Hypothesis Testing

The two-tailed test

8.4)

Column1	Agent1	Agent2
Mean	8.25	8.683333333
Variance	1.059090909	1.077878788
Observations	12	12
Pearson Correlation	0.901055812	
Hypothesized Mean Difference	0	
df	11	
t Stat	-3.263938591	
P(T<=t) one-tail	0.003772997	
t Critical one-tail	1.795884819	
P(T<=t) two-tail	0.007545995	
t Critical two-tail	2.20098516	

Difference in means: -0.433333333

The obtained related samples t=-3.26. The associated two tailed p-value is p = 0.0075 so the observed t is highly significant at the 5% level.

The sample mean numbers of impurities present after filtration for Agent 1 and Agent 2 were 8.25 and 8.68 respectively. The mean for Agent 1 is 0.433 lower than for Agent 2. The data shows evidence that the filtration Agent 1 results in lower impurity level and would be preferred.

The one-tailed test

8.5) If we were to undertake a one-tailed test this would indicate with greater significance (p value of 0.00370 that Agent 1 is more effective than Agent 2.

The independent samples T-test

8.5)

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	52.91333333	44.23333333
Variance	233.1289718	190.1758192
Observations	60	60
Pooled Variance	211.6523955	
Hypothesized Mean Difference	0	
df	118	
t Stat	3.267900001	
P(T<=t) one-tail	0.000709735	
t Critical one-tail	1.657869522	
P(T<=t) two-tail	0.00141947	
t Critical two-tail	1.980272249	

The obtained samples t=3.27.

The associated two tailed p value is p=0.0014 so the observed t is significant at the 1% level (two-tailed).

The sample mean income for males and females were 52.9 and 44.2 respectively.

There is strong evidence that the income for males is higher.

We assume that the population variances underlying the incomes for malees and females do not differ so we can perform the equal variances form of the unrelated samples t test. To validate this assumption, we can perform the F-test two-sample for variances.

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	52.91333333	44.23333333
Variance	233.1289718	190.1758192
Observations	60	60
df	59	59
F	1.225860221	
P(F<=f) one-tail	0.21824624	
F Critical one-tail	1.539956607	
p2	0.43649248	

The sample variances are 233.13 and 190.18 respectively.

F = 1.23 giving a two tailed p-value of p=0.436.

The observed F ratio is not significant and the assumption that the population variances do not differ is valid.