Institute of Technology of Cambodia

Department of Applied Mathematics and Statistics

Currency Exchange Rate Prediction

Group 1

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Why do we chose this topic?

We chose **Currency Exchange Rate Prediction** due to its real-world impact and the complexity of the problem. It's crucial for **businesses** and **individuals** in **international trade** or **travel**. The project provides an opportunity to apply data science skills to a multifaceted problem influenced by various factors. The potential outcome could be a tool aiding in **financial planning** and **strategy**. Beside that we also want to know the **Trend** and the **Behavior** on the rate between the 2 currency.

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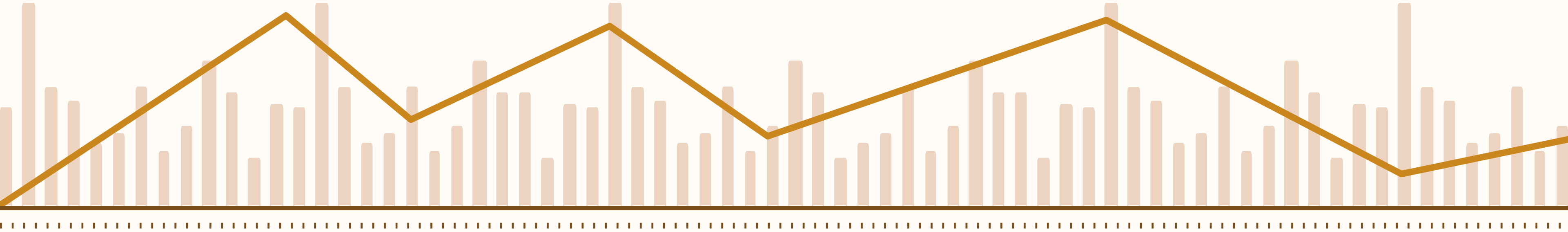


1

Data Collection

yahoo! finance

Three step to get the Dataset

Yahoo Finance

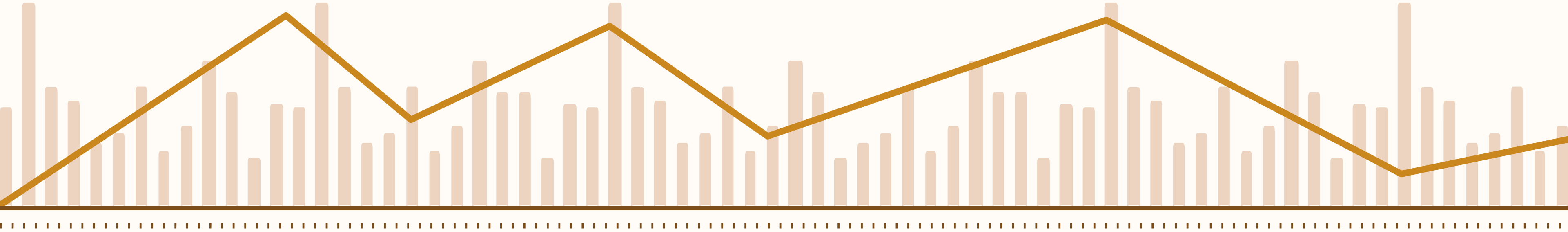
Go to Yahoo Finance and Search “USD/KHR(KHR=X)” or click this link.

Navigation

After landing on Yahoo Finance, navigate to Historical Data.

Download

Select the criteria you want then click on the download button.



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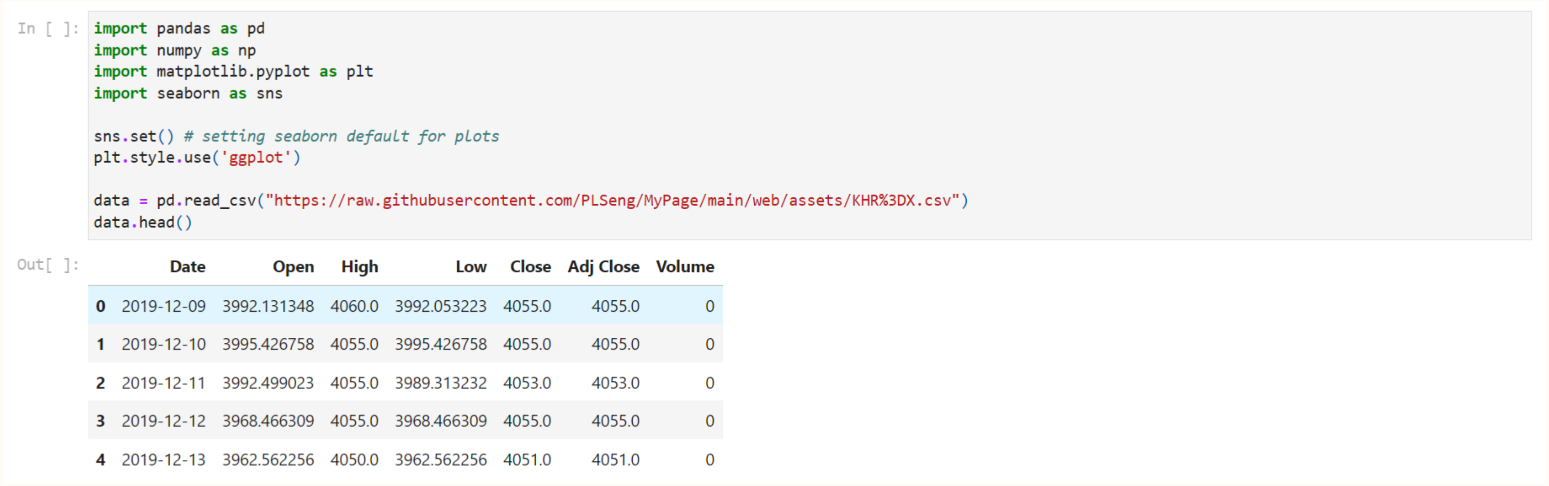
Data Preprocessing

Import Data and Necessary Library

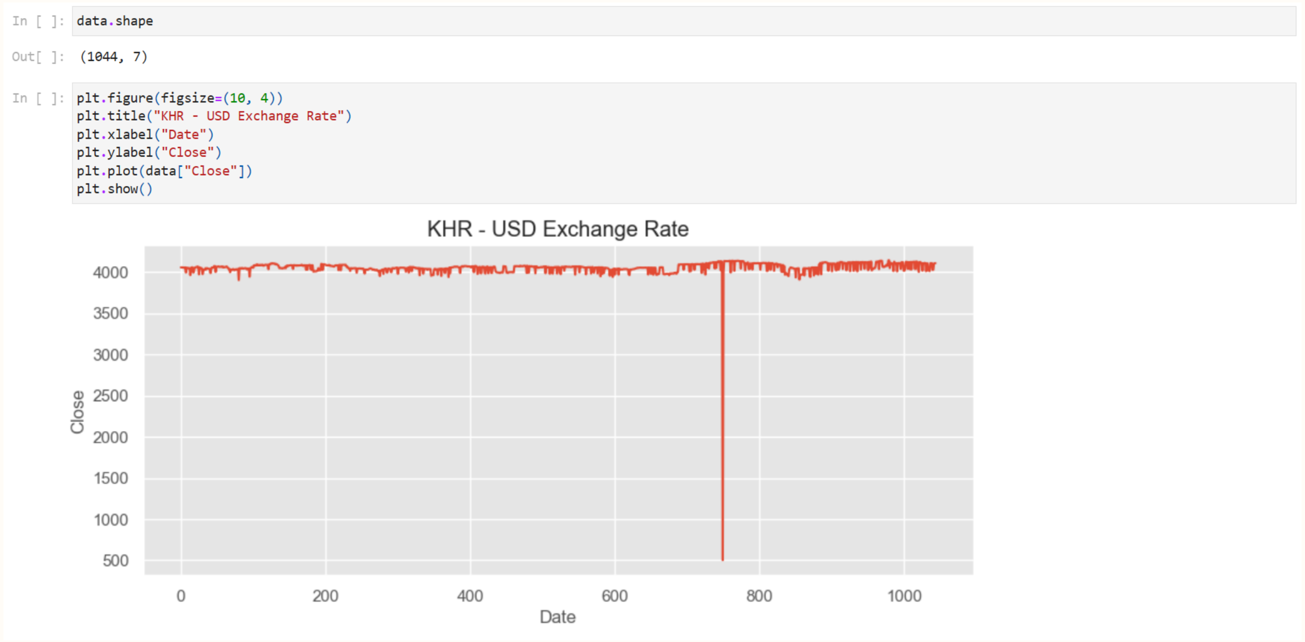


```
In [ ]: import pandas as pd
        import numpy as np
        import matplotlib.pyplot as plt
        import seaborn as sns

        sns.set() # setting seaborn default for plots
        plt.style.use('ggplot')

        data = pd.read_csv("https://raw.githubusercontent.com/PLSeng/MyPage/main/web/assets/KHR%3DX.csv")
        data.head()
```

Out[ ]:

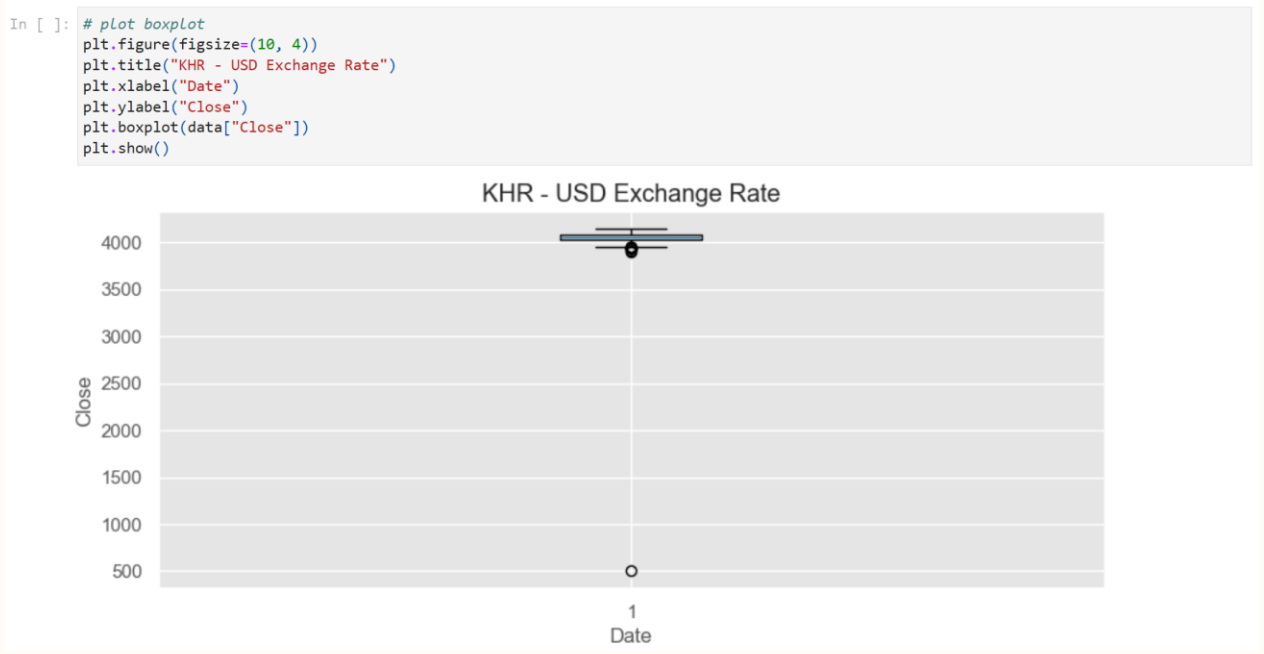
	Date	Open	High	Low	Close	Adj Close	Volume
0	2019-12-09	3992.131348	4060.0	3992.053223	4055.0	4055.0	0
1	2019-12-10	3995.426758	4055.0	3995.426758	4055.0	4055.0	0
2	2019-12-11	3992.499023	4055.0	3989.313232	4053.0	4053.0	0
3	2019-12-12	3968.466309	4055.0	3968.466309	4055.0	4055.0	0
4	2019-12-13	3962.562256	4050.0	3962.562256	4051.0	4051.0	0

Import Data and Necessary Library



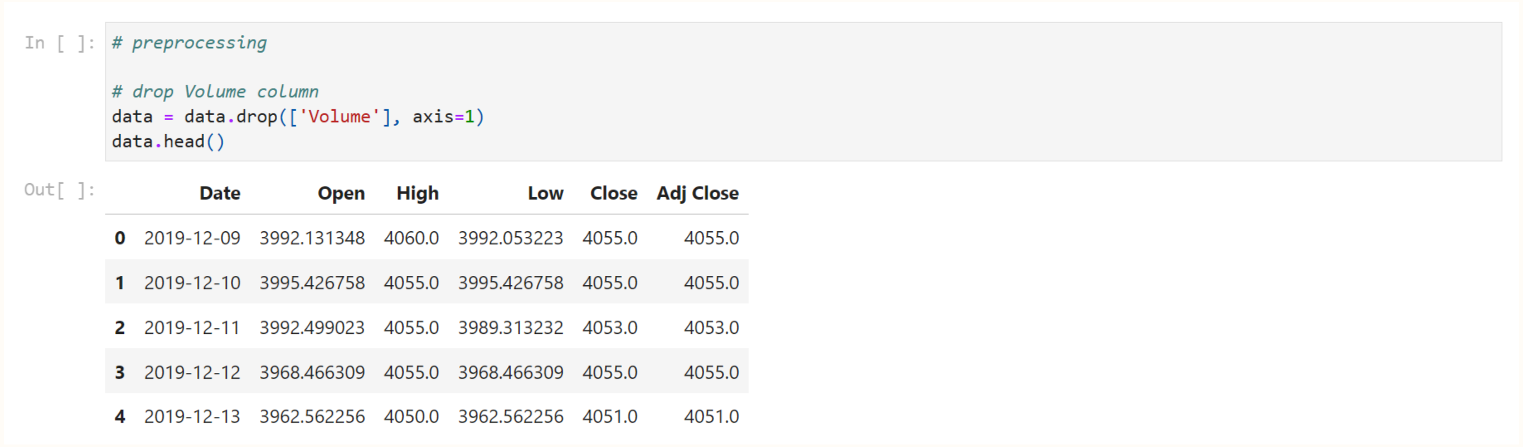
```
In [ ]: data.shape

Out[ ]: (1044, 7)

In [ ]: plt.figure(figsize=(10, 4))
        plt.title("KHR - USD Exchange Rate")
        plt.xlabel("Date")
        plt.ylabel("Close")
        plt.plot(data["Close"])
        plt.show()
```

Plot Boxplot to see outliers



```
In [ ]: # plot boxplot
        plt.figure(figsize=(10, 4))
        plt.title("KHR - USD Exchange Rate")
        plt.xlabel("Date")
        plt.ylabel("Close")
        plt.boxplot(data["Close"])
        plt.show()
```

Drop Empty Column

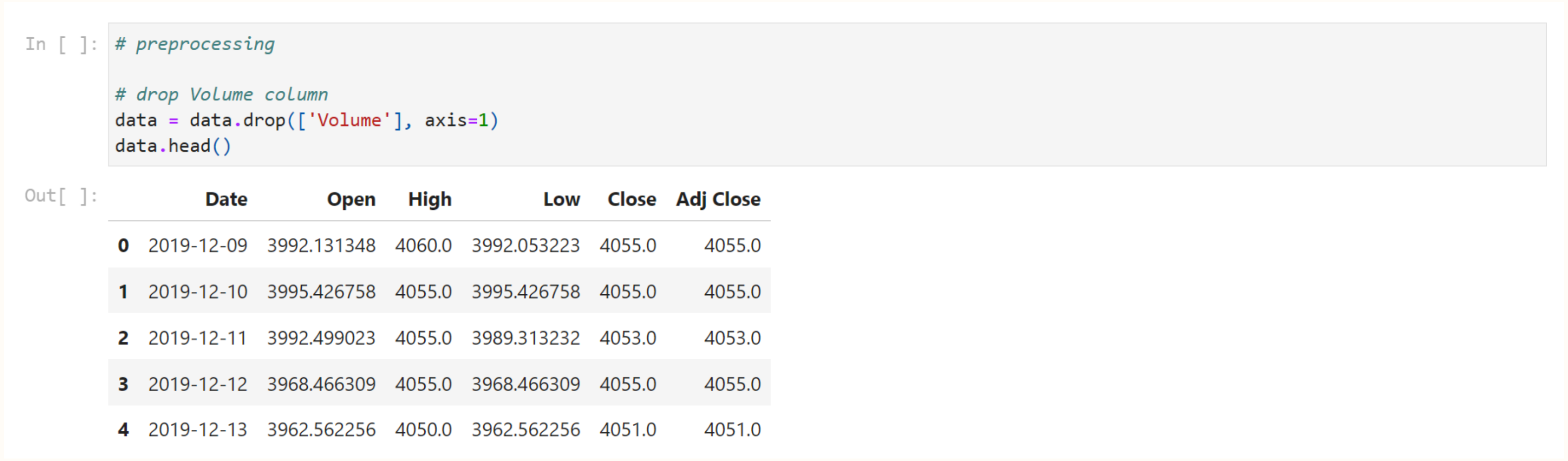


```
In [ ]: # preprocessing

        # drop Volume column
        data = data.drop(['Volume'], axis=1)
        data.head()
```

Out[ ]:

	Date	Open	High	Low	Close	Adj Close
0	2019-12-09	3992.131348	4060.0	3992.053223	4055.0	4055.0
1	2019-12-10	3995.426758	4055.0	3995.426758	4055.0	4055.0
2	2019-12-11	3992.499023	4055.0	3989.313232	4053.0	4053.0
3	2019-12-12	3968.466309	4055.0	3968.466309	4055.0	4055.0
4	2019-12-13	3962.562256	4050.0	3962.562256	4051.0	4051.0

Drop Empty Column

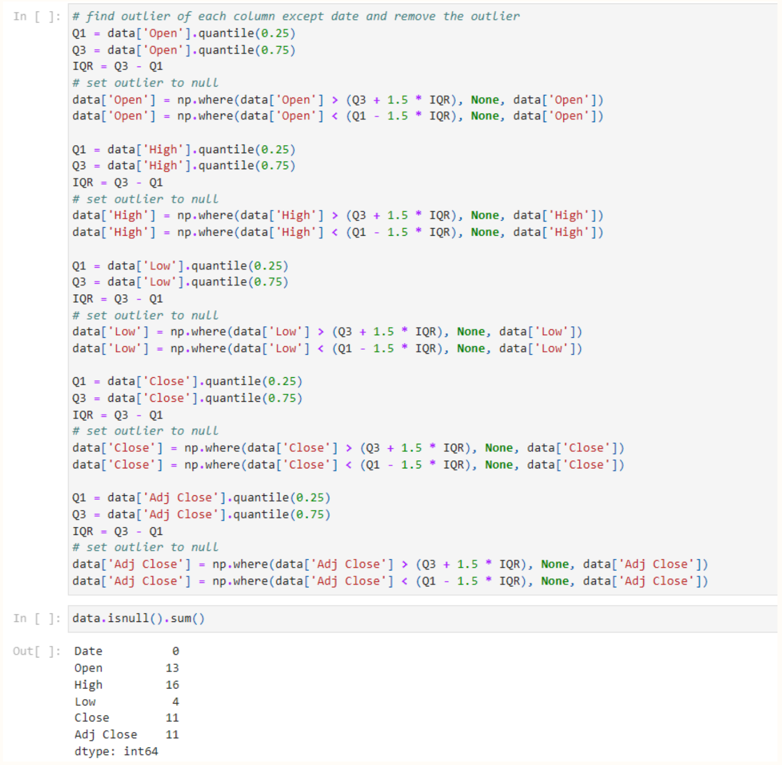


```
In [ ]: # preprocessing

        # drop Volume column
        data = data.drop(['Volume'], axis=1)
        data.head()
```

Out[ ]:

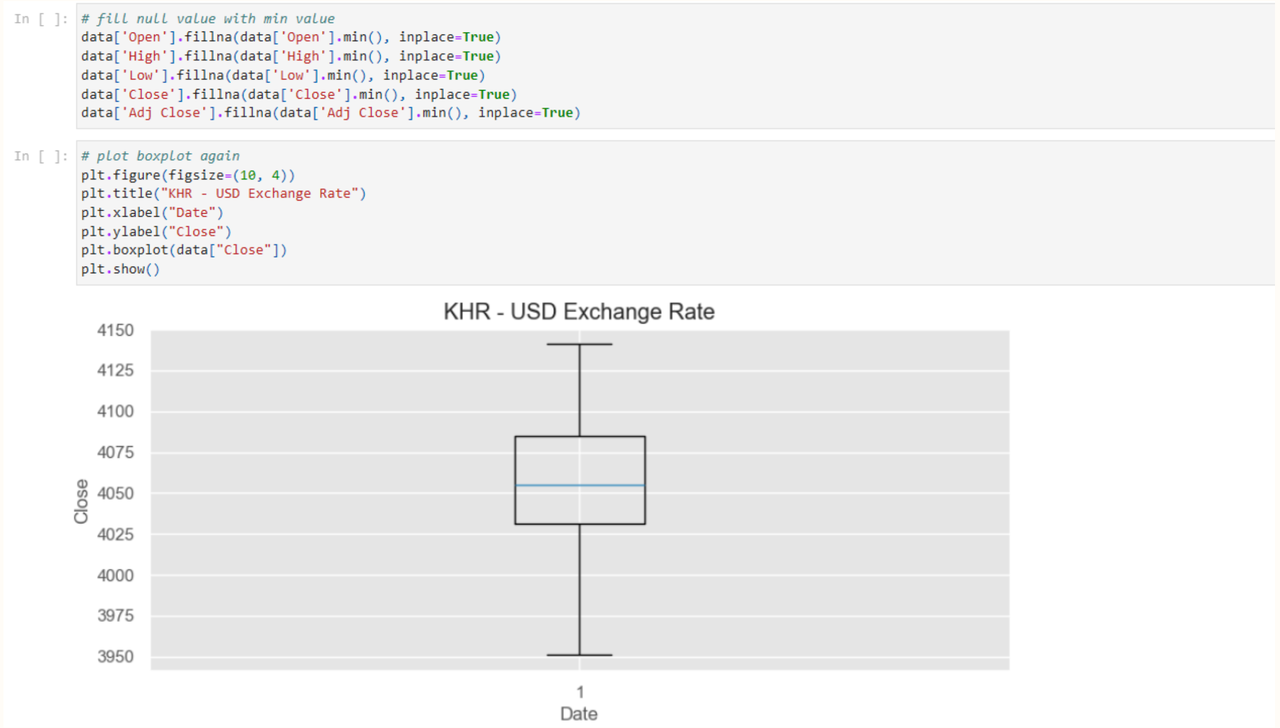
	Date	Open	High	Low	Close	Adj Close
0	2019-12-09	3992.131348	4060.0	3992.053223	4055.0	4055.0
1	2019-12-10	3995.426758	4055.0	3995.426758	4055.0	4055.0
2	2019-12-11	3992.499023	4055.0	3989.313232	4053.0	4053.0
3	2019-12-12	3968.466309	4055.0	3968.466309	4055.0	4055.0
4	2019-12-13	3962.562256	4050.0	3962.562256	4051.0	4051.0

Drop Outliers



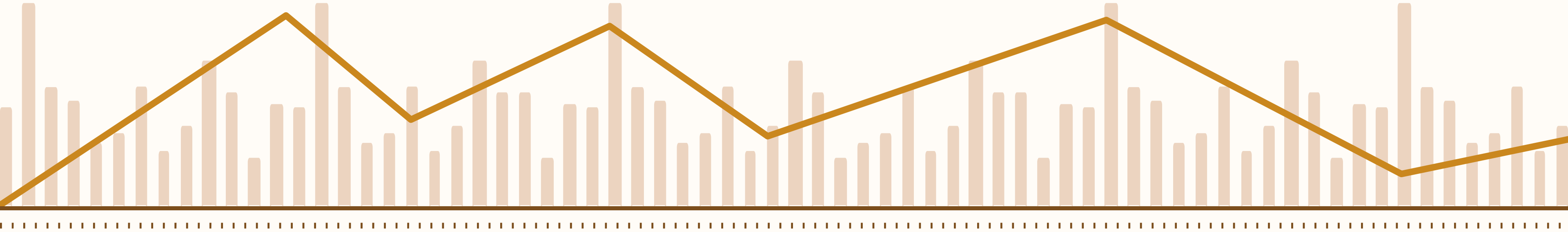
```
In [ ]: # find outlier of each column except date and remove the outlier
        Q1 = data['Open'].quantile(0.25)
        Q3 = data['Open'].quantile(0.75)
        IQR = Q3 - Q1
        # set outlier to null
        data['Open'] = np.where(data['Open'] > (Q3 + 1.5 * IQR), None, data['Open'])
        data['Open'] = np.where(data['Open'] < (Q1 - 1.5 * IQR), None, data['Open'])

        Q1 = data['High'].quantile(0.25)
        Q3 = data['High'].quantile(0.75)
        IQR = Q3 - Q1
        # set outlier to null
        data['High'] = np.where(data['High'] > (Q3 + 1.5 * IQR), None, data['High'])
        data['High'] = np.where(data['High'] < (Q1 - 1.5 * IQR), None, data['High'])

        Q1 = data['Low'].quantile(0.25)
        Q3 = data['Low'].quantile(0.75)
        IQR = Q3 - Q1
        # set outlier to null
        data['Low'] = np.where(data['Low'] > (Q3 + 1.5 * IQR), None, data['Low'])
        data['Low'] = np.where(data['Low'] < (Q1 - 1.5 * IQR), None, data['Low'])

        Q1 = data['Close'].quantile(0.25)
        Q3 = data['Close'].quantile(0.75)
        IQR = Q3 - Q1
        # set outlier to null
        data['Close'] = np.where(data['Close'] > (Q3 + 1.5 * IQR), None, data['Close'])
        data['Close'] = np.where(data['Close'] < (Q1 - 1.5 * IQR), None, data['Close'])

        Q1 = data['Adj Close'].quantile(0.25)
        Q3 = data['Adj Close'].quantile(0.75)
        IQR = Q3 - Q1
        # set outlier to null
        data['Adj Close'] = np.where(data['Adj Close'] > (Q3 + 1.5 * IQR), None, data['Adj Close'])
        data['Adj Close'] = np.where(data['Adj Close'] < (Q1 - 1.5 * IQR), None, data['Adj Close'])

In [ ]: data.isnull().sum()

Out[ ]: Date          0
        Open         13
        High         16
        Low           4
        Close        11
        Adj Close    11
        dtype: int64
```

Fill Empty cell with min value



```
In [ ]: # fill null value with min value
        data['Open'].fillna(data['Open'].min(), inplace=True)
        data['High'].fillna(data['High'].min(), inplace=True)
        data['Low'].fillna(data['Low'].min(), inplace=True)
        data['Close'].fillna(data['Close'].min(), inplace=True)
        data['Adj Close'].fillna(data['Adj Close'].min(), inplace=True)
```

```
In [ ]: # plot boxplot again
        plt.figure(figsize=(10, 4))
        plt.title("KHR - USD Exchange Rate")
        plt.xlabel("Date")
        plt.ylabel("Close")
        plt.boxplot(data["Close"])
        plt.show()
```



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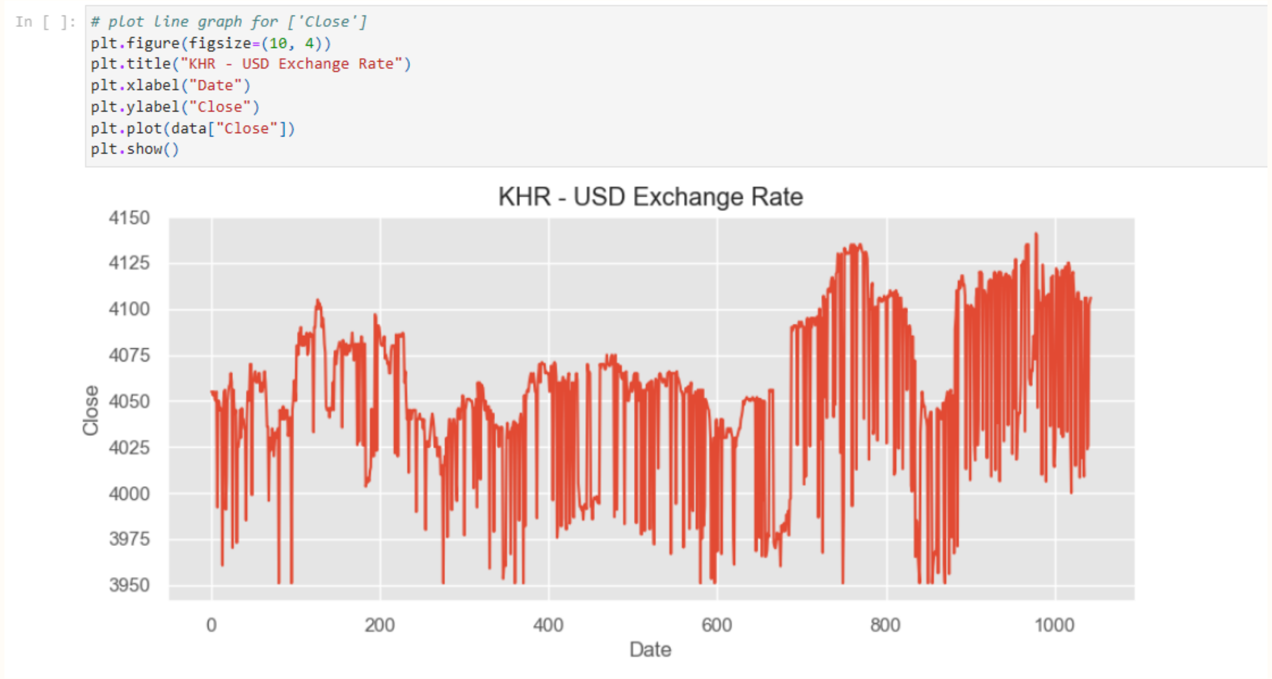
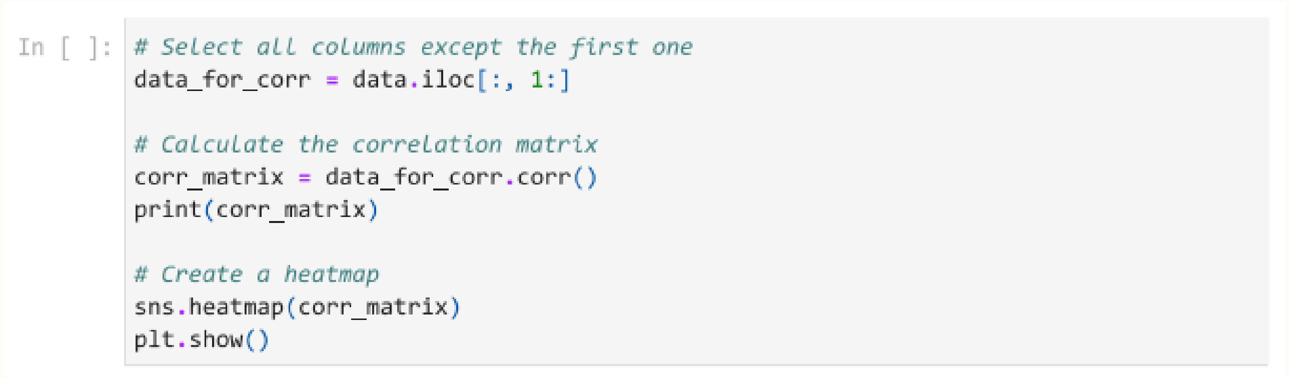
Data Visualisation

Plot the time series graph



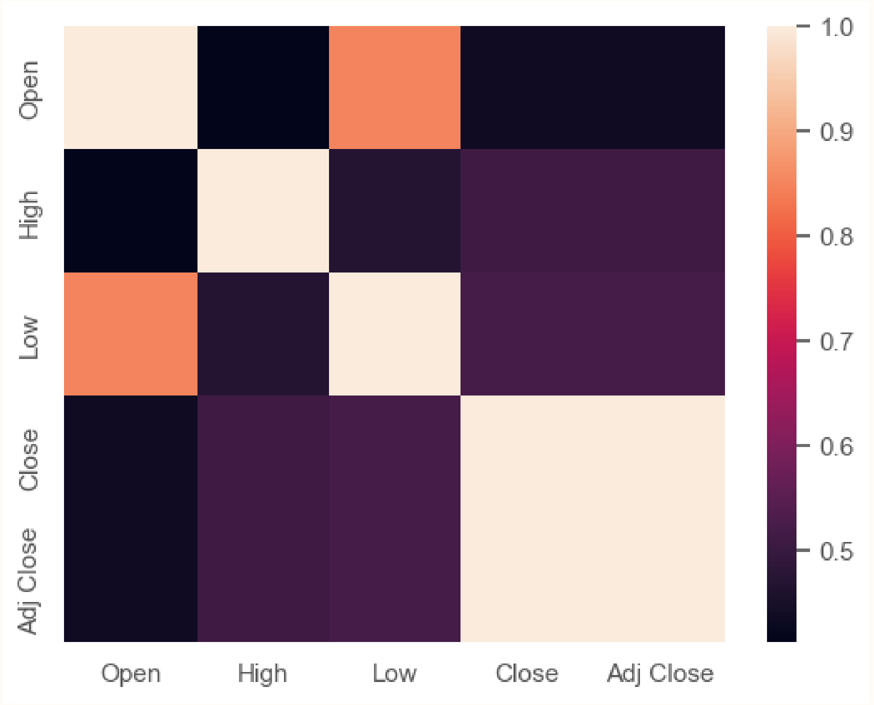
```
In [ ]: # plot line graph for ['Close']
        plt.figure(figsize=(10, 4))
        plt.title("KHR - USD Exchange Rate")
        plt.xlabel("Date")
        plt.ylabel("Close")
        plt.plot(data["Close"])
        plt.show()
```

Plot a heatmap to see the correlation



```
In [ ]: # Select all columns except the first one
        data_for_corr = data.iloc[:, 1:]

        # Calculate the correlation matrix
        corr_matrix = data_for_corr.corr()
        print(corr_matrix)

        # Create a heatmap
        sns.heatmap(corr_matrix)
        plt.show()
```

Plot a heatmap to see the correlation



4

Data Analysis

scikit learn

Scikit-Learn

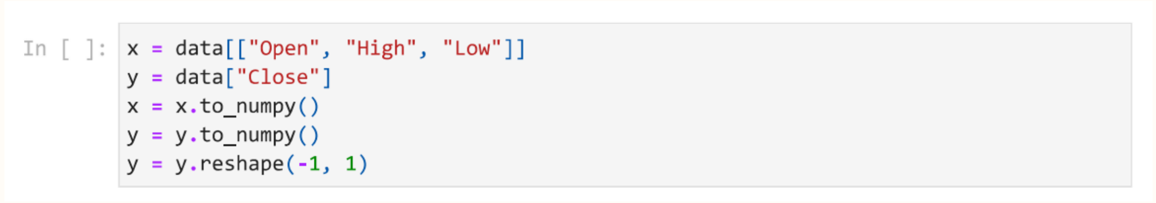
train_test_split

train_test_split in **scikit-learn** splits data into random train and test subsets. It takes arrays as inputs and you can specify the size of the test and train datasets. It also allows for reproducible output and stratified splitting.

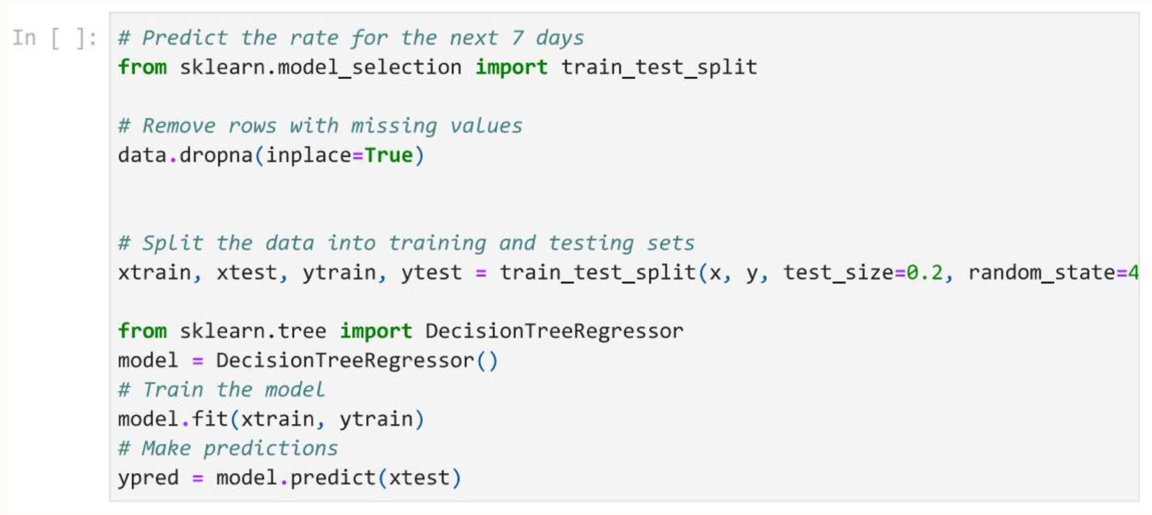
DecisionTreeRegressor

DecisionTreeRegressor in **scikit-learn** is a decision tree regressor. It splits data into train and test subsets based on various parameters like **criterion**, **splitter**, **max_depth**, etc. It's used for creating **models** that **predict** the value of a **target variable**.

Regression

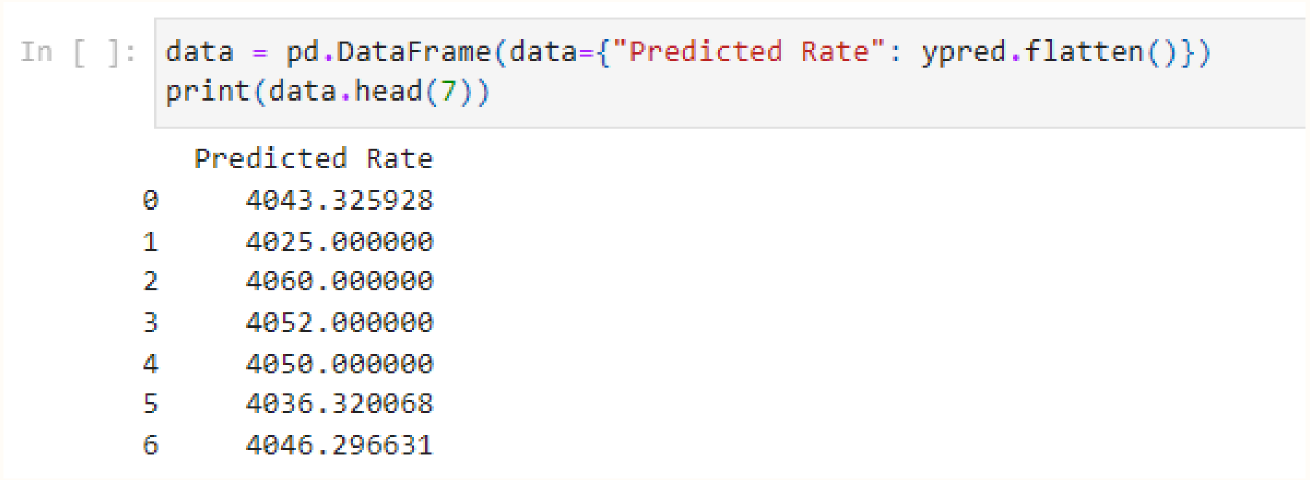


```
In [ ]: x = data[["Open", "High", "Low"]]
        y = data["Close"]
        x = x.to_numpy()
        y = y.to_numpy()
        y = y.reshape(-1, 1)
```



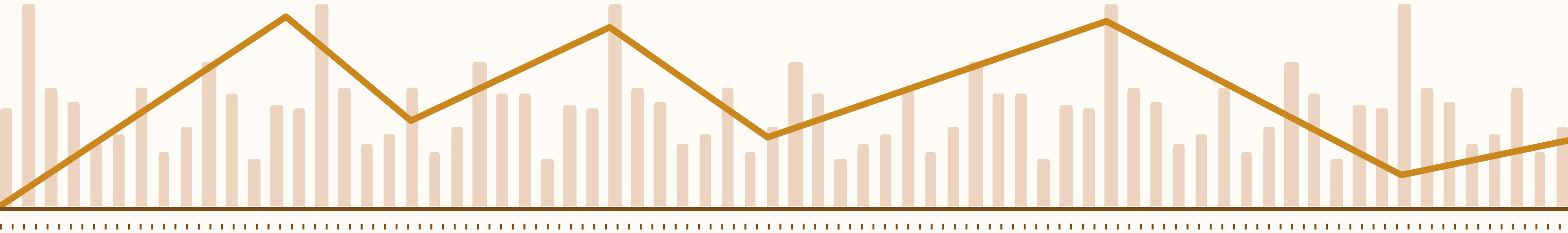
```
In [ ]: # Predict the rate for the next 7 days
        from sklearn.model_selection import train_test_split

        # Remove rows with missing values
        data.dropna(inplace=True)


        # Split the data into training and testing sets
        xtrain, xtest, ytrain, ytest = train_test_split(x, y, test_size=0.2, random_state=4

        from sklearn.tree import DecisionTreeRegressor
        model = DecisionTreeRegressor()
        # Train the model
        model.fit(xtrain, ytrain)
        # Make predictions
        ypred = model.predict(xtest)
```

Prediction



```
In [ ]: data = pd.DataFrame(data={"Predicted Rate": ypred.flatten()})
        print(data.head(7))
```

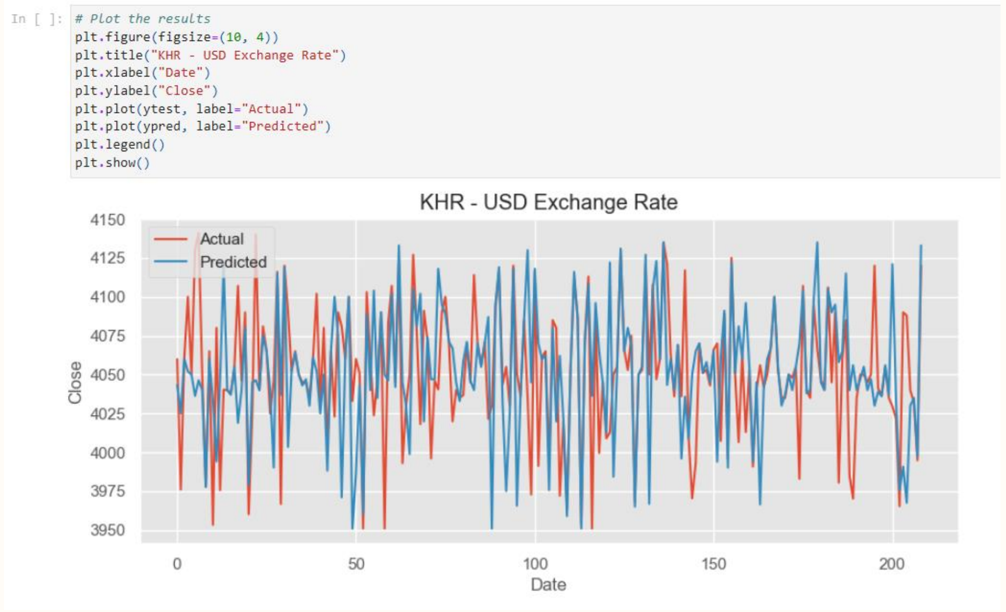
```
   Predicted Rate
0     4043.325928
1     4025.000000
2     4060.000000
3     4052.000000
4     4050.000000
5     4036.320068
6     4046.296631
```



5

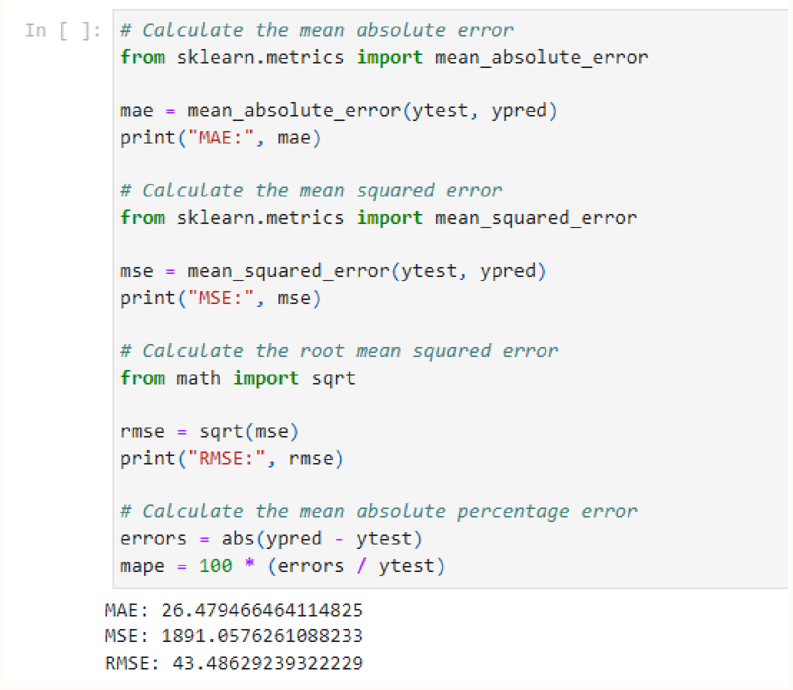
Accuracy Rate

Trendline between Actual and Predicted Value



```
In [ ]: # Plot the results
        plt.figure(figsize=(10, 4))
        plt.title("KHR - USD Exchange Rate")
        plt.xlabel("Date")
        plt.ylabel("Close")
        plt.plot(ytest, label="Actual")
        plt.plot(ypred, label="Predicted")
        plt.legend()
        plt.show()
```

Get the accuracy rate



```
In [ ]: # Calculate the mean absolute error
        from sklearn.metrics import mean_absolute_error

        mae = mean_absolute_error(ytest, ypred)
        print("MAE:", mae)

        # Calculate the mean squared error
        from sklearn.metrics import mean_squared_error

        mse = mean_squared_error(ytest, ypred)
        print("MSE:", mse)

        # Calculate the root mean squared error
        from math import sqrt

        rmse = sqrt(mse)
        print("RMSE:", rmse)

        # Calculate the mean absolute percentage error
        errors = abs(ypred - ytest)
        mape = 100 * (errors / ytest)
```

```
MAE: 26.479466464114825
MSE: 1891.0576261088233
RMSE: 43.48629239322229
```

6

Conclusion

Thanks!

Do you have any questions?