Solutions to Econ 422 Problem Set 3

1a) Average wage is \$957.95. Average IQ is 101.28. Sample standard deviation of IQ is 15.05 points.

1b) The predicted increase in wage for an increase in IQ of 15 points is (15 x 8.30) = \$124.5. With an R^2 of 0.0955, IQ explains only 9.55% of the variation in wage.

2a) Average participation rate is 87.36%. Average match rate is 0.73 (a \$1 contribution by the worker is matched by a 73¢ contribution by the firm).

2b) $\widehat{prate}$ = 83.08 + 5.86 mrate where 83.08 is the intercept and 5.86 is the coefficient on mrate. There are 1534 observations in the sample. R^2 is 0.0747 (7.47% of the variation in prate is explained by the regression).

2c) Interpretation of the intercept: Predicted participation rate is 83.08% when the firm does not contribute anything to the worker's plan (match rate = 0). Interpretation of the coefficient on mrate: Predicted prate increases by 5.86% for each unit increase (a \$1 contribution by the worker is matched by a \$1 contribution by the firm) in mrate.

2d) When mrate = 3.5, predicted prate is 103.59%. This is not a reasonable prediction as the participation rate cannot be greater than 100%. This illustrates that, especially when dependent variables are bounded, a simple regression model can give strange predictions for extreme values of the independent variable. (In the sample of 1534 firms, only 34 have mrate ≥ 3.5.)

2e) 7.47% of the variation in prate is explained by mrate. This is not much, and suggests that many other factors influence 401(k) plan participation rates.

3a) $\widehat{sleep}$ = 3586.38 – 0.1507 totwrk where 3586.38 is the intercept and -0.1507 is the coefficient on totwrk (a one-minute increase in time spent in paid work decreases time spent in sleeping per week by 0.1507 minutes). There are 706 observations in the sample. $R^2 = 0.1033$. The intercept implies that the estimated amount of sleep per week for someone who does not work is 3586.4 minutes, or about 59.77 hours.

3b) If totwrk increases by 2 hours per week, sleep is estimated to fall by (120 x 0.1507) = 18.08 minutes. This is only a few minutes a night.

4a) 95% confidence interval for β_0: $43.2 \pm (t_{n-2} \times 10.2) = 43.2 \pm (2.048 \times 10.2) = (22.31, 64.09)$

4b) $t = \frac{61.5-55}{7.4} = 0.878$. Under the null hypothesis, this t-statistic is distributed as $t_{n-2} = t_{28}$. The two-sided 5% critical value for a t distribution with 28 degrees of freedom is about 2.048, since $t = 0.878 < 2.048$, we cannot reject $\beta_1 = 55$ at the 5% level.

4c) $t = \frac{61.5-55}{7.4} = 0.878$. Under the null hypothesis, this t-statistic is distributed as $t_{n-2} = t_{28}$. The one-sided 5% critical value for a t distribution with 28 degrees of freedom is about 1.701, since $t = 0.878 < 1.701$, we cannot reject $\beta_1 = 55$ at the 5% level.