Practical Session 12

Hypothesis tests

In this session, you can use Excel to carry out hypothesis tests for a mean (assuming a large sample or known variance) or a proportion. You should try to do this with the exercises for this week. Note that no new functions are needed: just the functions associated with the normal distribution that were introduced two weeks ago.

To illustrate, here we show the formal test for a mean for the first example we saw in class this week.

1. Given some of the recent policy decisions taken by Biden, it is natural to think that his popularity might have gone down over the last year.

    We recorded the difference between the ratings now and those given 2 years ago by 10 students. The results are:

    <div align="center">-2, -0.4, -0.7, -2, +0.4, -2.2, +1.3, -1.2, -1.1, -2.3</div>

    Do these data provide sufficient evidence that the true mean rating of Rivera in the student population has reduced? Assume the data are normally distributed with known variance equal to 1 and carry out a hypothesis test with a significance level of 5%.

    a) μ = true mean rating of Albert Rivera.
    b) Hypotheses: H$_0$: $\mu = 0$ (null hypothesis), H$_1$: $\mu < 0$ (alternative or experimental hypothesis.
    c) Data: $N = 10$, $\bar{x} = -1.02$, $\alpha = 0.05$
    d) If H$_0$ is true then $\bar{X}$ is normally distributed with mean 0 and variance 1/10 = 0.1. The standard deviation of $\bar{X}$ is calculated using $=$ **SQRT(0.1)** which gives 0.316.
    e) Now we can calculate the p-value using =NORM.DIST(-1.02;0;0.316;TRUE) which gives 0.0006.
    f) The (tiny) area marked in red is the p-value.
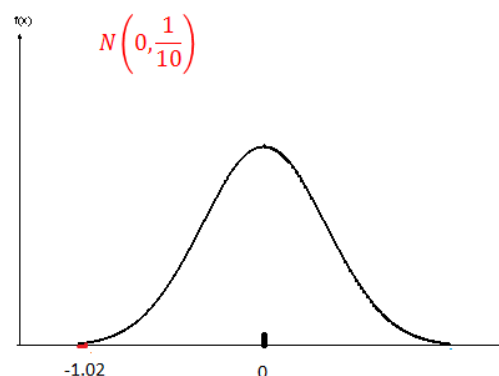
    g) Comparing the p-value with the significance level, we have that 0.0006 < 0.05 so
    h) We reject H$_0$ in favour of H$_1$ at a 5% significance level, or in real words,
    i) Yes we do have evidence that the rating of Biden has decreased.