

8th set assignments Introductory Econometrics

Literature: Hayashi(2000), pp.187-191

Task 1

Deriving the endogeneity bias

The structural model of a simple model of supply and demand looks like:

$$\begin{aligned}q_i^d &= \alpha_0 + \alpha_1 p_i + u_i \\q_i^s &= \beta_0 + \beta_1 p_i + v_i \\q_i^d &= q_i^s\end{aligned}$$

- Solve for the market clearing price p_i and the market clearing quantity q_i to derive the reduced form.
- Use the reduced form to derive expressions for $Cov(p_i, u_i)$ and $Cov(p_i, v_i)$.
- Considering the demand equation, we know that the OLS estimator for α_1 converges in probability to:

$$\hat{\alpha}_{1,OLS} \xrightarrow{p} \frac{Cov(p_i, q_i)}{Var(p_i)}$$

Show, using the demand equation in the structural form, that

$$Cov(p_i, q_i) = \alpha_1 Var(p_i) + Cov(p_i, u_i)$$

and, hence

$$\hat{\alpha}_{1,OLS} \xrightarrow{p} \alpha_1 + \frac{Cov(p_i, u_i)}{Var(p_i)}$$

Task 2

Instrumental variables

Suppose, you have extracted an observable factor x_i from the supply shifter v_i . You receive the following structural form:

$$\begin{aligned}q_i^d &= \alpha_0 + \alpha_1 p_i + u_i \\q_i^s &= \beta_0 + \beta_1 p_i + \beta_2 x_i + \zeta_i \\q_i^d &= q_i^s\end{aligned}$$

- Which properties should x_i have to be a valid instrument?
- Solve for the market clearing price p_i and the market clearing quantity q_i to derive the reduced form as in task 1.
- Use the reduced form to derive expressions for $Cov(x_i, p_i)$ and $Cov(x_i, q_i)$.
- What would be a consistent estimator for the slope parameter in the demand equation α_1 ?