

Data Analytics Capstone Topic Approval Form

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Capstone Project Name: Time Series Forecasting of the Gold Price in USD

Project Topic: This project is using the industry data published by the WORLD GOLD COUNCIL (<https://www.gold.org/goldhub/data/gold-prices>) containing the information of the prices in USD and the dates from Dec 1978 to Nov 2024.

☒ **This project does not involve human subjects research and is exempt from WGU IRB review.**

Research Question: How accurately can the gold price be predicted?

Hypothesis: Null hypothesis – The gold price can be predicted at 90% accuracy

Alternate Hypothesis- The gold price can be predicted with less than 90% accuracy.

Context: The price of gold reflects a complex interplay of economic, social, and financial factors. Gold is often viewed as a refuge during economic uncertainty, recession, or financial crises. Its rising price typically signals fear or instability in financial markets. Gold tends to retain its value over time, making it a popular choice for preserving purchasing power during periods of high inflation. Rising gold prices often indicate concerns about currency devaluation or inflationary pressures. Gold prices are also influenced by interest rates. Lower interest rates reduce the opportunity cost of holding on-yielding assets such as gold or driving demand. The near future can be estimated by the price of the gold which can relate to the economy or financial situation by the gold price prediction.

Data: The dataset is real-world gold price from 1978 to 2024 from WORLD GOLD COUNCIL. This dataset was needed to generate the predictive ARIMA model. The dataset has close to 12,000 observations.

The dataset is in xlsx format (not csv) with 9 sheets. Only one sheet (Daily) was used for this project. The Daily sheet has information on days (weekdays only) from Dec 29, 1978 to Nov 22, 2024 with 19 different currencies including USD. All the 20 columns including the date and 19 different currencies are quantitative.

The dataset is owned by WORLD GOLD COUNCIL official website, but it was open to public to download with valid email account to log in. No additional permission was needed.

Data Gathering: Data was downloaded from WORLD GOLD COUNCIL official website in .xlsx format. The dataset contains 9 sheets, and 'Daily' sheet was used for this project. It contains the dates and the prices in 19 different currencies, so only Date and USD columns were used. The date ranges from Dec 29, 1978 to Nov 22, 2024. No missing or null values were found. Approximately 90% of the data was set to training set, and the remaining 10% was set to the test set.

Data Analytics Tools and Techniques:

1. Jupyter notebook version 6.5.4
2. Python libraries
 - a. Matplotlib.dates
 - b. Matplotlib.pyplot
 - c. Pandas
 - d. Numpy
 - e. Auto_arima
 - f. Mean_squared_error
 - g. ARIMA
 - h. Seasonal_decompose
 - i. rcParams

Justification of Tools/Techniques:

- a. matplotlib.dates was used to provide the sophisticated date plotting capabilities.

- b. Matplotlib.pyplot was used to make a data visualization such as graphs and plots.
- c. Pandas was used to analyze and manipulate the dataset in xlsx format including reading, saving, set dates using bdate_range, renaming the column, and make another set of DataFrame with selected columns.
- d. Numpy was used to enable efficient processing of large volumes of numerical data.
- e. Auto_arima was used to identify the optimal set for the ARIMA model.
- f. Mean_squared_error was used to evaluate the accuracy of the model's predictions by determining how closely they match the ground truth.
- g. ARIMA model was used to track the occurrences taking place over a specific time period.
- h. Seasonal_decompose was used to examine of time series influenced by factors that vary cyclically or periodically over time.
- i. rcParams, which is runtime configuration parameters, was used to offer a method for moving some of the repetitive code into a configuration file.

Project Outcomes: The projected outcome of this project is to predict the gold price from May 2015 to Nov 2024 and compare the real data for the accuracy using the ARIMA time series modeling.

Projected Project End Date: 2/1/2025

Sources:

WORLD GOLD COUNCIL. <https://www.gold.org/goldhub/data/gold-prices>.

Course Instructor Signature/Date:

☒ The research is exempt from an IRB Review.

☐ An IRB approval is in place (provide proof in appendix B).

Course Instructor's Approval Status: Approved

Date: 12/3/2024

Reviewed by:

Comments: [Click here to enter text.](#)

MSDA Capstone Release Form

It is the policy of Western Governors University (WGU) that student capstone projects should not be based on or include any proprietary or classified information or material belonging to your employer or any other organization. Such material belongs to the third party and is referred to as "restricted information," which requires you to obtain the party's permission to include the work.

Accordingly, in conducting your capstone project you are required to make one of the following declarations:

- ☒ My capstone project is not based upon and does not include restricted information.
- ☐ My capstone project is based upon and/or includes restricted information. *Before* submitting any capstone work, I will obtain authorization to use the restricted information in the manner proscribed by WGU.

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Source

Gold spot prices. WORLD GOLD COUNCIL. (Nov 22, 2024).

<https://www.gold.org/goldhub/data/gold-prices>.