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### Property of a matrix used in multidimensional scaling

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2. Biorn, E. & E.S. Jansen. Individual effects in a system of demand functions. *Scandinavian Journal of Economics* 85 (1983): 461-483.
3. Searle, S.R. & E.C. Townsend. Best quadratic unbiased estimation of variance components from unbalanced data in the 1-way classification. *Biometrics* 27 (1971): 643-657.

90.2.4. *Property of a Matrix Used in Multidimensional Scaling*, proposed by H.P. Boswijk and H. Neudecker. Multidimensional scaling is concerned with deriving information about a set of vectors  $\{x_1, \dots, x_n\}$  from their distances (see Chatfield and Collins [1980]). For that aim the following matrix is used:

$$B = -\frac{1}{2}NDN,$$

where

$$D = \{d_{ij}^2\} \quad \text{with } d_{ij} = ((x_i - x_j)'(x_i - x_j))^{1/2},$$

an  $n \times n$  matrix of squared Euclidian distances and

$$N = I_n - \frac{1}{n}ss' \quad \text{with } s = (1, \dots, 1)'$$

Prove that  $B$  is positive semidefinite.

REFERENCE

Chatfield, C. & A.J. Collins. *Introduction to Multivariate Analysis*. London/New York: Chapman and Hall, 1980.

90.2.5. *Optimal Structural Estimation of Triangular Systems: I. The Stationary Case*, proposed by P.C.B. Phillips. Consider the structural model

$$y_{1t} = \beta y_{2t} + u_{1t} \tag{1}$$

$$y_{2t} = \gamma' x_t + u_{2t} \tag{2}$$

where  $t = 1, \dots, n$ ,  $u_t = (u_{1t}, u_{2t})'$  is iid  $N(0, \Sigma)$  with covariance matrix  $\Sigma = \sigma^2 \Sigma_0$  and

$$\Sigma_0 = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$$

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