

What is Zero-Order Correlation?

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Zero-order correlation, also known as Pearson's correlation coefficient, measures the linear relationship between two variables without considering the influence of other variables. It ranges from -1 to +1, where a value of 0 indicates no relationship, a positive value indicates a positive relationship, and a negative value indicates a negative relationship. This type of correlation is useful in understanding the strength and direction of the relationship between two variables, but it does not imply causation. It is commonly used in statistics and research to analyze data and make predictions.

What is Zero-Order Correlation?

In statistics, the correlation between two variables tells us about the relationship between those two variables.

One of the most basic types of correlation is known as zero-order correlation, which refers to the correlation between two variables without controlling for the possible influence of other variables.

One example of this type of correlation is the Pearson Correlation Coefficient, which measures the linear association between two variables and can take on values between -1 and 1 where:

**-1 indicates a perfectly negative linear correlation between two variables
0 indicates no linear correlation between two variables
1 indicates a perfectly positive linear correlation between two variables**

The further away the correlation is from zero, the stronger the association between the two variables.

First-Order and Second-Order Correlations

If we calculate the correlation between two variables A and B while controlling for the influence of a third variable C, we would refer to the correlation between A and B as a first-order correlation.

Similarly, if we calculate the correlation between two variables A and B while controlling for the influence of variables C and D, we would refer to the correlation between A and B as a second-order correlation.

Example of Zero-Order Correlation

Suppose we have the following dataset that shows the number of hours spent studying and the exam score received by 10 different students:

Hours	Exam
1	72
2	78
2	76
2	70
3	92
3	94
4	89
5	85
5	90
6	96

It turns out that the correlation between these two variables is 0.762. This would be considered the zero-order correlation between the two variables because we aren't controlling for the potential influence of a third variable.

However, in reality it's possible that other factors could affect the relationship between these two variables.

For example, perhaps the student's current grade in the class has an effect on their exam score. Suppose we had access to this data as well:

Current Grade	Hours	Exam
70	1	72
75	2	78
89	2	76
85	2	70
86	3	92
90	3	94
94	4	89
88	5	85
92	5	90
90	6	96

If we then calculated the correlation between hours and exam *while controlling for the effect of current grade*, we'd find that the first-order correlation between hours and exam is 0.578.

This means there is still a fairly strong positive correlation between hours studied and exam score received even after controlling for the effect of the student's current grade in the class.

. This tutorial explains how to calculate partial correlations in Excel.

Zero-Order Correlations in a Correlation Matrix

Whenever we create a correlation matrix for a set of variables, the correlation coefficients shown within the

matrix are always zero-order correlations because they're simply the correlations between each pairwise combination of variables without considering the influence of any other variables.

For example, consider our dataset from the previous example:

Current Grade	Hours	Exam
70	1	72
75	2	78
89	2	76
85	2	70
86	3	92
90	3	94
94	4	89
88	5	85
92	5	90
90	6	96

If we created a correlation matrix for this dataset, it would look like this:

	Current Grade	Hours	Exam
Current Grade	1.000	0.689	0.637
Hours	0.689	1.000	0.762
Exam	0.637	0.762	1.000

The way to interpret this is as follows:

The correlation between current grade and hours studied is 0.689. The correlation between current grade and exam score received is 0.637. The correlation between hours studied and exam score received is 0.762.

Each of these correlations is a zero-order correlation.

The following tutorials provide additional information about correlation coefficients:

[Introduction to the Pearson Correlation Coefficient](#)

[How to Read a Correlation Matrix](#)

[How to Calculate Partial Correlation in Excel](#)