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Date

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M1:
ST2APS-DE (10/01/2019)
Amphi orange

MATIÈRE Applied Statistics

Part 1 :

Exercise 1 : 2/5

1. 6 games had 11 or fewer balls made. 1

2. ~~6~~ vehicles have driven between 50 and 100 thousands km and between 250 and 300 thousands km.

3. We use bar(plot) plot ~~Both (a) and (b)~~ seems to follow a normal distribution. (a) and (b) seems to ~~be~~ follow symetrical distributions. ~~but (c)~~

4. We use box(plot) plot We have 25% of workshops that have between 40 and 41 elves, 25% of workshops that have between 41 and 42 elves, 25% of workshops that have between 42 and 45 elves and 25 of workshops that have between 45 and 50 elves. There are no ~~outlayers~~ outliers. This distribution is not symetrical because if would plot it as a barchart, ~~on the right part ... would~~ the left part would be less large and ~~more~~ higher than the right part.

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Part 1 :

Exercise 1 : $\mu = 27$, $\sigma = 49$, $n = 36$

We want $P(\bar{x} \geq 28) = 1 - P(\bar{x} \leq 28)$

$= 1 - P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq \frac{\mu_0 - \mu}{\sigma/\sqrt{n}}\right)$

such as $\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \sim \mathcal{N}(0;1)$

$= 1 - P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq \frac{28-27}{49/\sqrt{36}}\right)$

$= 1 - P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq \frac{6}{49}\right)$

In $\mathcal{N}(0;1)$, $p(X \leq 0,12) \sim 0,54776$, $P(\bar{x} \geq 28) \sim 1 - 0,54776$

$P(\bar{x} \geq 28) \sim \underline{0,45224}$.

In R we would use ~~qnorm$\left(\frac{6}{49}\right)$~~

Exercise 2 : $\mu = 550\$$, $\sigma = 120$.

$P(600 \leq \bar{x} \leq 720) = P(\bar{x} \leq 720) - P(\bar{x} \leq 600)$

$= P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq \frac{720-\mu}{\sigma/\sqrt{n}}\right) - P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq \frac{600-\mu}{\sigma/\sqrt{n}}\right)$

such as $\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \sim \mathcal{N}(0;1)$.

$P(600 \leq \bar{x} \leq 720) = P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq \frac{720-550}{120/\sqrt{15}}\right) - P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq \frac{600-550}{120/\sqrt{15}}\right)$

~~$\sim P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq 0,005\right) - P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq 0,01\right)$~~

$\sim P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq 5,48\right) - P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq 1,61\right)$

$\sim \underline{0,06}$.

Part3:

Quizz:
1. c
2. a
3. b
4. a

Exercise2:

~~1. r.daily.GE.0 = 1,1843613 x r.daily~~

1. $\overline{r.daily.GE.0} = 1,1843613 \times r.daily.SP500.0 - 0,0001334$.

2. ~~This model~~ GE.0 and SP500.0 are correlated as the β_1 is positive. As the R^2 equals 0,568, we can say that this model doesn't represent well the dataset, maybe we should have more features to make a better model.

3. $1,1843613 \times 0,3 - 0,0001334 \simeq \underline{0,355}$.

Part4:

Exercise 3: 4/4

a. $H_0 : \mu = 454g$

b. $H_1 : \mu \neq 454$

c. We stated H_0 and H_1.

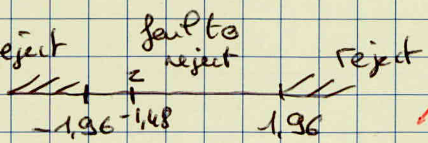
$n = 35$ and $\alpha = 0,05$

Statistic Test and distribution: as we have $n > 30$ and we don't know σ, we will use $Z = \frac{\bar{x} - \mu}{s/\sqrt{n}} \sim \mathcal{N}(0,1)$.

As we are in a two tail test: the Z ~~critical~~ rejection zone is $Z > x$ or $Z < -x$ with $P(X < x) = \cancel{0,975}\ 1 - \frac{\alpha}{2}$

$P(X < x) = 0,975$.

So rejection zone is:



$$z = \frac{449 - 454}{20/\sqrt{35}} \simeq -1,48 .$$ ~~So $-1,96 < z < 1,96$~~

As $-1{,}96 < z < 1{,}96$, we fail to reject null hypothesis H_0 with 95%
~~As a result, that means~~ confidence level.

As a result, with 95 % confidence level, we can't affirm that its packaging machine is not working properly.

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