Today’s class

**Stochastic regressors:**

Unbiased and consistent OLS estimates under the assumptions in chapter 8. We have now:

B2. Values of regressors are drawn randomly from fixed populations

Usually, we can do the same analysis as with model A. **Today we look at the failure of one of the usual assumptions:**

B7. The disturbance term is distributed independently of the regressors: \( u_i \) independent of all the \( X_{jk} \)

Or B7’.

This is violated by measurement errors in explanatory variables:

Finite sample properties? Large sample properties?
Main relationship is that: consumption is a given share of income:

$$C = \beta \times Y$$

- A change in Income by $\Delta Y$
- Generates a change in consumption by $\beta \Delta Y$
  This will increase income by the same amount “next period”.
- So the 2\textsuperscript{nd} change in Consumption is $\beta^2 \Delta Y$
- ...
- At the end of the day, the total change in income is:
  $$\frac{1}{1-\beta} \Delta Y$$
- **Multiplier** because $\frac{1}{1-\beta} > 1$
- $\beta$ is the **propensity to consume out of income**.
Main issues

• Many of you are not very familiar with the concept of “plim” and its issues (it is only a large sample approximations).
• The plim of an estimator can be quite different from you point estimates.
• If one explanatory variable is correlated with the disturbance term then you can not use the expectation. You have to explain this.
• You need to be able to state the 3 requirements for a good IV. You need the three conditions to obtain a consistent IV estimator. If one of the conditions is violated then the use of this new estimator is unreliable.
Main issues (definition of a good IV)

• Three conditions for a good IV, Z for X in:

  (*) \( Y = \beta_1 + \beta_2 X + u \)

  – Correlated with the explanatory variable of interest, X, (such that \( b_{iv} \) exists in the sample) and \( \text{Cov}(X,Z) \) different from 0 (to have consistency).

  – Uncorrelated with the disturbance term, u. So that \( \text{Cov}(Z,u)=0 \) (to have consistency).

  – The variable Z does not belong in the model (*) as an explanatory variable. Otherwise (*) is misspecified and the IV estimator is subject to an omitted variable large sample “bias” (hence, \( b_{iv} \) is not consistent for \( \beta_2 \)), see PS12.
Main issues (DWH test)

• State the correct Ho/H1
• State the issues of this test.
  – Only valid if the sample is large.
  – It has low power (high probability of type II errors) if the instrumental variable is weakly correlated with the explanatory variable of interest. In this case, se(b_iv) is very large and even a large difference with b_ols may not be significant.
  – State the efficiency of OLS if Ho appears valid.