Additional Problems Cheat Sheet

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As part of the Econometrics Cheat Sheet Project

THIS IS A WORK IN PROGRESS

NOT INTENDEND FOR GENEAL PURPOSE

Problem of endogenous explanatory variables

Omitted variables provoke OLS inconsistency. Solution: proxy variables.

- The IV method: can also solve variable errors.
- The TSLS.

$$y = \beta_0 + \beta_1 x + u$$

The problem of the bias of omitted variables. Solution:

- Proxy variables.
- If proxy variables are not available, search for one with a relation with x. A z variable that meet the requirements:

$$Cov(z, u) = 0$$

$$Cov(z, x) \neq 0$$

If the requirements are meet, z is an Instrumental Variable (IV).

TSLS

Can have multiple instrumental variables (is the IV, but with various instrumental variables at the same time). And $Cov(z, u) = 0$ can be relaxed, but there has to be a minimum of variables that satisfies it.

Can have multicollinearity problems.

Some tests:

- Endogeneity tests: is TSLS better than OLS when there are no endogenous variables? Do we really need TSLS? $\rightarrow$ Hausman test $\rightarrow$ H_0: OLS is consistent (it is better to use OLS).
- Over-identification. An IV should meet:
  - $Corr(z, u) = 0$ (exogeneity)
  - $Corr(z, x) \neq 0$ (relevance)
- Is there too many IV? $\rightarrow$ Sagan test $\rightarrow$ H_0: all IV seem ok

Bias of omitted variable

By specification error.

True model:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + u$$

The estimated model:

$$\tilde{y} = \tilde{\beta}_0 + \tilde{\beta}_1 x_1$$

If $Corr(x_1, x_2) = 0$ there is no bias.

Bias summary:

	$Corr(x_1, x_2) > 0$	$Corr(x_1, x_2) < 0$
$\beta_2 > 0$	$(+)bias$	$(-)bias$
$\beta_2 < 0$	$(-)bias$	$(+)bias$

- (+) bias $\rightarrow$ β_1 will be higher than it should be (it includes the effect of x_2).
- (-) bias $\rightarrow$ β_1 will be lower than it should be (in includes the effect of x_2).

Incorrect functional forms

Ramsey RESET test: it test the specification errors of a regression. H_0: the model is correctly specified.