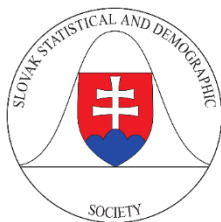


BOOK OF ABSTRACTS

28th AMSE

Applications of Mathematics and Statistics in Economics

2026



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Wrocław University of Economics and Business, Faculty of Economics and Finance, Poland

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FOREWORD

Dear colleagues and friends,

It is my great pleasure to welcome you to the 28th International Scientific Conference Applications of Mathematics and Statistics in Economics (AMSE 2026), held in the city of Martin, Slovakia.

For nearly three decades, AMSE has evolved into an established international forum where mathematics, statistics, and economics converge to address the increasingly complex challenges of today's world. Built upon the long-standing partnership between Prague University of Economics and Business, Matej Bel University in Banská Bystrica, and Wrocław University of Economics and Business, the conference has fostered a vibrant scientific community characterised by excellence, international cooperation, and lasting professional relationships. Today, this tradition continues to grow, bringing together established scholars and the next generation of researchers in quantitative economics.

The contributions presented at AMSE 2026 clearly demonstrate that quantitative methods have never been more relevant. Artificial intelligence, digital transformation, sustainable development, demographic change, financial stability, and evidence-based public policy all require sophisticated analytical tools capable of transforming data into reliable knowledge. The abstracts collected in this volume illustrate how mathematical modelling, econometrics, statistical analysis, optimisation, and data science contribute to the understanding of these challenges.

The scientific programme this year reflects both methodological innovation and practical relevance. Alongside developments in

artificial intelligence, official statistics, and digital technologies, participants address issues of macroeconomic dynamics, insurance, pension systems, wealth inequality, environmental sustainability, regional development, and numerous other applications of quantitative methods in economics. Such diversity demonstrates the vitality of our domain and its ability to respond to rapidly changing economic and social conditions.

Another significant step in the continuing development of AMSE is the opportunity for selected contributions to be published in the FENStatS Series in Statistics and Data Science, published by Springer Nature in collaboration with, under the auspices of, the Federation of European National Statistical Societies (FENStatS). Together with publication opportunities in cooperating scientific journals, this broadens the dissemination of research presented at the conference and further strengthens its international academic profile.

The strength of AMSE has always rested on its people. The conference brings together distinguished scholars, early-career researchers, and doctoral students in an atmosphere that encourages open discussion, constructive criticism, and the exchange of ideas. Scientific progress is achieved not only through formal presentations but also through conversations between sessions, collaborative thinking, and the willingness to learn from one another.

On behalf of the Scientific Committee, I would like to express my sincere gratitude to all authors for submitting their research, to our invited speakers for sharing their expertise, to the reviewers for their thoughtful evaluations, and to the members of the Organizing Committee for their careful preparation of the conference. I also warmly thank our partner universities, professional societies, and supporting institutions whose long-standing cooperation has contributed to making AMSE a well-established international forum for quantitative research in economics and statistics.

I hope that AMSE 2026 will provide an inspiring environment for stimulating scientific discussions, the establishment of new collaborations, and the development of ideas that will continue well beyond our meeting in Martin.

I wish you a successful conference, fruitful discussions, and a pleasant stay in Slovakia.

Emília Zimková
Chairperson of the AMSE 2026 Scientific Committee

28th international scientific conference

AMSE 2026

Applications of Mathematics and Statistics in Economics

25 August 2026 – 29 August 2026

Martin, Slovak Republic

PURPOSE OF THE CONFERENCE

The AMSE conference seeks to promote use of mathematical and statistical methods in addressing theoretical and practical problems or challenges of economics. The conference puts an emphasis upon innovativeness and novelty of quantitative methods in real-world economic scenarios, whilst highlighting their applicability. The conference gives a unique opportunity to present research results achieved in the field where mathematics and statistics meet economics.

CONFERENCE SESSIONS

- Challenges of digitalization and technology advancement
- Regional, developmental and environmental issues
- Macroeconomic issues, insurance and social security
- Social and tax policies, wealth inequality
- Manifold applications of statistics

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A LOOK AT THE AMSE HISTORY

Year	Date	Place	Organizer
1998	3 – 4 Sep	Liptovský Trnovec	Matej Bel University in Banská Bystrica
1999	2 – 3 Sep	Liptovský Trnovec	Matej Bel University in Banská Bystrica
2000	31 Aug – 1 Sep	Poprad	Matej Bel University in Banská Bystrica
2001	13 – 14 Sep	Zadov	University of Economics in Prague
2002	4 – 7 Sep	Kudowa-Zdrój	Wrocław University of Economics
2003	4 – 5 Sep	Banská Bystrica	Matej Bel University in Banská Bystrica
2004	3 – 4 Sep	České Budějovice	University of Economics in Prague
2005	1 – 2 Sep	Wrocław	Wrocław University of Economics
2006	31 Aug – 1 Sep	Trutnov	University of Economics in Prague
2007	29 Aug – 1 Sep	Poprad	Matej Bel University in Banská Bystrica
2008	27 – 29 Aug	Wisła	Wrocław University of Economics
2009	27 – 28 Aug	Uherské Hradiště	University of Economics in Prague
2010	25 – 29 Aug	Demänovská Dolina	Matej Bel University in Banská Bystrica
2011	31 Aug – 3 Sep	Łądek-Zdrój	Wrocław University of Economics
2012	30 – 31 Aug	Liberec	University of Economics in Prague
2013	28 Aug – 1 Sep	Gerlachov	Matej Bel University in Banská Bystrica
2014	27 – 31 Aug	Jerzmanowice	Wrocław University of Economics
2015	2 – 6 Sep	Jindřichův Hradec	University of Economics in Prague
2016	31 Aug – 4 Sep	Banská Štiavnica	Matej Bel University in Banská Bystrica
2017	30 Aug – 3 Sep	Szklarska Poręba	Wrocław University of Economics
2018	29 Aug – 2 Sep	Kutná Hora	University of Economics in Prague
2019	28 Aug – 1 Sep	Nižná	Matej Bel University in Banská Bystrica
2021	2 Sept	Wrocław [online]	Wrocław University of Economics
2022	31 Aug – 4 Sep	Velké Losiny	University of Economics in Prague
2023	30 Aug – 3 Sep	Rajecké Teplice	Matej Bel University in Banská Bystrica
2024	28 Aug – 1 Sep	Pawłowice, Wrocław	Wrocław University of Economics
2025	27 – 31 Aug	Hradec Králové	University of Economics in Prague
2026	25 – 29 Aug	Martin	Matej Bel University in Banská Bystrica

CONTENTS

FOREWORD	i
PURPOSE OF THE CONFERENCE	iv
CONFERENCE SESSIONS.....	iv
SCIENTIFIC COMMITTEE	v
ORGANIZING COMMITTEE	vi
A LOOK AT THE AMSE HISTORY	vii
ABSTRACTS OF PLENARY LECTURES	1
MIKULÁŠ LUPTÁČIK, WOLFGANG KOLLER, EDUARD NEŽINSKÝ	
Impact of automation on employment and productivity: a nonlinear input-output model.....	2
MAREK ROJÍČEK	
AI in official statistics: where we are and what next?	5
ABSTRACTS OF PRESENTATIONS	6
KAROLÍNA BAKUNCOVÁ, TEREZA FRÖMMELOVÁ	
Social policies effect analysis using time-series clustering	7
MARTIN BOĎA, RUDOLF ZIMKA, EMÍLIA ZIMKOVÁ, MÁRIA GRAUSOVÁ	
Econometric estimation and analysis of a three-dimensional model of business fluctuations: an applied perspective	8
MICHAELA BRUTENIČOVÁ, MIROSLAV HUŽVÁR, IGOR KOLLÁR, JANA ŠPIRKOVÁ	
Towards an α -cut-interval-based fuzzy best-worst method: a pension sustainability index case study	9

ADAM ČABLA	
Extreme value analysis under severe measurement uncertainty: the case of wealth rankings revisited.....	11
JOANNA DĘBICKA, ANNA JĘDRZYCHOWSKA	
Demographic structure and premium variability in bridging household life insurance: a cross-country comparison in the Visegrád group.....	12
ALBERT GARDON	
Measuring the volatility of a freight rate in container shipping	13
AGATA GIRUL, EDYTA MAZUREK, JOANNA DĘBICKA	
Finances in later adulthood: an analysis of seniors' economic security level	14
MARIÁN GOGOLA, MÁRIA MURRAY SVIDROŇOVÁ	
Factors influencing the choice of mode of transport: differences between teachers and students in Slovakia.....	15
KAMIL GRABARCZYK	
Measuring tax progressivity and redistribution from large-scale microdata: a reproducible statistical framework in R	16
JÁN HUŇADY, VERONIKA CHYLÁKOVÁ	
Between leaders and laggards: digitalisation clusters in the EU	18
JÁN HUŇADY, ŽANETA LACOVÁ, ANNA VALLUŠOVÁ	
Assessing the effectiveness of public policy instruments in shaping enterprise digital maturity: a comparative EU analysis.....	19
JAN JEKL, JOSEF REBENDA, JIŘÍ JÁNSKÝ	
Analysis of admission tests in a 5-year engineering master's program at a technical university	21
ALENA KAŠČÁKOVÁ, IVANA KURÁKOVÁ, ANDREA SEBERINI	
Beyond environmental concern: a factor-analytic study of climate change anxiety in Slovakia.....	22
PETER LACO, PAVOL KRÁL	
AI adoption by the European companies: an examination of driver behaviour and associated barriers within the European Union	24
MICHAL LEVICKÝ, MILAN MAROŠ, MARTA URBANÍKOVÁ	
The application of Benford's law to the financial data of Slovak companies	25

IVANA MALÁ	
On the perception of quality of life among the European Union population aged over 50 in the SHARE database	26
AGNIESZKA MARCINIUK, BEATA ZMYŚLONA	
Determinants of pension fund return rates: analysis of the management effects	28
ALISHA MARCINOVÁ	
Heterogeneity of wealth deprivation in Europe: evidence from FGT indices and cluster analysis	29
MATÚŠ MARCIŠ, IGOR KOLLÁR, VIERA MENDELOVÁ, LENKA HVOLKOVÁ	
Determinants of advanced technologies adoption among SMEs in the EU27	30
MARKÉTA MATULOVÁ	
Socio-economic determinants of residential energy retrofit uptake: a regional analysis of the "new green savings" program in the Czech Republic	31
PETR MUSIL, JAROSLAV KAHOUN, JANA FISCHEROVÁ	
Extension of regional indicators	32
KLAUDIA PRZYBYSZ, AGNIESZKA STANIMIR	
A statistical comparative analysis of the development of agritourism in the context of SDGs	33
EMÍLIA ZIMKOVÁ, BRANISLAV KUČERÍK, LUBOMÍR PINTER	
Monetary persistence and money demand dynamics in Japan	34
AUTHOR INDEX.....	35

ABSTRACTS OF PLENARY LECTURES

In the alphabetical order
of speakers

Impact of automation on employment and productivity: a nonlinear input-output model

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Impacts of automation, digitalization and artificial intelligence for the economic and social developments are the main challenges nowadays and in the focus of intensive debates and scientific theoretical and empirical research. The new technologies offer both new opportunities as well as new challenges. Fundamental implications can be expected for the labour market by substitution machines for labour. To which extent will the expected productivity growth generated by automation and digitalization substitute the use of labour? Is the working society running out of jobs or can the reduced size of working population in EU countries be compensated by new technologies?

Taking into account that the performance of an economy is not given by the simple addition of the activities of its sectors but by the complex interrelationships between them, the aim of this lecture is to contribute to the recent discussion by extension of the input-output models postulating substitution possibilities between the employment (human workers), traditional physical capital (machines, assembly lines, production halls etc.) and automation capital (industrial robots, 3D printers, etc.), covering a „programmable“ type of labour. Using the Cobb-Douglas production function with all three production factors for each sector of the economy, we extend the model by Schumann (1968, pp. 138-164), Luptáčík (1977, pp. 53-61) and Luptáčík (2010, pp. 16-17). Under the objective of labour input minimization for an exogenously given final demand subject to the constraints for the disposable physical and automation capital for each sector in the economy we obtain a special class of the nonlinear optimization problems called geometric programming problems (Luptáčík, 2010, Chapter 6). As an alternative model variant, which can be formulated as a multi-objective geometric

programming problem, we examine a model that maximises the welfare function described as a nonlinear combination (via the power function) of the final demand for commodities produced in an economy under the disposability constraints for labour, physical and automation capital. The solutions of the primal geometric programming models yield the optimal combination of labour, physical and automation capital in each sector and consequently in the economy.

The core of our contribution lies on the solution of the dual problem, which is a problem with nonlinear objective function and a system of linear equations as the constraints. The dual variables are related to each term in the primal problem, in the objective function as well as in the constraints with clear economic interpretation as elasticity coefficients (Luptáčík, 1977, 2010, Chapter 6). The dual variables related to the terms in the primal constraints indicate the percentage change of the employment in the economy when the disposable physical (or automation) capital in sector j increases by 1% as well as the impact of the changes in final demand. Using the dual relationships the lower bound for the total employment change due to the increasing automation capital can be analytically derived (the employment multiplier of automation) and the results can be decomposed in the multiplicative way into technological effects and the interindustry effects.

We illustrate the analytical possibilities of the models using a model with two sectors (for simplicity but without loss of generality), providing deeper insight into the substitution processes between all three primary factors, considering the sectoral interdependencies in the economy. Several propositions concerning the relationships between the parameters of the model and that impact for the employment in the economy (and consequently for productivity) can be derived from the dual problem, even without knowing the optimal solution. In an application to real world, we use data on industrial robots from IFR (International Federation of Robotics) and combine them with the input-output table from Austria aggregated to nine IO-sectors. We discern three manufacturing sectors that result from a classification in high, medium and low usage of industrial robots and six remaining IO-sectors. The parameters of the Cobb-Douglas production function used in the application were estimated for the manufactured goods and plausibly calibrated for the rest of the economy. We report the empirical results both on the primal and the dual model, thus demonstrating the propositions derived in the theoretical part of the lecture and shedding

some light on the real-world impact of automation on employment and productivity.

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Luptáčík, M. 1977. Geometrische Programmierung und Ökonomische Analyse, *Mathematical Systems in Economics*, Vol. 32, Verlag Anton Hain, 1977.

Luptáčík, M. 2010. *Mathematical Optimization and Economic Analysis*, Springer, 2010. Springer Verlag, Berlin, 2010.

Schumann, J. 1968. *Input-Output Analyse*, Springer Verlag, Berlin, 1968.

Key words

Cobb-Douglas production function, automation, employment, productivity, nonlinear input-output model

AI in official statistics: where we are and what next?

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AI is increasingly used in statistical production, dissemination, and reuse, transforming how data is handled and processed. Official statistics are increasingly consumed by external AI systems, necessitating careful consideration of data preparation, output and discoverability. This affects critical aspects such as efficiency in the workplace, as well as quality, transparency, comparability, and trust in statistical outputs and processes. AI is therefore a strategic and structural issue for statistical agencies and international organizations, calling for a coordinated approach. AI applications span various domains, enhancing capabilities and innovation across three key areas: statistical production (editing, coding, classification, outlier detection, survey design, etc.), dissemination (intelligent search and discovery, machine-readable and AI-ready output), and internal operations (HR, sourcing, corporate knowledge management). The rapid development of AI in recent years places high demands on statistical agencies to stay relevant and competitive. Their staff must start using and experimenting with AI tools (like Claude, Gemini, ChatGPT) immediately to build intuition, understand their flaws, and rethink daily workflows. It is also necessary to build metadata systematically to be structured, dynamic, and machine-readable.

Key words

artificial intelligence, official statistics, production, dissemination, metadata, quality

ABSTRACTS OF PRESENTATIONS

In alphabetical order
according to the first author

Social policies effect analysis using time-series clustering

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The main goal of this presentation is to analyze the development of age-specific fertility rates (ASFR) in the Czech Republic using time series clustering methods across different female age groups. The aim is to identify distinct fertility patterns and examine how major social and economic policies influence reproductive behavior over time. Special attention is given to periods of significant policy and institutional change, including post-socialist economic transformation, labor market developments, and reforms in family, childcare, and parental leave policies. The analysis explores whether fertility trends across age groups converged or diverged following these interventions and which cohorts were most affected. The study demonstrates the usefulness of time series clustering in demographic research and provides insights into how policy measures shape fertility behavior differently across women's age groups in the Czech Republic.

Key words

time-series, clustering, social policies

Econometric estimation and analysis of a three-dimensional model of business fluctuations: an applied perspective

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The presentation considers a variation of the four-dimensional model proposed by Murakami & Asada [2018, J Econ Dyn Control (92): 183-201] based on quasi-Keynesian ideas that has gained some popularity in recent literature. The model is couched as three-dimensional and describes the dynamics of the capacity utilization rate, the nominal interest rate, and inflation expectations. The presentation investigates the possibility of its econometric estimation and analysis with an application to selected advanced economies. Toward this end, national accounting data for the last three decades are utilized and analyzed for every economy separately. The continuous-time representation of the model is transformed into a corresponding approximate discrete analog, and its estimation version is investigated for the existence of equilibria and their stability. The findings are relevant in planning and making of monetary and fiscal policy with the aim of maintaining balanced growth paths.

Key words

continuous-time model, econometric estimation, equilibrium stability, cycles

Acknowledgement

This presentation was funded by VEGA project # 1/0346/25.

Towards an α -cut-interval-based fuzzy Best-Worst method: a pension sustainability index case study

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The sustainability of pension systems has become a major policy challenge due to demographic ageing and growing economic uncertainty. Reliable weighting of sustainability indicators is crucial for constructing meaningful composite indices that support evidence-based policy evaluation. This presentation follows up on the results from applying the triangular fuzzy Best-Worst method to the nine indicators of the Mercer pension sustainability index. Using optimistic, pessimistic, and mixed decision-making perspectives, we derived indicator weights and calculated sustainability scores for selected European countries. The findings show that different decision-making perspectives influence the weight structure, particularly for the most important and least important indicators, while largely preserving the overall ranking of criteria and countries. This highlights the importance of explicitly incorporating uncertainty in expert judgments when assessing pension system sustainability. The study represents an initial step toward applying an α -cut interval-based fuzzy Best-Worst method, which extends fuzzy preference modelling through interval-valued representations derived from α -cuts. Compared with fixed triangular fuzzy numbers, this approach offers greater flexibility in capturing uncertainty and enables more comprehensive sensitivity analyses. Consequently, it may provide deeper insights into the robustness of composite sustainability indices and support more informed evaluations of long-term pension system viability.

Key words

pension sustainability index, indicator weights, fuzzy Best-Worst method, α -cut intervals

Acknowledgement

This presentation was funded by VEGA project # 1/0124/24.

Extreme value analysis under severe measurement uncertainty: the case of wealth rankings revisited

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Understanding the upper tail of the wealth distribution is central to measuring economic inequality, as a small number of individuals may account for a substantial share of total wealth. Many commonly used inequality measures, including the Gini coefficient and top wealth shares, rely – explicitly or implicitly – on assumptions about tail behavior. Extreme value theory (EVT), and in particular generalized Pareto distribution (GPD) modeling, is therefore a commonly used, theoretically justified tool for analyzing the wealth of the richest individuals.

However, the empirical foundation of such analyses remains problematic. Rich-list data, such as those published by Forbes or CEOWORLD, consist of highly uncertain estimates rather than observed values and are often subject to substantial, asymmetric errors. Treating these estimates as exact observations may lead to biased inference on tail properties and, consequently, to misleading conclusions about inequality.

In this contribution, we demonstrate that classical EVT inference – based on maximum likelihood, L-moments, and bootstrap procedures – primarily reflects variability in reported estimates rather than uncertainty about the underlying wealth distribution. Using sensitivity and robustness analysis, we show that key conclusions are often unstable under plausible perturbations of top-tail values. We propose an alternative framework that treats wealth observations as imprecise quantities and derives ranges of admissible tail behavior instead of point estimates. Our findings suggest that the tail index is weakly identified, calling for more cautious interpretation of inequality measures and concentration indicators.

Key words

extreme value theory, wealth distribution, tail index, measurement uncertainty, generalized Pareto distribution

Demographic structure and premium variability in bridging household life insurance: a cross-country comparison in the Visegrád group

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In this presentation, we introduce a novel Bridging Household Life Insurance (BHLI) product designed to meet the evolving needs of families by providing economic protection after the death of an adult household member. The approach starts by identifying economic losses arising from both lost income and unpaid household labour. We present a multi-state actuarial model that incorporates household life-cycle and demographic and economic variables, enabling precise calculation of net premiums. This model goes beyond classical life insurance approaches, accounting not only for adult survival probabilities but also for the number and age of children and the household's stage of development.

Our focus is on the household demographic structure and how parental age, as well as children's age and gender, influence premium variability across the Visegrád Group. Using a comparative approach, we examine households in Hungary, Poland, the Czech Republic, and Slovakia, highlighting both common patterns and country-specific differences in risk profiles and pricing. The analysis provides insights for designing tailored household insurance products and enhances understanding of the potential responsiveness of regional life insurance markets for such contracts.

Key words

household demographics and life cycle, unpaid household labour, economic security, multi-state modelling, household life insurance

Measuring the volatility of a freight rate in container shipping

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The freight rate can be modelled by a jump-diffusive process. The volatility is one of parameters of such a process, however, it describes jointly the random behaviour of the process as a family of infinite many trajectories in the sense of the spread of possible realizations. The parameter is estimated based on historical data, in fact based on one past trajectory, usually as a standard deviation of instantaneous relative changes. As a straight consequence of its construction it is invariant for any permutation of relative changes, although, every permutation produces completely different shape of a trajectory. Thus, the parameter does not describe properly the actual fluctuation of a single chosen trajectory. The problem is complicated even more. A process trajectory is a curve and a natural measure for the curve fluctuation is the total variation. Unfortunately, almost every trajectory of a diffusive process has the infinite total variation on any non-empty interval. Thus, in the article there are considered several approaches how to measure the strength of fluctuations of a single freight rate trajectory. Their properties are then verified based on computer simulations.

Key words

freight rate, container shipping, freight fluctuations

Finances in later adulthood: an analysis of seniors' economic security level

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The aim of the study was to analyse the level of economic security among older adults in the Visegrád Group countries in the context of its links to health and material conditions. The study assumed that economic security is not a single dimension, but rather an element of a broader framework of functioning in later adulthood. The analysis sought to answer the question of the extent to which the variation in the financial situation of older adults stems from differing configurations of health, living conditions, and the ability to cope with economic risk.

The analysis utilised EU-SILC data for Poland, the Czech Republic, Hungary, and Slovakia. Factor analysis was used to identify dimensions describing economic security, health, and material conditions; the Two-Step Cluster method was used to identify profiles of older adults' functioning; and, to identify differences between profiles, a structural similarity analysis was conducted, revealing distinguishing differences. Logit model estimation was used to assess the impact of determinants on profile membership.

Four profiles of older adults' functioning were identified. The results indicate that economic security is not synonymous with material conditions or health, but constitutes a separate, partially independent dimension. A distinction is evident between current financial liquidity and long-term poverty risk. The economic security of older adults is multidimensional and cannot be analysed in isolation.

Key words

economic security, identification of distinctive differences, profiling, older adults, Visegrád countries

Factors influencing the choice of mode of transport: differences between teachers and students in Slovakia

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Understanding the factors that influence the selection of a certain travel mode is essential in the context of sustainable mobility in Europe. Since various demographic groupings interpret these characteristics divergently, we concentrated on the university setting for several reasons: it provides an interesting environment to examine the traffic behavior of two demographics: students and teachers, while both groups make autonomous decisions about their travel mode. Moreover, university campus is a precursor to eventually changing travel behavior and solving sustainable transportation issues. We analyzed the differences in the perception of selected factors between students (n=238) and teachers (n=74) from four Slovak universities (total sample=312). The study employs a combination of statistical methods (T-tests, MANOVA, pairwise comparisons) to assess main travel modes and the perceived importance of five factors (travel cost, travel time, parking, ecological aspect, and ride sharing). The findings indicated that while students utilize more eco-friendly transportation methods (such as public transport and walking), teachers attribute greater significance to the environmental considerations of transportation but mostly use cars. The study also validated that students exhibit heightened sensitivity to travel cost.

Key words

travel mode choice, factors, preferences, university students, faculty

Acknowledgement

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Measuring tax progressivity and redistribution from large-scale microdata: a reproducible statistical framework in R

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Administrative microdata have become an increasingly important source for evidence-based economic analysis and public policy evaluation. Their effective use, however, requires transparent and computationally efficient analytical workflows capable of processing large datasets and implementing complex fiscal rules. This presentation introduces a reproducible statistical framework developed in the R environment for analysing large-scale tax microdata and evaluating income tax systems.

The proposed workflow integrates data validation, preprocessing, rule-based tax computation, aggregation of administrative records, estimation of effective tax rates, distributional analysis and simulation of alternative fiscal policy scenarios within a single analytical pipeline. The framework implements multiple taxation regimes, automatically calculates tax liabilities, derives redistribution indicators, including effective tax rates across income groups and a modified Kakwani progressivity index, and generates reproducible graphical and tabular outputs.

Rather than focusing on substantive conclusions regarding a particular tax system, the presentation emphasises the methodological aspects of reproducible fiscal analytics, including modular workflow design, transparent implementation, computational scalability and automated reporting. Redistribution analysis serves as a case study illustrating how an integrated statistical workflow can support fiscal policy evaluation using administrative microdata. The proposed approach demonstrates how open-source statistical software can support quantitative economic research, official statistics and evidence-based policy evaluation through reusable and extensible analytical methods.

Key words

administrative microdata, large datasets, reproducible framework, analytical pipeline, fiscal analytics, redistribution analysis, computation, R

Between leaders and laggards: digitalisation clusters in the EU

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The aim of the presentation is to assess the progress of European Union countries toward targets of Digital Decade 2030 in 2021 and 2025. The presentation focuses on two pillars of this policy programme, digital skills and business digitalization. To reduce dimensionality, principal component analysis (PCA) was applied, confirming a coherent underlying digitalization structure across countries of the EU. Based on PCA scores, hierarchical clustering analysis was applied using Ward's method with the squared Euclidean distance, identifying three groups of countries: leaders, developing countries and laggards. Across the analysed years, five countries, Croatia, Cyprus, Portugal, Slovenia and Slovakia, transitioned to the laggard cluster, while Luxembourg advanced to the leading group. An analysis of indicator values reveals that this repositioning reflects a slower pace of growth rather than decline, as the average growth in AI adoption among declining countries was significantly lower than among countries that remained in the developing group. These findings suggest that digital divide is widening selectively, while the shifting structure of principal components indicates that human capital availability may be gaining importance as the differentiating factor among EU countries.

Key words

digitalisation, European Union, human capital, digital skills, cluster analysis

Acknowledgement

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Assessing the effectiveness of public policy instruments in shaping enterprise digital maturity: a comparative EU analysis

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The presentation examines the impact of economic public policy instruments on the digital readiness of enterprises in the context of ongoing economic transformation, with a particular emphasis on European Union Member States and the Slovak Republic. Its objective is to assess how selected instruments – such as subsidies, tax incentives, investment support, and innovation programmes – facilitate the development of digital capabilities and enhance enterprises' capacity to adapt to the digital economy.

The findings indicate that the digital skills of the population are the most significant predictor of enterprise digital maturity and the uptake of e-government services. Moreover, the results suggest that the effectiveness of public support depends less on the volume of financial resources and more on their efficient allocation and the coordination of policy instruments. The analysis further underscores the importance of targeted public interventions in addressing barriers to digitalisation, particularly for small and medium-sized enterprises.

Slovakia continues to lag behind the EU average, mainly due to a fragmented support framework, insufficient digital competencies, and limited institutional capacity. The presentation therefore highlights the need to enhance the transparency, accessibility, and strategic focus of public support mechanisms. It contributes to the ongoing debate on optimising digitalisation policies and offers recommendations aimed at fostering the systematic development of digital skills, promoting a more integrated support model, and strengthening the coordinating role of European Digital Innovation Hubs.

Key words

digital transformation, digital skills, digital maturity of companies, public policy instruments

Acknowledgement

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Analysis of admission tests in a 5-year engineering master's program at a technical university

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Recruitment of students, and generally recruitment of employees, is a universal challenge common for all institutions. The process of selecting candidates who fulfil requirements defined by institutional standards is of utmost importance in public administration. For economic reasons, many public institutions, including universities, have been using admission tests as a part of recruitment process. The aim of this presentation is to contribute to improving the selection procedure by analyzing the data collected at admission tests and identifying types of questions that are potentially inconvenient, that is, too simple, too difficult, or both. A statistical approach is used to analyze the results of admission tests for the general study prerequisites for engineering students at a technical university. Each test consists of mathematical tasks as well as non-mathematical tasks based on spatial imagination or logic. Groups of high and low scoring applicants are considered, and difficulty level of question types is discussed to provide deeper insight into the problematic aspects of the admission tests. The analysis might serve as a basis for adjusting the admission tests in the future, potentially leading to a more effective, fair and cost-efficient recruitment process.

Key words

recruitment process, admission tests, mathematics, quantitative analysis, difficulty analysis, high/low scoring applicants

Acknowledgement

This work was supported by the Project for the Development of the Organization 'DZRO Military autonomous and robotic systems'.

Beyond environmental concern: a factor-analytic study of climate change anxiety in Slovakia

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Awareness of climate change is increasingly associated with negative emotional consequences that extend beyond general environmental concern to affect individuals' psychological functioning and quality of life. Clayton and Karazsia (2020) developed the Climate Change Anxiety Scale (CCAS) to capture this construct, distinguishing between cognitive-emotional impairment, functional impairment, personal experience of climate change, and behavioural engagement. The present study examines the factor structure of the Slovak adaptation of the CCAS in a sample of 323 respondents aged 18–30, collected as part of the ECOCARE project. The suitability of data for factor analysis was confirmed by a Kaiser-Meyer-Olkin measure of 0.898, indicating excellent sampling adequacy. Principal component analysis with Varimax rotation yielded a four-component solution explaining 62.55% of the total variance. Despite the use of a different extraction method, the resulting structure was broadly comparable to the four-factor solution identified by Clayton and Karazsia (2020) using principal axis factoring. Notably, two items deviated from the original structure: item O13 ("My friends say I think about climate change too much") and item O17 ("I wish I behaved more sustainably") loaded onto the experience factor rather than onto functional impairment and behavioural engagement respectively, suggesting culturally specific patterns in how Slovak young adults relate personal climate experience to social and behavioural dimensions of anxiety. The study is part of a broader intergenerational research design within a research programme grant no. VEGA 1/0124/24 on active ageing, encompassing adults aged 55+, with direct relevance for healthy and active ageing policy.

Key words

personal climate experience, Climate Change Anxiety Scale (CCAS), principal component analysis, young adults, psychological functioning

Acknowledgement

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AI adoption by the European companies: an examination of driver behaviour and associated barriers within the European Union

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The diffusion of artificial intelligence (AI) technologies across European firms has accelerated in recent years, yet adoption remains uneven across sectors, firm sizes, and Member States. This presentation investigates the key drivers influencing AI adoption behavior among companies within the European Union (EU) and identifies the principal barriers that constrain its uptake. Drawing on secondary datasets published by Eurostat, the study examines how organizational characteristics, technological readiness, regulatory environments, and market dynamics shape AI adoption decisions.

We focus on strategic orientation toward innovation, availability of skilled human capital, access to high-quality data, and perceived competitive pressure as drivers encouraging AI integration. Persisting barriers, including high implementation costs, concerns regarding data privacy and regulatory compliance, lack of internal expertise, and uncertainty about return on investment are also explored. The analysis also investigates heterogeneity across countries comparing differences between countries with advanced digital economies and those that are less developed.

This research aims to contribute to a more nuanced understanding of how European companies navigate the opportunities and constraints associated with AI deployment.

Key words

artificial intelligence, companies, drivers, barriers, European Union

Acknowledgement

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The application of Benford's law to the financial data of Slovak companies

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Benford's law is a mathematical-statistical law describing the expected distribution of leading digits in naturally occurring numerical data. It is widely applied in economic and financial research to assess the degree to which empirical data aligns with the theoretically expected distribution. The aim of this presentation is to verify the applicability of Benford's law to the financial data of Slovak companies operating within a specific industry for a single accounting period, evaluating the degree of agreement between individual items in financial statements and the expected distribution of leading digits. The research is based on an analysis of key financial indicators obtained from corporate financial statements. Given the specific nature of Benford's law, particular attention is paid to data preparation to ensure the suitability of the analyzed dataset. The agreement between the actual and theoretical distribution of leading digits is verified using appropriate statistical methods, followed by the identification of financial statement items that exhibit the highest degree of compliance with Benford's law. This presentation contributes to the field by assessing the reliability and representativeness of financial data at the industry level. The findings can form the basis for further use in financial analyses and evaluations of industry characteristics, serving as a starting point for broader, methodologically advanced investigations into the application of Benford's law within the Slovak business environment.

Key words

Benford's law, financial statements, industry analysis, data reliability

On the perception of quality of life among the European Union population aged over 50 in the SHARE database

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All EU member states are facing the reality of their ageing populations. Established 25 years ago, the SHARE survey (the Survey of Health, Ageing and Retirement in Europe) has become the most comprehensive source of high-quality social science individual data on EU residents aged over 50. Almost 5,000 publications and applications on a wide range of issues have been published based on the survey.

Quality of life is an immeasurable phenomenon and is a central concern for welfare EU states. The analysis focuses on nine waves of the SHARE survey, comparing the subjective and objective measures of quality of life. The development of the CASP-12 quality of life index, together with subjective life expectancy, financial problem expectations, health conditions, limitations in daily activities, depression, and life satisfaction are modelled. The data structure is a panel with regular additional sampling in each wave, enabling changes in conditions and perceptions among individual respondents during their ageing process, as well as changes in the individual countries' situation, to be described. Associations between indicators based on different definitions are analysed, quantifying the situation of ageing respondents from various perspectives. The study attempts to quantify and compare hypotheses and results from multiple available studies (both theoretical and SHARE-based).

Key words

SHARE, quality of life, CASP-12, regression

Acknowledgement

This presentation was funded by the long-term institutional support of research activities by the Faculty of Informatics and Statistics, Prague University of Economics and Business.

Determinants of pension fund return rates: analysis of the management effects

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Pension funds constitute a key component of modern social security systems. Their primary function is to collect and invest in pension contributions to provide participants with financial resources upon retirement. In the context of an ageing population, their importance is increasing, particularly as a supplement to pay-as-you-go schemes.

The pension system in Poland is structured around three pillars: the mandatory system managed by the Social Insurance Institution (Pillar I) and Open Pension Funds (Pillar II), and the voluntary pillar (Pillar III). One of the components of the third pillar is the Employee Capital Plans (PPK), a voluntary long-term savings scheme co-financed by employees, employers, and the state. PPK assets are invested in funds with varying risk levels, adjusted to the participant's age. The rate of return depends on factors such as the type of fund and investment strategy. PPK contributes to increasing retirement savings, supports the long-term sustainability of the public pension system, fosters capital market development, and promotes financial education. At the same time, some participants perceive it as a relatively liquid form of saving, allowing earlier access to funds under certain conditions.

The aim of this study is to analyse returns of defined-date funds within the PPK framework and identify factors influencing these returns, with particular emphasis on the role of the managing institution. The study also evaluates the attractiveness and risk of PPK funds across institutions. Furthermore, a variance components model is employed to decompose total return variability into inter-institutional and intra-institutional components.

Key words

pension system, Employee Capital Plans, return rates, defined-date funds, variance component model

Heterogeneity of wealth deprivation in Europe: evidence from FGT indices and cluster analysis

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The presentation investigates the extent and heterogeneity of household wealth poverty levels across European Union member states using microdata from the fourth wave of the Household Finance and Consumption Survey (HFCS, 2021). Employing the Foster-Greer-Thorbecke (FGT) indices, we calculate FGT₀, FGT₁, and FGT₂ values for both wealth and income at EU aggregate and national levels. The wealth poverty threshold was set at 25% of the EU median net wealth (approximately 30,000 EUR). Findings show cross-national differences, with the ratio of households below the threshold ranging from 15% to 50%. K-Means clustering applied to FGT indices identified four distinct clusters, validated using the Kruskal-Wallis and Dunn tests. Each cluster reflects a different wealth-poverty mechanism: Cluster 1 exhibits low poverty rates, supported by high homeownership and intergenerational transfers. Cluster 2 represents a baseline group with moderate wealth deprivation, and Cluster 3 is characterized by significant household indebtedness and rental market constraints despite relatively high income. Cluster 4 displays the highest poverty rates driven by asset illiquidity. While existing studies focus on wealth inequality, the mechanisms driving cross-national differences in wealth poverty remain underexplored. This study identifies four distinct poverty mechanisms across EU member states, suggesting differentiated policy responses.

Key words

wealth poverty, FGT indices, cluster analysis

Determinants of advanced technologies adoption among SMEs in the EU27

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Small and medium-sized enterprises (SMEs) form the backbone of the European Union economy and play an important role in innovation, resilience, and competitiveness. In the context of the digital and green transition, the adoption of advanced technologies has become an important policy priority. However, this adoption remains relatively limited among European SMEs and uneven between countries, sectors, and types of firms. This study examines the determinants of the adoption of advanced technologies among SMEs in the EU27. Using data from Flash Eurobarometer 559, based on 12,899 interviews conducted in spring 2025, the study applies binary logistic regression to estimate the probability that a firm has adopted advanced technologies. The analysis focuses on firm-level characteristics such as size, age, sector, turnover, innovation activity, export orientation, access to finance, and perceived barriers to innovation and digitalization. The study contributes to a better understanding of the digital transformation of SMEs and provides relevant evidence for policies that support the adoption and competitiveness of advanced technologies in the European Union.

Key words

SMEs, advanced technologies, technology adoption, digital transition, EU27

Acknowledgement

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Socio-economic determinants of residential energy retrofit uptake: a regional analysis of the "new green savings" program in the Czech Republic

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The building sector is a cornerstone of climate mitigation, accounting for 36% of energy-related emissions in the EU. In the Czech Republic, the "New Green Savings" (Nová zelená úsporám / NZÚ) program is the primary instrument for achieving residential energy efficiency. However, policy effectiveness is often hampered by the "energy efficiency gap" and the "success to the successful" syndrome, where subsidies may disproportionately benefit affluent areas.

This presentation evaluates the distribution of NZÚ subsidies across Czech regions in relation to the socio-economic characteristics of the population. The originality of the research lies in the integration of high-resolution administrative data on subsidy disbursements (2021–2025) with detailed results from the 2021 Population and Housing Census. Using advanced spatial statistical modeling and econometric analysis, we examine the relationship between subsidy uptake and variables such as household income proxies, education levels, and housing stock age. The study identifies geographical "hot spots" of participation and assesses whether recent sub-programs, such as "NZÚ Light," have successfully mitigated "retrofit poverty" in structurally disadvantaged regions. The findings provide critical insights into the alignment of climate action with social equity, offering evidence-based recommendations for the future design of inclusive energy policies.

Key words

energy efficiency, New Green Savings (Nová zelená úsporám / NZÚ), Census 2021, spatial analysis, social equity, energy policy

Extension of regional indicators

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The research team of the Prague University of Economics and Business has finalised the project focused on the extension of regional indicators, namely regional price levels and expenditure components of regional GDP. The consistent data set describes Czech NUTS 3 regions in 2020 that was one hand affected by the Covid-19 pandemic, on the other hand it was the most recent year for which source data were available during the project.

Prague holds its unique position in the Czech Republic. The highest GDP per capita is also generated using resources supplied by other regions, e.g. commuters whose contribution is about 25%. Despite the highest nominal consumption expenditure per capita (129.9% of the national average), its share of GDP is only 27% while in most other regions fluctuates around half of GDP. It has been proved that the price level is the highest in Prague (about 25% above the national average) that shrinks the difference in consumption expenditures per capita to 4.3% in real term. Material well-being of Prague households remains the highest followed by Středočeský kraj (surroundings of Prague, 1.3% above the national average), whereas households in all other regions are below the average. Prague benefits from being net exporter of products.

Key words

national accounts, regions, price levels, well-being

Acknowledgement

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A statistical comparative analysis of the development of agritourism in the context of SDGs

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Agritourism is a form of tourism activity that may respond to the growing demand for sustainable travel. In the aftermath of the Covid-19 pandemic, consumers began to value destinations that are less crowded and less popular on traditional tourist maps. Consequently, interest in this form of leisure activity has increased. Moreover, the growing dissemination of information on sustainable tourism has contributed to the growing importance of sustainable behaviours among consumers of tourism services, which, in turn, influences the requirements imposed on the supply side of the sector.

The presentation attempts to statistically analyse the tourism sector related to agritourism and to link the importance of agritourism to sustainable development. The analyses are based on incomplete, aggregated data from the databases of Statistics Poland (GUS) and Eurostat. In this presentation, we aim to highlight the existing gap in data on agritourism and the pressing need to address it. At present, such data are often combined with those about small hotels and guesthouses, or they are not distinguished from other forms of activity, such as agriculture (current regulations allow agritourism activities to remain unregistered when the number of accommodation places is small).

Key words

sustainable development goals, tourism, agritourism, statistical analysis

Monetary persistence and money demand dynamics in Japan

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This presentation examines the stability and persistence of money demand in Japan over the period 1966–2024. Japan provides a unique environment for analysing monetary behaviour due to prolonged low inflation, financial liberalization, and the extensive use of unconventional monetary policy instruments, including quantitative easing, negative interest rates, and yield curve control. The study investigates whether long-run money demand relationships remained stable despite these profound changes in the monetary policy framework. An autoregressive distributed lag (ARDL) model combined with an error correction mechanism (ECM) is employed to analyse both long-run equilibrium relationships and short-run adjustment dynamics. Unit root tests, ARDL Bounds testing, and stability diagnostics are used to evaluate the robustness of the estimated money demand function. The results confirm the existence of a stable long-run relationship among money demand, real income, interest rates, and inflation. The ARDL Bounds test provides evidence of cointegration, while CUSUM and CUSUMSQ tests indicate parameter stability. The estimated error correction coefficient suggests moderate monetary persistence combined with a stable long-run money demand relationship. Overall, the findings indicate that money demand remains a useful informational variable for monetary policy despite financial liberalization, unconventional monetary interventions, and major macroeconomic shocks.

Key words

monetary persistence, money demand stability, ARDL model, CUSUM test, Japan

Acknowledgement

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AUTHOR INDEX

Bakuncová, Karolína, 7
Boďa, Martin, 8
Bruteničová, Michaela, 9

Chyláková, Veronika, 18

Čabla, Adam, 11

Dębicka, Joanna, 12, 14

Fischerová, Jana, 32
Frömmelová, Tereza, 7

Gardoń, Albert, 13
Girul, Agata, 14
Gogola, Marián, 15
Grabarczyk, Kamil, 16
Grausová, Mária, 8

Huňady, Ján, 18, 19
Hužvár, Miroslav, 9
Hvolková, Lenka, 30

Jánský, Jiří, 21
Jędrzychowska, Anna, 12
Jekl, Jan, 21

Kahoun, Jaroslav, 32
Kaščáková, Alena, 22
Kollár, Igor, 9, 30
Koller, Wolfgang, 2
Král, Pavol, 24
Kučerík, Branislav, 34
Kuráková, Ivana, 22

Laco, Peter, 24

Lacová, Žaneta, 19
Levický, Michal, 25
Luptáčík, Mikuláš, 2

Malá, Ivana, 26
Marciniuk, Agnieszka, 28
Marcinová, Alisha, 29
Marciš, Matúš, 30
Maroš, Milan, 25
Matulová, Markéta, 31
Mazurek, Edyta, 14
Mendelová, Viera, 30
Murray Svidroňová, Mária, 15
Musil, Petr, 32

Nežinský, Eduard, 2

Pinter, Ľubomír, 34
Przybysz, Klaudia, 33

Rebenda, Josef, 21
Rojíček, Marek, 5

Seberini, Andrea, 22
Stanimir, Agnieszka, 33

Špírková, Jana, 9

Urbaníková, Marta, 25

Vallušová, Anna, 19

Zimka, Rudolf, 8
Zimková, Emília, 8, 34
Zmyšlona, Beata, 28

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