Lecture 4: Hypothesis Testing One Sample

1. **According to the Hard Business Review (in the article "How to Spend Way Less Time on Email Every Day"), the average professional checks his/her emails 15 times per day.**

- The correct answer is A, B and D.

Solution:

$$\overline{x} - t_{N-1}\frac{s}{\sqrt{N}} < \mu < \overline{x} + t_{N-1}\frac{s}{\sqrt{N}}$$

Vi bruger den ovenstående formel og her kan det ses, at vi finder de forskellige værdier. Vi kan se, at gennemsnittet er fundet til at være 7041,429. Her kan det ses, at vi skal finde den kritiske vinkel. Hvorimod standardafvigelsen er fået til at være 1555... og middelværdien er fundet til at være 7041,429. Derefter kan vi bruge kritisk vinkel igen og derefter standardafvigelsen. Vi ved, at selve der er 7 arbejdere og det fortæller at hvis vi trækker 7-1, så får vi efterfølgende en værdi som er svarende til 6.

Vi finder ud af i sidste ende, at vores værdi er endt til at være liggende i interval mellem 4785 og 9298. Vores kritiske vinkel 5…. som er ligget mellem værdierne.

2. **A job advisor claims that the average salary for engineers is 24,000 euros/year. Ten engineers are randomly selected and the mean of their salaries is 23450 euros/year and a standard deviation of 400 euros/year. Is there evidence (at 95% confidence level) to reject the statement of the job advisor?**

- Yes, there is a clear 95% confidence level to reject the statement of the job advisor because the mean of the 10 sample engineers salaries is 23,450 which clearly is the opposite of what the statement is about for the salary of all the engineers
- Therefore you can reject the statement of the job advisor.

3. **The number of children born in 7 towns in a region is:**

6310	5460	8440	7160	9930	5900	6090

Find the 99% confidence interval for the mean number of children born annually per town.

First we can say that Tn-1 = 6.

In the Excel file, we can see that we have two intervals 4785,90 and 9297 and that tells us that we with 99% guarantee can say that the statement is correct.

4. **A survey of 50 students found that the mean age of their bicycles was 5,6 years. Assuming the standard deviation of the population is 0,8 years, which of these statements is correct?**

If we look closer, then we can clearly see that we must repeat the same steps again. In this case we can for instance start by find the value N. In this case we can see that the population size is equal to 50, whereas if look closer to the standard deviation then it is very well written in the task, to be 0,8.

We will use the same formular from before. In this case, we can see the following formula.

$$\bar{x} - t_{N-1} * \frac{s}{\sqrt[2]{N}} < \mu < \bar{x} + t_{N-1} * \frac{s}{\sqrt[2]{N}}$$

$$\bar{x} = 5{,}6$$

$$t_{N-1} = t_{50-1} = t_{49}$$

And then we have the middle value s/n.

$$\frac{s}{\sqrt[2]{N}} = \frac{0{,}8}{\sqrt[2]{50}} = \frac{0{,}8}{\sqrt{7}} \approx 0{,}3023716$$

If you add the mean and the s/n with eachother, then you will see that you will get 5,9.

$$5{,}6 + 0{,}3 \approx 5{,}9$$

I this case we only need to find out the other part of the equation on the same method as we used before.

In this case, we can just subtract the equation and then we get a lower interval.

$$5{,}6 - 0{,}3 = 5{,}3$$

And because we have found that the interval is (5.3 ; 5.9).

And because of this we can say that based on the sample of 50 students, we can be 90% and 99% confident that the mean age of alle bicycles is between the given interval above (5.3 ; 5.9). Therefore B is the correct answer.

5. **The following data represent a sample of the assets (in millions of euros) of 30 motherhoods computer hardware manufacturers in Europe. Find the 90% confidence interval of the mean.**

We will use the same formula, this time we have used Excel to find the standard deviation. First, we have found the mean for the sample, and then we will try and find the mean for the population.

We can see that the critical t-value is equal to 1,311. Therefore, we can try and implement these formulas inside student t's theory.

$$\bar{x} - t_{N-1} * \frac{s}{\sqrt[2]{N}} < \mu < \bar{x} + t_{N-1} * \frac{s}{\sqrt[2]{N}}$$

$$\bar{x} = 11{,}09$$

$$t_{30-1} = 1{,}311$$

$$s = 14{,}4$$

$$N = 30$$

So, now we will try to find the interval.

$$\frac{s}{\sqrt[2]{N}} = \frac{14{,}4}{\sqrt[2]{30}} \approx 2{,}629068$$

$$\bar{x} - t_{29} = 11{,}09 - 1{,}311 = 9{,}779$$

$$2{,}629068 \cdot 9{,}779 \approx \mathbf{25{,}70966}$$

Whereas if we look forward towards the upper area, then we can just add the 11,09 and 1,311 together.

$$11{,}09 + 1{,}311 = 12{,}401$$

$$2{,}629068 \cdot 12{,}401 \approx \mathbf{32,60307}$$

Therefore, my answer will in the last end, become (25,709 < x < 32,60).

$$\bar{x} - t_{N-1} * \frac{s}{\sqrt[2]{N}} < \mu < \bar{x} + t_{N-1} * \frac{s}{\sqrt[2]{N}}$$