5^{th} practice sheet multivariate methods II

Helmut Waldl

summer term 2012

17. Show: If we are using $\mathbf{Z} \approx \mathbf{F}_1 \mathbf{l}_1^T$ as a first approximation for $\mathbf{Z}$ where $\mathbf{F}_1$ is the first principal component of $\mathbf{Z}$ then the sum of the empirical variances is $p - \lambda_1$.

18. Use the data of exercise 15) and compute a ML factor analysis. For a first determination of the number of factors k use a Scree plot. The finally used number of factors should be determined with Bartlett's significance inspection (see exercise 15). Determine the estimates of the loading matrix $\hat{L}$ and of the matrix of the specific variances $\hat{V}$.
    Hint: During the iteration procedure there might occur numerical difficulties which stop the iterations. To prevent an abortion of the program in the case of communalities > 1 (Heywood case) set the communalities greater then 1 to a value of 1.

19. Use the data of exercise 15) and compute a factor analysis with $k = 3$ factors following

    (a) the principal component analysis.

    (b) the principal factor analysis where the communalities are estimated with the multiple correlation coefficient ρ_j^2.

    (c) the **iterated** principal factor analysis with communality estimates on the basis of ρ_j^2. Set the maximal number of iterations to 50.

    Compare the results among each other and with the results of the ML factor analysis.

20. Rotate the results of the factor analyses of exercises 18) and 19) each with one convenient orthogonal **and** with one oblique rotation method and compare the results.