Experiment – 4
22BMH1131

Z-test and T-test

T-test

1.

Before training	*12.9*	*13.5*	*12.8*	*15.6*	*17.2*	*19.2*	*12.6*	*15.3*	*14.4*	*11.3*
After training	*12.7*	*13.6*	*12.0*	*15.2*	*16.8*	*20.0*	*12.0*	*15.9*	*16.0*	*11.1*

Aim:

To perform paired data T-test for the above data to find the effectiveness of the of the program.

Data:

```
> before = c(12.9, 13.5, 12.8, 15.6, 17.2, 19.2, 12.6, 15.3, 14.4, 11.3)

> after = c(12.7, 13.6, 12.0, 15.2, 16.8, 20.0, 12.0, 15.9, 16.0, 11.1)
```

Syntax:

```
t.test (before, after, paired=TRUE)
```

Output:

```
> before=c(12.9, 13.5, 12.8, 15.6, 17.2, 19.2, 12.6, 15.3, 14.4, 11.3)
> after = c(12.0, 12.2, 11.2, 13.0, 15.0, 15.8, 12.2, 13.4, 12.9, 11.0)
> t.test(before,after, paired=TRUE, alt="less")

        Paired t-test

data:  before and after
t = 5.2671, df = 9, p-value = 0.9997
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
     -Inf 2.170325
sample estimates:
mean of the differences
                   1.61
```

Conclusion:

In response, we obtained a p-value well above 0.05, which leads us to conclude that we can reject the null hypothesis H0 in favor of the alternative hypothesis H1: the new training has made substantial improvements to the team.

2.

with drug	: 15 10 13 7 9 8 21 9 14 8
placebo	: 15 14 12 8 14 7 16 10 15 2

Aim:

To find if there is a significant difference between the average effect of these two drugs.

Data:

>x = c(15, 10, 13, 7, 9, 8, 21, 9, 14, 8)

>y = c(15, 14, 12, 8, 14, 7, 16, 10, 15, 12)

Syntax:

>t.test(x,y,alt="less",var.equal=TRUE)

Output:

```
    Two Sample t-test

data:  x and y
t = -0.53311, df = 18, p-value = 0.3002
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
     -Inf 2.027436
sample estimates:
mean of x mean of y 
     11.4      12.3 
```

Conclusion:

P value(0.3002) > 0.05 then there is no evidence to reject our Null hypothesis.

Z-Test

3.

	Week1	Week2
Favorable	45	56
Unfavorable	35	47

Aim:

To test the hypothesis for Large Samples by using Two–sample Z-test for the above data.

Data:

H0: P1 = P2

H1: P1 =P2

Syntax:

```
Prop.test(c(45,46),c(45+35,56+47))
```

Output:

```
> prop.test(c(45,56),c(45+35,56+47))

        2-sample test for equality of proportions with continuity correction

data:  c(45, 56) out of c(45 + 35, 56 + 47)
X-squared = 0.010813, df = 1, p-value = 0.9172
alternative hypothesis: two.sided
95 percent confidence interval:
 -0.1374478  0.1750692
sample estimates:
   prop 1    prop 2
0.5625000 0.5436893
```

Conclusion:

we observe that the p-value is 0.9172 so we accept the null hypothesis that P1 =P2

4.

Suppose a coin toss turns up 12 heads out of 20 trials. At .05 significance level, can one reject the null hypothesis that the coin toss is fair?

Aim:

To test the hypothesis for Large Samples by using one –sample Z-test for the above situation.

- *The null hypothesis is that p = 0.5. We begin with computing the test statistic*

Data:

>pbar = 12/20

>p0 = .5

>n = 20

Syntax:

> z= (pbar-p0)/sqrt(p0+(1-p0)/n)

Output:

```
[1] 0.1380131
```

- *We then compute the critical values at .05 significance level*

Data:

> alpha= .5

Syntax:

> z.half.alpha = qnorm (1-alpha/2)

> c(-z.half.alpha , z.half.alpha)

Output:

```
[1] -0.6744898  0.6744898
```

Conclusion:

The test statistic 0.89443 does not lie between the critical values

-0.6744898 and 0.6744898. Hence, at .05 significance level, we reject the null hypothesis that the coin toss is fair