**Anderson, T. W.**

**Estimating linear statistical relationships.** (English) Zbl 0542.62039

Ann. Stat. 12, 1-45 (1984).

This survey paper describes the statistical analysis of a collection of related models, defined as follows. For $i = 1, ..., n$ the observable p by vector $X_i$ is decomposed as $Z_i + U_i$, where the nonobservable $Z_i$ is the "systematic" part and the nonobservable $U_i$ is the "random error". The systematic part varies in a linear space of dimension less than p. Each component of $U_i$ has zero mean, and the covariance matrix of the components of $U_i$ is denoted by C. $U_1, ..., U_n$ are mutually independent and are independent of $(Z_1, ..., Z_n)$.

The cases discussed are given by the Cartesian product of the two sets of conditions (1,2) and (a,b,c):

(1) $Z_1, ..., Z_n$ are nonrandom parameters. (2) $Z_1, ..., Z_n$ are random.

(a) $C = \sigma^2 I$, where I is the p by p identity matrix and $\sigma^2$ is unknown. (b) C is diagonal but not necessarily equal to $\sigma^2 I$. (c) C is unrestricted, so that replicated observations are needed to estimate it.

Through most of the paper, it is assumed that the $U_i$ are normally distributed, and if the $Z_i$ are random they are normally distributed. Maximum likelihood estimators of the coefficients of the equations determining the linear space of $Z_i$ and of the components of C are derived and analyzed. Such estimators do not exist in some cases.

Reviewer: L.Weiss

**MSC:**

| | |
|---|---|
| 62H12 | Estimation in multivariate analysis |
| 62H25 | Factor analysis and principal components; correspondence analysis |
| 62-02 | Research exposition (monographs, survey articles) pertaining to statistics |



**Keywords:**

estimating linear statistical relationships; identification; rotation; principal component analysis; simultaneous equations models; survey paper; Maximum likelihood estimators

**Full Text:** DOI