More Inference Tasks

- There is more to inference than just computing standard errors; often, we want to test hypotheses.
  - Most commonly, to know if each parameter differs significantly from zero, or if it is just noise
  - To draw confidence intervals around estimates
- Less commonly, we want to estimate the likelihood function for the parameters.
  - For Bayesian updating, to measure evidence for one theory over another or to draw likelihood intervals

More Inference Tasks (cont.)

For these tasks, it is not enough to know the variance of the estimates.

- We need to know the actual shape of the sampling distribution.
- Remember that the OLS estimators are continuous random variables, so they vary according to some probability density function.
  - This is called the sampling distribution.
- To have a sense how meaningful our value is, we need to know the shape of the sampling distribution.

Sampling Distribution Shape

In classical statistics, there are two major paths that can establish the shape of the sampling distribution.

1. Add an assumption that errors are normally distributed in the population model.
    - This is a very strong assumption, and we need to check how realistic it is.
2. If the sample is large, we rely on the asymptotic properties of OLS, including the central limit theorem (CLT), which says our sampling distributions will be normal for large sample sizes.

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- Beyond classical statistics, there are techniques like bootstrapping that can estimate the shape of the sampling distribution, even when it's not normal.
    - We will focus on classical methods this week.
- We will begin with the assumption of normal errors first, then look at large sample sizes.