Adv. Microeconometrics Computer Assignment

A. Schmidt

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1 - Size distortions

Simulate data from the following model:

$$Y = X\beta + \varepsilon$$
$$X = Z\Pi + V$$

where: * Y and X are $n \times 1$ vectors which contain the endogenous variables; * Z is a $n \times k$ matrix of instruments; * ε and V are $n \times 1$ vectors that contain disturbances. * The different rows of $\begin{pmatrix} \varepsilon & \vdots & V \end{pmatrix}$, are independently normally distributed, i.e.,

$$\begin{pmatrix} \varepsilon_i \\ V_i \end{pmatrix} \sim \mathcal{N}(0, \Sigma), \qquad \Sigma = \begin{pmatrix} 1 & \vdots & \rho \\ \rho & & 1 \end{pmatrix}$$

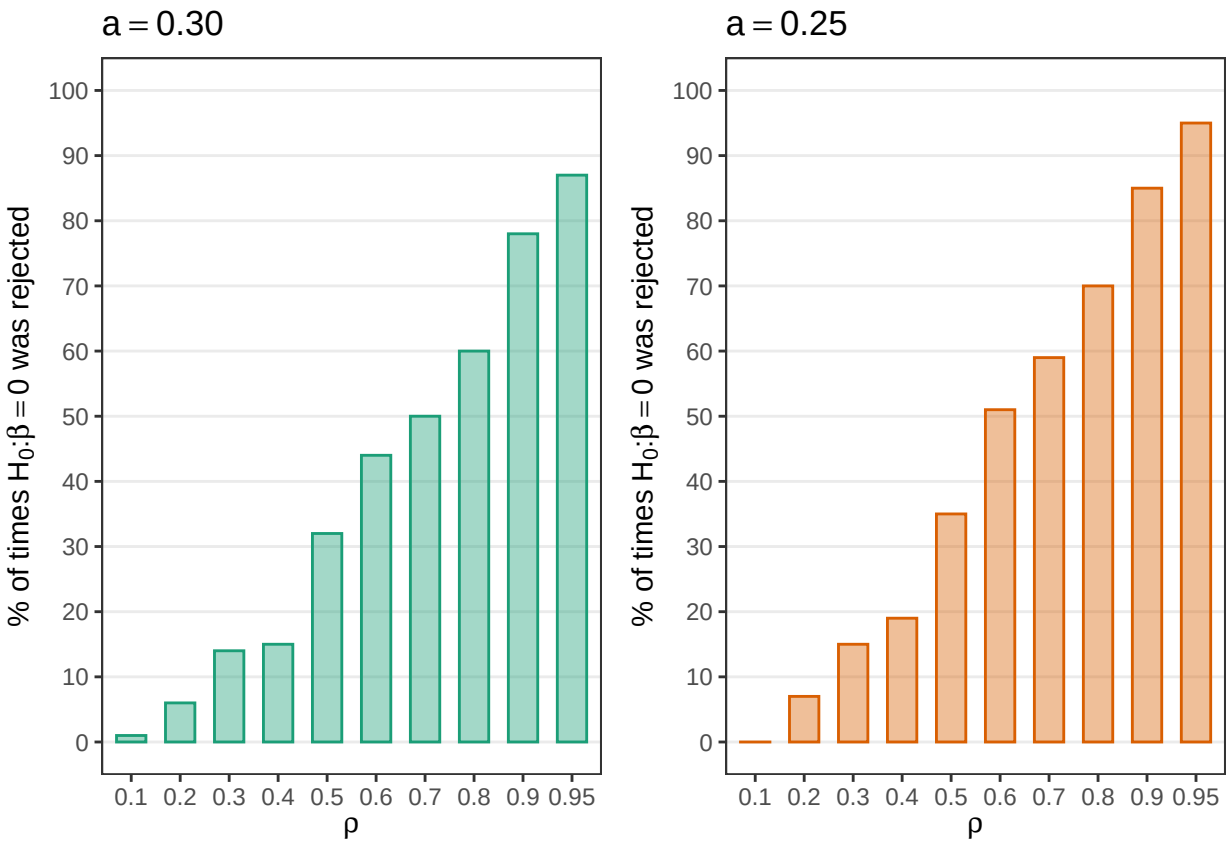
* $n = 100$, $k = 10$, $\Pi = a \times e_{10}$ with $e_{10} \in \mathbb{R}^{10}$ whose first element is 1 and the remaining are equal to zero. * All elements from Z are independently distributed and follows a standard normal distribution. * $a \in \{0.3, .0.25, 0.2, 0.15, 0.1, 0.05, 0\}$ * $\rho \in \{0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95\}$

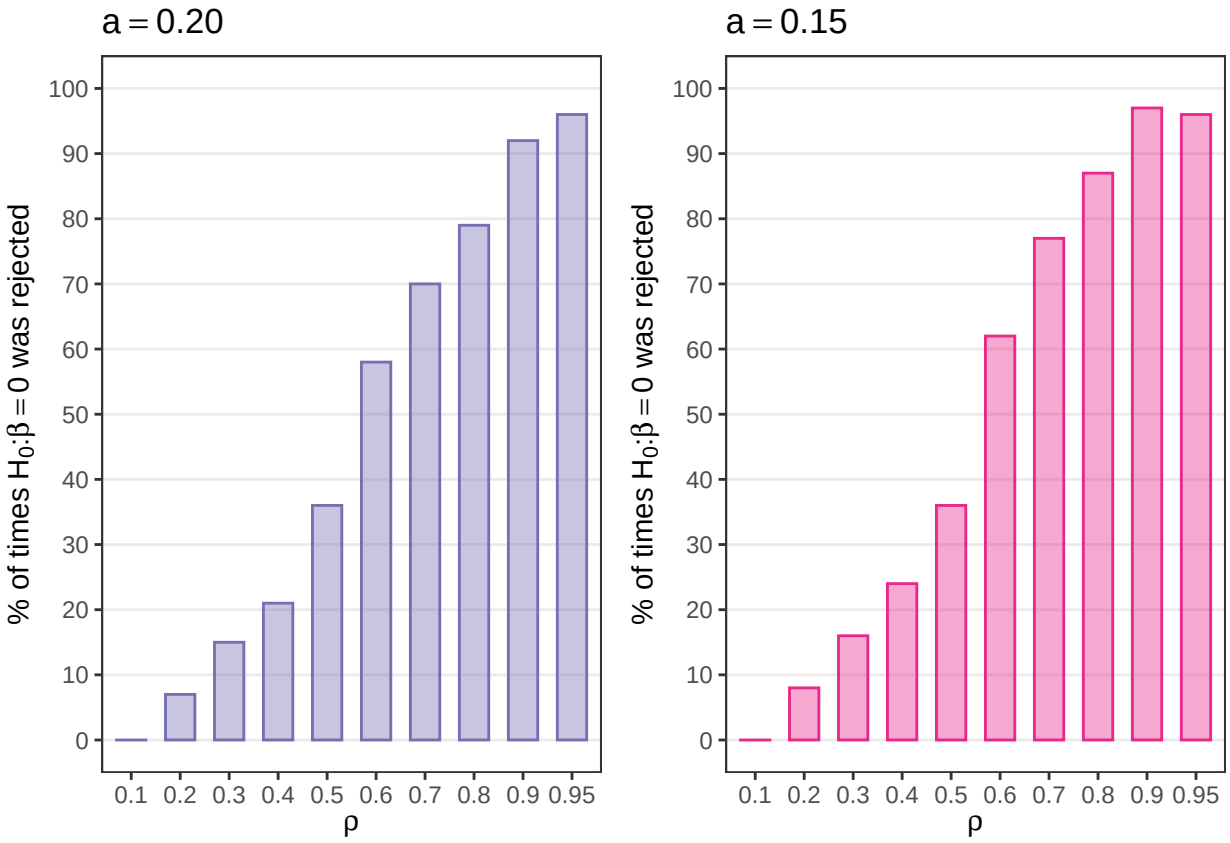
Item 1

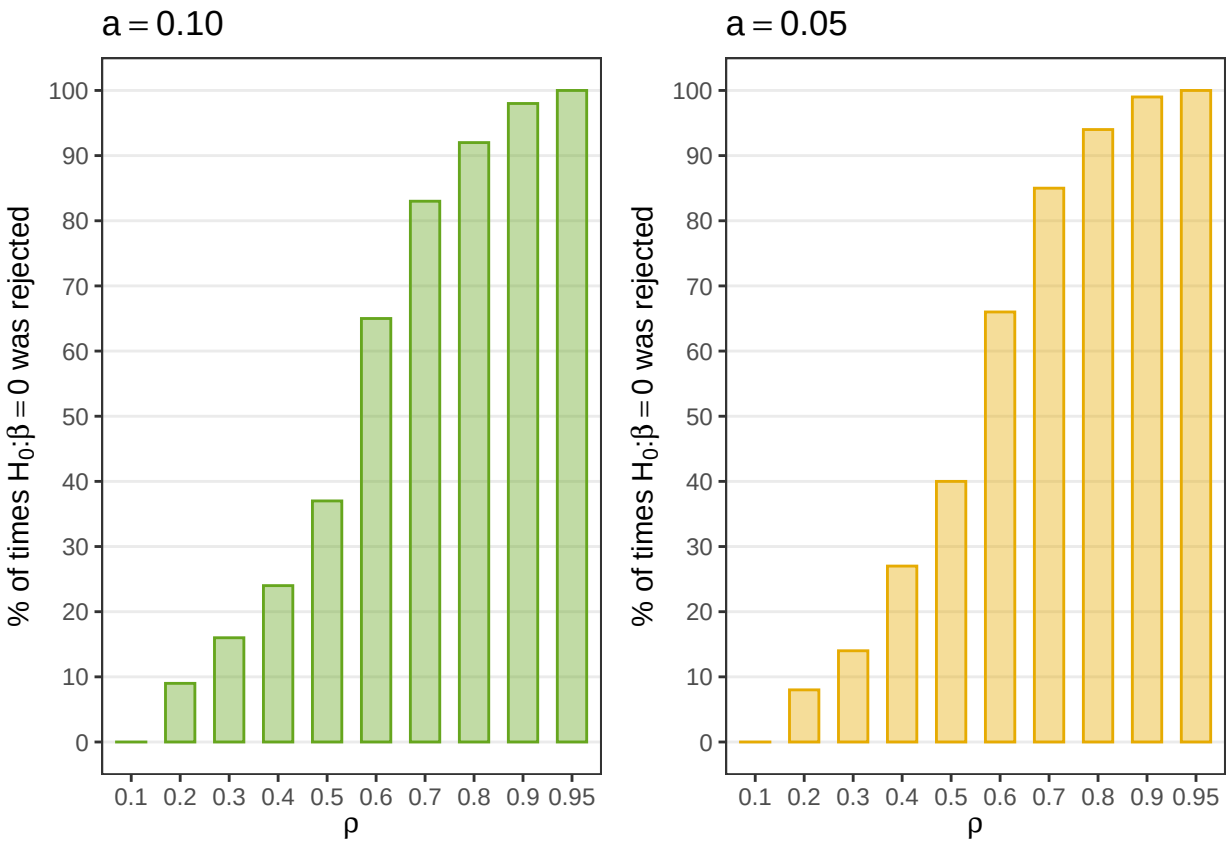
_For each value of α make a figure of the rejection frequency as a function of ρ when testing $H_0 : \beta = 0$ with 95% significance using the $2SLS$ t-statistic (so five figures which show the rejection frequency as a function of α).

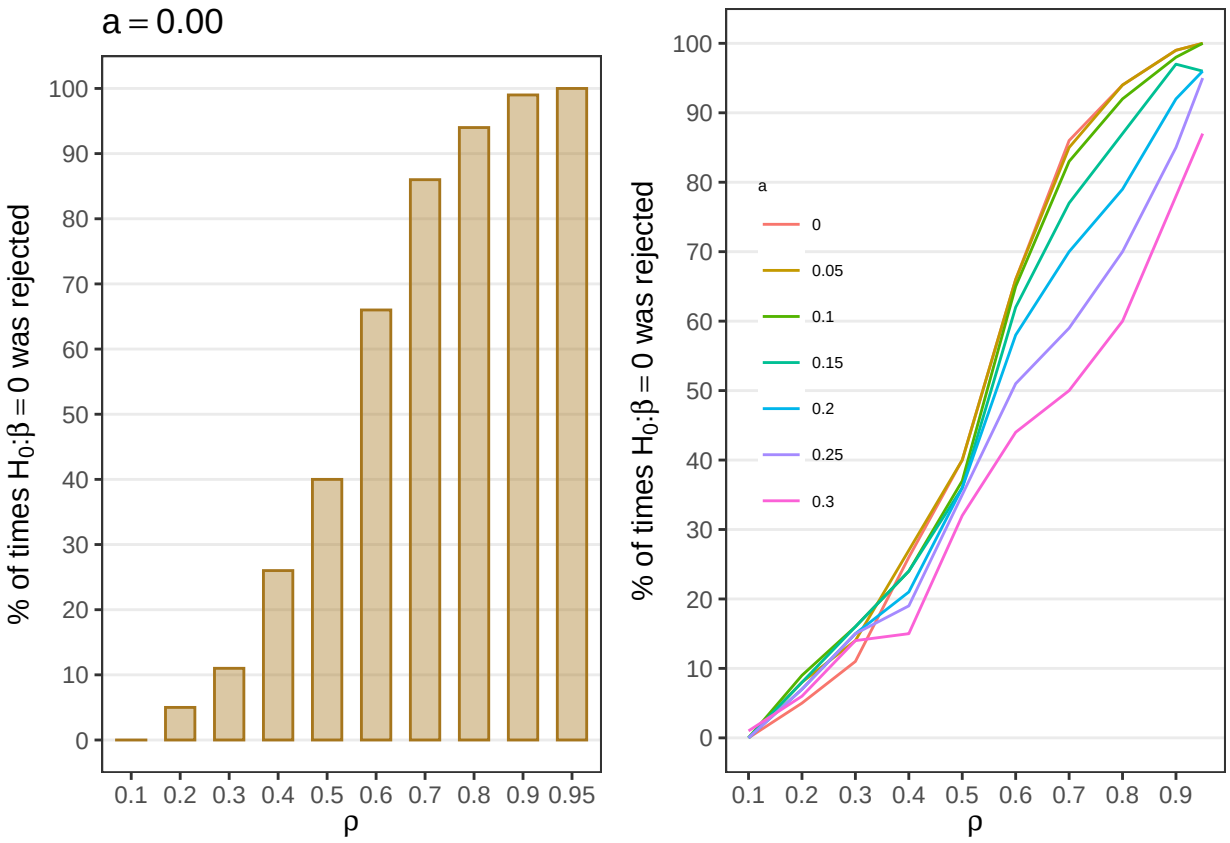
Using a package

Graph for Q1


a = 0.30
a = 0.25
% of times H0:β = 0 was rejected
ρ
0
10
20
30
40
50
60
70
80
90
100
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0.95

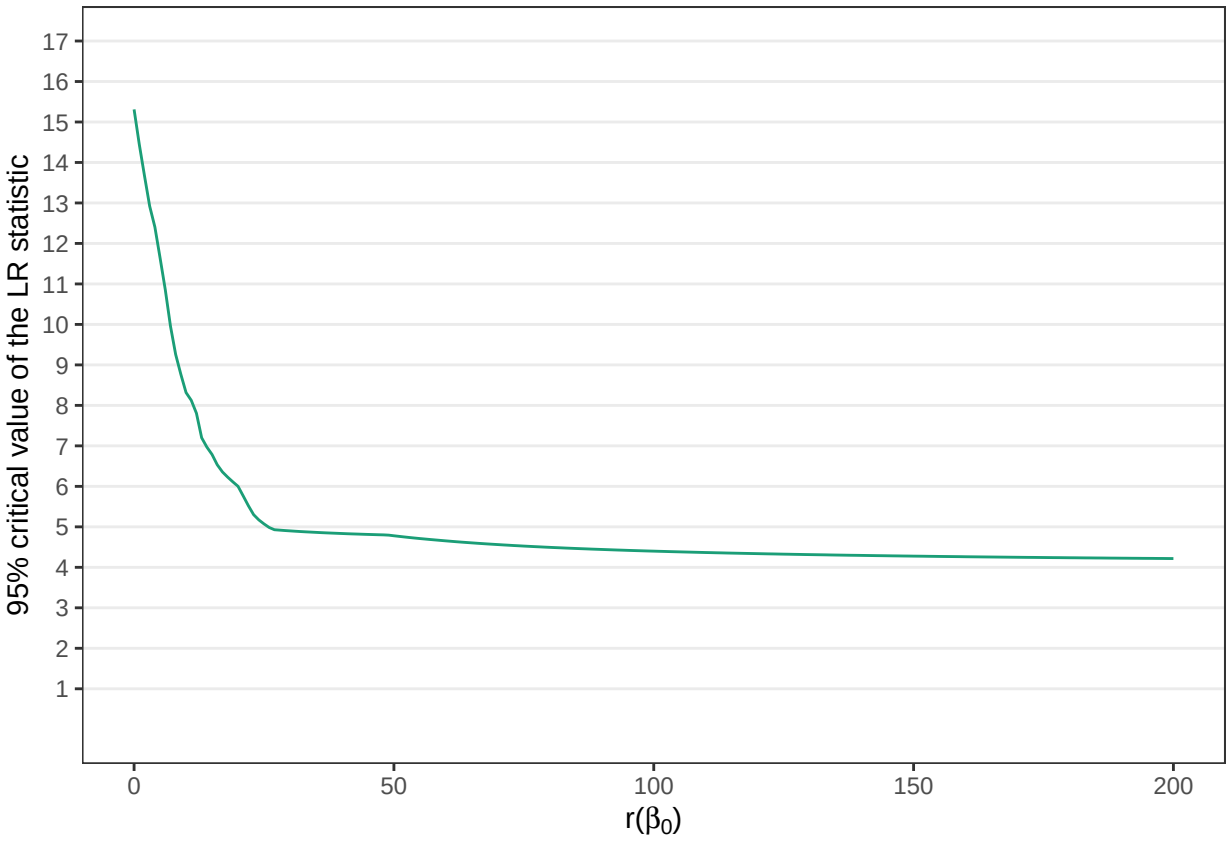

a = 0.20
a = 0.15
% of times H0:β = 0 was rejected
ρ
0
10
20
30
40
50
60
70
80
90
100
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0.95


a = 0.10
a = 0.05
% of times H0:β = 0 was rejected
0
10
20
30
40
50
60
70
80
90
100
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0.95
ρ



Question 2

Compute and make a figure of the 95% critical value function of the LR statistic as a function of $r(\beta_0)$ for $k = 10$. What can you say about the critical value when $r(\beta_0) = 0$ or infinite?


95% critical value of the LR statistic
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
50
100
150
200
r(β0)

Question 3