Retail-Analysis-with-Walmart-Data

July 1, 2023

[2]:

```
# Import necessary libraries
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
```

[3]:

```
df = pd.read_csv('Walmart_Store_sales.csv')
df
```

[3]:

```
      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
0     211.096358         8.106
1     211.242170         8.106
2     211.289143         8.106
3     211.319643         8.106
4     211.350143         8.106
…          …             …
6430  192.013558         8.684
6431  192.170412         8.667
6432  192.327265         8.667
6433  192.330854         8.667
6434  192.308899         8.667
```

```
[6435 rows x 8 columns]
```

[4]:

```
# Convert date to datetime format and show dataset information
df['Date'] =  pd.to_datetime(df['Date'])
df.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   datetime64[ns]
 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: datetime64[ns](1), float64(5), int64(2)
memory usage: 402.3 KB
```

[5]:

```
df.head(2)
```

[5]:

```
   Store       Date  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
0      1 2010-05-02    1643690.90             0        42.31       2.572
1      1 2010-12-02    1641957.44             1        38.51       2.548

          CPI  Unemployment
0  211.096358         8.106
1  211.242170         8.106
```

[6]:

```
# checking for missing values
df.isnull().sum()
```

[6]:

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

[7]:

```
# Splitting Date and create new columns (Day, Month, and Year)
df["Day"]= pd.DatetimeIndex(df['Date']).day
```

```
df['Month'] = pd.DatetimeIndex(df['Date']).month
df['Year'] = pd.DatetimeIndex(df['Date']).year
df
```

[7]:

```
      Store       Date  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
0         1 2010-05-02    1643690.90             0        42.31       2.572
1         1 2010-12-02    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 2010-05-03    1554806.68             0        46.50       2.625
…     …        …           …           …          …         …
6430     45 2012-09-28     713173.95             0        64.88       3.997
6431     45 2012-05-10     733455.07             0        64.89       3.985
6432     45 2012-12-10     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  Day  Month  Year
0     211.096358         8.106    2      5  2010
1     211.242170         8.106    2     12  2010
2     211.289143         8.106   19      2  2010
3     211.319643         8.106   26      2  2010
4     211.350143         8.106    3      5  2010
…          …           …  …    …   …
6430  192.013558         8.684   28      9  2012
6431  192.170412         8.667   10      5  2012
6432  192.327265         8.667   10     12  2012
6433  192.330854         8.667   19     10  2012
6434  192.308899         8.667   26     10  2012

[6435 rows x 11 columns]
```

[8]:

```
store_sales = df.groupby("Store")["Weekly_Sales"].sum()
store_with_max_sales = store_sales.idxmax()
max_sales = store_sales.max()
print(" Store with max sales:",max_sales )
```

```
 Store with max sales: 301397792.46000004
```

[9]:

```
store_with_min_sales = store_sales.idxmin()
min_sales = store_sales.min()
print(" Store with min sales:",min_sales )
```

```
 Store with min sales: 37160221.960000016
```

[10]:

```
plt.figure(figsize=(15,7))
```

```
# Sum Weekly_Sales for each store, then sortded by total sales
total_sales_for_each_store = df.groupby('Store')['Weekly_Sales'].sum().
 ↪sort_values()
total_sales_for_each_store_array = np.array(total_sales_for_each_store) #␣
 ↪convert to array
```

```
<Figure size 1080x504 with 0 Axes>
```

Which store has minimum and maximum sales?

```
[11]: # Assigning a specific color for the stores have the lowest and highest sales
clrs = ['lightsteelblue' if ((x < max(total_sales_for_each_store_array)) and (x␣
 ↪> min(total_sales_for_each_store_array))) else 'midnightblue' for x in␣
 ↪total_sales_for_each_store_array]

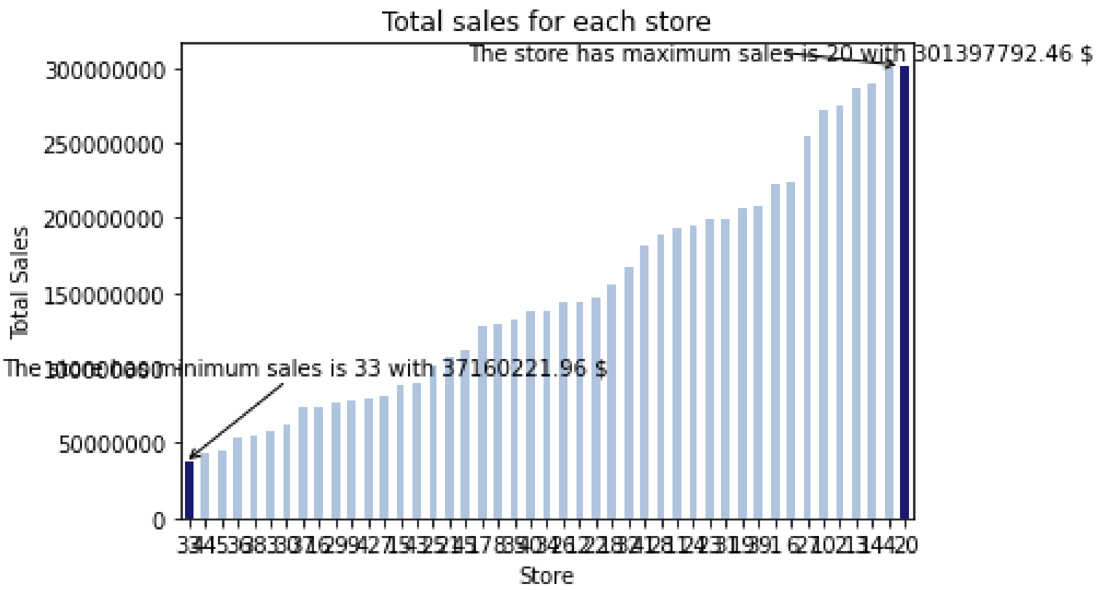

ax = total_sales_for_each_store.plot(kind='bar',color=clrs);

# store have minimum sales
p = ax.patches[0]
print(type(p.get_height()))
ax.annotate("The store has minimum sales is 33 with {0:.2f} $".format((p.
 ↪get_height())), xy=(p.get_x(), p.get_height()), xycoords='data',
            xytext=(0.17, 0.32), textcoords='axes fraction',
            arrowprops=dict(arrowstyle="->", connectionstyle="arc3"),
            horizontalalignment='center', verticalalignment='center')


# store have maximum sales
p = ax.patches[44]
ax.annotate("The store has maximum sales is 20 with {0:.2f} $".format((p.
 ↪get_height())), xy=(p.get_x(), p.get_height()), xycoords='data',
            xytext=(0.82, 0.98), textcoords='axes fraction',
            arrowprops=dict(arrowstyle="->", connectionstyle="arc3"),
            horizontalalignment='center', verticalalignment='center')


# plot properties
plt.xticks(rotation=0)
plt.ticklabel_format(useOffset=False, style='plain', axis='y')
plt.title('Total sales for each store')
plt.xlabel('Store')
plt.ylabel('Total Sales');
```

```
<class 'numpy.float64'>
```



Which store has maximum standard deviation i.e., the sales vary a lot. Also, find out the coefficient of mean to standard deviation?

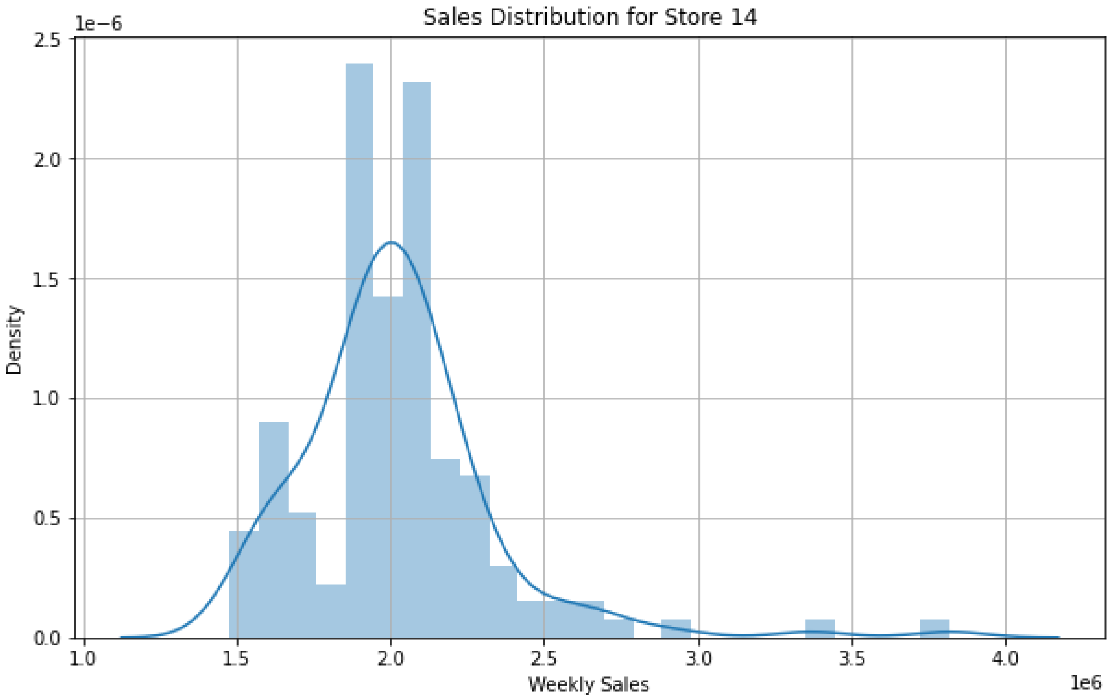
[12]:
```
store_std = df.groupby("Store")["Weekly_Sales"].std()
store_with_max_std = store_std.idxmax()
max_std = store_std.max()
print("Store with maximum standard deviation:", store_with_max_std)
```

```
Store with maximum standard deviation: 14
```

[13]:
```
store_data = df[df["Store"] == store_with_max_std]
```

[14]:
```
plt.figure(figsize=(10, 6))
sns.distplot(store_data["Weekly_Sales"])
plt.title("Sales Distribution for Store {}".format(store_with_max_std))
plt.xlabel("Weekly Sales")
plt.ylabel("Density")
plt.grid(True)
plt.show()
```

```
/usr/local/lib/python3.7/site-packages/seaborn/distributions.py:2619:
FutureWarning: `distplot` is a deprecated function and will be removed in a
future version. Please adapt your code to use either `displot` (a figure-level
function with similar flexibility) or `histplot` (an axes-level function for
histograms).
  warnings.warn(msg, FutureWarning)
```



```
[15]: # Coefficient of mean to standard deviation
      coef_mean_std = pd.DataFrame(df.groupby('Store')['Weekly_Sales'].std() / df.
       ↪groupby('Store')['Weekly_Sales'].mean())
      coef_mean_std = coef_mean_std.rename(columns={'Weekly_Sales':'Coefficient of␣
       ↪mean to standard deviation'})
      coef_mean_std
```

```
[15]:        Coefficient of mean to standard deviation
      Store
      1                                       0.100292
      2                                       0.123424
      3                                       0.115021
      4                                       0.127083
      5                                       0.118668
      6                                       0.135823
      7                                       0.197305
      8                                       0.116953
      9                                       0.126895
      10                                      0.159133
      11                                      0.122262
      12                                      0.137925
      13                                      0.132514
      14                                      0.157137
      15                                      0.193384
```

```
16                                       0.165181
17                                       0.125521
18                                       0.162845
19                                       0.132680
20                                       0.130903
21                                       0.170292
22                                       0.156783
23                                       0.179721
24                                       0.123637
25                                       0.159860
26                                       0.110111
27                                       0.135155
28                                       0.137330
29                                       0.183742
30                                       0.052008
31                                       0.090161
32                                       0.118310
33                                       0.092868
34                                       0.108225
35                                       0.229681
36                                       0.162579
37                                       0.042084
38                                       0.110875
39                                       0.149908
40                                       0.123430
41                                       0.148177
42                                       0.090335
43                                       0.064104
44                                       0.081793
45                                       0.165613
```

[16]:

```
# Group the data by store and calculate mean and standard deviation of sales
store_stats = df.groupby("Store")["Weekly_Sales"].agg(["mean", "std"])
```

[17]:

```
# Calculate the coefficient of mean to standard deviation (coefficient of␣
 ↪variation)
store_stats["coefficient_of_variation"] = store_stats["mean"] /␣
 ↪store_stats["std"]
```

[18]:

```
# Find the store with the maximum coefficient of variation
store_with_max_cv = store_stats["coefficient_of_variation"].idxmax()
max_cv = store_stats.loc[store_with_max_cv, "coefficient_of_variation"]
```

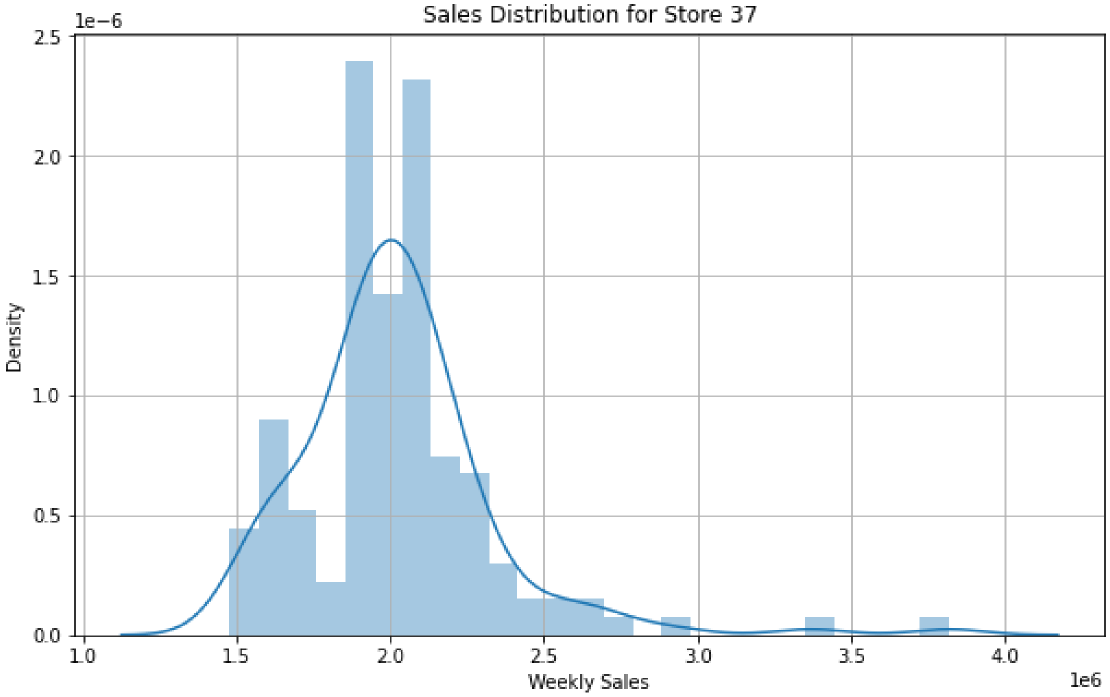
[19]:

```
print("Maximum coefficient of variation:", max_cv)
```

```
Maximum coefficient of variation: 23.761932646021123
```

[20]:
```
plt.figure(figsize=(10, 6))
sns.distplot(store_data["Weekly_Sales"])
plt.title("Sales Distribution for Store {}".format(store_with_max_cv))
plt.xlabel("Weekly Sales")
plt.ylabel("Density")
plt.grid(True)
plt.show()
```

```
/usr/local/lib/python3.7/site-packages/seaborn/distributions.py:2619:
FutureWarning: `distplot` is a deprecated function and will be removed in a
future version. Please adapt your code to use either `displot` (a figure-level
function with similar flexibility) or `histplot` (an axes-level function for
histograms).
  warnings.warn(msg, FutureWarning)
```



Which store/s has good quarterly growth rate in Q3'2012

[21]:
```
# Filter the sales data for Q3'2012
q3_2012_data = df[(df["Date"].dt.year == 2012) & (df["Date"].dt.quarter == 3)]
```

[22]:
```
# Group the data by store and calculate the quarterly growth rate
store_growth = q3_2012_data.groupby("Store")["Weekly_Sales"].apply(lambda x: (x.
↪iloc[-1] - x.iloc[0]) / x.iloc[0] * 100)
```

[23]:

```
# Find stores with positive quarterly growth rate
stores_with_growth = store_growth[store_growth > 0]
```

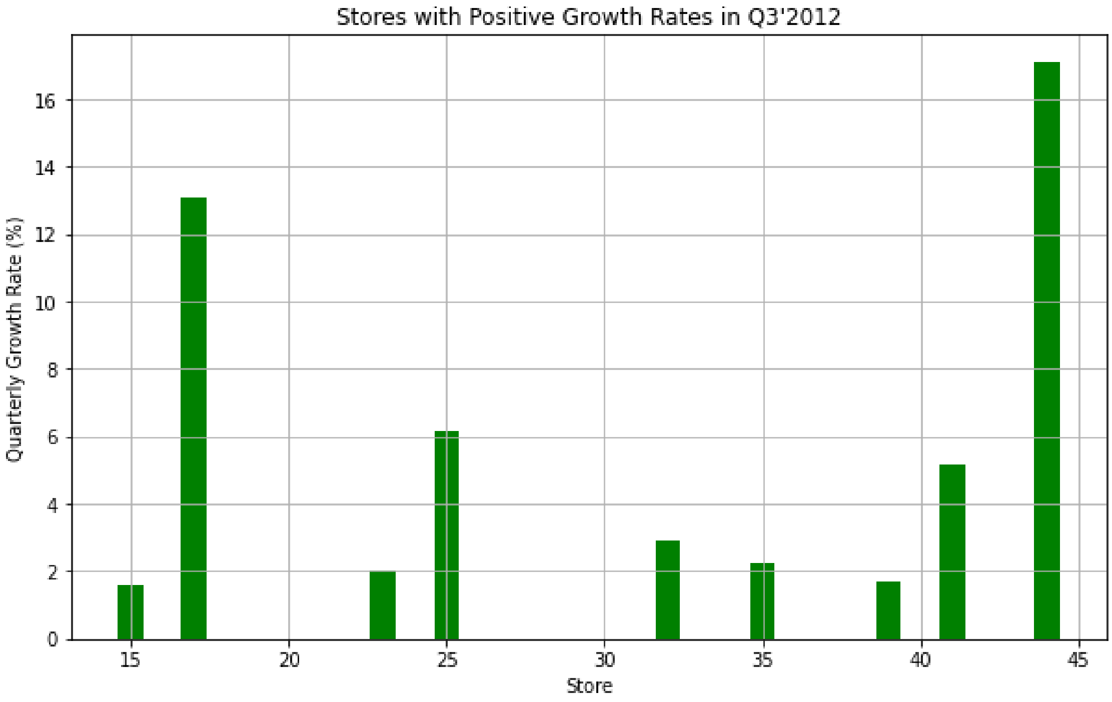
[24]:

```
print(stores_with_growth)
```

```
Store
15     1.610891
17    13.076958
23     2.035248
25     6.150163
32     2.896583
35     2.228729
39     1.689103
41     5.154565
44    17.093989
Name: Weekly_Sales, dtype: float64
```

[25]:

```
plt.figure(figsize=(10, 6))
plt.bar(stores_with_growth.index, stores_with_growth.values, color='green')
plt.title("Stores with Positive Growth Rates in Q3'2012")
plt.xlabel("Store")
plt.ylabel("Quarterly Growth Rate (%)")
plt.grid(True)
plt.show()
```



Find out holidays which have higher sales than the mean sales in non-holiday season for all stores together

[27]:

```
# Filter the data for non-holiday weeks and calculate the mean sales
non_holiday_mean = df[df["Holiday_Flag"] == 0]["Weekly_Sales"].mean()
```

[30]:

```
# Filter the data for holiday weeks and calculate the mean sales for each␣
 ↪holiday
holiday_means = df[df["Holiday_Flag"] == 1].groupby("Date")["Weekly_Sales"].
 ↪mean()
```

[31]:

```
# Find holidays with higher sales than the mean sales in non-holiday season
holidays_higher_than_mean = holiday_means[holiday_means > non_holiday_mean]
```

[32]:

```
print(holidays_higher_than_mean)
```

```
Date
2010-11-26    1.462689e+06
2010-12-02    1.074148e+06
2011-11-02    1.051915e+06
2011-11-25    1.479858e+06
2012-07-09    1.074001e+06
2012-10-02    1.111320e+06
Name: Weekly_Sales, dtype: float64
```

[33]:

```
# Filter the sales data for each holiday type
super_bowl_data = df[df["Holiday_Flag"] & (df["Date"].isin(["2010-02-12",␣
 ↪"2011-02-11", "2012-02-10"]))]
labour_day_data = df[df["Holiday_Flag"] & (df["Date"].isin(["2010-09-10",␣
 ↪"2011-09-09", "2012-09-07"]))]
thanksgiving_data = df[df["Holiday_Flag"] & (df["Date"].isin(["2010-11-26",␣
 ↪"2011-11-25", "2012-11-23"]))]
christmas_data = df[df["Holiday_Flag"] & (df["Date"].isin(["2010-12-31",␣
 ↪"2011-12-30", "2012-12-28"]))]
```

[34]:

```
# Calculate the mean sales for each holiday type
super_bowl_mean = super_bowl_data.groupby("Date")["Weekly_Sales"].mean()
labour_day_mean = labour_day_data.groupby("Date")["Weekly_Sales"].mean()
thanksgiving_mean = thanksgiving_data.groupby("Date")["Weekly_Sales"].mean()
christmas_mean = christmas_data.groupby("Date")["Weekly_Sales"].mean()
```

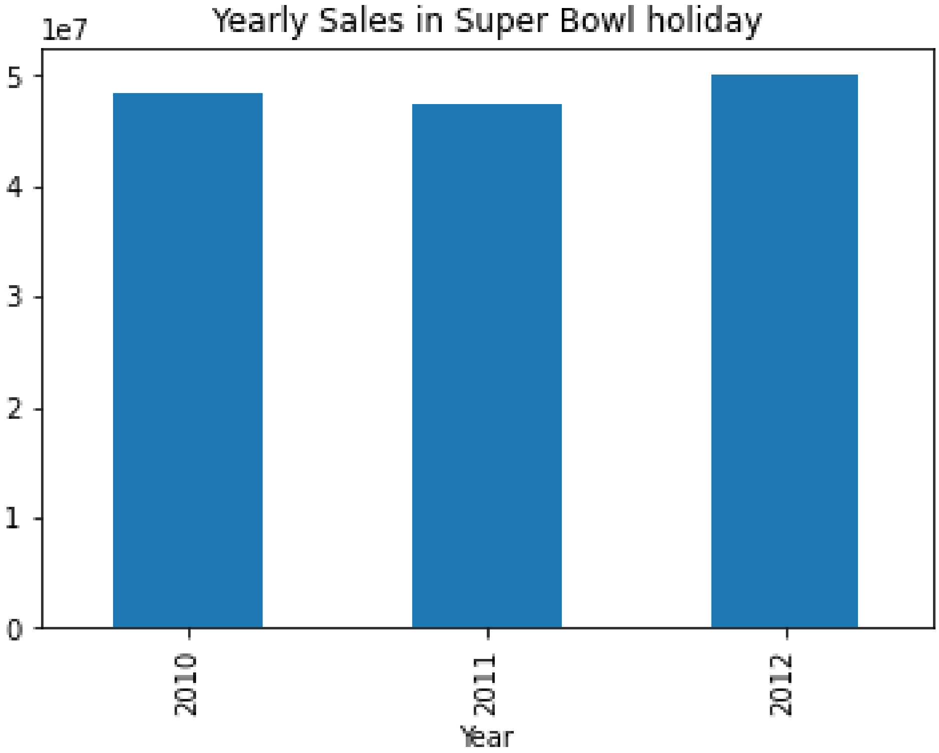
[42]:

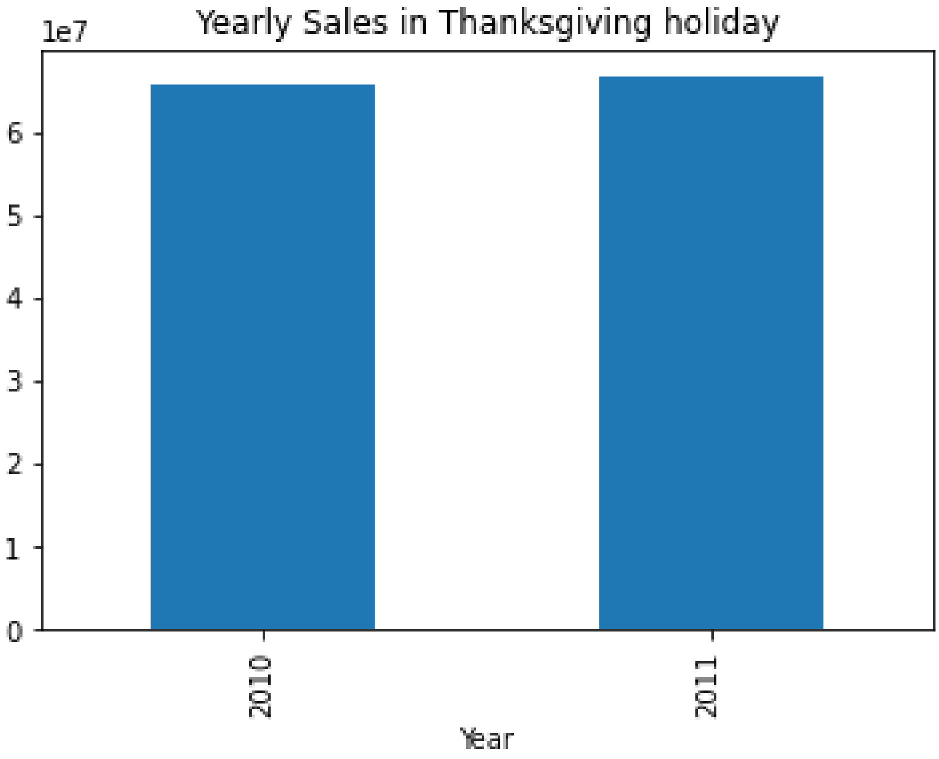
```
Super_Bowl_df = pd.DataFrame(df.loc[df.Date.isin(Super_Bowl)].
 ↪groupby('Year')['Weekly_Sales'].sum())
Thanksgiving_df = pd.DataFrame(df.loc[df.Date.isin(Thanksgiving)].
 ↪groupby('Year')['Weekly_Sales'].sum())
Labour_Day_df = pd.DataFrame(df.loc[df.Date.isin(Labour_Day)].
 ↪groupby('Year')['Weekly_Sales'].sum())
```

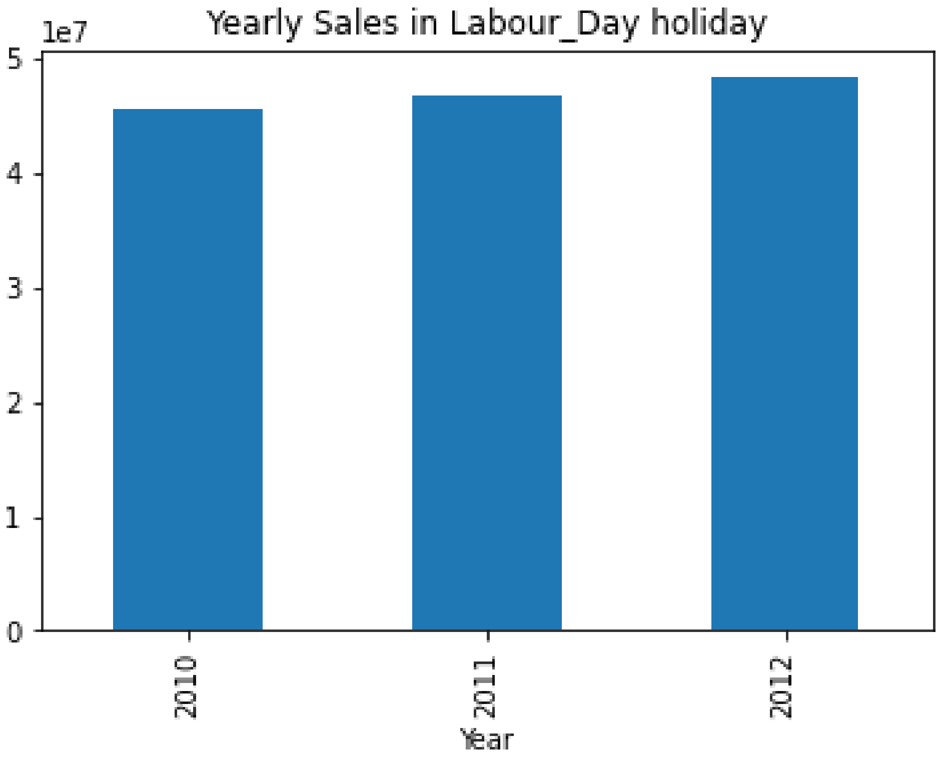
```
Christmas_df = pd.DataFrame(df.loc[df.Date.isin(Christmas)].
 ↪groupby('Year')['Weekly_Sales'].sum())

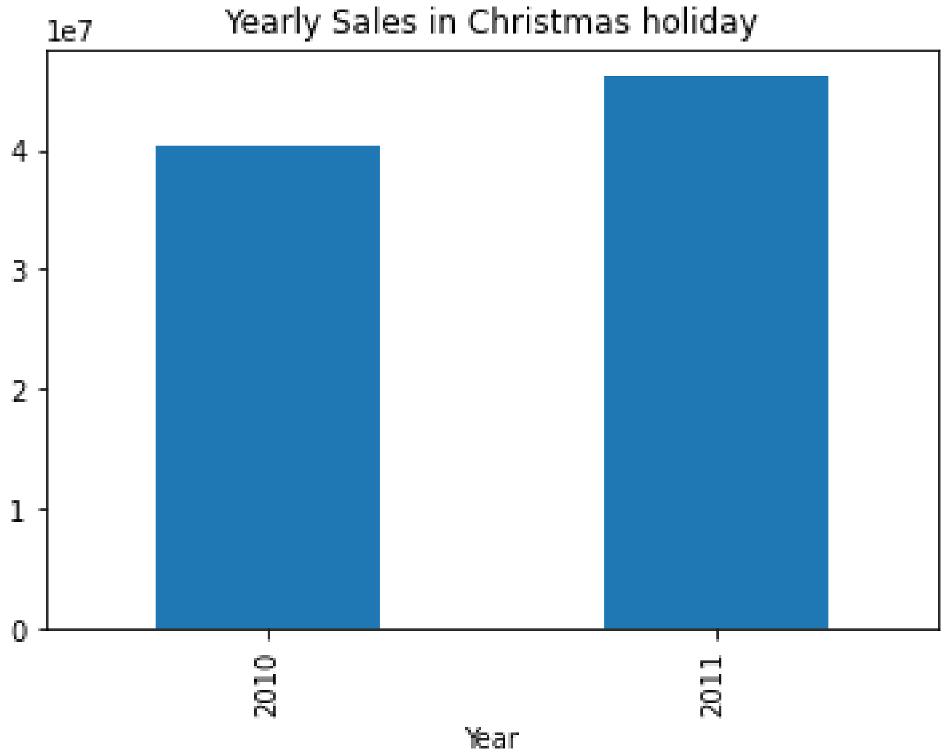

Super_Bowl_df.plot(kind='bar',legend=False,title='Yearly Sales in Super Bowl␣
 ↪holiday')
Thanksgiving_df.plot(kind='bar',legend=False,title='Yearly Sales in␣
 ↪Thanksgiving holiday')
Labour_Day_df.plot(kind='bar',legend=False,title='Yearly Sales in Labour_Day␣
 ↪holiday')
Christmas_df.plot(kind='bar',legend=False,title='Yearly Sales in Christmas␣
 ↪holiday')
```

[42]:
```
<AxesSubplot:title={'center':'Yearly Sales in Christmas holiday'},
xlabel='Year'>
```



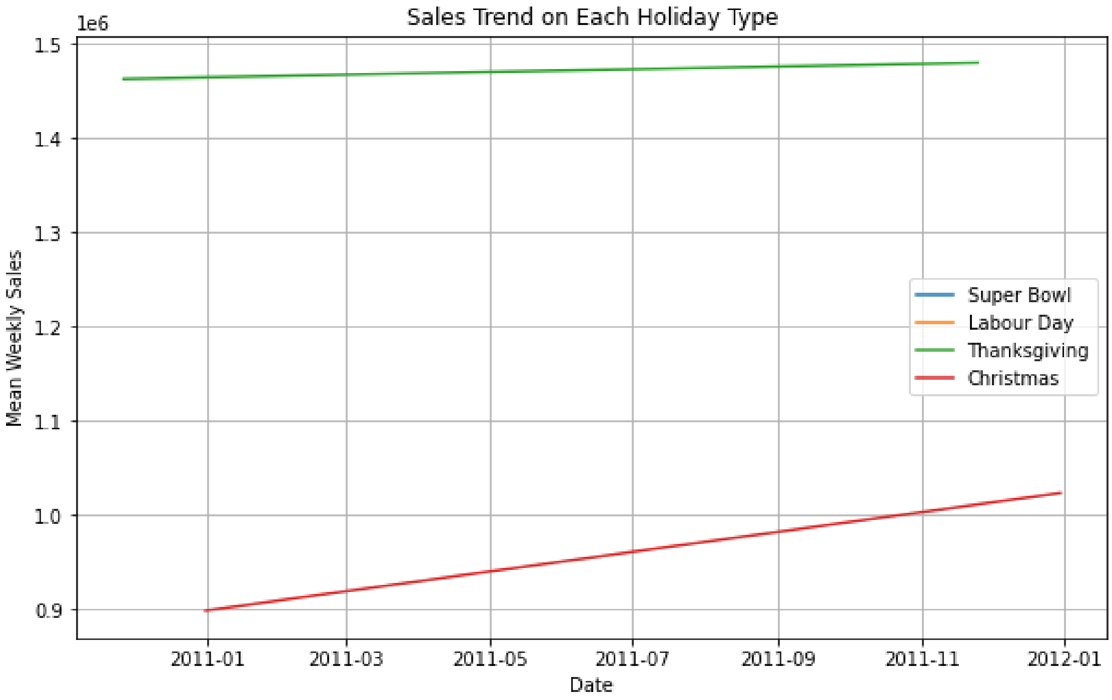

Yearly Sales in Thanksgiving holiday
1e7
0
1
2
3
4
5
6
2010
2011
Year


Yearly Sales in Labour_Day holiday
1e7
0
1
2
3
4
5
2010
2011
2012
Year



[35]:

```
# Plot the sales trend for each holiday type
plt.figure(figsize=(10, 6))
plt.plot(super_bowl_mean.index, super_bowl_mean.values, label="Super Bowl")
plt.plot(labour_day_mean.index, labour_day_mean.values, label="Labour Day")
plt.plot(thanksgiving_mean.index, thanksgiving_mean.values,␣
 ↪label="Thanksgiving")
plt.plot(christmas_mean.index, christmas_mean.values, label="Christmas")
plt.title("Sales Trend on Each Holiday Type")
plt.xlabel("Date")
plt.ylabel("Mean Weekly Sales")
plt.legend()
plt.grid(True)
plt.show()
```



[38]:

```
def plot_line(df,holiday_dates,holiday_label):
    fig, ax = plt.subplots(figsize = (15,5))
    ax.plot(df['Date'],df['Weekly_Sales'],label=holiday_label)

    for day in holiday_dates:
        day = datetime.strptime(day, '%d-%m-%Y')
        plt.axvline(x=day, linestyle='--', c='r')

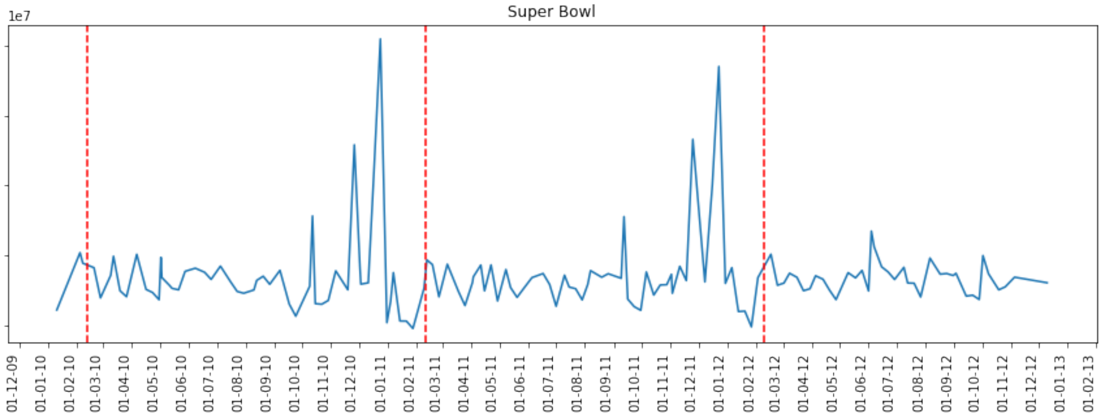

    plt.title(holiday_label)
    x_dates = df['Date'].dt.strftime('%Y-%m-%d').sort_values().unique()
    xfmt = dates.DateFormatter('%d-%m-%y')
    ax.xaxis.set_major_formatter(xfmt)
    ax.xaxis.set_major_locator(dates.DayLocator(1))
    plt.gcf().autofmt_xdate(rotation=90)
    plt.show()
```

[39]:

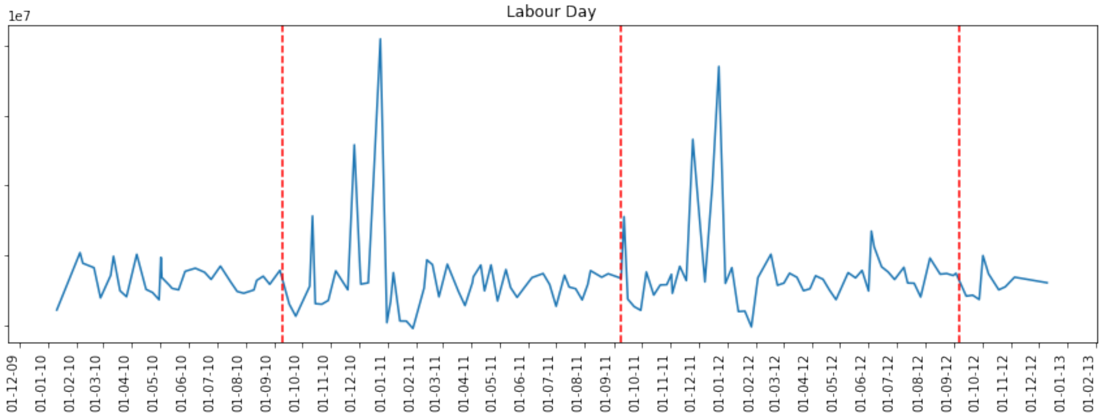
```
total_sales = df.groupby('Date')['Weekly_Sales'].sum().reset_index()
Super_Bowl =['12-2-2010', '11-2-2011', '10-2-2012']
Labour_Day =  ['10-9-2010', '9-9-2011', '7-9-2012']
Thanksgiving =  ['26-11-2010', '25-11-2011', '23-11-2012']
Christmas = ['31-12-2010', '30-12-2011', '28-12-2012']
```

[40]:

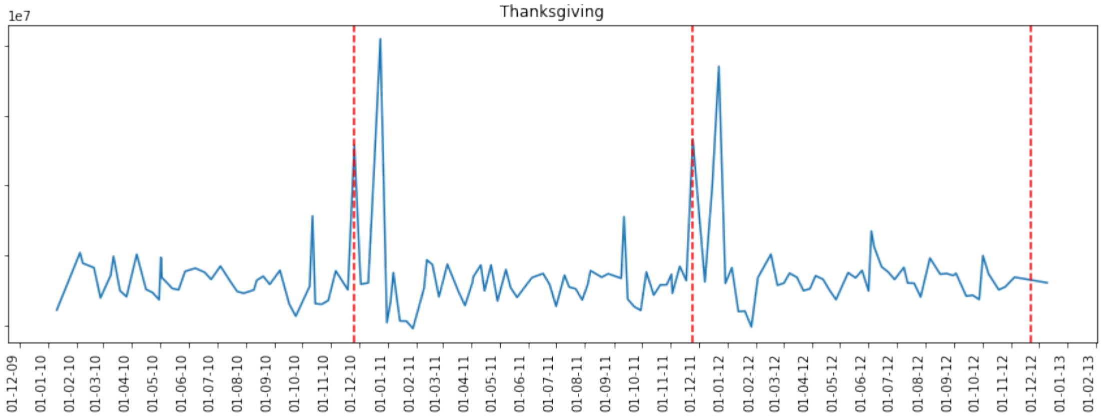
```
plot_line(total_sales,Super_Bowl,'Super Bowl')
plot_line(total_sales,Labour_Day,'Labour Day')
plot_line(total_sales,Thanksgiving,'Thanksgiving')
plot_line(total_sales,Christmas,'Christmas')
```



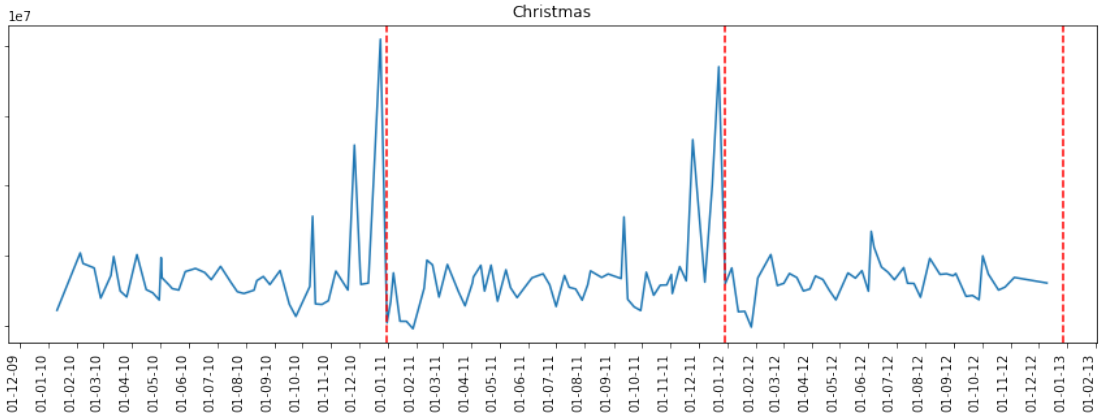
Super Bowl



Labour Day



Thanksgiving

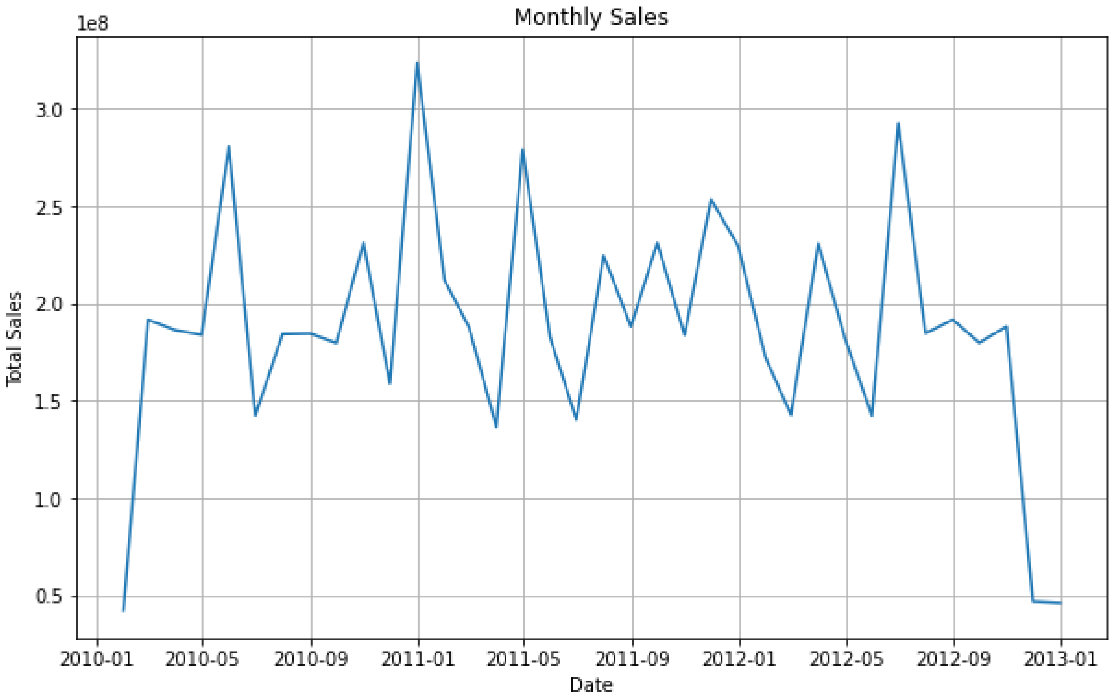


Q5: Provide a monthly and semester view of sales in units and give insights

[45]:
```
df["Date"] = pd.to_datetime(df["Date"])
df.set_index("Date", inplace=True)
# Resample the data on a monthly basis to calculate total sales for each month
monthly_sales = df.resample("M")["Weekly_Sales"].sum()
```

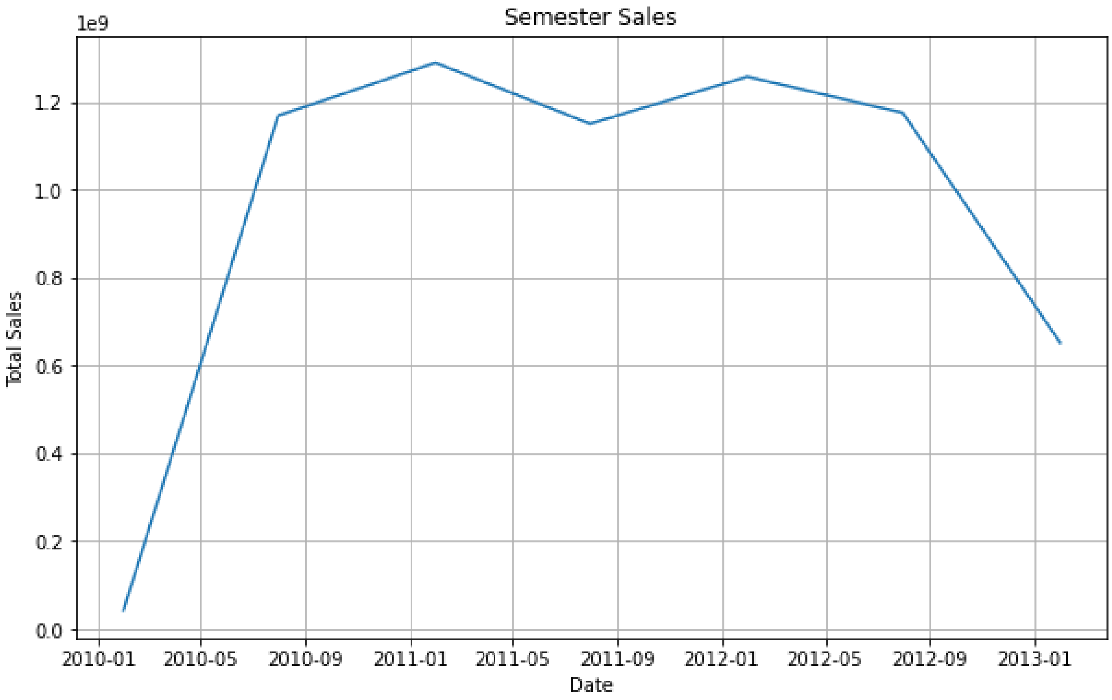
[46]:
```
# Resample the data on a semester basis to calculate total sales for each semester
semester_sales = df.resample("6M")["Weekly_Sales"].sum()
```

[47]:
```
# Plot the monthly sales data
plt.figure(figsize=(10, 6))
plt.plot(monthly_sales.index, monthly_sales.values)
plt.title("Monthly Sales")
plt.xlabel("Date")
plt.ylabel("Total Sales")
plt.grid(True)
plt.show()
```



[48]:

```
# Plot the semester sales data
plt.figure(figsize=(10, 6))
plt.plot(semester_sales.index, semester_sales.values)
plt.title("Semester Sales")
plt.xlabel("Date")
plt.ylabel("Total Sales")
plt.grid(True)
plt.show()
```



```
[49]: # Provide insights based on the sales trends
monthly_sales_mean = monthly_sales.mean()
semester_sales_mean = semester_sales.mean()
```

```
[50]: print("Average monthly sales: ", monthly_sales_mean)
print("Average semester sales: ", semester_sales_mean)
```

```
Average monthly sales:  187144971.86416662
Average semester sales:  962459855.3014281
```

Build prediction models to forecast demand (Modeling)

```
[51]: # find outliers
fig, axs = plt.subplots(4,figsize=(6,18))
X = df[['Temperature','Fuel_Price','CPI','Unemployment']]
for i,column in enumerate(X):
    sns.boxplot(df[column], ax=axs[i])
```

```
/usr/local/lib/python3.7/site-packages/seaborn/_decorators.py:43: FutureWarning:
Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without an
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/usr/local/lib/python3.7/site-packages/seaborn/_decorators.py:43: FutureWarning:
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```
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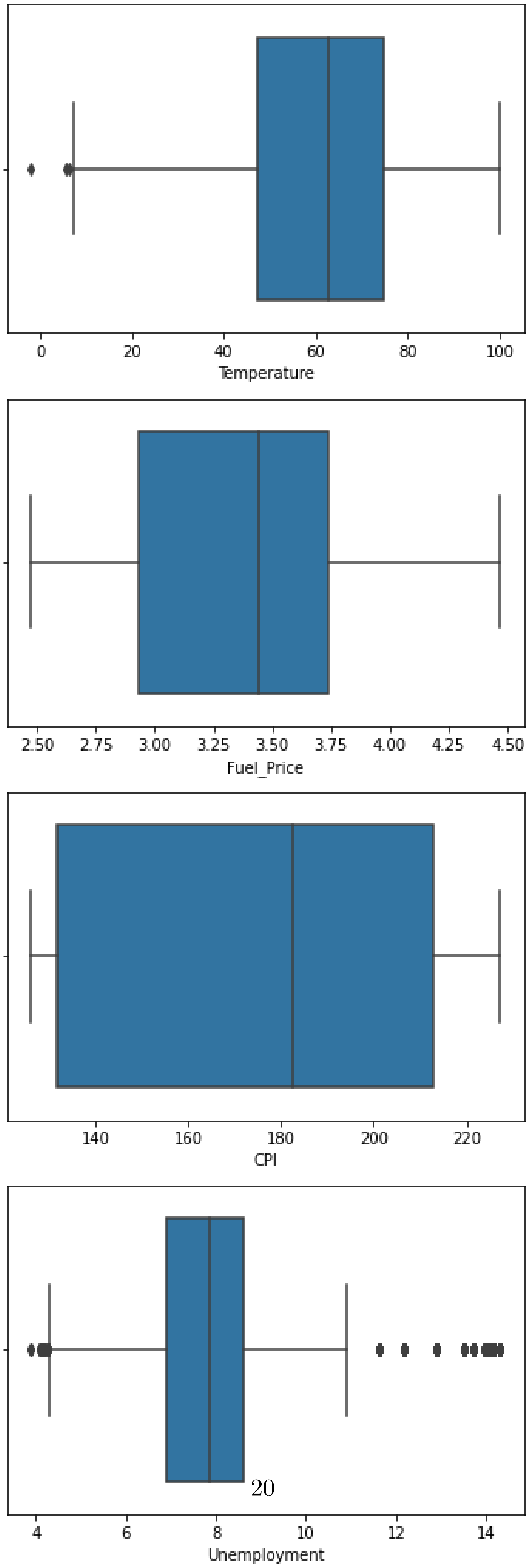
explicit keyword will result in an error or misinterpretation.
  FutureWarning
```


0
20
40
60
80
100
Temperature
2.50
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Fuel_Price
140
160
180
200
220
CPI
4
6
8
10
12
14
Unemployment

[54]:
```
# drop the outliers
df = df[(df['Unemployment']<10) & (df['Unemployment']>4.5) &␣
 ↪(df['Temperature']>10)]
df
```

[54]:
```
            Store  Weekly_Sales  Holiday_Flag  Temperature  Fuel_Price  \
Date
2010-05-02      1    1643690.90             0        42.31       2.572
2010-12-02      1    1641957.44             1        38.51       2.548
2010-02-19      1    1611968.17             0        39.93       2.514
2010-02-26      1    1409727.59             0        46.63       2.561
2010-05-03      1    1554806.68             0        46.50       2.625
…             …           …           …            …          …
2012-09-28     45     713173.95             0        64.88       3.997
2012-05-10     45     733455.07             0        64.89       3.985
2012-12-10     45     734464.36             0        54.47       4.000
2012-10-19     45     718125.53             0        56.47       3.969
2012-10-26     45     760281.43             0        58.85       3.882

                   CPI  Unemployment  Day  Month  Year
Date
2010-05-02  211.096358         8.106    2      5  2010
2010-12-02  211.242170         8.106    2     12  2010
2010-02-19  211.289143         8.106   19      2  2010
2010-02-26  211.319643         8.106   26      2  2010
2010-05-03  211.350143         8.106    3      5  2010
…                  …            …   …     …    …
2012-09-28  192.013558         8.684   28      9  2012
2012-05-10  192.170412         8.667   10      5  2012
2012-12-10  192.327265         8.667   10     12  2012
2012-10-19  192.330854         8.667   19     10  2012
2012-10-26  192.308899         8.667   26     10  2012

[5658 rows x 10 columns]
```

[56]:
```
# check outliers
fig, axs = plt.subplots(4,figsize=(6,18))
X = df[['Temperature','Fuel_Price','CPI','Unemployment']]
for i,column in enumerate(X):
    sns.boxplot(df[column], ax=axs[i])
```

```
/usr/local/lib/python3.7/site-packages/seaborn/_decorators.py:43: FutureWarning:
Pass the following variable as a keyword arg: x. From version 0.12, the only
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```

```
  FutureWarning
/usr/local/lib/python3.7/site-packages/seaborn/_decorators.py:43: FutureWarning:
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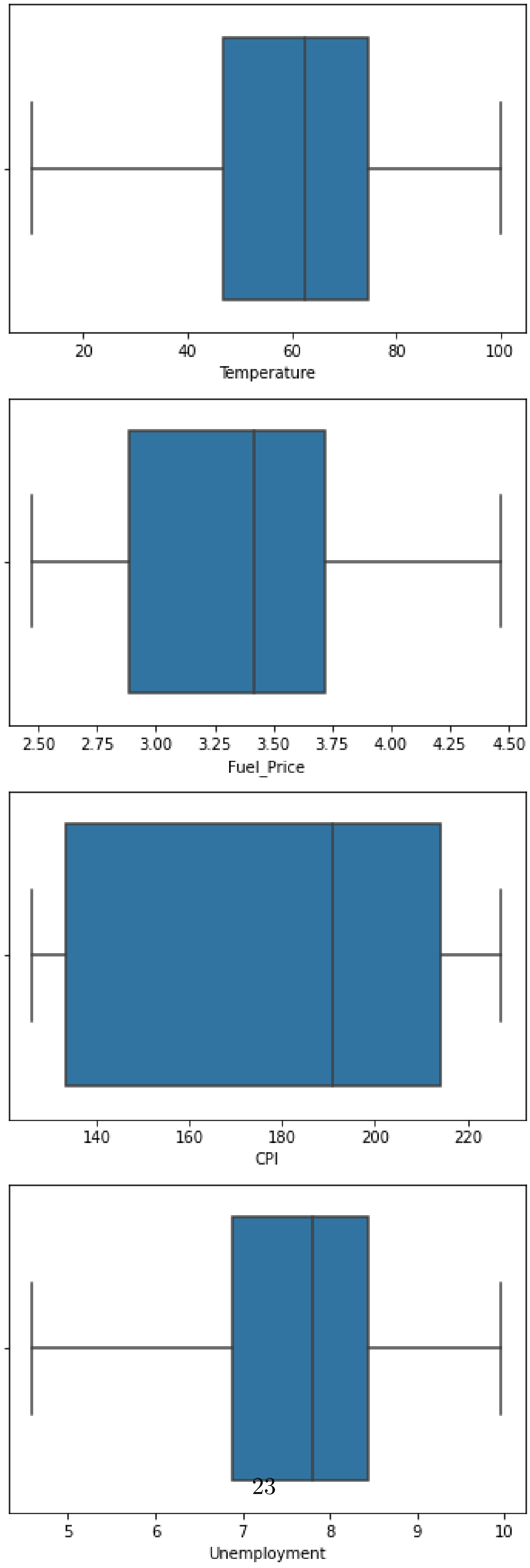
explicit keyword will result in an error or misinterpretation.
  FutureWarning
```


20
40
60
80
100
Temperature
2.50
2.75
3.00
3.25
3.50
3.75
4.00
4.25
4.50
Fuel_Price
140
160
180
200
220
CPI
5
6
7
8
9
10
Unemployment

Building model

[59]:

```
# Import sklearn
from sklearn.ensemble import RandomForestRegressor
from sklearn.model_selection import train_test_split
from sklearn import metrics
from sklearn.linear_model import LinearRegression
```

[60]:

```
# Select features and target
X = df[['Store','Fuel_Price','CPI','Unemployment','Day','Month','Year']]
y = df['Weekly_Sales']

# Split data to train and test (0.80:0.20)
X_train, X_test, y_train, y_test = train_test_split(X,y,test_size=0.2)
```

[61]:

```
# Linear Regression model
print('Linear Regression:')
print()
reg = LinearRegression()
reg.fit(X_train, y_train)
y_pred = reg.predict(X_test)
print('Accuracy:',reg.score(X_train, y_train)*100)
```

```
Linear Regression:

Accuracy: 13.544261458505280
```

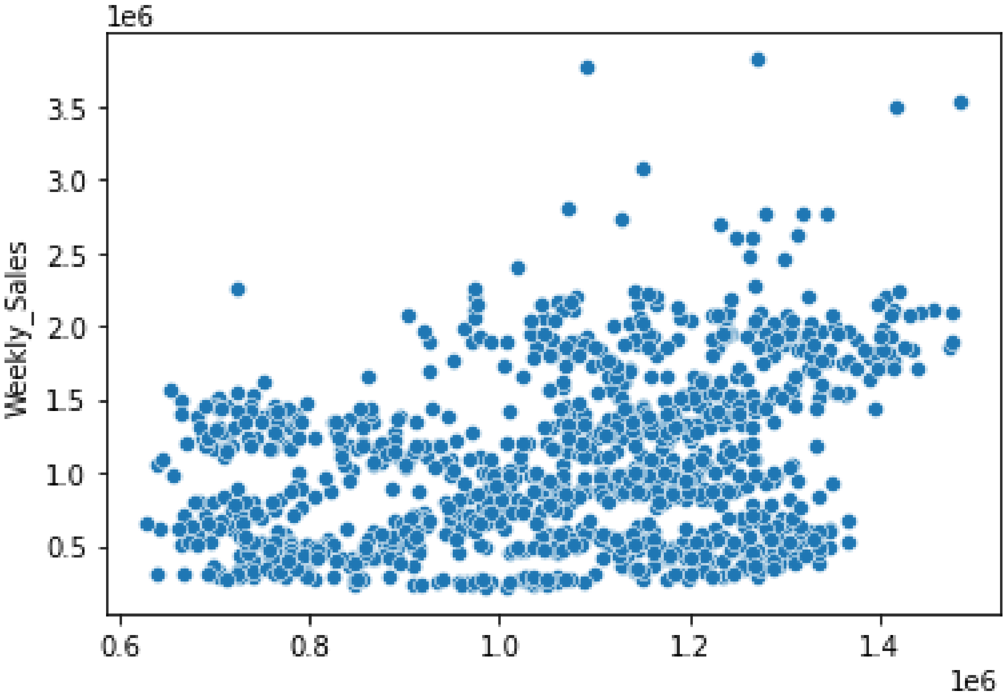
[62]:

```
print('Mean Absolute Error:', metrics.mean_absolute_error(y_test, y_pred))
print('Mean Squared Error:', metrics.mean_squared_error(y_test, y_pred))
print('Root Mean Squared Error:', np.sqrt(metrics.mean_squared_error(y_test,␣
 ↪y_pred)))


sns.scatterplot(y_pred, y_test);
```

```
Mean Absolute Error: 453254.98996341514
Mean Squared Error: 302364524014.50336
Root Mean Squared Error: 549876.8262206577
```

```
/usr/local/lib/python3.7/site-packages/seaborn/_decorators.py:43: FutureWarning:
Pass the following variables as keyword args: x, y. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without an
explicit keyword will result in an error or misinterpretation.
  FutureWarning
```



[63]:

```
# Random Forest Regressor
print('Random Forest Regressor:')
print()
rfr = RandomForestRegressor(n_estimators = 400,max_depth=15,n_jobs=5)
rfr.fit(X_train,y_train)
y_pred=rfr.predict(X_test)
print('Accuracy:',rfr.score(X_test, y_test)*100)

print('Mean Absolute Error:', metrics.mean_absolute_error(y_test, y_pred))
print('Mean Squared Error:', metrics.mean_squared_error(y_test, y_pred))
print('Root Mean Squared Error:', np.sqrt(metrics.mean_squared_error(y_test,␣
 ↪y_pred)))

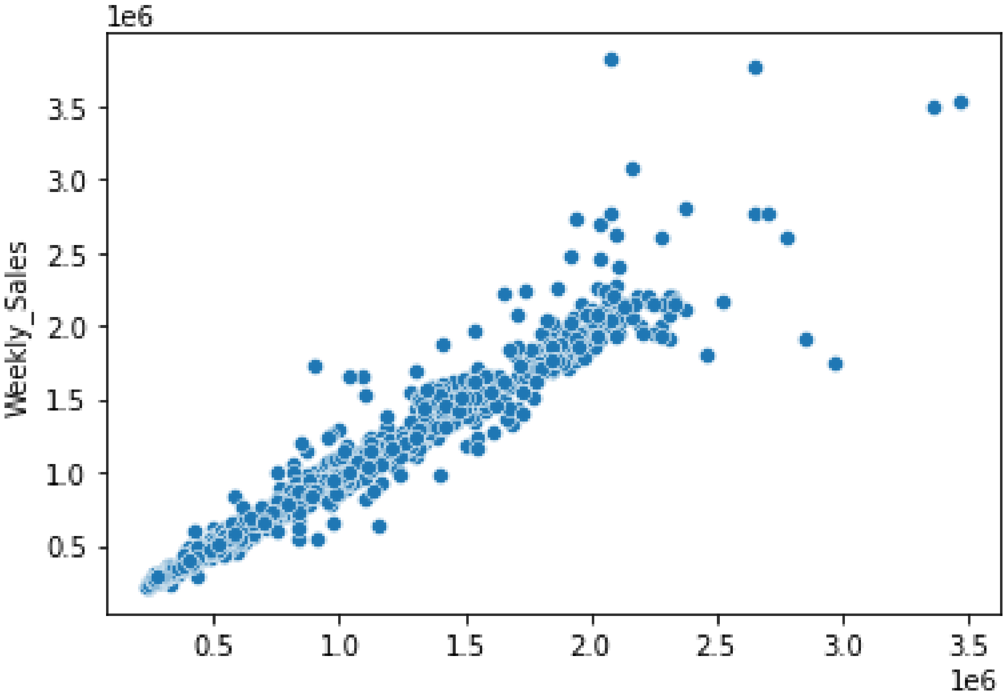

sns.scatterplot(y_pred, y_test);
```

```
Random Forest Regressor:

Accuracy: 94.2896058424671
Mean Absolute Error: 70803.25902171675
Mean Squared Error: 19246618028.373486
Root Mean Squared Error: 138732.18094001652
```

```
/usr/local/lib/python3.7/site-packages/seaborn/_decorators.py:43: FutureWarning:
Pass the following variables as keyword args: x, y. From version 0.12, the only
```

```
valid positional argument will be `data`, and passing other arguments without an
explicit keyword will result in an error or misinterpretation.
  FutureWarning
```



[ ]:
```
Random Forest is the best model with accuracy 94%
```