Introduction to Econometrics
Sogang University

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Home Assignment 2

Due: April 11, 2017

1. Using the data caschool.xls, regress log(testscr) on log(str) and log(avginc).
   (a) Test the significance of the coefficients of log(str) and log(avginc) at the 5% level.
   (b) Construct the 95% confidence intervals for the coefficients of log(str) and log(avginc).
   (c) Test the joint significance of the coefficients of log(str) and log(avginc) at the 5% level.
   (d) When the student-teacher ratio increases by 1%, how much does test score increase?

2. Consider the linear regression model
$$y_t = \alpha + \beta t + u_t,\ u_t \sim iid(0, \sigma^2), (t = 1, ..., T).$$
An estimator of β is
$$b = \frac{y_T - y_1}{T - 1}.$$
   (a) Is estimator b consistent? (Hint: use Chebyshev's inequality)
   (b) If $u_t \sim i.i.d.\ N(0, 1)$, what is the asymptotic distribution of b?

3. For the linear regression model
$$y_t = \beta x_t + \varepsilon_t,\ \varepsilon_t \sim iid\left(0, \sigma^2\right),\ t = 1, \cdots, n,$$
an estimator
$$\bar{b} = \frac{\sum_{t=1}^{n} y_t}{\sum_{t=1}^{n} x_t}$$
is considered. Assume $\{X_t\}$ is a sequence of constants.
   (a) What assumptions are required for the consistency of $\bar{b}$?
   (b) Derive the asymptotic distribution of $\bar{b}$.

4. Let $\varepsilon_t \sim iid\,(0, \sigma^2)$ and $u_t = \varepsilon_t + \varepsilon_{t-1}$. What is the probability limit of $\frac{1}{n}\sum_{t=1}^{n} u_t$?

5. Let $X_1, X_2, ...$be independent random variables with $P\{X_n = 1\} = p_n$ and $P\{X_n = 0\} = 1 - p_n$. Show that $X_n \xrightarrow{p} 0$ if $p_n \to 0$ as $n \to \infty$.