Module #4: Electronic Spreadsheet ~ Excel

TOPICS	Due Dates:	
	Basic	Advanced & Master
Electronic Spreadsheet	Feb 26	
Electronic Spreadsheets (cont.)		March 5

Notes:
1. You must complete the Basic Level by Feb 26th even if you plan to do the Advanced and/or the Master Assignment later. Assuming you plan to proceed to the Advanced level, you should do the first two steps of the Advanced Assignment (Pretty Up your graphs and Spreadsheets) and turn them in along with your Basic results on February 26th. Hard copy please; not Email!
2. There are many spreadsheet programs suitable for this module, including Quattro Pro and Lotus 1,2,3, but if you are not committed by prior experience or ownership to another spreadsheet, Excel may be your best choice. Excel is available for both the MAC and the PC; it is on all the Wesleyan Computer Labs. Note that data files are interchangeable in that Excel can read Quattro Pro files and Quattro Pro can read and save (with the SAVEAS command) Excel files; however, this does not work if the file contains more than one worksheet. The ITS Help Desk can provide advice and help with Excel but not other spreadsheet programs.

Background Reading: Before starting this Module, you *must* read the *Using Electronic Spreadsheets* handout. You may find it helpful to support the Web sources cited at the end of that handout.

I.   Basic Level:

Step 1: For this exercise you will start with the data on the eye color and heights of students in E270. The data is available in an Excel file ClasDat.xls. Your first step should be to download this file onto your disk and then load it into Excel from the Net. To achieve this objective, click on the link on the E280 Handouts page and the computer will either (a) start up Excel and load the file or (b) let you save it on your C: or H: drive. If you don't like heights, you can gather your own data and work with it instead for this exercise.

Observe the following points about this file:
- The Height Data is located on the first Sheet, labeled HEIGHTS at the bottom of the file (The tab labeled ACTUARY at the bottom of the page gets you to data for the Advanced Level assignment). .
- Column 1 of the height data.contains a serial number for each student. A trick was used to avoid having to type in 25 integers. Observe that cell A4 contains 1, cell A5 contains =A4+1. These two entries were made from the keyboard. Then the entry in cell A5 was copied and pasted into cell A6 through to cell A28. Excel automatically updated the "relative address" so that the entry in cell A6 is =A4+1, etc.; then Excel calculated the serial numbers automatically.

Step 2: Calculate the average height of the first student's parents. You can do this by entering "+(G4+H4)/2 in cell J4. Then copy the entry in cell J4 and paste it in locations J5 through J28. Enter "Ave Parent" in cell J3. Right justify it by clicking the right justify icon. Also, you could widen this column by placing the cursor between column labels J and K at the top of the sheet so that the double arrow appears, then drag to the right. (You can adjust the heights of rows in the same way.)

Step 3: Use the appropriate Excel statistical functions to calculate the mean , median, Mode, S, and $\bar{S}$ of the student heights in successive rows at the bottom of the Student column. (To access Excel's functions, click on the f_x tool bar icon.) Key in appropriate identifying labels for these concepts in column A. After you have these four values for students, copy-paste them in one exciting

swoop into columns C through E so that you have the four statistics for fathers, mothers and parental averages.

Step 4: You will use Excel's FREQUENCY function to prepare a frequency distribution of student heights. This will be similar to Table 2-2 on page 28 of W&W. However, because we have only a limited number of observations, it may be appropriate to have fewer cells.

Note: Excel's frequency function creates a frequency distribution from raw data. You will be asked to select as the Data Array the cells containing the student height data. You will also be asked to specify the Bin Array specifying the upper cell boundary (For W&W Table 2.2 these numbers would be 61.5, 64.5, etc).

The best way to proceed is to set up a trial Bin Array using the same values as W&W, starting at the bottom of column A. Then start the FREQUENCY function and accept the offer of Help in the lower left-hand corner of your screen. After you have successfully run the frequency function you should experiment. For example, try changing your Bin Array so that it has fewer but slightly wider cells in order that you won't have too many empty cells. Finally, construct an appropriate column of "cell boundary" labels for each column of the histogram you will be constructing in Step 5(these will differ from the bin values).

Step 5: Click the CHART WIZARD icon (looks like a Bar Chart) to plot a histogram similar to that in panel b on page 29 of W&W. The Chart Wizard will give you an opportunity to specify the location of your data by blocking it in with the mouse. Insert the graph at an appropriate place on your spreadsheet page (you can move it around and change its shape with the mouse). Also construct a pie chart using the same data and insert it on the page.)

Step 6: Use CHART WIZARD to create an XY scatter graph, putting student height on the ordinate (vertical axis) and average parent height on the abscissa (horizontal axis).

Step 7: You are to use the BINOMDIST function to evaluate the following Bernoulli probabilities: b(2,6,0.5); b(20,60,0.5); b(200,600,0.5).

First let's set up a new worksheet in the same spreadsheet. To do this click on an empty Sheet tab at the bottom of your spread sheet (If none are empty, use the Insert menu to create a new worksheet). Then right click on that worksheet's tab and change its name to "BERNOULLI."

Place your answers, clearly labeled, on the BERNOULI page.

Step 8: Ten parts are produced on a machine each day. The probability of a defective part is 1/3. Use the BINOMDIST function to calculate a rectangular table of binomial probabilities: b(i,10,1/3), with i = 0 to 10.

HINT: Don't set up the BINOMDIST function 11 times. Instead, first create a column numbered 0 to 10 on the BERNOULI page. These might be in locations A10 to A20. Then use the BINOMDIST function to enter b(A10,10,0.3333) into cell B10; you must specify location A10 instead of the number 0. Now copy the result in B10 into cells B11 through B20 to get your probabilities.

NOTE: Assuming you plan to go ahead to the Advanced Level, please complete Step 9 and Step 10 (fancy up your graphs)and turn them in along with your Basic level results.

II. Advanced and Master Levels ~ Graphics and Mortality

Advanced Level: Steps 9 through Step 12 plus Step 13.

Master level: Complete the rest of the table, including the tricky Life Insurance Policy and Annuity questions in the last two columns of the table.

Step 9: Plot a neat histogram showing the probability of 0, 1, 2,…,10 defective parts from Step 8. Clearly label everything on your graph, adding an appropriate title and naming the axes appropriately.

Step 10: Fancy up the three graphs you created at the Basic Level. Clearly label everything on your graph, adding an appropriate title and naming the axes appropriately.

☺ Hint: To change a feature of the graph, click on the feature with the right mouse button and you may find a useful menu.

Step 11: Read into Excel file Mod4Dat.xls. (It is located in the same place you found ClassDa.xls.) Separate worksheets on the file contain the following data sets:

- poverty Contains U.S. poverty rates from 1959 to 1996 overall and by age and sex.
- USHistory Contains U.S. labor force participation rates from 1800 to 1990 by sex.
- Occupations Contains U.S. data from 1990 by racial/ethnic group and sex.

Select the data set of most interest to you by clicking the appropriate tab at the bottom of the page.

Now design two different and revealing ways to view graphically all or part of the data in the spreadsheet so that it will be informative and attractive to the viewer.

Step 12: You are to play Actuary. Optional: To find out what actuaries do, check out http://www.actuary.org/whatactu.htm (Some Econ and Math Econ majors have entered this lucrative profession)

Start this step by clicking the Actuary tab at the bottom of Excel file MD4Excel. The first column on the table is AGE. The other columns are identified below. Your first task is to calculate the values of columns 2 through 8 for ages 1 through 99. Note that the information is already there for some of the items in order that you can verify that your formulas are generating the correct answers when you paste them in appropriately.

Some Key Actuarial Symbols and Concepts:

L_X the number surviving to age x out of the 1,023,102 alive at age 0 (nearest birthday). This is the first column of data on the table.

$D_X = L_X - L_{X-1}$, the number dying between age x and x+1.

$_X|Q_O = D_X / 1,023,102$, the probability that a newborn child will die at age x.

$Q_X = D_X / L_X$ = conditional probability of dying within a year for an individual who has lived to age x.

$P_X = 1 - Q_X = L_{X+1}/L_X$ = probability of living to age x+1, given one has survived to age x.

$_NP_X = L_{X+N}/L_X$ = probability that a person of age x will live to age x+n

$$\overset{o}{e}_x = \sum_{n=1}^{\infty} {}_n p_x + 0.5 = (L_{x+1} + L_{x+2} + \ldots) / L_x + 1/2 = \text{The life expectation of an individual}$$

of age x

Step 13: Plot a neat graph showing P_x as a function of age.

Step 14: Calculate the value of a $1,000 one year term life insurance policy purchased at the beginning of the year by someone of age x; i.e., complete column 9. (The premium is paid at the beginning of the year; your heirs get the $1,000 if you die during the year.)

Step 15: Calculate the value of a $1,000 One Year Annuity purchased by an individual of age x. Purchasers who live until year end will receive $1,000 on their birthday.

Step 16: Calculate the value of a *$1,000 Single Payment Life Insurance Policy* purchased by an individual of age x. (Your heirs will receive the $1,000 at the end of the year in which you die.)

Step 17: Calculate the value for an individual of age x of a *$1,000 Life Annuity* that will pay $1,000 every year until death.

The odds are tilted against insurance companies. In practice insurance and annuities cannot be sold at the valuations you calculated because of "adverse selection": people who think that they are likely to die young (they smoke; their relatives died young) are most likely to buy insurance; people who expect to live a long time are likely to buy annuities.