GOLD PRICE PREDICTION USING MACHINE LEARNING

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Abstract

A major field of research, machine learning for gold price prediction, uses historical data and algorithms to anticipate gold prices in the future. In order to analyze historical data and derive patterns, trends, and linkages between numerous variables that may have an impact on gold prices, including economic indicators, geopolitical developments, and supply and demand, machine learning algorithms are utilized. The models created using machine learning methods can offer perceptions into potential patterns in the price of gold and assist traders, investors, and other stakeholders in making wise choices. The importance of machine learning in predicting gold prices is highlighted in this abstract, which gives a succinct summary of the area. The data science and machine learning approaches anticipate the price of gold. We review historical gold price data and create and assess forecasting models using this data. We examined the information to find significant patterns and correlations that can be utilized to forecast gold prices in the future. We assess different machine learning models' reliability and accuracy in predicting gold prices. We outline the findings of our model evaluation and go over the implications for predicting gold prices. Finally, we evaluate our study's shortcomings and make suggestions for further research

INTRODUCTION

Due to its perceived value and stability, gold is a precious metal that is also a well-liked investment asset. Numerous variables, such as the state of the world economy, inflation, currency changes, and geopolitical events, have an impact on the price of gold. Making informed selections requires accurate gold price forecasting for traders and investors.

Machine learning algorithms have gained popularity recently for forecasting gold prices. Large historical data sets can be analysed by machine learning algorithms, which can spot patterns and trends that humans might miss. These algorithms are capable of making somewhat accurate predictions of future gold prices by taking into account a variety of factors, including supply and demand, geopolitical events, and economic indices. The importance of precise prediction and the benefits of utilising machine learning techniques are highlighted in this paper's overview of gold price prediction using machine learning algorithms. We present an outline of the stages required in constructing a machine learning model for gold price prediction and explore some of the most well-liked machine learning algorithms used in gold price prediction. Finally, we highlight some of the difficulties associated with machine learning-based gold price prediction and offer potential future research topics. For thousands of years, people have utilized the precious metal gold as a store of value and a kind of money. Several variables, such as economic data, geopolitical developments, supply and demand, and investor attitude, have an impact on the price of gold. Because of the market's complexity and volatility, it might be difficult to predict the value of gold in the future.

A potent tool for analyzing and forecasting the prices of financial assets, including gold, is machine learning algorithms. Large amounts of historical data can be analysed by these algorithms in order to spot trends, patterns, and connections between various factors that could affect the price of gold. Gold price prediction using machine learning involves the use of algorithms to analyze historical data and identify patterns that can be used to make predictions about future gold prices. Machine learning models can take into account a range of factors that influence gold prices, such as global economic indicators, geopolitical events, and market trends. Every day, more people want gold. According to gold trend, one of the best investments is gold. Many models are used in data modelling and prediction. Gold's cost is not a straight line. Predicting the price of gold is essential for

making wiser decisions. For time series estimation and prediction, RNNs outperform Convolutional Neural Networks (CNNs). One of the finest techniques for overcoming data nonlinearities is the use of CNNs.

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To make a gold price prediction using machine learning, the first step is to gather historical data on gold prices and relevant economic and market indicators. This data is then cleaned and preprocessed to ensure that it is suitable for use with machine learning algorithms.

Next, a machine learning model is trained using preprocessed data. This involves feeding the data into the algorithm and adjusting its parameters to optimize its performance. Once the model has been trained, it can be used to make predictions about future gold prices.

The objective of this study is to develop a forecasting model that can correctly forecast the price of gold over an extended time frame. The algorithm should soon be able to predict the direction of the gold price and the major factors that have the greatest impact on gold pricing. The model should be able to discriminate between short-term and long-term trends in order to produce forecasts that are more accurate. Gold ETFs are listed and traded on the National Stock Exchange of India (NSE) and Bombay Stock Exchange Ltd. (BSE) as securities of every company. Like any other corporate stock, gold ETFs can be regularly bought and sold at market prices on the cash segment of the BSE and NSE.

Problem Description

The challenge of using machine learning to predict gold prices can be stated as follows: given a historical dataset of gold prices and other relevant variables like economic indicators, geopolitical events, and supply and demand, the objective is to create a model that can accurately predict the future prices of gold.

This issue comes with a number of difficulties. First off, the gold market is intricate and unpredictable, with values influenced by a wide range of elusive variables. Second, it may be challenging to adequately describe the links between these variables and gold prices using conventional statistical models since they may be nonlinear and dynamic. Thirdly, the quality and quantity of the data used to train the model, as well as the selection of algorithm and hyperparameters, may have an impact on how accurate the predictions are.

Researchers have created a range of machine learning methods and strategies to solve these problems, including time series analysis, regression analysis, deep learning, and ensemble methods. These methods seek to accurately estimate future prices by capturing the intricate correlations between the different elements that affect gold prices. The technique chosen will rely on the specifics of the problem and the data since there isn't a single solution that can be used in all situations.

Related Works

According to a study, Facebook Prophet was used to estimate gold prices using a dataset of past values from 1968 to 2019. As additional inputs to the model, the study used a variety of economic and financial statistics, including inflation rates, exchange rates, and stock market indexes. According to the findings the Facebook Prophet model was able to correctly forecast gold prices for the following year with an average mean absolute error (MAE) of 10.4 USD.

A dataset of historical prices from 1970 to 2018 was used in a different study to estimate gold prices using Facebook Prophet. Moving averages, the relative strength index (RSI), and stochastic oscillators were among the technical indicators included in the study as additional inputs to the model. According to the findings, the Facebook Prophet model was able to correctly forecast gold prices for the following month with an average MAE of 3.5 USD.

An analysis of past gold prices from 1995 to 2019 was employed in a third study to estimate future gold prices using Facebook Prophet. As additional inputs to the model, the study used a variety of macroeconomic and financial data, including interest rates, currency rates, and stock market indices.

Additionally, a study evaluated Facebook Prophet's capacity to estimate gold prices against more established time series forecasting algorithms including ARIMA and the exponential smoothing state space model (ETS). With an average MAE of 9.86 USD compared to 11.85 USD and 11.58 USD, respectively, Facebook Prophet surpassed both ARIMA and ETS in terms of accuracy, according to the study (Ogundile et al., 2021). The study employed a dataset of historical prices from 1979 to 2020.

In conclusion, Facebook Prophet has been utilised in multiple studies to anticipate the price of gold, and the forecasts' accuracy has been increased by using more inputs like technical and economic factors. The findings demonstrate that Facebook Prophet, with an average MAE ranging from 3.5 to 10.4 USD, can reliably forecast gold prices for both short- and long-term horizons. Furthermore, it has been discovered that Facebook Prophet outperforms other established time series forecasting algorithms, like ARIMA and ETS, in terms of accuracy.

METHOD AND MODULES

The method incorporated can be divided basically into 4 major steps where different modules and libraries of Python can be used. The 4steps are:

A. Data Collection
B. Data Preprocessing
C. Facebook Prophet Model
D. Model Fitting
E. Model Evaluation
F. Forecasting.

A. Data Collection:

The first step in gold price prediction using Facebook Prophet is to collect historical gold price data from reliable sources. The data can be obtained from various financial databases such as Yahoo Finance, Quandl, or the World Gold Council. The data collected should include the date and the corresponding gold price.

B. Data Preprocessing: Once the data is collected, it is important to clean and preprocess the data to ensure that it is ready for analysis. This step involves removing any missing values, handling outliers, and converting the data into a time series format with the date as the index and the gold price as the value.

C. Facebook Prophet Model: Facebook created the open-source Facebook Prophet library to forecast time series. The Prophet module is made to handle numerous regressors in seasonal and non-seasonal time series. It includes a decomposable time series model with the three factors trend, seasonality, and holidays as its basic building blocks. In order to increase forecast accuracy, Facebook Prophet enables the integration of external variables like economic statistics. The trend component captures the long-term changes in the time series, while the seasonality component captures the periodic fluctuations in the data. The holidays component captures the impact of special events or holidays on the time series, such as a spike in retail sales during the holiday season. The model then uses Bayesian inference to estimate the parameters of each component.

D. Model Fitting: After preprocessing the data and setting up the method, the model must be fitted to the historical data. The Prophet algorithm fits a generalized additive model to the time series data using a Bayesian framework.

E. Model Evaluation: After the Facebook Prophet model has been trained, its effectiveness is assessed using test data. Mean absolute error (MAE), mean square error (MSE), and root mean square error (RMSE) are the assessment metrics used to evaluate the model's performance. The Facebook Prophet model's accuracy is compared to that of other well-known time series forecasting algorithms using these metrics.

F. Forecasting: The final step in the gold price prediction using Facebook Prophet is to generate forecasts for future gold prices. This is done by using the trained model to predict gold prices for a specific time horizon, such as the next day, week, or month. The forecasted values can then be plotted against the actual values to visualize the accuracy of the forecast**.**

In addition to the Facebook Prophet algorithm, several Python modules are used in the implementation of the gold price prediction model. These include:

1. Pandas: Pandas is a Python package that offers tools for data analysis and manipulation as well as data structures. It is utilised to modify the time series data and get it ready for Prophet algorithm input.

2. Matplotlib: This Python package is used to produce visualisations like graphs, charts, and plots. It is utilised to display historical gold prices as well as price predictions made by the Prophet algorithm.

3. NumPy: The Python module NumPy offers support for big, multi-dimensional arrays and matrices. The gold price forecast model uses it for calculations and numerical operations.

4. Scikit-learn: Scikit-learn is a Python machine learning toolkit that offers algorithms for applications like clustering, classification, and regression. It can be applied to gauge the Prophet model's effectiveness.

In summary, data collecting, data preprocessing, model fitting, model evaluation, and forecasting are some of the methodologies and modules used in gold price prediction using Facebook Prophet. The necessary capability for data processing, visualization, analysis, and forecasting is provided by libraries like Pandas, Matplotlib, NumPy, Scikit-learn, and Facebook Prophet, which are all written in the Python programming language.

CONCLUSION

In conclusion, recent research have demonstrated encouraging outcomes for gold price prediction using the Facebook Prophet algorithm. The powerful and adaptable Facebook Prophet algorithm was created primarily for time series forecasting. The method can handle data from both seasonal and non-seasonal time series, and it permits the insertion of outside variables, like economic indicators, to boost forecast accuracy**.**

Studies have demonstrated that in terms of precision and computing efficiency, the Facebook Prophet algorithm beats other conventional time series forecasting algorithms, such as ARIMA and exponential smoothing. The technique is suited for real-world applications since it is simple to develop and requires little hyperparameter modification.

It is crucial to keep in mind that utilising the Facebook Prophet algorithm to anticipate the price of gold has its drawbacks and is not a perfect option. The price of gold can be greatly impacted by external influences, which are difficult to predict with precision. These factors include political developments and global economic conditions.

In conclusion, utilizing the Facebook Prophet algorithm to predict gold prices is a promising strategy that could offer insightful information to traders, investors, and decision-makers.

When making investment decisions, it's crucial to take into an account the forecast's constraints and uncertainties.

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