E370 - Statistical Analysis For Business and Economics

Indiana University, Department of Economics

Spring 2024, Syllabus
Section 8726

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Class Dates:	01/08/24 – 05/03/24
Class Time:	TTh 03:00 PM - 04:15 PM Ballantine Hall
Class Location:	(BH 243)
Office Hours:	(in-person) Tuesday 01:50 PM – 02:50 PM,
	(via Zoom) By appointment.

General Information

Course Description: The overall goal of this course is to introduce you to the discipline of statistics as a science of understanding and analyzing economic data and not as a branch of mathematics. The class is designed to provide you with the tools needed to answer real-world questions and better understand the process of statistical inference in economics. While a good understanding of these universal statistical tools is its own reward and can find applications in many areas[1], our course will mostly discuss examples pertaining to the economics and business world (you are welcome to think about other applications and consult with me if necessary). Additionally, our focus in this course is not an in-depth analysis of a specific field of economics but the tools used in different areas. Therefore, be ready to see examples from different fields of economics (health, education, labor, etc.).

Our journey will start from graphical, tabular, and numerical summaries of different types of data and will take us through the topics of probability theory, population and sampling distributions, hypothesis testing, and regression analysis.

Course Objectives: At the completion of the course, you are expected to be able to:

- Translate between plain English and statistical terms and concepts before applying statistical tools. In other words, you are expected to be able to identify key information in the description of the economic problem and write down this information in statistical language/notation (regardless of the wording of the economic situation);

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[1]For example, by introducing a variety of ways to summarize data in the large datasets, our course develops data analysis and presentation skills, and teaches you to express ideas in a language broadly understood by the researchers in biology, physics, sociology, and other areas.

- Select a suitable statistical approach to analyze a new situation;
- Represent data using tables and graphs, and summarize data using a variety of numer-ical measures;
- Understand (and implement) the process of statistical inference;
- Understand (and perform) basic model building using regression tools;
- Understand the role of underlying assumptions in statistical analyses;
- Use Excel to produce graphs and calculate numerical measures in relation to your analysis. Proficiently read outputs produced by Excel add-ins;
- Interpret quantitative results of statistical analyses for the audience in plain English.

Prerequisites: MATH-M 118 (or equivalent) is required.

Textbook

Recommended Textbook: Robert A. Donnelly. Business Statistics, Pearson. 3rd Edition, 2019 (ISBN-13: 978-0134685267).

You have access to the eText as a part of this course. Your copy is available on Canvas page and you can access it through the link "IU eTexts (Unizin Engage)" on the left-sidebar. For more information and the Engage e-reader tutorial, please review "The Student Guide to IU eTexts"[2].

You may purchase a print version of the textbook. The 2nd edition of the textbook is also available for purchase. Textbook material of the 2nd and 3rd editions are very similar. So, either edition will suit to study theoretical concepts of our class. However, examples and practice problems may differ between editions.

Optional Reading: Optional readings (readings recommended for boosting your interest in the subject) will sometimes be referenced on the lecture slides and in the modules on Canvas. These are non-technical (and fun) readings to demonstrate the use of statistics and help you develop intuition.

Please, consider Naked Statistics: Stripping the Dread from the Data by Charles Wheelan as an optional reading for our course.

Technology and Software

Students are expected to have access to Canvas on a regular basis to keep abreast of course evolution as some important announcements and all assignments will be posted on Canvas. Additionally, students are expected to have access to MS Excel outside the class to be able to perform calculations in their assignments.

Excel: To perform cumbersome calculations, our class will utilize MS Excel (Office 2011 or later is recommended). Excel can be accessed for free through IUB Citrix Cloud (https: //uits.iu.edu/ iuanyware). Alternatively, you can download Microsoft Office through IUB at https:// iuware.iu.edu/, which includes Excel for your platform.

Computers and Other Devices: I will use Excel during the class to demonstrate some calculations and Excel features. Lecture slides on Canvas (Files link, folder Slides) include

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[2]https://expand.iu.edu/browse/etexts/courses/the-student-guide-to-iu-etexts

information relevant to these discussions (screenshots, Excel function descriptions, etc.). Pre-recorded videos demonstrating solutions to some exercises from the slides are also available on Canvas. Additionally, Excel files with solutions to all the exercises from the slides will be posted on Canvas (Files link, folder Solutions to Excel Problems (Slides)).

You are not expected to perform Excel calculations during the lecture. So, there is no requirement to bring a laptop to class. But you are welcome to have your laptop and follow the steps of the analysis performed in Excel during the lecture. This will allow you to practice along, save you time on the Excel assignments, and make it easier to understand where you have questions and ask them right away in class.

Note: No electronic devices are allowed during the exams except calculators.

Canvas: The course will use Canvas for posting class announcements, HWs, quizzes, grades, exam information, and any additional material. I will send messages through Canvas often, so please make sure to read these messages carefully and check Canvas regularly.

Course Assignments
Our course includes several types of assignments:

- Reading assignments. While reading in statistics may sound like a difficult task, the selected readings in our class are non-technical, easy to read, and even fun. The main goal is to discuss some important concepts in an intuitive way and develop a deeper intuition. On the reading assignments, you will be required to write a short reflection on the reading or answer questions related to the reading. Reading assignments are graded on completion.

- Excel assignments. These assignments ask that you submit Excel files with your work for each chapter. Excel assignments are graded on completion meaning that the main requirement for getting a grade is that you complete all the work.

  ◦ I will discuss and demonstrate how to solve some/all of the exercises from the Excel assignments during the class. So, it is a real time-saver to follow along in class because I will be doing exercises from your assignments. Most times, I will be able to finish everything from your assignments in class and you will only need to save to your work and submit it on Canvas.
  ◦ If you were not able to follow Excel work in class, you will be able to find pre-recorded videos demonstrating how to solve exercises from the Excel assignments on Canvas (to locate these videos, look for a component "Videos with Excel Exercises (Chapter #)" in the modules).
  ◦ Excel files with suggested solutions will be posted on Canvas shortly after the deadline (folder Solutions to Excel Problems (Slides) under the Files link).

- Homeworks. Homework assignments will be graded on accuracy. They are constructed to prepare you for the exams and include various types of questions that may as well require short answers and extensive explanations. There may be questions requiring you to analytically, graphically or numerically with the help of Excel analyze a problem. Suggested solutions to the HWs will be posted on Canvas shortly after the deadline.

- Exams. Exams are a culmination of your work on a particular topic (-s). Obviously, exams are graded on accuracy.

- Occasional extra credit activities are possible in class. Extra credit points will be added to the total score you earn in the class and, therefore, should be regarded as an opportunity to improve your grade (you should not, however, expect that it will be a significant portion of the grade). Extra credit activities may include, but are not limited to, extra credit questions on the HWs and exams, Canvas quizzes, Top Hat questions, etc. No makeups or deadline extensions will be given for extra credit activities.

- Ungraded self-assessment quizzes (Quick Checks). These quizzes are optional and the main goal is to give you an opportunity to practice and check your understanding before you start working on your assignments.

Collaboration: Discussion of class assignments with peers is permissible, may be highly beneficial, and is encouraged. However, your answers submitted for a grade should represent your own work. Note that offering and accepting Excel files with solutions and answers to the assignment questions on Canvas from others (including students in your class, former students, or any other people) is an academic misconduct and all involved parties will be penalized following IU Code of Student Rights, Responsibilities, & Conduct[3]. Please submit your own work!!!
NO COLLABORATION IS ALLOWED DURING EXAMS!!!

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[3] According to this policy, submitting Excel files previously posted by any E370/S370 instructors or created and used by former E370/S370 students is an academic misconduct and will be treated accordingly.

Course Grade

Your course grade will be based on the score (out of total 900 points) you earn for[4]:

- Departmental Final Exam (comprehensive, multiple choice, maximum 270 pts which is 30% of the grade);
- Two midterm exams (multiple choice, maximum 180 pts for each exam or 360 pts in total which is 40% of the grade);
- Eight homework assignments (maximum 20 pts for each HW or 160 pts in total which is 17.8% of the grade). There will be nine homework assignments in total, each worth 20 pts. The lowest homework score will be dropped and eight best scores will be counted towards your final grade;
- Eight Excel assignments showing your work on the assigned Excel exercises for each chapter (maximum 9 pts for each assignment or 72 pts in total which is 8% of the grade). There will be nine Excel assignments in total, each worth 9 pts. The lowest Excel assignment score will be dropped and eight best scores will be counted towards your final grade;
- Two reading assignments (maximum 19 pts for each assignment or 38 pts in total which is 4.2% of the grade);

Missed assignments are counted as zero points towards your final grade.

Grade Scale: The final letter grade for the course will be based on the following scale:

Grade	Points Range	% Range	Grade	Points Range	% Range
A+	(873-900)	(97% - 100%)	C+	(684-711)	(76% - 79%)
A	(828-873)	(92%- 97%)	C	(612-684)	(68% - 76%)
A-	(810-828)	(90%- 92%)	C-	(585-612)	(65% - 68%)
B+	(783-810)	(87%- 90%)	D+	(558-585)	(62% - 65%)
B	(738-783)	(82% - 87%)	D	(495-558)	(55% - 62%)
B-	(711-738)	(79% - 82%)	D-	(450-495)	(50% - 55%)
			F	(Below 450)	(Below 50%)

I reserve a right to make advantageous adjustments to this scale in student's favor (curve). Such adjustments will NOT be applied on an individual basis and will only be applied to all students in the class if necessary. However, you should not rely on a possibility of such adjustments when forming your expectations about the grade because curving is neither guaranteed nor is a regular practice in this course.

Scores on the border of the letter grade are decided in student's favor towards a higher letter grade. Please, note that this rule applies only if your total points are exactly on the border of the letter grade[4].

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[4] For example, let us imagine a student whose score is close to the border between A- and A. If their total score is slightly less than 828 then the score is converted into A- (even if the score is 0.1 below 828). At the same time, if the total score is 828, it is converted into A.

No grade pleading will be entertained in this class. I very well understand difficulties of the situations faced by the students when I receive their individual requests about raising the grade. But I cannot deviate from the rules I apply to other students in the class. To avoid unpleasant grades in the end, please remember that every bit helps. So, do not miss assignments and extra credit opportunities even if they don't offer a lot of points, and work on earning your grade from the start of the class.

Grade Contests: Except for the final exam, any concerns regarding assignment grades must be contested within a week of posting. The window to address such concerns for the final exam will be announced later (but you should expect it to be much shorter than a week). The scores become a permanent part of your record if not contested.

Timing of the Assignments and Late Submissions

Timing: There is no time limit set on any assignments posted on Canvas in this class. This means that you do NOT need to complete HWs, quizzes, etc. in one sitting. For example, you can start working on a HW and leave it without submitting. Canvas will save your answers. Next time when you open your HW, you will see previously entered answers and will be able to continue working on the HW.

Late Submissions:

Quick Checks. These are ungraded optional quizzes and do not have deadlines on them. You can refer to them at any point in the class as needed.

HWs and Excel Assignments. These assignments will be accepted late within 48 hours of the deadline with a penalty. Assignments submitted after the deadline will receive a flat point deduction for each 24-hour period following the due date:

- HWs: 3 points;
- Excel assignments: 1.35 points.
- Readings: 2.85 points;

More specifically, students who submit their HW within 24 hours after the deadline receive a deduction of 3 points (independent of their earned score). Students who submit their HW within 24 – 48 hours after the deadline receive a 6-point deduction (3 points for each 24-hour period). After 48 hours, HWs will not be accepted. Late submissions on the Excel assignments will be treated similarly except for a different point deduction[5].

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[5] Let's think about specific example with Excel assignments. Suppose that the Excel assignment has a due date on Sunday midnight. You were not able to submit it on time and tuned in your work on Tuesday afternoon. Let's also imagine that, after reviewing your work, the grader gives you 6 points out of 9 because you haven't completed all the problems. After the grader puts in the score on Canvas, the late submission penalty is applied and your assignment receives 3.3 points (6 points you get for your work – 1.35 points for the first 24-hour period – 1.35 for the second 24-hour period = 3.3 points).

Exam Dates

Exam dates are tentatively set in the syllabus and are subject to change in the extreme circumstances:

Exam 1   February, 15 (Th)
Exam 2   April, 4 (Th)
Final Exam   May, 2 (Th), 7:40PM – 9:40PM

Topics covered in midterms will be specified prior to each exam. Midterms are NOT cumu-lative and cover only the part of the course that was not tested in the previous midterm (-s). The Final Exam is cumulative and covers all topics discussed in the class.

Please, notice that the final exam for our class is Department-wide. The time for the De-partmental final exams is determined by the IU Office of the Registrar and is outside of my

control. Therefore, no alternative schedule for the final exam will be considered.

Makeup Exams

Makeups: Students are expected to attend class and participate in all graded activities, including midterms and final examinations. Missing an assignment or exam earns zero points.

A student who is anticipating being absent from exam or not being able to submit their graded assignments before the deadline due to official religious holidays for which the work is not allowed or university-approved activities should provide a written notice to the instructor ahead of time (more information is provided in the section on class rule and policies below). Provided that the instructor was notified on time, students who miss their exam due to these reasons will be granted accommodations in the form of a makeup exam. The instructor will also determine if other graded assignments can be rescheduled or an equivalent work can be done as a makeup, as determined by the instructor.

If you have a hardship or other significant circumstances (including medical conditions) re-quiring longer-term absences from classes and assignments, or have a death in your immediate family, please contact the Dean of Students Office to request an absence notification memo. The Office will verify documentation related to your absence and contact your instructors, including me, requesting to develop accommodations for these circumstances.

I reserve the right to pick a time and location for the makeup exams depending on the proctor and classroom availability. While the topical coverage of the makeup exams is guaranteed to be the same as the original exams, makeup exams are not guaranteed to preserve the same format. Makeup exams may utilize some short-answer and open-ended questions while the original exams will include all multiple-choice questions. The extent of a makeup exam given in a short-answer and open-ended format may be anywhere from 0% to 100% and may vary from one exam to another.

It is imperative that your schedule permits you to take the final exam. No alternative schedule will be considered for the Final Exam in this class!!! Students who fail to attend the final exam because of catastrophic occurrence, which is beyond the student's control and necessitates their absence, and who have a passing grade up to that point should contact me as soon as possible.

Please bring your Indiana University ID to each exam.

Important Dates

Course Deadlines: You are responsible for changing your status in the course (drop or withdraw) within school established time period. I will not be able to drop the course for you if you miss the deadline. Some important deadlines are listed below and additional informa-tion is available at https://calendars.registrar.indiana.edu/official-calendar/.

Add/Drop Deadline (no W grade)	Jan 14, 2024
Course Withdrawal Deadline (automatic W)	Mar 10, 2024
Complete Session Withdrawal Deadline	Apr 26, 2024

Other Important Dates:

| Spring Break | March 10 – March 17, 2024 (no classes) |

Tentative Course Schedule[6]

Week	Topic	Assignments
Week 1	Course Introduction. Ch 1. Statistics and Data.	
Week 2	Ch 2. Displaying Descriptive Statistics.	Excel Assgnmt (Ch 2) HW1
Week 3	Ch 3. Calculating Descriptive Statistics.	Excel Assgnmt (Ch 3) HW2
Week 4	Finish Ch 3. Calculating Descriptive Statistics. Ch 4. Introduction to Probability. Ch 5. Discrete Probability Distributions (Binomial Distribution).	Excel Assgnmt (Ch 5) HW3
Week 5	Ch 6. Continuous Probability Distributions (Normal Distribution).	Excel Assgnmt (Ch 6) HW4
Week 6	Finish Ch 6. Continuous Probability Distributions (Normal Distribution). Exam 1.	
Week 7	Ch 7. Sampling and Sampling Distributions.	
Week 8	Ch 7. Sampling and Sampling Distributions. Start Ch 8. Interval Estimation.	Excel Assgnmt (Ch 7) HW5
Week 9	Ch 8. Interval Estimation.	Excel Assgnmt (Ch 8) HW6
Week 10	Spring Break	
Week 11	Ch 9. Hypothesis Testing, Single Parameter (Mean).	Excel Assgnmt (Ch 9, P1) HW7
Week 12	Ch 9. Hypothesis Testing, Single Parameter (Mean, Proportion).	Excel Assgnmt (Ch 9, P2) HW8
Week 13	Finish Ch 9. Hypothesis Testing, Single Parameter. Exam 2.	
Week 14	Ch 14. Simple Linear Regression.	
Week 15	Ch 14. Simple Linear Regression.	
Week 16	Ch 14. Simple Linear Regression. (If time permits) Ch 15. Multiple Regression.	Excel Assgnmt (Ch 14) HW9

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[6] Schedule may be adjusted depending on our progress in class (changes will be announced in class and on Canvas).

Some Policies and Class Rules

Communication: Announcements on Canvas and in lecture make up official communica-tion for the course.

Emails: Please adhere to the following guidelines when emailing the teaching team:

- All course-related emails need to be sent using your IU email or Canvas. Failing to use these tools for email communication might send your email to the spam folder.

- Please, be sure to insert section number or the class time in the email (especially if your request requires looking up your grade or your submission on Canvas). This helps the teaching team to speed up the response.

- While you are welcome to email the teaching team with questions about the mate-rial, some things are better discussed in person. For emails that require a lengthy explanation of the material, please consider attending office hours. Some examples of appropriate email questions and office hours questions are below:
  Email:
  ◦ You are working on an assignment and you want to make sure your understanding of a particular issue is correct before moving on (e.g., "I believe the standard deviation given in the problem is the sample standard deviation, but I'm not confident; is this correct?).

  Office Hours:
  ◦ You are working on an assignment and you do not have a very solid understanding of a particular issue (e.g., "I am unsure how to conduct a hypothesis test for the proportion. Can you explain it to me?").

Responding to Emails:

- Please keep in mind that I receive a great deal of emails from many sources. Besides, I have many responsibilities that require my attention. So, you should not expect an immediate response when you send me a message. Generally, 24-72 hours is considered a reasonable amount of time to receive a reply from me, but I do not typically respond to email after 5:00PM or on weekends.

- Typically, the volume of emails increases substantially when a deadline or an exam is approaching. So, you should expect a slower response during these times.

- I reserve a right not to respond or reply with a short "Please, check the Canvas page" to the emails asking me to reiterate information from an announcement on Canvas.

Copyright: The instructor of course holds the exclusive right to distribute, modify, post, reproduce, and link to course materials, including all notes, videos, lecture slides, assign-ments, Excel files with solutions, and exams. You cannot distribute, post, or alter this material. You are encouraged to take notes and make copies of course materials for your own educational use. But you may not, nor may you knowingly allow others, to re-post in other forums, distribute, or reproduce content from this course without the express written permission of the instructor (this also includes providing materials to commercial course material suppliers such as CourseHero and other similar services).

Any violation of this course rule will be reported to the appropriate university offices, in-cluding the Dean of Students, as academic misconduct.

Final Exam Policies: You can find IU Final Exam policies at https://registrar. indiana.edu/grades/class-rosters/final-examinations.html and should appeal to them if you 1) have more than three final exams in one day, 2) have final exams conflicts, 3) missed the final exam.

Accessible Educational Services: Accommodations will be made for students registered with Accessible Educational Services (AES) office. If you need an accommodation, then it is your responsibility to register with AES and contact me outside of class to present the written supporting memorandum of accommodation. Note that requests for AES accommodations must be received and authorized by your instructor no less than two weeks in advance of need, in order to allow adequate time to review and make appropriate arrangements. No accommodations should be assumed until authorized by your instructor. Additional information can be found at https://studentlife.indiana.edu/student-support/iub-aes/register-for-services.html.

Religious Accommodations: Accommodations will be made for students who want to ob-serve their religious holidays provided that the student notifies the instructor no later than two weeks prior to the anticipated absence. Students needing accommodations for a reli-gious observance must submit a request using officially approved form located here: https://vpfaa.indiana.edu/faculty-resources/teaching-resources/religious-observances-information.html.

University-Approved Activities: Accommodations will be made for students who miss the schoolwork because of university-approved activities. If you are participating in a university-approved activity (https://studentaffairs.indiana.edu/student-support/dean-of-students/attendance.html), please let me know as early in the course as possi-ble so that accommodations can be made (beginning of the semester or at least two weeks in advance of the absence).

Academic Integrity and Ethical Behavior: In addition to skills and knowledge, IU aims to teach you appropriate ethical and professional standards of conduct and inform you of obligations in upholding the highest standards of professional and ethical integrity. You will find an extensive information on these matters in IU Code of Student Rights, Responsibilities, and Conduct (http://studentcode.iu.edu/).

In line with these policies, dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, sub-mitting work of another person or work previously used without informing the instructor, or tampering with academic work of other students. Whenever in doubt, ask me about appropriateness of your actions. Students who are found dishonest will receive the most severe academic sanction consistent with IU polices.

Some Q&A's

Why is there so much work in this class? First, in E370/S370 each new concept requires a deep understanding of the previously studied ones. Frequent assignments ensure that you master each part of the course at a sufficient level before we move on. Second, statistics is learned by doing it. Assignments ask you to do statistics, i.e. focus on actually doing it rather than passively reviewing and reading.

Do I need to remember all formulas for the exams? No! You will be provided with the formula sheet including the most important formulas covered in the course up to the exam date. Sample formula sheets are already posted on Canvas (Files link, folder Exams). Adjustments are possible depending on the class progress towards the exam date.

How am I going to do complicated calculations that require Excel in the exam?Exam questions are designed to avoid complex and time-consuming calculations including those for which Excel is required. It is achieved through several channels. First, the numbers are selected such that calculations are easy to do on a calculator. Second, questions limit complexity of calculations by reducing the amount of data in the problem. Third, questions formulate a problem with "ready-to-use" numbers calculated in Excel (so that no additional Excel calculations are necessary) and ask you to focus on interpretation. Therefore, you should not worry about Excel calculations aspect of the exams.

Do I need to bring a calculator to the exam? Yes, it is recommended that you have a calculator during the exam. Majority of calculations in the exams can be done "by hand". But some of them might be time-consuming to perform manually. To save time (and avoid stress related to the calculation part), it is recommended that you have a calculator.