Christina Li
November 21, 2018

"I pledge my honor that I have abided by the Stevens Honor System." –cli50

Homework 6

12.41

a. $\Psi_1 = \mu_2 - \frac{\mu_1 + \mu_2}{2}$

b. $\Psi_2 = \frac{\mu_1 + \mu_2 + \mu_4}{3} - \mu_3$

12.42

a.

First sample:

H_0: $\Psi_1 = 0$

H_a: $\Psi_1 \neq 0$

Second sample:

H_0: $\Psi_2 = 0$

H_a: $\Psi_2 \neq 0$

b.

$\Psi_1 = c_1 = \overline{x_2} - \frac{\overline{x_1} + \overline{x_4}}{2}$

Blue: $\overline{x_1} = 3.194$

Brown: $\overline{x_2} = 3.724$

Gaze down: $\overline{x_3} = 3.107$

Green: $\overline{x_4} = 3.86$

$\Psi_1 = c_1 = \overline{x_2} - \frac{\overline{x_1} + \overline{x_4}}{2} = 3.724 - \frac{3.194+3.86}{2} = 0.197$

$\Psi_2 = c_2 = \frac{\overline{x_1} + \overline{x_2} + \overline{x_4}}{3} - \overline{x_3} = \frac{3.194+3.724+3.86}{3} - 3.107 = 0.486$

c.

$s_p = 1.68$

$SE_{c1} = s_p\sqrt{\sum \frac{a_i^2}{x_i}} = 1.68\sqrt{\frac{(1)^2}{37} + \frac{(-\frac{1}{2})^2}{67} + \frac{(-\frac{1}{2})^2}{77}} = 0.3098$

$SE_{c2} = s_p\sqrt{\sum \frac{a_i^2}{x_i}} = 1.68\sqrt{\frac{(\frac{1}{3})^2}{67} + \frac{(\frac{1}{3})^2}{37} + \frac{(\frac{1}{3})^2}{77} + \frac{(-1)^2}{41}} = 0.2933$

d.

$t = \frac{c_1}{SE_{c1}} = \frac{0.197}{0.3098} = 0.64$

$df_n = k - 1 = 4 - 1 = 3$

$df_d = N - k = 222 - 4 = 218$

P-value = tdist(0.64, 218, 2) = 0.523

Because the P-value is greater than the level of the significance level, 0.05, we fail to reject the null hypothesis. Thus, there is not enough sufficient evidence to say that the average score of the brown eyes with the average of the other two eye colors.

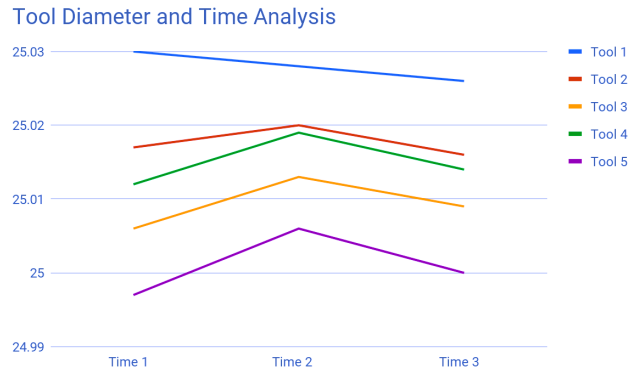
$t = \frac{c_2}{SE_{c2}} = \frac{0.486}{0.2933} = 1.66$
$df_n = k - 1 = 4 - 1 = 3$
$df_d = N - k = 222 - 4 = 218$
P-value = tdist(1.66, 218, 2) = 0.0983
Because the P-value is greater than the level of the significance level, 0.05, we fail to reject the null hypothesis. Thus, there is not enough sufficient evidence to say that the average score when the model is looking at you versus the score when looking down are not the same.

e.
95% confidence interval for Ψ_1 is:
$df = N - 1 = 222 - 1 = 221$
$c_1 \pm t * SE_{c1} = 0.197 \pm (1.9707)(0.3098) = (-0.41, 0.81)$
The 95% confidence interval for Ψ_1 lies between -0.41 and 0.81.
95% confidence interval for Ψ_2 is:
$df = N - 1 = 222 - 1 = 221$
$c_2 \pm t * SE_{c2} = 0.486 \pm (1.9707)(0.2933) = (-0.09, 1.06)$
The 95% confidence interval for Ψ_2 lies between -0.09 and 1.06.

13.39
a.

	Tool 1	Tool 2	Tool 3	Tool 4	Tool 5
Time 1	25.03, 0.012	25.017, 0.0012	25.006, 0.0015	25.012, 0	24.997, 0.0012
Time 2	25.028, 0	25.013, 0.0012	25.013, 0.0012	25.019, 0.0012	25.006, 0
Time 3	25.026, 0	25.009, 0	25.009, 0	25.014, 0.004	25, 0.0015

b.



c.

Source	DF	SJ	MS	F	P
Tools	4	0.0036	0.001	412.9	$9.27 * 10^{-26}$
Time	2	0.00019	$9.5 * 10^{-5}$	43.6	$1.33 * 10^{-9}$
Tools Time	8	0.00013	$1.67 * 10^{-5}$	7.65	$1.55 * 10^{-5}$
Error	30	$6.53 * 10^{-5}$	$2.18 * 10^{-6}$		
Total	44	0.003985			

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d.
Tools, time and tools time are all statistically significant for this test, yet tools are by far the most significant followed by time and then tools times. Looking at the P-values and MS values, the order is flipped, meaning that tools time is by far the most significant followed by time and then tools.