gold-price-prediction

June 26, 2024

#GOLD PRICE PREDICTION

---

[1]:
```
# Importing the pandas library for data manipulation and analysis
import pandas as pd

# Importing the numpy library for numerical operations
import numpy as np

# Importing the matplotlib library for plotting and visualization
import matplotlib.pyplot as plt

# Importing the seaborn library for statistical data visualization
import seaborn as sns
```

[2]:
```
# Load the dataset (assuming it's stored in a CSV file)
gold_data = pd.read_csv('/content/goldstock.csv')
```

[3]:
```
# Display the dimensions (number of rows and columns) of the DataFrame␣
↪'gold_data'
gold_data.shape
```

[3]: (2511, 7)

[4]:
```
# Display the first five rows of the DataFrame 'gold_data'
gold_data.head()
```

[4]:

	no	Date	Close	Volume	Open	High	Low
0	0	1/19/2024	2029.3	166078	2027.4	2041.9	2022.2
1	1	1/18/2024	2021.6	167013	2009.1	2025.6	2007.7
2	2	1/17/2024	2006.5	245194	2031.7	2036.1	2004.6
3	3	1/16/2024	2030.2	277995	2053.4	2062.8	2027.6
4	4	1/12/2024	2051.6	250946	2033.2	2067.3	2033.1

[5]:
```python
# Display the data types of each column in the DataFrame 'gold_data'
gold_data.dtypes
```

[5]:
```
no          int64
Date       object
Close     float64
Volume      int64
Open      float64
High      float64
Low       float64
dtype: object
```

[6]:
```python
# Convert the 'Date' column to datetime format using pandas
gold_data['Date'] = pd.to_datetime(gold_data['Date'])

# Set the 'Date' column as the index of the DataFrame 'gold_data'
gold_data.set_index('Date', inplace=True)

# Display the data types of each column in the modified DataFrame 'gold_data'
gold_data.dtypes
```

[6]:
```
no          int64
Close     float64
Volume      int64
Open      float64
High      float64
Low       float64
dtype: object
```

[7]:
```python
# Rename columns 'Open', 'High', 'Low', and 'Close' to lowercase
gold_data.rename(columns={'Open': 'open', 'High': 'high', 'Low': 'low', 'Close':
 ↪ 'close'}, inplace=True)

# Display the first five rows of the modified DataFrame 'gold_data'
gold_data.head()
```

[7]:

Date	no	close	Volume	open	high	low
2024-01-19	0	2029.3	166078	2027.4	2041.9	2022.2
2024-01-18	1	2021.6	167013	2009.1	2025.6	2007.7
2024-01-17	2	2006.5	245194	2031.7	2036.1	2004.6
2024-01-16	3	2030.2	277995	2053.4	2062.8	2027.6
2024-01-12	4	2051.6	250946	2033.2	2067.3	2033.1

[8]:
```python
# Display concise summary of the DataFrame 'gold_data', including data types␣
 ↪and memory usage
gold_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 2511 entries, 2024-01-19 to 2014-01-22
Data columns (total 6 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   no      2511 non-null   int64
 1   close   2511 non-null   float64
 2   Volume  2511 non-null   int64
 3   open    2511 non-null   float64
 4   high    2511 non-null   float64
 5   low     2511 non-null   float64
dtypes: float64(4), int64(2)
memory usage: 137.3 KB
```

[9]:

```python
# Count the number of missing values (NaN) in each column of the DataFrame␣
↪'gold_data'
gold_data.isna().sum()
```

[9]:

```
no        0
close     0
Volume    0
open      0
high      0
low       0
dtype: int64
```

[10]:

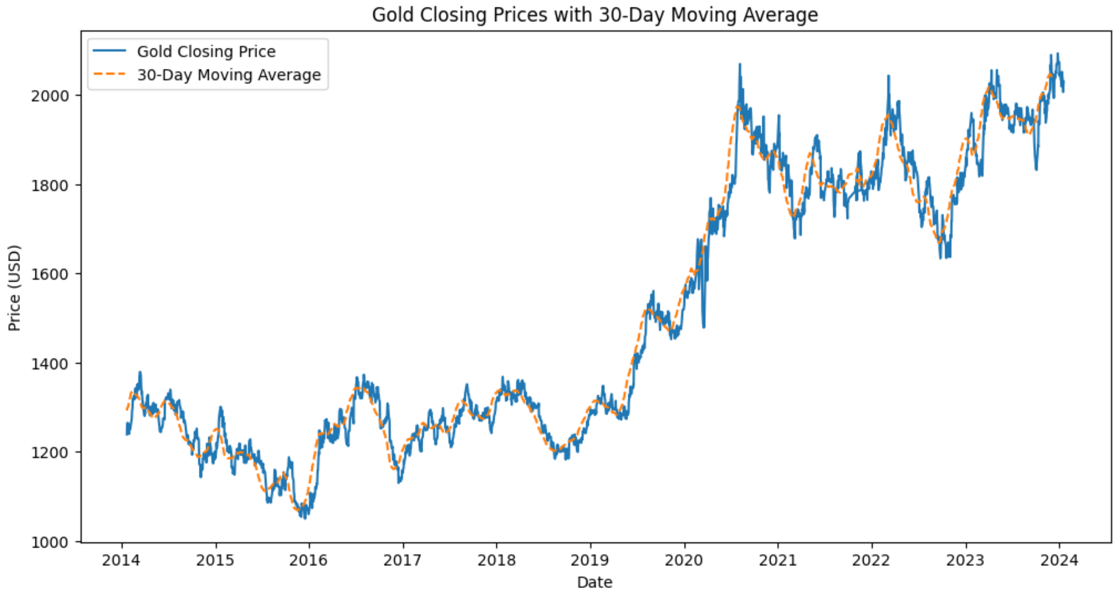
```python
# Create a figure with a specific size
plt.figure(figsize=(12, 6))

# Create a line plot using seaborn to visualize 'Low Price' over time
sns.lineplot(data=gold_data, x='Date', y='low', label='Low Price')

# Set the title of the plot
plt.title('Low and High Prices')

# Label the x-axis
plt.xlabel('Date')

# Label the y-axis
plt.ylabel('Price (USD)')

# Display the legend on the plot
plt.legend()

# Show the plot
plt.show()
```

[11]:
```python
# Display the column names of the DataFrame 'gold_data'
gold_data.columns
```

[11]: Index(['no', 'close', 'Volume', 'open', 'high', 'low'], dtype='object')

[12]:
```python
# Plot closing prices for initial visualization
plt.figure(figsize=(12, 6))

# Plot the 'close' column from gold_data
plt.plot(gold_data['close'], label='Gold Closing Price')

# Set the title of the plot
plt.title('Gold Closing Prices')

# Label the x-axis
plt.xlabel('Date')

# Label the y-axis
plt.ylabel('Price (USD)')

# Display the legend on the plot
plt.legend()

# Show the plot
plt.show()
```

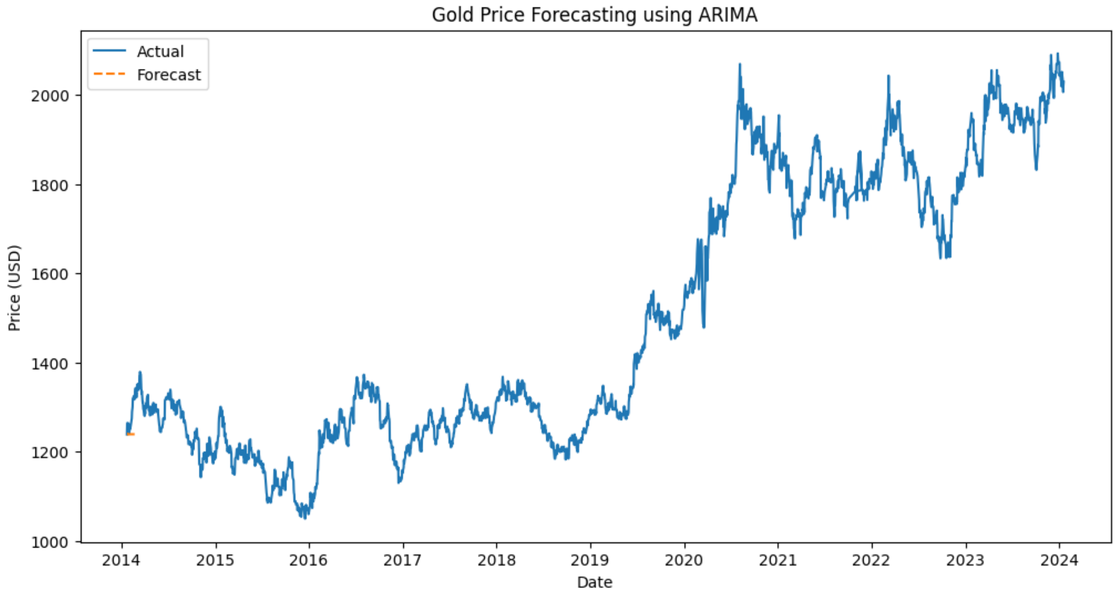
[13]:
```
# Calculate 30-day moving average for trend identification
gold_data['MA_30'] = gold_data['close'].rolling(window=30).mean()

# Plot original closing prices and moving average
plt.figure(figsize=(12, 6))

# Plot the original closing prices
plt.plot(gold_data['close'], label='Gold Closing Price')

# Plot the 30-day moving average with dashed line style
plt.plot(gold_data['MA_30'], label='30-Day Moving Average', linestyle='--')

# Set the title of the plot
plt.title('Gold Closing Prices with 30-Day Moving Average')

# Label the x-axis
plt.xlabel('Date')

# Label the y-axis
plt.ylabel('Price (USD)')

# Display the legend on the plot
plt.legend()

# Show the plot
plt.show()
```



[14]:
```
from statsmodels.tsa.arima.model import ARIMA
from sklearn.metrics import mean_squared_error

# Fit ARIMA model
model = ARIMA(gold_data['close'], order=(5, 1, 0))  # Example order, tune as␣
 ↪needed
model_fit = model.fit()

# Forecast future prices
forecast_steps = 30  # Example: forecast next 30 days
forecast = model_fit.forecast(steps=forecast_steps)

# Plot original data and forecast
plt.figure(figsize=(12, 6))
plt.plot(gold_data.index, gold_data['close'], label='Actual')  # Plot actual␣
 ↪prices
plt.plot(pd.date_range(start=gold_data.index[-1], periods=forecast_steps + 1,␣
 ↪freq='D')[1:], forecast, label='Forecast', linestyle='--')  # Plot␣
 ↪forecasted prices
plt.title('Gold Price Forecasting using ARIMA')
plt.xlabel('Date')
plt.ylabel('Price (USD)')
plt.legend()
plt.show()

# Evaluate model performance
```

```
mse = mean_squared_error(gold_data['close'][-forecast_steps:], forecast)  #␣
 ↪Calculate Mean Squared Error
print(f'Mean Squared Error (MSE): {mse}')  # Print MSE
```

```
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:473:
ValueWarning: A date index has been provided, but it has no associated frequency
information and so will be ignored when e.g. forecasting.
  self._init_dates(dates, freq)
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:473:
ValueWarning: A date index has been provided, but it is not monotonic and so
will be ignored when e.g. forecasting.
  self._init_dates(dates, freq)
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:473:
ValueWarning: A date index has been provided, but it has no associated frequency
information and so will be ignored when e.g. forecasting.
  self._init_dates(dates, freq)
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:473:
ValueWarning: A date index has been provided, but it is not monotonic and so
will be ignored when e.g. forecasting.
  self._init_dates(dates, freq)
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:473:
ValueWarning: A date index has been provided, but it has no associated frequency
information and so will be ignored when e.g. forecasting.
  self._init_dates(dates, freq)
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:473:
ValueWarning: A date index has been provided, but it is not monotonic and so
will be ignored when e.g. forecasting.
  self._init_dates(dates, freq)
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:836:
ValueWarning: No supported index is available. Prediction results will be given
with an integer index beginning at `start`.
  return get_prediction_index(
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:836:
FutureWarning: No supported index is available. In the next version, calling
this method in a model without a supported index will result in an exception.
  return get_prediction_index(
```

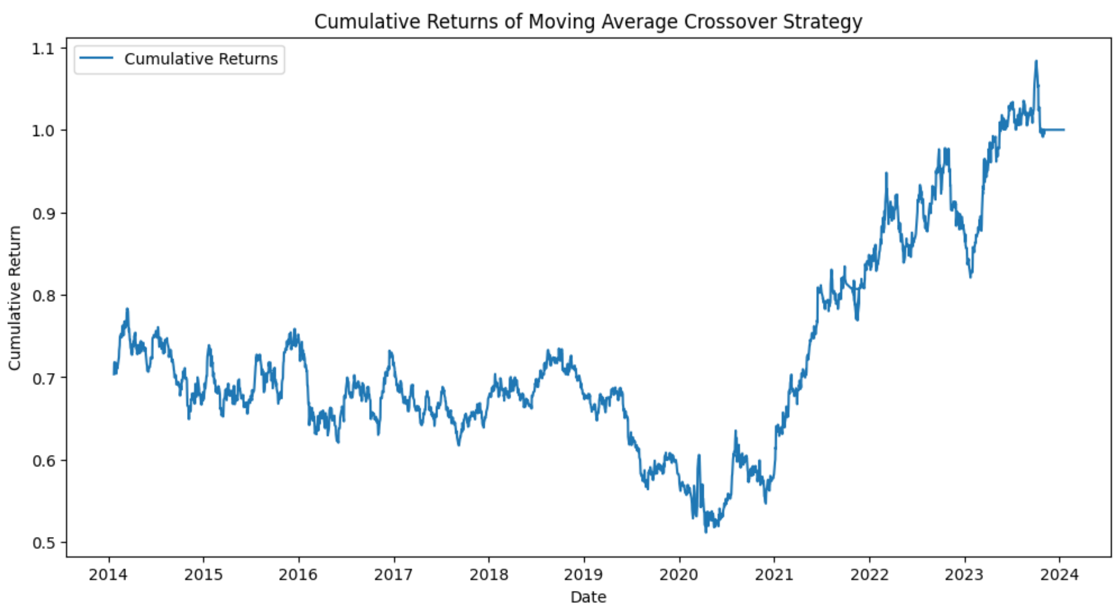



```
Mean Squared Error (MSE): 4161.579773310184
```

[18]:
```python
# Implement a simple moving average crossover strategy
gold_data['MA_50'] = gold_data['close'].rolling(window=50).mean()  # Calculate 50-day moving average
gold_data['MA_200'] = gold_data['close'].rolling(window=200).mean()  # Calculate 200-day moving average

# Generate buy/sell signals based on crossover
gold_data['Signal'] = 0  # Initialize signal column
gold_data['Signal'][50:] = np.where(gold_data['MA_50'][50:] > gold_data['MA_200'][50:], 1, -1)  # Generate signals

# Calculate daily returns
gold_data['Daily_Return'] = gold_data['close'].pct_change()  # Calculate daily percentage change in closing prices

# Calculate strategy returns
gold_data['Strategy_Return'] = gold_data['Daily_Return'] * gold_data['Signal'].shift(1)  # Calculate strategy returns

# Calculate cumulative returns
gold_data['Cumulative_Return'] = (1 + gold_data['Strategy_Return']).cumprod()  # Calculate cumulative returns

# Plot cumulative returns
plt.figure(figsize=(12, 6))
```

```
plt.plot(gold_data.index, gold_data['Cumulative_Return'], label='Cumulative␣
↪Returns')  # Plot cumulative returns over time
plt.title('Cumulative Returns of Moving Average Crossover Strategy')
plt.xlabel('Date')
plt.ylabel('Cumulative Return')
plt.legend()
plt.show()
```

```
<ipython-input-18-7faf9f0b0115>:7: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  gold_data['Signal'][50:] = np.where(gold_data['MA_50'][50:] >
gold_data['MA_200'][50:], 1, -1)  # Generate signals
```



[21]:
```
gold_data.head()
```

[21]:
```
              no   close  Volume    open    high     low  MA_30  MA_50  MA_200  \
Date
2024-01-19     0  2029.3  166078  2027.4  2041.9  2022.2    NaN    NaN     NaN
2024-01-18     1  2021.6  167013  2009.1  2025.6  2007.7    NaN    NaN     NaN
2024-01-17     2  2006.5  245194  2031.7  2036.1  2004.6    NaN    NaN     NaN
2024-01-16     3  2030.2  277995  2053.4  2062.8  2027.6    NaN    NaN     NaN
2024-01-12     4  2051.6  250946  2033.2  2067.3  2033.1    NaN    NaN     NaN

            Signal  Daily_Return  Strategy_Return  Cumulative_Return
```

```
Date
2024-01-19       0        NaN        NaN        NaN
2024-01-18       0  -0.003794       -0.0        1.0
2024-01-17       0  -0.007469       -0.0        1.0
2024-01-16       0   0.011812        0.0        1.0
2024-01-12       0   0.010541        0.0        1.0
```

[24]:

```python
# Define events and their impact dates
events = {
    'US Fed Interest Rate Decision': ['2014-01-29', '2014-03-19', '2014-06-18'],
    'Brexit Referendum': ['2016-06-23']
    # Add more events as needed
}

# Extract impact dates from dataset and analyze price movements
for event, dates in events.items():
    try:
        event_dates = pd.to_datetime(dates)
        for date in event_dates:
            # Extract price data around event date (e.g., before and after)
            price_before = gold_data.loc[date - pd.DateOffset(days=5): date -␣
 ↪pd.DateOffset(days=1), 'close']
            price_after = gold_data.loc[date + pd.DateOffset(days=1): date + pd.
 ↪DateOffset(days=5), 'close']

            # Compare prices and analyze impact
            if not price_before.empty and not price_after.empty:
                price_change = price_after.mean() - price_before.mean()
                print(f'Event: {event}, Date: {date.date()}, Average Price␣
 ↪Change: {price_change:.2f}')
            else:
                print(f'Event: {event}, Date: {date.date()}, Not enough data to␣
 ↪calculate price change')
    except Exception as e:
        print(f"Error processing event {event} with dates {dates}: {e}")
```

```
Event: US Fed Interest Rate Decision, Date: 2014-01-29, Not enough data to
calculate price change
Event: US Fed Interest Rate Decision, Date: 2014-03-19, Not enough data to
calculate price change
Event: US Fed Interest Rate Decision, Date: 2014-06-18, Not enough data to
calculate price change
Error processing event Brexit Referendum with dates ['2016-06-23']:
Timestamp('2016-06-18 00:00:00')
```