Decision Tree In Stock Market Price Prediction

Import libraries

In [1]:
```
import numpy as np
import pandas as pd
from sklearn.tree import DecisionTreeRegressor
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
import matplotlib.pyplot as plt
plt.style.use('bmh')
from sklearn import metrics
```

Store The Data Into A Data Frame

In [2]:
```
#Load The Data
df = pd.read_csv('QAN.AX.csv')
df= df.dropna()
df=df.rename(columns={"Open": "Open Price", "High": "High Price", "Low": "Low
 Price", "Close": "Close Price", "Adj Close": "Adj Close Price"})
df.head(6)
```

Out[2]:

	Date	Open Price	High Price	Low Price	Close Price	Adj Close Price	Volume
0	2005-01-04	3.94036	3.97231	3.92971	3.94036	2.569208	4556107
1	2005-01-05	3.90841	3.92971	3.89776	3.89776	2.541431	3790749
2	2005-01-06	3.88711	3.91906	3.87646	3.91906	2.555320	8103344
3	2005-01-07	3.92971	3.95101	3.90841	3.95101	2.576152	3692280
4	2005-01-10	3.91906	3.95101	3.91906	3.92971	2.562263	3415499
5	2005-01-11	3.95101	3.97231	3.91906	3.92971	2.562263	5434922

In [3]:
```
df.tail(6)
```

Out[3]:

	Date	Open Price	High Price	Low Price	Close Price	Adj Close Price	Volume
3933	2020-07-24	3.69	3.72	3.62	3.64	3.64	6075858
3934	2020-07-27	3.64	3.68	3.59	3.68	3.68	5816771
3935	2020-07-28	3.64	3.68	3.58	3.59	3.59	5844107
3936	2020-07-29	3.58	3.63	3.47	3.48	3.48	14824612
3937	2020-07-30	3.46	3.47	3.35	3.36	3.36	18258048
3938	2020-07-31	3.34	3.35	3.20	3.23	3.23	23172628

Print The Number Of Trading Days

In [4]:
```
number_of_rows=df.shape[0]
```

Visualize The Close Price Data

In [5]:
```
plt.figure(figsize=(16,8))
plt.title('QAN.AX')
plt.xlabel('Days')
plt.ylabel('Close Price USD ($)')
plt.plot(df['Close Price'])
plt.show()
```

Only Pick Close Price

In [6]:
```
df = df[['Close Price']]
```

Print The Data

In [7]:
```
df
```

Out[7]:

	Close Price
0	3.94036
1	3.89776
2	3.91906
3	3.95101
4	3.92971
...	...
3934	3.68000
3935	3.59000
3936	3.48000
3937	3.36000
3938	3.23000

3939 rows × 1 columns

Create a new column that represent the true value of the prediction

In [8]:
```
df['True_Prediction'] = df[['Close Price']].shift(-1)
df= df.dropna()
df
```

Out[8]:

	Close Price	True_Prediction
0	3.94036	3.89776
1	3.89776	3.91906
2	3.91906	3.95101
3	3.95101	3.92971
4	3.92971	3.92971
...	...	...
3933	3.64000	3.68000
3934	3.68000	3.59000
3935	3.59000	3.48000
3936	3.48000	3.36000
3937	3.36000	3.23000

3938 rows × 2 columns

Check whether there is a null value in the dataframe

In [9]:
```
df[df.isna().any(axis=1)]
```

Out[9]:

	Close Price	True_Prediction

Create an array that contains all values in 'Close' column

In [10]:
```
X= np.array(df.drop(['True_Prediction'], 1))
```

Create an array that contains all values in 'True_Prediction' column

In [11]:
```
y= np.array(df['True_Prediction'])
```

Split The Data Ramdomly Into 70% Training and 30% Testing

In [12]:
```
x_train, x_test, y_train, y_test = train_test_split(X, y, test_size = 0.3, ran
dom_state=0)
```

In [13]:
```
df
```

Out[13]:

	Close Price	True_Prediction
0	3.94036	3.89776
1	3.89776	3.91906
2	3.91906	3.95101
3	3.95101	3.92971
4	3.92971	3.92971
...	...	...
3933	3.64000	3.68000
3934	3.68000	3.59000
3935	3.59000	3.48000
3936	3.48000	3.36000
3937	3.36000	3.23000

3938 rows × 2 columns

Train the model with training data

In [14]:
```
tree = DecisionTreeRegressor().fit(x_train, y_train)
```

store predicted value to 'predictions'

In [15]:
```
predictions= tree.predict(x_test)
```

Print the performance measurements

In [16]:
```
print('Mean Squared Error:', metrics.mean_squared_error(y_test, predictions))
print('Mean Absolute Error:', metrics.mean_absolute_error(y_test, predictions
))
print('R2: ', metrics.r2_score(y_test, predictions))
```

```
Mean Squared Error: 0.0087183715900561
Mean Absolute Error: 0.06530356461342755
R2:  0.9967864550288561
```

Test the model by fitting it with time series order

- Create a test data that contains the last 30% of the whole data set
- Create a actual value for each test data
- Process all data into the training ready data

In [17]:
```
testing = df[int(len(df)*0.7):]
Actual_value= np.array(df['True_Prediction'][int(len(df)*0.7):])

testing = np.array(testing.drop(['True_Prediction'], 1))
Actual_value= np.array(df['True_Prediction'][int(len(df)*0.7):])
```

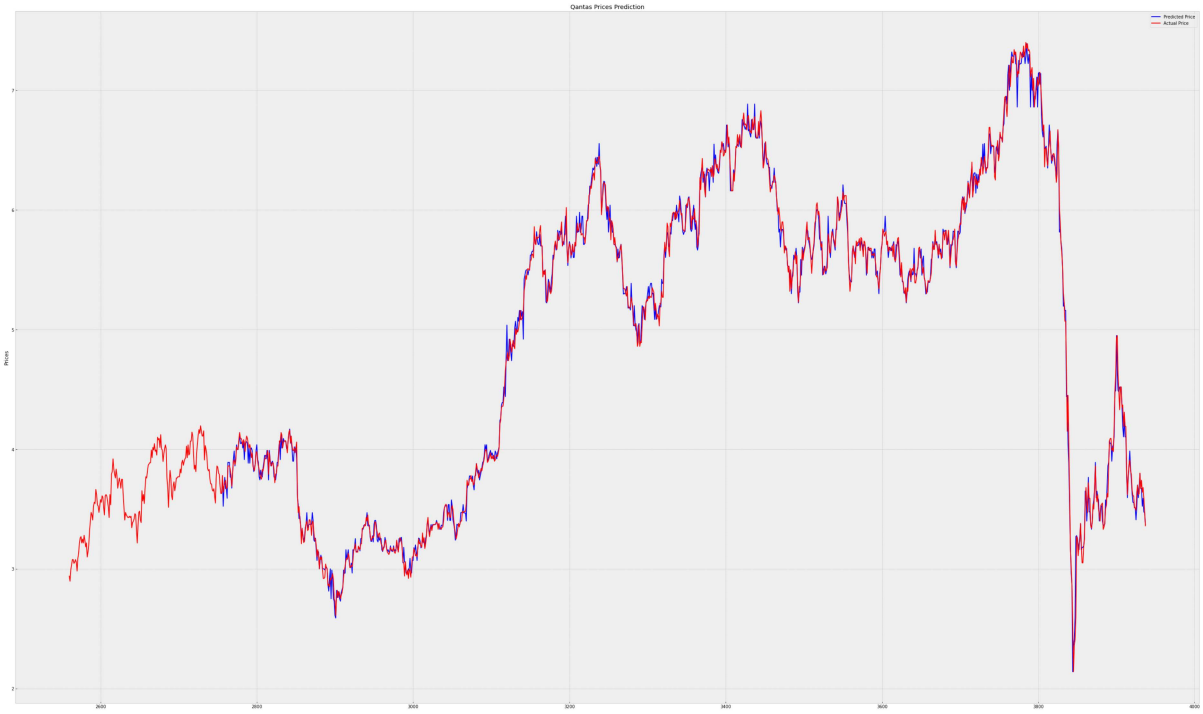
Generates the prediction based on 'testing'

In [18]:
```
testing_predictions= tree.predict(testing)
```

Display the predictions from the model in time series graph

Note: the graph starts from the first 65% of the data

In [19]:
```
plt.figure(figsize=(50, 30))
test_set_range = df[int(len(df)*0.7):].index
all_range= df.index
plt.plot(test_set_range, testing_predictions, color='blue',label='Predicted Pr
ice')
plt.plot(all_range[round(0.65*len(all_range)):], df['Close Price'][round(0.65*
len(all_range)):].values, color='red', label='Actual Price')
plt.title('Qantas Prices Prediction')
plt.ylabel('Prices')
plt.legend()
plt.show()
```



Print the performance measurements

In [20]:
```
print('Mean Squared Error:', metrics.mean_squared_error(Actual_value, testing_
predictions))
print('Mean Absolute Error:', metrics.mean_absolute_error(Actual_value, testin
g_predictions))
print('R2: ', metrics.r2_score(Actual_value, testing_predictions))
```

```
Mean Squared Error: 0.008301922913814685
Mean Absolute Error: 0.062405557958891085
R2:  0.9948866107341898
```

Forcasting 5 days in the future

Create a dataframe for forcasting the price in 5 days

In [21]:
```
future= pd.read_csv('QAN.AX.csv')
```

In [22]:
```
future = future.dropna()
```

In [23]:
```
future= future[['Date','Close']][-15:]
```

In [24]:
```
future
```

Out[24]:

	Date	Close
3924	2020-07-13	3.51
3925	2020-07-14	3.49
3926	2020-07-15	3.64
3927	2020-07-16	3.70
3928	2020-07-17	3.62
3929	2020-07-20	3.63
3930	2020-07-21	3.80
3931	2020-07-22	3.67
3932	2020-07-23	3.74
3933	2020-07-24	3.64
3934	2020-07-27	3.68
3935	2020-07-28	3.59
3936	2020-07-29	3.48
3937	2020-07-30	3.36
3938	2020-07-31	3.23

Set the number of days needs to be predicted and create 5 more rows in the dataframe

In [25]:
```
days=5
Predict_1 = {'Date':'2020-08-03', 'Close': np.NAN}
Predict_2 = {'Date':'2020-08-04', 'Close': np.NAN}
Predict_3 = {'Date':'2020-08-05', 'Close': np.NAN}
Predict_4 = {'Date':'2020-08-06', 'Close': np.NAN}
Predict_5 = {'Date':'2020-08-07', 'Close': np.NAN}
```

In [26]:
```
future = future.append([Predict_1,Predict_2,Predict_3,Predict_4,Predict_5], ignore_index=True)
```

In [27]:
```
future
```

Out[27]:

	Date	Close
0	2020-07-13	3.51
1	2020-07-14	3.49
2	2020-07-15	3.64
3	2020-07-16	3.70
4	2020-07-17	3.62
5	2020-07-20	3.63
6	2020-07-21	3.80
7	2020-07-22	3.67
8	2020-07-23	3.74
9	2020-07-24	3.64
10	2020-07-27	3.68
11	2020-07-28	3.59
12	2020-07-29	3.48
13	2020-07-30	3.36
14	2020-07-31	3.23
15	2020-08-03	NaN
16	2020-08-04	NaN
17	2020-08-05	NaN
18	2020-08-06	NaN
19	2020-08-07	NaN

Create a variable that contains the predictions for the next 5 days

In [28]:
```
predict_set = np.array(future.drop(['Date'], 1))[-6:]
```

In [29]:
```
predict_set
```

Out[29]:
```
array([[3.23],
       [ nan],
       [ nan],
       [ nan],
       [ nan],
       [ nan]])
```

Use the model 'tree' to predict

In [30]:
```
for i in range(0,days):

    a= predict_set[i]
    a=np.reshape(a, (1,1))
    value= tree.predict(a)
    predict_set[i+1]= value
```

Print the predictions

In [31]:
```
predict_set= predict_set[1:]
predict_set
```

Out[31]:
```
array([[3.26333333],
       [3.225     ],
       [3.2098    ],
       [3.25285714],
       [3.25714286]])
```

Assign the predictions value into the dataframe by replacing NAN variables

In [32]:
```
future.loc[future['Close'].isnull(), 'Close'] = predict_set
```

In [33]:
```
future
```

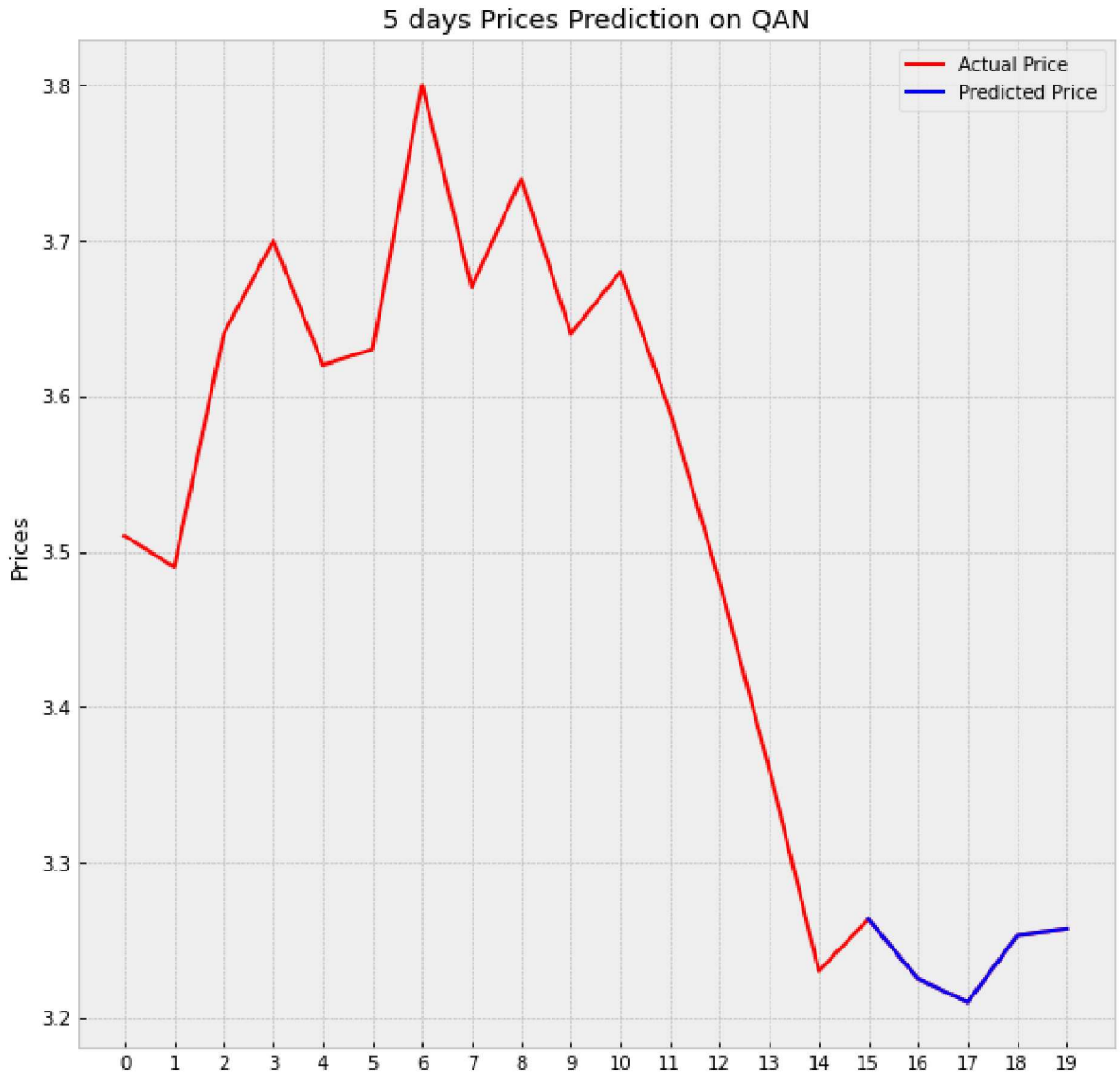
Out[33]:

	Date	Close
0	2020-07-13	3.510000
1	2020-07-14	3.490000
2	2020-07-15	3.640000
3	2020-07-16	3.700000
4	2020-07-17	3.620000
5	2020-07-20	3.630000
6	2020-07-21	3.800000
7	2020-07-22	3.670000
8	2020-07-23	3.740000
9	2020-07-24	3.640000
10	2020-07-27	3.680000
11	2020-07-28	3.590000
12	2020-07-29	3.480000
13	2020-07-30	3.360000
14	2020-07-31	3.230000
15	2020-08-03	3.263333
16	2020-08-04	3.225000
17	2020-08-05	3.209800
18	2020-08-06	3.252857
19	2020-08-07	3.257143

Visualize the forcasting result

In [34]:
```
plt.figure(figsize=(10, 10))
predict_set_range = future[-5:].index
all_range= future.index

plt.plot(all_range, future['Close'].values, color='red', label='Actual Price')
plt.plot(predict_set_range, predict_set, color='blue',label='Predicted Price')
plt.title('5 days Prices Prediction on QAN')
plt.ylabel('Prices')
plt.xticks(range(0, 20))
plt.legend()
plt.show()
```



In [ ]: