

Practical work 8

Anova

This example teaches you how to perform a single factor ANOVA (analysis of variance) in Excel. A single factor or one-way ANOVA is used to test the null hypothesis that the means of several populations are all equal.

Below you can find the salaries of people who have a degree in economics, medicine or history.

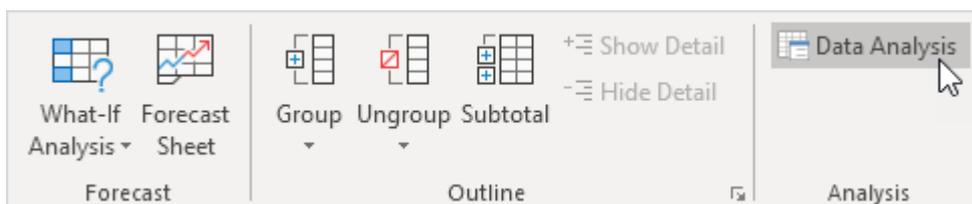
$H_0: \mu_1 = \mu_2 = \mu_3$

H_1 : at least one of the means is different.

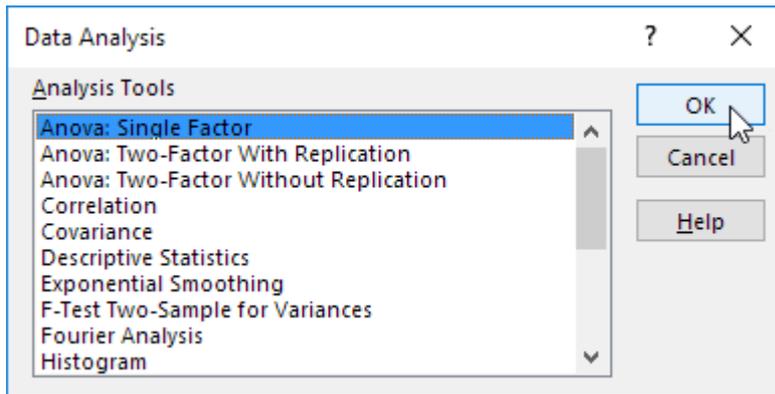
	A	B	C	D
1	economics	medicine	history	
2	42	69	35	
3	53	54	40	
4	49	58	53	
5	53	64	42	
6	43	64	50	
7	44	55	39	
8	45	56	55	
9	52		39	
10	54		40	
11				

To perform a single factor ANOVA, execute the following steps.

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

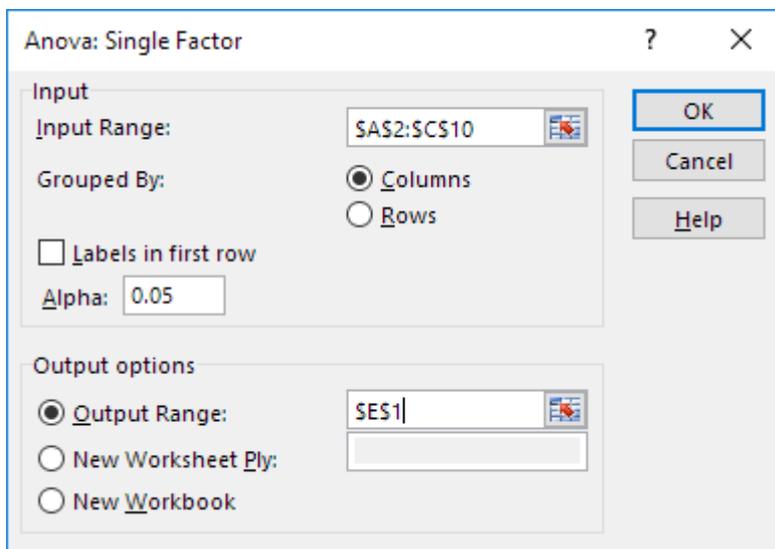


2. Select Anova: Single Factor and click OK.



3. Click in the Input Range box and select the range A2:C10.

4. Click in the Output Range box and select cell E1.



5. Click OK.

Result:

E	F	G	H	I	J	K
Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Column 1	9	435	48.33333	23.5		
Column 2	7	420	60	32.33333		
Column 3	9	393	43.66667	50.5		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1085.84	2	542.92	15.19623	7.16E-05	3.443357
Within Groups	786	22	35.72727			
Total	1871.84	24				

Conclusion: if $F > F_{crit}$, we reject the null hypothesis. This is the case, $15.196 > 3.443$. Therefore, we reject the null hypothesis. The means of the three populations are not all equal. At least one of the means is different. However, the ANOVA does not tell you where the difference lies. You need a [t-Test](#) to test each pair of means.