

ECONOMETRICS II, FALL 2025

Homework 9. Due Monday November 3.

1. Simulate a random walk w_t (with innovation standard error of 1) and generate $x_t = w_t + \sigma u_t$ and $y_t = 3 * w_t + \sigma v_t$ for $t = 1, \dots, T$ and regress $y_t = \mu + a * x_t + \epsilon_t$. Set $\sigma = 1$ and do it like 100 times or more and find the average t-values and R-squares. Let $T = 20, 100, 1000$. Can you see that $\hat{a} - 3$ converges at rate T ? (This implies that the usual $\sqrt{T}(\hat{a} - 3)$ converges to 0 as T gets larger. Calculate the Dickey-Fuller t-value on the residual and compare to the Engle-Granger critical values (Google them). Does the test confirm that x_t and y_t are cointegrated.

If you have time (it will be running the same code), try with $\sigma = .01$ and $\sigma = 10$. In the latter case, it is almost a spurious regression, the test will likely fail to find co-integration.