Economics 522A, Homework 9

Due Tuesday, April 10

1. Assume that $y_1 = 0$, and for $t = 2, \ldots, T$, that

$$y_t = \alpha y_{t-1} + \epsilon_t,$$

where the ϵ_t are IID $N(0,1)$. Let $\hat{\alpha}$ be the OLS coefficient in a regression of y_t on y_{t-1} (without a constant).

Simulate the distribution of $\hat{\alpha}$ for $T = 20$, for different possible values of α: $\alpha = .5$, $\alpha = .9$, and $\alpha = 1$. For each value of α, generate 1000 draws, plot the histograms of the draws for $\hat{\alpha}$, and calculate its bias.

2. Let y be an $n \times 1$ vector, and let X be $n \times k$, and that $E[y|X] = X\beta$. We divide the variables in X into two groups:

$$E[y|X] = X_1\beta_1 + X_2\beta_2,$$

where X_1 is $n \times k_1$, X_2 is $n \times k_2$, and $k_1 + k_2 = k$. Let $\hat{\beta}_1$ be the OLS coefficients in a regression of y on X_1. Derive $E[\hat{\beta}_1|X]$ (note: we are conditioning on all of X), simplifying as much as possible. Compare you results to the findings in LN19, Section 2, and interpret your formula.