**Lab 1: Classical Item Analysis**

**Jan 25, 2023**

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| Outline   * Descriptive item analysis using ‘psychometric’ R package and ‘ltm’ R package * Examples |

* R packages

1. Installation of R packages

Packages > Install package(s) > USA(TN) > ltm

Packages > Install package(s) > USA(TN) > psychometric

2. Function ‘item.exam’ in the R package ‘psychometric’

See pages 35-37 of the ‘psychometric’ manual downloaded from h<ttp://cran.r-p>roject.org/web/packages/psychometric/psychometric.pdf

3. Function ‘descript’ in the R package ‘ltm’

See pages 12-13 of the ‘ltm’ manual downloaded from http://cran.r-project.org/web/packages/ltm/ltm.pdf

* Examples

1. Binary responses

[1] Dataset

binary.txt

25-item, 250-person

Codes as 0 or 1

[2] R Script

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| # Call libraries  library(psychometric)  library(ltm)  ## Binary responses  # Import binary data (binary.txt)  binary <- read.table("C: \\binary.txt",header=TRUE)  binary[1:10,]  # Item analysis with psychometric  item.exam(binary, discrim=T)  # Item analysis with ltm  descript(binary) |

Correlation (item, total without the item to be evaluated);

Point biserial correlation

In

in

In

[3] Result interpretations

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| > item.exam(binary, discrim=T)  Discrimination Index  In  in  In  Sample.SD Item.total Item.Tot.woi Difficulty Discrimination  item1 0.4978508 0.6324939 0.5910706 0.444 0.7108434  item2 0.4908807 0.6402460 0.6000768 0.400 0.7228916  item3 0.5008587 0.5818083 0.5360870 0.488 0.6746988  item4 0.5009870 0.6346134 0.5930903 0.496 0.7469880  item5 0.4938823 0.7077386 0.6732997 0.416 0.8072289  item6 0.4924490 0.7636111 0.7347651 0.592 0.9156627  item7 0.4978508 0.6233392 0.5811626 0.556 0.7228916  item8 0.4809629 0.5921317 0.5490829 0.360 0.6626506  item9 0.4853517 0.7161472 0.6831262 0.624 0.8313253  item10 0.4990594 0.6401956 0.5993108 0.544 0.7469880  item11 0.4990594 0.6262365 0.5841888 0.456 0.7108434  item12 0.4973827 0.4132358 0.3573209 0.440 0.4096386  item13 0.5009870 0.6596983 0.6203280 0.496 0.7590361  item14 0.4438061 0.4763648 0.4297744 0.268 0.4698795  item15 0.4986890 0.7213460 0.6878557 0.548 0.8313253  item16 0.4931824 0.6479857 0.6082666 0.588 0.7228916  item17 0.4853517 0.6820721 0.6459484 0.376 0.7710843  item18 0.4978508 0.6296499 0.5879912 0.556 0.7108434  item19 0.4931824 0.6649736 0.6267140 0.588 0.7710843  item20 0.4809629 0.6487450 0.6101331 0.360 0.7590361  item21 0.4821138 0.6465533 0.6076622 0.636 0.7108434  item22 0.4986890 0.3507230 0.2918030 0.452 0.3734940  item23 0.4674119 0.6894658 0.6553950 0.680 0.7590361  item24 0.4973827 0.6280022 0.5862493 0.440 0.7349398  item25 0.4821138 0.6187748 0.5776507 0.364 0.6867470  > descript(binary)  Descriptive statistics for the 'binary' data-set  Sample:  25 items and 250 sample units; 0 missing values  Proportions for each level of response:  Item Difficulty  0 1 logit  item1 0.556 0.444 -0.2249  item2 0.600 0.400 -0.4055  item3 0.512 0.488 -0.0480  …  item23 0.320 0.680 0.7538  item24 0.560 0.440 -0.2412  item25 0.636 0.364 -0.5580  Frequencies of total scores:  0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25  Freq 11 12 13 9 12 11 8 10 9 5 10 8 11 6 3 7 16 13 6 11 14 11 9 14 6 5  Point Biserial correlation with Total Score:  Item discrimination information  Included Excluded  item1 0.6312 0.5899  item2 0.6390 0.5989  item3 0.5806 0.5350  …  item23 0.6881 0.6541  item24 0.6267 0.5851  item25 0.6175 0.5765 |

2. Polytomous responses

[1] Dataset

polytomous.txt

25-item, 316-person

Codes as 0, 1, or 2

[2] R Script

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| ## Polytomous responses  # Import polytomous data (polytomous.txt)  polytomous <- read.table("C:\\ polytomous.txt",header=TRUE)  polytomous[1:10,]  # Item analysis with psychometric  item.exam(polytomous, discrim=F)  # Item analysis with ltm  descript(polytomous) |

[3] Result interpretations

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| > item.exam(polytomous, discrim=F)  Sample.SD Item.total Item.Tot.woi Difficulty Discrimination  item1 0.8038485 0.5734986 0.5190729 0.9620253 NA  item2 0.7746939 0.5617981 0.5085068 0.7246835 NA  item3 0.7192354 0.4568807 0.4005706 0.5126582 NA  item4 0.8615185 0.6346449 0.5820676 1.0253165 NA  item5 0.8556388 0.5831891 0.5259146 0.9651899 NA  item6 0.8372182 0.4950019 0.4317014 0.7879747 NA  item7 0.8108851 0.6097981 0.5581475 1.1107595 NA  item8 0.8056150 0.5776090 0.5234131 0.6993671 NA  item9 0.8185304 0.5362457 0.4776173 0.7753165 NA  item10 0.7849550 0.6307976 0.5828575 0.8417722 NA  item11 0.7558426 0.6082055 0.5601495 0.5981013 NA  item12 0.7187813 0.4982534 0.4445514 0.4715190 NA  item13 0.8070166 0.6644440 0.6184400 1.0949367 NA  item14 0.8260380 0.6698615 0.6232656 0.8734177 NA  item15 0.8162258 0.5003796 0.4391494 0.9177215 NA  item16 0.8284365 0.5959158 0.5417554 1.1234177 NA  item17 0.8516433 0.5818934 0.5247844 0.9303797 NA  item18 0.7782649 0.4835009 0.4240974 0.7120253 NA  item19 0.6625779 0.5529693 0.5071800 0.4525316 NA  item20 0.5768977 0.4579376 0.4132186 0.3037975 NA  item21 0.4340815 0.4279675 0.3935647 0.1835443 NA  item22 0.7728243 0.5834186 0.5320557 0.7310127 NA  item23 0.6781041 0.5862001 0.5416885 0.4778481 NA  item24 0.6009837 0.4389271 0.3913451 0.3291139 NA  item25 0.7655429 0.5072766 0.4505318 0.8101266 NA  ============================================================================================  > descript(polytomous)  Descriptive statistics for the 'polytomous' data-set  Sample:  25 items and 316 sample units; 0 missing values  Item difficulty can be calculated based on the proportions for each item.  Proportions for each level of response:  0 1 2  item1 0.3418 0.3544 0.3038  For “item1” as an example, the item difficulty (item mean score) can be calculated as follows:  (0 X 0.3418) + (1 X 0.3544) + (2 X 0.3038) = 0.962  item2 0.4747 0.3259 0.1994  item3 0.6203 0.2468 0.1329  …  item23 0.6266 0.2690 0.1044  item24 0.7405 0.1899 0.0696  item25 0.4051 0.3797 0.2152 |