

Reliability Analysis

By Using SPSS

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*The **reliability** of a measuring instrument is defined as the ability of the instrument to measure consistently the phenomenon it is designed to assess. Reliability, therefore, refers to test consistency.*

Cronbach's Alpha

It is very common in research to collect multiple measures of the same construct. For example, in a questionnaire designed to measure optimism, there are typically many items that collectively measure the construct of optimism. To have confidence in a measure such as this, we need to test its reliability, the degree to which it is error-free. The type of reliability we'll be examining here is called internal consistency reliability, the degree to which multiple measures of the same thing agree with one another.

Cronbach's alpha – This is a single correlation coefficient that is an estimate of the average of all the correlation coefficients of the items within a test. If alpha is high (0.80 or higher), then this suggests that all of the items are reliable and the entire test is internally consistent. If alpha is low, then at least one of the items is unreliable, and must be identified via item analysis procedure.

Cronbach's Alpha

Example: Does my questionnaire measure customer satisfaction in a useful way? Using reliability analysis, you can determine the extent to which the items in your questionnaire are related to each other, you can get an overall index of the repeatability or internal consistency of the scale as a whole, and you can identify problem items that should be excluded from the scale.

- What is alpha and why should we care?
 - Cronbach's alpha is the most commonly used measure of reliability (i.e., internal consistency).
 - It was originally derived by Kuder & Richardson (1937) for dichotomously scored data (0 or 1) and later generalized by Cronbach (1951) to account for any scoring method.
 - A high value of alpha is good, but it is important to have a deeper knowledge to use it properly.

- Other types of reliability
 - Test/Re-Test
 - » The same test is taken twice.
 - Equivalent Forms
 - » Different tests covering the same topics
 - » Can be accomplished by splitting a test into halves

- Cronbach's basic equation for alpha

$$\alpha = \frac{n}{n-1} \left(1 - \frac{\sum Vi}{V_{test}} \right)$$

- n = number of questions
- Vi = variance of scores on each question
- Vtest = total variance of overall scores on the entire test

- How alpha works
 - Vtest is the most important part of alpha

$$\alpha = \frac{n}{n-1} \left(1 - \frac{\sum V_i}{V_{test}} \right)$$

- If Vtest is large, it can be seen that alpha will be large also:
 - » Large Vtest → Small Ratio $\sum V_i / V_{test}$ → Subtract this small ratio from 1 → high alpha

- What makes a question “Good” or “Bad” in terms of alpha?
 - SPSS will report “alpha if item deleted”, which shows how alpha would change if that one question was not on the test.
 - Higher “alpha if item deleted” means a question is not so good because deleting that question would improve the overall alpha.

Obtaining Reliability of Scale - Example

105 members of the community completed a ten-item 'attitudes-to-help-seeking' instrument, using a 5-point Likert scale (1=Strongly disagree to 5=Strongly agree). You wish to determine the internal consistency of this scale using Cronbach's alpha.

The data is given in Attitude_Reliability.sav

Obtaining Reliability of Scale using SPSS - Example

Obtaining Cronbach's Alpha:

Analyze → Scale → Reliability Analysis

Model → Alpha

- **Drag items on the left to the right dialog box**
 - **In this case: items hs1 to hs10**

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- Press “statistics”
- Choose “scale if item deleted”
- Then Press “continue”
- Then “OK”

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- **The SPSS Output**

Case Processing Summary

		N	%
Cases	Valid	105	100.0
	Excluded ^a	0	.0
	Total	105	100.0

a. Listwise deletion based on all variables in the procedure.

**105 cases (observations/respondents) were used
in the calculation of Cronbach's alpha**

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.768	.792	10

The obtained alpha score is 0.768, which indicates that the scale has high internal consistency (reliability).

Cronbach alpha is a reliability coefficient that indicates how well the items are positively correlated to one another. The closer the Cronbach alpha is to 1, the higher the internal consistency. As a thumb rule, values of below 0.6 are considered to be poor, 0.6 to 0.7 ranges are acceptable and those over 0.7 are good.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
hs1	17.94	21.862	.648	.528	.720
hs2	17.39	23.048	.345	.301	.764
hs3	18.19	22.348	.693	.533	.719
hs4	17.72	22.836	.379	.259	.758
hs5	17.75	21.977	.646	.464	.721
hs6	17.86	23.220	.425	.209	.749
hs7	17.39	25.029	.246	.158	.772
hs8	18.45	24.692	.415	.339	.752
hs9	18.15	24.265	.526	.389	.743
hs10	17.44	23.710	.253	.193	.781

Note that items 7 and 10 have lowest “corrected item – total correlations”. If these two items were removed from the scale, the “alpha if item deleted” column shows that overall reliability would increase slightly. Hence, deletion of these items may be considered.