In [21]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
# %matplotlib notebook
```

In [1]:
```python
data = pd.read_csv('weatherHistory.csv' , parse_dates = ['Formatted Date'] , index_col = ['Formatted Date'])
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-1-8706dcf1ab9a> in <module>
----> 1 data = pd.read_csv('weatherHistory.csv' , parse_dates = ['Formatted Date'] , index_col = ['Formatted Da
te'])

NameError: name 'pd' is not defined
```

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

Out[3]:

Formatted Date	Summary	Precip Type	Temperature (C)	Apparent Temperature (C)	Humidity	Wind Speed (km/h)	Wind Bearing (degrees)	Visibility (km)	Pressure (millibars)	Daily Summary
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]:
```python
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]:
```python
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]:
```python
new_data = data.dropna() # remove null columns and store it in a new data set
```

In [6]:
```python
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]:
```python
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]:
```python
new_data.index = pd.to_datetime(new_data.index , utc =True)
```

Using Resample Function

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

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

Out[10]:

Formatted Date	Temperature (C)	Apparent Temperature (C)	Humidity	Wind Speed (km/h)	Wind Bearing (degrees)	Visibility (km)	Pressure (millibars)
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]:
```python
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]:
```python
resampled_data['month'] = resampled_data.index.month
```

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

In [14]:
```python
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]:
```python
resampled_data.index = resampled_data.index.date
```

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

In [17]:
```python
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]:
```python
# 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 Temperature (C)'
```

In [19]:
```python
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()
```

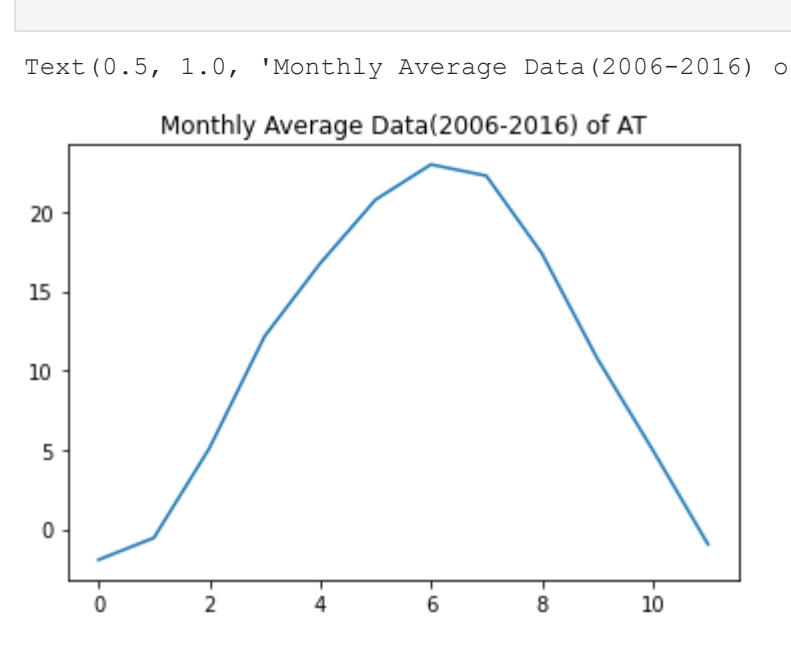
In [20]:
```python
# now we have to find avg apparent tempreature for month to month like april 2006 to april 2016
month_to_month_Humidity = {}
for month in range(1,13):
    month_to_month_Humidity[month] = list(resampled_data[resampled_data['month'] == month]['Humidity'].values)
```

In [21]:
```python
# 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]:
```python
AT_difference_monthly = find_avg_difference(month_to_month_AT)
Humidity_difference_monthly = find_avg_difference(month_to_month_Humidity)
```

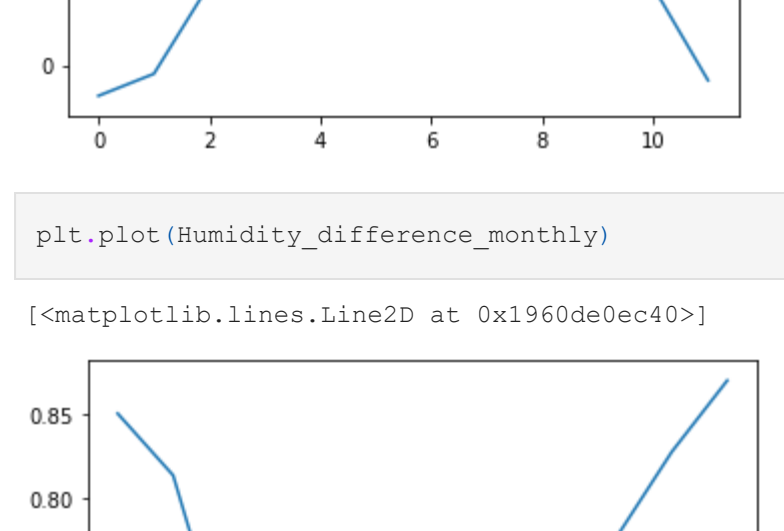
In [23]:
```python
plt.plot(AT_difference_monthly)
plt.title('Monthly Average Data(2006-2016) of AT')
```

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



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

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



Manually Resampling

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

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

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

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

In [29]:
```python
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_for].val
            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
```

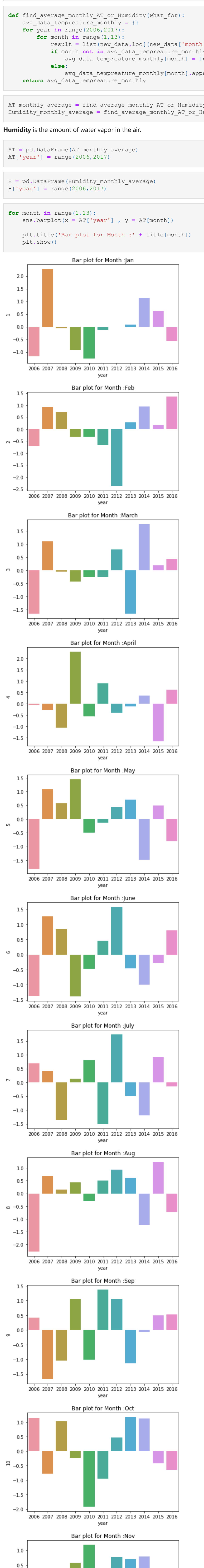
In [70]:
```python
AT_monthly_average = find_average_monthly_AT_or_Humidity('Apparent Temperature (C)')
Humidity_monthly_average = find_average_monthly_AT_or_Humidity('Humidity')
```

Humidity is the amount of water vapor in the air.

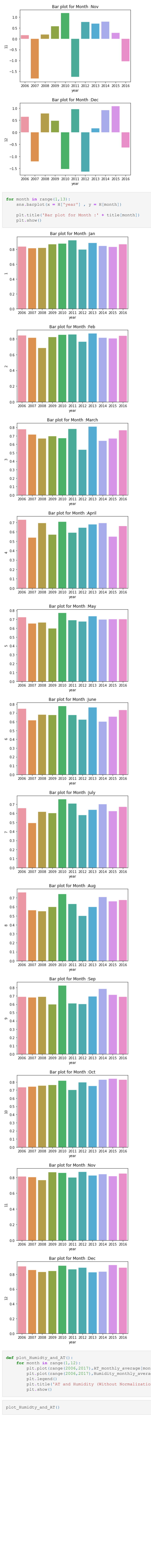
In [37]:
```python
AT = pd.DataFrame(AT_monthly_average)
AT['year'] = range(2006,2017)
```

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

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

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

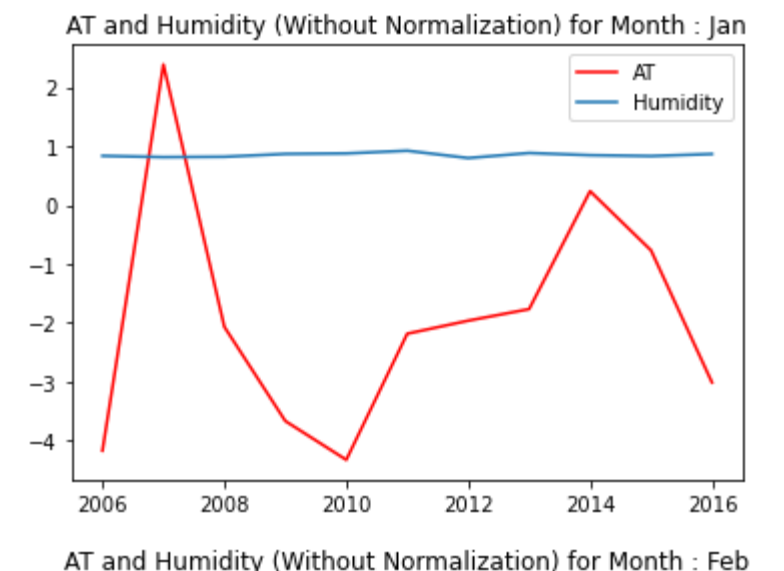


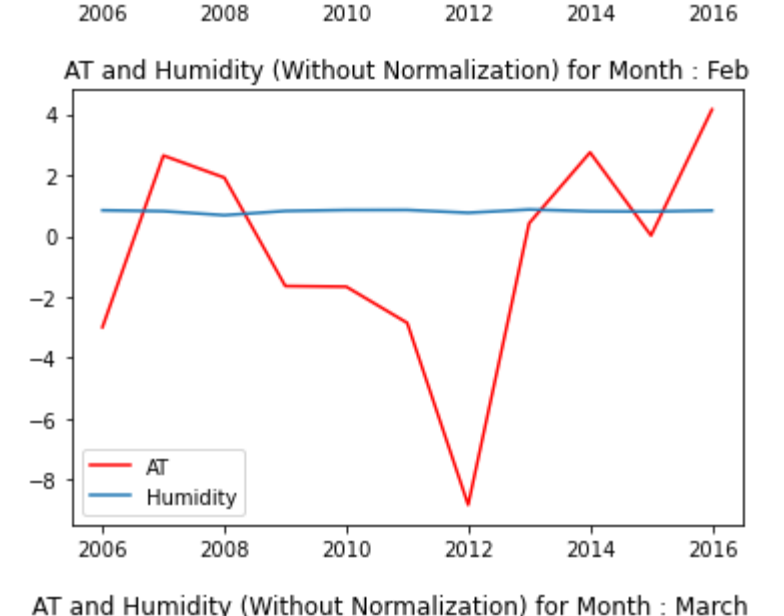
In [64]:
```python
for month in range(1,13):
    sns.barplot(x = H['year'] , y = H[month])

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

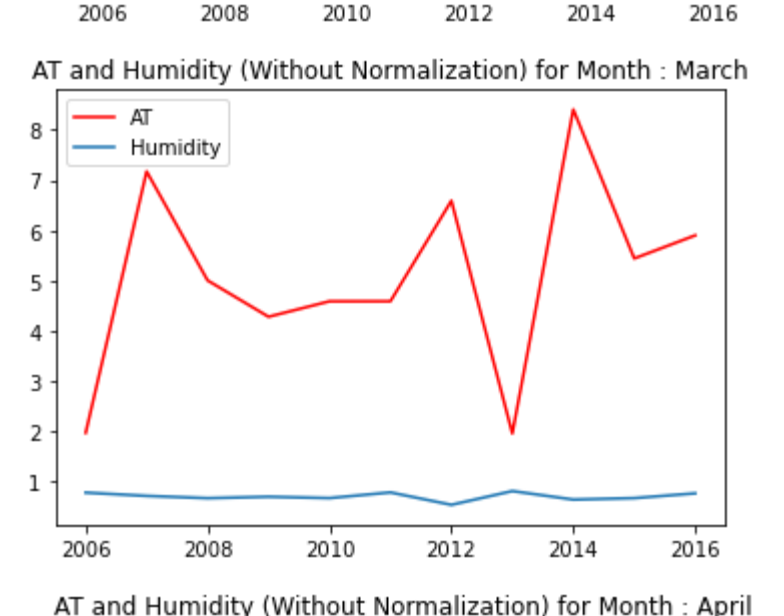


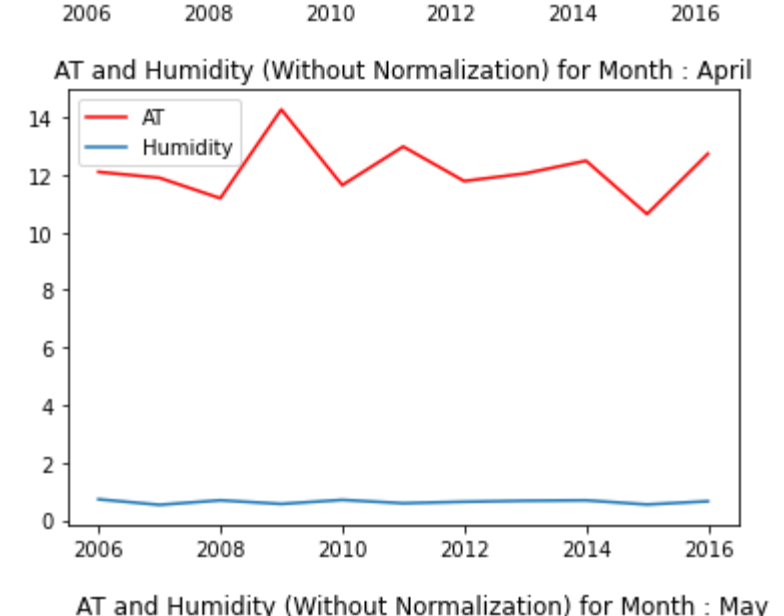
In [31]:
```python
def plot_Humidty_and_AT():
    for month in range(1,12):
        plt.plot(range(2006,2017),AT_monthly_average[month] , label = 'AT' , color = 'red')
        plt.plot(range(2006,2017),Humidity_monthly_average[month] , label = 'Humidity')
        plt.legend()
        plt.title('AT and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

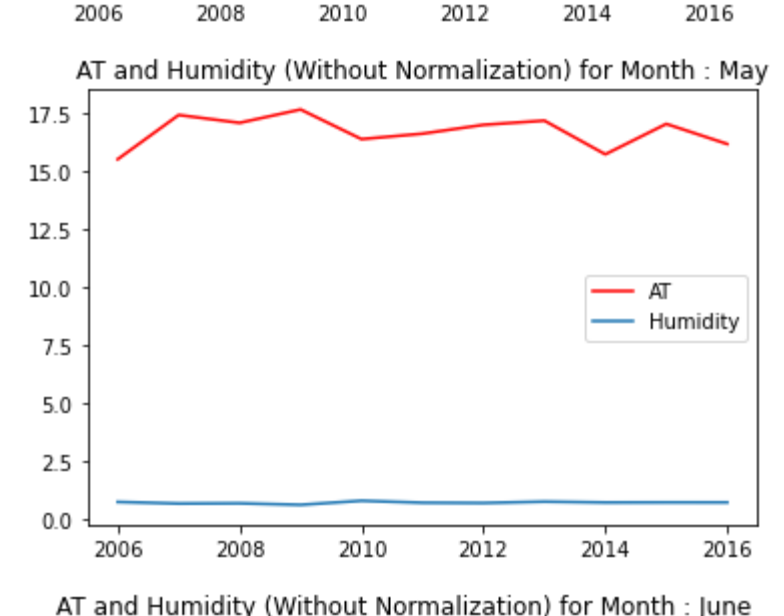
In [32]:
```python
plot_Humidty_and_AT()
```

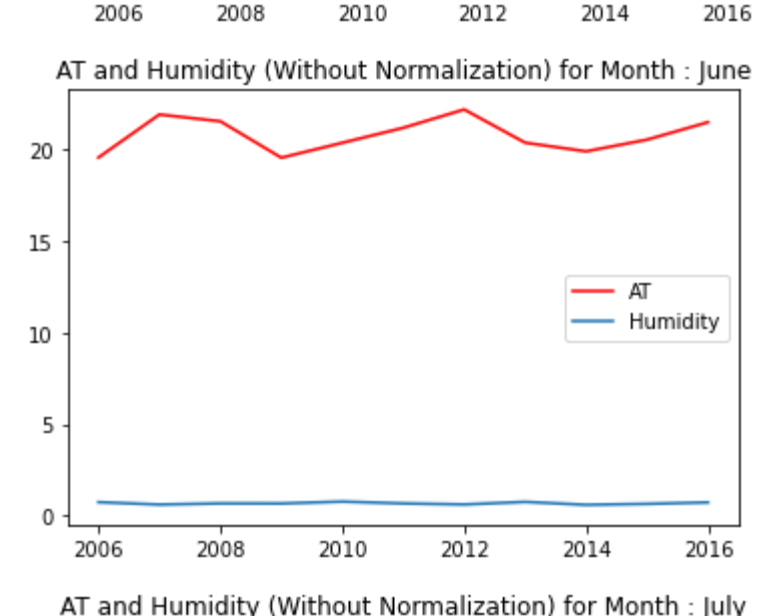


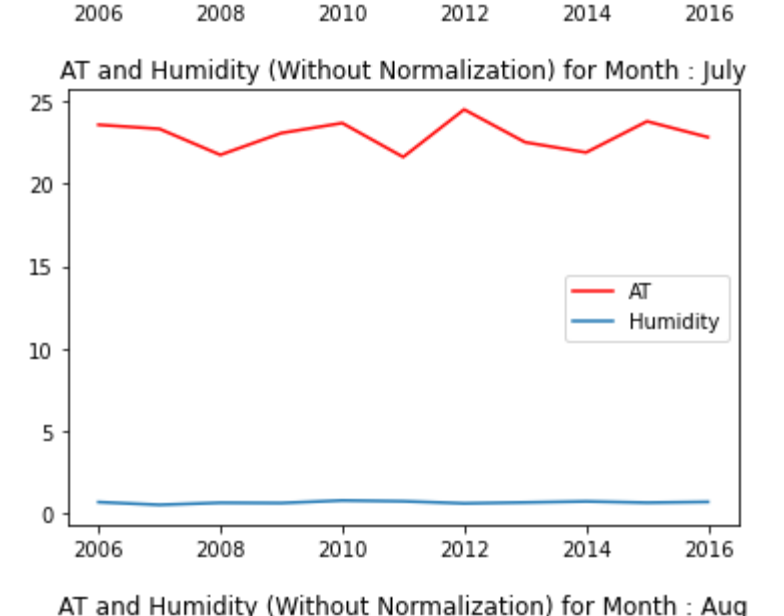


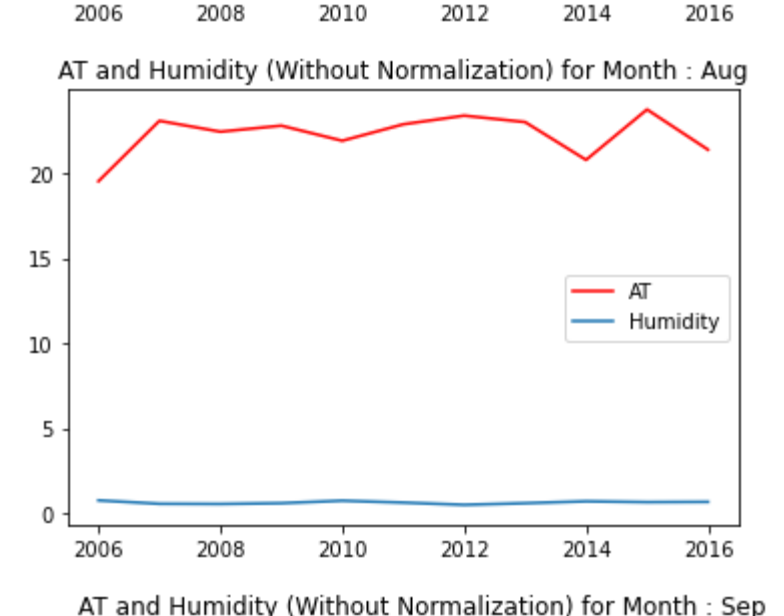


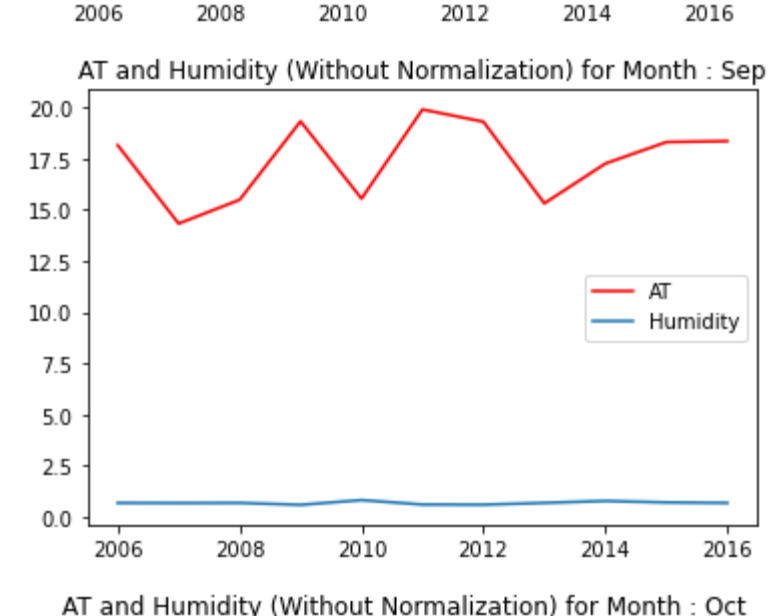


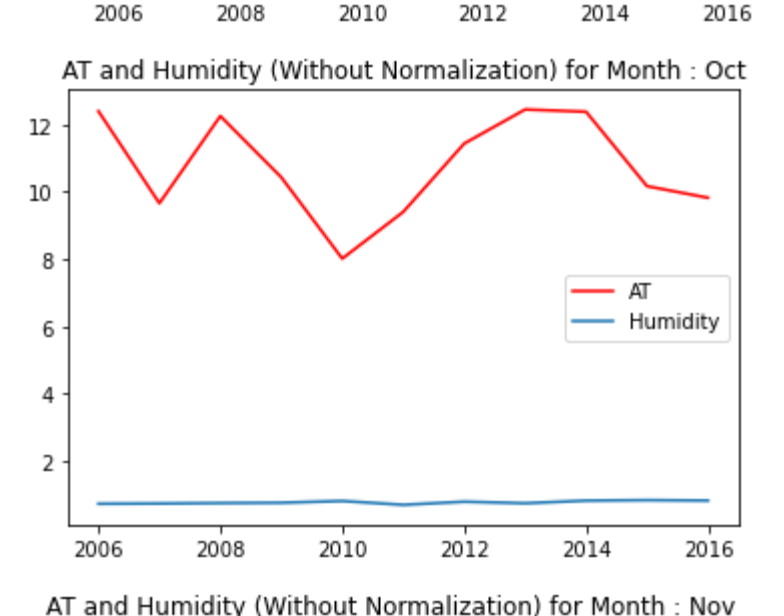


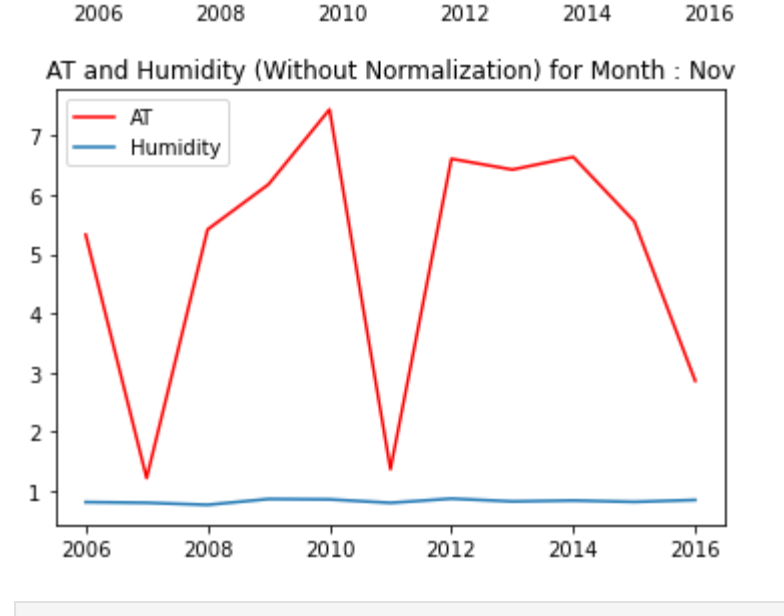








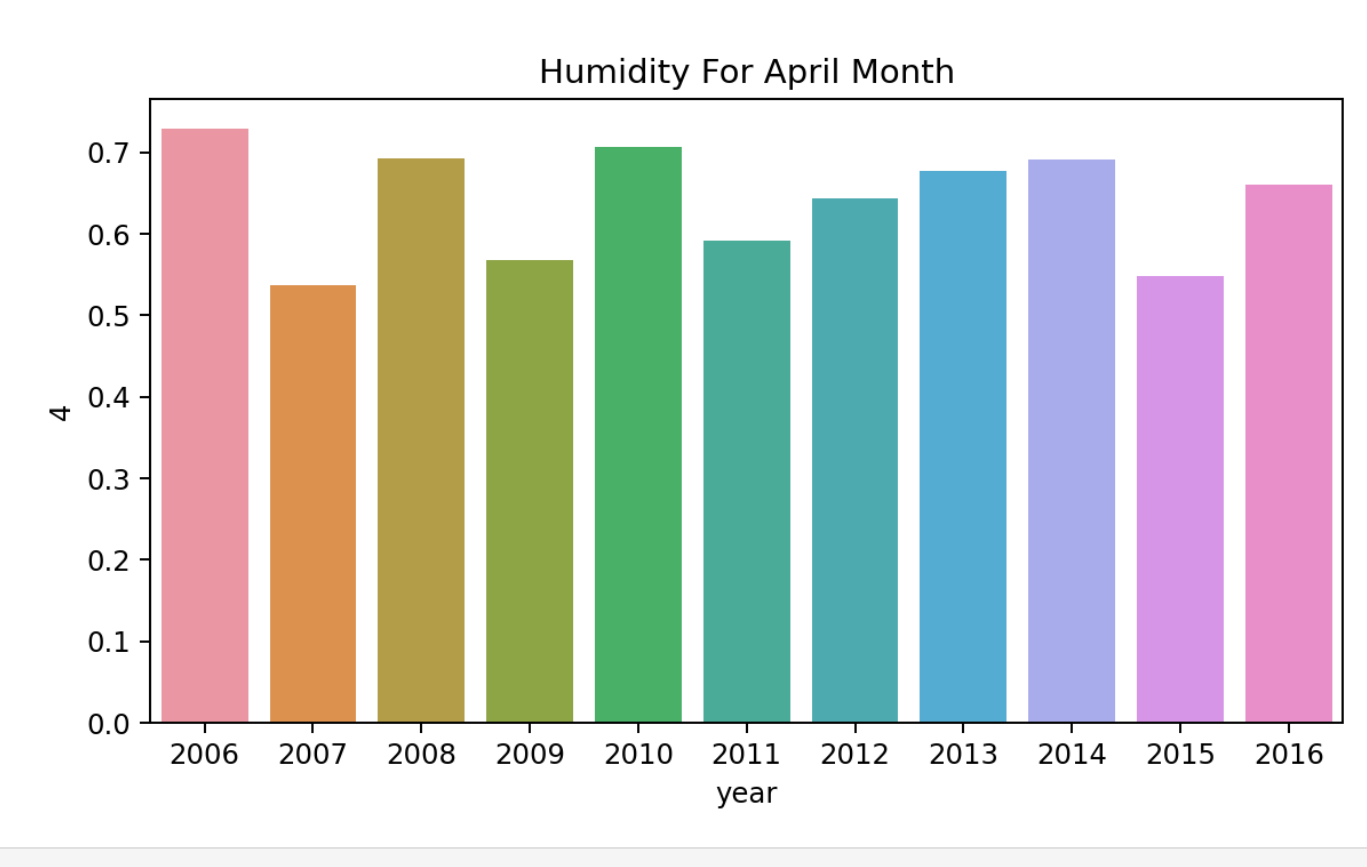




In [65]:
```
%matplotlib notebook
```

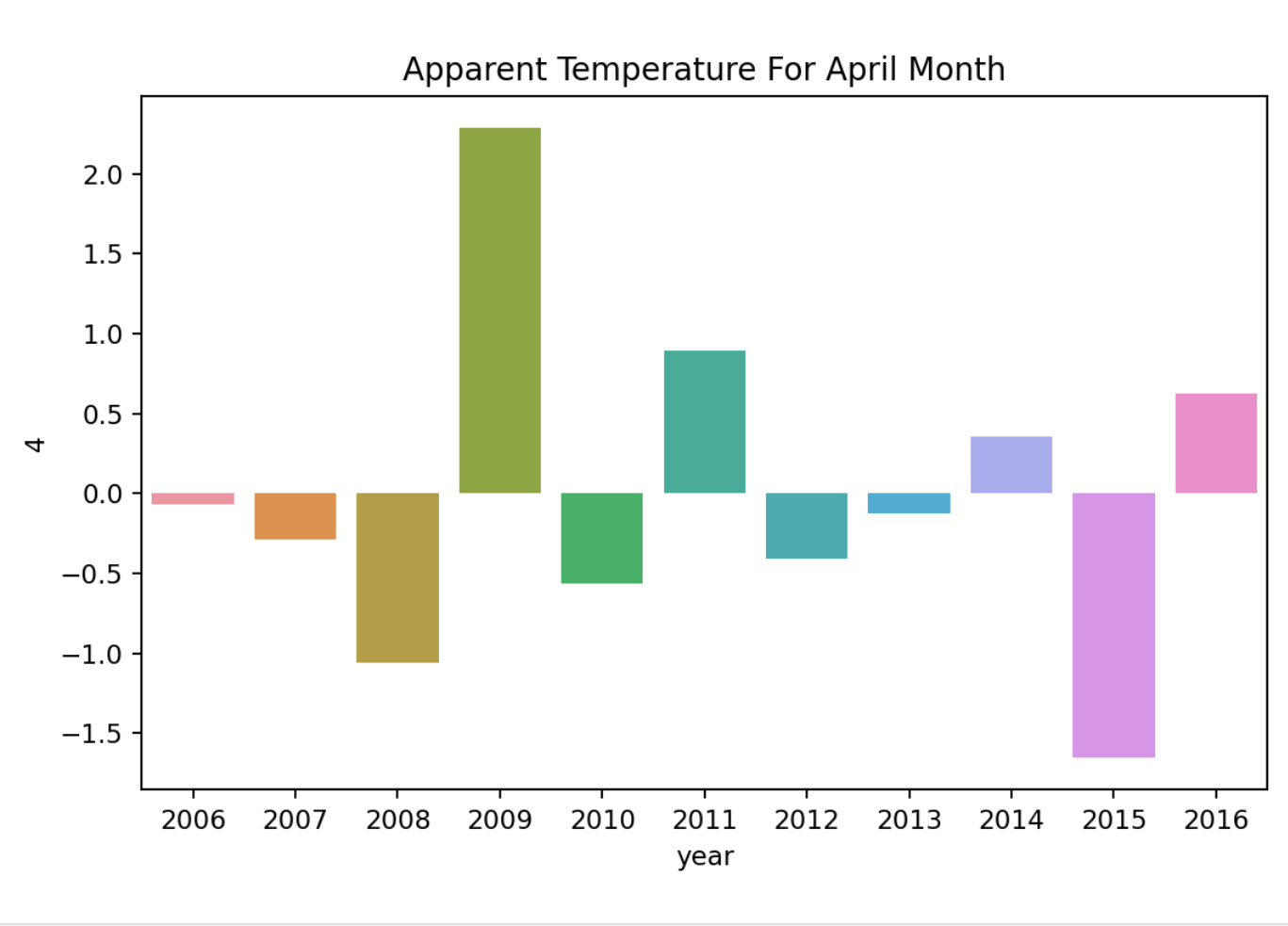
In [73]:
```
sns.barplot(H['year'] , H[4])
plt.title('Humidity For April Month')
plt.show()
```

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

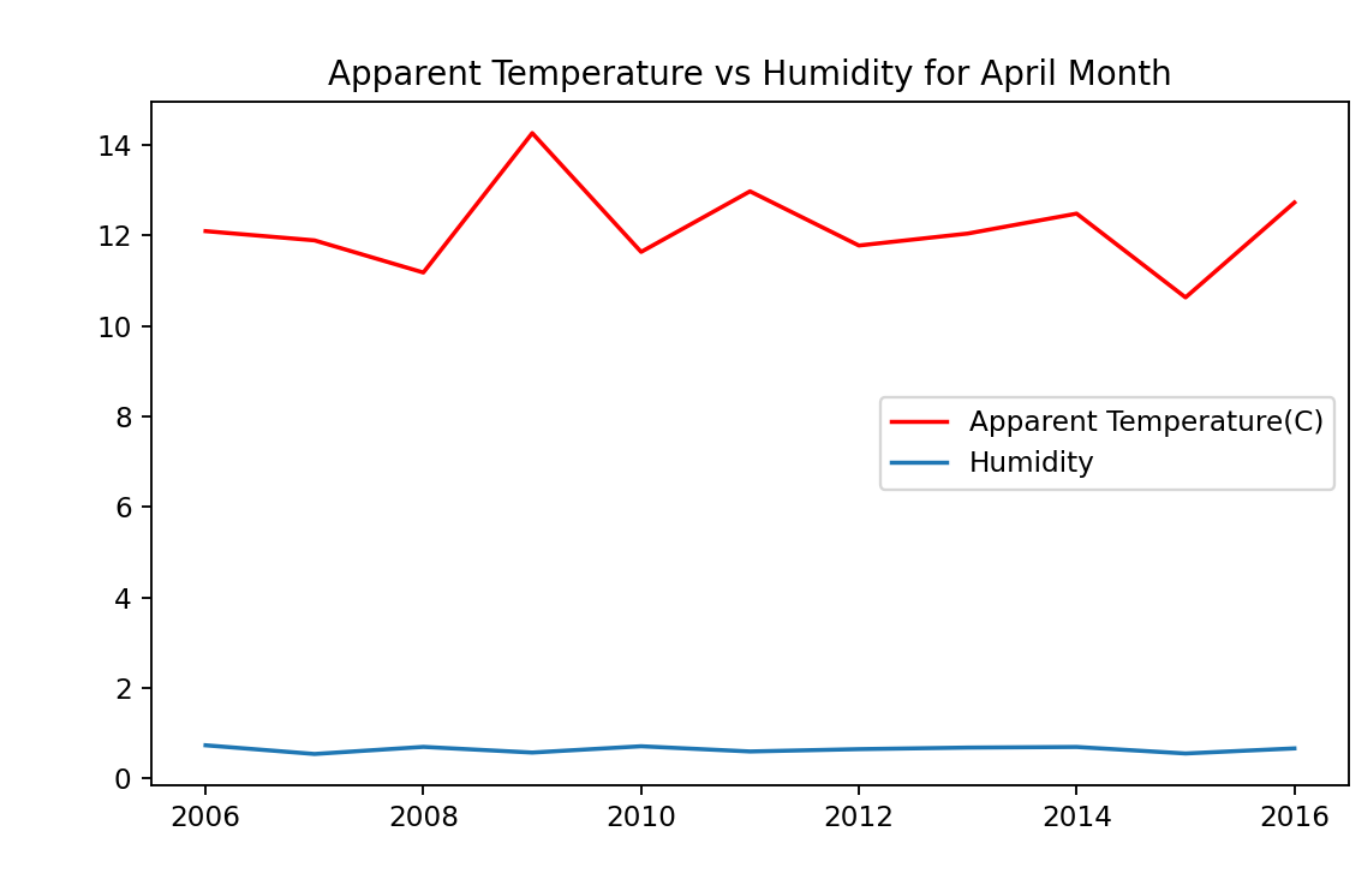


In [80]:
```
sns.barplot(AT['year'] , AT[4])
plt.title('Apparent Temperature For April Month')
plt.show()
```

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

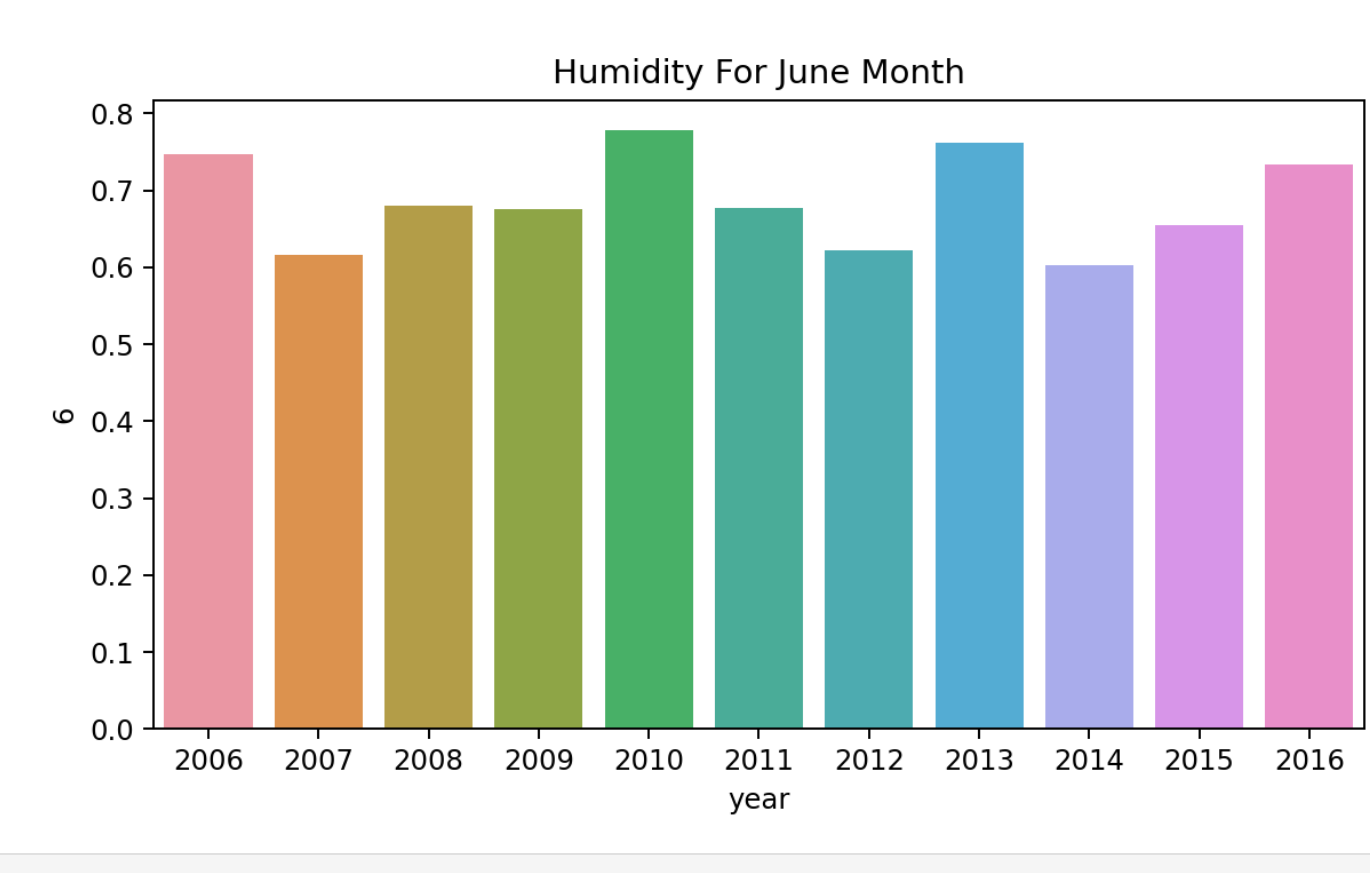


In [82]:
```
plt.plot(range(2006,2017),AT_monthly_average[4] , label = 'Apparent Temperature(C)' , color = 'red')
plt.plot(range(2006,2017),Humidity_monthly_average[4] , label = 'Humidity')
plt.legend()
plt.title('Apparent Temperature vs Humidity for April Month')
plt.show()
```



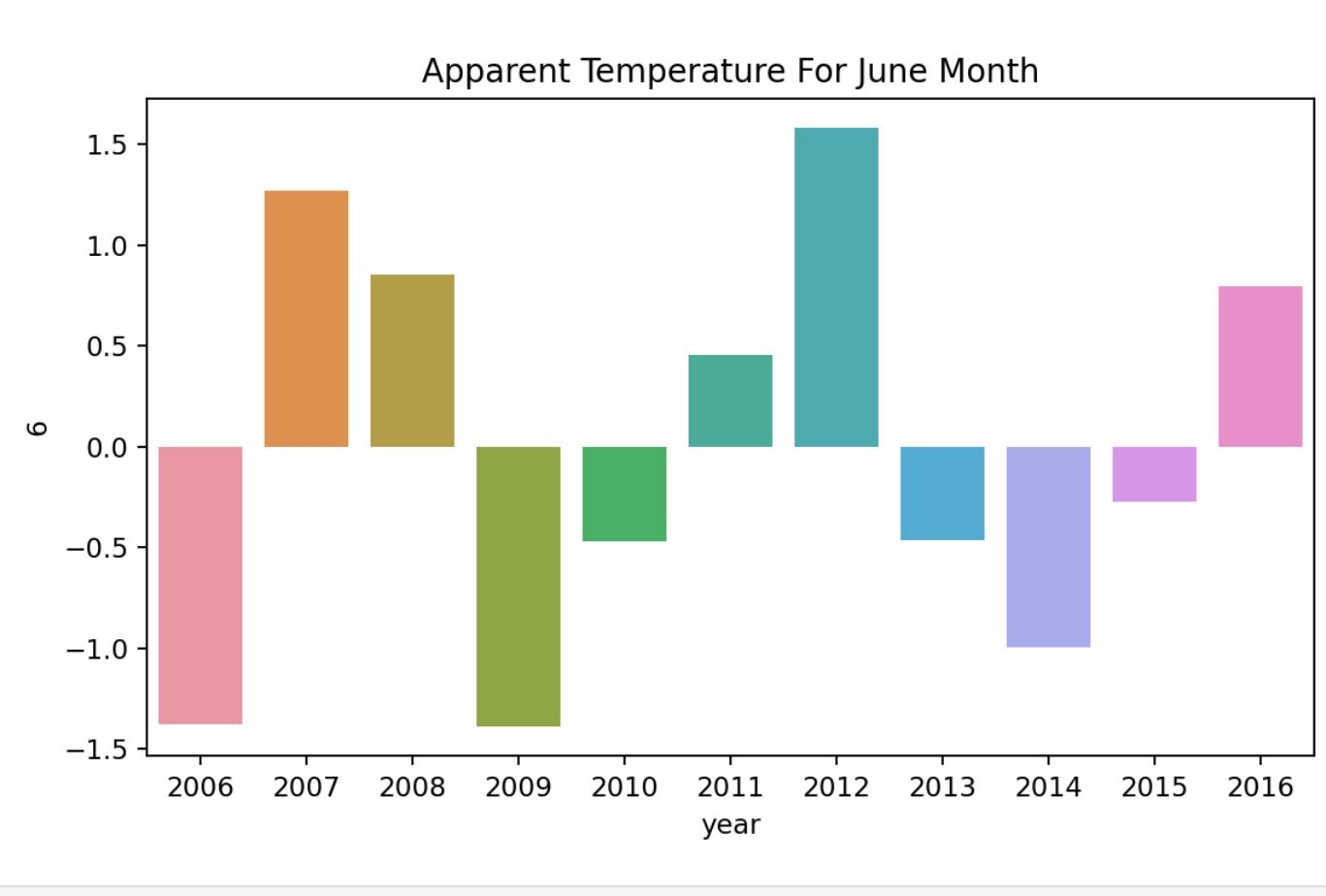
In [75]:
```
sns.barplot(H['year'] , H[6])
plt.title('Humidity For June Month')
plt.show()
```

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

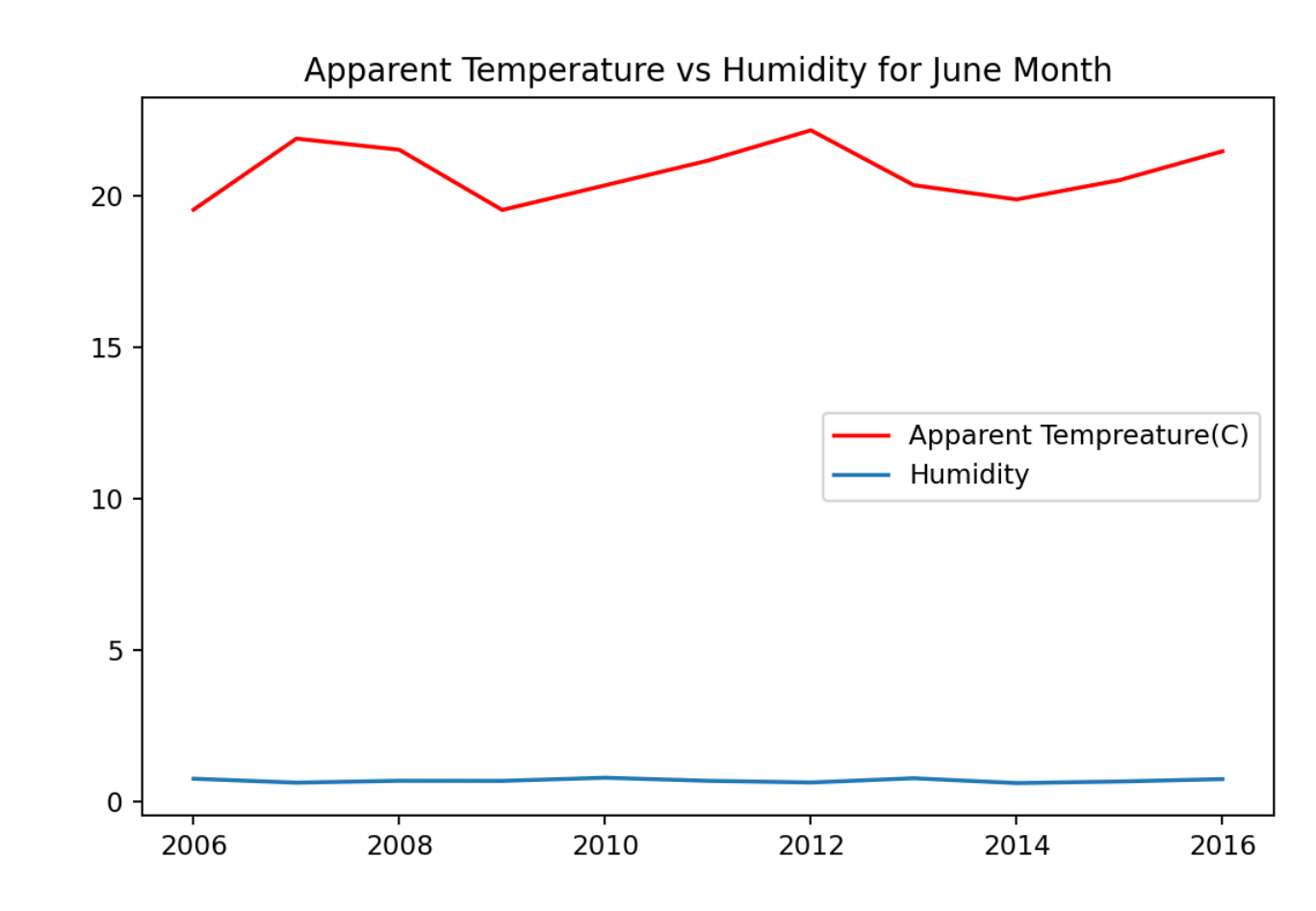


In [83]:
```
sns.barplot(AT['year'] , AT[6])
plt.title('Apparent Temperature For June Month')
plt.show()
```

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