

ECON 7010 - Formula Sheet

Standard regression model:	$y = X\beta + \varepsilon$
OLS estimator:	$b = (X'X)^{-1}X'y$
Residual vector:	$e = (y - \hat{y}) = y - Xb$
Estimator of error variance:	$s^2 = (e'e)/(n - k)$
Covariance matrix for random vector, x :	$V(x) = E[(x - E(x))(x - E(x))']$
Covariance matrix for errors:	$V(\varepsilon) = \sigma^2 I_n$
Usual idempotent (“projection”) matrix:	$M = I_n - X(X'X)^{-1}X'$
Deviations about means matrix:	$M_0 = I_n - (1/n)11'$; where $1' = (1, 1, 1, \dots, 1)$
Coefficient of determination:	$R^2 = 1 - [(e'e) / \sum_{i=1}^n (y_i - \bar{y})^2] = 1 - [(e'e) / (y'M_0y)]$
t-statistic:	$t_i = (b_i - \beta_i) / (s.e.(b_i)) \sim t_{n-k}$
Confidence interval:	$[b_i - t_c s.e.(b_i) \quad , \quad b_i + t_c s.e.(b_i)]$
F-statistic:	$F = \{(Rb - q)'[R(X'X)^{-1}R']^{-1}(Rb - q) / J\} / s^2$ $= [(e*'e^* - e'e) / J] / [(e'e) / (n - k)]$
Wald test statistic:	$W = (Rb - q)'[R(X'X)^{-1}R']^{-1}(Rb - q) / s^2$
IV estimator: (just-identified)	$\hat{\beta}_{IV} = (Z'X)^{-1}Z'y$
(over-identified)	$\hat{\beta}_{IV} = [X'Z(Z'Z)^{-1}Z'X]^{-1}X'Z(Z'Z)^{-1}Z'y$
Hausman test statistic:	$H = (b_I - b_E)'[\hat{V}(b_I) - \hat{V}(b_E)]^{-1}(b_I - b_E)$
Restricted Least Squares estimator:	$b_* = b - (X'X)^{-1}R'[R(X'X)^{-1}R']^{-1}(Rb - q)$
GLS estimator:	$\hat{\beta} = (X'\Omega^{-1}X)^{-1}X'\Omega^{-1}y$; $\Omega^{-1} = P'P$