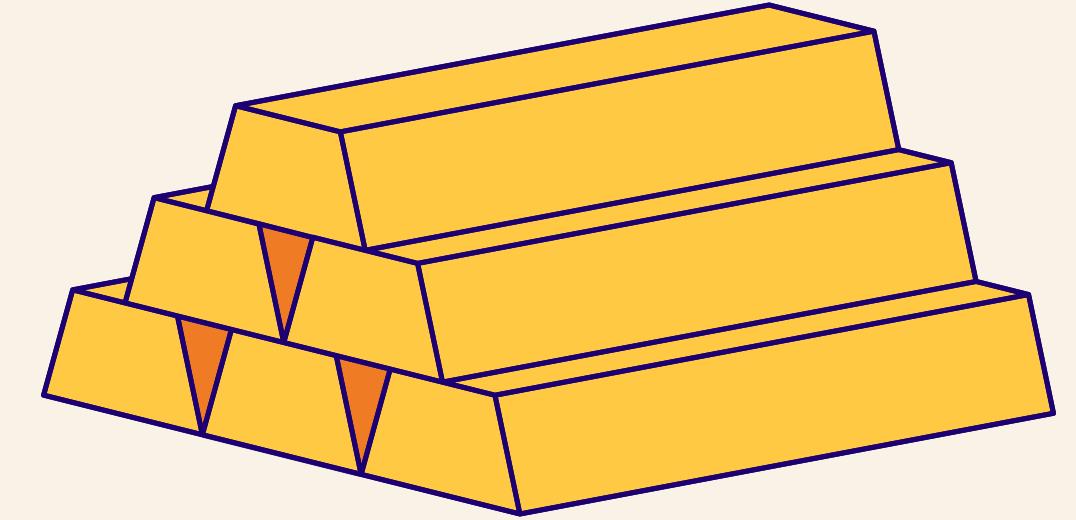


Gold Price Analysis & Prediction



By: Malak Essam

Analyzing Gold
Prices: Insights and
Strategies

1 - Problem Statement

2 - Data sets

3 - Time Series Analysis

4 - Advanced Modeling

5 - Trading Strategy

6 - Market Sentiment Analysis

7 - Impact of Market Events

8 - Conclusion

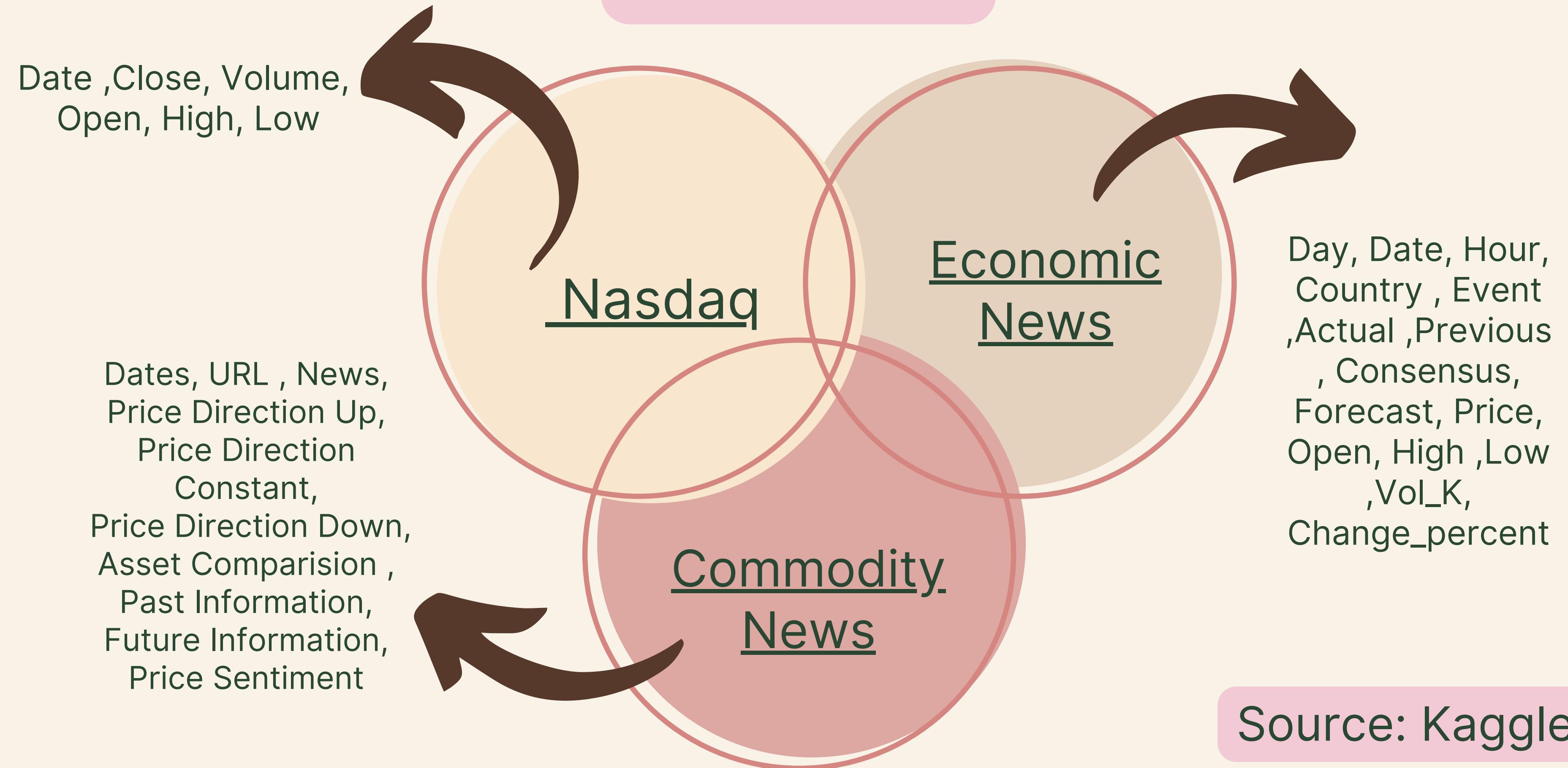


01 - Problem Statement

- Utilizing daily gold price dataset from 2014 to 2024 sourced from Nasdaq.
- Objective: Analyze trends, develop predictive models, and provide insights.
- Challenges: Complex factors affecting gold prices like economic indicators.
- Importance: Empowering investors with data-driven strategies in volatile markets.
- Approach: Statistical analysis, machine learning, sentiment analysis.

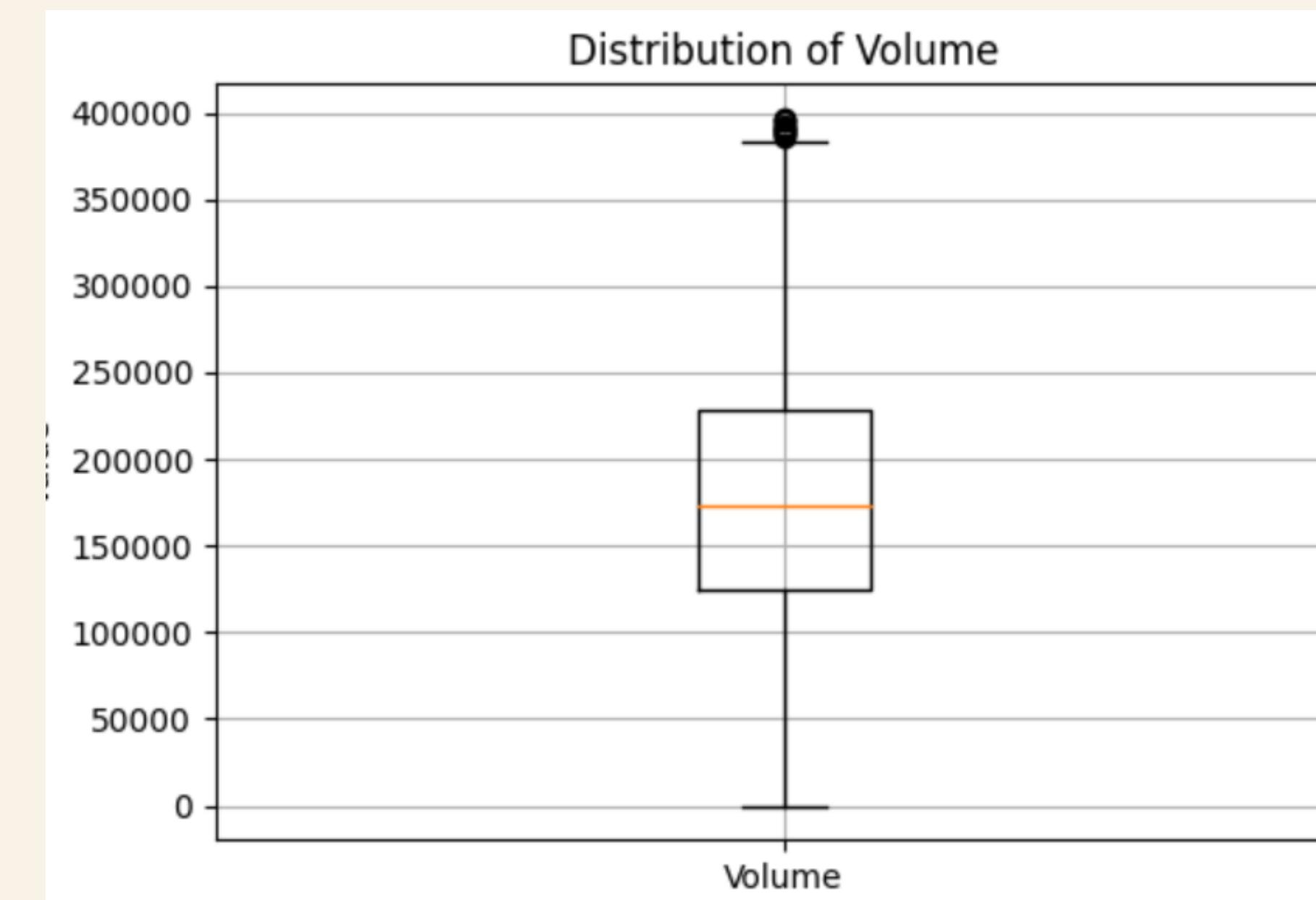
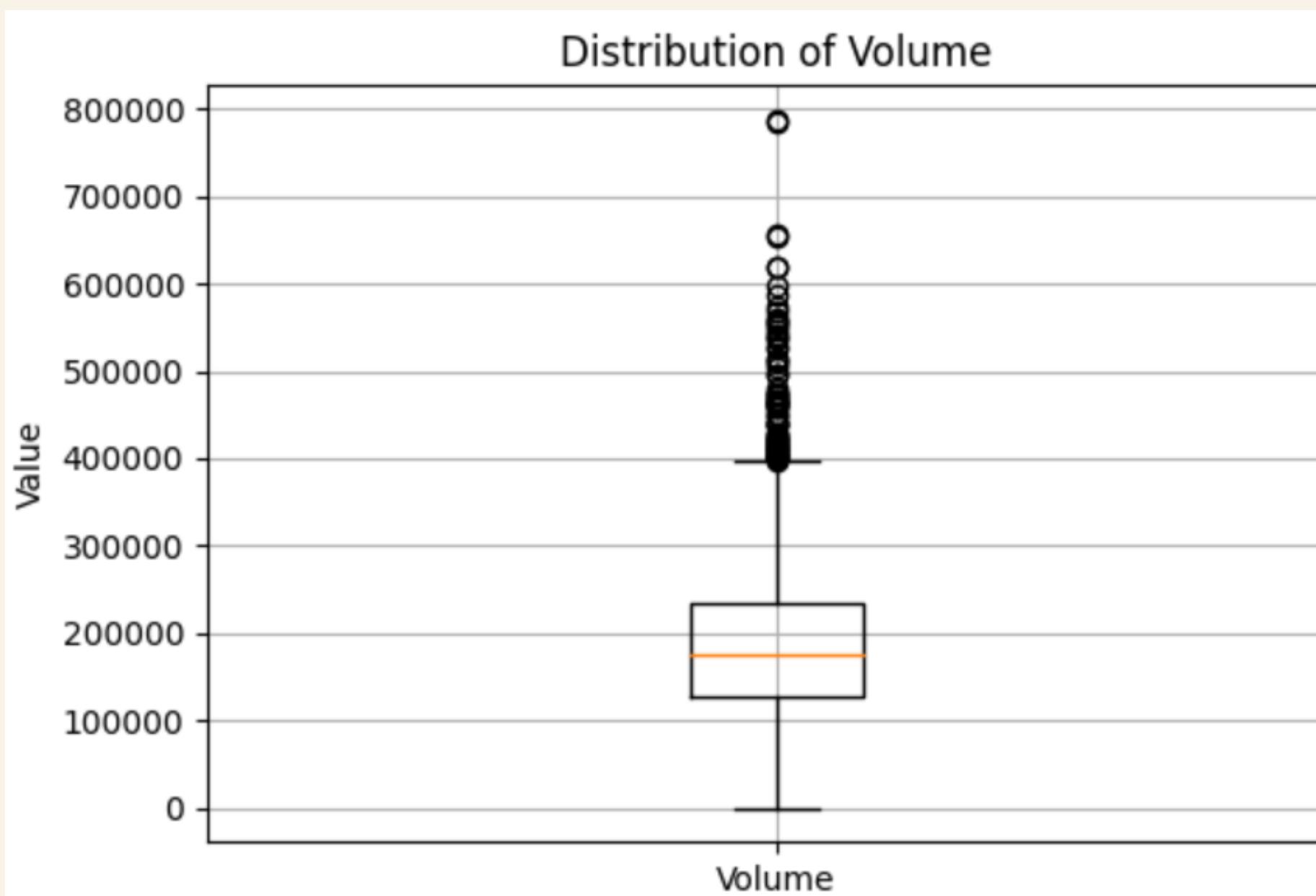
The image shows a laptop keyboard in the foreground, with a blurred screen in the background displaying a code editor containing CSS code. Above the laptop, a social media post is visible, featuring a profile picture of a woman named Alba Castro, some text, and a blurred image. At the bottom of the slide, there are two blue icons: a heart and a share symbol.

Data Sets



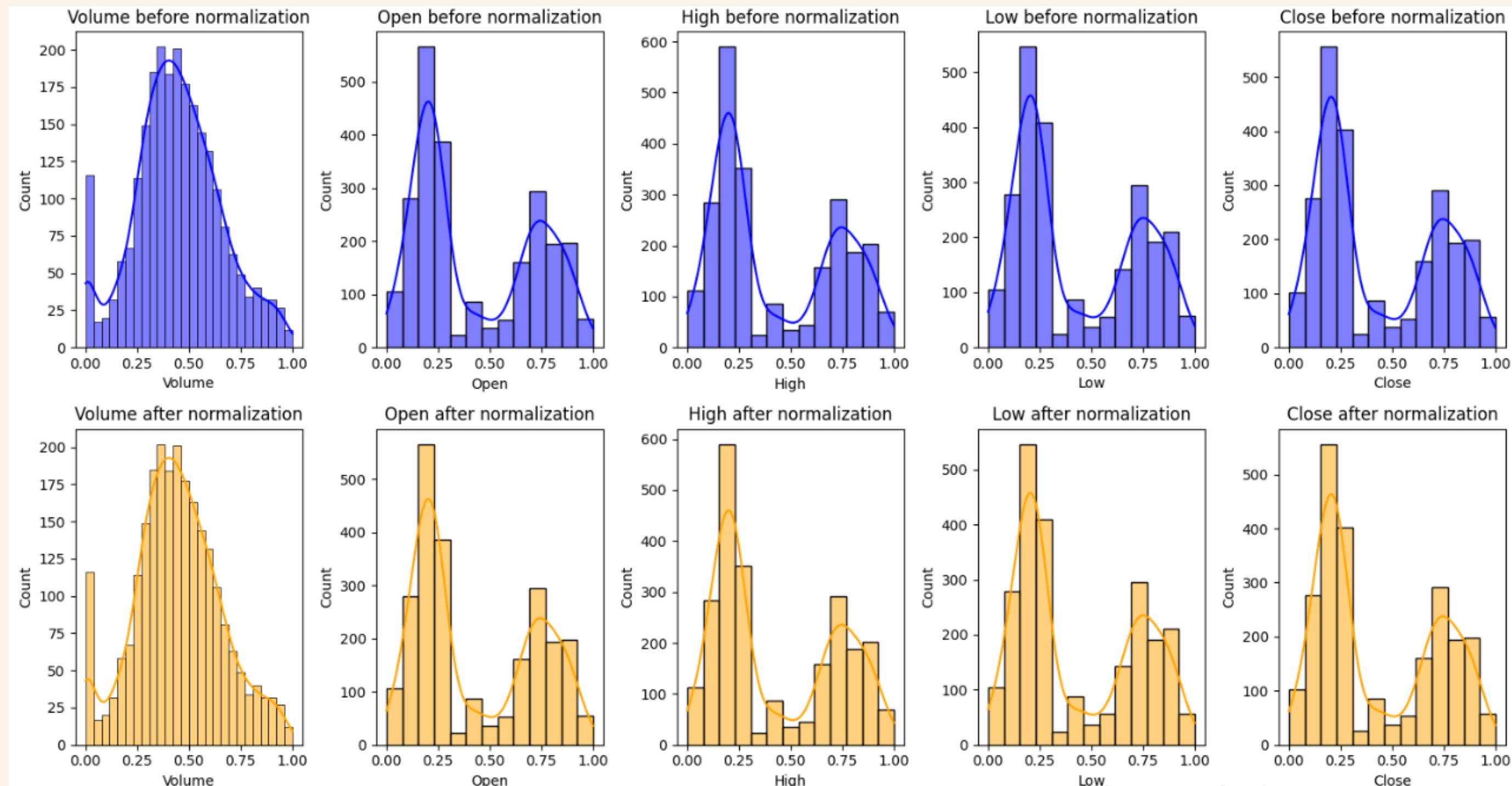
Data preprocessing

Removed outliers in Volume columns above the upper whisker by using IQR



Data preprocessing

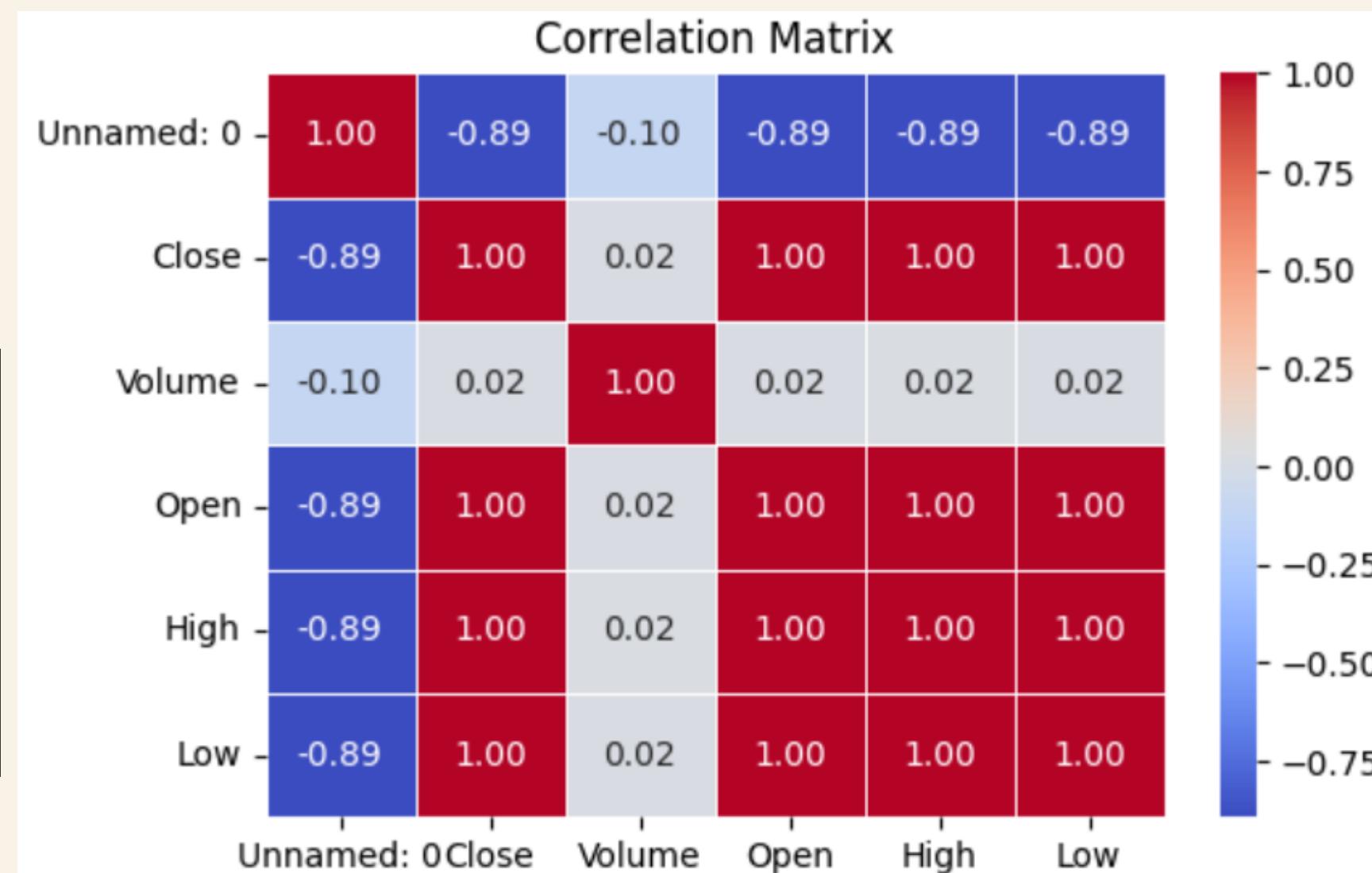
Normalized Numeric Features



Data preprocessing

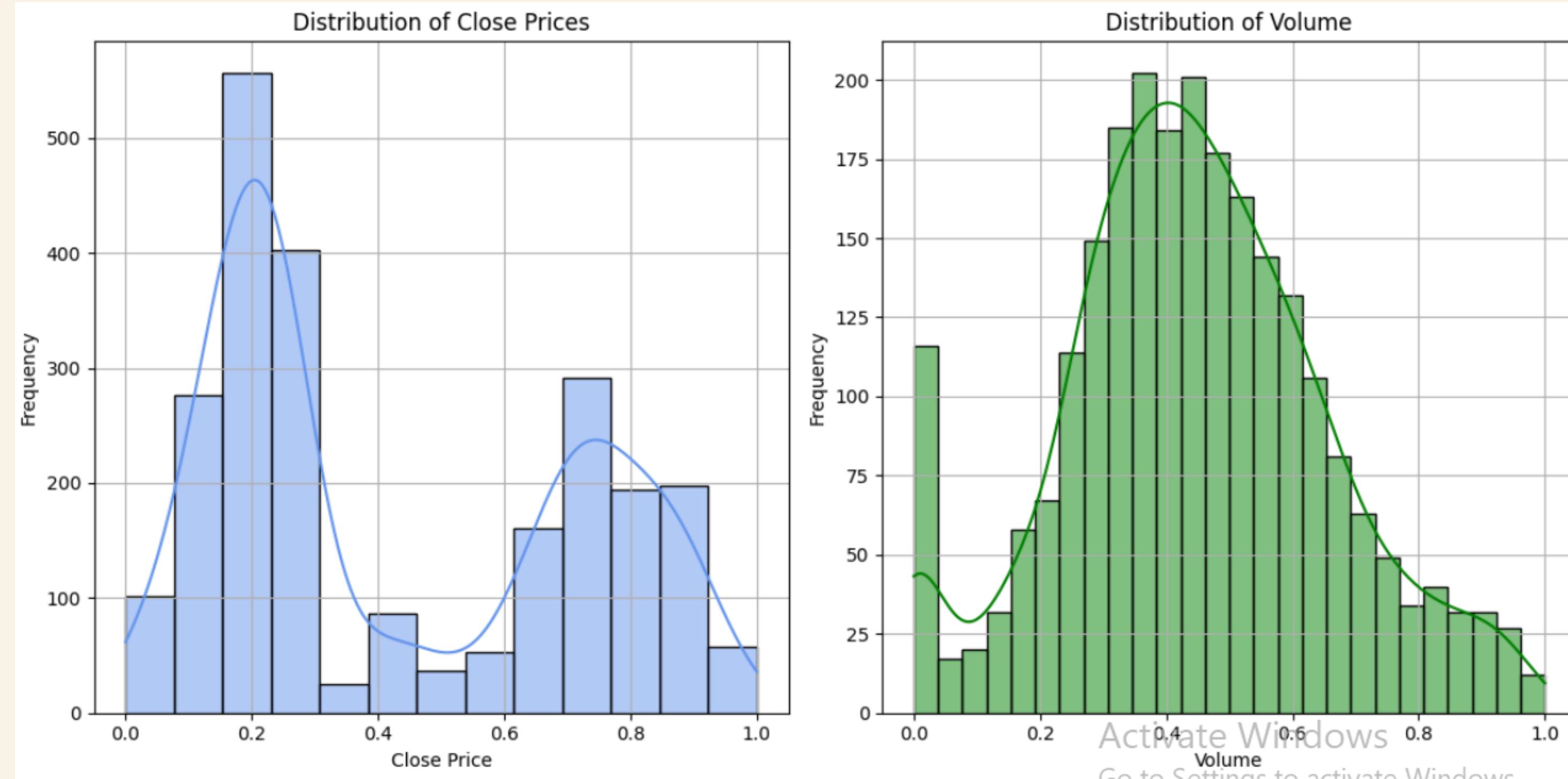
- Data had no missing values
- High correlation between gold close price and low, open and high features.
- Converted Date to Datetime format and sorted by ascending order

Unnamed: 0	0					
Date	0	#	Column	Non-Null Count	Dtype	
Close	0	---	---	-----	-----	
Volume	0	0	Unnamed: 0	2437 non-null	int64	
Open	0	1	Close	2437 non-null	float64	
High	0	2	Volume	2437 non-null	float64	
Low	0	3	Open	2437 non-null	float64	
dtype:	int64	5	High	2437 non-null	float64	
			Low	2437 non-null	float64	



Time Series Analysis

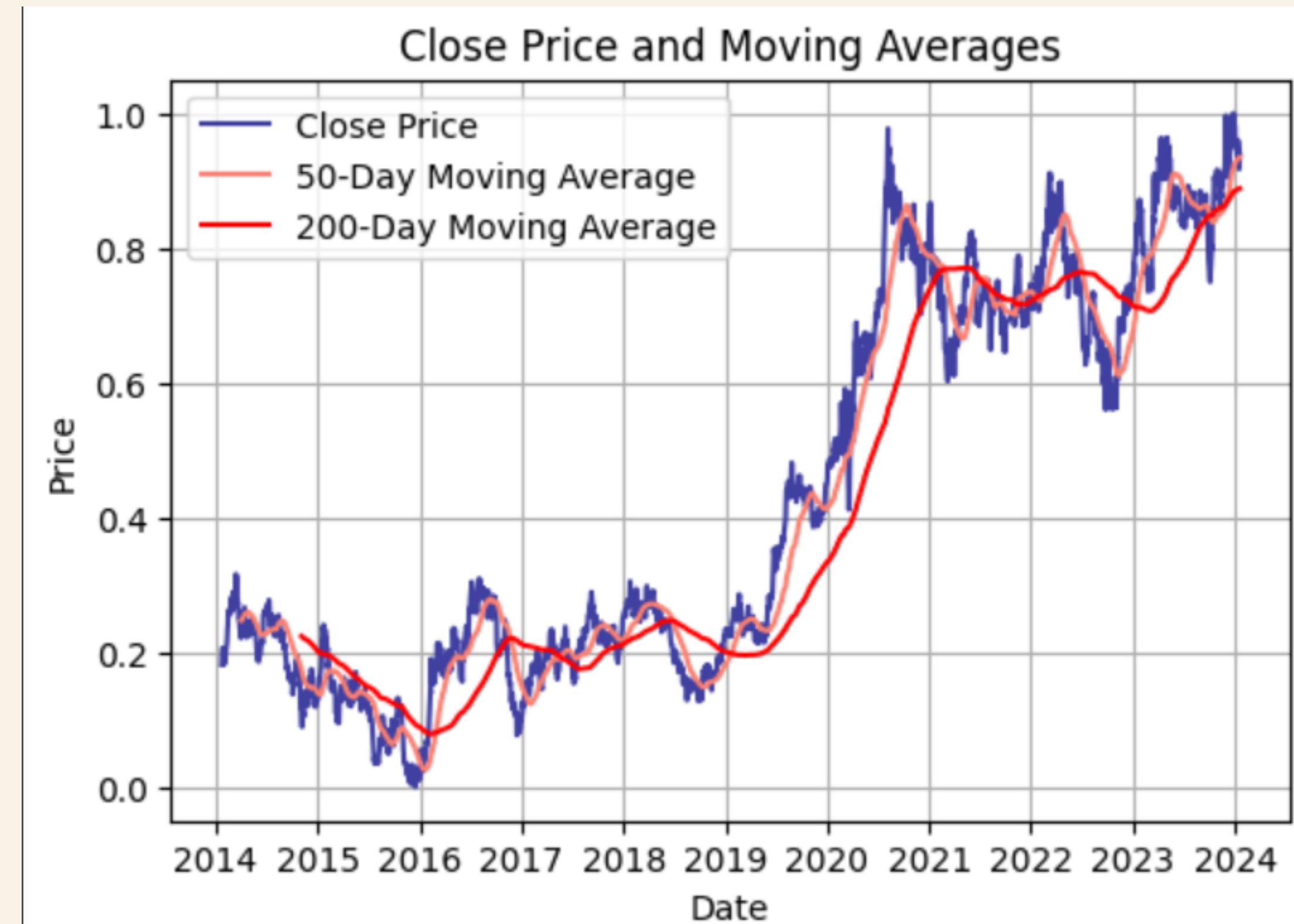
- Distribution of Gold price and trading volume



Time Series Analysis

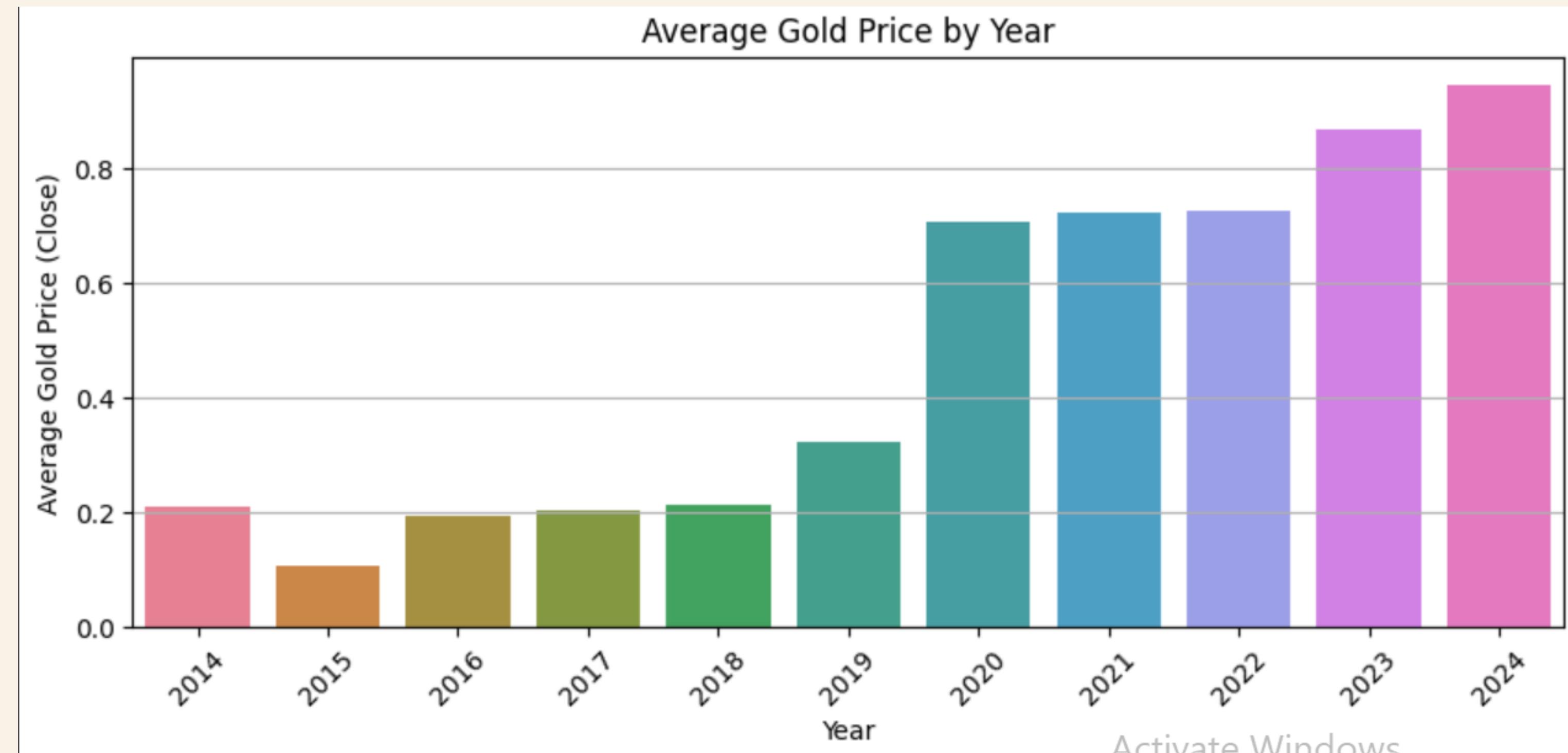
This graph shows the closing prices of a financial instrument over time, along with two different moving averages

- Blue line crossing above orange line: Potential bullish trend, price rising.
- Blue line crossing below orange line: Potential bearish trend, price falling.



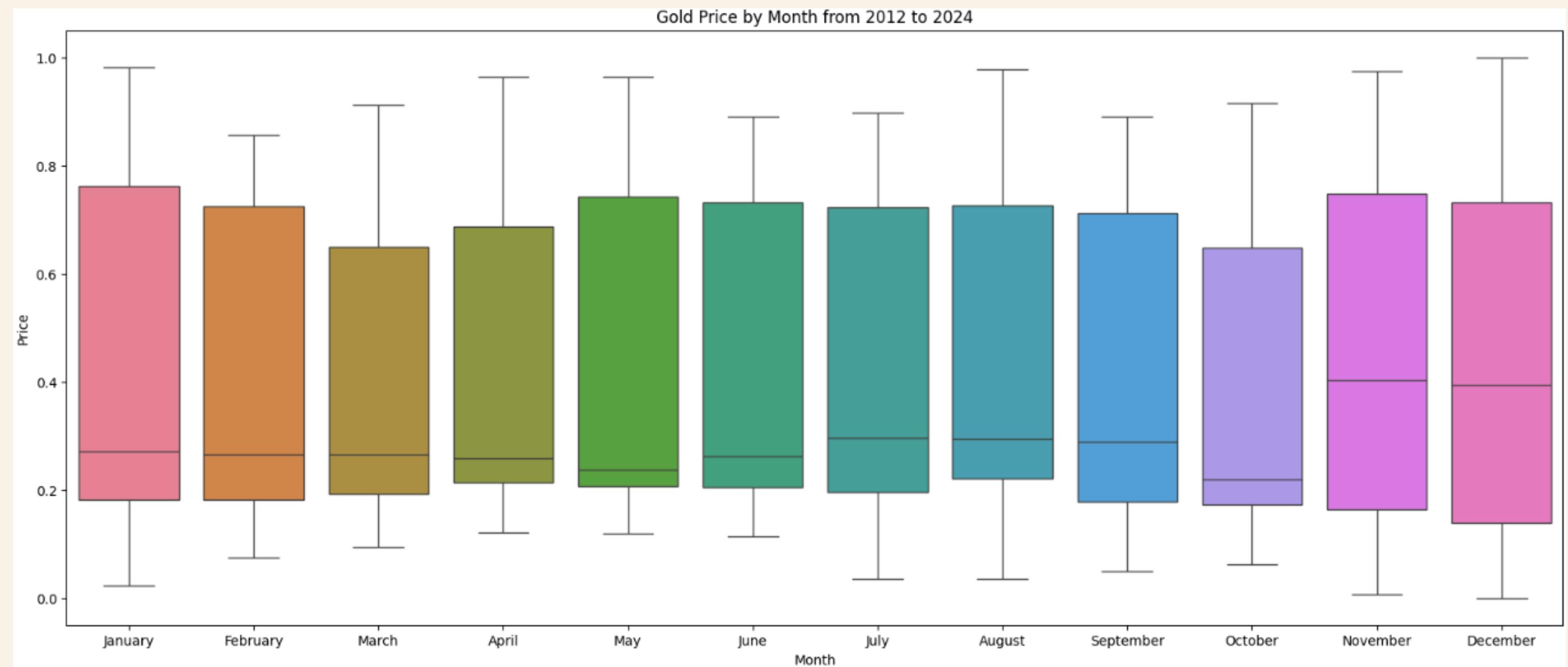
Time Series Analysis

Yearly time analysis: Gold Prices are raising by time



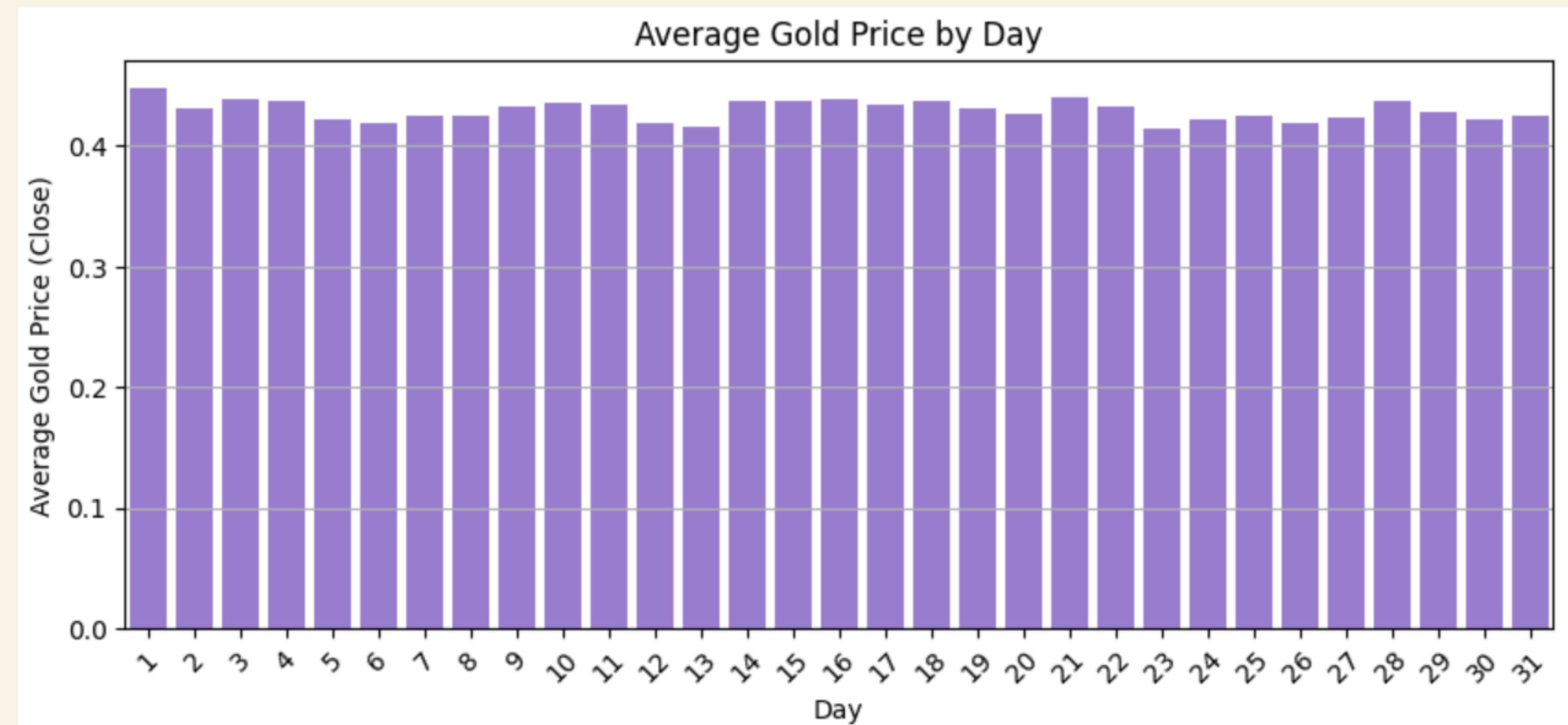
Time Series Analysis

Monthly time analysis: November has high variability of gold prices



Time Series Analysis

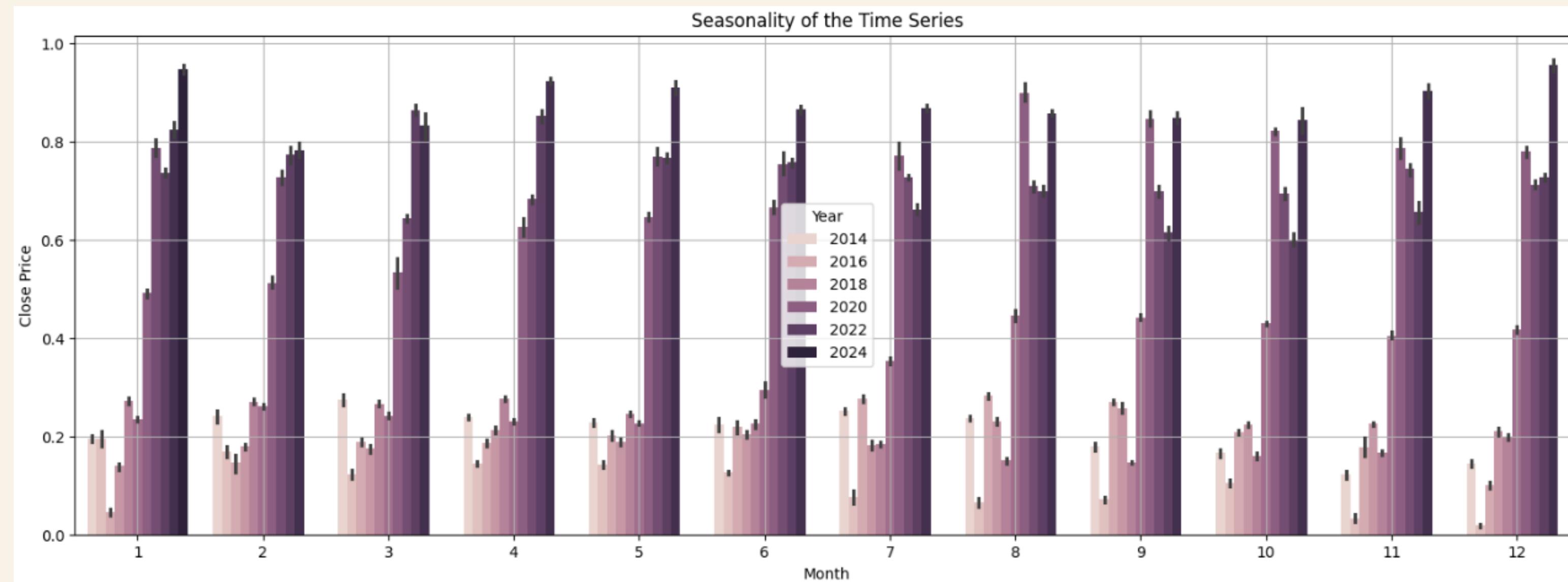
Daily time analysis: Gold prices raise at the first day of each month



Time Series Analysis

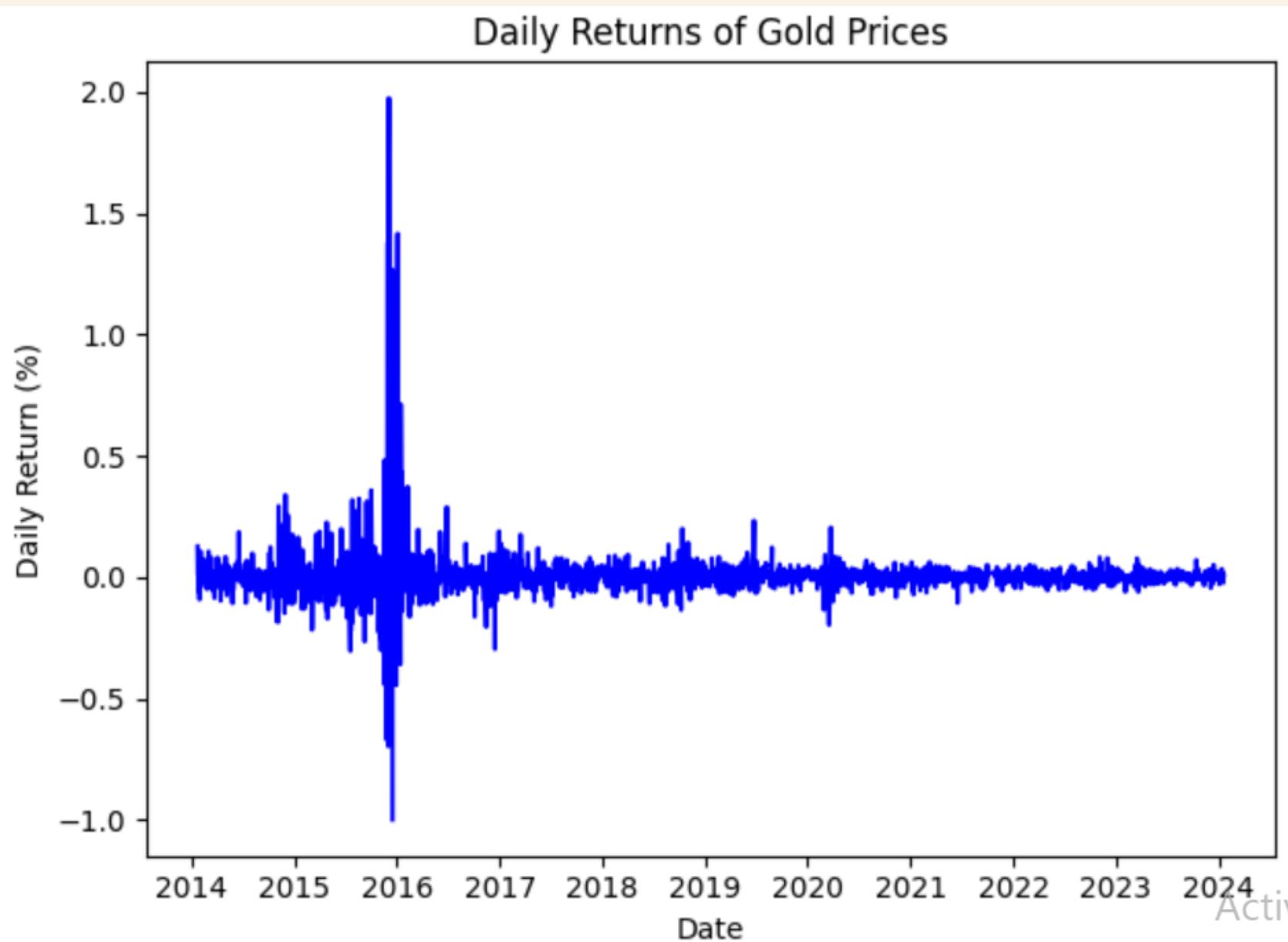
Seasonality time analysis

- in 2016 the gold prices were low in all months compared to other years
- Gold prices are high across most of months compared to other years
- in 2020 august month there was a huge rise in gold prices compared to other months

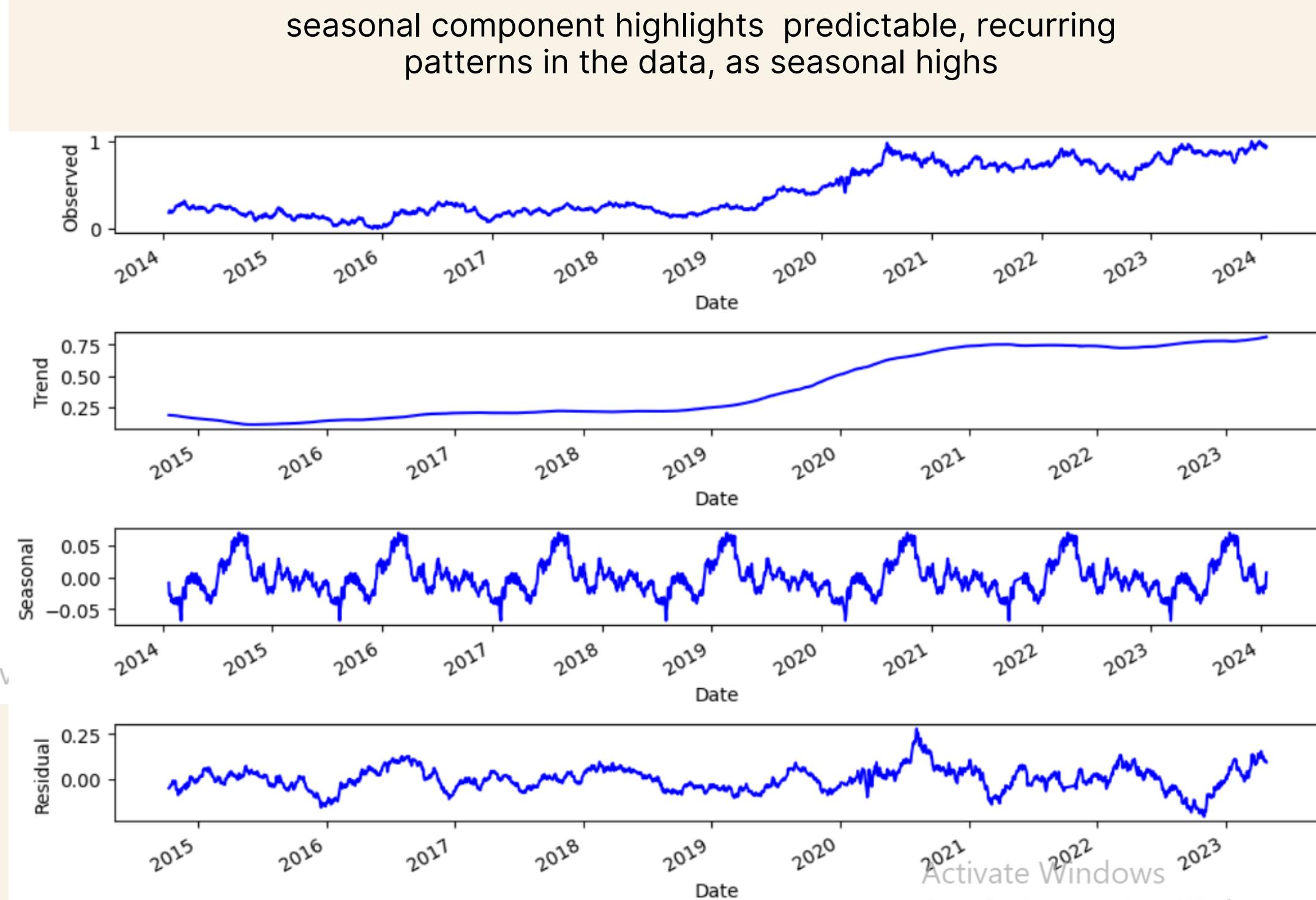


Time Series Analysis

Seasonality time analysis



High volatility in 2016 indicates that the price of gold is changing rapidly and unpredictably



02 - Advanced Modeling

Percentage of data in training set: 79.15 %

Percentage of data in testing set: 20.85 %

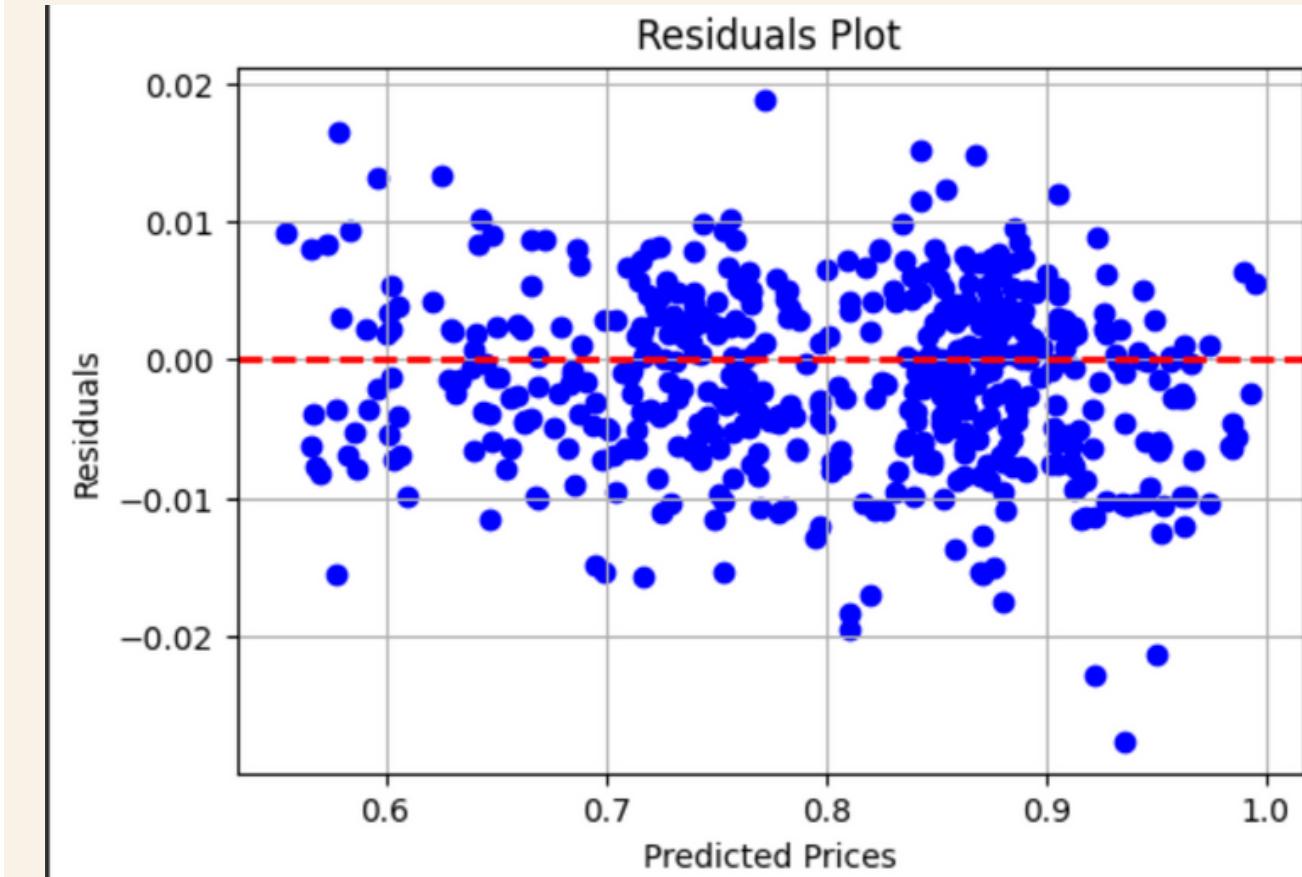
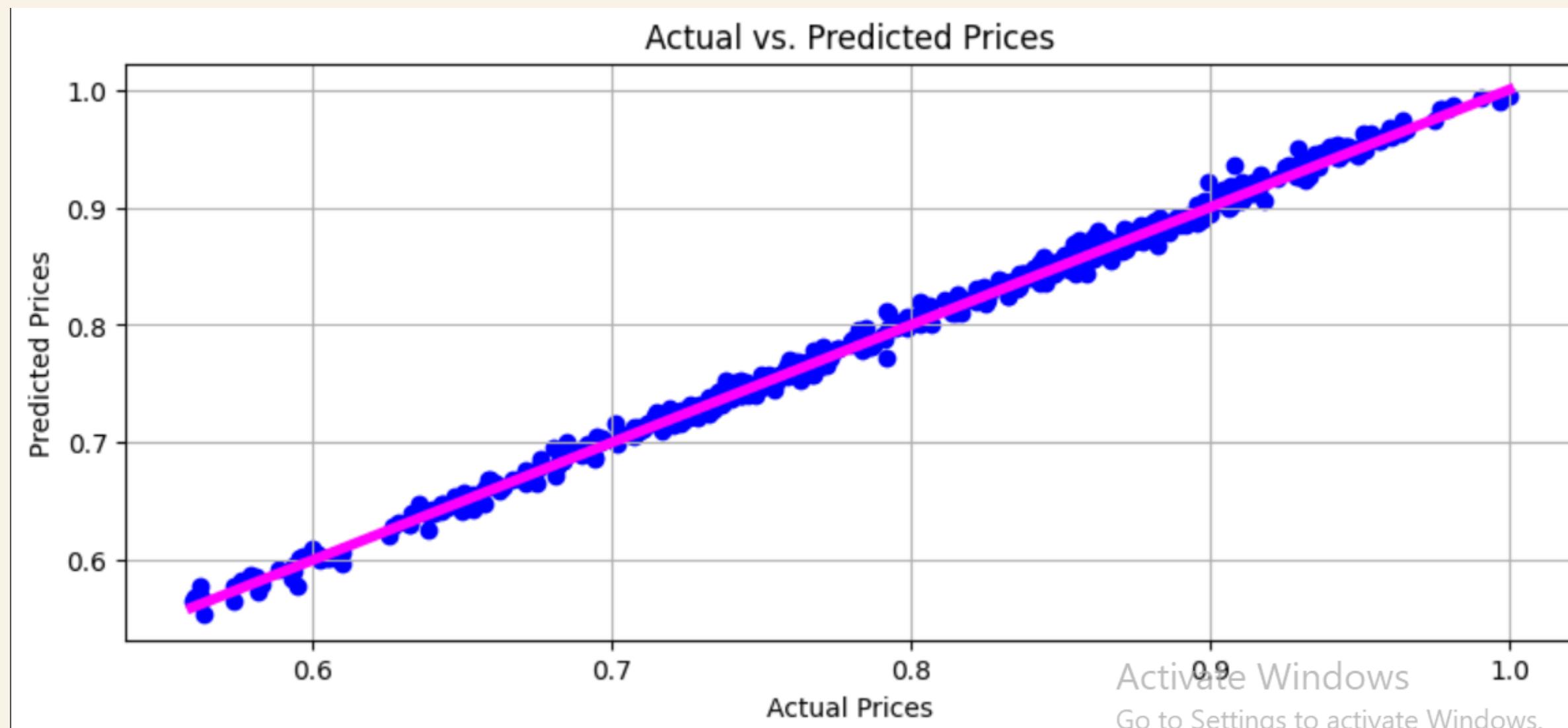
*Data visualization
simplifies the
communication of
analysis findings*



02 - Advanced Modeling

Linear regression model

- Mean Squared Error (MSE): **4.26e-05** - indicates small difference between predicted and actual values.
- Root Mean Squared Error (RMSE): **0.0065** - same unit as the target variable.
- Mean Absolute Error (MAE): **0.0051** - indicates model predictions are close to actual values on average.
- R-squared (R²): Very high (**0.9959**) - model explains a large proportion of the variance in the target variable.

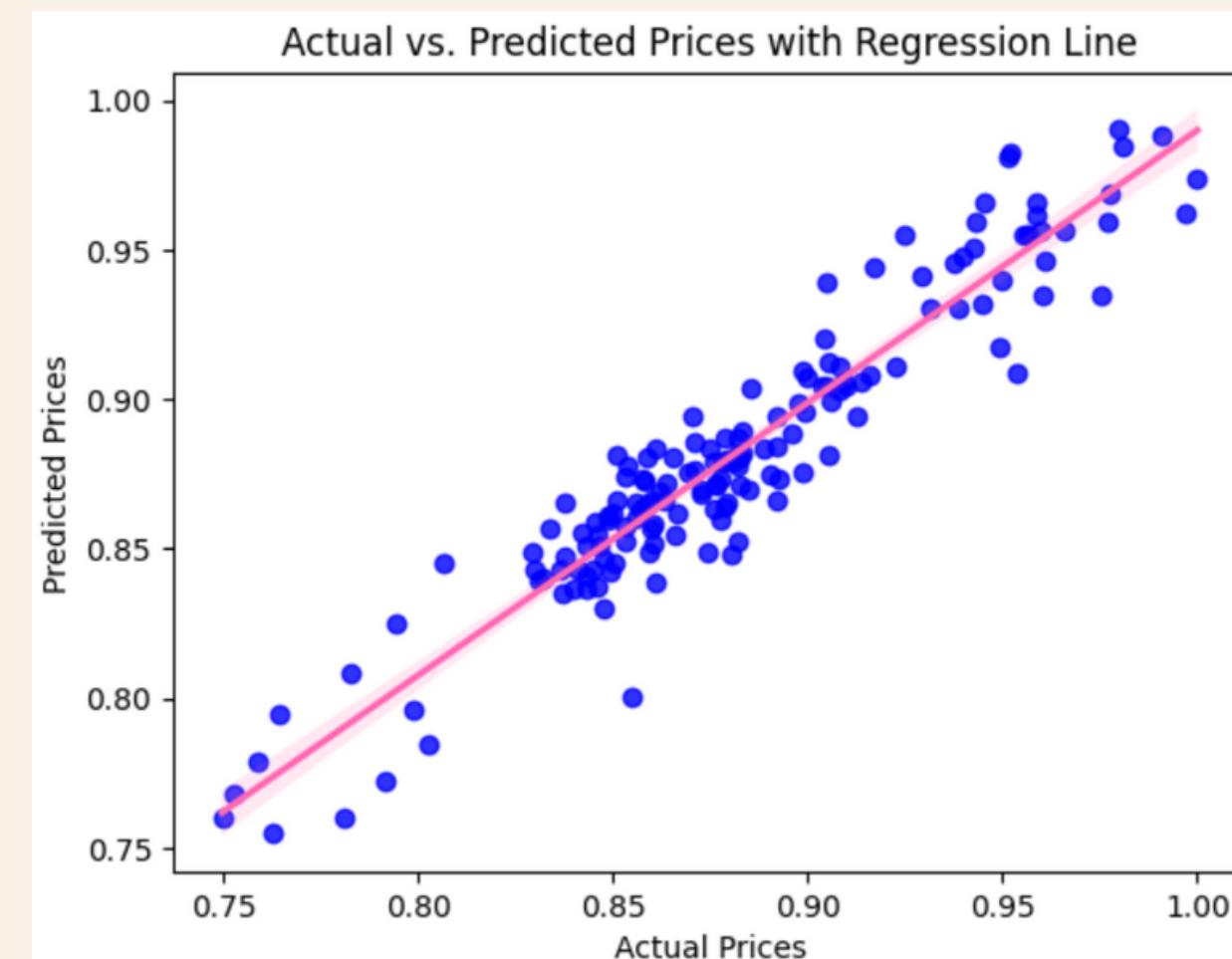
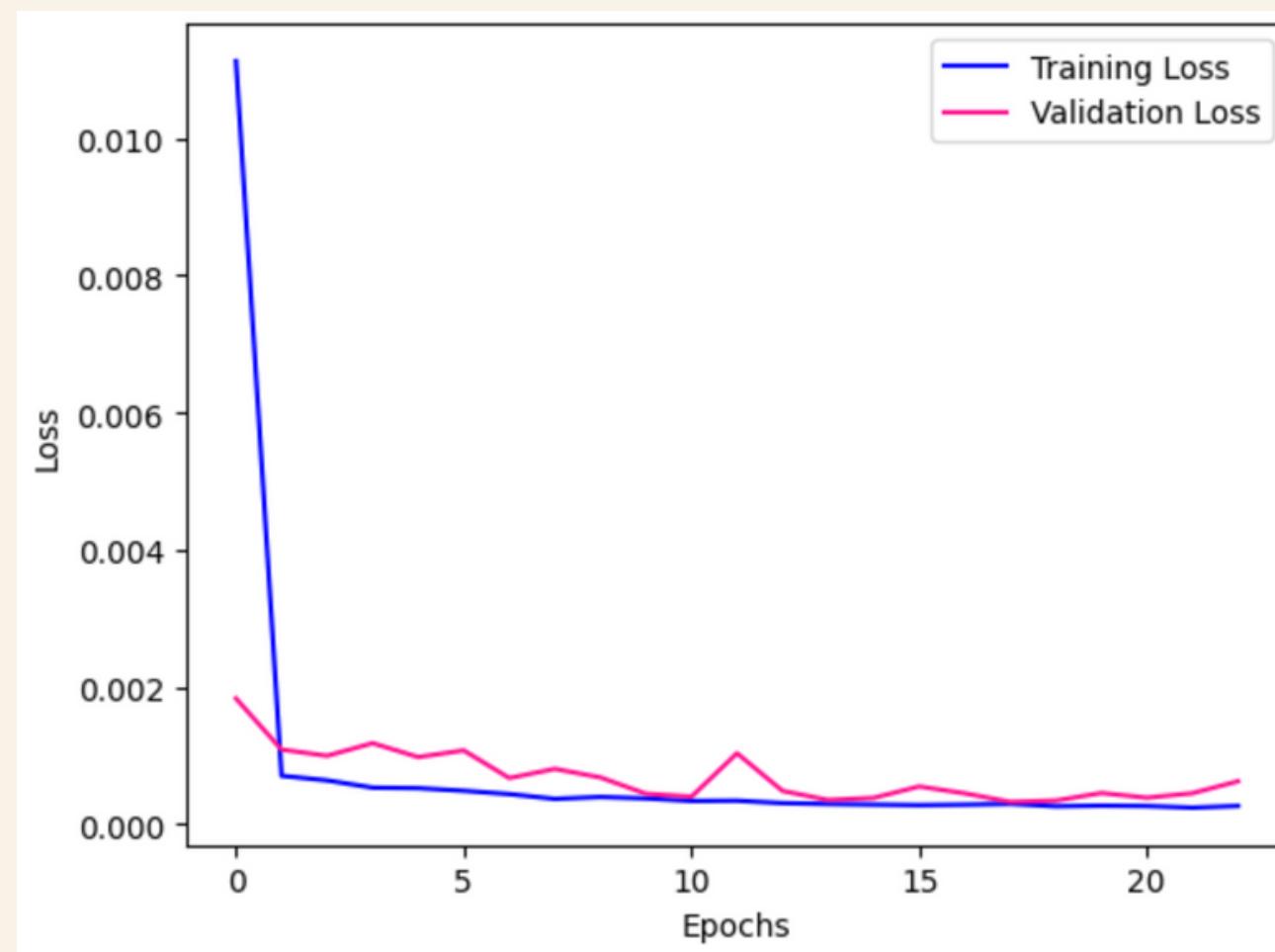
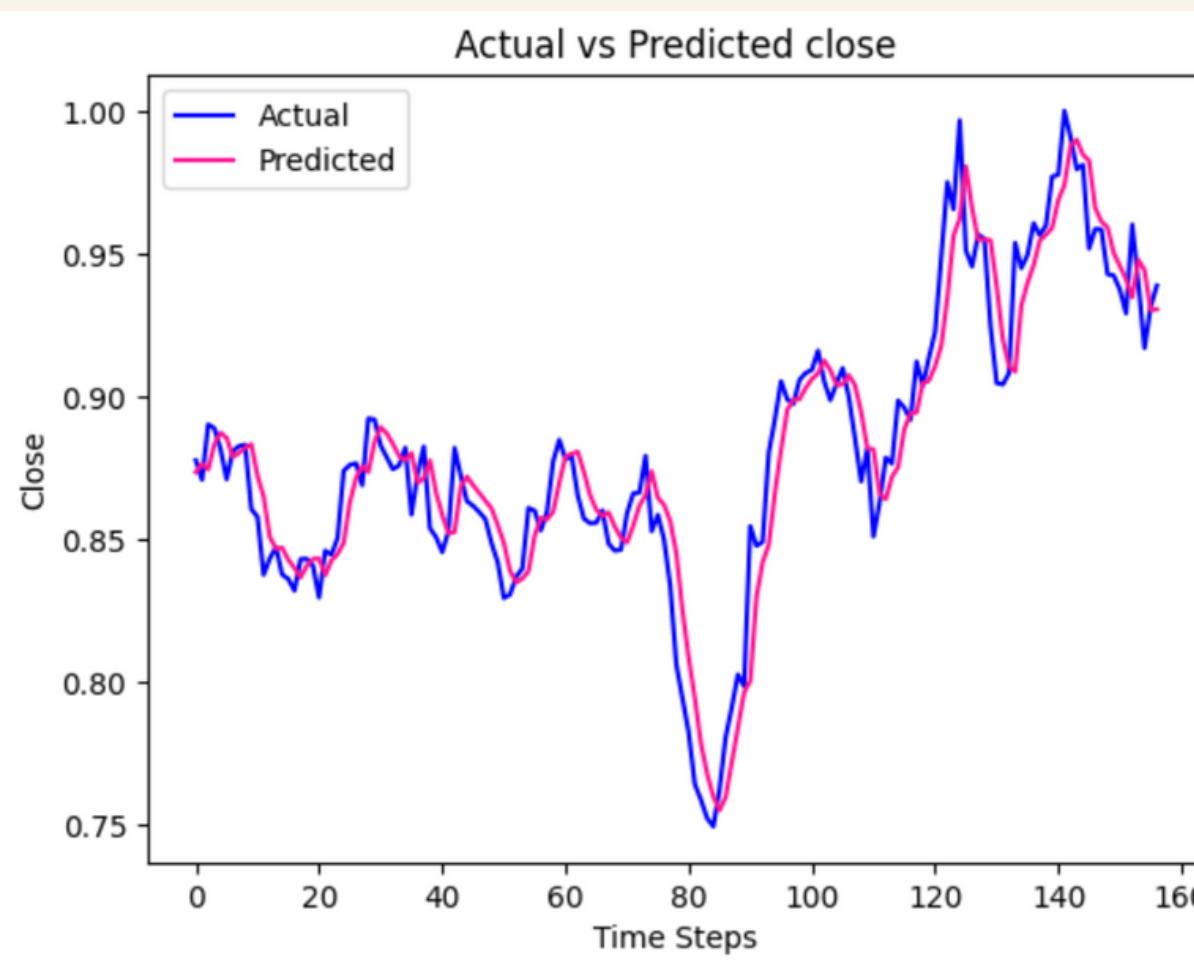


Go to Settings to activate Windows.

02 - Advanced Modeling

Lstm model

- low MSE (0.000259) on the test set, indicating good overall prediction accuracy.
- The RMSE (0.016)
- The R-2 (0.898): the model explains nearly 90% of the variance in the actual closing prices.



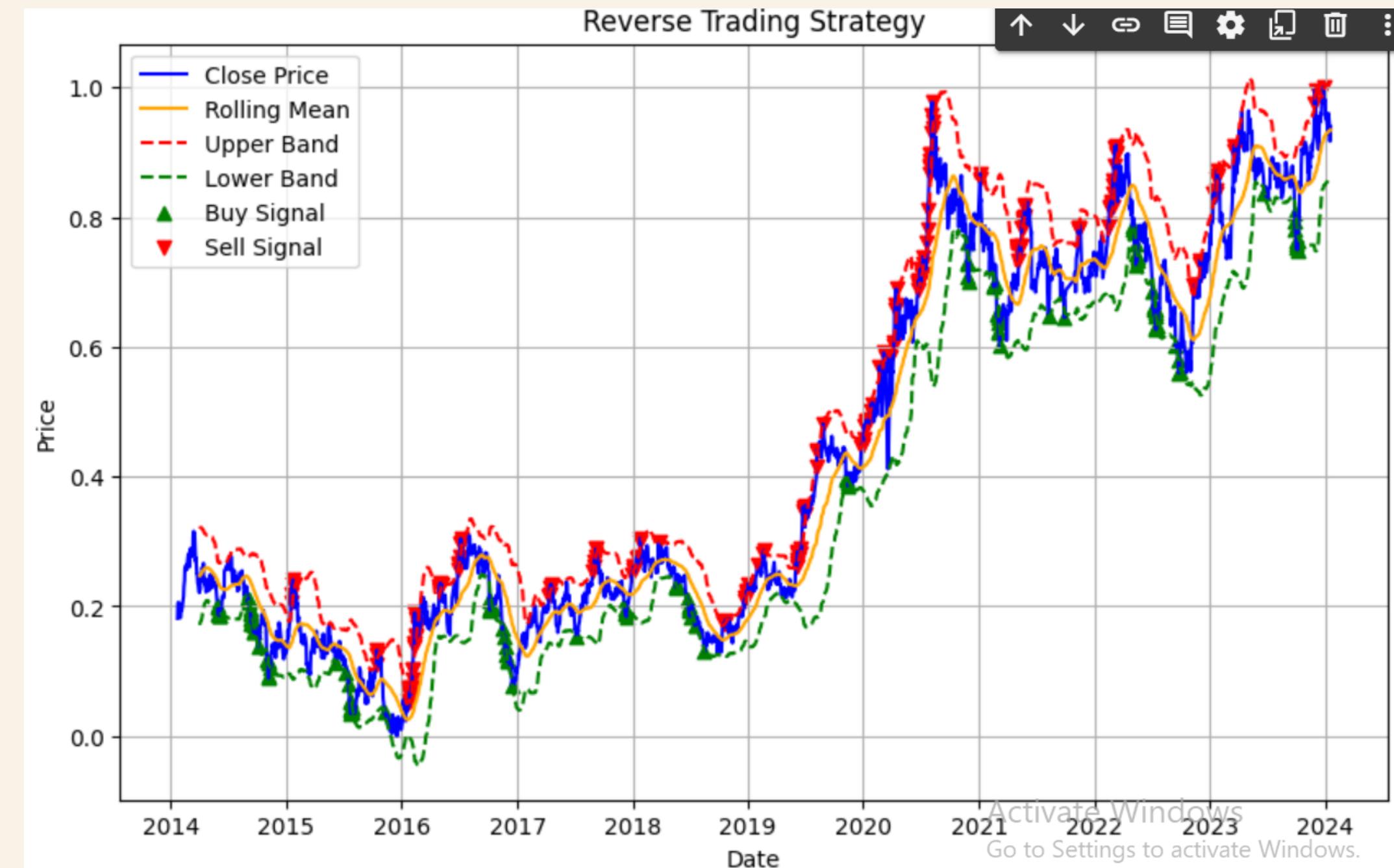
03 - Trading strategy

Strategy:

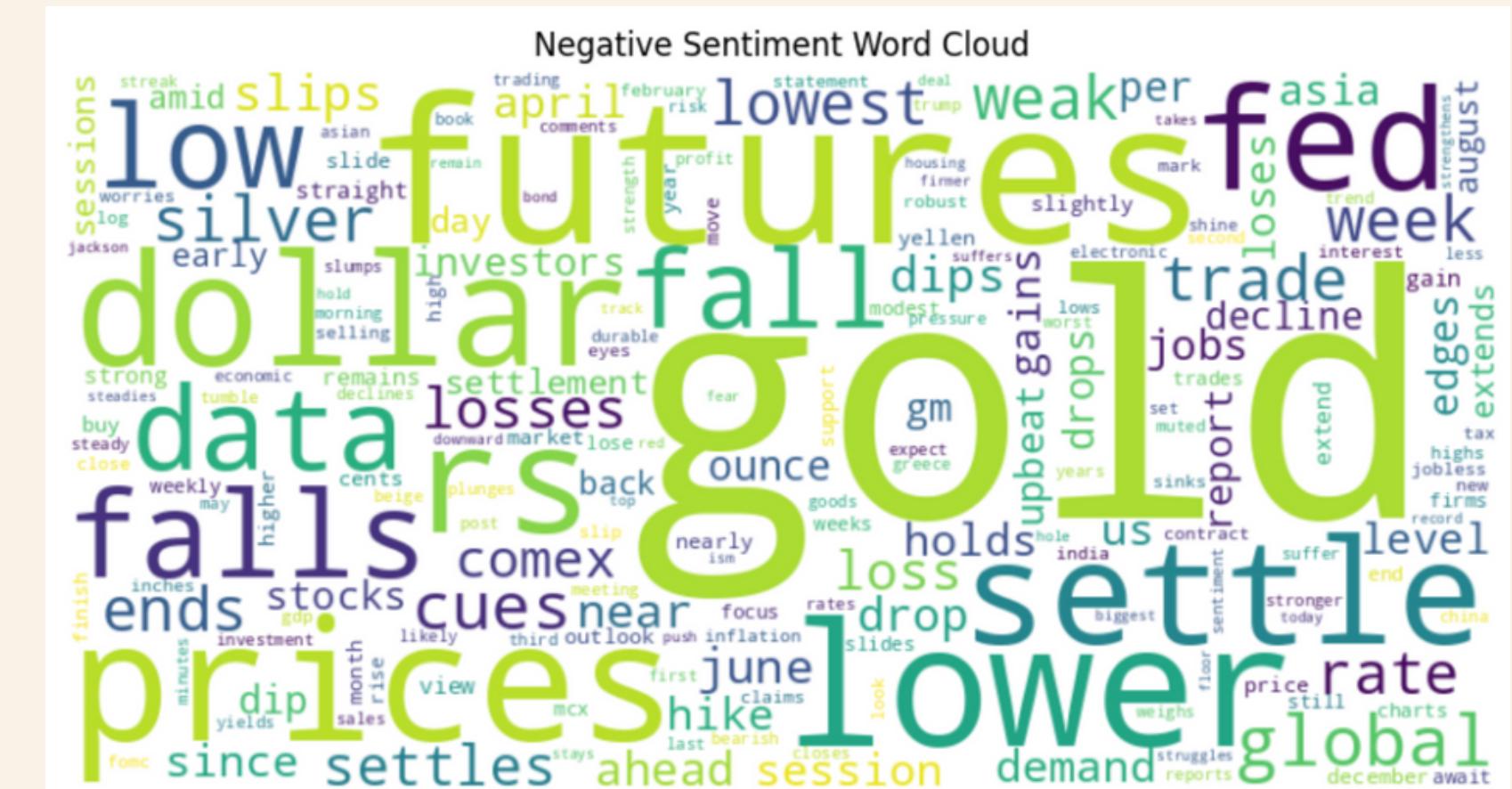
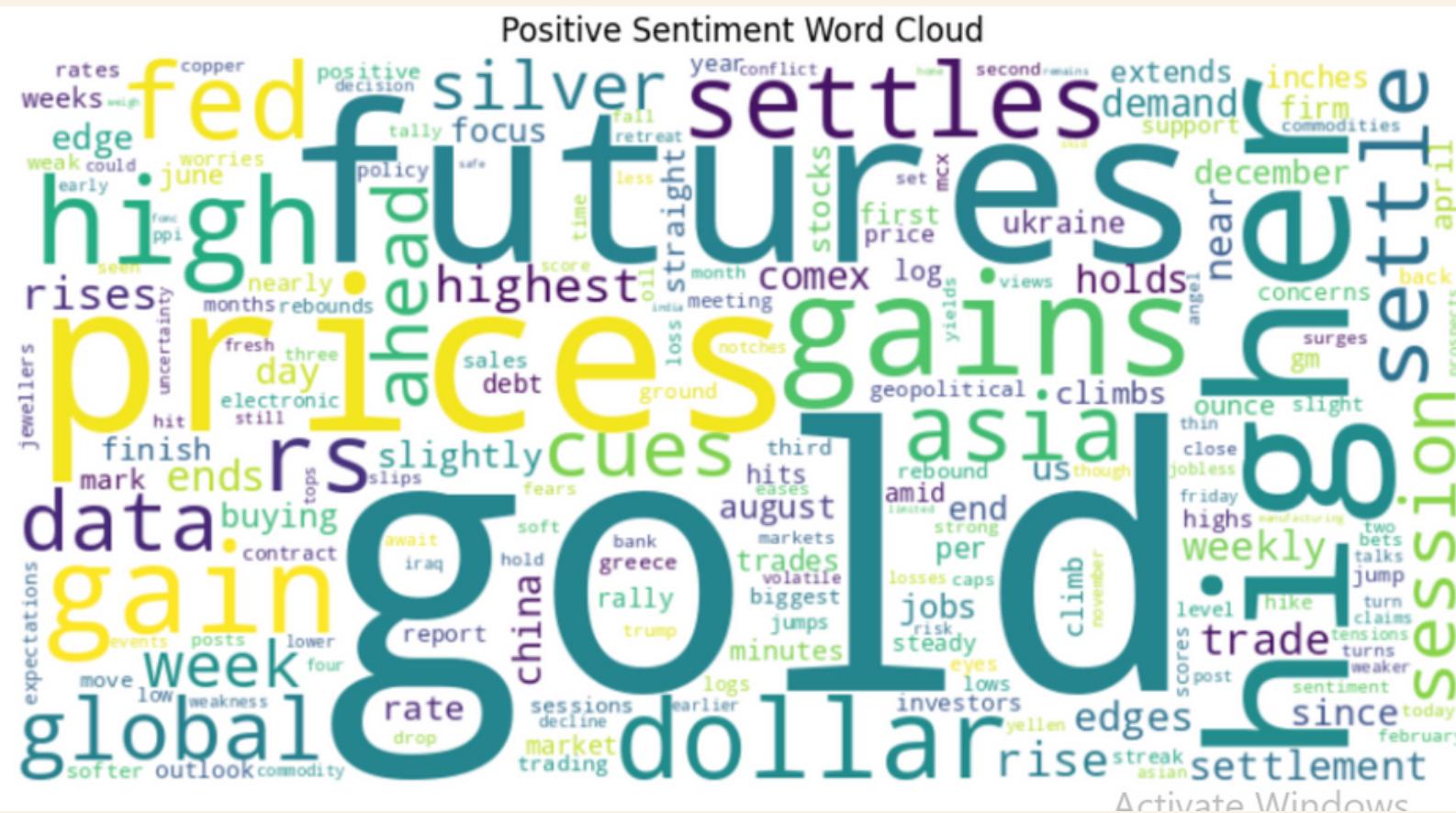
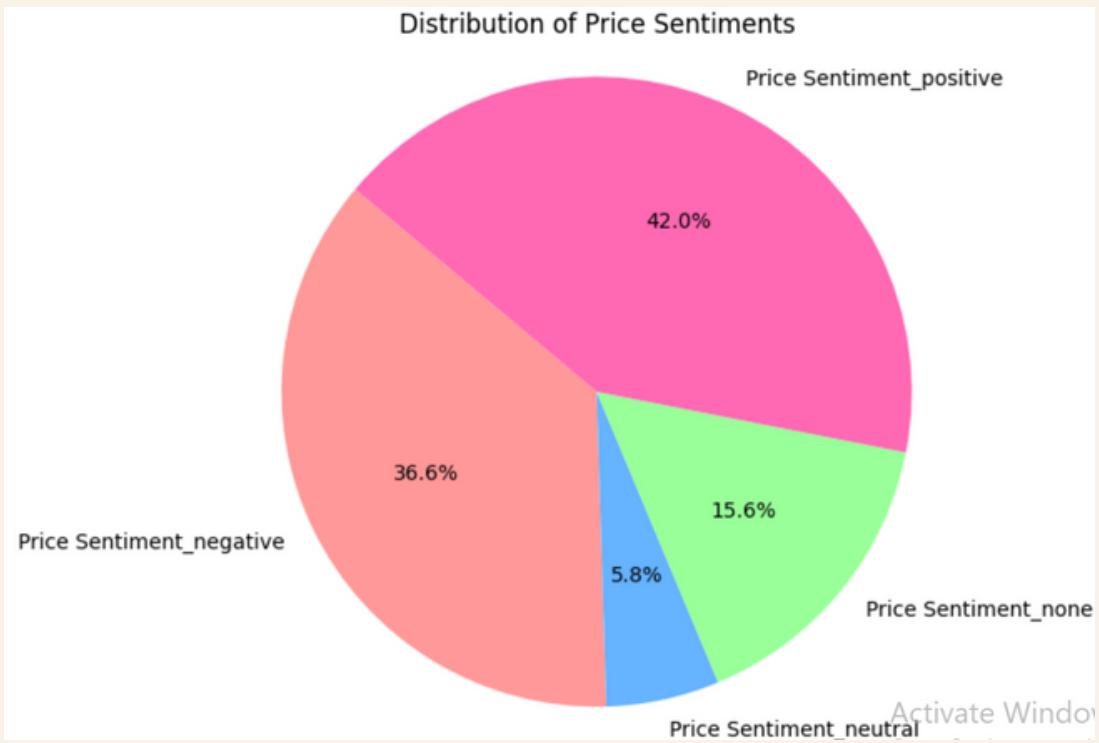
- Uses **Bollinger Bands** to identify overbought (upper band) and oversold (lower band) conditions.
- Generates buy signals when price falls below lower band (intending to capture price bounces).
- Generates sell signals when price goes above upper band (intending to capture price pullbacks).
- Uses additional exit bands to limit potential losses.

Back testing Results:

- Buy Win Rate: **38.8%**
- Sell Win Rate: **61.1%**

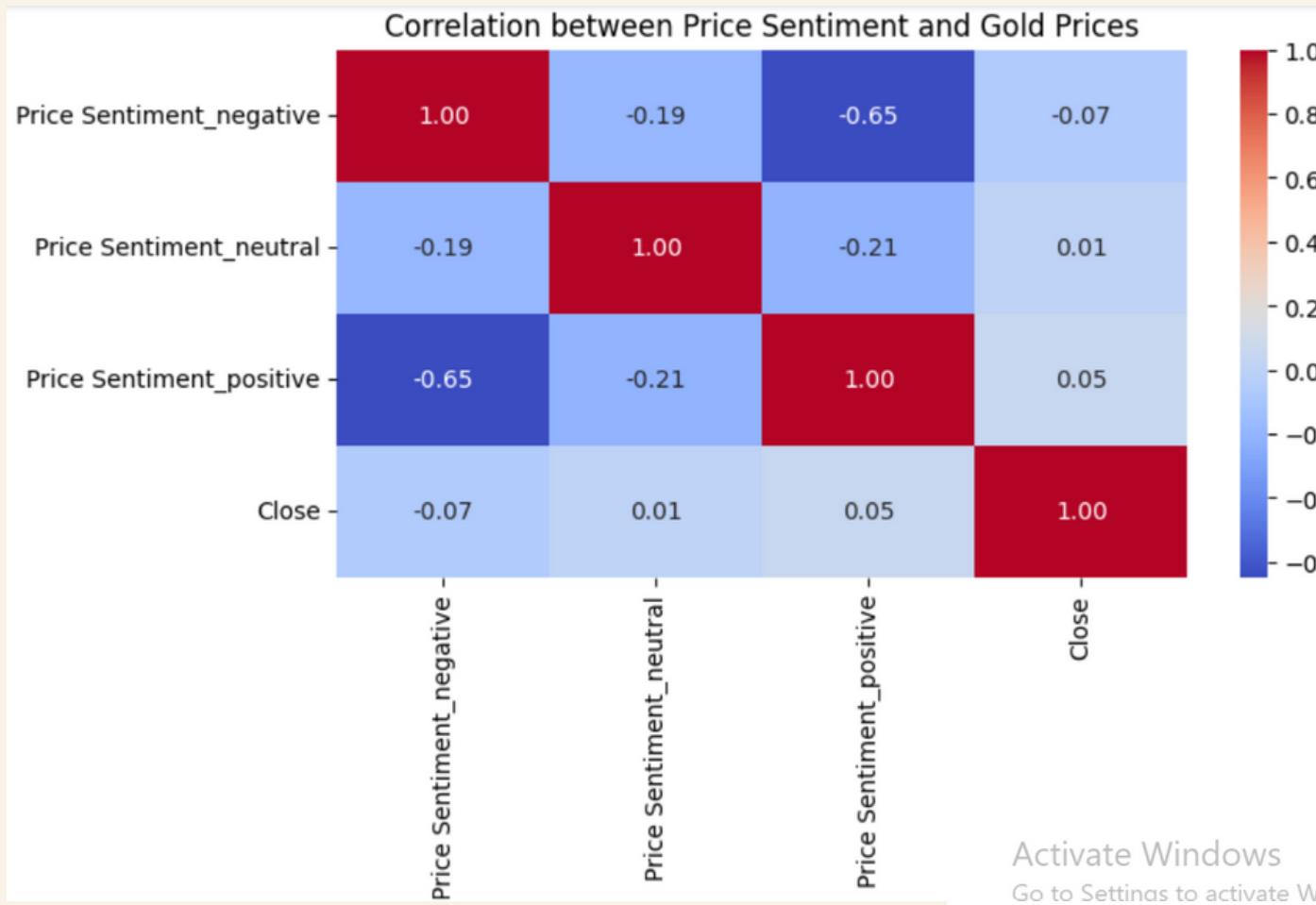


04 - Market Sentiment Analysis

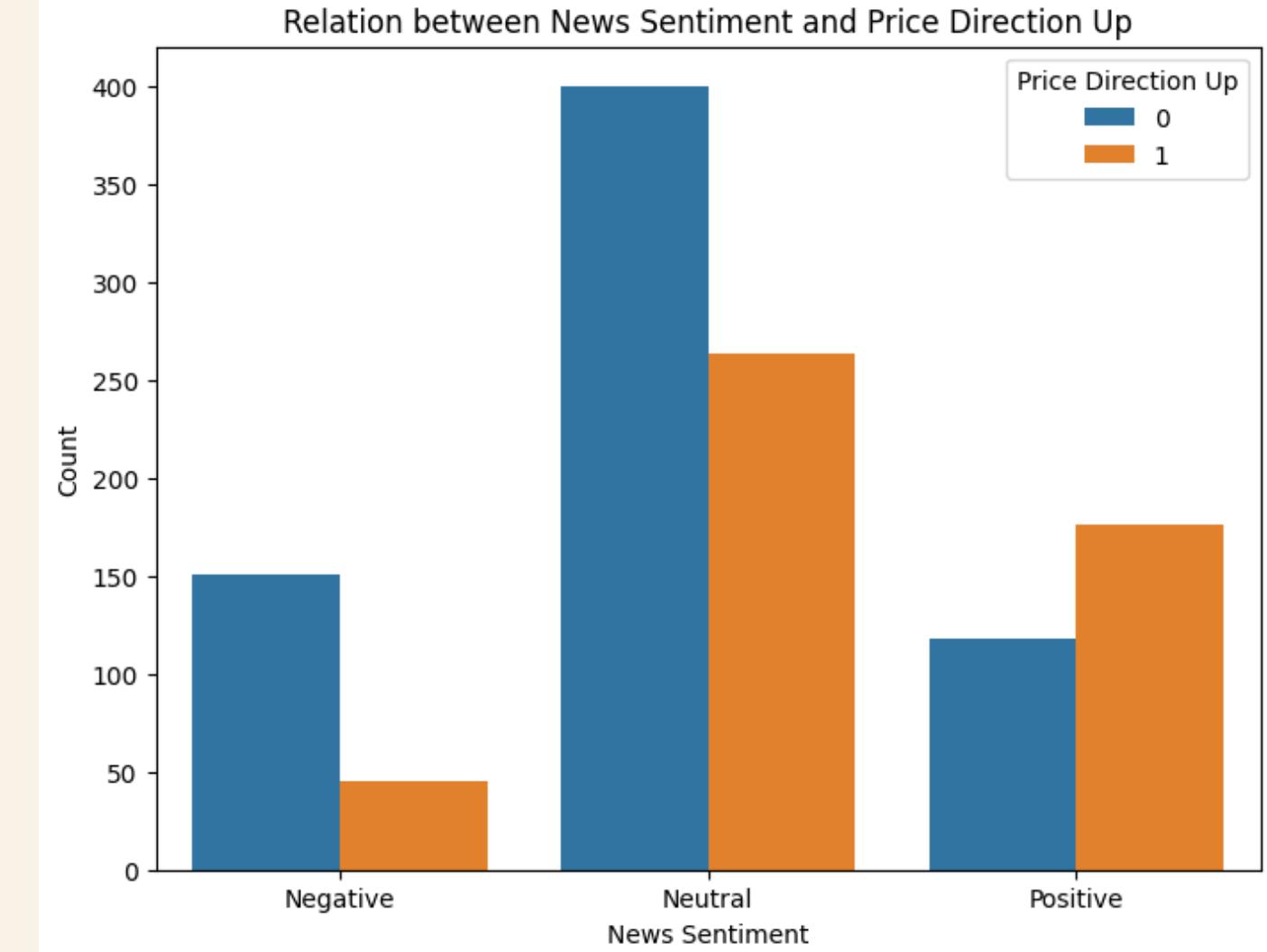


- There is a tendency for gold prices to **increase** when there is a **positive** sentiment
- **No relationship** between neutral sentiment and gold prices.
- There is a tendency for gold prices to **decrease** when there is a **negative** sentiment.

04 - Market Sentiment Analysis



Activate Windows
Go to Settings to activate Win



05 - Impact of Market Events

The two Event peaks are:

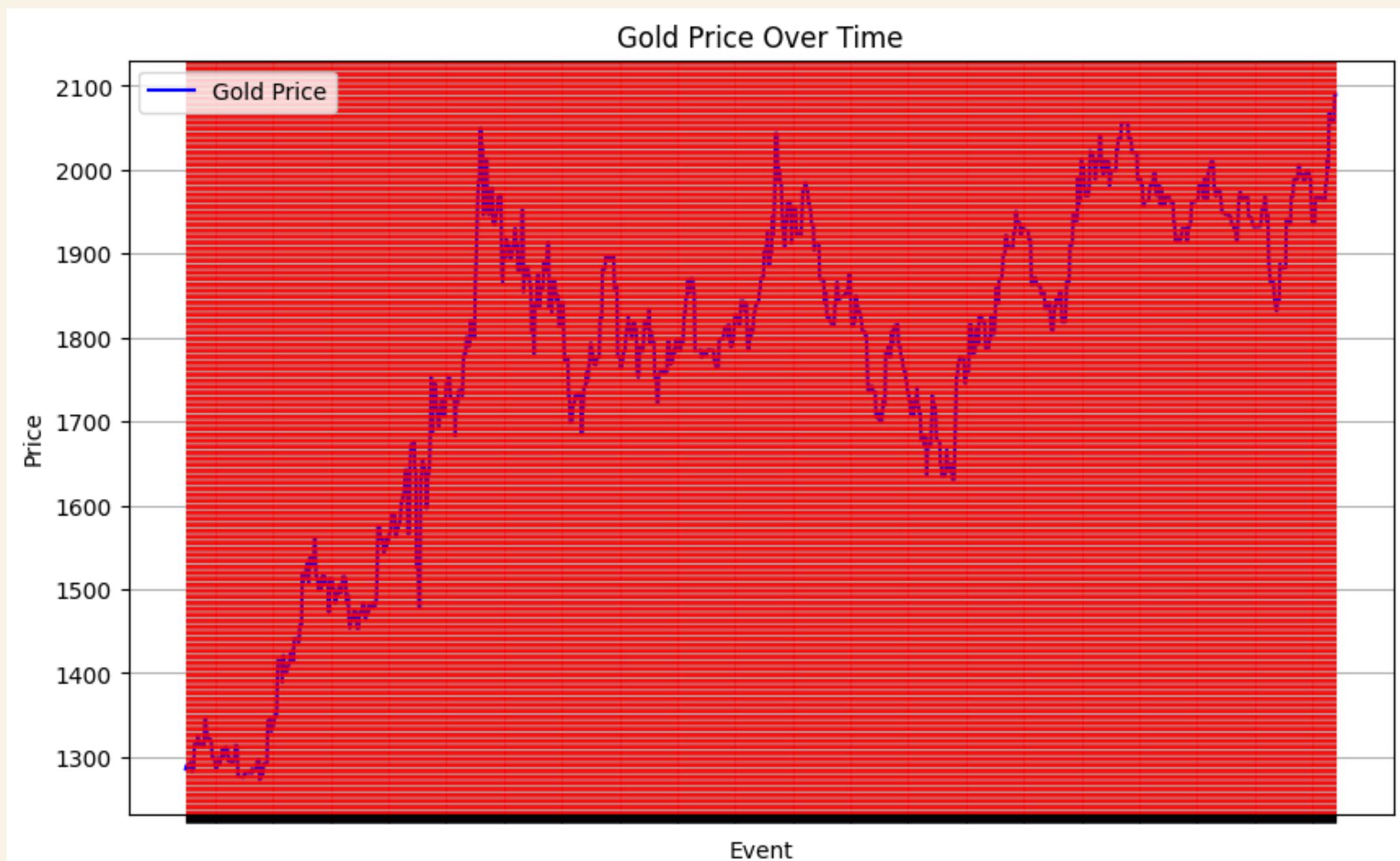
Unemployment Rate NOV, Price: 2089.7

ISM Manufacturing PMI NOV, Price: 2089.7

why?

Unemployment Rate: When more people are out of work, it shows the economy might not be doing well. So, investors turn to gold, which makes its price go up.

ISM Manufacturing PMI: If the index for manufacturing goes down, it means factories are not doing as well. This hints at a weaker economy overall. Investors then buy more gold, pushing its price higher.



05 - Impact of Market Events

- GDP Growth Rate had highest gold price
- GDP represents the total value of all goods and services produced within a country's borders.
- A positive GDP growth rate indicates that the economy is expanding.
- Negative growth rate suggests economic contraction.

1. Economic Confidence:

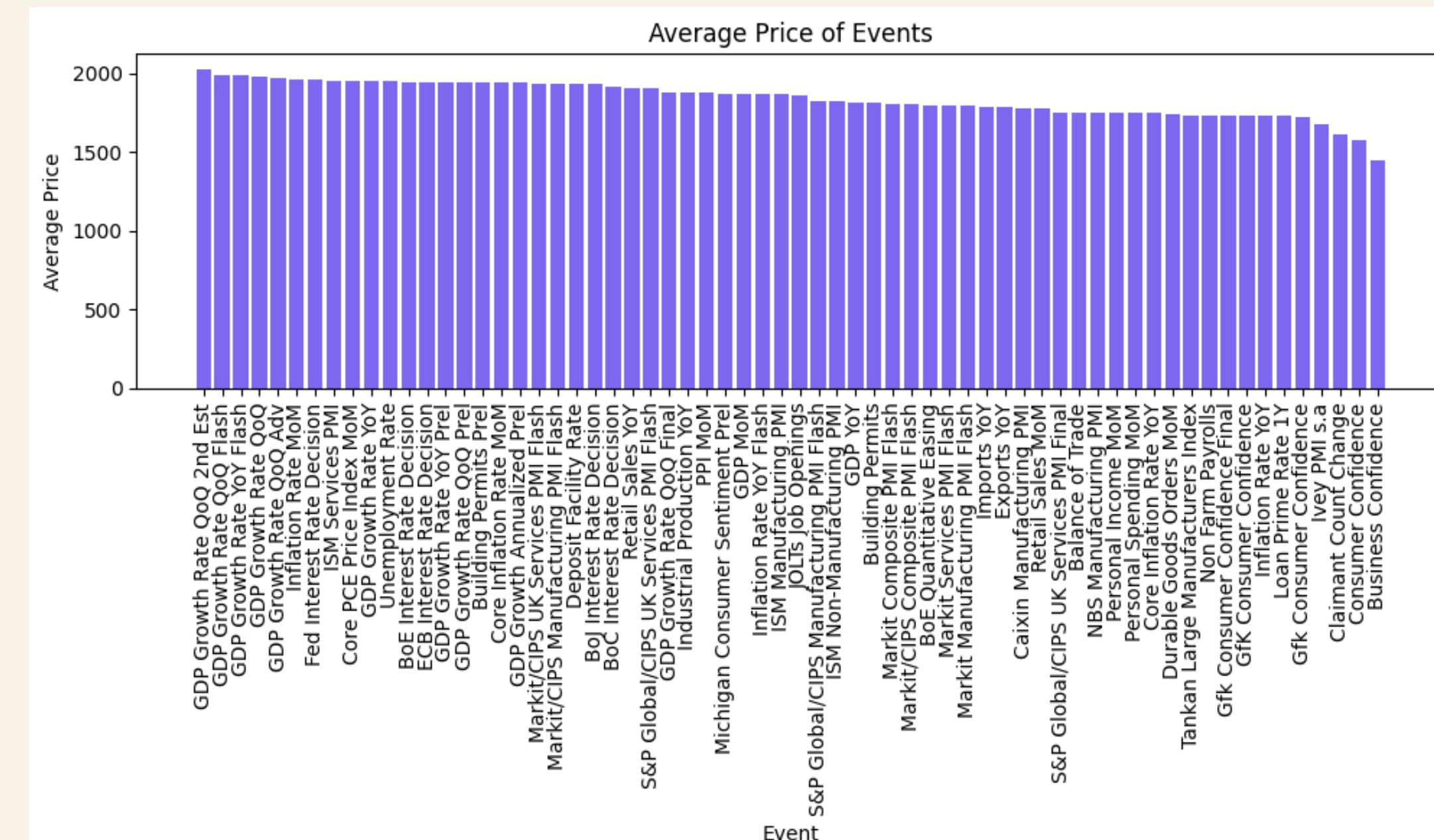
Positive growth signals economic stability, boosting investor confidence in gold as a safe-haven asset.

2. Inflation Hedge:

Gold acts as a hedge against inflation, preserving wealth during periods of rising prices.

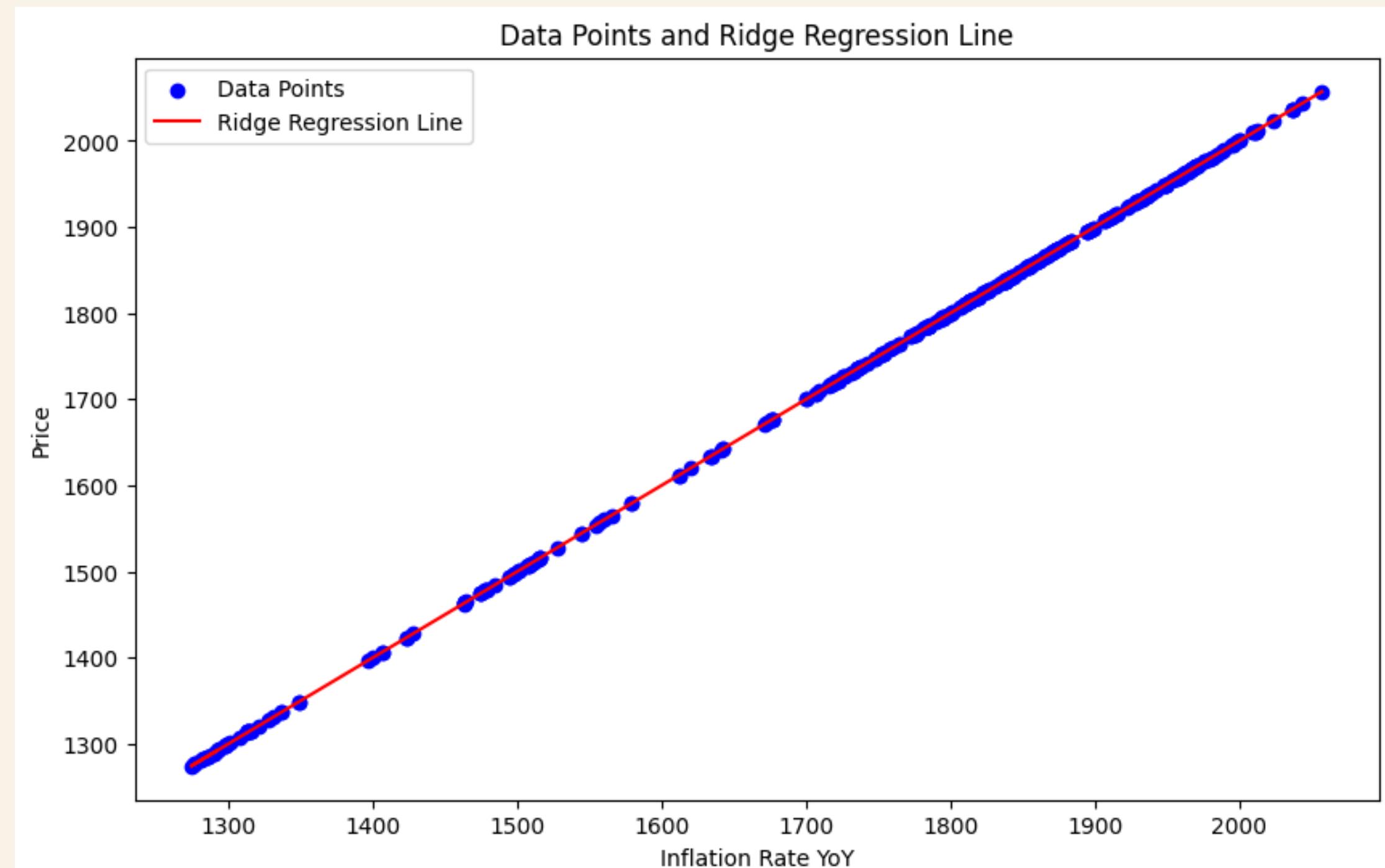
3. Increased Demand:

Economic expansion spurs demand for gold in various sectors, further driving up its price.



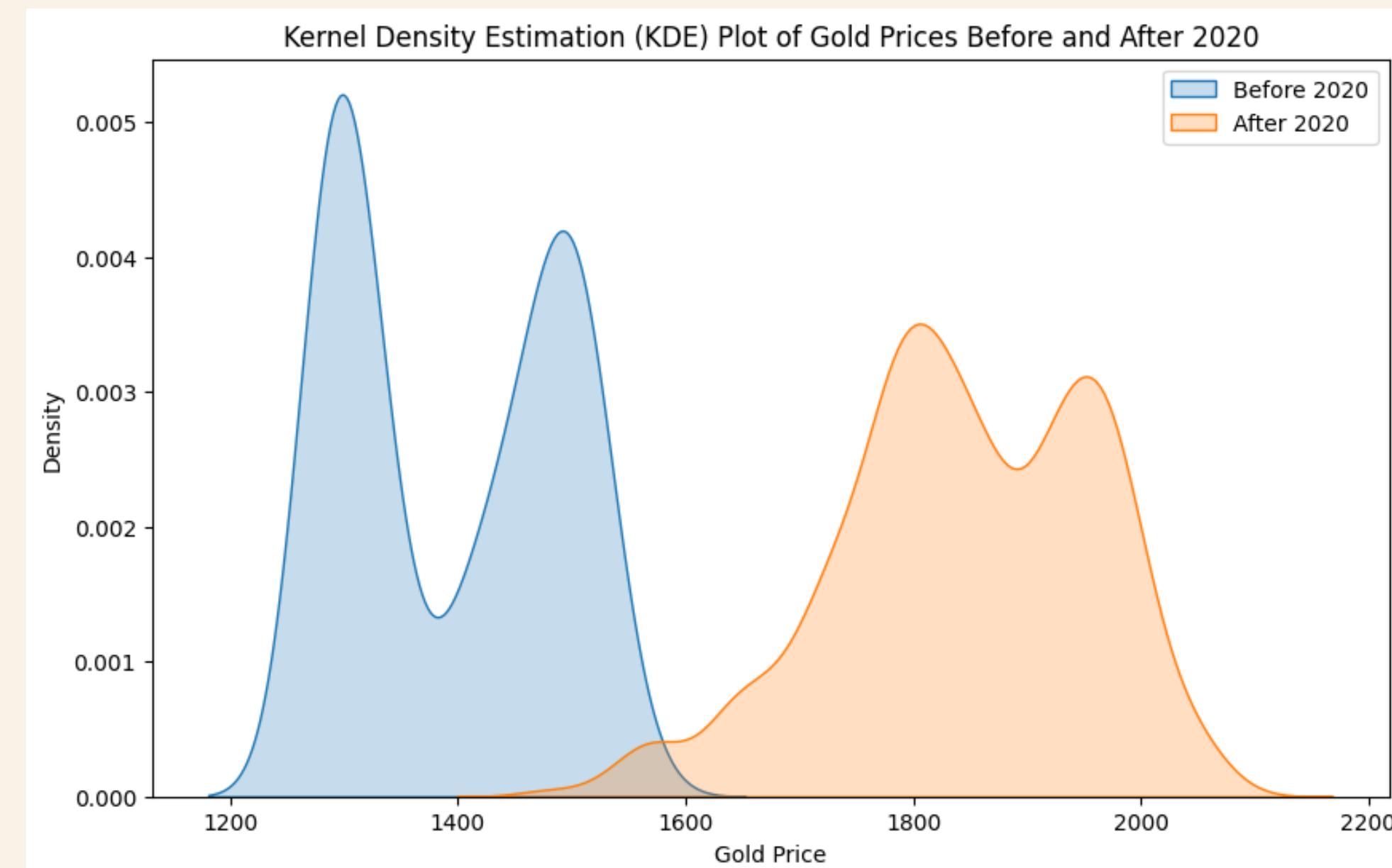
05 - Impact of Market Events

- Correlations with Inflation Rate
- event using linear regression analysis
- Ridge regressor
- Inflation Rate is a significant predictor of Gold price
- Models effectively capture the relationship with minimal overfitting, shown by consistent performance across folds.



05 - Impact of Market Events

- statistical test (t-test) to see whether there is a difference between the mean gold prices between before and after 2020.
- T-statistic: -60.58.
- P-value: 0.0.
- Significance Level: 0.05.
- Since the p-value is less than the significance level, we reject the null hypothesis.
- Result: There is a significant difference in the mean gold prices between the two periods (before and after 2020).



Thanks

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