Lab no : 2 ***Date : 2080/ /***

Title: Testing of Hypothesis

PROJECT 2.1 (Hypothesis Testing of Single Mean of Large Sample):

Enter the following values in SPSS and create a confidence interval assuming normal distribution:

Length**:** 125, 120, 121, 123, 122, 130, 124, 122, 120, 122, 118, 119, 123, 124, 122, 124, 121, 122, 138, 149, 123, 128, 122, 130, 120, 122, 124, 134, 137, 128, 122, 121, 125, 120, 13 2, 130, 122, 124

Test whether this sample of size 40 has come from a population whose mean length is 125 cm.

PROCEDURE :

1. Enter the data
2. Select Analyze => Compare Means => One sample T Test
3. Click Options => Type 95% Confidence Interval
4. Click Continue => OK.

SOLUTION :

STEP I: Null Hypothesis (H_0)

$\mu = 125$ cm

i.e. there is no significance difference between the sample mean and the population mean.

STEP II: Alternative Hypothesis (H_1)

$\mu \neq 125$ cm

i.e. there is significance difference between the sample mean and the population mean.

STEP III: Test Statistics

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$$

CALCULATION (FROM SPSS):

One-Sample Statistics				
	N	***Mean***	***Std. Deviation***	***Std. Error Mean***
Length	40	125.2750	6.14770	.97204

One-Sample Test						
Test Value = 125						
	t	***df***	***Sig. (2-tailed)***	***Mean Difference***	***95% Confidence Interval of the difference***	
					Lower	***Upper***
Length	.283	39	.779	.27500	-1.6911	2.2411

So, P Value = 0.779

STEP IV : Given level of Significance

$$\alpha = 5\% = 0.05$$

STEP V : Decision

Since P > α , accept H_0 and reject H_1

CONCLUSION:

Hence, there is no significance difference between the sample mean and the population mean.

PROJECT 2.2 (Hypothesis Testing of Two Population Means for Matched Paired Samples):

The sales of a product of a company after and before advertisement are as follows:

Month	***1***	***2***	***3***	***4***	***5***	***6***
Before X	120	140	160	140	180	190
After X	200	210	150	200	220	240

Is advertisement effective at 5% ?

PROCEDURE :

1.Enter the data

2.Select Analyze => Compare Means => Paired Sample T Test

3.Click Options => Type 95% Confidence Interval

4.Click Continue => OK.

SOLUTION :

STEP I: Null Hypothesis (H_0)

$\mu_1 = \mu_2$

i.e. there is no significance difference between the mean before and after advertisement.

STEP II: Alternative Hypothesis (H_1)

$\mu_1 \neq \mu_2$

i.e. there is significance difference between the mean before and after advertisement.

STEP III: Test Statistics

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{{\sigma_1}^2}{N_1} + \frac{{\sigma_2}^2}{N_2}}}$$

Calculation (From SPSS):

Paired Sample Statistics				
	N	***Mean***	***Std. Deviation***	***Std. Error Mean***
Before_X	6	155.0000	26.64583	10.87811
After_X	6	203.3333	30.11091	12.29273

Paired Sample Correlations			
	N	***Correlation***	***Sig.***
Before X & After X	6	.374	.465

Paired Sample Test							
	Paired Differences						
	Mean	***Std. Deviation***	***Std. Error Mean***	***95% Confidence Interval of the difference***		***t***	***Sig. (2-tailed)***
				Lower	***Upper***		
Before X-After X	-48.33333	31.88521	13.01708	-81.79481	-14.87186	-3.713	.014

So, P Value = 0.014

STEP IV : Given level of Significance

$$\alpha = 5\% = 0.05$$

STEP V : Decision

Since $P < \alpha$, accept H_1 and reject H_0

CONCLUSION:

Since there is significance difference between the means before and after the advertisement, the advertisement is proved to be effective.

PROJECT 2.3 (Hypothesis Testing When Raw Data for Independent Sample is Given):

The monthly advertising cost of a company for two products X and Y were as follows during 6 month period:

Month	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Cost I (X)	220	240	160	240	280	290	-
Cost II (Y)	100	110	150	100	120	140	145

Is there sufficient evidence to conclude that average cost on advertising on product Y is more than on product X ?

PROCEDURE :

1.Enter the data

2.Select Analyze => Compare Means => Independent Sample T Test

3. Move Value into Test Variables and type into grouping variable

4. Click define groups and type 1 and 2 into group 2

5.Click Continue => OK.

SOLUTION :

STEP I: Null Hypothesis (H_0)

$\mu_x = \mu_y$

i.e. there is no significance difference between the average cost of advertising on products X and Y.

STEP II: Alternative Hypothesis (H_1)

$\mu_x < \mu_y$

i.e. the average cost of advertising on products Y is more than that on product X.

STEP III: Test Statistics

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{{s_1}^2}{N_1} + \frac{{s_2}^2}{N_2}}}$$

Calculation (From SPSS):

Group Statistics				
	N	***Mean***	***Std. Deviation***	***Std. Error Mean***
Cost_I(X)	6	238.3333	46.65476	19.04673
Cost_II(Y)	7	123.5714	21.35304	8.07069

Independent Samples Test										
		Leven's Test for Equality of Variances		*t-test for Equality of Means*						
		F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*	*95% confidence Interval of the Difference*	
									Lower	*Upper*
Cost	*Equal Variances assumed*	1.357	.269	5.862	11	.000	114.76190	19.57600	71.67541	157.84840
	Equal Variances not assumed			5.548	6.775	.001	114.76190	20.68608	65.51535	164.00846

So, P Value = 0.269

STEP IV : Given level of Significance

$$\alpha = 5\% = 0.05$$

STEP V : Decision

Since P > α , accept H_0 and reject H_1

CONCLUSION:

Hence, the average cost of advertising on products Y is more than that on product X.