

Correlation, Factor Analysis and related methods

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Summary

“ abstract here. . . ”

Outline

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*Various functions used throughout this chapter were collated in the package **Psychomisc**.*

Introduction

[1]

Application

We will be using a data set conveniently proposed by W. Revelle in his psych package.

25 personality self report items taken from the International Personality Item Pool (ipip.ori.org) were included as part of the Synthetic Aperture Personality Assessment (SAPA) web based personality assessment project. The data from 1000 subjects are included here as a demonstration set for scale construction and factor analysis.

```
require(psych)  
data(bfi)
```

Descriptive item statistics

| | var | n | mean | sd | median | trimmed | mad | min | max | range | skew | kurtosis | se |
|----|-----|---------|------|------|--------|---------|------|------|------|-------|-------|----------|------|
| A1 | 1 | 1000.00 | 2.29 | 1.28 | 2.00 | 2.13 | 1.48 | 1.00 | 6.00 | 5.00 | 0.87 | -0.11 | 0.04 |
| A2 | 2 | 994.00 | 4.82 | 1.12 | 5.00 | 4.98 | 1.48 | 1.00 | 6.00 | 5.00 | -1.08 | 1.03 | 0.04 |
| A3 | 3 | 989.00 | 4.60 | 1.21 | 5.00 | 4.76 | 1.48 | 1.00 | 6.00 | 5.00 | -1.00 | 0.60 | 0.04 |
| A4 | 4 | 993.00 | 4.76 | 1.40 | 5.00 | 5.00 | 1.48 | 1.00 | 6.00 | 5.00 | -1.08 | 0.29 | 0.04 |
| A5 | 5 | 988.00 | 4.58 | 1.15 | 5.00 | 4.70 | 1.48 | 1.00 | 6.00 | 5.00 | -0.76 | 0.24 | 0.04 |
| C1 | 6 | 997.00 | 4.39 | 1.22 | 5.00 | 4.50 | 1.48 | 1.00 | 6.00 | 5.00 | -0.72 | -0.00 | 0.04 |
| C2 | 7 | 997.00 | 4.22 | 1.29 | 4.00 | 4.32 | 1.48 | 1.00 | 6.00 | 5.00 | -0.64 | -0.18 | 0.04 |
| C3 | 8 | 995.00 | 4.28 | 1.26 | 5.00 | 4.38 | 1.48 | 1.00 | 6.00 | 5.00 | -0.68 | -0.13 | 0.04 |
| C4 | 9 | 986.00 | 2.63 | 1.36 | 2.00 | 2.51 | 1.48 | 1.00 | 6.00 | 5.00 | 0.51 | -0.76 | 0.04 |
| C5 | 10 | 997.00 | 3.47 | 1.52 | 4.00 | 3.48 | 1.48 | 1.00 | 6.00 | 5.00 | -0.09 | -1.06 | 0.05 |
| E1 | 11 | 996.00 | 2.93 | 1.58 | 3.00 | 2.84 | 1.48 | 1.00 | 6.00 | 5.00 | 0.36 | -1.07 | 0.05 |
| E2 | 12 | 994.00 | 3.32 | 1.58 | 3.00 | 3.29 | 1.48 | 1.00 | 6.00 | 5.00 | 0.05 | -1.16 | 0.05 |
| E3 | 13 | 994.00 | 3.98 | 1.29 | 4.00 | 4.02 | 1.48 | 1.00 | 6.00 | 5.00 | -0.35 | -0.55 | 0.04 |
| E4 | 14 | 997.00 | 4.42 | 1.43 | 5.00 | 4.59 | 1.48 | 1.00 | 6.00 | 5.00 | -0.86 | -0.19 | 0.05 |
| E5 | 15 | 991.00 | 4.38 | 1.24 | 5.00 | 4.50 | 1.48 | 1.00 | 6.00 | 5.00 | -0.72 | -0.03 | 0.04 |
| N1 | 16 | 990.00 | 2.83 | 1.51 | 3.00 | 2.72 | 1.48 | 1.00 | 6.00 | 5.00 | 0.46 | -0.88 | 0.05 |
| N2 | 17 | 990.00 | 3.51 | 1.53 | 4.00 | 3.52 | 1.48 | 1.00 | 6.00 | 5.00 | 0.01 | -1.07 | 0.05 |
| N3 | 18 | 997.00 | 3.20 | 1.52 | 3.00 | 3.15 | 1.48 | 1.00 | 6.00 | 5.00 | 0.22 | -1.06 | 0.05 |
| N4 | 19 | 996.00 | 3.06 | 1.54 | 3.00 | 2.97 | 1.48 | 1.00 | 6.00 | 5.00 | 0.35 | -0.96 | 0.05 |
| N5 | 20 | 992.00 | 2.94 | 1.55 | 3.00 | 2.84 | 1.48 | 1.00 | 6.00 | 5.00 | 0.42 | -0.95 | 0.05 |
| O1 | 21 | 994.00 | 4.74 | 1.18 | 5.00 | 4.88 | 1.48 | 1.00 | 6.00 | 5.00 | -0.82 | 0.13 | 0.04 |
| O2 | 22 | 994.00 | 3.93 | 1.33 | 4.00 | 3.95 | 1.48 | 1.00 | 6.00 | 5.00 | -0.15 | -0.75 | 0.04 |
| O3 | 23 | 991.00 | 4.32 | 1.22 | 5.00 | 4.42 | 1.48 | 1.00 | 6.00 | 5.00 | -0.66 | -0.05 | 0.04 |
| O4 | 24 | 992.00 | 4.83 | 1.18 | 5.00 | 5.00 | 1.48 | 1.00 | 6.00 | 5.00 | -1.01 | 0.58 | 0.04 |
| O5 | 25 | 996.00 | 2.51 | 1.22 | 2.00 | 2.39 | 1.48 | 1.00 | 6.00 | 5.00 | 0.65 | -0.22 | 0.04 |

describe(bfi)

Reliability analysis

The Table below show the main indicators of scores reliability for each dimension:

| | AG | CO | EX | NE | OP |
|---------------------|------|------|------|------|------|
| Cronbach α | 0.65 | 0.74 | 0.77 | 0.80 | 0.47 |
| Average r | 0.27 | 0.36 | 0.41 | 0.46 | 0.15 |
| Guttman Λ_6 | 0.66 | 0.74 | 0.78 | 0.82 | 0.53 |

```
keys.list <- list(Agree=c(-1,2:5),
                 Conscientious=c(6:8,-9,-10),
                 Extraversion=c(-11,-12,13:15),
                 Neuroticism=c(16:20),
                 Openness = c(21,-22,23,24,-25))
keys <- make.keys(25,keys.list,item.labels=colnames(bfi))
( scores <- score.items(keys,bfi,short=TRUE) )
```

Coorelation structure of the BFI

Below are the Scale intercorrelations corrected for attenuation, with raw correlations below the diagonal, alpha on the diagonal, and corrected correlations above the diagonal:

| | AG | CO | EX | NE | OP |
|---------------|-------------|-------------|-------------|-------------|-------------|
| Agree | 0.65 | 0.36 | 0.62 | -0.30 | 0.33 |
| Conscientious | 0.25 | 0.74 | 0.28 | -0.22 | 0.24 |
| Extraversion | 0.44 | 0.21 | 0.77 | -0.24 | 0.57 |
| Neuroticism | -0.22 | -0.17 | -0.19 | 0.81 | 0.11 |
| Openness | 0.18 | 0.14 | 0.34 | 0.07 | 0.47 |

References

- [1] P M Fayers and D Machin. *Quality of life. The assessment, analysis and interpretation of patient-reported outcomes*. Wiley, 2000.