

Gold Price Forecasting and Algorithmic Trading Using Time Series Models

Kasra Hashemi and Piyush Rawat

Data

A Kaggle dataset containing gold prices in the Iranian market from 2013 to 2024 was used for this analysis. We focused on the market price per gram of 18 Karat gold. However, the same methodology can easily be applied to other time series in the dataset.

Exploratory Data Analysis

After applying both additive and multiplicative time series decomposition, the price series revealed no clear signs of seasonality but did show a significant trend component. Additionally, the series exhibited strong evidence of non-stationarity, including heteroskedasticity.

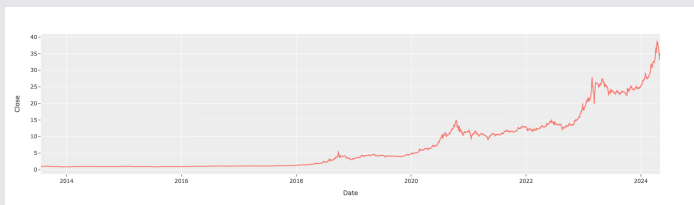


Figure: 18-Karat Market Prices per Gram

Forecasting Approaches

We implemented three forecasting approaches:

- ▶ Naive Moving Average 'Forecast' with a 9-day rolling window
- ▶ Holt's linear trend method
- ▶ ARIMA(1,1,1) method

For the ARIMA model, we applied a Box-Cox transformation and used first differencing to achieve stationarity. In all three approaches, the series was split 90-10 for training and testing.

Forecasting Results

Among the models, the ARIMA model performed the best, successfully capturing the trend. However, due to the high level of noise in the series, accurate forecasting remains challenging.

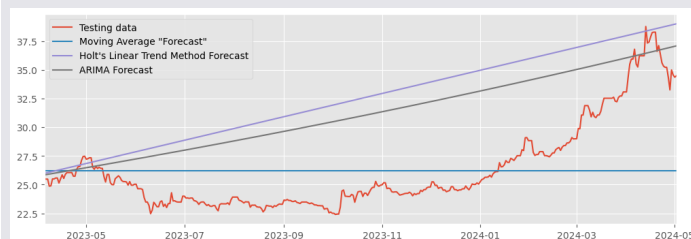


Figure: Comparison of the Models in the Test Period

Algorithmic Trading Based on the RSI (Relative Strength Index)

We also backtested a simple buy-and-sell strategy based on the Relative Strength Index (RSI), specifically:

- ▶ **Buy** when the RSI drops below 30
- ▶ **Sell** when the RSI rises above 70

This strategy was tested across various RSI timeframes, ranging from a 2-day to a 91-day RSI. The optimal window for the RSI was found to be between 27 and 31 days.

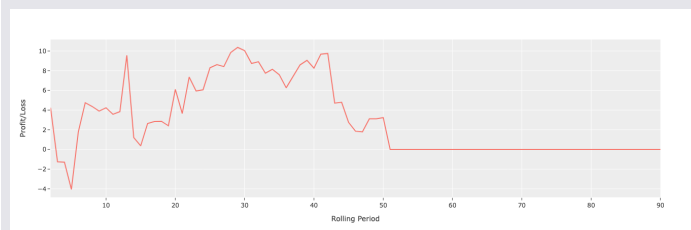


Figure: RSI Timeframe Returns

Overall, the RSI-based strategy underperformed compared to the simple buy-and-hold approach, with its highest returns being only one-third of those achieved through buy-and-hold.