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Theoretical Justification of Decision Rules for the Number of Factors: Principal Component Analysis as a Substitute for Factor Analysis in One-Factor Cases

Manabu Sato[1)2)] and Masaaki Ito[3)]

1) Center for Foundational Arts and Sciences, Faculty of Health Sciences, Hiroshima Prefectural College of Health Sciences
2) Current address: Graduate School of Information Sciences, Hiroshima City University
3) Graduate School of Engineering, Hiroshima University

Abstract: Applying principal component analysis as a substitute for factor analysis, we often adopt the following *greater-than-one rule* to decide the number of factors, k: *Take the number of eigenvalues of the correlation matrix that is greater than one*. Another approach to deciding k is based on *the scree graph*. In the present paper, the adequacy of these rules for one-factor cases is discussed. On the basis of obtained results, some recommendations for data analysis are given. Our approach to this study is based on the analytical expressions of eigenvalues under some simple but practical cases. In deriving theoretical results, we use *a representation of a polynomial in terms of a remainder sequence*. This technique is useful for finding the sign of polynomials under inequality constraints, so the idea is also introduced.

Key words: cubic equation, greater-than-one rule, number of factors, principal component analysis, representation of a polynomial in terms of a remainder sequence, scree test

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