**Homework 3**

**AGEC 643**

**Due Nov 11, 2014 in Class**

1. Build a stochastic simulation model using historical yield on price for corn in HWK32014.XLSX. The catch is you have to detrend the data and simulate the price and yield as MVN and you may NOT use Simetar functions.
   1. Use Optimal control theory to estimate the intercept and slopes for the trend regressions of price and yield.
   2. Calculate the residuals from trend and their standard deviation
   3. Calculate the 2x2 correlation matrix using the Excel correlation function
   4. Factor the 2x2 correlation matrix by hand.
   5. Print the results for all these steps.
2. Next use =RAND( ) to generate 500 USDs for each random variable (this means you have to use 1,000 RAND( ) functions). Simulate 500 pairs of MVN yields and prices using 2014 averages in part 3. Hint: use the std dev for the residuals for the MVN simulation. Calculate the summary statistics for your MVN sample.
   1. Print the formulas and results for the first 10 observations for each calculation and the summary statistics.
3. Once you tested your MVN means for yields and prices copy the 1,000 RAND values and paste them as values. Do this only when the means are close to the true means specified below. Now you will use the following input values to simulate 500 calculated government payments named PLC and ARC-CO.

Assumed 2014 average price $3.22

Assumed 2014 average yield 164.4

Base acres 100

CCP yield 180

Loan rate 1.95

Reference price 3.70

Program the following farm program payments (once for each pair of stochastic prices and yields).

PLC = (max [reference price – max (stoch price or loan rate)] or zero) \* 0.85 \* Base Acres \* CCP yield

NOTE: PLC cannot be negative so if stoch price is greater than reference price PLC is zero.

ARC-CO payment involves several steps.

* 1. ARC revenue benchmark = (Olympic average yield 2009-2013) \* (Olympic average price 2009-2013)

But if a price in 2009-2013 is less than the reference price then substitute in the reference price

* 1. ARC revenue guarantee = ARC revenue benchmark \* 0.86
  2. Maximum ARC payment rate = 0.10 \* ARC revenue benchmark
  3. This is the stochastic part.

ARC actual revenue = stochastic yield \* max (stochastic national price or loan rate)

* 1. ARC payment rate = min [(ARC revenue guarantee – ARC actual revenue), or maximum ARC payment rate]

NOTE: ARC payment rate can never be negative

* 1. ARC-CO payment = ARC payment rate \* Base Acres \* 0.85

At this point you will have 500 PLC and 500 ARC payments for 2014. Calculate the summary statistics for these payments. Do not print all 500 stochastic values. Please only print summary stats for all formulas and the first 10 rows of stochastic values.

1. Rank the empirical pdfs from part 3 for PLC and ARC payments using FSD, SDSD, SDRF, CE, SERF, and StopLight. At this point you may use Simetar. But I would like to see you program SDSD by hand using the F(x) rankings like I did in class. Print the rankings without printing all 500 values for each ranking method.
2. In the readings you will find a monograph, Richardson, Ray, and Trapp, I wrote prior to my dissertation. There is an example optimal control problem in the manuscript. It is a profit maximization problem for a firm that produces 3 outputs using 4 inputs. I want you to program this problem in Excel and solve for the optimal profits.
   1. Print your Excel code and the results for the controls and the profit.
   2. HINT: Excel will find a more optimal solution than I published 38 years ago using Fortran on a main frame IBM 360 computer, with 1280 meg or RAM. Yes that is correct, the main frame only had 1280 meg and only 640 was available to users.