Homework -2

MULTIPLE REGRESSION

In [99]:
```
import numpy as np
import pandas as pd
from scipy import stats

import matplotlib as ml
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

In [84]:
```
data_df = pd.read_csv('data.csv')
```

In [85]:
```
data_df.head()
```

Out[85]:

	Hour	CO	Traffic	Wind
0	1	2.4	50	-0.2
1	2	1.7	26	0.0
2	3	1.4	16	0.0
3	4	1.2	10	0.0
4	5	1.2	12	0.1

1. Find the correlation and plot the scatter plot of (Y and H), (Y and T), (Y and W)

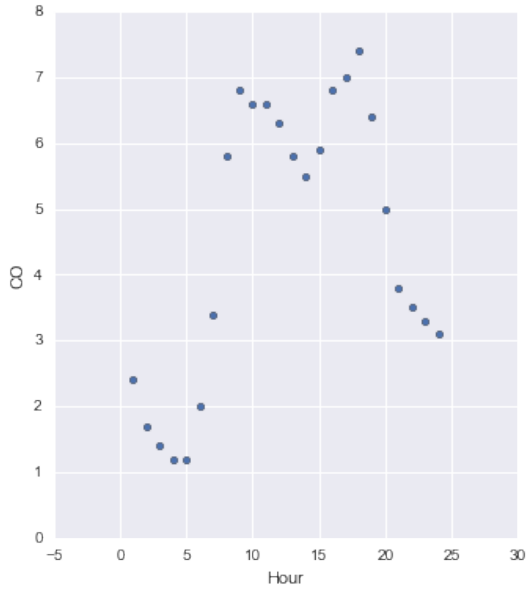
In [86]:
```
Y = data_df.CO
H = data_df.Hour
T = data_df.Traffic
W = data_df.Wind
```

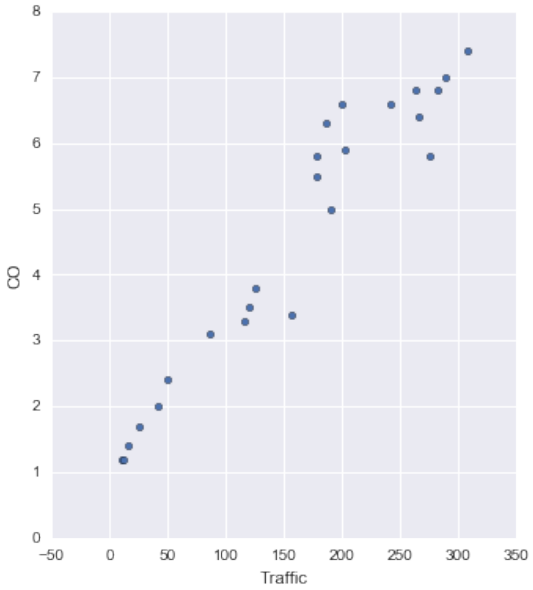
In [129]:
```
print np.corrcoef(H,Y)
print "\nHere Correlation between H and Y is 43.83%"

print np.corrcoef(T,Y)
print "\nHere Correlation between T and Y is 96.26%"

print np.corrcoef(W,Y)
print "\nHere Correlation between W and Y is 70.97%"
```

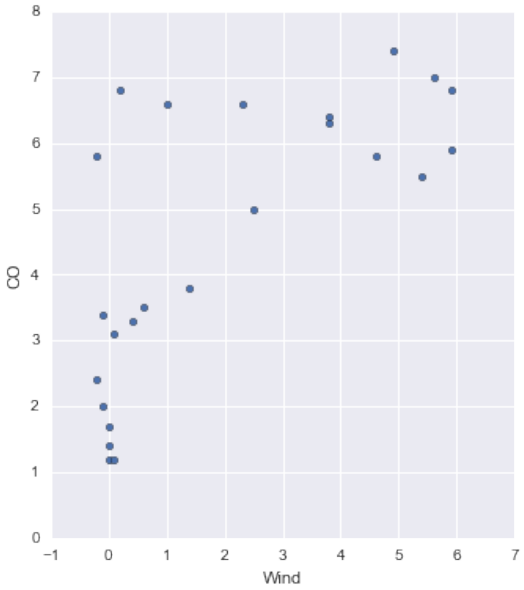
```
[[ 1.          0.42835141]
 [ 0.42835141  1.        ]]

Here Correlation between H and Y is 43.83%
[[ 1.          0.96266546]
 [ 0.96266546  1.        ]]

Here Correlation between T and Y is 96.26%
[[ 1.          0.70974865]
 [ 0.70974865  1.        ]]

Here Correlation between W and Y is 70.97%
```

In [145]:
```
fig, axs = plt.subplots(1,3)
data_df.plot(kind = "scatter", x = 'Hour', y = 'CO', ax = axs[0], figsize=(18
,6))
data_df.plot(kind = 'scatter', x = 'Traffic', y = 'CO', ax = axs[1])
data_df.plot(kind = 'scatter', x = 'Wind', y = 'CO', ax = axs[2])
```

Out[145]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x124081110>
```







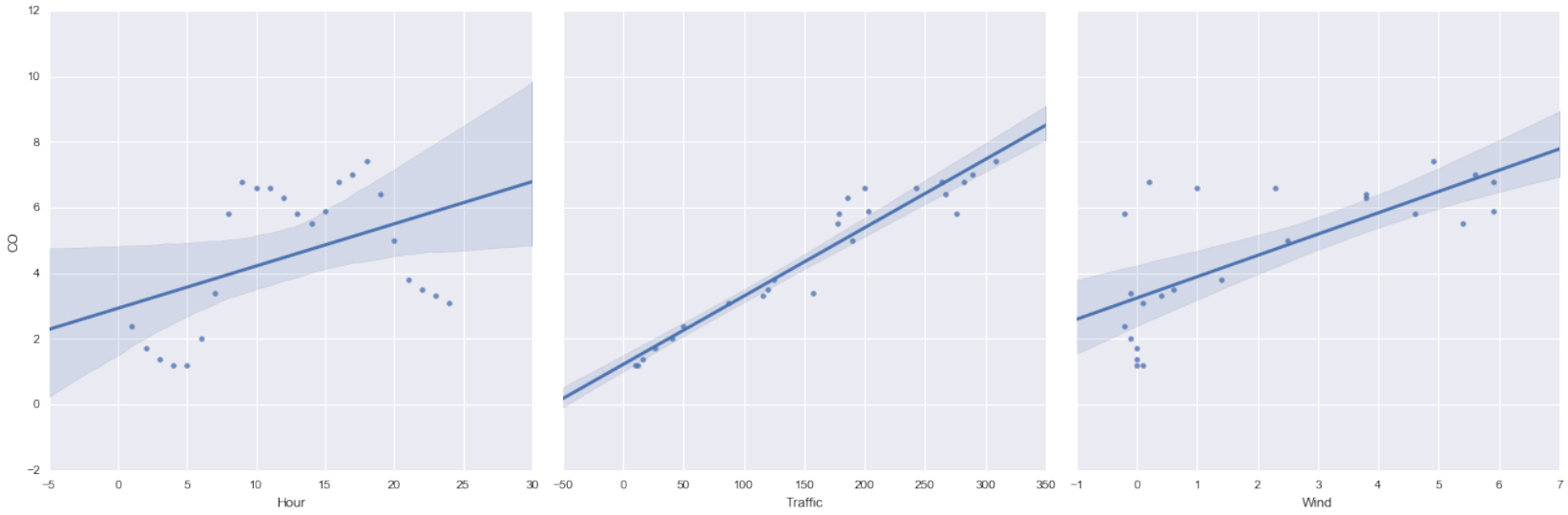
2.

In [168]:
```
slope1, intercept1, r_value1, p_value1, std_err1 = stats.linregress(H,Y)
slope2, intercept2, r_value2, p_value2, std_err2 = stats.linregress(T,Y)
slope3, intercept3, r_value3, p_value3, std_err3 = stats.linregress(W,Y)

print "R^2 for H and Y is: ", r_value1**2
print "R^2 for T and Y is: ", r_value2**2
print "R^2 for W and Y is: ", r_value3**2
```

```
R^2 for H and Y is:  0.183484932457
R^2 for T and Y is:  0.92672478996
R^2 for W and Y is:  0.503743142976
```

In [144]:
```
g = sns.PairGrid(data_df, y_vars=["CO"], x_vars=["Hour", "Traffic", "Wind"],
size=6)
g.map(sns.regplot)
```

Out[144]: <seaborn.axisgrid.PairGrid at 0x123553390>



3.

In [125]:
```
print np.corrcoef(T,H)
print 'Correlation Between T and H is 42.85%'
print np.corrcoef(W,T)
print 'Correlation Between W and T is 61.34%'
print np.corrcoef(H,W)
print 'Correlation Between H and W is 42.26%'
```

```
[[ 1.          0.42852285]
 [ 0.42852285  1.        ]]
Correlation Between T and H is 42.85%
[[ 1.          0.61344359]
 [ 0.61344359  1.        ]]
Correlation Between W and T is 61.34%
[[ 1.          0.42263809]
 [ 0.42263809  1.        ]]
Correlation Between H and W is 42.26%
```

4.

In [201]:
```
# Y = Y , X = T,H
Y = data_df['CO']
X1 = data_df[['Traffic', 'Hour']]
X2 = data_df[['Wind', 'Traffic']]
X3 = data_df[['Hour', 'Wind']]
X = data_df[['Hour', 'Traffic', 'Wind']]
```

Traffic and Hour

In [178]:
```
import statsmodels.formula.api as smf
lm1 = smf.ols(formula='CO ~ Hour+Traffic', data=data_df).fit()
```

In [185]:
```
print "Coefficients of the model: "
print lm1.params
```

```
Coofficients of the model:
Intercept    1.175000
Hour         0.005815
Traffic      0.020647
dtype: float64
```

In [186]:
```
print "Confidence Interval: "
print lm1.conf_int()
```

```
Confidence Interval:
                  0         1
Intercept  0.593308  1.756692
Hour      -0.034879  0.046509
Traffic    0.017712  0.023583
```

In [187]:
```
print "R-squared: "
print lm1.rsquared
```

```
R-squared:
0.927031639809
```

In [188]:
```
print "Predictions of CO using model i.e due to regression: "
print lm1.predict(X1)
```

```
Predictions of CO using model i.e due to regression:
[ 2.21318299  1.72346137  1.52280278  1.40473362  1.45184334  2.05643174
  4.45734036  6.92019105  7.0498902   6.22981084  5.36843677  5.08518874
  4.94647222  4.93163986  5.45363882  6.71894271  7.24094167  7.63905648
  6.79832977  5.21429814  3.87803481  3.78061301  3.70383857  3.11088016]
```

wind and aTraffic

In [189]:
```
lm2 = smf.ols(formula='CO ~ Wind+Traffic', data=data_df).fit()
```

In [190]:
```
print "Coofficients of the model: "
print lm2.params
```

```
Coofficients of the model:
Intercept    1.274461
Wind         0.174747
Traffic      0.018290
dtype: float64
```

In [191]:
```
print "Confidence Interval: "
print lm2.conf_int()
```

```
Confidence Interval:
                   0         1
Intercept  0.862413  1.686510
Wind       0.056697  0.292797
Traffic    0.015497  0.021084
```

In [192]:
```
print "R-squared: "
print lm2.rsquared
```

```
R-squared:
0.949509414529
```

In [194]:
```
print "Predictions of CO using model i.e due to regression: "
print lm2.predict(X2)
```

```
Predictions of CO using model i.e due to regression:
[ 2.15403275  1.75001201  1.56710781  1.45736529  1.5114208   2.00689364
  4.12858237  6.28766769  6.4673089   5.87548946  5.33446254  5.34051672
  5.35228115  5.4737881   6.01842196  7.13413758  7.53897407  7.76416936
  6.82204075  5.18650768  3.805409    3.57415953  3.46604851  2.88320231]
```

Hour and Wind

In [195]:
```
lm3 = smf.ols(formula='CO ~ Hour+Wind', data=data_df).fit()
```

In [196]:
```
print "Coofficients of the model: "
print lm3.params
```

```
Coofficients of the model:
Intercept    2.776934
Hour         0.046881
Wind         0.588501
dtype: float64
```

In [198]:
```
print "Confidence Interval: "
print lm3.conf_int()
```

```
Confidence Interval:
                   0         1
Intercept  1.432270  4.121597
Hour      -0.056757  0.150520
Wind       0.272591  0.904411
```

In [199]:
```
print "R-squared: "
print lm3.rsquared
```

```
R-squared:
0.523810181436
```

In [200]:
```
print "Predictions of CO using model i.e due to regression: "
print lm3.predict(X3)
```

```
Predictions of CO using model i.e due to regression:
[ 2.70611473  2.87069625  2.91757757  2.96445888  3.0701903   2.99937142
  3.04625274  3.03428395  3.31656567  3.83424779  4.64618041  5.57581323
  6.09349535  6.61117747  6.95230929  6.99919061  6.86952163  6.50445224
  5.90398246  5.18581247  4.58534268  4.1614232   4.09060432  3.96093533]
```

5

In [202]:
```
lm = smf.ols(formula='CO ~ Hour+Traffic+Wind', data=data_df).fit()
```

In [203]:
```
print "Coofficients of the model: "
print lm.params
```

```
Coofficients of the model:
Intercept    1.318967
Hour        -0.005689
Traffic      0.018402
Wind         0.179189
dtype: float64
```

In [204]:
```
print "Confidence Interval: "
print lm.conf_int()
```

```
Confidence Interval:
                0         1
Intercept  0.813076  1.824858
Hour      -0.041289  0.029911
Traffic    0.015455  0.021349
Wind       0.055038  0.303340
```

In [205]:
```
print "R-squared: "
print lm.rsquared
```

```
R-squared:
0.949788420165
```

In [206]:
```
print "Predictions of CO using model i.e due to regression: "
print lm.predict(X)
```

```
Predictions of CO using model i.e due to regression:
[ 2.19752889  1.78603442  1.59632719  1.48022712  1.52926028  2.02138505
  4.15030336  6.31650814  6.49290518  5.89449551  5.34887679  5.35434601
  5.36319541  5.48245555  6.02640551  7.14322537  7.54382407  7.76233641
  6.80506571  5.14949276  3.7505791   3.50952957  3.39439527  2.80129731]
```

In [208]:
```
import os
os.environ
```

Out[208]:

```
{'TERM_PROGRAM_VERSION': '361.1', 'LOGNAME': 'dhrumindesai', 'USER': 'dhrumin
desai', 'PATH': '/Users/dhrumindesai/anaconda/bin:/usr/local/bin:/usr/bin:/bi
n:/usr/sbin:/sbin', 'HOME': '/Users/dhrumindesai', 'TERM_PROGRAM': 'Apple_Ter
minal', 'LANG': 'en_US.UTF-8', 'TERM': 'xterm-color', 'Apple_PubSub_Socket_Re
nder': '/private/tmp/com.apple.launchd.h5sGFTrCQH/Render', 'SHLVL': '1', 'XPC
_FLAGS': '0x0', 'TMPDIR': '/var/folders/6j/hxy_rx8d2713_pfzyb7l7mp00000gn/T/'
, 'TERM_SESSION_ID': '369B75E4-025E-435F-A3FD-78111711F9C9', 'XPC_SERVICE_NAM
E': '0', 'JPY_PARENT_PID': '568', 'SSH_AUTH_SOCK': '/private/tmp/com.apple.la
unchd.lJ3gWUSu6u/Listeners', 'SHELL': '/bin/bash', 'GIT_PAGER': 'cat', '_': '
/Users/dhrumindesai/anaconda/bin/jupyter', 'OLDPWD': '/Users/dhrumindesai/des
ktop/Stevens/BIA-652', 'CLICOLOR': '1', '__CF_USER_TEXT_ENCODING': '0x1F5:0x0
:0x0', 'PWD': '/Users/dhrumindesai/desktop/Stevens/BIA-652/Homework-2', 'PAGE
R': 'cat'}
```


In [ ]: