Econ 220B

Answers to 220B Winter 2007 Final Exam

1a.)

$$\begin{bmatrix} \hat{\alpha} \\ \hat{\boldsymbol{\gamma}} \end{bmatrix} = \begin{bmatrix} T & \Sigma \mathbf{z}_t' \\ \Sigma \mathbf{z}_t & \Sigma \mathbf{z}_t \mathbf{z}_t' \end{bmatrix}^{-1} \begin{bmatrix} \Sigma y_t \\ \Sigma \mathbf{z}_t y_t \end{bmatrix}$$

or

$$\hat{\boldsymbol{\gamma}} = \left[\Sigma(\mathbf{z}_t - \overline{\mathbf{z}})(\mathbf{z}_t - \overline{\mathbf{z}})' \right]^{-1} \left[\Sigma(\mathbf{z}_t - \overline{\mathbf{z}})(y_t - \overline{y}) \right]$$

1b.) $m = q$
$k = q + 1$
SSR_R from regression of y_t on 1
SSR_U from regression described in 1a

1c.) no further assumptions needed
$n_1 = q$
$n_2 = T - q - 1$

1d.) $R^2 = 1 - SSR_U / SSR_R$
$m(T-k)^1 F = -1 + SSR_R / SSR_U$

$$\frac{1}{1 + m(T-k)^{-1} F} = \frac{SSR_U}{SSR_R}$$

$$R^2 = 1 - \frac{1}{1 + m(T-k)^{-1} F} = \frac{m(T-k)^{-1} F}{1 + m(T-k)^{-1} F}$$

1e.)

$$R^2 = \frac{mF}{(T-k) + mF} \xrightarrow{p} 0$$

$$(T-k)R^2 = \frac{(T-k)mF}{(T-k) + mF} = \frac{mF}{1 + mF/(T-k)} \xrightarrow{p} mF \xrightarrow{L} \chi^2(m)$$

2a.) Yes if we regressed y_t on x_t^*, no if we regressed y_t on x_t

$\mathbf{y} = \mathbf{x}\beta + \mathbf{u}$

$\mathbf{u} = \boldsymbol{\varepsilon} - \mathbf{v}\beta$

$E(\mathbf{u}|\mathbf{x}) \neq \mathbf{0}$

2b.) $[T^{-1}\Sigma(x_t^* + v_t)^2]^{-1}\,[T^{-1}\Sigma(x_t^* + v_t)(\beta x_t^* + \varepsilon_t)]$

$\xrightarrow{p} (q^2 + \tau^2)^{-1}(q^2\beta) = bq^2/(q^2 + \tau^2)$

3a.) CLT

b.) endogenous regressors

c.) valid instrument

d.) relevant instrument

e.) serial correlation

f.) $\Sigma\mathbf{x}_t(y_t - \mathbf{z}_t'\boldsymbol{\beta}) = \mathbf{0}$

$\hat{\boldsymbol{\beta}} = (\Sigma\mathbf{x}_t\mathbf{z}_t')^{-1}(\Sigma\mathbf{x}_t y_t)$

g.) $\mathbf{h} = \mathbf{x}_t(y_t - \mathbf{z}_t'\boldsymbol{\beta})$

$\hat{\mathbf{D}}' = -T^{-1}\Sigma\mathbf{x}_t\mathbf{z}_t'$

$$\mathbf{S} = \left[\frac{1}{1-\rho} + \frac{\rho}{1-\rho}\right]\boldsymbol{\Gamma}_0 = \left[\frac{1+\rho}{1-\rho}\right]\boldsymbol{\Gamma}_0$$

$$\hat{\mathbf{V}} = \left[\left(T^{-1}\Sigma\mathbf{z}_t\mathbf{x}_t'\right)\left(\frac{1+\rho}{1-\rho}\right)\boldsymbol{\Gamma}_0^{-1}\left(T^{-1}\Sigma\mathbf{x}_t\mathbf{z}_t'\right)\right]$$

h.)

$$\frac{(\hat{\beta}_1 - 3)}{\sqrt{\mathbf{e}_1'(\hat{\mathbf{V}}/T)\mathbf{e}_1}} \approx N(0,1)$$