2019 (Covid-19) throughout the world. One of the impacts of Covid-19 in 2020 is the economic impact. Based on the Official Statistical Gazette published by the Central Bureau of Statistics on Inflation Developments in March 2020, Indonesia's inflation rate was 0.10%, especially in Denpasar City the inflation rate was 0.11% [1]. An increase in the overall price level is called inflation [2]. Inflation is defined as a condition in which the price of goods increases [3]. Inflation in Denpasar City, which tends to weaken, is caused by several things, including increasing unemployment due to layoffs (Termination of Employment) and the work system that has changed to Work From Home (WFH). Research by Yanuarti et.al stated that the increase in positive cases of Covid had an effect on inflation in Indonesia [4]. A country wants low and stable inflation. High inflation will certainly cause people's real income to decrease, the price of goods to increase, and the value of the currency to decrease. According to Keynesian, if the economy has good job opportunities, an increase in government spending, an increase in private consumption and an increase in private investment, it will generate a large demand as well, causing inflation [2].

If we only look at the decline in inflation during the pandemic, this is certainly an encouraging thing. However, this low inflation of course also has an impact on other things, a decrease in production, consumption, and investment which of course will end in a decline in economic growth [5]. This is what happened during the COVID-19 pandemic. The Social Restriction Policy, lock down, and WFH caused public consumption to decline, production value also decreased. Inflation research during the Covid-19 pandemic has been carried out by many researchers such as [6-8]. However, this research focuses on inflation during the Pandemic, while this research will focus on the inflation value after the Covid 19 Pandemic. This is then the importance of forecasting or predicting inflation. Forecasting of inflation is important in economic policy makers. Inflation value predictions have also been carried out in various

studies such as (Almosova et al., 2019), (Nyoni, 2019), (Astutik, et al., 2018) with various forecasting models [9-11]. The focus of the government after the Covid-19 pandemic is of course how to stabilize the inflation rate. This research is expected to be used as a consideration for making economic policies, especially in Denpasar City for the future.

2. RESEARCH METHOD

The type of research used in this research is quantitative. The data used is monthly inflation data taken from the Central Statistics Agency in 2020 to 2022. Data analysis uses the ARIMA (Autoregressive Moving Average) model with the Box-Jenkins method. Box and Jenkins introduced the ARIMA model in 1970 which is also known as the Box-Jenkins method which consists of a series of activities to identify, estimate, and diagnose the ARIMA model with time series data [12]. This model is well known in the world of finance and economics for forecasting. The ARIMA model demonstrates an efficient ability to make short-term forecasts. In the ARIMA model, the prediction value is based on the previous time value along with the error [13].

3. RESULTS AND DISCUSSIONS

The ARIMA method consists of four stages, the first is model identification, the second is model estimation, the third is a diagnostic test, and the last is forecasting.

Model Identification Process

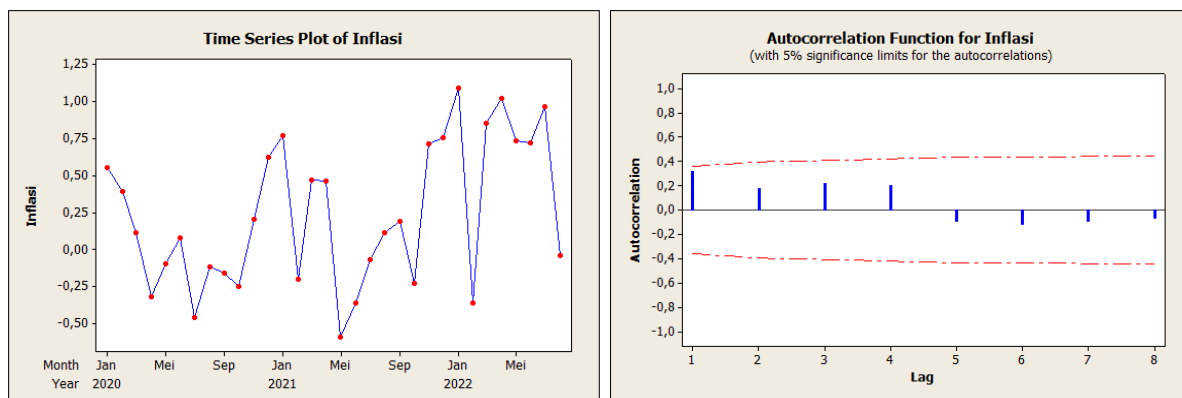


Figure 1 Time Series Plot and Autocorrelation Function

In Figure 1, it can be seen that there is no autocorrelation, seen from lag 1 to 8, all values below 0.5 indicate close to 0, and from bar lag 1 to lag 8 nothing exceeds the red boundary line. This indicates that the data is stationary. After doing the next step is to estimate the parameters which will be explained below.

Model Estimation and Parameter Significance Test

After identifying the data, the next step is to estimate the parameters. The output results obtained are as follows.

Table 1 ARIMA Model

Model	AR (1)	MA (1)
ARIMA (1,1,0)	$P_{value} = 0.028$ Significant	
ARIMA (0,1,1)		$P_{value} = 0.000$ Significant
ARIMA (1,1,1)	$P_{value} = 0.347$ Not significant	$P_{value} = 0.000$ Significant

Table 1 explains that from all the models tested, it is found that the models with all significant parameters are ARIMA (1,1,0) and ARIMA (0,1,1) models so that both models are included in the best possible model.

Best Model Selection and Diagnostic Checking

In the Best Model Selection and Diagnostic Checking, the best model selection will be carried out based on the ARIMA criteria.

Table 2 Model Selection

Model	MSE	RMSE	MAE	AIC	Log likelihood
ARIMA (1,1,0)	0.27	0.43	0.35	120.22	-70.23
ARIMA (0,1,1)	0.22	0.32	0.23	100.56	-74.76

Based on Table 2, the three significant models, one of the best models was selected which has the smallest MSE, RMSE, MAE, and AIC values, and the largest log likelihood value. From Table 2 it is known that the model that meets the criteria is ARIMA (0,1,1). Based on the ARIMA model used, the best model is ARIMA (0,1,1). The model obtained is as follows:

$$ARIMA(0,1,1): x_t = 0,94 + x_{t-1} - x_{t-2} + \varepsilon_t - 0,02\varepsilon_{t-1} .$$

Forecasting

From the estimation results, the following results are obtained: it turns out that from the three models, the ARIMA model (0,1,1) has a significant parameter, White Noise, and has the smallest MS value. Thus, the correct model for this data is ARIMA (0,1,1). Forecasting results for the next 10 months can be seen in table 3 below.

Table 3 Forecasting Results

Year	Month	Forecasting
2022	September	0.609
	October	0.631
	November	0.652

	December	0.674
2023	January	0.695
	February	0.716
	March	0.738
	April	0.759
	May	0.780
	Juni	0.802

4. CONCLUSIONS AND SUGGESTIONS

Based on the results of forecasting using the ARIMA model, the inflation rate in Denpasar in 2022 will continue to increase. If this is allowed to happen, of course there will be a spike in inflation. Therefore, based on these results, the Denpasar City government must adjust the policies taken in stabilizing the inflation rate in the midst of efforts to restore economic growth. It would be better if the government gradually restores economic growth while keeping inflation down. Of course, this effort cannot be carried out with hasty policies, nor can it be carried out by only emphasizing on one thing or one field.

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