Complex PCA in Customer Satisfaction studies

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Abstract

For a company, the knowledge of Customer Satisfaction (CS), regarding a given product or service, represents an important starting point for every business strategy. In order to measure CS many methods have been proposed: Servqual, Servperf etc. In many of these methods, the survey allows to have two sets of data collected in two fully matched matrices. In order to analyze this schema of data, a first solution consists in analyzing the two matrices separately using Principal Component Analysis (PCA). If we want to analyze the two matrices at the same time, we can performing a PCA on a new matrix obtained by horizontal juxtaposition of the two data matrices. Other more appropriate symmetrical and non symmetrical solutions, that allow to analyze the two sets of data jointly, are: Co-Inertia Analysis, Co-Structure Analysis and Partial Least Square (Vivien, 2001). The information obtained by means of the mentioned analysis is of different types, in order to have almost all the information embedded in only one analysis, it is possible to use Complex Principal Component Analysis (CPCA) (Horel, 1984). Let $(X; M, N)$ be a statistical triplet in which $X=P+iW$ of dimension $(n \times p)$ is the statistical units-variables data matrix of complex data, where P consists in the n consumer perceptions of the p service descriptors and W consists in the n consumer weights of the p service descriptors, M and N are hermitian matrices of dimension $(p \times p)$ and $(n \times n)$ respectively, measuring the distances among the individuals and the variables. We can analyze this statistical triplet by CPCA. The very important statement, that allows to extend the results of the PCA to the complex data matrix, is the following: the matrix $A=XNX'M$ $[X'MXN]$ is hermitian and positive. Starting from this proposal, it is possible to analyze the matrix X considering his decomplexification $R=\begin{bmatrix} P & -W \\ W & P \end{bmatrix}$ (Escoufier, Grourud, 1980). An application enhancing the interpretative gain of the results will concern the evaluation of CS.

References

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