

Chapter VIII

Principal Component Analysis Using the Factor Procedure

ABSTRACT

This chapter describes the factor procedure. The first section of the chapter begins with the definition of factor analysis. This is the statistical techniques whose common objective is to represent a set of variables in terms of a smaller number of hypothetical variables (factor). ACA uses principal component analysis to group authors into several categories with similar lines of research. We also present many different approaches of preparing datasets including manual data inputs, in-file statement, and permanent datasets. We discuss each of the key SAS statements including DATA, INPUT, CARDS, PROC, and RUN. In addition, we examine several options statements to specify the followings: method for extracting factors; number of factors, rotation method, and displaying output options.

INTRODUCTION

This chapter describes principal component analysis using the factor procedure in the SAS system. The first section of the chapter explains why ACA uses principal component analysis of the factor procedures in the SAS system. In addition, the chapter discusses the following topics.

- Overview of Input, Procedures, and Outputs of ACA SAS Analysis
- Definition of Factor Analysis
- Getting the Data into a SAS Data Set
- Preparing an ACA Proc Factor Program
- Processing the Inputs
- Interpreting the Factor Procedure Outputs

Numerous multivariate analysis tools exist. The appropriate research methods are determined by three important questions regarding the characteristics of the variables under study (Cooper & Emory, 1995, p. 521).

1. Are there dependent variables in the problems?
2. Is there more than one dependent variable?
3. Are the variables metric or nonmetric?

The variables in author cocitation analysis are the authors. The author is defined as “a body of writings by a person” or “a body of contributions by a person.” The term “a person” refers to a single author or one of multiple authors. Authors are not dependent on each other, although one author may exercise some influence on other authors. The second important question is whether the variables are metric (quantitative) or nonmetric (qualitative). Metric variables are measured by ratio and interval measurements; nonmetric variables refer to data that are nominal or ordinal. Nominal data indicate classes and categories that are not measurable by the quantitative units such as kg, meter, miles, pounds, frequency, etc. Examples of nominal data include an individual’s religion, nationality, gender, marital status, union membership status, etc. Since our data has no dependent variables and is metric data, three multivariate analysis tools are applied in this research: factor analysis, cluster analysis and multidimensional scaling.

All three techniques used in the ACA aim at grouping/classifying all variables into several subgroups with common underlying hidden structures, characteristics and/or attributes. The hidden structures/characteristics/attributes are given different terms: factors in factor analysis, clusters in cluster analysis, and dimensions in multidimensional scaling. Although all three techniques seek to summarize/simplify a large number of variables, there are some distinctive differences among these techniques. The basic concepts and some differences among the three techniques are discussed in Chapters VIII, IX, and X.

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