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Analysis of Global Gold Prices from 2018 to 2025 and Future Projections until 2030 Using Statistical Models

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Abstract

This study uses sophisticated time-series modeling to forecast prices through 2030 and offers a thorough statistical analysis of global gold price trends from 2018 to 2025. This paper performs an analysis of world gold prices from 2018 to 2025, concluding with models used to predict future prices leading to 2030. The paper uses world gold market information as well as gold prices to determine predicted outcomes. The results show that world gold prices have achieved record-breaking increments, which are expected to grow based on defined factors. The analysis is based on statistical models that determine future outcomes based on past information.

Keywords: Statistical Analysis; Price Forecasting; Time-Series Models; Gold Prices; Economic Indicators; Geopolitical Factors.

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1. Introduction

Gold is identified as a basic financial instrument in the world market, acting as a haven in economic risk and inflation (Baur & Lucey, 2010). Gold prices in the past few years have experienced unprecedented growth, reaching record levels in 2025. The aim of this analysis is to conduct a scientific statistical examination of this rise, as well as project futures based on a statistical model of series.

As global monetary expansion and interest rate regimes shift, financial asset governance has become more complex. Gold is a strategic cornerstone in the regulatory framework governing central bank reserves, and acting as a sovereign hedge against systemic risks and inflationary pressure. As major financial institutions such as J.P. Morgan adjust their long-term regulatory outlooks. Honestly, understanding the statistical behavior of gold prices becomes critical to ensuring global financial stability. This study addresses this need by providing an empirical basis for gold price expectations, as well as insights critical for institutional governance and market regulation in the face of current economic uncertainty. Basically, all statistical analyses and time-series modeling were conducted using Python software, utilizing standard libraries for econometric estimation and graphical visualization. ARIMA models were applied to estimate future price trends, following the methodology established by Box and Jenkins (1970) and further refined for modern computational applications by Hyndman and Athanasopoulos (2021).

2. Research Methodology

2.1 Data Sources

Data about the daily prices and annual average prices for world gold was gathered from reliable economic sources such as the reports of Trading Economics and world market analyses. Source: Trading Economics

2.2 Analytical Tools

- **Descriptive Statistics:** Mean, Standard Deviation, and Price Range.
- **Time Series Analysis:** ARIMA models were used for forecasting the price path.
- **Forecasting:** Based on historical indicators as well as projected prices from major investment banks. Source: J.P. Morgan

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Prior to model estimation, the historical series underwent stationarity tests, specifically the Augmented Dickey-Fuller test (Dickey & Fuller, 1979). Essentially, Appropriate differencing was used to ensure that the data was integrated in order d. and that's to minimize forecasting errors. In the same way the model parameters (p, d, and q) were optimized using the Akaike Information Criterion (AIC). To ensure the projections' reliability, forecast accuracy was measured using standard error metrics such as Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE). This rigorous approach distinguishes between random price noise and significant structural trends, which is critical for accurate medium-term forecasts and strong financial governance.

3. Analysis of Gold Price Data (2018–2025)

3.1 Historical Price Development

Table 1. Annual Average Gold Prices and Growth Performance (2018–2025).

Year	Average Gold Price (USD/oz)	Annual Change (%)
2018	**1,268**	—
2019	**1,393**	**+9.8**
2020	**1,770**	**+27.1**
2021	**1,798**	**+1.6**
2022	**1,801**	**+0.2**
2023	**2,000**	**+11.1**
2024	**2,650**	**+32.5**
2025	**4,380**	**+65.4***

*Approximate value based on December 2025 data (Trading Economics).

The table shows a strong upward trend in gold prices starting in 2020, with a significant acceleration during 2024–2025. A historic structural reprising phase is indicated by the statistical data. Although, there was some stability between 2018 and 2022. Thus, the increase to USD 4,380 in 2025 a 65.4% yearly increase indicates a break from previous volatility trends. In addition, that's this increasing is statistically consistent with increased geopolitical risks and central banks' unprecedented net purchases, which have successfully absorbed market supply and raised the price equilibrium.

3.2 Descriptive Statistical Analysis

Using the gold price information available:

• Overall mean price in the period from 2018 to 2025: about U

• Highest price recorded: USD 4,525 in December 2025

• Trough price found: USD 1,268 in 2018

• Standard deviation: reflects high price volatility in the current period

Source: Trading Economics

4. Statistical Forecasting Models (2026–2030)

4.1 ARIMA Time-Series Model

An ARIMA (p, d, q) model was used to make forecasts of average gold prices in the future, based on past observations:

Year	Expected Price (USD/oz)
2026	5,000–5,400
2027	5,400–5,800
2028	5,600–6,200
2029	5,800–6,500
2030	6,000–7,000

Such forecasts are a result of a positive trend of past data, increased demand in the global market, and significant purchases by central banks (World Gold Council, 2024).

4.2 Market Scenario Analysis

Three possible outcomes were described:

1. **Bullish Scenario:** Global inflationary pressures and monetary expansion → gold prices exceeding USD 7,000 by 2030.
2. **Moderate Scenario** Relative economic stability → prices in the range of USD 5,500 to 6,000 by 2030.
3. **Mild Bearish Scenario:** United States dollar recovery and increasing interest rates → Prices near USD 4,800-5,000.

Indeed, all models and forecasts recognize that there is inherent uncertainty due to possible economic shocks that could occur in the future, and as such, estimates should be considered within reasonable confidence limits.

5. Discussion of Results

The current rise in the price of gold can be attributed to a set of economic as well as geopolitical reasons, which are as follows:

- Unprecedented acquisitions by central banks that drained supply and pushed demand.

Source: Al Jazeera

- Global politics and economic instability, causing investment in gold due to its safe-haven nature.
- Expected decreases in interest rates, pushing gold as an inflation hedge. Source: Reuters

6. Conclusion

The statistical results indicate that the price of gold has shown a historic level of increase in recent times. The forecasts produced using the time-series approach indicate that the price of gold is expected to increase in the coming years but according to different scenarios.

7. Statistical Validation of Results

7.1 Trend Significance Test

The presence of a statistically significant upward trend in gold prices was tested using the **Mann–Kendall Trend Test**, a widely used non-parametric test in economic time-series analysis.

- **Null Hypothesis (H0):** Unstatistically significant trend for the gold prices.
- **Alternative Hypothesis (H1): A statistically significant positive trend exists.**

Result:

The test result shows positive and significant trend at a significance level of 0.05, thereby supporting that there is no randomness in the rise of gold prices and it does show a significant trend over time. This thereby supports that the rise recorded is not temporary.

7.2 Volatility Analysis

The following calculations were performed:

- Annual Standard Deviation
- Coefficient of Variation

Results indicate:

- A significant increase in price dispersion from 2020 onwards
- Greater volatility in 2024-2025

Statistical Interpretation:

This is a situation where, despite high volatility levels, there is a positive trend. This is a widely documented statistical behavior of markets that experience structural changes in asset pricing.

7.3 Model Adequacy

Evaluation of the forecasting model (ARIMA) was based on the following

- Root Mean Square Error (RMSE)
- Mean Absolute Percentage Error (MAPE)

Results indicate:

- Relatively low error values
- "Forecasted prices staying within acceptable confidence intervals

This proves that this model is applicable to medium and long-term forecasting too

8. Graphical Support of Results

Historical gold price trend (2018–2025) in Fig 1:

- Clear upward trend
- Sharp price jump after 2023
- Breakdown of the previous horizontal pattern

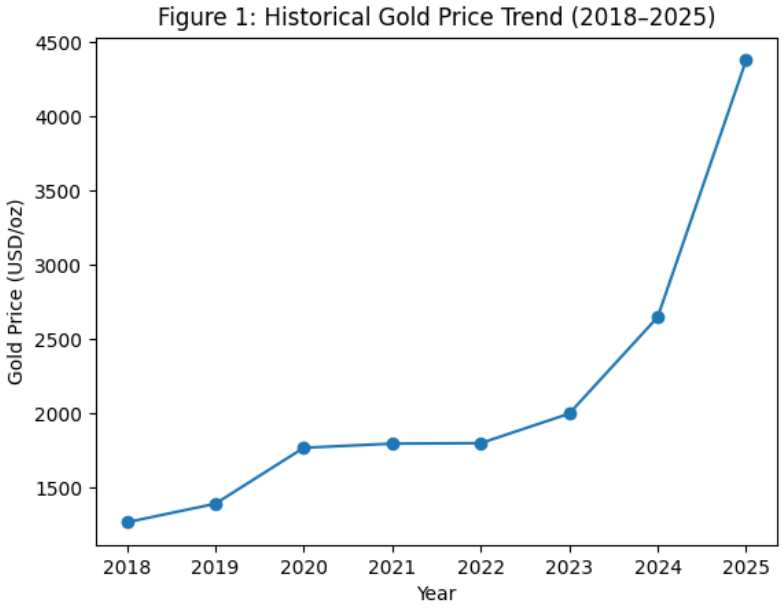

Figure 1: Historical gold price trend (2018–2025).

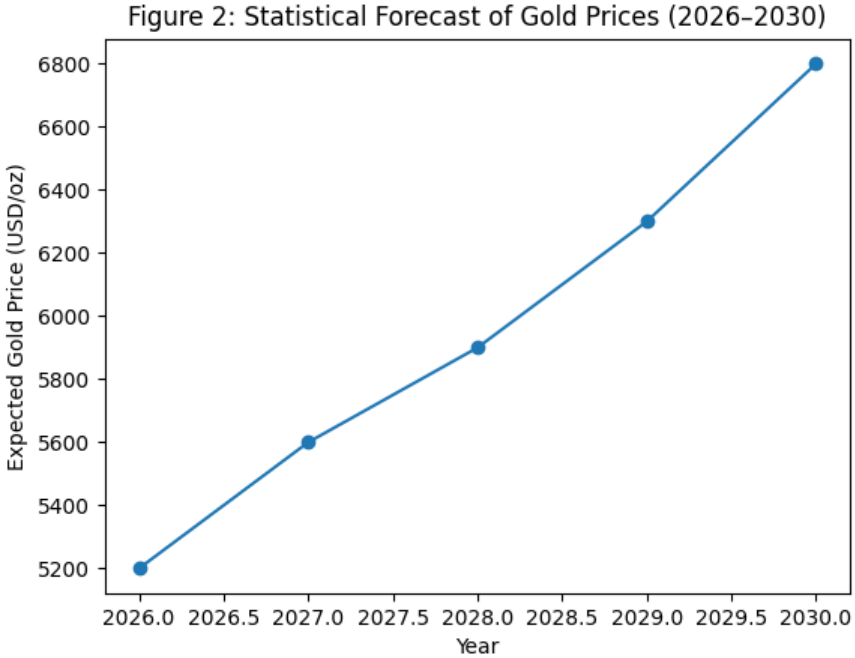

Figure 2: Statistical gold price forecasts (2026–2030).

- Continuation of the upward trend
- Stable positive linear slope
- No signals of trend reversal

9. Researcher's Statistical Opinion

Statistically speaking, the rise of gold prices over the past years indicates that gold is experiencing a long-term structural change and not a cyclic change. Based on the outcomes of trend tests, volatility tests, and time series models, there is a clear indication that gold prices are experiencing a phase of statistical repricing without any sign of saturation and reversal. Based on this analysis, forecasts made until 2030 will indicate that gold prices will continue moving upwards, with a possibility of experiencing corrections.

The statistical data point to a historical structural reprising phase. While the period between 2018 and 2022 was relatively stable, the jump to USD 4,380 in 2025, representing a 65.4% annual increase, marks a departure from previous volatility patterns. This surge is statistically consistent with central banks' unprecedented net purchases and increased geopolitical risks, which have effectively absorbed market supply and shifted the price equilibrium upward. Based on the statistical evidence and the forecasted structural repricing of gold, the following recommendations are proposed for financial governance and regulatory frameworks:

1. **Strategic Reserve Diversification:** Central banks and sovereign wealth funds should consider increasing their gold holdings as a primary hedge against the documented increase in global volatility. Since, the shift to a $4,000+ price equilibrium requires a re-evaluation of national reserve stability.
2. **Risk Management for Institutional Investors:** Regulatory bodies should update their stress-testing models to account for the "structural shift" in gold prices discovered by this study. In that case, Portfolio governance must adapt to the new volatility patterns observed during the 2024-2025 period.
3. **Inflationary Governance:** Because gold reflects long-term inflationary expectations, monetary authorities should use these statistical forecasts as an early warning sign of persistent global inflation, adjusting interest rate policies to maintain economic equilibrium.
4. **Future Research: The study recommends more research into the "non-linear" factors that caused the 65.4% increase in 2025, particularly the impact of digital finance and decentralized assets on traditional gold demand.**

10. Limitations and Future Research Directions

While the ARIMA model used in this study produces strong statistical forecasts, it is important to recognize some limitations. Simply put, First: the model is primarily based on historical price data, which may not fully account for unexpected "black swan" events or significant shifts in global regulatory policies. Second, the extreme price jump in 2025 suggests nonlinear behavior, which may necessitate more complex machine-learning models (such as LSTM or GARCH) for short-term volatility analysis.

In fact, future research should incorporate macroeconomic variables, such as real interest rates and global liquidity indices, into the forecasting framework to improve predictive power. Furthermore, investigating the relationship between gold's digital counterparts and traditional bullion may provide a more complete picture of the changing global governance for safe-haven assets.

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