SLOVENSKÁ SPOLOČNOSŤ PRE HOSPODÁRSKU INFORMATIKU

THE SLOVAK SOCIETY FOR ECONOMIC INFORMATICS

ZBORNÍK ABSTRAKTOV

20. medzinárodná vedecká konferencia

„AIESA – BUDOVANIE SPOLOČNOSTI ZALOŽENEJ NA VEDOMOSTIACH“

PROCEEDINGS (ABSTRACTS)

20th International Scientific Conference

„AIESA – BUILDING OF SOCIETY BASED ON KNOWLEDGE“

A I E S A

Applied Informatics Econometrics Statistics Accounting

24. – 25. november 2022 | 24. – 25. november 2022 | BRATISLAVA

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organizovanú
Slovenskou spoločnosťou pre hospodársku informatiku

pod záštitou
dekana Fakulty hospodárskej informatiky
prof. Ing. Ivana Brezinu, CSc.

PROCEEDINGS (ABSTRACTS)

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Plenárne rokovanie

Plenary Session

The use of blockchain in European-listed companies: a content analysis of corporate reports

Michaela Bednárová, Enrique Bonsón, David Perea

Abstract
With technological developments such as blockchain, we seem to be entering a new digital era, which is expected to have a significant impact on a wide array of sectors. The aim of this paper is to provide some insights into proliferation of this disruptive technology by analysing blockchain disclosures in corporate reports. Using automatic extraction techniques, the relevant information was collected and classified according to different categories of disclosure. The sample consisted of 1,396 annual/sustainability reports, published in 2018, 2019, and 2020, of 337 companies listed on 13 Western European countries' stock markets. Our findings show that, according to corporate reports, the use of blockchain is still at an early stage and that the first adopters are usually large companies operating in the financial and technology sectors located in countries with a well-defined blockchain national strategy.

Key words
Blockchain, Distributed Ledger Technology, Corporate Disclosure

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Quantified aggregation in evaluation

Miroslav Hudec

Abstract
In many real–world decisions (either professional or everyday ones), we face a larger number of elementary conditions, which should be aggregated. The usual logical aggregations are realised by conjunction (and operator), disjunction (or operator) or averaging functions. However, there are situations where the requirement is of the structure "the majority of elementary conditions should be satisfied" (a relaxed version of conjunction, where elementary conditions are not mandatory). This aggregation has a nice behaviour of adapting to data, i.e., it is able to cover conjunctive, averaging and disjunctive aggregation. The semantic uncertainty is a natural feature of many tasks and therefore it should be covered in the quantified aggregation. Fuzzy sets and logical aggregations are able to manage these tasks effectively. This logic aggregation function is examined theoretically and demonstrated on the examples.

Key words
Fuzzy quantifier, Logic aggregation function, Data evaluation

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Hodnocení efektivnosti v modelech s pevně daným součtem výstupů

Efficiency evaluation in models with fixed-sum outputs

Josef Jablonský

Abstract
Traditional data envelopment analysis (DEA) models do not consider any relations with respect to the sum of values of outputs. In many real applications, the sum of outputs is predetermined and cannot be changed. In this paper, main models considering fixed-sum outputs are formulated and discussed their properties. They usually proceed in two steps. The first step consists in deriving a new efficient frontier, usually called equilibrium efficient frontier. This frontier is computed in such a way that the values of fixed-sum outputs for all units are modified to reach maximum efficiency of all units. In the second step, the efficiency score of the original units is derived with respect to the new frontier. This characteristic allows complete ranking of the units. The results of the model are illustrated on the evaluation of efficiency of countries attending Winter Olympic Games 2022. They are compared with traditional DEA models.

Key words
Data envelopment analysis, equilibrium efficient frontier, fixed-sum outputs, ranking

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Regional cooperation on cyber security issue

Zoltán Rajnai

Abstract
In modern democracies the digital revolution has been stretching to all aspects of life which generates significant dependency. Nowadays members of the society are less viable if they do not use e-mail addresses, bank accounts and cards, or some sort of positioning system. The role and significance of digital infrastructures is undisputed, they became unquestionable components of transparent state functions, economic prosperity, and successful scientific research. One the one hand, modern information society considers information and communications technologies the engine of societal evolution. On the other hand, the challenges of dependency, the dynamics of development and the rate of penetration involve serious threats. The speaker would like to speak about some issues of the Hungarian aspects of national cyber security, and highlighting the Hungarian situation in cyber security. In 2013 our Parliament adopted the national cyber security strategy. It defines the main goals and directions of cyber security. In the same year, 8 years ago, and published the law on information security for government networks too. These two cybersec laws lay the foundation for the Hungarian approach on cybersecurity. The presentation like to demonstrate the importance of regional cooperation on cyber security issues, and would like to give you some general examples for international cooperation put in practice for example the Visegrad countries group too.

Key words
Information society, cyber security, cyber security strategy

People with disabilities - a statistical picture in Poland and the EU

Paweł Ulman

Abstract
Disability has been an experience present in human history since the beginning of time. However, it is only in the last few decades that attitudes towards disability and people with disabilities have begun to change from a medical approach, emphasising the specific impairments of a disabled person, to a social and holistic approach, shifting the focus to a holistic perception of disability in the context of limitations experienced by a disabled person as a member of a particular society. This increased interest in people with disabilities and their everyday life has led to an increased need for reliable statistical data. Unfortunately, the ambiguity of defining disability at the national level, as exemplified by Poland, and even more so at the international level, makes it difficult to determine unequivocally the scale and structure of the problem under consideration. The aim of the paper is to present the dilemmas of disability measurement in Poland and the EU. Furthermore, basic statistical research addressing this issue and numerical results showing the scale of disability in Poland and the EU will be presented. For this purpose, data from Polish surveys of official statistics and from surveys carried out for Eurostat will be used.

Key words
Disability, official statistics, scale of disability

1. sekcia

1st Section

Informačné technológie a informačné systémy

Informatics technologies and information systems

Porovnanie exekučnej efektívnosti hľadania dát v tabuľke symbolov implementovanej v poli a v jednosmernom lineárnom zozname v C# aplikácii

A Comparison of Execution efficiency of Searching for Data in an Array and Linked List Implementation of a Symbol Table in a C# Application

Igor Košťál

Abstract
A symbol table is a frequently used abstract mechanism for storing key-information pairs in search applications, while the information (values) can be later searched by a key. When using a symbol table in an application, it is very important to choose its effective implementation. We have created a C# application that implements a table of symbols in an array and in one-way linked list. The application stores the same key - value pairs, in its case they are domain address - IP address pairs, into both of implementations. The application allows to search IP addresses by domain address keys, or vice versa, in an array and in one-way linked list, while the application measures the execution time of each search in each implementation of the symbol table. By comparing these execution times, we determined which implementation of the symbol table is more execution efficient.

Key words
Symbol table, dynamic array, one-way linked list, searching, C# application

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Applying Machine Learning to Model Inflation on the Slovak Macroeconomic Data

Erika Mináriková, Miroslav Hudec

Abstract
The last decade has witnessed a rapid development of artificial intelligence algorithms in many scientific and industry fields. In our work, we focus on applying and evaluating these methods to model inflation in the Slovak Republic. We generated and explored machine learning methods including linear regression, RIDGE regression, LASSO regression, random forests, and neural networks to support predicting the course of inflation. To create these solutions, the public data set that comprises fifty monthly Slovak time series from January 2000 to December 2019 was used. Our results are checked via the cross-validation and simulations using different training, validation, and test samples. The result supports the understanding for the further work on macroeconomic forecasting by deep learning models.

Key words
Linear regression, Random forest, Neural network, Inflation

Princípy tvorby textových zadaní pre dosiahnutie žiadaných grafických výstupov s využitím neurónových sietí a strojového učenia

Principles of creating text prompts to achieve desired graphical outputs using neural networks and machine learning

Peter Procházka

Abstract
Nowadays, new technologies in the field of neural networks and machine learning using big data are developing at a great speed, allowing the creation of high-quality images by simply defining in text form what the image should represent. On the one hand, these technologies have raised many ethical questions, but on the other hand, they have made the work of computer graphic designers, dress designers, marketers, just anyone who needs to generate new ideas quickly and efficiently, much easier.
The article starts with an overview of these technologies, focuses at the core on understanding how to properly define requirements from a user perspective when using a particular service, and concludes by describing some of the negatives of this new area of computer science.

Key words
Text to image, midjourney, stable diffusion

Výhody využívania LMS systémov

The benefits of using LMS systems

Eva Rakovská

Abstract
The last two years marked by pandemics, teacher shortages and other factors are causing problems in education. Despite the massive use of online learning in recent times, it appears that the benefits of Learning Management Systems in education are not being fully exploited and are only seen as a support tool for education. The creation of high-quality teaching materials and courses that would meet the individual needs of students in difficult times is not a one-time matter, but the gradual development of a fully automated course with the use of new LMS features or with the help of several plugins incorporated directly into the courses.
The contribution is devoted to the sustainability of the development of electronic courses, maps the advantages of using LMS Moodle standards and tools in the creation of a fully automated electronic course, and provides guidance on how to monitor the quality of teaching through the Analytics module.

Key words
Education, LMS, e-learning, e-learning development methodology, sustainability of education

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Sieťové vyučovanie nie je len e-learning a MOOC

Network teaching is not only e-learning and MOOCs

Peter Schmidt, Pavol Jurík, Jaroslav Kultan

Abstract

Social changes, the great development of IT networks, social networks and globalization in the economy, social and educational fields have raised new problems in the education of young people, in postgraduate and lifelong learning. The content, tools, methodology and principle of education are changing. Classic educational forms, methods and didactic procedures are being replaced by entirely new ones. The place of education, the durability of the acquired education, the sources and methods of acquiring new knowledge, as well as the methods and forms of communication between the teacher and the student are changing. The new phenomenon - network teaching - although it uses the tools of e-learning, MOOC, distance and direct teaching, but it is a much broader system that also actively uses social networks, network communication, artificial neural networks and other technologies. The article is focused on the analysis of the characteristics of modern educational technologies based on the use of modern IS.

Key words

E-learning, MOOC, network education, globalization, distance education

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Použitie lingvistických súhrnov vo webovej aplikácii

Using linguistic summaries in web application

Pavol Sojka, Peter Procházka

Abstract

Nowadays, we are more and more inundated with data, which is created during the daily normal activity of a person, and in addition to our own data, we are also overwhelmed by data from other sources. Most people do not have the ability to efficiently process data and also do not have sufficient knowledge of statistical methods and other related sciences. This work formalizes the integration of quantified summaries and quantified evaluation into the concept of database queries to enable their flexibility, for example by using nested quantified query conditions on hierarchical data structures. Later in our work, we adapted our research to a practical application. We have created a software environment for evaluating data based on a set of data obtained from the Statistical Office of the Slovak Republic. These datasets are mainly focused on landscape characteristics such as altitude, area of towns and villages and similar parameters. Based on user preferences, our system will recommend the most suitable place to spend your vacation.

Key words

Data processing, fuzzy logic, linguistic summaries, web technologies

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2. sekcia

2nd Section

Aktuálne trendy vývoja teórie a praxe účtovníctva a audítorstva

Current trends of development of accounting and auditing theory and practise

Prediction of results of financial statements companies in automotive industry in Slovakia after COVID-19 pandemic

Martina Ballová

Abstract
Paper focuses on results of financial statements companies in automotive industry and prediction of future results as the result of the end of COVID-19 pandemic. Slovakia is the biggest car producer per citizen in the world and as the automotive represents 50 % of all industrial production in Slovak Republic it is important for whole economic of country. Regression analysis provides method for analysing and prediction of future results of financial statements companies. This method a set of statistical methods used for the estimation of relationships between a dependent variable and one or more independent variables.

Key words
Financial statements, pandemic, automotive, COVID-19, regression analysis

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Vývoj tržieb v maloobchode v kontexte pandémie COVID-19

The Development of Retail Trade Sales in the Context of the COVID-19 Pandemic

Miriama Blahušiaková

Abstract
The paper analyses the sales in the sector "Retail trade" excluding motor vehicles and motorcycles during the financial years 2018-2021. The aim is to analyse and prove the impact of the pandemic on the sales of companies operating in this sector. We have analysed 3,896 entities, which have been analysed both in terms of the region of operation and in terms of the main activity. The results showed that despite the pandemic, sales in retail trade grew, although growth in the pandemic year was lower than in other accounting periods. Despite the moderate growth in sales, more than 50.00% of the companies in this sector experienced a decline in sales in the first pandemic year 2020.

Key words
Sales, retail sector, COVID-19 pandemic, financial position

Účtovné zobrazenie transakcií vylúčených z pôsobnosti IFRS 3 *Podnikové kombinácie*

Accounting view of the transactions exluded from scope of IFRS 3 *Business Combination*

Renáta Hornická

Abstract
IFRS 3 *Business Combinations* deals with the accounting solution of business combinations. In the accounting and recognising of business combinations according to IFRS 3, the acquisition method of accounting is prescribed. The basic condition for the application of IFRS 3 is that the transaction or event meets the definition of a business combination. The aim of the paper is to identify transactions excluded from the scope of IFRS 3 and to present their accounting presentation according to IFRSs. The acquisition method is not applied to transactions excluded from the scope of IFRS 3. Based on the analysis of the provisions of IFRS 3, the article defines transactions that do not fall within the scope of IFRS 3 together with their accounting presentation according to IFRSs.

Key words
Business combinations, formation of joint agreement in the financial statements of the join arrangements itself, acquisition of an asset or group of assets, accounting entities under common control, investment entity

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Významné postavenie inteligentných technológií a ich zverejňovanie vo výročnej správe v priemyselných podnikoch na Slovensku

The significant position of intelligent technologies and their disclosure in the annual report in Slovak industrial enterprises

Kornélia Lovciová

Abstract
The strategy of intelligent technology allows companies to reorganize their activities by applying digitization to their processes, which causes traditional technological processes to change into intelligent processes and points to the necessity of its implementation in the strategies of Slovak industrial companies, so that companies can maintain their prosperity on the market. The aim of the paper is to evaluate the position of intelligent technologies, because they play a key role in the transformation of production processes of industrial enterprises and the publication of information about the strategy of intelligent technology implemented in an industrial enterprise in the annual report in accordance with the Accounting Act.

Key words
Smart technology, strategy, annual report, accounting act, digitization

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Vplyv právnej úpravy na obchodné spoločnosti z titulu inštitútu spoločnosti v kríze

The impact of legal regulation on business companies due to the institution of companies in crisis

Lucia Ondrušová

Abstract
The implementation of business activity in the Slovak Republic is affected by legal regulations as well as the overall state of the business environment, which is influenced by the situation at home and in the world. Since 2016, legislation has been introduced to regulate the business environment as a result of the institution of companies in crisis, where legal impacts on companies were established, which increased the company's obligations due to obligations to shareholders and thereby put companies in trouble in connection with the payment of obligations to real creditors. Subsequently, in 2020, various restrictive measures were introduced due to the Covid-19 pandemic, which had an impact on the functioning of commercial companies, which resulted in an increase in liabilities due to various loans. Increasing credits and loans as a result of solving revenue shortfalls during the pandemic had the effect of worsening the situation in business companies due to the institution of companies in crisis.

Key words
Company in crisis, bankruptcy, threatened bankruptcy, liabilities, equity

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Účtovné a daňové riešenie zlúčenia ako typu kombinácie podnikov z pohľadu nástupníckej účtovnej jednotky v Slovenskej republike

Accounting and tax solution of a merger as a type of business combinations from the acquiring company point of view in the Slovak Republic

Martina Podmanická

Abstract
Mergers are a part of a broader issue of certain types of business joining into larger economic or legal units or division of business. This is known as business combinations in international accounting terminology. The aim of this paper is to comprehensively present and analyse the issue of mergers as type of business combinations from the acquiring company point of view in the Slovak Republic from an accounting and a tax point of view. The paper clarifies mergers transaction as possible types of business combinations; explains the fundamental concepts related to the merger, because their understanding is necessary for the correct accounting solution of given transaction; informs about the legal context of mergers to the extent necessary to explain the accounting context. The paper also presents a comprehensive accounting and tax solution to this issue from the acquiring company point of view according to the currently valid accounting and tax legislation.

Key words
Merger, acquiring company, fair value, goodwill

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3. sekcia

3rd Section

Aplikácia štatistických a aktuárskych vied v sociálno-ekonomickej oblasti

Application of statistical and actuarial sciences in social-economic area

Assessment of capital requirements under Solvency II using non-parametric copulas

Anna Denkowska, Krystian Szczęsny, Stanisław Wanat

Abstract
Given the importance of the diversification effect in determining Solvency Capital Requirements (SCRs) and some inadequacies of the standard formula that is used to estimate SCRs, in October 2020 the European Insurance and Occupational Pensions Authority (EIOPA) launched a pan-European comparative study on diversification in internal models. The subject of the paper refers to one of the goals of this research, which is a better understanding of the relationship between the methods of dependency modeling and risk aggregation, and the resulting benefits of diversification. We present here a proposal to estimate the Solvency Capital Requirement and the diversification effect for the non-life insurance premium and provisions risk sub-module. It is based on a non-parametric approach to modeling the relationship between the risk of the segments included in this sub-module.

Key words
Solvency Capital Requirement, Diversification Effect, Nonparametric estimation, piecewise linear copula, checkerboard copula

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Kapitálová požiadavka poisťovne v súlade s direktívou Solventnosť II

Capital requirement of the insurance company in accordance with the Solvency II Directive

Martina Horváthová

Abstract
The insurance sector is a very specific sector of the market. Its role is to protect the client by providing him with financial compensation for damages caused by an adverse fortuitous situation. However, in order for clients to enter into such a liberal insurance contract, they must have a sense of trust and security towards the relevant insurance company. Therefore, this entire sector is based on the trustworthiness of insurance entities. The insurance company faces several risks that can affect its financial health. Each of these risks must be looked at individually, but their connection must also be considered. The competent supervisory body monitors the development of the given insurance company and in case of violation of the regulations can fatally intervene in its activities. The capital requirement for solvency is one of the tools with which a given insurance company evaluates the financial security it needs for its smooth continuation of operations.

Key words
Solvency, capital requirement for solvency, standard formula, internal model, Solvency II

Relation between the macroeconomic factors and the life expectancy in Central European countries

Grzegorz Korbela

Abstract
The extensive literature on extrapolative stochastic mortality models mainly focuses on extrapolating past trends in mortality and summarizes these trends by one or more latent factors. However, the interpretation of these trends is usually not very clear. In contrast, multi-population mortality modeling research focuses mainly on extrapolating past mortality trends and summarizing these trends using one or more common latent factors. The aim of the study is to show that long-term life expectancy and economic growth are related to each other, which allows the use of economic factors in predictive mortality models. This relationship is studied within groups of countries with a similar welfare model, which has been the subject of research by sociologists for many years. The analysis is based in particular on the level of economic growth, represented by real gross domestic product (GDP) per capita, to capture a common trend in mortality for a group of populations with similar socio-economic conditions. The analysis covers the countries of Central Europe.

Key words
Life expectancy, macroeconomic factors, predictive mortality models

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Kybernetické riziká a ich poistiteľnosť
Cyber risks and their insurability

Zuzana Krátka

Abstract
Cyber risk is closely connected with cyberspace, which, thanks to its constant significant variability, provides relatively easy options for anonymity, which, together with time and space limitlessness, creates conditions for its abuse. This is a risk arising from the use of electronic data and its transmission. This includes physical damage caused by cyber-attacks, loss or corruption of data and its financial consequences, fraud committed by misuse of data, as well as any liability arising from failure to maintain the availability, integrity and confidentiality of electronically stored information. Cyber insurance is very important for the successful digitization of the economy. The demand for cyber insurance is currently growing more significantly than the capacity offered. In both theory and practice, it is therefore necessary to pay sufficient attention to the issue of the insurability of cyber risks.

Key words
Cyber risk, Digitization, Insurability, Cyber insurance

Konštrukcia dlhopisového portfólia v súlade s imunizačnými stratégiami
Bond portfolio construction in accordance with immunization strategies

Ľudovít Pinda

Abstract
Constructing a performing bond portfolio is a challenging process. The bond portfolio can fulfilled the function of an investment instrument, or serve as part of the technical reserves of commercial insurance companies. When investing, it is advisable to use a passive or active strategy. If the bond portfolio fulfilled the function of the assets of the insurance company's technical reserves portfolio, the immunization strategies discussed in the post must be taken into account when constructing it.

Key words
Bond portfolio, indexing, core-plus strategy, full immunization

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Softvérová podpora rozhodovacích procesov v oblasti životného poistenia
Software support of decision-making processes in the field of life insurance

Anna Strešňáková

Abstract
Decision-making processes are part of the everyday life not only of the policyholder but also of the insurer. Containing a number of conditioning conditions, criteria, preferences is difficult, so the support of the decision-making process is left to computer technology. Software support is developed not only in the applications of large companies focused on application development, but also in the field of Open source systems. In the article, we will focus on the possibilities of using these systems in the field of life insurance.

Key words
Life insurance, softvare support, open source system

Analýza disparít podielu zamestnanosti vo vzniknutých a zaniknutých podnikoch v členení podľa SK NACE a NUTS3 v rokoch 2008 až 2018

Disparity analysis of employment share of enterprise births and deaths broken down by SK NACE and NUTS3 in the years 2008-2018

Erik Šoltés, Silvia Komara

Abstract
The paper aims at the impact of demographic events of enterprises, such as their birth and death, on employment in active enterprises in the regions of the Slovak Republic from the years 2008 to 2018, while this impact is monitored within the demographics of enterprises through the following indicators: employment share of enterprise births and employment share of enterprise deaths. The aim of the paper is to reveal the net effect of three factors: year, the section of economic activities, and region on the share of employment in established enterprises and death enterprises. For this purpose, a general linear model and the associated analysis of marginal means and contrast analysis are used. The presented analyses are based on the Demography of enterprises 2008 to 2018 database, which was provided to us by the SO SR for research purposes.

Key words
Business demography, Employment share of enterprise births, Employment share of enterprise deaths, Least squares means, Contrast analysis

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Využitie stochastických modelov v analýze úmrtnosti populácie na Slovensku vo vzťahu k životnému poisteniu

Using stochastic models in the mortality analysis population in Slovakia in relation to the life insurance

Tatiana Šoltésová, Jana Kútiková

Abstract
Monitoring mortality is an important part of maintaining the stability of life insurance companies, as it is an assumption for various actuarial calculations.
The aim of the article is to analyse the development of mortality of the population of Slovakia from the establishment of the independent Slovak Republic (1993) until present (2020) using two stochastic models - Lee-Carter model and Cairns-Blake-Dowd model and to point out their applicability for different age groups of the insurance portfolio.
In the article, we compare the projection properties of individual mortality models for data from Slovakia in the age interval from 0 to 100 years, depending on the type of model. We are based on data on the mortality rate of the Slovak population obtained from the database of the Statistical Office of the Slovak Republic.

Key words
Mortality, Lee-Carter model, Cairns-Blake-Dowd model, life insurance, SAS Enterprise Guide

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Analýza prežitia Coxovým modelom proporcionálnych rizík

Survival Analysis with Cox proportional hazard model

Patrícia Teplanová

Abstract
Cox's semiparametric proportional hazard regression model is the most commonly used model in survival analysis, since it allows us to examine the explained variable survival time by explaining both quantitative and qualitative variables, without knowing the probability distribution of the hazard function. The risk component in this model represents the nonparametric component and the regression coefficients the parametric component. The model was applied to medical data in order to determine the influence of various variables on the survival time of the subjects studied.

Key words
Survival analysis, hazard function, survival function, Cox model

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Využitie ILS v kyberpoistení

Use of ILS in cyber insurance

Michal Závodný

Abstract
Cyber attacks are constantly increasing in the world, while the digital world is already a significant part of our lives in these days. It is more or less certain that this trend will continue in the coming decades, with an increasing character. Intensifying cyber attacks are a threat both to individuals and to business entities. As their frequency increases, so does the emphasis on protection and security. If an incident does occur, cyberinsurance can play a significant role. In general, this product is a combination of property and liability insurance. In connection with cyber insurance and damages resulting from it, the question arises as to how insurance companies will cover damages from these risks in the future. An option are ILS tools, the benefits of which in relation to cyber insurance are discussed in this article.

Key words
Cyber risk, cyberinsurance, securitization, ILS

Porovnanie hospodárskeho výsledku podľa IFRS 4 a IFRS 17 pre produkt životného poistenia unit-linked

Comparisson of the profit and loss under IFRS 4 and IFRS 17 for the unit-linked life insurance product

Silvia Zelinová

Abstract

The paper focuses on comparing the financial result of unit-linked investment life insurance according to two international financial standards. Both international financial standards have the same name, Insurance contracts. IFRS 17 fully replaces IFRS 4 on January 1, 2023. In 2022, insurance companies prepare financial statements according to both standards, and the purpose of this paper is to draw attention to the final difference in the financial result of the chosen life insurance product according to both standards. The unit-linked product is currently a product often offered by insurance companies, and the IFRS 17 standard itself regulates its valuation separately, using the Variable Fee Approach (VFA) method. We will present this method in detail in the paper and at the same time apply it to insurance contracts even when actuarial assumptions are changed.

Key words

Standard IFRS 17, VFA method, unit-linked product, Contractual Service Margin (CSM), Risk Adjustment (RA)

4. sekcia

4th Section

Aplikácia modelov a metód operačného výskumu a ekonometrie v ekonomickom rozhodovaní

Application of operation research and econometric models and methods in economic decision making

Management science a informačný manažment
Management science and information management

Ivan Brezina

Abstract
The innovative study program Information Management in the field of study Economics and Management is based on the symbiosis of techniques from the scientific field of management science and information technology. It was compiled in such a way as to correspond to modern trends in the development of the scientific fields of management science and information management, to support students' analytical and abstract thinking. Its structure is oriented towards the solution of current economic problems with a strong emphasis on the IT support of these solutions, which are solved by economists-informatics in a wide variety of organizations. The combination of management science and information technology should provide students with the basics of a creative approach to problem solving. Therefore, it is necessary to emphasize the importance and effectiveness of this connection.

Key words
Management science, information management

Porovnanie prognostickej presnosti rôznych metód strojového učenia
Comparing the forecast accuracy of various machine learning methods

Ádám Csápai, Erika Mináriková

Abstract
In this paper we examine the forecast accuracy of various machine learning methods. It has been shown that these methods can enhance forecast performance. We forecast inflation in Slovakia. The dataset contains 37 variables. At first, we estimate a linear regression model. This gives us the benchmark. Secondly, we estimate regularized least squares models, such as the ridge regression, lasso regression and elastic net models. Thirdly, we use ensemble machine learning techniques, namely bagging, boosting and random forests. We split the data into a training and testing sample and do point forecasts and compare the RMSE of the models. Our findings support the conclusion that our methods can improve the forecast accuracy if a relatively large dataset is available.

Key words
Machine learning, forecasting, big data, inflation

Princípy formulovania viackriteriálnej volebnej hry

Principles of formulating a multi-criteria voting game

Zuzana Čičková, Simona Chuguryan

Abstract
In game theory, multi-criteria games (games with vector payoff functions) are an extension of the standard one-criteria game, and their essence lies in expanding the number of criteria that players use when evaluating the results of their decisions. Thus, players consider more number of criteria that influence their decision making, which is connected to the same number of their payoff functions. This contribution is devoted to possible approaches to the formulation of a multi-criteria voting game. We will focus on the possible formation of a coalition from the point of view of the proximity of a political program covering several public areas. Obviously, coalition members should be close to the coalition program, but they also consider their own strength within the coalition and also coalition stability, which generally leads to the formulation of a multi-criteria programming problem.

Key words
Voting game, Multi-criteria decision making, Game theory

Modelování koopetičních vztahů

Modelling of coopetition relations

Petr Fiala

Abstract
Coopetition is a business strategy that exceeds the rules of competition and cooperation by combining the benefits of both. Coopetition combines these benefits into a new dynamics which can be used not only to generate larger profits, but also to change the nature of the business environment in favor of users. The article focuses on modelling of coopetition relations with game theory. Traditional game theory is divided into non-cooperative and cooperative models. So-called biform games combine non-cooperative and cooperative models. The coopetition model has five dimensions that the company can use to identify strategies: players, added value, rules, tactics and scope. The article proposes an extended coopetition model of the biform game based on negotiations between the participants in the solved problem.

Key words
Coopetition, Competition, Cooperation, Biform game, Negotiation

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Špecifický prístup z teórie hier pri výbere umiestnenia predajne v nákupných centrách

A specific approach from game theory in choosing the location of a store in a shopping centers

Pavel Gežík

Abstract
The paper is about the choice of store location in a shopping center, but also about the general aspect of choosing the location of brick-and-mortar stores in the space, or in the city. It would be rational to use location models for choosing the location of the store. It would ensure an appropriate location of the store with regard to possible customers and evenly position the store with regard to its competitors. In reality, However, in real life, it can be seen the opposite approach is common when the same or similar shops are grouped in one place. This situations is explains by Nash equilibrium theory. The article describes the general aspects of this seemingly irrational location of brick-and-mortar stores in the space or in the town. It explains the concept of " Hotelling's Game" and the concept of "Median Customer Theorem with an Even Number of Competitors" in the context of game theory. It illustrates these terms on a specific example of the changing of location the TELCO brick-and-mortar store in shopping center. It also analyzes the location of the stores of the three largest TELCO retailers in the Slovak Republic in the largest shopping center in the Slovak Republic.

Key words
Game Theory, Hotelling's Game, TELCO brick-and-mortar stores

Priestorová analýza vybraných ukazovateľov sčítania domov a bytov 2021 v Slovenskej republike

Spatial Analysis of Selected Indicators of 2021 Housing Census in the Slovak Republic

Michaela Chocholatá

Abstract
This paper deals with the spatial analysis of selected indicators of the 2021 Housing Census in the Slovak Republic (number of houses with gas connection, number of houses with sewerage connection, number of flats with flush toilet in the flat, number of flats with bath or shower in the flat) using local univariate and multivariate Geary statistics. The spatial analysis was performed using a weight matrix of the type „queen". The results of analyses based on both univariate and multivariate Geary statistics confirm the significant impact of the geographical location of the region in space and also make it possible to identify regions with similar univariate and multivariate profile, respectively as their neighbouring regions. Based on four-dimensional Geary statistics, 38 districts with a similar profile were identified.

Key words
2021 Housing Census, the Slovak Republic, spatial analysis, local univariate and local multivariate Geary statistics

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Vplyv inflácie na modelovanie prepínania režimov výnosov
Impact of Inflation on Modeling Switching Regimes of Returns

Marian Reiff, Juraj Pekár

Abstract
We are currently observing often changes in sentiment on the financial markets. The investor must react in time and adapt investment strategies. To determine market states, it is possible to use the Markov switching model, which can be estimated in what state the market is in. In view of the mentioned approach, the aim is the identification and subsequent division of the time periods analyzed into bull and bear markets, the returns of which are used for the subsequent analysis of investment strategies. Decision-making assumptions can then also include the assumption of the emergence of, for example, a crisis and, therefore, modification of the investor's strategy based on the situation in which the market is. The aim of the paper is to present the possible use of the Markov switching model for the distribution of the period and to use this information to determine the investor's strategy. The case study was carried out on the historical data of the components of the S&P500 stock index and information about inflation PPIACO - Producer Price Index by Commodity.

Key words
Markov Switching Model, Bear Market, Bull Market

Prehľad prístupov k analýzam ekonomických dosahov pandémií
Review of Approaches to Pandemics' Economic Impacts Analyses

Karol Szomolányi, Adriana Lukáčiková, Martin Lukáčik

Abstract
The COVID-19 pandemic has triggered a global economic crisis. The academic world responded with many scientific outputs analysing the economic impacts of the pandemic outbreaks. This review focuses on some papers with a mathematical background. There are three classes of epidemic macro models: two-way interaction between the epidemic and the macroeconomy, one-way interaction, and reduced-form models. Two-way models suppose optimal choices of the agents include the state of the epidemic and the impact of their macro decisions on the epidemic. Unlike the one-way approach assumes that the epidemic is pre-simulated. Reduced form models feature macroeconomic choices independent of the epidemic.

Key words
COVID-19 pandemic, two-way models, one-way models, reduced-form models

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2. sekcia / 2nd section
Aktuálne trendy vývoja teórie a praxe účtovníctva a audítorstva
Current trends of development of accounting and auditing theories and practise

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3. sekcia / 3rd section
Aplikácia štatistických a aktuárskych vied v sociálno-ekonomickej oblasti
Application of statistics and actuarial sciences in social-economic areas

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4. sekcia / 4th section
Aplikácia modelov a metód operačného výskumu a ekonometrie v ekonomickom rozhodovaní
Application of operational research and econometrics models and methods in economic decision making

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