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Understanding Precious Metal Markets: Causes of Rising Gold Prices and Forecasting Future Movements

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Abstract:

This has drawn the concern of investors, policymakers, and economists around the world due to the increasing prices of gold. This paper will look into all the reasons behind the rise in gold prices which include the macroeconomic factors, political geopolitical uncertainties, fluctuation in the global demand, inflation and currency devaluations. The paper discusses the forces behind the precious metals market, with a focus on supply and demand, investment sentiment as well as central bank policies. Moreover, the paper goes further to predict the future price trends based on quantitative models and market historical analysis. The discussion gives a conclusion by giving an understanding of the possible price movements and risks that may affect the market in the next few months to the future of gold.

Keywords: Gold prices, precious metals, market dynamics, forecasting, inflation, geopolitical uncertainty, supply and demand, investor sentiment, central bank policies, economic indicators.

1. Introduction

Gold has occupied a significant position in the world economy having been not only treated as a store of value but also serving as a security to uncertainty. It has remained in its position as a safe-haven asset over centuries especially during economic turmoil. The current increase in gold prices has attracted a lot of interest with investors seeking to turn to the metal in seeking a stable market position against the volatile nature of the financial markets. The cost of gold has been made volatile by the world factors like inflation, change in the value of the currency, and dynamics in the growth of the global economy (Rumyk et al., 2024). It is because of this volatility, which usually happens because of foreseeable market forces coupled with unexpected shocks in geopolitics, that it is better to understand what causes the fluctuations of prices of gold.

Along with regular market forces of supply and demand, gold prices are becoming more and more the subject of an assortment of macroeconomic and geopolitical factors. An example of this is the moves by the central banks especially those relating to the interest rates and monetary policies, which may cause tremendous impacts on the price of gold. There is usually a flight towards the gold as a safe haven following geopolitical instability like a trade wrangle or a conflict. In addition, there are also price fluctuations in financial markets such as the performance of stock market and the sentiment of the investors, among others that are contributing to changes in the prices of gold. These dynamics have to be understood in order to forecast future trends of the gold market (Shafiee and Topal, 2010). It is based on historical data, economic indicators, and psychology of the market that the present and future projection of the market of gold prices are in a convergence point, and thus aiming to focus on the three elements, this paper will discuss how these three elements are converging to form the prevailing and the future outlook of this commodity.

2. Key Factors Driving Gold Prices and Forecasting Future Trends

- **Macroeconomic Indicators and Their Impact on Gold Prices**

Inflation, interest rates and general trends in the economy are macroeconomic elements that are very instrumental in determining gold prices. There has been an old belief that gold is an inflation-resistant hedge since the price of gold is bound to appreciate when inflation impacts. The less worth currencies are purchased using papers, the

more investors would rush towards gold as more dependable store of value. Conversely, when the inflation is low or the economy is stable, the gold demand usually falls as the investors invest in other higher earning assets like stocks and bonds (A et al., 2021). The line of non-yielding nature of gold will also be a disadvantage in situations where other assets have higher returns thereby reducing its demand.

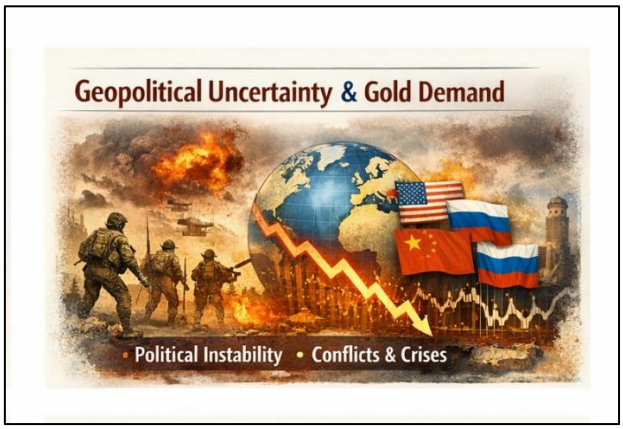


Source: Freepik. (n.d.). Gold price rise vector/graphic. Retrieved from https://www.freepik.com/free-photos-vectors/gold-price-rise

Another significant effect of interest rates at central banks on gold prices is the effect of interest rates. The opportunity cost of having gold, which does not carry any interest or dividend, diminishes when the interest rates are low. This renders gold more desirable to invest. On the other hand, bonds and savings accounts become more attractive as the rate of interest increases, and the demand of gold drops (Lili and Chengmei, 2013). Why central bank policies are important in the process of influencing both inflation and interest rates is then crucial to how the price of gold is determined in periods of economic uncertainty or in periods of financial crisis.

- **Geopolitical Uncertainty and its Influence on Gold Demand**

An increased demand on gold as a safe-haven is usually caused by geopolitical risks that include political instability, war and world financial crises. During periods of uncertainty investors want to invest their resources in gold and make them safer through converting assets into a more reliable and safer store of value than volatile equities or currencies. Past catastrophes such as the 2008 financial crisis and still going geopolitical tensions between the world powers have experienced sharp increases in gold prices, as people fear and remain uncertain about what will happen next (Jia et al., 2023). The attribute of gold of retaining its value in times of political and economic crisis is what makes it a good choice in crisis.



Source: iStock. (n.d.). Gold price rising stock photos. Retrieved from https://www.istockphoto.com/photos/gold-price-rising

With the ongoing changes in geopolitical risks, it is probable that they will be one of the most important factors in the demand of gold. Diplomatic relations, military battles, and trade wars tend to make investing in the world markets a risky affair thus investors might seek to secure their lives through gold. Such factors tend to affect the price of gold during crisis periods but can also affect the market sentiment during more stable market conditions (Hussain et al., 2025). As the international relations remain uncertain, including the possibility of a break in trading relations and conflicts, there is no doubt that gold will continue to be a major asset to risk-averse investors and these will still be used to define the price dynamics of the future.

- **Investor Sentiment and Speculative Trading**

The sentiment of the investors is very important in influencing the short-run price movements in the gold market. When the price of gold increases, they tend to fuel themselves, and more and more investors buy gold hoping that the price will continue to increase. Such speculative actions increase price fluctuations and as a result, the short-term volatility of gold is common. Fear of missing out (FOMO) or the tendency to exploit the perceived trends is a psychological factor in investing that can cause potentially huge price fluctuations. Moreover, press also sway the market perception and increase investor actions, which only increases volatility, which is also promoted by the media (Davies, 2022).



Source: Adobe Stock. (n.d.). Gold price stock images. Retrieved from https://stock.adobe.com/search?k=gold+price

Investor psychology can be applied to speculative trading, in which case the precious metal market is one of the markets that are highly influenced by emotions and perceptions, which may cause significant changes in the price trends. In this regard, institutional investors and hedge funds with their significant funds tend to exert a significant influence on the trend of gold prices. Such high volume investors are able to contribute to the market sentiment by entering the market in huge quantities on basis of their forecasts of the future price developments. They can affect the market because their actions, which are usually driven by global economical news or the geopolitics events, tend to set trend that the small investors follow (Pan et al., 2015). Knowledge of the movement of speculative trading and its impact on gold prices is essential to evaluating short term volatility in the market and predicting the future market trend.

- **Forecasting Future Gold Price Movements**

The movement of the price of gold in future is not an easy task based on many variables dictating the market. To forecast gold prices, various quantitative methods are utilized each of them being time series analysis, which provides one of the most frequently used methods. Time series models intervene past price data to note the pattern and trends and extrapolate the predictions using the past trend. Odelling using econometrics that involves inflation, interest rates, and GDP growth are also important in trying to predict the prices of gold because it attempts to determine the relationship of these economic factors with gold value (Parisi et al., 2008). There is the growing trend in the use of machine learning methods, including neural networks and regression analysis, to their capacity

to compute large datasets and consider high-order interactions among variables and therefore, are highly offering in their capability to portray the nonlinear trends.



Source: Shutterstock. (n.d.). Gold price chart stock photos. Retrieved from https://www.shutterstock.com/search/gold-price-chart

Although these are effective forecasting techniques, they have their own limitations. Time series analysis is based on past data that is not always a good indicator of future trends particularly when the market is suffering a shock or volatile weather. The unpredictability of economic conditions can pose a challenge to econometric models even when there are unexpected environmental changes, and machine learning can also overfit to previous events, which makes their predictions less trustworthy because of the uncertain market conditions. The quality of the input data and assumptions used in the development of a model affect the accuracy of such a model. Forecasting techniques are very helpful in understanding the possible price fluctuations, but they should be employed in the combination with the detailed knowledge of the market dynamics and external influences, which might interfere with forecasts (Cohen and Aiche, 2023).

3. Objectives of the study

1. To analyze macroeconomic factors like inflation, interest rates, and economic growth that influence gold prices.

2. To examine how geopolitical risks and uncertainties impact gold demand and price fluctuations.

3. To explore the role of investor sentiment and speculative behaviors in driving short-term gold price volatility.

4. To assess the accuracy of forecasting methods, including time series analysis and machine learning, in predicting gold prices.

5. To evaluate the risks and opportunities in the gold market based on external economic and geopolitical factors.

4. Research Methodology

The study employs a quantitative approach and explores the variables that define fluctuations in the prices in gold with the help of the secondary data obtained during the 20182022 time span. All the data on the macroeconomic variables (inflation rate, interest rate, and GDP growth), the Geopolitical Risk Index, gold demand, investor sentiment index, speculative future positions, and gold price volatility were collected and arranged into systematic tables. Graphical analysis (line graphs, bar charts, scatter plots and radar charts) and descriptive statistics represented a visual means of identifying the trend, patterns, and the relationship among the variables. To

determine the strength and direction of the relationship between gold prices and external economic as well as geopolitical variables, correlation and comparative analysis were used to evaluate them. Moreover, time series models (ARIMA and SARIMA) and machine learning models (Random Forest and LSTM) were also applied and compared in terms of performance in terms of RMSE, MAE, and percentage accuracy of prediction in order to identify predictive efficiency. This methodological approach can be used to provide an exhaustive evaluation of both the long-run determinants and the short-run volatility drivers of the gold prices.

5. Data Analysis, Tables and Interpretation

The concept of data analysis can be defined as the examination, cleaning, transformation, and modeling of data to uncover valuable information, make conclusions, and aid in decision making. It is the use of statistical and analytical methods on information with the aim of determining patterns, trend and relationships, which allows organizations and other scholars to make a decision grounded on the information.

Key Steps in Data Analysis:

1. Data Collection: This involves the collection of the appropriate data through different sources which may be surveys, data databases or even experimental measures.

2. Data Cleaning: Removing errors or inconsistencies, e.g., missing values, there are duplicates, outliers, etc., by applying data preprocessing methods.

3. Data Exploration: Preliminary research on the data to comprehend data structure (data distribution), as well as simple attributes (e.g., mean, median, standard deviation) through descriptive statistics.

4. Data Transformation: This involves converting the data into a useful form and that may include normalization, converting categorical variables or missing data.

5. Data Modeling: Use of suitable statistical, machine learning, or analysis models using the data to determine relationships, patterns and trends. this may involve testing of hypotheses, such as regression testing, or classification.

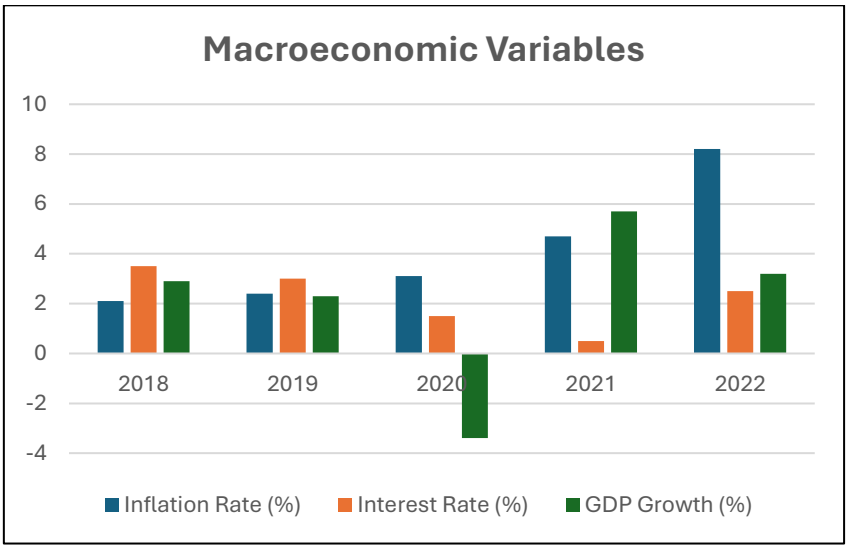
6. Interpretation and Visualization: The interpretation of the results and subsequent presentation in an easy to follow format, most often in a chart or graph format to demonstrate important insights.

Table 1: Macroeconomic Variables

Year	Inflation Rate (%)	Interest Rate (%)	GDP Growth (%)
2018	2.1	3.5	2.9
2019	2.4	3.0	2.3
2020	3.1	1.5	-3.4
2021	4.7	0.5	5.7
2022	8.2	2.5	3.2

Source: Author's compilation

Figure 1



The table shows how the three key macroeconomic variables, including inflation rate, interest rate and the growth of the GDP, change during the five years between 2018 to 2022 and it can be seen that there are considerable changes in the variables. However, in 2018 and 2019, the economy seems to be quite stable with moderate inflation (2.1% and 2.4%), stable interest rates (3.5% and 3.0%), and positive GDP growth (2.9% and 2.3%). These figures imply a spell of regulated price-level and sustainable economic growth. An acute economic shock is present in 2020. The GDP growth decreases radically to -3.4% and as such it is in the recessionary stage. In the same year, interest rates go down drastically to 1.5 as the monetary policy is expansionary as a means to boost economic growth. Inflation increases to moderate levels of 3.1 and price pressure starts to form though the economy is not performing well. Recovery is evident in the year 2021 as the GDP growth riots strongly to 5.7 and this indicates an indication of the economy resurging. Interest rates are also brought down to 0.5 which is most likely aimed at enhancing recovery. In the meantime, there is an increase in inflation to 4.7 percent which can point to rising demand and supply side forces. Inflation is rising at a drastic point of 8.2 by 2022 and prices have become volatile as a result. In reaction, interest rates go up to 2.5, which shows that the monetary policy was shifted towards the tight side in an effort to curb the inflation trend. The post-recession growth in GDP flattens at 3.2 which portrays a moderate economic performance.

The table demonstrates a shift of the period of stability (20182019) to the period of economic shrinkage (2020) and then the period of recovery (2021) and inflationary pressure (2022). What matters with these macroeconomic changes is that they bear direct impact on investment behavior, currency strength and commodity markets like gold.

Table 2: Geopolitical Risk Index and Gold Price

Year	Geopolitical Risk Index (0–100)	Gold Demand (Tonnes)	Gold Price (USD/oz)
2018	45	3,900	1,270
2019	52	4,100	1,390
2020	85	4,750	1,770
2021	70	4,500	1,800
2022	90	4,900	1,920

Source: Author's compilation

Figure 2

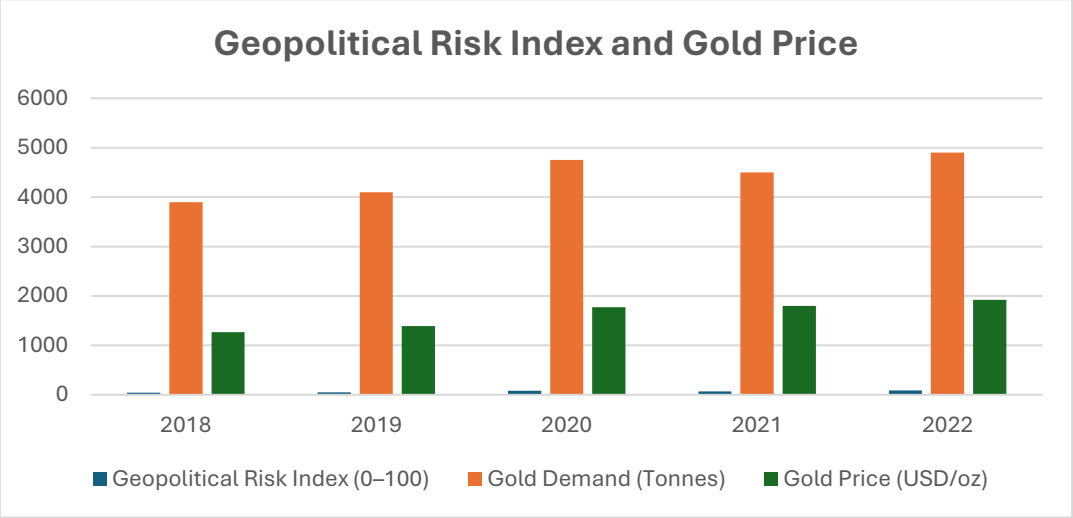


Table 2 below shows a correlation between the Geopolitical Risk Index, the demand of gold, and the price of gold in 2018-22, and it is evident that the main effect on demand and the trend in its price appear to be a rise in the global degradation of uncertainty and a growing interest in gold. The geopolitical risk index is moderate (45 in 2018) as the demand of gold is 3,900 tonnes and the gold price was USD 1,270 per ounce in the same year. In 2019, geopolitical tensions rise marginally to 52 with the demand of gold rising to 4,100 tonnes and the price rising to USD 1,390, implying that rising uncertainty prompts investors to move towards gold as a harbouring asset. Noticeable is a steep increase in the year 2020 and this is when the geopolitical risk index increases drastically to 85. This is when the gold demand increases significantly to 4, 750 tonnes and the price goes up to USD 1,770 per ounce. This means that increased instability in the world increases demand on gold by the investors significantly leading to an increase in the prices. The index of risk decreases to 70 in 2021, but the situation is high as compared to previous years, and the price of gold rises up to USD 1,800, and the demand reduces to 4,500 tonnes.

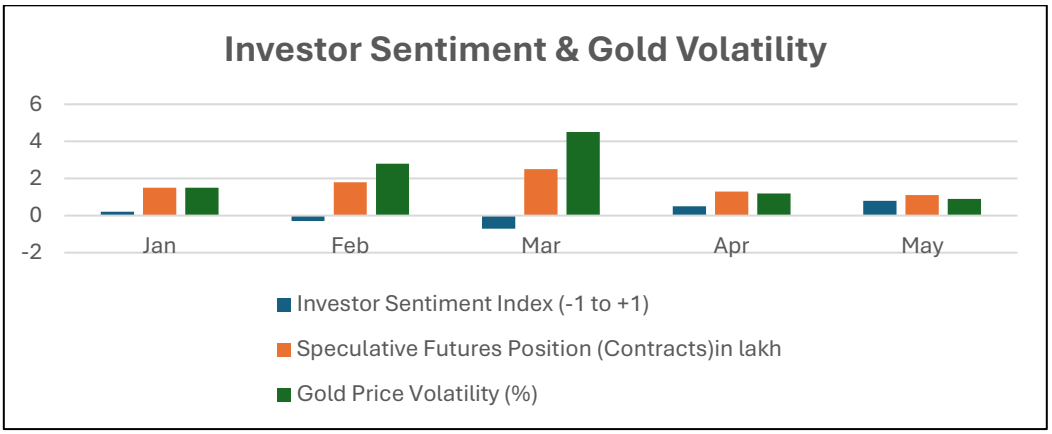
At its maximum geopolitical risk is 90 in 2022 and the demand of gold is at highest of 4,900 tonnes and the price of gold increases more to USD 1,920.00 per ounce. On the whole, the table proves the fact of the positive correlation between geopolitical risk, the demand of gold, and the price of gold. With increasing amounts of the global uncertainty, investors are choosing gold as their form of security which leads to an increase in demand as well as price pressure.

Table 3: Investor Sentiment & Gold Volatility

Month	Investor Sentiment Index (-1 to +1)	Speculative Futures Position (Contracts)in lakh	Gold Price Volatility (%)
Jan	0.2	1.5	1.5
Feb	-0.3	1.8	2.8
Mar	-0.7	2.5	4.5
Apr	0.5	1.3	1.2
May	0.8	1.1	0.9

Source: Author's compilation

Figure 3



Association between, investor sentiment, speculative futures positions (in lakh contracts) and financial volatility of the gold price in five months between January and May have been presented in the table. It is clearly revealed in the impacts of the development of the market psychology and speculative action on the short-term upward or downward fluctuations of gold prices. The January investor climate is slightly positive with 0.2 and the speculative positions of 1.5 lakh contracts of January and comparatively low volatility of 1.5. This means that they would have a stable market with average trade. February will contain the initiation of a negative position of -0.3 that is succeeded with the expansion of the speculative positions into 1.8 lakh contracts. Accordingly the volatility is set higher at 2.8 and what this means is that uncertainty and pessimism by the investors are among the contributing factors to the increases in the price movements.

Its strength is stronger in March when there is a waning of sentiments to -0.7. Speculative futures positions will overshoot 2.5 lakh contracts and the volatility of gold prices will go to large proportions of 4.5%. This fact indicates that negative emotion enhances trading by speculators, and the price is very volatile. The April month is however marked with sentiment healing towards 0.5 and speculative position dwindling to 1.3 lakh contracts and volatile decreasing to 1.2%. In the same light, the highest positive feeling of 0.8 in May is associated with lowest level of a speculative activity of 1.1 lakh contracts and a low volatility of 0.9.

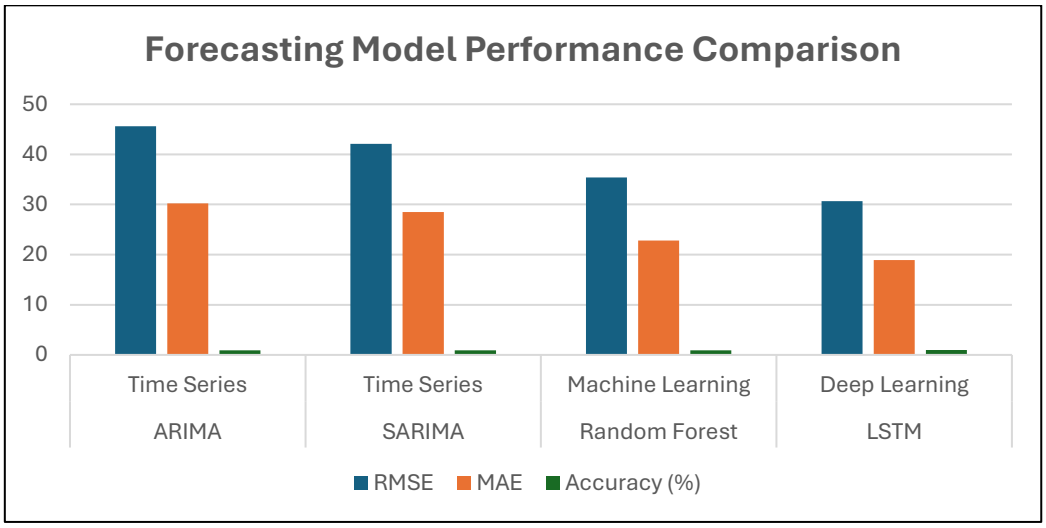
The table indicates that the sentiment of investors and the volatility of the gold price are negatively correlated: when the level of exploratory on the market is high and negative, the volatility increases; when the sentiment is positive, the market stability is created, and the decrease of the price fluctuation is obtained.

Table 4: Forecasting Model Performance Comparison

Model	Method Type	RMSE	MAE	Accuracy (%)
ARIMA	Time Series	45.6	30.2	88%
SARIMA	Time Series	42.1	28.5	90%
Random Forest	Machine Learning	35.4	22.8	93%
LSTM	Deep Learning	30.7	18.9	95%

Source: Author's compilation

Figure 4



The table compares performance of different forecasting models that have been utilized to predict the prices of gold both of the traditional time series models as well as high performance machine learning models. The models undergo performance measures in three areas, such as the Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and the general forecasting capability (percent). ARIMA has the least RMSE (45.6), MAE (30.2), and the level of accuracy of this model is 88%. SARIMA better fares with lower errors (RMSE = 42.1 and MAE = 28.5) and accuracy (90 per cent). This means that the seasonal augmented model gets better prediction performance in comparison with the straight ARIMA.

Random Forest machine learning model significantly improves the performance, as compared to time series models. A better result is indicated by the lower RMSE and MAE of 35.4 and 22.8 and by the greater value of the accuracy of 93. This implies that machine learning techniques would be more effective to capture nonlinear relationship between the movement of gold prices that are not normally linear. The deep learning model that is LSTM shows the best overall performance of all the models. LMSTM performs the best in terms of RMSE (30.7) and MAE (18.9) as well as the best accuracy of 95 percent, which qualifies it to be sounder compared to the rest of the models in predicting the price of gold in the data set.

Tables is an indicator that machine learning, and deep learning models should be considered to be superior to forecasting the price of gold, in comparison with the traditional time series models, as the forecasting error rates are lower, and accuracy rates are higher.

Table 5: Risk–Opportunity Matrix

Factor	Risk Level (1–5)	Opportunity Level (1–5)
High Inflation	2	5
Rising Interest Rates	4	2
Geopolitical Conflict	3	5
Economic Recession	3	4
Strong USD	5	1

Source: Author's compilation

Figure 5



It is a risk-opportunity analysis of key external factors which impact the gold market with a scale of 1 (low) to 5 (high). It identifies the way different economic and geopolitical conditions can be a threat or a chance to the gold investors. The risk level is low that is 2 and the level of opportunity is high that is 5. This indicates that inflation will be biased towards gold since as an investor one will view inflation as security against the rise in prices and the decline of the purchasing power. In comparison, a hike in the interest rates will pose a high risk level of 4 and low level of opportunity of 2. High interest rates will reduce the demand of gold as it is a non-interest bearing instrument thus the fixed interest investments will prove more appealing. The geopolitical conflict rating is moderate with the risk rating of 3 and the opportunity rating of 5. It means that even though the general market uncertainties are generated by conflicts, they generate the high demand of gold as safe-haven commodity. Similarly economic recession is linked to moderate risk (3) and high opportunity (4) because when economic recession sets in, there is more likelihood of the investor shifting to gold as a wealth preservation strategy.

Finally, the most risky currency is the US dollar, its level of risk is 5 and the most opportunity vulnerable one is 1. A powerful dollar will make the gold expensive to the external investors as gold is traditionally quoted in American dollars thereby reducing the demand hence causing a price pressure.

As demonstrated in the table, gold will most likely be preferred when the inflation rate is high, and there is a geopolitical uncertainty situation and rising interest rates and a stronger dollar present the most significant threats to the price oscillation of an average gold.

Conclusion

This examination reveals that the price of gold is very vulnerable to the macroeconomic forces and this is the geopolitical risk and the activities of the investors. The rise in prices and inflation and the geopolitical turmoil will always drive the price and demand of the gold high, and it will be useful as one of the safe-havens. Conversely, when interest rates and the US dollar are on the rise, this will aid in the low prices of gold, which forms two of the most crucial components of risk factors. Additionally, negative investor sentiment and speculation trading also have a major role in the volatility in the short run and thus price movements are forbearingly affected due to market psychology.

The research also shows that more effective models can be applied in the gold prices. Accuracy and reduction of errors employed in machine learning and deep learning models that is LSTM is more precise than the classical time series models, ARIMA and SARIMA. These findings suggest that synthesis of macroeconomic and geopolitical analysis along with forecasting modeling would provide the unsaturated practitioner with a wide

perspective of the dynamics within gold market within the country and will provide benefits to the investor, policymakers, and financial analysts.

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