

AGEC 643
Homework 1
Due Sept. 13, 2013

Be sure to document all cells with formulas that you type using the =VFORMULA() function.

1. Use the data in HWK1 2013.XLSX, worksheet Data 1, and answer the steps below.
 - a. Calculate the summary statistics
 - b. Estimate trend regressions
 - c. Forecast variables for 5 years using trend regression
 - d. Calculate the correlation matrix for the variables
 - e. Calculate the covariance matrix for the variables
 - f. Calculate the square root of the correlation matrix; call it R
 - g. Transpose the R matrix
 - h. Calculate the product of RR' , check if it equals the original correlation matrix
 - i. Sort the original data on column 2 from low to high, carrying along all the other columns
 - j. Convert the matrix of data to a column vector
 - k. Next reverse the steps in j and create a matrix from the column vector
 - l. Create a diagonal matrix (10 x 10) of 1's
2. Use the data in HWK1 2013.XLSX, workbook Data 2.

Use Theta for the univariate parameter estimator to calculate the parameters for the Y variable. Add the EMP distribution and be sure to add in the common random number in the EMP function. Use CDFDEV to determine the best distribution to fit the random variable Y. Report the CDFDEV stats and the UPES parameters in a table on one page.
3. Use the data in HWK1 2013.XLSX, workbook Data 2 and run the regression below.
 - a. Estimate the multiple regression model using the Simetar function
 - b. Forecast the dependent variable for three years given these X's and report the values:

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
X ₁	4	3	3.5
X ₂	74	75	76
X ₃	40	41	42
X ₄	9.7	9.7	9.7
X ₅	3.9	2.9	2.7

- c. Simulate the dependent variables for 3 years using the Y-hats in step b using the std. dev. of the residuals
- d. Repeat step c using the standard error of prediction, calculated as:
=std. dev. * Y-hat_t/mean.

- e. Report the summary statistics for the 6 simulated variables in steps c and d in a table that is easy to read.
 - f. Report the PDF and CDF of the third year's values in steps c and d.
 - g. Use UPES to estimate parameters for the residuals from the regression model and include EMP. Simulate the different distributions and pick the best one based on CDFDEV, like in problem 2.
4. Develop a simple simulation model to estimate the PDF and CDF of total net returns for a business.

	<u>X₁</u>	<u>X₂</u>	<u>X₃</u>
Production			
Mean	100	200	400
Std. dev.	20	65	125
Price			
Mean	7.00	6.00	4.50
Std. dev.	1.50	0.5	0.55
Minimum			4.00
Maximum			6.00
Variable Cost/Prod Unit			
	3.00	6.00	4.00
Fixed Cost	1000.0		

KOVs:

- Calculate total revenue
- Calculate total costs
- Calculate total net returns

Simulate the model and report summary statistics for all stochastic variables and the KOVs. Present the CDF and PDF for the net returns distribution.

5. Use the data in HWK1 2013.XLSX, worksheet Data 3. Estimate the parameters for the probability distributions of the monthly total rainfall that could be collected by the water harvesting devise outside the AGLS building. Assume the water harvesting devise collects 100 percent of the rainfall during each month. The devise stores the water underground so assume zero evaporation. The water harvesting devise collects the water from the roofs of both buildings plus the surface of the device itself.
- a. Test for normality on each months distribution and a distribution for total annual rainfall.
 - b. What is the best distribution to simulate each month's rainfall?
 - c. Develop monthly rainfall probability distributions from NOAA using total monthly rainfall for College Station.
 - d. Simulate the monthly distributions for 1 year and simulate an annual rainfall using the sum of your simulated monthly rainfall amounts. Report the summary stats for simulated monthly rainfall in inches.

- e. Simulate the distribution for the total rainfall developed by summing the historical monthly totals. Compare the statistics for this simulation to those for total rainfall simulated as a sum of monthly rainfall in part d. How do they differ statistically? Which one should be used for a simulation model?
- f. Now for the real question. Build a simulation model for the water harvesting system and report the results in millions of gallons. Report the PDF charts for all 12 months and for the total annual (Jan – Dec) water harvested.
- g. Now what is the size (gallons) of under ground storage we need to build that will hold a year's water collection with 90% confidence?