

What is the process for conducting a power analysis for correlations using SAS in data analysis?

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The process for conducting a power analysis for correlations using SAS in data analysis involves several steps. First, the researcher needs to determine the desired statistical power and effect size for the study. This can be based on previous research or the researcher's expectations.

Next, the researcher needs to collect the necessary data, including the sample size, number of variables, and expected correlation coefficients.

Then, using SAS, the researcher can run a power analysis by inputting the collected data and specifying the desired power and effect size. The output of the power analysis will provide information on the required sample size and detectable effect size for the study.

After obtaining the results of the power analysis, the researcher can determine if the study has sufficient statistical power to detect the desired effect size. If the power is low, the researcher may need to adjust the sample size or effect size.

Finally, the researcher can conduct the actual correlation analysis using SAS and interpret the results based on the determined power and effect size. This process allows for a more accurate and reliable analysis of correlations in data using SAS.

SAS Data Analysis Examples: Power Analysis for Correlations

Example

A researcher is trying to develop a new, less expensive, test to detect a particular chemical in soil samples. The old test correlates to the criterion (i.e., gold standard measurement) at $r = 0.89$. The new test correlates to the criterion at $r = 0.76$. Two research assistants are asked to collect soil samples to compare the old test with the new test. The first research assistant collects 42 independent soil samples; the second research assistant collects 47 samples. Each runs a power

analysis to determine the observed power.

Next, the research assistants are asked to calculate the number of independent samples necessary to detect a difference between 0.89 and 0.76 for power values of .7, .8 and .9.

Prelude to the Power Analysis

There are two different aspects of power analysis. One is to calculate the observed power for a specified sample size as in the first part of the example. The other aspect is to calculate the necessary sample size when given a specific power as in the second part of the example. Technically, power is the probability of rejecting the null hypothesis when the specific alternative hypothesis is true. For all examples, we will assume $\alpha = 0.05$.

Power Analysis

In SAS, it is fairly straightforward to perform power analysis for comparing correlations. For example, we can use SAS's proc power for our calculation as shown below. We first specify the onecorr statement and that the distribution is Fisher's r to z (fisherz). Next we use

the nullcorr statement and provide the correlation of the old test to the criterion. Next, we use the corr statement and provide the correlation between the new test and the criterion. We use the ntotal statement to indicate the number of samples collected, and we have a period (.) on the power statement to indicate that we want SAS to calculate the power. The first research assistant collected 42 soil samples, so we specify 42 in the ntotal statement. We will run the analysis a second time with the value of 47 on the ntotal statement, the number of samples the second research assistant collected.

```
proc power;  
onecorr dist=fisherz  
nullcorr = 0.89  
corr = 0.76  
ntotal = 42  
power = .;  
run;
```

The POWER Procedure

Fisher's z Test for Pearson Correlation

Fixed Scenario Elements

Distribution Fisher's z transformation of r

Method Normal approximation

Null Correlation 0.89

Correlation 0.76

Total Sample Size 42

Number of Sides 2

Nominal Alpha 0.05

Number of Variables Partialled Out 0

Computed Power

Actual

Alpha Power

0.0488 0.761

```
proc power;
```

```
onecorr dist=fisherz
```

```
nullcorr = 0.89
```

```
corr = 0.76
```

```
ntotal = 47
```

```
power = .;
```

```
run;
```

The POWER Procedure

Fisher's z Test for Pearson Correlation

Fixed Scenario Elements

Distribution Fisher's z transformation of r

Method Normal approximation

Null Correlation 0.89

Correlation 0.76

Total Sample Size 47

Number of Sides 2

Nominal Alpha 0.05

Number of Variables Partialled Out 0

Computed Power

Actual

Alpha Power

0.049 0.809

We can see that the first research assistant observed a power of approximately 0.76, while the second research assistant observed a power of approximately 0.81.

Now the research assistants need to calculate the necessary sample sizes for power values of .7, .8 and .9.

In SAS, we could run three separate power analyses, or we could run one analysis and get the results for all three levels of power in a single table. Let's do that.

```
proc power;  
onecorr dist=fisherz  
nullcorr = 0.89  
corr = 0.76  
ntotal = .  
power = .7 .8 .9;  
run;
```

**The POWER Procedure
Fisher's z Test for Pearson Correlation**

Fixed Scenario Elements

Distribution Fisher's z transformation of r

Method Normal approximation

Null Correlation 0.89

Correlation 0.76

Number of Sides 2

Nominal Alpha 0.05

Number of Variables Partialled Out 0

Computed N Total

Nominal Actual Actual N

Index Power Alpha Power Total

1 0.7 0.0487 0.703 37

2 0.8 0.0490 0.800 46

3 0.9 0.0492 0.902 61

The required sample size for a power of .7 is 37. The required sample size for a power of .8 is 46, and the required sample size for a power of .9 is 61. This makes sense, because as power increases, the sample size must increase, assuming that alpha and the effect size are held constant.