ETH Time Series Project Price Forecast 2023

April 12, 2022

[5]:

```
import yfinance as yf
import pandas as pd
import numpy as np
import seaborn as sns
from datetime import datetime
from datetime import timedelta
import plotly.graph_objects as go
from fbprophet import Prophet
from fbprophet.plot import plot_plotly, plot_components_plotly
import warnings
warnings.filterwarnings('ignore')
pd.options.display.float_format = '${:,.2f}'.format
```

[8]:

```
#downloading ETH historical data from yahoo finance with yfinance library
today = datetime.today().strftime('%Y-%m-%d')
start_date = '2016-01-01'

eth_df = yf.download('ETH-USD', start_date, today)
eth_df.tail()
```

```
[*********************100%***********************]  1 of 1 completed
```

[8]:

```
                Open      High       Low     Close  Adj Close       Volume
Date
2022-04-08 $3,233.27 $3,301.61 $3,179.14 $3,192.07  $3,192.07  17557050669
2022-04-09 $3,191.98 $3,261.96 $3,187.47 $3,261.92  $3,261.92   9908112156
2022-04-10 $3,261.29 $3,303.00 $3,211.87 $3,211.87  $3,211.87  10427054790
2022-04-11 $3,209.58 $3,214.46 $2,962.76 $2,981.05  $2,981.05  21891804831
2022-04-12 $2,987.16 $3,076.92 $2,960.05 $3,023.27  $3,023.27  20259698688
```

1 Exploratory Data Analysis

[9]:

```
eth_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 1616 entries, 2017-11-09 to 2022-04-12
Data columns (total 6 columns):
 #   Column     Non-Null Count  Dtype
```

```
---  ------     --------------  -----
 0   Open       1616 non-null   float64
 1   High       1616 non-null   float64
 2   Low        1616 non-null   float64
 3   Close      1616 non-null   float64
 4   Adj Close  1616 non-null   float64
 5   Volume     1616 non-null   int64
dtypes: float64(5), int64(1)
memory usage: 88.4 KB
```

[10]:

```
#check if we have any NAs
eth_df.isnull().sum()
```

[10]:

```
Open         0
High         0
Low          0
Close        0
Adj Close    0
Volume       0
dtype: int64
```

[11]:

```
#check columns in a dataframe
eth_df.columns
```

[11]:

```
Index(['Open', 'High', 'Low', 'Close', 'Adj Close', 'Volume'], dtype='object')
```

[12]:

```
#adding date column to the df/reindexing
eth_df.reset_index(inplace=True)

eth_df.columns
```

[12]:

```
Index(['Date', 'Open', 'High', 'Low', 'Close', 'Adj Close', 'Volume'],
dtype='object')
```

[16]:

```
#we only need 2 columns for our forecasting prophet model
df = eth_df[['Date', 'Open']]

new_names = {
    'Date': 'ds',
    'Open': 'y',
}

df.rename(columns=new_names, inplace = True)
```

[17]:

```
#check if data is ready for prophet
df.tail()
```

```
[17]:               ds         y
      1611 2022-04-08 $3,233.27
      1612 2022-04-09 $3,191.98
      1613 2022-04-10 $3,261.29
      1614 2022-04-11 $3,209.58
      1615 2022-04-12 $2,987.16
```

```
[18]: #plot the open price
      x = df['ds']
      y = df['y']

      fig = go.Figure()

      fig.add_trace(go.Scatter(x=x, y=y))

      #Set title
      fig.update_layout(
      title_text = 'Time series plot of Ethereum Open Price')
```

2 Prophet model

```
[20]: #fitting data into the Prophet model

      m = Prophet(
      seasonality_mode='multiplicative'
      )

      m.fit(df)
```

```
INFO:fbprophet:Disabling daily seasonality. Run prophet with
daily_seasonality=True to override this.
```

```
[20]: <fbprophet.forecaster.Prophet at 0x16a66261c10>
```

```
[21]: #now we can create an entire years worth of date data for our prophet model to make predictions
      future = m.make_future_dataframe(periods=365)
      future.tail()
```

```
[21]:               ds
      1976 2023-04-08
      1977 2023-04-09
      1978 2023-04-10
      1979 2023-04-11
      1980 2023-04-12
```

3 Model Predictions

[22]:
```
forecast = m.predict(future)
forecast[['ds', 'yhat', 'yhat_lower', 'yhat_upper']].tail()
#one year in advance
```

[22]:
```
              ds      yhat  yhat_lower  yhat_upper
1976 2023-04-08 $3,795.84   $2,235.47   $5,274.51
1977 2023-04-09 $3,793.83   $2,271.73   $5,215.67
1978 2023-04-10 $3,784.79   $2,274.64   $5,246.04
1979 2023-04-11 $3,769.76   $2,263.95   $5,204.02
1980 2023-04-12 $3,775.60   $2,237.83   $5,215.04
```

[23]:
```
#prediction for the next day
next_day = (datetime.today() + timedelta(days=1)).strftime('%Y-%m-%d')

#next day is 4/13/2022
forecast[forecast['ds'] == next_day]['yhat'].item()
```

[23]:
```
3055.09070239782
```

4 Forecast Plots

[25]:
```
plot_plotly(m, forecast)
```

5 Forecast Components

[26]:
```
#other components of our forecast model include trend, yearly, and weekly␣
 ↪visualiation diagrams
plot_components_plotly(m,forecast)
```

[ ]:
```
Our model tells us that:
    1. There will be an upward trend for the price of Ethereum
    2. The price of ETH is lowest in July and April on a Saturday.
    3. ETH is most expensive around November and May on a Thursday.
```