How can I perform a Durbin-Watson test in Excel?

Authored by
stats writer

April 27, 2024

The Durbin-Watson test is a statistical tool used to determine the presence of autocorrelation in a dataset. It is commonly used in regression analysis to check for the presence of serial correlation. To perform a Durbin-Watson test in Excel, one can follow these steps:

1. Organize the dataset in columns, with the independent variable in the first column and the dependent variable in the second column.
2. Click on the "Data" tab and select "Data Analysis" from the drop-down menu.
3. In the Data Analysis dialog box, select "Durbin-Watson Test" from the list of tools and click "OK".
4. In the input range field, enter the range of the independent and dependent variables.
5. Select the desired output option and click "OK" to generate the results. The output will include the Durbin-Watson statistic and the corresponding p-value, which can be used to determine the presence of autocorrelation in the dataset. This simple process allows for the easy and efficient performance of the Durbin-Watson test in Excel.

Perform a Durbin-Watson Test in Excel

One of the is that there is no correlation between the residuals, e.g. the residuals are independent.

One way to determine if this assumption is met is to perform a , which is used to detect the presence of autocorrelation in the residuals of a regression. This test uses the following hypotheses:

H0 (null hypothesis): There is no correlation among the residuals.

HA (alternative hypothesis): The residuals are autocorrelated.

This tutorial provides a step-by-step example of how to

perform a Durbin-Watson test in Excel.

Step 1: Enter the Data

First, we'll enter the values for a dataset that we'd like to build a :

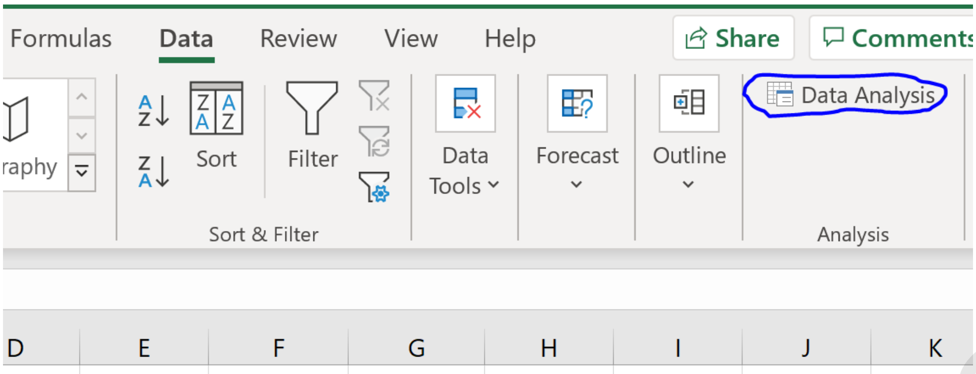
	A	B	C	D	E	F	G
1	**x1**	**x2**	**y**				
2	3	4	45				
3	5	4	47				
4	5	5	49				
5	6	5	54				
6	7	6	50				
7	8	6	47				
8	8	7	50				
9	12	6	59				
10	14	5	64				
11	15	6	60				
12	16	6	58				
13	16	8	59				
14	19	7	52				
15							
16							
17							
18							
19							
20							
21							
22							

Step 2: Fit a Multiple Linear Regression Model

Next, we'll fit a multiple linear regression model using y as the response variable and x1 and x2 as predictor variables.

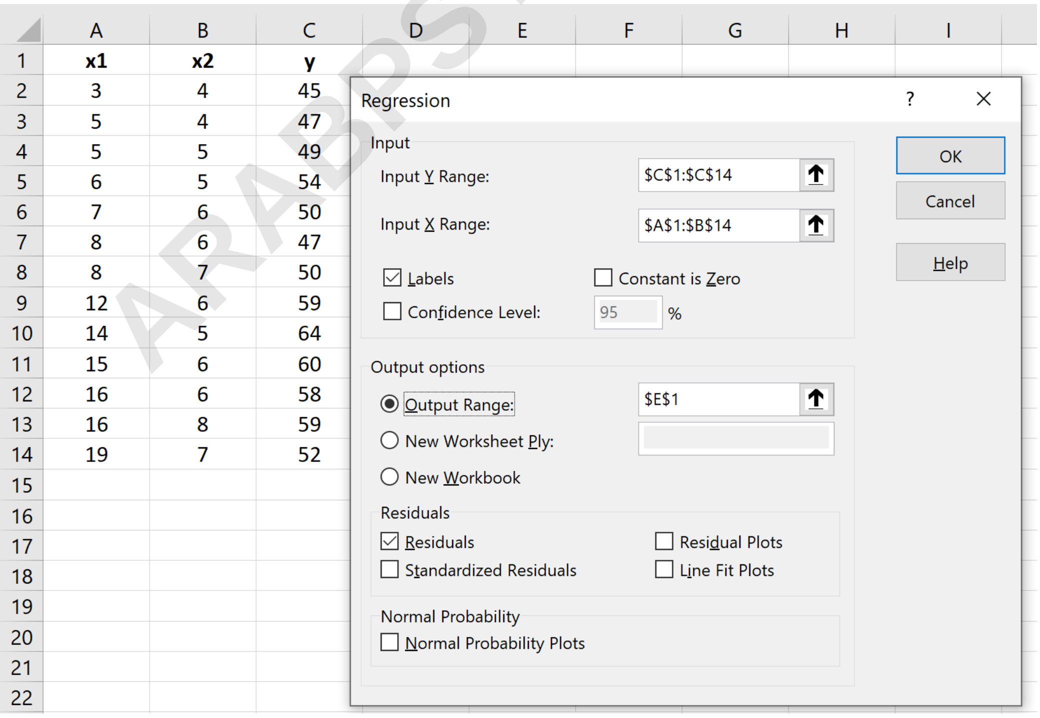
To do so, click the Data tab along the top ribbon. Then

click Data Analysis within the Analyze group.



If you don't see this as an option, you need to first .

In the window that appears, click Regression and then click OK. In the new window that appears, fill in the following information:



Once you click OK, the regression output will appear:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.750703
R Square	0.563556
Adjusted R	0.476267
Standard E	4.367605
Observatio	13

ANOVA

	df	SS	MS	F	ignificance F
Regression	2	246.3172	123.1586	6.456215	0.015836
Residual	10	190.7597	19.07597		
Total	12	437.0769			

	Coefficients	andard Errc	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	Jpper 95.0%
Intercept	50.30152	6.748134	7.454138	2.17E-05	35.26574	65.3373	35.26574	65.3373
x1	1.032967	0.323748	3.190647	0.009644	0.311611	1.754323	0.311611	1.754323
x2	-1.31117	1.45364	-0.90199	0.388272	-4.55008	1.927748	-4.55008	1.927748

RESIDUAL OUTPUT

Observation	Predicted y	Residuals
1	48.15576	-3.15576
2	50.2217	-3.2217
3	48.91053	0.089467
4	49.9435	4.0565
5	49.6653	0.334698
6	50.69827	-3.69827
7	49.3871	0.612897
8	54.83014	4.169863
9	58.20724	5.792764
10	57.92904	2.070962
11	58.962	-0.962
12	56.33967	2.660326
13	60.74974	-8.74974

Step 3: Perform the Durbin-Watson Test

The test statistic for the Durbin-Watson test, denoted *d*, is calculated as follows:

$$d = \sum_{t=2}^{T}(e_t - e_{t-1})^2 / \sum_{t=1}^{T} {e_t}^2$$

where:

T: The total number of observationset: The tth residual from the regression model

To calculate this test statistic in Excel, we can use the following formula:

RESIDUAL OUTPUT

Observation	*Predicted y*	*Residuals*		*d*	1.347536	=SUMXMY2(G27:G38, G26:G37) / SUMSQ(G26:G38)
1	48.15576	-3.15576				
2	50.2217	-3.2217				
3	48.91053	0.089467				
4	49.9435	4.0565				
5	49.6653	0.334698				
6	50.69827	-3.69827				
7	49.3871	0.612897				
8	54.83014	4.169863				
9	58.20724	5.792764				
10	57.92904	2.070962				
11	58.962	-0.962				
12	56.33967	2.660326				
13	60.74974	-8.74974				

The test statistic turns out to be 1.3475.

To determine if a Durbin-Watson test statistic is significantly significant at a certain alpha level, we can

refer to of critical values.

For α = .05, n = 13 observations, and k = 2 independent variables in the regression model, the Durbin-Watson table shows the following upper and lower critical values:

Lower critical value: 0.86Upper critical value: 1.56

Since our test statistic of 1.3475 does not lie outside of this range, we do not have sufficient evidence to reject the null hypothesis of the Durbin-Watson test.

In other words, there is no correlation among the residuals.

What to Do if Autocorrelation is Detected

If you reject the null hypothesis and conclude that autocorrelation is present in the , then you have a few different options to correct this problem if it's serious enough:

For positive serial correlation, consider adding lags of the dependent and/or independent variable to the model.For negative serial correlation, check to make

sure that none of your variables are *overdifferenced*.For seasonal correlation, consider adding seasonal to the model.