Retail Analysis with Walmart Data

In [3]:
```
import pandas as pd
import numpy as np
from math import sqrt
from datetime import date
import matplotlib.pyplot as plt
from matplotlib import style
from sklearn.linear_model import LinearRegression
from sklearn import model_selection
from sklearn.metrics import mean_squared_error
```

In [111]:
```
datasets = pd.read_csv("D:/Riya/SIMPLILEARN/Data Sience with Python/My Project/Python 3-Retail Analysis with Wal
```

In [112]:
```
datasets
```

Out[112]:

	Store	Date	Weekly_Sales	Holiday_Flag	Temperature	Fuel_Price	CPI	Unemployment
0	1	5/2/2010	1643690.90	0	42.31	2.572	211.096358	8.106
1	1	12/2/2010	1641957.44	1	38.51	2.548	211.242170	8.106
2	1	19-02-2010	1611968.17	0	39.93	2.514	211.289143	8.106
3	1	26-02-2010	1409727.59	0	46.63	2.561	211.319643	8.106
4	1	5/3/2010	1554806.68	0	46.50	2.625	211.350143	8.106
...	...	...	...	...	...	...	...	...
6430	45	28-09-2012	713173.95	0	64.88	3.997	192.013558	8.684
6431	45	5/10/2012	733455.07	0	64.89	3.985	192.170412	8.667
6432	45	12/10/2012	734464.36	0	54.47	4.000	192.327265	8.667
6433	45	19-10-2012	718125.53	0	56.47	3.969	192.330854	8.667
6434	45	26-10-2012	760281.43	0	58.85	3.882	192.308899	8.667

6435 rows × 8 columns

In [52]:
```
datasets.describe()
```

Out[52]:

	Store	Weekly_Sales	Holiday_Flag	Temperature	Fuel_Price	CPI	Unemployment
count	6435.000000	6.435000e+03	6435.000000	6435.000000	6435.000000	6435.000000	6435.000000
mean	23.000000	1.046965e+06	0.069930	60.663782	3.358607	171.578394	7.999151
std	12.988182	5.643666e+05	0.255049	18.444933	0.459020	39.356712	1.875885
min	1.000000	2.099862e+05	0.000000	-2.060000	2.472000	126.064000	3.879000
25%	12.000000	5.533501e+05	0.000000	47.460000	2.933000	131.735000	6.891000
50%	23.000000	9.607460e+05	0.000000	62.670000	3.445000	182.616521	7.874000
75%	34.000000	1.420159e+06	0.000000	74.940000	3.735000	212.743293	8.622000
max	45.000000	3.818686e+06	1.000000	100.140000	4.468000	227.232807	14.313000

Analysing the Datasets

In [6]:
```
datasets.shape
```

Out[6]:
```
(6435, 8)
```

In [7]:
```
datasets.isnull().sum()
```

Out[7]:
```
Store           0
Date            0
Weekly_Sales    0
Holiday_Flag    0
Temperature     0
Fuel_Price      0
CPI             0
Unemployment    0
dtype: int64
```

In [8]:
```
datasets.columns
```

Out[8]:
```
Index(['Store', 'Date', 'Weekly_Sales', 'Holiday_Flag', 'Temperature',
       'Fuel_Price', 'CPI', 'Unemployment'],
      dtype='object')
```

In [9]:
```
datasets.Store.unique()
```

Out[9]:
```
array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17,
       18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34,
       35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45], dtype=int64)
```

Which store has maximum sales..

In [10]:
```
sales_list=[]
sales_list=datasets.groupby(["Store"])["Weekly_Sales"].sum()
max_sales=max(datasets.groupby(["Store"])["Weekly_Sales"].sum())
sales_list
```

Out[10]:
```
Store
1     2.224028e+08
2     2.753824e+08
3     5.758674e+07
4     2.995440e+08
5     4.547569e+07
6     2.237561e+08
7     8.159828e+07
8     1.299512e+08
9     7.778922e+07
10    2.716177e+08
11    1.939628e+08
12    1.442872e+08
13    2.865177e+08
14    2.889999e+08
15    8.913368e+07
16    7.425243e+07
17    1.277821e+08
18    1.551147e+08
19    2.066349e+08
20    3.013978e+08
21    1.081179e+08
22    1.470756e+08
23    1.987506e+08
24    1.940160e+08
25    1.010612e+08
26    1.434164e+08
27    2.538559e+08
28    1.892637e+08
29    7.714155e+07
30    6.271689e+07
31    1.996139e+08
32    1.668192e+08
33    3.716022e+07
34    1.382498e+08
35    1.315207e+08
36    5.341221e+07
37    7.420274e+07
```

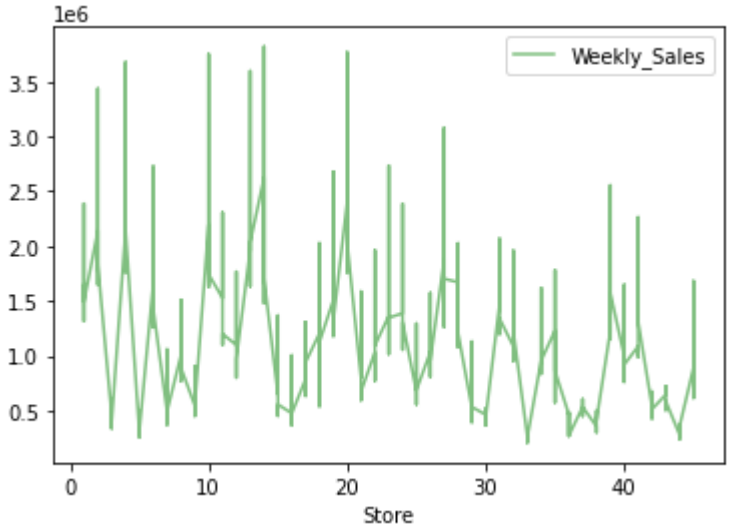
```
38    5.515963e+07
39    2.074455e+08
40    1.378703e+08
41    1.813419e+08
42    7.956575e+07
43    9.056544e+07
44    4.329309e+07
45    1.123953e+08
Name: Weekly_Sales, dtype: float64
```

In [11]:
```
for i in range(1,46):
    if max_sales==sales_list[i]:
        print("Store which has maximum sales of {} is {}".format(max_sales,i))
```

```
Store which has maximum sales of 301397792.46000004 is 20
```

In [35]:
```
datasets.plot(kind='line', x='Store',y='Weekly_Sales', alpha=1.5,fig=(4,5),color='green')
```

Out[35]: <AxesSubplot:xlabel='Store'>



Thus, the store with maximum sales of 301397792.46000004 is store no. 20

Which store has maximum standard deviation i.e., the sales vary a lot and the coefficient of mean

to standard deviation

In [12]:
```
std_dev=[]
std_dev=datasets.groupby(["Store"])["Weekly_Sales"].std()
max_std=max(datasets.groupby(["Store"])["Weekly_Sales"].std())
std_dev
```

Out[12]:
```
Store
1     155980.767761
2     237683.694682
3      46319.631557
4     266201.442297
5      37737.965745
6     212525.855862
7     112585.469220
8     106280.829881
9      69028.666585
10    302262.062504
11    165833.887863
12    139166.871880
13    265506.995776
14    317569.949476
15    120538.652043
16     85769.680133
17    112162.936087
18    176641.510839
19    191722.638730
20    275900.562742
21    128752.812853
22    161251.350631
23    249788.038068
24    167745.677567
25    112976.788600
26    110431.288141
27    239930.135688
28    181758.967539
29     99120.136596
30     22809.665590
31    125855.942933
32    138017.252087
33     24132.927322
34    104630.164676
35    211243.457791
36     60725.173579
37     21837.461190
```

```
38     42768.169450
39    217466.454833
40    119002.112858
41    187907.162766
42     50262.925530
43     40598.413260
44     24762.832015
45    130168.526635
Name: Weekly_Sales, dtype: float64
```

In [13]:
```
for i in range(1,46):
    if max_std==std_dev[i]:
        print("Store which has maximum standard deviation of {} is {}".format(max_sales,i))
```

```
Store which has maximum standard deviation of 301397792.46000004 is 14
```

Thus, the store with maximum standard deviation of 301397792.46000004 is store no. 14.

In [14]:
```
mean=[]
mean=datasets.groupby(['Store'])['Weekly_Sales'].mean()
mean
```

Out[14]:
```
Store
1     1.555264e+06
2     1.925751e+06
3     4.027044e+05
4     2.094713e+06
5     3.180118e+05
6     1.564728e+06
7     5.706173e+05
8     9.087495e+05
9     5.439806e+05
10    1.899425e+06
11    1.356383e+06
12    1.009002e+06
13    2.003620e+06
14    2.020978e+06
15    6.233125e+05
16    5.192477e+05
17    8.935814e+05
18    1.084718e+06
19    1.444999e+06
20    2.107677e+06
21    7.560691e+05
22    1.028501e+06
23    1.389864e+06
24    1.356755e+06
25    7.067215e+05
26    1.002912e+06
27    1.775216e+06
28    1.323522e+06
29    5.394514e+05
30    4.385796e+05
31    1.395901e+06
32    1.166568e+06
33    2.598617e+05
34    9.667816e+05
35    9.197250e+05
36    3.735120e+05
37    5.189003e+05
38    3.857317e+05
```

```
39    1.450668e+06
40    9.641280e+05
41    1.268125e+06
42    5.564039e+05
43    6.333247e+05
44    3.027489e+05
45    7.859814e+05
Name: Weekly_Sales, dtype: float64
```

The coefficient of mean to standard deviation

In [20]:
```
for i in range(1,46):
    cv=std_dev[i]/mean[i]
    print("Coefficient of mean to standard deviation of store {} is {}".format(i,cv))
```

```
Coefficient of mean to standard deviation of store 1 is 0.10029212268130752
Coefficient of mean to standard deviation of store 2 is 0.12342387633191824
Coefficient of mean to standard deviation of store 3 is 0.11502140735338794
Coefficient of mean to standard deviation of store 4 is 0.12708253937002847
Coefficient of mean to standard deviation of store 5 is 0.11866844091939749
Coefficient of mean to standard deviation of store 6 is 0.13582285902663824
Coefficient of mean to standard deviation of store 7 is 0.19730468653665717
Coefficient of mean to standard deviation of store 8 is 0.11695283213906865
Coefficient of mean to standard deviation of store 9 is 0.12689546764678367
Coefficient of mean to standard deviation of store 10 is 0.15913349066639104
Coefficient of mean to standard deviation of store 11 is 0.12226183360044687
Coefficient of mean to standard deviation of store 12 is 0.1379253219997774
Coefficient of mean to standard deviation of store 13 is 0.13251362792719143
Coefficient of mean to standard deviation of store 14 is 0.1571367360094833
Coefficient of mean to standard deviation of store 15 is 0.19338398778229554
Coefficient of mean to standard deviation of store 16 is 0.16518065494781425
Coefficient of mean to standard deviation of store 17 is 0.1255206714123267
Coefficient of mean to standard deviation of store 18 is 0.1628454974226666
Coefficient of mean to standard deviation of store 19 is 0.13268011534826385
Coefficient of mean to standard deviation of store 20 is 0.1309026856173849
Coefficient of mean to standard deviation of store 21 is 0.1702923921734945
Coefficient of mean to standard deviation of store 22 is 0.1567828757814859
Coefficient of mean to standard deviation of store 23 is 0.1797211491975351
Coefficient of mean to standard deviation of store 24 is 0.1236373766137555
Coefficient of mean to standard deviation of store 25 is 0.15986040240723462
Coefficient of mean to standard deviation of store 26 is 0.11011066299216304
Coefficient of mean to standard deviation of store 27 is 0.13515544496695323
Coefficient of mean to standard deviation of store 28 is 0.13732974165124925
Coefficient of mean to standard deviation of store 29 is 0.18374246746816345
Coefficient of mean to standard deviation of store 30 is 0.05200803855544513
Coefficient of mean to standard deviation of store 31 is 0.09016105262945949
Coefficient of mean to standard deviation of store 32 is 0.1183104917616628
Coefficient of mean to standard deviation of store 33 is 0.09286835290692934
Coefficient of mean to standard deviation of store 34 is 0.1082252383219858
Coefficient of mean to standard deviation of store 35 is 0.22968111389976448
Coefficient of mean to standard deviation of store 36 is 0.16257891245773293
Coefficient of mean to standard deviation of store 37 is 0.04208411895180788
Coefficient of mean to standard deviation of store 38 is 0.11087544692154411
Coefficient of mean to standard deviation of store 39 is 0.1499077910802601
```

```
Coefficient of mean to standard deviation of store 40 is 0.12342978096269436
Coefficient of mean to standard deviation of store 41 is 0.14817711243560774
Coefficient of mean to standard deviation of store 42 is 0.09033532809329818
Coefficient of mean to standard deviation of store 43 is 0.06410362927019238
Coefficient of mean to standard deviation of store 44 is 0.08179331054568031
Coefficient of mean to standard deviation of store 45 is 0.16561272979512937
```

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

In [42]:
```
datasets.Date = pd.to_datetime(datasets.Date)
```

In [44]:
```
df_pivot = datasets.pivot_table(index='Store', columns='Date', values='Weekly_Sales', aggfunc='sum')
df_pivot.head()
```

Out[44]:

Date	2010-01-10	2010-02-04	2010-02-07	2010-02-19	2010-02-26	2010-03-09	2010-03-12	2010-03-19	2010-03-26	2010-04-06	...	2012
Store												
1	1453329.50	1594968.28	1492418.14	1611968.17	1409727.59	1540163.53	1548033.78	1472515.79	1404429.92	1615524.71	...	1675
2	1827440.43	2066187.72	2003940.64	2124451.54	1865097.27	1904608.09	2015781.27	1946070.88	1750197.81	2102539.93	...	1937
3	358784.10	423294.40	381151.72	421642.19	407204.86	366473.97	476420.77	375328.59	359949.27	396968.80	...	445
4	1842821.02	1979247.12	1881337.21	2049860.26	1925728.84	1935857.58	2102530.17	1897429.36	1762539.30	1903290.58	...	2202
5	283178.12	331406.00	305993.27	303447.57	270281.63	323798.00	344490.88	281706.41	273282.97	337825.89	...	347

5 rows × 143 columns

In [46]:
```
df_Qr = (df_pivot.groupby(pd.PeriodIndex(df_pivot.columns, freq='Q'), axis=1).apply(lambda x: x.sum(axis=1)/x.sh
df_Qr.columns
```

Out[46]:
```
PeriodIndex(['2010Q1', '2010Q2', '2010Q3', '2010Q4', '2011Q1', '2011Q2',
             '2011Q3', '2011Q4', '2012Q1', '2012Q2', '2012Q3', '2012Q4'],
            dtype='period[Q-DEC]', name='Date', freq='Q-DEC')
```

In [50]:
```
df_Qr3_2012 =df_Q['2012Q3']
df_Qr3_2012.sort_values(ascending=False)
```

Out[50]:
```
Store
4     2.137677e+06
20    2.055495e+06
13    2.026666e+06
2     1.866406e+06
10    1.764113e+06
27    1.682603e+06
14    1.678369e+06
39    1.574996e+06
1     1.552767e+06
6     1.528435e+06
23    1.425305e+06
19    1.387028e+06
31    1.371194e+06
41    1.364466e+06
24    1.343833e+06
11    1.341197e+06
28    1.254638e+06
32    1.178514e+06
18    1.042293e+06
26    1.034798e+06
22    9.848787e+05
12    9.814590e+05
40    9.706384e+05
17    9.611665e+05
34    9.563549e+05
8     9.061550e+05
35    8.543436e+05
45    7.376035e+05
21    7.002923e+05
25    6.924534e+05
43    6.147272e+05
7     6.101995e+05
15    5.757812e+05
42    5.692367e+05
9     5.440200e+05
16    5.367759e+05
37    5.208770e+05
29    5.106552e+05
30    4.318312e+05
```

```
38    4.274415e+05
3     4.138747e+05
44    3.350405e+05
5     3.233852e+05
36    2.981770e+05
33    2.647560e+05
Name: 2012Q3, dtype: float64
```

stores have good quarterly growth rate in Q3'2012 are 4,20,13 and so on.

Top one is store no. 4 and it's quarterly growth rate in Q3'2012 is 2.137677e+06

Holidays having higher sales...

In [57]:
```
Christmas_sales=datasets.loc[(datasets["Date"]=="2010-12-31") | (datasets["Date"]=="2011-12-31") | (datasets["Da
Christmas_sales.head(10)
```

Out[57]:

	Store	Date	Weekly_Sales	Holiday_Flag	Temperature	Fuel_Price	CPI	Unemployment
47	1	2010-12-31	1367320.01	1	48.43	2.943	211.404932	7.838
190	2	2010-12-31	1750434.55	1	47.30	2.943	211.064774	8.163
333	3	2010-12-31	382677.76	1	53.20	2.943	214.698647	7.564
476	4	2010-12-31	1794868.74	1	38.09	2.955	127.087677	7.127
619	5	2010-12-31	298180.18	1	49.79	2.943	211.956714	6.768
762	6	2010-12-31	1464050.02	1	49.14	2.943	212.914967	7.007
905	7	2010-12-31	729572.08	1	13.76	2.829	191.255700	9.137
1048	8	2010-12-31	773586.49	1	41.47	2.943	214.744730	6.433
1191	9	2010-12-31	459770.85	1	45.92	2.943	214.926813	6.560
1334	10	2010-12-31	1707298.14	1	49.67	3.148	127.087677	9.003

In [58]:
```
print ("Total sales in christmas holidays is {}" .format(Christmas_sales["Weekly_Sales"].sum()))
```

```
Total sales in christmas holidays is 40432519.0
```

In [61]:
```
Thanksgivings=datasets.loc[(datasets["Date"]=="2010-11-26") | (datasets["Date"]=="2011-11-25") |
                           (datasets["Date"]=="2012-11-23") | (datasets["Date"]=="2013-11-29")]
Thanksgivings.head(10)
```

Out[61]:

	Store	Date	Weekly_Sales	Holiday_Flag	Temperature	Fuel_Price	CPI	Unemployment
42	1	2010-11-26	1955624.11	1	64.52	2.735	211.748433	7.838
94	1	2011-11-25	2033320.66	1	60.14	3.236	218.467621	7.866
185	2	2010-11-26	2658725.29	1	62.98	2.735	211.406287	8.163
237	2	2011-11-25	2614202.30	1	56.36	3.236	218.113027	7.441
328	3	2010-11-26	565567.84	1	68.71	2.735	215.061402	7.564
380	3	2011-11-25	556925.19	1	68.00	3.236	221.901118	7.197
471	4	2010-11-26	2789469.45	1	48.08	2.752	126.669267	7.127
523	4	2011-11-25	3004702.33	1	47.96	3.225	129.836400	5.143
614	5	2010-11-26	488362.61	1	66.15	2.735	212.303441	6.768
666	5	2011-11-25	507900.07	1	61.93	3.236	219.042820	6.300

In [62]:
```
print ("Total sales in Thanksgiving holidays is {}" .format(Thanksgivings["Weekly_Sales"].sum()))
```

```
Total sales in Thanksgiving holidays is 132414608.5
```

In [64]:
```
Labour_Day=datasets.loc[(datasets["Date"]=="2010-09-10") | (datasets["Date"]=="2011-09-09") |
                        (datasets["Date"]=="2012-09-07") | (datasets["Date"]=="2013-09-06")]
Labour_Day.head(10)
```

Out[64]:

	Store	Date	Weekly_Sales	Holiday_Flag	Temperature	Fuel_Price	CPI	Unemployment
83	1	2011-09-09	1540471.24	1	76.00	3.546	215.861056	7.962
226	2	2011-09-09	1748000.65	1	77.97	3.546	215.514829	7.852
369	3	2011-09-09	377347.49	1	81.72	3.546	219.213531	7.567
512	4	2011-09-09	2093139.01	1	73.34	3.554	129.368613	5.644
655	5	2011-09-09	321110.22	1	79.04	3.546	216.422682	6.529
798	6	2011-09-09	1483574.38	1	80.21	3.546	217.398030	6.925
941	7	2011-09-09	613135.23	1	45.61	3.566	194.638785	8.622
1084	8	2011-09-09	848358.09	1	69.01	3.546	219.260435	6.425
1227	9	2011-09-09	528784.86	1	75.65	3.546	219.445767	6.404
1370	10	2011-09-09	1670579.82	1	89.06	3.771	129.368613	8.257

In [65]:
```
print ("Total sales in Labour day is {}" .format(Labour_Day["Weekly_Sales"].sum()))
```

```
Total sales in Labour day is 46763227.529999994
```

In [68]:
```
Super_Bowl=datasets.loc[(datasets["Date"]=="2010-02-12") | (datasets["Date"]=="2011-02-11") |
                        (datasets["Date"]=="2012-02-10") | (datasets["Date"]=="2013-02-08")]
Super_Bowl.head(10)
```

Out[68]:

	Store	Date	Weekly_Sales	Holiday_Flag	Temperature	Fuel_Price	CPI	Unemployment

In [69]:
```
Super_Bowl["Weekly_Sales"].sum()
```

Out[69]:
```
0.0
```

In [71]:
```
print("Holidays which have higher sales is Thanksgivings. The total weekly sales of thanksgiving holidays is",
      Thanksgivings["Weekly_Sales"].sum())
```

```
Holidays which have higher sales is Thanksgivings. The total weekly sales of thanksgiving holidays is 13241460
8.5
```

Holidays which have higher sales is Thanksgivings. The total weekly sales of thanksgiving holidays is 132414608.5

Monthly and semester view of sales in units and give insights

In [73]:
```
datasets["Year"]= pd.DatetimeIndex(datasets['Date']).year
datasets["Month"]= pd.DatetimeIndex(datasets['Date']).month
datasets
```

Out[73]:

	Store	Date	Weekly_Sales	Holiday_Flag	Temperature	Fuel_Price	CPI	Unemployment	Year	Month
0	1	2010-05-02	1643690.90	0	42.31	2.572	211.096358	8.106	2010	5
1	1	2010-12-02	1641957.44	1	38.51	2.548	211.242170	8.106	2010	12
2	1	2010-02-19	1611968.17	0	39.93	2.514	211.289143	8.106	2010	2
3	1	2010-02-26	1409727.59	0	46.63	2.561	211.319643	8.106	2010	2
4	1	2010-05-03	1554806.68	0	46.50	2.625	211.350143	8.106	2010	5
...	...	...	...	...	...	...	...	...	...	...
6430	45	2012-09-28	713173.95	0	64.88	3.997	192.013558	8.684	2012	9
6431	45	2012-05-10	733455.07	0	64.89	3.985	192.170412	8.667	2012	5
6432	45	2012-12-10	734464.36	0	54.47	4.000	192.327265	8.667	2012	12
6433	45	2012-10-19	718125.53	0	56.47	3.969	192.330854	8.667	2012	10
6434	45	2012-10-26	760281.43	0	58.85	3.882	192.308899	8.667	2012	10

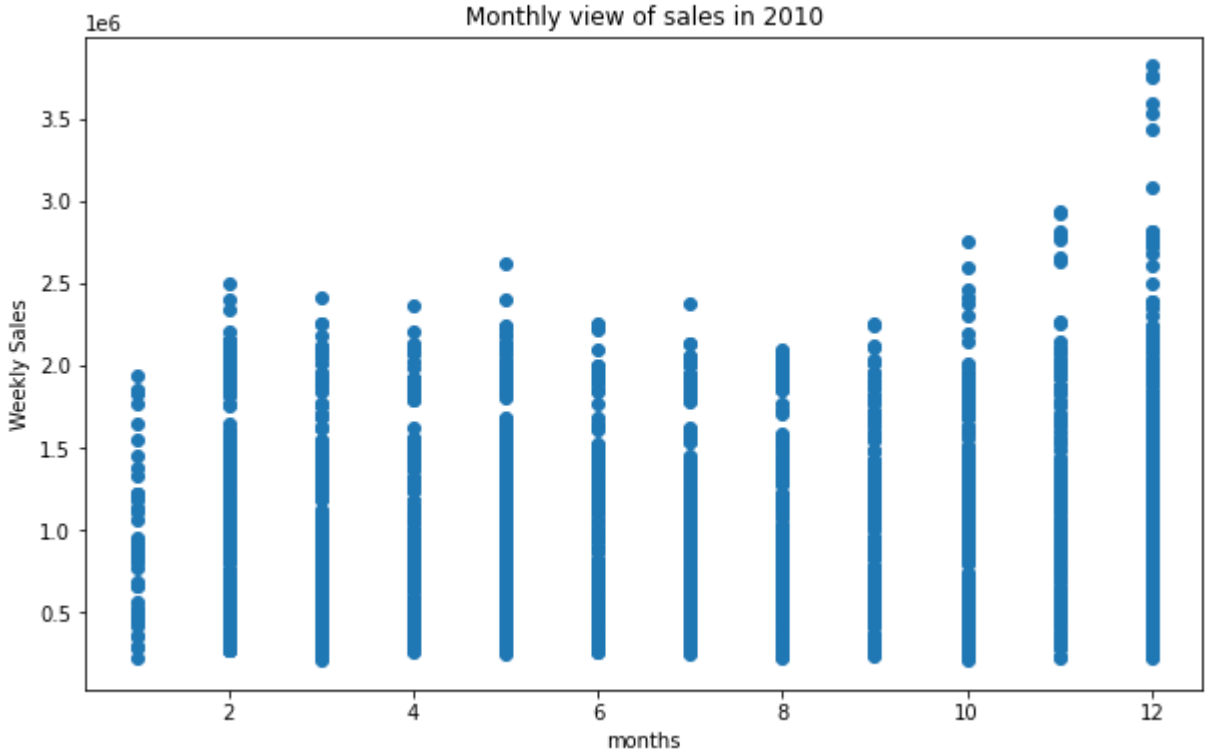
6435 rows × 10 columns

In [75]:
```
year_2010=datasets.loc[datasets["Year"]==2010]
year_2011=datasets.loc[datasets["Year"]==2011]
year_2012=datasets.loc[datasets["Year"]==2012]
```

Monthly view of sales for each year

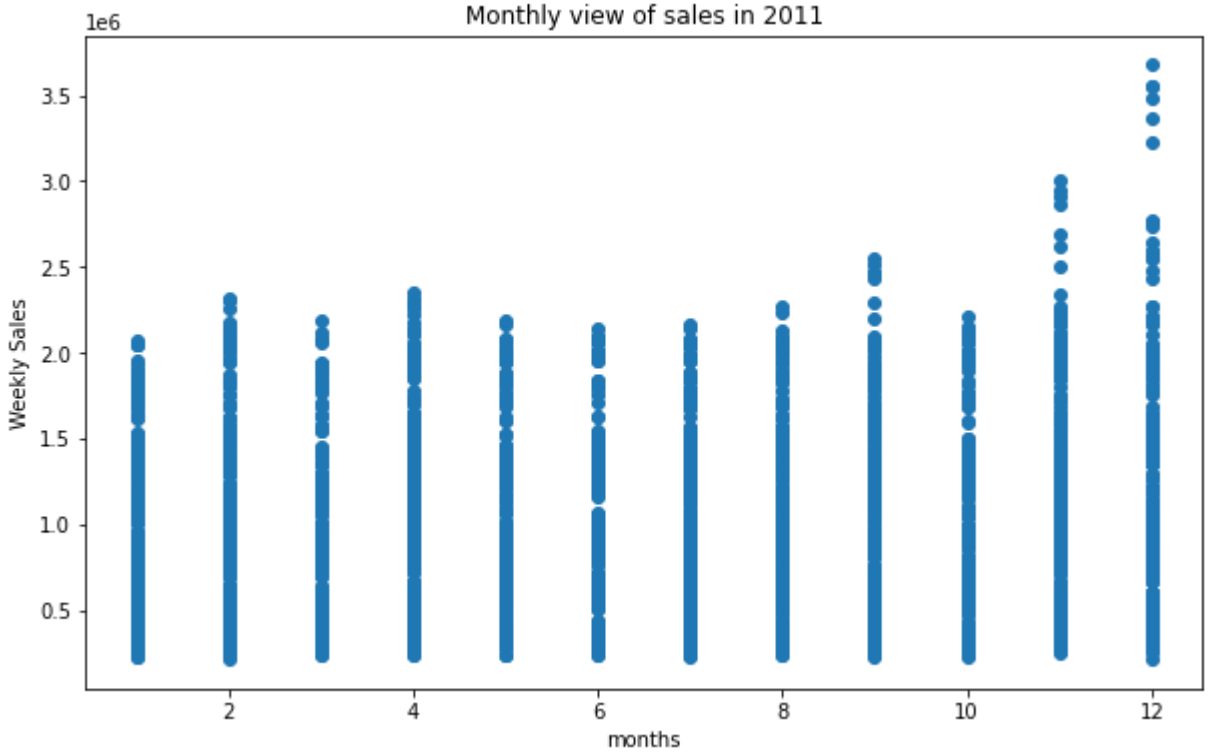
In [78]:
```
plt.figure(figsize=(10,6))
plt.scatter(year_2010["Month"],year_2010["Weekly_Sales"])
plt.xlabel("months")
plt.ylabel("Weekly Sales")
plt.title("Monthly view of sales in 2010")
```

Out[78]: Text(0.5, 1.0, 'Monthly view of sales in 2010')



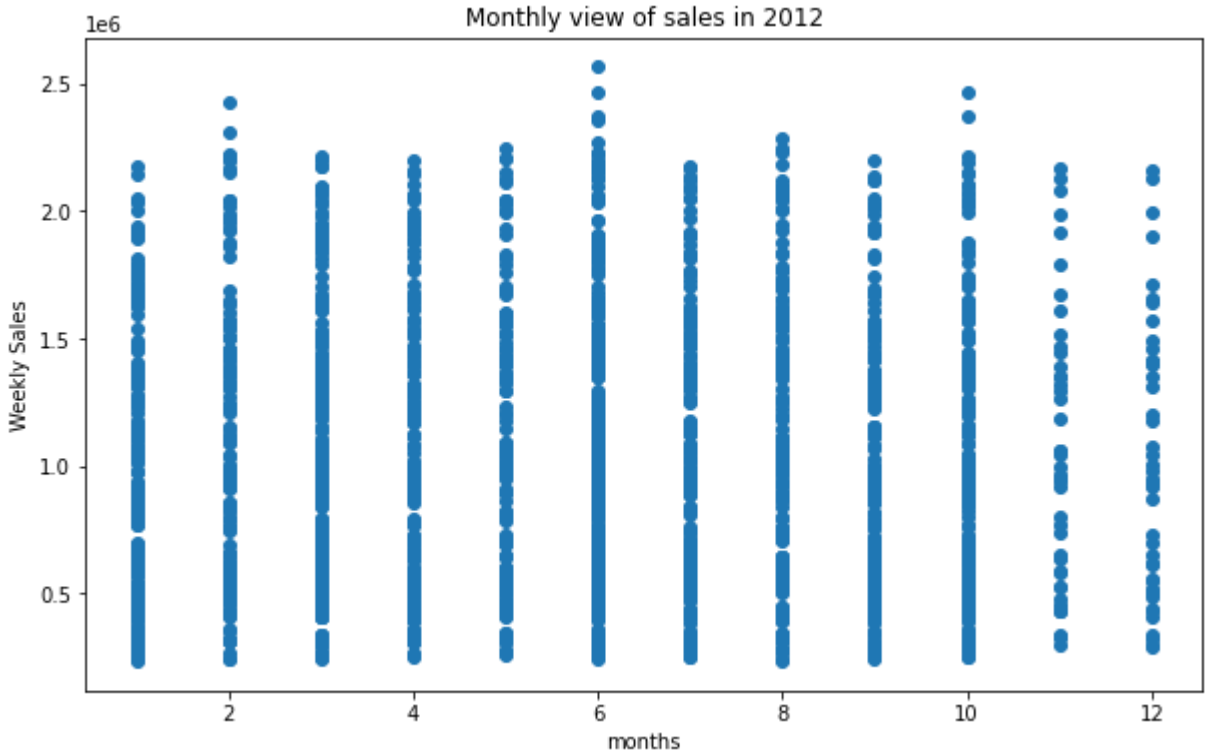
In [81]:
```
plt.figure(figsize=(10,6))
plt.scatter(year_2011["Month"],year_2011["Weekly_Sales"],cmap='green')
plt.xlabel("months")
plt.ylabel("Weekly Sales")
plt.title("Monthly view of sales in 2011")
```

Out[81]: Text(0.5, 1.0, 'Monthly view of sales in 2011')



In [82]:
```
plt.figure(figsize=(10,6))
plt.scatter(year_2012["Month"],year_2012["Weekly_Sales"])
plt.xlabel("months")
plt.ylabel("Weekly Sales")
plt.title("Monthly view of sales in 2012")
```

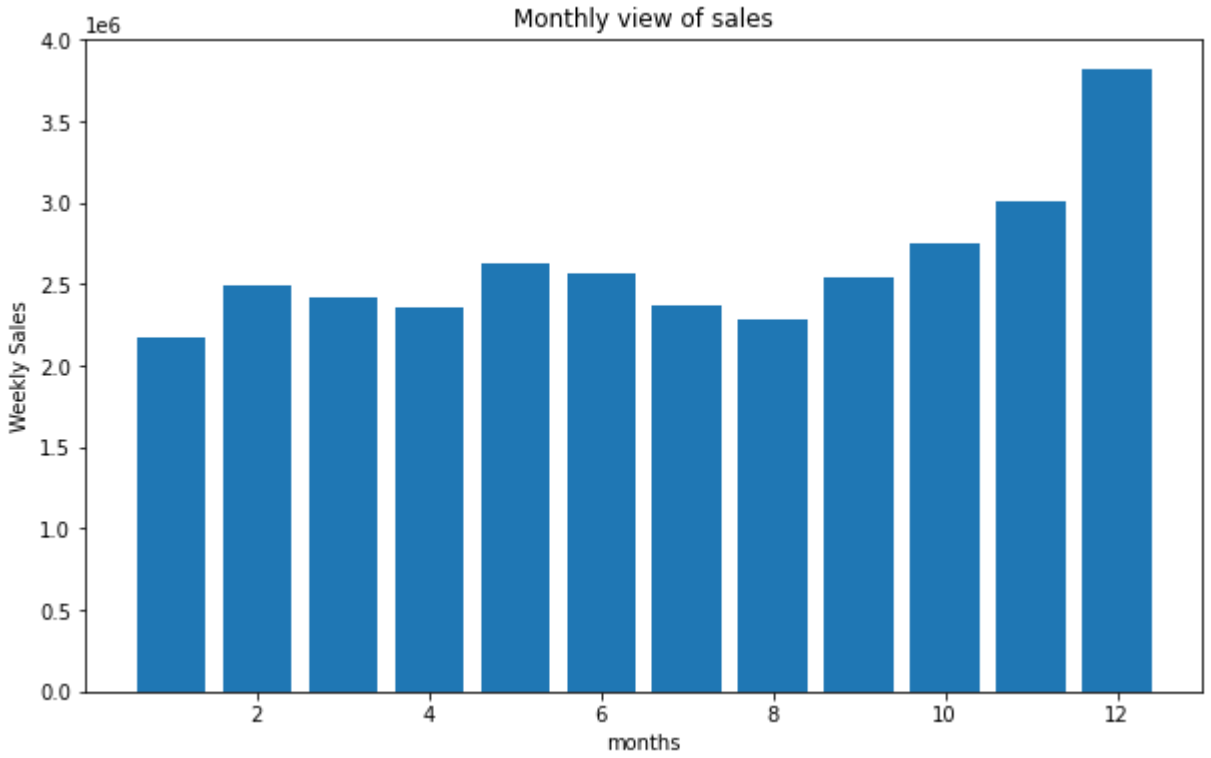
Out[82]: Text(0.5, 1.0, 'Monthly view of sales in 2012')



Monthly view of sales...

In [83]:
```
plt.figure(figsize=(10,6))
plt.bar(datasets["Month"],datasets["Weekly_Sales"])
plt.xlabel("months")
plt.ylabel("Weekly Sales")
plt.title("Monthly view of sales")
```

Out[83]: Text(0.5, 1.0, 'Monthly view of sales')



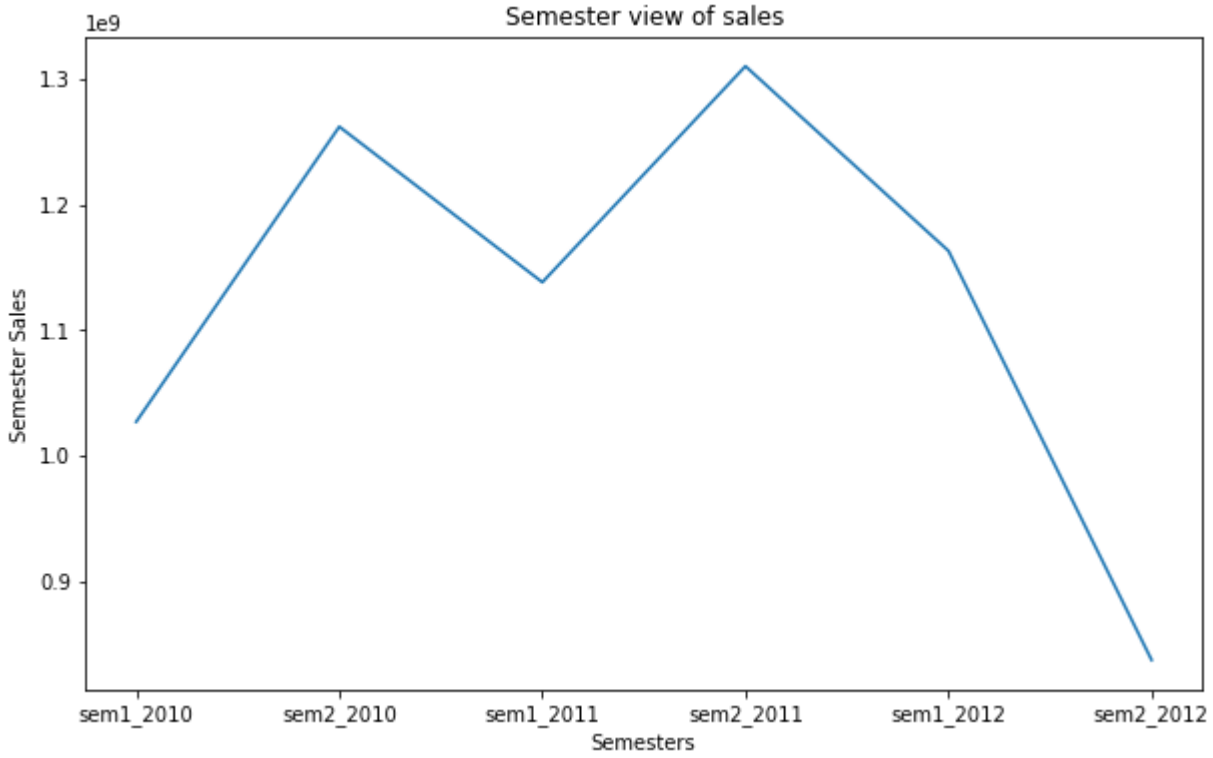
Semester view of sales

In [84]:
```
semester_sales=[]
semester_sales.append(year_2010.loc[year_2010["Month"]<7,["Weekly_Sales"]].sum())
semester_sales.append(year_2010.loc[year_2010["Month"]>6,["Weekly_Sales"]].sum())
semester_sales.append(year_2011.loc[year_2011["Month"]<7,["Weekly_Sales"]].sum())
semester_sales.append(year_2011.loc[year_2011["Month"]>6,["Weekly_Sales"]].sum())
semester_sales.append(year_2012.loc[year_2012["Month"]<7,["Weekly_Sales"]].sum())
semester_sales.append(year_2012.loc[year_2012["Month"]>6,["Weekly_Sales"]].sum())
```

In [85]:
```
semester_names=["sem1_2010","sem2_2010","sem1_2011","sem2_2011","sem1_2012","sem2_2012"]
```

In [89]:
```
plt.figure(figsize=(10,6))
plt.plot(semester_names,semester_sales)
plt.xlabel("Semesters")
plt.ylabel("Semester Sales")
plt.title("Semester view of sales")
```

Out[89]:
```
Text(0.5, 1.0, 'Semester view of sales')
```



For Store 1 – Building prediction models to forecast demand

Linear Regression Model

In [90]:
```
x=datasets.drop(["Weekly_Sales","Date"],axis=1)
y=datasets["Weekly_Sales"]
```

In [95]:
```
linreg=LinearRegression(n_jobs=-1)
xtrain,xtest,ytrain,ytest=model_selection.train_test_split(x,y,test_size=0.4,random_state=42)

linreg.fit(xtrain,ytrain)
```

Out[95]:
```
LinearRegression(n_jobs=-1)
```

In [96]:
```
print(linreg.intercept_)
print(linreg.coef_)
```

```
80380267.57798947
[-15063.98405298  16701.66272831   -806.19443715  47215.71929544
  -2175.95412712 -26362.8254153  -39081.36479694  11681.52115132]
```

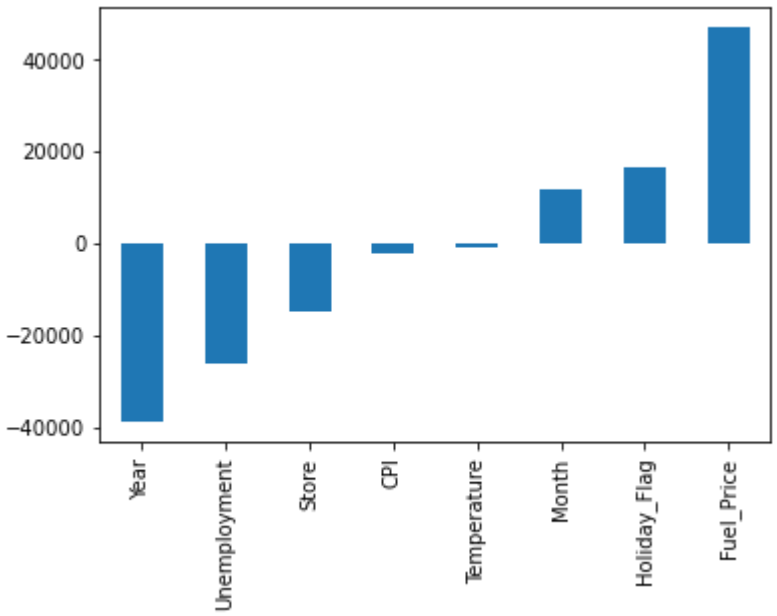
In [97]:
```
x.columns
```

Out[97]:
```
Index(['Store', 'Holiday_Flag', 'Temperature', 'Fuel_Price', 'CPI',
       'Unemployment', 'Year', 'Month'],
      dtype='object')
```

In [99]:
```
features=['Store', 'Holiday_Flag', 'Temperature', 'Fuel_Price', 'CPI', 'Unemployment', 'Year', 'Month']
```

In [100]:
```
relation=pd.Series(linreg.coef_,x.columns).sort_values()
relation.plot(kind="bar")
```

Out[100]: <AxesSubplot:>



The plot shows that fuel price have greater positive impact on weekly sales. Unemployment also has certain negative impact on weekly sales. CPI has least impact towards weekly sales.

In [101]:
```
print(format(linreg.score(xtest,ytest)))
```

```
0.14998336593087003
```

In [102]:
```
print(sqrt(mean_squared_error(ytrain,linreg.predict(xtrain))))
```

```
522629.1662854094
```

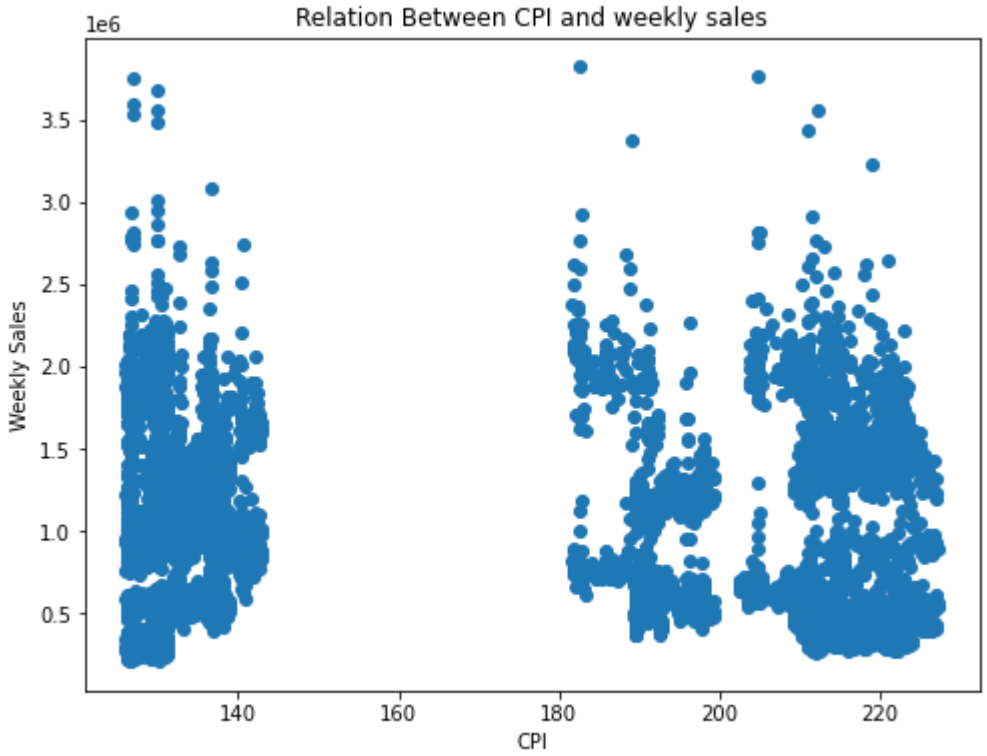
In [103]:
```
print(sqrt(mean_squared_error(ytest,linreg.predict(xtest))))
```

```
519668.86389805033
```

Thus test error is less compared to train error. Hence our predicted model is well and good.

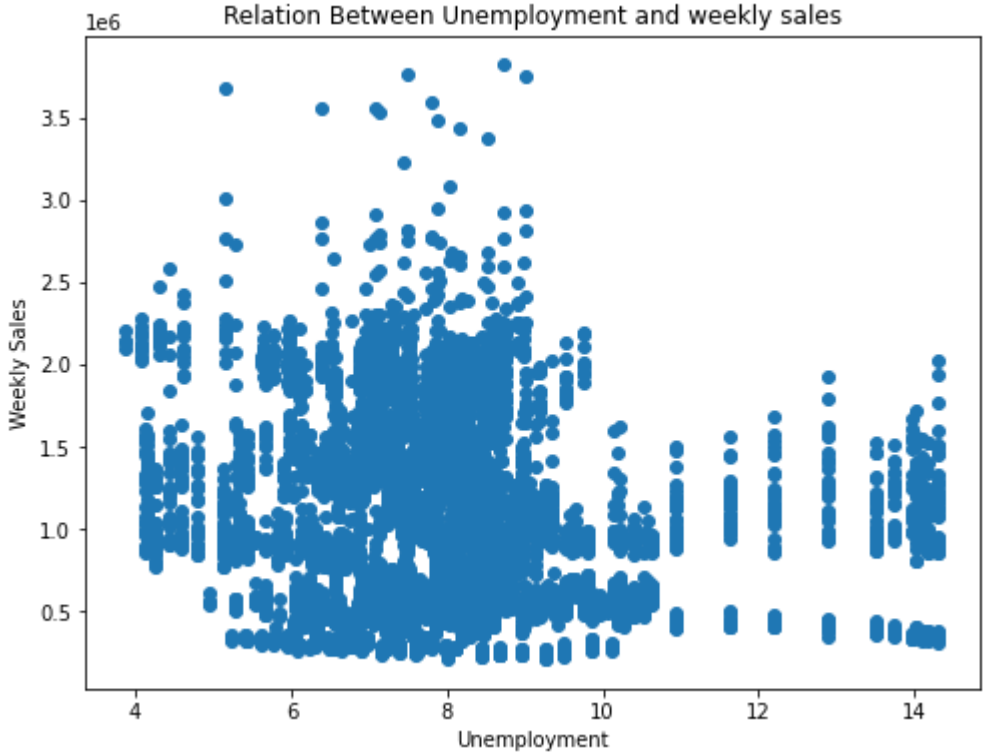
In [104]:
```
plt.figure(figsize=(8,6))
plt.scatter(datasets["CPI"],datasets["Weekly_Sales"])
plt.title("Relation Between CPI and weekly sales")
plt.xlabel("CPI")
plt.ylabel("Weekly Sales")
```

Out[104]:
```
Text(0, 0.5, 'Weekly Sales')
```



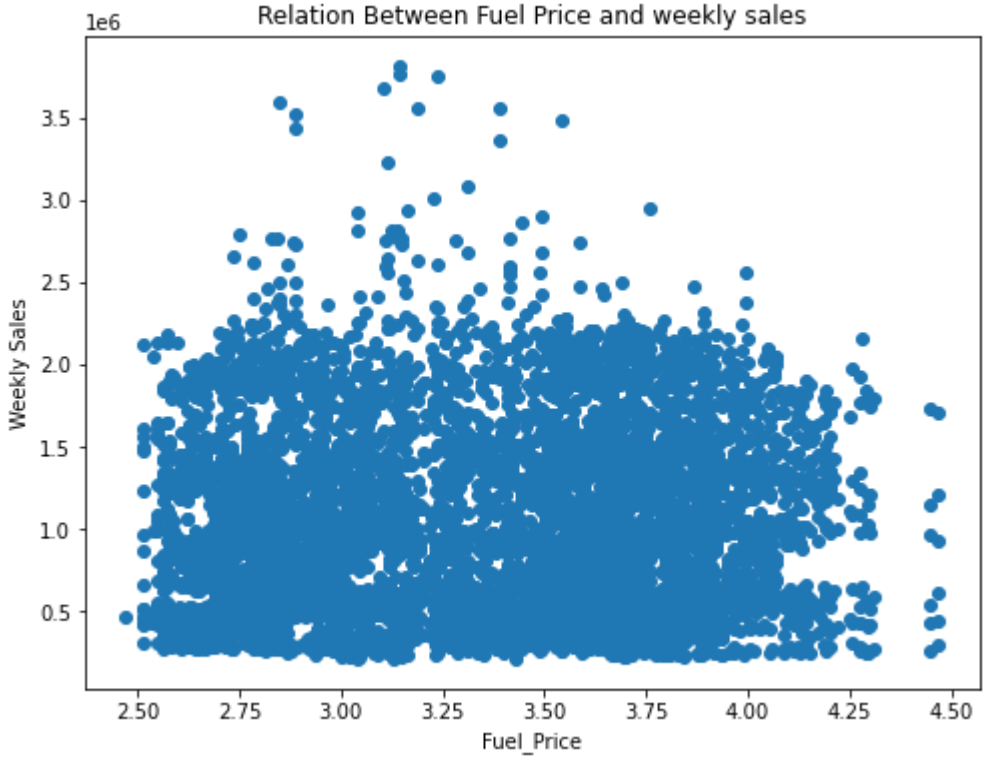
In [106]:
```
plt.figure(figsize=(8,6))
plt.scatter(datasets["Unemployment"],datasets["Weekly_Sales"])
plt.title("Relation Between Unemployment and weekly sales")
plt.xlabel("Unemployment")
plt.ylabel("Weekly Sales")
```

Out[106]:
```
Text(0, 0.5, 'Weekly Sales')
```



In [107]:
```
plt.figure(figsize=(8,6))
plt.scatter(datasets["Fuel_Price"],datasets["Weekly_Sales"])
plt.title("Relation Between Fuel Price and weekly sales")
plt.xlabel("Fuel_Price")
plt.ylabel("Weekly Sales")
```

Out[107]:
```
Text(0, 0.5, 'Weekly Sales')
```



Changing dates into days by creating new variable.

In [109]:
```
datasets['days'] = datasets['Date'].dt.day_name()
datasets
```

Out[109]:

	Store	Date	Weekly_Sales	Holiday_Flag	Temperature	Fuel_Price	CPI	Unemployment	Year	Month	days
0	1	2010-05-02	1643690.90	0	42.31	2.572	211.096358	8.106	2010	5	Sunday
1	1	2010-12-02	1641957.44	1	38.51	2.548	211.242170	8.106	2010	12	Thursday
2	1	2010-02-19	1611968.17	0	39.93	2.514	211.289143	8.106	2010	2	Friday
3	1	2010-02-26	1409727.59	0	46.63	2.561	211.319643	8.106	2010	2	Friday
4	1	2010-05-03	1554806.68	0	46.50	2.625	211.350143	8.106	2010	5	Monday
...	...	...	...	...	...	...	...	...	...	...	...
6430	45	2012-09-28	713173.95	0	64.88	3.997	192.013558	8.684	2012	9	Friday
6431	45	2012-05-10	733455.07	0	64.89	3.985	192.170412	8.667	2012	5	Thursday
6432	45	2012-12-10	734464.36	0	54.47	4.000	192.327265	8.667	2012	12	Monday
6433	45	2012-10-19	718125.53	0	56.47	3.969	192.330854	8.667	2012	10	Friday
6434	45	2012-10-26	760281.43	0	58.85	3.882	192.308899	8.667	2012	10	Friday

6435 rows × 11 columns

In [ ]:

In [ ]:

In [ ]: