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# The multiple regression model (III) extra

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Assume as true model (data generating process):

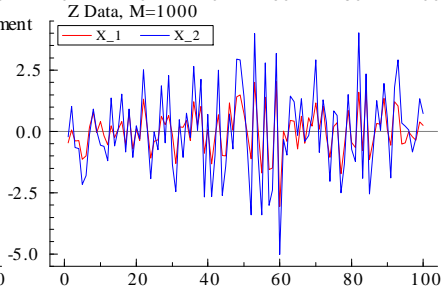
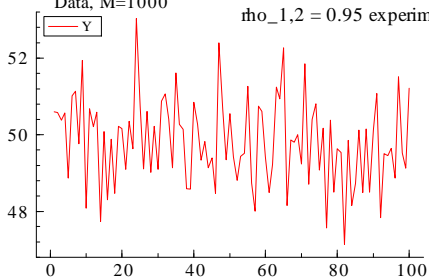
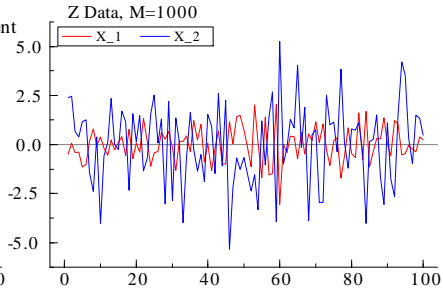
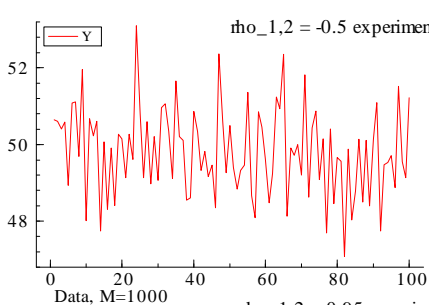
$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i \quad (1)$$

$$= 50 - 0.5X_{1i} + 0.02X_{2i} + \varepsilon_i \quad (2)$$

$$n = 100 \quad (3)$$

$$\varepsilon_i \sim N(0, 1) \quad (4)$$

Know from theory (Lect 10) that  $\sigma_{X_1}$ ,  $\sigma_{X_2}$  and  $\rho_{X_1 X_2}$  matter for OLS estimation properties.



## Monte Carlo results with 1000 replications

$$\sigma_{X_1} = 1, \sigma_{X_2} = 2,$$

$$\rho_{X_1 X_2} = -0.5$$

$$\sigma_{X_1} = 1, \sigma_{X_2} = 2,$$

$$\rho_{X_1 X_2} = 0.5$$

$$\sigma_{X_1} = 1, \sigma_{X_2} = 2,$$

$$\rho_{X_1 X_2} = 0.95$$

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### Biases:

$$E(\hat{\beta}_1 - \beta_1) \quad -0.00011089$$

$$-0.00053379$$

$$E(\hat{\beta}_2 - \beta_2) \quad -0.0000917$$

$$-0.00025440$$

### 5% reject

#### freqs:

$$t_{\beta_1=0} \quad 0.98900$$

$$0.32900$$

$$t_{\beta_2=0} \quad 0.066000$$

$$0.049000$$