TESTING HYPOTHESIS ON TWO SAMPLE MEANS BY USING MICROSOFT EXCEL

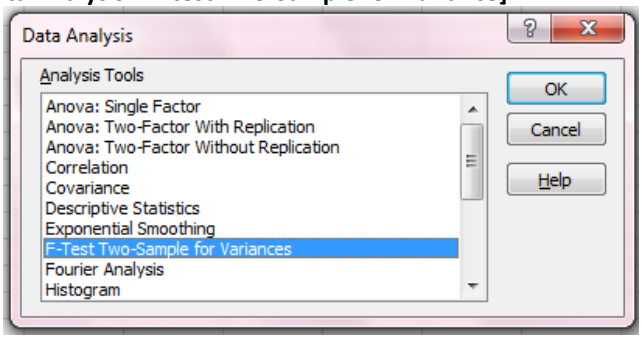
YOU WILL FIND IN THIS FILE GENERAL APPROACH ON HOW TO APPLY DIFFERENT TESTS. ADAPT THE METHOD TO YOUR DATA AND YOUR REQUESTS!

TESTING HYPOTHESIS ON VARIANCES

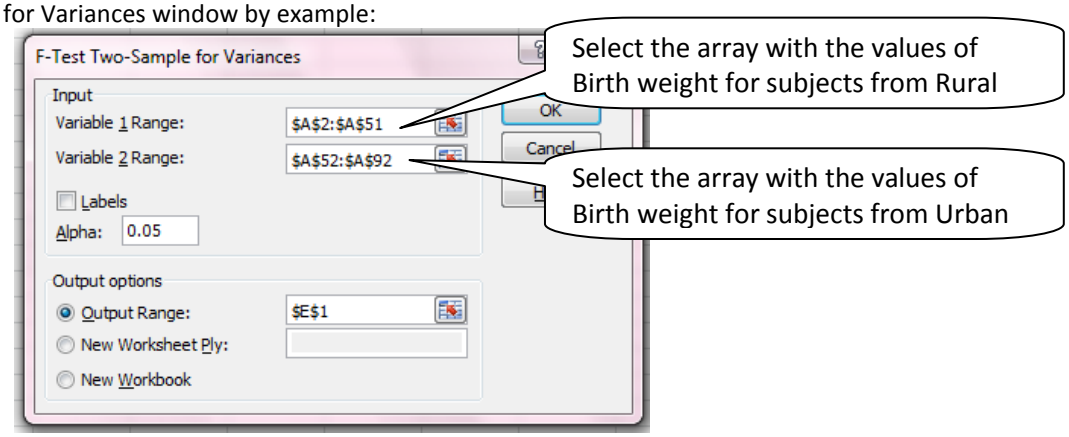
Is the mean of "Birth weight (g)" significantly different in subjects from Rural compared to subjects from Urban?

To apply the F-test:

- Sort the data according with "Rural vs. Urban"
- **[Data – Analysis – Data Analysis – F-test Two-Sample for Variance]**



- F-test Two-Samples for Variances window by example:



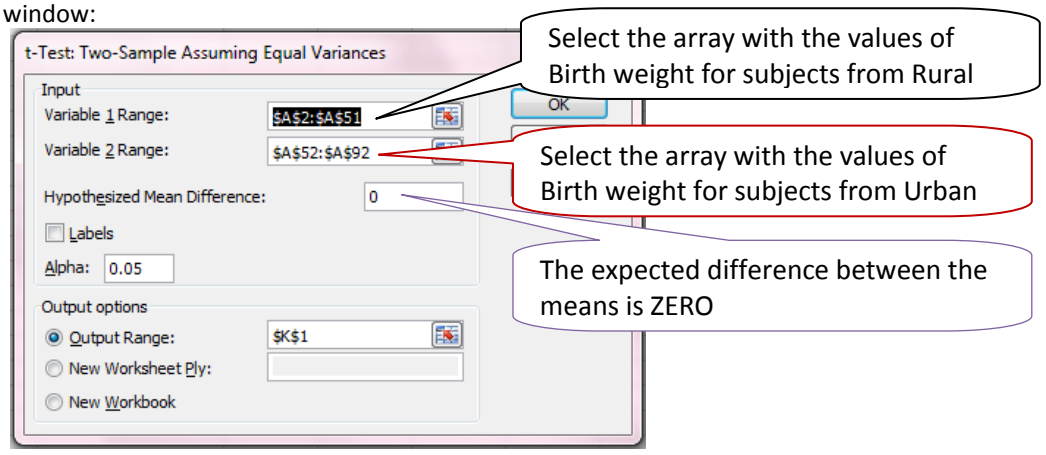
  - *Labels*: checked it if the first row of the input contains labels that should not be included in the data analysis (in this case it does not exists)
  - *Alpha*: refers to the type I error probability for the statistical test. Let us use the default value of 5%.
  - *Output options*: put the results in the same sheet starting with an empty cell (e.g. E1).
  - *The results*: will look like in the image bellow:

	A	B	C	D	E	F	G	H
1	Birth weight (g)	Rural vs. Urban			F-Test Two-Sample for Variances			
2	2500	Rural						
3	2500	Rural				*Rural*	*Urban*	
4	2600	Rural			Mean	3210	3290	
5	2600	Rural			Variance	151327	174350	
6	2800	Rural			Observations	50	41	
7	2800	Rural			df	49	40	
8	2800	Rural			F	0.8679		
9	2800	Rural			P(F<=f) one-tail	0.3162		
10	2800	Rural			F Critical one-tai	0.6103		
11	2850	Rural						
12	2900	Rural						
13	2950	Rural			H0:	The variance of birth weight on subjects from Rural is not significantly different by the variance of birth weight on subjects from Urban		
14	3000	Rural						
15	3000	Rural						
16	3000	Rural						
17	3000	Rural			H1:	The variance of birth weight on subjects from Rural is significantly different by the variance of birth weight on subjects from Urban		
18	3000	Rural						
19	3000	Rural						
20	3100	Rural						
21	3100	Rural			p = 0.3162	> 0.05 ==> we failed to reject the null hypothesis, so the variances of the birth weight are not significantly different on subjects from Rural		
22	3100	Rural						
23	3100	Rural						
24	3150	Rural						
25	3200	Rural			test for means	T-test: Two-Sample Assuming Equal Variances		
26	3200	Rural						

MEANS COMPARISON: T-TEST FOR TWO INDEPENDENT SAMPLES

To apply the t-test for independent samples:

- **[Data – Analysis – Data Analysis – t-Test: Two-Sample Assuming Equal Variances]**
- **T**-test Equal Variances window:



- Validate the selection by clicking OK button.

- After the inclusion of the answers to all requests your results will be similar with the one in the image bellow:

t-Test: Two-Sample Assuming Equal Variances

	Rural	*Urban*
Mean	3210	3290
Variance	151327	174350
Observations	50	41
Pooled Variance	161674.1573	
Hypothesized Mean Diffe	0	
df	89	
t Stat	-0.9443	
P(T<=t) one-tail	0.1738	
t Critical one-tail	1.6622	
P(T<=t) two-tail	0.3476	
t Critical two-tail	1.9870	

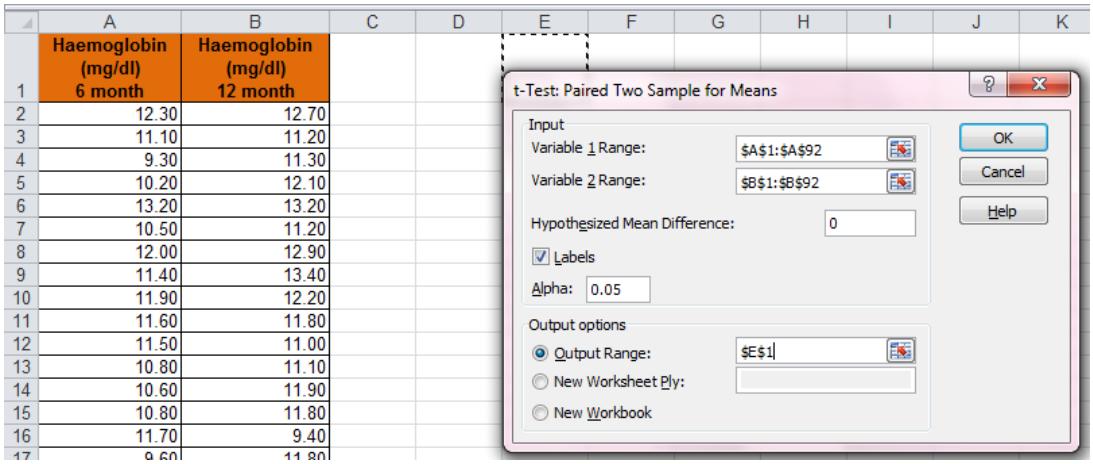
H0:	The mean of birth weight on subjects from Rural is not significantly different by the mean of birth weight on subjects from Urban
H1:	The mean of birth weight on subjects from Rural is significantly different by the mean of birth weight on subjects from Urban
t-statistic	-0.9443
p-value	0.3476
Statistical interpretation	H0 is failed to be rejected
Clinica interpretation	The birth weight mean of on subjects from Rural is not significantly different by the mean of birth weight on subjects from Urban

C. MEANS COMPARISON: T-TEST FOR PAIRED SAMPLES

Is the mean of "Haemoglobin (mg/dl) 6 month" is significantly different by the mean of "Haemoglobin (mg/dl) 12 month"?

To apply the Paired Samples t-test:

- **[Tools – Data Analysis – t-Test: Paired Two Sample for Means]**
- Test window:



- *Variable 1 Range*: select the value that correspond to haemoglobin at 6 months for all children in the sample
- *Variable 2 Range*: select the value that correspond to haemoglobin at 12 months all children in the sample

- *Hypothesized Mean Difference*: enter 0 to test the hypothesis that the mean difference is equal with zero.

- Your results will be similar with the one in the image bellow:

	A	B	C	D	E	F	G
1	**Haemoglobin (mg/dl) 6 month**	**Haemoglobin (mg/dl) 12 month**			t-Test: Paired Two Sample for Means		
2	12.30	12.70					
3	11.10	11.20				*Haemoglobin (mg/dl) 6 month*	*Haemoglobin (mg/dl) 12 month*
4	9.30	11.30			Mean	11.03	11.84
5	10.20	12.10			Variance	1.17	1.40
6	13.20	13.20			Observations	91	91
7	10.50	11.20			Pearson Correlation	0.35	
8	12.00	12.90			Hypothesized Mean Differenc	0	
9	11.40	13.40			df	90	
10	11.90	12.20			t Stat	-6.04	
11	11.60	11.80			P(T<=t) one-tail	1.68E-08	
12	11.50	11.00			t Critical one-tail	1.66	
13	10.80	11.10			P(T<=t) two-tail	3.36E-08	
14	10.60	11.90			t Critical two-tail	1.99	
15	10.80	11.80					
16	11.70	9.40					
17	9.60	11.80			H0:	The mean haemoglobin at 6 months is not	
18	9.40	10.60				significantly different by the mean of	
19	11.00	11.40				haemoglobin at 12 months.	
20	10.80	12.60			H1 (two-tail):	The mean haemoglobin at 6 months is	
21	10.60	11.80				significantly different by the mean of	
22	9.70	12.10				haemoglobin at 12 months.	
23	10.10	13.30			t-statistic	-6.04	
24	11.50	12.90			p-value	3.36E-08	0.0000000336
25	12.70	12.80			Statistical interpretation	since p < 0.05 ==> H0 is rejected	
26	11.70	12.50			Clinical interpretation	Since the mean of haemoglobin at 12 months is	
27	11.40	12.90				significantly higher compare with that on 6	
28	13.10	12.70				months we could conclude that the treatment	
29	12.10	11.80				significantly improved the values of haemoglobin	