**Degrees of Identification**

**Under Identification:** cannot meaningfully estimate an equation.

**Just Identified:** # of restrictions is the minimum needed to identify the equation.

**Over Identified:** if there exists more restrictions than necessary, but still identified.

**Identification:**

 How do you untangle the reduced form coefficients so that they have meaning?

**Key:** Knowledge about specific parameters or certain error covariances are “0.”

**Example:**

Demand

$Q\_{t}^{d}=α\_{1}+α\_{2}P\_{t}$ (deterministic case) (1)

$Q\_{t}^{d}=α\_{1}+α\_{2}P\_{t}+u\_{1t}$ (stochastic) (2)

where $α\_{2}<0$

 P P

 1 . .

 . .

 2 . .

 Q Q

1. (2)

Supply

$Q\_{t}^{s}=β\_{1}+β\_{2}P\_{t}$ (deterministic case) (3)

$Q\_{t}^{s}=β\_{1}+β\_{2}P\_{t}+u\_{2t}$ (stochastic) (4)

where $β\_{2}>0$

 P P

 (3) . . … (4)

 . . .

 .. . . . . .

1. . . . . (2)

Q Q

 (1) + (3) (2) + (4)

 “Deterministic” “Stochastic”

**Issues:**

1. In deterministic case, we have an answer but one data point does not generalize for alternative prices and quantities. In fact, an infinite number of lines can be gleaned from this intersection.
2. In the stochastic case, we have several distinct points, but we do not know what is truly the supply curve or what is truly the demand curve. (dashed line is both)

**Solution:** Let information be provided that shifts one curve (endogenous variable) while holding the other constant. That constant variable (curve) is now identified, since it sustains a locus of points signifying a general relationship.

Identify Demand: (add new variable to supply)

∴ (3) becomes:

$Q\_{t}^{s}=β\_{1}+β\_{2}P\_{t}+β\_{3}R\_{t}$ (5)

And

(R1 < R2 < R3 < R4)

 P

 R1

 R2

 R3

 R

 Q

Or in reduced form:

$Q\_{t}^{d}=Π\_{11}+Π\_{21}R\_{t}+V\_{1t}$ (6)

$Q\_{t}^{s}=Π\_{12}+Π\_{22}R\_{t}+V\_{2t}$ (7)

where $Π\_{11}=\frac{(α\_{1}+α\_{2}β\_{1})}{(1-α\_{2}β\_{2})}$ $Π\_{12}=\frac{(α\_{2}β\_{3})}{(1-α\_{2}β\_{2})}$

 $Π\_{21}=\frac{(β\_{1}+α\_{1}β\_{2})}{(1-α\_{2}β\_{2})}$ $Π\_{12}=\frac{(β\_{3})}{(1-α\_{2}β\_{2})}$

 $V\_{1t}=\frac{(u\_{1t}+α\_{2}u\_{2t})}{(1-α\_{2}β\_{2})}$ $V\_{2t}=\frac{(u\_{2t}+β\_{2}u\_{1t})}{(1-α\_{2}β\_{2})}$

Remember you can calculate, say (α1, α2), from (2) using the reduced form:

α2 = $\frac{Π\_{12}}{Π\_{22}}=\frac{\frac{(α\_{2}β\_{3})}{(1-α\_{2}β\_{2})}}{\frac{(β\_{3})}{(1-α\_{2}β\_{2})}}=α\_{2}$

α1 = Π11 – α2Π21 = Π11 – ($\frac{Π\_{12}}{Π\_{22}})$ Π21

= $\frac{(α\_{1}+α\_{2}β\_{1})}{(1-α\_{2}β\_{2})}-α\_{2}\frac{(β\_{1}+α\_{1}β\_{2})}{(1-α\_{2}β\_{2})}$

= $\frac{(α\_{1}+α\_{2}β\_{1})}{(1-α\_{2}β\_{2})}-\frac{(α\_{2}β\_{1})}{(1-α\_{2}β\_{2})}-\frac{(α\_{2}α\_{1}β\_{2})}{(1-α\_{2}β\_{2})}$

= $\frac{(α\_{1}-α\_{2}α\_{1}β\_{2})}{\left(1-α\_{2}β\_{2}\right)}$

= $\frac{α\_{1}(1-α\_{2}β\_{2})}{(1-α\_{2}β\_{2})}$

= $α\_{1}$

Key is exclusion: β1, β2, β3 cannot be derived from these equations.

**Conditions for Identification**

Ⅰ. Order (Necessary condition)

1. Check each equation
2. # of exogenous variables (Ke) excluded from the equation must be greater than or equal to the number of endogenous variables included in the equation (mi) (as explanatory variables) minus one.

∴ Ke $\geq $ mi – 1