# Forecasting Gold Prices through ARIMA Model

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## ABSTRACT

Gold, a symbol of trust beyond time that has defied changing civilizations and financial systems for centuries, has maintained its value in every period and continues to be important for individuals and countries in every corner of the world. Gold is used not only as a store of value but also as a tool for creating economic and political power. In this study, the monthly price movements of the Türkiye economy between 1980-2024 were modeled, and it was aimed to predict the gold prices for 2025 based on these data. Autoregressive Integrated Moving among the Average (ARIMA) models, the ARIMA (4, 1, 3) model, is seen to be the best model according to Akaike  information criteria. In 2025, it is predicted that gold price in Türkiye will increase on a monthly basis, although there may be daily fluctuations.

**Keywords:** Gold prices, Autoregressive integrated moving average, Forecast

The study titled ‘Estimating gold prices using the refinement method’ was presented at the International Conference on Empirical Economics and Social Sciences Congress. In this study, the scope of the summary was expanded and the analysis was deepened by updating the dataset used.

## INTRODUCTION

Gold, one of the most valuable and preferred metals in history, dates back to the early stages of human history. The first traces of gold were found in excavations in Mesopotamia, Egypt, and South America. Especially due to its shining and stainless structure, gold was used as an ornament, jewelry, and religious symbol by early civilizations. Gold has been a symbol of luxury and power in Ancient Greek (1000-500 BC), Roman and Persian Empires throughout history. Gold has become a symbol not only of wealth but also of economic and political power.

The Greeks and Romans used gold coins as their main means of trade, and gold coins became widespread during the Roman Empire. In the Middle Ages (5th-15th centuries), gold was important not only for jewelry and ornaments but also for objects used in religious ceremonies and as currency. Gold coins became increasingly common in Europe. With the Age of Discovery (15th-17th centuries), the discovery of the American continent accelerated the search for gold. In the 16th century, Spain and Portugal brought large amounts of gold from America. Gold  gained great value both in Europe and among the native people of the New World. During this period, gold mining increased. In the 19th century, gold mining became more efficient, and gold consolidated its role in national economies. In the 19th century, the gold standard (a monetary system backed by gold) was adopted in many countries. Gold became the cornerstone of international trade and reserve currency for central banks.

In the 20th century, gold became a major currency, particularly during the Great Depression of 1929 and the Bretton Woods Crisis of 1971. The role of gold in the financial system had changed significantly since the end of the Woods agreement. Gold became more than just a precious metal; it became a preferred safe haven investment tool during times of economic uncertainty.

Today, gold has an important place in investment, currency reserves, the electronics industry, and jewelry production, and is expected to continue to exist as an important economic tool in the future. During economic uncertainties and financial crises worldwide, the demand for gold increases, and central banks increase their

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gold reserves. Gold is still considered a safe haven investment. However, the industrial application of gold adds value to its value. Another important area where gold is valuable is technology. Gold is widely used in electronic devices, especially in circuit boards, microchips, and connections. The high conductivity, resistance to oxidation, and low resistance properties of gold make it an ideal material for electronic applications. They are also being increasingly used in medical devices.

**Gold prices**

Gold prices are affected by several factors, including global economic conditions, geopolitical developments, investor behavior, central bank policies, inflation rates, interest rates, and exchange rates. These dynamics are important to understand how the value of gold changes over time. During periods of high inflation, increased economic uncertainty, or low interest rates, demand for gold increases. This is because gold is often viewed as a hedge against inflation. Interest rates also have a direct effect on gold prices. Low interest rates encourage investors to invest in gold rather than cash. This increases the value of the gold. On the other hand, high interest rates can weaken the potential for gold to generate returns, which can cause prices to fall. Gold prices are usually determined in US dollar. A stronger dollar can cause the value of gold to fall, whereas a weaker dollar can cause the value of gold to rise. This is because gold is used as a store of value against depreciating dollar. An increase in gold prices can reduce demand in the short term. However, investors can make strategic purchases by considering the long-term price fluctuations. Geopolitical events (e.g., wars, economic crises, or political uncertainties) can directly affect gold prices. In such cases, investors turn to gold as a safe haven, leading to an increase in prices. Gold demand refers to the aggregate desire of individuals, institutions, and governments to purchase gold for various reasons. Gold demand consists of major segments, such as investment, jewelry, technology and industrial use, and central bank reserves, and is influenced by these factors. India and China have the world's largest gold demand markets. The demand for jewelry and investment purposes is quite high in these countries. The annual gold demand and annual values for other countries are presented in Table 1.

Table 1. World gold demand (in kg and billion US dollar, 2023)

| **Countries** | **Annual gold demand (tons)** | **Annual value (billion US d**ollar**)** |
|---|---|---|
| **India** | 1,000+ | 45 |
| **Chinese** | 700 | 35 |
| **Türkiye** | 150-200 | 10-12 |
| **United States** | 200 | 10-12 |
| **United Arab Emirates** | 50-60 | 3-4 |
| **Saudi Arabia** | 75-100 | 4-5 |
| **Indonesia** | 60-80 | 2-3 |
| **Russia** | 100-120 | 5-6 |
| **South Korea** | 40-50 | 2 |
| **Mexican** | 40-50 | 2 |
| **Total Global Demand** | **4,700+** | **300** |

World Gold Council, 2023

Demand in tons includes jewelry, investment, central bank purchases, and other industrial uses in the country.

India, which has the largest demand for gold worldwide, has traditionally demanded for weddings, festivals,

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and investment purposes. China's demand is driven primarily by the investment and jewelry sectors. In Türkiye, where gold is an important investment tool and has an important place in society, gold demand increases especially during times of economic uncertainty.

The total annual demand for the period 2013-2022 was 4,653 tons. Jewelry 52% (2,222 tons), bar and coin 26 % (1,128 tons), and Technology 8% (329 tons). World gold demand and total gold demand in the second quarter of 2024 was recorded as 1,258 tons, representing a 4% increase compared to the same period in the previous year. During this period, gold demand was driven largely by investments and central bank purchases. In 2024, jewelry demand weakened, whereas bar and coin investments remained strong in Asia. Outflows from investment funds in the West moderated the offsetting of the overall demand (World Gold Council, 2024).

By 2024, gold demand in Türkiye showed a significant decrease, especially on a consumer basis. According to a World Gold Council report, consumer gold demand in Türkiye decreased by 45% compared to the previous year and fell to 22.1 tons in the third quarter of the year. This is the lowest demand level recorded for 2022. In the same period, demand for bullions and coins decreased by 55% annually to 12.7 tons, while jewelry demand decreased by 17% to 9.4 tons. Despite this decrease in Türkiye, global gold demand increased by 5% in the same period, reaching 1,313 tons. The decrease in consumer demand in Türkiye could be associated with high gold prices and economic conditions. These data show that gold demand in Türkiye differs from global trends, and that internal dynamics are decisive in the gold market.

The gold supply refers to the total amount of gold available in the market. In the global economy, gold supply is directly affected by prices, demand, and political factors. The gold supply comes from sources such as mining, recycling, central banks, investment funds, individual investors, and industrial use. The majority of gold supply comes from new gold mines, and is one of the main determinants of supply in the long term.

Among the leading countries in gold production, China and Australia each produced 330 tons, Russia 300 tons, the United States 210 tons, Canada 190 tons, South Africa 130 tons, Uzbekistan 100 tons, Indonesia 90 tons, Ghana 90 tons, and 80 tons of 2023. It is gold obtained by recycling used jewelry, electronic waste, and other gold-containing products. Recycling is an important factor that increases supply during periods of high prices. Central banks can influence supply by buying and selling gold within the framework of the reserve policies. The sale of gold-based assets can indirectly contribute to the physical gold supply. Industrial use, which is the amount of gold used in industrial processes and returned to the market, constitutes only a small part of the total supply.

Table 2. Annual supply (total above ground stocks, on average, 2013-2022)

| **Gold supply** | **Ratio** | **The value of** |
|---|---|---|
| Total mine supply | 75% | 3,482 tons |
| Recycled gold | 25% | 1,172 tons |
| Total supply | | 4,653 tons |

World Gold Council, 2024

In the second quarter of 2024, the recycled gold supply increased by 4% compared to the previous year, reaching 335 tons. High gold prices have led individuals and institutions to recycle more old gold. Total gold supply in the second quarter of 2024 was 1,258 tons, 4% more than in the same period of the previous year (World Gold Council, 2024).

## ECONOMETRIC METHODOLOGY

This study aimed to estimate gold prices using ARIMA models. In this context, this section includes a theoretical explanation of the ARIMA models. The model setup processes and estimation steps are included. ARIMA models, which are used to predict future values based on historical data, consist of three basic components: AutoRegressive (AR), Integrated (I), Moving Average (MA). It allows the estimation of future values by modeling with a combination of these components (Box and Jenkins, 1970).

**Autoregression (AR):** The AR (p) process assumes that the current value of a time series can be explained by its values over the past p periods. In this model, the time series is linearly related to the lagged values. The first-order autoregressive process is denoted by AR (1), and its equation is expressed as Equality (1).

$$Y_t = \delta + \varphi_1 Y_{t-1} + \varepsilon_t \quad (1)$$

The AR (p) process can be written as:

$$Y_t = \delta + \varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + \varphi_3 Y_{t-3} + \cdots \ldots \ldots \ldots \ldots .. + \varphi_p Y_{t-p} + \varepsilon_t \quad (2)$$

The pth-order AR process is expressed in Equation (2). Where, the error term $\varepsilon\ t$ is an uncorrelated random variable with zero mean, and constant variance. δ is the (constant) term, and represents the mean of the stochastic process $Y_t$ while $\varphi_1, \varphi_2, \varphi_3, \ldots \ldots \ldots \ldots .., \varphi_p$' s are unknown autoregressive parameter (Griffiths, 1993).

**Integrated Component (I):** This represents the stationary component of the time series. Stationarity implies that the mean and variance of a time series do not change over time.

**Moving Average (MA):** Moving average models explain the observation value in any period of a time series as a combination of the error term in the same period and the error terms of a certain number of previous periods. The observations are linear combinations of past error terms, and there is no autocorrelation among the error terms. The first order moving average process MA is denoted by (1), and its equation is denoted by (3).

**MA (1) Process**

$$Y_t = \mu + \varepsilon_t + \omega_1 \varepsilon_{t-1} \quad (3)$$

The general MA (q) process can be written as:

$$Y_t = \mu + \varepsilon_t + \omega_1 \varepsilon_{t-1} + \omega_2 \varepsilon_{t-2} + \cdots \cdots \cdots \cdots + \omega_q \varepsilon_{t-q} \quad (4)$$

The q-order MA process can be represented by Equation (4). Where, μ is the uncorrelated random residual with zero mean and constant variance, μ is the fixed parameter, and $\varphi_i$ (i=1, 2, ……, q) is the unknown parameters (Box and Jenkins, 1970). The three basic components are expressed by the ARIMA model, as follows:

ARIMA (p, d, q)

Where,

p = number of AR (Autoregressive) terms

d = Number of differencing operations performed to make the time series stationary

q = number of MA (Moving Average) terms

Autoregressive Integrated Moving Average (ARIMA) models are powerful tools that are widely used in time-series analysis. However, like all other models, ARIMA has some advantages and disadvantages. The biggest advantage of the average model is that it can effectively model autocorrelation (i.e., the relationship between observations) in past data. In addition, the flexible structure of ARIMA allows it to be adapted to different types of time-series data using autoregressive (AR), moving average (MA), and integrated (I) components. The model can estimate complex data structures by combining the deterministic and stochastic components.

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Although the absence of seasonal effects and nonlinearity in the model was a disadvantage at first, it was modeled by considering these effects over time. It is also possible to model the seasonal effects. ARIMA models have evolved into seasonal ARIMA (SARIMA) models (Hamilton, 1994). A significant disadvantage of ARIMA models is their inadequacy in modeling and predicting nonlinear processes. To overcome this deficiency, NARIMA (Nonlinear ARIMA) models have been developed to predict nonlinear dynamics. NARIMA models offer an effective alternative, particularly for the analysis of complex and nonlinear time-series data (Hyndman and Athanasopoulos, 2018).

**Gold price prediction model**

The ARIMA model was discovered by George Box and Gwilym Jenkins in 1970 and introduced in the literature as an important prediction method for time-series analysis. This model can change the dynamic structures of a time series and is considered an effective tool for predicting values (Box and Jenkins, 1970). ARIMA method is a systematic process used to determine the most suitable model of time series data and to achieve reliable predictions. This method follows a step-by-step process approach to achieve accurate and meaningful results. The application of the ARIMA model generally consists of four basic steps:

**Step 1: Model identification**

In the first step of estimating the ARIMA model, it was necessary to determine the stationarity of the series. The traditional method for evaluating nonstationarity is to visualize the original time-series data. Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) were examined. On the other hand, stationarity analysis can be used to determine whether a series contains a unit root. In this study, stationarity analysis was conducted using Augmented Dickey Fuller (ADF) and Phillips Peron (PP) tests. According to the two tests, the Cumhuriyet gold price series is stationary in the first difference. The stationarity degree (d) in the ARIMA (p, d, q) model is determined to be 1.

**Step 2: Model estimation**

In the second step, the AR and MA models were estimated using the degree of stationarity determined in Step 1. To determine the most appropriate model among the 20 models, the log-likelihood information criterion (LogL), Akaike information criterion (AIC), Bayesian information criterion (BIC), and Hannan Quinn information criterion (HQ) were calculated, and the results are presented in Table 3.

Table 3. Information of the models' criteria

| Model | Information criteria | | | |
|---|---|---|---|---|
| | LogL | AIC | BIC | HQ |
| (4, 1, 3) | 846.759403 | -3.114347 | -3.042617 | -3.086289 |
| (1, 1, 2) | 841.934965 | -3.111282 | -3.071432 | -3.095695 |
| (0, 1, 1) | 839.529124 | -3.109774 | -3.085864 | -3.100421 |
| (2, 1, 3) | 842.967551 | -3.107686 | -3.051896 | -3.085863 |
| (3, 1, 2) | 842.871470 | -3.107329 | -3.051539 | -3.085506 |
| (1, 1, 1) | 839.629367 | -3.106429 | -3.074549 | -3.093959 |
| (0, 1, 2) | 839.587932 | -3.106275 | -3.074395 | -3.093805 |
| (0, 1, 3) | 840.539798 | -3.106096 | -3.066246 | -3.090508 |

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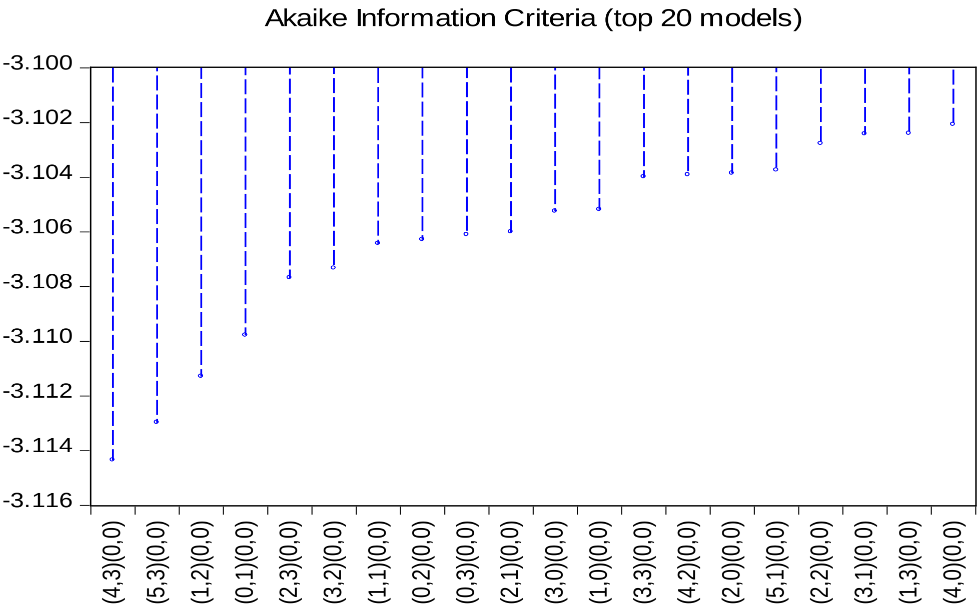
| | | | | |
|---|---|---|---|---|
| (2, 1, 1) | 840.515509 | -3.106006 | -3.066156 | -3.090418 |
| (3, 1, 0) | 840.311129 | -3.105246 | -3.065396 | -3.089658 |
| (1, 1, 0) | 838.293105 | -3.105179 | -3.081269 | -3.095826 |
| (3, 1, 3) | 842.972440 | -3.103987 | -3.040227 | -3.079046 |
| (4, 1, 2) | 842.951444 | -3.103909 | -3.040149 | -3.078968 |
| (2, 1, 0) | 838.936052 | -3.103851 | -3.071972 | -3.091381 |
| (2, 1, 2) | 840.644785 | -3.102769 | -3.054949 | -3.084063 |
| (3, 1, 1) | 840.551312 | -3.102421 | -3.054601 | -3.083716 |
| (1, 1, 3) | 840.543708 | -3.102393 | -3.054573 | -3.083688 |
| (4, 1, 0) | 840.458077 | -3.102075 | -3.054255 | -3.083369 |
| (4, 1, 1) | 840.819453 | -3.099701 | -3.043911 | -3.077878 |

AIC information criteria was found to have the lowest values (4, 1, 3). According to the AIC information criteria, the alternative 20 models are presented in Graph 1. This indicates that the model in question provides the best estimation with the dataset.




Graphic 1. Models according to Akaike information Criterion

**Step 3: Diagnostic checks**

Among the ARIMA models, the best model was selected according to four information criteria; however, both the residuals and parameters of the best ARIMA (4, 1, 3) model must pass diagnostic tests. Thus, the accuracy and reliability of the estimation results were ensured. It is also important to determine whether the error terms exhibit white-noise properties. To assess the reliability of the applied models, Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) plots of the residuals, known as correlograms, were used. These functions are important tools for checking whether the error terms (residuals) of the model are independent. The error terms of the ARIMA (4, 1, 3) model are within 95% confidence limits because the model error is similar to white noise, which indicates that the model is good enough. White noise refers to a situation in time-

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series analysis in which the errors are random and independent (independent of past values). In other words, since there is no significant correlation between the error terms (i.e., correlations are close to zero at all lags), the model is correctly estimated and has high reliability. As a result, this model is considered the best among the selected ARIMA models. The existence of autocorrelation among error terms is checked using the Q statistic based on the Ljung -Box test introduced by Ljung and Box (Ljung and Box, 1978). The p value obtained from this test is insignificant, confirming that there is no correlation between the residuals).

Table 4. Correlograms of residuals

| Autocorrelation | Partial Correlation | | AC | PAC | Q-Stat | Prob. |
|---|---|---|---|---|---|---|
| .\|. \| | .\|. \| | 1 | -0.006 | -0.006 | 0.0209 | |
| .\|. \| | .\|. \| | 2 | -0.003 | -0.003 | 0.0255 | |
| .\|. \| | .\|. \| | 3 | 0.012 | 0.012 | 0.0981 | |
| .\|. \| | .\|. \| | 4 | -0.025 | -0.025 | 0.4448 | |
| .\|. \| | .\|. \| | 5 | -0.001 | -0.001 | 0.4449 | |
| .\|. \| | .\|. \| | 6 | -0.042 | -0.042 | 1.4019 | |
| .\|. \| | .\|. \| | 7 | 0.011 | 0.011 | 1.4669 | |
| .\|. \| | .\|. \| | 8 | -0.006 | -0.007 | 1.4894 | 0.222 |
| .\|. \| | .\|. \| | 9 | -0.019 | -0.018 | 1.6836 | 0.431 |
| .\|. \| | .\|. \| | 10 | -0.051 | -0.054 | 3.1360 | 0.371 |
| .\|. \| | .\|. \| | 11 | 0.035 | 0.035 | 3.8217 | 0.431 |
| .\|. \| | .\|. \| | 12 | -0.021 | -0.023 | 4.0636 | 0.540 |
| .\|. \| | .\|. \| | 13 | 0.001 | 0.003 | 4.0646 | 0.668 |
| .\|. \| | .\|. \| | 14 | 0.026 | 0.021 | 4.4322 | 0.729 |
| .\|. \| | .\|. \| | 15 | 0.032 | 0.033 | 4.9978 | 0.758 |
| .\|. \| | .\|. \| | 16 | 0.024 | 0.020 | 5.3246 | 0.805 |
| .\|. \| | .\|. \| | 17 | 0.014 | 0.018 | 5.4297 | 0.861 |
| .\|. \| | .\|. \| | 18 | -0.022 | -0.025 | 5.6960 | 0.893 |
| .\|. \| | .\|. \| | 19 | 0.001 | 0.002 | 5.6965 | 0.931 |
| .\|. \| | .\|. \| | 20 | 0.042 | 0.043 | 6.6867 | 0.918 |
| .\|. \| | .\|. \| | 21 | -0.042 | -0.035 | 7.6638 | 0.906 |
| .\|. \| | .\|. \| | 22 | 0.006 | 0.002 | 7.6818 | 0.936 |
| .\|. \| | .\|. \| | 23 | 0.003 | 0.006 | 7.6863 | 0.958 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .\|. \| | .\|. \| | 24 | 0.081 | 0.086 | 11,383 | 0.836 |
| .\|. \| | .\|. \| | 25 | -0.033 | -0.031 | 11,981 | 0.848 |
| .\|. \| | .\|. \| | 26 | 0.011 | 0.017 | 12,055 | 0.883 |
| .\|. \| | .\|. \| | 27 | -0.008 | -0.014 | 12,092 | 0.913 |
| .\|. \| | .\|. \| | 28 | -0.028 | -0.024 | 12,544 | 0.924 |
| .\|. \| | .\|. \| | 29 | 0.023 | 0.022 | 12,834 | 0.938 |
| .\|. \| | .\|. \| | 30 | -0.011 | -0.003 | 12,899 | 0.954 |
| .\|. \| | .\|. \| | 31 | 0.089 | 0.077 | 17,409 | 0.831 |
| .\|. \| | .\|. \| | 32 | 0.009 | 0.015 | 17,451 | 0.865 |
| .\|. \| | .\|. \| | 33 | -0.004 | -0.001 | 17,460 | 0.895 |
| .\|. \| | .\|. \| | 34 | -0.010 | -0.009 | 17,514 | 0.918 |
| .\|. \| | .\|. \| | 35 | -0.033 | -0.035 | 18,132 | 0.923 |
| .\|. \| | .\|. \| | 36 | 0.006 | 0.011 | 18,151 | 0.941 |

**Step 4: Model estimation**

The Box-Jenkins ARIMA modeling process is a model estimation. ARIMA (p, d, q) models were designed primarily to estimate the variable of interest. In this study, considering the historical data of Turkish economy, monthly price movements between 1980-2024 were modeled and in the light of these data, a prediction was made about the Cumhuriyet gold prices for 2025.

Table 5. Estimation of ARIMA (4, 1, 3) model

| | Coefficient | Std. Error | t- Statistic | Prob. |
|---|---|---|---|---|
| AR(1) | 1.179125 | 0.000583 | 2022.967 | 0.0000 |
| AR(2) | 0.613739 | 0.000254 | 2414.665 | 0.0000 |
| AR(3) | -0.768057 | 0.000615 | -1248.505 | 0.0000 |
| AR(4) | -0.024826 | 0.000131 | -189.6366 | 0.0000 |
| MA(1) | 0.089675 | 0.028967 | 3.095814 | 0.0021 |
| MA(2) | -0.846871 | 0.024631 | -34.38211 | 0.0000 |
| MA(3) | -0.183146 | 0.030183 | -6.067872 | 0.0000 |
| SIGMASQ | 0.002551 | 0.000101 | 25.36414 | 0.0000 |
| Inverted AR Roots | .98 | -.69+.71i | -.69 | -.71 |
| Inverted MA Roots | .96 | -.23 | -.71 | -.71 |

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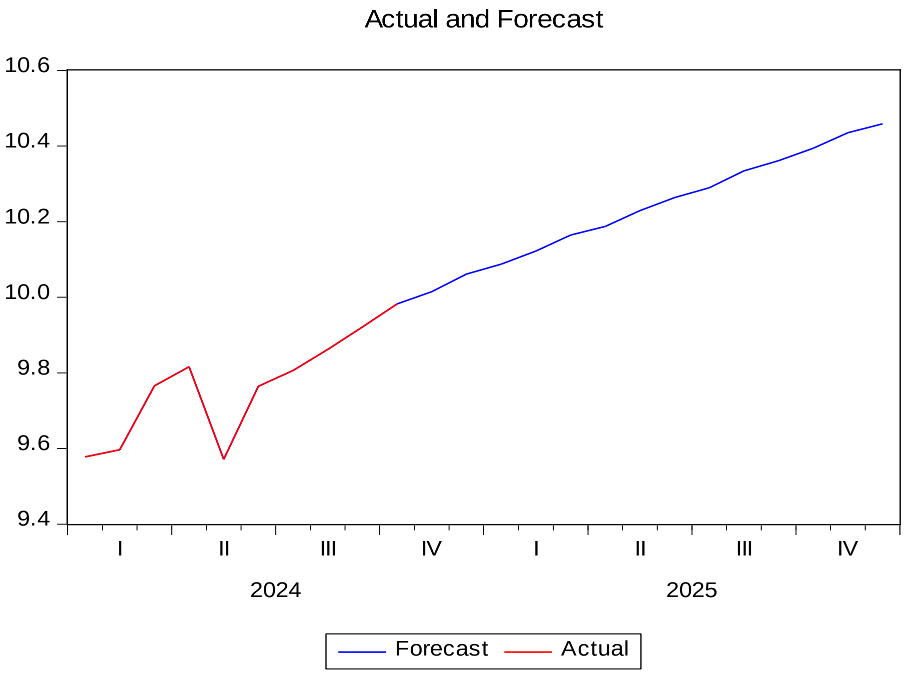
Table 5 presents the estimation results of the ARIMA (4, 1, 3) models. All coefficients in the model are statistically significant. The Cusum and Cusum Q values should be investigated to examine whether this model, as a whole, changes systematically over time and whether the model is stable. Cusum and Cusum Q, the unit circle, refer to a circle whose center is 1 unit away from point (0, 0) on the coordinate plane. Since the model is inside the unit circle, it is seen that the model does not show any significant structural change over time and the model is stable.




Graphic 2. Actual and forecast values of gold prices

In 2025, it is possible that the gold prices in Türkiye will fluctuate daily, but it is likely to increase on a monthly basis. Gold prices in Türkiye are directly affected by exchange rate movements. Global economic factors can also affect gold prices in Türkiye; for example, economic uncertainties or geopolitical risks around the world can direct investors toward gold. Changes in the gold supply and demand balance, especially factors such as global gold production or Türkiye's gold imports, can affect prices. In addition, domestic political developments and economic policies in Türkiye can affect investors' confidence and gold demand.

## CONCLUSION AND POLICY CONCLUSIONS

Gold is a unique metal with its chemical and physical properties and has an important place in historical, economic, industrial, and cultural areas. Despite changes in the economic systems on which gold is used as a basis, it continues to exist as a valuable commodity. Gold prices are determined by the complex interactions between economic and political factors. The value of gold in global markets fluctuates constantly in response to investors' search for safe havens and economic uncertainty. The rise in the value of gold can often be associated with risky market conditions and low interest rates. Gold investors should carefully monitor economic indicators and global development, while determining their strategies by predicting future market movements.

In this study, the Autoregressive Integrated Moving Average (ARIMA) model was estimated to predict the future values of gold prices. In 2025, the gold in Türkiye is expected to increase in value on a monthly basis, although there may be daily fluctuations. Gold may occasionally fluctuate, especially because of factors such as global economic uncertainty, inflation rates, and exchange rate fluctuations. However, in the long-term outlook, a general upward trend in the price of gold is foreseen, as investors continue to seek safe havens and the demand for gold increases. This increase is shaped by both domestic market dynamics and global economic development. Inflation rates in Türkiye, interest rate policies, and changes in exchange rates are among the factors that directly affect the value of gold. In addition, international markets and geopolitical risks stand out as important factors that determine the price of gold.

Forecasting gold prices using models such as ARIMA has important implications for investors, economists, and policymakers. However, it should be noted that these estimates can be affected by external factors and market dynamics. However, with the right policy interventions and regulations, gold price fluctuations can be better managed and economic stability can be achieved. Strong and integrated policy strategies must be developed to prevent speculation in the gold market, protect investors, and prepare for economic crises.

Gold has historically been viewed as a hedge against inflation, averting economic uncertainty, and as a safe haven against volatility in financial markets. Therefore, accurately predicting gold prices provides important information not only for investors and economists but also for policymakers, such as governments and central banks. Some policy recommendations that can be drawn from the study findings are as follows:

Central banks should pay attention to fluctuations in gold markets when determining interest rates or when taking measures such as monetary expansion. Rapid increases in gold prices may indicate increased inflationary pressure and heightened economic uncertainty. Therefore, it is important for central banks to monitor the gold markets and take precautions against excessive fluctuations in gold prices to ensure financial stability.

Gold prices can fluctuate suddenly owing to speculative movement. Financial regulators can develop regulations to protect investors from excessive speculation of precious metals such as gold. These regulations can be used to prevent investors from taking excessive risk by increasing their margins. This may include regulations that limit trading (margin trading) and leverage. Additionally, market manipulation can be prevented by ensuring transparency in the gold market.

Governments and economic authorities should develop a more comprehensive strategy to monitor external influences on gold prices. This could include creating a system that tracks geopolitical development and global economic indicators. In times of crisis, such information is important for governments to intervene and implement measures to ensure economic stability.

## REFERENCES

1. Box, G. E. P., Jenkins, G. M. and Reinsel, G. C. (1970). Time Series Analysis: Forecasting and Control. San Francisco: Holden- Day.
2. Box, G. E. P., Jenkins, G. M. and Reinsel G.C. (2008). Time Series Analysis: Forecasting and Control, fourth ed., Wiley, Oxford. https://doi.org/10.1002/9781118619193
3. Din, M. A. (2016). ARIMA by Box Jenkins methodology for estimation and forecasting models in higher education, Athens, in: ATINER'S Conference Paper Series, No: EMS2015-1846.
4. Hamjah, M. A. (2014). Forecasting major fruit crops production in Bangladesh using Box Jenkins ARIMA model, J. Econ. Sustain. Giant. 5(7) 96–107.
5. Hamilton, J. D. (1994). Time Series Analysis, Princeton university press.
6. Hyndman, R. J. and Athanasopoulos, G. (2018). Forecasting: principles and Practice (2nd edition).
7. Gaynor, P. E. and Kirkpatrick, R. C. (1994). Introduction to Time Series Modeling and Forecasting in Business and Economics, McGraw-Hill. https://doi.org/10.1093/biomet/65.2.297
8. Gujrati, D. and Porter, D. C. (2009). Basic econometrics, Irvin, fifth ed., McGraw-Hill.
9. Ljung, G. M. and Box, G. E. P. (1978). On a measure of a lack of fit in time series models, Biomatika 65, 297–303.
10. Thapa, R., Devkota, S., Jamshidi, B. and Subedi, S. (2022). Forecasting area, production and productivity of vegetables using crops in Nepal the Box -Jenkins ARIMA model, Turkish J. Agric. food Sci. tech. 10 (12), 174–181. https://doi.org/ 10.24925/turjaf.v10i2.174-181.4618
11. Yasmin S. and Moniruzzaman M. D. (2024). Forecasting of area, production, and Yield of jute in Bangladesh using Box-jenkins ARIMA model, Journal of agriculture and food research, Journal of Agriculture and Food Research 16, 101203. https://doi.org/10.1016/j.jafr.2024.101203
12. Tsui, W. H. K., Balli, H. O. and Gower, H. (2011). Aviation education and research Proceedings, Forecasting airport Passenger traffic: the case of Hong Kong International Airport, Aviat. Edu. Pic. Proc. 54–62. http://hdl.handle.net/10179/3717

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## APPENDIXES

| | | |
|---|---|---|
| Inverse Roots of AR/MA Polynomial (s) | | |
| Specification: DC C AR(1) AR(2) AR(3) MA(1) MA(2) | | |
| MA(3) MA(4) | | |
| Date: 12/13/24 Time: 03:25 | | |
| Sample: 1980M01 2025M01 | | |
| Included observations: 537 | | |
| AR Root (s) | Modulus | Cycle |
| -0.690764 ± 0.707586i | 0.988854 | 2.680351 |
| 0.983034 | 0.983034 | |
| No root lies outside the Unit circle. | | |
| The ARMA model is stationary. | | |
| M.A. Root (s) | Modulus | Cycle |
| -0.708594 ± 0.705616i | 0.999999 | 2.664286 |
| 0.964382 | 0.964382 | |
| -0.226276 | 0.226276 | |
| No root lies outside the Unit circle. | | |
| ARMA model is reversible. | | |