ECON 709B - Problem Set 4

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1. 7.28 Estimate the regression: $\hat{log(wage)} = \beta_1 education + \beta_2 experience + \beta_3 experience^2/100 + \beta_4$.[1]

```
library(tidyverse)
```

```
cps09mar <- read_delim("cps09mar.txt",
                       delim = "\t",
                       col_names = c("age", "female", "hisp", "education", "earnings",
                                     "hours", "week", "union", "uncov", "region", "race",
                                     "maritial"),
                       col_types = "ddddddddddddd") %>%
  mutate(experience = age - education - 6,
         experience_2 = (experience^2)/100,
         wage = earnings / (hours*week),
         l_wage = log(wage),
         constant = 1) %>%
  filter(race == 4,
         maritial == 7,
         female == 0,
         experience < 45)

y <- cps09mar$l_wage

x <- cps09mar %>%
  select(education, experience, experience_2, constant) %>%
  as.matrix() %>%
  unname()

n <- dim(x)[1]
i <- diag(nrow = n, ncol = n)
```

   (a) Report the coefficient estimates and robust standard errors.

...

   (b) Let θ be the ratio of the return to one year of education to the return to one year of experience for $experience = 10$. Write θ as a function of the regression coefficients and variables. Compute $\hat{\theta}$ from the estimated model.

...

   (c) Write out the formula for the asymptotic standard error for $\hat{\theta}$ as a function of the covariance matrix for $\hat{\beta}$. Compute $s(\hat{\beta})$ from the estimated model.

*I worked on this problem set with a study group of Michael Nattinger, Andrew Smith, and Ryan Mather. I also discussed problems with Emily Case, Sarah Bass, and Danny Edgel.

[1] Use the subsample of the CPS that you used for problems 3.24 and 3.25 (instead of the subsample requested in the problem)

...

(d) Construct a 90% asymptotic confidence interval for θ from the estimated model.

...

(e) Compute the regression function at $education = 12$ and $experience = 20$. Compute a 95% confidence interval for the regression function at this point.

...

(f) Consider an out-of-sample individual with 16 years of education and 5 years experience. Construct an 80% forecast interval for their log wage and wage. [To obtain the forecast interval for the wage, apply the exponential function to both endpoints.]

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