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Report

The XXXVIII Conference on Multivariate Statistical Analysis 4–6 November 2019, Łódź, Poland

The 38th edition of the International Conference on Multivariate Statistical Analysis (MSA) was held in Łódź, Poland, on November 4-6, 2019. The MSA conference was organized by the Department of Statistical Methods of the University of Łódź, the Institute of Statistics and Demography of the University of Łódź, the Polish Statistical Association, Branch in Łódź and the Committee on Statistics and Econometrics of the Polish Academy of Sciences. The conference organization was financially supported by the National Bank of Poland, the Polish Academy of Sciences and the Ministry of Science and Higher Education[1].

The Scientific Committee was headed by Professor Czesław Domański and the Organizing Committee consisted of members: Aleksandra Baszczyńska, Assistant Professor from the Department of Statistical Methods of the University of Łódź and Katarzyna Bolonek-Lasoń, Assistant Professor from the Department of Statistical Methods of the University of Łódź.

The Multivariate Statistical Analysis conference constituted a forum for discussion and exchanging opinions about development of statistics. Participants presented the latest theoretical achievements in the field of the multivariate statistical analysis, its practical aspects and applications. The scientific programme covered a wide range topics of statistical mathematics and multivariate statistical methods including multivariate distributions, statistical tests, nonparametric inference, factor analysis, cluster analysis, discrimination analysis, Bayesian methods, stochastic analysis and application of statistical methods in finance, economy, capital market and risk management.

The conference was attended by 72 participants from many academic centres in Poland (Gdańsk, Katowice, Kraków, Łódź, Poznań, Rzeszów, Szczecin, Warszawa, Wrocław) and from abroad (Germany, Italy). Representatives of Statistics Poland and Statistical Office in Łódź, Statistical Office in Poznań and Statistical Office in Rzeszów

[1] Organization of the international conference "Multivariate Statistical Analysis 2019 (MSA 2019)" – task financed under contract 712 / P-DUN/202019 from the funds of the Minister of Science and Higher Education allocated to the dissemination of science.

were also participants of the 2019 MSA conference. In 15 sessions (plenary and parallel) 42 papers were presented including 4 invited lectures.

The conference was opened by the Head of the Scientific Committee, Professor Czesław Domański. The subsequent speakers at the conference opening were Professor Antoni Różalski, Rector of the University of Łódź, and Professor Michał Przybyliński, the Vice Dean – Education and Student Affairs of the Faculty of Economics and Sociology of the University of Łódź.

The chairman of the session Czesław Domański opened the first plenary session with two papers. The first one was an invited lecture entitled "Optimal sample allocation in stratified sampling schemes – linear algebra methods and algorithms" and it was presented by Professor Jacek Wesołowski (Statistics Poland, Warsaw University of Technology). The description how methods of linear algebra (eigenvectors and eigenvalues of a population based matrix) can be used in order to determine such sample allocations in stratified schemes which are domains-wise optimal was presented. The second paper "Kernel discriminant coordinates in the case of geographically weighted temporal-spatial data with variable selection" presented by Professor Mirosław Krzyśko (Adam Mickiewicz University Poznań) where the extension of a method developed by Mika et al. (1999) as well as Baudat and Anouar (2000) in kernel discriminant coordinates analysis for fixed vector data is used.

The second session (chairman Professor Mirosław Krzyśko) was a historical one with papers devoted to two important statisticians: Jakub Kazimierz Haur (a paper presented by Professor Czesław Domański) and Marcin Kromer (a paper presented by Professor Jerzy T. Kowaleski, University of Łódź).

In the third reminiscent session (chairman Professor Czesław Domański), the conference participants recalled outstanding statisticians who died last year. Professor Krystyna Katulska was commemorated by Professor Mirosław Krzyśko, Professor Mirosław Krzysztofiak was commemorated by Ewa Wycinka (University of Gdańsk), Professor Józef Kolonko by Professor Janusz Wywiał (University of Economics in Katowice), Professor Stanisław Wydmus and Professor Michał Major by Professor Stanisław Wanat (Cracow University of Economics).

During the conference other invited lectures were presented:

- "Selected aspects of households' well-being measurement" by Professor Józef Dziechciarz (Wroclaw University of Economics and Business), where an attempt to review problems and methodological proposals for measuring households' well-being was presented.
- "Advances in learning from contaminated datasets" by Professor Francesca Greselin (University of Milan-Bicocca, Italy), with an introduction into a robust

and adaptive version of the Discriminant Analysis rule, capable of handling situations in which one or more of the afore-mentioned problems occur.

- "A new virtual library containing interactive learning objects for statistics education" by Professor Hans-Joachim Mittag (University of Hagen, Germany), with presentation of project activities aiming at developing interactive learning objects for statistics education.

Papers presenting the latest theoretical achievements in the field of the multivariate statistical analysis are the following:

- Andrzej Bąk, "Methods of imputation of missing data using the R program on the example of the Local Data Bank", with results of attempts to apply supplementing missing data using methods proposed in the literature and packages of the R program.
- Katarzyna Budny, "Multivariate Chebyshev's inequality – some bounds on the probability of a random vector taking values in the Euclidean ball", where some multivariate generalizations of Chebyshev's inequality with the bounds on the probability of a random vector taking values in the Euclidean ball, expressed by the moments of a random vector based on the definition of the power of a vector are proposed.
- Anna Denkowska, Stanisław Wanat, "Linkages and systemic risk in the European insurance sector: Some new evidence based on dynamic spanning trees", with presentation of the analysis results of linkage dynamics and systemic risk in the European insurance sector, which are obtained using correlation networks.
- Czesław Domański, "Some remarks about normality tests based on characteristics of stochastic processes", with some results on normality tests.
- Wojciech Gamrot, „On Likert scale and regression coefficient", where an approach of using the Likert scale variables in statistical surveys with closed questions is considered.
- Grzegorz Kończak, "On permutation multivariate extension of McNemar test", with the proposal of the extension of the well-known McNemar test based on data from k ($k > 2$) samples.
- Jerzy Korzeniewski, "Determining semantic relatedness of concepts – modifications proposals", with presenting the modification of the Leacock and Chodorow method in determining the semantic relatedness of concepts.
- Małgorzata Krzciuk, "On EBLUP under some linear mixed model with correlated random effects", with considerations on the problem of small area prediction under a linear mixed model with presenting results of the Monte Carlo simulation analyses based on real data from the Local Data Bank of Statistics Poland.

- Dominika Polko-Zając, "On permutation tests for comparing multidimensional populations", with presentations of a permutative, simultaneous procedure for identifying differences between the vectors of average values and the variance-covariance matrices in two studied populations.
- Dominik Sieradzki, Wojciech Zieliński, "Sample allocation in estimation of proportion in finite populations", where comparison of precision of estimation depending on chosen sample allocation for new proposed method and Neyman allocation and proportional allocation is presented.
- Agnieszka Stanimir, "Multivariate statistical methods in the analysis of multiple responses questions", with presentation of the possibility of using multivariate statistical methods in the analysis of questions with multiple choices of responses.
- Piotr Sulewski, "Recognizing distributions rather than goodness-of-fit testing", where the idea of recognizing distributions rather than carrying out classic goodness-of-fit tests based on the measure of discrepancy is considered.
- Krzysztof Szymoniak-Książek, "Properties of nonparametric isotropy tests" focusses on the discussion of properties of nonparametric significance tests verifying random field isotropy hypothesis.
- Janusz L. Wywiał, Grzegorz Sitek, "On variance of sample matrix eigenvalue", where the estimator being a function of simple random sample variances and covariances of a multidimensional random variable whose distribution is not necessarily normal is regarded.
- Artur Zaborski, "Triads or tetrads? Comparison of incomplete methods for measuring similarity in preferences" with the comparison of the two incomplete methods for measuring the similarity of preferences, i.e. the triad method and the tetrad method.
- Tomasz Żądło, "On generalization of Quatember's bootstrap", where a generalization of the Quatember algorithm is proposed with the study on the properties of the proposal with recent competitors.

Papers presenting practical aspects as well as theoretical ones in the field of the multivariate statistical analysis are the following:

- Maciej Beręsewicz, Katarzyna Zadroga, "Estimation of the number of illegally residing foreigners in Poland in 2017–2018 using Bayesian non-linear mixed count regression models" focuses on estimating the number of foreigners residing illegally in Poland in 2017–2018, where the Bayesian non-linear mixed model for count data was proposed, depending solely on the aggregated data reported by the Border Guards, the Police and in the PESEL register.

- Michał Bernardelli, "Identification of turning points in time series from the cryptocurrency market" with the investigation of the possibility of using the hidden Markov models and Viterbi paths for the analysis of one-dimensional price series from the cryptocurrency market.
- Jacek Białek, "Chain drift problem in the CPI measurement based on scanner data" with presentation of some simulation results which show the situations on the market leading to the biggest chain drift bias if the index differs from unity when prices revert back to their base level.
- Beata Bieszk-Stolorz, "Selected models of recurrent events in the assessment of the risk of re-registration in the labour office" with the analysing of the risk of subsequent registrations in the labour office depending on selected characteristics of the unemployed: gender, age, education and seniority.
- Second Bwanakare, Marek Cierpiał-Wolan, "Generalised Cross-Entropy Econometrics vs conflicting cross-border (Big) data sources. National accounts updating", where the proposal of an efficient approach to combining data from various sources and a comparison of the results with the traditional technique applied in official statistics are presented.
- Grażyna Dehnel, Marek Walesiak, "An assessment of social cohesion of Poland's provinces based on classic and interval-valued data" focusses on the description of a comparative analysis of results of assessing social cohesion with two assessment criteria: cluster analysis to identify similarities and differences in the ranking of provinces, and the analysis of the degree to which different rankings of objects with respect to specific variables correspond to those obtained by using the aggregate measure for 4 datasets.
- Małgorzata Graczyk, Bronisław Ceranka, "Some remarks about highly D-efficient spring balance weighing designs", with consideration of a new construction method of determining highly D-efficient spring balance weighing designs in classes in which D-optimal design does not exist.
- Małgorzata Graczyk, Bronisław Ceranka, "New results regarding the construction method of D-optimal chemical balance weighing designs", where the study of the experiment in that determination of the unknown measurements of p objects in n weighing operations according to the model of the chemical balance weighing design is presented.
- Wioletta Grzenda, "Bayesian multinomial logit models for disordered categories in the analysis of the situation of young people in the labour market in Poland" focusses on the binomial logit model used in the analysis of the situation of respondents in the labour market with special attention paid to inequalities in the labour market in Poland and the problem of saturation of this market with university graduates.

- Stanisław Jaworski, "Some remarks about estimation of Polish unemployment rate", where the discussion on the estimation of unemployment rate by using structural time series model is presented.
- Alina Jędrzejczak, Kamila Trzcińska, "Application of the Zenga Distribution to the analysis of household income in Poland by socio-economic group" with the results of the calculations confirming that the Zenga distribution is a good income distribution model, which can be successfully applied to income inequality analysis and income distribution comparisons.
- Adam Juszczak, "Application of web-scrapping in inflation measurement", where both positive and negative aspects of web-scraping usage in the Consumer Price Index Calculation (CPI) are considered.
- Marta Małecka, "Asymptotic Properties of Duration-Based VaR Backtests" focusses on applying the non-standard likelihood ratio properties, especially a generalized geometric VaR test, with presenting its asymptotic distribution.
- Iwona Markowicz, Paweł Baran, "Divergences in intra-Community trade: the case of Poland" deals with the analysis of data discrepancies in Polish trade in relations: Poland–EU country (bilateral relations) and Poland–EU countries (country–countries relationship, called an aggregate).
- Aneta Ptak-Chmielewska, "Application of multidimensional classification to prediction of SME", with a comparison of the effectiveness of linear discriminant analysis with multidimensional discrimination, such as support vector machines.
- Elżbieta Roszko-Wójtowicz, Maria M. Grzelak, "Innovation activities and competitiveness of manufacturing divisions in Poland in the years 2009–2017", where measuring and assessing the impact of innovative activity on the competitiveness of manufacturing divisions are presented using both static lagged panel models and dynamic panel models.
- Grażyna Trzpiot, "Seniors in cities and senior friendly cities analysis for selected Polish cities" focusses on the results of a study assessing selected Polish cities as senior-friendly cities, using the robust taxonomic approach.
- Łukasz Wawrowski, "Impact of dependent variable transformation on poverty rate estimates in poviats" presenting the results of the estimation of headcount ratio at LAU 1 level in Poland that was possible through the use of data from the EU-SILC and The Polish Census of Population and Housing and indirect estimation methods.
- Ewa Wycinka, Beata Jackowska, "Competing risks models in estimation of companies life time" focuses on the proposal of the use of estimators (the naive Kaplan-Meier estimator, the Aalen-Johansen estimator and the IPCW estimator)

which take into account the type of event in modelling the distribution of enterprise existence time.

- Łukasz Ziarko, "On the possibility of using association analysis to describe the behaviour of contractors in public tenders" with the presentation of the application of association analysis (basket analysis) described in the literature to identify illegal agreements concluded between the applicants for public procurement and evaluation of the proposed approach.

The XXXVIII conference on Multivariate Statistical Analysis 2019 was closed by the Head of the Scientific Committee, Professor Czesław Domański, who summarized the conference and thanked the guests for arriving and taking active participation in the conference. The next edition of MSA 2020 conference is planned for November 16–18, 2020 and will be held in Łódź, Poland.

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