Midterm Study Guide

ECON 340: Economic Research Methods — Instructor: Div Bhagia

Here is some general information about the midterm exam.

- This will be a closed-book exam. You will be given a formula sheet and the normal distribution table to assist you. Both are uploaded on Canvas.
- You will be allowed to use a calculator. No phones or computers are allowed.
- I have also uploaded one practice exam with solutions to give you an idea of what to expect on the exam.
- Some of the questions on the exam will be similar to the ones we did in class or on the problem sets. So please review them.
- The most important thing to prepare for the exam is to review the notes for each topic and the slides and handouts for each lecture.
- You do not need to know any proofs for the exam.
- While writing the exam, make sure to show your work so you can get partial credit in case you make a small error.

What all do you need to know?

1. *Summation Notation* – It's important to be comfortable with the summation notation as it will enable you to understand and implement formulas for different statistics.

2. *Describing Data*

    - How to fill in a frequency distribution table.
    - How to calculate the mean, median, and mode for a variable. (Including calculating mean from the frequency distribution table for grouped data.)
    - What is a percentile?
    - How to calculate a weighted mean.
    - Means are affected by outliers while medians are not and why that is the case.
    - How to calculate the variance, standard deviation, covariance, and correlation for sample or population data. Understand how and why the formula for these statistics works.
    - How to calculate the Z-score and what it captures.
    - What do different values of correlation imply?
    - Understand that correlation does not imply causation

3. *Random Variables*

    - How to calculate the expected value and variance of discrete random variables. What do these capture?
    - How to look up the area under the curve for any normally distributed variable from the standard normal table
    - How to calculate the conditional probability from marginal probabilities and vice-versa
    - Understand and be able to calculate the conditional expectation
    - What does it mean for random variables to be uncorrelated or independent?

4. *Sampling and Estimation*

   - What are the properties of a good estimator?
   - Sample mean is a random variable.
   - What is the expectation and variance of the sample mean?
   - When is the sample mean normally distributed? When to invoke the Central Limit Theorem?
   - Be able to construct and explain the logic behind confidence intervals.
   - Be able to reason what happens to the variance of the sample mean and the margin of error due to changes in population variance or sample size.
   - Be able to test a hypothesis and explain the logic behind it. (We only covered two-tailed tests i.e. testing null hypothesis of the form $H_0 : \mu = \mu_0$ against alternative hypothesis $H_1 : \mu \neq \mu_0$.)
   - Be able to calculate and explain what a p-value is in simple English.