

## Econ 3040 Final Exam Formula Sheet

expected value (mean) of $Y$ (for discrete $Y$ )	$\mu_Y = \sum p_i Y_i$
variance of $Y$ (for discrete $Y$ )	$\sigma_Y^2 = \sum p_i (Y_i - \mu_Y)^2$
standard deviation of $Y$	$\sigma_Y = \sqrt{\sigma_Y^2}$
covariance between $X$ and $Y$	$\sigma_{XY} = E[(X - \mu_X)(Y - \mu_Y)]$
correlation coefficient (between $X$ and $Y$ )	$\rho_{XY} = \frac{\sigma_{XY}}{\sigma_X \sigma_Y}$
expected value of the sample average, $\bar{Y}$	$E(\bar{Y}) = \mu_Y$
variance of the sample average, $\bar{Y}$	$\sigma_{\bar{Y}}^2 = \frac{\sigma_Y^2}{n}$
sample variance of $Y$ (estimator for $\sigma^2$ )	$s_Y^2 = \frac{1}{n-1} \sum_{i=1}^n (Y_i - \bar{Y})^2$
sample variance of $y$ in a regression model	$s_y^2 = \frac{1}{n-k-1} \sum_{i=1}^n e_i^2$
t-statistic (assuming large $n$ )	$t = \frac{\text{estimate} - \text{hypothesis}}{\text{std. error}}$
95% confidence interval	estimate $\pm 1.96 \times \text{std. error}$
LS estimator for $\beta_1$ (single regressor model)	$b_1 = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{\sum_{i=1}^n (X_i - \bar{X})^2}$
LS estimator for $\beta_0$ (single regressor model)	$b_0 = \bar{Y} - b_1 \bar{X}$
variance of $b_1$ (single regressor model)	$\text{var}[b_1] = \frac{\sigma_\epsilon^2}{\sum X_i^2 - \frac{(\sum X_i)^2}{n}}$
LS predicted values (single regressor model)	$\hat{Y}_i = b_0 + b_1 X_i$
LS residuals	$e_i = Y_i - \hat{Y}_i$
R-squared	$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS}$
adjusted-R-squared	$\bar{R}^2 = 1 - \frac{RSS/(n-k-1)}{TSS/(n-1)}$
F-statistic	$F = \frac{(R_U^2 - R_R^2)/q}{(1 - R_U^2)/(n - k_U - 1)}$
IV estimator	$\hat{\beta}_{IV} = \frac{\sum [(y - \bar{y})(z - \bar{z})]}{\sum [(x - \bar{x})(z - \bar{z})]}$
time averages for panel data	$\bar{y}_i = \frac{1}{T} \sum_{t=1}^T (y_{it}) \quad ; \quad \bar{x}_i = \frac{1}{T} \sum_{t=1}^T (x_{it})$
model with fixed effects	$y_{it} = \beta_1 x_{it} + \alpha_i + \epsilon_{it}$