BUAN 6356.002
Problem Set 1
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Question 1:
1. Ave educ level = 12.56
Lowest year: 0
Highest year: 18

2. Ave hourly wage = 5.909
It seems high compare to the hourly wage back in 1976 because currently the hourly wage is only around $8/hour.

3. CPI 1976: 56.9
CPI 2010: 218.056

4.
1976: 5.909
Ave hourly wage in 2010 dollars: 5.909 * 218.056 / 56.9 = 22.645
This hourly wage seem reasonable as Inflation increase higher than wage.

5. No. of women: 252
No. of men: 274

Question 2
1. Largest value of math4: 100%
Smallest value of math4: 0%
The range makes sense because the students may satisfy 100% with their 4th grade math or totally not satisfy with it (0%).

2. No. of schools have perfect pass rate on the math test: 38
Percentage: 38/1823 * 100 = 2.085%

3. No. of schools have math pass rates of exactly 50%: 17

4. Ave pass rate of math: 71.91%
Ave pass rate of reading: 60.06%
Reading is harder pass.

5. Strong and positive correlation 0.8427281

6. Average = 5,195
SD = 1,091.89
95% pupils expenditures is in 5,195 +/- 1091.89*2
There's a wide variation in per pupil spending.

7. School A's spending exceed School B's: 9.09%
100 * [ln(6000) − ln(5500)] = 8.701138
9.09 is the exact percentage difference between School A's spending exceed School B's while 8.701138 is the estimated number. The difference between these 2 numbers is small.

% difference = 0.989552

Question 3
1. Ave prate = 87.36
Ave mrate = 0.7315

2. prate = 83.0755 + 5.8611*mrate
R-squared: 0.0747
Sample size = 1534

3. When mrate = 0, prate equals 83.0755.
When mrate increases by 1%, prate increases 5.8611%

4. mrate=3.5, prate = 103.5894
This is not reasonable because the participation rate exceeds 100%.
In this case the model is broken when mrate hits a certain big value.

5. 7.47% of the variation in prate is explained by mrate.

Question 4:
1. Avg salary = $865,900, Avg tenure = 7.955 years
2. 5 ceos in are in their 1st year
Longest tenure as a CEO: 37 years
3. ln(salary) = 6.505498 + 0.009724 ceoten
   R-sq = 0.01316, df=175
   A 1 year increase in tenure is associated with a 0.97% increase in a CEO's salary.

Question 5
1. Ave salary = 957.9
Ave IQ = 101.3
SD of IQ = 15.05264

2. Wage = 116.9916 + 8.3031 * IQ
IQ = 15, wage = 241.5381
Only 9.554% of variation in wage is explained by IQ.

3. ln(wage) = 5.8869943 + 0.0088072 * IQ
If IQ increases by 15 points, the approximate percentage increase in predicted wage is 0.0088072 *100*15 = 13.2108

Question 6
1. I don't think each additional dollar spent has the same effect on the pass rate.
A diminishing effect seems more appropriate because the math pass rate

2. If we take changes, we obtain: $\Delta math10 = \beta_1 \Delta \log(expend) \approx (\beta_1/100)(\%\Delta expend)$
Therefore if $\%\Delta expend = 10$, we get $\Delta math10 = \beta_1/10$

3. math10 = -69.341 + 11.164 * ln(expend)
R-sq = 0.02966
Sample size = df + 2 = 408

4. The spending effect is not big as 1% increase in spending leads to only 0.11164 increase in math10
Spending increases by 10%, estimated percentage point increase in math10 is 11.164/10 = 1.1164

5. Max expend = 7419
Max math10 = -69.341 + 11.164 * ln(7419) = 30.15033, which is not greater than 100.
This is not much of a worry in this data set.

Question 7
1. price = -19.31500 + 0.12844*sqrft + 15.19819*bdrms

2. increase in price for a house with one more bedroom = 15.19819

3. 0.12844*140 + 15.19819*1 = 33.17979
-> price increases higher compare to the answer above.

4. 63.19%

5. -19.31500 + 0.12844*2438 + 15.19819*4 = 354.6145

6. 300 - 354.61448 = -54.61448
The buyer underpaid for the house.

Question 8
1. ln(salary) = 4.62092 + 0.16213*ln(sales) + 0.10671*ln(mktval)

2. ln(salary) = 4.687e+00 + 1.614e-01*ln(sales) + 9.753e-02*ln(mktval) + 3.566e-05*profits
This variable cannot be included in logarithmic form because profit can be negative value or 0.
These firm performance variables cannot explain most of the variation in CEO salaries because the R-square is only 22%

3. ln(salary) = 4.558e+00 + 1.622e-01*ln(sales) + 1.018e-01*ln(mktval) + 2.905e-05*profits + 1.168e-02*ceoten
The estimated percentage return for another year of CEO tenure is 1.168%

4. 0.7768976
Highly correlated
It means that the profits of the firm highly increase when percentage of market value increases.

Question 9
1. atndrte: Min= 6.25, Ave = 81.71, Max = 100.00
priGPA: Min= 0.857, Ave = 2.587, Max = 3.930
ACT: Min= 13.00, Ave = 22.51, Max = 32.00

2. atndrte = 75.700 + 17.261*priGPA -1.717*ACT
When GPA and ACT equal 0, class attend is 75.700
It doesn't have useful meaning because with high class attend, students less likely to have GPA and ACT scores equal 0.

3. Class attendance increases by 17.261, when priGPA increase by 1 value when ACT stays the same.
Class attendance decreases by 1.717, when ACT increase by 1 value when priGPA stays the same.
There's a surprise in the ACT score effect in class attendance. It means that student with high ACT score is less likely to attend class.

4. 104.3627. The attend rate exceeds 100%.
There's 1 student in the sample with these values of the explanatory variables.

5. student A attend rate: 93.1521
student A attend rate: 67.3061
difference = 93.1521 - 67.3061 = 25.846

Question 10
1. range of the educ variable: 6 to 20
   percentage of men completed 12th grade but no higher grade:
  % = 698/1230 = 0.5674797
Ave motheduc = 12.18
Ave fatheduc = 12.45
Ave educ = 13.04
-> Children have higher education compare to their parents

2. educ = 6.96435 + 0.30420*motheduc + 0.19029*fatheduc
24.93% sample variation in educ is explained by parents' education
motheduc increases by 1 unit, educ increases by 0.30420

3. educ = 8.44869 + 0.18913*motheduc + 0.11109*fatheduc + 0.50248*abil
Ability only helps little in explaining variations in education, even after controlling for parents'
education. As R-sq increases only from 24.93% to 42.75%

4. educ = 8.240226 + 0.190126*motheduc + 0.10893*fatheduc + 0.401462*abil + 0.050599*abil^2
Educ minimizes when cognitive ability is -3.967

5. SD = 2.184406
Mean = 1.7966
-> 99% of the men cognitive ability belongs to the range 1.7966 +/ - 3*2.184406
Only a small fraction of men in the sample have ability less than the value calculated above -> The
model is good.

6.

Predicted Edu By Abil Scatterplot