ECON-C4200 - Econometrics II

Recap of Econometrics II

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Recap questions

- Q: Can a time series be stationary around a deterministic trend?
- A: yes. If the time-series you are studying seems to exhibit long-term growth (or decline), it could be that it is stationary around a deterministic trend. In such a case you want to try the Dickey-Fuller test with a deterministic trend.

Recap questions

- Q: Can a random walk be stationary?
- A: No. A random walk is by design non-stationary. Recall that if the series is a random walk, then the coefficient of the lagged dependent variable is unity (=1). If the coefficient is less than one (even when very close, but less than one), the series is stationary.
- You can try this by asking yourself what is the expected value of the series k periods from now. If the series is

$$Y_t = \beta_1 Y_{t-1} + u_t,$$

  the expected value of Y_t is $\beta_1 Y_{t-1}$, that of Y_{t+1} is $\beta_1 \mathbb{E}[Y_t] = \beta_1(\beta_1 Y_{t-1}) = \beta_1^2 Y_{t-1}$ and therefore the expected value of Y_{t+k} is given by $\beta_1^{k+1} Y_{t-1}$.
- If $\beta_1 < 1$, then $\beta_1^{k+1} <<< 1$ for large k and for very large k it goes towards zero. Try it out with $\beta_1 = 0.99$ and $k = 100$, $k = 1000$.

Recap questions

- Q: Are coefficients in all autoregressive models biased towards zero?
- A: No. The typical problem is that the time series is not stationary. For a stationary series, OLS yields unbiased coefficients.

Recap questions

- Q: Lecture 8, slide # 54: If the coefficient of $Y_{t-1} = 1$, the model would be nonstationary. Now the confidence interval is far from one, yet we do not rejet the Null. Why?
- A: The reason is that we are now estimating the adjusted model where the coefficient of Y_{t-1} is $\delta = \beta_1 - 1$ instead of β_1 (see slides #45 - 46).

Recap questions

- Q: When testing for a unit root, we are not worried about the possibility that the coefficient of Y_{t-1} is larger than one. But aren't many series exponential, like GDP?
- Some series are exponential for some of the time, think e.g. about COVID-19 infection rates. Such time series are modelled using different tools than those we studied.
- But one should keep in mind that very few economic time series exhibit exponential growth for longer periods, and even those look very different after differencing. Think about GDP and GDP growth rates.