Econ 342 — Jan. 12, 2009

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Spring 2009

Problem Set 1

1. Hayashi, page 274, #1; page 283 #2; page 285 #5, # 9; page 286 # 10;

2. Consider the multiple equation GMM model we went over in class where each of the m equations is linear:

$$y_{im} = z'_{im}\delta_m + \epsilon_{im} \tag{1}$$

$m = 1, 2, ...M \quad n = 1, 2, ...n$. As in class, let x_{im} denote the vector of instruments for the mth equation.

Let $\hat{\delta}(\hat{W})$ denote the GMM estimator of the "stacked" vector of coefficients- i.e. the coefficients in each equation stacked on top of each other.

Consider the weighting matrix $\hat{W}_1 = I_{\sum_{m=1}^{M} K_m}$ where $I_{\sum_{m=1}^{M} K_m}$ is the $\sum_{m=1}^{M} K_m \times \sum_{m=1}^{M} K_m$ identity matrix.

(a) What is the asymptotic distribution of the multiple equation GMM estimator using this weighting matrix?

(b) Suppose we now use the weighting matrix $\hat{S}_{xx}$, which is the $\sum_{m=1}^{M} K_m \times \sum_{m=1}^{M} K_m$ matrix whose j, k block is of the form

$$\frac{1}{n}\sum_{i=1}^{n} x_{ij}x'_{ik}$$

If the system of equations is exactly identified (i.e. $L_m = K_m$) for all m, under what conditions is the GMM estimator using $\hat{S}_{xx}$ as the weighting matrix asymptotically equivalent to the GMM estimator using the optimal weighting matrix?

(c) Suppose now the system is overidentified, and we use the weighting matrix $\hat{S}_{xx}^{-1}$. Under what conditions is this GMM estimator asymptotically equivalent to the GMM estimator using the optimal weighting matrix?