From the Editor

It is with great pleasure that we can announce the upgrading of Statistics in Transition new series (SiTns) in terms of points allocated by the Ministry of Education and Science to scientific journals, and by the same token, to the articles published in SiTns – from 40 to 70 points.

Also, the formal and legal relations with authors publishing in our journal will change as well – namely papers submitted from now on will be made available in the framework of Creative Commons Attribution-ShareAlike 4.0 (CC BY-SA 4.0) free licences. The practical implication of this is that the authors will retain all their copyrights, and the readers will be able to use the work according to the provisions of the licence. Authors will be granting the licence to the publisher of SiTns in a statement submitted along with the paper (the new statement form can be downloaded from https://sit.stat.gov.pl/ForAuthors).

The presented March issue contains 12 articles by authors from 13 countries: Turkey, India, Iran, Poland, Botswana, Jordan, Thailand, USA, Pakistan, Canada, Nigeria, Saudi Arabia, and Indonesia. We are convinced that such a geographic diversity adds to the value of also the thematically diversified problems discussed in the articles presented in our journal.

Invited paper

The issue starts with the Invited paper entitled ***Estimation of mask effectiveness perception for small domains using multiple data sources*** by **Aditi Sen** and **Partha Lahiri**. The paper discusses the impacts of pandemics on public health and related societal issues. Due to the fact that mask wearing is one of the few precautions against COVID-19, the authors develop a synthetic estimation method to estimate proportions of perceived mask effectiveness for small area using a logistic model that combines information from multiple data sources. The authors select the working model using an extensive data analysis facilitated by a new variable selection criterion for survey data and benchmarking ratios and propose a jackknife method to estimate variance of their proposed estimator. From the data analysis, it is evident that the proposed synthetic method outperforms direct survey-weighted estimator with respect to commonly used evaluation measures. To quantify people's perception of mask effectiveness and to prevent the spread of COVID-19 for small areas, the authors use Understanding America Study's (UAS) survey data on COVID-19 as the primary data source. The issue

of mask effectiveness perception is a critical one and helps in understanding the future impacts or spread of the disease at the state level. Wearing masks is undoubtedly one of the few and most effective precautionary measures.

Research articles

Aysegul Yabaci and **Deniz Sigirli** in their article ***Comparison of tree-based methods used in survival data*** present survival trees and forests as the popular non-parametric alternatives to parametric and semi-parametric survival models. The Conditional inference trees (Ctree), Conditional inference forests (Cforest) and Random survival forests (RSF) methods are discussed in detail and the performances of the survival forest methods, namely the Cforest and RSF have been compared with a simulation study. The results of the simulation demonstrate that the RSF method with a log-rank score distinction criteria outperforms the Cforest and the RSF with log-rank distinction criteria. As a result, it has been shown that the RSF method performs better than the Cforest. For both methods, it can be said that the Aalen estimator performs better than the other estimators. The performance of both methods was better when the proportional hazard assumption was not provided. In addition, the RSF method shows that the logrank distinction criteria, which is one of two different separation criteria, performs better than the logrank score distinction criteria.

The paper entitled ***Estimating the population mean using a complex sampling design dependent on an auxiliary variable*** by **Arijit Chaudhuri** and **Sonakhya Samaddar** starts with a view that the simplest strategy to estimate a population total without bias is to employ Simple Random Sampling (SRS) with replacement (SRSWR) and the expansion estimator based on it. Anything other than that including SRS Without Replacement (SRSWOR) and usage of the expansion estimator is a complex strategy. In the paper, the authors examine if from a complex sample at hand a gain in efficiency may be unbiasedly estimated comparing the "rival population total-estimators" for the competing strategies and how suitable model-expected variances of rival estimators compete in magnitude as examined numerically through simulations.

Mehdi Goldoust and **Adel Mohammadpour** discuss ***Generalized extended Marshall-Olkin family of lifetime distributions***. The authors introduce a new generalized class of lifetime distributions, called the LPS2 family of distributions, by compounding a lifetime and twice power series distributions in a serial and parallel structure. The new models extend several distributions widely used in the lifetime literature such as the exponential power series, Weibull power series, and complementary of exponential power series distributions. A mathematical treatment of the new distributions is provided, including ordinary and incomplete moments, quantile, moment generating and mean residual functions. The maximum likelihood

estimation technique is used to estimate the model parameters and a simulation study is conducted to investigate the performance of the maximum likelihood estimates. The authors perform a Monte Carlo simulation study to assess the finite sample behaviour of the maximum likelihood estimators. Some members of the LPS2 family are fitted to two real data sets to illustrate the usefulness of the new distributions. They provide better fits than other competing models consistently.

Barbara Kowalczyk's and **Robert Wieczorkowski's** article *New improved Poisson and negative binomial item count techniques for eliciting truthful answers to sensitive questions* is devoted to demonstrating how Item Count Techniques (ICTs) – pioneered by Miller – are working in the context of indirect survey questioning methods designed to deal with sensitive features. These techniques have gained the support of many applied researchers and encountered further theoretical development. The two new item count methods called Poisson and negative binomial ICTs were also proposed. However, if the population parameters of the control variable are not given from the outside source, the methods are not very efficient. In the paper the authors analyse best linear unbiased and maximum likelihood estimators of the population proportion of the sensitive attribute in the new introduced models. Theoretical results presented in the manuscript are supported by a comprehensive simulation study. The improved procedure allowed increasing efficiency of the estimation as compared to the original Poisson and negative binomial ICTs. In the article three new models are proposed: Poisson-Poisson neutral questions ICT, Poisson-negative binomial neutral questions ICT, and negative binomial-negative binomial neutral questions ICT. Newly proposed methods maintain privacy of respondents at the same level regarding the sensitive question. At the same time the three newly proposed techniques increase efficiency of the estimation, which is very important in indirect methods of questioning.

Broderick Oluyede, Thatayaone Moakofi, and **Fastel Chipepa** discuss a new class of distributions in the paper entitled *The odd power generalized Weibull-G power series class of distributions: properties and applications*. The authors develop a new class of distributions, namely the odd power generalized Weibull-G power series (OPGW-GPS) class of distributions and present some special classes of the proposed distribution. Structural properties have also been derived. The authors conducted a simulation study to evaluate the consistency of the maximum likelihood estimates. Moreover, two real data examples on selected data sets were provided to illustrate the usefulness of the new class of distributions. The proposed model outperforms several non-nested models on selected data sets. Furthermore, from the results shown in the manuscript, the authors conclude that the OPGW-WP distribution is indeed a better model compared to several selected models since it is associated with the lowest values for all the the goodness-of-fit statistics (and the largest p-value for the K-S statistic).

In the next paper, ***A modified robust confidence interval for the population mean of distribution based on deciles,*** a new approach to estimating the population mean of a skewed distribution is considered by **Moustafa Omar Ahmed Abu-Shawiesh, Juthaphorn Sinsomboonthong**, and **B. M. Golam Kibria**. Acknowledging that the confidence interval is an important statistical estimator used to estimate the population location and dispersion parameters, the authors look for a robust modified confidence interval building upon an adjustment of the Student's t confidence interval based on the decile mean and decile standard deviation for estimating the population mean of a skewed distribution. The efficiency of the proposed interval estimator is evaluated using an extensive Monte Carlo simulation study. The coverage ratio and average width of the proposed confidence interval are compared with some existing, widely used confidence intervals. The simulation results show that, in general, the proposed interval estimator performs significantly well. For illustration purposes, three real-life data sets are analyzed, which support the findings obtained from the simulation study to some extent. Consequently, the authors recommend practitioners using the robust modified confidence interval for estimating the population mean when the data is generated by a normal or skewed distribution.

The paper entitled ***Estimation procedures for reliability functions of Kumaraswamy-G Distributions based on Type II Censoring and the sampling scheme of Bartholomew*** by **Aditi Chaturvedi** and **Surinder Kumar** discusses Kumaraswamy-G distributions and derive a Uniformly Minimum Variance Unbiased Estimator (UMVUE) and a Maximum Likelihood Estimator (MLE) of the two measures of reliability, namely $R(t) = P(X > t)$ and $P = P(X > Y)$ under Type II censoring scheme and sampling scheme of Bartholomew (1963). Authors also develop interval estimates of the reliability measures. A comparative study of the different methods of point estimation has been conducted on the basis of simulation studies. An analysis of a real data set has been presented for illustration purposes. The paper focuses on developing classical estimators for different parameters and reliability functions of Kumaraswamy-G distributions under various sampling schemes and investigating their properties. However, an interesting alternative to MLE and UMVU estimators can be provided by the empirical Bayes approach or ML-II estimators based on the robust Bayesian approach of Shrivastava et al..

The paper by **Jakub Janus** entitled ***Long-term sovereign interest rates in Czechia, Hungary and Poland: a comparative assessment with an affine term structure model*** provides a comparative evaluation of the behaviour of long-term sovereign yields in Czechia, Hungary and Poland from 2001 to 2019. An affine term structure model developed by Adrian, Crump and Moench (2013) is used as an empirical framework for the decomposition of the bond yields into term premium and risk-neutral

components. The paper aimed to examine the sovereign 10-year bond yields in three Central European economies: Czechia, Hungary, and Poland, from 2001 to 2019. The ACM term structure to extract time-varying risk-neutral and term premium components were developed. The evolution of these components, along with their relative role in driving the actual interest rates were discussed. The international comovements of 10-year yields between the CE economies and Germany was studied, and as an extension the baseline term structure model was corrected.

Uzma Yasmeen, Muhammad Noor-ul-Amin, and **Muhammad Hanif** in their article focus on *Variance estimation in stratified adaptive cluster sampling*. In many sampling surveys, the use of auxiliary information at either the design or estimation stage, or at both these stages is usual practice. Auxiliary information is commonly used to obtain improved designs and to achieve a high level of precision in the estimation of population density. Adaptive cluster sampling (ACS) was proposed to observe rare units with the purpose of obtaining highly precise estimations of rare and specially clustered populations in terms of least variances of the estimators. This sampling design proved to be more precise than its more conventional counterparts, including simple random sampling (SRS), stratified sampling, etc. In this paper, a generalised estimator is anticipated for a finite population variance with the use of information of an auxiliary variable under stratified adaptive cluster sampling (SACS). The bias and mean square error expressions of the recommended estimators are derived up to the first degree of approximation. A simulation study showed that the proposed estimators have the least estimated mean square error under the SACS technique in comparison with variance estimators in stratified sampling.

The last article prepared by **Akeem Ajibola Adepoju, Sauta S. Abdulkadir, Danjuma Jibasen**, and **Haruna Chiroma** propose *Interval Type-2 fuzzy Exponentially Weighted Moving Average Control Chart*. The paper aims to develop an Interval Type-2 fuzzy Exponentially Weighted Moving Average Control Chart (IT2FEWMA) under the fuzzy type-2 condition. This development will facilitate monitoring small and moderate shifts in the production process in conditions of uncertainty. The manuscript extends the control limits of the classical control chart of the exponentially weighted moving average (EWMA). The IT2FEWMA is advantageous over the classical EWMA due to its flexibility over the control limits, but it is not capable of detecting a big shift in the process due to the fact that classical EWMA does not have such capacity too. This article is a new addition to the existing Statistical Process Control Tools. It is useful when the process engineer needs to monitor a process whose measurement is obtained in fuzzy environment and a small shift needs to be detected.

Research Communicates and Letters

The Research Communicates & Letters section presents a paper by **Anna Islamiyati, Raupong, Anisa Kalondeng**, and **Ummi Sari** entitled *Estimating the confidence interval of the regression coefficient of the blood sugar model through a multivariable linear spline with known variance*. The estimates from confidence intervals are more powerful than point estimates, because there are intervals for parameter values used to estimate populations. In relation to global conditions, involving issues such as type 2 diabetes mellitus, it is very difficult to make estimations limited to one point only. Therefore, in this article, the authors estimate confidence intervals in a truncated spline model for type 2 diabetes data. They use a non-parametric regression model through a multi-variable spline linear estimator. The use of the model results from the irregularity of the data, so it does not form a parametric pattern. Subsequently, the authors obtained the interval from beta parameter values for each predictor. Body mass index, HDL cholesterol, LDL cholesterol and triglycerides all have two regression coefficients at different intervals as the number of the found optimal knot points is one. This value is the interval for multivariable spline regression coefficients that can occur in a population of type 2 diabetes patients.

Włodzimierz Okrasa
Editor