

Advanced Quantitative Methods

Lab 11: Bootstrap and simulation

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1. Using the `asiabaro.dta` data set, estimate a logistic regression explaining abstention in elections by trust in the government, satisfaction with democracy, gender, urbanisation, and preference for democracy. Using simulations:
 - (a) Predict, with a 95% confidence interval, the probability of someone abstaining who lives in an urban area and is "typical" on all other variables.
 - (b) Repeat for rural area.
 - (c) Plot predicted abstention probability by satisfaction with democracy.
 - (d) Add a graphical depiction of confidence intervals to the plot.
 - (e) Repeat using a bootstrap procedure.
2. Run Monte Carlo experiments with the following data generation process:

$$\begin{aligned}y_i &= \beta_0 + \beta_1 x_i + \varepsilon_i \\ &= 1 + \frac{1}{2} x_i + \varepsilon_i \\ \varepsilon_i &\sim N(0, 1) \\ x_i &\sim N(5, 2)\end{aligned}$$

- (a) Plot histograms of β_0 and β_1 ...
 - (b) ... for sample sizes $n = \{10, 100, 1000\}$
 - (c) Repeat with ε_i having a t -distribution with 1 d.f.
3. Run Monte Carlo experiments with the following data generation process:

$$\begin{aligned}x_i &= a + x_{i-1} + u_i \\ y_i &= b + y_{i-1} + v_i \\ x_0 &= y_0 = 0 \\ u_i &\sim N(0, 1) \\ v_i &\sim N(0, 1) \\ a &= b = \frac{1}{2}\end{aligned}$$

- (a) Plot histograms of β_0 and β_1 when regressing y on x
- (b) Repeat for $a = b = 0$