

*PREFACE TO STUDENT PROJECT SAMPLES*

Updated: April 20, 2006

*Jacob:* What does this discussion thread contain?

*Rachel:* The discussion thread has extracts from student projects with comments by the NEAS faculty.

*Jacob:* Do you show the complete student project in this discussion forum?

*Rachel:* A few projects are complete; most extracts are just a few paragraphs.

*Jacob:* Are these the best student projects? Are they all correct?

*Rachel:* Some projects are good; some are mediocre. The comments by the NEAS faculty explain what is done correctly, what might be done differently, and what is incorrect. The comments here do not necessarily mean the student project has an error. We have asked our faculty to comment on the good, the bad, and the optional, so that other candidates have a clear perspective of what is appropriate for the student projects.

*Illustration:* Candidates often ask how many data points to simulate, what significance level to use, and what inferences to draw. The answers depend on the choices of  $\sigma$ ,  $\alpha$ ,  $\beta_1$ , and  $\beta_2$ ; the null hypothesis that we are testing, a continuous vs an abrupt change in  $\beta$ , and other aspects of the regression.

*Data Points:* A statistician might say: more data points are better. In contrast, actuaries emphasize recent data, since patterns in old data may not be relevant. Reserving actuaries use development periods of 10 to 15 years and averages of 3 to 8 years, giving 30 to 120 data points. For the student projects, we recommend more data points so that we can see changes more clearly in residual plots. The project template on changing inflation rates focuses on this item. If the inflation rate is changing, we want to use fewer years.

*Significance level:* Statisticians use 90% or 95% significance levels. A reserving actuary must set a reserve and a pricing actuary must set a rate, regardless of the significance of the regression analysis. When applying regression analysis to actuarial work, use the  $p$  value, not a pre-specified significance level. The simulations allow you to vary  $\sigma$  and see the effect on hypothesis testing. In practice,  $\sigma$  is high for much actuarial work.

*Inferences:* The common null hypothesis is that  $\beta$  is zero. In actuarial work, the null hypothesis is that  $\beta$  is constant, or that a  $\beta$  in the state under review is the same as the countrywide  $\beta$ . For the student project, state the hypotheses and explain how you will test them. We examine whether you understand the concepts, not whether your hypothesis satisfies a 5% significance level.

*STATISTICAL SOFTWARE*

*Jacob:* Some student projects use Minitab or SAS or other statistical software. Can we use these statistical packages?

*Rachel:* The student project demonstrates that you can apply the statistical techniques to real data using standard statistical software. Candidates who have access to statistical packages are encouraged to use them.

Most candidates do not have statistical packages, and these packages are too expensive for the on-line courses. *R* is a free on-line package, but it has a steep learning curve.

Almost all candidates have Excel. We provide sample Excel coding for the major time series techniques, sample data in Excel work-sheets, and comments on how to use the Excel built-in functions.

*Jacob:* Candidates who have Minitab or SAS can easily run regression models and test more complex hypotheses, such as the *F* tests to compare two regression equations. Candidates who have only Excel have more difficulty.

*Rachel:* This is true for the first few months. We intend to post illustrative work-sheets showing many of the more complex tests, making it easier to complete the projects with Excel. Before posting our project templates on the *F* tests, we have to create illustrative work-sheets showing how to perform the analysis in Excel.

#### *WRITE-UPS VS WORK-SHEETS*

*Jacob:* Does this discussion thread have the write-ups with the Excel work-sheets?

*Rachel:* We use extracts from the write-ups, so you can see what other candidates are doing for their student projects. We don't include the Excel worksheets; you must do the analysis yourself. It is too easy to copy an Excel file.

*Jacob:* The illustrative work-sheets show the techniques. Can't candidates copy those?

*Rachel:* The illustrative work-sheets are carefully designed to show the method but not to include all the pieces needed for the student project.

*Jacob:* Don't you describe these additional pieces in the discussion forum postings?

*Rachel:* A candidate who reads the posting and makes the needed adjustments to the Excel file demonstrates an understanding of the time series techniques.