BUSI5801D
Statistics for Managers
Winter 2023

Instructor: Ahmad Teymouri
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Class Meeting:

- Section A: Wednesdays, 18:05 – 20:55, Nicol Building, Room: 4040

Course Calendar Description:
Techniques for using data to make an informed use of statistics. Applications, interpretation and limitations of results. Sampling, descriptive statistics, probability concepts, estimation and testing of hypotheses and regression, using practical business situations.
Precludes additional credit for BUSI 5904.

Course Description:
The world produces more data in one day than people can use in their entire life. As the world becomes more and more awash with data, new challenges related to information overload as well as new opportunities have begun to arise. Data become useful if they are transformed into information. Data analysis is the science of correctly collecting data, assessing it for trustworthiness, extracting information from it, and presenting it in a comprehensible informative way. These skills are vital to institutions such as government, business, or health care where sound decisions must be made based on data and the way it is interpreted. That makes the role of a data analyst highly important especially in the business sector. The course includes the following subjects: data and their description: frequency tables, histograms, summarizing data: measures of location and dispersion, basic notions in probability and probability distribution (normal), random sampling methods, sampling distributions and central limit theorem, interval estimation, hypothesis testing and making decisions, chi-square tests on qualitative data: goodness-of-fit and test of independence, correlation and regression analysis, simple and multiple linear regression.

Course Learning Objectives:
The objectives of the course are to familiarize the participants with necessary data analysis and data modeling skills, to develop the ability to interpret large amounts of data and draw sound implications for the business at hand, and to exhibit the usefulness of data analysis in management problem solving and decision-making. Students will discover how to gain unique insights on past, present and future performance by combining modern tools and technologies together with knowledge and experience. They will gain an understanding of the

procedures for analyzing and presenting data, and the principles of making inferences from sample data. Emphasis is placed upon the understanding of the capabilities as well as the limitations of these procedures and on the correct interpretation of statistical results.

Course Prerequisites:
No prerequisite courses. Students are expected to know basic math (e.g., order of operations, solving for one unknown variable in one equation).

Required Materials:
- Textbook: G. Keller (2017) Statistics for Management and Economics (Abbreviated), 11th Edition, South-Western
- Computer with Microsoft Office Software
  In this module, the spreadsheet will be the basic tool of the decision-maker. It is indeed likely that you will use that tool at your disposal in your business environment for quick data manipulations (financial, accounting, production data, etc.). Microsoft EXCEL (versions Office 2003, 2007, 2010, 2013 or 2016), available in most languages on PCs or MACs, is a rather formidable spreadsheet package. Furthermore, it contains numerous statistical functions making it particularly suitable for teaching statistics at the MBA level. EXCEL skills are essential to be successful in this module.
- Video conferencing capabilities (for online meetings or classes)

Final Exam Date:
TBD

Drop Course Policy: The deadline for academic withdrawal is the last day of classes (each term).

Grading Scheme:

Assignments (1 × 12%)	12%
Group Case Studies (2 × 12%)	24%
Final Group Project	24%
Final Exam	40%
TOTAL	**100%**

Each component of your grade will be assigned a percentage score. Your final course grade will be a weighted average of each of these components.

Assignments
There is one assignment worth together 12% of the final mark and should be handed on week three. This assignment should be handed in individually. Candidates can help one another regarding the assignment problems. However, in order to maximize learning and understanding, the final analysis, write-up and submission must be your own.

Group Case Studies
There are two case studies worth 24% of the final mark and must be done in a group setting. Individual grading will be based on peer-evaluation. The first case study is to be handed in on week four (value 12% of

final mark) and the second case study is to be handed in on week seven (value 12% of final mark).
Groups will meet in-person or virtually to discuss and solve the assigned case. Only one written case analysis report is to be handed in by each group for each case study. This report should be in the form of an executive report as discussed below. No class presentation will be necessary, but each student is expected to be prepared to discuss all aspects of the case.
Each case study must be submitted in the form of an Executive Report. There is no strict standard form for such a report, but organization, neatness, and professionalism are particularly important here. Keep in mind that Management has a problem to solve and that it is your responsibility to communicate advice in this regard. Be concise and to the point. Longer is usually not better: inclusion of irrelevant or unnecessary material will lower the grade received. Guidelines for maximum length are provided below. As an example of a logical report structure, consider the following:

- Header: state to whom the report is addressed, from whom it is coming, the date and a relevant title identifying the problem.
- Introduction: present a brief statement of the problem, including all options available. Maximum length: 1 page.
- Recommendations: specify recommendations with brief and unambiguous supporting arguments. Maximum length: 1 page.
- Analysis: present your analysis in a logical and easily followed fashion. Do not clutter this part of your report with page after page of computer output; instead, enclose your outputs and all the necessary details in an appendix, and give the appropriate reference in the analysis. Maximum length: 2 pages.

Final Group Project
This part of assessment worth 24% of the final mark. The best way to understand something is to experience it for yourself. That's why the course's main assignment is conducting independent statistical research. Researchers and educators alike have consistently proposed that in courses where students conduct their own authentic statistical research, students will experience deeper learning and develop more positive attitudes about statistics. Statistical and Analytical Investigation will include two related to each other subprojects: a linear regression subproject and a comparison subproject. The instructions for this investigation are prepared on the basis of the recommendations for the discovery project in statistics developed by Dianna J. Spence, Sherry L. Hix, Thomas E., Cooper, and Robb Sinn sponsored by NSF grant award DUE-1021584.
During the statistical and analytical investigation, students choose their own research topic, within this topic students articulate their research question for both subprojects (comparison and regression analysis), define their variables, devise and carry out a data collection plan, conduct the appropriate analysis on the data, and prepare both a written report and an oral presentation to share the results with the instructor and the rest of the class. Students will work in their assigned team groups. The investigation is referred to as discovery one because the research topic is selected by the students, and the full project implementation is student-directed, with the guidance from the instructor kept to a minimum. The three phases of the investigation that rely heavily on technology are the data collection phase, the data analysis phase, and the dissemination phase.

- *Data Collection:* During the data collection phase, students may gather data from one of three sources: (1) constructing and administering surveys; (2) measuring and/or recording physical phenomena; or (3) accessing Internet data repositories or other existing datasets (3). A number of tools are available to help students create and administer online surveys. These include SurveyMonkey, Zoomerang, KwikSurvey, and Google Docs Survey Maker. Students using these and other similar tools are also able to leverage the software's capability of organizing the survey

results directly into a spreadsheet. Students measuring and recording physical phenomena can use a variety of technological devices to perform the desired measurements. The simplest of these could be a stopwatch app on a smart phone. More sophisticated examples could be the Texas Instruments CBLTM or CBRTM data collection systems with probes or similar devices to measure such variables as temperature, light, or motion. Finally, the Internet can be a virtual goldmine of rich data sources for student projects. There are databases and web pages featuring a plethora of resources, including sports data, government records and census data, nutritional information, consumer product specifications and ratings, and data on individual cities and states.

- *Data Analysis:* The results are produced during the analysis phase of the project, after the data is collected and organized. The two subprojects of the statistical and analytical investigation described here are t-tests (2 independent samples or matched pairs) and linear regression. Regardless of the type of analysis required for a given subproject, students must produce the appropriate descriptive statistics, including graphical representations (e.g., histograms) of the distribution of their sample data. For t-test projects, students must compute and interpret the t statistic and p-value for the test. For linear regression subprojects students must create a scatter plot and a graph of the regression line; they must also compute and interpret the value of the correlation coefficient r, coefficient of determination R2, and equation of the regression line. Students will use one or more technological tools to accomplish these analyses, and there are many such tools available. All of the analyses described can be performed with Microsoft Excel that supports all of the analysis functions described, even without installing the statistical analysis add-in package. The requirements of the linear regression project lend themselves particularly well to Excel. There are also some other advantages to using Excel: 1) The program is widely accessible to students from most platforms; 2) learning basic skills in Excel can prove useful for students in a broad variety of settings, which may enhance student motivation; and 3) the charts and graphs created in Excel port easily into student papers and presentations, as noted in the discussion below, under Dissemination.
- *Dissemination:* When the students have collected and analyzed their data, the last phase of the project is to prepare a written report. Most frequently, students choose to use Microsoft Word and Microsoft Excel. Both packages are familiar and widely available, and they lend themselves to the task especially well when Microsoft Excel was used for the data analysis, since graphics generated in Excel import easily into both Word. However, students are not restricted to the Microsoft Office suite for this phase of the project. Some students have used the word processor. Some have used the Adobe software suite to create documents. The statistical and analytical investigation has four checkpoints: Project Planning, Data Collection, Data Analysis, and Project Report. The page limitation for the Final Report is 20 pages, excluding references and appendices. Project Scoring Rubrics is published on Bright space (Appendix)

Late Assignments:

To ensure fairness for all students, penalties will be applied to late assignments: Failure to submit an assignment on time will result in an initial penalty of 25% points, followed by an additional 4% points per day thereafter.

Preparation and Participation:

Student participation in class discussions is highly encouraged. Bonus point/s can be earned for the participation.

Contribution to Program Learning Goals (MBA):

MBA Learning Goal	Not Covered	Introduced	Taught but Not Assessed	Taught and Assessed
MB1 Leadership and Collaboration *Graduates will be equipped for leadership and collaboration.*				✓
MB2 Communication *Graduates will be effective communicators*			✓	
MB3 Critical Thinking and Problem Solving *Graduates will be skilled in critical thinking and problem solving.*				✓
MB4 Functional Knowledge *Graduates will have functional knowledge of all areas of business.*				✓
MB5 Global Business *Graduates will have an appreciation of the global environment of business.*			✓	
MB6 Ethical Reasoning *Graduates will be skilled in ethical reasoning and decision-making.*				✓

ADDITIONAL INFORMATION

Course Sharing Websites:

Materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).

Recommended Calculator for Examinations:

If you are purchasing a calculator, we recommend any one of the following options: Texas Instruments BA II Plus (including Pro Model), Hewlett Packard HP 12C (including Platinum model), Staples Financial Calculator, Sharp EL-738C & Hewlett Packard HP 10bII

Group Work:

The Sprott School of Business encourages group assignments. They provide you with opportunities to develop and enhance interpersonal, communication, leadership, followership and other group skills. Group assignments are also an effective way to learn integrative skills for putting together a complex task. Your professor may assign one or more group tasks, assignments, or projects in this course. Before embarking on

a specific problem as a group, it is your responsibility to ensure that the problem is meant to be a group assignment and not an individual one.

Letter Grades:

In accordance with the Carleton University Undergraduate Calendar (p. 34), the letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100	B+ = 77-79	C+ = 67-69	D+ = 57-59	F = Below 50
A = 85-89	B = 73-76	C = 63-66	D = 53-56	
A - = 80-84	B - = 70-72	C - = 60-62	D - = 50-52	

Grades entered by Registrar:

WDN = Withdrawn from the course
DEF = Deferred

Academic Regulations:

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:
http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/

Requests for Academic Accommodation:

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

- **Pregnancy**
  Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Religious Obligations**
  Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Students with Disabilities**
  If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks

before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. https://carleton.ca/pmc/

- **Survivors of Sexual Violence**
  As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/sexual-violence-support/

- **Student Activities**
  Carleton University recognizes the substantial benefits, to both the individual student and the university, that result from participating in activities beyond the classroom experience. Reasonable accommodation will be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

For more information on academic accommodation, please contact the departmental administrator or visit: https://students.carleton.ca/course-outline/

Academic Integrity:

Violations of academic integrity—presenting another's ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration or completing work for another student—are a serious academic offence, weaken the quality of the degree, and will not be tolerated. Penalties may include; a grade of Failure on the submitted work and/or course; academic probation; a refusal of permission to continue or to register in a specific degree program; suspension from full-time studies; suspension from all studies at Carleton; expulsion from Carleton, amongst others. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy which is available, along with resources for compliance at: https://carleton.ca/registrar/academic-integrity/

Centre for Student Academic Support:

The Centre for Student Academic Support (CSAS) is a centralized collection of learning support services designed to help students achieve their goals and improve their learning both inside and outside the classroom. CSAS offers academic assistance with course content, academic writing and skills development. Visit CSAS on the 4th floor of MacOdrum Library or online at: https://carleton.ca/csas/

Other Important Information:

- Students must always retain a hard copy of all work that is submitted.
- All final grades are subject to the Dean's approval.
- For us to respond to your emails, we need to see your full name, CU ID, and the email must be written from

your valid CARLETON address. Therefore, in order to respond to your inquiries, please send all email from your Carleton cmail account. If you do not have or have yet to activate this account, you can do so by visiting https://carleton.ca/its/get-started/new-students-2/

Covid-19 Information:

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are a number of actions you can take to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's symptom reporting protocols.

Masks: Carleton has paused the COVID-19 Mask Policy, but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in cuScreen as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the University's COVID-19 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

Course Schedule

Week	Date/Section	Topic	Assessment Due Dates
1	Wednesday 11th Jan 2023	An Introduction to Descriptive Statistics, Data Types, Data Visualization, Measures of Central Tendency, Relative Standing Measures	
2	Wednesday 18th Jan 2023	Probability, Discrete Probability Distributions, Continuous Probability Distributions	
3	Wednesday 25th Jan 2023	Sampling Concepts, Sampling Distribution, Introduction to Estimation	Assignment
4	Wednesday 1st Feb 2023	Introduction to Testing Hypotheses and Making Decisions	Group Case Study 1
5	Wednesday 8th Feb 2023	Introduction to Chi-square tests on qualitative data: goodness-of-fit and test of independence	
6	Wednesday 15th Feb 2023	Exploring Relationships Using Scatterplots and Correlations/ Simple Linear Regression	
7	Wednesday 22nd Feb 2023	Non-Linear Regression. Multiple Regression	Group Case Study 2 Final Group Project

APPENDIX

Grading Rubric of Group Case Study

Skill	Below the Expectation 69% and less	Meets the Expectation Between 70% - 89%	Exceeds the Expectation 90% and more
Identification of the Main Issues/ Problems	Identifies and understands some of the issues in the case study	Identifies and understands most of the main issues in the case study	Identifies & understands all of the main issues in the case study
Analysis of the Issues	Superficial analysis of some of the issues in the case	Thorough analysis of most of the issues	Insightful and thorough analysis of all the issues
Comments on effective solutions/strategies (The solution may be in the case already or proposed by you)	Superficial and/or inappropriate solutions to some of the issues in the case study	Appropriate, well thought out comments about solutions, or proposals for solutions, to most of the issues in the case study	Well documented, reasoned and pedagogically appropriate comments on solutions, or proposals for solutions, to all issues in the case study
Links to Course Readings and Additional Research	Limited research and documented links to any readings	Good research and documented links to the material read	Excellent research into the issues with clearly documented links to class (and/or outside) readings

Grading Rubric of Final Group Project

Skill	Below the Expectation 69% and less	Meets the Expectation Between 70% - 89%	Exceeds the Expectation 90% and more	Point
Introduction and Overview of Research	No Statement of research question, variables not defined, hypothesis not started or explained.	Research question, variables, and hypothesis explained adequately.	Research question, variables, and hypothesis explained exceptionally well and with relevance.	5
Data Collection	Poor design, description, or implementation of survey design or sampling methods.	Good design, description, execution of survey design and sampling methods.	Exceptional design, description& execution of survey/sampling.	5
Statistical Analysis: All Variables	No descriptive statistics provided for demographic and research variables.	Basic descriptive statistics provided for all variables (5 numb er summary, mean, standard deviation, etc.).	Thorough analysis of each research variable with appropriate graphs and discussion.	5
Scatterplot and Regression Line	Scatterplot and/or regression line missing and/or correct.	Scatterplot and regression line present and correct.	SDcatterplot and regression line are well presented and illustrate result superbly.	5
Statistical Analysis: Correlation and Regression	Scatterplot, *r*, or line of best fit not explained correctly.	Scatterplot, *r*, line of best fit explained accurately.	R^2 and prediction equation example also explained.	10
Hypothesis	Null and alternative hypotheses not stated or incorrect.	Null and alternative hypotheses stated, but not in mathematical terms.	Null and alternative hypotheses both stated correctly in mathematical terms.	10
Statistical Analysis: Comparison	Inappropriate statistical tests conducted, or statistical test not conducted or explained correctly.	Appropriate statistical tests are conducted correctly and explained adequately.	Explanation of statistical tests is thorough, articulate, and precise.	10
Interpretation of Results	P-values not computed correctly or not interpreted correctly.	P-values computed correctly and interpreted correctly with respect to hypothesis.	Inte4rpretation of P-values includes clear discussion of significance level.	20
Conclusions	Report demonstrates no real-world understanding of the statistical results; no adequate explanation of findings.	Report demonstrates basic understanding of results and makes reasonable attempt to explain findings.	Report demonstrated thorough understanding of results and offers insightful explanation of findings.	20
Organization and Readability	Report is poorly organized or has many spelling/grammar errors, awkward sentences.	Report is reasonably organized with few writing errors and generally readable.	Report is exceptionally well-organized and well-written.	5
Technology	Failed to complete or submit all files (Word, PPT, Excel).	Adequate se and submission of Word, PPT and Excel files.	Exceptional PPT and XLS files submitted; good used of all appropriate technology.	5
Extra Effort				
Extra Mile	No additional effort or creativity demonstrated.	Some added effort or additional data collection or analysis.	Additional regressions, larger sample, obvious additional thoughtfulness, and work.	5