

SINGAPORE MANAGEMENT UNIVERSITY

School of Economics

Econ623 Econometrics II

Assignment 1

Due: Wed 3 February, 2010

1. If $X \sim N(0,1)$, show that the moment generating function of X is $\exp\left(\frac{1}{2}t^2\right)$.
2. If $\begin{bmatrix} X \\ Y \end{bmatrix} \sim N\left(\begin{bmatrix} \mu_X \\ \mu_Y \end{bmatrix}, \begin{bmatrix} \sigma_X^2 & \sigma_{XY} \\ \sigma_{XY} & \sigma_Y^2 \end{bmatrix}\right)$, show that the two marginal distributions and the two conditional distributions are all normally distributed and derive the mean and variance for each distribution.
3. In this exercise you need to write MATLAB programs to examine the finite sample properties of the OLS estimates in the following models

$$\text{Model 1: } Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t, \varepsilon_t \stackrel{iid}{\sim} N(0,1)$$

$$\text{Model 2: } Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t, \varepsilon_t \stackrel{iid}{\sim} t_4$$

Obtain the histograms of $\hat{\beta}_0$ and $\hat{\beta}_1$ based on 10,000 replications of simulated data with the sample size being 25 and 100, respectively. In all cases, simulate X_t s from $N(10,1)$ and fixed them in repeated samples. Examine how each histogram changes with the sample size and the error distribution. Testing for the normality of $\hat{\beta}_1$ in all four cases (namely Model 1 with $n=25, 100$ and Model 2 with $n=25, 100$). Write a short paragraph to summarize what you can observe from the experiment.