Statistical inference with Excel

Student-Test

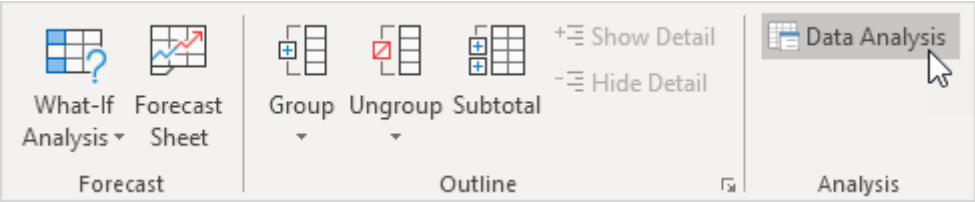
This example teaches you how to perform a t-Test in Excel. The t-Test is used to test the null hypothesis that the means of two populations are equal.
Below you can find the study hours of 6 female students and 5 male students.

$H_0: \mu_1 - \mu_2 = 0$
$H_1: \mu_1 - \mu_2 \neq 0$

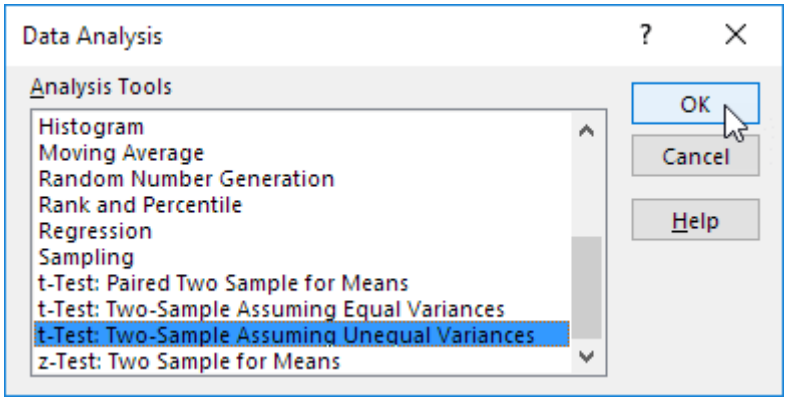
	A	B	C
1	Female	Male	
2	26	23	
3	25	30	
4	43	18	
5	34	25	
6	18	28	
7	52		
8			

To perform a t-Test, execute the following steps.

1. First, perform an F-Test to determine if the variances of the two populations are equal. This is not the case.
2. On the Data tab, in the Analysis group, click Data Analysis.

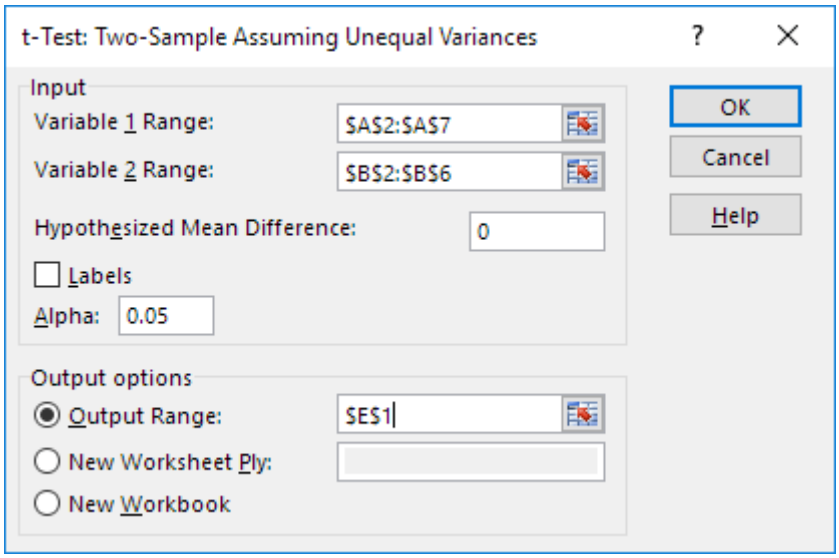


3. Select t-Test: Two-Sample Assuming Unequal Variances and click OK.



Dr. Menaceur A

4. Click in the Variable 1 Range box and select the range A2:A7.
5. Click in the Variable 2 Range box and select the range B2:B6.
6. Click in the Hypothesized Mean Difference box and type 0 (H_0: $\mu_1 - \mu_2 = 0$).
7. Click in the Output Range box and select cell E1.



8. Click OK.

Result:

E	F	G
t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	33	24.8
Variance	160	21.7
Observations	6	5
Hypothesized Mean Difference	0	
df	7	
t Stat	1.47260514	
P(T<=t) one-tail	0.092170202	
t Critical one-tail	1.894578605	
P(T<=t) two-tail	0.184340405	
t Critical two-tail	2.364624252	

Conclusion: We do a two-tail test (inequality). lf t Stat < -t Critical two-tail or t Stat > t Critical two-tail, we reject the null hypothesis. This is not the case, -2.365 < 1.473 < 2.365. Therefore, we do not reject the null hypothesis. The observed difference between the sample means (33 - 24.8) is not convincing enough to say that the average number of study hours between female and male students differ significantly.

Ex: Apply the above in series 4

Fisher-Test

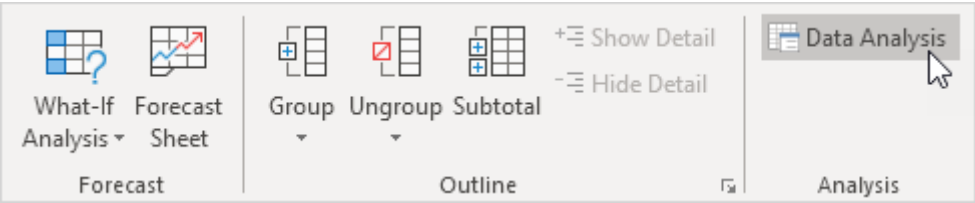
This example teaches you how to perform an F-Test in Excel. The F-Test is used to test the null hypothesis that the variances of two populations are equal.
Below you can find the study hours of 6 female students and 5 male students.

$H_0: \sigma_1^2 = \sigma_2^2$
$H_1: \sigma_1^2 \neq \sigma_2^2$

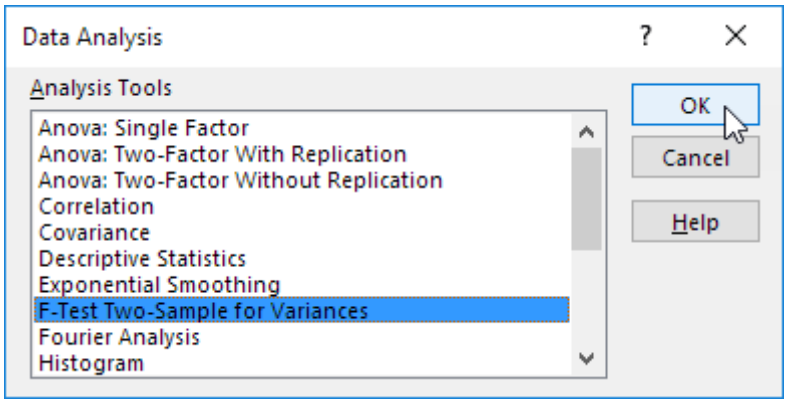
	A	B	C
1	Female	Male	
2	26	23	
3	25	30	
4	43	18	
5	34	25	
6	18	28	
7	52		
8			

To perform an F-Test, execute the following steps.

1. On the Data tab, in the Analysis group, click Data Analysis.

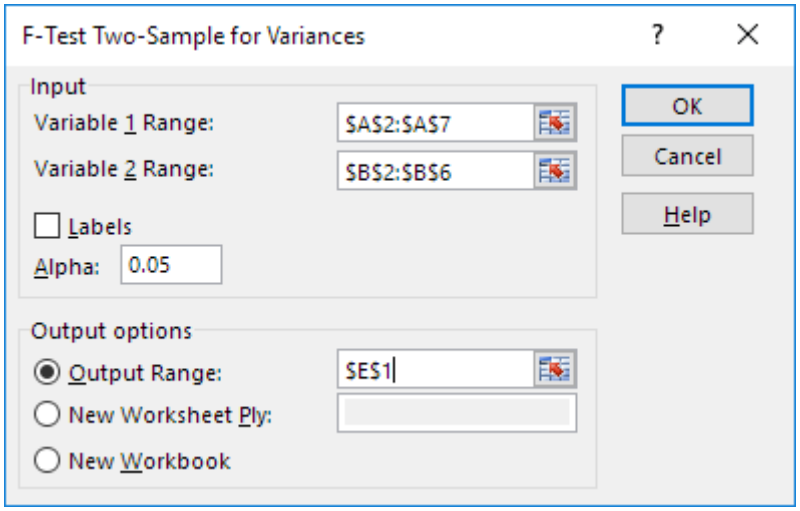


2. Select F-Test Two-Sample for Variances and click OK.



3. Click in the Variable 1 Range box and select the range A2:A7.

4. Click in the Variable 2 Range box and select the range B2:B6.
5. Click in the Output Range box and select cell E1.



6. Click OK.

Result:

E	F	G
F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	33	24.8
Variance	160	21.7
Observations	6	5
df	5	4
F	7.373271889	
P(F<=f) one-tail	0.037888376	
F Critical one-tail	6.256056502	

Important: be sure that the variance of Variable 1 is higher than the variance of Variable 2. This is the case, 160 > 21.7. If not, swap your data. As a result, Excel calculates the correct F value, which is the ratio of Variance 1 to Variance 2 (F = 160 / 21.7 = 7.373).

Conclusion: if F > F Critical one-tail, we reject the null hypothesis. This is the case,

7.373 > 6.256. Therefore, we reject the null hypothesis. The variances of the two populations are unequal.