**Problem Statement**The goal of this research is to create an accurate machine learning model that can predict commodity prices, specifically gold. In volatile commodity markets, precise price prediction is essential for sound decision-making and risk management. However, conventional forecasting techniques frequently fall short of capturing complex market dynamics. In order to produce a reliable forecasting tool with improved prediction accuracy, this research will use machine learning techniques on historical price data. Selecting a suitable model, determining important price factors, and understanding forecasts are the main obstacles. In spite of market unpredictability, the ultimate model aims to facilitate more informed, data-driven decision-making.  
  
 **LITERATURE REVIEW**

**Introduction**

Forecasting commodity prices accurately has become critical for commodity producers, traders, policymakers, and other stakeholders in order to make data-driven decisions in volatile markets. Traditional statistical techniques, such as ARIMA models, are limited in their ability to capture the complexities of price-influencing factors. This has increased interest in sophisticated machine learning approaches for greater predictive modeling. This review examines the notable academic literature on applying ML to commodities forecasting, which includes markets, methodologies, data, and performance.  
  
**General Commodity Price Forecasting**Amin (2020) developed ML models to forecast the prices of daily necessities commidities. When the results of linear regression, LSTM neural networks, and Facebook Prophet were compared, the LSTM model performed best with the lowest error rates. However, the scope of the investigation was limited to a certain commodity. Ly et al. (2021) research was concentrated on forecasting commodities prices with LSTM networks. They discovered significant accuracy gains over typical autoregressive models. The paper illustrated how LSTM models may capture complicated temporal connections. However, the neural network models were difficult to interpret.Feature selection plays an important role in building a robust machine learning algorithm for any use. (Kumar et al., 2016) emphasize the impact feature selection poses on the improvement of model accuracy by eliminating noisy inputs. (Htun et al., 2023) suggest that a combination of correlation-based filtering, wrapper-based iteration, and embedded importance ranking across key feature subsets holds strong promise for impactful feature selection and accurate forecasting.In order to forecast agricultural commodity prices, specifically those of brinjal in Odisha, India, Ranjit et al. (2022) examined ARIMA and machine learning (ML) approaches such as Random Forest (RF), Support Vector Regression (SVR), Generalized Regression Neural Network (GRNN), and Gradient Boosting Machine (GBM). It was found that ARIMA's accuracy was significantly lower than that of the other ML model approaches employed and that it was unable to capture the volatility in pricing over time. GRNN performs better than other ML models in the majority of the market. Ranjit et al. (2022) highlighted that the ML models mentioned above can produce superior outcomes if they are trained with adequate data. However, external influences that may be unanticipated and impact commodity prices could result in inaccurate future price predictions.

## **Gold Price Forecasting Attempts** Saumendra et al. (2022) conducted an extensive investigation into the extent to which the ML technique for gold price prediction has been used. In the current work, the present and future gold rates have been predicted using a number of machine learning algorithms, both independently and in combination with other techniques. Based on their review, the most popular machine learning techniques for predicting gold prices are SVM, LR, and SVR. “SVR among SVM, RF, KNN, SVR and LR got majority of the accuracy and it is rated as the highest ML technique in predicting the price of gold.” **Fig. 1 Analysis of types of ML methods for gold price forecasting (Saumendra et al. 2022)** Other machine learning techniques have demonstrated their efficiency in predicting the price of gold in addition to SVM, LR, RF, KNN, SVR, and DT methods. These techniques include genetic algorithm regularization online extreme learning machine, ICA-GRUNN, least squares support vector machine, MLP, L-FABS, ANFIS, ARIMA, GARCH, gray prediction model, and many more. However, MLP stood out with better performance accuracy and high usage.

## **Conclusion**

In conclusion, machine learning based approaches demonstrate significant potential in advancing commodity price forecasting accuracy, overcoming limitations of classical statistical models. But significant gaps exist both in building and adopting the latest advanced methods that capture uncertainty and in integrating them across commodities, models, and methodologies. More holistic research can pave the path to enabling reliable, explainable, and continuously learning forecasting tools for dynamic markets.

**Competitor Analysis**

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| --- | --- |
| **Strengths** | **Weaknesses** |
| **Established data infrastructure and methodologies.** | **Reliance on purely quantitative models.** |
| **Access to extensive historical data.** | **Pure focus on Gold.** |

|  |  |
| --- | --- |
| **Opportunities** | **Threats** |
| **Leveraging the predictive power of Machine Learning.** | **Entry of Big Tech firms with vast resources.** |
| **Enhancing risk management capabilities.** | **Tighter regulations on AI-based models** |

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