

How can I calculate autocorrelation in Excel?

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Autocorrelation refers to the degree of similarity between a signal and a time-shifted version of itself. In Excel, autocorrelation can be calculated using the CORREL function, which measures the linear relationship between two sets of data. To calculate autocorrelation, the data must be organized in a specific way and the CORREL function must be used with the appropriate parameters. This allows users to easily determine the level of correlation between different data points in a given time series, helping to identify patterns and trends. With the use of Excel, calculating autocorrelation becomes a simple and efficient process, providing valuable insights for data analysis.

Calculate Autocorrelation in Excel

Autocorrelation measures the degree of similarity between a time series and a lagged version of itself over successive time intervals.

It's also sometimes referred to as "serial correlation" or "lagged correlation" since it measures the relationship between a variable's current values and its historical values.

When the autocorrelation in a time series is high, it becomes easy to predict future values by simply referring to past values.

Autocorrelation in Excel

There is no built-in function to calculate autocorrelation in Excel, but we can use a single formula to calculate the autocorrelation for a time series for a given lag

value.

For example, suppose we have the following time series that shows the value of a certain variable during 15 different time periods:

	A	B	C	D	E	F
1	time	value				
2	1	22				
3	2	24				
4	3	25				
5	4	25				
6	5	28				
7	6	29				
8	7	34				
9	8	37				
10	9	40				
11	10	44				
12	11	51				
13	12	48				
14	13	47				
15	14	50				
16	15	51				
17						
18						
19						
20						
21						
22						
23						
24						

We can use the following formula to calculate the autocorrelation at lag $k = 2$.

`=(SUMPRODUCT(B2:B14-AVERAGE(B2:B16), B4:B16-`

AVERAGE(B2:B16))/COUNT(B2:B16))/VAR.P(B2:B16)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	time	value		lag	autocorrelation	formula									
2	1	22		2	0.656324582	=(SUMPRODUCT(B2:B14-AVERAGE(B2:B16), B4:B16-AVERAGE(B2:B16))/COUNT(B2:B16))/VAR.P(B2:B16)									
3	2	24													
4	3	25													
5	4	25													
6	5	28													
7	6	29													
8	7	34													
9	8	37													
10	9	40													
11	10	44													
12	11	51													
13	12	48													
14	13	47													
15	14	50													
16	15	51													
17															
18															
19															
20															
21															

This results in a value of 0.656325. This is the autocorrelation at lag $k = 2$.

We can calculate the autocorrelation at lag $k = 3$ by changing the range of values in the formula:

=(SUMPRODUCT(B2:B13-AVERAGE(B2:B16), B5:B16-AVERAGE(B2:B16))/COUNT(B2:B16))/VAR.P(B2:B16)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	time	value		lag	autocorrelation	formula									
2	1	22		2	0.656325	<code>=SUMPRODUCT(B2:B14-AVERAGE(B2:B16), B4:B16-AVERAGE(B2:B16))/COUNT(B2:B16)/VAR.P(B2:B16)</code>									
3	2	24		3	0.49105	<code>=SUMPRODUCT(B2:B13-AVERAGE(B2:B16), B5:B16-AVERAGE(B2:B16))/COUNT(B2:B16)/VAR.P(B2:B16)</code>									
4	3	25													
5	4	25													
6	5	28													
7	6	29													
8	7	34													
9	8	37													
10	9	40													
11	10	44													
12	11	51													
13	12	48													
14	13	47													
15	14	50													
16	15	51													
17															
18															
19															

This results in a value of 0.49105. This is the autocorrelation at lag $k = 3$.

We can find the autocorrelation at each lag by using a similar formula. You'll notice that the higher the lag, the lower the autocorrelation. This is typical of an autoregressive time series process.

	A	B	C	D	E	F	G
1	time	value		lag	autocorrelation		
2	1	22		2	0.656		
3	2	24		3	0.491		
4	3	25		4	0.279		
5	4	25		5	0.031		
6	5	28		6	-0.165		
7	6	29					
8	7	34					
9	8	37					
10	9	40					
11	10	44					
12	11	51					
13	12	48					
14	13	47					
15	14	50					
16	15	51					
17							
18							
19							
20							
21							