Course Syllabus STA301
Statistics for Economics and Business
(6 ECTS credits)

Instructor: Luc Hens
Telephone: +32 2 629 11 92
e-mail: luc.hens@vub.ac.be

Course description

Statistics for Business and Economics first reviews the basic concepts of statistical inference: sample variability, estimation with confidence intervals, and tests of statistical significance. The course then extends inference by looking into: (i) small-sample tests for averages ($t$-test); (ii) hypothesis tests comparing two sample averages; and (iii) Chi-square tests. The course finally introduces the student to simple regression (fitting a line to a scatter plot) and multiple regression (the generalization of the regression technique to more than one explanatory variable). Students learn how to use a statistical calculator and statistical software to do their own quantitative research. Emphasis on applying methods and interpreting results throughout. STA301 is equivalent to STA201 Intermediate Statistics.

Course prerequisites

STA101 Quantitative Methods / Introduction to Statistics is a prerequisite for STA301 Statistics for Business and Economics.

Course objectives

This course aims at providing students with an understanding of inferential statistics (making valid generalizations from sample data), including multiple regression. At the end of the course, students should be able to:

- critically analyze data sets and apply the tools of statistics to data in order to improve decision making;
- use statistical software and a scientific calculator to do statistical computations (enter data, generate descriptive statistics and graphs, estimate population parameters, perform hypothesis tests)
- communicate the results of statistical work, and more specifically write up the results of statistical analysis in a report consisting of a non-technical abstract aimed at decision makers, so that they can improve their decisions, and a main section aimed at peers explaining the technical details and exact interpretation of the results. The report is written in APA Style.

Course schedule

Chapter numbers refer to Freedman et al. (2007).

Week 1


Week 2

Probability distributions (chance processes, expected value, chance errors, standard error). Chapter 2 of the lecture notes (covers Freedman et al. (2007, Ch. 16, 17, 18)).

Tuesday: An introduction to R and R Commander. Bring your laptop computer (if you have one) to class. Make sure R and R Commander are installed on your laptop computer, and that you can connect to the internet.

Week 3

Sampling distributions: the sum of draws, the expected value and standard error of the sum of draws, the central limit theorem. The sampling distribution of a sample percentage. The sampling distribution of a sample average. Chapter 3 of the lecture notes (covers Freedman et al. (2007, Ch. 16, 17, 18, 20, 23 section 1)).

Week 4

Inference: confidence intervals. Chapter 4 of the lecture notes (covers Freedman et al. (2007, Ch. 21, 23)). Assignment 1 is due.

Week 5

Inference: hypothesis tests. Freedman et al. (2007, Ch. 26, 29).
**Week 6**

Inference: hypothesis tests for small samples. Freedman et al. (2007, Ch. 26, section 6). **Assignment 2 is due.**

**Week 7 — midterm exam week**

Inference: hypothesis tests on two averages. Freedman et al. (2007, Ch. 27). **Midterm examination.** Covers all material covered to date. Bring your student ID (with picture), a mechanical pencil, an eraser, a pen, a ruler with a centimeter scale, the TI-84 calculator, a set of spare batteries for the TI-84, and the laminated formula sheets.

**Week 8**

Inference: hypothesis tests on two averages. Freedman et al. (2007, Ch. 27). (There is a mistake in Freedman et al. (2007, Ch. 27). In example 2 (pp. 503-504), the authors use a one-sided alternative hypothesis; in example 3 (pp. 505-506), they do so, too. They base their one-sided hypothesis on the outcome of the sample. But this is *data snooping*, a practice they condemn on pp. 547-550. In both examples the alternative hypothesis should be two-sided.)

In class we work exercise A-2 from Freedman et al. (2007, p. 503). At home, adapt the script `SE-for-a-difference.R` to reflect the givens of exercise A-2. Then run the script ten times, and construct a table with the results (column 1 is the run no. (1, 2, 3, . . ., 10), column 2 is the difference of the sample averages, column 3 is the chance error, and column 4 is the chance error without the minus sign. Are the simulation results in columns 2 and 4 in line with what the expectation and the standard error you found in exercise A-2?

**Week 9**

Measures of linear relationship: correlation. Freedman et al. (2007, Ch. 8, 9). Friday of week 9 is the last day to drop a course.

**Week 10**

Measures of linear relationship: the regression line. Freedman et al. (2007, Ch. 11, 12). Download, print and read `line_of_best_fit.pdf`. **Assignment 3 is due.**

**Week 11**

Multiple regression (Chapter 10 of the lecture notes).

**Week 12**

Multiple regression, continued (Chapter 10 of the lecture notes). **Assignment 4 is due.**
Week 13
Inference for regression (Chapter 11 of the lecture notes).

Week 14
The Chi-Square test. Freedman et al. (2007, Ch. 28). Skip the explanation of how to use $\chi^2$-tables (starting on p. 527 with “In principle, there is one table ...” and ending with the sketch on the top of p. 528; statisticians use a statistical calculator or statistical software to find areas under the $\chi^2$-curve. Also skip section 3 (“How Fisher used the $\chi^2$-test”), pp. 533–535.

Week 15—Final exam week
Final exam. Covers all material since the midterm exam. Bring your student ID (with picture), a mechanical pencil, an eraser, a pen, a ruler with a centimeter scale, the TI-84 calculator, a set of spare batteries for the TI-84, and the laminated formula sheets.

Course materials
The required textbook is Freedman et al. (2007). You also need the Texas Instruments TI-84 calculator. Lecture notes are posted on the course web site.

Course assessment
There are four short research papers and two written exams. The final grade for the course will be calculated on the following weighting:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation and preparedness</td>
<td>10 %</td>
</tr>
<tr>
<td>Assignments (four, each carrying 7.5%)</td>
<td>30 %</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>30 %</td>
</tr>
<tr>
<td>Final exam</td>
<td>30 %</td>
</tr>
</tbody>
</table>

Grading scale of Vesalius College
Vesalius College grading policy, in line with the Flemish Educational norms, is now as stated follows:
<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade points(^a)</th>
<th>Score (/20)(^b)</th>
<th>Score (%)(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>0.00</td>
<td>00.0 to 9.9</td>
<td>00 to 49</td>
</tr>
<tr>
<td>D</td>
<td>1.00</td>
<td>10.0 to 10.9</td>
<td>50 to 53</td>
</tr>
<tr>
<td>D+</td>
<td>1.33</td>
<td>11.0 to 11.4</td>
<td>54 to 57</td>
</tr>
<tr>
<td>C-</td>
<td>1.67</td>
<td>11.5 to 12.4</td>
<td>58 to 61</td>
</tr>
<tr>
<td>C</td>
<td>2.00</td>
<td>12.5 to 12.9</td>
<td>62 to 65</td>
</tr>
<tr>
<td>C+</td>
<td>2.33</td>
<td>13.0 to 13.9</td>
<td>66 to 68</td>
</tr>
<tr>
<td>B-</td>
<td>2.67</td>
<td>14.0 to 14.4</td>
<td>69 to 72</td>
</tr>
<tr>
<td>B</td>
<td>3.00</td>
<td>14.5 to 15.4</td>
<td>73 to 76</td>
</tr>
<tr>
<td>B+</td>
<td>3.33</td>
<td>15.5 to 15.9</td>
<td>77 to 80</td>
</tr>
<tr>
<td>A-</td>
<td>3.67</td>
<td>16.0 to 16.9</td>
<td>81 to 84</td>
</tr>
<tr>
<td>A</td>
<td>4.00</td>
<td>17.0 to 20.0</td>
<td>85 to 100</td>
</tr>
</tbody>
</table>

\(^a\) Grade points rounded to .01
\(^b\) Scores (/20) rounded to .1
\(^c\) Scores (%) rounded to 1%

The participation and preparedness grade is computed by counting the number of classes attended out of the total, expressing this as a percentage, and converting the percentage to a letter grade using the table above. A student who arrived in class late or who was poorly prepared (for instance, by not having done the requested readings) loses one-third of the participation and preparedness mark for that class. For example, a student who attended 21 out of 27 classes (78%) and was always well-prepared (on time etc.) will obtain a B+. A student who attended 21 out of 27 classes, but was late three times, will get a mark of 20/27 (74%) and will obtain a B. If you can’t attend class for a valid reason, let me or the College administration know before class. Excused absences (doctors notice, or acceptable excuse at my discretion) will be counted as being present. Doctor’s notes should be handed in at the reception desk; the receptionist will inform all your professors.

### Additional Course Policies

**Formatting of written work.** See my formatting rules for written work for details on how to format a paper for my class:


You can find the assignments on the course home page.

**Late papers policy.** Written work should be submitted on paper at the beginning of class on the date specified in the course schedule. I don’t accept submission by e-mail. In accordance with Murphy’s Law, computers are likely to crash and printers are likely to run out of ink the evening before the due date. Start in time. Make backups of your work. Computer or printer problems are no valid reason for handing in work late. Late written work is allowed only in emergency cases, which must be documented by a physician or college official, in advance when possible. Otherwise the penalty for late work is 2 points (on a 20-point scale) per workday late.

Examinations provide the occasion for you to revise and consolidate your work during the term, to clear up any problems that have remained unresolved. They give you the chance to test whether you have really understood what you have read and done in class. The exams typically consist of exercises from the
textbook. Exams are closed-book, but you'll be allowed to use the TI-84 and the laminated formula sheet during the midterm and final exams (not a plain paper copy, only a laminated copy!). Makeup examinations will be allowed only in extreme emergency, which must be documented by a physician or college official, in advance when possible.

During the semester, you should make photocopies of your graded written work (papers and exams) and return the originals to me (needed for inspection by the external examiners and the accreditation body).

Don't mail or call me to inquire about your grade—I don’t communicate grades by e-mail or by telephone.

**Academic Honesty**

Academic dishonesty is not tolerated at the College. Academic honesty is not only an ethical issue but also the foundation of scholarship. Cheating and plagiarism are therefore serious breaches of academic integrity.

Following the College policy, cheating and plagiarism cases will be communicated in writing to the Associate Dean for Students and submitted to the Student Conduct Committee for disciplinary action.

If you refer to someone else’s work, appropriate references and citations must be provided. Grammar, spelling and punctuation count, so use the tools necessary to correct before handing in assignments.

**References**