

Econ 3040 Midterm 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}	$\text{var}[\bar{Y}] = \frac{\sigma_Y^2}{n}$
sample variance of Y (estimator for σ_Y^2)	$s_Y^2 = \frac{1}{n-1} \sum_{i=1}^n (Y_i - \bar{Y})^2$
sample variance of e (estimator for σ_e^2)	$s_e^2 = \frac{1}{n-2} \sum_{i=1}^n e_i^2$
t-statistic	$t = \frac{\text{estimate} - \text{hypothesis}}{\text{std. error}}$
95% confidence interval	estimate $\pm 1.96 \times \text{std. error}$
LS estimator for β_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 β_0 (single regressor model)	$b_0 = \bar{Y} - b_1 \bar{X}$
variance of b_1 (single regressor model)	$\text{var}[b_1] = \frac{\sigma_e^2}{\sum X_i^2 - \frac{(\sum X_i)^2}{n}}$
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	$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS}$
TSS	$\sum_{i=1}^n (y_i - \bar{y})^2$
ESS	$\sum_{i=1}^n (\hat{y}_i - \bar{\hat{y}})^2$
RSS	$\sum_{i=1}^n (e_i^2)$