# SOS3003
# Examination question 2

Fall 2009

Erling Berge



## FALL 2009 QUESTIONS

- Both questions use data from Malawi collected during field work in 2007. The data come from long interviews and questionnaire forms collected from 270 households plus some additional informers. The data also comprise trust game data from 267 pairs of players. In the present questions we use data from the trust game. More on the sample and variables is presented below.

# QUESTION 2

- In the same study as used above eight questions were asked about mistrust of people, and 14 about mistrust of institutions. It was assumed that there was at least one underlying trust-dimension responsible for the pattern of responses. To explore this question a principal component analysis was performed. In the analysis 16 of the 22 questions about mistrust were used.
- **a) Discuss the number of underlying dimensions and their meaning as far as attached tables allow.**



# Background

- The principal component analysis within the factor analysis framework allows the construction of indexes. It does not require many assumptions. It is sufficient that the variables can be used to compute Pearson correlations. It is fairly common to use as a device for detecting underlying attitude dimensions in a series of attitude questions. In this case we have a series of questions about trust and suspects that there are in reality a small number of more basic personality traits that shape the patern of responses from each individual.

# Principal components analysis

- The principal component analysis transforms K variables into K components in a way that maximizes the amount of explained total variance in the first component, then finds a component orthogonal to this explaining a maximum of the remaining variance. In this way K components are extracted. We want to determine how many to retain as indexes representing the original variables.



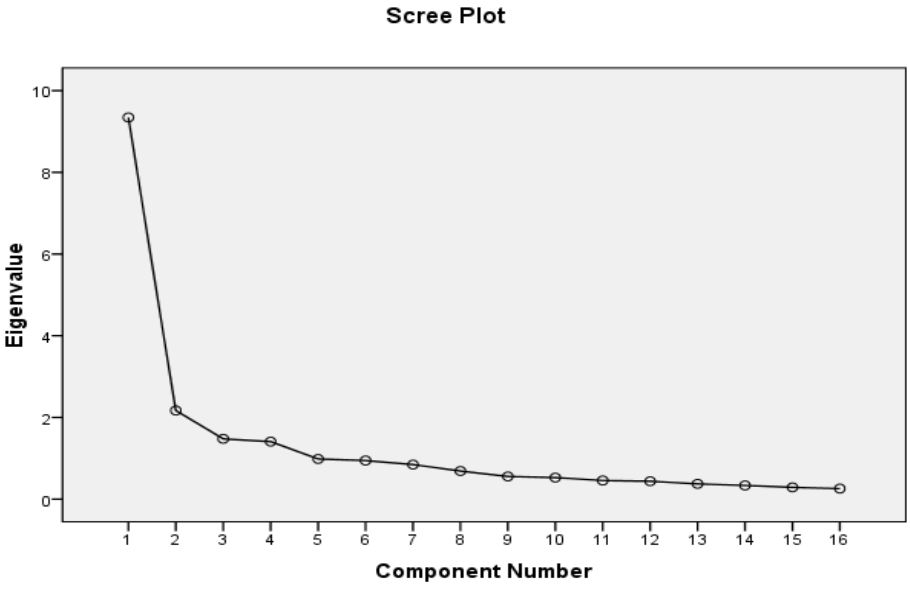
**Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 6.545 | 40.905 | 40.905 | 6.545 | 40.905 | 40.905 | 2.937 | 18.355 | 18.355 |
| 2 | 1.617 | 10.108 | 51.013 | 1.617 | 10.108 | 51.013 | 2.738 | 17.112 | 35.467 |
| 3 | 1.332 | 8.323 | 59.335 | 1.332 | 8.323 | 59.335 | 2.534 | 15.837 | 51.304 |
| 4 | 1.131 | 7.066 | 66.402 | 1.131 | 7.066 | 66.402 | 2.416 | 15.097 | 66.402 |
| 5 | .859 | 5.369 | 71.771 | | | | | | |
| 6 | .743 | 4.642 | 76.413 | | | | | | |

# Number of components

- The usual approach is to look at the eigenvalues of the components. The sum of eigenvalues add up to the number of standardized variables where each variable has a variance of 1. Hence components with eigenvalues less than 1 explain less variance than one variable. It does not seem fruitful to keep components contributing that little to the explanation of the total variance.
- In the table above we see that only the 4 first components have eigenvalues above 1.
- In the scree plot this corresponds to a levelling off in the eigenvlues after component no 4. The conclusion is that one at a maximum may retain 4 components to explain 66.4% of the variance of the original 16 variables.





# What have we found?

- To justify 4 components they have to provide some substantial information. To find the meaning of the four components it is usually helpful to rotate them to simple structure. This is done in the varimax procedure.



Rotated Component Matrix[a]

| | Rescaled Component | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| M2.d. Mistrust in Traditional Authorities | .185 | **.853** | .142 | .133 |
| M2.e. Mistrust in group village headmen | .248 | **.866** | .155 | .145 |
| M2.f. Mistrust in village headmen | .163 | **.764** | .333 | .247 |
| M2.j. Mistrust in police | .293 | .425 | .050 | **.597** |
| M2.k. Mistrust in traders | .215 | .074 | .130 | **.868** |
| M2.l. Mistrust in teachers | .099 | .437 | .408 | **.465** |
| M2.m.Mistrust in school administrators | .121 | .372 | .426 | **.546** |
| M2.n. Mistrust in religious leaders | .109 | .321 | **.616** | .222 |
| M3.a. Mistrust in family members | .205 | .172 | **.654** | .031 |
| M3.b. Mistrust in relatives | .222 | .014 | **.803** | .122 |
| M3.c. Mistrust in people in own village | .496 | .181 | **.542** | .211 |
| M3.d. Mistrust in people outside the village | **.690** | .098 | .167 | .188 |
| M3.e. Mistrust in people of same ethnic group | **.808** | .233 | .252 | .043 |
| M3.f. Mistrust in people outside ethnic group | **.814** | .151 | .221 | .149 |
| M3.g. Mistrust in people from same church/mosque | .408 | .237 | **.511** | .100 |
| M3.h. Mistrust in people not from same church/mosque | **.796** | .154 | .146 | .178 |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. The component matrix is also called factor loading matrix

# Correlating variables and components: factor loadings

- The rotated component matrix provides the most easily interpreted link between dimensions (components) and variables. The coefficient on each factor tells how much that factor affects the value of a variable. The higher the coefficient the more it affects the size of the variable. These coefficients are in factor analysis called factor loadings. Technically they are standardized regression coefficients meaning that they are also correlations
- Taking their square provides a measure of the proportion of the variance that a factor accounts for. To determine which variables correlate highly with each factor we take a look at the factor loadings larger than 0.5.



# Interpretation

- The first factor correlates mostly with indicators of mistrust in people from outside the local village, the second correlates with indicators of mistrust in traditional authorities, the third factor correlates with indicators of mistrust in local people and religious leaders, and the forth factor correlates with indicators of mistrust in modern authorities.
- Mistrust in teachers is somewhat ambiguous in this picture by correlating moderately with 3 factors, but mostly with modern authorities. It may seem to correspond to the kind of social reality they live in. They are a bit of every group except outsiders.