Week 7 Reading Questions
ECo 602
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1. Explain the effect, if any, of the population mean on the width of CIs for a population that is normally-distributed. If population mean does not affect the widths of CIs explain why not.
    a. The population mean does not directly effect the width of CIs for a normally-distributed population, as we can never know the true value of population parameters under a Frequentist paradigm. However, the sampling distribution of the mean, which is used to calculate CIs, is necessarily dictated (or at least influenced) by the (unknown) true mean of the population. Additionally, when parameterizing the sampling distribution like a normal distribution, the mean of the distribution is the (estimated) population mean.
2. Explain the effect, if any, of the population standard deviation on the width of CIs. If population standard deviation does not affect the widths of CIs explain why not.
    a. The population standard deviation affects the width of calculated CIs through the sampling distribution, which is impacted by the sample size and the population sd (and, by extension, the sample standard deviation). As the standard deviation goes up, so too does the level of uncertainty and the width of the calculated CIs. As the standard deviation goes down, the level of uncertainty falls and the width of CIs becomes narrower.
3. Explain the effect, if any, of the *population size* on the width of CIs. If *population size* does not affect the widths of CIs explain why not.
    a. Popualtion size does not effect the widths of CIs, because population size can never be truly known. And, unlike population mean, population size cannot be estimated using repeated sampling, and its estimate is not used in any of the CI calculations.
4. Explain the effect, if any, of the *sample size* on the width of CIs. If *sample size* does not affect the widths of CIs explain why not.
    a. The sample size effects the width of CIs through the standard error, which is the sample standard deviation divided by the square root of the sample size. The SSD, in turn, is also calculated using the sample size. Because of this, as the sample size increases, the standard error decreases and the width of the CIs decreases as well. Additionally, the standard deviation stabilizes around the estimated population standard deviation. Inversely, as the sample size decreases, the standard error increases and the CIs become wider (less precise).
5. Interpreting a CI. Use a narrative example of a real (or made up) dataset to describe what a Frequentist 95% confidence interval really means.
    a. Very broadly, a 95% Confidence Interval under the Frequentist statistical paradigm means that if you were to repeat a particular sampling effort (or “experiment”), 95% of the time the result would fall into this specific range, or interval (the confidence interval). For a more specific example: consider that you have a dataset of weights of 20 randomly selected cats living in a colony together. Within that sample, you find the average weight of a cat is 11 lbs, though there are many cats that are heavier or lighter than that average. A 95% confidence interval, calculated by hand, or using a software like R, is a range of weights in which the mean weight of a random sample of cats from that colony would fall 95% of the time. In other words, if you took 100 different groups of cats from that colony and calculated the mean weight of each group, approximately 95 of those groups’ mean weight would fall into the Confidence Interval.