

Tennessee State University
College of Business, Dept. of Economics & Finance
ECON 3050 (Quantitative Methods)
Fall 2020: Examination 1

Due Date & Time: September 16, 2020, 11:30 PM, Central

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1. How to submit this examination

1. Answers **MUST BE NICELY TYPED** in a Microsoft Word document. Times New Roman, 12pt font is highly recommended.
2. The document must have 1 inch margin all around on all pages. All pages must be numbered.
3. The cover page of the submission must include **your name, T-Number, class and section number**.
4. The Word document must be uploaded by no later than 11:30 PM, September 16, 2020 into the Examination 1 folder inside the eLearn Dropbox. This is the **ONLY WAY a valid submission can be made**.
5. Save this final Word file with the following name convention: *firstname-lastname-ECON3050-Exam-1.docx*. For example: *John-Doe-ECON3050-Exam-1.docx*. Then upload the file to the submission folder **BEFORE the deadline**.
6. Late Submissions **WILL NOT be accepted**. Early submissions are welcome and **strongly encouraged**.
7. Photographs of handwritten work, and email submissions **WILL NOT BE ACCEPTED**.
8. **No hard copy submission** is allowed.
9. Each submission will be subjected to a strict plagiarism test. Submissions failing the plagiarism test will **automatically earn a failing grade** in the examination. **NO EXCEPTIONS**.
10. All supporting data and calculations **MUST BE UPLOADED** alongside the Word File. The data work must be in a Microsoft Excel format.

2. What Topics You Need to Cover for This Examination?

This examination is based on these following concepts:

1. Introduction to Business Statistics
2. Data types and measurement
3. Calculating descriptive statistics
4. Displaying descriptive statistics
5. Sampling and Sampling Distribution
6. One Sample Hypothesis Tests
7. Two sample hypothesis test
8. Hypothesis test concerning variance
9. Analysis of Variance - One way

Lecture notes, additional handouts, and lecture videos covering the topics are posted inside eLearn.

2.1. How you should proceed

- Read the chapters of the book.
 - Read the lecture notes posted on eLearn.
 - Visit the additional materials section and read the **Basic Statistics Handout**.
 - Watch the lecture videos posted inside the eLearn
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3. Suggested Videos That You Should Watch

3.1. Disclaimers

The resources are provided so that you can perform your analysis on two largely comparable platforms: Microsoft Excel and Google Sheets.

You need to choose between Microsoft Excel or Google Sheets as your preferred analytics platform but it will be entirely fine to learn BOTH.

The videos are referred as learning materials. **No product, opinion, advertisement, etc. is endorsed. YOU ARE STRONGLY ADVISED TO IGNORE ANY COMMERCIAL MATERIAL THAT IS NOT RELETED TO FORMULAS AND CONCEPTS COVERED IN THE COURSE.** Please bring to my attention if you notice any inappropriate material.

3.2. Microsoft Excel Resources

1. **For Microsoft Windows:** How to Install the Data Analysis ToolPak in Microsoft Excel
https://www.youtube.com/watch?v=_yNxLFagKgw
2. **For Mac:** How to Install the Data Analysis ToolPak in Microsoft Excel
<https://www.youtube.com/watch?v=mtmrAXwLcuU>
3. Creating Pivot Tables in Excel
<https://www.youtube.com/watch?v=BkmxrvIfDGA>
4. Excel - One-Way ANOVA Analysis Toolpack
<https://www.youtube.com/watch?v=nmHFFFpOVZs>
5. F Test in Excel
<https://www.youtube.com/watch?v=2337cSdINF0>

3.3. Google Sheets Resources: Free and Online

1. Installing the XLMiner Analysis ToolPak add-on in Google Sheets
<https://www.youtube.com/watch?v=JHXsKwcRdRw>
 2. Google Sheets: Create Pivot Tables and Charts
https://www.youtube.com/watch?v=SzrBbBV_adM
 3. Two Way ANOVA - with Google Sheets XL-miner
<https://www.youtube.com/watch?v=uCkycwF2HUU>
 4. Running a t-Test using Google Sheets
<https://www.youtube.com/watch?v=YeVF2lnhr7o>
 5. Using Google Sheets to Calculate Differences in Proportions (Z Test)
<https://www.youtube.com/watch?v=1uGvuaCw6t8>
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4. Numerical Problems

Note: Solve each of these problems in the traditional way, paper and pencil. Then nicely type your answers in the Word document that will be submitted. DO NOT submit the images of the handwritten work documents.

1. Consider two samples Sample A: $\{1, 7, 8, 10, 11, 19\}$ and Sample B: $\{1, 3, 5, 7, 8, 10, 12, 14, 18\}$.

(a) Compute the arithmetic mean, geometric mean, median, variance, standard deviation, skewness, maximum, minimum, inter-quartile range, 90–th percentile, 75–th percentile, 95% confidence interval for population mean, 90% confidence interval for population mean, and 95% confidence interval for population mean for Sample A.

(b) Compute the arithmetic mean, geometric mean, median, variance, standard deviation, skewness, maximum, minimum, inter-quartile range, 90–th percentile, 75–th percentile, 95% confidence interval for population mean, 90% confidence interval for population mean, and 95% confidence interval for population mean for Sample B.

(c) Test the hypothesis that the populations from which the two samples have been drawn have the same mean. Precisely state the hypothesis in terms of H_0 and H_1 and the test statistic to be used for this hypothesis test.

(d) Test the hypothesis that the populations from which the two samples have been drawn have means whose difference is no more than 3. Precisely state the hypothesis in terms of H_0 and H_1 and the test statistic to be used for this hypothesis test.

(e) Test the hypothesis that the populations from which the two samples have been drawn have means whose difference is no less than 4. Precisely state the hypothesis in terms of H_0 and H_1 and the test statistic to be used for this hypothesis test.

2. Consider two samples Sample A: $\{2, 3, 1, 5, 7, 9, 11, 12, 17\}$ and Sample B: $\{2, 2, 3, 4, 1, 5, 6, 10, 9, 11, 2, 7, 9\}$.

(a) Compute the arithmetic mean, geometric mean, median, variance, standard deviation, skewness, maximum, minimum, inter-quartile range, 90–th percentile, 75–th percentile, 95% confidence interval for population mean, 90% confidence interval for population mean, and 95% confidence interval for population mean for Sample A.

(b) Compute the arithmetic mean, geometric mean, median, variance, standard deviation, skewness, maximum, minimum, inter-quartile range, 90–th percentile, 75–th percentile, 95% confidence interval for population mean, 90% confidence interval for population mean, and 95% confidence interval for population mean for Sample B.

(c) Test the hypothesis that the populations from which the two samples have been drawn have the same mean. Precisely state the hypothesis in terms of H_0 and H_1 and the test statistic to be used for this hypothesis test.

(d) Test the hypothesis that the populations from which the two samples have been drawn have means whose difference is no more than 3. Precisely state the hypothesis in terms of H_0 and H_1 and the test statistic to be used for this hypothesis test.

(e) Test the hypothesis that the populations from which the two samples have been drawn have means whose difference is no less than 4. Precisely state the hypothesis in terms of H_0 and H_1 and the test statistic to be used for this hypothesis test.

3. Consider two samples

Sample A: $\{18, 18, 30, 23, 25, 29, 17, 11, 24, 23\}$ and Sample B: $\{15, 33, 27, 7, 17, 19, 23, 20, 45, 25, 35\}$.

Test the hypothesis that the two populations from which these two samples have been drawn have the same mean and same variance.

4. Consider two samples

Sample A: $\{10, 21, 30, 29, 29, 30, 27, 11, 29, 29\}$ and Sample B: $\{11, 13, 14, 22, 21, 17, 24, 29, 31, 26, 11\}$.

Test the hypothesis that the two populations from which these two samples have been drawn have the same mean and same variance.

5. Consider two samples

Sample A: {71, 71, 92, 73, 85, 75, 99, 78, 85, 85} and Sample B: {88, 86, 92, 98, 76, 98, 75, 88, 92, 85, 88}.

Test the hypothesis that the two populations from which these two samples have been drawn have the same mean and same variance.

Hint: If two populations have the same mean then the difference between their means is 0. If two populations have the same variance then the difference between their variances is 0 too.

5. Data Analysis Questions

5.1. Prepare the Dataset in Excel Format

- Visit <https://www.worldometers.info/coronavirus/country/us/> and scroll down to find the statewide COVID-19 data for all states in the USA. Input this data in a new working dataset. This should be a Microsoft Excel dataset.
- Augment the data by creating two additional columns denoting the census (i) region & (ii) division that the states fall under. That information is available from https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf
- Save this final dataset with the following name convention: *firstname-lastname-ECON3050-Exam-1.xlsx*. For example: *John-Doe-ECON3050-Exam-1.xlsx*
- Once the data analysis is done on this dataset, only the **final results should be reported** in the Word file. Upload both the data file and the Word file as your submission.

5.2. Answer the Data Analysis Questions Using the Excel File

Note: Do the data analysis in the Microsoft Excel file and write your final answers in the Microsoft Word submission file.

1. Make a pie chart capturing the distribution of COVID-19 cases in various census regions.
2. Make a pie chart capturing the distribution of COVID-19 deaths in various census regions.
3. Make a pie chart capturing the distribution of COVID-19 cases in various census divisions.
4. Make a pie chart capturing the distribution of COVID-19 deaths in various census divisions.
5. Make a pie chart capturing the distribution of COVID-19 tests in various census divisions.
6. Make a pie chart capturing the distribution of COVID-19 tests in various census divisions.
7. Make a bar chart and a histogram capturing the distribution of COVID-19 cases in various census regions.
8. Make a bar chart and a histogram capturing the distribution of COVID-19 deaths in various census regions.
9. Make a bar chart and a histogram capturing the distribution of COVID-19 cases in various census divisions.
10. Make a bar chart and a histogram capturing the distribution of COVID-19 deaths in various census divisions.
11. Make a bar chart and a histogram capturing the distribution of COVID-19 tests in various census divisions.

12. Make a bar chart and a histogram capturing the distribution of COVID-19 tests in various census divisions.
13. Test the hypothesis that the differences in the means of COVID-19 deaths per million population is same between Northeast and Midwest Regions.
14. Test the hypothesis that the differences in the means of COVID-19 deaths per million population is same between South and Midwest Regions.
15. Test the hypothesis that the differences in the means of COVID-19 deaths per million population is same between South and Northeast Regions.
16. Test the hypothesis that the differences in the means of COVID-19 deaths per million population is same between South and Midwest Regions.
17. Test the hypothesis that the differences in the means of COVID-19 deaths per million population is same between South and West Regions.
18. Test the hypothesis that the differences in the means of COVID-19 deaths per million population is same between West and Midwest Regions.
19. Test the hypothesis that the differences in the means of COVID-19 deaths per million population is same between West and Northeast Regions.
20. Test the hypothesis that the difference in the variances of COVID-19 deaths per million population is same between Northeast and Midwest Regions.
21. Test the hypothesis that the difference in the variances of COVID-19 deaths per million population is same between South and Midwest Regions.
22. Test the hypothesis that the difference in the variances of COVID-19 deaths per million population is same between South and Northeast Regions.
23. Test the hypothesis that the difference in the variances of COVID-19 deaths per million population is same between South and Midwest Regions.
24. Test the hypothesis that the difference in the variances of COVID-19 deaths per million population is same between South and West Regions.
25. Test the hypothesis that the difference in the variances of COVID-19 deaths per million population is same between West and Midwest Regions.
26. Test the hypothesis that the difference in the variances of COVID-19 deaths per million population is same between West and Northeast Regions.
27. Check the hypothesis that means of COVID-19 deaths per million population is same between all regions.
28. Check the hypothesis that means of COVID-19 cases per million population is same between all regions.
29. Check the hypothesis that means of COVID-19 tests per million population is same between all regions.
30. Write a short essay (**no more than 2 pages**) describing the differences in COVID-19 cases, deaths, and deaths across regions. How difference are they. Is the pandemic affecting all parts of the country equally? What does the data say? How do the statistical tests help you reach the conclusion that you reached? **Make sure your essay is easily understandable to an intelligent reader who may not have any training in statistics and quantitative methods.** Feel free to support your arguments by summary tables, charts, graphs, etc.

NOTE: Assume $\alpha = 0.05$ for all hypothesis testing questions.