In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
# %matplotlib notebook
```

In [2]:
```
data = pd.read_csv('weatherHistory.csv' , parse_dates = ['Formatted Date'] , index_col = ['Formatted Dat
e'])
```

In [3]:
```
data.head()
```

Out[3]:

	Summary	Precip Type	Temperature (C)	Apparent Temperature (C)	Humidity	Wind Speed (km/h)	Wind Bearing (degrees)	Visibility (km)	Pressure (millibars)	Daily Summary
Formatted Date										
2006-04-01 00:00:00+02:00	Partly Cloudy	rain	9.472222	7.388889	0.89	14.1197	251	15.8263	1015.13	Partly cloudy throughout the day.
2006-04-01 01:00:00+02:00	Partly Cloudy	rain	9.355556	7.227778	0.86	14.2646	259	15.8263	1015.63	Partly cloudy throughout the day.
2006-04-01 02:00:00+02:00	Mostly Cloudy	rain	9.377778	9.377778	0.89	3.9284	204	14.9569	1015.94	Partly cloudy throughout the day.
2006-04-01 03:00:00+02:00	Partly Cloudy	rain	8.288889	5.944444	0.83	14.1036	269	15.8263	1016.41	Partly cloudy throughout the day.
2006-04-01 04:00:00+02:00	Mostly Cloudy	rain	8.755556	6.977778	0.83	11.0446	259	15.8263	1016.51	Partly cloudy throughout the day.

In [78]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 96453 entries, 2006-04-01 00:00:00+02:00 to 2016-09-09 23:00:00+02:00
Data columns (total 10 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Summary                   96453 non-null  object 
 1   Precip Type               95936 non-null  object 
 2   Temperature (C)           96453 non-null  float64
 3   Apparent Temperature (C)  96453 non-null  float64
 4   Humidity                  96453 non-null  float64
 5   Wind Speed (km/h)         96453 non-null  float64
 6   Wind Bearing (degrees)    96453 non-null  int64  
 7   Visibility (km)           96453 non-null  float64
 8   Pressure (millibars)      96453 non-null  float64
 9   Daily Summary             96453 non-null  object 
dtypes: float64(6), int64(1), object(3)
memory usage: 8.1+ MB
```

In [4]:
```
data.isnull().sum() # there are 517 null columns
```

Out[4]:
```
Summary                       0
Precip Type                 517
Temperature (C)               0
Apparent Temperature (C)      0
Humidity                      0
Wind Speed (km/h)             0
Wind Bearing (degrees)        0
Visibility (km)               0
Pressure (millibars)          0
Daily Summary                 0
dtype: int64
```

In [5]:
```
new_data = data.dropna() # remove null columns and store it in a new data set
```

In [6]:
```
new_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 95936 entries, 2006-04-01 00:00:00+02:00 to 2016-09-09 23:00:00+02:00
Data columns (total 10 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Summary                   95936 non-null  object 
 1   Precip Type               95936 non-null  object 
 2   Temperature (C)           95936 non-null  float64
 3   Apparent Temperature (C)  95936 non-null  float64
 4   Humidity                  95936 non-null  float64
 5   Wind Speed (km/h)         95936 non-null  float64
 6   Wind Bearing (degrees)    95936 non-null  int64  
 7   Visibility (km)           95936 non-null  float64
 8   Pressure (millibars)      95936 non-null  float64
 9   Daily Summary             95936 non-null  object 
dtypes: float64(6), int64(1), object(3)
memory usage: 8.1+ MB
```

In [7]:
```
new_data.describe()
```

Out[7]:

	Temperature (C)	Apparent Temperature (C)	Humidity	Wind Speed (km/h)	Wind Bearing (degrees)	Visibility (km)	Pressure (millibars)
count	95936.000000	95936.000000	95936.000000	95936.000000	95936.000000	95936.000000	95936.000000
mean	11.940976	10.862531	0.734841	10.804936	187.518773	10.362402	1003.150038
std	9.570671	10.717812	0.195724	6.920727	107.385351	4.173780	117.276976
min	-21.822222	-27.716667	0.000000	0.000000	0.000000	0.000000	0.000000
25%	4.604167	2.276389	0.600000	5.796000	116.000000	8.372000	1011.890000
50%	12.033333	12.033333	0.780000	9.933700	180.000000	10.046400	1016.420000
75%	18.844444	18.844444	0.890000	14.135800	290.000000	14.812000	1021.050000
max	39.905556	39.344444	1.000000	63.852600	359.000000	16.100000	1046.380000

In [8]:
```
new_data.index = pd.to_datetime(new_data.index , utc =True)
```

Using Resample Function

In [9]:
```
resampled_data = new_data.resample('M').mean() # resample accroading to Month end ('M')
```

In [10]:
```
resampled_data.head()
```

Out[10]:

	Temperature (C)	Apparent Temperature (C)	Humidity	Wind Speed (km/h)	Wind Bearing (degrees)	Visibility (km)	Pressure (millibars)
Formatted Date							
2005-12-31 00:00:00+00:00	0.577778	-4.050000	0.890000	17.114300	140.000000	9.982000	1016.660000
2006-01-31 00:00:00+00:00	-1.677942	-4.173708	0.834610	8.894211	161.018817	7.894064	1021.204960
2006-02-28 00:00:00+00:00	-0.065394	-2.990716	0.843467	10.957008	197.886905	7.418794	995.183914
2006-03-31 00:00:00+00:00	4.559274	1.969780	0.778737	14.421488	195.059140	9.602590	976.436263
2006-04-30 00:00:00+00:00	12.635031	12.098827	0.728625	10.930670	191.877778	10.626760	1013.493694

In [11]:
```
resampled_data.tail()
```

Out[11]:

Formatted Date	Temperature (C)	Apparent Temperature (C)	Humidity	Wind Speed (km/h)	Wind Bearing (degrees)	Visibility (km)	Pressure (millibars)
2016-08-31 00:00:00+00:00	21.420296	21.383094	0.674046	9.151378	184.563172	13.948140	1018.026398
2016-09-30 00:00:00+00:00	18.467924	18.355833	0.688833	6.849029	177.738889	13.723260	1017.969736
2016-10-31 00:00:00+00:00	10.593141	9.825775	0.827951	11.075846	206.046914	9.208206	1017.725457
2016-11-30 00:00:00+00:00	5.158800	2.860089	0.848847	10.507636	163.690511	8.725824	1019.215737
2016-12-31 00:00:00+00:00	1.239158	-2.017272	0.887981	11.024860	179.064603	7.460627	1019.946339

In [12]:
```
resampled_data['month'] = resampled_data.index.month
```

In [13]:
```
resampled_data['year'] = resampled_data.index.year
```

In [14]:
```
resampled_data.head()
```

Out[14]:

Formatted Date	Temperature (C)	Apparent Temperature (C)	Humidity	Wind Speed (km/h)	Wind Bearing (degrees)	Visibility (km)	Pressure (millibars)	month	year
2005-12-31 00:00:00+00:00	0.577778	-4.050000	0.890000	17.114300	140.000000	9.982000	1016.660000	12	2005
2006-01-31 00:00:00+00:00	-1.677942	-4.173708	0.834610	8.894211	161.018817	7.894064	1021.204960	1	2006
2006-02-28 00:00:00+00:00	-0.065394	-2.990716	0.843467	10.957008	197.886905	7.418794	995.183914	2	2006
2006-03-31 00:00:00+00:00	4.559274	1.969780	0.778737	14.421488	195.059140	9.602590	976.436263	3	2006
2006-04-30 00:00:00+00:00	12.635031	12.098827	0.728625	10.930670	191.877778	10.626760	1013.493694	4	2006

In [15]:
```
resampled_data.index = resampled_data.index.date
```

In [16]:
```
resampled_data = resampled_data[1:] # remove column with year 2005 column
```

In [17]:
```
resampled_data.head()
```

Out[17]:

	Temperature (C)	Apparent Temperature (C)	Humidity	Wind Speed (km/h)	Wind Bearing (degrees)	Visibility (km)	Pressure (millibars)	month	year
2006-01-31	-1.677942	-4.173708	0.834610	8.894211	161.018817	7.894064	1021.204960	1	2006
2006-02-28	-0.065394	-2.990716	0.843467	10.957008	197.886905	7.418794	995.183914	2	2006
2006-03-31	4.559274	1.969780	0.778737	14.421488	195.059140	9.602590	976.436263	3	2006
2006-04-30	12.635031	12.098827	0.728625	10.930670	191.877778	10.626760	1013.493694	4	2006
2006-05-31	15.650732	15.539479	0.721801	10.174161	209.310484	11.748066	1016.629785	5	2006

In [18]:
```
# now we have to find avg apparent tempreature for month to month like april 2006 to april 2016
month_to_month_AT = {}
for month in range(1,13):
    month_to_month_AT[month] = list(resampled_data[resampled_data['month'] == month]['Apparent Temperatur
e (C)'].values)
```

In [19]:
```
title = {1:'Jan',2:'Feb',3:'March',4:'April',5:'May',6:'June',7:'July',8:'Aug',9:'Sep',
         10:'Oct',11:'Nov',12:'Dec'}
def plot_AT_or_Humidity(what_for , month_dict):
    for index in range(1,13):
        t = title[index]
        plt.plot(range(2006,2017),month_dict[index])
        plt.title(what_for + ' for ' +t+' Month')
        plt.show()
```

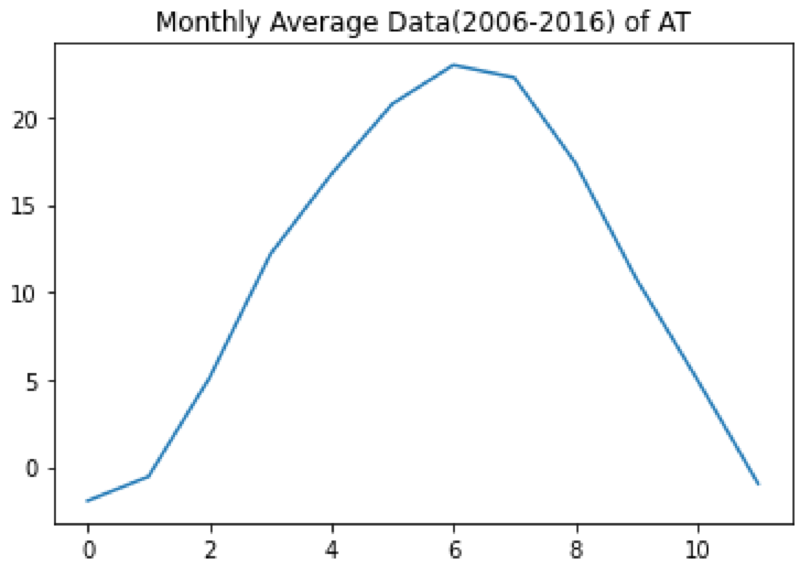
In [20]:
```
# now we have to find avg apparent tempreature for month to month like april 2006 to april 2016
month_to_month_Humidity = {}
for month in range(1,13):
    month_to_month_Humidity[month] = list(resampled_data[resampled_data['month'] == month]['Humidity'].va
lues)
```

In [21]:
```
# now we find difference
def find_avg_difference(month_dict):
    difference = []
    for month in range(1,13):
        difference.append(np.mean(month_dict[month]))
    return difference
```

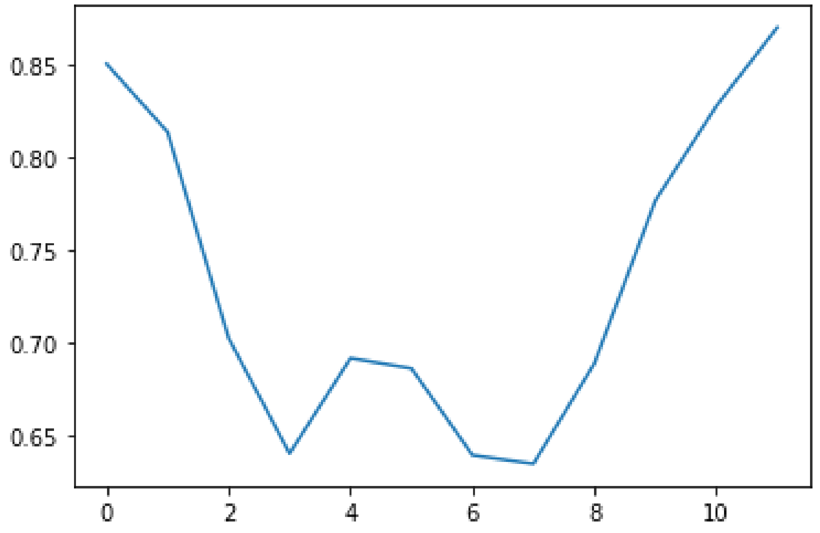
In [22]:
```
AT_difference_monthly = find_avg_difference(month_to_month_AT)
Humidity_difference_monthly = find_avg_difference(month_to_month_Humidity)
```

In [23]:
```
plt.plot(AT_difference_monthly)
plt.title('Monthly Average Data(2006-2016) of AT')
```

Out[23]:
```
Text(0.5, 1.0, 'Monthly Average Data(2006-2016) of AT')
```



```
In [24]: plt.plot(Humidity_difference_monthly)

Out[24]: [<matplotlib.lines.Line2D at 0x1960de0ec40>]
```



Manually Resampling

```
In [25]: new_data.index = new_data.index.date
```

```
In [26]: new_data.index = pd.DatetimeIndex(new_data.index)
```

```
In [27]: pd.options.mode.chained_assignment = None # remove unwanted SetupcopyWarning
```

```
In [28]: new_data['month'] = new_data.index.month
         new_data['year'] = new_data.index.year
```

In [29]:
```
def find_average_monthly_AT_or_Humidity(what_for):
    avg_data_tempreature_monthly = {}
    for year in range(2006,2017):
        for month in range(1,13):
            result = list(new_data.loc[(new_data['month'] == month)&(new_data['year']==year) , :][what_fo
r].values)
            if month not in avg_data_tempreature_monthly:
                avg_data_tempreature_monthly[month] = [np.mean(result)]
            else:
                avg_data_tempreature_monthly[month].append(np.mean(result))
    return avg_data_tempreature_monthly
```

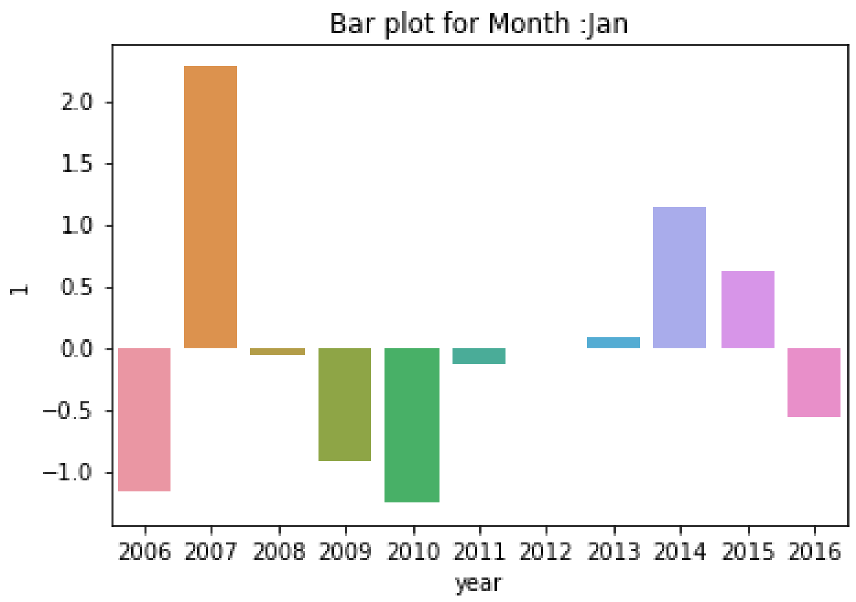
In [70]:
```
AT_monthly_average = find_average_monthly_AT_or_Humidity('Apparent Temperature (C)')
Humidity_monthly_average = find_average_monthly_AT_or_Humidity('Humidity')
```

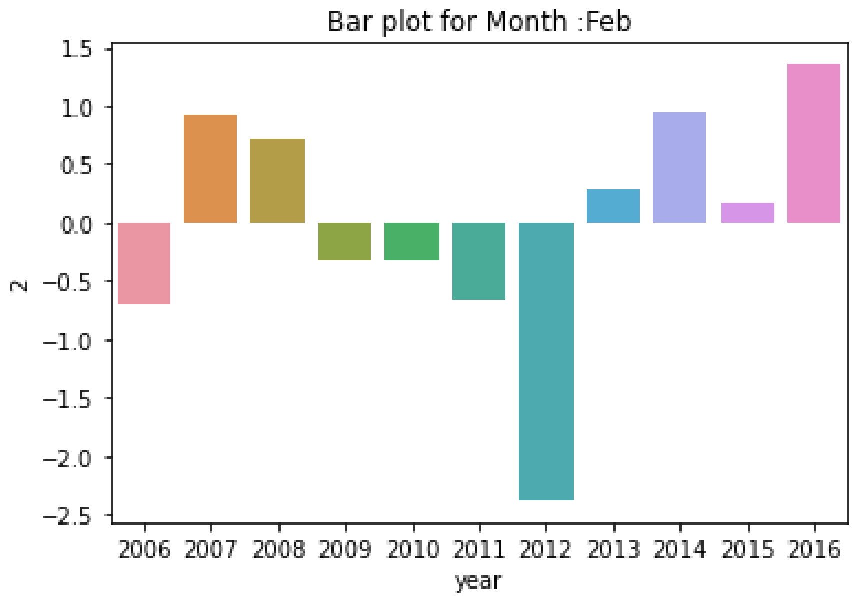
Humidity is the amount of water vapor in the air.

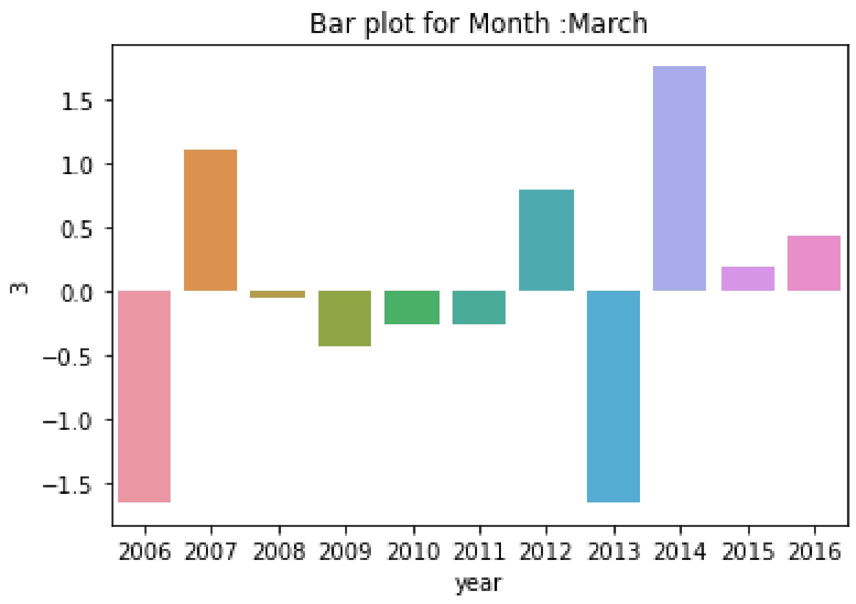
In [37]:
```
AT = pd.DataFrame(AT_monthly_average)
AT['year'] = range(2006,2017)
```

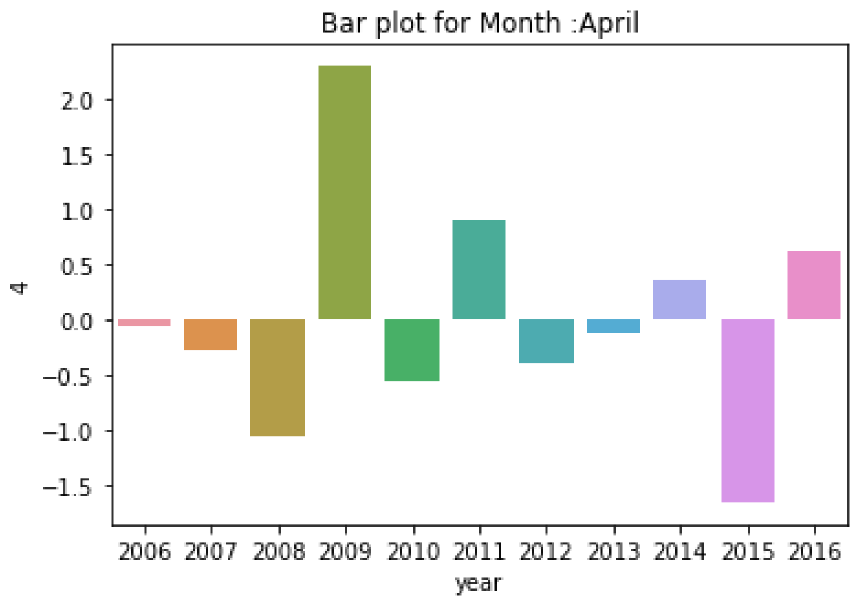
In [63]:
```
H = pd.DataFrame(Humidity_monthly_average)
H['year'] = range(2006,2017)
```

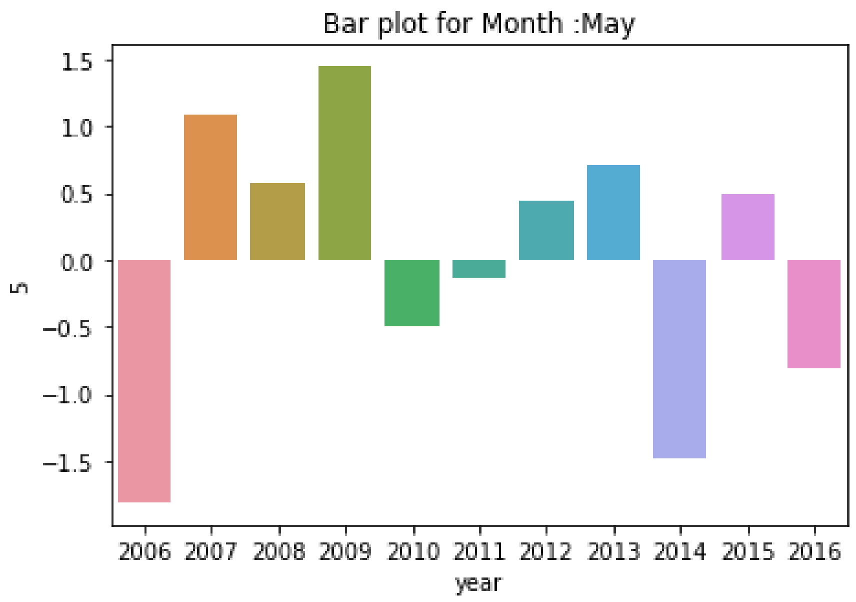
In [55]:
```
for month in range(1,13):
    sns.barplot(x = AT['year'] , y = AT[month])

    plt.title('Bar plot for Month :' + title[month])
    plt.show()
```

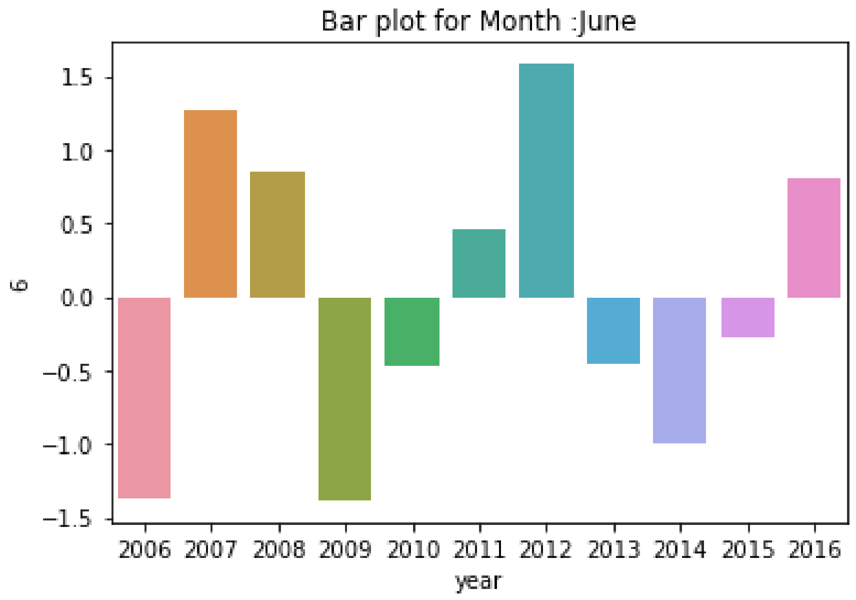

Bar plot for Month :Jan
1
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year

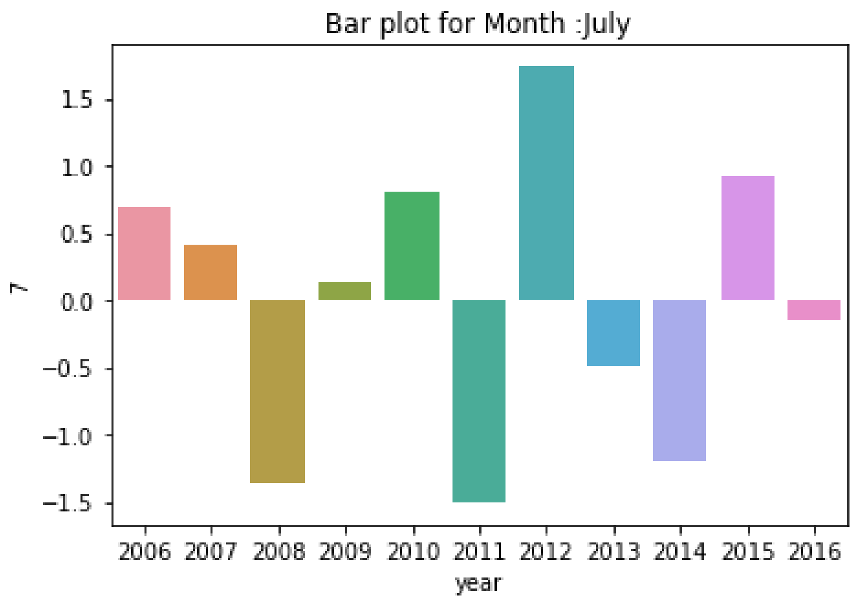

Bar plot for Month :Feb
2
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year


Bar plot for Month :March
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
3
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year

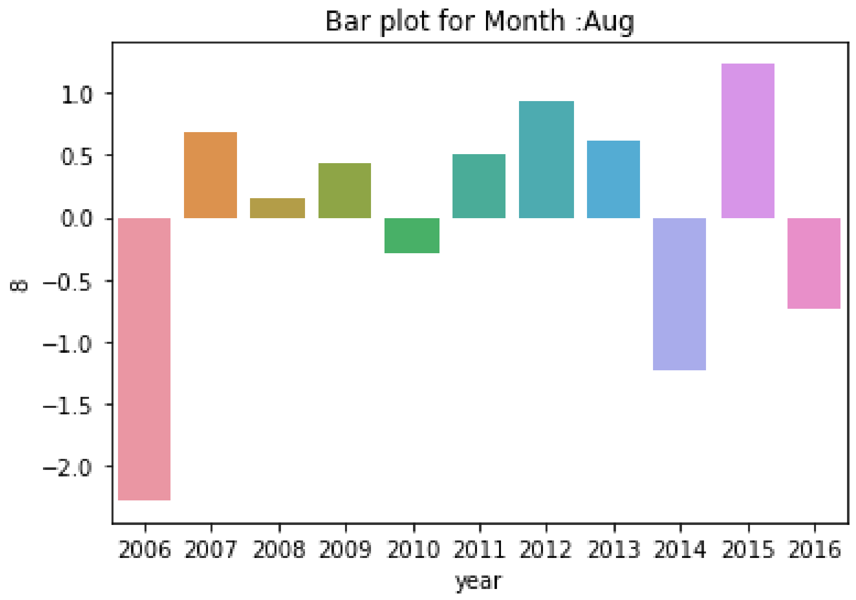

Bar plot for Month :April
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
4
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year


Bar plot for Month :May
5
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year

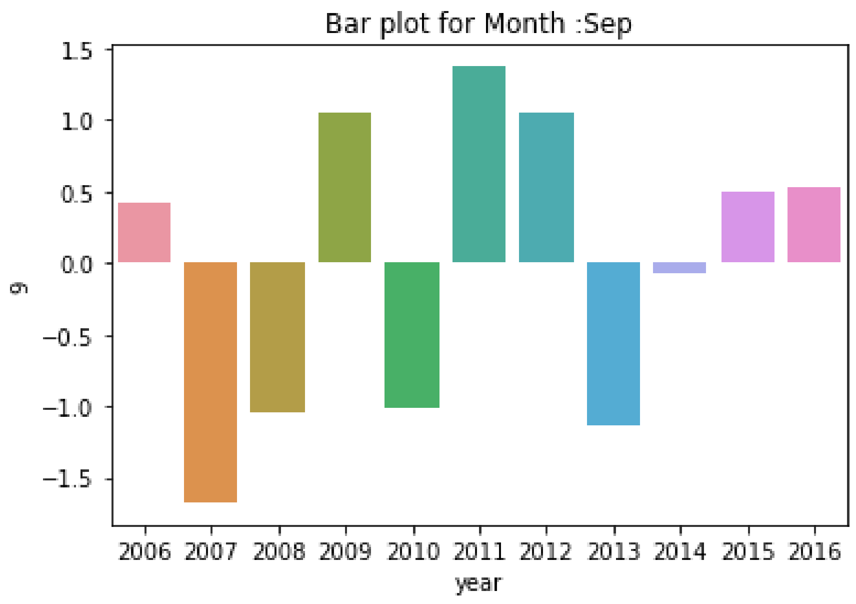

Bar plot for Month :June
6
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year

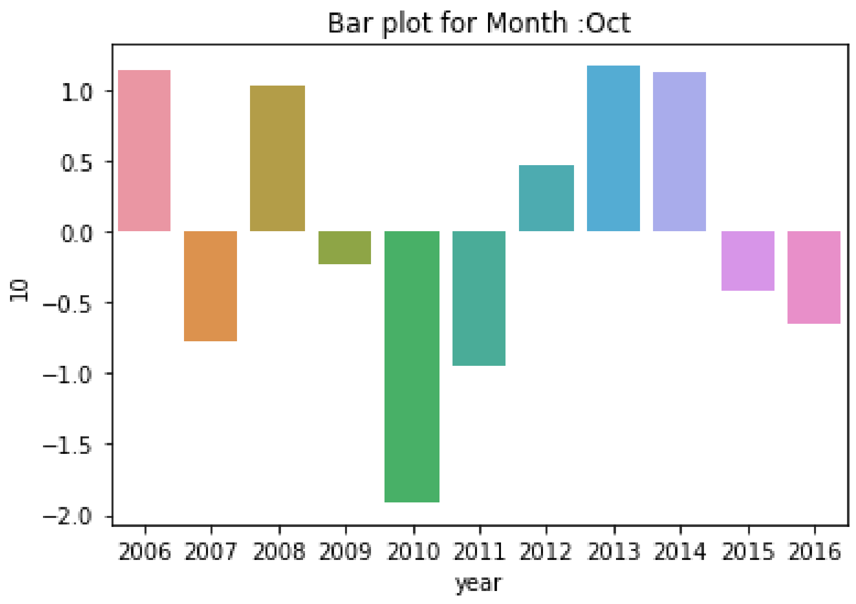


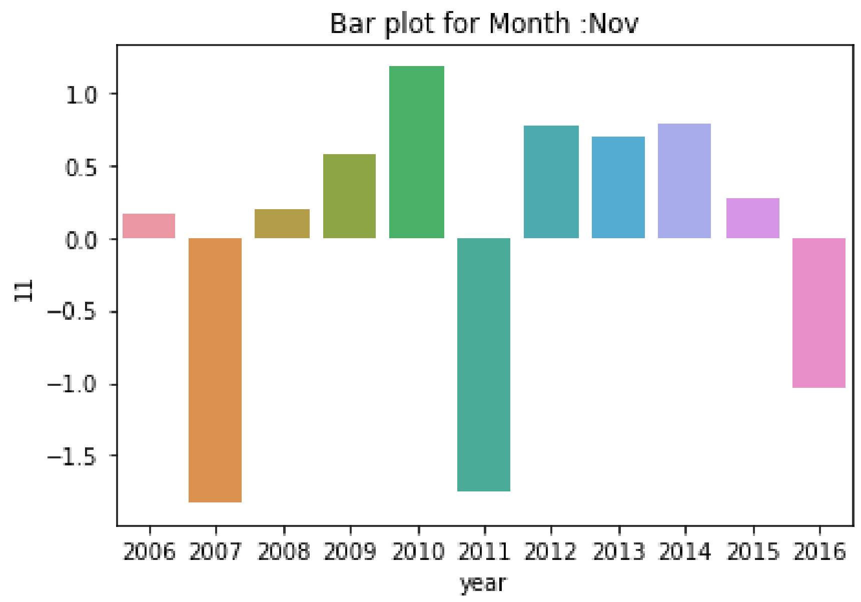
Bar plot for Month :July
7
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year

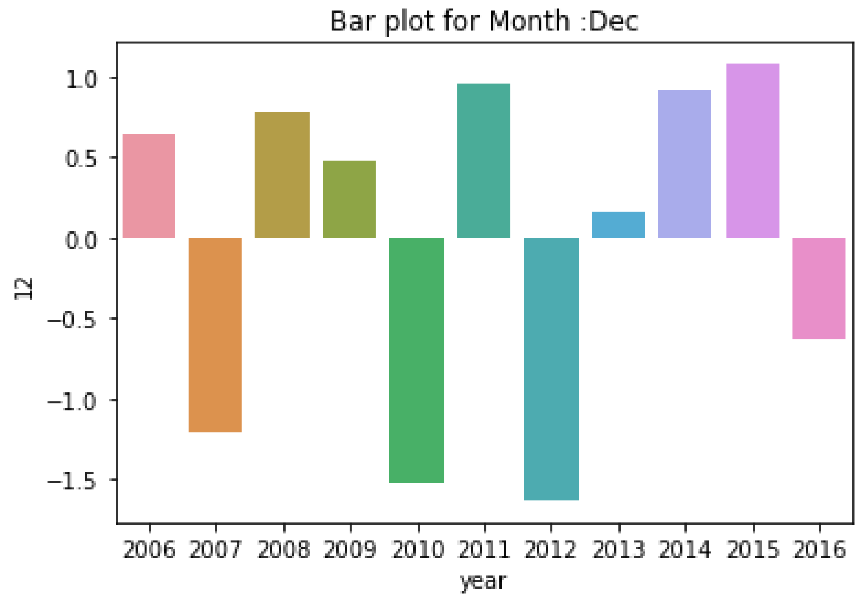


Bar plot for Month :Aug
8
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year

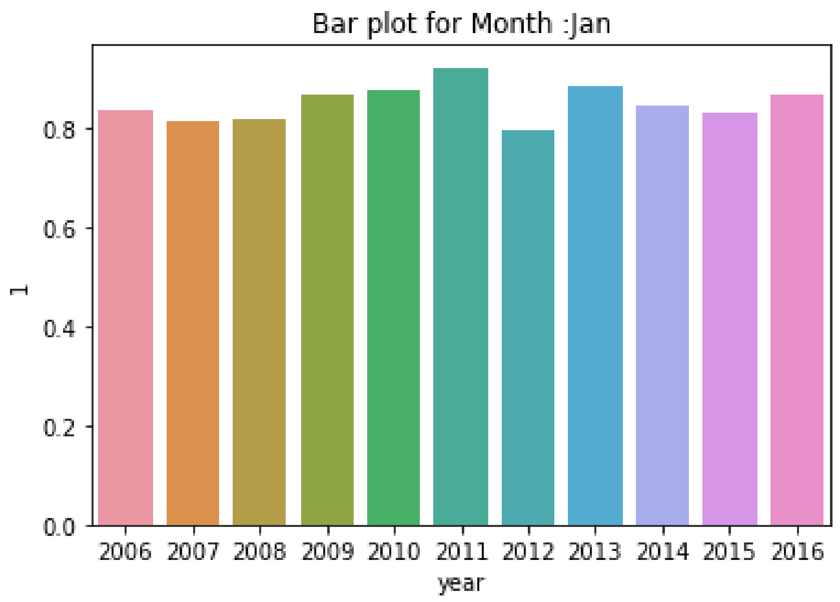

Bar plot for Month :Sep
9
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year

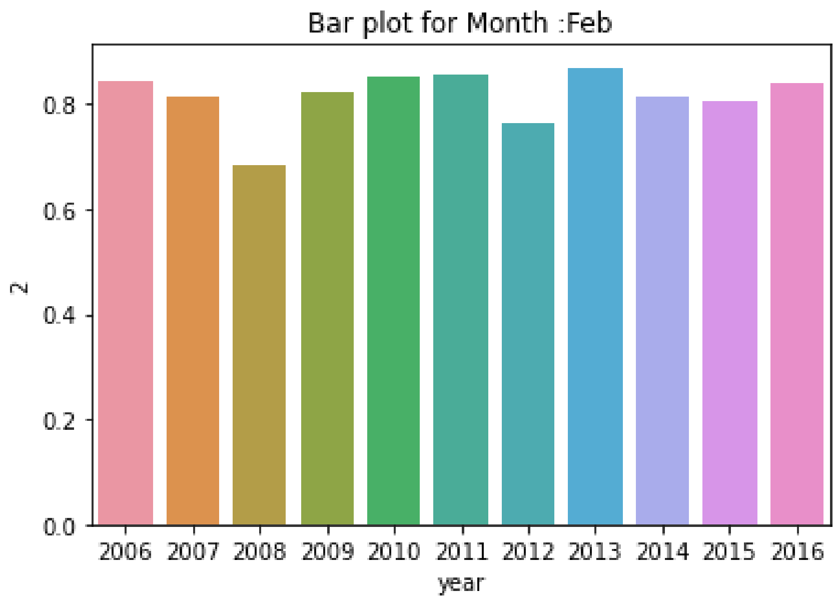

Bar plot for Month :Oct
10
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year

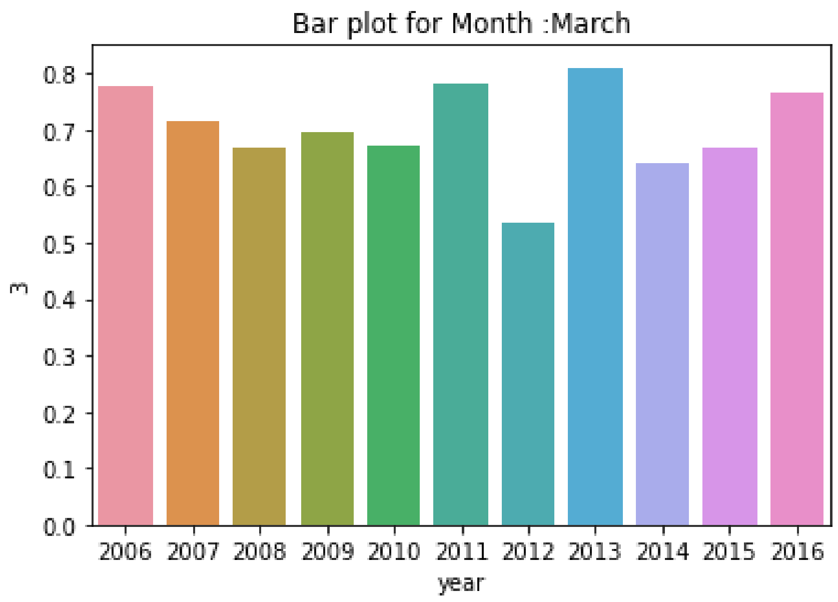

Bar plot for Month :Nov
1.0
0.5
0.0
−0.5
−1.0
−1.5
11
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year

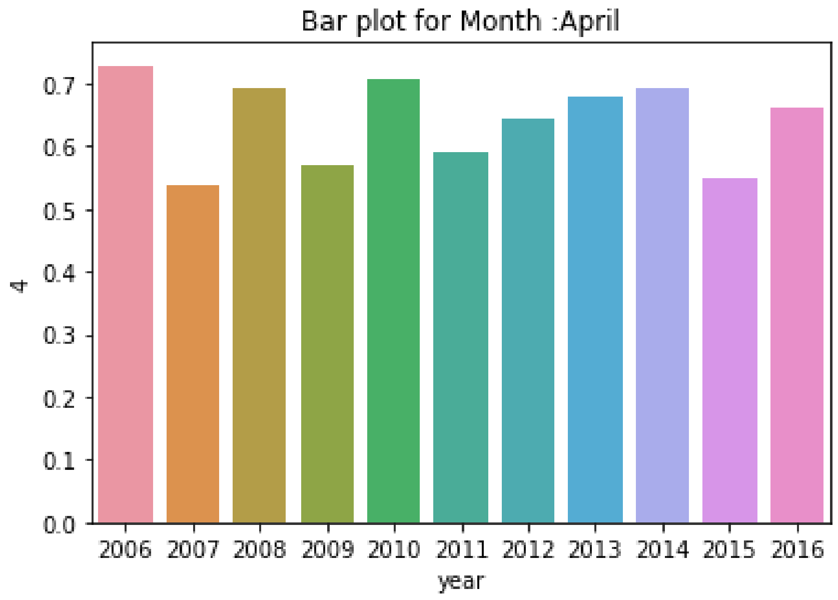

Bar plot for Month :Dec
1.0
0.5
0.0
−0.5
−1.0
−1.5
12
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year

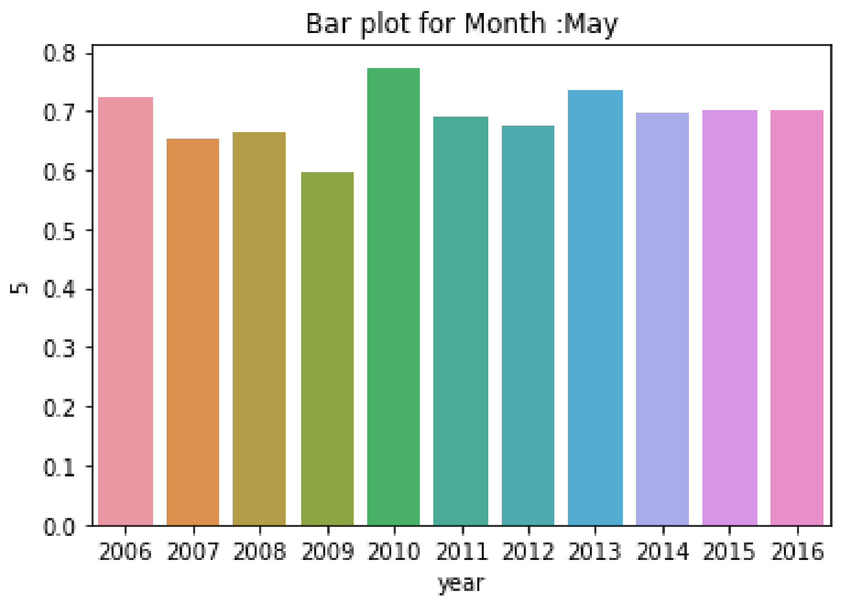
In [64]:
```
for month in range(1,13):
    sns.barplot(x = H['year'] , y = H[month])

    plt.title('Bar plot for Month :' + title[month])
    plt.show()
```

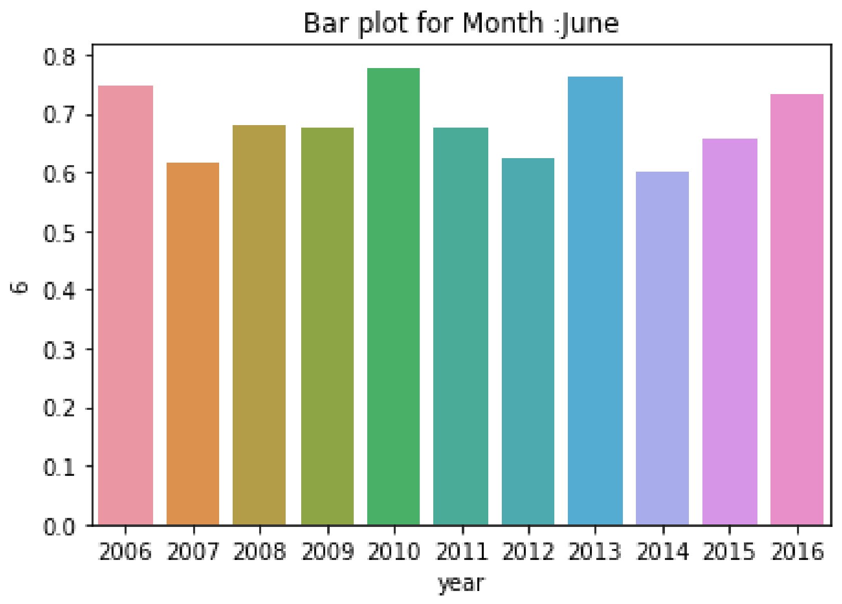

Bar plot for Month :Jan
1
0.0
0.2
0.4
0.6
0.8
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year

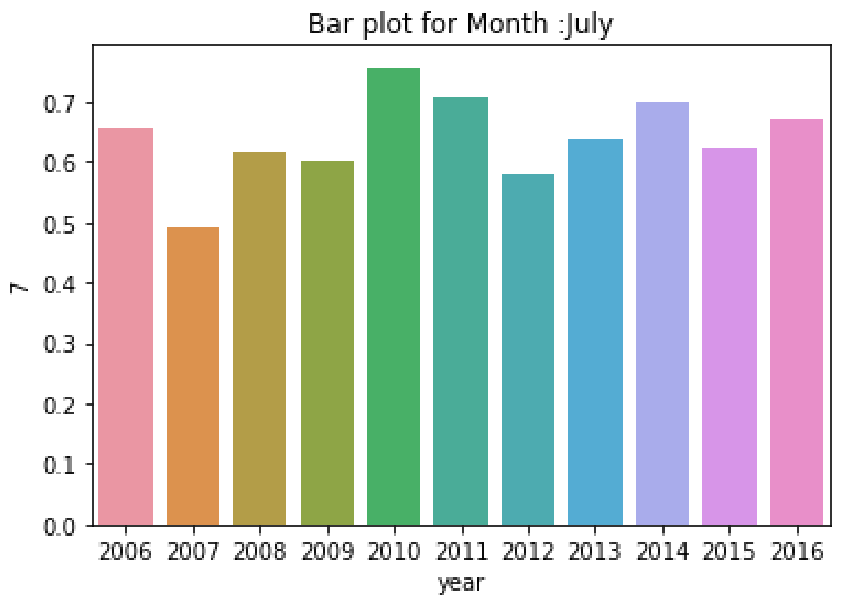

Bar plot for Month :Feb
2
0.0
0.2
0.4
0.6
0.8
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year

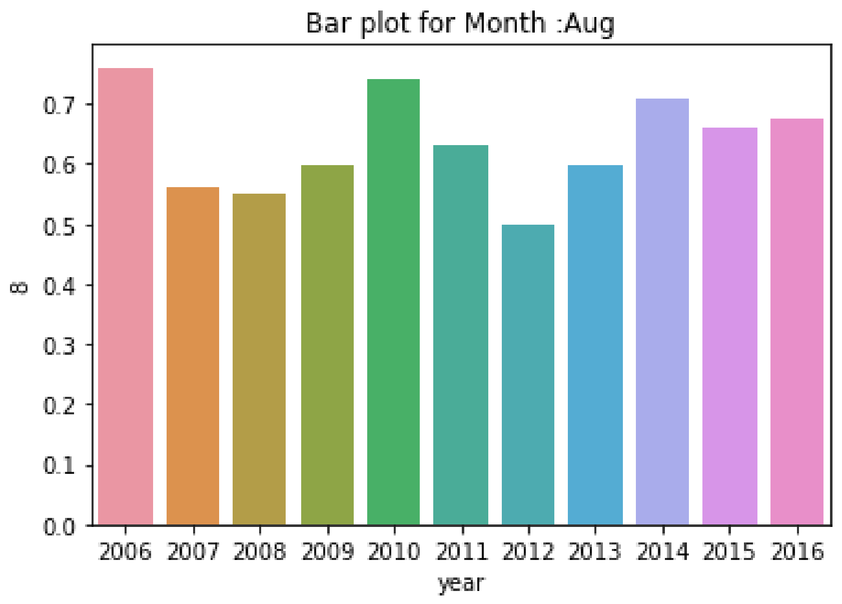

Bar plot for Month :March
3
year
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8

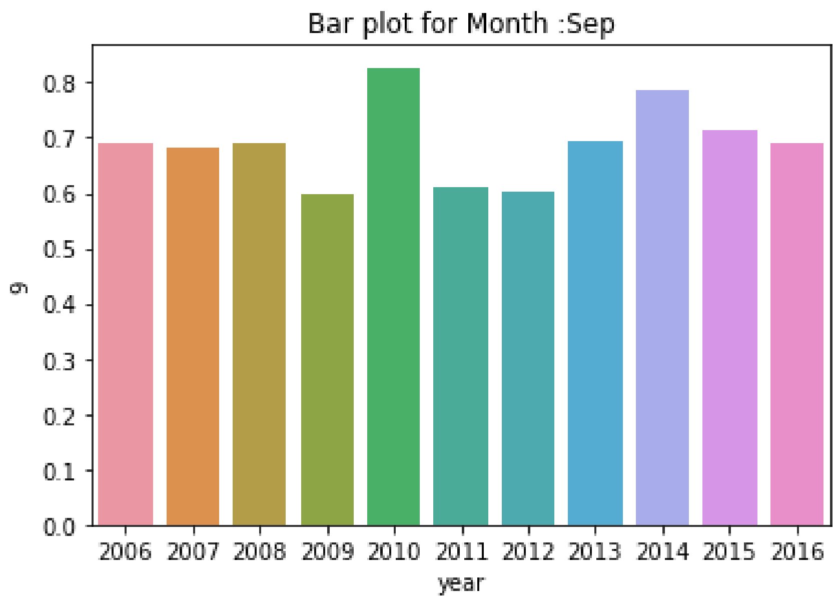

Bar plot for Month :April
4
year
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

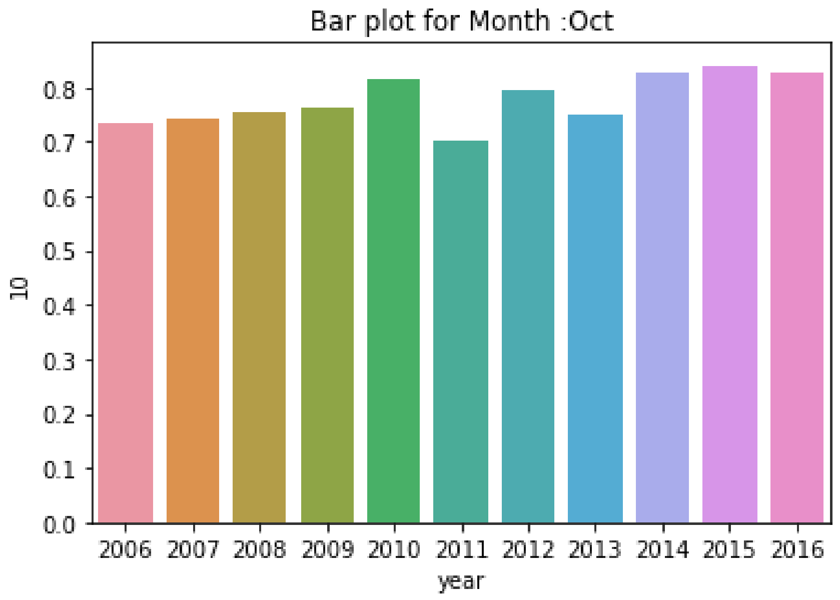

Bar plot for Month :May
5
year
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016

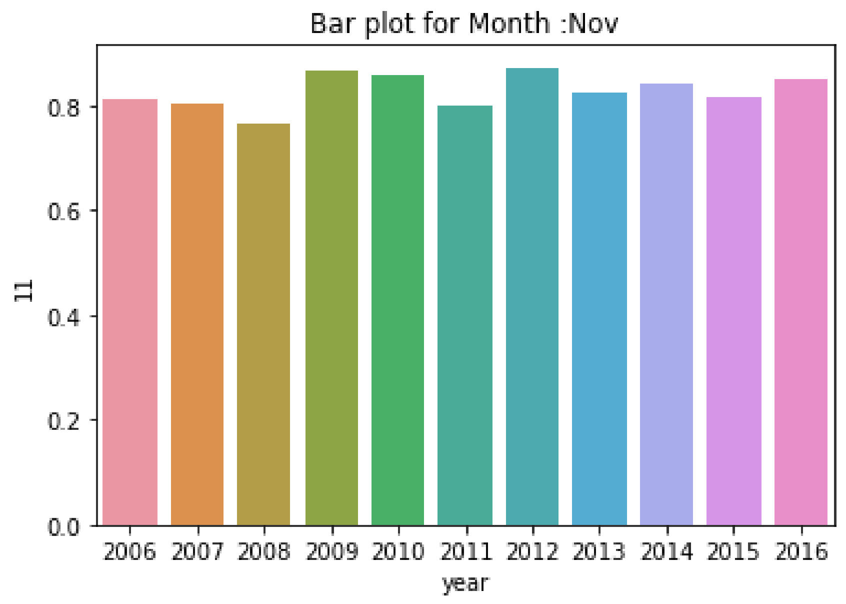

Bar plot for Month :June
6
year
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016

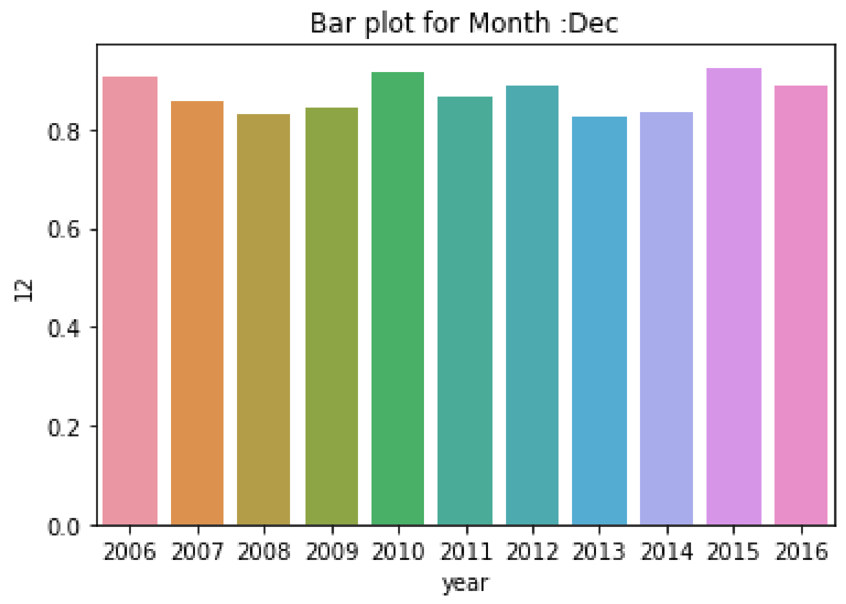

Bar plot for Month :July
7
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year


Bar plot for Month :Aug
8
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year


Bar plot for Month :Sep
9
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year

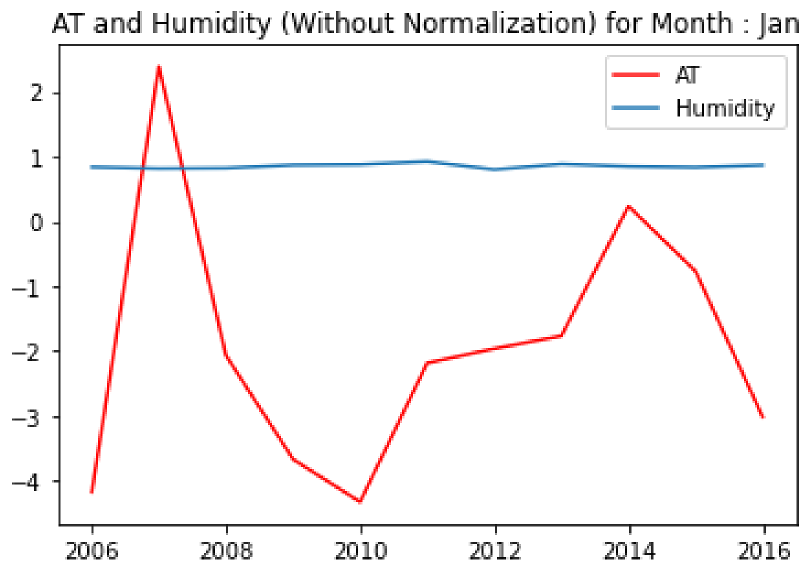

Bar plot for Month :Oct
10
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
year

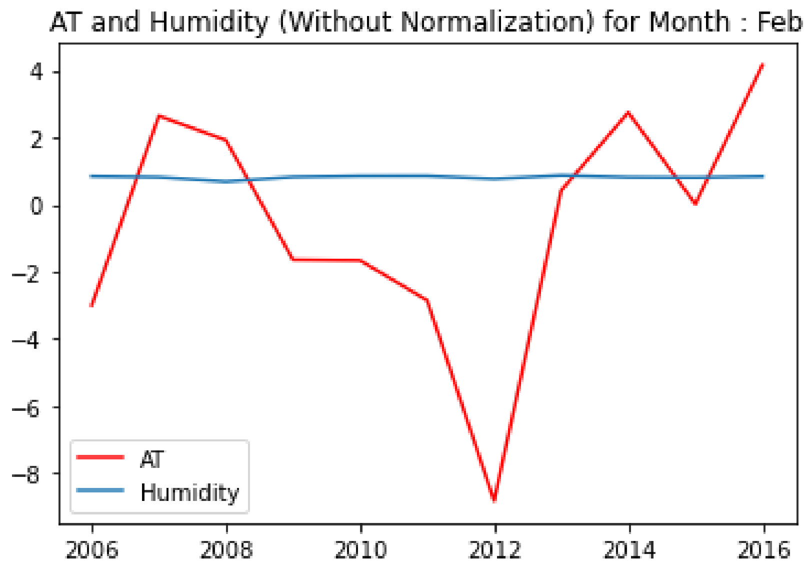

Bar plot for Month :Nov
11
0.0
0.2
0.4
0.6
0.8
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year


Bar plot for Month :Dec
12
0.0
0.2
0.4
0.6
0.8
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
year

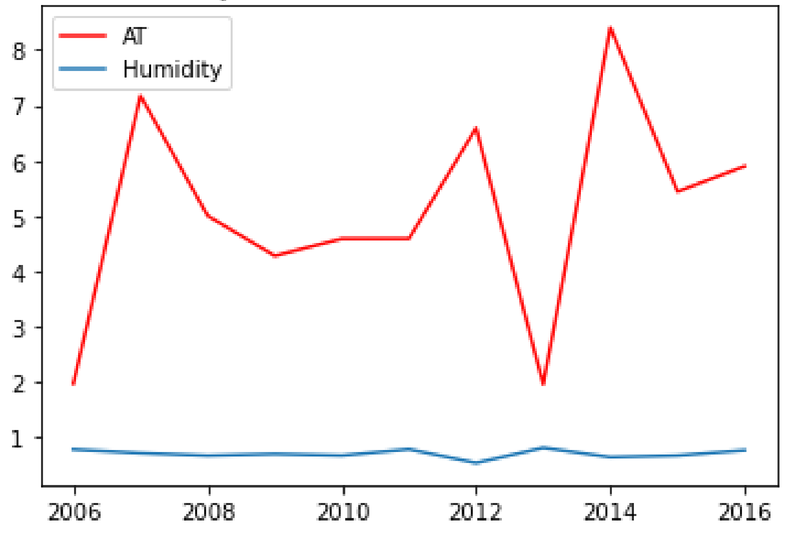
In [31]:
```
def plot_Humidty_and_AT():
    for month in range(1,12):
        plt.plot(range(2006,2017),AT_monthly_average[month] , label = 'AT' , color = 'red')
        plt.plot(range(2006,2017),Humidity_monthly_average[month] , label = 'Humidity')
        plt.legend()
        plt.title('AT and Humidity (Without Normalization) for Month : '+ title[month])
        plt.show()
```

In [32]:
```
plot_Humidty_and_AT()
```

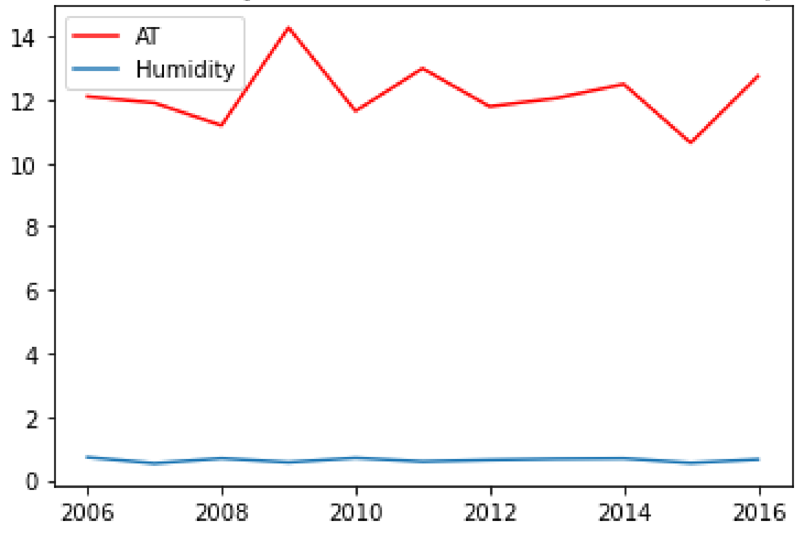

AT and Humidity (Without Normalization) for Month : Jan
AT
Humidity
2
1
0
−1
−2
−3
−4
2006
2008
2010
2012
2014
2016

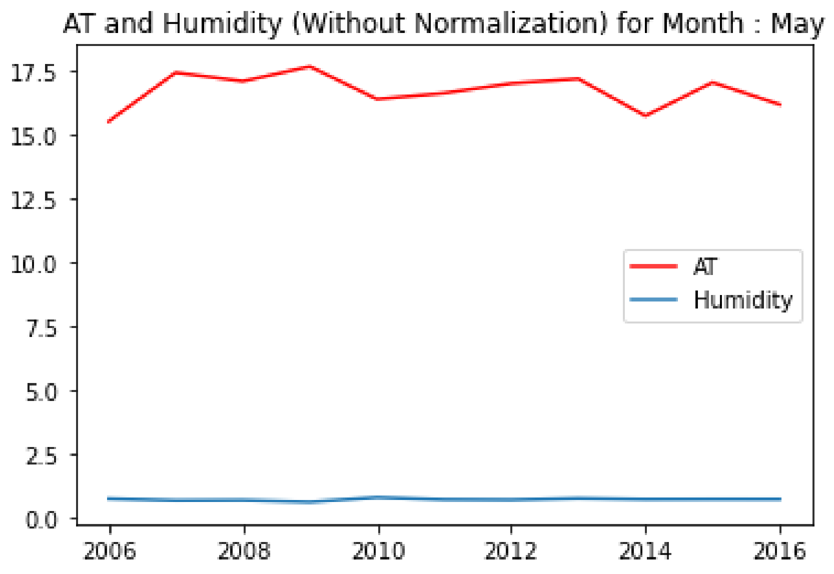

AT and Humidity (Without Normalization) for Month : Feb
AT
Humidity
4
2
0
−2
−4
−6
−8
2006
2008
2010
2012
2014
2016

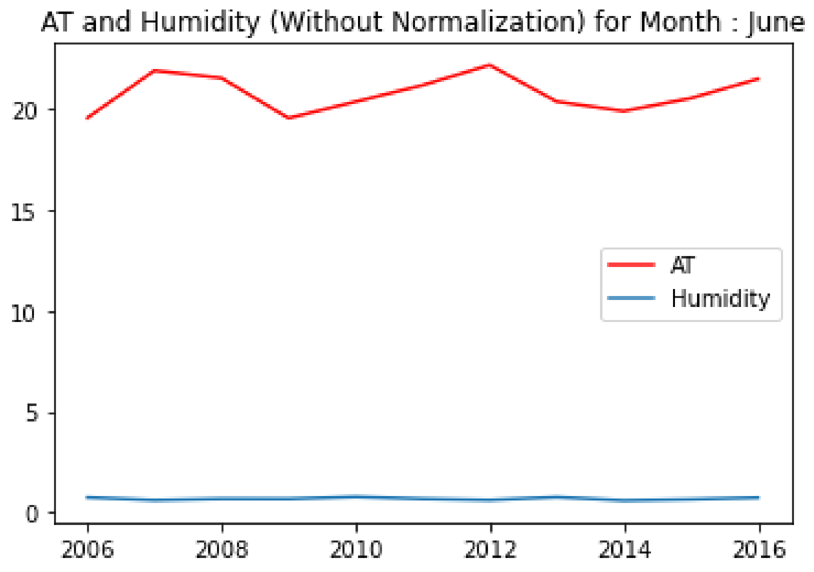
AT and Humidity (Without Normalization) for Month : March

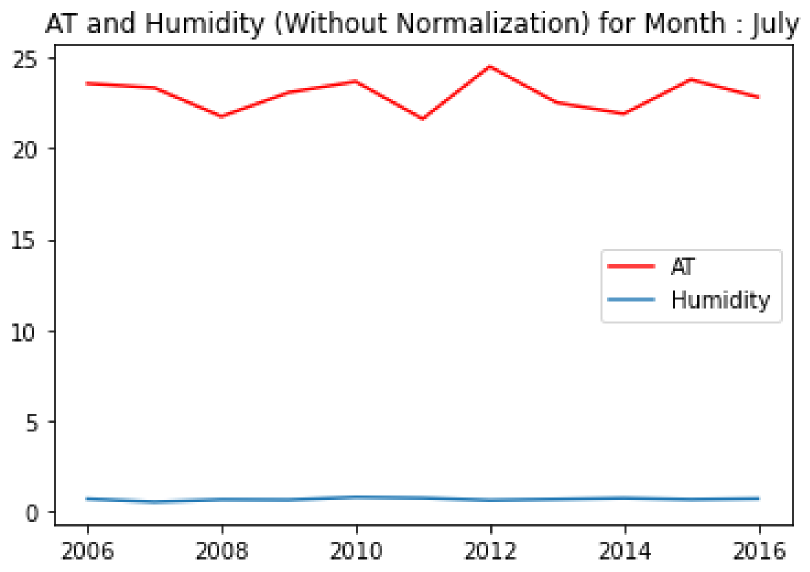


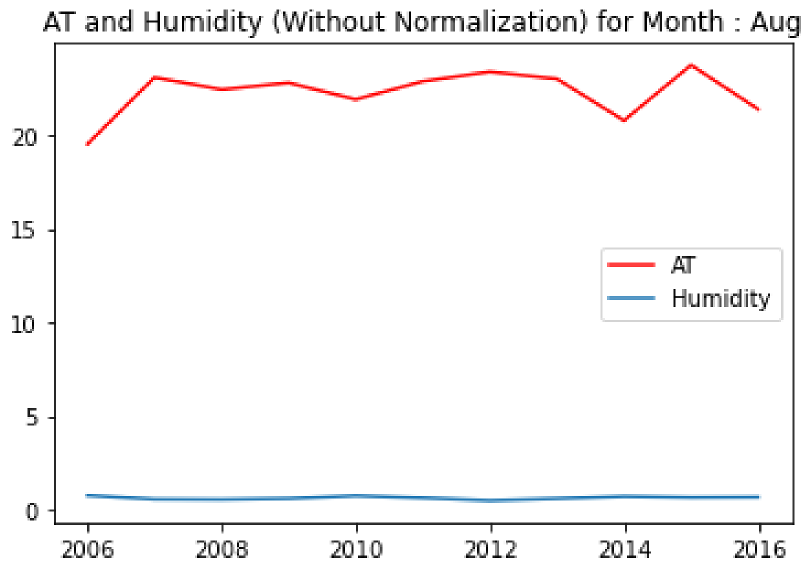
AT and Humidity (Without Normalization) for Month : April

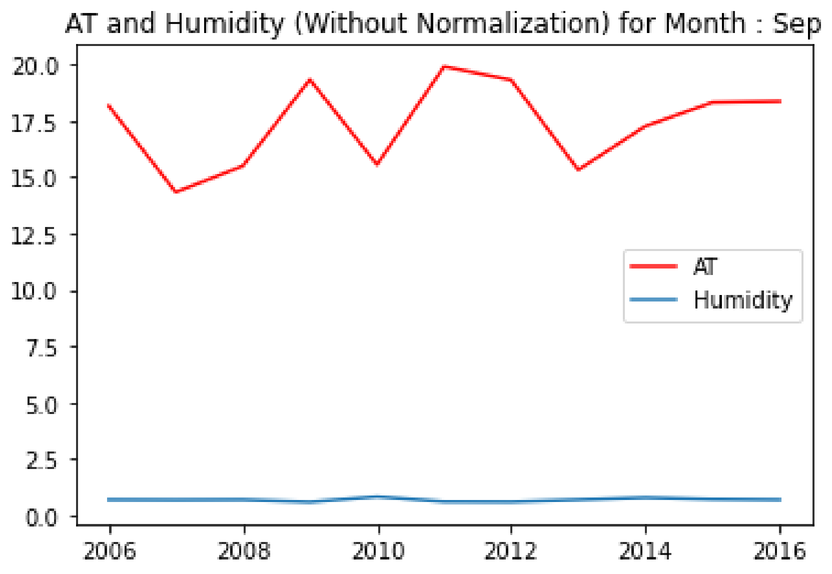


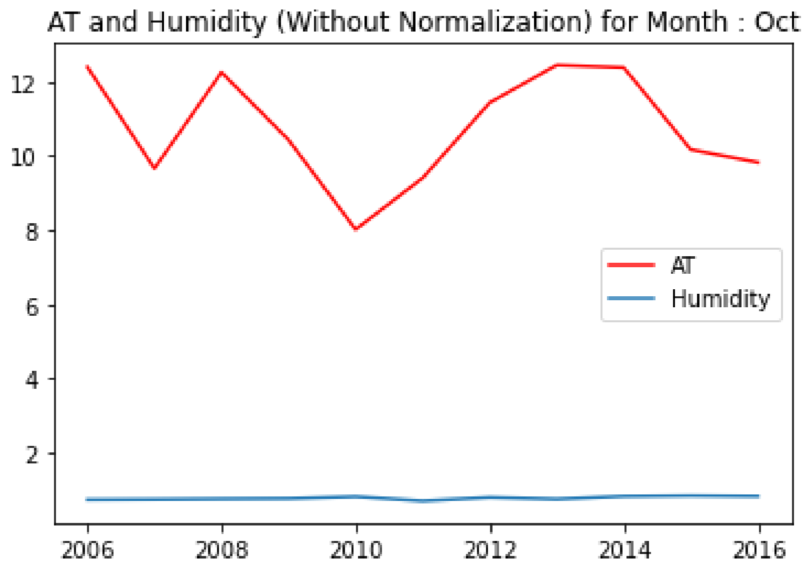

AT and Humidity (Without Normalization) for Month : May
AT
Humidity
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
2006
2008
2010
2012
2014
2016

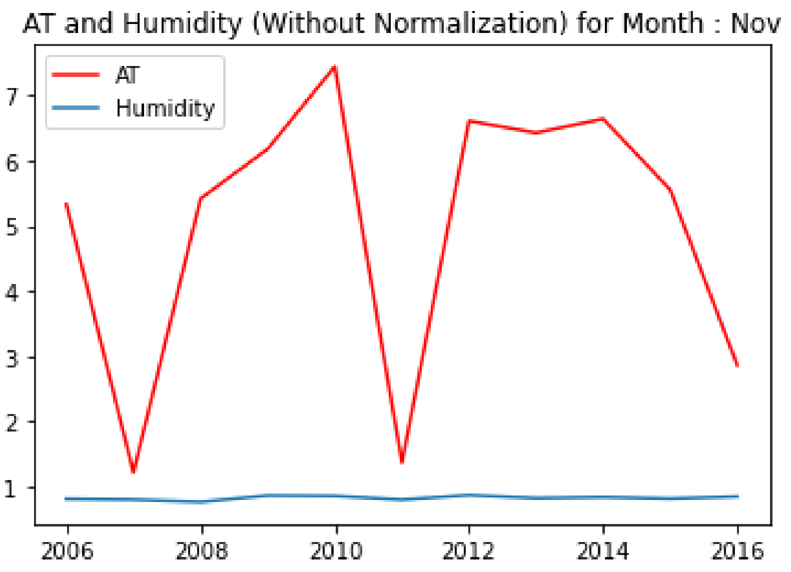

AT and Humidity (Without Normalization) for Month : June
AT
Humidity
20
15
10
5
0
2006
2008
2010
2012
2014
2016


AT and Humidity (Without Normalization) for Month : July
25
20
15
10
5
0
2006
2008
2010
2012
2014
2016
AT
Humidity


AT and Humidity (Without Normalization) for Month : Aug
20
15
10
5
0
2006
2008
2010
2012
2014
2016
AT
Humidity


AT and Humidity (Without Normalization) for Month : Sep
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
2006
2008
2010
2012
2014
2016
AT
Humidity

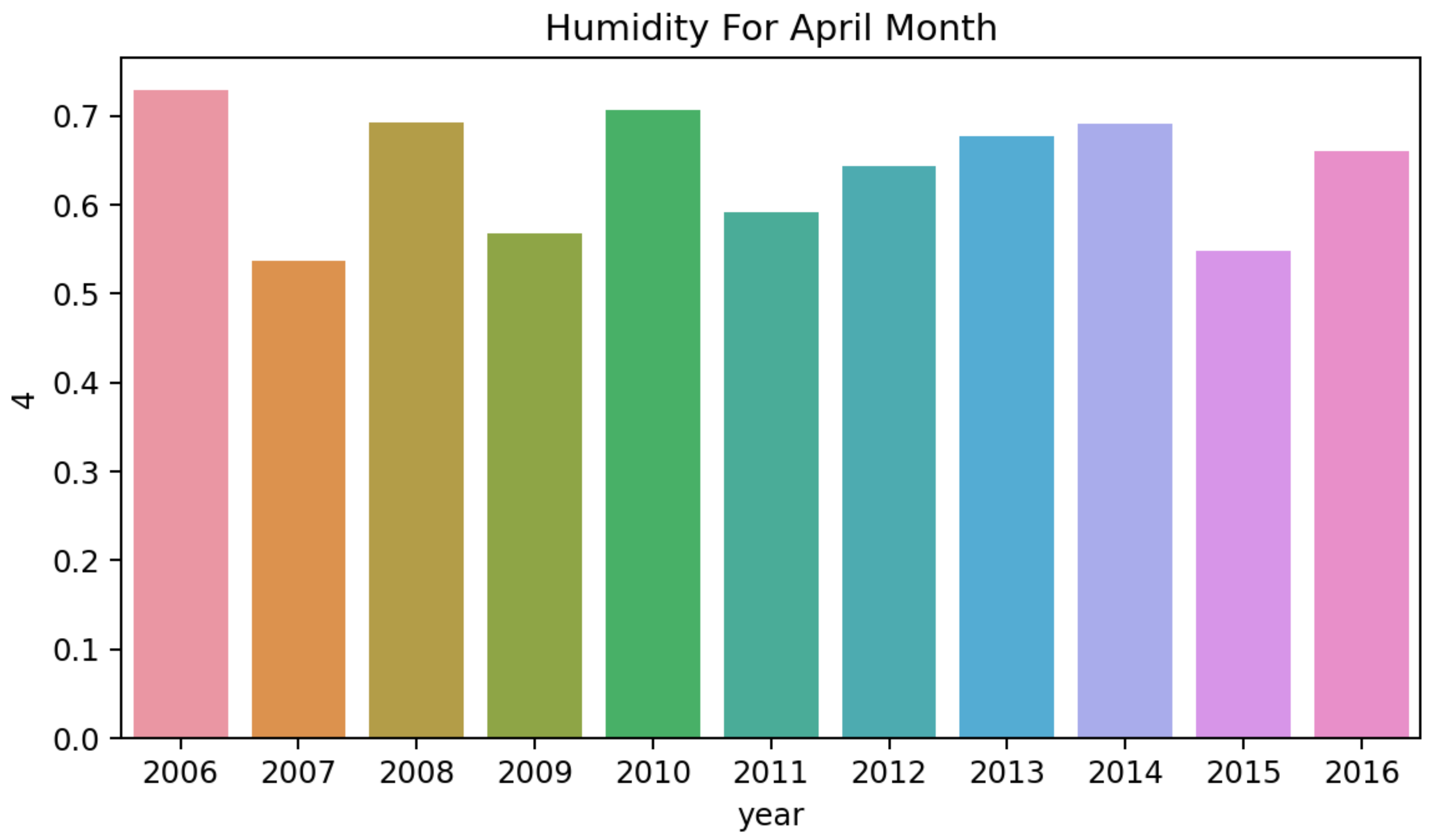

AT and Humidity (Without Normalization) for Month : Oct
12
10
8
6
4
2
2006
2008
2010
2012
2014
2016
AT
Humidity



In [65]:
```
%matplotlib notebook
```

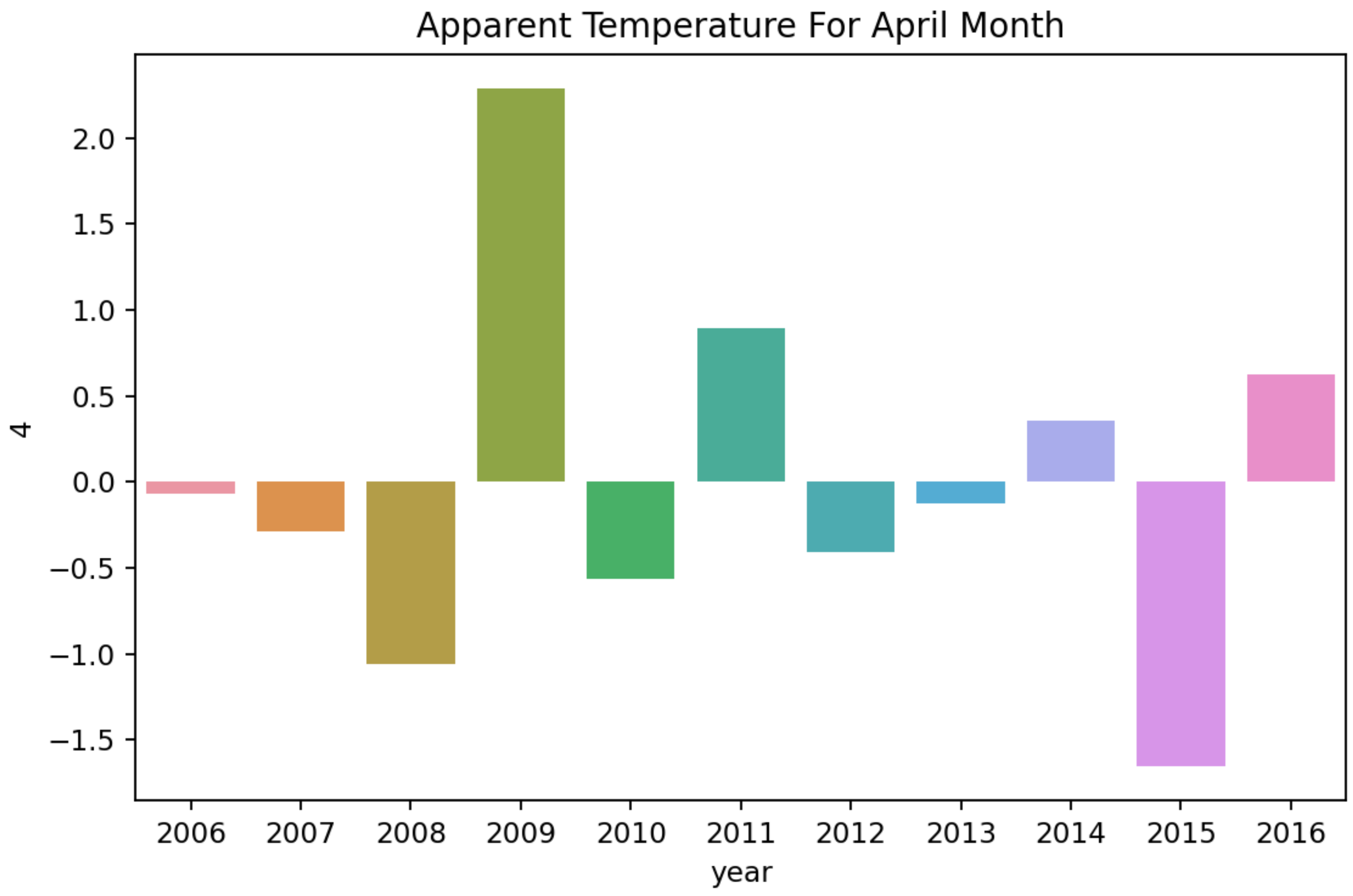
In [73]:
```
sns.barplot(H['year'] , H[4])
plt.title('Humidity For April Month')
plt.show()
```

```
E:\Anaconda\envs\myenv\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following var
iables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and p
assing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

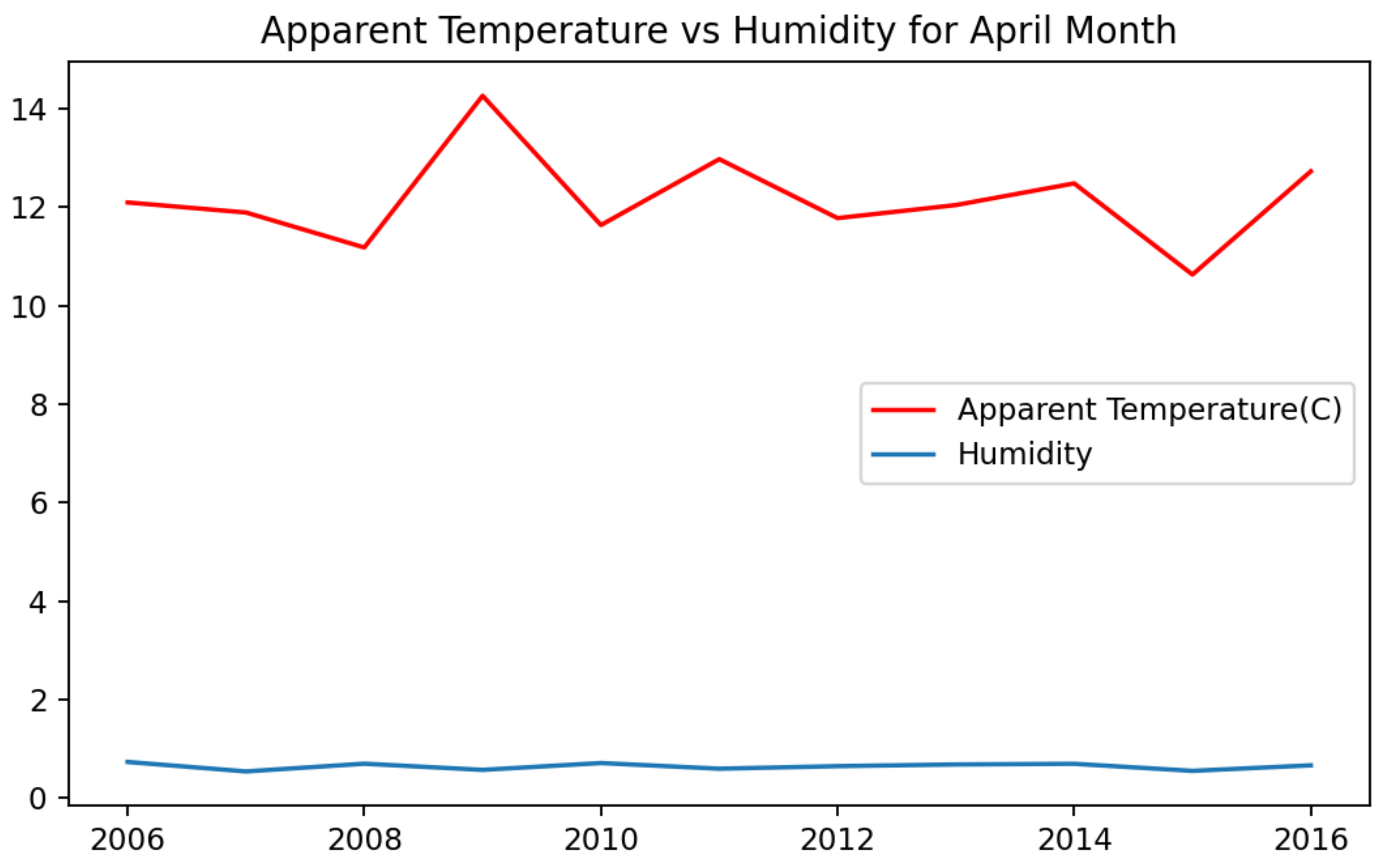


In [80]:
```
sns.barplot(AT['year'] , AT[4])
plt.title('Apparent Temperature For April Month')
plt.show()
```

```
E:\Anaconda\envs\myenv\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following var
iables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and p
assing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

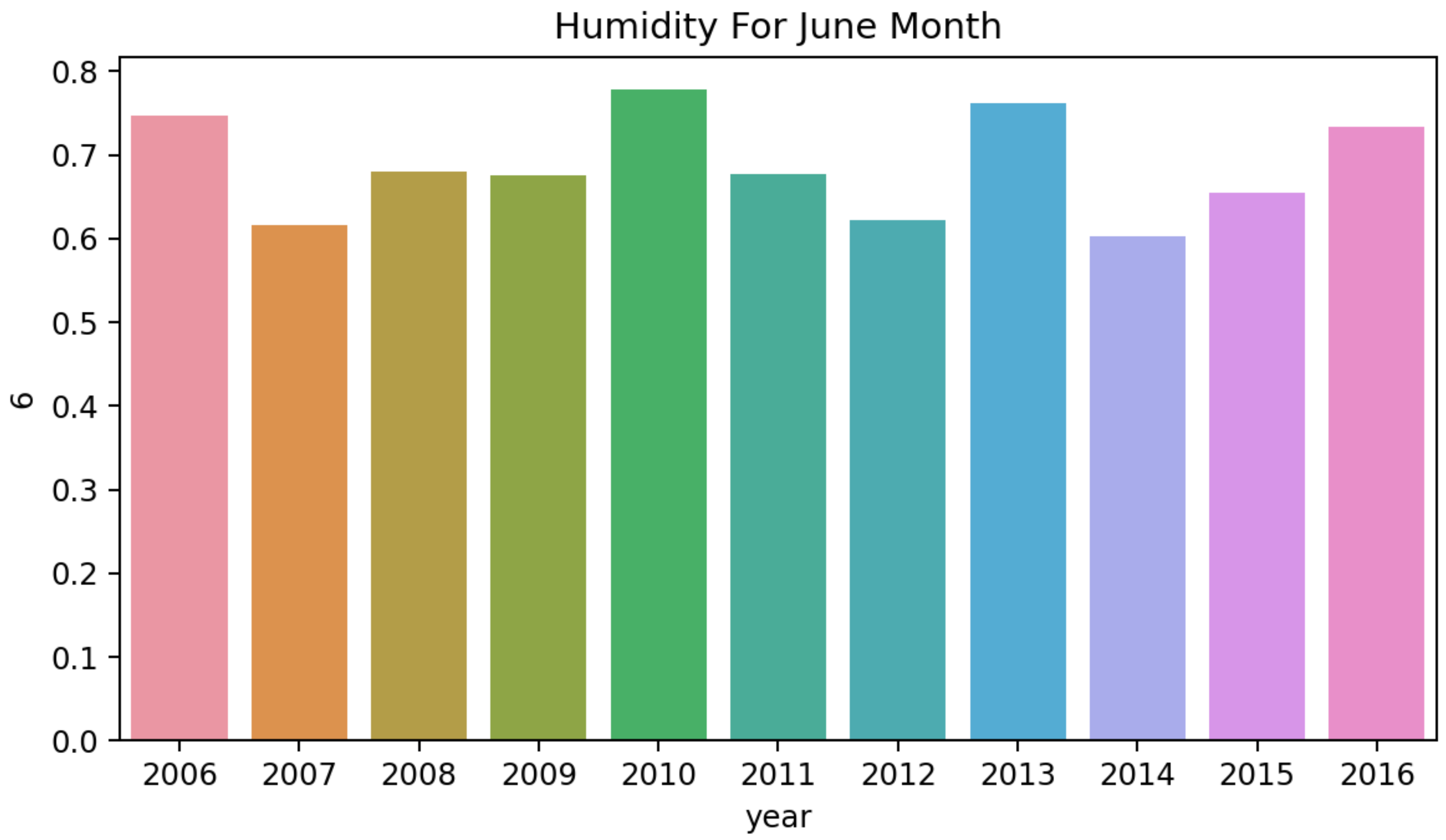


In [82]:
```
plt.plot(range(2006,2017),AT_monthly_average[4] , label = 'Apparent Temperature(C)' , color = 'red')
plt.plot(range(2006,2017),Humidity_monthly_average[4] , label = 'Humidity')
plt.legend()
plt.title('Apparent Temperature vs Humidity for April Month')
plt.show()
```



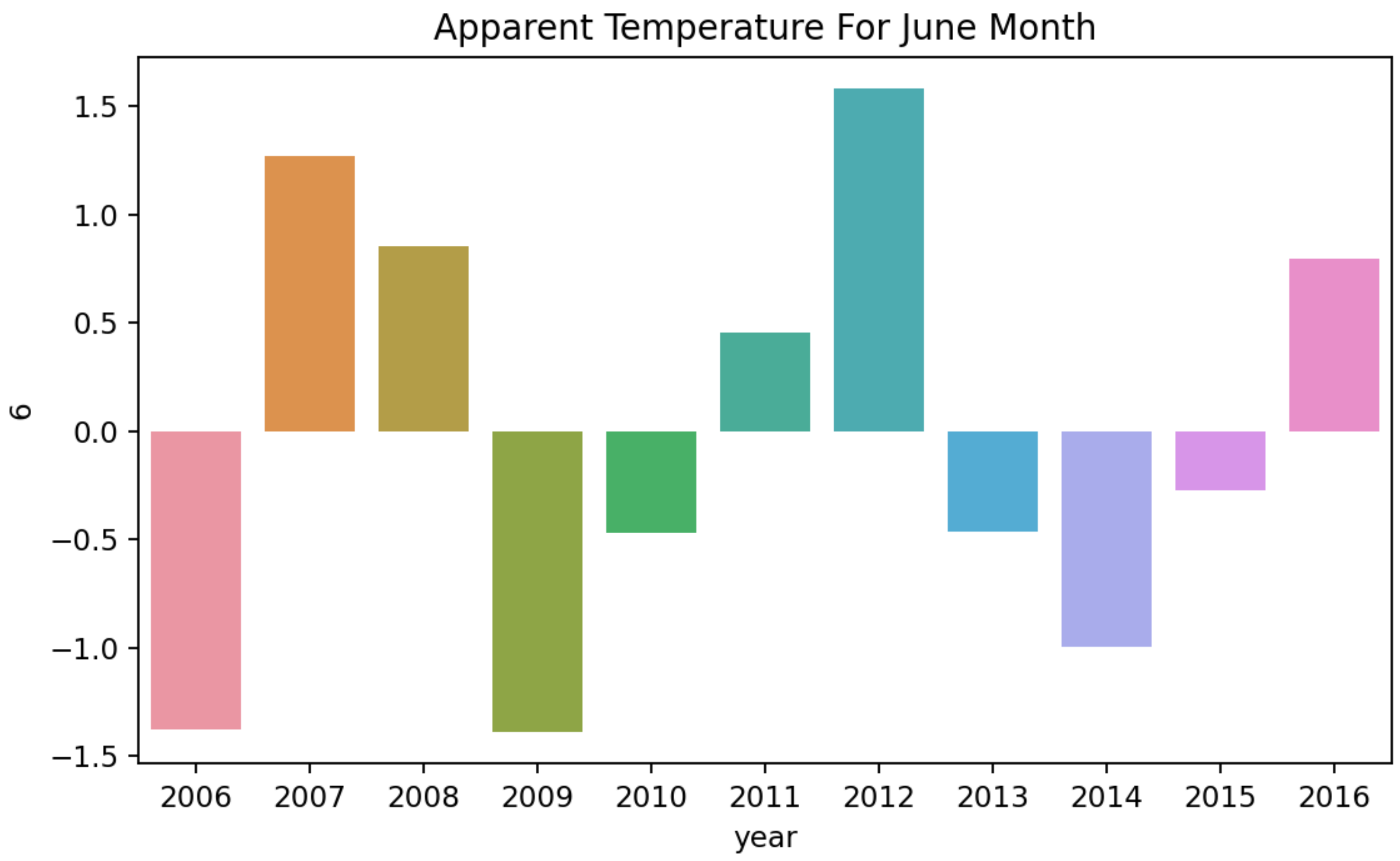
```
In [75]: sns.barplot(H['year'] , H[6])
         plt.title('Humidity For June Month')
         plt.show()
```

```
E:\Anaconda\envs\myenv\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following var
iables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and p
assing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

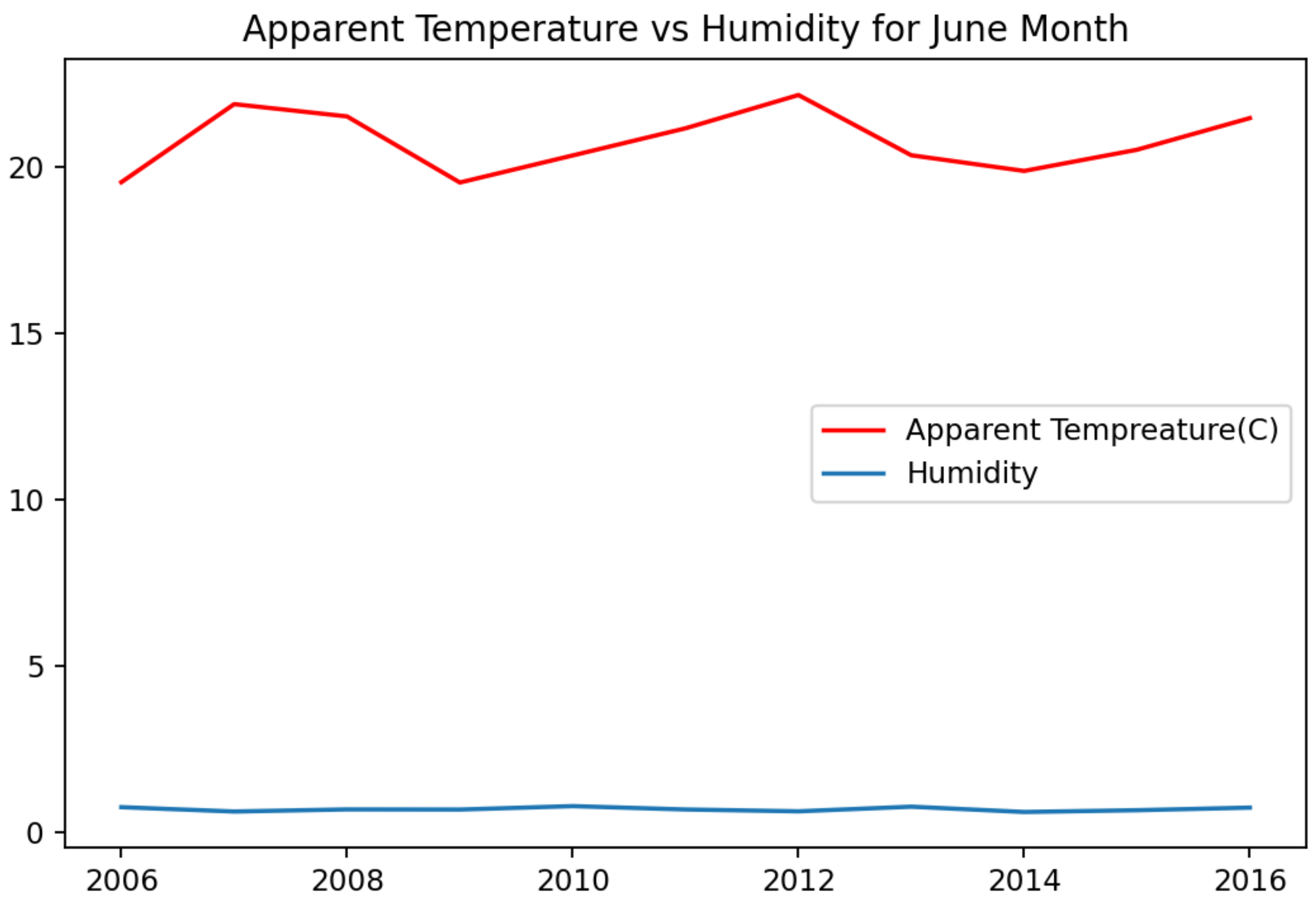


In [83]:
```
sns.barplot(AT['year'] , AT[6])
plt.title('Apparent Temperature For June Month')
plt.show()
```

```
E:\Anaconda\envs\myenv\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following var
iables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and p
assing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [84]:
```
plt.plot(range(2006,2017),AT_monthly_average[6] , label = 'Apparent Tempreature(C)' , color = 'red')
plt.plot(range(2006,2017),Humidity_monthly_average[6] , label = 'Humidity')
plt.legend()
plt.title('Apparent Temperature vs Humidity for June Month')
plt.show()
```



In [ ]: