

Finding a Standard Deviation

UMUC Statistics 200

First, let's talk about what is meant by a "standard deviation" or SD. This is a measure of the variation of a set of data from its mean, or average. So, if SD is small, most of the data is near the mean. If SD is large, then we have a lot of variance in our data and much of that data is far from the mean.

Now let's talk about how to calculate a standard deviation, by hand. I will do this in steps.

- (1) Find the mean (average) of the data.
- (2) Find the difference of the mean and each data value and square that difference. For example, if the mean was 10 and a data value was 12, then we get $(12-10)^2 = (2)^2 = 4$.
- (3) Sum all of those squared differences from Step #2 and divide by $(n-1)$, which is the number of data values less 1. This is the variance.

NOTE: It is typical to use $(n-1)$ for the division in Step #3 when we are dealing with a set of data that is part of a total population. Only in rare cases where our data represents the entire population of data, so we use (n) for the division. So for this class, we will use $(n-1)$. In addition, EXCEL assumes $(n-1)$ in its calculation. See below.

- (4) Finally, take the square root of the variance (Step #3) to find the standard deviation.

Now, let's talk about how you would find the standard deviation in EXCEL. It is very easy. Put the data in a column then in a new cell, type " $=STDEV(\text{cells})$ ", where "cells" is the column of data, such as " $=STDEV(B5:B9)$ ", where the data is in column-B and is found in rows 5 to 9. The answer will come in one step and be found in your cell where you entered the equation. Below is an example from EXCEL where you can follow the long method (steps 1 to 4) and also see the short method of using the STDEV equation.

	A	B	C	D
1				
2		EXAMPLE		
3				
4		Data (X)	(X-Mean)²	
5		2	23.04	
6		5	3.24	
7		8	1.44	
8		9	4.84	
9		10	10.24	
10				
11				
12		Description	Value	Equation
13	M	Mean (average) of Data	6.800	=AVERAGE(B5:B9)
14	S	Sum of (X-Mean) ²	42.800	=SUM(B5:B9)
15	N	Number of Data Values (N)	5	=COUNT(B5:B9)
16	S/(N-1)	Variance	10.700	=(C14/(C15-1))
17		Standard Deviation	3.271	=SQRT(C14/(C15-1))
18				
19		Standard Deviation	3.271	=STDEV(B5:B9)
20		(using direct EXCEL equation)		
21				