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Efficient ML Algorithm to Predict Future Gold Price Prediction

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ABSTRACT: The prediction of future gold prices holds significant importance for investors and financial analysts due to gold's status as a key asset in global markets. This project aims to develop an efficient machine learning (ML) algorithm capable of accurately forecasting gold prices. By leveraging historical data, economic indicators, and advanced ML techniques, we strive to model the complex patterns and trends influencing gold prices. The study involves the evaluation and comparison of various ML algorithms, including linear regression, decision trees, and neural networks and find out most effective approach. The selected model will be optimized for accuracy and computational efficiency. This involves fine-tuning the algorithm's parameters and employing techniques to reduce processing time without compromising predictive performance Through rigorous testing and validation, this project seeks to provide a reliable tool for predicting gold prices, thereby aiding investment decisions and market strategies We employ advanced machine learning techniques to analyze these factors and develop a predictive model. The study involves comparing various ML algorithms, such as linear regression, decision trees, and neural networks, to determine the most accurate and efficient approach. chosen model will be rigorously tested and optimized to ensure reliable gold price predictions, aiding investment decisions and market strategies.

KEYWORDS: Gold Price Prediction, Machine Learning, Forecasting, Economic Indicators, Regression Analysis, Activation Function, Trend, Financial market predictive modeling, Data Analytics.

I. INTRODUCTION

Historically, it has been viewed as a valuable and safe asset for investors, especially in times of economic uncertainty. Especially in times of economic uncertainty. Encourage them to make informed decisions, manage risk effectively and maximize profits, investors and policy makers. However, the volatility of the gold price, which is affected by many factors such as geographical conditions, market demand and currency fluctuations, makes it difficult to predict.

In this project, a future gold price prediction model uses machine learning technology to improve trading strategies and decision making by using machine learning algorithms to predict future gold prices. It provides investors with better insights and improves trading strategies by using historical data and best predictive modeling techniques. The project aims to explore various machine learning methods, optimize their performance and compare their prediction accuracy to generate the most effective betting value.

Storing and investing information is an important part of everyone's life. Investing involves using money now with the aim of generating positive returns in the future. From a financial perspective, this means that the acquired assets are not used immediately, but are used later to create wealth. In financial terms, investing means buying assets with the expectation of income over time or selling them at a higher price for income.

The Indian economy has many opportunities for investment and business expansion leading to higher income and large capital. Investors can choose from a variety of investment options, including stocks, bonds, commodities and real estate, offering a variety of options to suit different financial goals and risk appetites. Different profiles are available to suit investors' personal preferences and financial goals. Gold is considered one of the best investments by many investors due to its increasing value and widespread use in many areas. Investors' preference for gold as a risk hedging tool increased negative expectations for foreign exchange and capital markets.

Gold is also considered an "ultimate asset," meaning it is an asset that investors rely on when capital markets around the world fail to deliver the desired results

Therefore, it can be said that investors look at gold as a resistance to changes in other markets. Since gold is a precious metal, its price, like other commodities, is determined by supply and demand. But because gold has been stored and its products harvested for centuries, this year's production will have little impact on its value. Gold can be used both as a commodity and as an asset.



Gold does not behave like a commodity when compared to longterm assets like stocks or bonds. The price of gold depends on many different factors, including inflation, economic changes, and conflicts.

II. LITERATURE SURVEY

1. Gold Price Prediction Based On Yahoo Finance Data Using Lstm Algorithm

In 2023, Windha Mega Pradnya Duhita and Muhammad Farhan Al Farid highlighted the significance of gold as a highly valued precious metal in contemporary society. They stressed the need for individuals to keep a close watch on the purchase and sale prices of gold when investing in precious metals. Yahoo Finance is identified as a reliable platform for tracking these price fluctuations, including changes in the closing price, opening price, highest value, and lowest price. The authors observed that gold prices are highly volatile because of their frequent and repeated fluctuations.

They demonstrated that using the Long Short-Term Memory (LSTM) technique, combined with hyperparameter optimization through grid search, can lead to accurate predictions of gold prices based on historical data. Their study achieved a notable result, with the lowest error rate of 0.00033, by utilizing an LSTM parameter unit of 200 and a dropout rate of 0.1.

2. Prediction of gold and silver stock price using ensemble models

In their 2023 paper, Pradeep Kumar Mahato and Vahida Attar address the challenge of predicting gold prices, a task complicated by the non-linear and dynamic nature of temporal data influenced by numerous fiscal and monetary factors. Recognizing the significant monetary rewards and the complexity of stock prediction, The authors investigate a range of statistical and predictive analytics techniques, focusing on various ensemble models to forecast whether gold and silver prices will increase or decrease relative to their current levels. Utilizing a stacking approach, they achieved a notable accuracy of 85% for gold stock predictions and 79% for silver stock predictions using a hybrid bagging ensemble method.

3. Precious metal and Silver metal Prediction using Hybrid Machine Learning Models

In their 2022 paper, Sakshi Goel, Merry Saxena, and Pradeepta Kumar Sarangi examine the high demand for silver and gold due to their industrial, electrical, and decorative uses, along with their popularity in investments and trading. Accurate price prediction of these metals can be highly beneficial for investors. This study evaluates the effectiveness of machine learning models in forecasting the future prices of precious metal and silver metal in the Indian market. The authors focus on hybrid machine learning models, specifically Convolutional Neural Networks (CNN) and CNN-Recurrent Neural Networks (CNN-RNN). Using daily trading data from January 2021 to August 2022, They assess the accuracy of the models using the (MAPE).

III. EXISTING SYSTEM

There are many studies on gold prices in the literature. Although different variables were used in these studies, it has been shown that gold prices are generally related to the US dollar and stock returns. Many researchers have also investigated the relationship between various macroeconomic variables and the gold price. The relationship between gold prices and other commodity prices, especially oil prices, has also been examined extensively. However, the results of these studies have been found to be inconsistent.

A number of studies have examined the price of gold from existing studies, often using different methods. Generally, these studies model the price of gold based on the US dollar and commodity returns. Researchers also analyzed the relationship between the price of gold and different macroeconomic variables and other commodities. Especially gasoline. However, the results of these studies are often contradictory.

The relationship between the gold price and various commodity prices, especially crude oil, has been examined extensively. Researchers investigated how changes in oil prices affect gold prices. The origin of this research is to find and capture the relationship between these important things.

IV. SUGGESTED SYSTEM

The project seeks to examine the connection between gold prices and various economic and market variables. Understanding these relationships will benefit monetary policymakers, investors, fund managers, and portfolio managers in making better investment decisions. The study employs three machine learning algorithms: linear regression, random forest regression, and gradient boosting regression, to analyze the data. Evaluating these methods will aid in determining their accuracy across different conditions. The project is structured as follows: literature review, data and methodology, results and discussion, and conclusion.



The Linear regression is utilized for establish a direct relationship between gold prices and the selected variables. Random forest regression, an ensemble learning method, helps in capturing complex interactions between the variables. Gradient boosting regression, another advanced ensemble technique, is employed to improve prediction accuracy by minimizing errors sequentially. The comparison of these algorithms will determine their effectiveness under different conditions.

V. METHODOLOGY

1. Problem Definition and Data Collection

- Define the Problem: Clearly articulate the goal of predicting future gold prices using machine learning.
- Data Sources: Identify reliable sources for historical gold price data, economic indicators, and other relevant datasets (e.g., geopolitical events, market indices).

2. Data Preprocessing

- DataCleaning: Resolving missing values, errors, and inconsistencies in data.
- FeatureEngineering: Identify and engineer changes that will affect the price of gold, including market indicators, market sentiment, and historical prices.
- Standardization: Scaling the number of features to ensure they are consistent, which helps standardize training

3. Model Selection

- Algorithm Choice: Identify the most suitable machine learning algorithms according to the problem's requirements (e.g., regression for price prediction).
- Hyperparameter Tuning: Optimize parameters to enhance model performance using techniques like grid search or Bayesian optimization.
- Ensemble Methods: Consider combining multiple models (e.g., random forests, gradient boosting) to improve prediction accuracy.

4. Model Training and Validation

- Training Phase: Split data into training and validation sets using techniques like cross-validation to evaluate model performance.
- Validation Metrics: Use evaluation metrics such as RMSE, MAE, and R^2 to assess how well the models generalize to unseen data.

5. Model Evaluation

- Backtesting: Validate models on historical data to assess their predictive power and reliability.
- Performance Comparison: Contrast and compare the effectiveness of different models and techniques to find out the most efficient approach.

6. Interpretation and Visualization

- Interpretability: Evaluate the model results to identify the most influential features in predicting gold prices.
- Visualization: Create plots and charts to visualize trends, model predictions, and feature importance crucial.

VI. CONCLUSION

The study sought to examine the correlation between gold prices and several key factors, specifically, the stock market performance, crude oil prices, the rupee-dollar exchange rate, inflation rates, and interest rates. Monthly price data spanning from January 2000 to December 2018 was utilized for this investigation. The dataset was divided into two distinct periods: Period I, covering January 2000 to October 2011, characterized by a rising trend in gold prices; and Period II, spanning from November 2011 to December 2018, marked by a relatively stable or horizontal trend in gold prices.

The study employed three machine learning algorithms—linear regression, random forest regression, and gradient boosting regression to evaluate the data. It was noted that a strong correlation existed between the variables during Period I, characterized by rising gold prices, whereas the correlation weakened during Period II, marked by stable gold prices.

The study concludes that machine learning algorithms these tools are essential for such an analysis, but their accuracy is significantly these are shaped by the features of the data. The authors suggest further research utilizing similar datasets and different techniques to enhance understanding of these models' performance.



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