Cheat sheet for BUEC 333, Summer 2016

June 13, 2016

Key Concept 2.3

Let X, Y and V be random variables, let μ_x and σ_x^2 be the mean and variance of X, let σ_{XY} be the covariance between X and Y (and so forth for the other variables), and let a, b, and c be constants. The following facts follow from the definitions of the mean, variance, and covariance:

$$E(a + bX + cY) = a + b\mu_X + c\mu_Y, \tag{1}$$
$$\mathrm{Var}\,(aX + bY) = a^2\sigma_X^2 + 2ab\sigma_{XY} + b^2\sigma_Y^2, \tag{2}$$
$$E\left(Y^2\right) = \sigma_Y^2 + \mu_Y^2, \tag{3}$$
$$\mathrm{Cov}\,(a + bX + cV, Y) = b\sigma_{XY} + c\sigma_{VY}, \tag{4}$$
$$E\left(XY\right) = \sigma_{XY} + \mu_X\mu_Y, \text{ and} \tag{5}$$

Other formulas

1. The OLS estimators:

$$\hat{\beta}_0 = \bar{Y} - \hat{\beta}_1\bar{X}$$
$$\hat{\beta}_1 = \frac{\sum_{i=1}^{n}\left(X_i - \bar{X}\right)\left(Y_i - \bar{Y}\right)}{\sum_{i=1}^{n}\left(X_i - \bar{X}\right)^2}$$

2. The standard error of the regression:

$$SER = \sqrt{SSR/(n-2)}$$

3. Critical values for confidence intervals

    (a) 90%: 1.64
    (b) 95%: 1.96
    (c) 99%: 2.58