

AEB 6571 - Econometric Methods I

Assignment 6

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1. Suppose

- $y = X\beta_0 + \epsilon$;
- $\frac{X'\epsilon}{n} \xrightarrow{\text{a.s.}} 0$;
- $\frac{X'X}{n} \xrightarrow{\text{a.s.}} M$ is finite and positive definite.

Demonstrate that $\beta_n = (X'X/n)^{-1} (X'y/n)$ implies $\beta_n \xrightarrow{\text{a.s.}} \beta_0$.

2. Defining the characteristic function of the normal distribution as

$$f(\lambda) = E[\exp(i\lambda x)] \quad (1)$$

Take the second-order Taylor series expansion around $\lambda = 0$.

3. *Question 5, Page 110 Amemiya* There is a coin which produces heads with an unknown probability p . How many times should we throw this coin if the proportion of heads is to lie within 0.05 of p with probability at least 0.9?
4. *Question 9, Page 110 Amemiya* Suppose $\{X_i\}$ are i.i.d. with $E[X] = 0$ and $V[X] = \sigma^2 < \infty$.

(a) Obtain

$$\text{plim}_{n \rightarrow \infty} n^{-1} \sum_{i=1}^n (X_i + X_{i+1}). \quad (2)$$

(b) Obtain the limit distribution of

$$n^{-1/2} \sum_{i=1}^n (X_i + X_{i+1}). \quad (3)$$