MS Module 3: Confidence intervals and *t* distributions; confidence intervals and variances (overview)

(The attached PDF file has better formatting.)

Reading: §8.3 Intervals Based on a Normal Population Distribution

Know when to use *z* values vs *t* values.

- If the sample size is large, use *z* values and the central limit theorem.
- If the sample size is small and the population is normally distributed, use *t* values and degrees of freedom.

Confidence intervals and prediction intervals are used in several modules. Prediction intervals are wider, as they include the uncertainty caused by the error term. The relation of the formulas for the confidence interval and the prediction interval is similar for all modules, though the parameters of the formulas change.

Reading: §8.4 Confidence Intervals for the Variance and Standard Deviation of a Normal Population

Confidence intervals for the variance of a population use the χ^2 distribution. This distribution is not symmetric, so the confidence interval is not symmetric about the point estimate.

Reading: §8.5 Bootstrap Confidence Intervals

Bootstrapping is especially useful when the underlying population distribution is not normal, but it requires high computing power. The final exam asks qualitative questions about boostrapping, not mathematical problems.

Insurance regulation is concerned with extreme value distributions: hurricanes, epidemics, market crashes. The formulas for normal distributions do not apply to these risks, but insurers and financial economists have data bases of past events. They use bootstrapping to estimate tail values at risk and similar risk measures.