



THE UNIVERSITY OF  
CHICAGO

Department of Statistics

MASTER'S THESIS PRESENTATION

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Estimation of Large Covariance Matrices of Longitudinal Data  
Through Local Polynomial Regression

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Eckhart 117, 5734 S. University Avenue

#### ABSTRACT

The major difficulties in estimating a large unstructured covariance matrix are the high dimensionality and the positive definiteness constraint. To remove this obstacle, we first take advantage of the modified Cholesky decomposition of the covariance matrix. The covariance matrix is diagonalized by a lower triangular matrix constructed from the regression coefficients when each variable is regressed on its predecessors. It thus enables us to show the equivalence between estimation of covariance matrix and that of estimating a sequence of varying-coefficient and varying-order regression models. Fan & Zhang's (2000) two-step estimation of functional linear models is adopted as an illustration. We further propose nonparametric estimators of covariance matrices which are guaranteed to be positive definite. In selecting a suitable order for the sequence of regression, we use penalized likelihood criteria like AIC and BIC. We illustrate the methodology through a simulation study in which nonparametric covariance estimator outperforms the sample covariance matrix for large covariance matrices. A real data set is also analyzed to illustrate the methodology.

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