

## Chapter 57

# Forecasting and Technical Comparison of Inflation in Turkey With Box–Jenkins (ARIMA) Models and the Artificial Neural Network

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### ABSTRACT

*Inflation refers to an ongoing and overall comprehensive increase in the overall level of goods and services price in the economy. Today, inflation, which is attempted to be kept under control by central banks or, in the same way, whose price stability is attempted, consists of continuous price changes that occur in all the goods and services used by the consumers. Undoubtedly, in terms of economy, in addition to the realized inflation, inflation expectations are also gaining importance. This situation requires forecasting the future rates of inflation. Therefore, reliable forecasting of the future rates of inflation in a country will determine the policies to be applied by the decision-makers in the economy. The aim of this study is to predict inflation in the next period based on the consumer price index (CPI) data with two alternative techniques and to examine the predictive performance of these two techniques comparatively. Thus, the first of the two main objectives of the study are to forecast the future rates of inflation with two alternative techniques, while the second is to compare the two techniques with respect to statistical and econometric criteria and determine which technique performs better in comparison. In this context, the*

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*9-month inflation in April-December 2019 was forecast by Box-Jenkins (ARIMA) models and Artificial Neural Networks (ANN), using the CPI data which consist of 207 data from January 2002 to March 2019 and the predictive performance of both techniques was examined comparatively. It was observed that the results obtained from both techniques were close to each other.*

## **1. INTRODUCTION**

With the most general meaning, inflation refers to the increase in the overall level of prices. Today, inflation is tried to be kept under control by central banks. Inflation, which is attempted to be kept under control, is not only addressed in terms of firms or individuals, but it also has a significant meaning for the general population. At this point, the cost of inflation is seen on investors and consumers in making decisions at the basic level. The high inflation environment in the countries also puts investors and consumers into an environment of instability. In this context, inflation constitutes an input at the decision-making stage for both investors and consumers. On the other hand, accurate predictions of the future inflation rates are of great importance for decision makers.

## **2. FORECASTING METHODS**

Today, time series analysis and artificial neural network methods are frequently used in inflation forecasting. Considering the preliminary reporting in terms of time series, Box-Jenkins (ARIMA) method is used in the literature. In the time series analysis, past observations of data are interdependent. Therefore, it is possible to make future estimations with ARIMA models by using the information in the past observations. In this respect, the most basic point in working with time series models is that the series should show a static structure. If the average, variance and co-variance of a time series do not change over time, it can be said that the series exhibits a static structure. If the series is static, a suitable model is established in accordance with the Box-Jenkins method and the future predictions can be performed.

On the other hand, recently Artificial Neural Network (ANN) for nonlinear time series has also been widely used to make future estimates. In the studies conducted with ANN, it was found that the economic series presents successful results in the future estimations thanks to the advantages such as learning and generalizing information from the data presented to the network.

In Turkey, inflation targeting was started in 2002 by the implicit inflation regime. Figure 1 shows the time path graph of the actual and targeted inflation for the period of 2002-2018.

When Figure 1 is analyzed, it is seen that the inflation rate which had been realized until 2005 followed a path below the targeted inflation level. A similar situation occurred in 2009 and 2010. However, in the periods other than those periods, the actual inflation rate was higher than the targeted inflation rate. Thus, the difference between the actual inflation and the targeted inflation in recent years in Turkey is increasing gradually. Hence, estimating the future rates of inflation in our country has become important in terms of the targeted inflation rate.

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