Walmart_Project_Letshego

November 9, 2023

[1]:
```
import pandas as pd
import seaborn as sns
import numpy as np
import matplotlib.pyplot as plt
from matplotlib import dates
from datetime import datetime
```

[2]:
```
storedata = pd.read_csv("Walmart_Store_sales.csv")
```

[44]:
```
storedata
```

[44]:
```
      Store        Date  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
0         1  05-02-2010    1643690.90             0        42.31       2.572
1         1  12-02-2010    1641957.44             1        38.51       2.548
2         1  19-02-2010    1611968.17             0        39.93       2.514
3         1  26-02-2010    1409727.59             0        46.63       2.561
4         1  05-03-2010    1554806.68             0        46.50       2.625
…       …           …             …           …          …           …
6430     45  28-09-2012     713173.95             0        64.88       3.997
6431     45  05-10-2012     733455.07             0        64.89       3.985
6432     45  12-10-2012     734464.36             0        54.47       4.000
6433     45  19-10-2012     718125.53             0        56.47       3.969
6434     45  26-10-2012     760281.43             0        58.85       3.882

             CPI  Unemployment        Day
0     211.096358         8.106 2010-05-02
1     211.242170         8.106 2010-12-02
2     211.289143         8.106 2010-02-19
3     211.319643         8.106 2010-02-26
4     211.350143         8.106 2010-05-03
…          …            …          …
6430  192.013558         8.684 2012-09-28
6431  192.170412         8.667 2012-05-10
6432  192.327265         8.667 2012-12-10
6433  192.330854         8.667 2012-10-19
6434  192.308899         8.667 2012-10-26
```

```
[6435 rows x 9 columns]
```

[45]:
```
storedata.head()
```

[45]:
```
   Store        Date  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
0      1  05-02-2010    1643690.90             0        42.31       2.572
1      1  12-02-2010    1641957.44             1        38.51       2.548
2      1  19-02-2010    1611968.17             0        39.93       2.514
3      1  26-02-2010    1409727.59             0        46.63       2.561
4      1  05-03-2010    1554806.68             0        46.50       2.625

          CPI  Unemployment        Day
0  211.096358         8.106 2010-05-02
1  211.242170         8.106 2010-12-02
2  211.289143         8.106 2010-02-19
3  211.319643         8.106 2010-02-26
4  211.350143         8.106 2010-05-03
```

[4]:
```
storedata.isna().sum()
```

[4]:
```
Store           0
Date            0
Weekly_Sales    0
Holiday_Flag    0
Temperature     0
Fuel_Price      0
CPI             0
Unemployment    0
dtype: int64
```

[5]:
```
storedata.shape
```

[5]:
```
(6435, 8)
```

[6]:
```
storedata.describe()
```

[6]:
```
             Store  Weekly_Sales  Holiday_Flag  Temperature   Fuel_Price  \
count  6435.000000  6.435000e+03   6435.000000  6435.000000  6435.000000
mean     23.000000  1.046965e+06      0.069930    60.663782     3.358607
std      12.988182  5.643666e+05      0.255049    18.444933     0.459020
min       1.000000  2.099862e+05      0.000000    -2.060000     2.472000
25%      12.000000  5.533501e+05      0.000000    47.460000     2.933000
50%      23.000000  9.607460e+05      0.000000    62.670000     3.445000
75%      34.000000  1.420159e+06      0.000000    74.940000     3.735000
max      45.000000  3.818686e+06      1.000000   100.140000     4.468000

              CPI  Unemployment
```

```
count  6435.000000   6435.000000
mean    171.578394      7.999151
std      39.356712      1.875885
min     126.064000      3.879000
25%     131.735000      6.891000
50%     182.616521      7.874000
75%     212.743293      8.622000
max     227.232807     14.313000
```

[7]:
```
storedata.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6435 entries, 0 to 6434
Data columns (total 8 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   Store         6435 non-null   int64
 1   Date          6435 non-null   object
 2   Weekly_Sales  6435 non-null   float64
 3   Holiday_Flag  6435 non-null   int64
 4   Temperature   6435 non-null   float64
 5   Fuel_Price    6435 non-null   float64
 6   CPI           6435 non-null   float64
 7   Unemployment  6435 non-null   float64
dtypes: float64(5), int64(2), object(1)
memory usage: 402.3+ KB
```

[8]:
```
storedata.corr()
```

```
/tmp/ipykernel_235/1242414401.py:1: FutureWarning: The default value of
numeric_only in DataFrame.corr is deprecated. In a future version, it will
default to False. Select only valid columns or specify the value of numeric_only
to silence this warning.
  storedata.corr()
```

[8]:
```
                     Store  Weekly_Sales  Holiday_Flag  Temperature  \
Store         1.000000e+00     -0.335332 -4.386841e-16    -0.022659
Weekly_Sales -3.353320e-01      1.000000  3.689097e-02    -0.063810
Holiday_Flag -4.386841e-16      0.036891  1.000000e+00    -0.155091
Temperature  -2.265908e-02     -0.063810 -1.550913e-01     1.000000
Fuel_Price    6.002295e-02      0.009464 -7.834652e-02     0.144982
CPI          -2.094919e-01     -0.072634 -2.162091e-03     0.176888
Unemployment  2.235313e-01     -0.106176  1.096028e-02     0.101158

              Fuel_Price       CPI  Unemployment
Store           0.060023 -0.209492      0.223531
Weekly_Sales    0.009464 -0.072634     -0.106176
```

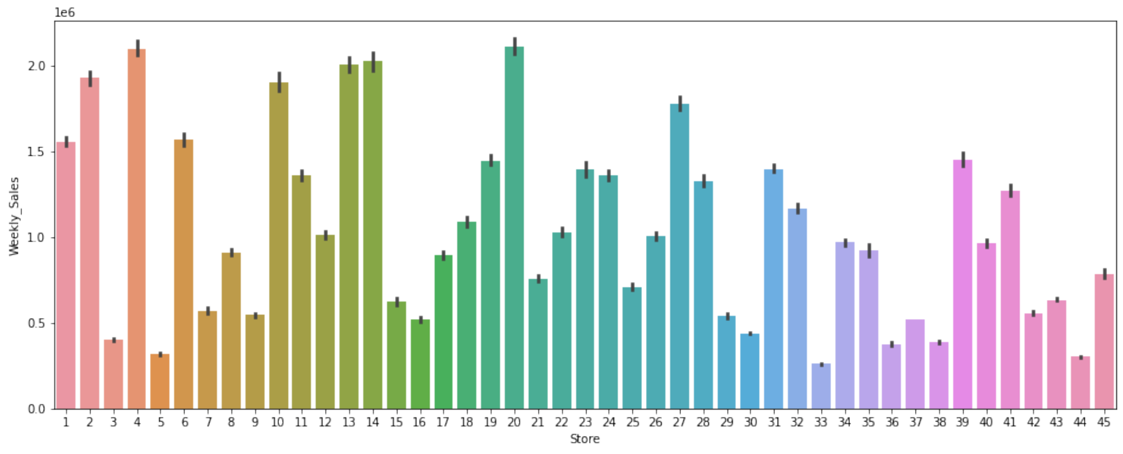
```
Holiday_Flag   -0.078347 -0.002162      0.010960
Temperature     0.144982  0.176888      0.101158
Fuel_Price      1.000000 -0.170642     -0.034684
CPI            -0.170642  1.000000     -0.302020
Unemployment   -0.034684 -0.302020      1.000000
```

[9]:
```
#Which store has maximum sales
max_sales = storedata.groupby('Store')['Weekly_Sales'].sum()
max_sales.idxmax()
```

[9]:
```
20
```

[10]:
```
#Plotting Which store has maximum sales with Bar Chart
plt.figure(figsize=(16,6))
sns.barplot(x=storedata.Store,y=storedata.Weekly_Sales)
```

[10]:
```
<AxesSubplot: xlabel='Store', ylabel='Weekly_Sales'>
```



[11]:
```
#Maximum Standard Deviation
max_std = storedata.groupby('Store')['Weekly_Sales'].std()
max_std.idxmax()
```

[11]:
```
14
```

[12]:
```
#Maximum Coefficient of Variation
max_cov = ((storedata.groupby('Store')['Weekly_Sales'].std()/(storedata.
  ↪groupby('Store')['Weekly_Sales'].mean()))*100)
max_cov.idxmax()
```

[12]:
```
35
```

[13]:
```
walmart_data_std = storedata.groupby('Store').agg({'Weekly_Sales':
 ↪['mean','std']})
walmart_data_std.head()
```

[13]:
```
      Weekly_Sales
              mean            std
Store
1     1.555264e+06  155980.767761
2     1.925751e+06  237683.694682
3     4.027044e+05   46319.631557
4     2.094713e+06  266201.442297
5     3.180118e+05   37737.965745
```

[ ]:
```

```

[14]:
```
#Grouping Data By Year & Month
growth = storedata.copy()
growth['Date'] = pd.to_datetime(growth.Date,format = '%d-%m-%Y')
growth['Year'] = growth['Date'].dt.year
growth['Month'] = growth['Date'].dt.month
growth
```

[14]:
```
      Store       Date  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
0         1 2010-02-05    1643690.90             0        42.31       2.572
1         1 2010-02-12    1641957.44             1        38.51       2.548
2         1 2010-02-19    1611968.17             0        39.93       2.514
3         1 2010-02-26    1409727.59             0        46.63       2.561
4         1 2010-03-05    1554806.68             0        46.50       2.625
…       …        …           …           …          …         …
6430     45 2012-09-28     713173.95             0        64.88       3.997
6431     45 2012-10-05     733455.07             0        64.89       3.985
6432     45 2012-10-12     734464.36             0        54.47       4.000
6433     45 2012-10-19     718125.53             0        56.47       3.969
6434     45 2012-10-26     760281.43             0        58.85       3.882

             CPI  Unemployment  Year  Month
0     211.096358         8.106  2010      2
1     211.242170         8.106  2010      2
2     211.289143         8.106  2010      2
3     211.319643         8.106  2010      2
4     211.350143         8.106  2010      3
…          …           …    …     …
6430  192.013558         8.684  2012      9
6431  192.170412         8.667  2012     10
6432  192.327265         8.667  2012     10
6433  192.330854         8.667  2012     10
6434  192.308899         8.667  2012     10
```

```
[6435 rows x 10 columns]
```

```
[15]: #Group data with year = 2012
      growth_rate = growth.groupby('Year')
      growth_rate_2012 = growth_rate.get_group(2012)
      growth_rate_2012.head()
```

```
[15]:      Store        Date  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
      100      1 2012-01-06    1550369.92             0        49.01       3.157
      101      1 2012-01-13    1459601.17             0        48.53       3.261
      102      1 2012-01-20    1394393.84             0        54.11       3.268
      103      1 2012-01-27    1319325.59             0        54.26       3.290
      104      1 2012-02-03    1636339.65             0        56.55       3.360

                  CPI  Unemployment  Year  Month
      100  219.714258         7.348  2012      1
      101  219.892526         7.348  2012      1
      102  219.985689         7.348  2012      1
      103  220.078852         7.348  2012      1
      104  220.172015         7.348  2012      2
```

```
[16]: growth_rate_2012 = storedata[(pd.to_datetime(storedata['Date']) >= pd.
        ↪to_datetime('07-01-2012')) & (pd.to_datetime(storedata['Date']) <= pd.
        ↪to_datetime('09-30-2012'))]
      growth_rate_2012 = growth_rate_2012.groupby(['Store'])['Weekly_Sales'].sum()
      print("Store Number {} Has Good Quartely Growth In Q3'2012 {}".
        ↪format(growth_rate.idxmax(),growth_rate.max()))
```

```
Store Number       Store  Date  Weekly_Sales  Holiday_Flag  Temperature
Fuel_Price   CPI  \
Year
2010   6292    47          1905            1         4599         2049  1184
2011   6340    99           527           53         4657         2068  1243
2012   6392   142          2830          105         4707         1427  1286

      Unemployment  Month
Year
2010          1607     43
2011          1621     95
2012          1673    139   Has Good Quartely Growth In Q3'2012       Store
Date  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
Year
2010     45 2010-12-31    3818686.45             1       100.14       3.336
2011     45 2011-12-30    3676388.98             1        99.66       4.211
2012     45 2012-10-26    2565259.92             1       100.07       4.468
```

```
             CPI  Unemployment  Month
Year
2010  215.555730        14.313     12
2011  223.249677        14.021     12
2012  227.232807        12.187     10
```

```
/tmp/ipykernel_235/986712457.py:1: UserWarning: Parsing dates in DD/MM/YYYY
format when dayfirst=False (the default) was specified. This may lead to
inconsistently parsed dates! Specify a format to ensure consistent parsing.
  growth_rate_2012 = storedata[(pd.to_datetime(storedata['Date']) >=
pd.to_datetime('07-01-2012')) & (pd.to_datetime(storedata['Date']) <=
pd.to_datetime('09-30-2012'))]
/tmp/ipykernel_235/986712457.py:1: UserWarning: Parsing dates in DD/MM/YYYY
format when dayfirst=False (the default) was specified. This may lead to
inconsistently parsed dates! Specify a format to ensure consistent parsing.
  growth_rate_2012 = storedata[(pd.to_datetime(storedata['Date']) >=
pd.to_datetime('07-01-2012')) & (pd.to_datetime(storedata['Date']) <=
pd.to_datetime('09-30-2012'))]
```

[17]:
```
#Stores Holiday Sales
stores_holiday_sales = storedata[storedata['Holiday_Flag'] == 1]
```

[18]:
```
#Stores Weekday Sales
stores_nonholiday_sales = storedata[storedata['Holiday_Flag'] == 0]
```

[ ]:
```
#Store Sales In Superbowl Day
#Super Bowl: 12 February 2010, 11 February 2011, 10 February 2012 & 08 February␣
 ↪2013
stores_holiday_sales_superBowl = stores_holiday_sales[(pd.
 ↪to_datetime(stores_holiday_sales['Date']) == pd.
 ↪to_datetime('12-02-2010'))|(pd.to_datetime(stores_holiday_sales['Date']) ==␣
 ↪pd.to_datetime('11-02-2011'))|(pd.to_datetime(stores_holiday_sales['Date'])␣
 ↪== pd.to_datetime('10-02-2012'))|(pd.
 ↪to_datetime(stores_holiday_sales['Date']) == pd.to_datetime('08-02-2023'))]
```

[ ]:
```
#Stores Sales In Labour Day
#Labour Day: 10 September 2010, 09 September 2011, 07 September 2012 & 06␣
 ↪September 2013
stores_holiday_sales_labourDay = stores_holiday_sales[(pd.
 ↪to_datetime(stores_holiday_sales['Date']) == pd.
 ↪to_datetime('10-09-2010'))|(pd.to_datetime(stores_holiday_sales['Date']) ==␣
 ↪pd.to_datetime('09-09-2011'))|(pd.to_datetime(stores_holiday_sales['Date'])␣
 ↪== pd.to_datetime('07-09-2012'))|(pd.
 ↪to_datetime(stores_holiday_sales['Date']) == pd.to_datetime('06-09-2023'))]
```

[ ]:
```
#Stores Sales in Thanks Giving
#Thanksgiving: 26 November 2010, 25 November 2011, 23 November 2011 & 29␣
 ↪November 2013
```

```
stores_holiday_sales_thanksgiving = stores_holiday_sales[(pd.
 ↪to_datetime(stores_holiday_sales['Date']) == pd.
 ↪to_datetime('26-11-2010'))|(pd.to_datetime(stores_holiday_sales['Date']) ==␣
 ↪pd.to_datetime('25-11-2011'))|(pd.to_datetime(stores_holiday_sales['Date'])␣
 ↪== pd.to_datetime('23-11-2012'))|(pd.
 ↪to_datetime(stores_holiday_sales['Date']) == pd.to_datetime('29-11-2023'))]
```

[ ]:
```
#Stores Sales in Christmas
#Christmas: 31 December 2010, 30 December 2011, 28 December 2012 & 27 December␣
 ↪2013
stores_holiday_sales_Christmas = stores_holiday_sales[(pd.
 ↪to_datetime(stores_holiday_sales['Date']) == pd.
 ↪to_datetime('31-12-2010'))|(pd.to_datetime(stores_holiday_sales['Date']) ==␣
 ↪pd.to_datetime('30-12-2011'))|(pd.to_datetime(stores_holiday_sales['Date'])␣
 ↪== pd.to_datetime('28-12-2012'))|(pd.
 ↪to_datetime(stores_holiday_sales['Date']) == pd.to_datetime('27-12-2023'))]
```

[23]:
```
stores_nonholiday_sales_mean = stores_nonholiday_sales.groupby(['Date']).
 ↪agg({'Weekly_Sales':'mean'}).reset_index()
```

[24]:
```
stores_holiday_sales_sum = stores_holiday_sales.groupby(['Date']).
 ↪agg({'Weekly_Sales':'sum'}).reset_index()
```

[25]:
```
for row in stores_holiday_sales_sum.itertuples():
    for row1 in stores_nonholiday_sales_mean.itertuples():
        if row.Weekly_Sales > row1.Weekly_Sales:
            print("On this Date {} Holiday Sales is greater than Non Holiday␣
 ↪Sales and the Sales :- {}".format(row.Date,row.Weekly_Sales))
            break;
```

```
On this Date 07-09-2012 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 48330059.31
On this Date 09-09-2011 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 46763227.53
On this Date 10-02-2012 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 50009407.92
On this Date 10-09-2010 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 45634397.839999996
On this Date 11-02-2011 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 47336192.79
On this Date 12-02-2010 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 48336677.63
On this Date 25-11-2011 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 66593605.26
On this Date 26-11-2010 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 65821003.24
On this Date 30-12-2011 Holiday Sales is greater than Non Holiday Sales and the
```

```
Sales :- 46042461.04
On this Date 31-12-2010 Holiday Sales is greater than Non Holiday Sales and the
Sales :- 40432519.0
```

[26]:
```
print("Super Bowl Day Sale",stores_holiday_sales_superBowl['Weekly_Sales'].
  ↪sum())
print("Labour Day Sale",stores_holiday_sales_labourDay['Weekly_Sales'].sum())
print("Thanksgiving Day Sale",stores_holiday_sales_thanksgiving['Weekly_Sales'].
  ↪sum())
print("Christmas Day Sale",stores_holiday_sales_Christmas['Weekly_Sales'].sum())
```

```
Super Bowl Day Sale 145682278.34
Labour Day Sale 140727684.68
Thanksgiving Day Sale 132414608.5
Christmas Day Sale 86474980.03999999
```

[27]:
```
x_features_object = storedata[storedata['Store'] == 1][['Store','Date']]
date_obj = storedata[storedata['Store'] == 1][['Date']]
date_obj.index +=1
x_features_object.Date = date_obj.index
x_features_object.head()
```

[27]:
```
   Store  Date
0      1     1
1      1     2
2      1     3
3      1     4
4      1     5
```

[28]:
```
y_target = storedata[storedata['Store'] == 1]['Weekly_Sales']
y_target.head()
```

[28]:
```
0    1643690.90
1    1641957.44
2    1611968.17
3    1409727.59
4    1554806.68
Name: Weekly_Sales, dtype: float64
```

[29]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x_features_object,y_target,random_state=1)
```

[30]:
```
from sklearn.linear_model import LinearRegression
linreg = LinearRegression()
linreg.fit(x_train,y_train)
feature_dataset =␣
  ↪storedata[storedata['Store']==1][['Store','CPI','Unemployment','Fuel_Price']]
```

```
feature_dataset.head()
```

```
[30]:    Store         CPI  Unemployment  Fuel_Price
      0      1  211.096358         8.106       2.572
      1      1  211.242170         8.106       2.548
      2      1  211.289143         8.106       2.514
      3      1  211.319643         8.106       2.561
      4      1  211.350143         8.106       2.625
```

```
[31]: response_set_cpi = storedata[storedata['Store']==1]['CPI'].astype('int64')
      response_set_unemployment = storedata[storedata['Store']==1]['Unemployment'].
       ↪astype('int64')
```

```
[32]: from sklearn.model_selection import  train_test_split
      x_train_cpi,x_test_cpi,y_train_cpi,y_test_cpi =␣
       ↪train_test_split(feature_dataset,response_set_cpi,random_state=1)
      x_train_unemp,x_test_unemp,y_train_unemp,y_test_unemp =␣
       ↪train_test_split(feature_dataset,response_set_unemployment,random_state=1)
```

```
[33]: from sklearn.linear_model import LogisticRegression
      logreg = LogisticRegression(max_iter=10000)
      logreg.fit(x_train_cpi,y_train_cpi)
      y_pred = logreg.predict(x_test_cpi)
      logreg.fit(x_train_unemp,y_train_unemp)
```

```
[33]: LogisticRegression(max_iter=10000)
```

```
[34]: y_pred_unemp = logreg.predict(x_test_unemp)
```

```
[35]: from sklearn import metrics
      print(metrics.accuracy_score(y_test_cpi,y_pred))
      print(metrics.accuracy_score(y_test_unemp,y_pred_unemp))
```

```
0.7222222222222222
0.9444444444444444
```

```
[36]: print('CPI actual :',y_test_cpi.values[0:30])
      print('CPI predicted :',y_pred[0:30])
      print('Actual Unemployment :',y_test_unemp.values[0:30])
      print('Predicted Unemployment :',y_pred_unemp[0:30])
```

```
CPI actual : [215 221 211 211 221 211 210 211 215 217 221 212 216 218 211 210
211 217
 215 211 212 217 221 219 214 211 211 219 215 219]
CPI predicted : [215 221 211 211 221 211 211 211 215 215 221 211 215 218 211 211
211 217
 215 211 211 217 221 220 215 211 211 221 215 220]
```

```
Actual Unemployment : [7 7 7 8 7 7 7 7 7 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
7]
Predicted Unemployment : [7 7 7 7 6 7 7 7 7 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
7 7 7]
```

[43]:
```
storedata['Day'] = pd.to_datetime(storedata['Date'])
storedata.head()
```

```
/tmp/ipykernel_235/398302857.py:1: UserWarning: Parsing dates in DD/MM/YYYY
format when dayfirst=False (the default) was specified. This may lead to
inconsistently parsed dates! Specify a format to ensure consistent parsing.
  storedata['Day'] = pd.to_datetime(storedata['Date'])
```

[43]:
```
   Store        Date  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
0      1  05-02-2010    1643690.90             0        42.31       2.572
1      1  12-02-2010    1641957.44             1        38.51       2.548
2      1  19-02-2010    1611968.17             0        39.93       2.514
3      1  26-02-2010    1409727.59             0        46.63       2.561
4      1  05-03-2010    1554806.68             0        46.50       2.625

          CPI  Unemployment        Day
0  211.096358         8.106 2010-05-02
1  211.242170         8.106 2010-12-02
2  211.289143         8.106 2010-02-19
3  211.319643         8.106 2010-02-26
4  211.350143         8.106 2010-05-03
```

[ ]: