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Improving mean estimation in ranked set sampling using the Rao regression-type estimator

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Abstract. Ranked set sampling is a statistical technique usually used for a variable of interest that may be difficult or expensive to measure, but whose units are simple to rank according to a cheap sorting criterion. In this paper, we revisit the Rao regression-type estimator in the context of the ranked set sampling. The expression of the minimum mean squared error is given and a comparative study, based on simulated and real data, is carried out to clearly show that the considered estimator outperforms some competitive estimators discussed in the recent literature.

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Key words and phrases. Auxiliary variable, order statistics, product-type estimators, ratio-type estimators, bivariate Normal distribution, simulation.

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A large class of new bivariate copulas and their properties

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Abstract. In this paper, we shall construct a large class of new bivariate copulas. This class happens to contain several known classes of copulas, such as Farlie–Gumbel–Morgenstern, Ali–Mikhail–Haq and Barnett–Gumbel, as its especial members. It is shown that the proposed copulas improve the range of values of correlation coefficient and thus they are more applicable in data modeling. We shall also reveal that the dependent properties of the base copula are preserved by the generated copula under certain conditions. Several members of the new class are introduced as instances and their range of correlation coefficients are computed.

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Diagnostics analysis for skew-normal linear regression models: Applications to a quality of life dataset

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Abstract. The skew-normal distribution has been used successfully in various statistical applications. The main purpose of this paper is to consider local influence analysis, which is recognized as an important step of data analysis. Motivated to simplify expressions of the conditional expectation of the complete-data log-likelihood function, used in the EM algorithm, diagnostic measures are derived from the case-deletion approach and the local influence approach inspired by Zhu et al. [*Biometrika* **88** (2001) 727–737] and Zhu and Lee [*J. R. Stat. Soc. Ser. B. Stat. Methodol.* **63** (2001) 111–126]. Finally, the results obtained are applied to a dataset from a study to evaluate quality of life (QOL) and to identify its associated factors in climacteric women with a history of breast cancer.

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Key words and phrases. Case-deletion, local influence, skew-normal distribution, approach, EM algorithm.

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Parameter estimation for discretely observed non-ergodic fractional Ornstein–Uhlenbeck processes of the second kind

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Abstract. We use the least squares type estimation to estimate the drift parameter $\theta > 0$ of a non-ergodic fractional Ornstein–Uhlenbeck process of the second kind defined as $dX_t = \theta X_t\,dt + dY_t^{(1)}$, $X_0 = 0$, $t \geq 0$, where $Y_t^{(1)} = \int_0^t e^{-s}\,dB_{a_s}$ with $a_t = He^{\frac{t}{H}}$, and $\{B_t, t \geq 0\}$ is a fractional Brownian motion of Hurst parameter $H \in (\frac{1}{2}, 1)$. We assume that the process $\{X_t, t \geq 0\}$ is observed at discrete time instants $t_1 = \Delta_n, \dots, t_n = n\Delta_n$. We construct two estimators $\hat{\theta}_n$ and $\check{\theta}_n$ of θ which are strongly consistent and we prove that these estimators are $\sqrt{n\Delta_n}$-consistent, in the sense that the sequences $\sqrt{n\Delta_n}(\hat{\theta}_n - \theta)$ and $\sqrt{n\Delta_n}(\check{\theta}_n - \theta)$ are tight.

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Key words and phrases. Drift parameter estimation, non-ergodic fractional Ornstein–Uhlenbeck process of the second kind.

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A Bayesian approach to errors-in-variables beta regression

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Abstract. Beta regression models have been widely used for the analysis of limited-range continuous variables. Here, we consider an extension of the beta regression models that allows for explanatory variables to be measured with error. Then we propose a Bayesian treatment for errors-in-variables beta regression models. The specification of prior distributions is discussed, computational implementation via Gibbs sampling is provided, and two real data applications are presented. Additionally, Monte Carlo simulations are used to evaluate the performance of the proposed approach.

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Key words and phrases. Bayesian analysis, beta distribution, beta regression, continuous proportions, errors-in-variables models.

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Sums of possibly associated multivariate indicator functions: The Conway–Maxwell-Multinomial distribution

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Abstract. The Conway–Maxwell-Multinomial distribution is studied in this paper. Its properties are demonstrated, including sufficient statistics and conditions for the propriety of posterior distributions derived from it. An application is given using data from Mendel's ground-breaking genetic studies.

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A note on weak convergence results for infinite causal triangulations

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Abstract. We discuss infinite causal triangulations and equivalence to the size biased branching process measure—the critical Galton–Watson branching process distribution conditioned on non-extinction. Using known results from the theory of branching processes, this relation is used to prove a novel weak convergence result of the joint length-area process of a infinite causal triangulations to a limiting diffusion. The diffusion equation enables us to determine the physical Hamiltonian and Green's function from the Feynman–Kac procedure, providing us with a mathematical rigorous proof of certain scaling limits of causal dynamical triangulations.

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Semiparametric quantile estimation for varying coefficient partially linear measurement errors models

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Abstract. We study varying coefficient partially linear models when some linear covariates are error-prone, but their ancillary variables are available. After calibrating the error-prone covariates, we study quantile regression estimates for parametric coefficients and nonparametric varying coefficient functions, and we develop a semiparametric composite quantile estimation procedure. Asymptotic properties of the proposed estimators are established, and the estimators achieve their best convergence rate with proper bandwidth conditions. Simulation studies are conducted to evaluate the performance of the proposed method, and a real data set is analyzed as an illustration.

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Weighted sampling without replacement

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Abstract. Comparing concentration properties of uniform sampling with and without replacement has a long history which can be traced back to the pioneer work of Hoeffding (1963). The goal of this note is to extend this comparison to the case of non-uniform weights, using a coupling between samples drawn with and without replacement. When the items' weights are arranged in the same order as their values, we show that the induced coupling for the cumulative values is a submartingale coupling. As a consequence, the powerful Chernoff-type upper-tail estimates known for sampling with replacement automatically transfer to the case of sampling without replacement. For general weights, we use the same coupling to establish a sub-Gaussian concentration inequality. As the sample size approaches the total number of items, the variance factor in this inequality displays the same kind of sharpening as Serfling (1974) identified in the case of uniform weights. We also construct an other martingale coupling which allows us to answer a question raised by Luh and Pippenger (2014) on sampling in Polya urns with different replacement numbers.

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Key words and phrases. Weighted sampling, sampling without replacement, concentration inequalities, convex order, martingale coupling.

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On Hilbert's 8th problem

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Abstract. A Hadamard factorisation of the Riemann ξ-function is constructed to characterize the zeros of the zeta function.

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