Centro de Investigación en Ingeniería Matemática

Universidad de Concepción

11th CI²MA Focus Seminar
"Recent Advances in Statistical Modeling Using Flexible Distributions"
Supported by Departamento de Estadística, CI²MA and Fondecyt 1130233.

January 07, 2016
Computer Laboratory, Departamento de Estadística, 5th floor
Facultad de Ciencias Físicas y Matemáticas, Universidad de Concepción

Organizer: Mauricio Castro

Programme

15.00 **Mauricio Castro** (Universidad de Concepción, Chile):
Influence assessment in censored mixed-effects models using the multivariate Student's-t distribution

15.45 **Clécio Da Silva Ferreira** (Universidade Federal de Juiz de Fora, Brasil):
Asymmetric distributions and its applications

16.30 **Reinaldo Arellano** (Pontificia Universidad Católica, Chile):
Bias reduction of maximum likelihood estimates for a modified skew normal distribution

17.15 **COFFEE BREAK**

17.30 **Alejandro Rodríguez** (Universidad de Talca, Chile):
A non parametric statistic for testing conditional heteroscedasticity

18.15 **Nora Serdyukova** (Universidad de Concepción, Chile):
Convergence rate under the "multi-index assumption in multiple regression models

20.30 **Seminar Dinner**

Practical information

Seminar participants who would like to join dinner should register with CI²MA secretary:

Ms Angelina Fritz, CI²MA
E-mail: `afritz@ci2ma.udec.cl`, Phone: (041) 2661324

11th CI^{2}MA Focus Seminar
Recent Advances in Statistical Modeling Using Flexible Distributions
Universidad de Concepción, January 7, 2016
Supported by CI^{2}MA and Fondecyt 1130233

INFLUENCE ASSESSMENT IN CENSORED MIXED-EFFECTS MODELS USING THE MULTIVARIATE STUDENT'S-t DISTRIBUTION

LUIS M. CASTRO

Abstract. In biomedical studies on HIV RNA dynamics, viral loads generate repeated measures that are often subjected to upper and lower detection limits, and hence these responses are either left- or right-censored. Linear and non-linear mixed-effects censored (LMEC/NLMEC) models are routinely used to analyze these longitudinal data, with normality assumptions for the random effects and residual errors. However, the derived inference may not be robust when these underlying normality assumptions are questionable, especially the presence of outliers and thick-tails. Motivated by this, [3] recently proposed an exact EM-type algorithm for LMEC/NLMEC models using a multivariate Student's-t distribution, with closed-form expressions at the E-step. In this paper, we develop influence diagnostics for LMEC/NLMEC models using the multivariate Student's-t density, based on the conditional expectation of the complete data log-likelihood. This partially eliminates the complexity associated with the approach of [1, 2] for censored mixed- effects models. The new methodology is illustrated via an application to a longitudinal HIV dataset. In addition, a simulation study explores the accuracy of the proposed measures in detecting possible influential observations for heavy-tailed censored data under different perturbation and censoring schemes.

This contribution is based on a joint work with L. Matos (Universidade Estadual de Campinas), D. Bandyopadhyay (Virginia Commonwealth University) and V. Lachos (Universidade Estadual de Campinas).

References

[1] R. Cook. Detection of influential observation in linear regression, *Technometrics*, 5–18, 1977.
[2] R. Cook. Assessment of local influence, *J. R. Stat. Soc. Ser. B.*, 48:133–169, 1986.
[3] L. Matos, M. Prates, M.-H. Chen, V. Lachos. Likelihood based inference for linear and nonlinear mixed-effects models with censored response using the multivariate-t distribution, *Statist. Sinica*, 23:1323–1345, 2013.
[4] L. Matos, D. Bandyopadhyay, L. M. Castro and V. Lachos. Influence assessment in censored mixed-effects models using the multivariate Student's-t distribution, *J. Mult. Anal.*, 141:104–107, 2015.

CI^{2}MA and Departamento de Estadística, Universidad de Concepción
E-mail address: luiscastroc@udec.cl

11th CI^{2}MA Focus Seminar
Recent Advances in Statistical Modeling Using Flexible Distributions
Universidad de Concepción, January 7, 2016
Supported by CI^{2}MA and Fondecyt 1130233

ASYMMETRIC DISTRIBUTIONS AND ITS APPLICATIONS

CLÉCIO DA SILVA FERREIRA

Abstract. Probability distributions for asymmetric data have been widely studied in recent years. In this talk, a class of asymmetric distributions, including the skew-normal distribution is presented, studying some of its properties and also reviewing the methods for parameter estimation. Applications of this class of distribution will be presented in the context of some statistical models, such as non-linear models, semi-parametric models, among others.

This contribution is based on a joint work with V. Lachos (Universidade Estadual de Campinas) and H. Bolfarine (Universidade Estadual de São Paulo).

References

[1] C. S. Ferreira, V. H. Lachos and H. Bolfarine. Multivariate Skew Scale Mixtures of Normal Distributions. Accepted for publication in *Advan. in Stat. Anal.*, 2015.

[2] C. S. Ferreira, V. H. Lachos and H. Bolfarine. Skew Scale Mixtures of Normal Distributions: Properties and Estimation. *Stat. Method.*, 8, 154–171, 2011.

Departamento de Estatística, Instituto de Ciências Exatas, Universidade Federal de Juiz de Fora

E-mail address: clecio.ferreira@ufjf.edu.br

11th CI^{2}MA Focus Seminar
Recent Advances in Statistical Modeling Using Flexible Distributions
Universidad de Concepción, January 7, 2016
Supported by CI^{2}MA and Fondecyt 1130233

BIAS REDUCTION OF MAXIMUM LIKELIHOOD ESTIMATES FOR A MODIFIED SKEW NORMAL DISTRIBUTION

REINALDO ARELLANO-VALLE

Abstract. This paper presents a modified skew-normal model that contains the normal model as a special case. Unlike the usual skew-normal model, the Fisher information matrix of the proposed model is always non-singular. Despite of this desirable property for the regular asymptotic inference, as with the skew-normal model, in the proposed model the divergence of the maximum likelihood estimator of the skewness parameter may occur with positive probability in samples with moderate sizes. As a solution to this problem, a modified score function is used for the estimation of the skewness parameter. The quasi-likelihood approach is considered to build confidence intervals. When the model includes location and scale parameters, the proposed method is combined with the unmodified maximum likelihood estimates of these parameters.

This contribution is based on a joint work with J. Arrue (Universidad de Antofagasta) and H. Gómez (Universidad de Antofagasta).

References

[1] J. Arrue, R. Arellano-Valle and H. Gómez. Bias reduction of maximum likelihood estimates for a modified skew normal distribution. Technical Report from Departamento de Estadística, Pontificia Universidad Católica de Chile, 2015.

Departamento de Estadística, Pontificia Universidad Católica de Chile
E-mail address: reivalle@mat.puc.cl

11th CI^{2}MA Focus Seminar
Recent Advances in Statistical Modeling Using Flexible Distributions
Universidad de Concepción, January 7, 2016
Supported by CI^{2}MA and Fondecyt 1130233

A NON PARAMETRIC STATISTIC FOR TESTING CONDITIONAL HETEROSCEDASTICITY

ALEJANDRO RODRÍGUEZ

Abstract. In the context of time series analysis, conditional heteroscedasticity has an important effect on the coverage of prediction intervals. Moreover, when prediction intervals are constructed using unobserved component models (UCMs), the problem increases due to the possible existence of several components that may or may not be conditional heteroscedastic, and consequently, the true coverage depends on the correct identification of the source of the heteroscedasticity. Proposals for testing heteroscedasticity have been applied to the auxiliary residuals of the UCM; however, in most cases, these procedures are unable, on average, to identify the heteroscedastic component correctly. The problem it that is being affected by the the presence of serial correlation in the series tested, as it is the case of the auxiliary residuals, consequently, the distribution of the statistic under the null hypothesis of conditional homoscedasticity is unknown; moreover it is not trivial to obtain analytical expressions for the autocorrelation functions of the square of the auxiliary residuals; therefore, the asymptotic distribution of the statistics used cannot be derived. We propose a non-parametric statistic for testing heteroscedasticity based on the well-known Wilcoxon?s rank statistic. We study the asymptotic validation of the statistics and consider bootstrap procedures for approximating its finite sample distribution. Simulation results show an improvement in the power and the size of the homoscedasticity tests.

This contribution is based on a joint work with R. Herrera (Universidad de Talca) and G. Pino Saldias (Universidad de Talca).

References

[1] A. Rodriguez, R. Herrera and G. Pino Saldias. A non parametric statistic for testing conditional heteroscedasticity. Technical Report from Departamento de Ingeniería Industrial, Universidad de Talca, 2015.

Departamento de Ingeniería Industrial, Universidad de Talca
E-mail address: alrodriguez@utalca.cl

11th CI^{2}MA Focus Seminar
Recent Advances in Statistical Modeling Using Flexible Distributions
Universidad de Concepción, January 7, 2016
Supported by CI^{2}MA and Fondecyt 1130233

CONVERGENCE RATE UNDER THE "MULTI-INDEX" ASSUMPTION IN MULTIPLE REGRESSION MODELS

NORA SERDYUKOVA

ABSTRACT. Suppose that, the multivariate regression function $F : \mathbb{R}^d \longleftarrow \mathbb{R}$ that we want to estimate presents a "multi-index" structure, that is $F(x) = f(\theta_1' x, \ldots, \theta_m' x)$ where $f : \mathbb{R}^m \longleftarrow \mathbb{R}$ with $m \leq d$. The vectors θ_j define an effective subspace where function F lives. The link function f and vectors θ_j are unknown. Results on the best order of convergence for nonparametric estimation under the "multi-index" are presented.

DEPARTAMENTO DE ESTADÍSTICA, UNIVERSIDAD DE CONCEPCIÓN
E-mail address: `nserdyukova@udec.cl`