
Unit 8 (Part C). Simultaneous equation models

The identification problem

- When we say that a structural equation is identified, it means that, in order to remove the simultaneity bias, we can use the TSLS estimation method to estimate the equation.
- When we say that a structural equation is not identified, it means that we cannot use the TSLS estimation method to estimate the equation.

Consider the following cases, which are created to demonstrate the identification problem under various conditions. As such, not all cases follow the theory of demand and supply.

Case 1. Both the demand function and the supply function are identified. Why?

$$\begin{cases} Q_t = \alpha_1 + \alpha_2 P_t + \alpha_3 Y_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_2 P_t + \beta_3 F_t + \beta_4 A_t + v_t & \text{Supply function} \end{cases}$$

TSLS $Q \text{ c } P \ Y \ @ \text{ c } Y \ F \ A$ (Eviews will produce the TSLS estimates of the demand function)

TSLS $Q \text{ c } P \ F \ A \ @ \text{ c } F \ A \ Y$ (Eviews will produce the TSLS estimates of the supply function)

Case 2. The demand function is identified but the supply function is not identified. Why?

$$\left\{ \begin{array}{ll} Q_t = \alpha_1 + \alpha_2 P_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_2 P_t + \beta_3 F_t + \beta_4 A_t + v_t & \text{Supply function} \end{array} \right.$$

TSLS $Q \subset P @ \subset F A$ (Eviews will produce the TSLS estimates of the demand function)

TSLS $Q \subset P F A @ \subset F A$ (Eviews will say: The order condition is violated)

Case 3. The demand function is not identified but the supply function is identified. Why?

$$\left\{ \begin{array}{ll} Q_t = \alpha_1 + \alpha_2 P_t + \alpha_3 Y_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_2 P_t + v_t & \text{Supply function} \end{array} \right.$$

TSLS $Q \subset P Y @ \subset Y$ (Eviews will say: The order condition is violated)

TSLS $Q \subset P @ \subset Y$ (Eviews will produce the TSLS estimates of the supply function)

Case 4. The demand function is not identified and the supply function is not identified. Why?

$$\begin{cases} Q_t = \alpha_1 + \alpha_2 P_t + \alpha_3 Y_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_2 P_t + \beta_3 Y_t + v_t & \text{Supply function} \end{cases}$$

TSLS $Q \subset P \ Y \ @ \subset Y$ (Eviews will say: The order condition is violated)

TSLS $Q \subset P \ Y \ @ \subset Y$ (Eviews will say: The order condition is violated)

Case 5. The demand function is not identified and the supply function is not identified. Why?

$$\begin{cases} Q_t = \alpha_1 + \alpha_2 P_t + \alpha_3 F_t + \alpha_4 A_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_2 P_t + \beta_3 F_t + \beta_4 A_t + v_t & \text{Supply function} \end{cases}$$

TSLS $Q \subset P \ F \ A \ @ \subset F \ A$ (Eviews will say: The order condition is violated)

TSLS $Q \subset P \ F \ A \ @ \subset F \ A$ (Eviews will say: The order condition is violated)

Case 6. The demand function is not identified and the supply function is not identified. Why?

$$\left\{ \begin{array}{ll} Q_t = \alpha_1 + \alpha_2 P_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_2 P_t + v_t & \text{Supply function} \end{array} \right.$$

TSLS $Q \subset P @ c$ (Eviews will say: The order condition is violated)

TSLS $Q \subset P @ c$ (Eviews will say: The order condition is violated)

Case 7. The supply function is identified. Why?

$$\left\{ \begin{array}{ll} Q_t = \alpha_1 + \alpha_3 Y_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_2 P_t + \beta_3 F_t + \beta_4 A_t + v_t & \text{Supply function} \end{array} \right.$$

LS $Q \subset Y$ (Eviews will produce the OLS estimates of the demand function)

TSLS $Q \subset P F A @ c F A Y$ (Eviews will produce the TSLS estimates of the supply function)

Case 8. The demand function is identified. Why?

$$\begin{cases} Q_t = \alpha_1 + \alpha_2 P_t + \alpha_3 Y_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_3 F_t + \beta_4 A_t + v_t & \text{Supply function} \end{cases}$$

TSLS $Q \text{ c } P \text{ Y } @ \text{ c } Y \text{ F } A$ (Eviews will produce the TSLS estimates of the demand function)

LS $Q \text{ c } F \text{ A}$ (Eviews will produce the OLS estimates of the supply function)

Case 9. The supply function is not identified. Why?

$$\begin{cases} Q_t = \alpha_1 + \alpha_3 F_t + \alpha_4 A_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_2 P_t + \beta_3 F_t + \beta_4 A_t + v_t & \text{Supply function} \end{cases}$$

LS $Q \text{ c } F \text{ A}$ (Eviews will produce the OLS estimates of the demand function)

TSLS $Q \text{ c } P \text{ F } A @ \text{ c } F \text{ A}$ (Eviews will say: The order condition is violated)

Case 10. The demand function is not identified. Why?

$$\left\{ \begin{array}{ll} Q_t = \alpha_1 + \alpha_2 P_t + \alpha_3 Y_t + u_t & \text{Demand function} \\ Q_t = \beta_1 + \beta_3 Y_t + v_t & \text{Supply function} \end{array} \right.$$

TSLS $Q \subset P \ Y \ @ \ c \ Y$ (Eviews will say: The order condition is violated)

LS $Q \subset Y$ (Eviews will produce the OLS estimates of the supply function)
