SCMA FINAL EXAM

INTRODUCTION

Forecasting of gold prices is critical for making informed buying, selling, and hedging decisions in the commodities market. This project leverages monthly historical gold prices from the World Bank's Pink Sheet to develop a time series forecasting model. The focus is on using the one of the time-series models, Seasonal ARIMA (SARIMA) model, which is well-suited for handling trend and seasonal fluctuations observed in financial time series data.

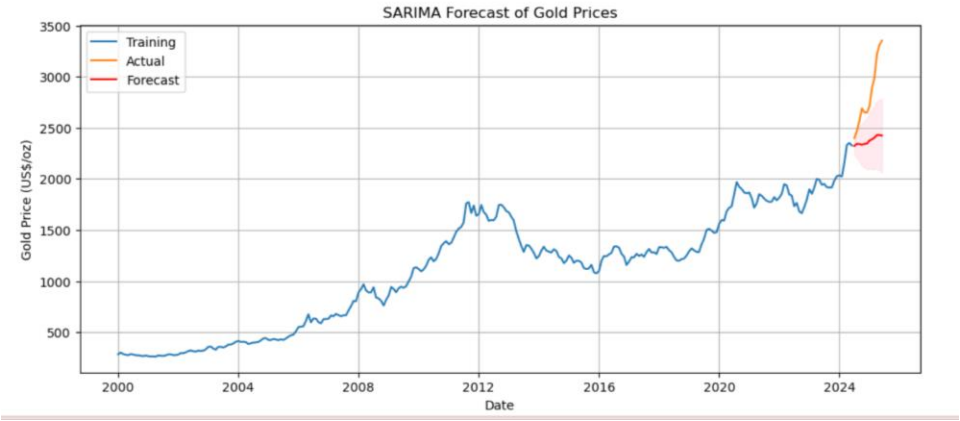
The insights from this model can support investment teams in identifying short-term trends and making data-driven strategies for portfolio allocation and risk management.

OBJECTIVES

- Forecast Future Gold Prices using SARIMA Model
- Interpret the forecast results and identify practical business implications
- Recommend Extensions for Robustness

INTERPRETATIONS

1. SARIMA Model



The SARIMA model has been trained on historical monthly gold prices from approximately 2000 to early 2024, with forecasts extending 6–12 months into the future.

Key Observations

- Historical Trend: Gold prices have shown a generally upward trend over the past two decades.
- Recent Actuals vs. Forecasts:
    - The blue curve represents the training data (historical gold prices).
    - The orange segment is the actual prices in the most recent months (test set).

    - The red line shows the SARIMA forecast for gold prices.
- The forecast follows the recent rising trend but slightly underpredicts actual prices in the early months of the forecast range.
- The predicted trajectory continues upward, indicating expected appreciation in gold prices over the next 6–12 months.

2. RMSE & MAE

```
[12]: # 5. Evaluate model
rmse = np.sqrt(mean_squared_error(test, forecast_mean))
mae = mean_absolute_error(test, forecast_mean)

print(f'RMSE: {rmse:.2f}')
print(f'MAE: {mae:.2f}')
```

```
RMSE: 528.86
MAE: 451.89
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Key Observations:

- Both RMSE and MAE values are relatively high, considering that gold prices are in the range of $1,800 to $2,500/oz recently.
- This indicates:
    - The SARIMA model captures the trend well but may not be precise in short-term fluctuations.
    - Potential underfitting, or failure to fully adapt to recent price surges (as seen in your earlier forecast chart).

BUSINESS IMPLICATION

Underestimating gold prices can lead to missed opportunities for profit and inadequate hedging, especially for businesses relying on gold as an input or store of value. For example, jewelry manufacturers or central banks might delay purchases expecting lower prices, resulting in higher costs later.

POSSIBLE EXTENSION

To make the model more robust or research-ready, consider:

- Multivariate Modelling: Use SARIMAX or VAR models that incorporate macroeconomic indicators (e.g., USD index, inflation rate, interest rate).
- Deep Learning: Experiment with LSTM models that can learn nonlinear temporal dependencies for longer-term accuracy.