2. Estimating equation systems

Consider a system of G equations, where the ith equation is of the form

$$y_i = X_i \beta_i + u_i, \quad i = 1, 2, \ldots, G \tag{1}$$

where y_i is a vector of the dependent variable, X_i is a matrix of the exogenous variables, β_i is the coe□cient vector and u_i is a vector of the disturbance terms of the ith equation.

We can write the 'stacked' system as

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_G \end{bmatrix} = \begin{bmatrix} X_1 & 0 & \cdots & 0 \\ 0 & X_2 & \cdots & 0 \\ \vdots & \vdots & & \vdots \end{bmatrix}$$

And the variance-covariance matrix of the estimated parameters is

$$Var\left(\hat{\beta}\right) = \left(X' \Omega^{-1} X\right)^{-1} \tag{15}$$

Two-stage least squares estimation

If the regressors of one or more equations are correlated with the disturbances ($E\left(u_i|X_i\right) = 0$), the estimated coefficients are biased. This can be circumvented by an instrumental variable (IV) estimation. The instrumental variables for each equation H_i can be either different or identical for all equations. The instrumental variables of each equation may not be correlated with the disturbance terms of the corresponding equation ($E\left(u_i|H_i\right) = 0$).

At the first stage new ('fitted') regressors are obtained by

$$\hat{X}_i = H_i \left(H$$

These two methods can be combined. In this case the restrictions imposed using the latter method are imposed on the linear independent parameters due to the restrictions imposed using the first method:

$$R\beta^0 = q \tag{37}$$

where β^0 is the vector of the restricted β coefficients.

with $\Omega = \Sigma \quad I$ and $\sigma_{ij} = E\left(u_i u_j\right)$.

The variance-covariance matrix of the estimated parameters is

$$Var \; \hat{\beta}_{\lambda} = X$$

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with $\Omega = \Sigma \quad I$ and $\sigma_{ij} = E(u_i u_j)$.
The variance-covariance matrix of this estimator is

$$Var \quad \beta^0 \quad \lambda$$

supply side. Variable `q` (food consumption per capita) is also the dependant variable of this equation. The regressors are again `p` (ratio of food prices to general consumer prices) and a constant as well as `f` (ratio of preceding year's prices received by farmers) and a

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Multiple R-Squared: 0.755019 Adjusted R-Squared: 0.726198
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