Author:Ratnam Dubey

Renaissance Learning

In [1]:
```
# Importing Required Libraries
```

In [2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn import preprocessing
le = preprocessing.LabelEncoder()
from sklearn.preprocessing import LabelEncoder
plt.rcParams.update({'font.size':6})
from collections import defaultdict
d = defaultdict(LabelEncoder)
d1 = defaultdict(LabelEncoder)
from sklearn.linear_model import LogisticRegression
```

Importing the Data

In [3]:
```
demographic =  pd.read_csv("D:\\Analytics
Excercise\\AnalyticsExercise\\Data\\demographic.csv" )
quiz_act =  pd.read_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\qui
z_act.csv")
sub_16 =  pd.read_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\sub_d
ata_15_16.csv")
sub_17 =  pd.read_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\sub_d
ata_17.csv")
```

In [4]:
```
sub_16.rename(columns ={'School ID' : 'ID'} , inplace=True)
sub_17.rename(columns ={'School ID' : 'ID'} , inplace=True)
demographic.rename(columns ={'School ID' : 'ID'} , inplace=True)
quiz_act.rename(columns ={'School ID' : 'ID'} , inplace=True)
```

Stripping the columns Name as they are not consistant changing School_ID to ID

In [5]:
```
sub_16.columns = sub_16.columns.str.strip()
sub_17.columns = sub_17.columns.str.strip()
demographic.columns = demographic.columns.str.strip()
quiz_act.columns = quiz_act.columns.str.strip()
```

Combining the Data with demographic Information as to get better insight on the Data for Analysis

In [6]:
```
sub_16_demo = pd.merge(sub_16, demographic, on='ID')
sub_17_demo = pd.merge(sub_17, demographic, on='ID')
```

Replacing the Space with Under Score as the columnmn name has space in the names

In [7]:
```
sub_16_demo.columns = [c.replace(' ', '_') for c in sub_16_demo.columns]
sub_17_demo.columns = [c.replace(' ', '_') for c in sub_17_demo.columns]
```

Exploring the Data

In [8]:
```
sub_16_demo.info()
```

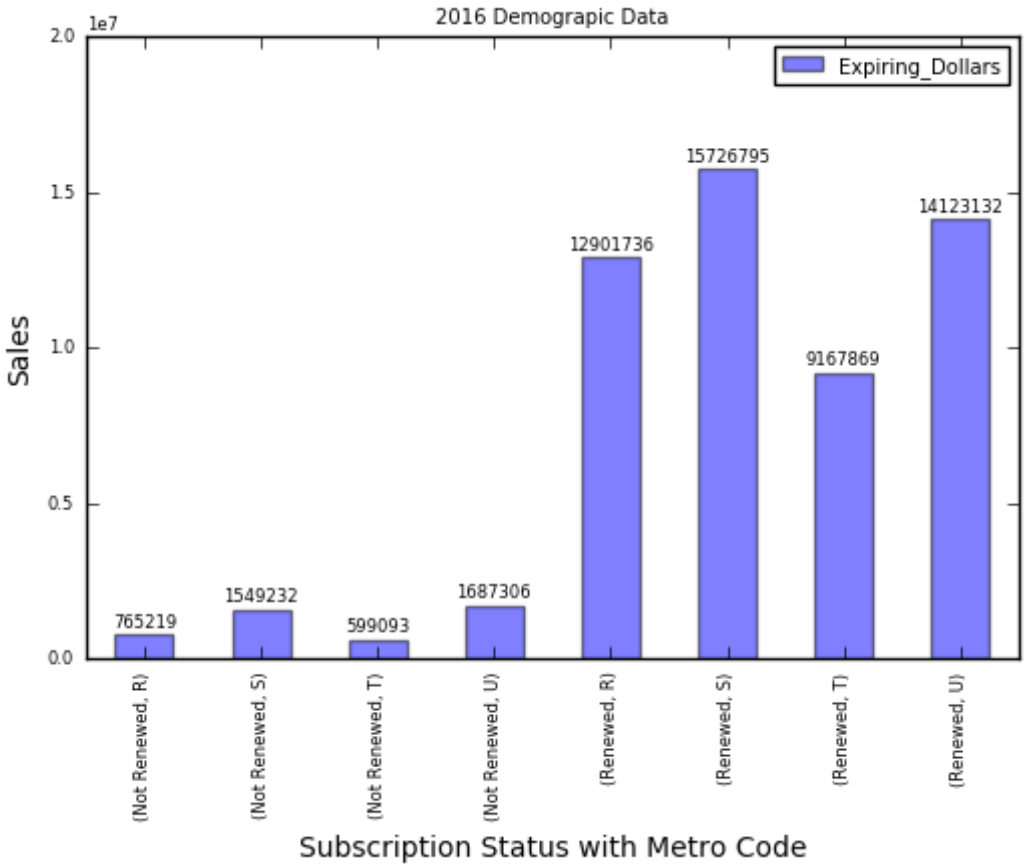
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 23215 entries, 0 to 23214
Data columns (total 17 columns):
ID                                23215 non-null int64
State                             23215 non-null object
Subscription_End_Date             23215 non-null object
Expiring_Dollars                  23215 non-null int64
Expiring_Students                 23215 non-null int64
Subscription_Status               23215 non-null object
Renewal_Date                      21277 non-null object
Metro_Code                        22135 non-null object
Apple_Mac_Code                    19954 non-null object
PC_Code                           19954 non-null object
Poverty_Level_Code                19781 non-null object
Avg_Household_Income              23215 non-null object
Title_1_Code                      19815 non-null object
Software_budget_per_head          19954 non-null object
Training_Budget_Per_head          19954 non-null object
Lunch_Program_Eligible_Students   23215 non-null int64
Affluence_Indicator               23209 non-null float64
dtypes: float64(1), int64(4), object(12)
memory usage: 3.2+ MB
```

In [9]:
```
sub_16_demo.info()
```

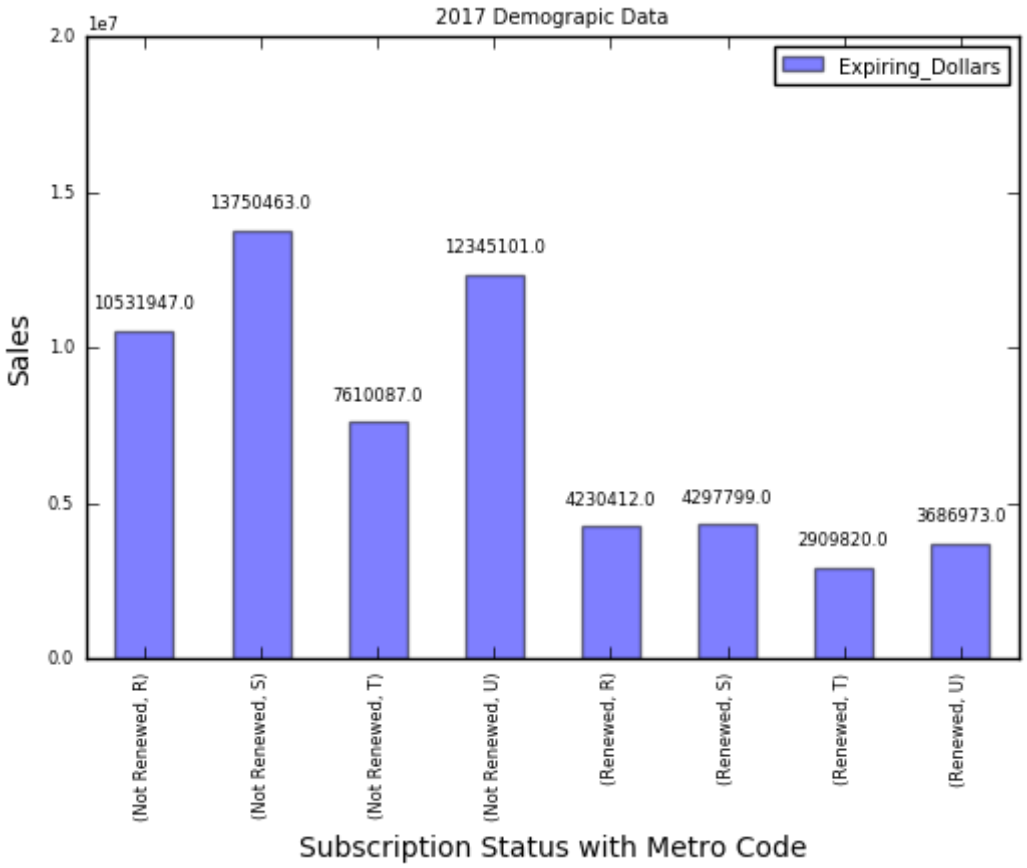
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 23215 entries, 0 to 23214
Data columns (total 17 columns):
ID                                  23215 non-null int64
State                               23215 non-null object
Subscription_End_Date               23215 non-null object
Expiring_Dollars                    23215 non-null int64
Expiring_Students                   23215 non-null int64
Subscription_Status                 23215 non-null object
Renewal_Date                        21277 non-null object
Metro_Code                          22135 non-null object
Apple_Mac_Code                      19954 non-null object
PC_Code                             19954 non-null object
Poverty_Level_Code                  19781 non-null object
Avg_Household_Income                23215 non-null object
Title_1_Code                        19815 non-null object
Software_budget_per_head            19954 non-null object
Training_Budget_Per_head            19954 non-null object
Lunch_Program_Eligible_Students     23215 non-null int64
Affluence_Indicator                 23209 non-null float64
dtypes: float64(1), int64(4), object(12)
memory usage: 3.2+ MB
```

Getting demographic changes based on Scaled Data

In [10]:
```
ax = sub_16_demo.groupby(['Subscription_Status' ,'Metro_Code'])['Expiring_Dollars'].sum().plot(kind="Bar", title="2016 Demograpic Data" , alpha=0.5 , ylim=(0,20000000) ,)
plt.xlabel('Subscription Status with Metro Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 5), textcoords='offset points' )
plt.legend()
plt.show()
```



In [11]:
```
ax = sub_17_demo.groupby(['Subscription_Status' ,'Metro_Code'])['Expiring_Dollars'].sum().plot(kind="Bar" , title="2017 Demograpic Data" , alpha=0.5 , ylim=(0,20000000) ,)
plt.xlabel('Subscription Status with Metro Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
plt.legend()
plt.show()
```



Conclusion :-As we can see there is sales drop in the Renewed Data where as there is Increase in the sales of Non-Renewed Data

Cheking the Demographic Information Based on Avg Income

In [12]:
```
demographic_op_1 = sub_16_demo.groupby(['Subscription_Status','Metro_Code' ,'Avg_Household_Income' ])['Expiring_Dollars'].sum()
demographic_op_1.to_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\Findings\\Demographic_op1.csv", index=True , header=True)

demographic_op_2 = sub_17_demo.groupby(['Subscription_Status','Metro_Code' ,'Avg_Household_Income' ])['Expiring_Dollars'].sum()
demographic_op_2.to_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\Findings\\Demographic_op2.csv", index=True , header=True)
```

In [13]:
```
demographic_op_3 = sub_16_demo.groupby(['Subscription_Status','Metro_Code' ,'P
overty_Level_Code' ])['Expiring_Dollars'].count()
demographic_op_3.to_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\Fin
dings\\Demographic_op3.csv", index=True , header=True)

demographic_op_4 = sub_17_demo.groupby(['Subscription_Status','Metro_Code' ,'P
overty_Level_Code' ])['Expiring_Dollars'].count()
demographic_op_4.to_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\Fin
dings\\Demographic_op4.csv", index=True , header=True)
```

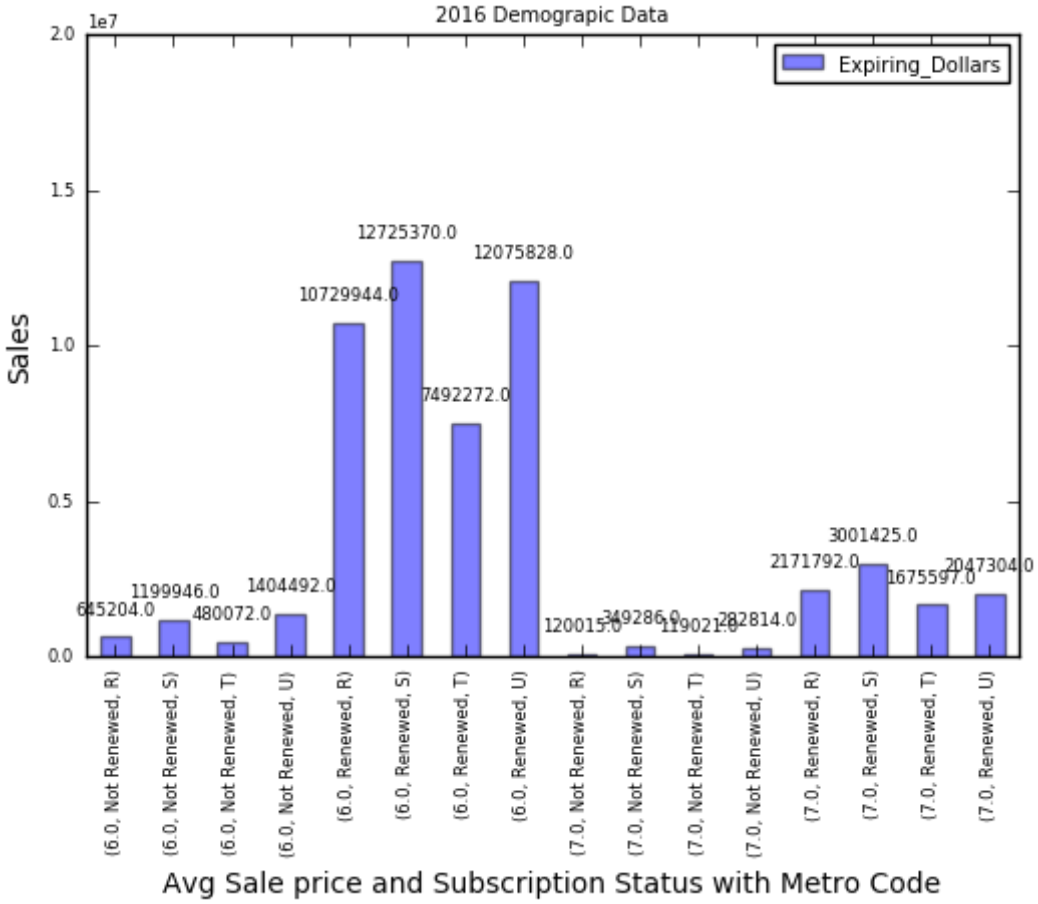
Results are drived in Excel for Avg Income and Poverty Level

Finding the KPI (Key performance Indicators) like Average Selling Price = Sales / Number of Students

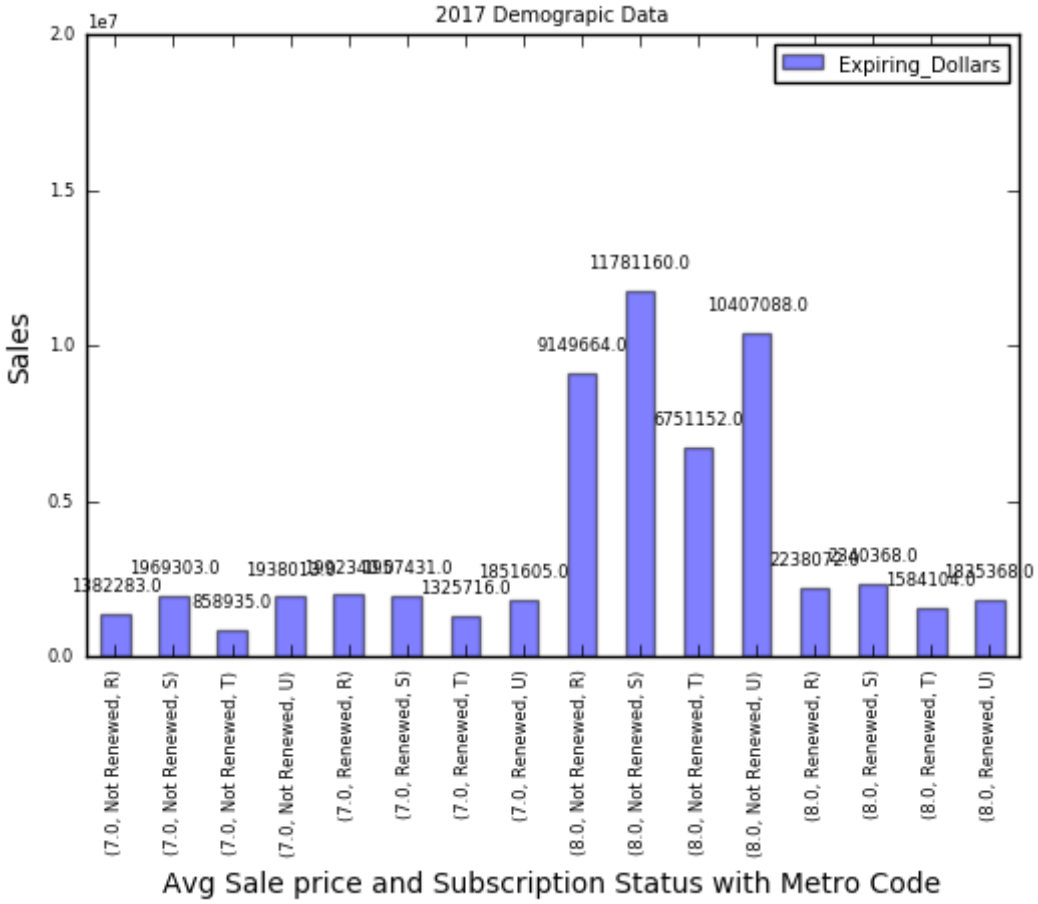
In [14]:
```
sub_16_demo['Avg_Sell_price'] = sub_16_demo['Expiring_Dollars']/sub_16_demo['E
xpiring_Students']
sub_17_demo['Avg_Sell_price'] = sub_17_demo['Expiring_Dollars']/sub_17_demo['E
xpiring_Students']
```

In [15]:
```
# Checking the Impact of Average selling price on the Sales
```

In [16]:
```
ax = sub_16_demo.groupby(['Avg_Sell_price' ,'Subscription_Status' ,'Metro_Cod
e'])['Expiring_Dollars'].sum().plot(kind="Bar", title="2016 Demograpic Data",
alpha=0.5 , ylim=(0,20000000) ,)
plt.xlabel('Avg Sale price and Subscription Status with Metro Code',
fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [17]:
```
ax = sub_17_demo.groupby(['Avg_Sell_price' ,'Subscription_Status' ,'Metro_Cod
e'])['Expiring_Dollars'].sum().plot(kind="Bar", title="2017 Demograpic Data",
alpha=0.5 , ylim=(0,20000000) ,)
plt.xlabel('Avg Sale price and Subscription Status with Metro Code',
fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



Conclusion :- 2016 - As the Sales prices hiked from $6 to 7$ there is no evidence of Sales drop i.e - Not Renewed Increase 2017 - As the Sales prices hiked from $7 to 8$ there is significant sales drop (Except Rural areas of Renewed in 2017) In Space compared to 2016 Renewed Data there is drop of 22% In Town there is dop of 6% In Urban area drop of 11%

Are we Experiencing any time lag ??

Converting the time in days so that we take take the Difference of Days Days with -tve sign means Subscription was renewed was done prior to Renewal Date : i.e -61 , 61 days before End of Subscription Days with +tve sign means delay in Subscription Renewal in Days : 61 , 61 days after Subscription Ends

In [18]:
```
sub_16_demo['Renewal_Date'] =
sub_16_demo['Renewal_Date'].apply(pd.to_datetime)
sub_16_demo['Subscription_End_Date'] = sub_16_demo['Subscription_End_Date'].ap
ply(pd.to_datetime)

sub_16_demo['Renew_delay'] = sub_16_demo['Renewal_Date'] - sub_16_demo['Subscr
iption_End_Date']
sub_16_demo['Renew_delay'] = sub_16_demo['Renew_delay'] / np.timedelta64(1,
'D')

sub_17_demo['Renewal_Date'] =
sub_17_demo['Renewal_Date'].apply(pd.to_datetime)
sub_17_demo['Subscription_End_Date'] = sub_17_demo['Subscription_End_Date'].ap
ply(pd.to_datetime)

sub_17_demo['Renew_delay'] = sub_17_demo['Renewal_Date'] - sub_17_demo['Subscr
iption_End_Date']
sub_17_demo['Renew_delay'] = sub_17_demo['Renew_delay'] / np.timedelta64(1,
'D')
```

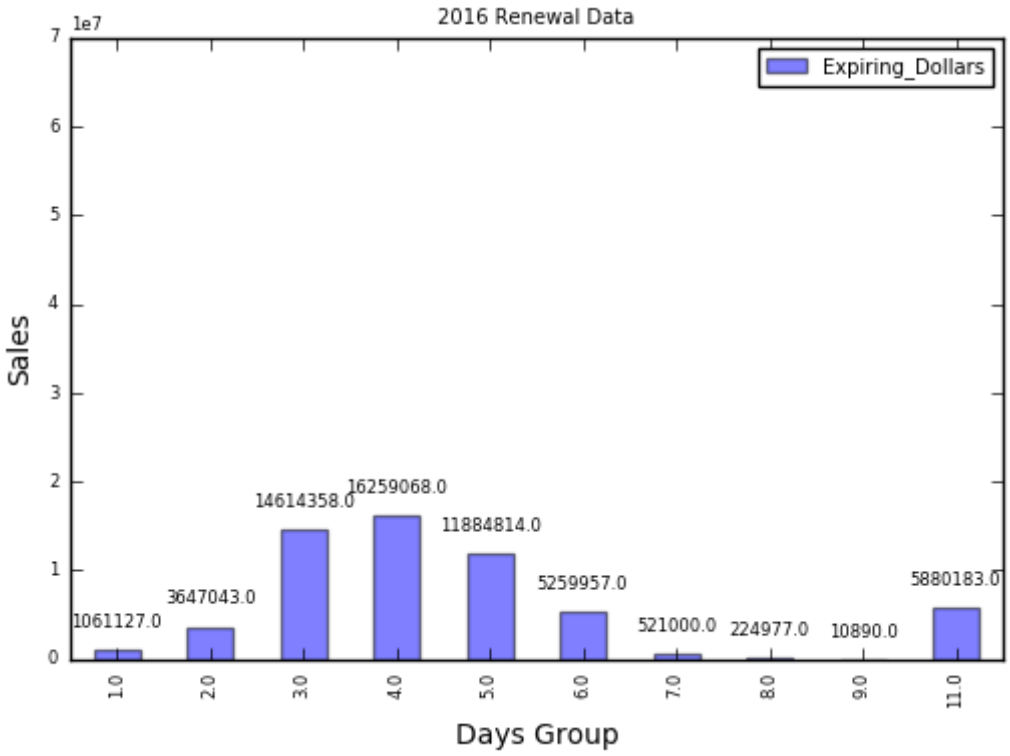
Grouping the Time Lag

In [19]:
```
def transform_diff_grp(dl):
    if dl > 180 : return 10
    elif 150 < dl <= 180 : return 9
    elif 120 < dl <= 150 : return 8
    elif 90 < dl <= 120 : return 7
    elif 30 < dl <= 90 : return 6
    elif 0 <= dl <= 30 : return 5
    elif -30 < dl <= -1 : return 4
    elif -90 < dl <= -30 : return 3
    elif -150 <= dl <= -90 : return 2
    elif -400 < dl <= -151 : return 1
```

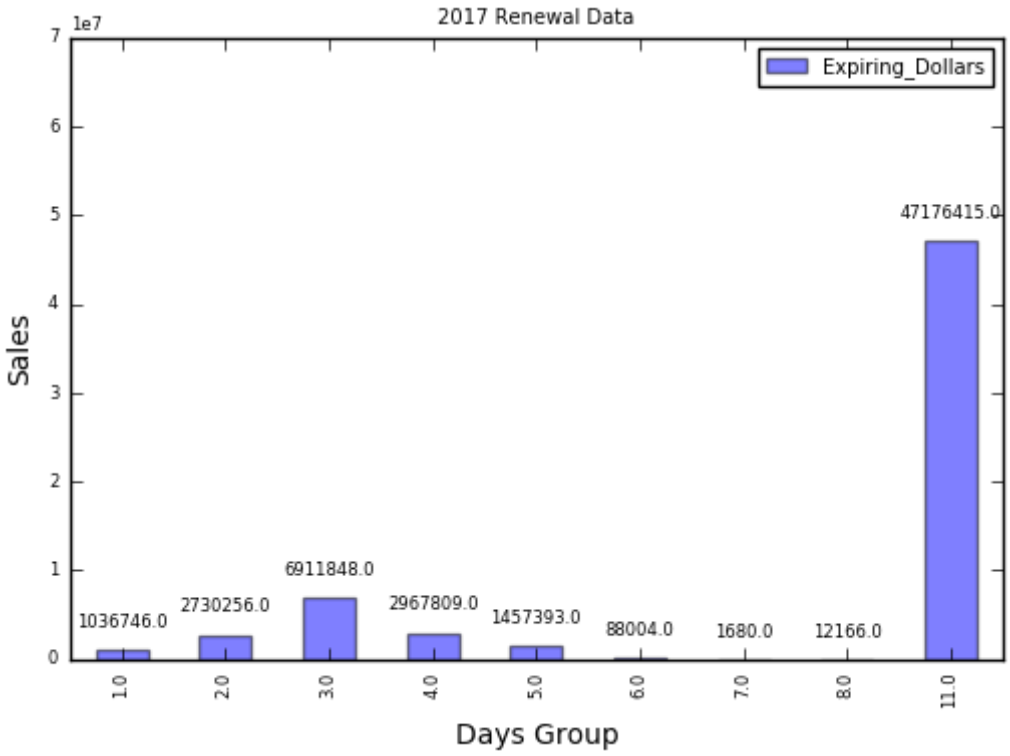
In [20]:
```
sub_16_demo["Days_group"] = sub_16_demo['Renew_delay'].map(transform_diff_grp)
sub_17_demo["Days_group"] = sub_17_demo['Renew_delay'].map(transform_diff_grp)
```

In [21]:
```
sub_16_demo['Days_group'].fillna(11, inplace=True)
sub_17_demo['Days_group'].fillna(11, inplace=True)
```

In [22]:
```
ax = sub_16_demo.groupby(['Days_group'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 Renewal Data",
alpha=0.5 , ylim=(0,70000000))
plt.xlabel('Days Group', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [23]:
```
ax = sub_17_demo.groupby(['Days_group'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 Renewal Data",
alpha=0.5 , ylim=(0,70000000))
plt.xlabel('Days Group', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



Conclusion # There is Big Increase in the Number 11 which is Not Renewed Data as there is No Renewal Date available # There is almost 800% down fall in the sales for 2017 year #IN 2016 the Renewal patten Except 11 is 3 : Subscription got renewed before 30 days to 90 days period 4 : before 1 to 30 days 5 : After 0 to 30 Days #In 2017 the RenewelPatten is hike in 3 : Subscription got renewed before 30 days to 90 days period compared to 4 & 5 But Drop in the Sales as the Sales is less for the period Assumptions are based on the Graph pattern

Gropuing of Renewed and Not Renewed data

In [24]:
```
sub_16_demo_ren = sub_16_demo[sub_16_demo['Subscription_Status']== "Renewed"]
sub_16_demo_nonren = sub_16_demo[sub_16_demo['Subscription_Status']== "Not Ren
ewed"]

sub_17_demo_ren = sub_17_demo[sub_17_demo['Subscription_Status']== "Renewed"]
sub_17_demo_nonren = sub_17_demo[sub_17_demo['Subscription_Status']== "Not Ren
ewed"]
```

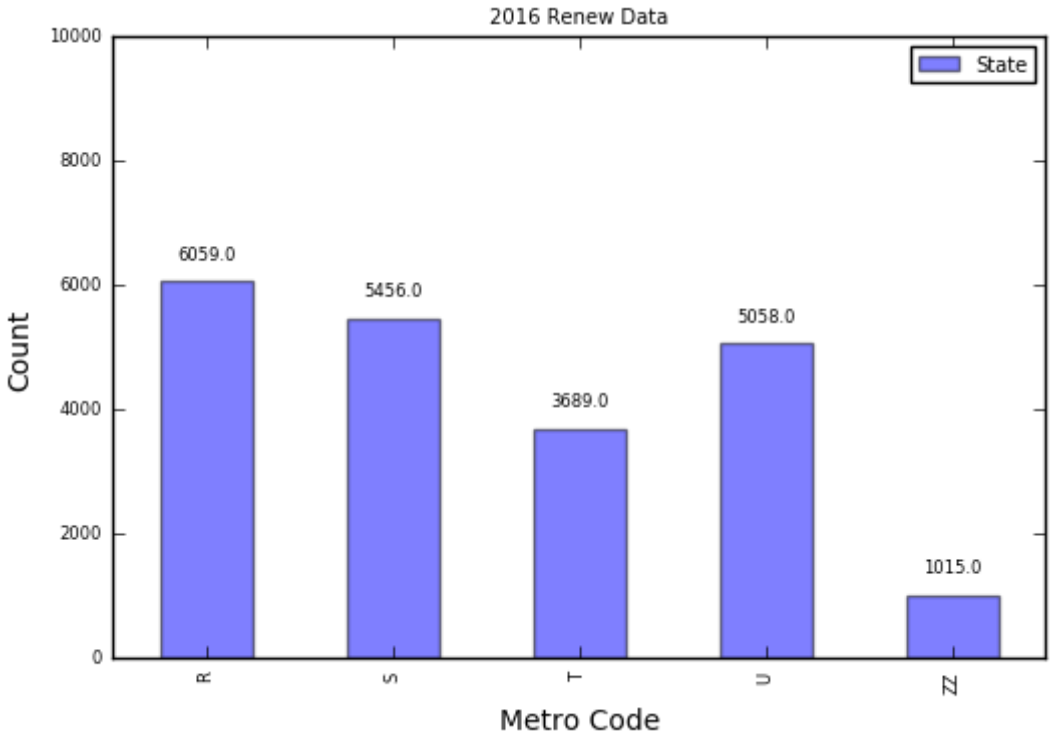
Imputing Missing values "ZZ" in all the columns as the ZZ is not Present in Data as to get the missing value count

In [25]:
```
sub_16_demo_ren.fillna('ZZ', inplace=True)
sub_17_demo_ren.fillna('ZZ', inplace=True)

sub_16_demo_nonren.fillna('ZZ', inplace=True)
sub_17_demo_nonren.fillna('ZZ', inplace=True)
```

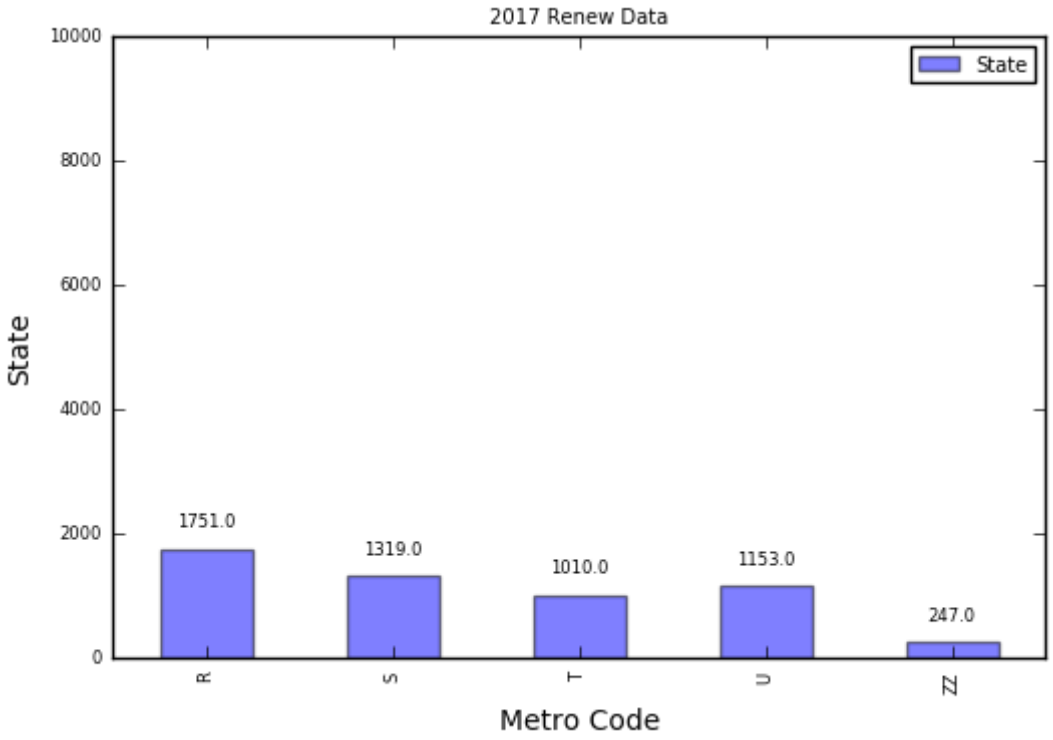
```
C:\Users\dubey\Anaconda2\lib\site-packages\pandas\core\frame.py:2762: Setting
WithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/st
able/indexing.html#indexing-view-versus-copy
  downcast=downcast, **kwargs)
```

Metro Space Analysis { R Rural/Non-Metro , S Suburban, U Urban , T Town }

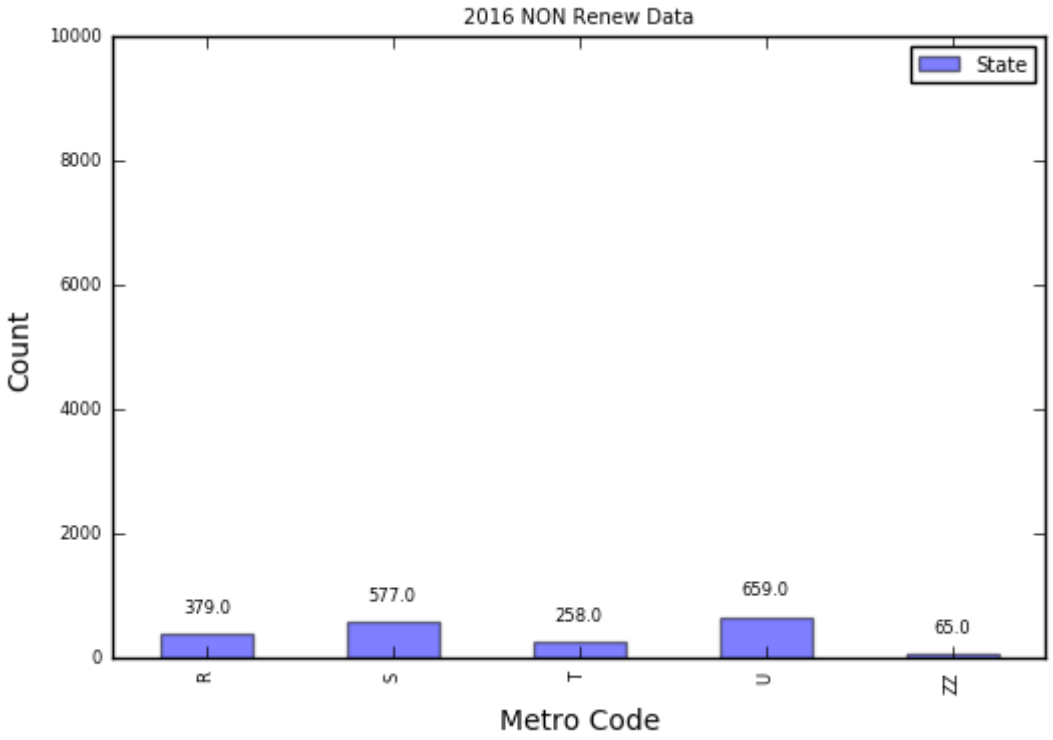
In [26]:
```
 ax = sub_16_demo_ren.groupby(['Metro_Code'])['State'].count().plot(kind="Bar"
 , title= "2016 Renew Data", alpha=0.5 , ylim=(0,10000))
plt.xlabel('Metro Code', fontsize=10)
plt.ylabel('Count', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



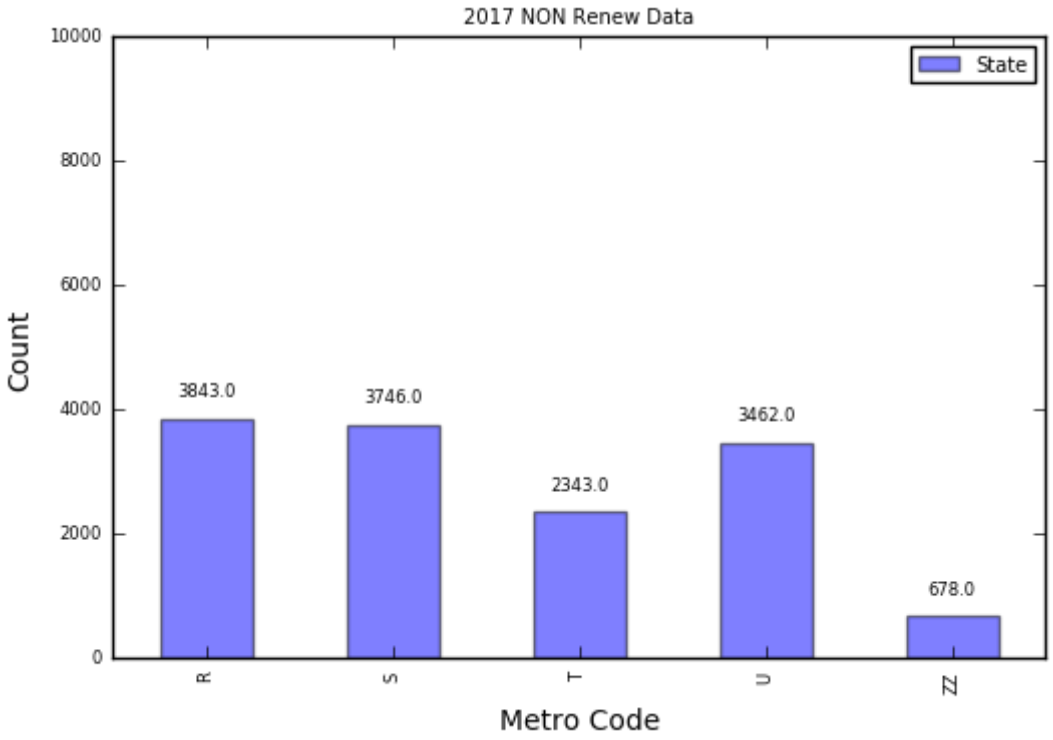
In [27]:
```
 ax = sub_17_demo_ren.groupby(['Metro_Code'])['State'].count().plot(kind="Bar"
 , title= "2017 Renew Data", alpha=0.5 , ylim=(0,10000))
plt.xlabel('Metro Code', fontsize=10)
plt.ylabel('State', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [28]:
```
 ax = sub_16_demo_nonren.groupby(['Metro_Code'])['State'].count().plot(kind="Bar" , title= "2016 NON Renew Data", alpha=0.5 , ylim=(0,10000))
plt.xlabel('Metro Code', fontsize=10)
plt.ylabel('Count', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
plt.legend()
plt.show()
```



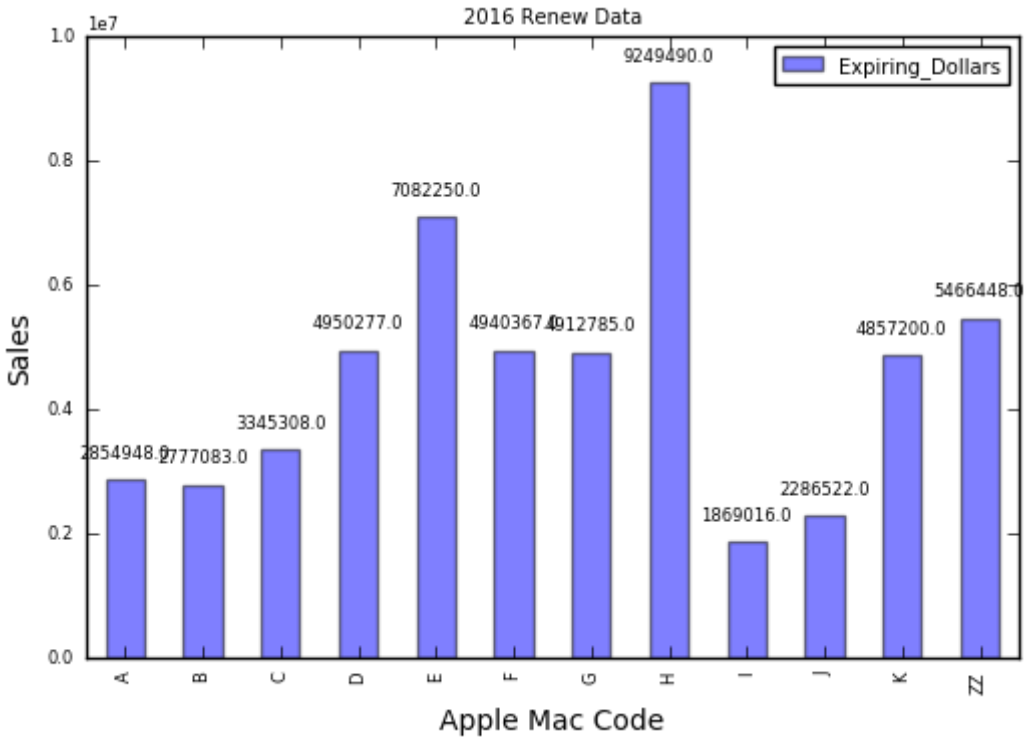
In [29]:
```
 ax = sub_17_demo_nonren.groupby(['Metro_Code'])['State'].count().plot(kind="Bar" , title= "2017 NON Renew Data", alpha=0.5 , ylim=(0,10000))
plt.xlabel('Metro Code', fontsize=10)
plt.ylabel('Count', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
plt.legend()
plt.show()
```



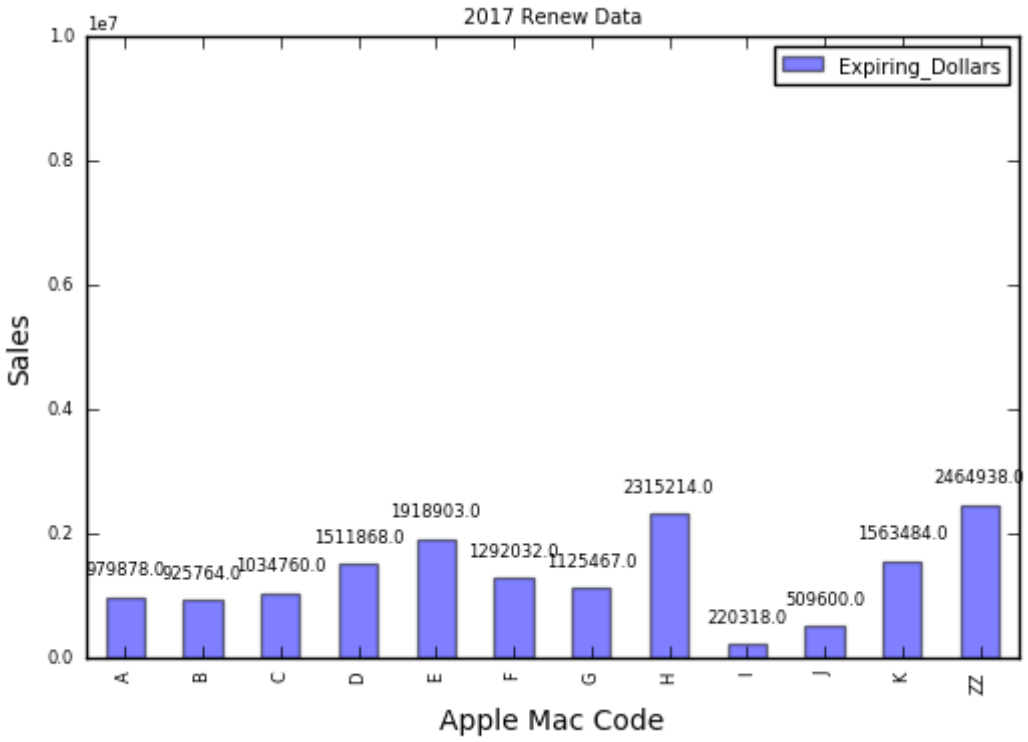
Conclusion # There is Significant amount of Change in the Metro Code # Renewed Data Change 2016 compared to 2017 Rural (2016-2017) : 70% Drop SubUrban (2016-2017) : 75% Drop Town (2016-2017) : 72% Drop Urban (2016-2017) : 77% Drop ZZ(Unkown Space) (2016-2017) : 75% Drop # NON Renewed Data Change 2016 compared to 2017 Rural (2016-2017) : 900% Increase SubUrban (2016-2017) : 549% Increase Town (2016-2017) : 800% Increase Urban (2016-2017) : 400% Increase ZZ(Unkown Space) (2016-2017) : 900% Increase # Values are Approx Values

Apple Mac Code {A 1-9 B 10-24 C 25-49 D 50-99 E 100-249 F 250-499 G 500-999 H 1,000-4,999 I 5,000-9,999 J 10,000 Or More K Unknown Quantity}

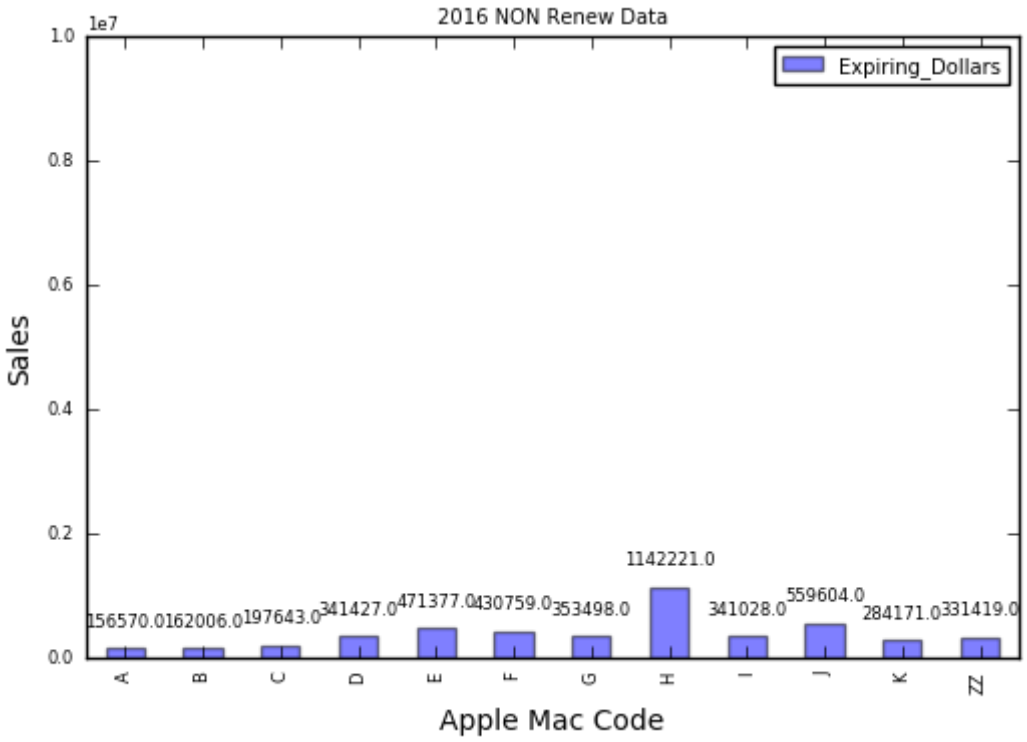
In [30]:
```
 ax = sub_16_demo_ren.groupby(['Apple_Mac_Code'])['Expiring_Dollars'].sum().pl
ot(kind="Bar" , title= "2016 Renew Data", alpha=0.5 , ylim=(0,10000000))
plt.xlabel('Apple Mac Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



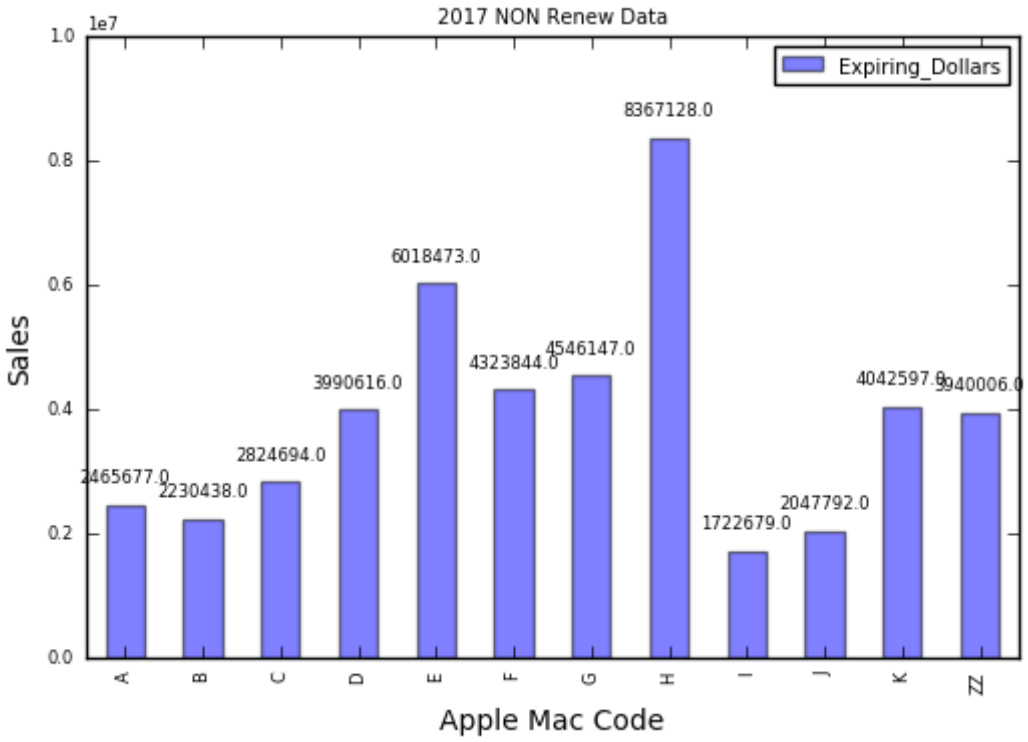
In [31]:
```
 ax = sub_17_demo_ren.groupby(['Apple_Mac_Code'])['Expiring_Dollars'].sum().pl
ot(kind="Bar" , title= "2017 Renew Data", alpha=0.5 , ylim=(0,10000000))
plt.xlabel('Apple Mac Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [32]:
```
 ax = sub_16_demo_nonren.groupby(['Apple_Mac_Code'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 NON Renew Data", alp
ha=0.5 , ylim=(0,10000000))
plt.xlabel('Apple Mac Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



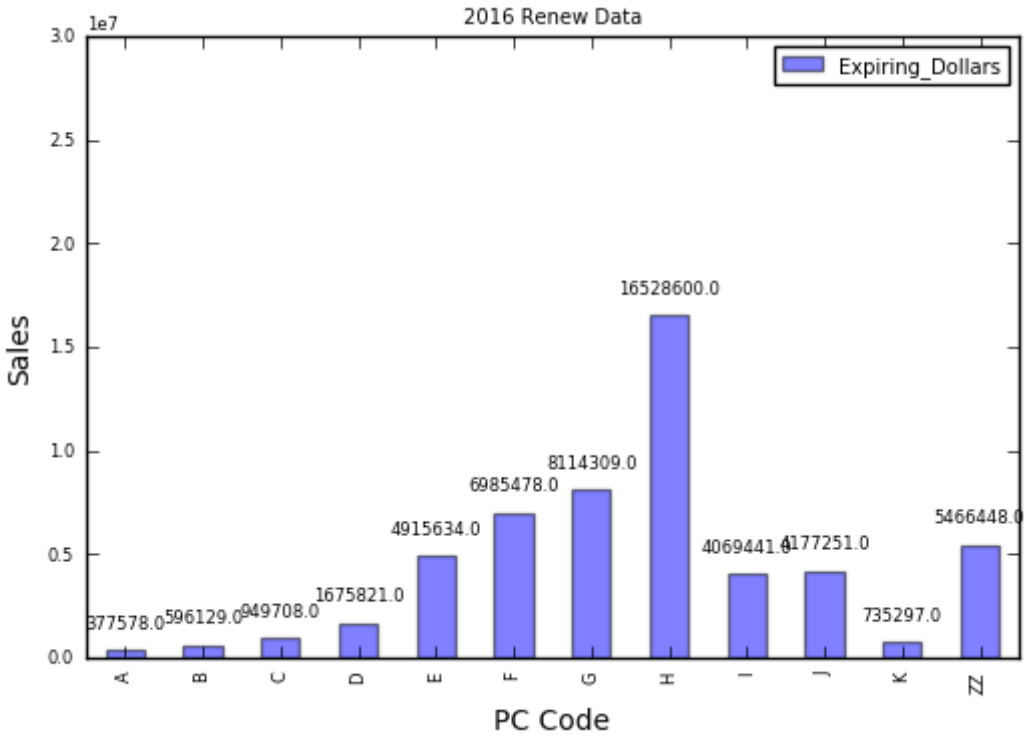
In [33]:
```
 ax = sub_17_demo_nonren.groupby(['Apple_Mac_Code'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 NON Renew Data", alp
ha=0.5 , ylim=(0,10000000))
plt.xlabel('Apple Mac Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



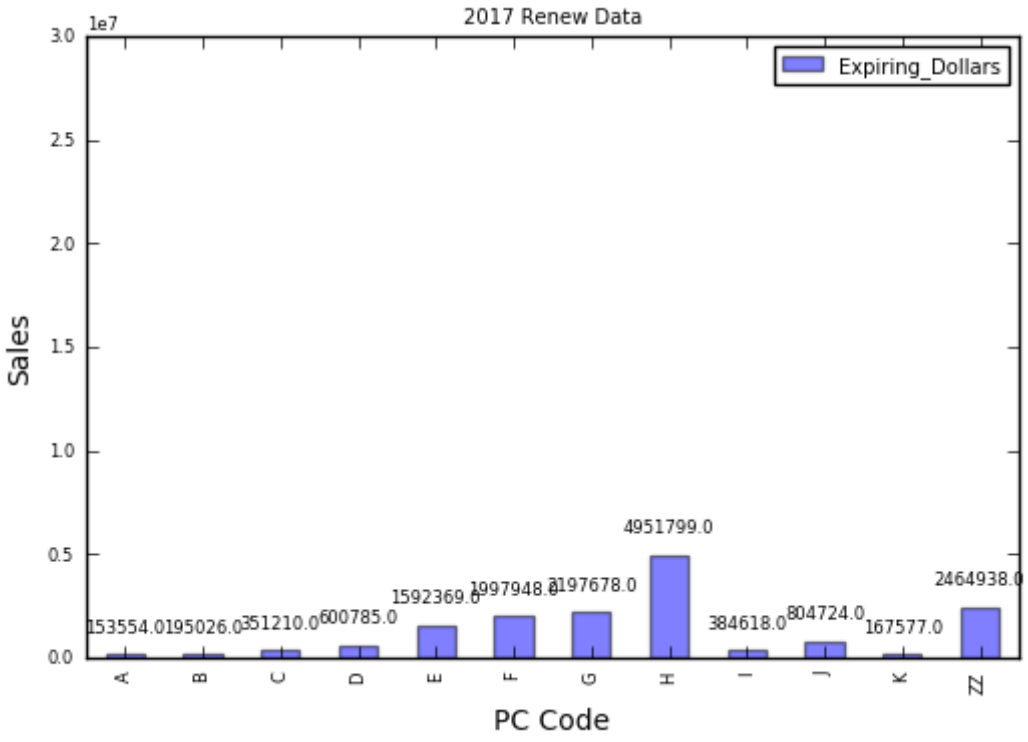
Conclusion # Apple Mac Code "H" (1,000-4,999) is high in Non renew Data of 2016 Compared to 2017 # Null values has Significatntly Increased # Difference in Non renew Pattern is Different from 2016 to 2017 # Assumptions are based on the Sales figure pattern

PC Code A 1-9 B 10-24 C 25-49 D 50-99 E 100-249 F 250-499 G 500-999 H 1,000-4,999 I 5,000-9,999 J 10,000 Or More K Unknown Quantity)

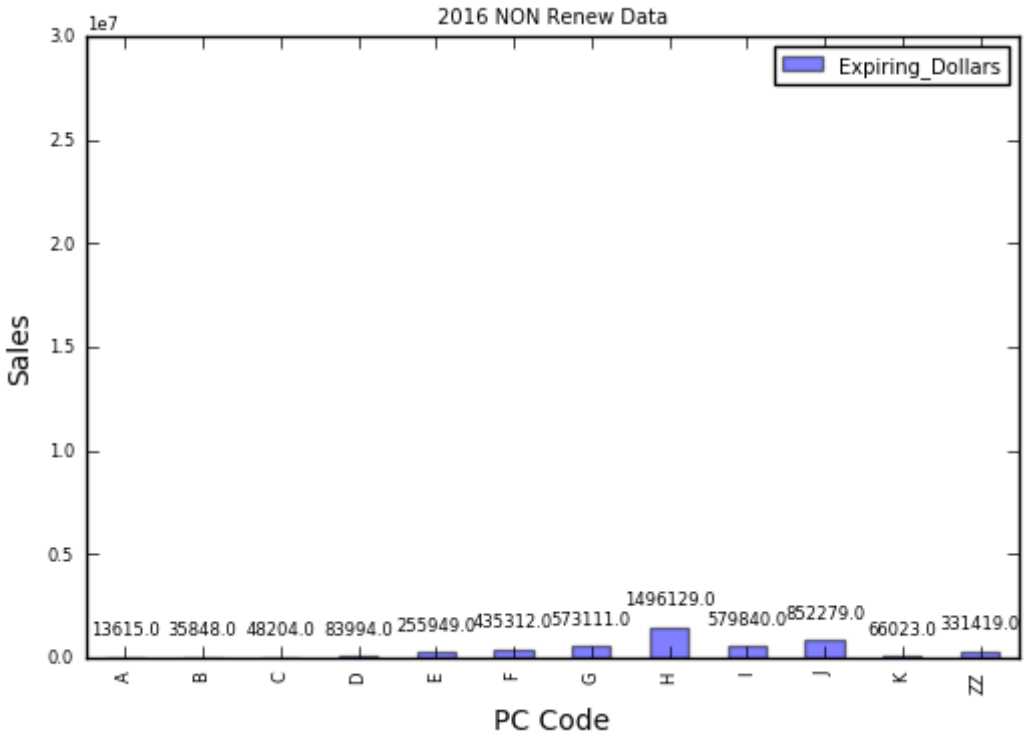
In [34]:
```
 ax = sub_16_demo_ren.groupby(['PC_Code'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 Renew Data",
alpha=0.5 , ylim=(0,30000000))
plt.xlabel('PC Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



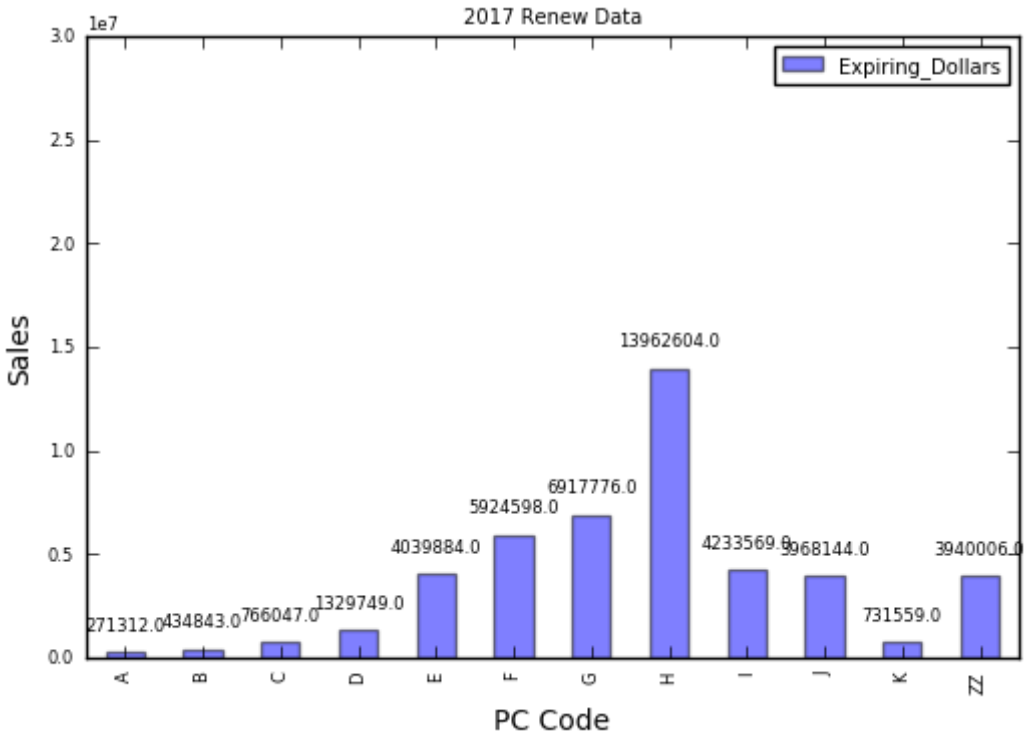
In [35]:
```
 ax = sub_17_demo_ren.groupby(['PC_Code'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 Renew Data",
alpha=0.5 , ylim=(0,30000000))
plt.xlabel('PC Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [36]:
```
 ax = sub_16_demo_nonren.groupby(['PC_Code'])['Expiring_Dollars'].sum().plot(k
ind="Bar" , title= "2016 NON Renew Data", alpha=0.5 , ylim=(0,30000000))
plt.xlabel('PC Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



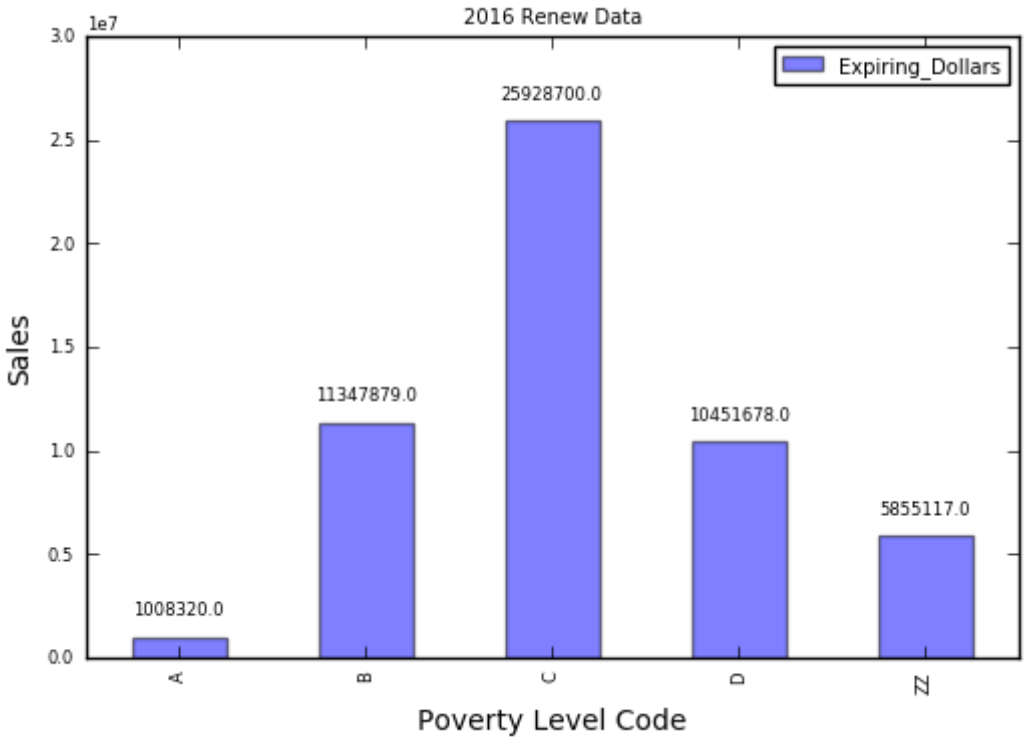
In [37]:
```
 ax = sub_17_demo_nonren.groupby(['PC_Code'])['Expiring_Dollars'].sum().plot(k
ind="Bar" , title= "2017 Renew Data", alpha=0.5 , ylim=(0,30000000))
plt.xlabel('PC Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



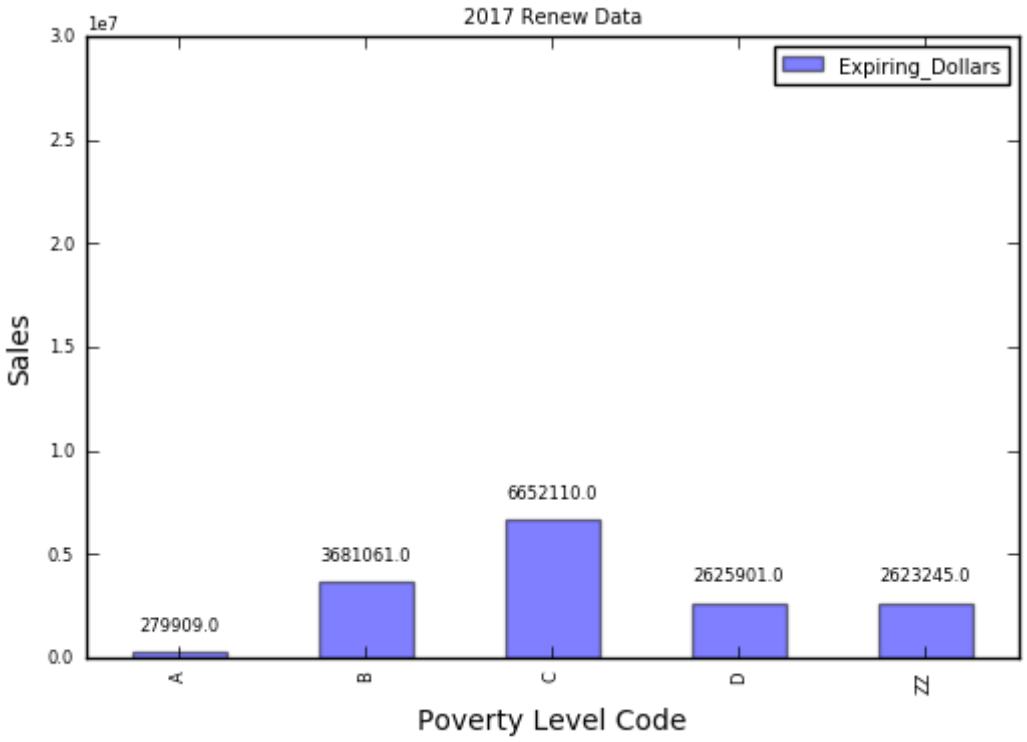
Conclusion # PC Code Missing values has been increased in 2017 compared to 2016 in Renewed Data # Rest all is Same based on plot Pattren

Poverty Level (A 0 - 5.9 Percent B 6 - 15.9 Percent C 16 - 30.9 Percent D 31 Percent Or More E Unclassified)

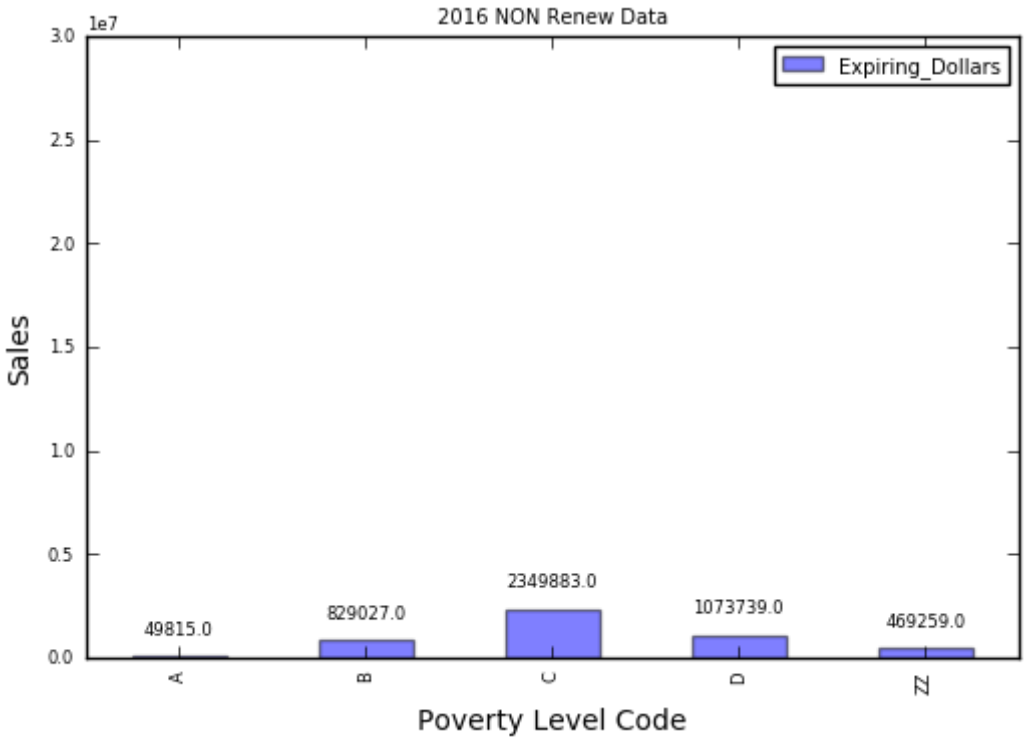
In [38]:
```
 ax = sub_16_demo_ren.groupby(['Poverty_Level_Code'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 Renew Data",
alpha=0.5 , ylim=(0,30000000))
plt.xlabel('Poverty Level Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



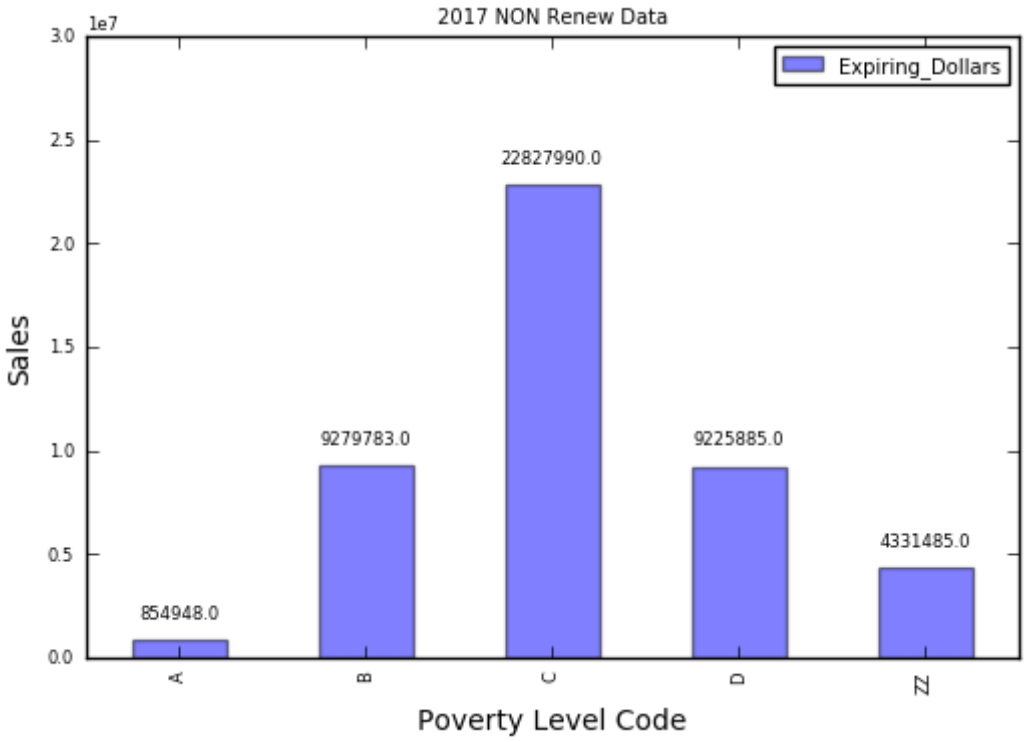
In [39]:
```
 ax = sub_17_demo_ren.groupby(['Poverty_Level_Code'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 Renew Data",
alpha=0.5 , ylim=(0,30000000))
plt.xlabel('Poverty Level Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [40]:
```
 ax = sub_16_demo_nonren.groupby(['Poverty_Level_Code'])['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 NON Renew Data", alpha=0.5 , ylim=(0,30000000))
plt.xlabel('Poverty Level Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
plt.legend()
plt.show()
```



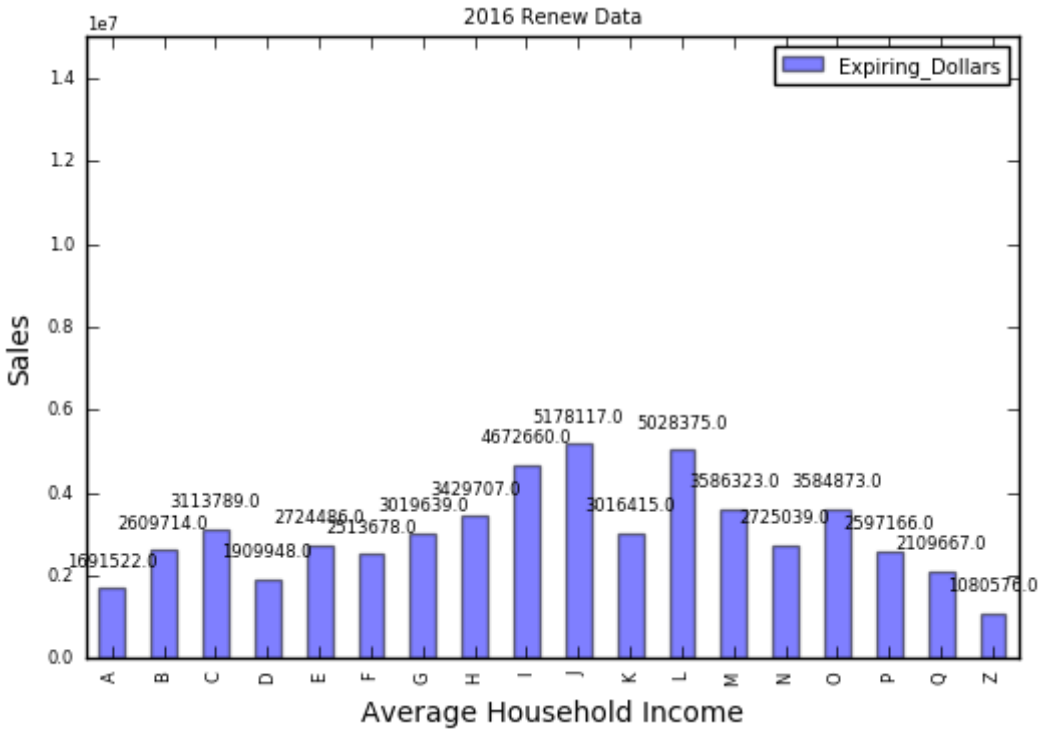
In [41]:
```
 ax = sub_17_demo_nonren.groupby(['Poverty_Level_Code'])['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 NON Renew Data", alpha=0.5 , ylim=(0,30000000))
plt.xlabel('Poverty Level Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
plt.legend()
plt.show()
```



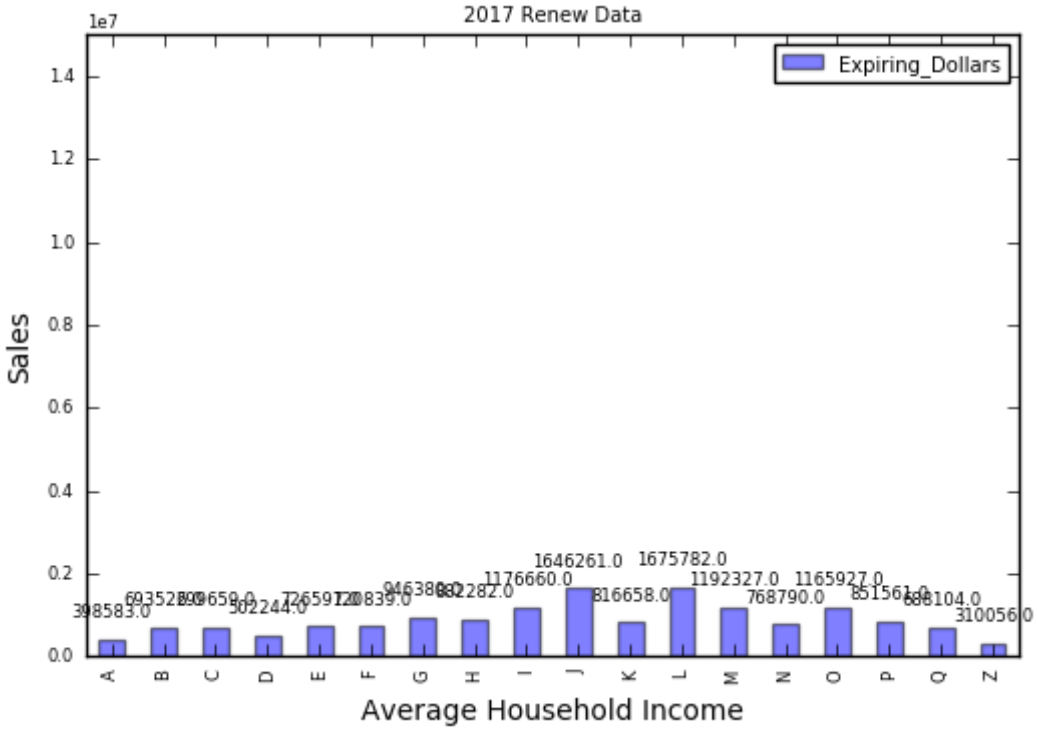
Conclusion # NO DIffererence in the Poverty Level Code Based on the Pattern Structure in the plot

Average House hold Income { A 1-27,999 B 28,000-31,999 C 32,000-34,999 D 35,000-36,999 E 37,000-38,999 F 39,000-40,999 G 41,000-42,999 H 43,000-44,999 I 45,000-47,999 J 48,000-51,999 K 52,000-54,999 L 55,000-59,999 M 60,000-64,999 N 65,000-69,999 O 70,000-80,999 P 81,000-93,999 Q 94,000 Plus Z unclassified }

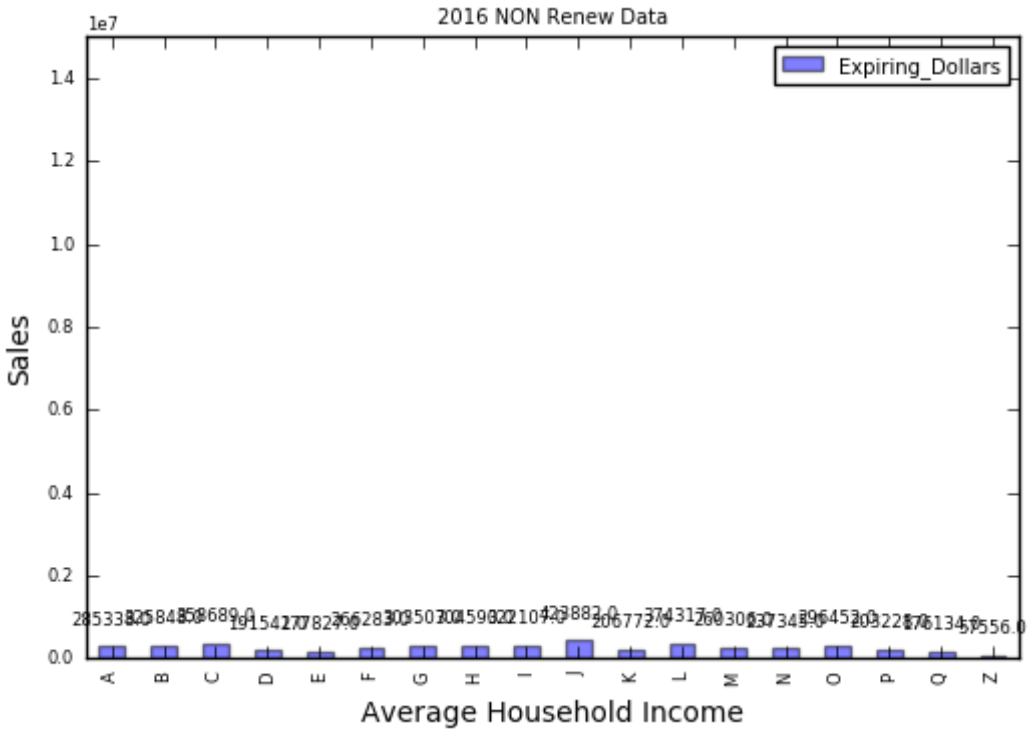
In [42]:
```
 ax = sub_16_demo_ren.groupby(['Avg_Household_Income'])['Expiring_Dollars'].su
m().plot(kind="Bar" , title= "2016 Renew Data", alpha=0.5 , ylim=(0,15000000))
plt.xlabel('Average Household Income', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



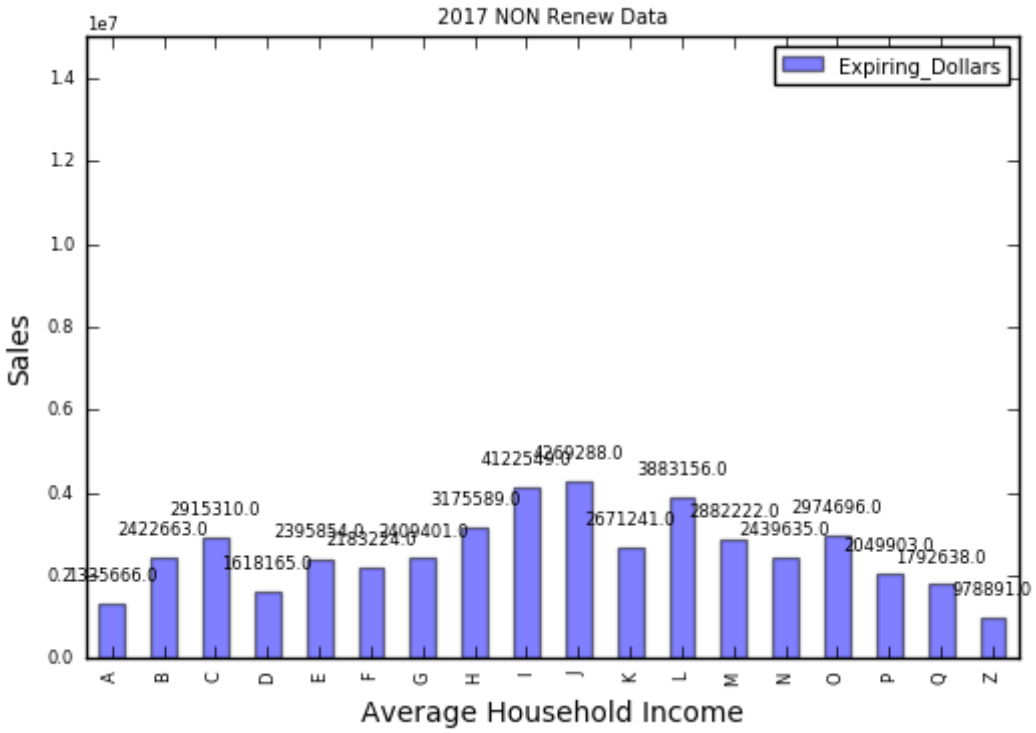
In [43]:
```
 ax = sub_17_demo_ren.groupby(['Avg_Household_Income'])['Expiring_Dollars'].su
m().plot(kind="Bar" , title= "2017 Renew Data", alpha=0.5 , ylim=(0,15000000))
plt.xlabel('Average Household Income', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [44]:
```
 ax = sub_16_demo_nonren.groupby(['Avg_Household_Income'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 NON Renew Data", alp
ha=0.5 , ylim=(0,15000000))
plt.xlabel('Average Household Income', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



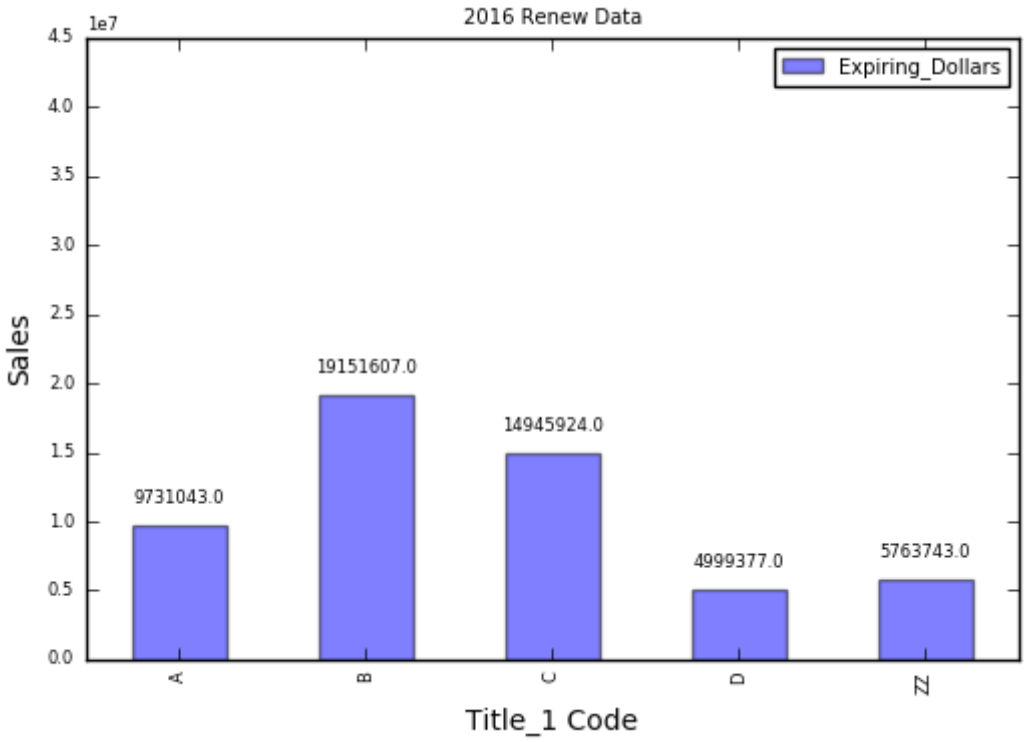
In [45]:
```
 ax = sub_17_demo_nonren.groupby(['Avg_Household_Income'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 NON Renew Data", alp
ha=0.5 , ylim=(0,15000000))
plt.xlabel('Average Household Income', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



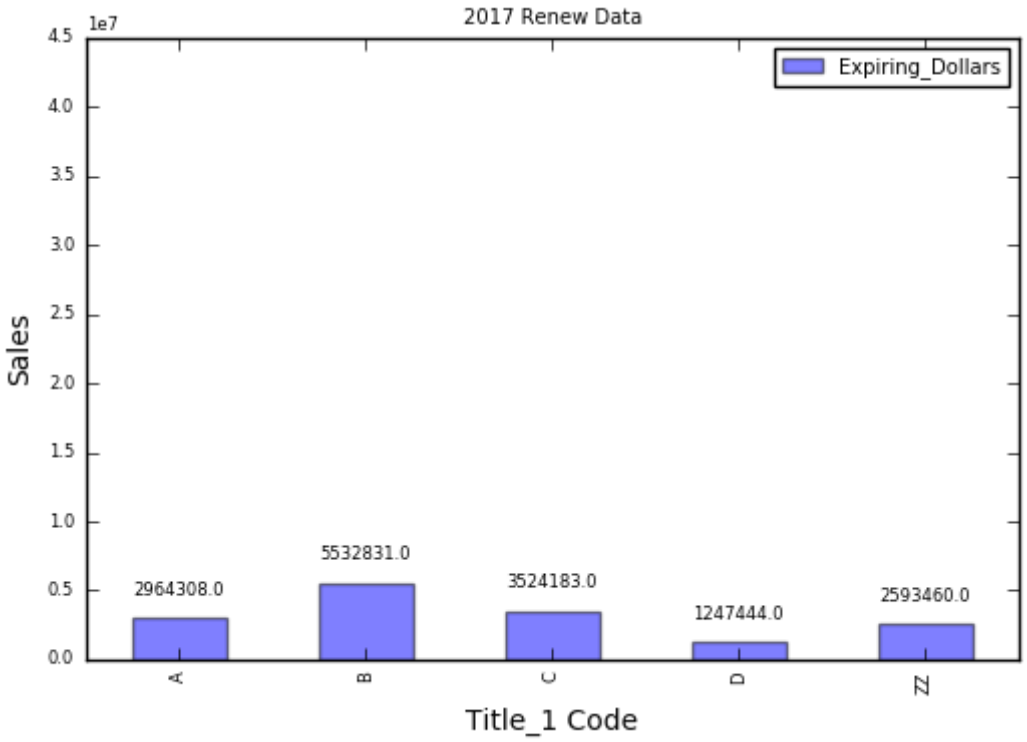
Conclusion Slight Decrease in the Avg House hold Income for the A Category A = 1-27,999 compared 2016 to 2017

Title_1_Code A $.00-$***149.99 B*** $150.00-$***299.99 C*** $300.00-$***499.99 D $500.00 Plus Space Unclassified***

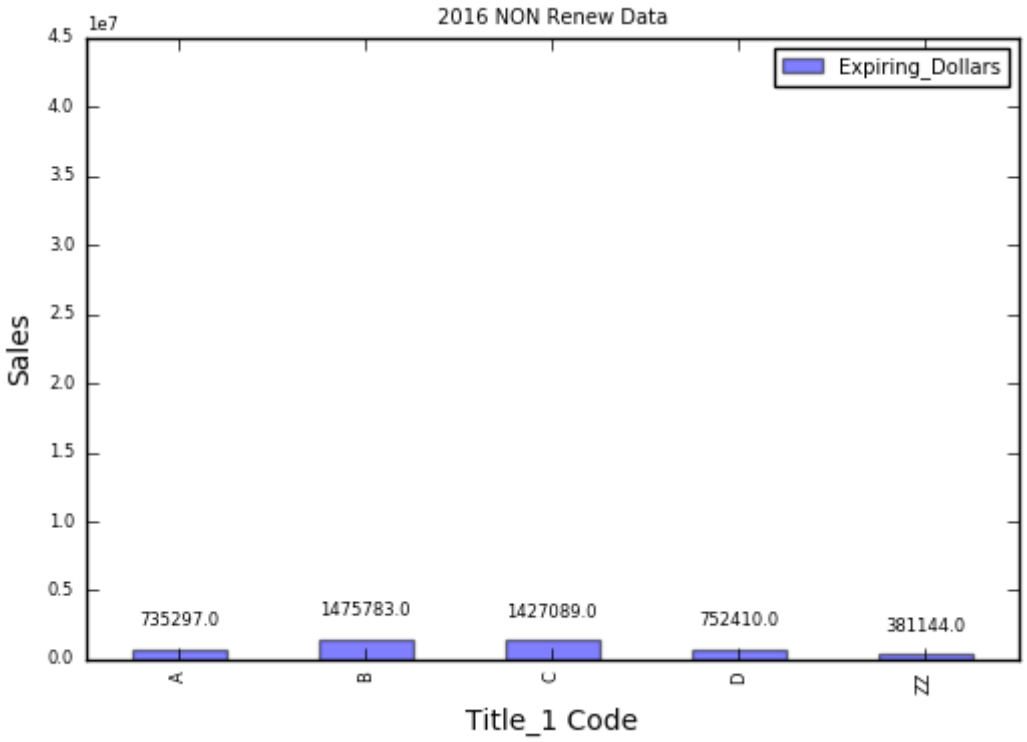
In [46]:
```
 ax = sub_16_demo_ren.groupby(['Title_1_Code'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 Renew Data",
alpha=0.5 , ylim=(0,45000000))
plt.xlabel('Title_1 Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



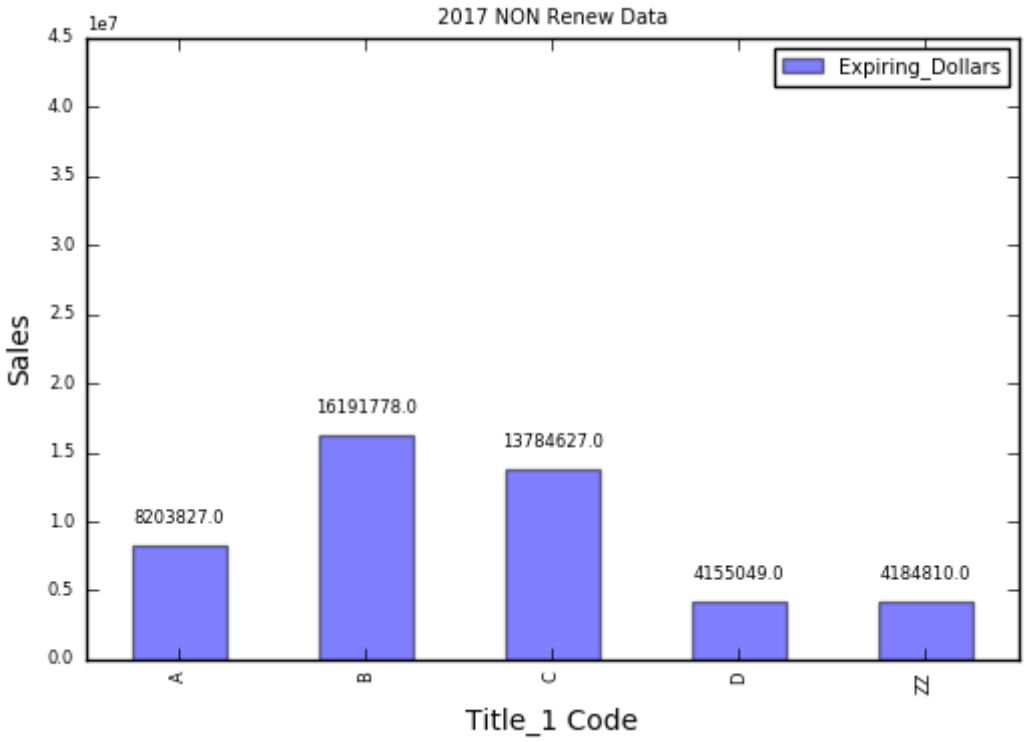
In [47]:
```
 ax = sub_17_demo_ren.groupby(['Title_1_Code'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 Renew Data",
alpha=0.5 , ylim=(0,45000000))
plt.xlabel('Title_1 Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [48]:
```
 ax = sub_16_demo_nonren.groupby(['Title_1_Code'])['Expiring_Dollars'].sum().p
lot(kind="Bar" , title= "2016 NON Renew Data", alpha=0.5 , ylim=(0,45000000))
plt.xlabel('Title_1 Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



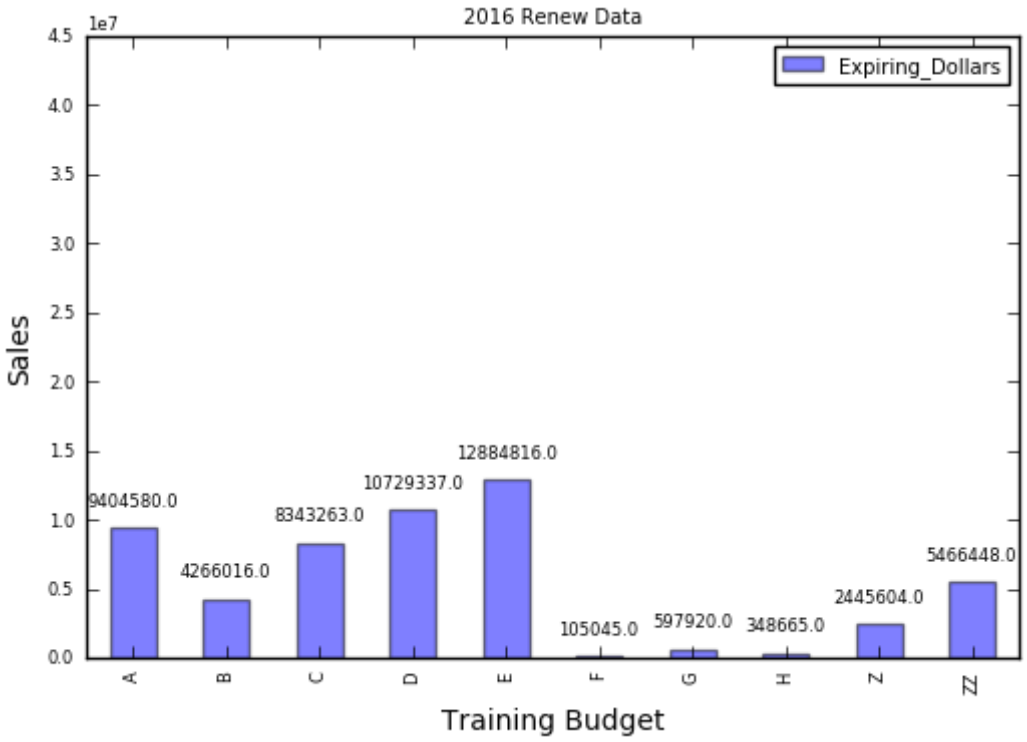
In [49]:
```
 ax = sub_17_demo_nonren.groupby(['Title_1_Code'])['Expiring_Dollars'].sum().p
lot(kind="Bar" , title= "2017 NON Renew Data", alpha=0.5 , ylim=(0,45000000))
plt.xlabel('Title_1 Code', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



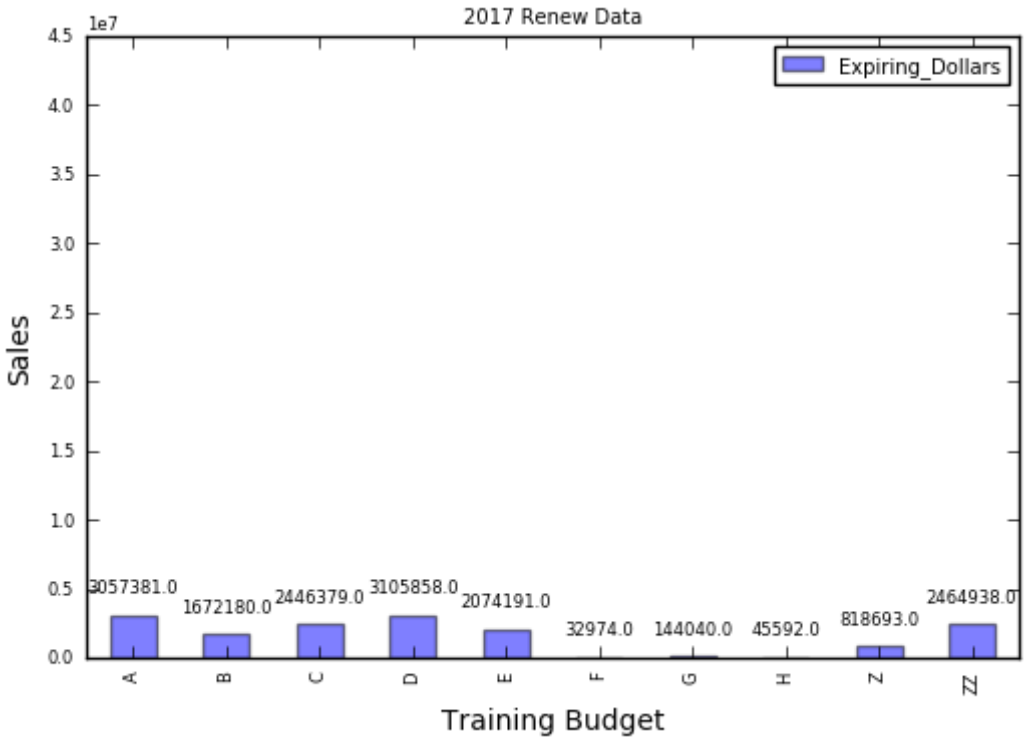
Conclusion # In 2017 both Renewed and Non Renewed Data "Category D " - D $500.00 Plus has been declined compared to 2016 # Misssing Values has been Increased in 2017 compare to 2016 for Both Renew and Non Renew Data

Training_Budget_Per_head "A $1-$ ***4 B*** $5-$ ***6 C*** $7-$ ***8 D*** $9-$ ***10 E*** $11-$ ***13 F*** $14-$ ***16 G*** $17-$ ***24 H $25 + Z Unclassified***

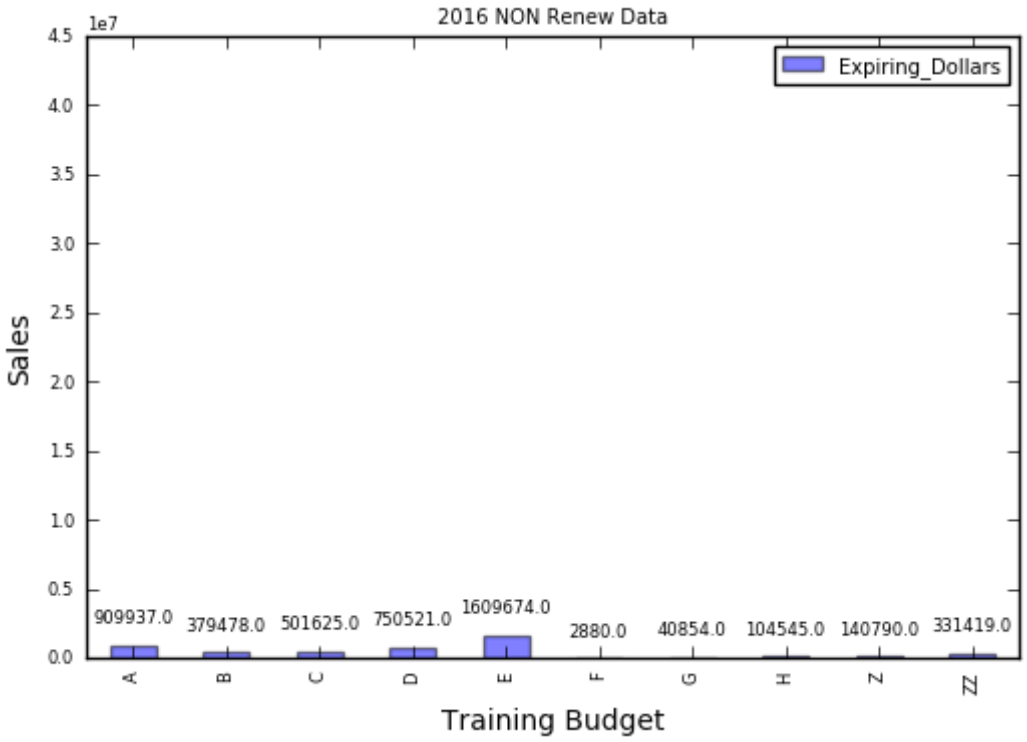
In [50]:
```
 ax = sub_16_demo_ren.groupby(['Training_Budget_Per_head'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 Renew Data",
alpha=0.5 , ylim=(0,45000000))
plt.xlabel('Training Budget', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



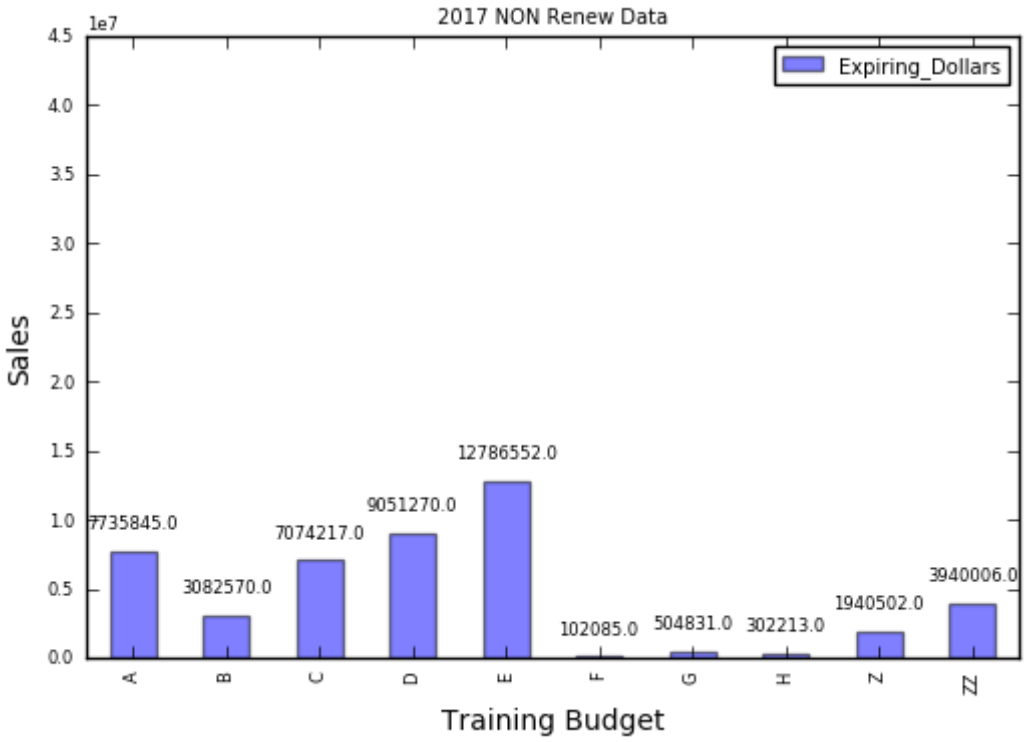
In [51]:
```
 ax = sub_17_demo_ren.groupby(['Training_Budget_Per_head'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 Renew Data",
alpha=0.5 , ylim=(0,45000000))
plt.xlabel('Training Budget', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [52]:
```
 ax = sub_16_demo_nonren.groupby(['Training_Budget_Per_head'])['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2016 NON Renew Data", alpha=0.5 , ylim=(0,45000000))
plt.xlabel('Training Budget', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
plt.legend()
plt.show()
```



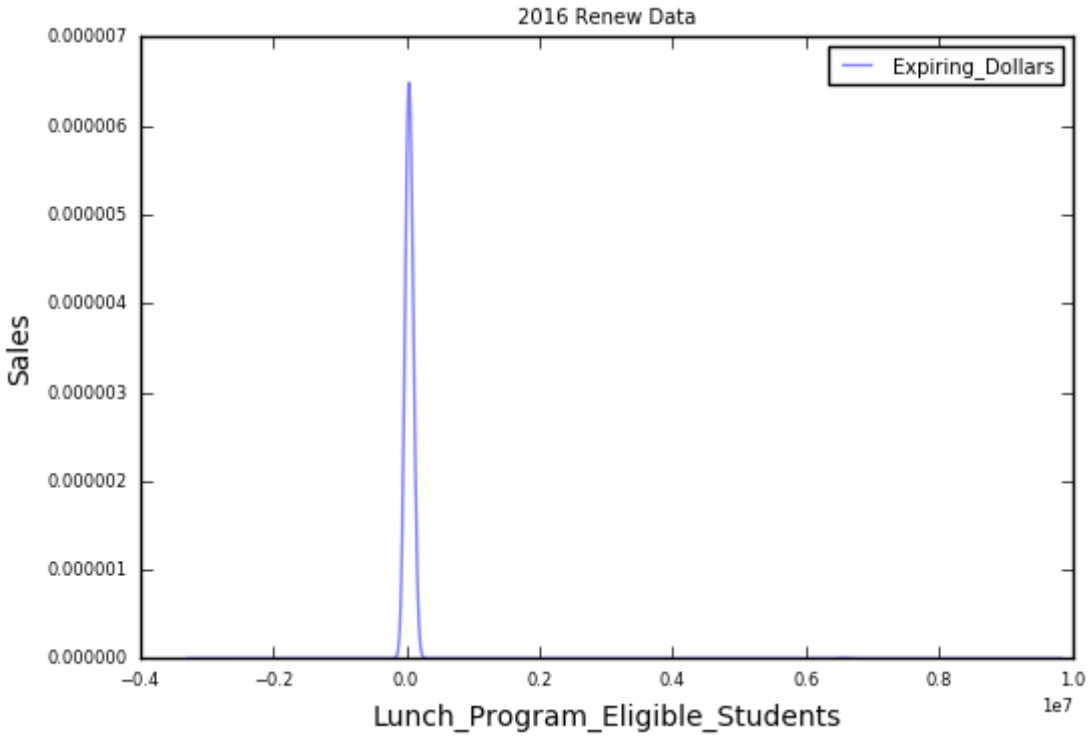
In [53]:
```
 ax = sub_17_demo_nonren.groupby(['Training_Budget_Per_head'])['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 NON Renew Data", alpha=0.5 , ylim=(0,45000000))
plt.xlabel('Training Budget', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
plt.legend()
plt.show()
```



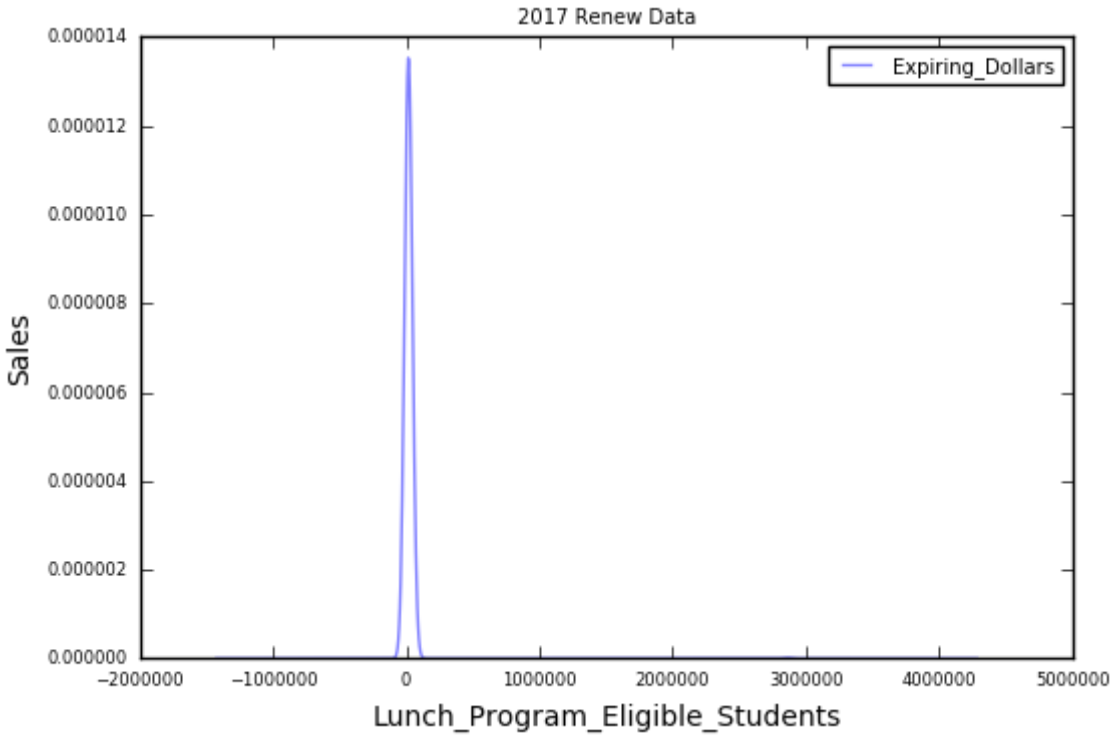
Conclusion # Traning budget E has decline for renew data 2017 E $11-13$ # Where as D $9-10$ Category has been Increased for Non Reneweed Data # Increasein Missing Values

Lunch_Program_Eligible_Students

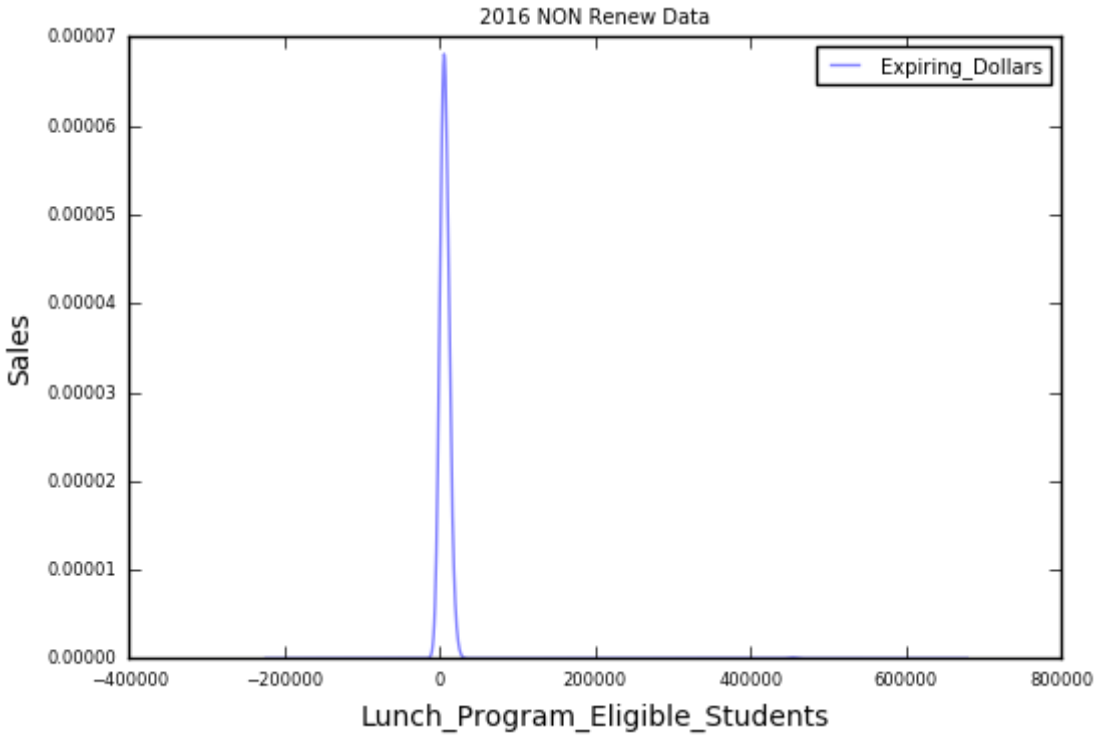
In [54]:
```
 ax = sub_16_demo_ren.groupby(['Lunch_Program_Eligible_Students'])['Expiring_D
ollars'].sum().plot(kind="density" , title= "2016 Renew Data", alpha=0.5 )
plt.xlabel('Lunch_Program_Eligible_Students', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



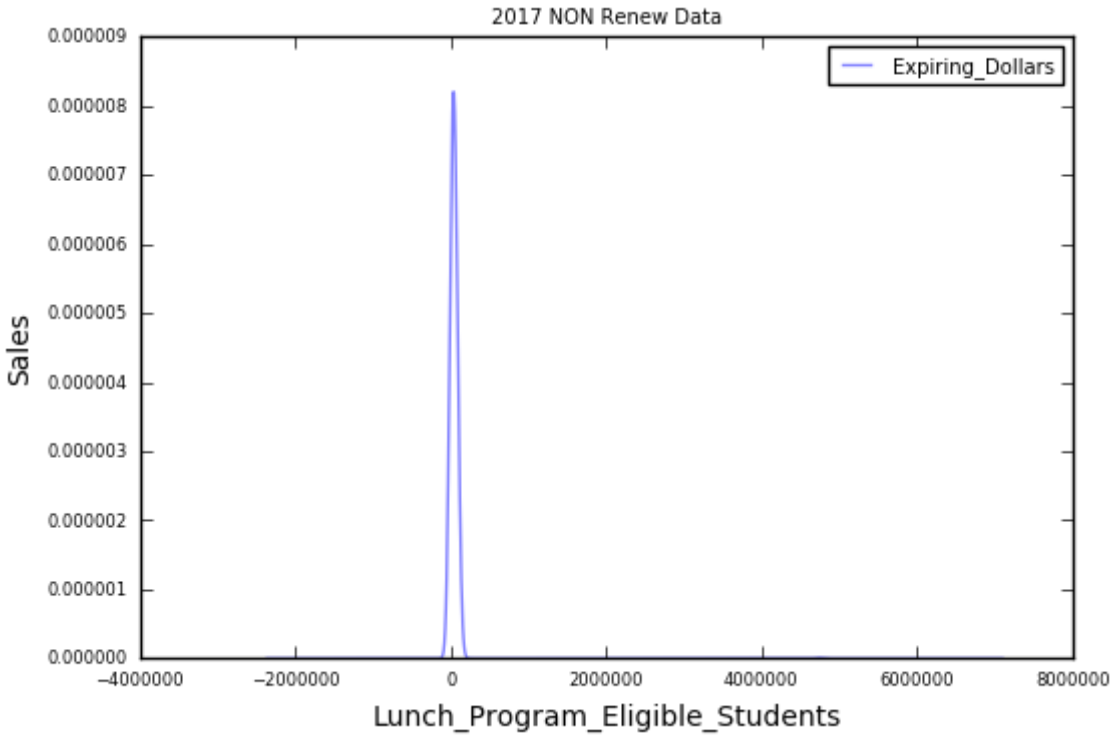
In [55]:
```
 ax = sub_17_demo_ren.groupby(['Lunch_Program_Eligible_Students'])['Expiring_D
ollars'].sum().plot(kind="density" , title= "2017 Renew Data", alpha=0.5 )
plt.xlabel('Lunch_Program_Eligible_Students', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



In [56]:
```
 ax = sub_16_demo_nonren.groupby(['Lunch_Program_Eligible_Students'])['Expirin
g_Dollars'].sum().plot(kind="density" , title= "2016 NON Renew Data", alpha=0.
5 )
plt.xlabel('Lunch_Program_Eligible_Students', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



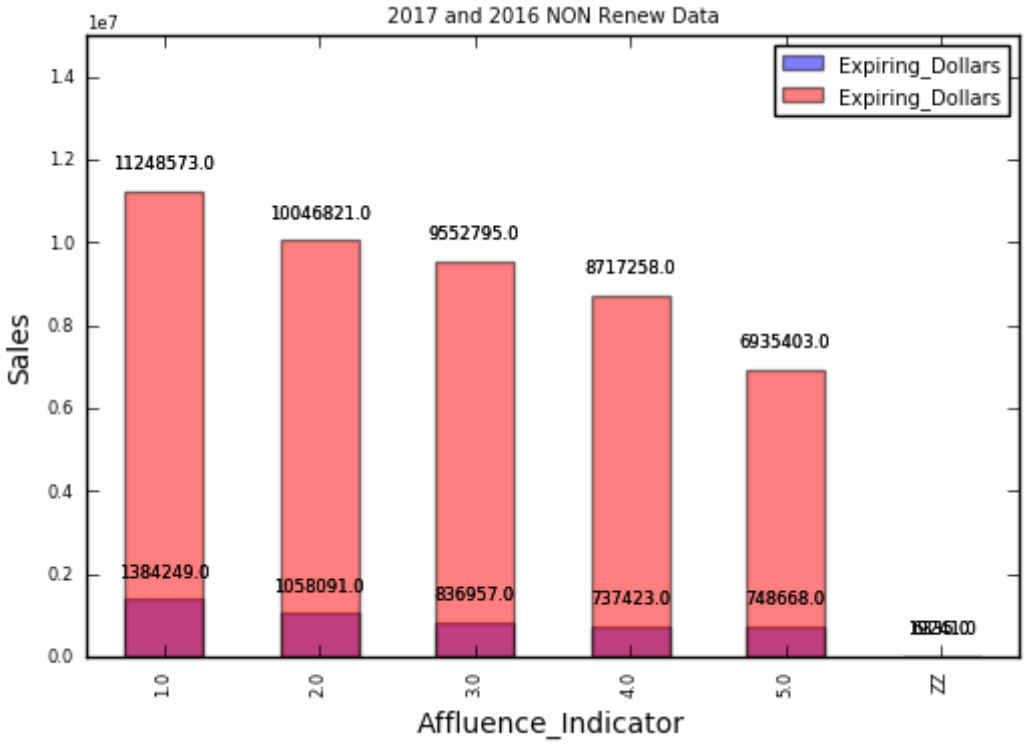
In [57]:
```
 ax = sub_17_demo_nonren.groupby(['Lunch_Program_Eligible_Students'])['Expirin
g_Dollars'].sum().plot(kind="density" , title= "2017 NON Renew Data", alpha=0.
5 )
plt.xlabel('Lunch_Program_Eligible_Students', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



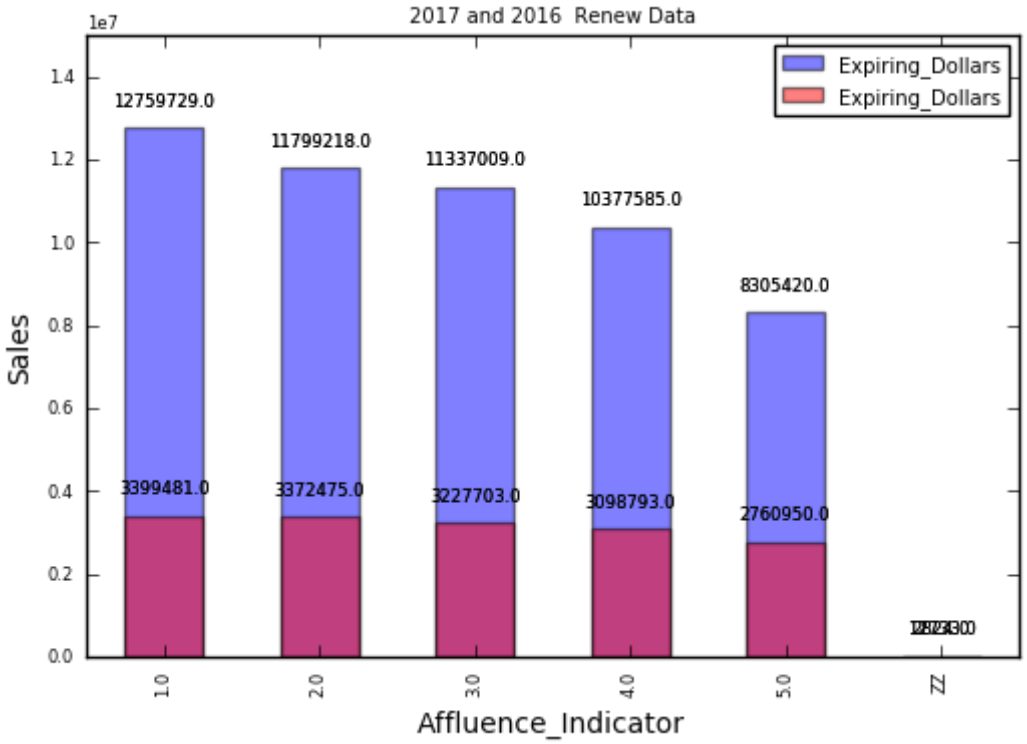
Conclusion NO Significant amount of Changes in 2016 as compare to 2017

Affluence_Indicator 1 Low 2 Below Average 3 Average 4 Above Average 5 High Space Unknown

In [58]:
```
ax1 = sub_16_demo_nonren.groupby(['Affluence_Indicator'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 and 2016 NON Renew D
ata", alpha=0.5,color="Blue" ,ylim=(0,15000000))
ax = sub_17_demo_nonren.groupby(['Affluence_Indicator'])['Expiring_Dollars'].s
um().plot(kind="Bar" , title= "2017 and 2016 NON Renew Data",
alpha=0.5,color="Red" ,ylim=(0,15000000))
plt.xlabel('Affluence_Indicator', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax1.patches:
    ax1.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.g
et_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poi
nts')
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```

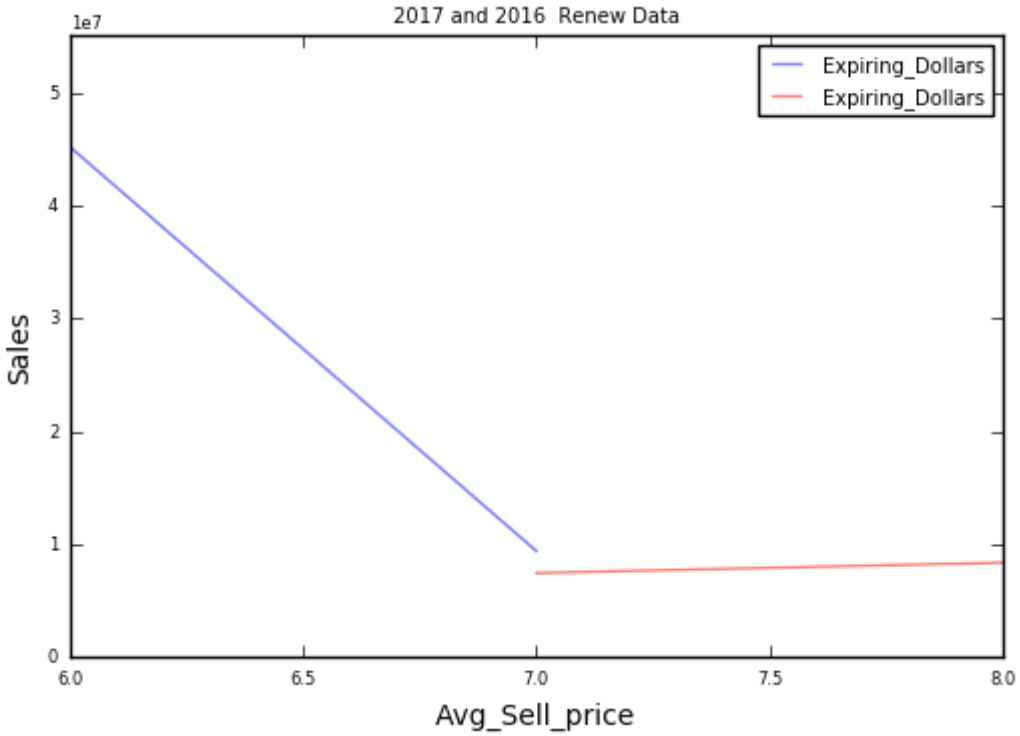


In [59]:
```
ax1 = sub_16_demo_ren.groupby(['Affluence_Indicator'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 and 2016  Renew Dat
a", alpha=0.5,color="Blue" ,ylim=(0,15000000))
ax = sub_17_demo_ren.groupby(['Affluence_Indicator'])
['Expiring_Dollars'].sum().plot(kind="Bar" , title= "2017 and 2016  Renew Dat
a", alpha=0.5,color="Red" ,ylim=(0,15000000))
plt.xlabel('Affluence_Indicator', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax1.patches:
    ax1.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.g
et_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poi
nts')
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```

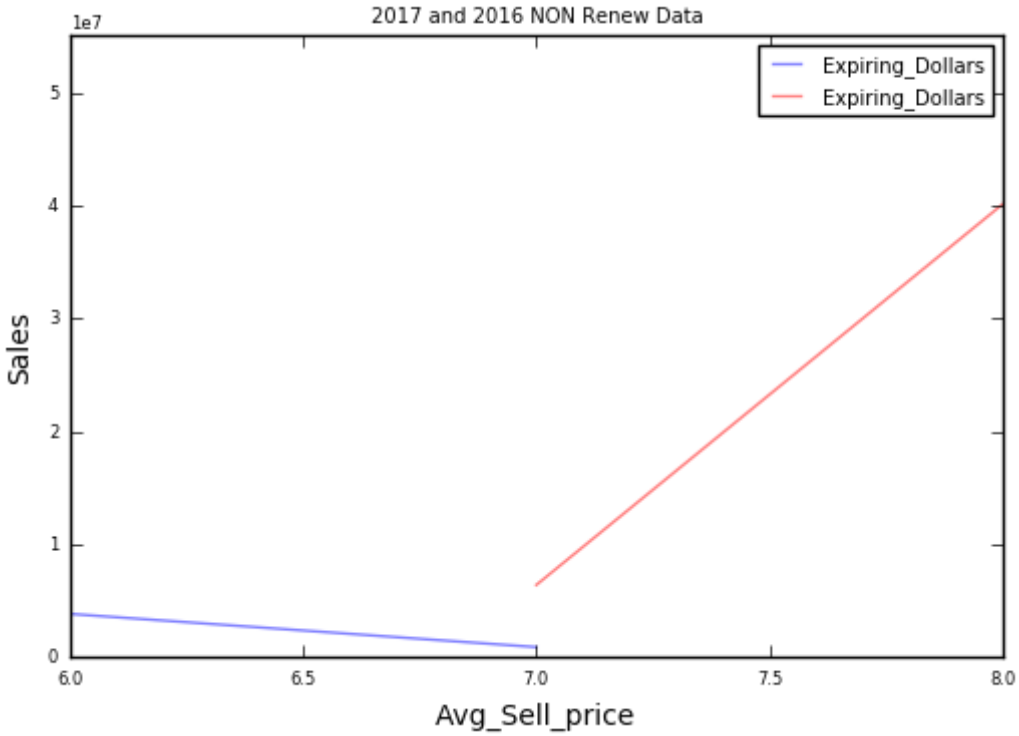


Average Selling Price = Sales / Number of Students

In [60]:
```
ax1 = sub_16_demo_ren.groupby(['Avg_Sell_price'])['Expiring_Dollars'].sum().plot(kind="line" , title= "2017 and 2016  Renew Data", alpha=0.5,color="Blue" ,ylim=(0,55000000))
ax = sub_17_demo_ren.groupby(['Avg_Sell_price'])['Expiring_Dollars'].sum().plot(kind="line" , title= "2017 and 2016  Renew Data", alpha=0.5,color="Red" ,ylim=(0,55000000))
plt.xlabel('Avg_Sell_price', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax1.patches:
    ax1.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset points')
plt.legend()
plt.show()
```



In [61]:
```
ax1 = sub_16_demo_nonren.groupby(['Avg_Sell_price'])
['Expiring_Dollars'].sum().plot(kind="line" , title= "2017 and 2016 NON  Renew
 Data", alpha=0.5,color="Blue" ,ylim=(0,55000000))
ax = sub_17_demo_nonren.groupby(['Avg_Sell_price'])
['Expiring_Dollars'].sum().plot(kind="line" , title= "2017 and 2016 NON Renew
 Data", alpha=0.5,color="Red" ,ylim=(0,55000000))
plt.xlabel('Avg_Sell_price', fontsize=10)
plt.ylabel('Sales', fontsize=10)
for p in ax1.patches:
    ax1.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.g
et_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poi
nts')
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



Conclusion Non Subscriber Data got Increased when the price increased from 7.0 to 8.0 on a contarary when the price increased from 6.0 to 7.0 t there is non renew subscriber got less Primary Reason for non subscription is the Avg price increased in 2017

Data Modelling

Label Encoding on Data For Modelling

In [62]:
```
# Creating the Training Data
frames = [sub_16_demo_ren, sub_16_demo_nonren, sub_17_demo_ren]
Final_train = pd.concat(frames)
```

In [63]:
```
# Manupulating the Data , For Missing Data iMputing Random value
# IN Subscription End Date and Renewal Date

Final_train.loc[(Final_train.Subscription_End_Date== 'ZZ') ,'Subscription_End_
Date' ] = 0
Final_train.loc[(Final_train.Renewal_Date== 'ZZ') ,'Renewal_Date' ] = 0

test = pd.DataFrame(sub_17_demo_nonren)
test['Subscription_End_Date'] = test['Subscription_End_Date'].apply(pd.to_date
time)

Final_train['Subscription_End_Date'] = Final_train['Subscription_End_Date'].ap
ply(pd.to_datetime)
Final_train['Renewal_Date'] =
Final_train['Renewal_Date'].apply(pd.to_datetime)

Final_train.loc[(Final_train.Renew_delay== 'ZZ') ,'Renew_delay' ] = 999
test.loc[(test.Renew_delay== 'ZZ') ,'Renew_delay' ] = 999
```

In [64]:
```
# Saving the Files  Training and Test

Final_train.to_csv("D:\\Analytics
Excercise\\AnalyticsExercise\\Data\\Findings\\Train.csv", index=True ,
header=True)
test.to_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\Findings\\test.
csv", index=True , header=True)
```

In [65]:
```
# Manually Labelling the Subscription_Status for further analysis
y = pd.DataFrame(Final_train['Subscription_Status'])
Final_train = Final_train.drop('Subscription_Status', 1)
test = test.drop('Subscription_Status', 1)

y.loc[(y.Subscription_Status== 'Renewed') ,'Subscription_Status' ] = 0
y.loc[(y.Subscription_Status== 'Not Renewed') ,'Subscription_Status' ] = 1

Y_train = list(y.Subscription_Status.values)
```

In [66]:
```
# Encoding the variable
Final_train_Data = Final_train.apply(lambda x: d[x.name].fit_transform(x))
test_Data = test.apply(lambda x: d1[x.name].fit_transform(x))
```

In [67]:
```
# Checking the Corrrelation Matrix
Corr_Analysis_Train = Final_train_Data.corr()
Corr_Analysis_Train.to_csv("D:\\Analytics
Excercise\\AnalyticsExercise\\Data\\Findings\\Corr_Analysis_Train.csv",
index=True , header=True)
Corr_Analysis_Train
```

Out[67]:

	ID	State	Subscription_End_Date	Expirin
ID	1.000000	-0.095962	-0.011059	0.0184
State	-0.095962	1.000000	-0.021967	-0.1288
Subscription_End_Date	-0.011059	-0.021967	1.000000	0.1464
Expiring_Dollars	0.018423	-0.128804	0.146446	1.0000
Expiring_Students	0.018499	-0.125126	-0.038972	0.9742
Renewal_Date	0.009274	-0.026287	0.790792	0.1289
Metro_Code	0.009948	-0.055793	-0.027661	0.1520
Apple_Mac_Code	0.039980	-0.057519	-0.001414	-0.1099
PC_Code	-0.130746	-0.045344	-0.006042	0.0125
Poverty_Level_Code	-0.040224	-0.025007	0.007688	-0.1474
Avg_Household_Income	0.124866	-0.037231	0.018711	0.0213
Title_1_Code	-0.065124	-0.031800	0.000902	-0.1968
Software_budget_per_head	-0.188744	0.097045	0.012356	-0.1892
Training_Budget_Per_head	-0.103766	0.061361	0.005958	-0.2234
Lunch_Program_Eligible_Students	0.005604	-0.126394	-0.045527	0.5701
Affluence_Indicator	0.161202	0.026276	0.001067	0.0163
Avg_Sell_price	-0.004899	-0.024648	0.916995	0.1646
Renew_delay	-0.033298	0.017015	-0.210561	-0.0175
Days_group	-0.044256	0.008720	-0.175087	0.0102

In [68]:
```
# Predicting the Renewed and Non Renewed Data for 2017 Defining X and Y
X = Final_train_Data
```

In [69]:
```
log_reg = LogisticRegression(solver='liblinear', C=100, tol=0.08)
log_reg.fit(X,Y_train)
```

Out[69]:
```
LogisticRegression(C=100, class_weight=None, dual=False, fit_intercept=True,
          intercept_scaling=1, max_iter=100, multi_class='ovr', n_jobs=1,
          penalty='l2', random_state=None, solver='liblinear', tol=0.08,
          verbose=0, warm_start=False)
```

In [70]:
```
print(log_reg.score(X, Y_train))
```

```
0.999965150723
```

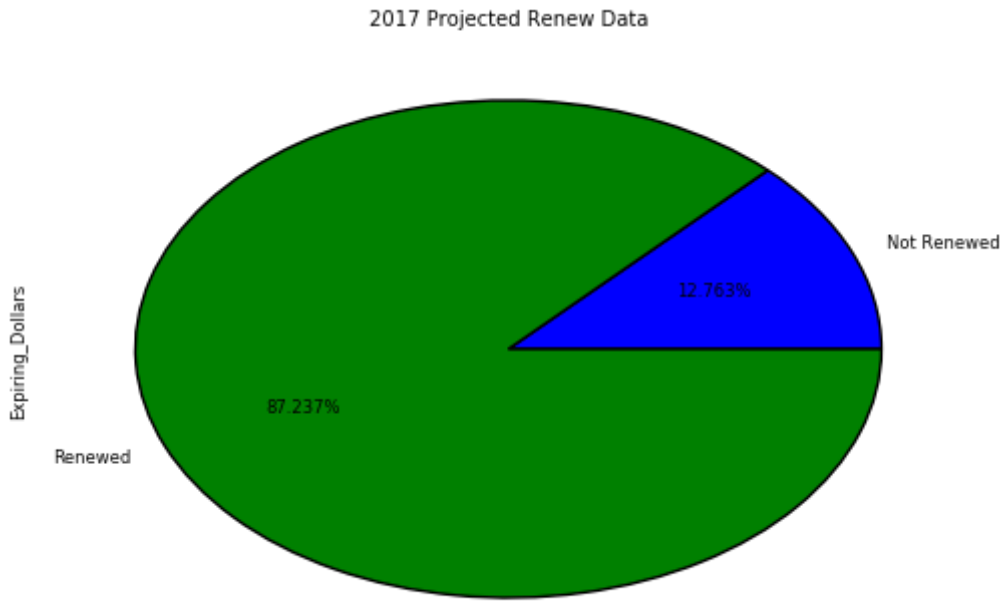
In [71]:
```
y_test = log_reg.predict(test_Data)
```

In [72]:
```
# Inverse the encoded
test = test_Data.apply(lambda x: d1[x.name].inverse_transform(x))
test['Subscription_Status'] = y_test
```

In [73]:
```
# Manually Un-Labelling the Subscription_Status
test.loc[(test.Subscription_Status== 0) ,'Subscription_Status' ] = 'Renewed'
test.loc[(test.Subscription_Status== 1) ,'Subscription_Status' ] = 'Not Renewe
d'
```

In [74]:
```
test.to_csv("D:\\Analytics Excercise\\AnalyticsExercise\\Data\\Findings\\Final
_Results.csv", index=True , header=True)
```

In [75]:
```
test_results = test
# CHecking and Analysing the Results
test_results.groupby(['Subscription_Status'])
['Expiring_Dollars'].count().plot(kind="pie" , autopct='%3.3f%%',title= "2017
 Projected Renew Data")
plt.show()
```

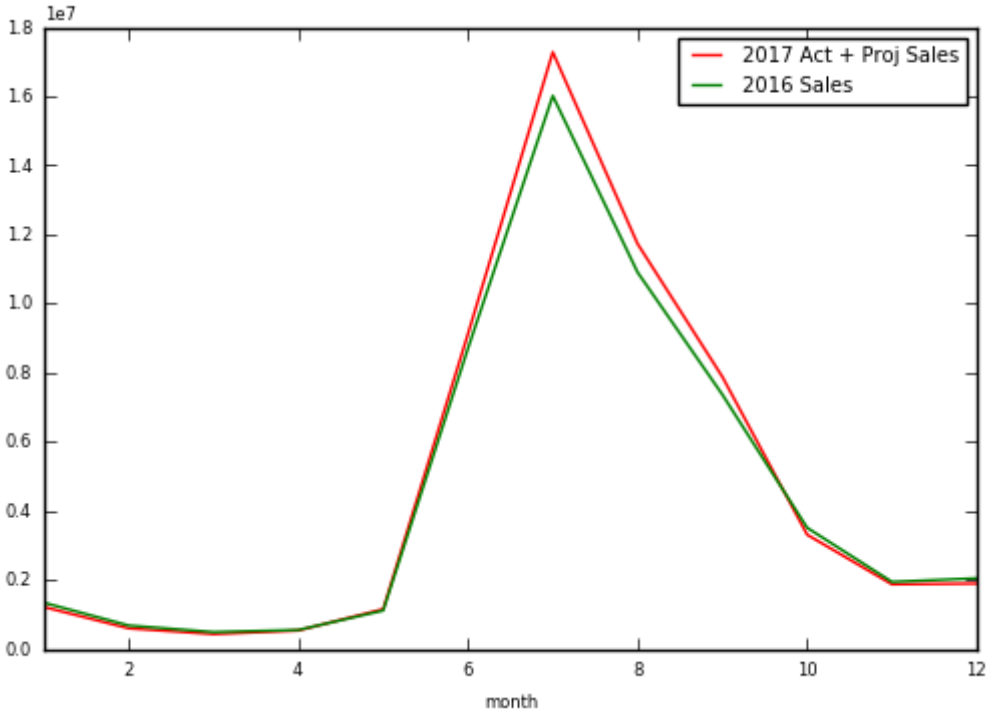


Conclusion There is Expected and Good Chances of Getting Renewed Data from Non Renewed Data in 2017 There is 87% of Chances that the School will Renew the Subscription 13% of School will not Renew the Subscription

Months in which Chances of Getting Renewed

In [76]:
```
frames = [sub_16_demo_ren, sub_16_demo_nonren]
Data_2016 = pd.concat(frames)
Data_final_2016 = Data_2016.drop(Data_2016[Data_2016['Subscription_Status'] ==
 "Not Renewed"].index)


frames1 = [sub_17_demo_ren, test_results]
Data_2017 = pd.concat(frames1)
Data_final_2017 = Data_2017.drop(Data_2017[Data_2017['Subscription_Status'] ==
 "Not Renewed"].index)


Data_final_2016['Subscription_End_Date'] = Data_final_2016['Subscription_End_D
ate'].apply(pd.to_datetime)
Data_final_2017['Subscription_End_Date'] = Data_final_2017['Subscription_End_D
ate'].apply(pd.to_datetime)

Data_final_2016['month'] = pd.DatetimeIndex(Data_final_2016['Subscription_End_
Date']).month
Data_final_2017['month'] = pd.DatetimeIndex(Data_final_2017['Subscription_End_
Date']).month
```

In [77]:
```
Data_final_2017.groupby(['month'])['Expiring_Dollars'].sum().plot(kind="line",
 color="Red" , label="2017 Act + Proj Sales")
Data_final_2016.groupby(['month'])['Expiring_Dollars'].sum().plot(kind="line",
 color="Green" , label="2016 Sales")
plt.legend()
plt.show()
```



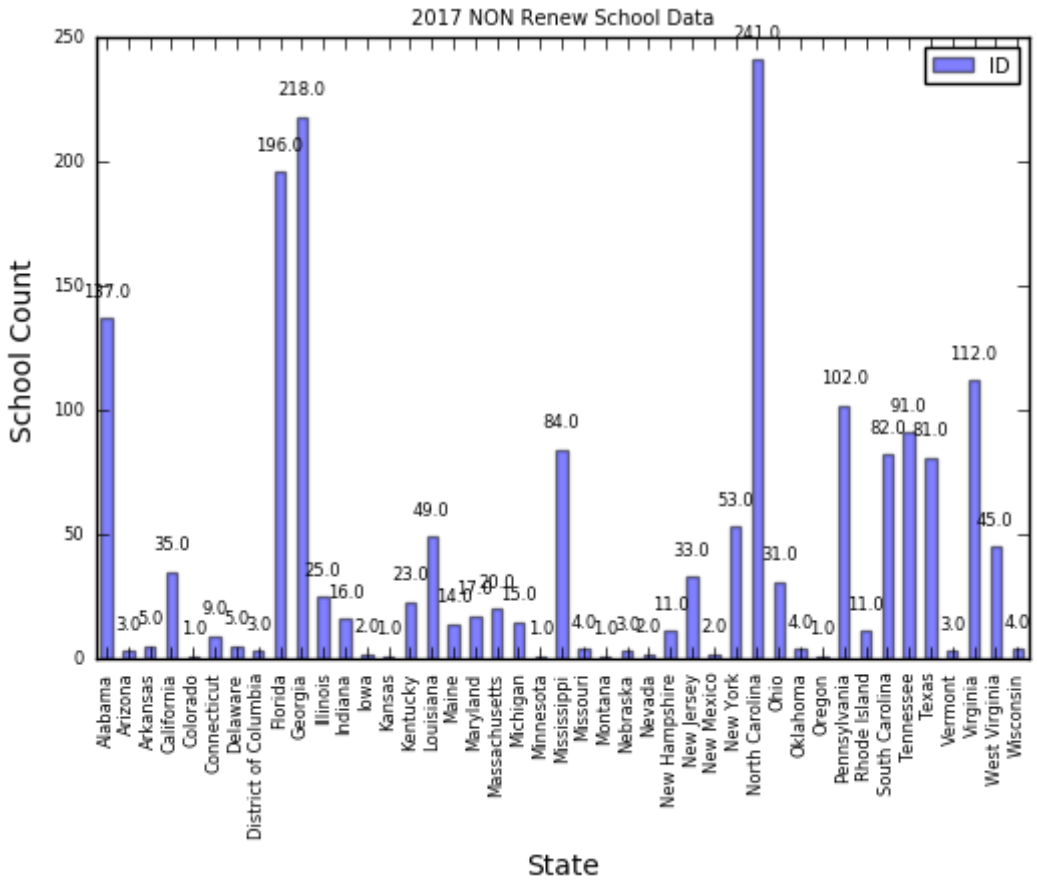
Getting Non Subscribed School are in which Cities more

In [78]:
```
non_subs_school=
pd.DataFrame(test_results[test_results['Subscription_Status']=="Not Renewed"])
```

In [79]:
```
non_subs_school.columns
```

Out[79]:
```
Index([u'ID', u'State', u'Subscription_End_Date', u'Expiring_Dollars',
       u'Expiring_Students', u'Renewal_Date', u'Metro_Code', u'Apple_Mac_Cod
e',
       u'PC_Code', u'Poverty_Level_Code', u'Avg_Household_Income',
       u'Title_1_Code', u'Software_budget_per_head',
       u'Training_Budget_Per_head', u'Lunch_Program_Eligible_Students',
       u'Affluence_Indicator', u'Avg_Sell_price', u'Renew_delay',
       u'Days_group', u'Subscription_Status'],
      dtype='object')
```

In [80]:
```
 ax = non_subs_school.groupby(['State'])['ID'].count().plot(kind="Bar" ,
title= "2017 NON Renew School Data", alpha=0.5 )
plt.xlabel('State', fontsize=10)
plt.ylabel('School Count', fontsize=10)
for p in ax.patches:
    ax.annotate("%.1f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.ge
t_height()), ha='center', va='center', xytext=(0, 10), textcoords='offset poin
ts')
plt.legend()
plt.show()
```



Conclusion North Carilona and Georgia has highest Chances of School Not renewing the Subscription followed by Florida and Albama