

## 1. A SMALL EMPIRICAL ASSIGNMENT

### I. Monte-Carlo simulation using Matlab.

To check the properties of the 2SLS estimator in different settings, I ask you to write a simple code in MATLAB.

I suggest you follow the following steps

1. Consider the simplest model:  $y = \beta_1 X + \gamma Z + u$ ;  $X$  endogenous (1 variable), 1 instrument  $Z$ ,  $X = \Pi Z + v$ ,  $Pi = C / \sqrt{(N)}$ ,  $\gamma = B / \sqrt{(N)}$
2. Start by giving values to the basic parameters of the model:  $N$  (sample size),  $\beta_1$ ,  $C$ ,  $B$  and the variances of  $v$ ,  $u$  and  $Z$ . You can set  $\beta_1=0$
3. Consider first the standard case:  $C$  is large,  $B = 0$
4. Generate the data using normal distributions, for instance
5. Estimate the OLS and the 2SLS estimator
6. Store the estimated  $\beta$  and the t-test.
7. Create a loop and repeat this  $R$  times (for instance  $R=100$ ).
8. Now, change the parameters  $\Pi$  and  $\gamma$  to see how the performance of  $\beta$  changes. Repeat 1–7 with 'problematic values of both parameters (ie., small values of  $\Pi$  and values of  $\gamma$  different from zero).
9. Compare your results: see how the bias of  $\beta_1$  changes as you change the values of the parameters. You can also see what happens with the rejection rates of the t-statistic of  $\beta_1 = 0$  in the non-problematic as well as in the problematic cases (weak instruments, endogenous regressors) (use normal critical values).

### II. Getting familiar with IVREG2

Use the data described here (card.dta) <http://www.nuff.ox.ac.uk/teaching/economics/bond/IV%20Estima> and estimate the model using ivreg2. You can add at the end of your equations the command "first" to see more first stage output. Read the output and try to interpret what you see.

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Good luck!!