Data for this homework is in the AGEC 643 Website in the Data Folder

1.   Use the data in 2010 HWK2-1.XLSX to estimate and simulate the crop prices as a multivariate Normal distribution using the general procedure. Detrend the data prior to estimating the parameters. Show all of your work with VFORMULA( ).

   A.   Simulate the MVN 500 iterations.
   B.   Show validation tests.

2.   Repeat problem 1 but estimate the parameters and simulate the prices as MVE as percent deviates from $\hat{Y}$ from trend. Show all of your work with VFORMULA( ). Show all of your work.

   A.   Simulate the MVE 500 iterations.
   B.   Show validation tests.

3.   Repeat problem 1 but simulate prices as a Normal kopula and simulate the prices as MVKopula as deviates from $\hat{Y}$ from trend. Use $\hat{Y}$-Hats from trend as the mean for the probabilistic forecast. Show all of your work.

   A.   Simulate the MVKopula 500 iterations.
   B.   Show validation tests.

NOTE: there is no problem 4, just trying to keep you on your toes.

5.   Use 2010 HWK2-2.XLSX and build a 5-year Monte Carlo farm simulation model. Simulate the farm for 5 years. Use a MVE deviation from trend distribution for your random yields and prices. Use the mean forecasted prices and yields in your MVE distribution. Show formulas for each formula you program.

   A.   Print the model and parameter estimation.
   B.   Print summary statistics for the KOVs.
   C.   Print a CDF and PDF of NPV.

6.   Options Problem uses data in the Excel file named 2010 Options Data.xlsx

   You are an investor who wants to insure your portfolio's value against any losses for one year. Use one year of historical data from the website to estimate any parameters that you need to complete the two parts of the exercise.

   Your portfolio consists of two positions:

- Long 1000 shares of SPY
- Long 1000 shares of GLD

Assumptions:
- The risk-free interest rate is 1.0%. That is, $r = 0.01$
- Treat SPY as a stock paying a continuous dividend yield of 0.25%.
- Treat GLD as a commodity with a convenience yield of 1.0%.

Hints:
- Only the terminal value of the portfolio one year from now is important in valuing the European options.
- Using the historical data, regress $\Delta \ln S$ on a constant to estimate parameters. Summary statistics for the recovered residuals, along with the properties of a Wiener process, will be needed for estimating σ. Note that there are 252 observations in the one year of historical data. That is, $\Delta t = 1/251$.

Part I:

Suppose that you will protect your portfolio by buying at-the-money (as of the market's close on 2008-10-13) European put options separately for each of the two assets in your portfolio. Calculate the values of these two options. Note: you can calculate the options' values on a per share basis, then multiply by the number of shares at the end.

Part II:

Suppose that you can find someone to write a you a single, custom over-the-counter option to cover the whole portfolio. Specifically they will sell you an at-the-money, European put option covering your whole portfolio. What is a fair price for this option? Is this more or less than the cost to protect the whole portfolio that you calculated in Part I? Why?