

Correlation of Latitude v Diameter v Depth

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Performing a correlation analysis of crater latitude vs. diameter and crater latitude vs. depth is where this whole class has been heading for me. My original research question was "Is there a relationship between crater location (distance from the equator) and size (diameter and depth). All I had to do was run the correlation procedure with the three required variables:

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PROC CORR; VAR DIAM_CIRCLE_IMAGE DEPTH_RIMFLOOR_TOPOG  
LATITUDE_CIRCLE_IMAGE;
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Although small, I was able to discover a statistically significant correlation between a crater's latitude and its diameter. I was also able to discover a small but statistically significant correlation between a crater's latitude and its depth. As a side-effect of the correlation I was also discovered that there is a statistically significant--and much larger--correlation between a crater's depth and its diameter.

Hypothesis 1

- H_0 There is no association between the latitude of a crater and its diameter.
- H_A There is an association between the latitude of a crater and its diameter.

Corr -0.05794
 $p < 0.0001$

Accept H_A

Among Mars craters, the correlation between crater latitude (quantitative explanatory variable) and crater diameter (quantitative response variable) was 0.05794 ($p < 0.0001$), suggesting that only 0.3% (i.e. -0.05794 squared) of the diameter variance can be explained by latitude.

Hypothesis 2

- H_0 There is no association between the latitude of a crater and its depth.
- H_A There is an association between the latitude of a crater and its depth.

Corr -0.04288
 $p < 0.0001$

Accept H_A

Among Mars craters, the correlation between crater latitude (quantitative explanatory variable) and crater depth (quantitative response variable) was -0.04288 ($p < 0.0001$), suggesting that only 0.2% (i.e. -0.04288 squared) of the depth variance can be explained by latitude.

Hypothesis 3

Correlation of Latitude v Diameter v Depth

- H_0 There is no association between the diameter of a crater and its depth.
- H_A There is an association between the diameter of a crater and its depth.

Corr 0.58671

$p < 0.0001$

Accept H_A

Among Mars craters, the correlation between crater diameter (quantitative explanatory variable) and crater depth (quantitative response variable) was 0.58671 ($p < 0.0001$), suggesting that 34.4% (i.e. 0.58671 squared) of the depth variance can be explained by diameter.

The CORR Procedure

3 Variables:

Simple Statistics						
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
DIAM_CIRCLE_IMAGE	384343	3.55669	8.59199	1366988	1.00000	1164
DEPTH_RIMFLOOR_TOPOG	384343	0.07584	0.22152	29148	-0.42000	4.95000
LATITUDE_CIRCLE_IMAGE	384343	-7.19921	33.60897	-2766965	-86.70000	85.70200

Pearson Correlation Coefficients, N = 384343		
Prob > r under H0: Rho=0		
	DIAM_CIRCLE_IMAGE	DEPTH_RIMFLOOR_TOPOG
DIAM_CIRCLE_IMAGE	1.00000	0.58671
Crater Diameter (in km)	3	<.0001
DEPTH_RIMFLOOR_TOPOG	0.58671	1.00000
Average Elevation of Crater Rim (in km)	2	1
LATITUDE_CIRCLE_IMAGE	-0.05794	-0.04288
Latitude of Crater Center	<.0001	<.0001

DIAM_CIRCLE_IMAGE DEPTH_RIMFLOOR_TOPOG LATITUDE_CIRCLE_IMAGE